

Bryozoa : The ascophorine infraorders Cribriomorpha, Hippothoomorpha and Umbonulomorpha mainly from New Caledonian waters

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ABSTRACT

The present paper deals with bryozoans in three of the four infraorders of the large suborder Ascophorina (order Cheilostomatida) from MUSORSTOM cruises along the northern Norfolk Ridge and around New Caledonia (including five species from the MUSORSTOM 3 cruise to the Philippines included with the other material). A total of 44 species is recorded (Cribriomorpha : 35 species; Hippothoomorpha : 1 species; Umbonulomorpha : 8 species) of which 22 species are new. A noteworthy feature in New Caledonian waters is the remarkable diversity of two families — the Petalostegidae and Bifaxariidae. Proportionally more species of these families are found here than anywhere else in the world.

RÉSUMÉ

Bryozoa : Les infra-ordres des Ascophorina : Cribriomorpha, Hippothoomorpha et Umbonulomorpha.

Ce travail traite des Bryozoaires appartenant à trois des quatre infra-ordres du grand sous-ordre des Ascophorina (ordre des Cheilostomatida) récoltés, lors des campagnes MUSORSTOM et assimilées, sur la rive de Norfolk et autour de la Nouvelle-Calédonie. Cinq autres espèces, récoltées lors de la campagne MUSORSTOM 3 aux Philippines, sont également prises en considération.

Au total 44 espèces ont été identifiées (35 Cribriomorpha; 1 Hippothoomorpha; 8 Umbonulomorpha) parmi lesquelles 22 sont nouvelles.

Il est intéressant de noter la remarquable diversité des deux familles des Petalostegidae et des Bifaxariidae dans les eaux néo-calédoniennes. Proportionnellement, plus d'espèces appartenant à ces deux familles y sont trouvées que partout ailleurs dans le monde.

INTRODUCTION

The marine benthic fauna of the New Caledonian Exclusive Economic Zone, historically little known, has recently become the focus of a number of systematic studies. The results of these studies, summarised in part by RICHER DE FORGES (1990) have highlighted some remarkable features of this fauna, especially the high diversity, the large numbers of new species, and, in certain locations such as along the northern Norfolk Ridge, the relatively high proportion of archaic taxa.

Studies of the Bryozoa of this region, still ongoing, show these kinds of features also. D'HONDT (1986) recorded 226 species from the Chesterfield Plateau and around New Caledonia. Seventeen were described as new, but judging from the large number of taxa unidentified to species level (67 species), the number of new species is likely to be higher than indicated. GORDON and D'HONDT (1991), as part of an ongoing study of the Bryozoa from several MUSORSTOM cruises, noted the remarkably high diversity of the previously little-known family Petalostegidae in New Caledonian waters, including several species of the genus *Chelidozoum*, hitherto known only from the Australian Miocene.

The present paper deals with three of the four infraorders of the large suborder Ascophorina (including five species from the MUSORSTOM 3 cruise to the Philippines which happened to be among the material dealt with by the author).

LIST OF STATIONS

Philippines

MUSORSTOM 3

Station DR 117. — 3.6.85, 12°31.3' N, 120°39.5' E, 97-92 m : *Adeonellopsis pentapora*, *Adeonellopsis* sp., *Celleporaria sibogae*, *Talivittaticella nuda*.

Station CP 139. — 6.6.85, 11°52.9' N, 121°14.7' E, 240-267 m : *Celleporaria aperta*.

New Caledonia

BIOCAL

Station DW 08. — 12.8.85, 20°34.35' S, 166°53.90' E, 435 m : *Chelidozoum quinarium*, *Costaticella peltata*.

Station CP 13. — 13.8.85, 20°18.53' S, 167°17.65' E, 3690 m : *Bifaxaria gracilis*, *Bifaxaria submucronata*.

Station DS 14. — 13.8.85, 20°18.09' S, 167°17.70' E, 3680 m : *Bifaxaria gracilis*.

Station CP 17. — 14.8.85, 20°34.54' S, 167°24.68' E, 3680 m : *Bifaxaria gracilis*.

Station CP 30. — 29.8.85, 23°07.26' S, 166°50.45' E, 850 m : *Bifaxaria modesta*.

Station DW 33. — 29.8.85, 23°09.71' S, 167°10.27' E, 675 m : *Bifaxaria bicuspis*, *Celleporaria mamillata*, *Diplonotos obesus*.

Station DW 36. — 29.8.85, 23°08.64' S, 167°10.99' E, 650 m : *Chelidozoum ternarium*, *Diplonotos confragus*, *Diplonotos serratus*, *Petalostegus harmeri*, *Terminocella perlucens*.

Station DW 38. — 30.8.85, 22°59.74' S, 167°15.31' E, 360 m : *Bifaxaria bicuspis*.

Station DW 44. — 30.8.85, 22°47.30' S, 167°14.30' E, 440 m : *Chelidozoum ternarium*.

Station DW 46. — 30.8.85, 23°00.43' S, 167°28.76' E, 775 m : *Chelidozoum quinarium*, *Chelidozoum ternarium*, *Gemellipora eburnea*, *Petalostegus bicornis*, *Petalostegus harmeri*, *Petalostegus vexillum*, *Terminocella perlucens*.

Station DW 51. — 31.8.85, 23°05.27' S, 167°44.95' E, 700 m : *Diplonotos similis*.

Station CP 55. — 1.9.85, 23°19.76' S, 167°30.46' E, 1175 m : *Diplonotos serratus*.

Station CP 58. — 1.9.85, 23°56.52' S, 166°40.55' E, 2660 m : *Bifaxaria submucronata*.

Station CP 61. — 2.9.85, 24°11.67' S, 167°31.37' E, 1070 m : *Petalostegus bicornis*.

Station CP 62. — 2.9.85, 24°19.06' S, 167°48.65' E, 1395 m : *Bifaxaria multicostata*, *Bifaxaria submucronata*, *Terminocella perlucens*.

Station DW 64. — 3.9.85, 24°47.93' S, 168°09.12' E, 250 m : *Gemellipora eburnea*.

- Station DW 65. — 3.9.85, 24°47.90' S, 168°09.09' E, 275 m : *Celleporaria macrodon*, *Gemellipora eburnea*, *Puellina harmeri*.
- Station DW 66. — 3.9.85, 24°55.43' S, 168°21.67' E, 515 m : *Chelidozoum quinarium*, *Klugerella musica*, *Petalostegus harmeri*, *Petalostegus pseudospinosus*, *Petalostegus scopulus*, *Raxifabia vafra*, *Strongylopora gracilis*, *Terminocella perlucens*.
- Station CP 67. — 3.9.85, 24°55.44' S, 168°21.55' E, 500 m : *Strongylopora gracilis*.
- Station DW 70. — 4.9.85, 23°24.70' S, 167°53.65' E, 965 m : *Bifaxaria modesta*, *Diplonotos serratus*, *Petalostegus scopulus*.
- Station KG 71. — 4.9.85, 22°04.85' S, 167°32.70' E, 2099 m : *Diplonotos serratus*.
- Station CP 72. — 4.9.85, 22°09.02' S, 167°33.18' E, 2100 m : *Bifaxaria submucronata*.
- Station CP 75. — 4.9.85, 22°18.65, 167°23.30' E, 825 m : *Diplonotos serratus*, *Domosclerus edulis*, *Raxifabia rara*.
- Station CP 109. — 9.9.85, 22°10.03' S, 167°15.22' E, 495 m : *Diplonotos minus*, *Gemellipora eburnea*.

MUSORSTOM 4

- Station DW 151. — 14.9.85, 19°07.00' S, 163°22.00' E, 200 m : *Bifaxaria compacta*, *Celleporaria macrodon*, *Gemellipora eburnea*.
- Station CP 153. — 14.9.85, 19°04.20' S, 163°21.20' E, 235 m : *Gemellipora eburnea*.
- Station CP 194. — 19.9.85, 18°52.80' S, 163°21.70' E, 550 m : *Diplonotos confragus*.
- Station DW 222. — 30.9.85, 22°57.60' S, 167°33.00' E, 410-440 m : *Chelidozoum ternarium*.
- Station DW 231. — 1.10.85, 22°33.70' S, 167°10.50' E, 75 m : *Celleporaria columnaris*, *Celleporaria fusca*.

CHALCAL 2

- Station DW 73. — 29.10.86, 29°39.90' S, 168°38'10' E, 573 m : *Diplonotos obesus*.
- Station DW 76. — 30.10.86, 23°40.50' S, 167°45.20' E, 470 m : *Diplonotos confragus*, *Diplonotos obesus*, *Diplonotos serratus*.
- Station DW 77. — 30.10.86, 23°38.35' S, 167°42.68' E, 435 m : *Diplonotos confragus*, *Diplonotos serratus*.
- Station DW 78. — 30.10.86, 23°41.30' S, 167°59.60' E, 233-360 m : *Diplonotos confragus*.

BIOGEOCAL

- Station CP 205. — 8.4.87, 22°40.61' S, 166°28.01' E, 1350-1380 m : *Bifaxaria menorah*, *Diplonotos* sp., *Petalostegus bicornis*.
- Station CP 214. — 9.4.87, 22°43.09' S, 166°27.19' E, 1665-1590 m : *Diplonotos confragus*, *Diplonotos* sp., *Petalostegus bicornis*, *Raxifabia porosa*.
- Station CP 232. — 12.4.87, 21°33.81' S, 166°27.07' E, 760-790 m : *Diplonotos confragus*, *Domosclerus edulis*.
- Station DW 253. — 16.4.87, 21°31.75' S, 166°28.73' E, 310-315 m : *Membraniporella skeletos*.
- Station CP 260. — 17.4.87, 21°00.00' S, 167°58.34' E, 1820-1980 m : *Domosclerus* sp.
- Station CP 265. — 18.4.87, 21°04.09' S, 167°00.40' E, 1760-1870 m : *Bifaxaria menorah*.
- Station CP 273. — 20.4.87, 21°01'53' S, 166°57'41' E, 1920-2040 m : *Domosclerus* cf. *abyssicolus*.
- Station CP 290. — 27.4.87, 20°36.91' S, 167°03.34' E, 920-760 m : *Diplonotos confragus*, *Diplonotos serratus*, *Petalostegus bicornis*.
- Station DW 296. — 28.4.87, 20°38.35' S, 167°10.32' E, 1230-1270 m : *Diplonotos sulcatus*.
- Station CP 297. — 28.4.87, 20°38.64' S, 167°10.77' E, 1230-1240 m : *Diplonotos confragus*.
- Station DW 308. — 1.5.87, 20°40.07' S, 166°58.05' E, 510-590 m : *Gemellipora eburnea*, *Membraniporella musica*.
- Station DW 313. — 2.5.87, 20°58.95' S, 166°59.04' E, 1640-1600 m : *Bifaxaria menorah*.

MUSORSTOM 6

- Station CP 465. — 21.2.89, 21°03.55' S, 167°32.25' E, 480 m : *Gemellipora eburnea*.

SMIB 4

- Station DW 37. — 7.3.89, 24°54.50' S, 168°22.30' E, 540 m : *Petalostegus harmeri*.
- Station DW 39. — 7.3.89, 24°56.20' S, 168°21.50' E, 560 m : *Petalostegus harmeri*, *Petalostegus pseudospinosus*.

Station DW 50. — 9.3.89, 23°42.20' S, 168°00.80' E, 295 m : *Chelidozoum binarium*.

Station DW 55. — 9.3.89, 23°21.40' S, 168°04.50' E, 260 m : *Gemellipora eburnea*.

Station DW 58. — 9.3.89, 22°59.80' S, 167°24.20' E, 560 m : *Petalostegus vexillum*.

SYSTEMATIC ACCOUNT

Suborder ASCOPHORINA Levinsen, 1909

Infraorder CRIBRIOMORPHA Harmer, 1926

Superfamily CRIBRILINOIDEA Hincks, 1879

Family CRIBRILINIDAE Hincks, 1879

Genus *KLUGERELLA* Moyano, 1991

TYPE SPECIES. — *Membraniporella antarctica* Kluge, 1914.

Klugerella musica sp. nov.

Fig. 1 a

MATERIAL EXAMINED. — New Caledonia. BIOCAL : stn DW 66, 515 m.

BIOGEOCAL : stn DW 308, 510-590 m.

DESCRIPTION. — Colony encrusting, uniserial and branching. Zooids 0.64-1.00 mm long and 0.25-0.42 mm wide, elongate-oval with a tapering proximal portion (cauda) which is proportionally longer in zooids budded distally than in those budded laterally. Opesia extensive, overarched by 12-14 pairs of costal spines which fuse in the midline, forming a narrow carina; each lateral spine roughly the shape of a tuning fork, with 2 prongs, the 'stem' of each fork narrower than the base, leaving a lacuna between each pair of spines; proximal costae not bifurcated. Lumen pores absent. Orifice simple, bordered by the most distal pair of costal spines proximally and rimmed by 6-7 oral spines distally and laterally; the oral spines alicorn, the proximal pair largest, with 3 tines, the other spines with 2 tines. No avicularia. Ovicell not known.

TYPES. — *Holotype* : a small colony on a piece of sponge from BIOCAL Stn DW 66, 24°55.43' S, 168°21.67' E, 515 m, northern Norfolk Ridge, MNHN-Bry 19872.

Paratype : MNHN-Bry 19872, two zooids from BIOGEOCAL stn DW 308, 20°40.07'S, 166°58.05' E, 510-590 m.

DISTRIBUTION. — New Caledonia and northern Norfolk Ridge, 510-590 m.

REMARKS. — This species bears a superficial resemblance to *Cribrilina alcornis* Jullien in the appearance of the oral spines, but that species has unbranched costae with several lateral fusions between them. The oral spines of *C. alcornis* are fewer (4) and more branched.

The species name *musica* refers to the tuning-fork shape of the costae.

Genus *MEMBRANIPORELLA* Smitt, 1873

TYPE SPECIES. — *Lepralia nitida* Johnston, 1838.

Membraniporella skeleton sp. nov.

Fig. 1 b-c

MATERIAL EXAMINED. — New Caledonia. BIOGEOCAL : stn DW 253, 310-315 m.

DESCRIPTION. — Colony encrusting, multiserial. Zooids 0.59-0.86 long and 0.42-0.47 mm wide. Opesia overarched by a shield of 13-15 costal spines which fuse in the midline; tiny raised lumen pores mark the position of each costal tip in the fusion area; the costae simple, unbranched, with a lacuna almost the full length between each pair. Oral spines 6, slender. Avicularia interzooidal, relatively conspicuous, usually 1 per zooid proximolaterally on the gymnocyst, somewhat irregular in shape, the rostrum orientated obliquely proximally, no cross-bar. Kenozooids present at the colony periphery, the opesia longitudinally oval, with extensive gymnocyst. Ovicell not known.

TYPE. — Unique *holotype* : a small colony from BIOGEOCAL stn DW 253, 21°31.75' S, 166°28.73' E, 310-315 m. Loyalty Islands Basin, MNHN-Bry 19873.

DISTRIBUTION. — New Caledonia, 310-315 m.

REMARKS. — The irregular shape of the avicularia is distinctive. The name of the species alludes to the resemblance of the costal shield to a rib cage.

Genus *PUELLINA* Jullien, 1886

TYPE SPECIES. — *Lepralia gattyae* Landsborough, 1852.

Puellina harmeri (Ristedt, 1985)

Cribrilaria harmeri Ristedt, 1985 : 26, pl. 6a-e, 7a-k, 8a-j, 9a-d.

MATERIAL EXAMINED. — New Caledonia. BIOCAL : stn DW 65, 275 m.

DISTRIBUTION. — Zamboanga, Mindanao (Philippines), 3 m; northern Norfolk Ridge, New Caledonia, 275 m.

REMARKS. — The characters of the present specimen accord perfectly with those described by RISTEDT (1985), viz. seven oral spines (four in ovicelled zooids), subpedunculate avicularia, and similar ovicell, suboral bar, ascopore, and numbers of costae. By the criteria given in BISHOP & HOUSEHAM (1987) and HARMELIN & ARISTEGUI (1988), this species may be included in subgenus *Glabrilaria*, although, as the latter authors have pointed out, all the characters discriminating the subgenera are more or less intergradational. HARMELIN & ARISTEGUI (1988) consider *P. harmeri* to be part of a clade of species derivable from a Tethyan ancestor.

Superfamily CATENICELLOIDEA Busk, 1852

Family CATENICELLIDAE Busk, 1852

Subfamily SCUTICELLINAE Stach, 1934

Genus *COSTATICELLA* Maplestone, 1899

TYPE SPECIES. — *Catenicella lineata* MacGillivray, 1895.

Costaticella peltata sp. nov.

Fig. 1 d-e

MATERIAL EXAMINED. — New Caledonia. BIOCAL : stn DW 08, 435 m.

DESCRIPTION. — Colony erect, branching, the main colony axis of bizooidal segments only, from which arise branches of unizooidal and bizooidal segments. The proximal zooid of a bizooidal pair 0.70-0.90 mm long (joint to joint); unizooidal segments 0.83-0.94 mm long and 0.44-0.51 mm wide; the distal zooid of a bizooidal segment arises from the side of the parent zooid at an angle of 70-90°. Zooids with an extensive costal shield of 24-33 spines, each with an infracostal window at its proximal end; no median carina at the fusion point. Orifice as wide (0.12-0.21 mm) as high, with the larger dimensions pertaining to the proximal zooids of bizooidal segments; condyles tiny, acicular. Any zooid may have one or both distolateral corners prolonged into a spine-like process with an associated interior chamber. Proximal to this process, usually on both sides, is a tiny avicularium with complete cross-bar. Immediately proximal to the avicularium is a tiny pore-chamber. On each side of a singlet zooid and the proximal zooid of a bizooidal segment is another tiny pore-chamber. Fertile segment not known.

TYPES. — *Holotype* : colony from BIOCAL Stn DW 08, 20°34.35' S, 166°53.90' E, 435 m, Loyalty Islands Basin, MNHN-Bry 19842.

Paratype : MNHN-Bry 19876, a small attached colony and a colony fragment from same locality as holotype.

DISTRIBUTION. — New Caledonia, 435 m.

REMARKS. — *Costaticella peltata* is very similar to the type species, *C. lineata* (MacGillivray), from the Lower Miocene of Victoria. According to STACH (1934), *C. lineata* is a senior synonym of *C. escharoides* Maplestone, and the species is characterised by overall similar dimensions and the same number of costal spines as *C. peltata*. STACH's (1934) description shows that *C. lineata* may be distinguished, however, by the size and disposition of the pore-chambers and coelomic compartments. He does not mention avicularia.

The species name *peltata* (Latin) means armed with a shield.

Genus *TERMINOCELLA* Harmer, 1957

TYPE SPECIES. — *Terminocella vittata* Harmer, 1957.

Terminocella perlucens Harmer, 1957

Fig. 1 f-h

Vittaticella perlucens Harmer, 1957 : 779, pl. 50, fig. 12.

MATERIAL EXAMINED. — New Caledonia. BIOCAL : stn DW 36, 650 m. — Stn DW 46, 570 m. — Stn CP 62, 1395 m. — Stn DW 66, 505-515 m.

DESCRIPTION. — Colony erect, branching, the main axes of bizooidal segments only, from which arise branches of mostly singlet segments. Singlet zooids 0.59-0.77 mm long and 0.25-0.36 mm wide (not including the distolateral processes). Frontal shield smooth. Lateral pore-chambers (vittae) very long and narrow, not visible frontally, with internal pore canals that are fairly conspicuous when seen in transparency. Orifice with concave proximal rim, the condyles small, pointing into the interior; in the middle of the proximal rim is a minute suture and pore indicative of vestigial costae. Distolateral corners of the zooid variable - 1 or both sides may be expanded into processes pointing more or less distolaterally, some almost laterally, or these lacking. A small chamber opening occurs at the distal end of each zooid either side of the joint. A small avicularium occurs on 1 or both sides of the zooid adjacent to the distal orificial rim; a small chamber opening occurs between the avicularium and the lateral pore-chamber. Daughter zooids of a bizooidal segment arise from a distolateral corner of the parent zooid at an angle of about 12°. Fertile segment not known.

DISTRIBUTION. — Ceram, Banda Sea (Indonesia), 567-1595 m; New Caledonia, 505-1395 m.

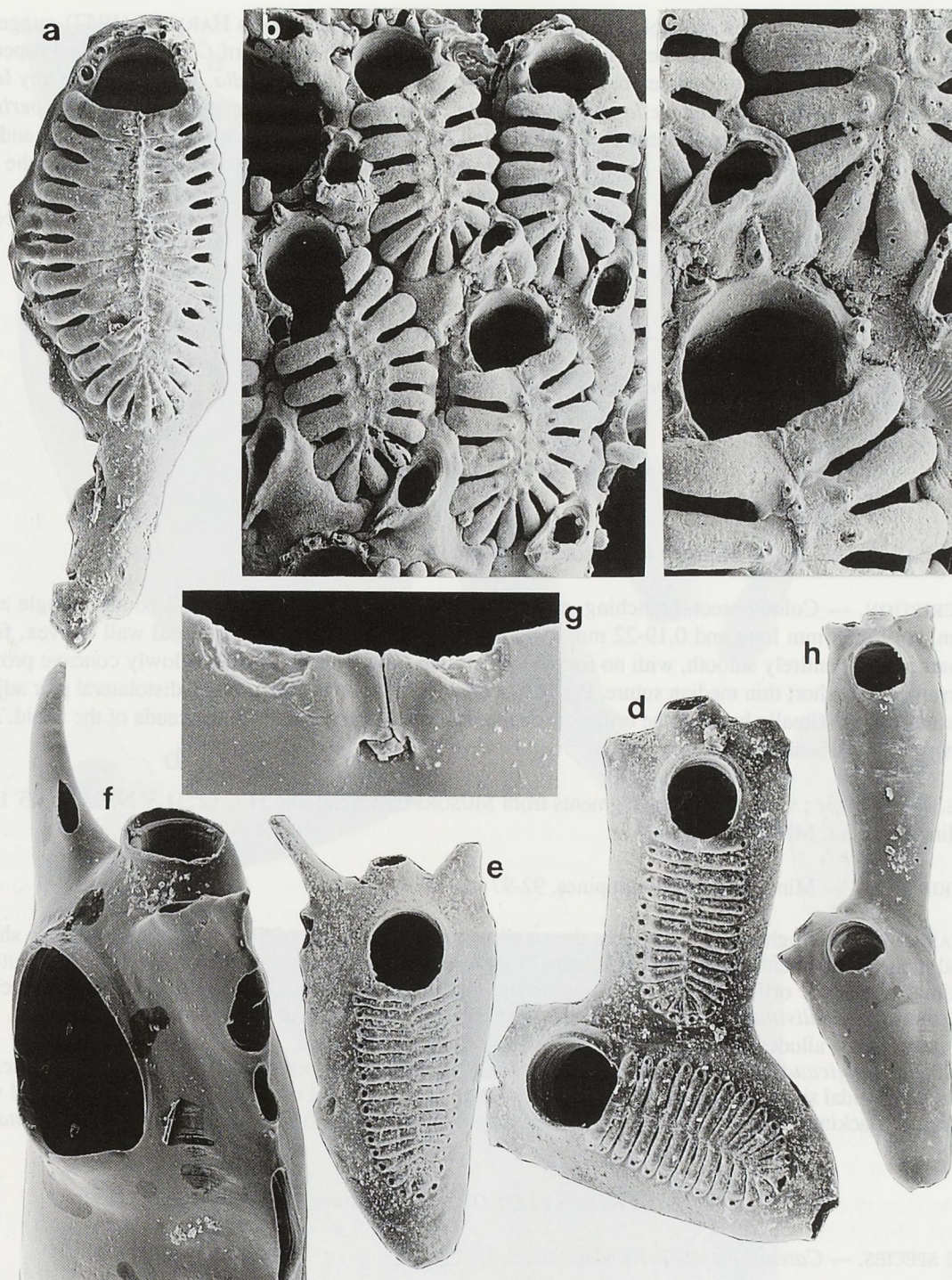


FIG. 1 a. — *Klugerella musica* sp. nov. : frontal view of autozooid (BIOCAL Stn DW 66).

FIG. 1 b-c. — *Membraniporella skeletos* sp. nov. : b, frontal view of autozooids and interzooidal avicularia; c, close-up of part of b (BIOGEOCAL Stn DW 253).

FIG. 1 d-e. — *Costaticella peltata* sp. nov. : d, bizooidal segment; e, unizoooidal segment (BIOCAL Stn DW 08).

FIG. 1 f-h. — *Terminocella perlucens* (Harmer) : f, anterior part of unizoooidal segment showing distolateral processes and avicularium; g, close-up of middle part of proximal rim; h, bizooidal segment (BIOCAL Stn DW 46).

REMARKS. — This species probably should be included in *Terminocella* as HARMER (1957) suggested. Although the longitudinal pore-chambers (vittae) resemble those in some species of *Catenicella*, and especially *Cornuticella*, they also very closely resemble those in the type species of *Terminocella*. The absence of any frontal foramina would be unusual in *Catenicella* and *Cornuticella*, whereas both *Terminocella vittata* and *T. perlucens* lack them. Furthermore, the arrangement of avicularia and chambers is the same in these two species and both occur at bathyal depths. Only fertile zooids will prove the point but *Terminocella* appears to be the most appropriate genus for *perlucens*.

Apart from species of *Talivittaticella*, *Terminocella perlucens* is the only other catenicellid known to occur in waters deeper than 1000 m.

Genus *TALIVITTATICELLA* Gordon & d'Hondt, 1985

TYPE SPECIES. — ?*Orthoscuticella problematicum* d'Hondt, 1981.

Talivittaticella nuda sp. nov.

Fig. 2 a-c

MATERIAL EXAMINED. — **Philippines.** MUSORSTOM 3 : stn DR 117, 97-92 m.

DESCRIPTION. — Colony erect, branching, comprising small jointed segments of 1-2 zooids. Single zooids claviform, 0.49-0.58 mm long and 0.19-0.22 mm wide, tapering narrowly proximally. Basal wall convex, frontal shield markedly so, entirely smooth, with no foramina or costae *per se*. Orifice with shallowly concave proximal rim interrupted by a short thin median suture. Pore areas extremely shallow, a long broad distolateral pair adjacent to, and extending proximally beyond, the orifice; a smaller lateral pair on the sides of the cauda of the zooid. Joints dark brown. Avicularia and ovicells not known.

TYPE. — *Holotype* : slide of colony fragments from MUSORSTOM 3 Stn DR 117, 12°31.3' N, 120°39.5' E, 97-92 m, Mindoro Strait, MNHN-Bry 19874.

DISTRIBUTION. — Mindoro Strait, Philippines, 92-97 m.

REMARKS. — Although this species lacks the small costal shield typical of *Talivittaticella*, the large shallow pores and their arrangement are very characteristic of the genus. Furthermore, the presence of a median suture in the proximal rim of the orifice indicates a relationship with costate species. Only the finding of an ovicell can settle the matter but *Talivittacella* is the only available genus for this species at the present time.

The species name alludes to the nearly featureless appearance of the zooids.

Vittaticella longicaudata Harmer appears to be similar in form but HARMER'S (1957) illustration indicates a slightly larger zooidal size. He also described avicularia, the exterior pores of coelomic chambers, and lateral vittae, all of which are lacking in *T. nuda*. The angle of branching differs too (40° in *T. nuda*, 69° in *V. longicaudata*).

Genus *STRONGYLOPORA* Maplestone, 1899

TYPE SPECIES. — *Catenicella pulchella* Maplestone, 1880.

Strongylopora gracilis sp. nov.

Fig. 2 d-g

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL : stn DW 66, 505 m. — Stn CP 67, 510 m.



FIG. 2 a-c. — *Talivittaticella nuda* sp. nov. : a, anterior view of distal zooid in c, showing the orifice with median slit and the extremely shallow pore-chambers (vittae); b, lateral view of unizoooidal segment showing pore-chambers; c, bizoooidal segment (MUSORSTOM 3 Stn DR 117).

FIG. 2 d-g. — *Strongylopora gracilis* sp. nov. : d, bizoooidal segment; e, lateral view of unizoooidal segment; f, frontal view of unizoooidal segment; g, close-up of proximal part of orifice (BIOCAL Stn DW 66).

DESCRIPTION. — Colony erect, branching, delicate, the branches mainly of alternating unizoidal and bizoidal segments, but short series of 2-3 singlet zooids may occur. Single zooids 0.59-0.75 mm long and 0.22-0.26 mm wide, somewhat claviform, slender overall, the proximal third tapering narrowly. Frontal shield smooth, with 2 frontolateral rows of windows, usually 5 on each side, with 2 more proximally on the cauda. Orifice with a gently concave proximal rim formed from a pair of reduced costal spines separated by a median suture and tiny foramen. Distolateral corners of zooids not prolonged; typically a pair of small distolateral avicularia adjacent to the orifice, and the tiny opening of a small chamber just below each avicularium. Ovicell not known.

TYPES. — *Holotype* : colony from BIOCAL Stn DW 66, 24°54.84' S, 168°21.99' E, 505 m, MNHN-Bry 19841, from same locality as holotype.

Paratype : MNHN-Bry 19875, from same locality as holotype.

DISTRIBUTION. — Northern Norfolk Ridge, 505-510 m.

REMARKS. — The type species of *Strongylopora* has an orificial sinus which is framed by vestigial costal spines (BANTA & WASS, 1979). HARMER (1957) included a non-sinusoid species, *S. benepennata*, in this genus - as in other genera (e.g., *Orthoscuticella*, *Cribricellina*), the occurrence of an ascopore or sinus or neither depends on the degree of expression of the vestigial costal field and is not as important a generic character as the organisation of the rest of the frontal shield.

The species name is a Latin adjective meaning slender.

Subfamily DITAXIPORINAE Stach, 1935

Several colonies, some fertile, were taken from a station in the Loyalty Islands Basin (BIOGEOCAL Stn DW 313, 1640-1600 m) and two stations on the northern Norfolk Ridge (BIOCAL Stn DW 70, 965 m; MUSORSTOM 4 Stn CP 214, 425-440 m). They represent a new genus and species of the catenicellid subfamily Ditaxiporinae. This subfamily was, until recently, known only from the Miocene of Australia; however, GORDON (1989a) recognised that a species from a N.Z. Oceanographic Institute station on the western slope of the Norfolk Ridge north of Norfolk Island represented a new species of *Plagiopora*. The finding of another ditaxiporine species on the northern Norfolk Ridge is of great interest. A preliminary study indicates that the subfamily may also include European and North American Eocene species presently included in the related family Ditaxiporinidae. Accordingly, the description of the new genus and species in the MUSORSTOM Collection will be given in a revision of the Ditaxiporinae and Ditaxiporinidae to be published in a later volume of Résultats des Campagnes MUSORSTOM.

Family PETALOSTEGIDAE Gordon, 1984

Genus *PETALOSTEGUS* Levinsen, 1909

Five species of *Petalostegus* were recorded in the present collections by GORDON & D'HONDT (1991). These included *P. bicornis* (Busk, 1884), *P. harmeri* Gordon & d'Hondt, 1991, *P. scopulus* Gordon & d'Hondt, 1991, and *P. vexillum* Gordon & d'Hondt, 1991. A fifth species was erroneously recorded as *P. spinosus* Powell, 1967. Since the paper of GORDON and D'HONDT (1991) it became possible to examine the holotype of *P. spinosus* and, surprisingly, it differs from the New Caledonian material which is now named below as a new species.

Petalostegus pseudospinosus sp. nov.

Petalostegus spinosus - GORDON & D'HONDT, 1991 : 99, pl. 4, B-G. Non Powell, 1967.

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL : stn DW 66, 515 m.
SMIB 4 : stn DW 39, 560 m.

DESCRIPTION. — See description of *P. 'spinosus'* in GORDON and D'HONDT (1991)

TYPES. — *Holotype* : colony from BIOCAL Stn DW 66, 24°55.43' S, 168°21.67' E, 515 m, MNHN-Bry 18950.

Paratype : NZOI P-948, from SMIB 4 Stn DW 39, 24°56.2' S, 168°21.5' E, 560 m.

DISTRIBUTION. — Northern Norfolk Ridge, 515-560 m.

REMARKS. — Two slides of holotype material of *Petalostegus spinosus* were made available from the Natural History Museum, London - 1964.8.12.1A comprises two branch fragments; 1964.8.12.1E comprises a separately mounted fertile segment with a broken ovicell. A critical feature of this species not mentioned in POWELL's (1967) description is that the female zooid has six costae, whereas there are only five in *P. pseudospinosus*. Thus three species are now known to have six costae in the female zooid, the other two being *P. bicornis* and *P. scopulus*. There are some differences in the autozooids as well - those in *P. spinosus* have more variably orientated avicularia and, while the geniculate process in both species can be somewhat spur-like, there is an additional spur, shaped somewhat like a rose thorn, on the dorsal side in *P. spinosus* at the point where the cauda expands into the dilatation. The depth distribution of the two species differs as well - *P. spinosus* is known only from 64-73 m off northern New Zealand.

The recognition of another new species of *Petalostegus* in the MUSORSTOM collection underscores the remarkable diversity of this family in New Caledonian waters.

Genus *CHELIDOZOOM* Stach, 1935

Three species of *Chelidozoum* were recorded in the present collections by GORDON and D'HONDT (1991) - these were *C. binarium* Gordon & d'Hondt, 1991, *C. quinarium* Gordon & d'Hondt, 1991, and *C. ternarium* Gordon & d'Hondt, 1991.

Superfamily BIFAXARIOIDEA Busk, 1884

Family BIFAXARIIDAE Busk, 1884

Genus *BIFAXARIA* Busk, 1884

TYPE SPECIES. — *Bifaxaria submucronata* Busk, 1884.

Bifaxaria submucronata Busk, 1884

Fig. 3 a-d, 18 a-e

Bifaxaria submucronata Busk, 1884 : 80, pl. 13, figs 1, 1a. — WATERS, 1889 : 14, pl. 1, fig. 6, pl. 3, fig. 18. — HARMER, 1957 : 861, pl. 57, figs 1-3, 19, 22. — HAYWARD & COOK, 1979 : 86, fig. 11c. — HAYWARD, 1981 : 46, fig. 24A.

Non *Bifaxaria submucronata* - GORDON, 1988 : 259, figs 28-31 (= *Bifaxaria modesta* sp. nov.).

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL : stn CP 13, 3690-3740 m. — Stn CP 58, 2750 m. — Stn CP 62, 1395 m. — Stn CP 72, 2110 m.

BIOGEOCAL : stn CP 260, 1820-1980 m. — Stn CP 273, 1920-2040 m.

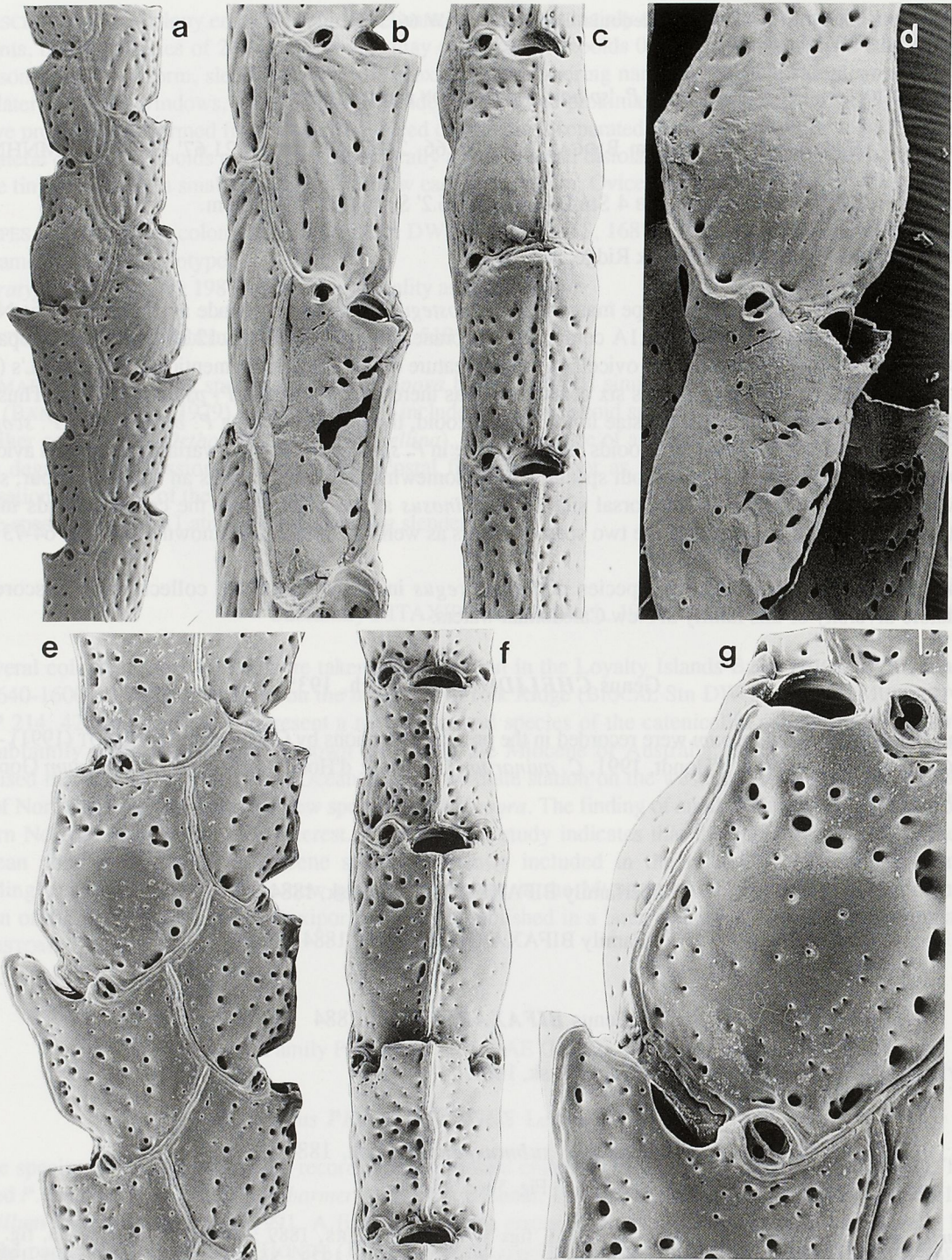


FIG. 3 a-d. — *Bifaxaria submucronata* (Busk) : a, lateral view of zooidal branch showing two ovicelled zooids; b, several zooids, with part of the outer umbonuloid shield removed from one zooid, exposing the spinocyst (BIOCAL Stn CP 62); c, frontal view of a female zooid with ovicell; d, female zooid with umbonuloid shield removed, and distal ovicell (BIOGEOCAL Stn CP 273).

FIG. 3 e-g. — *Bifaxaria compacta* sp. nov. : e, lateral view of zooidal branch showing an ovicelled zooid; f, frontal view of e; g, close-up of ovicell and female orifice (MUSORSTOM 4 Stn DW 151).

MUSORSTOM 6 : stn DW 396, 1400 m.

Brazil. The Natural History Museum (BMNH), London : Holotype slide 87.12.9.373, "Challenger" Stn 122, 640 m.

— Slide 1963.8.18.3, from same locality as holotype.

Indonesia. The Natural History Museum (BMNH), London : Slide 1964.2.2.12, "Siboga" Stn 211, 1158 m.

DISTRIBUTION. — Brazil, 640 m; South Africa 2690-3620 m; Indonesia 567-1158 m; New Caledonia and northern Norfolk Ridge, 960-2040 m.

REMARKS. — In the MUSORSTOM collection are three species that, apart from some differences in overall colony dimensions and robustness, are very similar in zooidal appearance. The overall dimensions of the three *submucronata*-like species are given in the table below.

	<i>Bifaxaria submucronata</i>	<i>Bifaxaria compacta</i>	<i>Bifaxaria modesta</i>
Colony height (max.)	59 mm	-	15 mm
Colony spread (max.)	37 mm	-	18 mm
Branch length (max.)	26 mm	> 7 mm	6 mm
Branch width (infertile part)	0.55-1.09 mm	0.77-0.94 mm	0.51-0.79 mm
Length of stem to first branch (max.)	17 mm	-	7 mm
No. of branches on 1 side of axis (max.)	9	-	8
Zooid length	0.66-0.98 mm	0.50-0.58 mm	0.54-0.91 mm
Zooid width (max.)	0.32-0.53 mm	0.35-0.53 mm	0.28-0.42 mm
No. of costae	11	9	9-10
♀ zooid length (+ peristome)	0.86-0.92 mm	0.73-0.75 mm	-
♀ zooid width (max.)	0.52-0.68 mm	0.50-0.60 mm	-
Ovicelled zooid length	1.01-1.17 mm	0.75-0.81 mm	-
Ovicelled zooid width	0.85-0.81 mm	0.60-0.79 mm	-

A re-examination of the specimens described by BUSK (1884) and HARMER (1957) confirms that they are conspecific, but that the putative *Bifaxaria submucronata* of GORDON (1988) is a different species (described below as *B. modesta* sp. nov.). Without having whole colonies to compare, the three tabulated species can be confused if one has only isolated branches or branch fragments. Apart from zooidal dimensions (which can overlap) a useful character is the nature of the spinocyst. The cryptic costae in both *B. submucronata* and *B. compacta* are sinuous and adjacent to each other such that adjacent costae touch, whereas, in *B. modesta*, the costae are simple and separated from each other. For any future worker it is imperative that the nature of the spinocyst is ascertained in the species being studied.

Bifaxaria compacta sp. nov.

Fig. 3 e-g

MATERIAL EXAMINED. — New Caledonia. MUSORSTOM 4 : stn DW 151, 200 m.

DESCRIPTION. — Colony presumably candelabriform, like other species in the genus. Branches of back-to-back zooids, bilaterally compressed. Zooids rather compact, often almost as wide as long, the peristome generally not or little projecting; median carina prominent, with lines of pores radiating from it. Spinocyst of 1 midproximal costa and 4 pairs of tapering laterally sinuous (almost pinnate) costae, with 3 intercostal lacunae between each pair. Longitudinal lateral suture between zooids more or less zigzag-like, with long shallow Vs. Lateral-oral avicularia not concealed; small, round, directed obliquely distally, the mandibular pivots leaving a small gap between or

touching and even fusing. Female zooid with well-developed anteriorly projecting peristome that has somewhat squared-off corners when viewed frontally. Ovicell not excessively bulging, more or less smooth with small scattered pores and larger pores around the periphery.

TYPES. — *Holotype* : Branch fragment from MUSORSTOM 4 Stn DW 151, 19°07.00' S, 166°22.00' E, 200 m, northwest of New Caledonia (MNHN-Bry 19882).

Paratypes : two fragments on the same slide (MNHN-Bry 19882), from same locality as holotype.

DISTRIBUTION. — Northern New Caledonia, 200 m.

REMARKS. — Although only a few branch fragments occurred in the collection they seem adequate enough for the recognition of a new species. The chief distinguishing characteristics are the compact shape of the zooids, the more squarely protruding peristome of the female zooid and the nature of the spinocyst.

Bifaxaria modesta sp. nov.

Bifaxaria submucronata - GORDON, 1988 : 259, figs 28-31. Non Busk, 1884.

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL : stn CP 30, 1140 m. — Stn DW 70, 965 m.

DESCRIPTION. — Colony candelabriform, the branches proximally curved, each branch arising from the 2nd, 3rd, or 4th zooid of the outer side of the preceding branch. Zooids proportionally longer than wide, the peristome typically projecting slightly; median carina prominent, with lines of pores from it. Spinocyst comprising 10 costae, including a proximal pair; simple, the lateral costae widely separated, only the large anterior pair arching as far as the midline. Longitudinal lateral suture not as zigzag-like as in *B. compacta*, curving somewhat towards each lateral-oral avicularium. These avicularia as in *B. compacta* but the mandibular pivots not touching each other. Fertile zooids not known.

TYPES. — *Holotype* : colony from BIOCAL Stn DW 70, 23°24.70' S, 167°53.65' E, 965 m, MNHN-Bry 19911.

Paratypes : MNHN-Bry 19850 and MNHN-Bry 19911 from same locality as holotype; MHHN-Bry 19912, from BIOCAL Stn CP 30, 23°09.65' S, 166°40.85' E, 1140 m.

DISTRIBUTION. — South of New Caledonia, 965-1140 m; Lord Howe Rise, 1573 m.

REMARKS. — The New Caledonian material accords exactly with the very limited material of putative *Bifaxaria submucronata* from the Lord Howe Rise described by GORDON (1988). The species is distinguished from other *submucronata*-like species in the smaller size of the colony and, in particular, the simple separated costae of the cryptic spinocyst.

Bifaxaria gracilis sp. nov.

Fig. 4 a-h

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL : stn CP 13, 3690-3740 m. — Stn DS 14, 3680 m. — Stn CP 17, 3680 m.

DESCRIPTION. — Colony candelabriform, the branches proximally curved, each branch arising from the 3rd, 4th, or 5th zooid of the outer side of the preceding branch; in the limited material available only 3 successive branches occur on any side of colony axes; the largest colony 16 mm high, with branching on one side of the axis to 13 mm, i.e., a 26-mm spread if branches were present on both sides; height of stem to first branch 8-10 mm; maximum branch length in present specimens almost 7 mm, the width (in infertile part) 0.49-0.58 mm. Zooids

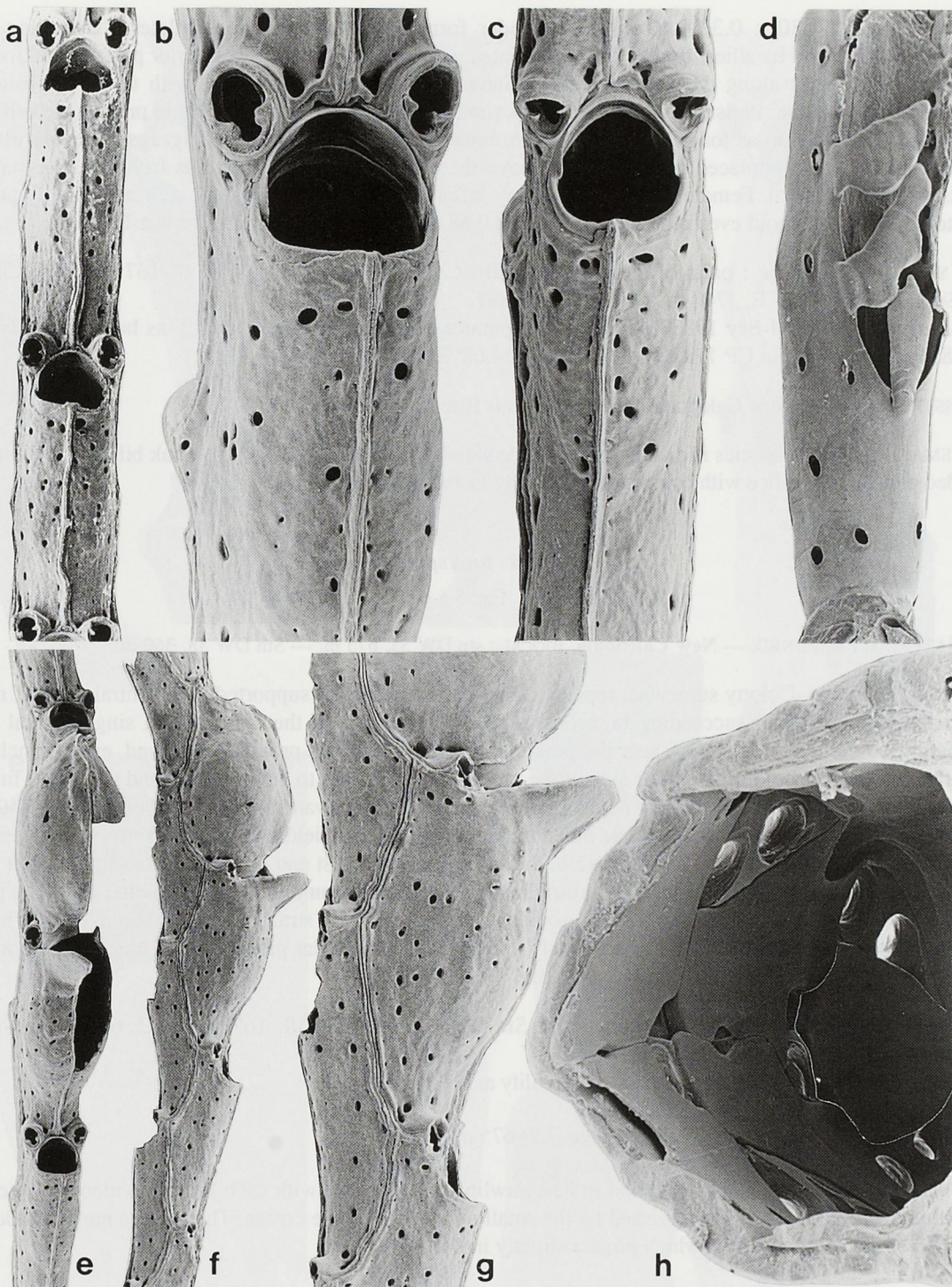


FIG. 4 a-h. — *Bifaxaria gracilis* sp. nov. : a, frontal view of zooids (BIOCAL Stn CP 13); b, close-up of orifice and lateral-oral avicularia (BIOCAL Stn DS 14); c, close-up of the orifice of the proximal zooid of a branch, tilted forward slightly to show the shape of the orifice better; d, zooid with umbonuloid shield removed (some costae missing) (BIOCAL Stn CP 17); e, fertile part of a branch, with female zooid and ovicell (partly broken) (BIOCAL Stn DS 14); f-g, same, lateral views (BIOCAL Stn CP 17); h, view looking into the zooidal chamber, showing the disposition of spinocystal costae (BIOCAL Stn CP 17).

alternating, 0.92-1.30 x 0.32-0.40 mm, of slender form, with relatively less bilateral flattening than in *B. submucronata* and its allies; frontal pores associated with area of spinocyst in anterior part of shield, costae 9, more or less straight along the anterior edge, sinuous along the posterior edge, with tip of opposite costae touching in the midline. Peristome not projecting beyond the median carina when seen in profile, the orifice quite rounded, about as wide as long. Lateral suture forming a series of long shallow zigzags from avicularium to avicularium. Avicularia placed conspicuously above the orifice, facing more or less frontally, the mandibular pivots widely separated. Female zooid considerably inflated, 1.24 mm x 0.56 mm, with a markedly projecting peristome; ovicelled zooid even more inflated, 1.24 x 0.68 mm, smooth, imperforate or nearly so.

TYPES. — *Holotype* : parts of a colony from BIOCAL Stn CP 13, 20°18.53' S, 167°17.65' E, 3690 m / 20°19.67' S, 167°18.58' E, 3740 m, MNHN-Bry 19897.

Paratypes : MNHN-Bry 19833, attached to a pumice pebble, from same locality as holotype; MNHN-Bry 19898, from BIOCAL Stn CP 17, 20°34.54' S, 167°24.68' E, 3680 m.

DISTRIBUTION. — New Caledonia : Loyalty Islands Basin, 3680-3740 m.

REMARKS. — This species is distinguished by the slender form of the zooids, the weak bilateral flattening, and rounded peristomial orifice with conspicuous frontally facing avicularia.

Bifaxaria bicuspis sp. nov.

Fig. 5 a-e

MATERIAL EXAMINED. — New Caledonia. BIOCAL : stn DW 33, 675 m. — Stn DW 38, 360 m.

DESCRIPTION. — Colony somewhat repent, not >5mm high and not supported by a central stem of rhizoids; the axial 'branch' and all succeeding branches (up to 11 on 1 side of the axis) with a single dorsal rhizoid, originating, in the lateral branches, near the proximal joint; the branches proximally curved, each branch arising from the 2nd or 3rd zooid of the outer side of the preceding branch, up to 3.5 mm long and 0.33-0.40 mm wide. Zooids alternating in the distal parts of branches, tending to opposite towards the proximal ends, 0.37-0.49 x 0.24-0.26 mm, of compact form, with moderate bilateral flattening; frontal shield with 4-5 radial rows of pores on each side of the carina; spinocyst of 7 simple costae, the anterior ones largest and only these ones touching at the tips, with the tips turned forwards and slightly protruding beyond the unbonuloid shield segments, exposing a pair of lumen pores. Lateral suture zigzagging where zooids alternate, tending to straight at the proximal ends of branches. Avicularia distolateral or lateral to orifice, nearly circular, the mandibular pivots merely touching or completely fused to form a cross-bar. Ovicelled zooids not seen.

TYPES. — *Holotype* : colony from BIOCAL Stn DW 33, 23°09.71' S, 167°10.27' E, 675 m, MNHN-Bry 19893.

Paratype : MNHN-Bry 19894, from same locality as holotype.

DISTRIBUTION. — Northern Norfolk Ridge, 360-675 m.

REMARKS. — This species is unusual in its sprawling colony form, with each branch evidently rooted to the substratum in life. It is also distinguished by the small number of simple costae. The species name alludes to the distal tips of the anterior costae which project slightly into the orifice.

Bifaxaria menorah sp. nov.

Fig. 5 f-h

MATERIAL EXAMINED. — New Caledonia. BIOGEOCAL : stn CP 205, 1350 m. — Stn CP 265, 1760-1870. — Stn DW 313, 1600-1640 m.

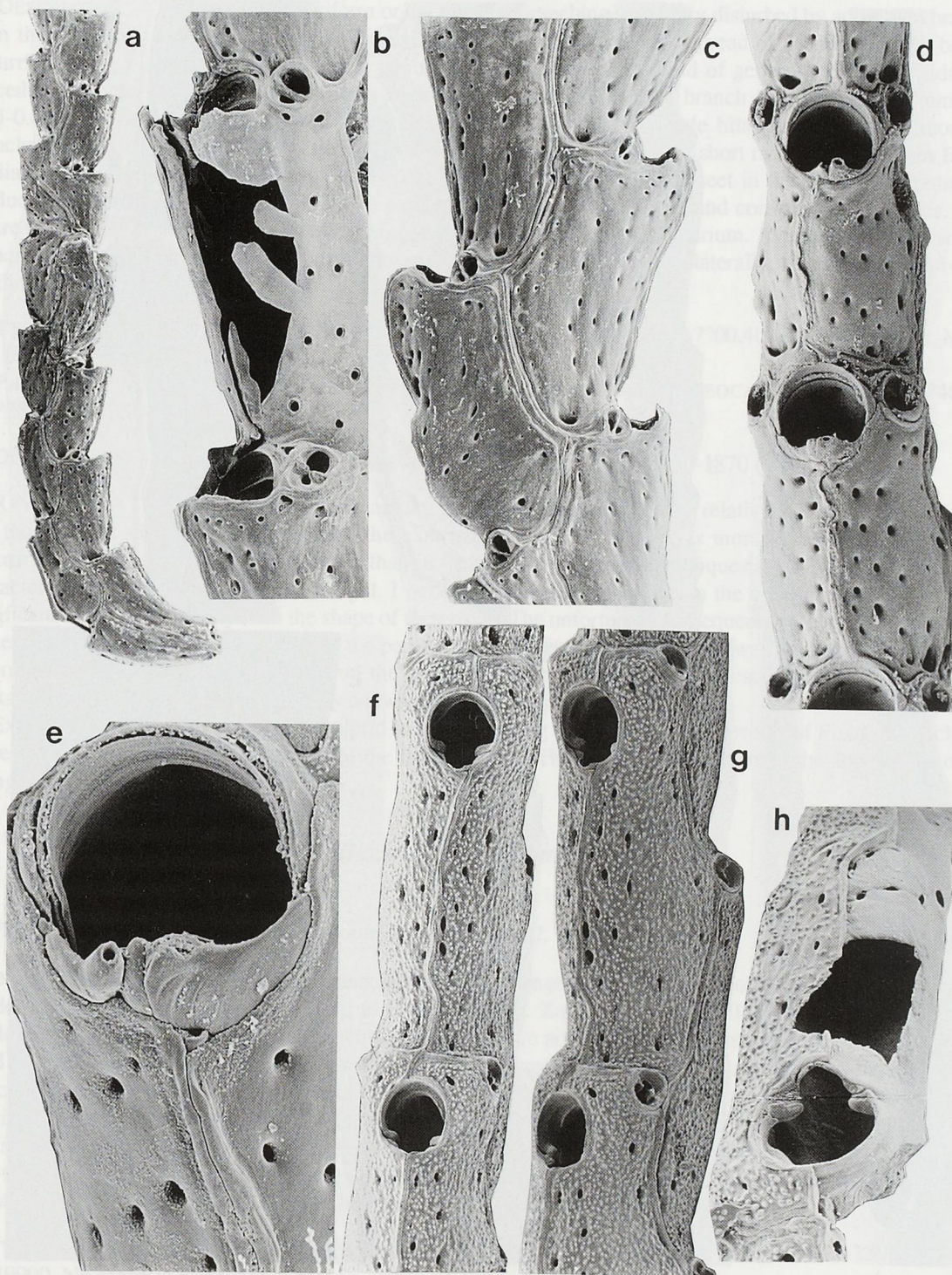


FIG. 5 a-e. — *Bifaxaria bicuspis* sp. nov. : a, lateral view of the proximal end of a branch; b, a zooid with half the umbonuloid shield removed, showing the simple spinocystal costae; c, lateral view of zooids; d, frontal view of zooids; e, close-up of orifice (BIOCAL Stn DW 33).

FIG. 5 f-h. — *Bifaxaria menorah* sp. nov. : f, frontal view of zooids; g, same, oblique view (BIOGEOCAL Stn DW 313); h, zooid with part of umbonuloid shield removed (some costae missing) (BIOGEOCAL Stn CP 265).

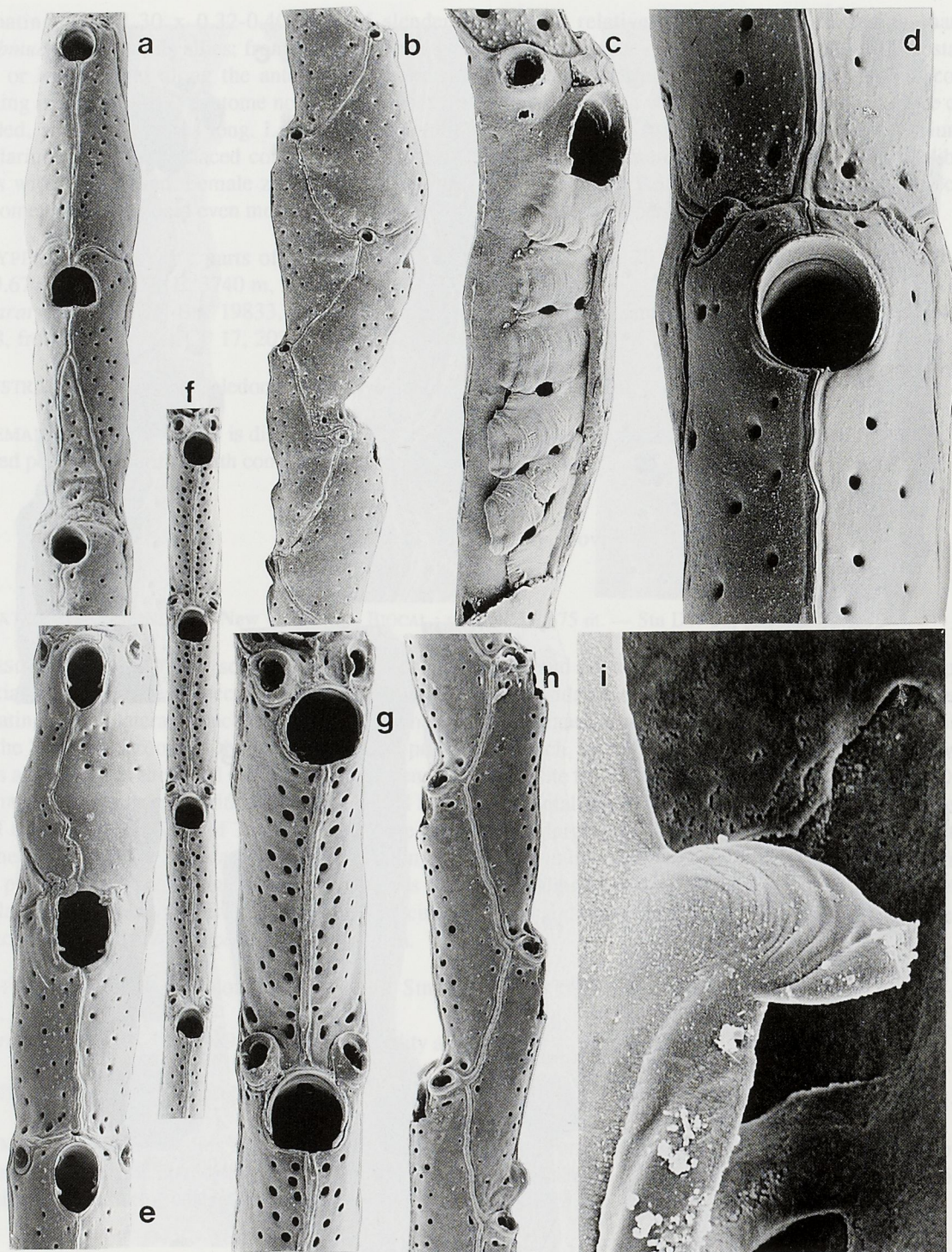


FIG. 6 a-d. — *Bifaxaria multicostata* sp. nov. : a, frontal view of female zooid and ovicell; b, same, lateral; c, zooid with half of the umbonuloid shield removed, exposing the pinnate costae; d, close-up of orifice (BIOCAL Stn CP 62).

FIG. 6 e. — *Raxifabia vafra* Gordon : frontal view of two autozooids and an ovicelled female zooid — note the dimorphic orifices (BIOCAL Stn DW 66).

FIG. 6 f-i. — *Raxifabia porosa* sp. nov. : f-g, frontal views of zooids; h, lateral view of zooids; i, close-up of left-hand oral costa, as seen after removal of umbonuloid shield (BIOGEOCAL Stn CP 214).

DESCRIPTION. — Colony candelabriform or the bilateral branching symmetry disturbed by additional branching from the main axis or branches close to the axis; up to 12 mm high, with a spread of 26 mm; up to 8 branches occurring along 1 arm of the colony, each arising from the 2nd or 3rd zooid of generally the outer side of the preceding branch; height of stem to first branch up to 5.5 mm; maximum branch length at least 5 mm, width 0.35-0.45 mm. Zooids alternating 0.52-0.74 x 0.30 mm, with relatively little bilateral flattening although the branches are still lensoid in cross section; frontal shield densely granular, with short radial lines of pores from the median carina; spinocyst of 9-10 closely adjacent subpinnate costae which meet in the midline. Peristome not produced, the orifice 'schizoporelloid', with a distinct U-shaped pseudosinus and conspicuous condyles. Lateral suture forming a series of roundly shallow zigzags from avicularium to avicularium. Avicularia at the distolateral corners of the zooid at some distance from the orifice, facing laterally or distolaterally, the mandibular pivots not touching. Ovicelled zooids not seen.

TYPE. — *Holotype* : colony from BIOGEOCAL Stn CP 265, 21°04.09' S, 167°00.40' E, 1760-1870 m, MNHN-Bry 19910.

Paratypes : MNHN-Bry 19907 and MNHN-Bry 19915, both from BIOGEOCAL Stn CP 205, 22°40.61' S, 166°28.01' E, 1350-1380 m.

DISTRIBUTION. — Southern New Caledonia and Loyalty Islands Basin, 1350-1870 m.

REMARKS. — The species is distinctive among the *Bifaxaria* species for its relative lack of bilateral flattening and the absence of a peristome. In fact, the external zooidal morphology is more typical of *Raxifabia* than *Bifaxaria*, but there are many more spines than in *Raxifabia*, which raises the question of which morphological characters should be accorded more weight. I believe the number of costae in the concealed spinocyst is more significant morphogenetically than the shape of the orifice. The unfortunate consequence of according more weight to the characters of the spinocyst than of the peristome, however, is that one will always have to remove the outer umbonuloid shield in order to determine the genus. But it must be said that description of the spinocyst in bifaxariids should be carried out routinely anyway.

External characters of *B. menorah* helpful in distinguishing this species from species of *Raxifabia* include the shape of the orifice and the granularity of the frontal shield. The species name refers to the appearance of some young colonies.

Bifaxaria multicostata sp. nov.

Fig. 6 a-d

MATERIAL EXAMINED. — New Caledonia. BIOCAL stn CP 62, 1395 m.

DESCRIPTION. — Colony presumed candelabriform; the longest (non-ovicelled) of 2 branches in the collection slender, curving, 8 mm in length and up to 0.42 mm wide. Zooids alternating, 0.68-0.84 x 0.24-0.30 mm, of slender form, with moderate bilateral flattening; median suture not carinate, the frontal shield smooth with lines of small pores; cryptic spinocyst with 12 contiguous similar-sized costae, all but the anterior pair pinnate, with 2-3 intercostal foramina between. Lateral suture thin, forming a series of relatively deep-V'd zigzags from avicularium to avicularium. Avicularium circular, relatively small, at the distolateral corners of the zooid, without mandibular pivots, facing distolaterally away from the orifice. Orifice rounded, without a peristome. Female zooid 0.79 x 0.30 mm, the median suture divided in the only example available; ovicelled zooid relatively slender, 0.73 x 0.36 mm, smooth with scattered pores around an imperforate area either side of the median suture.

TYPE. — *Holotype* : slide of fragments from BIOCAL Stn CP 62, 24°19.06' S, 167°48.65' E, 1395 m, MNHN-Bry 19909. No separate paratypes.

DISTRIBUTION. — Northern Norfolk Ridge, 1395 m.

REMARKS. — This species has the largest number of spinocystal costae of any species of *Bifaxaria* so far encountered.

Genus **RAXIFABIA** Gordon, 1988

TYPE SPECIES. — *Raxifabia vafra* Gordon, 1988.

Raxifabia vafra Gordon, 1988

Fig. 6 e

Raxifabia vafra Gordon, 1988 : 262, figs 36-39.

MATERIAL EXAMINED. — New Caledonia. BIOCAL : stn DW 66, 505-520 m.

DISTRIBUTION. — New Caledonia : northern Norfolk Ridge, 505-520 m; New Zealand: northeast of Three Kings Islands, 1024 m.

REMARKS. — Several specimens in the present collection, including two good-sized colonies, permit further characterisation of this species, since the holotype specimen was small and infertile. The colony branching pattern, while in one plane as in all bifaxariids, is somewhat irregular compared to the symmetrical candelabriform pattern common among *Bifaxaria* species - all branches, including the axial one, can produce two, or even three, subsequent branches. Orifices in this species are dimorphic - the fertile orifice is larger than that of autozooids; female and ovicelled zooids, however, are not much longer and scarcely wider than autozooids; female zooids 0.57 x 0.28-0.30 mm; ovicelled zooids 0.62 x 0.32-0.34 mm.

Raxifabia porosa sp. nov.

Fig. 6 f-i

MATERIAL EXAMINED. — New Caledonia. BIOGEOCAL stn CP 214, 1665-1590 m.

DESCRIPTION. — Colony form not known; only a single branch in the collection, 4.4 mm long and up to 0.36 mm wide. Zooids alternating, 0.66-0.75 x 0.19 mm, slender, with moderate bilateral flattening; median suture raised but not markedly carinate, with the immediate areas on either side densely perforated; only a small pair of costae, concealed beneath the proximal rim of the orifice. Orifice nearly round, with the proximal rim gently concave or almost straight. Lateral suture forming long shallow zigzags from avicularium to avicularium. Avicularia relatively conspicuous, at the distolateral corners of the orifice, the mandibular pivots scarcely evident, the rostrum directed obliquely proximally and frontally. Ovicelled zooids not seen.

TYPE. — *Holotype* : slide of branch fragments from BIOGEOCAL Stn CP 214, 22°43.09' S, 166°27.19' E, 1665-1590 m, MNHN-Bry 19913. No separate paratypes.

DISTRIBUTION. — South of New Caledonia, 1590-1655 m.

REMARKS. — Distinctive external characters of this species include the densely perforated areas either side of the median carina of the zooid and the proximally directed avicularia.

Raxifabia rara sp. nov.

Fig. 7 a-b

MATERIAL EXAMINED. — New Caledonia. BIOCAL stn CP 75, 825 m.

DESCRIPTION. — Colony form not known; only a single tiny branch in the collection, 1.6 mm long and up to 0.27 mm wide. Zooids small, 0.41-0.55 x 0.13-0.14 mm; median suture raised, the frontal shield appearing

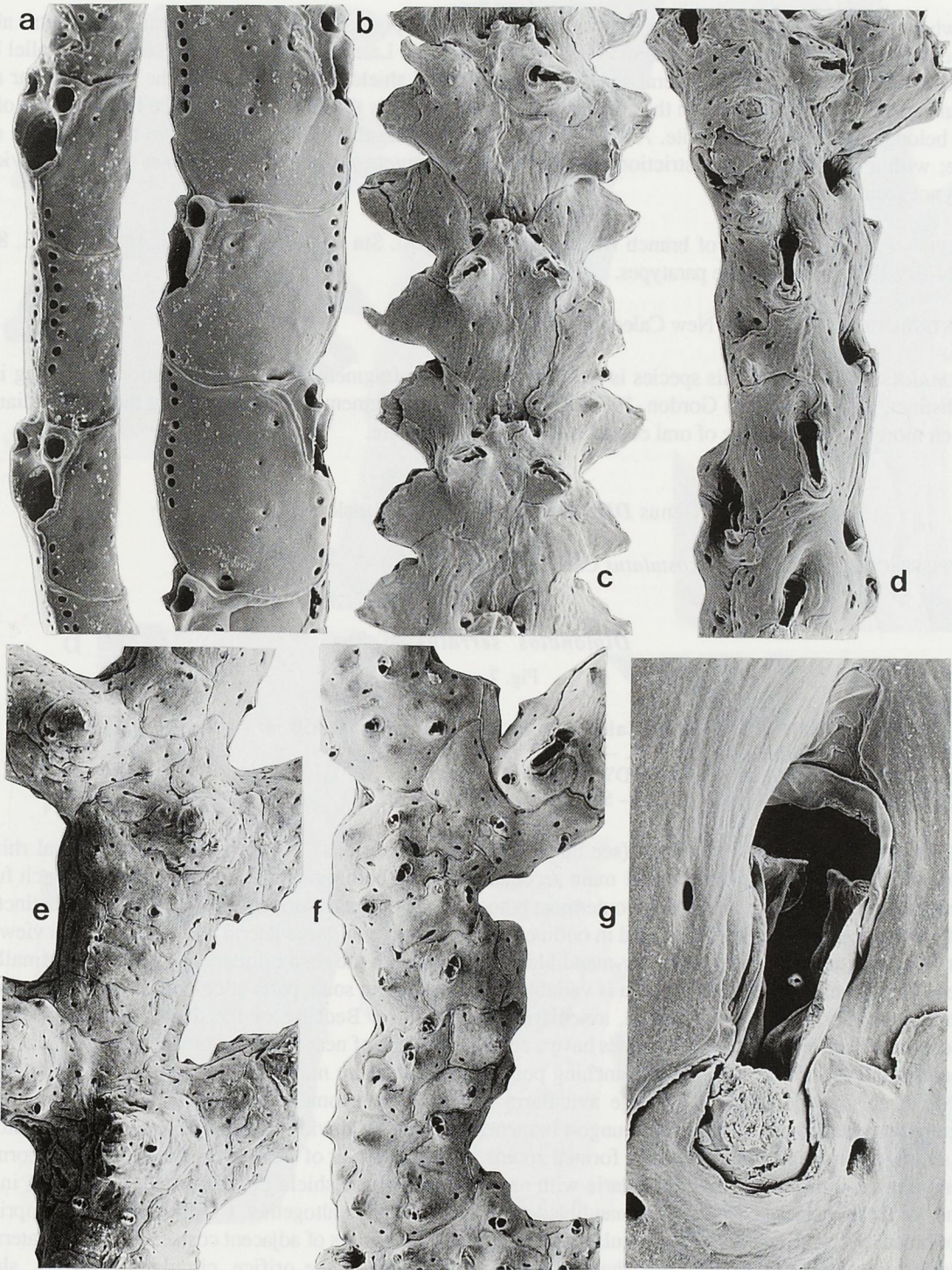


FIG. 7 a-b. — *Raxifabia rara* sp. nov. : a, oblique view of zooids; b, same, lateral view (BIOCAL Stn CP 75).

FIG. 7 c-g. — *Diplonotos serratus* sp. nov. : c, frontal view of zooids, with large lateral avicularia (BIOGEOCAL Stn CP 290); d, lateral view of zooids and large lateral avicularia (BIOCAL Stn KG 71); e, lateral view of older, thickened, part of a colony, showing mamillate projections (BIOCAL Stn CP 75); f, lateral view of younger part of colony than in e, showing one large and numerous smaller avicularia (BIOGEOCAL Stn CP 290); g, close-up of a large lateral avicularium (BIOCAL Stn KG 71).

somewhat carinate because of bilateral flattening; a single row of pores either side of the suture; oral costae absent. Orifice longer than wide, with a rounded-V-shaped proximal rim. Lateral suture forming a series of parallel bands around the branch owing to the lateral segments of the frontal shield wrapping around the branch as far as the median carina of the distal zooid on the opposite side - approximately the anterior third of the frontal shield of each zooid belongs to the zooid opposite. Avicularia set close to each other immediately above the distal rim of the orifice; with a slight medial constriction but no mandibular pivots as such; facing almost frontally. Ovicelled zooids not seen.

TYPE. — *Holotype* : slide of branch fragments from BIOCAL Stn CP 75, 22°18.65' S, 167°23.30' E, 825 m MNHN-Bry 19914. No separate paratypes.

DISTRIBUTION. — Southern New Caledonia, 825 m.

REMARKS. — Although this species is represented by a tiny fragment, I have no hesitation in naming it as it is so distinct. Like *R. tunicata* Gordon, 1988, it has umbonuloid segments that wrap around the branch diameter, but even more so. The absence of oral costae is also a notable feature.

Genus *DIPLONOTOS* Canu & Bassler, 1930

TYPE SPECIES. — *Diplonotos costulatus* Canu & Bassler, 1930.

Diplonotos serratus sp. nov.

Fig. 7 c-g, 8 a

MATERIAL EXAMINED. — New Caledonia. BIOCAL : stn DW 36, 650 m. — Stn CP 55, 1160-1175 m. — Stn DW 70, 965 m. — Stn KG 71, 2099 m. — Stn CP 75, 825 m.

CHALCAL 2 : stn DW 76, 470 m. — Stn DW 77, 435 m.

BIOGEOCAL : stn CP 290, 920-760 m. — Stn CP 297, 1230-1240 m.

DESCRIPTION. — Colony dendroid (see table below for dimensions), anchored by a tuft of basal rhizoids; generally with 1 main axis and at least 1 main secondary branch, both pinnate or even bipinnate; branch fusions not frequent, encountered in a few of the outermost branch tips. Youngest parts of branches generally distinctive in frontal view, appearing markedly serrated in outline owing to a series of large lateral avicularia; in side view these appear as a longitudinal series of narrow-mandibled structures with the rostra directed obliquely proximally; the degree of development of these avicularia is variable, however, and in some parts of colonies they may be lacking, with much smaller, variably orientated, avicularia in their place. Because of the development of secondary calcification, older, thicker, parts of colonies have a confused surface of near-occluded orifices, interzooidal sutures, pores and small avicularia; at or near branching points, however, there may be distinctive lateral prominences - some of these may be the loci of large avicularia which have become immersed in calcification. Zooidal characteristics clearly seen only in the youngest branches - frontal shield with 2-3 transverse slits, soon obliterated, either side of the median suture in newly formed zooids, and often a pair of small prominences at the 2 corners of the peristome; 1-2 moderate-sized avicularia with narrow rostra on the shield proximal to the peristome in some branches or these replaced by tiny short-mandibled avicularia or lacking altogether. Cryptic spinocyst comprising 5 pairs of broad, petaloid, costae with triangular foramina between the bases of adjacent costae. The paired lateral-oral avicularia typical of bifaxariids somewhat concealed at the sides of the orifice, circular, with long, slender, mandibular pivots; the large lateral avicularia with stout pivots that are continuous with the calcareous ledges of the palate. Female zooid generally with a pair of longitudinal slits in the middle of the frontal shield when newly formed and sometimes with the pair of moderate-sized avicularia seen on many autozooids; ovicell a prominent bulge in young zooids, more or less smooth, also sometimes with a pair of avicularia, and with a narrow median lip at the proximal edge.

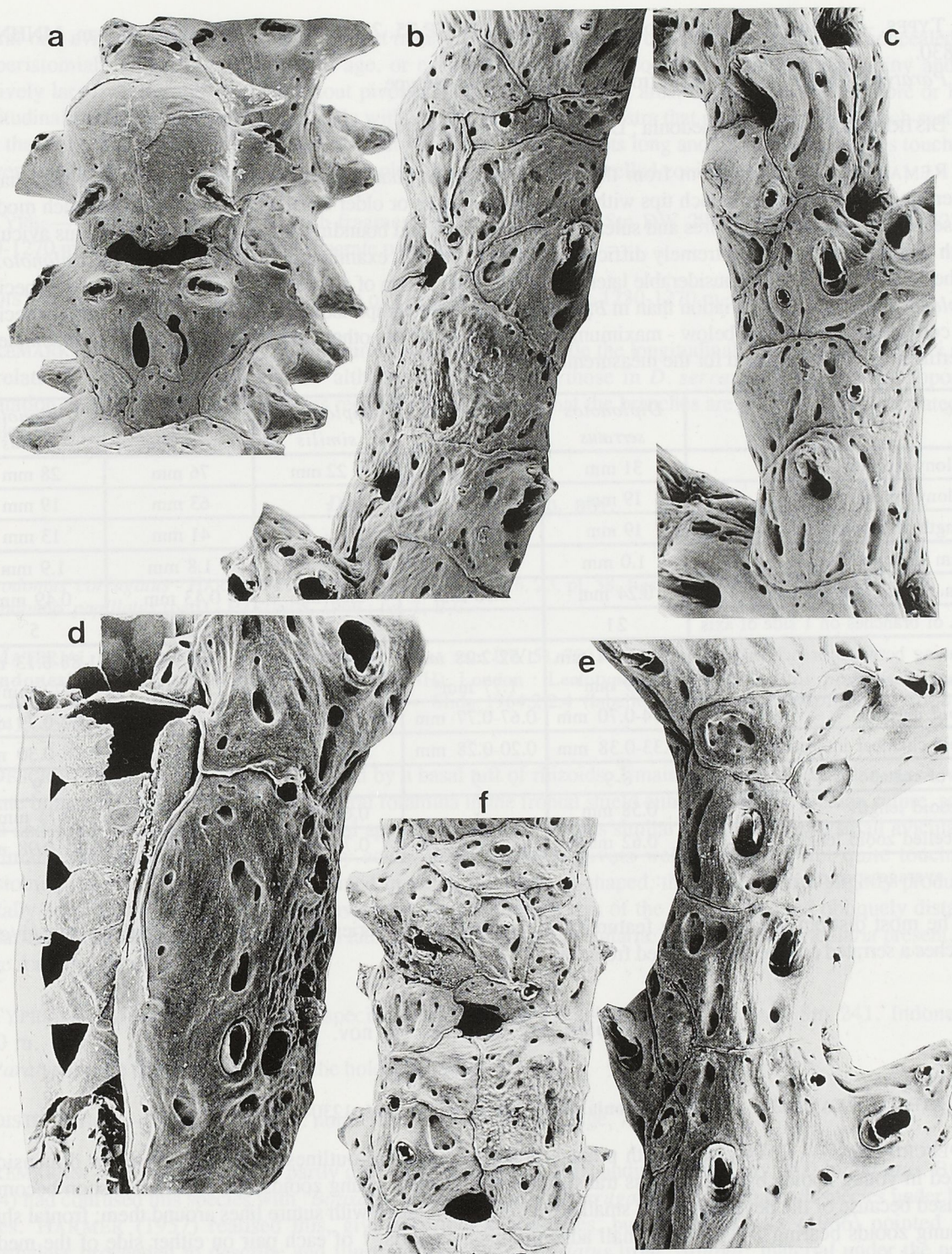


FIG. 8 a. — *Diplonotos serratus* sp. nov. : female zooid and ovicell before secondary calcification (BIOGEOCAL Stn CP 290).

FIG. 8 b-f. — *Diplonotos sulcatus* sp. nov. : b-c, e, oblique views of zooids with appreciable secondary calcification — notice the large lateral avicularia in c and e; d, zooid with part of spinocyst exposed; f, older, fertile, part of branch with an ovicelled zooid (the distal of the two orifices) (BIOGEOCAL Stn DW 296).

TYPES. — *Holotype* : Large colony from BIOCAL Stn CP 75, 22°18.65' S, 167°23.30' E, 825 m, MNHN-Bry 19830.

Paratypes : MNHN-Bry 19831, from same locality as holotype.

DISTRIBUTION. — New Caledonia : Loyalty Basin, northern Norfolk Ridge, 435-2099 m.

REMARKS. — It is apparent from the present collection that species of *Diplonotos* may be very hard to determine if colonies lack branch tips with young zooids. Axes or older basal parts of colonies are much modified by secondary calcification, pores and sulci, and the chambers and bounding suture lines of adventitious avicularia, such that interpretation is extremely difficult. As with *Bifaxaria*, examination of the spinocyst in *Diplonotos* can be helpful, although, with considerable lateral expansion and fusion of adjacent costae typical among the species of *Diplonotos*, there is less variation than in *Bifaxaria*. To help in comparison, the parameters of the larger species in the collection are tabulated below - maximum sizes are given unless otherwise stated. If colonies are incomplete or infertile a dash is substituted for the measurement.

	<i>Diplonotos serratus</i>	<i>Diplonotos sulcatus</i>	<i>Diplonotos similis</i>	<i>Diplonotos confragus</i>	<i>Diplonotos obesus</i>
Colony height	31 mm	-	> 22 mm	76 mm	28 mm
Colony spread	19 mm	-	-	63 mm	19 mm
Length of secondary branch	19 mm	-	-	41 mm	13 mm
Stem thickness	1.0 mm	-	1.0 mm	1.8 mm	1.9 mm
Min. branch width (lateral)	0.24 mm	0.35 mm	0.38 mm	0.43 mm	0.49 mm
No. of branches on 1 side of axis	21	-	-	32	5
Spacing between branch origins (centre to centre)	1.28-2.04 mm 1.49 mm*	1.52-2.28 mm 1.77 mm*	1.69-3.49 mm 2.39 mm*	1.69-2.96 mm 2.39 mm*	1.88-6.13 mm 3.72 mm*
Zooid length	0.54-0.70 mm	0.67-0.77 mm	0.52-0.72 mm	0.52-0.80 mm	0.62-0.79 mm
Zooid chamber internal width	0.33-0.38 mm	0.20-0.28 mm	0.33 mm	0.36-0.40 mm	0.28-0.30 mm
No. of costae	8-9	9	7	9	9
♀ zooid length	0.58 mm	-	0.66 mm	0.57 mm	0.74 mm
Ovicelled zooid length	0.62 mm	-	0.72 mm	0.64-0.68 mm	0.81-0.98 mm

* average spacing

The most distinctive identifying feature of *D. serratus* is the series of large lateral avicularia that give the branches a serrated outline when viewed frontally.

Diplonotos sulcatus sp. nov.

Fig. 8 b-f

MATERIAL EXAMINED. — New Caledonia. BIOGEOCAL : stn DW 296, 1230-1270 m.

DESCRIPTION. — Colony erect with pinnate branching. Zooidal outlines (see table above for dimensions) defined in young zooids by more or less transverse suture lines in young zooids, the boundaries soon becoming confused because of the development of small adventitious avicularia with suture lines around them; frontal shield in young zooids bearing 1-2 pairs of small adventitious avicularia, 1 of each pair on either side of the median suture, which may then occur in a shallow longitudinal depression; later zooidal surface with a number of scattered pores, generally occurring in depressions and longitudinal sulci, especially laterally; costae broad, closely appressed to adjacent ones, rapidly tapering at the base to leave triangular intercostal lacunae. Peristomial orifice becoming somewhat oval in outline with increasing secondary calcification and development of adventitious avicularia.

Lateral-oral avicularia small, oval, with distinct mandibular pivots; directed distolaterally, becoming concealed as the peristomial orifice is modified with age, or even lacking in many zooids. Lateral avicularia tiny and/or relatively large, the former oval with stout pivots constricting the opesia area, the latter elongate, more or less longitudinally aligned and orientated distally with long, acute, triangular rostra that project from the branch surface such that they face somewhat downward and outwards; mandibular pivots long and narrow with the tips touching or even fusing, giving the impression of a complete, thin, cross-bar. Ovicelled zooids not seen.

TYPE. — *Holotype* : slide of branch fragments from BIOGEOCAL Stn DW 296, 20°38.35' S, 167°10.32' E, 1230-1270 m, MNHN-Bry 19905. No separate paratypes.

DISTRIBUTION. — New Caledonia : north of Lifou, Loyalty Islands, 1230-1270 m.

REMARKS. — The most distinctive features of this species include the longitudinally aligned porous sulci and the relatively large lateral avicularia - although reminiscent of those in *D. serratus*, they have an opposite orientation and are neither as large or as regularly occurring, so that the branches are not comparably serrated in profile.

Diplonotos similis sp. nov.

Fig. 9 a-f

Sclerodomus corrugatus - HARMER, 1957 : 868, pl. 57, figs 10, 16, 23, pl. 58, figs 4, 11. Non Busk, 1884.
Sclerodomus papillatus (part) - HASTINGS, 1966 : fig. 1, B-C.

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL : stn DW 51, 700 m.

Indonesia. The Natural History Museum (BMNH), London : Lectotype slide of *Diplonotos papillatus* (Busk), 1887.12.9.379, "Challenger" Stn 196, 1509 m. — Slide 1964.2.2.4 (labelled *Sclerodomus papillatus*), "Siboga" Stn 241, 1570 m.

DESCRIPTION. — Colony erect, anchored by a basal tuft of rhizoids; 1 main and several secondary axes, with pinnate branching. Young zooids with several foramina in the frontal shield either side of the median suture, some small and some relatively large, the general appearance of older zooids similar, with occasional small avicularia, proximally directed, the rostrum roundly acute, the mandibular pivots well developed, not quite touching. Peristomial orifice more or less well defined in younger zooids, D-shaped, the proximal rim slightly produced frontally but not anteriorly. Lateral-oral avicularia at the outer corners of the orifice, directed obliquely distally, similar in size and appearance to the small lateral and laterofrontal avicularia. Larger lateral avicularia present, the palate roundly triangular, facing distally.

TYPES. — *Holotype* : the largest specimen on slide 1964.2.2.4, BMNH, "Siboga" Stn 241, Indonesia, 1570 m.

Paratypes : the other specimens on the holotype slide.

DISTRIBUTION. — New Caledonia : northern Northern Norfolk Ridge, 700 m.

REMARKS. — HASTINGS (1966) partly clarified the confusion surrounding the identity of *D. papillatus*. BUSK (1884) had confused this species with "*Bifaxaria*" (= *Domosclerus*) *corrugatus*, illustrating each species under both names. HARMER (1957) realised this, giving correct synonymies, but, as HASTINGS (1966) pointed out, nevertheless proceeded to describe and illustrate [putative] *papillatus* from "Siboga" material under the name *corrugatus*. HAYWARD (1981) cited HARMER's (1957) plate and figure references (i.e. *papillatus*) in the synonymy of putative "*Sclerodomus*" (= *Domosclerus*) *corrugatus* from Durban, South Africa, and the Kermadec Trench but his figures do indeed appear to be of *D. corrugatus*. HARMER's (1957) material, however, is not conspecific with *papillatus* Busk. BUSK's (1884) species (Fig. 19 a-e) also belongs to *Diplonotos*, but differs from HARMER's

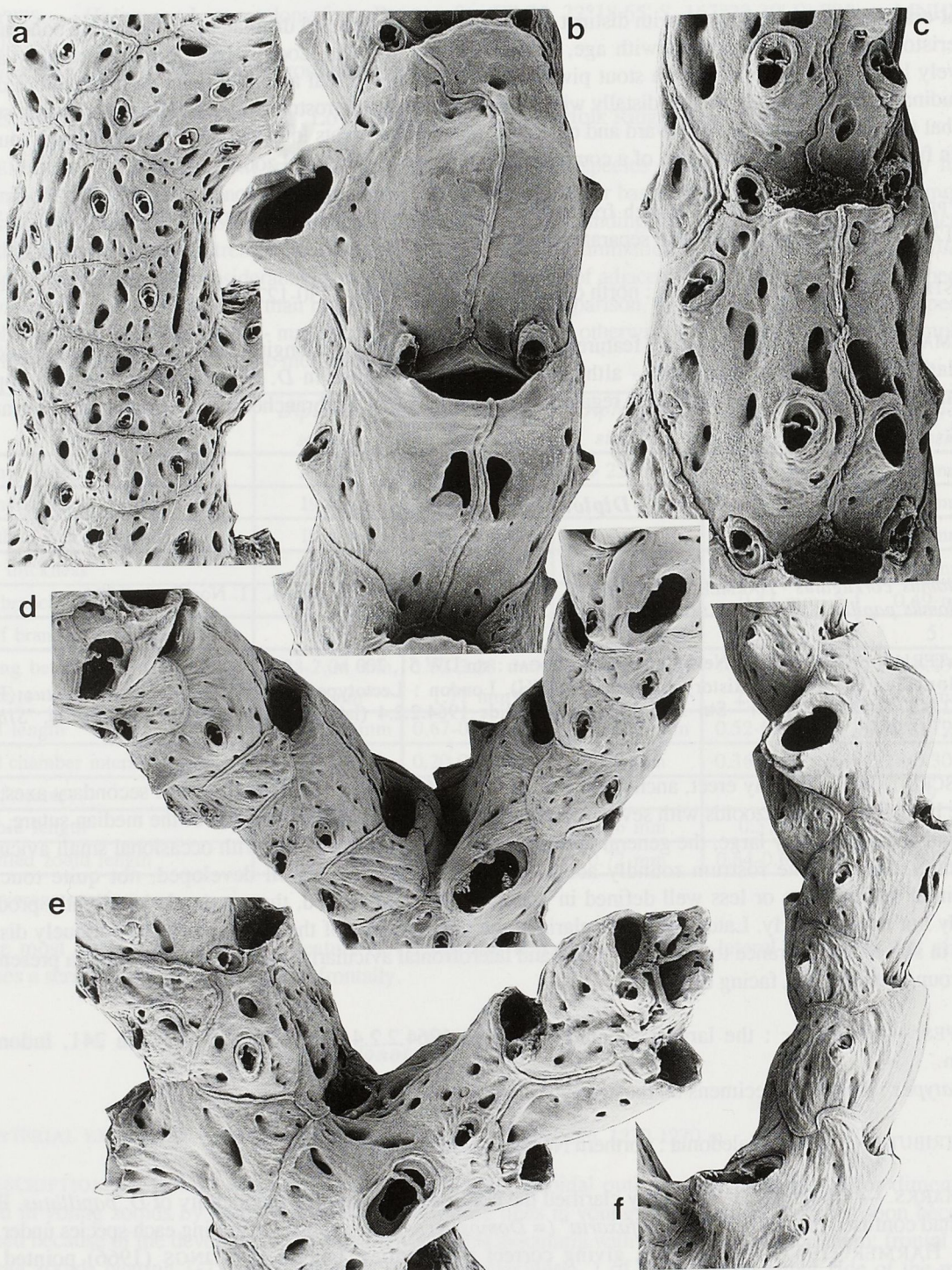


FIG. 9 a-f. — *Diplonotos similis* sp. nov. : a, lateral view of older, heavily calcified, part of branch; b, female zooid and ovicell - note the large lateral avicularium (partly broken); c, frontal view of secondarily calcified zooid; d-e, oblique views of bifurcations, showing the associated large lateral avicularium (cross-bar broken in d); f, lateral view of branch bearing the aviculiferous ovicell shown in b. (a, c, e, BIOCAL Stn DW 51; b, d, f, "Siboga" Stn 241, Banda Sea, 1570 m - BMNH 1964.2.2.4 part).

material in some important features including its less robust colony form, the absence of large avicularia at branch bifurcations, and the fact that the large avicularium associated with the ovicell has the palate facing proximally, not distally.

The New Caledonian material (a single large, infertile, colony) accords with a number of the characters of the "*Siboga*" specimens, especially in the morphology and orientation of both the small lateral avicularia and the large avicularia, and in the size of the zooids; however, the branch-to-branch spacing is less (1.26-1.60 mm, average 1.45 mm).

Diplonotos confragus sp. nov.

Fig. 10 a-f

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL : stn DW 36, 650 m.

MUSORSTOM 4 : stn CP 194, 550 m.

CHALCAL 2 : stn DW 76, 470 m. — Stn DW 77, 435 m. — Stn DW 78, 233-360 m.

BIOGEOCAL : stn CP 214, 1665-1590 m. — Stn CP 232, 760-790 m. — Stn CP 290, 920-760 m. — Stn CP 297, 1230-1240 m.

DESCRIPTION. — Colony dendroid, robust (see table above for dimensions), anchored by a tuft of basal rhizoids; with 1 main axis and at least 1 main secondary branch, both pinnate or even bipinnate; branch fusions infrequent, involving secondary, tertiary, and quaternary branches. Young zooids with the area of shield either side of the median suture initially relatively smooth with some peripheral granularity and small perforations, later developing a reticulate texture and becoming encroached upon by the chambers of tiny avicularia. Proximal rim of peristome variable, generally with small protuberances in the centre and at the lateral corners when young, becoming straighter with increasing calcification. Costae broad, closely appressed to adjacent ones, tapering at the base to leave triangular intercostal lacunae. Lateral suture tracing a zigzag course from orifice to orifice, with small avicularia between the Vs; these with mandibular pivots that do not touch, the palate facing nearly distally. Lateral-oral avicularia somewhat concealed, with small pivots, facing more or less frontally and orientated obliquely distally. Occasional large avicularia present, occupying the entire lateral wall of a parent zooid, generally single, sometimes paired on opposite sides of a branch; the main body of the avicularium under the rostrum pouch-like, the palate facing distally or obliquely so and the opesia laterally such that the elongated-D-shaped mandible swings through an arc of only about 25-35°; cross-bar with a small downward-pointing ligula. Female zooid with a pair of relatively large proximal fenestrae either side of the concealed mid-proximal costa when newly formed; these becoming closed over; the lateral-oral avicularia (concealed behind the peristomial rim) facing frontally and directed more or less toward each other, a little larger and more widely separated than in autozooids, and with stouter mandibular pivots that almost touch. Ovicell generally somewhat bulging, though not conspicuously so, or with the frontal surface a little concave, initially nearly smooth, or lightly textured, becoming encroached upon by adventitious avicularia and secondary calcification. Older parts of colonies with confused surface of more or less transverse or transversely sinuous suture lines and intervening longitudinal striations and porous sulci.

TYPES. — *Holotype* : Large, much-branching colony from CHALCAL 2 Stn DW 77, 23°08.35' S, 167°42.68' E, 435 m, MNHN-Bry 19866.

Paratypes : MNHN-Bry 19868, from same station as holotype; MNHN-Bry 19867, from CHALCAL 2 Stn DW 76, 23°40.50' S, 167°45.20' E, 470 m.

DISTRIBUTION. — New Caledonia : Loyalty Basin, northern Norfolk Ridge, 233-1665 m.

REMARKS. — The most distinctive feature of this species is the large pouch-like lateral avicularia with ligulate cross-bar and very narrow angle through which the mandible arcs. Although not abundant, these avicularia may be found in both the youngest and oldest parts of colonies.



FIG. 10 a-f. — *Diplonotos confragus* sp. nov. : a, frontal view of ovicelled female zooid with encroaching secondary calcification; b, frontal view of autozooids, with a pair of the pouch-like large lateral avicularia; c, oblique lateral view of autozooids and an ovicelled female zooid; d, lateral view of older, more calcified, part of colony; e, lateral view of autozooids and large lateral avicularium distally; f, oblique view of branch bifurcation and part of the spinocyst of an autozooid. (a-b, d, BIOGEOCAL Stn CP 290; c, e, BIOGEOCAL Stn CP 232).



FIG. 11 a-e. — *Diplonotos obesus* sp. nov. : a, frontal view of swollen part of branch with female zooid and ovicell (x); b, lateral view of an older branch with considerable secondary calcification; c, lateral view of distal tip of a branch with ovicell at x (BIOCAL Stn DW 33); d, female orifice and ovicell with relatively light secondary calcification; e, frontal view of autozooidal orifices showing lateral-oral avicularia (CHALCAL 2 Stn DW 73).

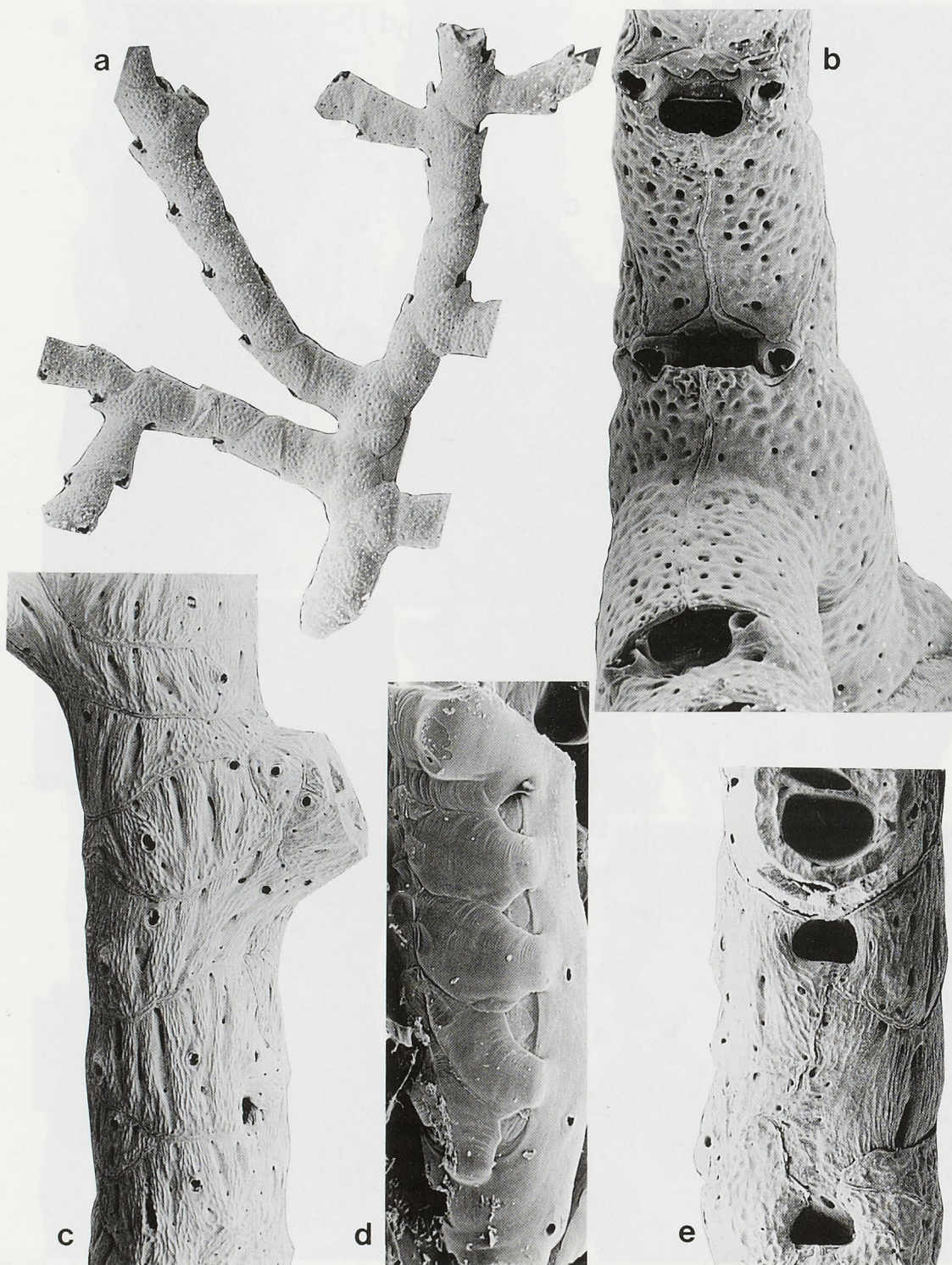


FIG. 12 a-b. — *Diplonotos minus* sp. nov. : a, unique holotype colony; b, frontal view of zooids from holotype colony (BIOCAL Stn CP 109).

FIG. 12 c-e. — *Diplonotos* sp. : c, lateral view near base of small colony; d, spinocyst of autozooid (BIOGEOCAL Stn CP 214); e, autozooidal orifices of small colony (BIOGEOCAL Stn CP 205).

Diplonotos obesus sp. nov.

Fig. 11 a-e

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL : Stn DW 33, 675-680 m.
CHALCAL 2 : stn DW 73, 573 m. — Stn DW 76, 470 m.

DESCRIPTION. — Colony with a clearly defined main axis, anchored by a tuft of basal rhizoids; secondary branches arising at somewhat irregular intervals up the axis, not necessarily pinnately; these branches not especially long, with little further branching, and increasing in thickness distally (where fertile zooids occur) such that they, and the colony overall, appear somewhat stubby. Young zooids with the area of shield either side of the median suture with a light reticulation, becoming encroached upon by the chambers of small avicularia. Peristomial rim initially protuberant at the proximolateral corners, becoming straighter and more transversely elongate in older zooids. Exact numbers of costae in the concealed spinocyst difficult to ascertain owing to a considerable degree of lateral fusion and the concomitant poor definition of suture lines, the triangular intercostal lacunae between spine bases scarcely apparent except for a large pair either side of the midproximal costa. Lateral-oral avicularia relatively closely set, more or less facing frontally and orientated distally, the mandibular pivots not touching. Lateral suture generally weakly defined in all but the youngest parts of branches owing to the rugose surface of branches and zooids, the lateral surface with scattered pores and tiny adventitious avicularia. Female zooid with the same appearance as autozooids but the orifice and proximal peristomial rim are wider and, in younger zooids, project outward further, the lateral-oral avicularia further apart than in autozooids and orientated obliquely toward each other. Ovicell with light reticulation in young zooids, with peripheral pores, completely concealed in thickened parts of branches.

TYPES. — *Holotype* : Colony from CHALCAL 2 Stn DW 73, 29°39.90' S, 168°38.10' E, 573 m, MNHN-Bry 19844.

Paratypes : MNHN-Bry 19881 and MNHN-Bry 19838, both from the same locality as holotype.

DISTRIBUTION. — Northern Norfolk Ridge, 470-680 m.

REMARKS. — Whole colonies of *Diplonotos obesus* are readily distinguished by the irregular spacing between branch origins and the rotund appearance of most branch tips. Where only fragments of colonies are encountered, these can be confused with *D. confragus* which has a similar rugose texture; *D. obesus* has, however, no large avicularia and the lateral intercostal lacunae are all but obliterated.

Diplonotos minus sp. nov.

Fig. 12 a-b

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL : stn CP 109, 495 m.

DESCRIPTION. — Colony dendroid, anchored by a basal tuft of rhizoids, diminutive (5.5 mm high), slender, the maximum stem thickness 0.55 mm; secondary branches of similar dimensions to the "main" axis, arising at irregular intervals along it. Zooids 0.47-0.62 x 0.26-0.53 mm, with the internal zooidal chamber 0.17 mm wide; the area of shield either side of the median suture dimpled and porous; proximal peristomial rim not protruding laterally but produced anteriorly somewhat. Spinocyst comprising 4 pairs of closely contiguous pinnate costae. Lateral-oral avicularia facing more or less frontally, directed laterally or obliquely so, the mandibular pivots not touching. Lateral suture zigzagging from orifice to orifice, the lateral walls dimpled, with a few scattered pores. No lateral or adventitious avicularia. Ovicelled zooids not seen.

TYPES. — *Holotype* : Slide of fragments of a unique colony from BIOCAL Stn CP 109, 22°10.03' S, 167°15.22' E, 495 m, MNHN-Bry 19884. No separate paratypes.

DISTRIBUTION. — Off southeast New Caledonia, 495 m.

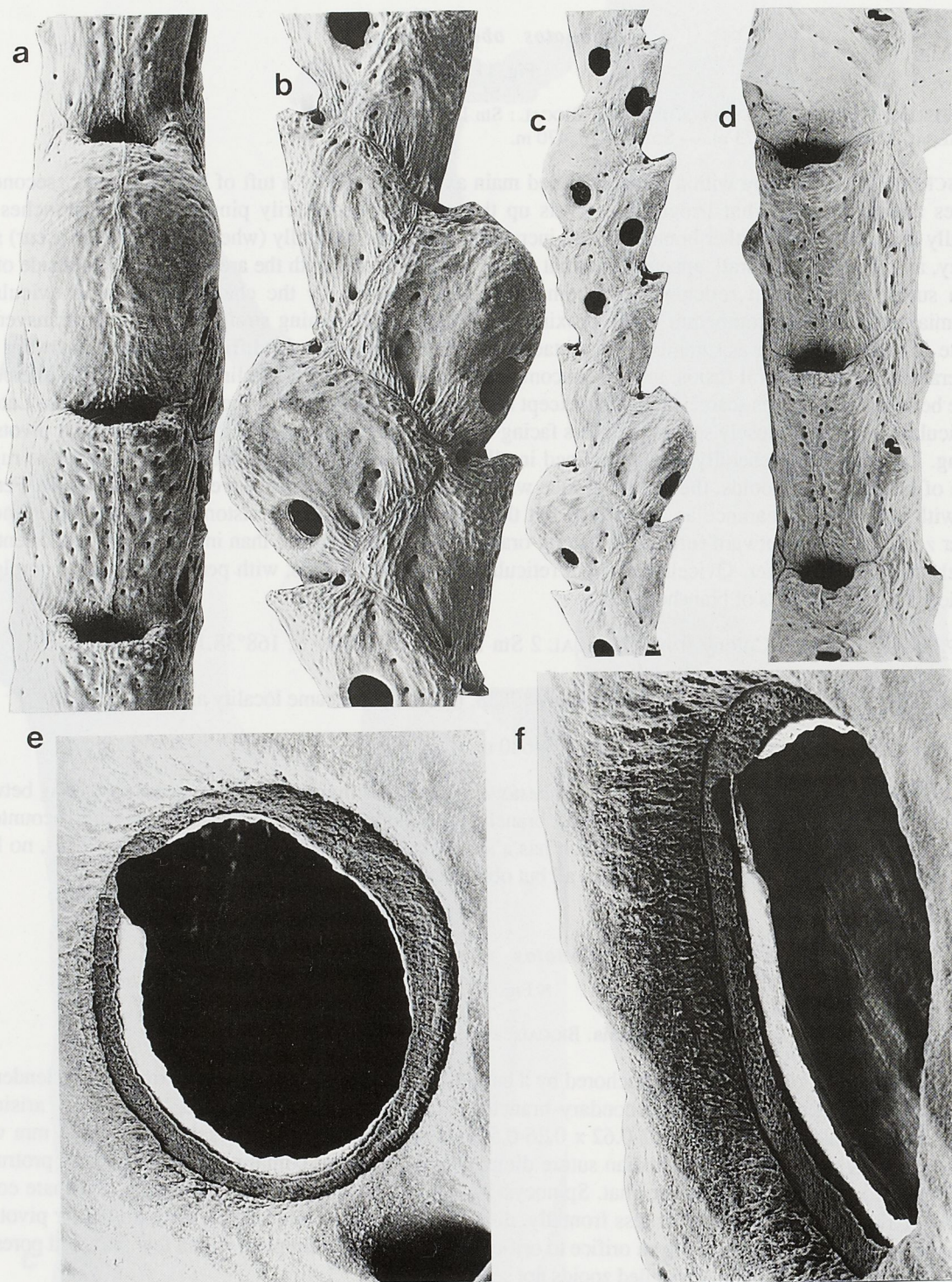


FIG. 13 a-f. — *Domosclerus edulis* sp. nov. : a, frontal view of ovicelled female zooid; b, close-up of the proximal two ovicells in c with boreholes; c, distal end of a branch showing a series of boreholes in zooids and ovicells; d, frontal view of autozooids; e-f, frontal and oblique views of the borehole in the distalmost ovicell in c (BIOGEOCAL Stn CP 232).

REMARKS. — This is an unusual species. The branches are not articulated so it cannot be included in *Bifaxaria* and the narrow orifice and spinocyst preclude a relationship with *Aberrodomus* Gordon, 1988. On the other hand, the pinnate costae, the frontally porous shield, and the complete absence of lateral/adventitious avicularia are not otherwise known in *Diplonotos*. It probably should be placed in a new genus but, in the absence of information on female zooids and ovicells, I prefer to leave it in *Diplonotos* for now.

Diplonotos sp.

Fig. 12 c-e

MATERIAL EXAMINED. — New Caledonia. BIOGEOCAL : stn CP 205, 1350-1380 m. — Stn CP 214, 1665-1590 m.

DESCRIPTION. — Colony erect, anchored by a tuft of basal rhizoids, 11.5 mm high, maximum stem thickness 1.09 mm, branching sparse. Zooids 0.73-0.84 x 0.30-0.34 mm, the internal chamber width 0.18-0.25 mm, the frontal shield either side of the weak median suture in new zooids with a faint longitudinal texture and peripheral pores; concealed spinocyst comprising 5 pairs of contiguous petaloid costae, the anterior pair largest, with laterofrontal prominences; triangular lacunae present between the bases of the costae. Peristomial orifice transversely oval in youngest zooids, becoming soon D-shaped or rounded as frontal calcification increases. Lateral-oral avicularia absent. Lateral suture somewhat sinuous, soon tracing an obliquely lateral course down the sides of thickened branches, with tiny, irregularly orientated avicularia between the loops, as well as porous sulci and longitudinal striae. No large avicularia. Ovicelled zooids not seen.

DISTRIBUTION. — New Caledonia south of Nouméa, 1350-1665 m.

REMARKS. — Only two small colonies of this species were found, both infertile. Nevertheless, the species has distinctive features that should allow it to be recognised if and when larger colonies are found. These include the absence of lateral-oral peristomial avicularia and the characters of the spinocyst. *Sclerodomus inornatus* Hayward, 1981 from eastern South Africa, actually a species of *Diplonotos*, also lacks lateral-oral avicularia, but the zooids and lateral avicularia of that species are rather larger than those of *D.* sp. and there is apparently not the same kind of rapid secondary calcification with rounding and deepening of the peristome.

DAVID and POUYET (1986) reported putative *D. inornatus* east of Madagascar but the zooidal size range of their material is too small to be this species. Without examining their material it is not possible to comment on it further.

The tendency of the peristomial orifice to become rapidly deepened and rounded owing to the development of secondary calcification and adventitious avicularia is very reminiscent of the situation in *Xenicobrium novum* Gordon, 1988. It is clear, however, from the unusual diversity of *Diplonotos* species in the MUSORSTOM collections, that *Xenicobrium* must be regarded as a junior synonym of *Diplonotos*. The unique holotype specimen of *Xenicobrium novum* (see GORDON, 1988, fig. 1J) appears to be not more than the proximal part of an exceptionally robust colony that must have been much larger and more branching. At the time of its description its relative difference from the three known species of *Diplonotos* seemed to justify recognition of a separate genus. I now believe that *Xenicobrium* may be merged in *Diplonotos* and the type species should be referred to as *Diplonotos novus* (Gordon, 1988).

Genus *DOMOSCLERUS* Gordon, 1988

TYPE SPECIES. — *Domosclerus piscis* Gordon, 1988.

Domosclerus edulis sp. nov.

Fig. 13 a-f

Domosclerus sp. Gordon & d'Hondt, 1991 : 106.

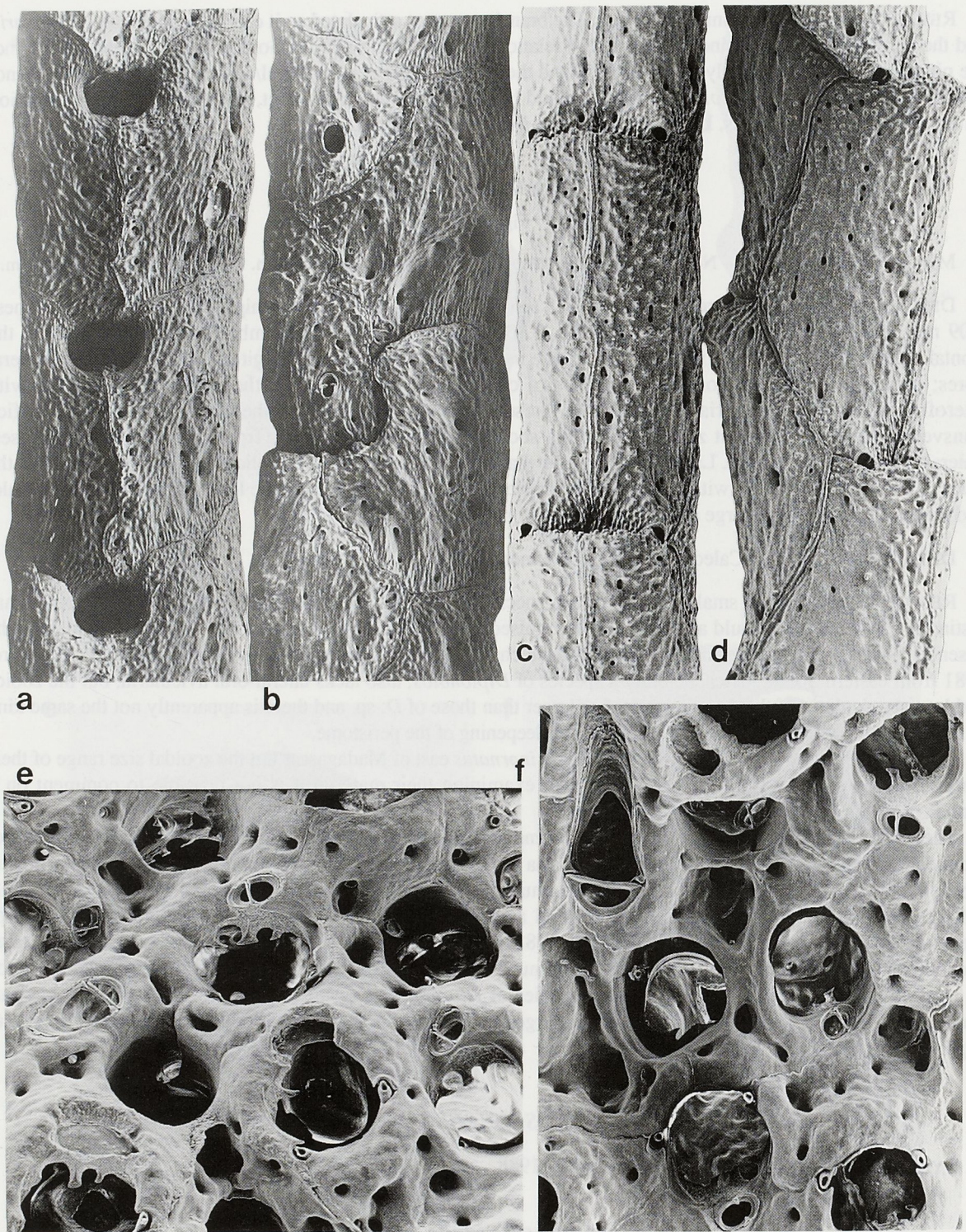


FIG. 14 a-b. — *Domosclerus* cf. *abyssicolus* (Busk) : frontal and lateral views of autozooids (BIOGEOCAL Stn CP 273).

FIG. 14 c-d. — *Domosclerus* sp. : frontal and lateral views of a branch (BIOGEOCAL Stn CP 260).

FIG. 14 e-f. — *Celleporaria* cf. *aperta* (Hincks) : two views of autozooidal orifices and avicularia - note the vicarious avicularium at upper left in f (MUSORSTOM 3 Stn CP 139).

MATERIAL EXAMINED. — **New Caledonia**. BIOCAL : stn CP 75, 825-860 m.
BIOGEOCAL : stn CP 232, 760-790 m.

DESCRIPTION. — Colony erect, with pinnate branching from the main axis; secondary branches arising at angles of 25-44° with branch intervals of 2.8-3.5 mm; lateral width of young branches 0.67-0.75 mm. Zooids 0.79-1.01 x 0.50-0.57 mm (internal chamber width 0.32-0.34 mm), the frontal shield either side of the median suture evenly perforated with small pores, the lateral surface with fine longitudinal striations and small areolar pores near the zigzag lateral suture; a single pair of oral costae beneath the granular proximal rim of the peristome; frontal shield straight in profile but at an angle to the branch axis such that the peristomial rim is projecting and the profile of young branches is somewhat serrated. Lateral-oral avicularia tiny, set at the corners of the orifice, directed obliquely distally, tending to become concealed in thicker-walled older zooids. Lateral avicularia somewhat pouch-like, of variable size (small to relatively large) and irregular occurrence, the opesia facing nearly laterally and the palate distolaterally, the proportionately small triangular rostrum directed proximolaterally or obliquely so; all avicularia with mandibular pivots that do not touch. Older, thickened, parts of branches with the lateral suture more sinuous, like a longitudinal string of Ss, with avicularia generally between the loops, the surface with longitudinal striations and short sulci with small pores within. Female zooids similar to autozooids, 0.75-0.94 x 0.58-0.77 mm; ovicells large, conspicuously bulging, the zooids bearing them on their frontals 0.88-0.98 x 0.60-0.75 mm, the ovicellular surface more or less imperforate (small marginal pores only), lightly textured.

TYPES. — *Holotype* : Part of colony from BIOGEOCAL Stn CP 232, 21°33.81' S, 166°27.07' E, 760-790 m, MNHN-Bry 19917.

Paratypes : MNHN-Bry 19918, from BIOCAL Stn CP 75, 22°18.65' S, 167°23.30' E, 825-860 m; MNHN-Bry 19919, from same locality as holotype.

DISTRIBUTION. — South of New Caledonia, 760-790 m.

REMARKS. — The type species of *Domosclerus*, *D. piscis* Gordon, completely lacks costae, including oral ones. The three species in the present collection, however, have been discovered to have suboral costae, which means the generic diagnosis given by GORDON (1988) must be amended to allow for this character in some of the species.

The species name alludes to the fact that this species is preyed upon by an unknown carnivore. GORDON and D'HONDT (1991) have documented the occurrence of boreholes 0.17-0.22 mm diameter in autozooids and ovicells of this species, with slightly more of the former bored than the latter.

Domosclerus cf. *abyssicolus* (Busk, 1884)

Fig. 14 a-b

cf. *Bifaxaria abyssicola* Busk, 1884 : 82, pl. 24, figs 5A-E.

MATERIAL EXAMINED. — **New Caledonia**. BIOGEOCAL : stn CP 273, 1920-2040 m.

DESCRIPTION. — Colony erect, pinnately branching; lateral branch width in young zooids 0.58-0.83 mm. Zooids 0.84-0.98 x 0.60-0.87 mm, the frontal shield somewhat granular in texture with associated fine striations; the immediate area either side of the median suture with small pores in a roughly linear series, with some other small pores further around on the lateral wall; a pair of suboral costae present under the proximal rim of the peristome. Branches parallel-sided, the peristomial orifice flush with the branch profile, the proximal rim not at all protruding. Lateral-oral avicularia absent. Lateral suture forming wide even zigzags longitudinally, the suture becoming more sinuous in older thickened branches. Small oval avicularia between the Vs or sinuosities of the lateral suture, the rounded rostrum proximally directed, the mandibular pivots not touching. Female zooids not seen.

DISTRIBUTION. — West of Lifou, Loyalty Islands, 1920-2040 m.

REMARKS. — Without more material it is difficult to make a definite comment on the relationships of this species to others in the genus, most of which need re-examining to ascertain the presence or absence of costae, and which should be re-illustrated by scanning electron micrographs. A distinctive feature of the present species which should be helpful in discrimination is the parallel-sided branch profile with flush, non-protruding, peristomial orifices. In this character it resembles *D. abyssicolus* Busk from the North Pacific Ocean, which evidently has similar, though larger, avicularia. BUSK's (1884) species comprises an incomplete and infertile specimen. As a unique holotype it is not able to be borrowed. *Sclerodomus inornatus* Hayward, 1981 is similar in appearance but, as I have been able to ascertain from an examination of the holotype, belongs instead to *Diplonotos* — it has a cryptic spinocyst of nine broad costae, closely appressed with no intercostal lacunae.

***Domosclerus* sp.**

Fig. 14 c-d

MATERIAL EXAMINED. — **New Caledonia.** BIOGEOCAL : stn CP 260, 1820-1980 m.

DESCRIPTION. — Colony erect, with a relatively long tuft of basal rhizoids anchored to foram grains. Lateral width of young branch 0.58-0.67 mm. Zooids 0.86-1.07 x 0.39-0.42 mm, the frontal shield granular, with small irregularly distributed perforations; a single pair of suboral costae present, supporting the densely granular proximal rim of the peristome; Branch profile similar to that of *D. edulis*, with the frontal shield at an angle to the branch axis and the peristome protruding as a consequence. Lateral suture forming regular wide-V zigzags longitudinally. Lateral-oral avicularia tiny, set at the corners of the orifice, directed obliquely distally; no other avicularia seen. Female zooids not seen.

DISTRIBUTION. — East of Lifou, Loyalty Islands, 1820-1980 m.

REMARKS. — This species is represented by a limited amount of infertile material. It resembles *D. edulis* in general appearance and in the possession of a pair of suboral costae but the zooids are proportionately longer and narrower and the branch width narrower than in that species.

Infraorder HIPPOTHOOMORPHA Gordon 1989b

Superfamily HIPPOTHOOIDEA Busk, 1859

Family PASYTHEIDAE Davis, 1934

Genus ***GEMELLIPORA*** Smitt, 1873

TYPE SPECIES. — *Gemellipora eburnea* Smitt, 1873.

Gemellipora eburnea Smitt, 1873

Gemellipora eburnea Smitt, 1873 : 35, 75, pl. 7, figs 152-156, pl. 9, figs 177, a, 178. — HARMER, 1957 : 994-995, pl. 69, figs 28-29 (*cum syn.*). — COOK, 1968 : 187. — HARMELIN, 1978 : 1071. — HAYWARD, 1981 : 58. — GORDON, 1984 : 112-113, pl. 44A-B.

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL : stn DW 46, 570 m. — Stn DW 64, 250 m. — Stn DW 65, 275 m. — Stn CP 109, 495 m.

MUSORSTOM 4 : stn DW 151, 200 m. — Stn CP 153, 235 m.

BIOGEOCAL : stn DW 308, 510-590 m.

MUSORSTOM 6 : stn CP 465, 480 m.

SMIB 4 : stn DW 55, 260 m.

DISTRIBUTION. — New Caledonia : Loyalty Islands Basin and northern Norfolk Ridge, 200-590 m; also Kermadec Ridge, Indonesia, Hawaii, Gulf of Mexico, West Indies, Georgia, Brazil, West Africa, Azores, Canary Islands, Madeira, Portugal, Spain.

REMARKS. — This wide-ranging species ranges in depth distribution from 46 m off Cuba (CANU & BASSLER, 1928) to 3307 m in the northeastern Atlantic (JULLIEN, 1883).

Infraorder UMBONULOMORPHA Gordon, 1989b

Superfamily LEPRALIELLOIDEA Vigneaux, 1949

Family LEPRALIELLIDAE Vigneaux, 1949

Genus *CELLEPORARIA* Lamouroux, 1821

TYPE SPECIES. — *Cellepora cristata* Lamarck, 1816.

Celleporaria cf. *aperta* (Hincks, 1882)

Fig. 14 e-f

cf. *Schizoporella aperta* Hincks, 1882 : 126, pl. 5, fig. 3.

Celleporaria aperta - HARMER, 1957 : 673 (part), text-fig. 56.

MATERIAL EXAMINED. — **Philippines.** MUSORSTOM 3 : stn CP 139, 250 m.

DISTRIBUTION. — South of Mindoro, Philippines, 250 m; Aru Islands, Indonesia, 13 m.

REMARKS. — As WINSTON and HEIMBERG (1986) pointed out, HARMER (1957) may have included more than one species in *Celleporaria aperta*. The present material accords perfectly with the official characters shown in his text-figure 56. If this form does represent a different species then it may be new. There are close similarities in the official denticles to those of *Celleporaria endivia* (Lamarck, 1816) but, according to POUYET (1978), that species lacks a suboral avicularium, which is very unusual in *Celleporaria*. HARMER (1957) included *Mucronella serratimargo* Ortmann, 1899 in the synonymy of *C. aperta* but ORTMANN's species has not been recognised since its original description so the characters remain uncertain.

Celleporaria columnaris (Busk, 1881)

Fig. 15 a-d

Cellepora columnaris Busk, 1881 : 343-344, 348, pl. 26, fig. 4. — BUSK, 1884 : 194, pl. 29, fig. 11, pl. 35, fig. 16.

Celleporaria columnaris - HARMER, 1957 : 677, pl. 42, figs 18-21, 23 (*cum syn.*). — POUYET, 1973 : 23, 28. — D'HONDT, 1986 : 721.

MATERIAL EXAMINED. — **New Caledonia.** MUSORSTOM 4 : stn DW 231, 75 m.

DISTRIBUTION. — Tanzania, Seychelles, Sri Lanka, Japan, Victoria, New South Wales, New Caledonia, Chesterfield Plateau, 5-350 m.

REMARKS. — The present material accords well with HARMER's (1957) description and illustrations of *C. columnaris*. As with some of his material, the tall granular columns are not common but, where they occur, are very distinctive. *Celleporaria labelligera* Harmer, 1957 is undoubtedly closely related to this species and, judging from the present material, may even be conspecific. Both species have orifices with a more or less straight

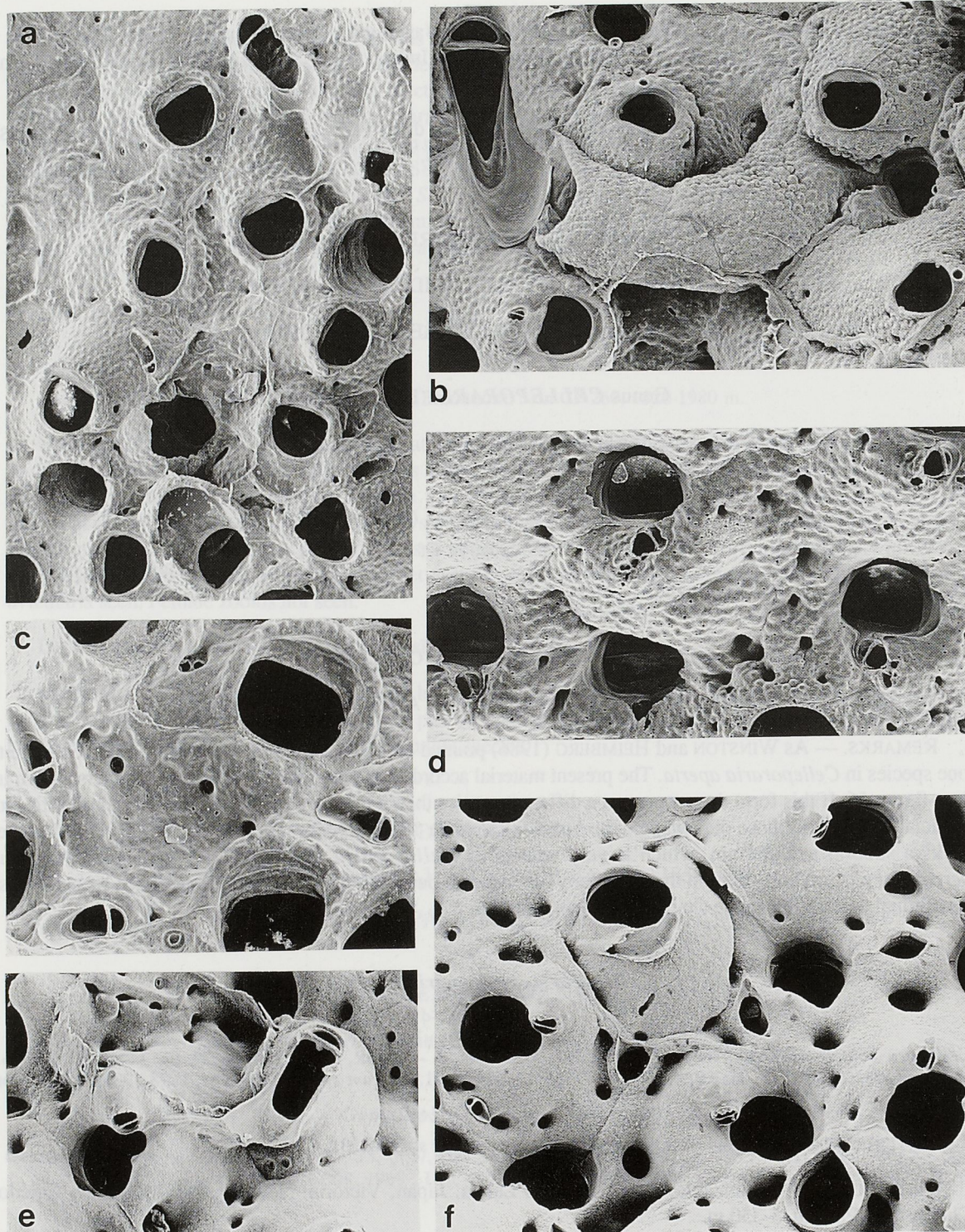


FIG. 15 a-d. — *Celleporaria columnaris* (Busk) : frontal views of autozooids and avicularia - note the vicarious avicularium, subjacent suboral avicularium, and worm tube in b and the suboral avicularia in d (a-c, MUSORSTOM 4 Stn DW 231; d, MUSORSTOM 3 Stn CP 102).

FIG. 15 e-f. — *Celleporaria fusca* (Busk) : frontal views of zooids - note the vicarious avicularium with ligulate cross-bar in e (MUSORSTOM 4 Stn DW 321).

proximal orificial rim, similar suboral avicularia and ovicells, and a granular-tubercular texture. According to the key to species provided by HARMER (1957, p. 666), *C. labelligera* may have 2-3 oral spines, an orifice as wide as long, a short peristomial lip proximally, and rare suboral avicularia; there are also rare spatulate, toothed, vicarious avicularia, and evidently the tall columnar structures are lacking. *Celleporaria columnaris*, on the other hand, is said to lack oral spines and a low peristomial rim and to have semicircular orifices and nearly smooth ovicells; it also has spatulate vicarious avicularia that may not always be present. These differences seem relatively trivial inasmuch as they are the kinds of characters that are known to vary greatly in expression among *Celleporaria* species. In the present material such is the case, combining, for example, a peristomial lip in the same colony as the tall columns; suboral avicularia may be present or lacking in the same colony, and, significantly, the ovicells are tuberculate and tubes of a commensal organism like those described by HARMER in *C. labelligera* are also present. D'HONDT (1986) reported *Celleporaria* aff. *labelligera* as well as *C. columnaris* from the Chesterfield Plateau and New Caledonia.

Celleporaria fusca (Busk, 1854)

Fig. 15 e-f

Cellepora fusca Busk, 1854 : 88, pl. 19, fig. 2, pl. 20, fig. 6.

Holoporella fusca - HASTINGS, 1932 : 447. — SOULE & SOULE, 1987 : 150.

Celleporaria fusca - HARMER, 1957 : 680, pl. 43, figs 1-7. — POUYET, 1973 : 24, 28. — BOCK, 1982 : 365, fig. 9.17d, ?pl. 25.4. — RYLAND & HAYWARD, 1992 : 253, fig. 15a-d.

MATERIAL EXAMINED. — New Caledonia. MUSORSTOM 4 : stn DW 321, 75 m.

DISTRIBUTION. — Indian Ocean, Seychelles, Sri Lanka, Singapore, Torres Strait, Queensland, New South Wales, Victoria, South Australia, New Caledonia and Loyalty Islands, 0-75 m.

REMARKS. — The present material accords well with the description and illustrations of HARMER (1957) although the rostra of the vicarious avicularia in both the "*Siboga*" and the present material are not toothed as shown by BOCK (1982) in South Australian specimens; the characteristic ligula on the cross-bar is present, however. WINSTON and HEIMBERG (1986) examined a range of specimens at The Natural History Museum, London, concluding that more than one species was represented in the "*Siboga*" samples, none of which constituted *C. fusca* (Busk, 1854), and attributing at least part of the material to their new species *C. sibogae*. Notwithstanding that HARMER (1957) may have included more than one species in the concept of *C. fusca*, it cannot be ruled out that part of his material may indeed have been *fusca* (see also the comments of RYLAND and HAYWARD (1992) in this regard). Although BUSK (1854) illustrated material from Bass Strait he did not show the vicarious avicularium as having a toothed rostrum, which means that this character may not be that significant. BUSK (1854) and BOCK (1982) described the species as "deep fuscous purple" and "usually purple when live", respectively (although BOCK's plate 25.4, labelled "*Celleporaria* cf. *fusca*", is of an orange-coloured species), whereas *C. sibogae*, which lacks the ligula on the cross-bar of the vicarious avicularium, was described by the authors as "a dull greenish or grayish color when dried". The MUSORSTOM material, dried from alcohol, is dark brown in colour.

Celleporaria macrodon sp. nov.

Fig. 16 a-b

MATERIAL EXAMINED. — New Caledonia. BIOCAL : stn DW 65, 245-275 m.

MUSORSTOM 4 : stn DW 151, 200 m.

DESCRIPTION. — Colony encrusting. Zooids at growing edge 0.50-0.67 x 0.32-0.47 mm, the frontal shield smooth to faintly tubercular, with up to 5 tiny marginal areolar pores. Orifice about as high (0.15 mm) as long, with 4-7 basally articulated oral spines. Three very stout denticles present, the median one typically tapering to a

straight edge, the lateral ones slightly alate. Symmetrically arranged median suboral avicularium present, the semicircular rostrum directed more or less frontally, facing distally, with 3-4 small tubercles around the rim; frontal shield rising somewhat to the small mucro in which the avicularium is set. As seen at the growing margin, most zooids have another small avicularium, like the suboral one, placed distally to the orifice, the rostrum directed distally, while at the proximal end of the zooid there is typically a medium-sized lingulate (parallel-sided) avicularium directed distally or, more usually, obliquely so, with complete, aligulate, cross-bar and well-developed palatal shelf distally. Less frequent vicarious avicularia may occur; these are lingulate to subspatulate and the cross-bar may sometimes have a ligula. Ovicells somewhat cucullate, with the same texture as the zooids.

TYPES. — *Holotype* : Colony from BIOCAL Stn DW 65, 24°47.93' S, 168°09.12' E, 250 m, MNHN-Bry 19925.

Paratypes : MNHN-Bry 19926, from same locality as holotype; MNHN-Bry 19929, from MUSORSTOM 4 Stn DW 151, 19°07.00' S, 163°22.00' E, 200 m.

DISTRIBUTION. — Northern New Caledonia and northern Norfolk Ridge, 200-250 m.

REMARKS. — There are several species of *Celleporaria* with orificial denticles. POUYET (1973) listed those described to date, of which HARMER (1957) illustrated some from Indonesia. None has the unusually stout denticles or as many oral spines as *C. macrodon*. As in *C. tridenticulata* there is a generally symmetrical suboral avicularium and mucro but the large avicularia of *C. macrodon* are proportionately narrower and far less spatulate.

Celleporaria mamillata (Busk, 1854)

Fig. 16 c

Cellepora mamillata Busk, 1854 : 87, pl. 120, figs 3-5. — HINCKS, 1881 : 267. — ?WATERS, 1887 : 197.

Holoporella mamillata - ?MARCUS, 1922 : 18. — HASTINGS, 1932 : 444-446, fig. 19, A-D.

Holoporella pigmentaria - LIVINGSTONE, 1926 : 97 (*vide* HASTINGS, 1932).

Celleporaria mamillata - HARMER, 1957 : 683. — POUYET, 1973 : 24, 29.

MATERIAL EXAMINED. — **New Caledonia.** BIOCAL : stn DW 33, 675 m.

DISTRIBUTION. — ?Mindanao, Northern Norfolk Ridge, Great Barrier Reef, ? New South Wales, Victoria, Patagonia, 22-675 m.

REMARKS. — This species has been accorded an unusual distribution. The type locality is in magellanic South America, but HASTINGS (1932) described specimens from the Great Barrier Reef which were said to "agree very exactly" with the type material. Several other authors have attributed warm-water specimens to this species, though some of these records, like that of PHILIPPS (1900) from Lifou, Loyalty Islands, were placed in the synonymy of *C. fusca* by HARMER (1957).

The present material has relatively large suboral avicularia like the one depicted by BUSK (1854, pl. 120, fig. 4) but there are also tiny suboral avicularia, in which case the mucro is narrower and spine-like. There may also be accessory non-articulated spines associated with the orifice, a feature that BUSK also mentioned, but the "mamillary projections" are lacking in the present, limited, material.

Celleporaria sibogae Winston & Heimberg, 1986

Fig. 16 d

Celleporaria sibogae Winston & Heimberg, 1986 : 30-32, figs 73-78. — WINSTON, 1986 : 13-14.

MATERIAL EXAMINED. — **Philippines.** MUSORSTOM 3 : stn DR 117, 97-92 m.

DISTRIBUTION. — ?Madagascar, Philippines, Indonesia, ?Queensland, 0-92 m.

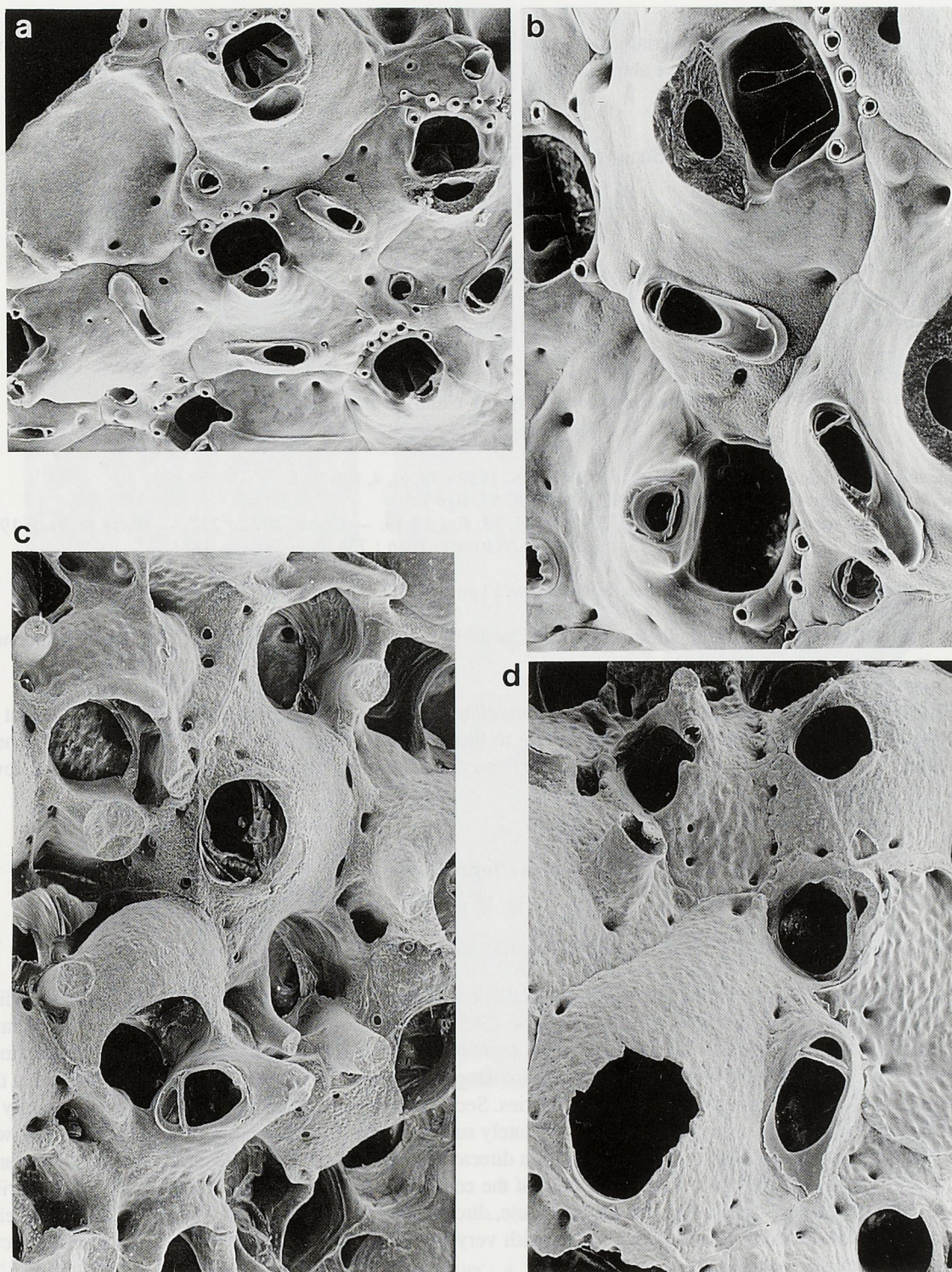


FIG. 16 a-b. — *Celleporaria macrodon* sp. nov. : zooids and avicularia near growing edge of colony (BIOCAL Stn DW 65).

FIG. 16 c. — *Celleporaria mamillata* (Busk) : frontal view of zooids - note the ovicelled zooid with large suboral avicularium (BIOCAL Stn DW 33).

FIG. 16 d. — *Celleporaria sibogae* Winston & Heimberg : zooidal orifices and avicularia (MUSORSTOM 3 Stn DR 117).

REMARKS. — The present material accords with *C. sibogae* in the characters of the suboral and vicarious avicularia, in contrast to *C. fusca* (see above).

Superfamily ADEONOIDEA Busk, 1884

Family ADEONIDAE Busk, 1884

Genus *ADEONELLOPSIS* MacGillivray, 1886

TYPE SPECIES. — *Adeonellopsis foliacea*, MacGillivray, 1886.

Adeonellopsis pentapora Canu & Bassler, 1929

Fig. 17 a-d

[?] *Adeonella tuberculata* Busk, 1884 : 180. — ORTMANN, 1889 : 53, pl. 4, figs 9a-b.

Adeonellopsis pentapora Canu & Bassler, 1929 : 382, pl. 53, figs 1-5.

Adeonellopsis yarraensis - HARMER, 1957 : 799-800, pl. 53, figs 18-19. — COOK, 1973 : 252. — WASS & YOO, 1975 : 810, pl. 8, fig. 7. — GORDON, 1984 : 73, pl. 24G. — D'HONDT, 1986 : 736. Non Waters, 1881.

MATERIAL EXAMINED. — **Philippines.** MUSORSTOM 3 : stn DR 117, 97-92 m.

DISTRIBUTION. — Japan, Philippines, Indonesia, Chesterfield Bank, Kermadec Ridge, 37-969 m; Pleistocene of Tasmania.

REMARKS. — Having examined syntypes of *Adeonellopsis yarraensis* (Waters, 1881), it is apparent that the Recent forms attributed to *yarraensis* do not belong to this species. The fossil syntypes comprise very slender, subcircular, colony fragments of smaller dimensions than the modern species, with a smaller spiramen of fewer pores.

Adeonellopsis sp.

Fig. 17 e-f

MATERIAL EXAMINED. — **Philippines.** MUSORSTOM 3 : stn DR 117, 97-92 m.

DESCRIPTION. — Colony erect, bilamellar, the flattened branches 0.92-1.30 mm wide, with 5-6 longitudinal series of zooids showing on each side. Zooids 0.56-0.85 x 0.22-0.26 mm, relatively elongate, with a large compound spiramen of 5-6 denticulate pores in a depressed area of the frontal shield. Shield texture finely granulated, the lateral margins with numerous small areolar pores; the furrows between adjacent zooids with a thin line of calcification marking the interzooidal boundaries. Secondary orifice somewhat wider than high, roundly D-shaped, associated with the raised peristome. Immediately subjacent is a relatively large suboral avicularium, with very small mandibular pivots and a long acute rostrum directed distolaterally or almost laterally towards the nearest branch margin or towards either margin in the case of the central series of zooids; a smaller, shorter, avicularium placed proximally on each zooid, the rostrum also acute, directed mostly distally, sometimes laterally. Along each branch margin is a series of vicarious avicularia, with very long (~ 0.28 mm) and narrow acute rostra directed distally. Gonozooids not seen.

REMARKS. — This species has affinities with *Adeonellopsis distoma* (Busk, 1858), recently redescribed by ARISTEGUI (1985). *Adeonellopsis distoma*, presently known only from west of Brittany, Madeira, Azores, Canaries, the west Mediterranean, and the Pliocene of Holland (BISHOP & HAYWARD, 1989), has a similar form,

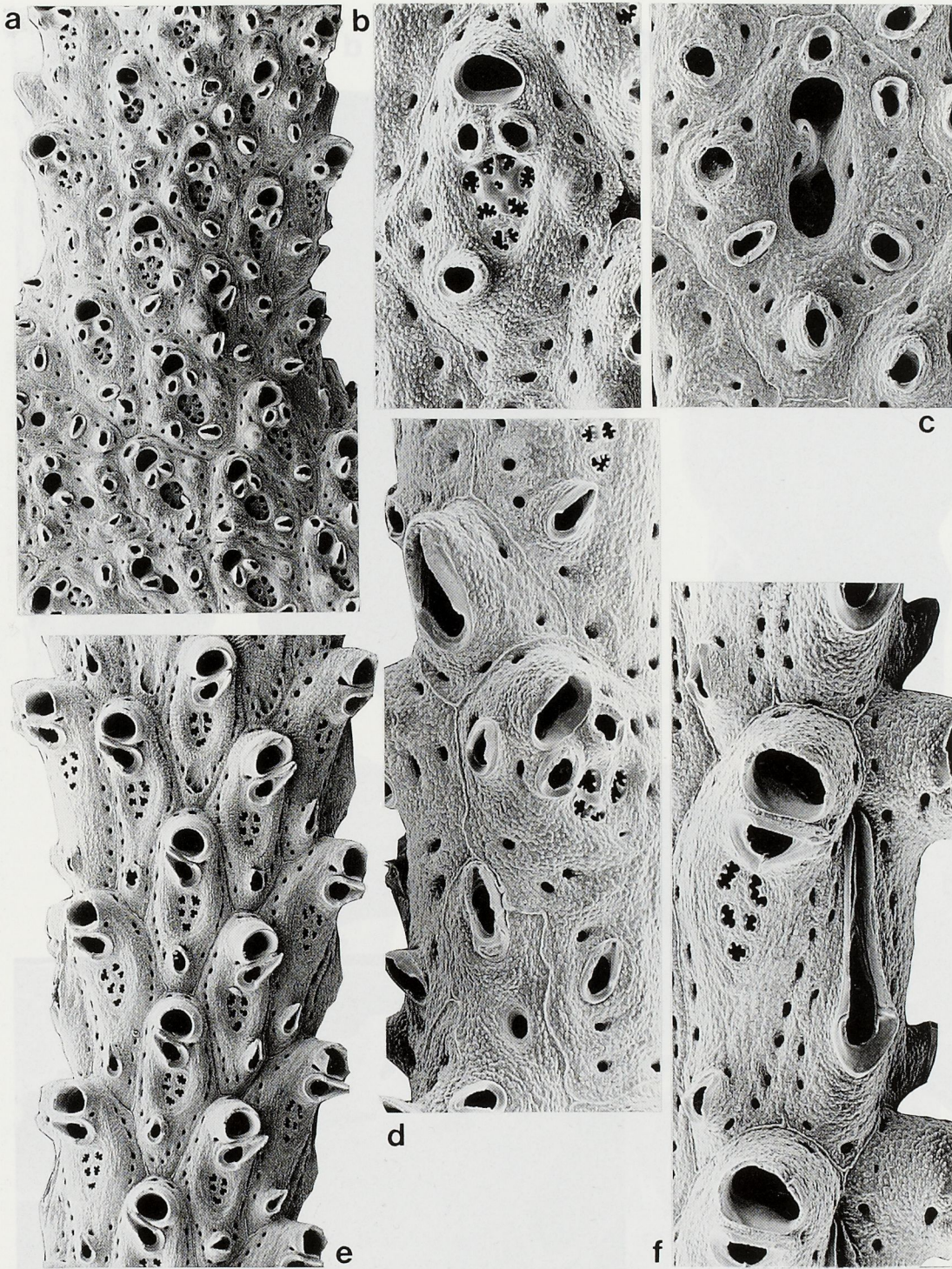
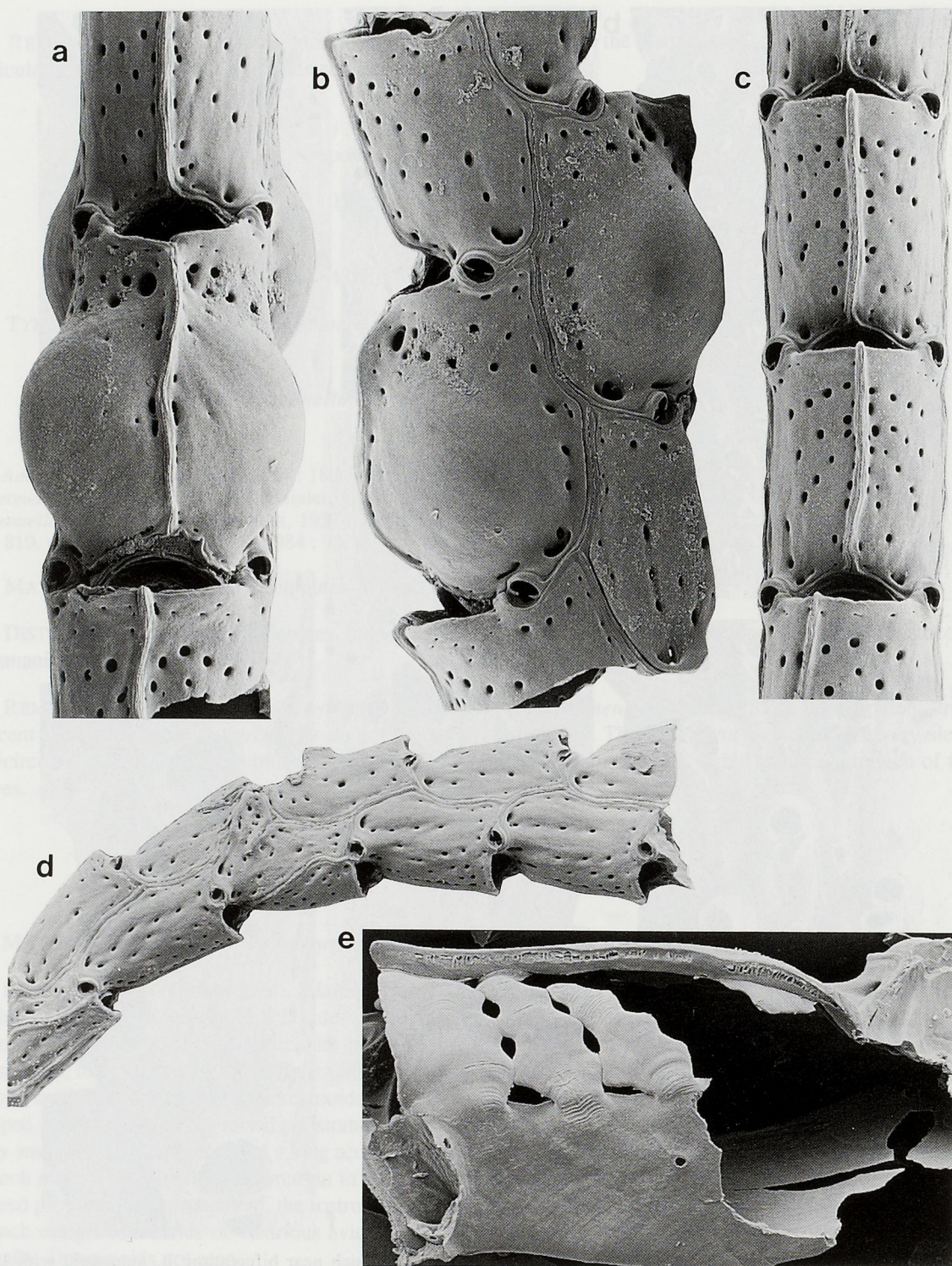


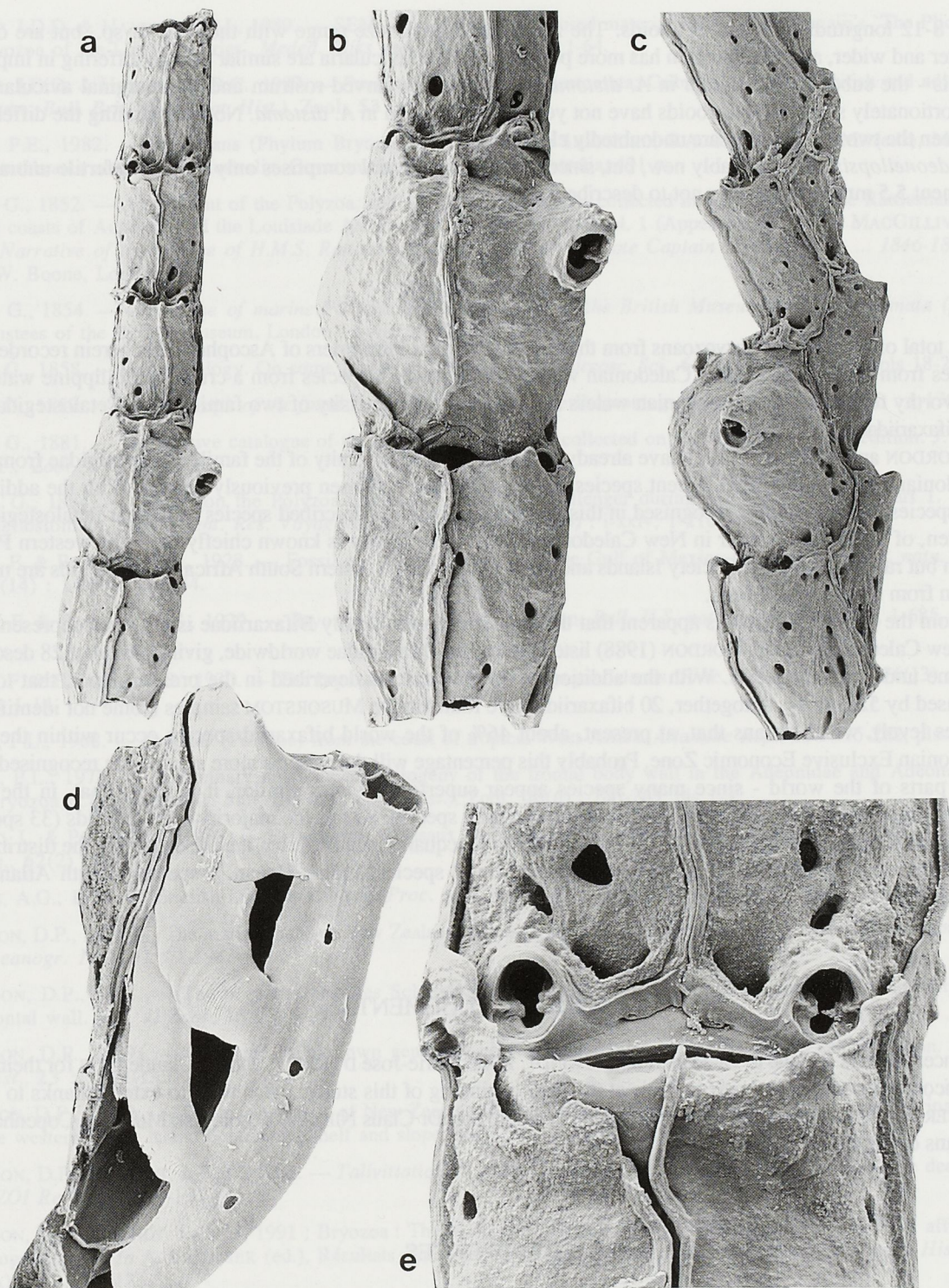
FIG. 17 a-d. — *Adeonellopsis pentapora* Canu & Bassler : a, part of branch near bifurcation; b, autozooid with little secondary calcification; c, zooid with marked secondary calcification; d, autozooid and avicularia at colony margin - note the relatively short vicarious avicularium distal to the autozooid (MUSORSTOM 3 Stn DR 117).

FIG. 17 e-f. — *Adeonellopsis* sp. : e, part of branch with autozooids; f, autozooids and vicarious avicularium at colony margin (MUSORSTOM 3 Stn DR 117).



Type material from the Natural History Museum, London

FIG. 18 a-e. — *Bifaxaria submucronata* Busk : a, frontal view of ovicelled zooid; b, same, lateral view; c-d, frontal and lateral views, respectively, of autozooids; e, lateral view of exposed spinocyst (some costae missing) ("Challenger" Stn 122, off Brazil, 640 m, BMNH 1887.12.9.373, lectotype, part).



Type material from the Natural History Museum, London

FIG. 19 a-e. — *Diplonotos papillatus* (Busk) : a-c, three views of the same branch fragment showing an aviculiferous ovicell; d, zooid with spinocyst exposed (midproximal costa missing); e, close-up of autozooidal orifice showing lateral-oral avicularia ("Challenger" Stn 196, Indonesia, 1509 m, BMNH 1887.12.9.379, lectotype, part).

with 8-12 longitudinal series of zooids. The zooids overlap in size range with those of *A. sp.*, but are overall shorter and wider, and the spiramen has more pores (6-10). The avicularia are similar though differing in important details - the suboral avicularium in *A. distoma* has a frontally curved rostrum and the marginal avicularia are proportionately shorter. Gonozooids have not yet been discovered in *A. distoma*. Notwithstanding the differences between the two species, they are undoubtedly closely related.

Adeonellopsis sp. is probably new, but, since the present material comprises only a single infertile unbranched fragment 5.5 mm long, I prefer not to describe it now.

DISCUSSION

A total of 44 species of bryozoans from the three smaller infraorders of Ascophorina is herein recorded - 39 species from six cruises in New Caledonian waters and a further 5 species from a cruise in Philippine waters. A noteworthy feature in New Caledonian waters is the remarkable diversity of two families, the Petalostegidae and the Bifaxariidae.

GORDON and D'HONDT (1991) have already noted the unusual diversity of the family Petalostegidae from New Caledonian waters - only two Recent species of Petalostegidae had been previously known. With the additional new species of *Petalostegus* recognised in this paper, the number of described species of Recent Petalostegidae is now ten, of which eight occur in New Caledonian waters. The family is known chiefly from the western Pacific Ocean but ranges east to the Society Islands and is also known from eastern South Africa. Petalostegids are not yet known from the Atlantic Ocean.

From the present study, it is apparent that the largely deep-sea family Bifaxariidae is also well represented in the New Caledonian region. GORDON (1988) listed the known Bifaxariidae worldwide, giving a total of 28 described and one undescribed species. With the addition of 15 new species described in the present paper, that total is increased by 52% to 44. Altogether, 20 bifaxariids were found in the MUSORSTOM samples (some not identified to species level), which means that, at present, about 46% of the world bifaxariid species occur within the New Caledonian Exclusive Economic Zone. Probably this percentage will decrease as more species are recognised from other parts of the world - since many species appear superficially very similar, it is likely that, in the past, potential new species may have been attributed to existing species. So far, the majority of bifaxariids (33 species) are known from the western Pacific (The Philippines to Macquarie Island). From the other oceans, the distribution is as follows - north Pacific, 1 species; eastern Pacific, 2 species; Indian Ocean, 4 species; South Atlantic, 2 species; North Atlantic, 2 species.

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