

Hydroids (Hydrozoa: Leptothecatae) from the Beagle Gulf and Darwin Harbour, northern Australia

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ABSTRACT

Sixty-three species of leptothecate hydroids including 12 new species and six new records for Australia are reported from three collections (one dredging and two SCUBA diving) made in the Beagle Gulf and Darwin Harbour in the Northern Territory of Australia. Large, visually dominant hydroid colonies from reef and soft bottom include known species with distributional ranges throughout the Indo-Pacific, Indonesia and the Timor Sea. The systematic status of several poorly known species is reviewed and ecological observations used to unravel past confusion of several species. The preferred and possibly obligatory habitat for many species is the tubiculous polychaete worm *Eunice tubifex*.

KEYWORDS: Hydroids, Leptothecatae, Beagle Gulf, Darwin Harbour, northern Australia.

INTRODUCTION

This is the second report on hydroids collected from the Beagle Gulf and environs of Darwin Harbour in the Northern Territory of Australia. The first paper (Watson 1999) described the anthoathecate hydroids; this paper describes the leptothecate hydroids. The Beagle Gulf is a large, open embayment of the northern Australian mainland facing the Timor Sea between Melville and Bathurst Islands; Darwin Harbour lies on an inlet of the Beagle Gulf (Fig. 1). A description of the physical regime of the Beagle Gulf and environs of Darwin Harbour is given in Watson (1999).

Leptothecate species reported in this paper are derived from three separate collections: a major dredging survey of the invertebrate fauna of the Beagle Gulf undertaken in 1993 by the Parks and Wildlife Commission of the Northern Territory (formerly Northern Territory Conservation Commission) and two collections made in the environs of Darwin Harbour in August-September 1998 and in September 1999, the latter two collections being made by the author and others using SCUBA. Underwater collections in the environs of Darwin were made on reefs 1 km off East Point (EP), Plater Rock, 1 km offshore from Talc Head (PR), from the breakwater and channel bed off the East Arm Port (EA) and on wharf piles and port structures in the Port of Darwin (PD). These collections from hard substrate augment the Beagle Gulf collection which was dredged from predominantly soft bed. While the collections upon which this report and Watson (1999) are based have

considerably increased knowledge of the hydroid fauna in the Beagle Gulf, future collecting will certainly add more species to the faunal list.

Materials and methods of collection are given in Watson (1999). Station number, locality, depth and date of sampling in the Beagle Gulf Survey from which hydroids were recovered are listed in Table 1. Species and sites of collection are listed in Table 2. A taxonomic index is provided as Appendix 1. Type and voucher specimens are lodged in the Museums and Art Galleries of the Northern Territory, Darwin (NTM C) and the Museum of Victoria, Melbourne (MV F).

Eighty-three of the 162 stations occupied in the Beagle Gulf Survey yielded leptothecate hydroids. Of the 63 leptothecate species recorded in this study, 12 are described as new, five of these being collected by SCUBA diving in the environs of Darwin Harbour and six species are new records for Australia. Twenty-two, 20 and 19 species were recorded from three Beagle Gulf stations (Stns 136, 154, 87 respectively). These stations were among those sampled furthest from land, but apart from this geographical relationship they appear to share no common environmental features, the bed ranging from coarse sand at -6 m (Stn 87), rocky bottom at -30 m, (Stn 154) and a sponge bed at -18 m (Stn 136). Species recorded at these stations include *Macrorhynchia phoenicia*, *Idiellana pristis*, *Thyrosocyphus torresii*, *Plumularia scabra*, *Plumularia badia*, *Nemertesia cylindrica*, *Lytocarpia angulosa*, and *Gymnangium longicorne*. These species were also the most visually dominant seen in the two extensive SCUBA surveys in the environs of Darwin Harbour. Underwater

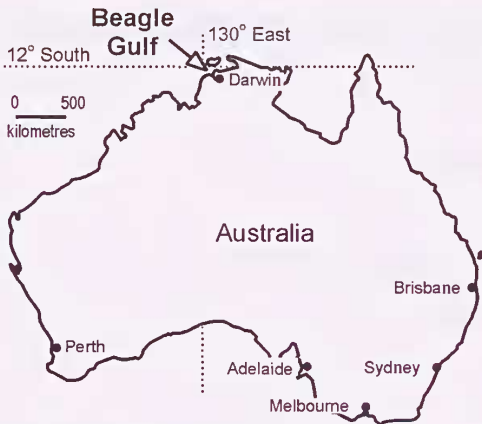


Fig. 1. Map of mainland Australia showing location of Beagle Gulf and Darwin.

observations in the environs of Darwin Harbour found that some other species (e.g. *Sertularella diaphana*, *S. quadridens*, *Gymnangium hians*, *Aglaophenia delicatula*, *Macrorhynchia philippina* and *Thyroscyphus fruticosus*) as well as several new species, were much more abundant than indicated by the dredged material. The only well represented species in the Beagle Gulf Survey collection not seen in Darwin Harbour was *Salacia sinuosa*.

Most of the previously known species range throughout the Indo-Pacific, Indonesia and the Timor Sea; many have circumtropical affinities extending to the Suez area, the Mediterranean Sea and the West Indies. Two (*Thyroscyphus macrocytharum*, *Salacia sinuosa*), are endemic to tropical and subtropical Australia. *Kirchnerpaneria irregularis* and *Monothecha flexuosa* are known only from Australia and South Africa while *Fillellum serratum*, *Antennella secundaria* and *Plu-*

Table 1. Beagle Gulf stations from which leptothebate hydroids were recovered.

Stn No.	Locality	Depth m	Substrate	Date sampled
7	N of Cape Ford, Anson Bay, 13° 25.08'S, 129° 53.94'S	13	Sand, shale, coral rubble	1/10/1993
9	NE of Cape Ford, Anson Bay 13° 25.02'S, 129° 55.98'E	16	Sine sandy mud	1/10/1993
13	NNE of Cape Ford, Anson Bay 13° 22.14'S, 129° 53.40'E	24	Sandy mud	2/10/1993
17	Anson Bay, 13° 21.96'S, 130° 4.98'E	12	Mud	2/10/1993
20	N of Cape Ford, Anson Bay, 13° 19.14'S, 129° 56.28'E	29	Coarse sand and shale	2/10/1993
21	W of Daly River mouth, Anson Bay, 12° 19.14'S, 129° 59.16'E	31	Mud	2/10/1993
26	S of Bateman Shoal, Anson Bay, 13° 16.08'S, 129° 55.82'E	23	Coarse sand, shale and gravel	3/10/1993
27	SE of Bateman Shoal, Anson Bay 13° 15.90'S, 129° 58.86'E	19	Coarse sand	3/10/1993
32	E of Batemen Shoal, Anson Bay, 13° 12.96'S, 129° 59.10'E	13	Rocky bottom	3/10/1993
33	S of North Peron Island, Anson Bay, 13° 13.26'S, 130° 1.92'E	9	Coarse sand and shale	3/10/1993
35	E of South Peron Island, 13° 12.84'S, 130° 7.98'E	6	Coarse sandy mud and shale	2/10/1993
36	W of North Peron Island, Anson Bay, 13° 10.26'S, 129° 55.62'E	15	Coarse sand and shale	3/10/1993
38	Channel Point to North Peron Island, 13° 9.24'S, 130° 5.52'E	20	Gravel	3/10/1993
40	W of North Peron Island, 12° 6.96'S, 129° 58.86'E	8	Mud and rock	3/10/1993
48	NNE of North Peron Island, 13° 0.96'S, 130° 4.98'E	13	Mud, shale and sand	4/10/1993
49	N of North Peron Island, 12° 57.90'S, 130° 1.92'E	16	Mud	4/10/1993
50	NNE of Point Peron, 12° 57.96'S, 130° 4.98'E	10	Sandy mud	4/10/1993
52	E of Point Blaze, Fog Bay, 12° 54.96'S, 130° 7.98'E	7	Mud and shale	4/10/1993
53	E of Point Jenny, Fog Bay, 12° 54.78'S, 130° 14.16'E	4	Sandy mud	4/10/1993
54	E of Point Jenny, Fog Bay, 12° 54.96'S, 130° 15.60'E	4	Sandy mud	4/10/1993
56	NW of Blaze Reef, Fog Bay, 12° 52.02'S, 130° 11.10'E	6	Coarse sand and shale	4/10/1993
57	E of Blaze Reef, Fog Bay, 12° 51.96'S, 130° 14.10'E	7	Mud and shale	4/10/1993
58	W of Finnis River, Fog Bay, 12° 7.02'S, 130° 56.10'E	7	Fine mud	4/10/1993
61	W of Five Mile Beach, Fog Bay, 12° 49.92'S, 130° 19.38'E	7	Fine mud	5/10/1993
66	Bynoe Harbour, 12° 41.88'S, 130° 36.30'E	8	Sponge bed	7/10/1993
67	Bynoe Harbour, 12° 70.92'S, 130° 33.12'E	9	Coarse sand and shale	7/10/1993
69	SW of Dun In Mirrie Island, Fog Bay, 12° 40.02'S, 130° 19.92'E	6	Mud	5/10/1993
74	Bynoe Harbour, 12° 36.96'S, 130° 32.04'E	26	Coarse sand and shale	7/10/1993
77	W of Unjin Point, Port Patterson, 12° 33.60'S, 130° 27.90'E	16	Sandy mud and gravel	6/10/1993
78	E of Unjin Point, Bynoe Harbour, 12° 34.02'S, 130° 32.04'E	28	Coarse sand, shale and gravel	7/10/1993
80	NW of Roche Reef, Grose Islands, 12° 31.02'S, 130° 17.22'E	17	Coarse sand, shale and gravel	5/10/1993
81	N of Bass Reef, Grose Islands, 12° 31.02'S, 130° 20.04'E	15	Gravel and sponges	5/10/1993
82	W of Quail Island, Grose Islands, 12° 30.96'S, 130° 22.92'E,	9	Coarse sand and gravel	6/10/1993
84	E of Moira Reef, Bynoe Harbour 12° 31.20'S, 130° 31.74'E,	11	Coarse sand and gravel	6/10/1993
85	N of Bass Reef, Bynoe Harbour, 12° 27.96'S, 130° 20.16'E	19	Coarse sand, shale and mud	6/10/1993
87	S of Fish Reef, Grose Islands, 12° 27.90'S, 130° 26.70'E	6	Coarse sand	6/10/1993
88	W of Middle Reef, Bynoe Harbour, 12° 28.02'S, 130° 28.98'E	38	Mud, gravel and rock	6/10/1993
89	Middle Reef, Bynoe Harbour, 12° 28.80'S, 130° 32.10'E	14	Mud and gravel	7/10/1993
91	NW of Fish Reef, Grose Islands, 12° 25.44'S, 130° 25.92'E	19	Mud and gravel	6/10/1993

mularia setacea are temperate and tropical cosmopolitan species. Seven, mostly small and inconspicuous species (*Hebella ?laterocaudata*, *Anthohebella parasitica*, *Sertularella decipiens*, *Halopteris plagiocampa*, *Plumularia bedoti*, *Clytia ?warreni*, *Clytia linearis*) are new to the tropical Australian region.

Abundant material and diving observations of previously unknown habitat preferences, habit and colour of colonies served to differentiate between several species which in the past have been confused or considered to be variants of known species. Ample material from the diving surveys has also provided a basis for

review of the systematic status of several poorly known species.

Many of the species reported in this paper were found on the tubes of the polychaete worm *Eunice tubifex* Crossland, 1904. The tough mucilaginous tubes which stand erect to a height of c. 30 cm, occur abundantly on reef and man-made structures throughout Beagle Gulf and Darwin Harbour. The tubes provide a more or less sediment-free substrate for a diverse invertebrate community of small compound ascidians, bryozoans, sponges and hydroids. *Eunice tubifex* is a preferred and possibly obligatory habitat for several hydroid species.

Table 1 (cont.). Beagle Gulf stations from which leptotheate hydroids were recovered.

Stn No.	Locality	Depth m	Substrate	Date sampled
92	E of Fish Reef, Bynoe Harbour, 12° 24.84'S, 130° 28.92'E	17	Coarse sand and gravel	6/10/1993
93	Thrings Channel, Bynoe Harbour, 12° 24.96'S, 130° 31.98'E	29	Shale	7/10/1993
95	Charles Point, 12° 21.90'S, 130° 31.92'E	15	Gravel and sponges	7/10/1993
97	NE of Charles Point, 12° 21.84'S, 130° 37.86'E	14	Coarse sand and shale	7/10/1993
100	N of Nightcliff, Darwin Harbour, 12° 21.18'S, 130° 50.40'E	5	Muddy sand and seagrass	12/10/1993
101	WNW of Charles Point, 12° 19.02'S, 130° 34.02'E	19	Sand, gravel and mud	7/10/1993
104	Darwin Harbour, 12° 19.08'S, 130° 43.92'E	15	Fine sandy mud	13/10/1993
105	Outer Darwin Harbour, 12° 19.02'S, 130° 47.10'E	15	Mud, sand, shale and seagrass	12/10/1993
106	Outer Darwin Harbour, 12° 18.08'S, 130° 50.40'E	12	Mud, gavel and shale	12/10/1993
110	Outer Charles Point, 12° 15.84'S, 130° 37.86'E	27	Sandy mud	13/10/1993
111	Outer Charles Point, 12° 16.08'S, 130° 40.98'E	28	Sandy mud	13/10/1993
113	Outer Darwin Harbour, 12° 15.84'S, 130° 47.22'E	20	Sandy mud and shale	12/10/1993
114	Outer Darwin Harbour, 12° 16.08'S, 130° 50.04'E	18	Mud, gravel and shale	12/10/1993
115	N of Lee Point, Shoal Bay, 12° 16.02'S, 130° 53.04'E	16	Mud and shale	11/10/1993
116	Shoal Bay, 12° 15.96'S, 130° 55.86'E	13	Sandy mud and seagrass	12/10/1993
118	Fenton Patches, Darwin Harbour, 12° 13.08'S, 130° 44.04'E	20	Coarse sand and shale	12/10/1993
119	Outer Darwin Harbour, 12° 12.90'S, 130° 47.04'E	23	Mud	12/10/1993
120	Outer Darwin Harbour, 12° 13.02'S, 130° 50.04'E	22	Coarse sand, shale and mud	12/10/1993
121	Shoal Bay, 12° 13.02'S, 130° 52.92'E	19	Mud	12/10/1993
122	Shoal Bay, 12° 13.08'S, 130° 55.98'E	17	Sandy mud and seagrass	12/10/1993
126	Outer Darwin Harbour, 12° 10.08'S, 130° 46.92'E	30	Mud and gravel	12/10/1993
127	Outer Darwin Harbour, 12° 10.02'S, 130° 49.86'E	27	Muddy sand, shale, sponges	12/10/1993
129	W of Gunn Point, Shoal Bay, 12° 09.96'S, 130° 59.76'E	15	Gravel	
131	Mouth of Leaders Creek, Shoal Bay, 12° 9.36'S, 131° 8.32'E	4	Sandy mud	10/10/1993
132	NE of Stephens Point, Adam Bay, 12° 10.02'S, 131° 11.40'E	4	Sandy mud, shale and gravel	10/10/1993
136	Outer Shoal Bay, 12° 6.90'S, 130° 49.92'E	18	Sponge bed	12/10/1993
137	SW of Marsh Shoals, outer Shoal Bay, 12° 7.02'S, 130° 52.92'E	20	Sponge bed	12/10/1993
138	S of Marsh Shoal, Vernon Islands, 12° 7.02'S, 130° 56.10'E	16	Gravel	11/10/1993
139	SSE of Lyne Reef, Vernon Islands, 12° 7.08'S, 130° 59.04'E	30	Shale and rock	11/10/1993
140	W of South West Vernon Island, 12° 6.90'S, 131° 4.80'E	13	Coral rubble	10/10/1993
144	W of Ruby Island, Chambers Bay, 12° 7.08'S, 131° 20.04'E	22	Shale and coral rubble	
146	N of Marsh Shoal, Vernon Islands, 12° 4.02'S, 131° 55.86'E	39	Rocky bottom	10/10/1993
147	SW of North West Vernon Islands, 12° 4.02'S, 131° 58.86'E	16	Shale and gravel	10/10/1993
148	S of North West Vernon Island, 12° 3.96'S, 131° 1.92'E	25	Rock	10/10/1993
149	E of East Vernon Island, 12° 4.98'S, 131° 8.40'E	26	Gravel, shale and sand	10/10/1993
150	Rooper Reef, Vernon Islands, 12° 3.96'S, 131° 11.10'E	22	Gravel	10/10/1993
152	W of Elizabeth Reef, Cape Hotham, 12° 4.02'S, 131° 20.04'E	21	Shale	9/10/1993
153	E of Dryston Reef, Cape Hotham, 12° 4.08'S, 131° 22.80'E	6	Sponge bed	9/10/1993
154	N of Oliver Reef, Vernon Islands, 12° 1.02'S, 130° 58.86'E	30	Rocky bottom	11/10/1993
155	N of North West Vernon Island, 12° 1.02'S, 131° 1.86'E	38	Shale and gravel	11/10/1993
156	W of Knight Reef, Vernon Islands, 12° 1.20'S, 131° 3.96'E	22	Coarse sand, shale and rocks	11/10/1993
157	NW of Knight Reef, Vernon Islands, 12° 1.44'S, 131° 8.04'E	14	Gravel	10/10/1993
159	NW of Cape Hotham, 12° 1.32'S, 131° 13.92'E	34	Coarse sand and shale	9/10/1993
160	North of Cape Hotham, 12° 0.96'S, 131° 16.92'E	29	Sand, shale, gavel, sponges	9/10/1993
161	SE of Cape Hotham, 12° 0.96'S, 131° 19.86'E	22	Coarse sand and shale	9/10/1993
162	N of Dayton Reef, Cape Hotham, 12° 0.12'S, 131° 22.74'E	12	Mud and shale	9/10/1993

Table 2. List of species and sampling sites. Numerals represent Beagle Gulf Survey station numbers. SCUBA sampling sites in Darwin Harbour are: EA = East Arm Port breakwater and channel, PD = Port of Darwin wharves, EP = East Point reefs, PR = Plater Rock, off Talc Head.

Species	Sampling Sites
<i>Lafoena amirantensis</i> (Millard and Bouillon, 1973)	38, 146
<i>Filellum ?serratum</i> (Clarke, 1879)	121, PR
<i>Hebellopsis costata</i> (Bale, 1884)	7, 8, 13, 38, 40, 53, 57, 80, 85, 136, 137, 140, 146, 159, PD, EA, PR
<i>Hebellopsis scandens</i> (Bale, 1888)	20, PD, EA, PR
<i>Hebella ?laterocaudata</i> Billard, 1942	139
<i>Anthohebella parasitica</i> (Ciamician, 1880)	7, 13, 33, 38, 40, 53, 137, 146, 159, PR
<i>Anthohebella darwinensis</i> sp. nov.	EA
<i>Halecium dyssymetrum</i> Billard, 1929	40, EP
<i>Halecium spatulum</i> sp. nov.	40, 48, PD.
<i>Hydrodendron dichotomum</i> (Allman, 1888)	138, PD, PR
<i>Diphasia mutulata</i> (Busk, 1852)	77, 111, 127, 129, 137, 140, 146, PR
<i>Diphasia digitalis</i> (Busk, 1852)	136
<i>Dynamena quadridentata</i> Ellis & Solander, 1786	87
<i>Dynamena bilamellata</i> sp. nov.	87
<i>Dynamena mertoni</i> (Stechow and Müller, 1923)	147, 52, 156, 40, 160, PD, PR
<i>Tridentata</i> sp.	156
<i>Idiellana pristin</i> (Lamouroux, 1816)	7, 13, 20, 26, 27, 35, 36, 40, 48, 50, 53, 57, 58, 74, 78, 80, 81, 82, 84, 85, 88, 97, 121, 122, 127, 129, 132, 136, 137, 140, 146, 147, 148, 150, 154, 159, 161, PD, PR, EP
<i>Idiellana lepida</i> sp. nov.	PR
<i>Salacia hexodon</i> (Busk, 1852)	7, 20, 42, 54, 89, PR
<i>Salacia sinuosa</i> (Bale, 1884)	48, 100, 137, 139, 147, 154, 155, 156
<i>Salacia tetracythara</i> (Lamouroux, 1816)	81, 126, 152, 155
<i>Salacia flavidula</i> sp. nov.	PR
<i>Salacia alata</i> sp. nov.	40
<i>Salacia bidentata</i> sp. nov.	132
<i>Sertularella decipiens</i> Billard, 1919	40, 147, 153, 154
<i>Sertularella quadridens</i> (Bale, 1884)	97, 138 EP, PR
<i>Sertularella diaphana</i> (Allman, 1885)	40, 87, 110, 113, 131, 146, 154, 156, EP, PR
<i>Sertularia trigonostoma</i> Busk, 1852	7, 82, 84, 138, 154
<i>Thuiaria operculata</i> sp. nov.	146, EA
<i>Thuiaria plumularioides</i> sp. nov.	110, 153, 154
<i>Thyroscyphus macrocytharus</i> (Lamouroux, 1824)	154
<i>Thyroscyphus torresii</i> (Busk, 1852)	13, 48, 67, 78, 87, 110, 127, 136, 137, 138, 155, EA, PD, PR
<i>Thyroscyphus fruticosus</i> (Esper, 1793)	PD, PR
<i>Syntheticium campylocarpum</i> Allman, 1888	13, 20, 21, 26, 81, 110, 111, 26, EA, PR
<i>Syntheticium orthogonium</i> (Busk, 1852)	7, 20, 40, 87, 126, 136, PR
<i>Antennella secundaria</i> (Gmelin, 1791)	7, 37, 82, 84, 95, 110, 111, 127, 136
<i>Halopteris polymorpha</i> (Billard, 1913)	129, 146, 138, EP
<i>Halopteris plagiocampa</i> (Pictet, 1893)	121
<i>Monothecha flexuosa</i> (Bale, 1894)	87
<i>Nemertesia cylindrica</i> (Kirchenpauer, 1876)	121, 136, 139, 146, 147, 91, 137, EA, PR
<i>Plumularia badia</i> Kirchenpauer, 1876	52, 58, 67, 95, 101 EA, EP, PR
<i>Plumularia scabra</i> Lamarck, 1816	80, 136, 137, 147, PR
<i>Plumularia setacea</i> (Linnaeus, 1758)	40, 137
<i>Plumularia bedoti</i> (Billard, 1911)	136
<i>Plumularia tubacarpa</i> sp. nov.	87
<i>Polyplumularia cornuta</i> (Bale, 1884)	66, 67, 92, 87, EA
<i>Kirchenpaueria irregularis</i> Millard, 1958	PD
<i>Aglaophenia delicatula</i> (Busk, 1852)	40, 81, 127, 153, 154, 156, PR
<i>Gymnangium hians</i> (Busk, 1852)	154, EP, PR
<i>Gymnangium longicorne</i> (Busk, 1852)	7, 40, 32, 38, 77, 78, 81, 87, 91, 97, 104, 110, 127, 129, 136, 137, 144, 147, 149, 150, 152, 156, 157, 159, 160, EA, PR
<i>Gymnangium undulatum</i> sp. nov.	PR
<i>Gymnangium unjinense</i> sp. nov.	77, 104, 110,
<i>Lytocarpia angulosa</i> (Lamarck, 1816)	17, 27, 67, 77, 82, 87, 89, 93, 100, 104, 105, 110, 111, 113, 114, 115, 116, 119, 120, 126, 127, 132, 136, 161, EA
<i>Lytocarpia phyteuma</i> (Kirchenpauer, 1872)	154, EP
<i>Macrorhynchia philippina</i> (Kirchenpauer, 1872)	49, 61, 110, 127, PD, EP
<i>Macrorhynchia ploenicia</i> (Busk, 1852)	7, 127, 137, 136, 138, 154, 156, EA, PR
<i>Macrorhynchia ambigua</i> sp. nov.	PD, PR
<i>Macrorhynchia quadriarmata</i> sp. nov.	137
<i>Clytia ?warreni</i> Stechow, 1919	87
<i>Clytia linearis</i> (Thornely, 1900)	56
<i>Clytia</i> sp. 1	61
<i>Clytia</i> sp. 2	38

SYSTEMATIC REPORT

Order Conica Broch, 1910

Family Campanulinidae Hincks, 1868

Genus *Lafoeina* G.O. Sars, 1874*Lafoeina amirantensis* (Millard and Bouillon, 1973)

(Fig. 2A, B)

Egmondella amirantensis Millard and Bouillon, 1973: 40. - Millard 1975: 133. - Gibbons and Ryland 1989: 389. - Ramil and Vervoort 1992: 22.

Lafoeina amirantensis - Calder 1991: 10. - Watson 1994: 147. - Calder and Vervoort 1998: 15.

Records and material. NTM C12947, alcohol preserved material; NTM C12607, microslide, from infertile colony, Stn 38. NTM C12608, microslide, from infertile colony from Stn 146. Both colonies on calcareous bryozoan.

Description. Colonies stolonial, hydrothecae minute, arising at intervals from a creeping tubular hydrorhiza. Hydrothecae tubular, perisarc thin, sometimes asymmetrically curved, base expanding from a very short pedicel, body of hydrotheca increasing slightly in diameter just below margin. Operculum of many fine segments loosely overlapping at apex; no line of demarcation between opercular segments and hydrothecal body. Nematotheca clavate, very small, borne on stolon between hydrothecae.

Colour. Colourless to white.

Measurements (μm).

Hydrotheca	
length including operculum	120 - 200
maximum width	52 - 72

Nematotheca	
length	32 - 36

Remarks. The specimen and the single nematotheca in the sample conform to previous descriptions and dimensions of *L. amirantensis* (Watson 1994).

Distribution. Indian Ocean (Millard and Bouillon 1973), Mediterranean Sea, east Atlantic (Ramil and Vervoort 1992), Bermuda (Calder 1991), Fiji (Gibbons and Ryland 1989), and mid-Atlantic Ridge (Calder and Vervoort 1998). This is the second Australian record of *L. amirantensis*, the first being from Bass Strait, southern Australia (Watson 1994).

Family Lafoeidae A. Agassiz, 1865

Genus *Filellum* Hincks, 1868*Filellum ?serratum* (Clarke, 1879)

(Fig. 2C)

Lafoea serrata Clarke, 1879: 242. - Hartlaub 1905: 595.

Reticularia serrata - Ralph 1958: 312.

Filellum serratum - Millard 1975: 178. - Gravier-Bonnet 1979: 22. - Ramil and Vervoort 1992: 54. - Hirohito 1995: 110. - Peña Cantero *et al.* 1998: 304.

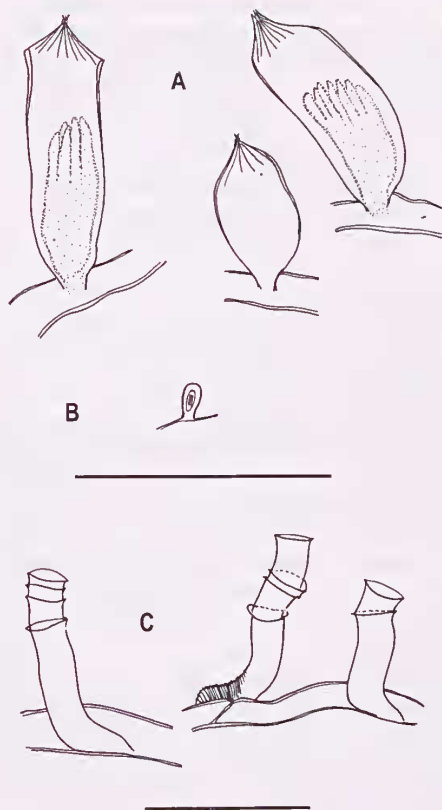


Fig. 2. A, B. *Lafoeina amirantensis*: A, hydrothecae. B, nematotheca. C, *Filellum ?serratum* on *Idiellana pristis*. Scale bars: A, B, 200 μm ; C, 500 μm .

Records and material. NTM C12609, microslide, sparse infertile colony creeping on *Idiellana pristis*, Stn 121. *Other record.* Plater Rock, infertile colony on aglaopheniid stem, coll: J. E. Watson, depth 10 m, 21/9/1999.

Description. Hydrothecae erect, long, tubiform, narrowing proximally to junction with hydrorhiza; marginal rim slightly but distinctly everted, marginal replications common. Anterior adnate surface closely transversely striated in some hydrothecae, smooth in others.

Colour. Colourless.

Measurements (μm).

Hydrotheca	
length of free part	320 - 560
diameter at margin	96 - 128

Remarks. In the absence of a coppinia it is difficult to distinguish between *Filellum antarcticum* and *Filellum serratum*, especially when proximal striations are variable among hydrothecae as in the present material. Striations typical of *F. serratum* are also reported to occur on some hydrothecae of *F. antarcticum* (Millard 1975). The present material is therefore

doubtfully assigned to *F. serratum* on the basis of the longer erect part of the hydrothecae and shorter adnate part, more typical of *F. serratum* than *F. antarcticum*.

Distribution. Cosmopolitan (Peña Cantero *et al.*, 1998). Previously recorded from Western Australia (Stechow 1925, Watson 1996).

Genus *Hebelloopsis* Hadzi, 1913
***Hebelloopsis costata* (Bale, 1884)**

(Fig. 3A)

Campanularia costata Bale, 1884: 56. - Stechow and Müller 1923: 463.

Scandia corrugata Millard and Bouillon, 1973: 60.

Hebella muscensis Millard and Bouillon, 1975: 10. - Boero *et al.* 1997: 22.

Records and material. NTM C12941, alcohol preserved material; NTM C12610, MV F86888, microslides, colony on *Idiellana pristis* from Stn 57. NTM C12943, alcohol preserved material from Stn 13. NTM C12942, alcohol preserved material from Stn 85. *Other records.* Many infertile colonies on *Thyroscyphus torresi*, *Syntheicum campylocarpum* and aglaopheniid hydroids, Stns 7, 8, 13, 38, 40, 53, 80, 136, 137, 140, 146, 159. Wharf pilings, Port of Darwin, infertile colonies on other hydroids, coll: J. E. Watson, depth 1 - 10 m, 16/9/1998. Plater Rock, infertile colonies on aglaopheniids and *Idiellana pristis*, coll: J. E. Watson, depth 4 - 10 m, 19/9/1999. East Point, infertile colonies on *Thyroscyphus torresii*, coll: J. E. Watson, depth 1 m, 19/9/1999.

Description. Hydrorhiza tubular, creeping on stems and branches of host. Hydrothecal pedicel short, tubular, perisarc smooth, widening a little distally and merging into base of hydrotheca. Hydrotheca long, tubular, perisarc thick, inclined to one side in distal third so that one wall convex and other concave, body with 8 - 11 deep entire annulations these becoming indistinct proximally, in some hydrothecae annulations reduced to undulations. Margin circular, with up to four replications, inclined to hydrothecal axis, rim distinctly everted, perisarc fairly thin. Diaphragm saucer-shaped, thin, indistinct, without thickening along hydrothecal wall, in empty hydrothecae line of attachment of hydranth marked by a row of internal upward-facing, thorn-like desmocytes. Hydranths too poorly preserved for tentacle count.

Colour. White to colourless.

Measurements (µm).

Pedicel	
length	136 - 160
diameter below hydrotheca	96 - 136
Hydrotheca	
length, diaphragm to margin, convex wall	1,000 - 1,120
diameter of margin, including everted rim	440 - 500
width of marginal rim	48 - 56

Remarks. The specimens conform exactly with Bale's (1884) description and figures of *Hebelloopsis costata* epizootic on *Idiellana pristis* from the type locality of Port Darwin. Dimensions of the hydrothecae arc, however, a little greater than those extracted from Bale's figure. No gonothecae were found among the abundant material in the collection.

Millard and Bouillon (1975) were unable to distinguish between sterile colonies of *Scandia corrugata* and *Hebella costata*, and regarded both as *nomina oblita*, replacing the name *H. costata* with *H. muscensis* and *S. corrugata* with *S. tubitheca*. Their opinion, adopted by Boero *et al.* (1997) is untenable since both *H. costata* and *H. corrugata* are valid names used in the literature during the past 50 years (Billard 1941, Pennycuik 1959, Mammen 1965 and see Calder 1991).

Distribution. Indian Ocean, (Millard and Bouillon 1975) Papua New Guinea (Boero *et al.* 1997), Australia (Bale 1884).

***Hebelloopsis scandens* (Bale, 1888)**
(Fig. 3B, C)

Lafaea scandens Bale, 1888: 758. - Jäderholm 1903: 274; - Billard 1904: 481; - Billard 1906: 174; - Warren 1908: 272, 341, 349.

Hebella scandens - Marktanner-Turneretscher 1890: 214. - Millard 1975: 182. - Gili and Ballesteros 1991: 247. - Genzano 1992: 144. - Migotto 1996: 26. - Watson 1996: 78. - Migotto 1997: 35. - Boero *et al.* 1997: 8.

Hebelloopsis scandens - Vannucci 1949: 237. - Vannucci 1950: 85. - Calder 1991: 43, 45, 95.

Records and material. NTM C13082, MV F86890, microslides, infertile colonies on *Syntheicum campylocarpum* from Stn 20. *Other records.* Port of Darwin on wharf pilings, fertile colonies on *Idiellana pristis* and *Thyroscyphus torresi*, coll: J. E. Watson, depth 1-10 m, 18/9/1998. Plater Rock, infertile colony on aglaopheniid stem, coll: J. E. Watson, depth 10 m, 21/9/1999.

Description. Hydrorhiza reptant on host; hydrothecae long, tubular, directed upwards for first third or half of length then bending sharply outwards and often downwards, lower wall with a deep inflexure but without internal thickening of perisarc; perisarc moderately thick, thinning to margin. Margin transverse, circular, even, with a short outrolled rim; some margins replicated two or three times

Colour. Transparent white.

Measurements (µm).

Hydrorhiza, diameter	64
Hydrotheca	
length abcauline wall, base to bend	224 - 296
length abcauline wall, bend to margin	200 - 304
diameter at margin	144 - 192

Genus *Hebella* Allman, 1888
***Hebella* ?*laterocaudata* Billard, 1942**
 (Fig. 3D)

Hebella laterocaudata Billard, 1942: 69. - Van Praët 1979: 883. - Van Soest 1976: 81. - Boero 1980: 134. - Calder 1991: 39. - Boero *et al.* 1997: 18.

Record and material. NTM C12612, small infertile colony on stem of *Idiellana pristis* from Stn 139.

Description. Hydrorhiza very thin, tubular, reptant on branches of host, following imbrications of adnate hydrothecal walls of host. Hydrothecae emergent between *Idiellana* hydrothecae, proximal wall of *Hebellopsis* resting on adcauline wall of host; hydrotheca tubiform, asymmetrical, usually inclined downwards, sometimes projecting directly away from host, wall in contact with host convex, free wall sinuous, swollen proximally, floor rounded, hydropore inserted on abcauline side of floor. Marginal rim circular, transverse, very thin, neither everted nor replicated.

Colour. White to colourless.

Measurements (μm).

Diameter of hydrorhiza	52
Hydrotheca	
length	280 - 320
diameter at margin	120 - 128

Remarks. The hydrorhiza appears to be too weak to support the hydrothecae, so that most rest on the adcauline hydrothecal walls of the host. The short, stubby hydrotheca with eccentrically placed hydropore is closest to *Hebella laterocaudata*; the hydrotheca is, however, shorter than the length of 560 μm given by Van Praët for that species, the hydrotheca narrows, rather than expands distally and the pedicel is smooth rather than slightly undulated as in Billard's (1942) figure. As the material consists of only one small, infertile colony, it is assigned with some reservation to *H. laterocaudata*.

Distribution. Indonesia (Billard 1942). This is the first record of the species from the Australian region.

**Genus *Anthohebella* Boero, Bouillon
and Kubota, 1997**

Boero *et al.* (1997) proposed the genus *Anthohebella* to accommodate hebellid species showing general characters of the subfamily Hebellinae but liberating swimming gonophores rather than a medusa. A hebellid species collected in Darwin Harbour, which generally conforms with these authors' concept of *Anthohebella*, but which liberates a partially formed medusa necessitates amendment of the generic diagnosis of *Anthohebella*.

Amended diagnosis of *Anthohebella*. Colony stolonial, hydrotheca borne on a short pedicel, campanulate or cylindrical, usually with annular thickening and thin membranous diaphragm. Hydranth with conical hypostome. Gonotheca solitary, originating from hydrorhiza, with or without opercular flaps. Swimming

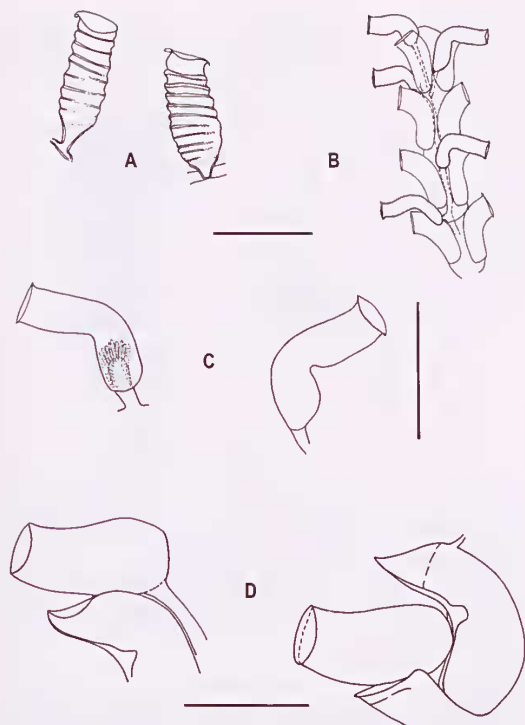


Fig. 3. A, *Hebellopsis costata*: two hydrothecae from colony on *Idiellana pristis*. B, C, *Hebellopsis scandens*: B, colony on *Synthecium campylocarpum*, hydrothecae inserted between those of host. C, strongly flexed hydrotheca with everted margin. D, *Hebella*? *laterocaudata*, infertile colony on *Idiellana pristis*. Scale bars: A, B, 1,000 μm ; C, D, 500 μm .

Remarks. Boero *et al.* (1997) reported colonies of *Hebella scandens* from Papua New Guinea the hydrothecae of which ranged in shape from almost straight to a right-angle bend. Hydrothecae from Beagle Gulf also show this morphological range, although it does not occur along the same colony as described by Boero *et al.* Colonies on *Thyroscyphus torresii* from Plater Rock show even more extreme torsion, all hydrothecae having two sharp right-angled bends. Neither singly nor doubly bent hydrothecae on any of the colonies I have examined seem to result from being forced to accommodate to the morphology of the host hydrothecae as described by Boero *et al.*, most, especially those on *T. torresii* being freely reptant. Either *H. scandens* shows extreme morphological variation according to the host species or there may be a different, although closely related species involved. The question must remain unresolved until fertile material of the doubly bent form is found.

Distribution. Cosmopolitan. Type locality, south-eastern Australia (Bale 1888).

gonophore with or without a velum, four radial canals, four marginal reduced tentacles or atentaculate bulbs, and gametes on the spadix.

Anthohebella parasitica (Ciamician, 1880)
(Fig. 4A, B)

Lafoea parasitica Ciamician, 1880: 673.

Hebella parasitica - Marktanner-Turneretscher 1890: 213. - Hadzi 1913: 105. - Leloup 1937: 4, 28. - Leloup 1938: 8. - Da Cunha 1950: 124. - Rossi 1950: 25. - Dawydoff 1952: 55. - Picard 1952: 347. - Yamada 1958: 51, 55. - Yamada 1959: 45. - Riedl 1970: 150. - Vervoort and Vasseur 1977: 12. - Mergner and Wedler 1977: 16. - Boero 1980: 142. - García *et al.* 1979: 16. - Gili 1982: 71. - Boero and Fresi 1985: 143. - Gili and Castelló 1985: 13. - Boero and Bouillon 1989: 37. - Gibbons and Ryland 1989: 380, 394. - Ryland and Gibbons 1991: 527, 559. - Hirohito 1995: 122. - Watson 1996: 78.

Anthohebella parasitica - Boero *et al.* 1997: 24.

Records and material. NTM C12613, MV F86891 microslides from Stn 7. NTM C12614, microslide, from Stn 33. *Other records.* Stns 13, 38, 40, 53, 137, 146, 159, many infertile colonies on stems of *Gymnangium longicorne*. Plater Rock, infertile colonies on stems of aglaopheniid hydroid, coll: J. E. Watson, depth 10 m, 22/9/1999.

Description. Hydrorhiza tubular, creeping on stem of *Gymnangium longicorne*, stolons running parallel along fascicular tubes of host. Hydrothecal pedicels long, deeply and roughly corrugated, perisarc very thick, merging into body of hydrotheca.

Hydrotheca large, deeply campanulate, asymmetrical, lower third of one wall convex, body then becoming almost tubiform, walls smooth to slightly undulated, perisarc moderately thick, thinning towards margin. Diaphragm shallow dish-shaped, indistinct, marked by a granular thickening at base of hydrotheca. Margin oblique with a large, strongly outrolled rim, perisarc of rim thin, some margins with a single replication. Hydranths large, not well preserved, with c. 25 tentacles.

Measurements (µm).

Pedicel

length to diaphragm	400 - 720
diameter at junction with hydrorhiza	104 - 144

Hydrotheca

length, diaphragm to margin	1,000 - 1,160
diameter at diaphragm	220 - 300
diameter at margin	66 - 800
width of marginal flange	96 - 112

Remarks. *Anthohebella parasitica* was abundant on stems of many of the larger aglaopheniid hydroids from many localities.

Distribution. Widely distributed in tropical and subtropical Pacific and Atlantic Oceans (Vervoort and Vasseur 1977), Mediterranean Sea (Boero 1980),

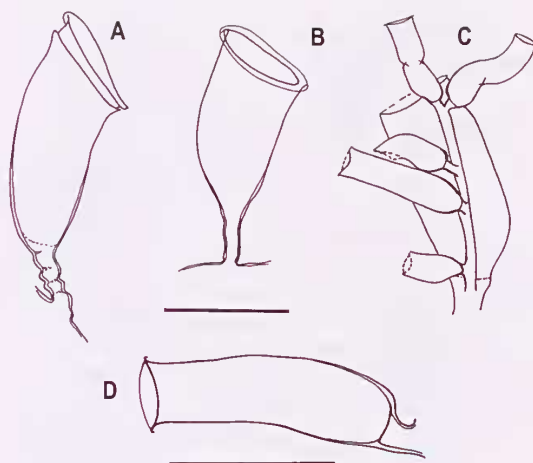


Fig. 4. A, B, *Anthohebella parasitica* from stem of *Gymnangium longicorne*: A, hydrotheca with replicated margin and undulated pedicel. B, hydrotheca with smooth pedicel. C, D, *Hebellopsis hartmeyeri* Stechow and Müller, 1923 drawn from type specimen on *Lytoscyphus fruticosus*: C, part of colony. D, hydrotheca showing diaphragm and strongly outrolled marginal rim. Scale bars: A, B, C, 1,000 µm; D, 500 µm.

doubtfully recorded from Japan (Hirohito 1995). Recorded from Western Australia (Watson 1996).

Anthohebella darwineensis sp. nov.
(Fig. 5A-D)

Record and material. Holotype, NTM C12958, alcohol preserved material; NTM C12615, NTM C12616, MV F86889, microslides from holotype, fertile colony on *Thyrosocyphus torresi*, from bed of channel, East Arm port site, Darwin Harbour depth 6 m, coll: J. E. Watson 17/8/1998.

Description. Colony stolonal, hydrorhiza tubular, reptant on stem and branches of host. Hydrotheca arising from stolon at regular intervals, usually beside a hydrotheca of host. Hydrotheca long, narrow, tubiform, bending outwards from hydrorhiza and away from host; pedicel short, asymmetrically placed at base of hydrotheca, sometimes with a single twist. Diaphragm thin, concave, adjoined to wall by a ring of perisarc, better developed as a triangular shelf on adcauline wall. Margin circular, not everted, sometimes with a single replication; perisarc of hydrotheca moderately thick. Hydranth with conical hypostome surrounded by 20 - 24 tentacles.

Gonotheca large, elongate conical, borne without pedicel on hydrorhiza, orifice distal, circular, operculum a single flap, perisarc of gonotheca thin. Nearly mature gonophore a single large eumedusoid; umbrella a small disk with four vestigial radial canals; four long rudimentary tentacles contracted into a wavy pattern; no velum or manubrium.

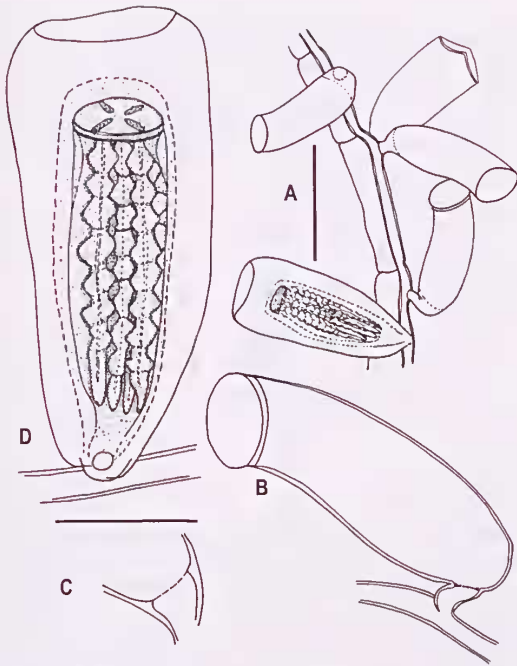


Fig. 5. *Anthohebella darwinensis* sp. nov. A, part of fertile holotype colony on *Thyroscyphus torresii*. B, hydrotheca, showing replicated margin. C, base of hydrotheca showing thin diaphragm and perisarc. D, gonotheca with nearly mature cumedusoid. Scale bars: A, 1,000 μ m; B - D, 500 μ m.

Colour. In life, hydrotheca white, gonotheca transparent to bluish-white, tentacles of gonophore white to pink, radial canals pink.

Measurements (μ m).

Hydrotheca	
length of pedicel (to diaphragm)	160 - 200
narrowest width of pedicel	300 - 360
length, margin to diaphragm	960 - 1,360
diameter at margin	368 - 424
Gonotheca	
length	1,600 - 1,760
maximum width	700 - 740

Remarks. The decidedly asymmetrical position of the hydrothecal pedicel permits bending of the hydrotheca alongside the hydrotheca of the host but depending on aspect of view, the pedicel may appear to be centrally placed. The large, solitary eumedusoids in the sample are almost mature. The umbrella is quite small in comparison with the length of the rudimentary tentacles. Neither manubrium, velum nor gametes were found.

Since the hydrotheca of *Anthohebella darwinensis* resembled figures of *Hebellopsis hartmeyeri* Stechow and Müller, 1923 from the Aru Sea (see Stechow and Müller, 1923, fig. 4), I examined type material of *H. hartmeyeri* loaned by the Zoologische Staatssammlung, Munich, Germany. The type series comprises two

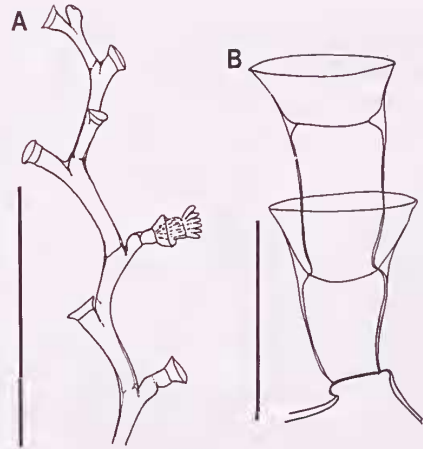


Fig. 6. *Halecium dyssymetrum* from stem of *Gymnangium longicorne*: A, stem. B, primary and secondary hydrophores. Scale bars: A, 2,000 μ m; B, 300 μ m.

microslide preparations containing several hydrothecae but no gonothecae. Both microslides are labelled "*Hebellopsis hartmeyeri*, sp. nov., auf *Lytoscyphus fruticosus*, Aru Inseln, Merton". Stechow and Müller's figure of *H. hartmeyeri* is somewhat misleading as it does not show the everted and outrolled marginal rim distinctly visible in the few undamaged hydrothecae in the microslides. Although considerably larger, the hydrotheca of *H. hartmeyeri* closely resembles *Hebella scandens* Balc. For comparison with *A. darwinensis*, *Hebellopsis hartmeyeri* is drawn from the type microslide (Fig. 4C-D).

Etymology. Named for the type locality of Darwin Harbour.

Family Haleciidae Hincks, 1868

Genus *Halecium* Oken, 1815

***Halecium dyssymetrum* Billard, 1929**

(Fig. 6A-B)

Halecium dyssymetrum Billard, 1929: 307. - Leloup 1935:1. - Millard 1975: 150. - Watson 1996: 78. - Migotto 1996: 32. - Watson 1997: 514.

Endothecium dyssymetrum - Calder 1991: 15.

Records and material. NTM C12921, alcohol preserved material; NTM C12617, microslide, infertile colony on *Gymnangium longicorne* from Stn 40. *Other records.* East Point, many infertile colonies on coral rubble, coll: J. E. Watson, depth 1 m, 26/9/1999.

Description. Hydrorhiza tubular, reptant on host; stems to 5 mm high, simple, monosiphonic, internodes geniculate, nodes oblique, indistinct to absent. Primary hydrophore distal on stem internode, long, expanding to diaphragm; diaphragm marked by an internal flexure of perisarc, secondary hydrophores when present, arising from diaphragm of primary hydrotheca. Hydrotheca deep

bowl-shaped, expanding to a circular margin; margin not everted. Hydranths large.

Colour. White.

Measurements (μm).

Stem	
length of internode	400 - 600
diameter at node	112 - 152

Hydrotheca	
length of primary hydrophore to diaphragm	60 - 360
depth of hydrotheca, diaphragm to margin	100 - 180
diameter at diaphragm	120 - 160
diameter of margin	200 - 236

Remarks. The species conforms to the description and dimensions of *Halecium dyssymetrum* reported from Western Australia (Watson 1997). Abundant infertile colonies were found on coral rubble in shallow water at East Point (author's observation, Sept. 1999).

Distribution. *Halecium dyssymetrum* is known from the Indian Ocean, Indo-Pacific and West Indies (Millard 1975). Australian distribution: Houtman Abrolhos Islands, Western Australia (Watson 1997).

Halecium spatulum sp. nov.

(Fig. 7A-E)

Halecium beanii (Johnston, 1838). - Stechow and Müller 1923: 460.

Records and material. Holotype, NTM C13049, alcohol preserved material, NTM C12618, NTM C12619, microslides from holotype, female colony on *Eunice tubifex*, Port of Darwin, on wharf pilings, coll: J. E. Watson, depth 8 m, 18/9/1998. Paratypes, NTM C12620, microslide, colony detached from substrate, Stn 40. NTM C12623, microslide, sparingly fertile colony creeping on aglaopheniid stem, Stn 48. *Other records.* Plater Rock, infertile colonies on other invertebrates, coll: J. E. Watson, depth 5-10 m, 22/9/1999.

Description. Hydrorhiza reptant on substrate, stems to 10 mm high, lower stems lightly to heavily fascicled, irregularly branched in one to several orders of branching more or less in the same plane; branches given off opposite stem node, stem and branch internodes long, straight, smooth, expanding distally to hydrophore, nodes oblique, facing in opposite directions, a tumescence above and below node. Primary hydrophores alternate, short, usually a minute saddle-shaped notch between hydrophore and stem, secondary hydrophores common, tertiary hydrophores rare; secondary hydrophores variable in length, base tumid on adcauline side, walls expanding evenly to margin. Hydrotheca shallow dish-shaped, expanding a little to a circular margin with thin, not everted rim; some hydrothecal margins replicated one or twice, diaphragm distinct, a few very small ellipsoidal desmocytes above diaphragm.

Hydranths extensible, with c. 16 tentacles.

Gonotheca elongated, spatulate, widening from base to distal margin, arising without distinct pedicel from below a primary hydrophore, distal end truncate, slightly domed, no operculum, perisarc thin and smooth.

Colour. Fascicled stems pale brown, becoming white in monosiphonic parts, female gonophore pale blue.

Measurements (μm).

Stem and branches	
length of internode	400 - 504
width at node	64 - 80

Hydrotheca	
primary hydrophore, depth margin to diaphragm	24 - 28
diameter at margin	88 - 120
secondary hydrophore, depth, base to margin	120 - 208

Gonotheca	
maximum length	440 - 460
distal width	136 - 200

Remarks. Material of *Halecium spatulum* from Beagle Gulf is meagre in comparison to the abundant colonies collected in the environs of Darwin. The fragile, lacy, white colonies are easily recognised *in situ*. The few gonothecae present in the Beagle Gulf collection were empty; those from Darwin Harbour were mature female, each gonophore containing many small ova.

In size and shape of colony *Halecium spatulum* resembles *H. lankesteri* (Bourne, 1890); however, the marginal rim of the hydrotheca is more flaring in that species (see Cornelius 1995). *Halecium spatulum* is also closely related to *H. sibogae* Billard, 1929 (see Gibbons and Ryland 1989, Ramil and Vervoort 1992), but lacks the comma-shaped notch at the base of the adcauline hydrothecal wall found in that species. Furthermore, the marginal rim is much less everted than shown by Ramil and Vervoort (1992), for *H. sibogae marconanum* Billard, 1934. An infertile specimen referred to *H. beanii* (Johnston, 1838) by Stechow and Müller (1923) from Aru Island is undoubtedly *H. spatulum*.

Etymology. Named for the spatulate gonotheca.

Genus *Hydrodendrou* Hincks, 1874

Hydrodendrou dichotomum (Allman, 1888)

(Fig. 8A-B)

Diplocyathus dichotomus Allman, 1888: 17. - Kirkpatrick 1890: 604. - Billard 1929: 71. - Leloup 1939: 5. - Yamada 1959: 35.

Ophiodes dichotomus - Billard 1910: 4. - Jäderholm 1916: 4.

Hydrodendron dichotomus - Pennycuik 1959: 155. - Hirohito 1983: 13.

Hydrodendron dichotomum - Rees and Vervoort 1987: 14. - Watson 1996: 78.

Records and material. NTM C12922, alcohol preserved material; NTM C12621, NTM C12622, MV F86894, microslides, large infertile colony intergrown

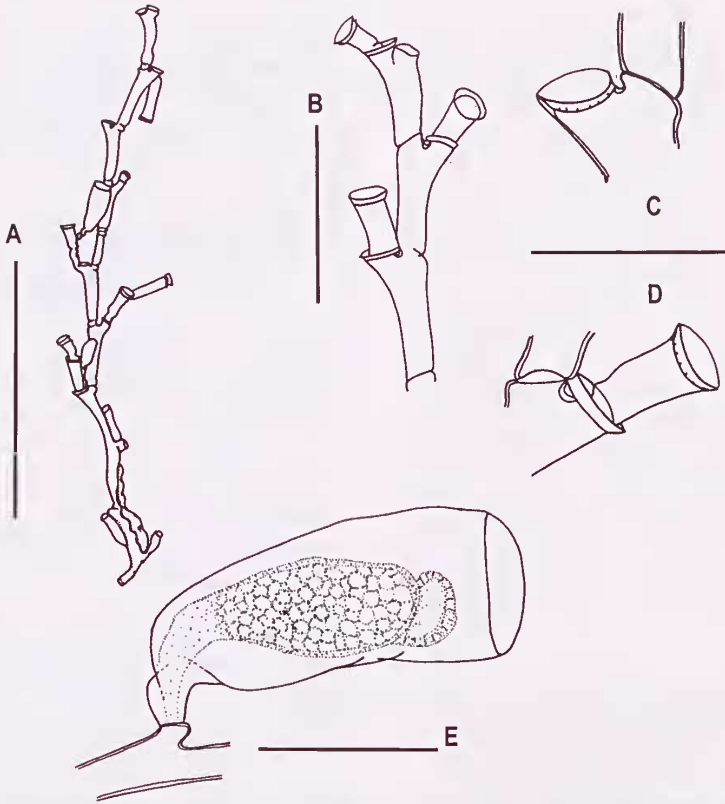


Fig. 7. *Halecium spatulum* sp. nov. A, stem from holotype colony. B, stem internodes from holotype. C, D, primary and secondary hydrophores from holotype. E, female gonotheca from paratype NTM C12623. Scale bars: A, 2,000 μ m; B - D, 300 μ m; E, 500 μ m.

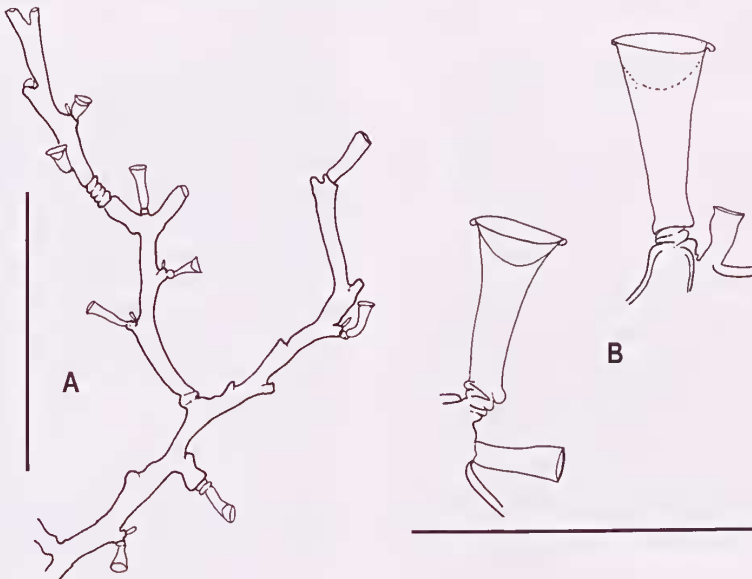


Fig. 8. *Hydrodendron dichotomum*: A, stem. B, hydrothecae with strongly outrolled marginal rim and short and long dactylothecae. Scale bars: A, 2,000 μ m; B, 500 μ m.

with bryozoan, from Stn 138. NTM C12923, MV F86947, alcohol preserved material; NTM C13078, microslide, infertile colony from wharf pilings, Port of Darwin, coll: J. E. Watson, depth 12 m, 16/8/1998. *Other records.* Plater Rock, infertile colony on sponge, coll: J. E. Watson, depth 10 m, 21/9/1999.

Description. Colonies to 70 x 70 mm, hydrocaulus unfascicled, a tangled and anastomosing mass of dichotomous branches without main stem. Branches and hydrorhiza of same diameter; cauline perisarc very thick proximally, thinning a little toward distal end of branches. Branches usually given off from distal part of internode below an oblique to transverse node; in younger branches sometimes an extra node or a series of imperfect internodal annulations, a hydrophore in each branch dichotomy. Hydrophores alternate on younger branches, borne distally on internode on short, thickened apophyses, pedicel crumpled. walls of hydrophore above pedicel swollen, more tumid on adcauline side, walls thereafter smooth, expanding evenly to hydrothecal margin; diaphragm deep bowl-shaped, no desmocytes observed; margin circular, rim everted and somewhat outrolled.

Nematothecae borne on a small platform below apophysis, vase-shaped to almost tubiform, narrowest at base and slightly constricted just below margin, rim circular, sometimes weakly everted, perisarc thin.

Hydranths extensible, with c. 30 tentacles.

Colour. Live colony pale yellow-brown, hydrothecae white.

Measurements (µm).

Stem	
length of internode	400 - 440
diameter of internode	
above apophysis	152 - 184
Hydrotheca	
length	256 - 352
diameter at base	40 - 56
diameter at margin	136 - 160
Nematotheca	
length	80 - 120
diameter at margin	40 - 60

Remarks. The colonies are so intimately intergrown with their invertebrate substrates that it is difficult to disentangle them. Few hydrothecae and axillary nematothecae remain on older branches. No secondary hydrothecae or desmocytes were seen in the samples.

The material corresponds to the description and figures of *Hydrodendron dichotomum* from Cape York, northern Australia (Allman 1888) and Indo-Pacific localities given by other authors. The hydrothecae and nematothecae are somewhat larger than dimensions given by Rees and Vervoort (1987) for material from the Gulf of Aden. *Hydrodendron dichotomum* is an epizooite of invertebrates in Darwin Harbour; it has also been

reported on sponge and antipatharians by Rees and Vervoort (1987).

Distribution. Indo-West Pacific, Gulf of Aden (Rees and Vervoort 1987). Type locality, Torres Strait (Allman 1888); also recorded from tropical eastern and western Australia (Pennycuik, 1959, Watson 1996) and Timor Sea.

Family Sertulariidae Lamouroux, 1812

Genus *Diphasia* L. Agassiz, 1862

***Diphasia mutulata* (Busk, 1852)**

(Fig. 9A-G)

Sertularia mutulata Busk, 1852: 391.

Diphasia mutulata - Bale 1884: 101. - Ritchie 1910: 12. - Thornely 1904: 118. - Thornely 1908: 83. - Billard 1933: 16. - Mergner and Wedler 1977: 18. - Watson 1996: 78.

Diphasia pinaster Billard, 1907: 357.

Diphasia heurteli Billard, 1924: 67. - Millard 1975: 258.

Diphasia heurteli var. *simplex* Billard, 1933: 19.

Nigellastrum mutulatum - Stechow and Müller 1923: 468.

Records and material. NTM C12907, alcohol preserved material; NTM C12624, NTM C12626, MV F86908, microslides, colonies on stems of agloopheniids, bryozoans and *Idiellana pristis* from Stn 77. NTM C12906, alcohol preserved material; NTM C12625, microslides from Stn 146. MV F86907, microslide, colony on *Idiellana pristis* from Stn 111. MV F86937, alcohol preserved material, from Stn 137. *Other records.* Stns 127, 129. Plater Rock, fertile colonies on stems of agalopheniid hydroids, coll: J. E. Watson, depth 9 m, 22/9/1999.

Description. Colonies of simple stems to 10 mm high arising at intervals from tubular hydrorhizae creeping on host; stems unbranched, proximal stem region variable in length, tubular, athecate, perisarc smooth, ending in a strong hinge joint. Hydrothecae biserial, paired, sometimes in contact, one pair on internode, nodes transverse, indistinct or absent.

Two distinct kinds of stems, each with differently shaped hydrothecae morphologically similar to *Diphasia mutulata* and *D. heurteli* occur in the colony.

Diphasia mutulata morph: tubular, adcauline wall sinuous, often a distinct hump in mid-region, free adcauline wall one quarter to one third length of adnate wall; abcauline wall concave to sinuous, deflected outwards, sometimes an internal shelf of perisarc well below margin; margin large, shovel-shaped, facing upwards, operculum dome-shaped, perisarc very delicate, often collapsed into hydrotheca.

Diphasia heurteli morph: tubular, long, narrow at base, expanding a little to margin, adnate adcauline wall convex, free part concave, c. half adcauline wall free; abcauline wall concave, a long upwardly pointed internal

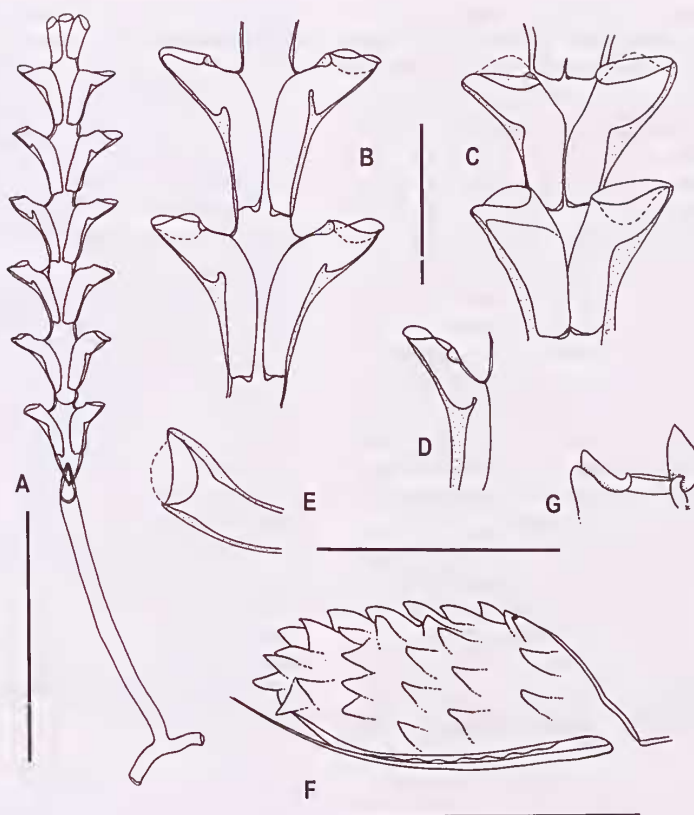


Fig. 9. *Diphasia mutulata*: A, stem from colony on *Idliellana pristis*. B, C, stem internodes from same colony. B, *Diphasia mutulata* morph. C, *Diphasia heurteli* morph. D, lateral view of hydrotheca of *Diphasia mutulata* morph. E, lateral view of hydrotheca of *Diphasia mutulata* morph showing operculum. F, gonotheca. G, orifice of gonotheca with operculum. Scale bars: A, 2,000 µm; B, C, 500 µm; D, E, G, 200 µm; F, 500 µm.

shelf about two-thirds distance up wall; margin facing upwards almost perpendicular to cauline axis with a pair of low lateral lobes, operculum usually collapsed inwards, perisarc delicate.

Gonothecae monoscriate and closely adpressed to hydrocaulus, one between each hydrothecal pair on a short, wide, pedicel; gonotheca ovoid, body covered in irregular rows of short, thick, distally-facing spines, distal orifice a small tube surrounded by spines.

Colour. Pale shining brown.

Measurements (µm).

Stem				
length of athecate part	60	- 1,900		
diameter of athecate part	88	- 128		
Internode				
length of <i>D. mutulata</i> morph	400	- 440	length adnate adcauline wall,	
length of <i>D. heurteli</i> morph	408	- 448	<i>D. mutulata</i> morph	336 - 392
width at node, <i>D. mutulata</i> morph	240	- 264	length free adcauline wall,	
width at node, <i>D. heurteli</i> morph	208	- 240	<i>D. mutulata</i> morph	80 - 160
Hydrotheca			width across pair, margin to margin,	
depth, abcauline margin to base,			<i>D. mutulata</i> morph	720 - 808
<i>D. mutulata</i> morph	496	- 520	width of margin,	
			<i>D. mutulata</i> morph	256 - 280
			depth, abcauline margin to base,	
			<i>D. heurteli</i> morph	480 - 504
			length adnate adcauline wall,	
			<i>D. heurteli</i> morph	400 - 408
			length free adcauline wall,	
			<i>D. heurteli</i> morph	80 - 160
			width across pair, margin to margin	
			<i>D. heurteli</i> morph	768 - 808
			width of margin <i>D. heurteli</i> morph	176 - 240
			Gonotheca	
			overall length	584 - 632
			width (lateral view)	256 - 272

Remarks. The two morphologically distinct hydrothecae occur on several of the colonies, the most

abundant morph corresponding to *Diphasia mutulata* Busk (1852) and the less abundant to *D. heurteli*. Busk (1852) drew attention to morphological differences between hydrothecae of the stems and branches of *D. mutulata* while Bale (1884) figured three different shapes of hydrothecae for that species. Billard (1907), recorded material from Moçambique as *Diphasia pinaster* (Ellis and Solander 1786) but in 1924 synonymised the name with *D. heurteli*. Millard (1975) remarked upon the similarity of *S. heurteli* and *D. mutulata*, but nevertheless considered the two species separate. In the present material depth of the hydrotheca is similar in both morphs, the main difference between them being the slenderer hydrotheca with a stronger outward bend and much more pronounced internal shelf in the *heurteli* morph (Fig. 9B). The *mutulata* morph is wider across the margins and the margin is broader and more bracket-like (Fig. 9C). There is no discernible intergradation in hydrothecal size or shape between the two morphological extremes in the present colonies and while there is no intermingling, the morphs arise in groups from a common hydrorhiza. The gonotheca of *D. heurteli* figured by Millard (1975) is immature; in the present material gonothecae of both morphs are identical.

Distribution. Torres Strait (Busk 1852), Queensland (Bale 1884) Gulf of Manaar (Thornely 1904), Andaman

Islands (Ritchie 1910), Suez area (Thornely 1908, Billard 1933), Red Sea (Mergner and Wedler 1977).

***Diphasia digitalis* (Busk, 1852)**

(Fig. 10A-B)

Sertularia digitalis Busk, 1852: 387, 393.

Desmoscyphus longitilca Allman, 1877: 26.

Desmoscyphus acanthocarpus Allman, 1888: 73.

Nigellastrum digitale - Stechow 1923: 12, 161.
- Mammen 1965: 57.

Diphasia digitalis - von Lendenfeld 1885a: 415, 633.
- Nutting 1900: 110. Nutting 1904: 110. - Ritchie 1910: 821. - Bale 1884: 101. - Bale 1915: 265. - Jäderholm 1916: 5, 16. - Jäderholm 1916: 16. - Jäderholm 1919: 16. - Jäderholm 1920: 4. - Jarvis 1922: 332, 343. - Hargitt 1924: 501. - Billard 1925: 209. - Gravely 1927: 14. - Nutting 1927: 218. - Billard 1931: 249. - Leloup 1932: 161. - Vervoort 1946: 307. - Vervoort 1959: 254. - Vervoort 1968: 37. - Vervoort 1972: 99. - Dcevey 1954: 270. - Pennycuik 1959: 191. - Yamada 1959: 54. - Rees and Thursfield 1965: 120. - Millard and Bouillon 1973: 67. - Millard and Bouillon 1974: 31. - Millard 1975: 257. - Mergner and Wedler 1977: 16. - Mayal 1983: 7. - Watson 1996: 78.

Record and material. NTM C12627, colony of four small infertile stems on *Idiellana pristis* from Stn 136.

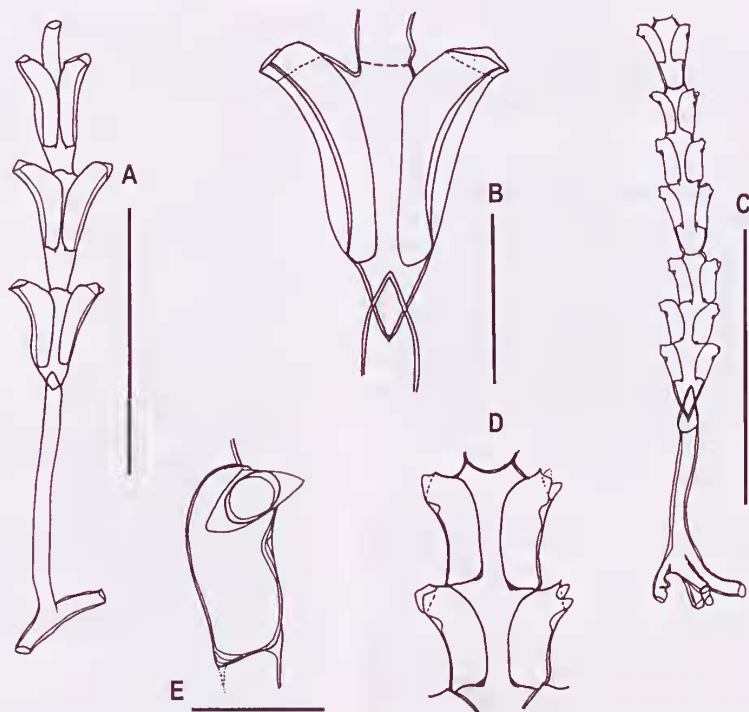


Fig. 10. A, B, *Diphasia digitalis*: A, proximal part of stem. B, proximal stem internode with hinge joint and hydrothecate internode. C - E, *Dynamena quadridentata*: C, stem from colony on aglaopheniid hydroid. D, stem internode. E, hydrotheca showing cusped margin. Scale bars: A, C, 2,000 μ m; B, D, E, 200 μ m.

Description. Stems arising from a creeping tubular hydrorhiza; stems short, unbranched, each bearing three to seven pairs of hydrothecae; proximal stem region athecate, long, tubular, perisarc smooth, ending in a strong hinge joint. Hydrothecae biseriata, paired, one pair on internode, node transverse, often indistinct. Hydrothecae long, tubular, expanding from a narrow base at summit of long infrathecal part of internode, adnate adcauline wall twice to three times length of free wall; free wall convex. Abcauline wall concave, sometimes with a slight proximal bulge. Margin quadrangular, perisarc delicate, a low cusp at summit of a longitudinal frontal pleat extending from base of hydrotheca to margin.

Colour. Colourless to pale brown.

Measurements (µm).

Stem		
length athecate	1,280	-1,700
diameter athecate part	160	- 184
length thecate internode	744	- 832
diameter at node	168	- 192
Hydrotheca		
width of pair across base	280	- 296
length adnate adcauline wall	552	- 632
length free adcauline wall	176	- 360
length abcauline wall	640	- 760
width across margin	216	- 240

Remarks. Although the sample is small and the hydrothecal margins are extensively damaged; there is no doubt that the specimen should be referred to *D. digitalis*.

Distribution. Circumglobal in tropical and subtropical seas. Australian distribution, Torres Strait (Busk 1852); Queensland (Pennycuik 1959), north-western Australia (Watson 1996).

Genus *Dynamena* Lamouroux, 1812

Dynamena quadridentata (Ellis and Solander, 1786)
(Fig. 10C-E)

Sertularia quadridentata Ellis and Solander, 1786: 57.

Pasya elongata Stechow and Müller, 1923: 469.

Dynamena quadridentata var. *elongata* Billard, 1925: 195. - Yamada 1959: 57. - Pennycuik 1959: 193.

Dynamena quadridentata - Watson 1996: 520.

Record and material. NTM C12911, alcohol preserved material; NTM C12628, MV F86912, microslides, infertile colony on stem of aglaopheniid hydroid, from Stn 87.

Description. Stems simple, straight, to 10 mm high, arising from a tubular, reptant hydrorhiza. Proximal stem region tubular, athecate, perisarc thick, ending in a strong hinge joint; stem thereafter thecate, internodes with three or four pairs of opposite hydrothecae, nodes transverse, collar-shaped, a short infrathecal part below hydrothecal groups. Hydrothecae frontal on stem, laterally separated or sometimes in contact; hydrotheca almost tubiform,

maximum width in distal third, bases and adcauline walls in contact in each internodal group, adnate adcauline wall convex, free part short, concave to convex, abcauline wall concave to margin, a submarginal knob of perisarc below margin; base of hydrotheca flat to slightly concave, a small knob of perisarc at base of adcauline wall. Margin facing outwards, oval, with two almost triangular lateral lobes and a minute adcauline cusp, perisarc thin, an abcauline opercular flap attached to submarginal knob.

Colour. Colourless.

Measurements (µm).

Stem		
length of internode	1,200	-1,500
width at node	136	- 152
diameter of athecate stem	152	- 168
Hydrotheca		
length adnate adcauline wall	324	- 336
length free adcauline wall	56	- 68
length abcauline wall	212	- 256
maximum width hydrotheca	112	- 128
depth of margin (lateral view)	88	- 96
width across marginal lobes (ventral view)	180	- 192

Remarks. Although the hydranth shows no evidence of a caecum, the species is referred to *Dynamena* rather than *Amphisbetia*, a difficulty in interpretation also remarked upon by Billard (1925). The minute adcauline cusp noted by Billard (1925) is visible only in lateral view of the hydrotheca in the present material. *Dynamena quadridentata* is a highly variable species, many varieties having been reported in the past; the present material closely resembles the var. *elongata* previously recorded from Australian waters.

Distribution. *Dynamena quadridentata* is known from the Indonesian region (Billard 1925) the Aru Sea (Stechow and Müller 1923) and Japan (Yamada 1959). In Australia it has been recorded from Western Australia (Stechow 1925, Watson 1996) and Queensland (Pennycuik 1959).

Dynamena bilamellata sp. nov.
(Fig. 11A-E)

Record and material. Holotype, NTM C12957, alcohol preserved material; NTM C12629, NTM C12630, MV F86920, microslides from holotype, infertile colony on red alga, from Stn 87.

Description. Stems simple, monosiphonic, to 10 mm high, arising from a flat, strap-like hydrorhiza; inflexures in perisarc not reaching coenosarc canal. Proximal stem region short, ending in a strong hinge joint, stem internodes thereafter thecate, nodes slender, a transverse collar-like constriction but sometimes with additional hinge joint; infrathecal part widening from node to base of hydrothecae, suprathecal part short.

Hydrothecae biseriata, in contact on front of stem, separated behind, facing slightly forward and outward;

base of hydrotheca flat, body tubular, narrowing to margin, adnate adcauline wall parallel to cauline axis, free wall at an angle of 60° to cauline axis, a little shorter than adnate wall, straight to slightly convex, two small spurs pointing downward into infrathecal part at base of adcauline wall; abcauline wall gently concave, slightly tumid near the base with a small submarginal thickening below hydrothecal margin; in older hydrothecae two prominent submarginal shelves project inwards into the hydrotheca from adcauline and abcauline walls. Perisarc of hydrotheca moderately thick.

Margin almost elliptical to subquadrate with two broad lobate cusps midway between adcauline and abcauline walls and a rounded, low adcauline cusp. Operculum pyramidal, low, moderately thick, abcauline valve the larger, adcauline flap divided into two; some margins untidily renovated by regenerated opercular valves. Hydranth stout, with c. 10 tentacles; no abcauline caecum.

Colour. Colourless.

Measurements (µm).

Stem		
distance between hydrothecal pairs	336	- 440
diameter at node	56	- 64
depth of infrathecal chamber	160	- 192
Hydrotheca		
length adnate adcauline wall	92	- 136
length free adcauline wall	80	- 96
length abcauline wall	144	- 160
width across hydrothecal pair at floor	128	- 140
maximum width	84	- 108
width margin (lateral view)	60	- 64

Remarks. The hydrothecal margin is more delicate than the opercular valves so it is often obscured; it is better seen in ventral view. The adcauline marginal cusp is more a change in angle of the rim rather than a true cusp. While the abcauline submarginal shelf is always present in younger hydrothecae, sometimes as a mere thickening of the wall, it is more pronounced in older hydrothecae, where it is produced into a distinct shelf opposite an identical shelf projecting inwards from the adcauline wall. Several stems end in long, trailing, tendrils.

Dynamena bilamellata is related to several species: 1) to *D. cornicina* McCrady (1859) in its strongly opposed cauline nodes, simple, unbranched stems, a tendency towards apical stolonisation and the presence of a submarginal abcauline shelf; there is, however, no mention in the literature of paired abcauline and adcauline shelves in that species, 2) to *D. heterodonta* (Jarvis, 1922) in the presence of opposed shelves and regeneration of the opercular valves but that species is typified by overlapping sets of hydrothecae along the internode and 3) to *D. dalmasi* (Versluys, 1899) (see Calder 1991) in general morphology and in the presence

of opposed submarginal shelves. While fitting some of the above criteria, the hydrocauli of *D. bilamellata* are considerably smaller in all critical dimensions than any of the above species.

Etymology. Named for the two internal submarginal shelves.

Dynamena mertoni (Stechow and Müller, 1923)

(Fig. 12A-G)

Sertularia mertoni Stechow and Müller, 1923: 472.

Records and material. NTM C12910, alcohol preserved material; NTM C12631, MV F86927, microslides, infertile colonies on *Eunice tubifex* from Stn 40. NTM C12909, MV F86934, alcohol preserved material; MV F86926, microslide, colony from Stn 156. NTM C12632, microslide, colony from Stn 52. NTM C12633, microslide, colony from Stn 147. NTM C12634, microslide, colony from wharf piles, Darwin Harbour, coll: J. E. Watson 8/9/1998, depth 6 m, fertile colonies on *Eunice tubifex*. **Other records.** Stn 160. Plater Rock, on compound ascidian and sponge, coll: J. E. Watson, depth 6 m, 22/9/1999.

Description. Hydrorhiza tubular, reptant, and strongly adherent to substrate. Stems to 20 mm high, monosiphonic, pinnate, arising at irregular intervals from hydrorhiza, pinnate, monosiphonic, rather lax, straight or slightly flexuose, lower part of stem athecate, moderately long, perisarc thick, ending in a strong hinge joint. Stem internodes thereafter short, nodes transverse, distinct, internodes becoming narrower distally. First two hydrocladia above hinge joint usually opposite, hydrocladia thereafter alternate, inserted above node at an angle of 70 - 80° to stem axis on short apophyses with transverse distal node varying from a mere constriction to a deep collar; node followed by a short athecate internode with one, sometimes two, deep, distal hinge joints; hydrocladium thecate, inflated beneath hydrothecae, nodes narrow, internodes bearing up to four pairs of hydrothecae.

Hydrothecae biseriatic, opposite, seated on front of internode, long, tubular, adnate adcauline walls conjoined, free adcauline wall c. one third length of adnate wall, curved outwards, abcauline wall partly adnate, straight proximally, concave distally, floor of hydrotheca straight to faintly rounded. Hydrothecal margin elliptical (ventral view) with two long, pointed lateral cusps shifted to adcauline side and a minute adcauline cusp, a small submarginal knot of perisarc on abcauline wall, operculum of two valves, adcauline valve with a central rupture line. A cauline hydrotheca in axil of hydrocladium, one above, almost level with distal node and one opposite, halfway along internode. Perisarc of hydrocladia and hydrothecae thin.

Gonothecae grouped on proximal stem, large, barrel shaped, borne on a short, stout pedicel, body faintly corrugated to almost smooth, perisarc moderately thick,

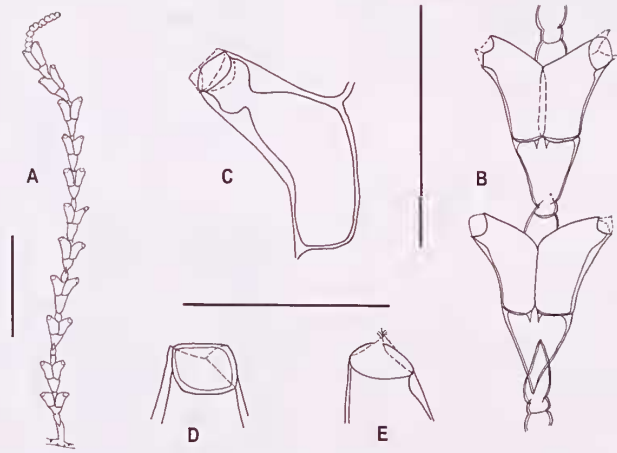


Fig. 11. *Dynamena bilamellata* sp. nov. A, stem from holotype colony with apical tendril. B, proximal stem internodes with proximal hinge joint. C, hydrotheca with submarginal shelves. D, E, opercular structures. Scale bars: A, 1,000 μ m; B, 500 μ m; C, D, E, 200 μ m.

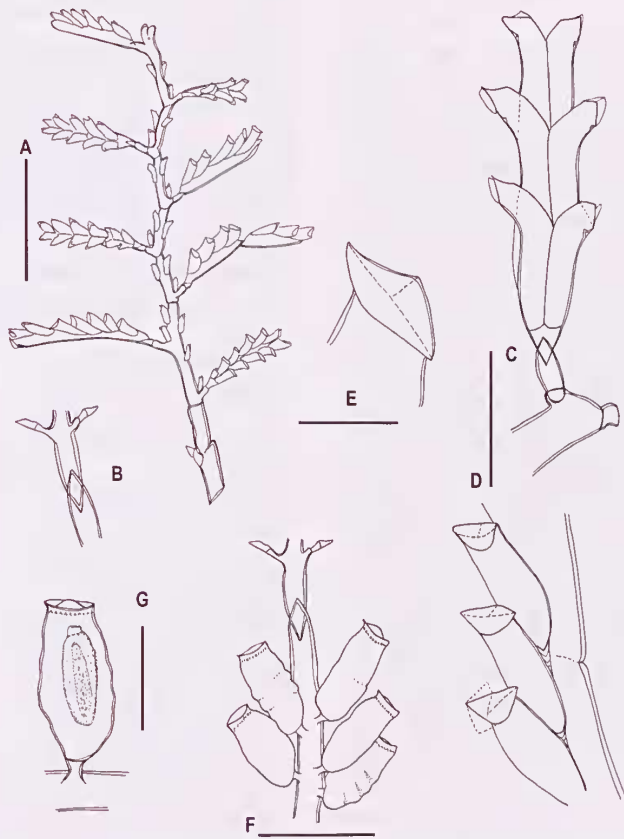


Fig. 12. *Dynamena mertoni*: A, infertile stem. B, proximal stem with hinge joint and opposite basal hydrocladia. C, hydrocladial internode. D, ventral view of operculate hydrothecae. E, lobate hydrothecal margin with entire operculum. F, gonothecae on proximal stem. G, gonotheca with planula larva. Scale bars: A, B, F, G, 2,000 μ m; C, D, 500 μ m; E, 300 μ m.

orifice distal, circular, inside a short, slightly everted collar, a row of denticles within, operculum a thick, dome-shaped plug. Gonotheca containing a single large planula larva.

Colour. Stems white to almost colourless, gonophores white to pale pink.

Measurements (μm).

Stem		
length of internode	720	-1,160
diameter of transverse node	200	- 360
Apophysis		
length of adcauline side	40	- 152
width at transverse distal node	88	- 152
Hydrotheca		
length of adnate adcauline wall	400	- 544
length of free adcauline wall	168	- 200
diagonal total length of abcauline wall to embayment	520	- 544
maximum width of hydrotheca	120	- 160
width of margin		
between embayments	120	- 156
width across marginal lobes (ventral view)	220	- 268
Gonotheca		
length, excluding pedicel	1,700	-1,780
length of pedicel	64	- 80
maximum diameter	800	- 900
diameter of marginal rim	480	- 496

Remarks. Although it is somewhat difficult to extract critical characters and comparative dimensions from Stechow and Müller's (1923) description of *Dynamena mertoni*, I believe the present material is that species.

The abundant present material shows the species should be referred to *Dynamena*. As noted by Stechow and Müller, the perisarc of the lower stem is quite thick with no evidence of polysiphony. In some stems where there are two sets of basal hinge joints there are also two pairs of opposite hydrocladia. Frequently, these hydrocladia are shed, leaving only paired apophyses. In many respects *D. mertoni* resembles *D. cornicina* McCrady, 1858, the differences being: 1) the complete absence of simple stems from the colonies, 2) the grouped overlapping pairs, rather than single pairs of hydrothecae, and 3) opposite hydrocladia above the basal hinge joint. The distal collar of the gonotheca also resembles that figured by Billard (1925) for *D. cornicina*; however, other authors (e.g. Gibbons and Ryland 1989, Millard 1975) have not shown this feature. Unfortunately few authors have given measurements or illustrations of *D. cornicina* thus impeding comparison with doubt arising as to whether all material referred to *D. cornicina* indeed belongs to that species.

There is a strong superficial resemblance between infertile hydrocauli of *D. mertoni* and very young stems of *Idiellana pristis*, especially as colonies of both species often share the same habitat of *Eunice tubifex* (J. E. W., pers. obsv).

This is the second record of *D. mertoni* and first description of the gonotheca. The species is abundant in Darwin Harbour.

Distribution. Previously known only from the Aru Sea (Stechow and Müller 1923).

Genus *Tridentata* Stechow, 1920

Tridentata sp.

(Fig. 13A-C)

Record and material. NTM C12635, microslide, one infertile stem on the polychaete *Eunice tubifex*, Stn 156.

Description. Hydrotheca a knot of tubes. Stem 5 mm high, monosiphonic, branched, proximal stem region short, athecate, perisarc thick, ending in several transverse constrictions. Proximal thecate region with three pairs of hydrothecae to level of first branch, branching thereafter sub-dichotomous, a hydrotheca in axil of dichotomy; dichotomous internode with a V-shaped to transverse distal node. Hydrothecae paired on internode, subalternate to opposite, frontal on branch internode, pairs separated by a long, slender infrathecal part and a short suprathecal part with deep transverse collar-shaped node. Hydrothecae tubular, narrowing to an upwardly tilted margin; adcauline walls of pair in contact, parallel to branch axis, adnate adcauline wall shorter than free part, free wall convex to almost straight, bent outwards at an angle of 30 - 40° to internode; abcauline wall concave, contiguous with infrathecal chamber, base of hydrotheca variable, flat, slightly convex or concave. Margin with two lateral lobes with deep embayments between and a small adcauline cusp; aperture oval, operculum of two tent-shaped valves, perisarc thin. Hydranth with abcauline caecum and c. 20 tentacles.

Colour. Colourless.

Measurements (μm).

Stem		
width above base		180
Branch		
length of internode	496	- 520
width at node	64	- 80
length of infrathecal part	240	- 256
Hydrotheca		
length of adnate adcauline wall	168	- 200
length of free adcauline wall (to embayment)	184	- 224
length of abcauline wall (to embayment)	192	- 200
depth of margin (lateral view)	88	- 108
width at margin (ventral view)	120	- 140

Remarks. As the specimen has an abcauline caecum, three marginal teeth, an operculum of two valves and almost opposite hydrocladial hydrothecae it is referred to *Tridentata* (for generic definition and discussion of *Tridentata* see Calder 1991 and Cornelius 1995). In some

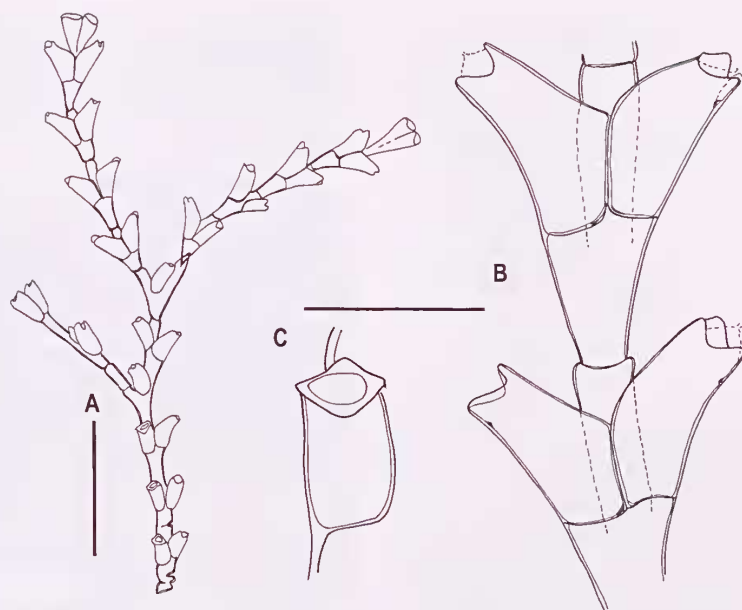


Fig. 13. *Tridentata* sp. A, part of stem. B, stem internodes and hydrothecae. C, hydrotheca, showing lobate margin. Scale bars: A, 1,000 μ m; B, C, 300 μ m.

malayensis Billard, 1925; however, in that species the lateral cusps are much sharper than those of the present specimen.

Due to the paucity of material and lack of gonosome the species cannot be confidently referred to any known species of *Tridentata*. Neither for the same reasons can it be described as new.

Genus *Idiellana* Cotton and Godfrey, 1942

Idiellana pristis (Lamouroux, 1816)

(Fig. 14A-E)

Idya pristis Lamouroux, 1816: 200. - Allman 1888: 85, 39. - Jäderholm 1916: 16. - Jäderholm 1920: 4. - Jarvis 1922: 344. - Bale 1924: 249.

Idiella pristis - Stechow 1919: 106. - Stechow and Müller 1923: 469. - Briggs and Gardner 1931: 191. - Blackburn 1942: 116. - Vervoort 1946: 306. - Buchanan 1957: 365. - Vervoort 1959: 252.

Idiellana pristis - Cotton and Godfrey 1942: 234. - Pennycuik 1959: 193. - Ralph 1961: 766. - Van Germeden-Hoogeveen 1965: 16. - Vervoort 1968: 36, 103. - Millard 1968: 266. - Hirohito 1969: 21. - Millard and Bouillon 1974: 8. - Millard 1975: 269. - Millard 1978: 194. - Bandel and Wedler 1987: 41. - Vervoort 1993: 188. - Migotto 1996: 65. - Watson 1996: 78.

Dynamena crisioides f. *gigantea* Vannucci, 1946: 558.

Pasythea philippina Marktanner-Turneretscher, 1890: 234, 239.

Records and material. NTM C12874, alcohol preserved material; NTM C12636, MV F86913,

microslides, colony, female colony detached from substrate, Stn 74. NTM C12875, alcohol preserved material, from Stn 7. NTM C12637 microslide, colony on *Eunice tubifex*, from Stn 161. NTM C12876, alcohol preserved material, from Stn 48. MV F86942, alcohol preserved material, from Stn 26. *Other records.* Stns 13, 20, 27, 35, 36, 40, 50, 53, 57, 58, 78, 80, 81, 82, 84, 85, 88, 97, 121, 122, 127, 129, 132, 136, 137, 140, 146, 147, 148, 150, 154, 159, many colonies on *Eunice tubifex* or detached from substrate. Wharf pilings, Darwin Harbour, many colonies on *Eunice tubifex*, coll: J. E. Watson depths 1-10 m, 15-20/8/1998. East Point reefs and Plater Rock, abundant fertile colonies on *Eunice tubifex*, other invertebrates and dead coral. coll: J. E. Watson, depths 1-12 m, 19-22/9/1999.

Description. Hydrorhiza a fibrous mass of thin, tangled stolons. Stems 40 - 170 mm high, monosiphonic, pinnate, sometimes sparingly branched, more or less straight, perisarc of older stems thick, proximal stem region usually athecate with remnant hydrocladia and hydrothecae; stem internodes short, nodes almost transverse, constricted, a hydrotheca in apophysal axis, a hydrotheca above and one opposite. Hydrocladia alternate, straight, given off at an angle of 70 - 80° from side of stem on lower third of internode; hydrocladial apophysis short with narrow, transverse distal node, hydrocladial internodes bearing up to 10 pairs of hydrothecae, internode beneath hydrothecae inflated.

Hydrothecae biseriate, long, set in an imbricated pattern on front of hydrocladium; adcauline wall convex to sinuous, adnate part overlapping opposite hydrotheca,

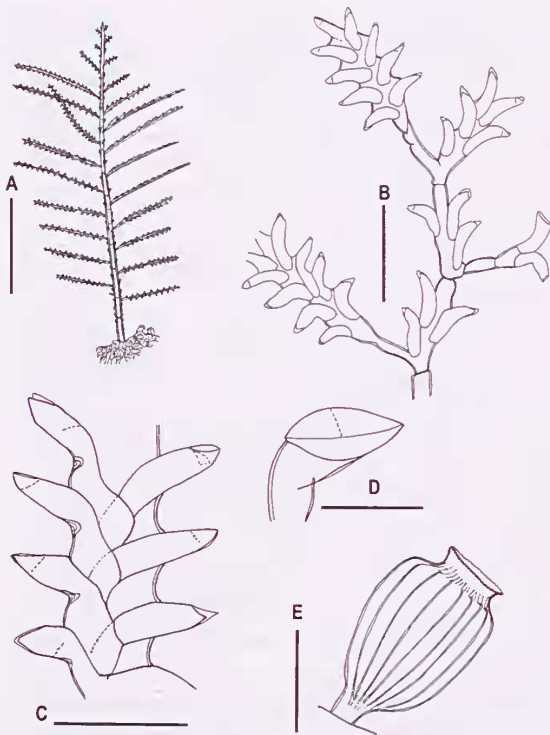


Fig. 14. *Idiellana pristis*: A, stem from young colony. B, part of stem and hydrocladia. C, hydrocladial internode showing imbricated pattern of hydrothecae. D, hydrotheca showing lateral lobes. E, gonotheca. Scale bars: A, 10 mm; B, E, 1,000 µm; C, 500 µm; D, 300 µm.

free part projecting upwards or outwards from hydrocladium. Abcauline wall concave to sinuous, lower third adnate to adcauline wall of hydrotheca below, usually a knot of perisarc at point where wall bends away from hydrocladium. Margin elongate oval with a pair of sharply pointed lateral lobes, embayments between deep, perisarc thin; operculum of two valves, often a pleat in adcauline valve. Hydrothecal perisarc moderately thick. Hydranth buried deep inside sinuous part of hydrotheca.

Gonothecae borne in longitudinal rows on lower to mid-region of hydrocaulus, one on internode; gonothecal pedicel short, wide, body of gonotheca large, urn-shaped, with numerous longitudinal pleats to shoulder, merging into a short, wide, neck, rim everted and sealed by a dome-shaped plug; perisarc of gonotheca very thick. Female gonophore ovoid, containing many large ova.

Colour. Dark honey brown.

Measurements (µm).

Stem	
length of internode	1,300 - 1,700
width at node	500 - 700
distal width of apophysis	160 - 192
Hydrocladium	
length of internode	1,440 - 4,000

width at node	120 - 160
Hydrotheca	
overall length	560 - 768
width across margin (ventral view)	208 - 240
Gonotheca	
overall length	1,700 - 1,740
width across shoulder	940 - 1,120
diameter of margin	580 - 600

Remarks. Due to their imbricating pattern and thickening of the perisarc with age it is difficult to draw or measure individual hydrothecae in older specimens. The Beagle Gulf material includes many young colonies comprising single stems with soft, flexuous perisarc. These differ in so many respects (flexuose stems, axillar hydrothecae on cauline internode and poorly developed imbrication of hydrothecae) that they could well be mistaken for smaller species such as *Dynamena mertoni* (Stechow and Müller, 1923). Intergradations can, however, usually be found among the large range of material. *Idiellana pristis* is one of the most widespread species in the Beagle Gulf.

Distribution. Circumtropical, especially the Indo-Pacific. Recorded from Western Australia (Watson 1996) and tropical Queensland (Pennycuik 1959).

Idiellana lepida sp. nov.
(Fig. 15A-E)

Record and material. Holotype, NTM C12954, alcohol preserved colony, NTM C12638, MV F86915, microsclides from holotype, colony on *Eunice tubifex*, Plater Rock, coll: J. E. Watson, depth 3 m, 21/9/1999.

Description. Hydrorhiza tubular, thick, entwining substrate. Stems to 90 mm long, monosiphonic, gracefully plumose, proximal part of stem long, ahydrocladate, nodes if present, transverse, faint; lower stem perisarc thick, thinning distally; two rows of opposite hydrothecae on stem, a distinct internal coenosarc tube running up centre of ahydrocladate stem region.

Hydrocladia alternate, close-set, up to 15 mm long, borne on a short, distinct apophysis directed upwards at an angle of 40° to cauline axis, distal apophysal node a transverse constriction, this followed by an athecate internode with strong hinge joint. Most hydrocladia unsegmented; if segmented, internodes with at least four pairs of hydrothecae, nodes strongly oblique, constricted.

Hydrothecae biseriate, paired, not protruding, tubiform, base of one of pair sometimes slightly displaced downwards with respect to other, each pair slightly overlapping that above, adcauline walls in contact, straight to convex, free length of adcauline wall minute, adcauline wall slightly inturned at base, ending in a small knob of perisarc, abcauline wall almost straight, a small internal submarginal thickening in perisarc. Cauline hydrothecae alternate, same as those on hydrocladia but separated laterally and vertically, one

beside apophysis and two or three in a row above. Margin of hydrotheca facing outward and tilted slightly upwards; margin with two prominent ear-shaped lateral cusps, perisarc thin, aperture oval. Operculum a single very thin adcauline valve. Hydranth without caecum and with 16 - 20 tentacles.

Gonothecae abundant throughout hydrocladial part of stem, borne on caulus or hydrocladia; cauline gonotheca inserted just above hydrocladial apophysis, hydrocladial gonothecae proximal on hydrocladia, arising behind hydrothecal pairs; gonotheca standing erect on a long, bent pedicel with basal constriction or twist, body large, barrel-shaped, faintly undulated to almost smooth, narrowing to a short, wide, slightly out-turned collar, operculum a low domed plug. Perisarc of gonotheca very thick, distal collar of thick, rough strands.

Colour. Pale brown.

Measurements (μm).

Stem

distance between hydrocladia on same side	1,200 - 1,400
width below hydrocladium	320 - 500
width of apophysis at distal node	128 - 144

Hydrocladium

maximum length of internode	5,000
width at node	120 - 160

Hydrotheca

length of adnate adcauline wall	212 - 240
length of free abcauline wall	184 - 224
maximum width	92 - 104
width across margin, between cusps (ventral view)	296 - 312
width of aperture	204 - 212
length of marginal cusp	20 - 24

Gonotheca

overall length	1,060 - 1,200
diameter of collar	400 - 500
length of pedicel	160 - 216

Remarks. Although the hydrothecae appear opposite in front view, from other angles of view they may appear to be subopposite. The adcauline opercular valve is very fragile and although none were found intact, its adcauline position is inferred from fragments of tissue adhering to the adcauline margin, the abcauline margin being invariably free of tissue. Most gonothecae contain a web of strands of tissue throughout the body. The absence of maturing gonophores and intact operculae suggests the gonothecae are immature.

Although it differs in respects such as arrangement and some structures of the hydrothecae, the lack of an abcauline caecum, the paired marginal hydrothecal cusps and an adcauline opercular valve indicates the species should be referred to *Idiellana*, a hitherto monospecific genus.

Only one colony of 24 stems was found, suggesting that *Idiellana lepida* may be a rare species.

Etymology. Refers to the graceful, lax colonies.

Genus *Salacia* Lamouroux, 1816

***Salacia hexodon* (Busk, 1852)**

(Fig. 16A, B)

Pasythea hexodon Busk, 1852: 395. - Bale 1884: 113. - Bale 1888: 771. - Jäderholm 1916: 5.

Salacia hexodon - Billard 1925: 207. - Pennycuik 1959:194. - Watson 1996: 78.

Records and material. NTM C12928, alcohol preserved material, from Stn 42. NTM C12929, alcohol preserved material; NTM C12640, MV F86910, microslides, colony from Stn 7. NTM C12927, alcohol preserved material, colony from Stn 54. Sparse infertile colonies 20 - 40 mm high, detached from substrate. *Other records.* Stns 20, 89. Plater Rock, small colonies amongst other hydroids on *Eunice tubifex*, coll: J. E. Watson, depth 8 m, 22/9/1999.

Description. Stems monosiphonic, slender, lax, branching irregularly dichotomous, so that no true stem is present; a short internode above each dichotomy and a partially adnate hydrotheca in each axil. Internodes long, tubular, expanding a little distally to proximal

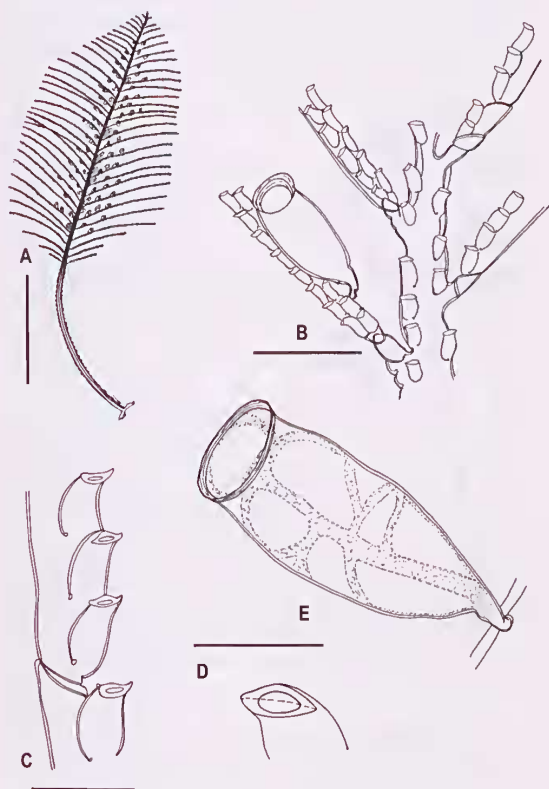


Fig. 15. *Idiellana lepida* sp. nov. A, fertile stem from holotype colony. B, part of stem and hydrocladia. C, hydrocladial internode. D, cusped hydrothecal margin. E, gonotheca. Scale bars: A, 10 mm, B, 1,000 μm ; C, 200 μm ; D, E, 500 μm .

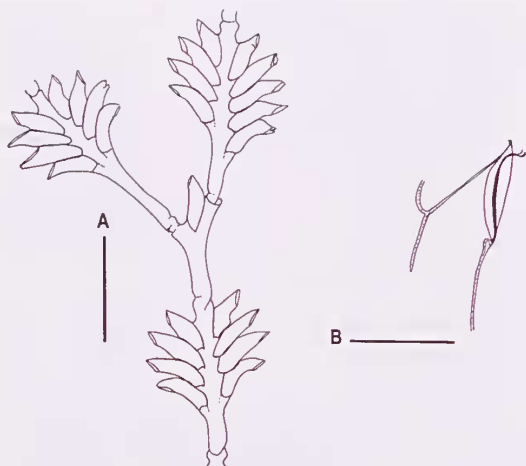


Fig. 16. *Salacia hexodon*: A, part of stem. B, lateral view of operculate hydrotheca. Scale bars: A, 1,000 μm ; B, 300 μm .

hydrothecae, nodes transverse, collar-like, perisarc moderately thick and smooth throughout.

Hydrothecae biseriate, three to five overlapping subopposite pairs, in a crest-like group; hydrothecae separated laterally, more or less tubular, widest about middle, inclined outwards, adnate adcauline wall moderately convex, free part almost same length or shorter than adnate wall; abcauline wall concave, adnate part about same length as free wall; margin slightly sinuate, inclined downwards, closed by a thick abcauline operculum attached to a small internal submarginal peg.

Colour. Colourless to brown.

Measurements (μm).

Internode		
length	2,150	-2,300
diameter at node	110	- 180
Hydrotheca		
length of adnate adcauline wall	350	- 500
length of free adcauline wall	280	- 380
length of adnate abcauline wall	300	- 380
length of free abcauline wall	140	- 180
width of margin	240	- 280

Remarks. The distalmost internodes often extend into tendrils although without any evidence of re-attachment to new substrate. This distinctive, straggling species occurs in small colonies of a few stems.

Distribution. A tropical species known from Torres Strait (Busk 1852, Kirkpatrick 1890), Queensland (Bale 1888, Pennycuik 1959), north-western Australia (Jäderholm 1916, Watson 1996) and Indonesia (Billard 1925).

***Salacia sinuosa* (Bale, 1884)**

(Fig. 17A-E)

Thuiaria sinuosa Bale, 1888: 772. - Ritchie 1911: 844. - Levinsen 1913: 271. - Bale: 1914: 12. - Briggs

1914: 294. - Bale 1915: 279. - Mulder and Trebilcock 1914: 9. - Briggs 1918: 38. - Hodgson 1950: 38.

Salacia sinuosa - Stechow 1922: 150. - Stechow 1923: 214. - Billard 1925: 204. - Blackburn 1942: 115. - Rees and Thursfield 1965: 151. - Watson 1994: 66. - Watson 1996: 78.

Records and material. NTM C12926, alcohol preserved material, colony from Stn 156. NTM C12925, MV F86929, alcohol preserved material; NTM C12641, MV F86911, microslides, colonies detached from substrate, Stns 154. *Other records.* Stns 48, 100, 137, 139, 147, 155.

Description. Hydrorhiza a tough plug of perisarc up to 20 mm wide. Stems long, the tallest 22 cm high, supple, smooth, strongly fascicled by many fine tubes running more or less parallel up stem to end of branches; lower stem region up to 3 mm thick, unbranched, mid to upper region dichotomously branched in three or more orders of branching in several planes producing a sparse canopy, ultimate branches pinnate, up to 50 mm long and 1 mm diameter at dichotomy, a short proximal length of each branch ahydrocladate, thereafter hydrocladate.

Hydrocladia inserted on prominent, twisted apophyses; three hydrothecae between successive hydrocladia, one axillar and two above, adcauline wall of distalmost adnate to hydrocladium; internodes usually

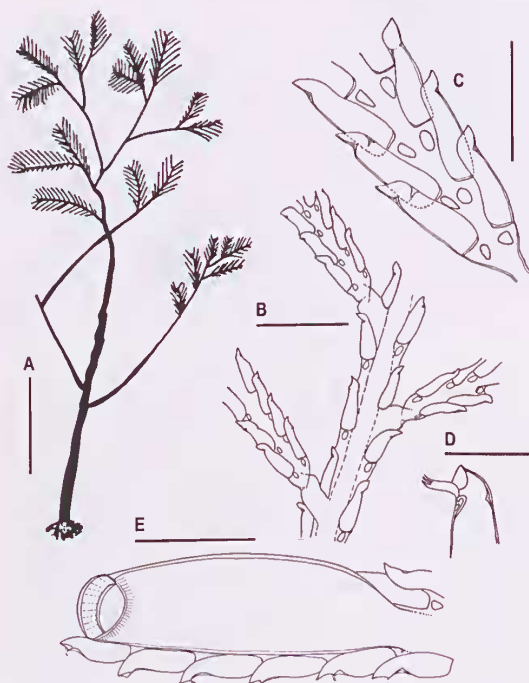


Fig. 17. *Salacia sinuosa*: A, colony of one main stem. B, branch with hydrocladia. C, hydrocladial internode. D, hydrotheca with internal submarginal shelf and operculum. E, gonotheca. Scale bars: A, 100 mm, B 1, 000 μm ; C, E, 500 μm ; D, 200 μm .

hydrocladia, one axillar and two above, adcauline wall of distalmost adnate to hydrocladium; internodes usually absent but when present, of variable length, nodes strongly constricted.

Hydrothecae biseriate, opposite to subopposite, separated transversely, overlapping vertically, tubular, sinuous, narrowing from floor to margin; adcauline wall usually completely adnate, but sometimes a short length free behind margin, a small shelf below margin and a circular to pyriform fenestration below base; abcauline wall almost straight to convex, a shelf in perisarc just below margin. Margin narrow, beak-shaped, inclined obliquely downwards, oblong to subcircular (frontal view), operculum attached to submarginal abcauline shelf. Perisarc of margin and operculum thin, perisarc of branches, hydrocladia and hydrothecae very thick. Hydranth without abcauline caecum.

Gonotheca large, loaf-shaped, inserted without pedicel between rows of hydrothecae, up to six gonothecae along hydrocladium; gonotheca adnate to hydrocladium, sometimes a short part behind margin free, distal end often in contact with base of next, wall smooth (see remarks), orifice distal, circular to subcircular, upturned with a raised thickened rim, a ring of irregularly-shaped denticles inside, operculum a thick plug of tissue.

Colour. Lower stems and branches dark brown to almost black, upper branches and hydrocladia pale brown.

Measurements (µm).

Hydrocladium	
distance between hydrocladia on same side	1,800 - 2,000
apophysis, length adcauline side	240 - 280
apophysis, width at node	192 - 240
Hydrotheca	
depth, adcauline margin to base	432 - 520
width at floor	120 - 176
width at margin (lateral view)	88 - 104
Gonotheca	
length	1,340 - 1,520
maximum width	460 - 540
diameter of aperture	256 - 360

Remarks. The colonies conform to descriptions and dimensions given by previous authors. The tough, woody appearance, thick perisarc and dichotomously branched canopy is distinctive. The beak-shaped hydrothecal margin and opercular valve may have up to seven replications.

Billard (1925) could not find in his material the transverse annulations on the gonotheca reported by Bale (1888) and suggested that their absence from his female material may be due to sexual dimorphism. Faint annulations present on the abcauline walls of many Beagle Gulf gonothecae can only be seen in preserved

material but become invisible in cleared and mounted specimens.

This species is abundant in deeper water in Beagle Gulf. It was not found in the shallower waters of Darwin Harbour.

Distribution. Indonesia (Billard, 1925). Better known from Australian waters: Queensland (Bale 1888), central coast of New South Wales (Ritchie 1911), Great Australian Bight and Tasmania (Briggs 1914, Hodgson 1950), Western Australia (Watson 1996).

Salacia tetracythara Lamouroux, 1816
(Fig. 18A-F)

Salacia tetracythara Lamouroux, 1816: 212. - Lamouroux 1821: 15. - Stechow 1913: 30. - Stechow 1922: 150. - Thornely 1916: 146. - Thornley 1924: 54. - Billard 1925: 202. - Mammen 1965: 54. - Pennycuik 1959: 194. - Rees and Vervoort 1987: 103. - Gibbons and Ryland 1989: 414. - Hirohito 1995: 183.

Thuiaria fenestrata Bale, 1884: 116. - Bale 1888: 773. - Kirkpatrick 1890: 604. - Nutting 1905: 950.

Calypthothuiaria opposita Von Campenhausen, 1896: 312.

Thuiaria tetracythara - Billard 1909: 319.

Records and material. NTM C12930, MV F86943, alcohol preserved material; NTM C12642, microslide, colony from Stn 126. NTM C12932, alcohol preserved material, colony from Stn 155. NTM C12931, alcohol preserved material; NTM C12643, MV F86909, microslides, colony from Stn 81. All fertile colonics, on dead bryozoans, sponge and shale. *Other record*, Stn 152.

Description. Tangled colonies to 100 mm high and 100 mm wide ranging from groups of simple, stiffly pinnate stems to a large fan-shaped colony of many intergrown stems with one or two orders of branches arising from a thick, ramified hydrorhiza. Stems up to 2 mm thick at base, stems and major branches fascicled, perisarc thick. Branch internodes visible only on younger, monosiphonic regions, nodes a transverse constriction, each internode with a hydrocladium and three hydrothecae, one axillar, one opposite and one below hydrocladium.

Hydrocladia long, monosiphonic, held out stiffly at an angle of c. 60° to axis of branch from a broad apophysis; apophysis with an indistinct, constricted, distal node; hydrocladial internodes usually absent but when present, with 2-6 pairs of hydrothecae.

Hydrothecae biseriate, immersed in hydrocladium, subopposite, laterally separated, overlapping vertically, long, tubular, narrowing from floor to margin; adcauline wall convex, convexity increasing distally, adcauline wall almost entirely adnate to internode, a very short free part just behind margin, abcauline wall straight to concave, floor of hydrotheca incurved to accommodate a thin circular to ovoid adcauline fenestration. Hydrothecal

one median adcauline cusp, in anterior view margin sub-circular; operculum a single abcauline flap attached to a small internal submarginal peg, perisarc of operculum delicate.

Gonotheca large, globular, up to six in an upright row along hydrocladium, pedicel short, perisarc very thick, smooth, aperture surmounted by a raised collar with vertical striations and a basal ring of large, internal, inwardly pointing denticles; operculum a thick plug of tissue.

Colour. Pale brown.

Measurements (μm).

Branch		
length of internode	800 - 980	
width at node	168 - 208	
Hydrocladial apophysis		
length, adcauline side	80 - 88	
width at node	88 - 144	
Hydrotheca		
depth abcauline margin to base	384 - 440	
maximum width	128 - 136	
width at margin (lateral view)	120 - 128	
Gonotheca		
overall length	1,040 - 1,060	
maximum width	760 - 860	
diameter of aperture	520 - 540	

Remarks. The material conforms to descriptions of *Salacia tetracythara* by previous authors. In monosiphonic parts of the branches the hydrocladial internodes are faintly flexuose, but this character is lost in older, polysiphonic parts of the stems. In younger branches the hydrocladial apophyses are sometimes quite long, extending 250 μm from the hydrocaulus to the base of the first hydrothecal pair. In large colonies the branches and hydrocladia are heavily intergrown and in some instances hydrocladia have extended and reversed direction of growth, becoming attached to the substrate. The marginal cusps of the hydrotheca are frequently damaged or obscured by opercular tissue and are thus difficult to see. While many gonothecae are empty, maturing gonophores suggest the colonies are probably male.

The hydrothecae of *Salacia tetracythara* superficially resemble those of *S. sinuosa*, however, the species are easily distinguished by colony form and shape of the gonotheca.

Distribution. Indian Ocean (Rees and Vervoort 1987), Indo-Pacific (Billard 1925; Ryland and Gibbons 1989), Japan (Hirohito 1995). Torres Strait (Kirkpatrick 1890), Australian tropical to temperate east and south-east coast (Bale 1884, 1888; Pennycook 1959).

Salacia flavidula sp. nov.
(Fig. 19A-D)

Records and material. Holotype, NTM C12959, alcohol preserved material; NTM C12644, microslide

from holotype colony. Paratypes, NTM C12645, alcohol preserved material, MV F86925, microslide. Colonies on *Eunice tubifex*, Plater Rock, coll: J. E. Watson, depth 3 m, 22/9/1999.

Description. Stems up to 20 mm long, plumose, lower hydrocladial stem region short, perisarc thick, lightly fascicled by two or three stolonal tubes which may reach proximal node; proximal node a blunt hinge joint, hydrocaulus thereafter monosiphonic, segmented, hydrocladial. Cauline internodes short, nodes transverse, deeply indented, a pair of opposite hydrocladia inserted on a wide shoulder-like apophysis above proximal node; two pairs of opposite or subopposite hydrothecae above hydrocladia, bases of hydrothecae not in contact across stem. Hydrocladial apophysis with a deep transverse proximal node and usually a secondary transverse node, sometimes a shallow V-shaped distal node. Hydrocladium broad, inflated below hydrothecae, perisarc very thin, ending in a blunt distal tip; hydrocladium usually entirely lacking nodes, but if present, represented only by a faint constriction in perisarc.

Hydrothecae biserial, alternate, sessile, frontal on hydrocladium, tubiform, narrowing to margin, adcauline wall convex, adnate to hydrotheca above, abcauline wall concave to almost straight, base of hydrotheca flat, concave or convex, partially overlapped by hydrotheca above. Adcauline margin of hydrotheca almost straight, a pair of lateral lobate cusps flanking margin, abcauline marginal embayment with a thin opercular valve.

Hydrocladial coenosarc and hypostome of hydranth containing numerous large bean-shaped haplonemes, none discharged. Hydranth with c. 24 tentacles, no abcauline caecum.

Colour. Brilliant lemon yellow in life; brown when preserved.

Measurements (μm).

Stem		
length of internode	960 - 1000	
width at node	224 - 352	
Apophysis		
length (adcauline side) to distal node	136 - 240	
width at proximal node	184 - 200	
Hydrocladium		
maximum length	8,000	
depth behind hydrothecae	168 - 296	
length of internode	2,400 - 3,700	
width at node	160 - 176	
Hydrotheca		
length (diagonal) adcauline wall		
margin to base	360 - 400	
length free abcauline wall		
(lateral view)	240 - 264	
width margin across cusps	128 - 160	
Nematocysts		
length	22 - 28	
width	8 - 10	

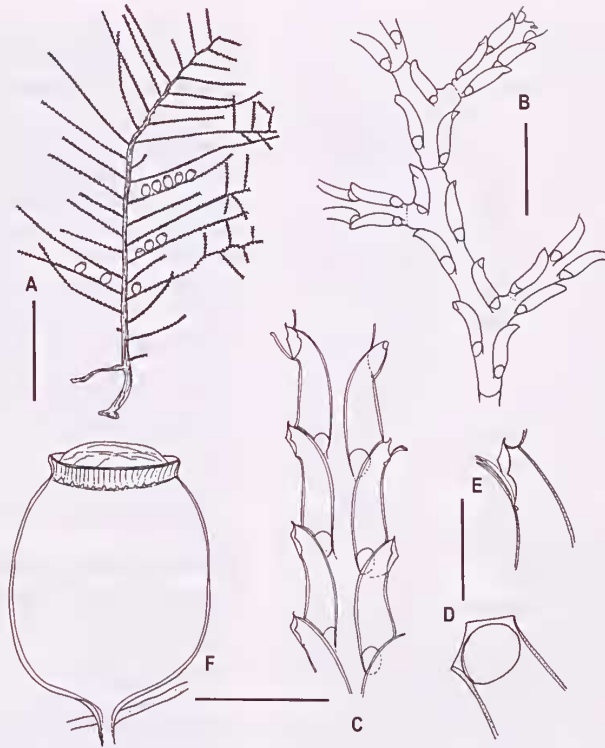


Fig. 18. *Salacia tetracythara*: A, fertile colony. B, hydrocladial part of stem. C, hydrocladial internode. D, ventral view of hydrotheca showing marginal cusps. E, operculate hydrotheca. F, gonotheca with operculum. Scale bars: A, 10 mm; B, 1,000 μ m; C, F, 500 μ m; D, E, 200 μ m.

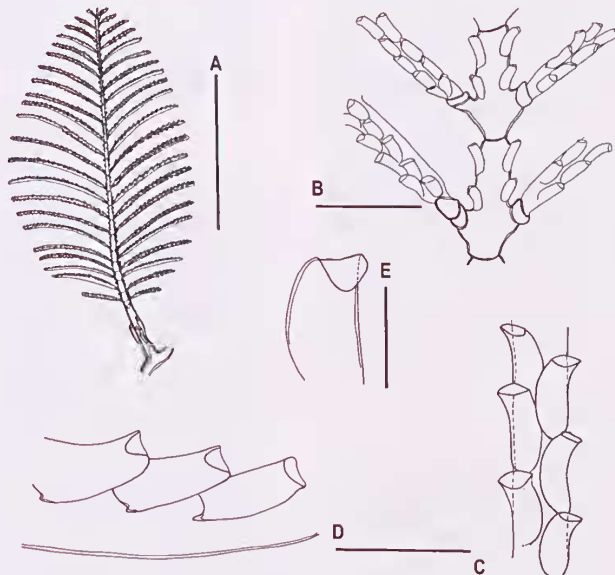


Fig. 19. *Salacia flavidula* sp. nov. A, stem from holotype colony from Plater Rock. B, part of stem with opposite hydrocladia. C, part of hydrocladium. D, lateral view of hydrocladium showing overlapping hydrothecae. E, frontal view of hydrotheca showing lobate cusps. Scale bars: A, 10 mm; B, 1,000 μ m; C, D, 500 μ m; E, 200 μ m.

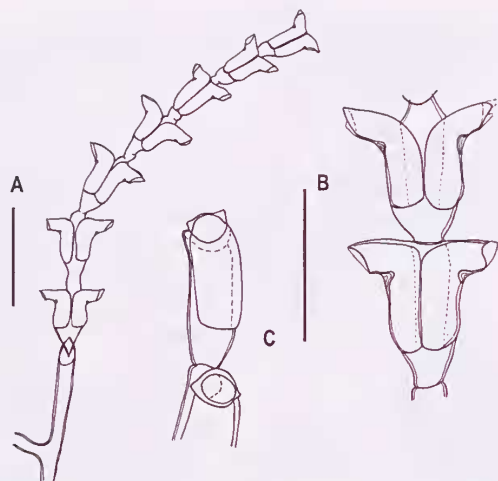


Fig. 20. *Salacia alata* sp. nov. A, stem from holotype colony. B, stem internodes. C, view of hydrothecae showing marginal cusps. Scale bars: A, 1,000 μm ; B, C, 500 μm .

Remarks. Although the colonies are quite stiff in life, the hydrocaulus becomes lax and fragile when preserved. While some species of hydroids have opposite proximal hydroeladia, few have opposite hydroeladia throughout the entire hydrocaulus. The intense yellow colour is imparted by an abundant flora of zooxanthallae in the coenosare; this flora was so resistant that it was difficult not to destroy important diagnostic features of the perisarc by pre-mounting clearing agents. As the material was initially preserved in formaldehyde solution the nematocysts could not be discharged, and so could not be further identified. While the hydrothecae have quite distinct marginal cusps, a feature unusual in *Salacia*, the absence of a caecum and presence of an abeauline operculum indicate the species should be referred to that genus.

Salacia flavidula forms spectacular yellow colonies of up to 30 stems on tubes of the polychaete *Eunice tubifex* growing on coralline boulders in shallow water, the stems of the hydroid arching out gracefully from the substrate. *Salacia flavidula* was found only at Plater Rock.

Etymology. Refers to the distinctive pale yellow colonies.

Salacia alata sp. nov.

(Fig. 20A-C)

Record and material. Holotype, NTM C12646, NTM C12647, MV F86914, microslides from holotype; infertile colony on red alga on *Eunice tubifex*, Stn 40. (All material mounted on microslides: no preserved holotype material remaining).

Description. Hydorrhiza tubular, reptant on alga. Stems simple, to 12 mm high, monosiphonic, proximal stem tubular, of same diameter as hydorrhiza, athecate,

of variable length, ending in a strong hinge joint; perisarc moderately thick, smooth. Stem internodes short, nodes transverse, collar-shaped, sometimes indistinct, a pair of hydrothecae on each internode, infrathecal and suprathecal parts short. Hydrothecae biseriate, opposite, tubiform, narrowing distally, adcauline walls in contact in front, separated behind, conjoined part straight to convexly curved, of variable length, free adeauline wall bending sharply outwards to become almost perpendicular or at obtuse angle to cauline axis, abeauline wall straight, a thick shelf of perisarc in flexure. Margin of hydrotheca tilted downwards at c. 45° to cauline axis with two small opposite lateral cusps, aperture sub-circular, sometimes a remnant of abeauline opercular flap inside, marginal perisarc thin. Hydranth without caecum, with 16 - 20 tentacles

Colour. Pale honey brown.

Measurements (μm).

Stem	
length of athecate section	560 - 2,000
length of thecate section	2,600 - 9,000
diameter of athecate section	120 - 128
length of thecate internode	560 - 600
width at node	88 - 112
Hydrothecae	
length of fused adeauline wall	304 - 376
length of free adeauline wall	200 - 272
width at margin (lateral view)	112 - 140
diameter of margin (frontal view)	120 - 160

Remarks. *Salacia alata* resembles *Salacia dubia* Billard, 1922, but in that species the hydrothecae are conical, not tubular, not bent acutely outwards and the species lacks an internal abeauline shelf.

Etymology. Refers to the sharply bent wing-shaped hydrothecae.

Salacia bidentata sp. nov.

(Fig. 21A, B)

Record and material. Holotype, NTM C12648, microslide, a small colony of three stems on *Eunice tubifex*, Stn 132 (All material mounted).

Description. Hydorrhiza reptant on substrate, stems monosiphonic, straight, proximal athecate region long, tubiform, perisarc smooth, moderately thick, ending in a strong hinge joint. Stem hydrothecate above joint, hydrothecae biseriate, opposite, proximal internodes with a pair of hydrothecae, succeeding internodes bearing two to four pairs of hydrothecae, nodes transverse to V-shaped, infrathecal segment immediately above node variable in length, others segments short. Hydrothecal pairs laterally separated in proximal stem region, adjoining walls becoming fused in distal part of stem. Hydrothecae tubular, narrowing behind margin, floor curved to straight, a small knot of perisarc at base of adcauline wall; adnate adcauline wall straight to slightly convex, free wall about one quarter length of adnate part,

curved upwards to margin, a small submarginal plug of perisarc projecting into hydrotheca; proximal abcauline wall straight to slightly concave, curvature increasing at flexure, a large hook-shaped or triangular submarginal shelf in bend projecting into hydrotheca. Margin with two blunt, wing-shaped lateral cusps, perisarc very thin, remnants of a thin abcauline opercular flap inside many hydrothecae. Hydranths well preserved, without caecum, deeply withdrawn into hydrotheca, body closely transversely wrinkled, approximately eight tentacles with distinct rings of nematocysts.

Colour. Pale transparent yellow (preserved material).

Measurements (μm).

Stem

length of athecate stem	1,500
diameter of athecate stem	96 - 112
diameter at node	56 - 112

Hydrotheca

width across pairs at base	144 - 240
length of adnate adcauline wall	256 - 320
length of free adcauline wall	64 - 88
width of margin	72 - 80
length of abcauline shelf	40 - 56

Remarks. Although the colony consists of only a few stems the large abcauline submarginal shelf and adcauline peg distinguishes *Salacia bidentata* from other species of *Salacia*. One stem shows evidence of breakage and regrowth below the hinge joint and another bears a hinge joint in the mid-stem region (Fig. 21A).

Etymology. Refers to the two internal submarginal cusps.

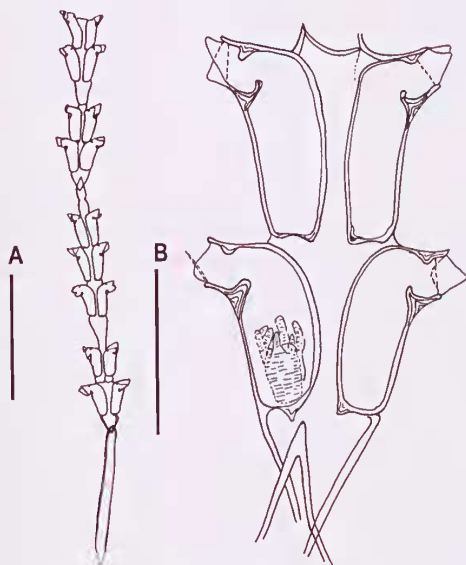


Fig. 21. *Salacia bidentata* sp. nov. A, stem from holotype colony. B, internode showing cuspsate hydrothecal margin, opercular structures and triangular submarginal shelf. Scale bars: A, 1,000 μm ; B, 500 μm .

Genus *Sertularella* Gray, 1848

There are three closely related species of *Sertularella* in the Beagle Gulf collection. These are: *S. decipiens* Billard 1919, *Sertularella diaphana* (Allman, 1885) and *S. quadridens* (Bale, 1884). These species are also closely related to *S. pinnata* (Lamouroux, 1816), a southern Australian species not found in the Beagle Gulf. The type locality of *S. diaphana* and *S. quadridens* is Moreton Bay on the subtropical Australian east coast, both species now being widely reported from the Indo-Pacific and *S. decipiens* has been previously reported from Indonesia and the Arafura Sea. In order to form a basis for distinction between the species of this group, material from the Beagle Gulf and other Australian localities, specimens in the collection of the Museum of Victoria, Australia, and in the author's private collection, were examined.

***Sertularella decipiens* Billard, 1919**

(Fig 22 A-E)

Sertularella decipiens Billard, 1919: 21. - Billard 1925: 155.

Records and material. NTM C12916, MV F86932, alcohol preserved material; NTM C12964, microslide, colony from Stn 154. NTM C12918, alcohol preserved material; NTM C12965, microslide, colony from Stn 40. NTM C12917, alcohol preserved material; NTM C12963, MV F86919, microslides, colony from Stn 147. Fertile and infertile colonies on *Eunice tubifex*. *Other record*, Stn 153.

Description. Hydrorhiza reptant on substrate, tubular, smaller in diameter than hydrocaulus. Stems to 30 mm high, stiffly pinnate, monosiphonic, perisarc thick, sometimes secondary branching; stem thecate almost from base, divided into short internodes, nodes oblique, deep, tilted parallel with hydrocladium below; three hydrothecae on internode, one axillar, one below hydrocladium and one opposite. Hydrocladia to 12 mm long, given off alternately at an angle of c. 60° halfway up cauline internode from a short apophysis, usually marked by a distinct constriction in perisarc, constriction deeper on proximal side of hydrocladium. Hydrocladial internodes may or may not be present, but if present, bearing three to six hydrothecae on each side, node an oblique constriction in perisarc.

Hydrothecae subopposite to almost opposite, immersed in internode, cauline hydrothecae well separated, close, but not in contact on hydrocladium, margin of one reaching about halfway along adcauline wall of that opposite; hydrotheca more or less tubular, narrowing a little to margin, adcauline wall shallowly convex, usually completely adnate but sometimes a very short free part; abcauline wall almost straight and parallel to hydrocladial axis, bending outwards just below margin, a small shelf of perisarc projecting into hydrotheca at point of

cladial axis, bending outwards just below margin, a small shelf of perisarc projecting into hydrotheca at point of flexure; ratio of length of abcauline to adcauline wall 1: 1.4 - 1.8, base of hydrotheca flat to slightly convex, a knot of perisarc projecting downwards into internode from base of wall. Margin tilted upwards at an angle of 25° - 30° to hydrocladial axis with four low, equidistant, sharp cusps, one adcauline, one abcauline and two lateral, separated by wide, shallow embayments; operculum of four valves. Margin not replicated.

Gonothecae borne on hydrorhiza and lower stem, long, sausage-shaped, straight or curved, perisarc very thick, pedicel variable in length, crumpled to almost straight, body of gonotheca encircled by 8 - 10 deep corrugations usually deepest about middle, fading out proximally but some gonothecae merely undulated throughout; aperture a shallow, transverse depression surrounded by four low cusps, operculum of four valves. Female gonophore ovoid, containing many large ova.

Colour. Live colonies pale yellow.

Measurements (µm).

Hydrorhiza, diameter		160
Stem		
diameter at node	340 - 640	
Hydrocladium		
length of apophysis, abcauline side	104 - 240	
diameter at proximal node	200 - 280	
Hydrotheca		
length of adcauline wall	600 - 624	
length of abcauline wall	336 - 448	
maximum width	256 - 336	
diameter at margin	200 - 216	
Gonotheca		
length excluding pedicel	2,580 - 2,800	
length of pedicel	100 - 600	
maximum diameter	740 - 980	
diameter of aperture	640 - 780	

Remarks. In fertile colonies, ova are not only present in the gonothecae but are also distributed throughout the coenosarc; whether this is a normal character of the species or occurred during preservation could not be determined.

In absence of the gonosome, *S. decipiens* can be distinguished from other members of the species group by the longer hydrotheca with distal outward bend, the small submarginal shelf at the point of flexure and the low inclination of the margin to the hydrocladial axis.

Stechow and Müller (1923) doubted the validity of *S. decipiens* suggesting it may be conspecific with *S. quadridens*. While the gonotheca of *S. decipiens* closely resembles that of *S. quadridens* it is almost twice as long as that of *S. quadridens* figured by Weltner (1900) and Billard (1925), and described by Stechow and Müller (1923). For this reason *S. decipiens* is considered a valid species, albeit closely related to *S. quadridens*. Stems of

S. decipiens are shorter, less tidily arranged and are a paler yellow than those of *S. quadridens* and *S. diaphana*. Colonies of *S. decipiens* usually comprise a few stems in a preferred habitat near the base of the tubes of the polychaete *Eunice tubifex*.

Distribution. Indonesia (Billard 1919, 1925). Not previously recorded from Australia.

***Sertularella quadridens* (Bale, 1884)**

(Fig. 23A-F, Table 3)

Thuiaria quadridens Bale, 1884: 119. - Bale 1888: 772. - Bale 1924: 242. - von Lendenfeld 1885b: 915. - Hartlaub 1900: 120. - Weltner 1900: 586. - Ritchie 1910: 818. - Billard 1910: 11. - Billard 1925: 150. - Jäderholm 1916: 6. - Stechow and Müller 1923: 471. - Vervoort 1941: 214. - Vervoort 1946: 314. - Ralph 1961: 830. - Rees and Thursfield 1965: 135. - Mammen 1965: 38. - Pennycuik 1959: 195.

Thuiaria vineta Allman, 1888: 68.

Records and material. NTM C12919, MV F86941, alcohol preserved material; NTM C12967, MV F86918, microslides, colony from Stn 97. NTM C12968, microslide, colony from Stn 138. NTM C12966, microslide, colony from Stn 136. NTM C12920, alcohol preserved material, East Point reef, Darwin, depth 7 m, coll: J. E. Watson, 19/9/1999. East Point reef, Darwin, depth 7 m, coll: J. E. Watson 17/8/1998, large infertile colony. NTM C13079, microslide, Plater Rock, coll: J. E. Watson, depth 8-10 m, 21/9/1999, large fertile colonies on *Eunice tubifex*. *Other record.* Stn 159.

Description. Hydrorhiza a bunch of tubular stolons; stolons creeping up stems to proximal hydrothecae but not forming fasciculations. Stems monosiphonic, pinnately branched in one plane, to 110 mm high, lower stem perisarc thick, thinning distally, hydrocladia up to 10 mm long, given off alternately from proximal part of stem internode, nodes deep, transverse to oblique, inclined opposite directions; three hydrothecae on internode between each hydrocladium, one in axil below node, one opposite and one below hydrocladium, axillar hydrotheca narrow at base, adcauline wall becoming free at or just below junction with cauline node.

Hydrocladia arising from apophysis in top third of internode, proximal part with several constrictions in perisarc, internodes variable in length bearing two to five hydrothecae on each side, nodes deep, transverse to slightly oblique. First hydrocladial hydrotheca on lower side of hydrocladium, hydrothecae thereafter sub-alternate, not in contact, tubiform to flask-shaped, widest about middle, adcauline wall gently convex or sometimes with a slight flexure where adcauline wall becomes free, wall two thirds to almost entirely adnate; free wall (when present) continuing curve of adnate part. Abcauline wall almost straight or a shallow sinuous curve, a short outward deflection of the wall just below margin; length:

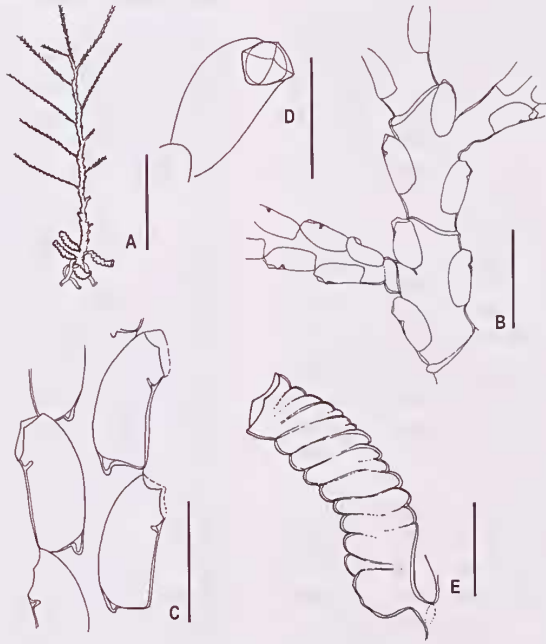


Fig. 22. *Sertularella decipiens*: A, stem from fertile colony. B, hydrocladia. C, hydrothecae on hydrocladium. D, quadrate hydrothecal margin and operculum. E, gonotheca. Scale bars: A, 10 mm, B, E, 1,000 μ m; C, D, 500 μ m.

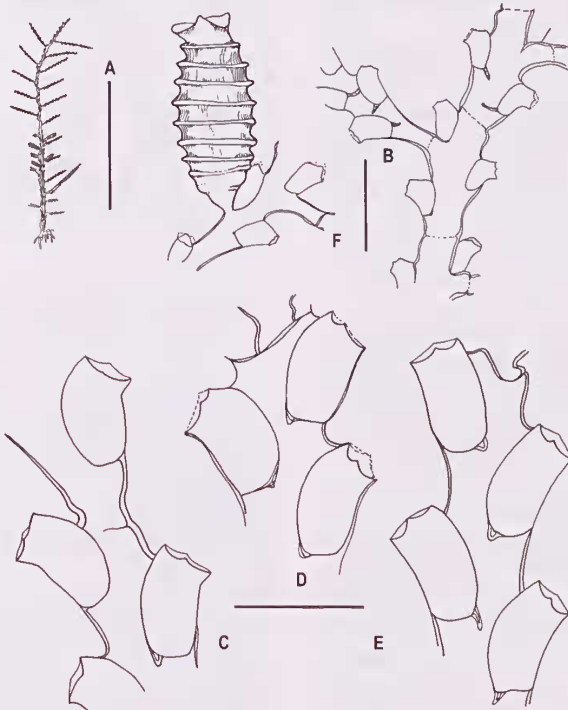


Fig. 23. *Sertularella quadridens*: A, fertile colony from Plater Rock. B, hydrocladial part of stem from same colony. C, hydrocladial internode from same colony. D, E, two hydrocladial internodes with differing hydrothecae from microslide from Peel Island, Queensland (microslide from Bale collection, Museum of Victoria). F, gonotheca from colony from Plater Rock. Scale bars: A, 300 mm, B, F, 1,000 μ m; C - E, 500 μ m.

wall free than hydrocladial hydrothecae. Floor of hydrotheca flat, thick, in mature hydrothecae a knot of perisarc at base of adcauline wall often extending into a spur. Margin circular, tilted upwards at an angle of 30° - 45° to hydrocladial axis with four equidistant low, pointed cusps, one adcauline, one abcauline and two lateral, rim thickened, operculum of four equal triangular, fairly thick flaps; margin not replicated.

Gonothecae large, borne below hydrothecae in mid-stem region; gonotheca slender, barrel-shaped, pedicel contiguous with body, perisarc thick, with eight deep, widely separated annular flanges passing around body, these fading out proximally; body between flanges finely vertically striated, distal end wide, tubular, orifice large, depressed into apex with four prominent equidistant, outwardly turned protuberances, operculum not visible, gonophore female.

Colour. Live colonies golden yellow.

Remarks. I have compared microslides of *Sertularella quadridens* Bale 1884 from Peel Island, Moreton Bay, Queensland, held in the collection of the Museum of Victoria, Melbourne with the Beagle Gulf specimens (see Table 3). The Beagle Gulf specimens are microscopically identical with a microslide preparation labelled "*Thutaria quadridens* Bale, Near Peel Island, Moreton Bay, 1886" held in the Bale collection of the Museum of Victoria. *Sertularella quadridens* is

redescribed from both the type and Beagle Gulf specimens.

The Beagle Gulf specimens are taller than the 25 - 50 mm length of stems reported by Bale (1884) but are within the size range given by Billard (1925) for material from Indonesia. The Beagle Gulf specimens have stout stems and thick perisarc, in younger stems the cauline nodes are a shallow constriction and may be altogether absent from older, thicker stems. The basal adcauline spurs described by Bale (1884) and mentioned by Billard (1925) are very well developed below some cauline hydrothecae in the Beagle Gulf specimens. These finger-like spurs are extensions of the adcauline wall, are sometimes forked and occasionally pass completely across the hydrocaulus to connect with the hydrotheca opposite. Both the type and present specimens have a variable length of adcauline wall free of the internode, ranging from none to one third of the total adcauline length. The distance between successive hydrothecae along the hydrocladium and laterally across the hydrocladium is highly variable in the Beagle Gulf material, in some colonies successive hydrothecae are well separated while in others the margin of one overlaps the base of that above. As in the type, some cauline hydrothecae are outwardly bent, widest in the distal half to one third and become decidedly narrow towards the margin; the marginal rim is noticeably thicker in the present specimens than in the type. The ratio of length of abcauline to adcauline wall of 1:1.7 is greater in the present material than in the type.

Bale's type material is infertile, the gonotheca being first described by von Lendenfeld (1885b) from Timaru, New Zealand and later from Indonesia (Weltner 1900, Billard 1925), the Arafura Sea (Stechow and Müller 1923) and Cape Jaubert, Western Australia (Jäderholm 1916).

Billard (1925) erected the variety *Sertularella quadridens* var. *cornuta* (for *S. polyzonias* var. *cornuta* Ritchie, 1910) which was also recognised by later authors (e.g. Vervoort 1993), to accommodate the considerable longitudinal separation of hydrothecae and greater length of internode than present in typical *S. quadridens*. The greatly elongated internode together with a much longer free adcauline hydrothecal wall, replication of the margin and absence of a knot of perisarc at the base of the adcauline wall suggest that the var. *cornuta* may actually be a distinct species.

Fertile colonies from Darwin Harbour occurred mainly on the tubes of the polychaete *Eunice tubifex* on which substrate their golden colour is quite distinctive.

Distribution. *Sertularella quadridens* is widely distributed throughout the Indo-Pacific and Indonesia. Australian distribution: Queensland (Bale 1884, Pennycook 1959), Cape Jaubert, Western Australia (Jäderholm 1916).

Table 3. Measurements (μm) for *Sertularella quadridens*: comparison of Beagle Gulf specimens with type from Queensland.

	Type from Peel Island	Beagle Gulf and Darwin
Stem		
Length of internode	1,560 - 1,800	1,200 - 1,660
width at node	340 - 440	224 - 640
length adnate adcauline wall stem hydrotheca	344 - 440	360 - 408
length free adcauline wall stem hydrotheca	144 - 216	160 - 200
Hydrocladium		
length of internode	1,740 - 2,000	980 - 1,860
width at node	200 - 320	200 - 340
width at apophysis	136 - 200	140 - 320
distance to first hydrotheca (proximal side)	600 - 760	280 - 700
Hydrotheca (hydrocladium)		
length of adnate adcauline wall	400 - 480	300 - 464
length of free adcauline wall	40 - 144	120 - 200
length of abcauline wall	376 - 384	320 - 384
width at base	168 - 200	144 - 184
maximum width	232 - 288	256 - 280
diameter at margin	240 - 280	192 - 224
Gonotheca		
length including pedicel	-	1,960 - 2,200
maximum width	-	760 - 820
length of pedicel	-	220 - 240
width of pedicel, proximal	-	140 - 180
depth of ridge	-	120 - 152

Sertularella diaphana (Allman, 1885)

(Fig. 24A-E)

Thuiaria distans Allman, 1877: 27 [secondary homonym; not *Dynamena distans* Lamouroux, 1816].

Thuiaria pinnata Allman, 1877: 28 [secondary homonym; not *Sertularella pinnata* Clark, 1876].

Thuiaria diaphana Allman, 1885:145.

?*Thuiaria hyalina* Allman, 1888: 69.

Sertularella distans Hartlaub, 1901: 100. - Nutting 1904: 88. - Vervoort 1968: 104.

Sertularella pinnigera Nutting, 1904: 86. - Hartlaub 1901: 113. - Deevey 1954: 270. - Vervoort 1968: 105.

Sertularella torreyi Nutting, 1905: 934, 949.

Sertularella speciosa Congdon, 1907: 463. - Bennett 1922: 250. - Fraser 1943: 92. - Deevey, 1954: 270. Vervoort 1968: 44, 105. - Wedler 1975: 333. - Cooke 1977: 96. - Colin 1978: 139. - Bandel and Wedler 1987: 38. - Flórez-González 1983: 120.

Sertularella tridentata Stechow, 1913: 137. - Stechow 1925: 226.

Sertularella diaphana - Bale, 1919: 337. - Jäderholm 1920: 6. - Billard 1925: 157. - Stechow 1925: 226. - Billard 1931: 248. - Billard 1933: 12 - Dollfus 1933: 127. - Millard 1958: 188. - Yamada 1958: 58. - Yamada 1959: 63. - Pennycuik 1959: 195. - Hirohito 1969: 21. - Millard 1970: 268. - Schmidt 1972:

42. - Millard 1975: 285. - Millard and Bouillon 1975: 14. - Millard 1978: 197. - Gibbons and Ryland 1989: 414. - Calder 1991: 101. - Vervoort 1993: 214. - Hirohito 1995: 192. - Watson 1996: 78.

Sertularella sargassi Stechow, 1920, 37. - Stechow 1923: 179.

Sertularella quadrilateralis Hargitt, 1924: 493.

Sertularella diaphana var *orthogona* Billard, 1925: 161. - Van Soest 1976: 83.

Sertularella diaphana var. *delicata* Billard, 1919, 21. - Billard 1925: 161.

Records and material. NTM C12912, alcohol preserved material; NTM C12972, MV F86922, microslides, colony from Stn 87. NTM C12914, alcohol preserved material NTM C12969, microslide, colony from Stn 154. NTM C12913, MV F86933, alcohol preserved material; NTM C12970, microslide, colony from Stn 110. Infertile branch fragments and small colonies. *Other records.* Stns 40, 113, 121, 131, 146, 156. East Point, Darwin, tall branched infertile colony, coll: J. E. Watson, depth 7 m, 11/8/1998. Plater Rock, large fertile colonies on coral boulders and *Eunice tubifex*, coll J. E. Watson, depth 3 m, 22/9/1999.

Description. Stems to 100 mm high, pinnately branched in one plane, lower stem thick, fascicled, polysiphonic tubes a continuation of hydrorhizal filaments, stems becoming monosiphonic distally. Stem internodes short, broad, nodes transverse to slightly oblique, sometimes indistinct. Hydrocladia distal on cauline internodes, three hydrothecae on internode, one below hydrocladium, one in, or in front of axil and one opposite, axillar hydrothecae adnate to caulus and of same shape as others. Hydrocladia alternate, on indistinct apophysis, proximal part fairly long, slender, atecate, the first hydrotheca on basal side of hydrocladium.

Hydrothecae alternate, immersed in internode, short, widely separated laterally, base of each reaching about halfway up wall of that opposite, widest in proximal third, adcauline wall convexly curved, a small knot of perisarc at base, floor a downwardly tilted shelf, abcauline wall straight to slightly concave, contiguous with hydrotheca below. Margin subcircular in frontal view, tilted upwards at angle of 45° - 60° to hydrocladial axis, rim distinctly thickened with four equidistant, low rounded cusps, one abcauline, one adcauline and two lateral, separated by shallow embayments, no replication of margin, operculum of four fairly thick triangular flaps. Hydranth with deep abcauline caecum and about 20 tentacles.

Gonothecae borne on stem and hydrocladia, inserted without pedicel below a hydrotheca, a circular foramen connecting with hydrocladium; gonotheca elongate conical, adpressed to hydrocladium, perisarc thick, most with several longitudinal pleats, some indistinctly undulated.



Fig. 24. *Sertularella diaphana*: A, hydrocladial part of stem from colony on *Eunice tubifex*. B, part of hydrocladial internode. C, gonotheca. D, colony corresponding to *Sertularella diaphana* var. *delicata* from *Gymnangium longirostre*. E, hydrothecae from same colony. Scale bars: A, E, 1,000 µm; B, D, 500 µm; C, 5,000 µm.

Colour. Live colonies orange to honey brown.

Measurements (μm).

Stem		
length of internode	900	- 112
diameter at node	460	- 600
Hydrocladium		
internode length	880	-1,700
diameter at node	160	- 200
width of apophysis	180	- 200
distance from apophysis to first hydrotheca	360	- 440
Hydrotheca		
length of adnate adcauline wall	360	- 392
length of free adcauline wall		48
diameter at margin	200	- 224
Gonotheca		
maximum length	2,060	-2,400
diameter at aperture	440	- 520

Remarks. Irregular transverse folds present in some gonothecae appear not to be normal ornamentation but are probably the result of interruptions or damage to growth.

A single, white, infertile stem 12 mm high, on *Gymnangium longirostre* from Stn 87, differs considerably from typical colonies of *Sertularella diaphana*. The slender, unfascicled stem has longer stem internode, greater separation of the hydrothecae along the hydrocladium, hydrothecae expanding to the margin and shorter adcauline wall (Figs 24C, D) conform exactly with *S. diaphana* var. *delicata* Billard, 1925. While concurring with Vervoort's (1993) rejection of the var. *delicata* as simply one of a range of intergrading forms of *S. diaphana*, it is possible that this variety may well be a distinct species. However, until the finding of a better range of fertile material the specimen is referred to *S. diaphana*.

Distribution. Virtually circumglobal in tropical and subtropical waters (Vervoort 1993). Tropical east and north-west Australia (Pennycuik 1959, Watson 1996).

Sertularella pinnata (Lamouroux, 1816)

(Fig. 25 A, B)

Caberea pinnata Lamouroux, 1816: 130.

Thuiaria lata Bale, 1882: 26. - Bale 1884: 120. - Bale 1894: 103. - Bale 1915: 287.

Sertularella lata - Nutting, 1904: 85. - Nutting 1905: 948. - Stechow 1913: 137. - Stechow 1923: 14. - Bale 1919: 337. - Jarvis 1922: 342. - Blackburn 1942: 115.

Sertularella tridentata Jäderholm, 1917: 13.

Sertularella ?diaphana - Stechow 1924: 69. - Stechow 1925, 226.

Sertularella pinnata - Gordon *et al.* 1998: 413.

Description. The following description is from a microslide held in the collection of the Museum of Victoria, Melbourne (MV F58895), labelled *Thuiaria lata* Bale, 1884 "co-type", and thought to be probably

syntype (Stranks 1993) and specimens in author's collection consisting of a large fertile colonies from 1) Crawfish Rock, Western Port, Victoria, depth 15 m, coll: J. E. Watson 24/11/66, 2) Green Cape, New South Wales, depth 17 m, coll: J. E. Watson 14/2/73.

Stems up to 200 mm high, 5 mm thick at base, plumose, with several secondary and tertiary branches given off in the same or nearly the same plane; stem and lower branches heavily fascicled, ultimate branches monosiphonic. Monosiphonic branch internodes short, very wide, nodes oblique, tilted in opposite directions, hydrocladium arising a little more than halfway up internode; internode with three hydrothecae, one in axil of hydrocladium, one below and one opposite.

Hydrocladia alternate on a short apophysis marked by a constriction in perisarc, hydrocladial internodes variable in length, two to five hydrothecae along each side, nodes distinct, oblique. Hydrothecae seated on front of hydrocladium, separated laterally, abcauline wall slightly sinuous, hydrotheca widest about middle, adcauline wall convex, completely adnate to internode; length-width ratio of abcauline to adcauline wall 1: 1.2; hydrotheca without true floor, a short spur of perisarc extending inwards from base of adcauline wall. Margin tilted upward at an angle of 55° - 60° to hydrocladial axis, circular in frontal view, with four low equidistant cusps, one abcauline, one adcauline and two lateral; rim thickened, margin not replicated, operculum of four flaps.

Gonotheca large, elongate conical, one to several along hydrocladium inserted without pedicel at base of a hydrotheca, connection with hydrocladium a wide foramen, gonotheca adpressed to or laying close to

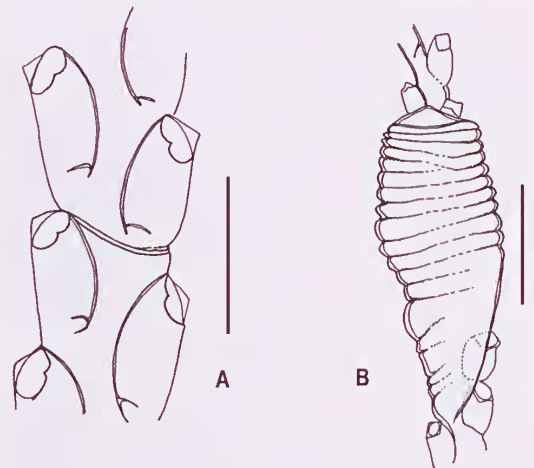


Fig. 25. *Sertularella pinnata*: A, hydrocladial internode. B, gonotheca. Scale bars: A, 500 μm ; B, 1,000 μm .

hydrocladium, perisarc thick with up to 14 smooth, deep transverse corrugations; corrugations less distinct on adcauline side and fading out proximally; orifice a shallow, circular apical depression, transverse to slightly oblique with a short adcauline lip; operculum a single thick flap.

Colour. Live colonies deep yellow to orange.

Measurements (μm).

Stem		
Length of internode	740 - 900	
width at node	540 - 600	
Hydrocladium		
length of internode	1,720 - 2,100	
width at node	360 - 400	
width at apophysis	240 - 300	
distance to first hydrotheca (proximal side)	140 - 200	
Hydrotheca (hydrocladium)		
length adcauline wall	456 - 464	
length abcauline wall	376 - 456	
maximum width	216 - 240	
diameter at margin	160 - 192	
Gonotheca		
length	2,700 - 2,840	
width at aperture	820 - 1,000	

Remarks. The difficulty of distinguishing infertile material of *Sertularella pinnata* from *Sertularella diaphana* and other members of the group has been discussed by previous authors (e.g. Bale 1919, Gordon *et al.*, 1998). Bale considered the hydrothecae of *S. pinnata* to be "closer together, less laterally divergent, do not face as much to the front of the hydrocladium and the hydrothecal margins are more nearly vertical than those of *S. diaphana*". Some of these supposed differences may, however, be due as much to the angle of presentation of the specimen on the microslide as to actual orientation of the hydrothecae on the hydrocladium.

Nutting (1904) considered the type of *Thuiaria hyalina* Allman, 1888 from the coast of Brazil to be conspecific with *Sertularella lata* (Bale, 1884). His figure of the type clearly depicts the slight convexity near the base of the hydrothecal abcauline wall typical of *S. pinnata*. Jarvis (1922) reported *S. pinnata* from several east African localities and although her description is brief and lacks figures, the transversely corrugated gonotheca with flattened distal end leaves little doubt that the species is *S. pinnata*. Stechow (1925) doubtfully assigned infertile material from Shark Bay, Western Australia to *S. diaphana*; the slight tumescence of the abcauline hydrothecal wall (Stechow's Fig. H, p. 227) suggests that the species is probably *S. pinnata*.

Distinction between species of the *Sertularella* species group. Infertile material of *Sertularella quadridens*, *Sertularella diaphana* and *Sertularella pinnata* cannot be easily distinguished on microscopic characters alone, a situation that has probably led to much

past misidentification of species. When fertile they are, however, readily separated, the gonothecae of *S. quadridens* (Fig. 23F) and *S. decipiens* (Fig. 22E) being more or less tubiform and ridged, that of *S. diaphana* is conical with longitudinal pleats (Fig. 24E) while that of *S. pinnata* is conical and transversely corrugated (Fig. 25 B).

Ecology. In southern Australia, the large, plumose orange-yellow colonies of *Sertularella pinnata* usually grow in association with colonies of *Plumularia procumbens* Spencer, 1891 or rarely, epilithically (J. E. W., unpubl.). The tall, orange-coloured colonies are unmistakable and cannot be confused with any other southern Australian species.

As far as presently known all four species are epizooites, the tropical ones occurring chiefly on tubes of the polychaete *Eunice tubifex* while *Sertularella pinnata* is a virtual obligate on another hydroid.

Distribution. Southern Australia (Bale 1884, 1915; Jäderholm 1920; Gordon *et al.*, 1998), East Africa (Jarvis 1922) and Brazil (Nutting 1904).

Genus *Sertularia* Linnaeus, 1758
***Sertularia trigonostoma* Busk, 1852**
 (Fig. 26A-E)

Sertularia trigonostoma Busk, 1852: 387-392.
 - Kirkpatrick 1890: 604. - Billard 1925: 174. - Pennycuik 1959: 198.

Sertularia trigonostoma var. *alternata* Vervoort, 1959: 284. - Mergner and Wedler 1977: 20.

Records and material. NTM C12903, alcohol preserved material; NTM C12951 microslide, colony from Stn 138. NTM C12904, alcohol preserved material; NTM C12899, MV F86924, microslides, colony from Stn 7. NTM C12905 alcohol preserved material, colony from Stn 82. Sparse, sparingly fertile colonies on pebbles and *Eunice tubifex*. *Other records.* Stns 84, 154.

Description. Hydrorhiza tubular, entwining substrate. Stems to 85 mm long, pinnate, lax, monosiphonic, cauline diameter decreasing distally, perisarc thick; proximal region of longer stems ahydrocladiate, shorter stems entirely hydrocladiate; cauline internodes indistinct.

Hydrocladia alternate, arising at an angle of c. 40° to cauline axis, longest in proximal stem region (up to 10 mm long on tallest stems), becoming shorter distally; hydrocladium inserted on long apophysis with distinct transverse distal node; two hydrothecae between each hydrocladium on same side, another in axil. Hydrocladial internode with two hydrothecae, node transverse to slightly oblique, distinct.

Hydrothecae biserial, subopposite, seated on front of internode, subopposite, slightly separated on proximal region of hydrocladium, adcauline walls adjoined distally along hydrocladium. Hydrotheca longer than wide, adcauline wall convex, free part very short, abcauline

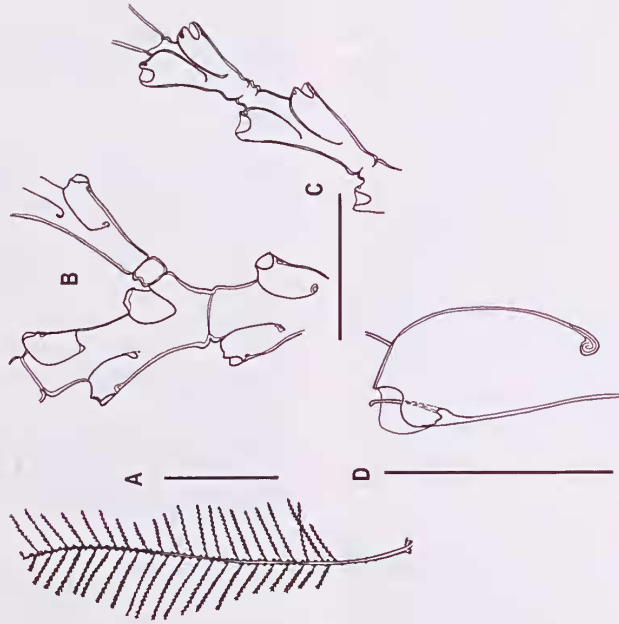


Fig. 27. *Thuitaria operculata* sp. nov. A, stem from holotype from Darwin Harbour. B, part of stem of holotype with hydrocladium. C, hydrocladial internodes. D, hydrotheca with operculum. Scale bars: A, 10 mm, B, C, 500 μ m; D, 200 μ m.

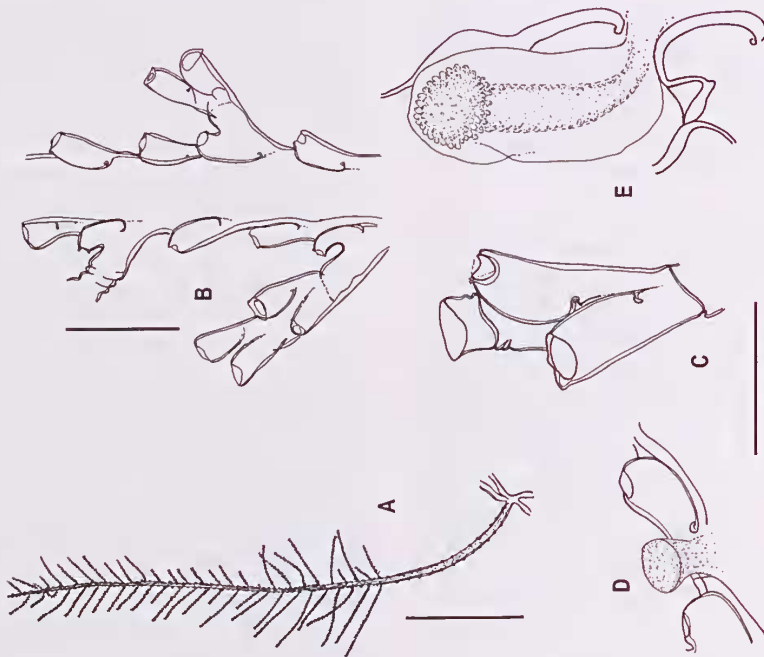


Fig. 26. *Serularella trigonostoma*: A, whole stem. B, hydrocladial part of stem. C, hydrocladial internode. D, developing gonotheca. E, immature gonotheca. Scale bars: A, 10 mm, B, 1,000 μ m; C, D, E, 500 μ m.

wall straight to faintly sinuous or concave, contiguous with internode, base of adcauline wall with an intumed knot of perisarc, no true floor to hydrotheca, connection with hydrocladium wide. Margin thickened with two lobate lateral cusps and a much smaller adcauline cusp, aperture elliptical, opercular remnants obscuring most margins. Hydranths not well preserved, no caecum; approximately 16 tentacles.

Gonotheca immature, balloon-shaped to irregularly cylindrical, inserted without pedicel between two cauline hydrothecae in mid to upper stem region, expanding a little apically to a blunt distal end, gonophore an aborted hydranth, perisarc extremely thin.

Colour. Pale yellow-brown.

Measurements (μm).

Stem		
distance between successive hydrocladia on same side	1,060	-1,100
length of apophysis (distal side)	112	- 128
width of apophysis at distal node	144	- 160
Hydrocladium		
length of internode	296	- 336
width at node	120	- 128
Hydrotheca		
length of adnate adcauline wall	184	- 228
length of free adcauline wall (lateral view)	32	- 56
width between marginal cusps	88	- 112
Gonotheca		
length	600	
width	256	

Remarks. Although the cauline perisarc is comparatively thick the stems are quite lax. Many hydrocladia are broken off at the distal apophysal node. The hydrothecal aperture is small and frequently obscured by adhering tissue and opercular remnants.

Vervoort (1959) erected the var. *alternata* to accommodate specimens from west Africa with alternate hydrothecae; the present material has subopposite hydrothecae, thus conforming to Busk's original description of the species.

This first description of the gonotheca is based on the single immature gonotheca present in the sample; it is remarkably small and delicate in comparison with the sturdy trophosome. As there is no sign of ova it is probably male.

Distribution. Tropical Indo-Pacific and Red Sea (Vervoort 1959, Mergner and Wedler 1977). Australian distribution: Torres Strait (Busk 1852) and tropical Queensland (Pennycuik 1959).

Genus *Thuiaria* Fleming, 1828

Thuiaria operculata sp. nov.

(Fig. 27A-D)

Records and material. Holotype, NTM C12956, alcohol preserved material, NTM C12949, NTM

C12971, MV F86921, microslides from holotype colony, East Arm port, concrete wall of berth, coll: J. E. Watson, depth 5 m, 20/8/1998, colony of several infertile stems. Paratype, NTM C12973, microslide, two infertile stems on hydrorhiza of *Idiellana pristis*, Stn 146.

Description. Hydrorhiza thick, gnarled. Stems to 35 mm high, gracefully plumose, monosiphonic, proximal stem robust, perisarc thick, thinning distally, a distinct transverse node above base of stem, proximal cauline internode athecate, cauline and hydrocladial internodes thereafter thecate, nodes distinct to absent, slightly oblique to transverse, perisarc tumid above and below node.

Hydrocladium proximal on internode, a hydrotheca deep in axil, one above, margin almost level with distal node, another in alternate position, opposite on stem. Hydrocladia alternate, long, upwardly directed at 60 - 70° to cauline axis, borne on a strong apophysis with one or two transverse distal nodes, internodes thereafter with two hydrothecae, nodes slightly oblique.

Hydrothecae frontal on internode, subalternate, facing forward, adnate adcauline wall smoothly convex, free part short, a small hook-shaped knot of perisarc at base of wall; abcauline wall contiguous with internode, straight to slightly sinuous, maximum width of hydrotheca in distal third, a bracket-like internal submarginal shelf just below abcauline margin. Aperture oval, facing upward with two large lateral lobes and a very small adcauline cusp; operculum a strong flap with outrolled rim, attached to abcauline submarginal shelf; perisarc of operculum thick. Hydranth with c. 10 tentacles, abcauline caecum visible in some hydranths.

Colour. Live stems pale greenish-white.

Measurements (μm).

Stem		
diameter of basal node	176	- 208
length of internodes	560	- 680
diameter at node	112	- 168
Branch		
length of internode	400	- 520
diameter at node	72	- 96
abcauline length of apophysis from stem node	180	- 208
length of first athecate internode	60	- 72
Hydrotheca		
length of adnate adcauline wall	180	- 204
length of free adcauline wall	32	- 44
maximum width	96	- 100

Remarks. The abcauline operculum of one valve and hydranth with abcauline caecum necessitates referral of the species to *Thuiaria*. The operculum attached to the knuckle-shaped submarginal shelf is quite delicate in frontal view but in lateral view appears much thicker, its outrolled upper edge being quite clear. In contracted hydranths the small abcauline caecum is rather obscure, being evident in extended hydranths.

Etymology. Named for the strongly developed opercular flap.

Thuiaria plumularioides sp. nov.

(Fig. 28A-F)

Records and material. Holotype, NTM C12974, NTM C12975, MV F86923, microslides, from infertile colony on sponge, Stn 153. Paratypes, NTM C12976, microslide, colony from Stn 110. NTM C12977, microslide, colony from Stn 154. (All holotype and paratype material mounted on microslides: no preserved material remaining).

Description. Hydorrhiza a knot of tubes entwining substrate. Stems to 25 mm high, straight, robust, pinnate, proximal part of stem ahydrocladate but with two rows of opposite hydrothecae; ahydrocladate part of stem usually with a strong distal hinge joint. Cauline nodes of hydrocladate part of stem distinct, slightly oblique to transverse; internode with three hydrocladia, one to three hydrothecae above hydrocladium, proximal one axillar, distalmost level with node. Cauline perisarc very thick proximally, thinning a little distally.

Hydrocladia close set, alternate, long, arching gracefully upwards at an angle of c. 30° to cauline axis from a strong apophysis with an indistinct transverse constriction and a pronounced distal hinge joint. Hydrocladial internodes long, nodes distinct hinge joints. Hydrothecae biseriata, frontal on hydrocladium, proximal internodes bearing up to 10 pairs of hydrothecae, pairs becoming fewer distally; hydrothecae overlapping,

facing upwards, sub-opposite on proximal region of hydrocladium, becoming opposite distally, each pair overlapping base of pair above. Hydrotheca long, tubular (lateral view), almost vasiform (anterior view), slightly tumid at base, narrowing just behind margin, adcauline walls joined, straight, a short convex length free of internode at a sharp outward distal bend; abcauline wall almost straight, a prominent abcauline submarginal shelf, a foramen at base of wall connecting with internode, base of hydrotheca rounded. Aperture oval, margin thickened with a pair of opposite laterally placed cusps and a rounded adcauline lobe; opercular valve attached to submarginal adcauline shelf. Hydranth with an abcauline caecum and about 10 tentacles.

Colour. In life, pale yellow.

Measurements (µm).

Stem	
maximum diameter at proximal node	850
length of internode	960 - 1,960
diameter at node	220 - 500
apophysis, length of abcauline wall	280 - 360
apophysis, width at transverse node	144 - 184
Hydrotheca	
length of adnate adcauline wall	184 - 240
length of free adcauline wall to margin	100 - 160
length of abcauline wall to top of margin	240 - 280
depth of margin, lateral view	60 - 64
width of margin, cusp to cusp, frontal view	68 - 80

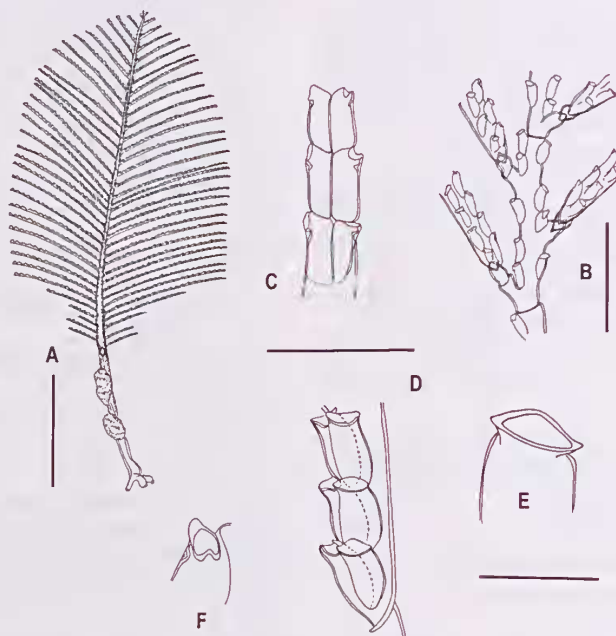


Fig. 28. *Thuiaria plumularioides* sp. nov. A, stem from holotype colony. B, hydrocladia. C, frontal view of hydrocladium. D, hydrocladium, lateral view. E, hydrotheca showing lobate margin. F, lateral view of hydrotheca showing submarginal abcauline thickening. Scale bars: A, 10 mm, B, 1,000 µm; C, D, 500 µm; E, F, 200 µm.

Remarks. The species is referred to *Thuiaria* on the basis of the abeauline caecum in the hydranth and the hydrotheca having an abeauline operculum. Colonies may be sparingly branched, one stem of the holotype colony having remnants of a branch near the base. The overlapping hydrothecae and slightly tumid base of the hydrothecae are characteristic.

Etymology. The species is named for its plumose morphology.

Genus *Thyroscyphus* Allman, 1877

***Thyroscyphus macrocytharus* (Lamouroux, 1824)**

(Fig. 29A)

Clytia macrocytharus Lamouroux, 1824: 647. - Lamarek 1837: 199.

Campanularia marginata Bale, 1884: 54. - Bale 1888: 758. - Bartlett 1907: 62. - Levensen 1913: 289.

Laomedea marginata - von Lendenfeld 1885a: 404.

Thyroscyphus marginatus - Bale 1914: 91. - Bale 1915: 245, 258. - Stechow 1924: 69. - Stechow 1925: 217. - Blackburn 1942: 112. - Watson 1973: 169.

Thyroscyphus balei Calder, 1983:16. - Watson 1992: 220.

Thyroscyphus macrocytharus - Watson 1994: 156. - Watson 1996: 78. - Watson 1997: 517.

Record and material. NTM C12987, MV F86893, microslides, sparingly fertile colony of four straggling stems on sponge, Stn 154.

Description. Hydrorhiza reptant on substrate, hydrocaulus of same diameter as hydrorhiza, monosiphonic, perisarc very thick. Stems to 10 mm high, internodes long, smooth, almost geniculate, nodes oblique, deeply incised. Hydrothecae alternate, distal on internode, borne on a moderately long pedicel either smooth or with one or two constrictions; hydrotheca campanulate, margin quadrate, conspicuously thickened, with four pointed eusps and four shallow emarginations; operculum of four equal valves. Gonotheca immature, top-shaped, borne on a short pedicel inserted in apophysis of stem beside hydrotheca.

Colour. Pale brown to colourless.

Measurements (μm).

Stem		
length of internode	960	- 1,320
width at node	168	- 256
Hydrotheca		
length of pedicel	100	- 240
depth, diaphragm to margin	680	- 792
diameter at margin	528	- 568

Remarks. The specimen conforms to the description of *Thyroscyphus macrocytharus* given by Watson (1994). Most hydrothecal pedicels of the present material are regenerated, some up to eight times. *Thyroscyphus macrocytharus* is endemic to Australia, usually occurring in shallow water; the present record from a depth of 30 m is the second deepest record for the species, the deepest being 137 m off southern Australia (Bale 1915).

Distribution. The previous northernmost record of *T. macrocytharus* is from Geraldton, Western Australia (Stechow 1925). This is the first record of the species from tropical Australia.

***Thyroscyphus torresii* (Busk, 1852)**

(Fig. 29B-C)

Laomedea torresii Busk, 1852: 402.

Thyroscyphus simplex Allman, 1888: 25. - Jäderholm 1903: 273. - Jäderholm 1916: 5. - Stechow and Müller, 1923: 466.

Campanularia torresii - Bale 1884: 52. - Kirkpatrick 1890: 604.

Thyroscyphus regularis Jäderholm, 1896: 9.

Thyroscyphus torresii - Jäderholm 1903: 273. - Stechow 1913: 12. - Jäderholm 1916: 5. - Stechow and Müller 1923: 466. - Redier 1963: 22. - Watson 1996: 78.

Cnidocyphus torresii - Spletstösser 1929: 70-82, 125. - Pennycuik 1959: 156. - Vervoort 1941: 204. - Vervoort 1993: 104.

Records and material. NTM C12887, alcohol preserved material, colony from Stn 110. NTM C12886 alcohol preserved material; NTM C12989, MV F86892, microslides, colony from Stn 13. NTM C12888, alcohol preserved material, colony from Stn 136. MV F86938, alcohol preserved material, colony from Stn 137. NTM C12988, microslide, colony from Stn 138. Many infertile colonies, the largest of 20 stems on shell and grit, *Gynnaugium longicorne* and sponge. **Other records.** Stns 48, 67, 78, 87, 127, 136, 155. East Port channel and wharf pilings, small and large colonies, Port of Darwin, coll: J. E. Watson, depth 3 m, 16/8/1998. Plater Rock, many sparsely fertile large and small colonies, coll J. E. Watson, depth 3 - 10 m, 21/9/1999.

Description. Hydrorhizal stolons tightly entwining substrate. Clusters of up to 20 pinnate stems to 100 mm high arising from hydrorhiza, basal stem region lightly fasciated by hydrorhizal stolons, stems thereafter monosiphonic, tubular, stiff and robust, perisarc of basal region very thick and smooth, thinning distally. Hydrocladia pinnate, alternate, well separated, long, no secondary branching, two alternate hydrothecae on stem between each branch and one axillar. Stem and hydrocladial internodes fairly long, nodes slightly oblique to transverse, marked by a notch in perisarc. Hydrocladial apophysis long, inclined upwards, proximal side marked by an indentation in perisarc in stem; first hydrocladial internode long, internodes shorter thereafter, nodes transverse, usually distinct.

Hydrothecae alternate, pedicel short, thick, smooth or with several ridges; hydrotheca asymmetrical, abeauline wall straight, proximal third of abeauline wall convex, the curve straightening out distally, diaphragm distinct, down-curved, often asymmetrically tilted, hydrothecal margin circular, rim quadrate with four low,

equidistant, sharply pointed cusps separated by four shallow emarginations; operculum thin, of four triangular flaps. Hydranths stubby, with at least 30 tentacles.

Gonothecae immature, top-shaped, arising in proximal stem region beside a hydrotheca or on stem, hydrocladium or apophysis from which a hydrotheca has been shed; perisarc thin.

Colour. Live colonies golden-yellow to golden-brown.

Measurements (µm).

Stem		
diameter at base	860	- 950
distance between successive branches	2,300	-2,800
length stem internodes between successive hydrothecae	800	-1,000
Branch		
length first internode	1,900	-2,040
length succeeding internodes	700	-1,100
width branch at base	200	- 260
width at node	192	- 224
Hydrotheca		
length, including pedicel	1,080	-1,200
length of pedicel apophysis to diaphragm	120	- 152
width of pedicel	160	- 192
width at diaphragm	240	- 280
diameter at margin	472	- 576
width of marginal embayment	232	- 320

Remarks. The hydrothecal pedicels of younger hydrocladia are usually smooth but in older stems are often ridged from repeated breakage and regeneration. There is no submarginal thickening of the hydrothecal rim as in *Thyroscyphus macrocytharus*, only a faint line below the rim in some hydrothecae marking the junction of the operculum with the body. Several colonies are infested with *Hebelloopsis scandens*, the hydrothecae of which are invariably close beside those of *Thyroscyphus*.

The lower stem regions bearing developing gonothecae are packed with globular white bodies, apparently developing gonophores which are visible through the stem perisarc. It is surprising that, as *T. torresii* is one of the most abundant hydroids in both dredged and scuba collections, only a few immature gonothecae were found. The only description and figure of the mature gonotheca of *T. torresii* is of a distally ridged gonotheca (Jäderholm 1903).

Distribution. Indonesia, China Sea, Mergui Archipelago (Vervoort 1993). Australian region: Torres Strait (Busk 1852, Kirkpartick 1890) Aru Sea (Stechow and Müller 1923), Fitzroy Island (Bale 1884), off Cape York (Allman 1888), Cape Jaubert, Western Australia (Jäderholm 1916), Queensland (Pennycuik, 1959).

Thyroscyphus fruticosus (Esper, 1793)

(Fig. 29D)

Spongia fruticosus Esper, 1793: 188.

Sertularella fruticosus - Thompson 1879: 100.

Campanularia fruticosus - Marktanner-Turneretscher 1890: 205.

Thyroscyphus vitiensis Marktanner-Turneretscher, 1890: 210. - Billard 1907: 343. - Jarvis 1922: 338.

Lytoscyphus fruticosus - Bedot 1905: 51. - Stechow and Müller 1923: 465. - Stechow 1925: 215.

Thyroscyphus fruticosus - Splittstösser 1929: 7, 122. - Billard 1933: 11. - Vervoort 1941: 202. - Vervoort 1946: 306. - Millard 1952: 199. - Ralph 1961: 754. - Vervoort 1965: 35. - Vervoort 1967: 35. - Schmidt 1971: 35. - Millard and Bouillon 1973: 76. - Millard 1975: 323. - Mergner and Wedler 1977: 18. - Gibbons and Ryland 1989: 425. - Watson 1996: 78.

Record and material. NTM C12889, MV F86945, alcohol preserved material; NTM C12990, microslide, Plater Rock, tall colonies on coral boulders and rock, coll: J. E. Watson, depth 5-8 m, 22/9/1999.

Description. Colonies of up to 10 stems to 150 mm high. Hydrorhiza a tangled mass of tough tubes embedded in substrate. Stem and branches stiff, monosiphonic, proximal part of stem athecate; branching irregular, predominantly in one plane, usually almost perpendicular to stem, no division into nodes, tubular in section, each segment widening to a short, proximally swollen apophysis supporting a hydrotheca. Perisarc of stem and branches very thick and smooth.

Hydrothecae strictly alternate on opposite sides of stem and branches, one in axil of branch; hydrotheca inclined upwards on a short thick pedicel, smooth or with one or two constrictions, tubular, asymmetrical, abcauline wall straight, adcauline wall convex, widest at proximal third, both walls narrowing slightly but distinctly behind margin; diaphragm distinct, marked by a circular shelf in perisarc tilted obliquely downwards; margin circular, rim thickened, an internal band of tissue below margin at narrowest point of hydrothecal body, margin sometimes with four almost imperceptible equidistant cusps, sometimes with one or two renovations. Operculum delicate, of four equal triangular valves.

Gonothecae borne on a short, thick pedicel below hydrothecal apophyses on stem and branches, larger than hydrotheca, top-shaped, tilted downwards, perisarc thick, smooth to rather lumpy, distal end obliquely truncated, sealed by a plug of tissue. Gonophore (possibly female) distal in gonothecal cavity.

Colour. Stem and branches of live colonies honey brown, hydrothecae and gonothecae rose pink; colony yellow-brown when preserved.

Measurements (µm).

Stem and branches		
diameter above hydrothecal pedicel	340	- 380
distance between successive hydrothecae on same side	1,480	-2,900
width below apophysis	400	- 540

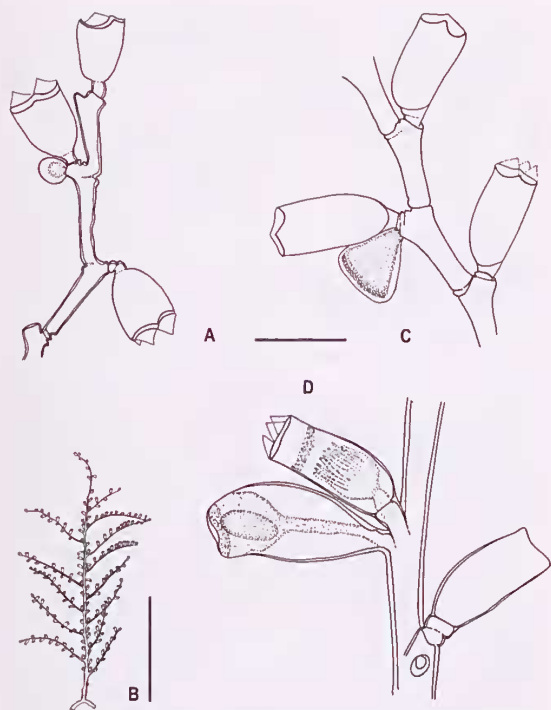


Fig. 29. A, *Thyroscyphus macrocytharus*: part of stem with developing gonotheca. B, C, *Thyroscyphus torresii*: B, fertile colony from Plater Rock. C, branch internodes with hydrothecae and young gonotheca. D, *Thyroscyphus fruticosus*: internodes from fertile colony from Plater Rock. Scale bars: A, C, D, 1,000 μ m; B, 5,000 μ m.

width across distal node of apophysis	240 - 320
Hydrotheca	
length (diagonal) of adcauline wall, diaphragm to margin	1,300 - 1,500
length of abcauline wall, diaphragm to margin	1,140 - 1,200
diameter of margin	488 - 536
length (abcauline side) of pedicel, apophysis to diaphragm	280 - 320
width of pedicel above apophysis	208 - 240
Gonotheca	
length	1,460 - 1,760
maximum width	840 - 940
diameter at margin	640 - 720

Remarks. *Thyroscyphus fruticosus* and *T. torresii* from the Beagle Gulf and Darwin share many characters, particularly in size of colony, habit and choice of habitat. The only reliable means of distinguishing between the species *in situ* is in the slightly more straggling colonies and pink colour of *T. fruticosus* while *T. torresii* is tidier in aspect and is honey brown in colour. Gibbons and Ryland (1989) reported very short (10 - 40 mm high) violet-coloured colonies of *T. fruticosus* from rock and sandy habitats in Fiji. The pink colouration of *T.*

fruticosus is lost in preservation, a reaction also noted by Millard (1975).

Confusing morphological similarities of *T. fruticosus* with *T. torresii* have probably led to some past confusion of the species, for example Gibbons and Ryland (1989, fig. 40) depict asymmetrical hydrothecae, clearly those of *T. fruticosus*, but with marginal cusps more resembling those of *T. torresii*. In sterile material, the only reasonably constant morphological differences are the absence of internodes from stem and branches of *T. fruticosus*, the usually larger hydrothecae and the sometimes almost imperceptible narrowing of the adcauline wall behind the margin.

Distribution. Mediterranean Sea, Indo-West Pacific Timor Sea, New Zealand. Australian distribution, north-western Australia (Watson 1996).

Family Syntheciidae Marktanner-Turneretscher, 1890 Genus *Synthecium* Allman, 1872

Diagnosis. Colony with erect stem bearing hydrocladia in opposite pairs. Stem and hydrocladia bearing hydrothecae in opposite pairs, the pairs always in the same plane forming two longitudinal rows. Gonothecae dioecious, springing from within hydrothecae.

Remarks. Seven species of *Synthecium* are reported from Australia: *Synthecium patulum* (Busk, 1852), *Synthecium orthogonium* (Busk, 1852), *Synthecium elegans* Allman, 1872 (see Jäderholm 1917), *Synthecium campylocarpum* Allman 1888, *Synthecium subventricosum* Bale, 1914 (recognised by Ralph (1958) as a small form of *Synthecium elegans*), *Synthecium megalothecum* Billard, 1924 (see Pennycuik 1959) and *Synthecium dentigerum* Jarvis, 1922 (see Watson 1969).

Even with fertile material it can be difficult to differentiate between species of *Synthecium*. Size differences between hydrothecae in male and female colonies reported in some species, are a further complicating factor. *Synthecium orthogonium* and *Synthecium campylocarpum* have been confused in the past and as no type material of *Synthecium patulum* is known to exist (see Totton 1930) concepts of the species have varied widely. Bale (1888) reported *Synthecium orthogonium* (here considered to be *S. campylocarpum*, see discussion later) from off the coast of New South Wales and Billard (1925) synonymised *S. orthogonium* and *S. campylocarpum* in *S. patulum*. *Synthecium orthogonium* from Indonesia was identified by Vervoort (1941) as *S. patulum* while the description and figure of a gonotheca identified as *S. patulum* by Millard and Bouillon (1973, 1975) is clearly that of *S. campylocarpum*.

The Beagle Gulf and Darwin collection includes two species, the most abundant of which is *Synthecium campylocarpum*; the other, less common, is here referred to *Synthecium orthogonium*. Although *Synthecium patulum* is not represented in the present collection, the

identity of other species rests largely upon establishment of the true identity of *S. patulum*. For comparison, a redescription of *S. patulum* from southern Australia is given, based on extensive material in the author's collection and holdings in the collection of the Museum of Victoria.

***Synthecium campylocarpum* Allman, 1888**
(Figs 30A-G, 31A-C)

Synthecium campylocarpum Allman, 1888: 78.
- Marktanner-Turneretscher 1890: 248. - Inaba 1890: 52-54. - Farquhar 1896: 466. - Stechow 1913: 127.
- Jäderholm 1919: 14. - Totton 1930: 169. - Ralph 1958: 347. - Yamada 1959: 52. - Hirohito 1969: 18. - Watson 1996: 78.

Synthecium orthogonium (Busk, 1852). - Bale 1888: 767. - Bale 1924: 250.

Records and material. NTM C12933, MV F86946, alcohol preserved material; NTM C12979, MV F86097, microslides, colony from Stn 111. NTM C12980, NTM C12981, microslides, colony from Stn 20. NTM C12983, microslide, colony from Stn 13. NTM C12934, NTM C12935 alcohol preserved material, colony from Stn 81. Colonies in poor condition on digitate sponges and *Eunice tubifex*, Plater Rock, large male colony on digitate sponge, coll J. E. Watson, depth 5 m, 22/9/1999. East Arm channel, large male colonies on *Eunice tubifex*, coll J. E. Watson, depth 3 m, 17/8/1998. *Other records.* Stns 21, 110, 26.

Description. Stems to 100 mm high. Hydrorhiza tubular, reptant on host, perisarc of hydrorhiza and stems thick. Stems wide proximally, narrowing distally, proximal internodes usually athecate, internodes thereafter long with one to three pairs of distal hydrothecae; hydrocladia opposite, distal on internode, given off at an angle of 60° - 90° to caulus above cauline hydrothecal pair; nodes transverse, distinct in younger parts of stems, indistinct to completely absent from older parts, sometimes a secondary node between primary nodes. Hydrocladia on a long vasiform apophysis, sometimes a transverse distal node below first hydrothecal pair. Hydrothecae opposite, occupying almost or entire internode, nodes vestigial or absent, hydrothecae often in contact vertically, a little separated in front, in contact behind; hydrotheca tubular, adcauline wall smoothly convex, one fifth to one quarter of wall free of internode, abcauline wall straight or slightly tumescent proximally, becoming concave, curvature increasing distally, perisarc thinning a little towards margin. Margin circular, sinuous, facing slightly forward, parallel to hydrocladial axis or tilted slightly upward, rim outrolled, sometimes up to four renovations from within hydrotheca.

Colonies dioecious, gonothecae borne on lower stem and hydrocladia. Male gonotheca long, irregularly pod-shaped, usually widest about middle, pedicel inserted

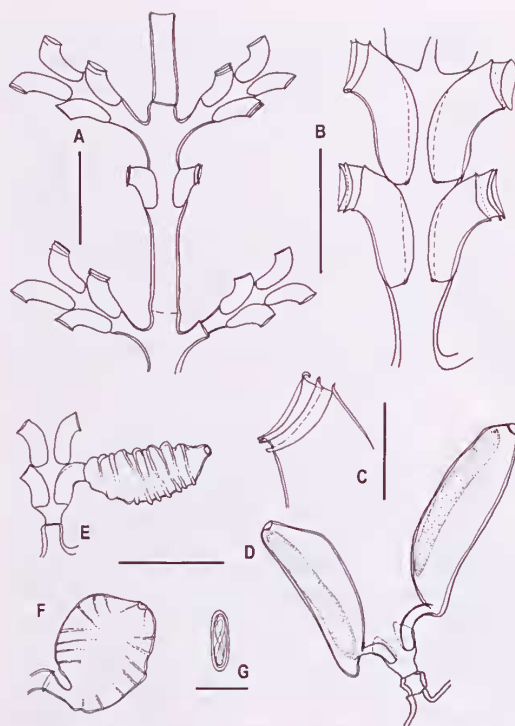


Fig. 30. *Synthecium campylocarpum* from Beagle Gulf and Plater Rock: A, hydrocladial part of stem. B, hydrocladial internode. C, hydrotheca with everted marginal replications. D, male gonotheca. E, lateral view of female gonotheca. F, frontal view of female gonotheca. G, nematocyst (haploneme?) from hydrocaulus. Scale bars: A, B, 500 μ m; C, 200 μ m; D - F, 1,000 μ m; G, 50 μ m.

with a right-angled bend deep into hydrotheca, often splitting hydrotheca; perisarc of gonotheca rather thin, smooth to faintly undulated, orifice small, circular, operculum a thin sheet of tissue, gonophore elongate. Female gonotheca small, lenticular, one side usually flat, other side convex, perisarc thicker than male, six to eight transverse ribs crossing entire body, more deeply incised on flatter side, ribs fading out proximally and distally, orifice small, circular, on a short tubular neck, neck foreshortening as gonotheca matures.

Cnidome of large ?haplonemes with blunt ends, capsule 62.5 x 17.5 μ m, tubule coiled, in tentacles and coenosarc of stems.

Colour. Live colonies yellow; female gonophore orange.

Measurements (μ m).

Hydrorhiza	
diameter	350 - 450
Stem	
length of internode	
(distance between hydrocladia)	1,700 - 2,000
diameter at node	240 - 320
Hydrocladium	
maximum length	8,000

length of apophysis	
to first hydrothecal pair	216 - 280
width across base of hydrothecal pair	296 - 336
Hydrotheca	
length of adnate adcauline wall	448 - 480
length of free adcauline wall	96 - 168
length of abcauline wall	256 - 368
diameter of margin	184 - 208
Gonotheca	
length of mature male	1,820 - 2,200
maximum width of male	560 - 700
length of mature female	1,120 - 1,600
width of female, frontal view	940 - 1,100
width of female, side view	640 - 740

Remarks. Apical tendrils occur on several of the longer stems. On some older stems, hydrocladial apophyses are regenerated up to three times, each regrowth marked by a shoulder-like node. The large range of material examined revealed no difference in height of stems nor in size of hydrothecae between sexes.

Bale (1888) referred to *S. orthogonium* a specimen from Port Jackson, on the eastern Australian coast, later finding nothing (Bale 1914, 1924) to distinguish it from *S. campylocarpum*. His opinion was followed by many later authors (c.g. Thornely 1904, Nutting 1905, Jäderholm 1903, Jäderholm 1916, Stechow and Müller 1923), none of whom described or figured their specimens. Ritchie (1911) assigned specimens from the eastern Australian coast to *S. orthogonium* noting that their dimensions did not agree very well with Billard's (1910) measurements of the holotype of that species. His description of the hydrotheca with sinuate margin is undoubtedly of *S. campylocarpum*.

I have compared a microslide preparation of a syntype of *Synthecium campylocarpum* from the *Challenger* collection, taken off the eastern Australian coast (Museum of Victoria collection registered number MV F58214), with a microslide specimen identified by Bale (1888) as *S. orthogonium* (specimen also held in the Museum of Victoria). The *Challenger* material is an almost complete fertile stem with young male gonothecae (Fig. 31D-F) and is almost identical with Bale's specimen, thus supporting Ralph's (1958) view that Bale's specimen is not *S. orthogonium* but *S. campylocarpum*.

When examined in isolation infertile material of *S. orthogonium* may be confused with *S. campylocarpum*, especially in colonies of *S. campylocarpum* in which the hydrothecae are more outwardly bent than usual. They are best distinguished by the larger and more robust stems and distinctly sinuate margin of *S. campylocarpum* compared with the smaller, more delicate stems and sharply bent hydrotheca without marginal sinuosity of *S. orthogonium*.

Distribution. Known from eastern subtropical to tropical northern Australia (Watson 1996) New Zealand, (Ralph 1958) Japan (Hirohito 1969).

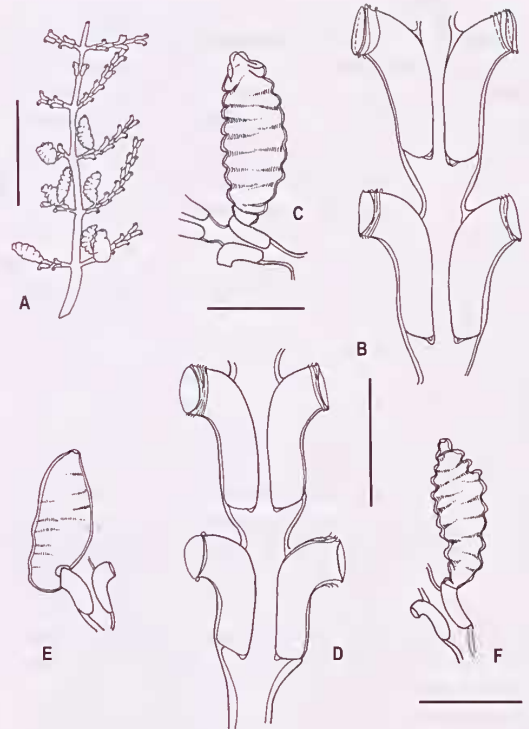


Fig. 31. *Synthecium campylocarpum*, syntype, from Port Jackson, *Challenger* Expedition. MV F58214: **A**, part of fertile stem. **B**, hydrocladial internode, hydrothecae with replicated margin with outrolled rim. **C**, male gonotheca. **D**, hydrocladial internode from a microslide specimen from Port Jackson, identified by Bale (1888), as *Synthecium orthogonium* held in Museum of Victoria. **E**, male gonotheca from same specimen. **F**, female gonotheca from same specimen. Scale bars: **A**, 5,000 μ m; **B**, **D**, 500 μ m; **C**, **E**, **F**, 1,000 μ m.

Synthecium orthogonium (Busk, 1852)
(Fig. 32A-F, Table 4)

Sertularia orthogonia Busk, 1852: 390. - Bale 1884: 88. - Billard 1910: 25.

Not *Synthecium orthogonium* - Bale 1888: 767. - Bale 1924: 250.

?*Synthecium orthogonium* - Jäderholm 1903: 289. - Jäderholm 1916: 6. - Thornely 1904: 119. - Nutting 1905: 950. - Stechow and Müller 1923: 465. - Pennycuik 1959: 190. - Watson 1996: 78.

Synthecium patulum (Busk, 1852) - Billard 1925: 125. - Vervoort 1941: 199.

Records and material. NTM C12936, alcohol preserved material, colony from Stn 136. NTM C12984, NTM C12985, MV F86890, microslides, infertile sparse colony on *Gynmangium longicorne* from Stn 87. NTM C12986, microslide, small fertile colony on aglaopheniid hydroid, Plater Rock, coll: J. E. Watson, depth 4 m, 21/9/1999.

Description. Hydrorhiza tubular, reptant; stems short, to 35 mm high, lax, tubular, with two or three pairs of opposite hydrocladia, proximal stem region athecate, variable in length; diameter of stem diminishing and thickness of perisarc reducing distally; stem internodes long, nodes when present, a transverse constriction in perisarc; one or two pairs of hydrothecae about halfway to two thirds up internode; hydrocladia long and flexuous, opposite or single, given off at a slight upward angle from a strong shoulder-like apophysis.

Hydrocladial nodes marked by a pronounced narrowing of perisarc or a transverse line, hydrothecae paired, distal on internode, proximal pair displaced slightly relative to one another; hydrothecae long, tubular, pairs may or may not be conjoined, adnate adcauline wall almost straight to faintly convex, free part bending sharply outwards and slightly forward perpendicular to hydrocladial axis for one third to half adcauline length, sometimes an internal thickening of perisarc at junction of adnate and free wall; abcauline wall slightly tumescent above base, almost straight to distal bend, then either straight or concave to margin, often an internal thickening of wall in bend. Margin parallel or almost parallel to hydrocladial axis, circular, rim strongly everted, some with up to seven marginal replications; perisarc of hydrotheca smooth.

Gonotheca on a short pedicel issuing from a hydrotheca in lower stem region, gonotheca sausage-shaped, tapering distally, body with two rows of 10 deep corrugations along one side, corrugations smoothing out behind; distal end obtuse, no orifice evident.

Colour. Live colony mauve, white or colourless when preserved.

Comparison of Beagle Gulf specimens with holotype. I have compared specimens from the Beagle Gulf and Darwin Harbour with the holotype of *Synthecium orthogonium* (Busk, 1852) from the type locality of Torres Strait, loaned by the Natural History Museum, London (Fig. 32 E, F). The NHM microslide preparation labelled "*Sertularia orthogonia* Australia, Rattles, Holotype, Busk 1852, Busk Coll: 99. 7. 1. 6367" consists of two stem fragments, one 7 mm long and the other 5 mm long, in good condition but without hydrorhiza. There are several pairs of opposite hydrocladia, one pair per internode, given off from just below a node. The hydrocladia bear up to seven pairs of opposite hydrothecae, one pair per internode; adcauline walls of some pairs joined but others separated. Hydrothecae tubular, distal on internode and sharply bent outwards below node where adcauline wall becomes free. Margin circular and parallel to hydrocladial axis; margins of several hydrothecae are sufficiently well preserved to show replication of the rim. Internal thickening of the abcauline wall is minimal, probably due to shrinkage over time. The Beagle Gulf and Darwin specimens almost exactly conform with the type, the only difference being

the somewhat shorter stem internodes, a variable character of little diagnostic value in the genus. Dimensions of the Beagle Gulf and Darwin specimens are compared in Table 4 with those of the holotype of *S. orthogonium*.

Busk (1852) considered that the strong outward bend of the hydrotheca of *Synthecium orthogonium* clearly characterised the species but later speculated that *S. orthogonium* may be a variety of *Synthecium patulum* (Busk, 1852) from southern Australia. Bale (1884) reported and figured *S. patulum* from Port Phillip Bay in southern Australia but did not comment upon any supposed relationship with *S. orthogonium*, continuing to regard *S. patulum* a distinct species (Bale 1914a). Billard (1925) described and accurately figured *S. orthogonium* and its gonangium from Indonesia but, like many other authors, assigned it to *S. patulum*. Comparison of dimensions tabulated above and dimensions (Figs 32, 33) show that the free adcauline wall of *S. orthogonium* is much longer and the hydrothecal margin much narrower than that of *S. patulum*. Fresh material of *S. orthogonium* is readily distinguishable from *S. patulum*, colonies of *S. orthogonium* being much smaller and more delicate than *S. patulum*. Although closely related, they are here regarded as distinct species.

Distribution. On present knowledge, *Synthecium orthogonium* is a tropical species the only reliable records of which are from Torres Strait (Busk 1852) and Indonesia (Billard, 1910).

Table 4. Comparison of measurements (μm) of Beagle Gulf and NHM Busk specimens of *Synthecium orthogonium*.

	Beagle Gulf, Darwin	NHM Busk specimen
Hydrorhiza diameter	112 - 200	-
Stem		
length of internode (distance between hydrocladia)	800 - 2,800	1,880 - 1,960
diameter at node	140 - 160	152 - 176
diameter lower stem	260	200
diameter thecate part of stem	216 - 264	184 - 224
Hydrocladium		
maximum length	4,000	-
length apophysis to first hydrothecal pair	108 - 272	-
width across base of first hydrothecal pair	256 - 320	-
Hydrotheca		
length of adnate adcauline wall	440 - 480	408 - 464
length of free adcauline wall	208 - 320	192 - 240
length of abcauline wall (diagonal)	360 - 440	328 - 376
length of abcauline wall base to bend	320 - 326	-
length of abcauline wall bend to margin	136 - 160	-
diameter of margin	136 - 160	120 - 152
length of outrolled rim	8 - 16	-
Gonotheca		
length	1,300 - 1,400	-
maximum width	360 - 376	-

Syntheceium patulum (Busk, 1852)

(Fig. 33A-G, Table 5)

Sertularia patula Busk, 1852, 390. - Bale 1884: 88.*Syntheceium patulum* - Bale 1888: 766. - Hodgson 1950:18. - Watson 1975: 165. - Watson 1994: 66.? *Syntheceium patulum* - Jarvis 1922: 332, 345. - Trebilcock 1928: 9. - Pennycuik 1959: 190.Not *Syntheceium patulum* - Billard 1925: 125. - Vervoort 1941:199. - Millard and Bouillon 1973: 64. - Millard 1975: 12. - Vervoort 1987: 94.

Description. Stems up to 50 mm high, occasionally with secondary branching; hydrorhiza tubular, reptant, perisarc of stems and hydrocladia fairly thick. Proximal ahydrocladial stem segment variable in length, some stems with hydrocladia extending almost to base; stem internodes long with one or two pairs of opposite hydrothecae near middle of internode, node a constriction in perisarc. Hydrocladia up to 12 mm long, opposite, given off at an angle of 45° - 50° to stem from distal end of internode. Hydrocladial hydrothecae paired, distal on internode, not conjoined; internode somewhat constricted proximally, expanding to base of hydrothecae; hydrothecae of first one or two pairs on internode a little displaced relative to one another.

Hydrotheca tubular, expanding a little distally, perisarc smooth, adcauline wall almost straight proximally, gently convex distally, free part about one quarter total length of wall, base rounded with a small plug of perisarc; abcauline wall proximally tumescent, becoming concave to margin. Margin tilted upwards at an angle of 45° - 60° to hydrocladial axis, strongly sinuate, rim moderately everted, sometimes replicated several times. Hydranth small with about 10 tentacles.

Two kinds of nematocysts present:

- small ?mastigophores in tentacles, 9 µm long, discharged with difficulty.

- large isorhizas 45 - 50 x 12 - 13 µm, tubule up to 500 µm long and 1 µm diameter, armed throughout with spirals of short bristles; in hydranth and scattered throughout coenosarc; easily discharged.

Colonies dioecious, gonotheca arising on a long pedicel from deep within hydrotheca on stem and proximal parts of hydrocladia; male gonotheca long, straight to curved, elliptical, and flattened in frontal aspect; narrow in side view with up to eight deep, irregular corrugations fading proximally, corrugations shallower in frontal view, perisarc very thick; orifice circular, small, on a very short neck sealed by a plug of tissue. Female gonothecae on different stems from male, lenticular, shorter than male, with five or six irregular corrugations, orifice small, circular, on a short neck, sealed by a plug of tissue; gonophore one large or two small ova covered by a thick gelatinous pellicle, almost filling gonothecal cavity.

Colour. Living colonies reddish-purple.

Remarks. The above description is a composite from colonies collected by the author from several localities in Bass Strait, Victoria, Australia.

Apical stolonisation from stems and distally from the hydrocladia commonly occur in some colonies, the stolons often giving rise to new stems. While there is some variation in diameter of the hydrothecal rim and in length of the adcauline wall throughout the range of colonies examined, the free wall is always one quarter to one fifth of total wall length. There is no difference in size of hydrothecae between male and female stems. Large nematocysts are very abundant in most colonies.

Table 5. Measurements (µm) of specimens of *Syntheceium patulum* from Bass Strait, southern Australia.

	Eastern Bass Strait	Western Port	Port Phillip Bay	Range of dimensions
Hydrorhiza, diameter			300	300
Stem				
maximum diameter	280 - 340	240 - 300	260 - 300	240 - 340
length of internode	2,060 - 2,160	1,640 - 1,800	1,780 - 1,900	1,640 - 2,160
diameter at node	260	240 - 260	240 - 280	240 - 280
Hydrocladium				
internode length	608 - 672	552 - 560	600 - 672	552 - 672
diameter at node	152 - 168	144 - 152	152 - 168	144 - 168
Hydrotheca				
length of adnate adcauline wall	480 - 496	408 - 440	440 - 480	408 - 496
length of free adcauline wall	160	112 - 120	96 - 120	96 - 160
diagonal length abcauline wall	416 - 440	352 - 68	384 - 400	352 - 440
diameter at margin	192 - 216	144	128 - 184	128 - 216
Gonotheca				
width of male (lateral view)			360 - 460	360 - 460
width of male (frontal view)			560 - 600	560 - 600
length of female	960 - 1,100		1,100 - 1,300	960 - 1,300
width of female (lateral view)	480		360 - 400	360 - 480
width of female (frontal view)	520 - 620		460 - 560	460 - 620

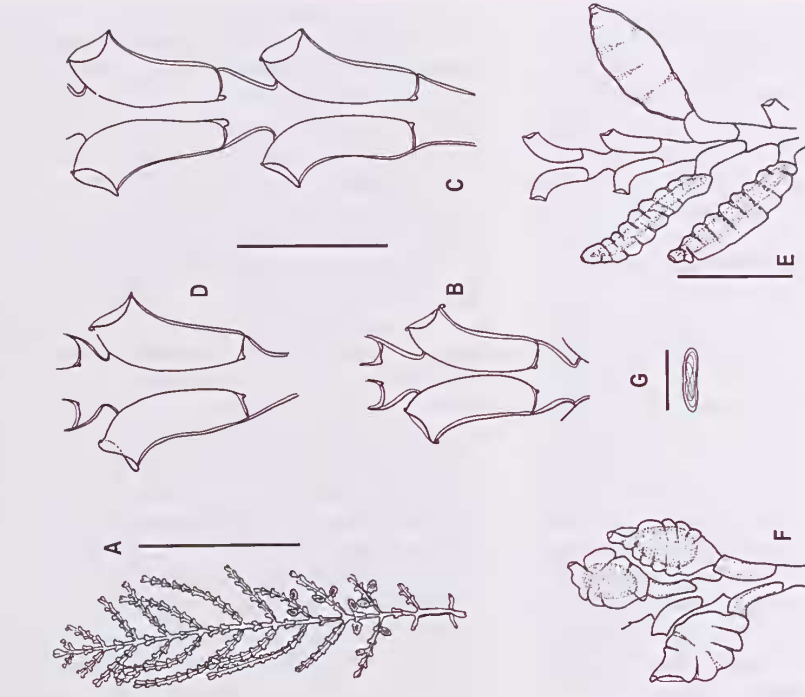


Fig. 32. *Syntheceum orthogonum*: A, stem from colony from Plater Rock. B, hydrocladial intermode from same colony. C, hydrotheca with replicated and everted margin from same colony. D, gonotheca from same colony. E, stem fragment from Busk's holotype of *Syntheceum orthogonum*. F, hydrocladial intermodes of Busk's holotype. Scale bars: A, 10 mm, B-F, 500 µm; C, 200 µm; D, E, 1,000 µm.

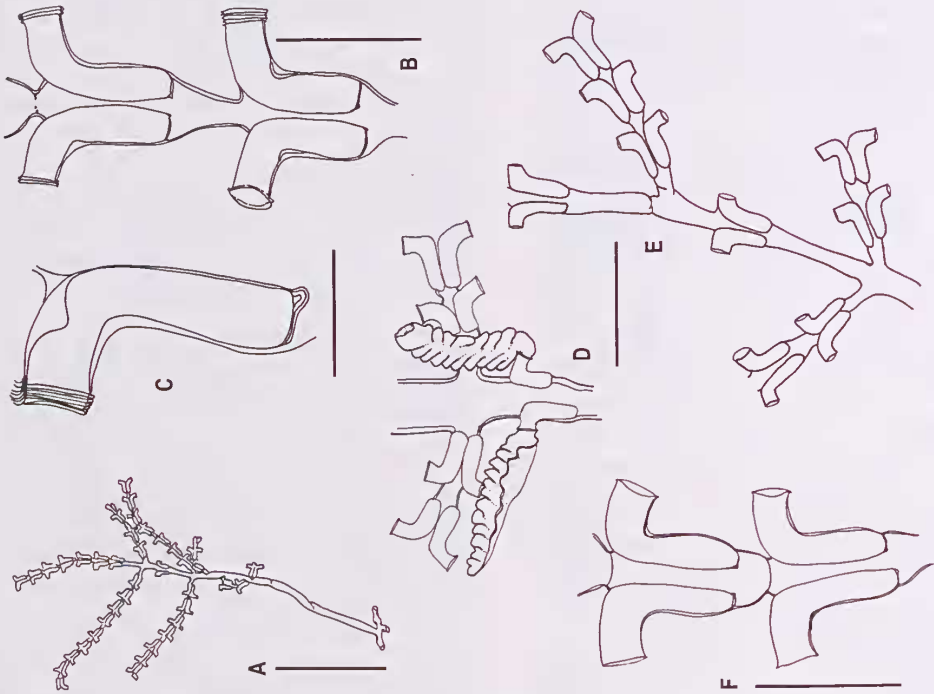


Fig. 33. *Syntheceum patulum*: A, fertile colony from Gabo Island, eastern Victoria. B, hydrocladial from same colony. C, hydrocladial from colony from Port Phillip Bay, Victoria. D, hydrocladial from colony from Backstairs Passage, South Australia. E, male gonotheca on colony from Western Port, Victoria. F, female gonotheca from colony from Port Phillip Bay. G, undischarged isorhiza from coenosarc of stem, colony from Western Port, Victoria. Scale bars: A, 10 mm; B-D, 500 µm; E, F, 1,000 µm; G, 50 µm.

Synthecium patulum is a common hydroid of south-eastern ocean, coastal and deep water embayments. The distinctively purple-coloured colonies grow in tufts on rock, bryozoans, sponge and dead shell in good current flow. The species is fertile over the summer months.

Family Halopteridae Millard, 1962

Genus *Antennella* Allman, 1877

***Antennella secundaria* (Gmelin, 1791)**

(Fig 34A-D)

Sertularia secundaria Gmelin, 1791: 3856.

Aglaophenia secundaria - Lamouroux 1824: 19.

Antennella secundaria - Pennycuik 1959: 176.

- Watson 1973: 183. - Millard 1975: 332. - Ryland and Gibbons 1991: 525. - Ramil and Vervoort 1992: 143. - Medel and Vervoort 1995: 35. - Schuchert 1997: 14. - Calder 1997: 29 (full synonymy). - Watson 1996: 78. - Watson 1997: 522.

Antenella secundaria - Stechow and Müller 1923: 473.

Records and material. NTM C12993, microslide, colony from Stn 95. NTM C13046, alcohol preserved material; NTM C12991, microslide, colony from Stn 136. NTM C 13047, alcohol preserved material, colony from Stn 84. NTM C12992, microslide, colony from Stn 111. Sparse, fertile colonies on alcyonarians, bryozoans and shellgrit. *Other records.* Sns 7, 37, 110, 82, 84, 95, 127.

Description. Hydrocladia up to 8 mm high, arising from a tubular hydrorhiza reptant on substrate; single nematothecae arising at intervals from hydrorhiza. Proximal part of hydrocladium with one to three athecate internodes, nodes transverse, each internode bearing one or two nematothecae, distalmost node strongly oblique. Hydrocladial internodes thereafter of similar length, alternately thecate and athecate, proximal node of thecate internode strongly oblique, passing beneath hydrotheca, distal node transverse below hydrothecal margin. Hydrotheca occupying almost entire internode, facing forward at an angle of c. 60° to hydrocladial axis, deep cup-shaped, walls almost parallel but abcauline wall sometimes faintly sinuate, free adcauline wall straight to slightly concave, adnate part convex, curving back to small hydropore at base of abcauline wall, perisarc thickened around base; margin circular, slightly sinuous.

Nematothecae bithalamic, small, two on athecate internode, basal chamber stout, cup small, foreshortened on adcauline side; mesial inferior stout, adcauline side of cup foreshortened, just reaching base of hydrotheca, lateral nematotheca borne on a long, slender pedicel where adcauline wall of hydrotheca becomes free, cup broad and shallow, excavated on adcauline side, not quite reaching hydrothecal margin; a small mesial superior nematotheca inserted beneath hydrotheca.

Gonothecae of both sexes borne on same hydrocladium, females in proximal region, males further along hydrocladium; female slipper-shaped, somewhat

flattened, facing forward, borne on a short, thick pedicel beside mesial inferior nematotheca; two large nematothecae at base of gonotheca; basal chamber of these long, cup wide, shallow, excavated on side facing gonotheca. Orifice of gonotheca distal, subcircular, closed by a thin operculum, gonotheca containing a single planula larva almost filling gonotheca at maturity. Male gonotheca considerably smaller than female, borne behind hydrotheca in same position as female, ovoid to kidney-shaped, flattened, apically blunt to rounded; no obvious orifice; a single small nematotheca at base, cup deeper and narrower than those on female; excavated on adcauline side. Spermatogenic mass almost filling gonothecal cavity.

Colour. Colourless, preserved material.

Measurements (µm).

Internode

length of athecate
(along base of hydrocladium) 328 - 400

length of thecate
(along base of hydrocladium) 168 - 272

diameter of transverse node 56 - 80

Hydrotheca

length of abcauline wall,
margin to hydropore 176 - 224

diameter of margin 208 - 240

Nematothecae

mesial nematotheca, overall length 70 - 80

diameter of cup 24 - 32

lateral, overall length 74 - 92

diameter of cup 42 - 44

Gonotheca

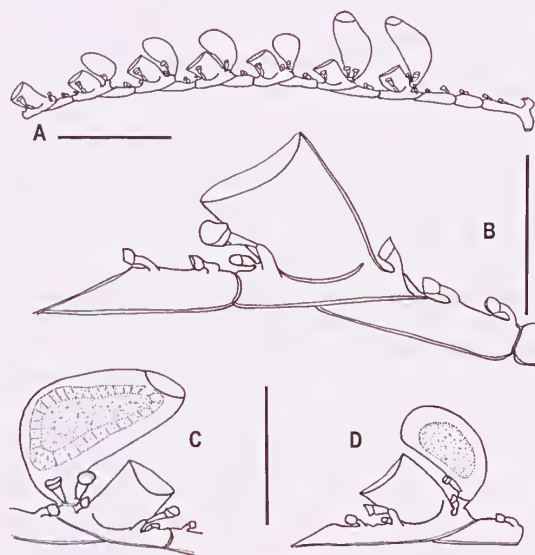


Fig. 34. *Antennella secundaria*: A, fertile hydrocladium. B, thecate and athecate internodes. C, female gonotheca. D, male gonotheca. Scale bars: A, 1,000 µm; B, 300 µm; C, D, 500 µm.

female, length of adcauline wall	544 - 632
maximum width	320 - 368
male, length of adcauline wall	280 - 344
maximum width	200 - 244

Remarks. The present material conforms with descriptions and dimensions of *Antennella secundaria* given by many authors (see Schuchert (1997)).

Distribution. Cosmopolitan in temperate and tropical seas.

Genus *Halopteris* Allman, 1877
Halopteris polymorpha (Billard, 1913)
 (Fig. 35A-H)

Plumularia polymorpha Billard, 1913: 24.

Antennella polymorpha - Vervoort 1941: 218.

Plumularia buski Billard, 1913: 21. - Nutting 1927: 22. - Redier 1966: 90.

Halopteris buskii Rees and Thursfield, 1965: 160. - Vervoort and Vasseur 1977: 72. - Gibbons and Ryland 1991: 527. - Rees and Vervoort 1987: 119.

Halopteris polymorpha - Pennycuik 1959: 178. - Vervoort 1966: 132. - Millard and Bouillon 1973: 83. - Millard 1975: 354. - Millard 1978: 193. - Hirohito 1983, 62. - Ryland and Gibbons 1991: 530. - Schuchert 1997: 64.

Records and material. NTM C12937, alcohol preserved material; NTM C12995, microslide, colony from Stn 138. NTM C12998, microslide, colony from Stn 121. NTM C12994, microslide, colony from Stn 129. NTM C12996, microslide, colony from Stn 146. Colonies on shell grit. NTM C12938, alcohol preserved material; NTM C12997, MV F86902, microslides, colony on sponge from East Point reef, coll: J. E. Watson, depth 7 m, 17/81998.

Description. Hydrorhiza short, tubular, ramified, of same diameter as stem. Stems to 20 mm high, monosiphonic, lower segments ahydrocladial, perisarc thick with irregularly spaced transverse nodes, distal lower stem with scattered nematothecae; first hydrothecate internode short with a strong proximal and V-shaped distal node, a hydrotheca just above node; cauline nodes thereafter oblique but less distinct, each with a hydrocladium and basal hydrotheca in lower third. Hydrocladial apophysis inserted alongside cauline hydrotheca, long, with transverse distal node, first hydrocladial internode athecate, short, with one proximal mesial nematotheca, distal node strongly oblique, internodes thereafter alternately hydrothecate and athecate, thecate internodes longer than athecate, two partial intranodal septa superior to hydrotheca. Hydrothecae variable in shape on different stems, from deep to shallow cup-shaped, seated in proximal to mid-region of internode at an angle of c. 45° to hydrocladial axis, free adcauline wall varying (on different stems) from almost straight to distinctly concave, base convex,

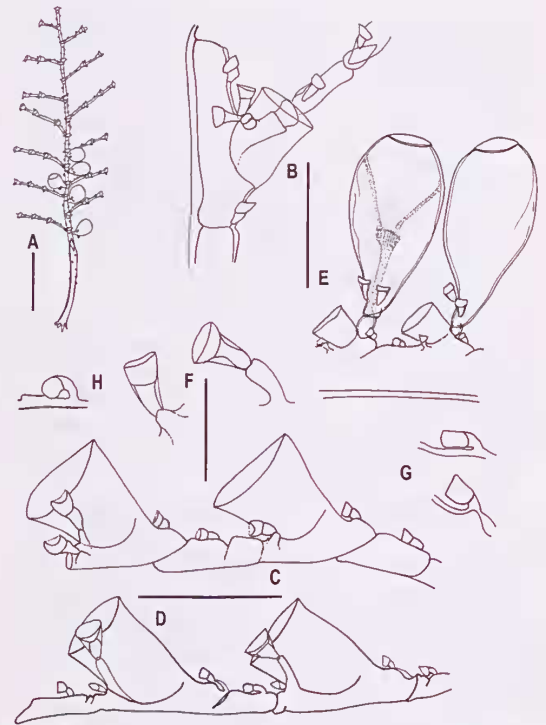


Fig. 35. *Halopteris polymorpha*: A, colony from Darwin Harbour. B, stem internode with hydrocladium. C, hydrocladial internode with cup-shaped hydrothecae. D, hydrocladial internode with cylindrical hydrothecae. E, female gonothecae. F, lateral nematothecae with short and long pedicels. G, mesial nematothecae. H, superior mesial nematotheca from below hydrotheca. Scale bars: A, 2,000 µm; B, E, 500 µm; F, G, H, 100 µm; C, D, 300 µm.

abcauline wall straight to slightly sinuous, expanding just behind margin. Margin circular, perpendicular to hydrothecal axis, perisarc rather thin.

Nematothecae all bithalamic; athecate internode with one mesial nematotheca on centre of internode with short, robust base, cup almost rectangular, adcauline side excavated, closely adpressed to hydrocladium; hydrothecate internode with one inferior mesial nematotheca similar to intersegmental nematotheca, not reaching base of hydrotheca; lateral nematothecae bithalamic, seated on pedicels of varying length, basal chamber moderately long, cup reaching to or just above hydrothecal margin, wide and shallow; adcauline side shallowly to deeply excavated; a small, superior mesial nematotheca inserted at base of hydrotheca. Cauline nematothecae same as mesial superior.

Female gonotheca large, balloon-shaped, widest distally, borne on a pedicel of one or two globular internodes beside cauline hydrotheca; two nematothecae similar to laterals side by side above pedicel; orifice terminal, elliptical to circular, closed by a slightly domed operculum.

Colour. Live colonies white.

Measurements (μm).

Stem		
diameter of athecate stem		120
length of first stem internode		424
length of succeeding internodes	360 -	400
diameter of nodes	56 -	64
Apophysis		
diameter at node	40 -	56
Hydrocladium		
length thecate internode	288 -	352
length of first intersegment	136 -	176
length of succeeding intersegments	88 -	120
diameter of transverse node	32 -	40
Hydrotheca (tubular form)		
length free adcauline wall	96 -	112
length abcauline wall	192 -	200
diameter of margin	160 -	168
Hydrotheca (cup-shaped form)		
length free adcauline wall	96 -	112
length abcauline wall	192 -	200
diameter of margin	160 -	168
Nematotheca		
length of pedicel of lateral	48 -	52
overall length of lateral	52 -	72
diameter of cup	44 -	52
Gonotheca		
length including pedicel	800 -	880
maximum width	376 -	440
diameter of operculum	192 -	224

Remarks. Both stems and hydrocladia show evidence of regeneration after breakage.

Colonies show two distinct hydrothecal morphologies (Fig. 35C, D) but all fall within the range of variation of *Halopteris polymorpha* defined by Schuchert (1997). The form with wider, cup-shaped hydrothecae resembles specimens from the Seychelles while those with more tubular hydrothecae are similar to those from Billard's (1913) Siboga Station 80 (see Schuchert 1997).

Relationship between Halopteris buski, H. polymorpha and H. glutinosa (Lamouroux, 1816). In a detailed study of the Halopterididae, Schuchert (1997) found that several species, including *Halopteris polymorpha*, have been confused with *Halopteris buski* (Bale, 1884). *Halopteris buski* from southern Australia can be confidently distinguished from *Halopteris polymorpha* only in fertile material, the female gonotheca of the former bearing up to 12 nematothecae in two rows compared with only two nematothecae at the base of the female of *H. polymorpha*. It is also clear from Kirchenpauer's figure of the female gonotheca of *Halopteris obconica* (Kirchenpauer, 1876) from southern Australia that *H. buski* is a synonym of that species.

Schuchert (1997) examined the remaining fragment of the type of *Halopteris glutinosa* (Lamouroux, 1816) from "mers des Indes et l'Australie" and suggested the possible conspecificity of *H. buski* with *H. glutinosa*. Although the condition of the type specimen was too

poor for accurate description, Schuchert's figure is typical of specimens from southern Australia referred by Bale (1884) to *H. buski*. Both Lamouroux (1816) and Bale (1884) commented on the distinctive scarlet colour of the species. Since only one species of hydroid from southern Australia has such distinctive colouration (J. E. W., pers. obsv.) it is certain that *H. obconica* and *H. buski* are conspecific with *H. glutinosa*.

Distribution. Indo-Pacific, Indian Ocean (Millard and Bouillon 1973) (Billard 1913), (Vervoort 1966), French Polynesia (Vervoort and Vasseur 1976). Tropical eastern Australia (Pennycuik 1959).

***Halopteris plagiocampa* (Pictet, 1893)**

(Fig. 36A-C)

Plumularia plagiocampa Pictet, 1893: 56. - Billard 1913: 31. - Jäderholm 1919: 21.

Halopteris plagiocampa - Schuchert 1997: 117.

Record and material. NTM C12998, microslide, infertile stem fragment in poor condition broken off from hydrorhiza, on *Idiellana pristin* from Stn 121.

Description. Stem 7 mm high, monosiphonic, perisarc very thin, smooth, internodes long with distinct transverse nodes, a row of four equidistant nematothecae on front of internode; opposite pairs of hydrocladia given off distally on internode. Hydrocladial apophysis short, with two transverse distal nodes; hydrocladia opposite, directed upwards at 35° - 60° to stem axis. Hydrocladial internodes variable in length, usually long and slender, proximal internode athecate with one small mesial nematotheca close to transverse proximal node, internodes thereafter with strongly oblique proximal node and transverse distal node. Hydrothecate internode shorter than proximal internode, hydrotheca seated on distal half. Hydrotheca deep, almost tubular, set an angle of 40° to hydrocladial axis, floor shallowly convex, free adcauline wall short, decidedly concave, abcauline wall straight, margin circular, rim not everted.

Nematothecae all bithalamic, mesial proximal on athecate internode, small, basal chamber stout, cup shallow, broad, mesial inferior similar, basal chamber more robust, nematotheca not reaching base of hydrotheca; lateral nematotheca inserted without pedicel below adnate adcauline wall, not reaching hydrothecal margin, basal chamber long, cup shallow and broad, a little excavated on adcauline side; cauline nematothecae similar to mesials; no lateral nematothecae associated with cauline hydrotheca.

Colour. Transparent to colourless (preserved material).

Measurements (μm).

Stem		
length of internode		800 -1,060
width at node		72 - 80
length of apophysis (abcauline side)	60 -	72
width of distal apophysal node	36 -	40

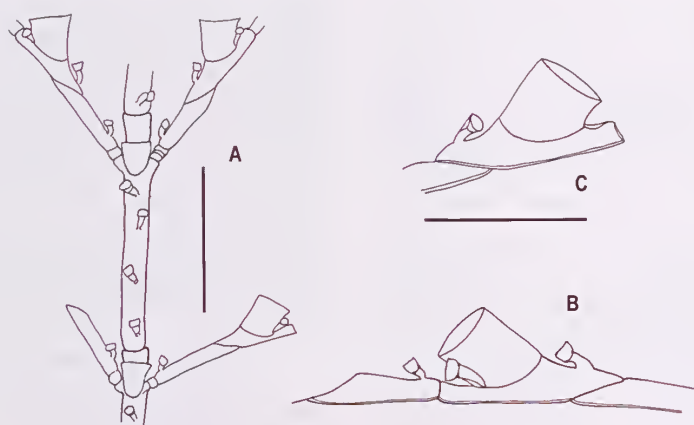


Fig. 36. *Halopteris plagiocampa*: A, part of stem. B, thecate hydrocladial internode. C, thecate hydrocladial internode with lateral nematothecae removed to show concave adcauline wall. Scale bars: A, 500 μm ; B, C, 300 μm .

Hydrocladium	
length of athecate intersegment	208 - 312
length of thecate internode	184 - 272
diameter at transverse node	36 - 40
Hydrotheca	
length of abcauline wall	140 - 148
length of free adcauline wall	60 - 64
diameter at margin	124 - 140
Nematotheca	
length of pedicel	
of intersegment mesial	24 - 28
diameter of cup	24 - 36
length of pedicel of lateral	40 - 46
diameter of cup	38 - 42
length of mesial inferior pedicel	32 - 38
diameter of cup	30 - 32

Remarks. Schuchert (1997) distinguished *Halopteris plagiocampa* from its close congener *Halopteris zygocladia* (Bale 1914) on the shorter basal chamber and more inrolled cup of the lateral nematotheca of *H. zygocladia*. As the few reasonably well preserved nematothecae of the present material do not appear to have inrolled cups the specimen is here referred to *Halopteris plagiocampa*.

Distribution. Indonesia, Japan (Billard 1913, Jäderholm 1919). A new record for Australia.

Family Plumulariidae Hincks, 1868

Genus *Monotheca* Nutting, 1900

***Monotheca flexuosa* (Bale, 1894)**

(Fig. 37A, B)

Plumularia flexuosa Bale, 1894: 115. - Mulder and Trebileoek 1916: 79. - Stechow 1925: 246. - Blackburn, 1938: 315. - Shepherd and Watson 1973: 140. - Watson 1973: 188.

Monotheca flexuosa - Stechow 1921: 260. - Stechow 1925: 246.

Record and material. NTM C12999, microslide, small infertile colony on shell grit, from Stn 87.

Description. Stems to 5 mm high, flexuous, monosiphonic, unbranched, arising from a creeping tubular hydrorhiza; perisarc of proximal stem fairly thick, nodes distinct, without nematothecae; internodes of hydrocladial stem region slender, expanding a little distally, nodes transverse, deeply incised, a nematotheca halfway along internode, one or two in axil of apophysis and one just below axil. Hydrocladia alternate, fairly short, proximal internode athecate, node narrow, slightly oblique, followed by hydrothecate internode; hydrotheca sunk into and projecting beyond end of hydrocladium, deeply campanulate, expanding to margin, abcauline wall weakly concave, adcauline wall almost straight, base rounded, margin circular, flaring but not everted.

Nematothecae all two-chambered, basal chamber of mesial inferior short, cup reaching base of hydrotheca, adcauline side foreshortened; twin laterals inserted in blunt apex of hydrocladium below hydrotheca, basal chamber long, cup circular, fairly wide and shallow; cauline and axillary nematothecae same as mesial.

Colour. Colourless.

Measurements (μm).

Stem	
length of internode	200 - 304
diameter of node	20 - 24
length of apophysis	20 - 32
Hydrocladium	
length of athecate internode	68 - 80
length of hydrothecate internode	120 - 152
diameter of node	20 - 24
Hydrotheca	
length of abcauline wall	92 - 100
diameter of margin	100 - 120

Remarks. One to three axillary nematothecae are present in the specimens, thus differing from *Monotheca*

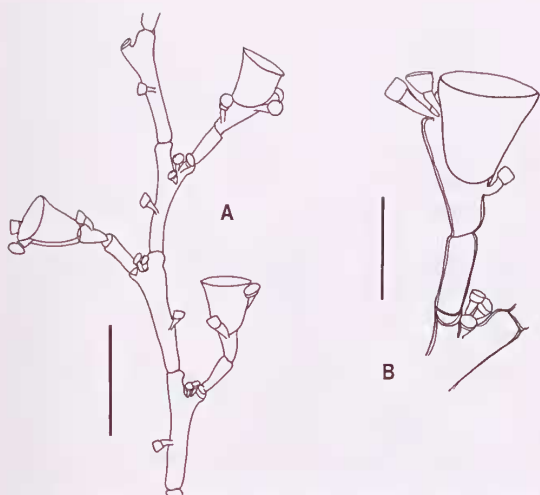


Fig. 37. *Monothecha flexuosa*: A, distal part of stem. B, hydrocladium. Scale bars: A, 1,000 μ m; B, 100 μ m.

flexuosa from southern Australia which usually has only one or two (J. E. W., pers. obsv.). While the significance of the third axillar nematotheca is not known in this tropical material, variation of the number of nematothecae is not regarded as a reliable diagnostic character.

In the absence of gonothecae, *Monothecha pulchella* (Bale, 1882) is virtually indistinguishable from *M. flexuosa*. The gonotheca of *M. pulchella* is large with a laterally directed terminal orifice and large internal submarginal teeth while that of *M. flexuosa* is more elongate with an axially directed terminal orifice and sometimes a raised collar. This difference may possibly be sexual as all gonophores of *M. flexuosa* so far found in southern Australia are female (J. E. W., pers. obsv.); the gonophore of *M. pulchella* is still unknown.

Distribution. Southern Australia and South Africa. Not previously recorded from tropical Australia.

Genus *Nemertesia* Lamouroux, 1812

Nemertesia cylindrica (Kirchenpauer, 1876)

(Fig. 38A-E)

Plumularia cylindrica Kirchenpauer, 1876: 45.

Antemularia cylindrica - Bale 1884: 146.

?*Nemertesia cylindrica* - Nutting 1927: 227.
- Pennycuik 1959: 178.

Records and material. NTM C12961, alcohol preserved material; NTM C13000, NTM C13002, MV F86906, microslides, colony from Stn 146. NTM C13001, microslide, colony from Stn 121. NTM C12962, alcohol preserved material; NTM C13013, microslide, colony from Stn 136. MV F86948, alcohol preserved material, colony from Stn 147. Fertile and infertile small to medium size colonies attached to rock. *Other records*, Stns 91, 137, 139. East Arm breakwater and channel bed,

many large colonies, coll: J. E. Watson depth 6 m, 20/8/98. Plater Rock channel bed, many large colonies on rock, coll: J. E. Watson, depth 15 m, 22/9/1999.

Description. Colonies to 200 mm high, up to 30 stems arising from a large fibrous, hydrorhizal mat up to 50 mm wide; stolons also enmeshing basal region of stems in a spongy sheath. Stems erect, long, monosiphonic, single or forked at an acute angle more or less in the same plane, internodes thick, short, nodes transverse, deeply incised in proximal and distal stem regions, often indistinct in mid-stem region.

Hydrocladia crowded, arising at an acute angle in verticels of up to eight around each internode, reducing to four or five in distal stem region. Apophyses with a short, slightly oblique, often indistinct node, a truncated tubular mamelon on adcauline side. Hydrocladial internodes long, straight, nodes distinct, slightly oblique, sometimes replicated. Hydrotheca occupying more than half of internode, tubiform, adcauline wall completely adnate, weakly convex, posterior wall slightly convex to straight, abcauline wall slightly sinuous, margin circular, cut obliquely away to join internode.

Mesial inferior nematotheca seated on a prominence of the internode, lying along internode to touch base of hydrotheca, bithalamic, basal chamber long, tapering, freely movable, cup deep, excavated on adcauline side; lateral nematotheca bithalamic, seated on a minute pedicel at hydrothecal margin, basal chamber short, inflated, side of cup deeply excavated and closely adpressed on side facing hydrotheca, obscuring hydrothecal margin. Cauline nematothecae same as mesials, one on each side of stem internode, just proximal to node, two or three flanking mamelon at base of apophysis.

Female gonothecae large, distributed along entire length of stem, several on internode, upwardly tilted, without pedicel, irregularly saccate to sausage-shaped (depending on angle of view), perisarc moderately thick, up to eight nematothecae similar to laterals distributed along frontal margin, orifice distal, subcircular to elongate, flanked by two blunt lateral lobes, orifice closed by a sheet of tissue, gonotheca containing three globular planulae.

Colour. Stems of live colonies dark shining brown, hydrocladia and gonothecae paler brown to almost white.

Measurements (μ m).

Stem		
length of internode	460	- 500
width at node	400	- 600
Hydrocladium		
maximum length		5,000
length of internode	448	- 464
width at node	80	- 96
Hydrotheca		
length of abcauline wall	224	- 256

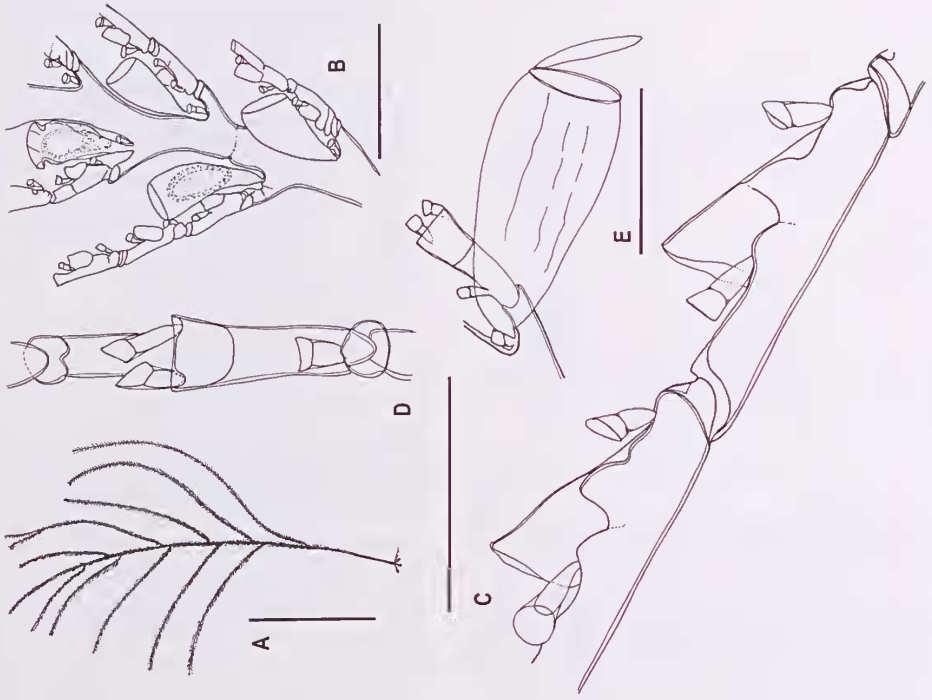


Fig. 39. *Plumularia badia*: A, one stem from tall colony from East Point reefs; B, part of fertile stem from Beagle Gulf; C, hydrocladium; D, hydrotheca, anterior view; E, gonothecha. Scale bars: A, 50 mm; B, 500 μ m; C, D, 200 μ m; E, 300 μ m.

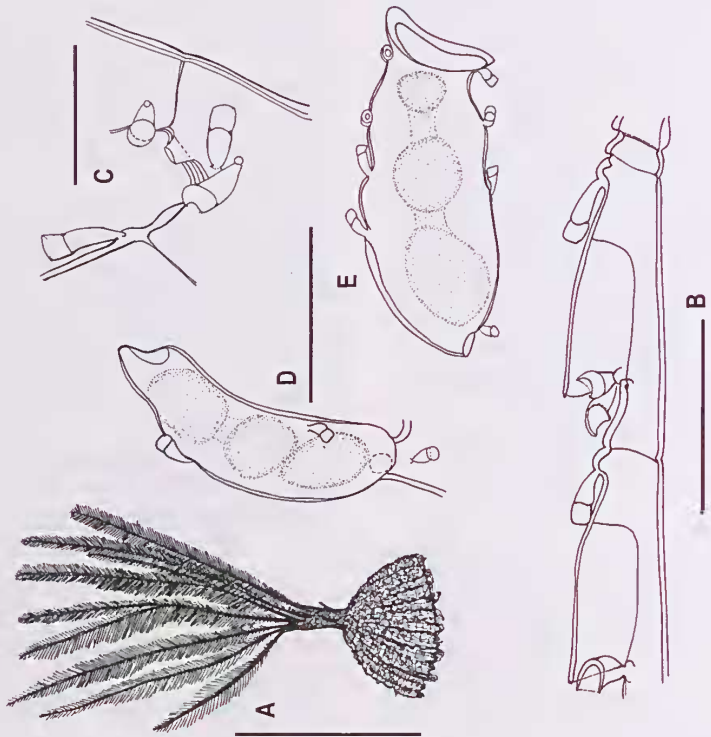


Fig. 38. *Nemeritesia cylindrica*: A, colony from East Arm breakwater; B, hydrocladium from same colony; C, apophysis of stem with cauline nematocyst and axillary mamelon; D, lateral view of female gonothecha; E, frontal view of female gonothecha. Scale bars: A, 50 mm; B, 300 μ m; C, 200 μ m; D, E, 500 μ m.

width at margin	80 - 96
Nematotheca	
overall length of median	92 - 100
depth of cup	32 - 48
overall length of lateral	72 - 80
Gonotheca	
length	800 - 1,040
width (frontal view)	340 - 400
width (lateral view)	176 - 240

Remarks. The abundant fertile material in the Beagle Gulf and Darwin Harbour collection led to re-appraisal of *Nemertesia cylindrica* (Kirchenpauer, 1876) and *N. indivisa* (Allman, 1883). *Nemertesia cylindrica* was erected on infertile material from Java, and Allman described *N. indivisa* from fertile specimens with lobate gonothecae from Cape York, Australia. Billard (1913) referred specimens from Indonesia with lobate gonothecae to *N. indivisa* and included *Antennularia cylindrica* Bale, 1884 from off Port Curtis, Queensland, in its synonymy. After examination of type material of *N. indivisa*, Bale (1919), following Billard (1913), wrongly concluded that *N. indivisa* and *N. cylindrica* were conspecific. Nutting (1927) and Pennycuik (1959) recorded, without adequate description or figures, *N. cylindrica* from the Philippines and Queensland respectively; because of lack of description, their records are doubtful. Billard (1913) described *N. indivisa* as having two pairs of axillary nematothecae and his figure depicts a complex lobate gonotheca. The Beagle Gulf material usually has two, sometimes three but never four axillary nematothecae. This, together with the completely different gonotheca shows that the material cannot be *N. indivisa*. As comparative measurements of the Beagle Gulf material agree with those extracted from Bale's (1884) figure of *Antennularia cylindrica* (pl. 10, fig. 7) it is concluded that the two are conspecific. This is the first record of the gonosome of *N. cylindrica*. Being very difficult to distinguish when infertile, it is unfortunate but understandable that *A. cylindrica* and *Nemertesia indivisa* were confused by earlier authors; they are, however, easily separated when fertile.

Colonies of *Nemertesia cylindrica* observed in Darwin Harbour are distinctive in their large size, the dark brown brush-like bunch of tall, straight stems emerging from a large, spongy hydrorhizal mass which sheaths and binds the lower stems firmly together, at the same time anchoring it in situations of strong current flow (J. E. W., pers. obsv.).

Distribution. Australian tropical east coast (Pennycuik, 1959).

Genus *Plumularia* Lamarck, 1816

Plumularia badia Kirchenpauer, 1876

(Fig. 39A-E)

Plumularia badia Kirchenpauer, 1876: 45. - Bale 1884: 128. - Bale 1913: 135. - Thornely 1916: 149. - Jäderholm

1916: 7. - Stechow and Müller 1923: 473. - Vervoort 1941: 221. - Watson 1996: 79.

Plumularia ramsayi Bale, 1884: 131. - Kirkpatrick 1890: 604. - Billard 1913: 52.

Plumularia gracilis von Lendenfeld, 1885b: 476.

Records and material. NTM C13003, NTM C13004, NTM C13005, NTM C13006, MV F86905, microslides, colony from Stn 52. NTM C13007, microslide, colony from Stn 95. NTM C12900, MV F86940, alcohol preserved material, East Arm channel and breakwater, coll: J. E. Watson, depth 7 m, 19/8/1998. NTM C12901, alcohol preserved material, East Point reef, immature and richly fertile mature colonies on dead coral boulders, coll J. E. Watson, depth 6 m, 19/9/1999. *Other records.* Stns 58, 67, 101. Plater Rock, many large fertile colonies on sponges, coll: J. E. Watson, depth 8 m, 21/9/1999.

Description. Hydrorhiza a tangle of narrow tubes entwining substrate. Colonies ranging from single, branched stems 20 mm high to large clusters of 60 complexly branched stems 240 mm high. Stems slender, monosiphonic, more or less alternately branched in same plane, lower stem region hydrocladial, hydrocaulus of short stems stiff, branching pseudosymphodial, almost perpendicular to cauline axis; stems of taller colonies long, flexuous, subdichotomous branching common to second or third order, branches directed acutely upwards, distally truncated. Stem and branch internodes short, smooth, nodes transverse, deeply incised proximally, fading distally, a node below and above origin of each branch, branch apophysis with oblique distal node. Perisarc of stem and branches smooth and thick.

Hydrocladia alternate, short, two on branch internode, in distal region of branch one row sometimes slightly displaced to front of branch with a third above, forming a verticil; hydrocladia backwardly curved, inserted on a long, geniculate, upwardly directed apophysis with a strong oblique distal node; two nematothecae in axil and a mamelon with short neck on apophysis distal to nematothecae. Hydrocladial internodes all hydrothecate, variable in length, node deeply oblique, a weak septum projecting downwards into internode from adcauline wall of hydrotheca. Hydrotheca deep cup-shaped, centrally placed on shorter internodes, proximal on longer internodes, adcauline wall immersed in internode, posterior wall perpendicular to internode, curved, abcauline at an angle of 30° to internode, wall straight, or with a slight concavity behind margin; margin sinuate, base excavated back into internode.

Nematothecae bithalamic, large, moveable, mesial inferior borne on a low prominence of internode, a deep perisarc-infilled notch in front, basal chamber of nematotheca long, cup foreshortened on adcauline side, not reaching base of hydrotheca; twin laterals similar to mesial, inserted on a prominence behind hydrothecal margin, projecting forward from margin, facing inwards towards axis of internode, cup shallowly excavated on

adcauline side. Cauline nematothecae same as laterals, one beside apophysis (often absent) and one in axil, a small mamelon or pore on base of apophysis between nematothecae.

Gonotheca inserted without pedicel in axil of branch apophysis, small, conical, distally truncated, terminal orifice circular, sealed by a thin opercular flap, perisarc very thin.

Colour. Stem and branches of live and preserved specimens shining dark brown to black, hydrocladia whitish, gonothecae transparent white.

Remarks. Variations in dimensions of hydrothecae occur throughout the colonies, some having a longer abcauline wall and a narrower margin than usual. The thickened, truncated apex of the branches noted by Kirchenpauer (1876) which suggests breakage occurs so consistently that it must be a normal habit of growth. While hydrocladia are alternate on older parts of the stems, the distal regions of some branches have hydrocladia in verticils of three, approaching the structure of *Nemertesia*. The gonothecae are so delicate that most collapse in mountant. There is some evidence that the gonophore may be expelled as an acrocyt.

The large amount of material examined in the present study and the wide range in some critical morphological dimensions supports comments on the variability of *Plumularia badia* by previous authors. But for the finding of some colonies of intermediate size, the short-stemmed, pseudosympodially branched form of *P. badia* could easily be mistaken for a different species from the tall form (Table 6). Such structural differences may be a response to ecological conditions, the simply branched, shorter, presumably juvenile morphology being lost as colonies increase in height and in number of stems. The

long tresses of the tall form occur on sponges and other invertebrate substrates in strong current flow of tidal channels, whereas the shorter, pinnate colonies occupy more sheltered habitats on reefs.

Plumularia badia is one of the most abundant species in Darwin Harbour.

Distribution. Indonesia and Torres Strait, Australian subtropical and tropical coasts (Bale 1884, Watson 1996).

Plumularia scabra Lamarck, 1816

(Fig. 40A-E)

Plumularia scabra Lamarck, 1816: 127. - Billard 1907: 322. - Billard 1913: 47. - Bale 1919: 342. - Rees and Thursfield 1965: 164.

Plumularia effusa Busk, 1852: 388, 400. - Kirchenpauer 1876: 46. - Bale 1884: 129. - Bale 1887: 22.

Acanthella effusa - Allman, 1883: 27. - Marktanner-Turneretscher, 1890: 260. - Kirkpatrick, 1890: 610. - von Campenhausen, 1897: 315. - Stechow and Müller, 1923: 474.

Records and material. NTM C12897, alcohol preserved material; NTM C13008, MV F86903, microslides, colony from Stn 147. NTM C12896, MV F86930, alcohol preserved material, Stn 137. NTM C13014, microslide, Stn 136. Infertile colonies of few to many stems. NTM C12898, alcohol preserved material, Plater Rock, large colonies on rock, coll: J. E. Watson, depth 15 m, 22/9/1999. *Other record*, Stn 80.

Description. Hydrothiza a knot of thin, tough tubes. Colony consisting of up to 15 monosiphonic stems to 300 mm high, greater length of stems unbranched, distal stem region a branched canopy with up to three orders of branching into verticils, a deep hinge joint above fork on each branch. Branch internodes variable in length, becoming shorter distally, nodes collar-shaped, deep, internodes of younger branches bearing four hydrocladia, older branches bearing up to 10; apices of some branches with two or three thick, upwardly directed apophysal spines without hydrocladia. Perisarc of stems and branches very thick, thinning a little distally.

Hydrocladial apophyses very long, upwardly directed with a strongly oblique distal node and deep creases in perisarc; hydrocladia alternate, short, on front of branch, close-set on younger branches, directed forward and slightly reflexed, older branches with whorls of up to six hydrocladia. Hydrocladial internodes short, nodes strongly oblique, narrow, one to four intranodal septa, one passing into hydrocladium midway along adcauline wall of hydrotheca, another at base of lateral nematotheca, one, hook-shaped, below posterior margin of hydrotheca and one, not always present, behind node. Hydrotheca small, occupying almost entire internode, tubiform, abcauline wall sinuous, curving upward to margin, adcauline wall convex, immersed in hydrocladium, margin broadly lobate, excavated back to internode.

Table 6. Comparative measurements (μm) of short (simple) and tall (multiple) forms of *Plumularia badia*.

	Tall form		Short form	
Stem, width at base	1,000		800	
Branch				
length of distal branch	272	- 520	560	- 936
internode				
width at node	176	- 224	160	- 176
length of apophysis	120	- 136	72	- 104
(adcauline side)				
Hydrocladium				
maximum length	1,500	- 1,720	1,400	- 1,700
length of internode	236	- 280	296	- 352
width at node	36	- 60	36	- 40
Hydrotheca				
length of abcauline wall	80	- 100	80	- 96
width of margin (lateral view)	56	- 88	64	- 72
Nematotheca				
mesial, length of pedicel	30	- 32	32	- 40
width of cup		30	24	- 26
lateral length of pedicel	40	- 50	32	- 40
width of cup	30	- 38	26	- 34
Gonotheca				
length	256	- 336	480	- 560
distal width	136	- 160	200	- 240

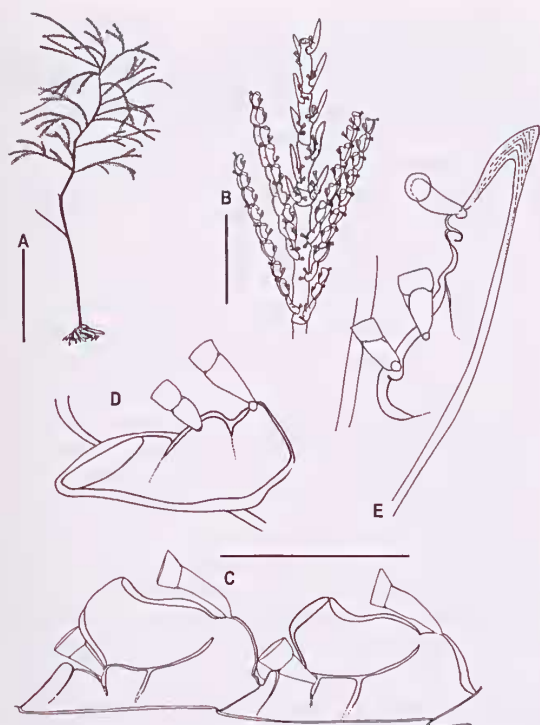


Fig. 40. *Plumularia scabra*: A, stem from colony from Beagle Gulf. B, hydrocladial part of stem with cauline spurs. C, hydrocladial internodes. D, apophysis of branch. E cauline spur. Scale bars: A, 50 mm, B, 1,000 μ m; C, D, E, 200 μ m.

Nematothecae large, all of similar shape, bithalamic, movable, basal chamber long, one mesial inferior on prominence of internode at base of hydrotheca, cup deep, adcauline side slightly foreshortened, adpressed into curve of abcauline hydrothecal wall or standing erect; lateral nematotheca inserted without pedicel below hydrothecal margin, basal chamber shorter than that of mesial, cup level with hydrothecal margin; two or three cauline nematothecae associated with apophysis - one axillar, facing inwards to branch, another about halfway along apophysis, the third (if present) at base of distal apophysal node.

Colour. Stem and branches of live colonies grey-brown, fading to lighter brown, hydrocladia grey-white.

Measurements (μ m).

Branch	
length, younger branch internode	760 - 800
width at node	96 - 136
Apophysis	
length abcauline wall	216 - 240
Hydrocladium	
length internode	200 - 216
width at node	40 - 52
Hydrotheca	
length abcauline wall	88 - 100

width at margin	76 - 100
Nematotheca	
length basal of chamber of mesial	48 - 64
marginal width of mesial cup	42
depth of cup (abcauline wall)	20 - 24
length of basal chamber of lateral	26 - 30
marginal width of lateral cup	24 - 26
depth of cup (abcauline wall)	26

Remarks. Although Lamarck's brief description of *Plumularia scabra* was accurate, Bale (1884) doubted the validity of the species but Billard (1907) in redescription of the type in the Lamarck collection of the Muséum du Paris confirmed the accuracy of Lamarck's description. Dimensions of the present material fall within the range of variation of the type. The apical apophysal spurs are diagnostic of the species.

Seen *in situ*, the colonies are tall with up to 15 stems and a sparse, gracefully branching canopy. The species prefers open, rocky habitat in good current flow at depths greater than 15 m at the base of reefs.

Distribution. "South Seas" (Lamarck 1816), Philippines, Indonesia (Billard 1913), Torres Strait (Busk 1852).

Plumularia setacea (Linnaeus, 1758)
(Fig. 41A, B)

Sertularia setacea Linnaeus, 1758: 813.

Plumularia setacea - Lamarck 1816: 129. - Hincks 1868: 296. - Bale 1888: 778. - Billard 1913: 32. - Ritchie 1911: 851. - Bale 1915: 294. - Pennycuik 1959: 180. - Ralph 1961: 33. - Millard 1975: 399. - Watson 1994: 67. - Cornelius 1995: 158. - Watson 1996: 79.

Plumularia tripartita von Lendenfeld, 1885b: 477.

Record and material. NTM C13009, microslide, damaged infertile stem on *Eunice tubifex*, Stn 40. *Other record.* Fragmentary stem, Stn 137.

Description. Stems to 4 mm high, cauline internodes long, slender, widening distally to a distinct, transverse node; internode bearing one to three nematothecae, if all three present, equally spaced along internode, distalmost just below hydrocladial apophysis; if only one, this usually proximal on internode. Perisarc of stem thick proximally, thinning distally and along hydrocladia. Hydrocladia alternate, inserted on an upwardly tilted distal apophysis; apophysis with one or two strong transverse nodes followed by a slightly oblique distal node; first hydrocladial internode hydrothecate, internodes thereafter alternately athecate and thecate; two or three hydrothecate internodes on hydrocladium, internodes long and slender, nodes slightly oblique, distinct; thecate internode widening from proximal node to base of hydrotheca

Hydrotheca on distal third of internode, abcauline wall confluent with internode, adcauline wall almost entirely adnate, convexly curved, free part short, straight, margin circular, tilted distally at an angle of c. 105° to

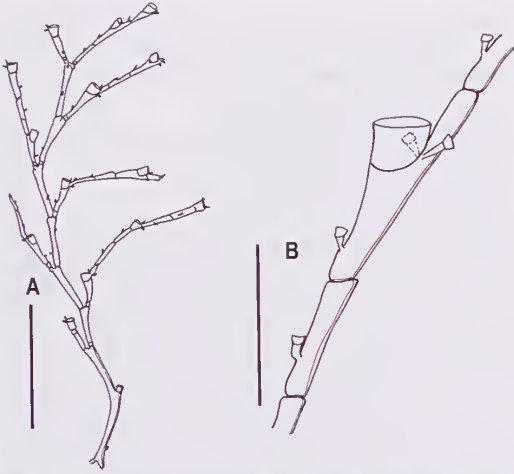


Fig. 41. *Plumularia setacea*: A, stem from Beagle Gulf. B, hydrocladial internodes. Scale bars: A, 1,000 µm; B, 300 µm.

hydrocladial axis; athecate internode with a small mesial nematotheca at proximal third to centrally placed, inclined towards hydrocladium, basal chamber short, robust, cup a little foreshortened on adcauline side; mesial nematotheca proximal on hydrothecate internode, same as athecate mesial; lateral nematotheca small, freely movable, facing outwards, basal chamber inserted without pedicel in internode beneath hydrotheca, cup small, circular; cauline nematothecae same as mesials. Perisarc of hydrocladia and hydrotheca thin; hydranth with 12 - 14 tentacles.

Colour. Colourless, preserved material.

Measurements (µm).

Stem	
length of internode	416 - 504
diameter at node	40 - 48
Hydrocladium	
length of athecate internode	200 - 240
length hydrothecate internode	336 - 400
diameter at node	32 - 40
Hydrotheca	
length of abcauline wall	68 - 80
diameter of margin	100 - 104

Remarks. The specimen agrees with dimensions of *Plumularia setacea* given by Ritchie (1911) for specimens from the Australian east coast.

Distribution. Cosmopolitan. Recorded from east, west and southern Australia.

***Plumularia bedoti* (Billard, 1911)**
(Fig 42A-D)

Plumularia bedoti Billard, 1911: 64. - Billard 1913: 27.

Record and material. NTM C13010, microslide, two small, damaged infertile stems on *Gymnangium longicorne*, Stn 136.

Description. Stems to 10 mm high, proximal half of stems and lower branch lightly fascicled, becoming monosiphonic in upper region, apophysis of branch with transverse distal node, branch ahydrocladate proximally, internodes thereafter with strongly oblique nodes, each internode with three alternate, equidistant hydrocladia, one proximal, one in middle and one distal on internode. Perisarc of stem and branches thick and smooth. Hydrocladia frontal on stem and branches, internodes slender, first internode athecate, distal node oblique, internode with one mesial nematotheca, internodes thereafter alternately thecate and athecate; thecate internode with oblique proximal and transverse distal node, transverse node sometimes indistinct; no intranodal septa. Hydrothecae seated on upper side of internode, tubular, deep, occupying almost entire internode, tilted forward at an angle of c. 55° to internode, adnate adcauline wall convex, short, free adcauline wall straight, abcauline wall weakly convex, margin perpendicular to hydrothecal axis, subcircular to oval, rim slightly everted.

Nematothecae bithalamic, mesial hydrothecate inferior seated on a small prominence, a perisarc infilled notch between basal chamber and proximal node, basal chamber short, robust, cup foreshortened on adcauline side, just reaching base of hydrotheca; basal chamber of lateral nematotheca long, conical, movable, cup broad and shallow, reaching hydrothecal margin, excavated on adcauline side. Athebate internode with one mesial nematotheca similar to mesial inferior, proximal on internode, bent forward. Cauline nematothecae similar to mesials, a row of five on internode, one near base of apophysis, one above and one in axil.

Colour. Colourless to white, preserved material.

Measurements (µm).

Stem, maximum width	160
Branch	
diameter monosiphonic region	72 - 88
length apophysis abcauline wall	56 - 64
distance between hydrocladia	
on same side	344 - 376
Hydrocladium	
length along base intersegment	120 - 144
length along base hydrothecate internode	88 - 100
width at transverse node	20 - 36
Hydrotheca	
length free adcauline wall	60 - 76
length abcauline wall	104 - 128
diameter of margin	80 - 84
Nematotheca	
mesial, length of basal chamber	18 - 24
mesial, diameter of cup	18 - 20
lateral, length basal chamber (excluding pedicel)	28 - 34
lateral, diameter of cup	30 - 32

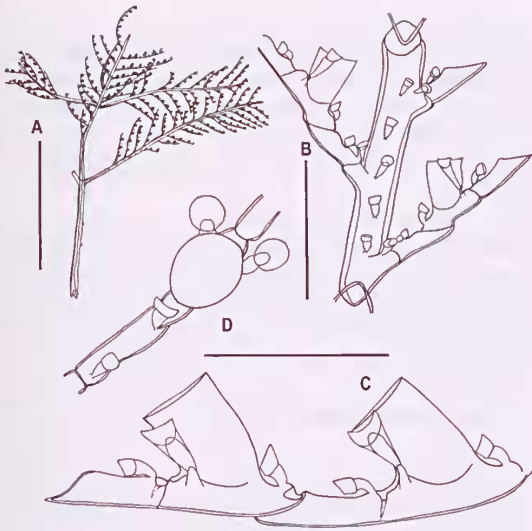


Fig. 42. *Plumularia bedoti*: A, stem from colony on *Gymnangium longicorne*. B, hydrocladiate part of stem. C, hydrocladial internodes. D, anterior view of hydrotheca. Scale bars: A, 3,000 µm; B, 300 µm; C, D, 200 µm.

Remarks. Although the colonies are much smaller than those of *Plumularia bedoti* described by Billard (1913), they conform in morphological characters and dimensions with that species. The apophysial mamelon mentioned by Billard is not evident in the Beagle Gulf specimens.

Distribution. Previously known only from Indonesia (Billard 1913).

Plumularia tubacarpa sp. nov.

(Fig. 43A-D)

Material and record. Holotype, NTM C13011, microslide, infertile stem on sponge amongst shellgrit, Stn 87. (No preserved material).

Description. Hydorrhiza a small knot of tubular stolons. Stem 9 mm high, monosiphonic, slender, erect, internodes long, smooth, increasing slightly in diameter distally, nodes transverse, caulis slightly tumescent above node, nodes becoming fainter distally along stem. Hydrocladia alternate, one to four, usually two on internode, given off from a long, slender upwardly directed apophysis on side of stem; apophysis with an oblique distal node and frequently a transverse septum behind node; hydrocladia directed upwards at an angle of c. 35° to internode, with up to 10 hydrothecae. Hydrocladial internodes all thecate, nodes strongly oblique, an incipient septum passing into internode between base of hydrotheca and mesial nematotheca.

Hydrotheca seated in middle of internode, deep cup-shaped, adcauline wall entirely adnate, convex, abcauline wall contiguous at an angle of 20° with internode, straight to faintly sinuous, concave just behind margin; margin

circular, rim slightly everted and inclined slightly to hydrocladial axis. Nematothecae all same shape and size, bithalamic, moveable, basal chamber long, cup foreshortened on adcauline side; mesial inferior seated on a prominence of internode, standing erect, not reaching base of hydrotheca; lateral nematotheca inserted on a minute pedicel behind hydrothecal margin, extending well beyond hydrotheca. Cauline internodes with variable number of nematothecae, one in axil of apophysis, one beside apophysis, one halfway between hydrocladia and sometimes one at side of internode just above node.

Gonotheca long, tubular, pointing downward, inserted without pedicel on proximal side of apophysis in lower stem region, distal end domed, perisarc smooth.

Colour. Colourless.

Measurements (µm).

Stem	
proximal diameter	88
distal diameter	168
distance between hydrocladia	
on same side	640 - 768
apophysis, adcauline length	76 - 88
Hydrocladium	
length of internode	376 - 416
width at node	24 - 32
Hydrotheca	
length of abcauline wall	112 - 136
width at margin	96 - 112
Nematotheca	
median, overall length	52 - 60
diameter of cup	24
Gonotheca	
length	840
width	88

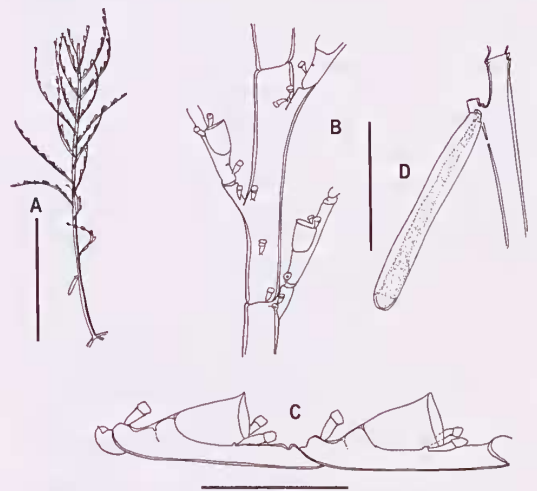


Fig. 43. *Plumularia tubacarpa* sp. nov. A, holotype colony. B, hydrocladiate part of stem. C, hydrocladial internodes. D, gonotheca. Scale bars: A, 2,000 µm; B, D, 500 µm; C 300 µm.

Remarks. The single stem of *Plumularia tubacarpa* appears to be young, the distal cauline internodes still being poorly developed and there is a distinct growing apical tip. The long, tubiform gonotheca containing coenosarcral tissue also appears to be immature.

Plumularia tubacarpa does not resemble any species of *Plumularia* in available literature. While some species reported from Indonesia have spatulate to rectangular gonothecae (e.g. *P. insignis* var. *gracilis* Billard, 1913 and *P. spiralis* var. *longitheca* Billard, 1913) the absence of intranodal septa in the hydrocladium distinguishes *P. tubacarpa* from *P. insignis* and the presence of two, not three axillar nematothecae distinguishes it from *P. spiralis*. The hydrorhiza of *P. tubacarpa* is intergrown with that of a young colony of *Polyplumaria cornuta* for which species it was originally mistaken.

Etymology. Refers to the long, tubular gonotheca.

Genus *Polyplumaria* G. O. Sars, 1874

***Polyplumaria cornuta* (Bale, 1884)**

(Fig. 44A-F)

Plumularia cornuta Bale, 1884: 132.

Polyplumaria cornuta - Billard 1913: 53. - Briggs and Gardner 1931: 191.

Record and material. NTM C12940 alcohol preserved material, colony from Stn 67. NTM C12939, alcohol preserved material; NTM C13012, MV F86904, microslides, colony from Stn 92. Sparse fertile colonies on shellgrit and gravel. *Other records.* Stns 66, 87. East Arm channel, infertile colony on coarse sand, coll: J. E. Watson, depth 6 m, 21/8/1998.

Description. Hydrorhiza a tangle of thin colourless stolons embedded in shellgrit. Stems solitary, to 280 mm long, slender and flexuous, a proximal region short to long and sometimes lightly fasciated, stem thereafter hydrocladate, monosiphonic; distal half to third of stem branched in verticels of three, branches short, reflexed, hydrocladate. Perisarc of stem and branches thick, smooth. Hydrocladia on branches alternate, on an indistinct apophysis, hydrocladial internodes thecate, short, nodes strongly oblique, deep, three strong septa passing downwards from base of hydrotheca almost through internode; two partial septa, one below mesial nematotheca and between lateral nematotheca and node. Apophyses of some branches with a spinous accessory hydrocladium with several intrathecal septa, one or two nematothecae near apex and one hydrotheca with twin laterals but no mesial nematotheca. Hydrotheca adnate to internode, adcauline wall obscured by three humps associated with intranodal septa, abcauline wall weakly sinuous with a small peak behind margin; margin strongly sinuate, cut back to meet internode.

Nematothecae all bithalamic, movable, mesial inferior on a small prominence of internode, an infilling of perisarc at base, nematotheca standing almost erect, basal

chamber long, slender, cup shallow, foreshortened on adcauline side to almost triangular; basal chamber of lateral moderately long, inserted at base of hydrothecal margin, cup rather shallow, broad, a little excavated on adcauline side. Cauline nematothecae similar to mesial; three on internode, one at base of apophysis and two in axil.

Gonotheca inserted without pedicel in axil of apophysis, small, almost triangular, widening distally, no operculum, perisarc very thin.

Colour. In life, very pale yellow-brown, lower stems darker brown.

Measurements (μm).

Branch		
distance between hydrocladia		
on same side	580 - 800	
Hydrocladium		
maximum length of hydrocladium	4,400 - 6,000	
length of internode	296 - 320	
width at node	60 - 72	
length of apophysial spine	260 - 280	
Hydrotheca		
length of abcauline wall	176 - 180	
width of margin	140 - 148	

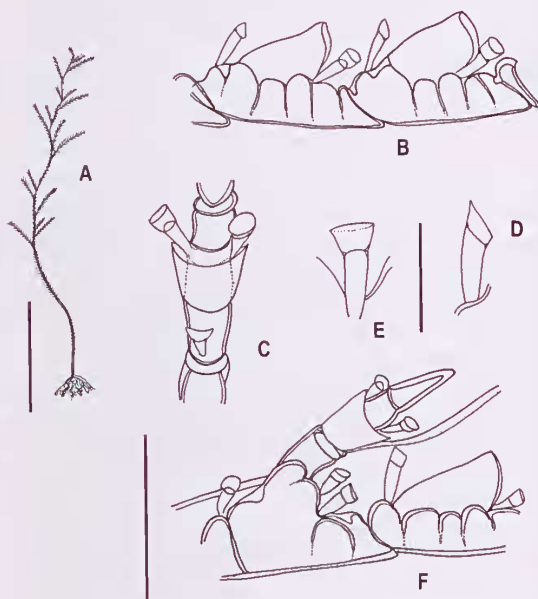


Fig. 44. *Polyplumaria cornuta*: A, colony from East Arm channel, Darwin Harbour. B, hydrocladial internodes. C, anterior view of hydrocladium. D, mesial nematotheca. E, lateral nematotheca. F, cauline spur. Scale bars: A, 50 mm; B, C, 300 μm ; D, E, 100 μm ; F, 300 μm .

Nematothecae

mesial inferior, length of basal chamber	66 - 90
diameter of cup	30 - 40
lateral, length of basal chamber	64 - 76
diameter of cup	44 - 52

Gonotheca

length	66 - 100
distal width	40 - 54

Remarks. The graceful, slender colonies tend to collapse out of fluid. The few gonothecae present on one colony are too poorly preserved and obscured by adventitious matter for determination of sex. Except for the absence of the mesial nematotheca associated with the hydrotheca on the accessory hydrocladium the present material conforms with the detailed description and dimensions of *Polyplunaria cornuta* given by Billard (1913).

Colonies occur in sandy beds of channels in strong current flow, their pale colour rendering them almost invisible (J. E. W., pers. obs.).

Distribution. Known only from Indonesia (Billard 1913) and Queensland (Bale 1884).

Family Kirchenpaueriidae Stechow, 1921

Genus *Kirchepaueria* Jickeli, 1883

***Kirchepaueria irregularis* Millard, 1958**

(Fig. 45A, B)

Kirchepaueria irregularis Millard, 1958: 211.
- Millard 1975: 370. - Watson 1996: 79.

Kirchepaueria sp. - Watson 1997: 530.

Record and material. NTM C13015, microslide, small infertile colony on oyster shell attached to boat mooring, Fannie Bay, near East Point, coll: K. Gowlett-Holmes, depth 3 m, 17/8/1998.

Description. Stems to 15 mm high, arising irregularly from a reptant hydrorhiza. Proximal stem region lightly fascicled, stems sparsely branched with one or two orders of branching. Cauline internodes long, narrow, smooth, nodes transverse to slightly oblique, perisarc of internodes thin; hydrocladia alternate, arching gracefully away from a short apophysis with transverse distal node. Hydrocladial internodes long, slender, smooth, nodes transverse to slightly oblique, no intranodal septa; most internodes thecate but some hydrocladia with an athecate segment. Hydrotheca on distal third of internode, cup-shaped, adcauline wall lying parallel to but free of internode; abcauline wall contiguous with internode, curving upwards; margin circular, rim faintly everted, perpendicular to hydrothecal axis and tilted proximally away from axis of internode. Nematothecae all of same size and shape, bithalamic, minute, mesial inferior distant from hydrotheca, mesial superior near distal node; one cauline nematotheca above axil of apophysis and one on internode below apophysis, a small mamelon on distal side of apophysis facing axillar nematotheca.

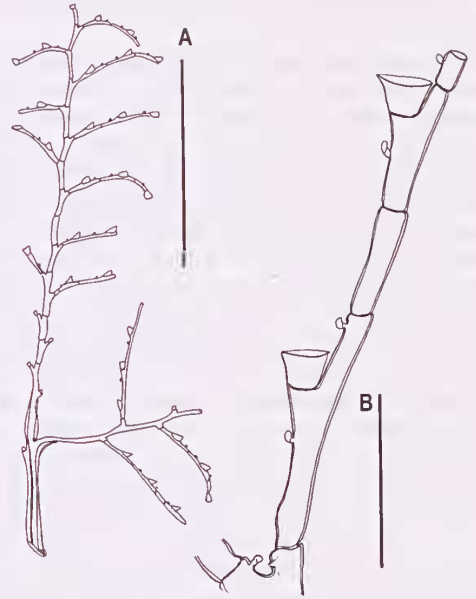


Fig. 45. *Kirchepaueria irregularis*: A, stem from colony, East Point. B, hydrocladium. Scale bars: A, 3,000 µm; B, 300 µm.

Colour. Live colonies transparent white.

Measurements (µm).

Stem	
length of internode	304 - 656
diameter at node	56 - 104
length of apophysis	40 - 56
Hydrocladium	
length of thecate internode	400 - 544
diameter at node	36 - 48
Hydrotheca	
length abcauline wall	44 - 68
diameter of marginal rim	76 - 96

Remarks. Colonies of this small species are fragile and lax, collapsing out of fluid. The specimens conform in all respects (including the irregular internode length and insertion of ancillary athecate internodes in the hydrocladium) with Millard's (1958, 1975) description and dimensions of the species.

Distribution. South Africa (Millard 1975). Australia: previously recorded from the Abrolhos Islands and Australian west coast Watson (1996, 1997).

Family Aglaopheniidae

Marktanner-Turneretscher, 1890

Genus *Aglaopheuia* Lamouroux, 1812

***Aglaopheuia delicatula* (Busk, 1852)**

(Fig 46A-E)

Plumularia delicatula Busk, 1852: 396.

Aglaophenia delicatula - Bale 1884: 167.
- Kirkpatrick 1890: 604. - Borradaile 1905: 843. - Billard 1913: 106. - Jäderholm 1920: 8. - Jarvis 1922: 350.
- Pennycook 1959: 185.

Thecocarpus delicatulus - Millard and Bouillon 1973: 94.

Records and material. NTM C13017, microslide, colony from Stn 81. NTM C12884, alcohol preserved material, colony from Stn 154. NTM C12883, alcohol preserved material; NTM C13020, MV F87897, microslides, colony from Stn 156. NTM C13019, microslide, colony from Stn 153. MV F86931, alcohol preserved material; NTM C13018, microslide, colony from Stn 127. NTM C13016, MV F86896, microslides, colony from Stn 40. Many infertile colonies, mostly on *Eunice tubifex*; one colony on stem of sertulariid hydroid. *Other records.* Stn 147, Plater Rock, colony on *Eunice tubifex*, coll: J. E. Watson, depths 3 - 10 m, 22/9/1999.

Description. Hydrorhiza knotted; stems to 35 mm high, plumose, monosiphonic, unbranched, narrowing distally, prosegment ahydrocladial, with strong distal hinge joint; stem thereafter hydrocladial. Hydrocladia frontal on stem, closely alternate, one on internode, cauline nodes transverse, indistinct or absent. Hydrocladial internodes short, nodes transverse, an intrathecal septum passing almost vertically downwards from posterior of hydrotheca to wall of internode opposite, a weak partial or complete septum passing from base of lateral nematotheca into internode. Hydrotheca conical, adcauline wall flatly convex, adnate, abcauline wall convex; a strong septum passing from abcauline wall to base, connecting with intranodal septum; margin dentate with a fairly long mesial abcauline cusp, an indentation at base of cusp opposite mesial nematotheca; mesial abcauline cusp flanked by a pair of blunt cusps, followed a more rounded pair, a third very low pair and sometimes a fourth posterior pair reduced to an mere undulation.

Mesial nematotheca tubular, free part short, not reaching hydrothecal margin, terminal orifice circular to canaliculate, an elliptical secondary orifice connecting with hydrotheca at base of free part; lateral nematotheca tubular, a little tumescent distally, bent forward beyond hydrothecal margin, orifice circular, only slightly excavated on adcauline side. Cauline nematothecae more or less bean-shaped, with a single orifice, one in axil, one of similar size below, both facing outwards and one larger, above hydrocladium.

Colour. Stems brown, hydrocladia almost white.

Measurements (µm).

Stem	
length of internode	224 - 232
width at node	84 - 88
Hydrocladium	
length of internode	212 - 228
width at node	64 - 84
Hydrotheca	
depth, mesial abcauline cusp to base	180 - 196
width of margin	120 - 128
Nematotheca	
length of mesial	200 - 212

diameter at orifice	18 - 26
length of lateral	104 - 112
diameter at orifice	20 - 24

Remarks. The specimens do not entirely conform with descriptions of *Aglaophenia delicatula* by Bale (1884) and Billard (1913). Billard gives a length of 340 - 380 µm and 40 - 50 µm for width of the hydrocladial internodes but these dimensions do not agree with an internode length of 110 µm calculated from his figure (Fig. 106). These dimensions differ considerably from both Bale's measurements (calculated from Pl. 14, Fig. 4) and those of the present specimens. Nor does the Beagle Gulf material agree with Bale's description of two cauline nematothecae below the hydrocladium, there being only one, centrally placed on the internode just above the node; Billard (1913) does not mention cauline nematothecae in his description. Despite these differences I have no doubt that the Beagle Gulf material is *A. delicatula*. The species may be an obligate epizooite of *Eunice tubifex*.

Distribution. Tropical northern and eastern Australia (Pennycuik 1959), Maldive Islands (Borradaile 1905).

Genus *Gymnangium* Hincks, 1874

***Gymnangium hians* (Busk, 1852)**

(Fig 47A-E)

Plumularia hians Busk, 1852: 396.

Halicornaria hians - Bale 1884: 179. - Kirkpatrick 1890: 604. - Stechow 1909: 101. - Stechow 1913: 10, 94. - Billard 1913: 68. - Jäderholm 1916: 8. - Briggs 1918: 47; Stechow 1919: 425. - Bedot 1921: 347. - Jarvis 1922: 355. - Nutting 1927: 237. - Vervoort 1941: 222. - Millard 1958: 219. - Pennycuik 1959: 186.

Halicornaria haswelli Bale, 1884, 180.

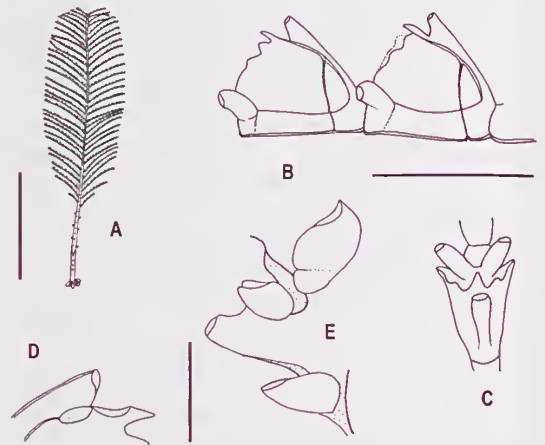


Fig. 46. *Aglaophenia delicatula*: A, stem from colony from Beagle Gulf. B, hydrocladial internode. C, hydrotheca, anterior view. D, mesial nematotheca. E, eauline nematothecae. Scale bars: A, 10 mm, B, C, D, 300 µm; E, 100 µm.

Aglaophenia balei Marktanner-Turneretscher, 1890: 272. - Billard 1905: 334.

Halicornaria balei - Ritchie 1910: 22.

Halicornaria flava Nutting, 1905: 955.

Halicornaria hians var. *laxa* Ritchie, 1910: 835.

Halicornaria hians var. *balei* Billard, 1913: 70. - Bedot 1921: 347. - Van Gernerden-Hoogveen 1965: 70.

Gymnangium hians - Stechow 1923: 19. - Stechow 1924: 69. - Stechow 1925: 254. - Yamada 1958: 51, 61. - Rees and Thursfield 1965: 171. - Millard and Bouillon 1973: 92. - Rho and Chang 1974: 147. - Millard 1975: 444. - Rho 1977: 279, 425. - Vervoort 1977: 84. - Vervoort and Vasseur 1977: 84. - Hirohito 1983: 77. - Ryland and Gibbons 1991: 542. - Hirohito 1995: 287. - Watson 1996: 79.

Gymnangium hians var. *balei* Mammen, 1967: 311. - Vervoort 1968: 114. - Schmidt 1972: 41. - Mergner and Wedler 1977: 24. - Van Praët 1979: 912.

Not *Gymnangium hians* - Jäderholm 1916: 8.

Records and material. NTM C12948, alcohol preserved material; NTM C13021, NTM C13022, MV F86928, fertile colony of five damaged stems detached from substrate, Stn 154. *Other records.* East Point, fertile colonies on *Eunice tubifex*, coll: J. E. Watson, depth 8 m, 17/8/1998. Plater Rock, many fertile colonies on *Eunice tubifex*, coll: J. E. Watson, depths 3-8 m 21/9/1999.

Description. Hydrorhiza ramified, stems unbranched, up to 40 mm long, stiffly plumose, monosiphonic, proximal stem wide, prosegment bearing remnant spurs

from shed hydrocladia; stem narrowing distally, perisarc thick and shining. Cauline nodes transverse, faint to distinct, hydrocladia alternate, on opposite sides of stem, directed upwards at an angle of c. 45° to axis, slightly recurved, usually two, sometimes one on internode; hydrocladia up to 20 mm long, internodes deep, nodes slightly oblique, faint, no intranodal septa. Hydrothecae saccate, contorted about middle, floor convex, proximal part of wall sometimes extended downwards into a knot of perisarc, free adcauline wall short, straight to slightly convex, abcauline wall completely adnate to mesial nematotheca, a thick hook-shaped intrathecal septum passing forward into hydrotheca from mid-abcauline wall, free end of septum a ragged edge (anterior view). Margin tilted upwards, a pair of sharply pointed, posteriorly pointing cusps in posterior third, margin strongly everted into pair of broad cusps, a pair of small cusps between lateral nematothecae, rarely a second pair of small, poorly defined cusps between these and lateral cusps.

Mesial nematotheca narrowing from base to apex, free part long, arching over hydrotheca, abcauline wall thickened, terminal orifice circular, a small secondary orifice just above junction with hydrotheca. Lateral nematothecae short, saccate, tubular, orifice large, open down to hydrothecal margin. Cauline nematothecae same as laterals, one above and one below hydrocladial apophysis and one behind axil.

Gonothecae conical, perisarc thin, in a single crowded row along stem, female containing a single planula larva.

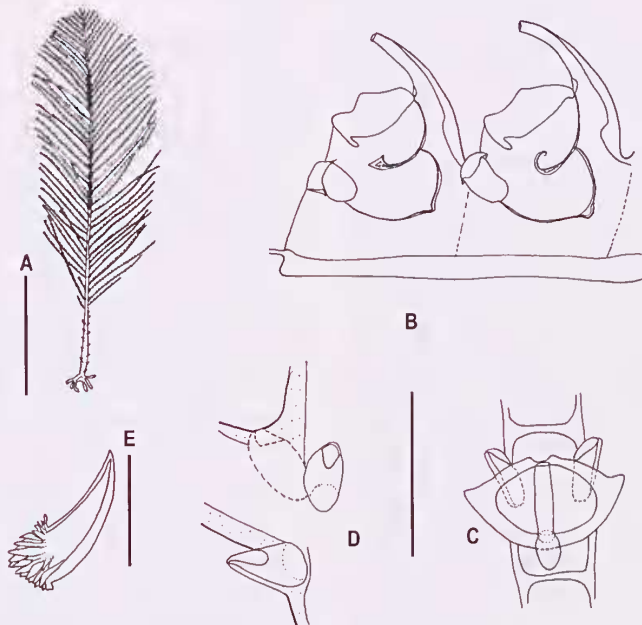


Fig. 47. *Gymnangium hians*: A, fertile stem from colony on *Eunice tubifex*, East Point reef. B, hydrocladial internodes. C, anterior view of hydrotheca. D, cauline nematothecae. E, intrathecal septum, showing ragged edge. Scale bars: A, 10 mm; B, C, D, 300 µm; E, 100 µm.

Colour. Stem shining dark brown, hydrocladia and gonothecae paler brown to cream.

Measurements (μm).

Hydrocladium		
length of internode	272	- 304
width of node	128	- 200
Hydrotheca		
depth, anterior margin to floor	180	- 200
width at margin (lateral view)	148	- 160
width across marginal lobes (top view)	268	- 288
Nematotheca		
mesial, length of free part	92	- 152
mesial, diameter of terminal orifice	16	- 18
lateral, length	84	- 100
Gonotheca		
length	900	- 1,000
width	520	- 680

Remarks. Ryland and Gibbons (1991) suggested a likely relationship of *Gymnangium haswelli* with *G. hians*. To investigate this, and relationships of *G. hians* with other similar Australian species I examined microslide preparations of putative type material of *Halicornaria haswelli* Bale, 1884 (MV F58843), *H. baileyi* Bale, 1884 (MV F58837) and *H. furcata* Bale, 1884 (MV F58839), held in the Museum of Victoria (see Stranks, 1993). *Gymnangium furcata* and *G. baileyi* from the temperate Australian east coast have similar branching habit and there are no microscopic characters that clearly differentiate them. *Gymnangium haswelli* and *G. hians*, known from subtropical and tropical Australia have unbranched plumose stems and also share similar microscopical characters. The four species thus fall into two distinct groups: *G. furcata* being conspecific with *G. baileyi*; and (supporting the suggestion of Ryland and Gibbons (1991)) *G. haswelli* is conspecific with *G. hians*. The Beagle Gulf and Darwin Harbour specimens conform exactly with the type of *G. hians* from Torres Strait.

It is possible that some of the many supposed variants of *Gymnangium hians* reported from the Indo-Pacific and other regions may be other, closely related species. For example, Bale's figure (1884, pl. 13, fig. 6) of the cuspidate hydrothecal margin of a specimen of *G. hians* exactly depicts the margin of a species, *G. undulatum*, described as new in this paper. *Gymnangium undulatum* can be clearly differentiated from *G. hians* by the long, undulated stems and cauline nematothecae. To establish the taxonomic limits of *G. hians* there is need for critical re-examination of preserved specimens of variants of the species reported from geographically different localities.

Gymnangium hians is one of the most abundant species in Darwin Harbour and environs, the colonies occurring almost exclusively on *Eunice tubifex*. It is surprising that the species was recovered from only one locality (Stn 154) in the wider Beagle Gulf survey.

Distribution. Type locality, Torres Strait. Known from tropical north-western Australia (Watson 1996) and Indo-Pacific (Ryland and Gibbons 1991, Watson 1996).

Gymnangium longicorne (Busk, 1852)

(Fig. 48A-F)

Plumularia longicornis Busk, 1852: 399.

Aglaophenia longicornis - Kirchenpauer 1872: 47. - Bale 1884: 157. - Bale 1886: 25. - Kirkpatrick 1890: 604. - Marktanner-Turneretscher 1890: 267.

Halicornaria longicornis - Billard 1913: 67. - Briggs and Gardner 1931: 195. - Pennycook 1959: 186.

Halicornaria intermedia Billard, 1913: 65.

Halicornaria longicorne var. *sibogae* Billard, 1913: 67.

Lytocarpus longicornis - Bedot 1921: 315, 321.

Macrorhynchia longicornis - Stechow and Müller 1923: 474.

Macrorhynchia longicornia - Watson 1996: 79.

Records and material. NTM C12877, alcohol preserved material, colony from Stn 7. NTM C12878, alcohol preserved material colony from Stn 127. NTM C12879, alcohol preserved material; NTM C13025, NTM C13026, microslides, colony from Stn 87. NTM C13024, MV F 86916, microslides, colony from Stn 32. Large and small colonies, some fertile, on pebbles, bryozoans and ascidians. *Other records.* Stns 38, 40, 77, 78, 81, 91, 97, 104, 110, 129, 136, 137, 144, 147, 149, 150, 152, 156, 157, 159, 160. East Arm port channel, coll: J. E. Watson depth 4-6 m, 17/8/1998, Plater Rock, coll: J. E. Watson, depth 3-6 m, 21/9/1999, many large, fertile colonies on coral boulders and other invertebrate substrate.

Description. Hydrotheca a mass of tubular stolons entwining substrate, stolonial filaments passing up into strong cauline fascicular tubes. Stems to 3 mm in diameter at base and 190 mm long, plumose, prosegment ahydrocladate, unbranched. Branches of up to three orders given off in almost same plane from frontal tube of stem, ultimate branches monosiphonic, a long, blade-shaped hinge joint separating monosiphonic branches from preceding polysiphonic region, two short nematothecae on base of branch above joint. Branch internodes short, visible only in distal region, nodes transverse, distinct. Hydrocladium short, with up to six hydrothecae, borne on short apophysis on front of branch, hydrocladia alternate, crowded, recurved, two on internode; internodes short, node almost transverse, two strong, complete intranodal septa crossing internode, proximal one passing into hydrotheca as a partial intrathecal septum, distal node adjoining lateral nematotheca. Hydrotheca long, saccate, occupying entire internode, adcauline wall adnate to internode, abcauline wall convex posteriorly, free half of wall saddle-shaped and tilted upwards to margin, a deep wedge of perisarc passing into hydrotheca below margin. Margin parallel

with or inclined slightly to internode, a short mesial abcauline cusp connecting with perisarcal flange; margin circular with a pair of broad, centrally placed erect lateral lobes.

Mesial nematotheca very variable in length from very long, considerably overtopping hydrothecal margin to shorter than hydrothecal margin, length increasing distally along hydrocladium, longest nematothecae thin, tubular, sometimes a little swollen in distal third, terminal orifice small, circular, a larger secondary orifice on a short neck above hydrotheca and a small internal foramen connecting with hydrotheca. Shorter nematothecae with same terminal and secondary orifices as on longer nematothecae. Lateral nematotheca long, thin, tubular, sinuous, adnate to hydrotheca and extending beyond margin, terminal orifice circular. Two cauline nematothecae at hydrocladial apophysis, short, narrowing from base to small terminal orifice, proximal one pointing along hydrocladium, the other facing across branch.

Gonotheca inserted without pedicel in axil of hydrocladium, large, leaf-shaped at maturity, perisarc very thin, no terminal orifice, mature female gonophore with many small ova, not filling cavity.

Stem and branches bearing structures termed here "pseudophylactocarps" (see remarks) which usually replace the first or second hydrocladium on a branch; pseudophylactocarp long, lax, proximal two or three hydrothecae normal, followed by up to eight internodes each bearing two or three long, digitate nematothecae.

Colour. Live colonies dark grey-brown; preserved stems shining golden-brown, branches and hydrocladia paler brown.

Measurements (µm).

Hydrocladium	
length overall	1,200
length of internode	172 - 180
width at node	48 - 60
Hydrotheca	
depth, margin to floor	120 - 132
width at margin	76 - 80
Nematotheca	
mesial, free length (typical form)	180 - 220
mesial, diameter of terminal orifice	16 - 18
mesial, free length (intermedia form)	44 - 60
lateral, length	140 - 160
Gonotheca	
length	456 - 576
maximum width	160 - 272
pseudophylactocarp	
maximum length overall	1,900
length internode	180 - 200
length nematothecae	112 - 152

Remarks. Some morphological variants in the large sample of *Gymnangium longicornae* available for study conform with descriptions of *G. intermedium* (Billard 1913) and *G. longicornae* var. *sibogae* (Billard, 1913).

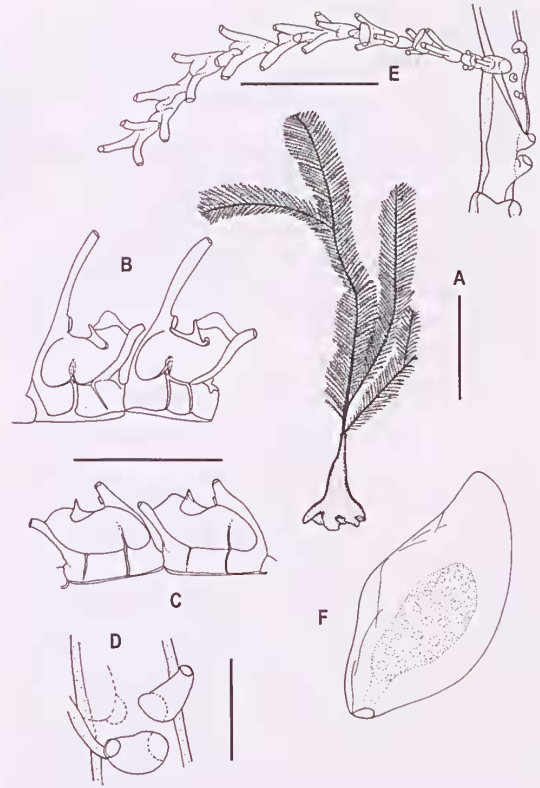


Fig. 48. *Gymnangium longicornae*: A, small colony from Beagle Gulf. B, hydrocladium with upwardly directed hydrothecae and long mesial nematothecae. C, hydrocladium from different colony from Beagle Gulf with parallel hydrothecae and short mesial nematothecae. D, cauline nematothecae. E, pseudophylactocarp from proximal stem region. F, female gonotheca. Scale bars: A, 50 mm; B, C, F, 300 µm; D, 100 µm; E, 500 µm.

Billard (1913) described and figured "hydroclades transformés" on the hydrocaulus of *Lytocarpia angulosa*. These lax and extremely flexible structures, present on several tropical species (J.E.W. pers. obsv.) are not true phylactocarps since they bear neither hydrothecae nor gonothecae and are defined here as "pseudophylactocarps". Lower stems of *G. longicornae* which are devoid of pseudophylactocarps are often invested with epizootic communities of small hydroids and other invertebrates but these epibionts are absent from regions where there are pseudophylactocarps. The nematothecae in the pseudophylactocarps are heavily armed, which, together with the sweeping action of these structures, is probably an adaptation to remove potential settlers from the stems. Hydrocladia and distal branches are quite deciduous, readily breaking off at hinge joints. Lateral nematothecae on distal parts of the hydrocladia are usually larger and more forwardly directed than those proximal on the hydrocladium.

Briggs and Gardner (1931) first described the gonotheca of *G. longicorne* from the Australian Great Barrier Reef. The range of developing and mature gonothecae in the present collection indicates that their material was immature.

Gymnangium longicorne is one of the most abundant hydroids in the Beagle Gulf collection and one of the more conspicuous species in Darwin Harbour.

Distribution. Indonesian region (Billard, 1913). Australian distribution: Torres Strait (Busk 1852), tropical Queensland (Pennycuik 1959). The locality of Port Jackson given by Marktanner-Turneretscher (1890) is probably incorrect.

Gymnangium undulatum sp. nov.

(Fig 49A-F)

Record and material. Holotype, NTM C12952, alcohol preserved material; NTM C13027, NTM C13048, MV F86901, microslides from holotype. Large colonies on top of coral boulders, Plater Rock coll: J. E. Watson, depth 4 m, 22/9/1999.

Description. Hydrorhiza composed of thick stolons reptant on substrate. Stems long, to 250 mm, plumose, unbranched, monosiphonic, strongly undulated, bends occurring every 15 - 25 mm along length, divided into internodes by strong, slightly oblique nodes, a tumescence below each node, cauline perisarc very thick, smooth. Prosegment ahydrocladate, in hydrocladate region, hydrocladia close, alternate, directed slightly forwards from opposite sides of stem on a moderately long apophysis with distal hinge joint; two, occasionally three, hydrocladia on internode, if two, proximal in lower third to halfway along internode, upper one just below distal node; sometimes two opposite hydrocladia and on internode. Hydrocladial nodes slightly oblique, marked only by a faint constriction and thinning of perisarc; no intranodal septa. Hydrothecae saccate, margin tilted obliquely backwards at an angle of c. 40° to hydrocladial axis, a strong septum passing forwards into body from midway along abcauline wall, septum dividing wall into two pronounced convexities, in ventral view septum seen as a shelf with ragged edge; adcauline hydrothecal wall gently convex, a small knot of perisarc at connection with internode. Hydrothecal margin with three pairs of equidistant, deeply scalloped cusps, no unpaired anterior tooth, cusp of middle pair the largest (lateral view), often pointing posteriorly; posterior cusp the broadest, posterior margin of hydrotheca straight between lateral nematothecae.

Mesial nematotheca digitate, just overtopping hydrothecal margin, terminal orifice may be entirely absent or with a small orifice on side facing hydrotheca, orifice just above hydrothecal margin or a completely open gutter from apex to hydrothecal margin. Lateral nematothecae small, rectangular to elongate conical, proximally rounded, distal end level with hydrocladium,

a large connection with internode and a large terminal orifice. Three cauline nematothecae associated with apophysis: two frontal, large, one in axil and one below apophysis, the one below with two large excavated orifices side by side, axillar one with a single orifice of similar shape, orifices facing distally; rear nematotheca behind axil, smaller, similar to laterals but with wider orifice, facing distally.

Colour. Live colonies grey-brown.

Measurements (µm).

Stem		
length of internode	576	- 1,088
diameter at node	240	- 304
Hydrocladium		
length of internode	280	- 336
width at node (lateral view)	120	- 152
Hydrotheca		
depth, marginal cusp to floor	240	- 304
width at margin	172	- 180
height of middle marginal cusp	44	- 68
Nematotheca		
mesial, free length	56	- 84
mesial, diameter of terminal orifice		
lateral, length	80	- 86
lateral, width at orifice	52	- 72
cauline, maximum length	128	- 140

Remarks. While there is no discernible change in size, shape or orientation of the cauline internodes at the bends in the hydrocaulus, at each bend the hydrocladia reverse their orientation, so that the group facing the front is succeeded by a rear-facing group.

Although the colonies are infertile, I have little doubt that the species should be referred to *Gymnangium*. Jäderholm (1916) briefly described *G. lians* (Busk, 1852) from a small specimen collected off Cape Jaubert, north-western Australia. His description and figure shows it to undoubtedly be *G. undulatum*. In microscopical characters, *G. undulatum* has much more deeply scalloped marginal cusps than *G. lians*. In the field, colonies of *G. undulatum* are unmistakable, growing in thick groups of undulating stems 300 - 400 mm high (extending to 500 - 600 mm when straightened out). *In situ*, the species can deliver a painful, long-lasting sting.

Gymnangium undulatum was found only at Plater Rock, where numerous large colonies occurred on upper surfaces of coral rock in good current flow at 3 - 4 m depth.

Etymology. Named for the tall, undulating stems.

Gymnangium unjuense sp. nov.

(Fig. 50A-E)

Record and material. Holotype, NTM C13023, NTM C13028, MV F86898, microslides, infertile colony from Stn 104. Paratype, NTM C13029, microslide, small infertile colony from Stn 110 (no preserved material remaining).

Description. Stems simple, plumose, to 50 mm high, arising from a thin, reptant hydrorhiza embedded in fine

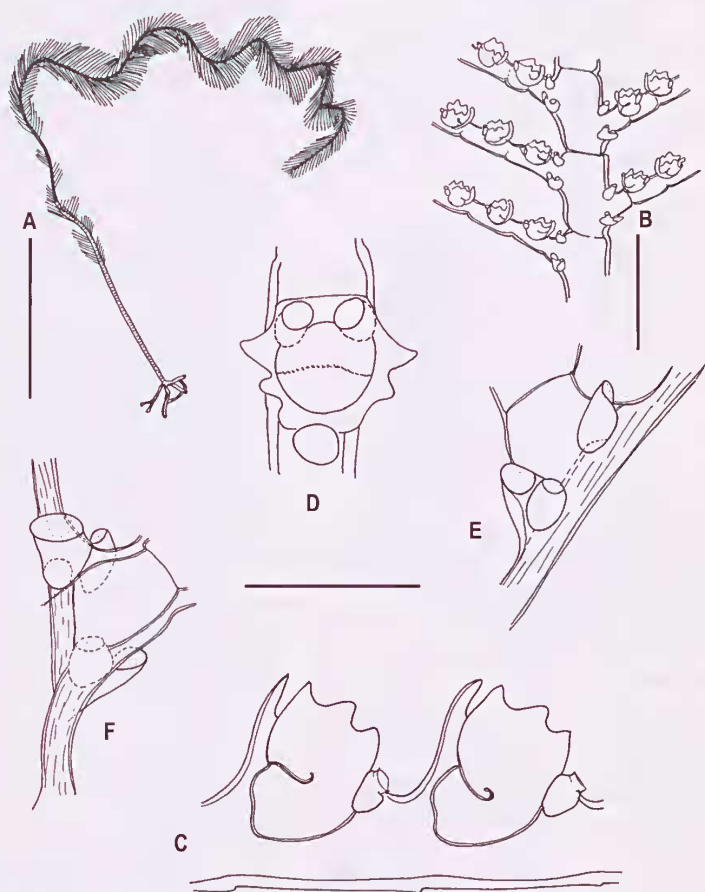


Fig. 49. *Gymnangium undulatum* sp. nov. A, stem from holotype colony from Plater Rock. B, hydrocladial part of stem. C, hydrocladial internodes. D, anterior view of hydrotheca. E, cauline nematothecae flanking apophysis, frontal view. F, cauline nematothecae, rear view. Scale bars: A, 50 mm, B, 1,000 μ m; C-F, 300 μ m.

sediment. Stem fascicled, prosegment consisting of many parallel tubes, becoming monosiphonic distally, perisarc thick; proximal stem ending in a pronounced blade-shaped hinge joint, blades connected by a thin web of perisarc. Entire length of fascicular tubes other than axillar tube with a row of closely spaced ovoid nematothecae; axillar tube unsegmented, giving off hydrocladia at an angle of c. 30° to axis. Hydrocladial apophysis short, distal node transverse, indistinct, internodes thereafter moderately long, perisarc smooth, thick, nodes merely a faint thinning of perisarc; three equidistant partial intranodal septa below hydrotheca, proximal septum short, mid-septum longer, curved forwards, distal septum straight or curved backwards from base of lateral nematotheca.

Hydrotheca entirely adnate to internode, body semi-ovoid, tilted upwards at an angle of c. 30° to internode, posterior adcauline wall deeply sunk in internode, a short plug-like extension of the middle intranodal septum

passing into hydrotheca from summit of an upward bulge in internode; abcauline wall weakly convex to sinuous, a slight concavity behind margin. Margin transverse to hydrothecal axis, mesial abcauline cusp prominent, sharply pointed, followed by three pairs of very shallow, scalloped cusps; margin straight between lateral nematothecae; perisarc of hydrotheca thin, thickening a little below margin.

Mesial nematotheca completely adnate to hydrotheca, terminating below margin, orifice sinuate, open down to hydrotheca; lateral nematotheca conical, widening to deep gutter-shaped orifice, open to internode. Cauline nematothecae same as laterals, orifice large, one above hydrocladium, facing upwards along stem axis and one below, facing along hydrocladium, a large circular mamelon between; nematothecae on polysiphonic tubes of stem ovoid.

Colour. Stem honey brown; hydrocladia lemon yellow.

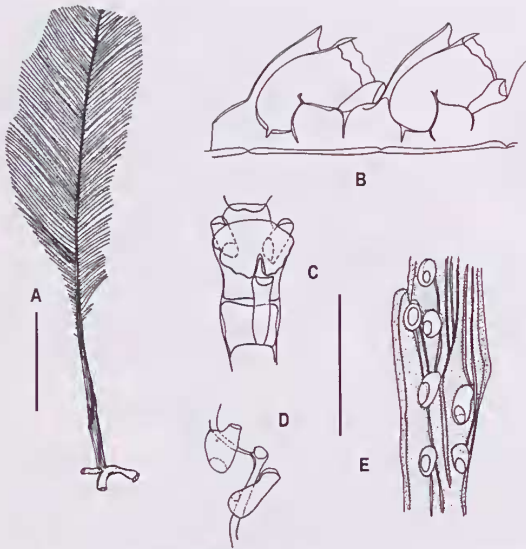


Fig. 50. *Gymnangium uninense* sp. nov. A, whole stem from holotype, Beagle Gulf. B, hydrocladium. C, anterior view of hydrotheca. D, cauline nematothecae. E, ovoid nematothecae on proximal stem. Scale bars: A, 10 mm, B-E, 300 µm.

Measurements (µm).

Stem		
width at base		1,000
diameter of axial tube	128 - 176	
distance between hydrocladia on same side	600 - 624	
Hydrocladial internode		
length	296 - 344	
width at node	88 - 112	
Hydrotheca		
axial length margin to base	216 - 240	
diameter at margin (lateral view)	160 - 176	
length mesial cusp (lateral view)	48 - 56	
Nematotheca		
length mesial	232 - 272	
height mesial apex above hydrotheca	44 - 52	
length lateral	100 - 112	
maximum width (lateral view)	44 - 52	

Remarks. The distinctive ovoid cauline nematothecae appear as parallel series of closely spaced white dots in the ahydrocladial region of the stem. In some morphological features *Gymnangium uninense* is related to *Lytocarpia orientalis* (Billard, 1913); however it differs from that species in 1) absence of a mamelon from the base of the hydrocladium, 2) the hydrothecal margin has three, not four pairs of cusps and 3) in the well developed intranodal septa which are only incipient in *L. orientalis*. The species is only provisionally assigned to *Gymnangium*. When fertile material is found, it may need to be transferred to another genus; if to *Lytocarpia*, then its relationship with *L. orientalis* will need to be re-examined.

Etymology. Named for the type locality off Unjin Point in the Beagle Gulf.

Genus *Lytocarpia* Kirchenpauer, 1872

Lytocarpia angulosa (Lamarck, 1816)

(Fig 51A-G)

Plumularia angulosa Lamarck, 1816: 126.

Aglaophenia angulosa - Lamouroux 1816: 166.
- Lamouroux 1924: 15

Plumularia huxleyi Busk, 1852: 395.

Thecocarpus angulosus - Billard 1913: 85.

Aglaophenia huxleyi - Bale 1884: 161. - Bale 1886: 26.

Acanthocladium huxleyi - Kirkpatrick 1890: 604.

Thecocarpus angulosus - Billard 1913: 85. - Briggs and Gardner 1931: 192.

Acanthocladium angulosum - Bedot 1921: 335.
- Stechow and Müller 1923: 476.

Records and material. NTM C12880, alcohol preserved material; NTM C13031, microslide, colony from Stn 126. NTM C12882, alcohol preserved material, colony from Stn 113. NTM C12881, alcohol preserved material; NTM C13030, microslide, colony from Stn 93. MV F86939, alcohol preserved material, colony from Stn 120. NTM C13032, MV F86917, microslides, colony from Stn 110. Infertile colonies on pebbles and shellgrit. *Other records.* Stns 17, 27, 66, 67, 77, 82, 87, 89, 92, 100, 104, 105, 106, 111, 114, 115, 116, 118, 119, 127, 132, 136, 152, 159, 160, 161. East Port channel bed, infertile colony on coarse sand, coll: J. E. Watson, depth 6 m, 20/9/1998.

Description. Hydrorhiza a bundle of thin, fibrous stolons; colonies of single, straight stems to 500 mm high and 2 mm wide at base, prosegment long, polysiphonic, ahydrocladial, comprising numerous parallel tubes, some running almost to tips of branches; upper stem region bearing single plumose hydrocladial branches to 30 mm long in verticels of three; branch internodes short, nodes oblique, faint. Hydrocladia alternate, long, close-set, inserted in front of frontal tube of branch, internodes short, nodes slightly oblique, distinct to absent; no intranodal septa. Hydrotheca irregularly hemispherical, anterior adcauline wall strongly convex, lower wall gently rounded, a concavity between two large knots of perisarc separating the two wall sections; a thick intrathecal septum passing from base of mesial nematotheca obliquely forward two thirds distance into hydrotheca, terminating in a knot of perisarc. Margin circular with a single, short mesial abcauline cusp connecting with intrathecal septum followed by three pairs of broad, low lobes, the first pair slightly more acute than others.

Mesial nematothecae of two distinct lengths on different colonies: long nematotheca tubular, arching over hydrothecal margin, terminal orifice small, excavated, base of nematotheca broad at junction with

hydrotheca, a secondary orifice, sometimes absent, just above hydrotheca, a small foramen connecting base with hydrotheca; short nematothecae may or may not overtop hydrothecal margin, base same as that of long nematotheca, orifice excavated, often connecting with secondary orifice above hydrotheca. Lateral nematotheca triangular, extending to and sometimes overlapping hydrocladial node; orifice broad, a small posterior foramen connecting with hydrocladium. Polysiphonic tubes of stem and branches with rows of oblong nematothecae, each with a single terminal orifice. Numerous pseudophylactocarps arising at intervals from the outermost polysiphonic tubes of stem and branches to just above first hydrocladium; pseudophylactocarps short, lax, comprising up to 20 short segments separated by deeply constricted nodes, each segment with three long, tubular nematothecae, terminal orifice of nematotheca sinuous, sometimes minutely crenulated; nematotheca containing a battery of large nematocysts.

Colour. Stems light brown, hydrocladia pale yellow-brown.

Measurements (μm).

Hydrocladium		
overall length	2,900	-3,000
length of internode	200	- 224
width at node	96	- 112
Hydrotheca		
depth	128	- 160
width at margin	136	- 144
Nematothecae		
length of short mesial	240	- 280
width of orifice, short mesial	28	- 32
length of long mesial	280	- 320
width of orifice, long mesial	32	
length of lateral	80	- 104
width of orifice, lateral	16	- 20
Pseudophylactocarp		
maximum length	2,500	
length of internode	160	- 180

Remarks. The present material conforms to the redescription of Lamarck's type material of *Plumularia angulosa* by Billard (1909).

There is no lengthening of the mesial nematothecae along the hydrocladium such as occurs in some aglaopheniid species, the long and short forms of nematothecae occurring on separate colonies, those with long mesial nematothecae being the more common form.

The tall, single stems growing from a large bundle of fibrous stolons are well adapted to life strong current flow in beds of tidal channels. *Lytocarpia angulosa* is one of the most abundant species in the Beagle Gulf collection. The structure and presumed purpose of pseudophylactocarps has been discussed previously.

Distribution. Indonesian region and Indian Ocean (Millard and Bouillon 1973), Australian tropical east coast (Pennycuik 1959).

Lytocarpia phyteuma (Kirchenpauer, 1876) (Fig. 52A-G)

Aglaophenia phyteuma Kirchenpauer, 1876: 23.

Aglaophenia clavícula Whitelegge, 1899: 373.

Thecocarpus phyteuma - Stechow 1919: 139.
-Pennycuik 1959: 187. - Millard and Bouillon 1973: 95.
? *Thecocarpus phyteuma* - Vervoort and Vasseur 1977: 86

Thecocarpus leopoldi Leloup, 1930: 1.

Lytocarpia phyteuma - Ryland and Gibbons 1991: 548.

Records and material. NTM C12953, alcohol preserved material; NTM C13033, NTM C13034, MV F86899, microslides, fertile colony on *Eunice tubifex*, Stn 154. NTM C13081, MV F86927, microslides, East Point, fertile colony on *Eunice tubifex*, coll: J. E. Watson, depth 7 m, 17/8/1998.

Description. Hydrothiza tubular, entwining substrate. Stems plumose, to 50 mm high, unbranched, monosiphonic, prosegment ahydrocladial, divided thereafter into short internodes by indistinct transverse nodes, perisarc thick. Hydrocladia alternate, frontal on stem, close, one on internode, held out stiffly at an angle of c. 45°; hydrocladia long with up to 30 hydrothecae, first hydrothecate internode adpressed to hydrocaulus, perisarc of internode thick, nodes marked by a notch and a faint transverse line or thinning of perisarc, a short intranodal septum passing from posterior of hydrotheca.

Hydrotheca semi-ovoid, a strong partial to entire septum passing from internode into hydrotheca at about one third distance from posterior margin; margin inclined backwards at c. 35° to internode, mesial abcauline cusp tongue-shaped, prominent, flanked by three pairs of rounded cusps of almost equal size and shape, not bent outwards and a pair of smaller, sharper cusps, bent slightly outwards behind lateral nematothecae. Perisarc of hydrotheca moderately thick, thinner below margin but thickened below marginal cusps.

Mesial nematotheca adnate to hydrotheca, not reaching hydrothecal margin, abcauline wall weakly convex to sinuous, narrowing to a gutter-shaped orifice open down to hydrotheca. Lateral nematothecae ovoid, facing outwards, narrowing distally, overlapping next internode, orifice large, gutter-shaped, open down to internode. Two nematothecae on each cauline internode, pouch-shaped with wide orifice, one just above node, the other at base of hydrocladium, facing outwards.

Corbula replacing a hydrocladium, proximal segment hydrothecate followed by an internode bearing a small, free leaflet; corbula with up to 20 ribs, corbula closed but with a distinct thinning of perisarc at base of ribs, free edges of ribs deep, upturned, no rachial internodes, base of each rib hydrothecate, margin of hydrotheca entire but without mesial or lateral nematothecae; rib with at least 12 erect nematothecae similar to hydrothecal

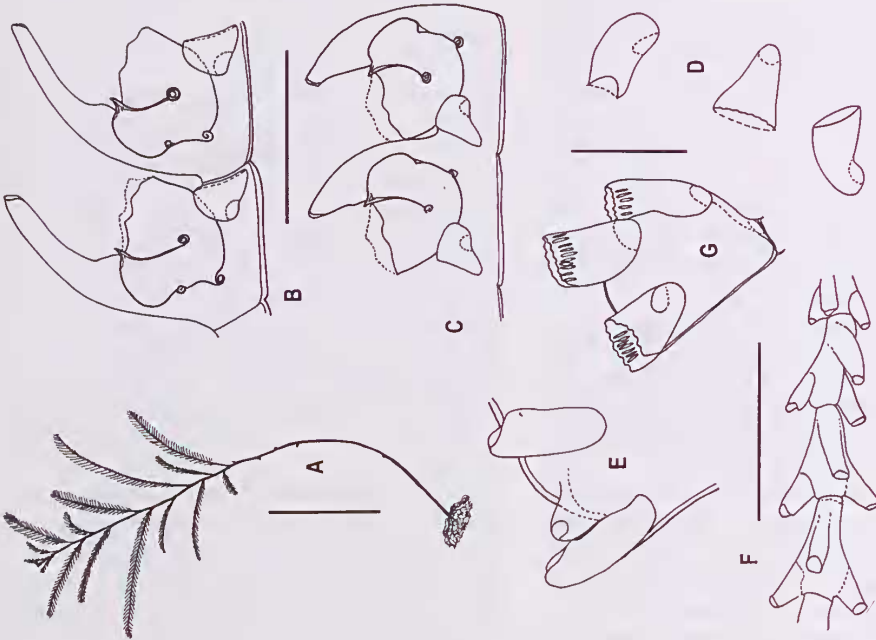


Fig. 51. *Lytocarpia angulosa*: A, colony from Beagle Gulf. B, hydrocladial internodes with long mesial nematothecae. C, hydrocladial internodes from different colony with short mesial nematothecae. D, lateral nematothecae from three angles of view. E, cauline nematothecae with central mamelon. F, part of pseudophylactocarp from outer tubes of stem. G pseudophylactocarp nematothecae enlarged to show nematocysts. Scale bars: A, 50 mm, B, C, F, 300 μ m; D, E, G, 100 μ m.

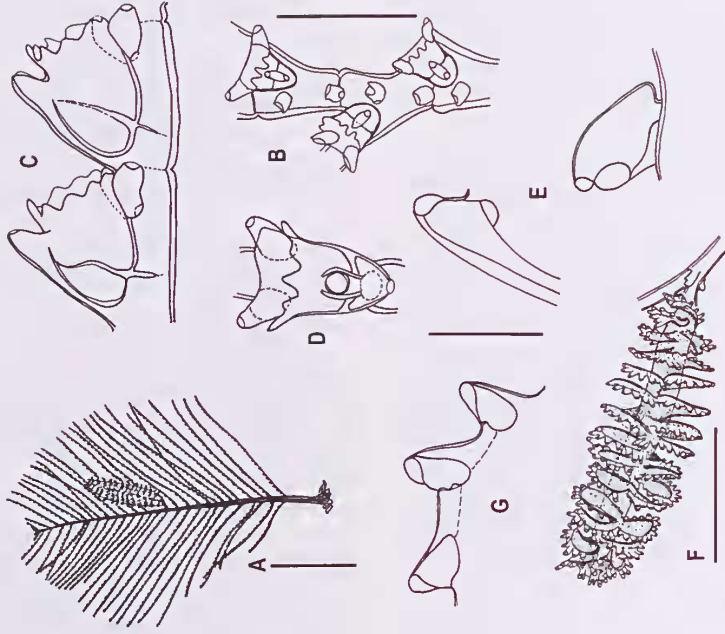


Fig. 52. *Lytocarpia phytouma*: A, fertile colony from Beagle Gulf. B, stem and proximal hydrocladial hydrothecae. C, hydrocladial internodes. D, anterior view of hydrotheca. E, mesial nematotheca. F, corbula. G, gonocladial nematothecae. Scale bars: A, 5,000 μ m; B, 500 μ m; C, D, 200 μ m; E, 2,000 μ m; F, 1,000 μ m.

laterals, orifice of nematothecae wide, gutter-shaped. Gonophores probably female.

Colour. Stems deep honey brown, hydrocladia paler brown.

Measurements (µm).

Stem		
length of internode	304 - 344	
width at node	128 - 144	
Hydrocladium		
maximum length	12,000	
Hydrocladial internode		
length	240 - 272	
width at node	80 - 112	
Hydrotheca		
length along base	218 - 224	
depth, behind margin to base	136 - 144	
width at margin	160 - 176	
length of anterior marginal cusp	28 - 40	
Nematothecae		
length of mesial	232 - 256	
free height above hydrotheca	72	
width of distal end (lateral view)	24 - 36	
length of lateral	88 - 100	
width at orifice (lateral view)	28 - 36	
Corbula		
maximum length	6,000	
width (lateral view)	1,120	
height of leaflets above body	344 - 400	

Remarks. Specimens from Beagle Gulf and Darwin Harbour generally conform to Stechow's (1919) description and figures of *Lytocarpia phyteuma*, however, the free part of the corbula ribs appear to be longer than shown by Stechow. The distinct partial hydrocladial intranodal septum described by Whitelegge (1899) for *A. clavacula* but not by Stechow is clear in the present specimens. There is some doubt that Vervoort and Vasseur's (1977) specimens from French Polynesia are indeed *L. phyteuma* because the hydrotheca shown in their fig. 36a is longer, lies parallel to the internode and the lateral nematothecae point downwards.

Colonies of *L. phyteuma* were found only on *Eunice tubifex*.

Distribution. Pacific region, tropical eastern Australia.

Genus *Macrorhynchia* Kirchenpauer, 1872

***Macrorhynchia philippina* Kirchenpauer, 1872**
(Fig. 53A-D)

Macrorhynchia philippina Kirchenpauer, 1872: 19. - Stechow 1923: 241. - Stechow and Müller 1923: 475. - Stechow 1924: 69. - Stechow 1925: 258. - Hirohito 1983: 78. - Rees and Vervoort 1987: 177. - Watson, 1996: 79. - Migotto 1996: 40. - Watson 1997: 538. - Calder 1997: 62.

Aglaophenia philippina - Kirchenpauer 1872: 29, 45-46.

Lytocarpus philippinus - Kirkpatrick 1890: 604. - Bale 1888: 786. - Billard 1913: 78. - Bale 1914: 6. - Bale 1915: 293. - Jäderholm 1916: 7. - Briggs and Gardner 1931: 193. - Millard 1958: 220. - Pennycuik 1959: 186. - Millard and Bouillon 1973: 93. - Millard 1975: 449.

Records and material. NTM C12894, alcohol preserved material; NTM C13036, microslide, colony from Stn 110. NTM C12893, alcohol preserved material; NTM C13037, microslide, colony from Stn 49. NTM C13035, microslide, colony from Stn 127. Large and small infertile colonies on *Eunice tubifex*. NTM C12895, MV F86936, alcohol preserved material, fertile colonies on other invertebrates and *Eunice tubifex* on wharf structures, Darwin Harbour, coll: J. E. Watson, depth 2-12 m, 17/8/1998. *Other records.* Stn 61. East Point, coll: J. E. Watson, depth 7 m, 19/8/1998. Plater Rock, colonies on other invertebrates and *Eunice tubifex*, coll: J. E. Watson depth 2-15 m 21/9/1999.

Description. Hydroid rhiza reptant on substrate. Colonies variable in size from single stems a few centimetres long to large complex colonies of several stems to 200 mm high. Stems erect, plumose, simple or branched, if branched, up to 4 mm wide at base, fascicled, polysiphonic tubes running parallel to near apex of branches. Two or three orders of branching may be present, branches straight, given off sparsely and irregularly from stem, branch internodes indistinct. Hydrocladia frontal on branch, alternate, one on internode; hydrocladial internodes short, deep, nodes slightly oblique; two partial intranodal septa, one passing

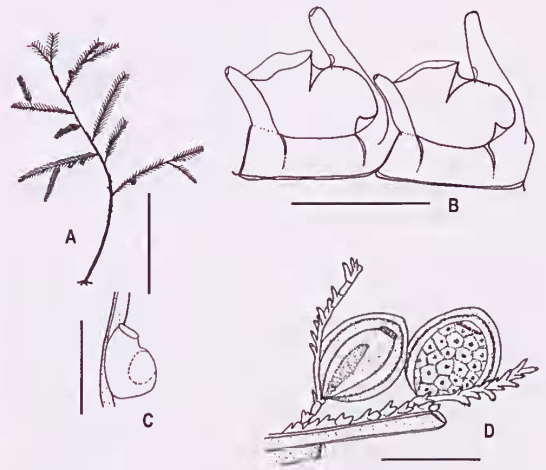


Fig. 53. *Macrorhynchia philippina*: A, small fertile colony from wharf pilings, Darwin Harbour. B, hydrocladial internodes. C, cauline nematotheca. D, phylactocarp with male and female gonothecae. Scale bars: A, 50 mm; B, 300 µm; C, 100 µm; D, 1,000 µm.

down from base of hydrotheca, the other from base of lateral nematotheca.

Hydrotheca saccate, adcauline wall flat or slightly convex in contact with internode, where free of internode attached to lateral nematotheca, a deep indentation in base at proximal end of adcauline wall, abcauline sinuate, rising abruptly behind margin, a deep V-shaped septum penetrating hydrotheca between mesial nematotheca and margin. Margin circular with a pair of opposite, low lobes.

Mesial nematotheca erect, tubular, parallel with hydrothecal abcauline wall, reaching to or beyond hydrothecal margin, tapering a little distally, terminal orifice circular, a little excavated on adcauline side, a secondary orifice above junction with hydrotheca and another, internal, connecting with hydrotheca. Lateral nematotheca long, tubular, inclined forward, overtopping hydrothecal margin, orifice circular or slightly excavated. A cauline nematotheca on branch at base of hydrocladium, short, body inflated, a circular orifice on a short neck.

Phylactocarp a modified hydrocladium given off from front of branch, phylactocarp about same length as gonotheca; proximal internode with a hydrotheca, next internode short, athecate, succeeding internode with two nematothecae and pedicel of gonotheca, following three to six internodes short with two long, digitate nematothecae with circular distal orifice. Gonothecae large, lenticular, containing a degenerate medusa, one or two gonothecae, sometimes a male and a female, on same rachis, perisarc thin, female containing many small ova. At release, medusa ovoid, without mouth or canals but with a ring of strongly refringent granules around margin.

Colour. In life, stems and branches dark brown to black, hydrocladia pale grey, male gonophore purple to black, female cream to pale orange. The refringent granules on the released medusa sparkle blue and white under the microscope.

Measurements (µm).

Hydrocladium	
maximum length	6,000
length of internode	280 - 320
width at node	64 - 88
Hydrotheca	
length along base	136 - 160
depth, margin to base	180 - 200
width across margin	160 - 180
Nematotheca	
maximum length of mesial	336 - 360
maximum free height	128
width across orifice	20
length of lateral	160 - 168
width across orifice	20 - 22
Phylactocarp	
length	900 - 1,100
Gonotheca	
length	920 - 1,200

Nematotheca

length 120 - 176

Remarks. *Macrorhynchia philippina* is a very common tropical Australian species, colonies on the Great Barrier Reef growing to very large size (J. E. W., pers obsv.). Colonies on the polychaete *Eunice tubifex* in Beagle Gulf and Darwin Harbour were, however, quite small. Gonophores of the present material conform exactly with the description and figure of *M. philippina* by Gravier (1970). Other authors (see Calder 1997) have reported female gonophores containing one to three ova or planulae. Colonies of *M. philippina* can deliver a painful sting.

Distribution. Circumglobal tropical. Australian distribution: tropical Queensland to Western Australia (Pennycuik 1959, Watson 1997).

***Macrorhynchia phoenicia* (Busk, 1852)**

(Fig. 54A-E)

Plumularia phoenicia Busk, 1852:398.

Plumularia aurita Busk, 1852: 397:

Aglaophenia rostrata Kirchenpauer, 1872: 45.

Aglaophenia spectabilis Allman, 1883: 43.

Aglaophenia phoenicia - Bale 1884: 159. - Bale 1886: 15. - Bale 1887: 87. - Kirchenpauer 1892: 45. - Inaba 1892: 347.

Lytocarpus phoeniceus - Kirkpatrick 1890: 604. - Nutting 1905: 954. - Ritchie 1910: 21. - Billard 1910: 48. - 1913: 74. - Bale 1913: 138. - Stechow 1913: 95. - Jäderholm 1916: 7. - Jäderholm 1919: 25. - Jäderholm 1923: 5. - Bedot 1922: 181. - Jarvis 1922: 354. - Briggs and Gardner 1931:194. - Vervoort 1946: 328. - Pennycuik 1959: 187. - Millard 1968: 284. - Millard and Bouillon 1973: 94. - Millard 1975: 451: 94.

Lytocarpus phoenicea - Marktanner-Turneretscher 1890: 276. - Nutting 1927: 233. - Leloup 1930: 11.

Lytocarpus auritis - Bale 1913: 138.

Macrorhynchia phoenicia - Stechow 1921: 232. - Stechow 1923: 69. - Stechow 1925: 259. - Yamada 1959: 85. - Mammen 1965: 313. - Hirohito 1983: 80. - Ryland and Gibbons 1991: 555. - Hirohito 1995: 299. - Watson 1996: 79.

Records and material. NTM C12890, alcohol preserved material; NTM C13039, microslide, colony from Stn 136. NTM C12892, alcohol preserved material, colony from Stn 138. NTM C12891, alcohol preserved material, colony from Stn 7. NTM C13041, microslide, colony from Stn 156. NTM C13038, microslide, colony from Stn 137. Small unbranched colonies on *Eunice tubifex*; larger branched fertile colonies on calcareous bryozoans. MV F86935, alcohol preserved material, sparsely fertile colonies on *Eunice tubifex*, Plater Rock, coll: J. E. Watson, depth 12 m, 21/9/1999. **Other records.** Stns 127, 154. East Arm port site, many large colonies on rock and wharf structures, coll: J. E. Watson, depth 3-12 m, 20/9/1999.

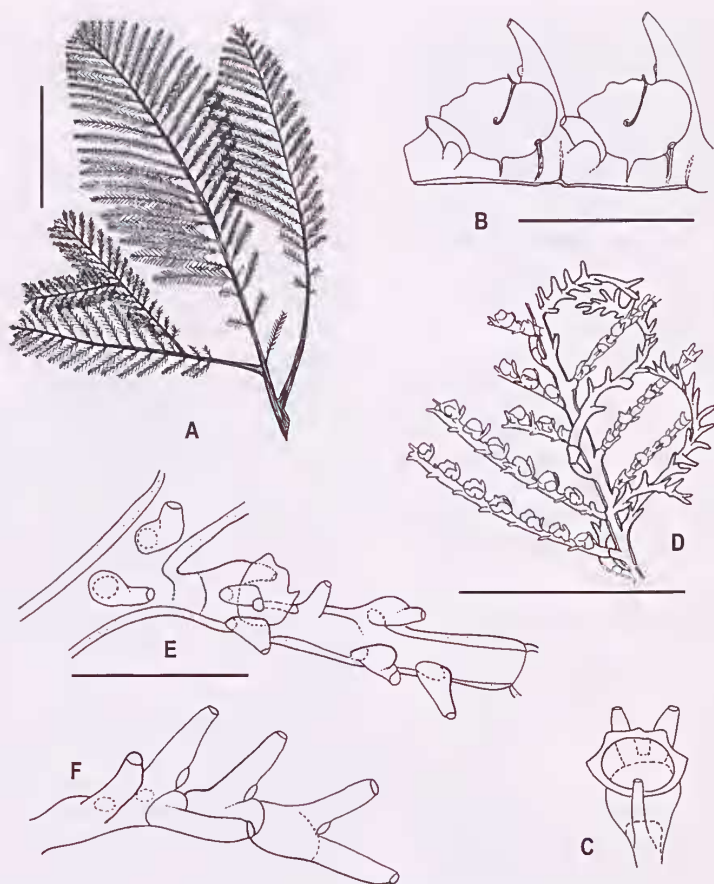


Fig. 54. *Macrorhynchia phoenicia*: A, branch from large colony from East Arm port, Darwin Harbour. B, hydrocladial internodes. C, hydrotheca, anterior view. D, phylactocarps on distal part of branch. E, proximal part of phylactocarp. F, distal part of phylactocarp. Scale bars: A, 10 mm, B, C, 300 μ m; D, 3,000 μ m; E, F, 500 μ m.

Description. Colonies comprising three or four main stems arising from a tubular hydrorhiza entwining substrate. Tallest stems 200 mm, heavily fascicled, parallel polysiphonic tubes passing almost to tips of branches; branching fan-wise, primary branches given off from posterior axillar tube, secondary and tertiary branching common in large colonies. Branch prosegment with a long, blade-shaped distal hinge joint, nodes thereafter transverse, obscure, more distinct in monosiphonic distal region, perisarc of polysiphonic tubes thick, thinning distally. Hydrocladia alternate to subalternate, short, close, inserted on a cylindrical apophysis on axillar tube of branch; nodes transverse, internode with two strong partial to complete intranodal septa, the strongest near base of hydrotheca, the next, partial, beneath mid-adcauline wall, and two, weak, below walls of lateral nematotheca.

Hydrotheca short, ventricose, basal adcauline wall convex, distal part fused to lateral nematotheca, abcauline wall strongly convex, a short part free below

mesial nematotheca; body of hydrotheca divided by a strong, narrow, partial septum passing down into hydrotheca from free abcauline wall.

Margin tilted away from internode, mesial abcauline cusp a small spine connecting with intrathecal septum; margin subcircular, strongly everted, a pair of blunt cusps in mid-lateral region, a smaller pair near base of lateral nematothecae, a single, minute adcauline cusp between lateral nematothecae.

Mesial nematotheca moderately long, erect, tubular, tapering, usually considerably overtopping hydrothecal margin; abcauline wall convex, terminal orifice small, circular, a secondary orifice above junction with hydrotheca; lateral nematotheca tubular, bent, narrowing to margin, overlapping hydrocladial node, terminal orifice small, circular, a large oval foramen connecting with hydrotheca. Two cauline nematothecae at base of hydrocladium, tubular, shorter than laterals, body twisted, orifice circular, proximal nematotheca pointing along hydrocladium, distal one facing along branch.

Phylactocarp replacing proximal hydrocladium on branch; rachis long, arching, proximal internode with normal hydrotheca, next internode long with an oblique distal node and three short nematothecae similar to caulines; succeeding internodes with two or three digitate nematothecae like mesials, terminal orifice circular, a secondary orifice at base and a small internal foramen connecting with internode.

Colour. Live colonies uniform golden brown to dark brown.

Measurements (μm).

Branch (monosiphonic region)		
distance between hydrocladia on same side	376	- 480
Hydrocladium		
length of internode	256	- 264
width at node	64	- 80
Hydrotheca		
depth, floor to margin	136	- 140
width at margin	128	- 132
Nematotheca		
length of mesial	200	- 220
width of terminal orifice	16	- 18
length of lateral	100	- 112
Phylactocarp		
maximum length, mature	1,400	-2,000
length of internode	140	- 156
length of abcauline wall of nematotheca	200	- 196

Remarks. The apical branches of larger colonies sometimes end in long, tangled tendrils. *Macrorhynchia phoenicia* is easily recognised by its bristly appearance, pinnate branching and uniformly brown colour. Short, immature colonies occur in habitat such as wharf structures and on *Eunice tubifex* while larger, presumably older, colonies occur in less disturbed habitat of natural reefs. It is very abundant in Darwin Harbour and probably more abundant in Beagle Gulf than suggested by the survey data.

Distribution. Tropical Indian Ocean, Indonesia, Japan (Millard 1975). Australian distribution: Torres Strait (Busk 1852), tropical Queensland (Pennycuik 1959).

Macrorhynchia ambigua sp. nov.

(Fig. 55A-G)

Records and material. Holotype, NTM C12960, alcohol preserved material, NTM C13080, NTM C13046, microslides from holotype; colony detached from substrate, Stn 154. Paratype, MV F86929, microslide, colony from wharf piles, Port of Darwin, on *Eunice tubifex*, coll: J. E. Watson, 5 m, 20/8/1998.

Description. Hydorrhiza a knot of tough stolons entwining substrate. Stems stiff, to 100 mm high, heavily fasciated, single stems branched irregularly alternate to subopposite, or stems may be branched fan-wise from hydorrhiza, secondary branching rare; polysiphonic tubes

of stem parallel, running along branches, but distal part of branches monosiphonic; nodes if present, transverse, prosegment ahydrocladate with a central row of nematothecae or oval foramen representing former sites of cauline nematothecae.

Hydrocladia frontal on axial tubes of stem and branches, short, alternate one per internode, inserted on apophysis with transverse to slightly oblique distal node and a reduced, central nematotheca. Hydrocladate internodes short, nodes transverse, indistinct, marked by a notch in perisarc; internode with two strong septa, one almost vertical below intrathecal septum, the other sloping distally from base of lateral nematotheca.

Hydrothecae not immersed in internode, ventricose, abcauline wall and proximal adcauline wall strongly convex, base flatter, posterior adcauline wall free of internode, a slightly oblique intrathecal septum passing almost halfway into hydrotheca from proximal intranodal septum. Margin inclined at an angle of 10 - 20° to internode with a prominent, blunt abcauline cusp passing downward into hydrotheca as a wide hatchet-shaped wedge; margin with a pair of low, central lobes, sometimes reduced to mere undulations, in frontal view, margin oval with smoothly everted rim, perisarc of margin very thin.

Mesial nematotheca reaching abcauline cusp, usually completely adnate, widening to orifice but with a short narrow neck seen only in frontal view. Lateral nematotheca on proximal hydrocladial internodes fairly short, lengthening a little distally along internode, tubular, reaching node but not reaching hydrothecal margin, orifice circular, connection with internode large. A cauline nematotheca at base of hydrocladial apophysis, small, like proximal hydrocladial laterals but with shorter orifice, facing upwards and outwards. Two large, tubular cauline nematothecae flanking hydrocladium, terminal orifice deeply excavated, a tumid mamelon with circular orifice between.

Phylactocarp replacing a branch hydrocladium, borne on a short apophysis, adcauline wall of basal internode with a reduced nematotheca; next internode long, upwardly curved below an unmodified hydrotheca, followed by a long internode with hydrotheca with twin lateral nematothecae and slightly reduced mesial nematotheca, a single long nematotheca similar to laterals above; phylactocarp thereafter directed upwards almost parallel to axis of branch, bearing up to eight internodes, nodes transverse, with two (sometimes one or three) opposite nematothecae. Nematothecae short, stubby, widest about middle, terminal orifice circular, a pore without collar at junction with internode. A single gonotheca borne frontally on a short pedicel on second hydrothecate internode, gonotheca large, lenticular, perisarc very thin and transparent, gonophore female, packed with small ova.

Colour. Live colonies brown, gonophore cream.



Fig. 55. *Macrorhynchia ambigua* sp. nov. A, holotype colony from Beagle Gulf. B, branch from larger paratype colony from wharf piles, Port of Darwin. C, part of stem with cauline nematothecae and hydrocladia. D, hydrocladial internodes. E, anterior view of hydrotheca. F, cauline nematotheca, frontal view with tumid mamelon on apophysis. G, phylactocarp with gonotheca. Scale bars: A, B, 50 mm; C, G, 500 µm; D - F, 300 µm.

Measurements (µm).

Branch (monosiphonic region)		
length of internode	200 - 272	
width at node	136 - 160	
length of apophysis, adcauline side	120 - 144	
Hydrocladium		
maximum length of hydrocladium	1,900 - 2,100	
length of internode	240 - 272	
width at node	72 - 80	
Hydrotheca		
length parallel to internode	216 - 240	
depth, floor to margin	172 - 180	
width at margin	132 - 140	
length of abcauline cusp	32 - 40	
Nematotheca		
length of mesial	192 - 212	
width of terminal orifice	20 - 30	
length of lateral	92 - 100	
Phylactocarp		
overall length, mature	1,760 - 1,850	

length of internode	140 - 160
width of node	72 - 100
length of abcauline wall	
of nematotheca	144 - 160
width of terminal orifice	44 - 48

Remarks. Some colonies show a tendency towards elongation of the mesial and lateral nematothecae along the hydrocladium; this may also be accompanied by slight exaggeration of the central (lateral) cusp on the hydrothecal margin in which case the hydrothecae show some resemblance to those of *Macrorhynchia philippina*. However, the reproductive structures, habit and colour of the colonies readily distinguish *M. ambigua* from *M. philippina*. In many respects *M. ambigua* also resembles *M. phoenicia*, and as the species share the same habitat, sterile colonies of *M. ambigua* can be easily mistaken for a variant of *M. phoenicia*; in fact it is likely that many so-called variants of *M. phoenicia* are actually *M. ambigua*. Reliable differences between the two species

are: 1) the intrathecal septum of *M. ambigua* is much wider in lateral view and more wedge-shaped than that of *M. phoenicia*, 2) the mesial nematotheca of *M. ambigua* is shorter than that of *M. phoenicia* and is completely adnate to the abcauline wall of the hydrotheca, 3) the mature phylactocarp differs significantly from that of *M. phoenicia* and 4) mature colonies of *M. ambigua* are much smaller and of paler brown colour than those of *M. phoenicia*.

The stems of *M. ambigua* are rather brittle, showing repeated regeneration after breakage above the hydrorhiza. It may be a sparingly fertile species, there being relatively few gonangia in the material examined. *M. ambigua* was found only on tubes *Eunice tubifex*. The bases of the stems are frequently overgrown by pale, soft sponge.

Etymology. Refers to the difficulty in distinguishing the species from *M. phoenicia*.

Macrorhynchia quadriarmata sp. nov.

(Fig 56A-G)

Record and material. Holotype, NTM C13043, microslide, fragment of branched, infertile colony on shellgrit from Stn 137. (No preserved material remaining).

Description. Hydrorhiza of a few fragmentary stolons. Colony 30 mm high, stem lightly fascicled, polysiphonic tubes running almost to broken tip of stem; prosegment long, lowest two branches broken off, a hinge joint overgrown by fasciculations above stump of proximal branch; six remaining branches regularly alternate, distant, directed upwards, perisarc firm; frontal tube of caulus hydrocladiate. Branches monosiphonic, borne on a long apophysis, distal node of apophysis transverse, followed by an athecate internode with a long blade-shaped distal joint, the two sections joined by a thin membrane, branch nodes thereafter transverse, narrow, obscure proximally, becoming more pronounced distally. Hydrocladia alternate, frontal on stem and branches, one, sometimes two on branch internode, inserted on a short apophysis with slender, acute distal node, hydrocladia bearing up to six hydrothecae, internodes rather long, nodes transverse, deeply constricted, base of internode curving from node below hydrotheca; two distinct, complete, almost vertical intranodal septa, one at proximal third of hydrotheca and one below lateral nematotheca.

Hydrotheca slipper-shaped, adcauline wall flat, bisected by an inclined, almost complete intrathecal septum connecting with intranodal septum, a small proximal foramen in base of wall usually obscured by tissue, abcauline wall convex to base of mesial nematotheca then recurving to margin, a deep pocket of perisarc behind margin. Margin almost parallel with internodal axis with a pair of broad, sometimes

proximally displaced lateral lobes; lobes everted, a small, blunt cusp between lateral nematothecae. Perisarc of hydrocladia and hydrothecae thin.

Mesial nematotheca erect, increasing in length distally along hydrocladium, proximal nematotheca on hydrocladium not reaching hydrothecal margin, distalmost nematotheca very long, thin, tubular, considerably overtopping hydrothecal margin, distal end swollen, terminal orifice of both forms small, circular, a large secondary orifice on a short neck above junction with hydrotheca. Lateral nematothecae bifid, superior nematotheca long, thin, tubular, sinuous, extending beyond hydrothecal margin, terminal orifice circular, inferior nematotheca tubular, much shorter and wider than superior, pointing obliquely downwards from internode; openings of both nematothecae to internode confluent through a small foramen.

Branch apophysis with one large cowl-shaped adcauline nematotheca, a similar nematotheca on succeeding athecate internode; orifice small, circular, facing downwards to internode, both nematothecae with a large foramen connecting with branch. A cauline nematotheca on branch at base of hydrocladium, large, like inferior lateral, pointing away from hydrocladium; nematothecae also present on axillar tube of stem above proximal hinge joint.

Pseudophylactocarps replacing first hydrocladium on lowest branches, rachis unbranched, first two or three internodes with normal hydrothecae followed by up to six internodes with long, tubular nematothecae similar to superior laterals, pointing obliquely forwards and outwards, terminal orifice circular, a secondary orifice just above base.

Colour. Honey brown.

Measurements (µm).

Stem		
width at base		168
distal width		152
distance between opposite hydrocladia	1,100	-1,560
Branch		
length of adcauline wall of apophysis	112	- 160
width of apophysis at node	88	- 104
length of abcauline wall athecate internode	320	- 440
Hydrocladium		
maximum length		1,400
length of apophysis	88	- 92
length of internode	224	- 248
width at node	28	- 32
Hydrotheca		
length of fixed adcauline wall	200	- 216
height, margin to base	128	- 160
width at margin	64	- 72
Mesial nematotheca		
free length	144	- 140

diameter of terminal orifice	12 - 16
width of secondary orifice	32 - 48
Nematotheca	
length of superior lateral	100 - 112
diameter of terminal orifice	12 - 16
length of inferior lateral	48 - 56
diameter of terminal orifice	16 - 20

Phylactocarp	
length of nematothecate internode	168 - 176
length of nematotheca	112 - 136

Remarks. Several features characterise *Macrorhynchia quadriarmata*: 1) the small size and graceful habit of the colony which is more like that of a plumulariid than an aglaopheniid hydroid, 2) the exceptionally long mesial nematothecae, 3) the bifid lateral nematothecae and 4) the long blade-shaped proximal hinge joint of the branch with thin connecting membrane.

Etymology. Named for the four lateral nematothecae on the hydrocladial internode.

Family Campanulariidae Johnston, 1837

Genus *Clytia* Lamouroux, 1812

***Clytia* ?*warreni* Stechow, 1919**

(Fig. 57A-C)

Clytia elongata Warren, 1908: 338 [*nomen nudum*].

Clytia warreni Stechow, 1919: 48. - Millard 1975: 221.

Record and material. NTM C12946, alcohol preserved material; NTM C13044, MV F86886, microslides, sparsely fertile colony on stem of *Pennaria disticha*, Stn 87.

Description. Hydrorhiza tubular, reptant on substrate. Hydrothecal pedicels variable in length, simple, perisarc smooth, hyaline, with up to eight proximal and eight distal close annulations, sometimes a few annulations mid-way along pedicel. Hydrothecae long, slender, sub-cylindrical, widening above diaphragm in proximal third and just below margin, diaphragm distinct. Hydrothecal perisarc thinning distally; margin with six to 10 long, obtuse cusps, a deep embayment between, cusps often inclined inwards.

Gonotheca long, obconical, borne on an annulated pedicel arising from the hydrorhiza, distal end truncate, orifice circular, closed by a sheet of tissue; perisarc of gonotheca thin and smooth.

Colour. Colourless.

Measurements (µm).

Hydrorhiza, diameter	48 - 56
Stem	
length	424 - 1,120
diameter	40 - 64
Hydrotheca	
length, base to apex of cusp	448 - 496
diameter at diaphragm	64
diameter below marginal cusps	136 - 224

height of cusp	32 - 60
distance between cusps	48 - 68
Gonotheca	
length, base to apex	420
maximum width	170

Remarks. Because of thinning of the marginal perisarc it is difficult to accurately count the number of cusps in the few undamaged hydrothecae in the sample. The hydrothecae are smaller than descriptions of *Clytia warreni*, the number of marginal cusps variable and the two immature gonothecae do not show the distal narrowing as reported for that species. The material is therefore referred with some doubt to *C. warreni*.

Distribution. This is the first record of *C. warreni* outside South Africa.

***Clytia linearis* (Thornely, 1900)**

(Fig.57D, E)

Obelia linearis Thornely, 1900: 453.

Campanularia gravieri Billard, 1904: 482. - Millard and Bouillon 1973: 51. - Millard 1975: 215.

Campanularia obliqua Clarke, 1907: 9.

Clytia linearis - Cornelius 1982: 84. - Gibbons and Ryland 1989: 404. - Calder 1991: 62. - Migotto 1996: 85.

Record and material. NTM C12945, alcohol preserved material; NTM C13045, MV F86887, microslides, small fertile colony on *Pennaria disticha*, Stn. 56.

Description. Hydrorhiza reptant on substrate. Single hydrothecae and erect stems to 10 mm given off irregularly from hydrorhiza; stems monosiphonic, subsympodially branched; stem and branch internodes long, smooth, nodes a series of annulations. Hydrotheca distal on internode, one, sometimes two on internode, pedicel short, annulated proximally and distally or completely throughout; hydrotheca slender, deeply campanulate, expanding smoothly to margin, diaphragm distinct, transverse, in empty hydrothecae marked by a ring of thorn-shaped desmocytes pointing into hydrotheca. Margin denticulate with 10 - 12 long, sharp cusps separated by deep embayments; perisarc thinning trough hydrotheca to become almost invisible at margin. Hydranth with 14 - 16 tentacles.

Gonotheca borne on an annulated pedicel in fork of stem beside a hydrothecal pedicel; gonotheca long, obconical, distally truncate, perisarc thin, enclosing up to eight developing medusae, distal end of gonotheca closed by a thin sheet of tissue; mature medusa (at point of release) with 14 tentacles and inverted exumbrella.

Colour. White.

Measurements (µm).

Stem	
diameter at base of erect stem	84 - 88
length of stem internode	520 - 672

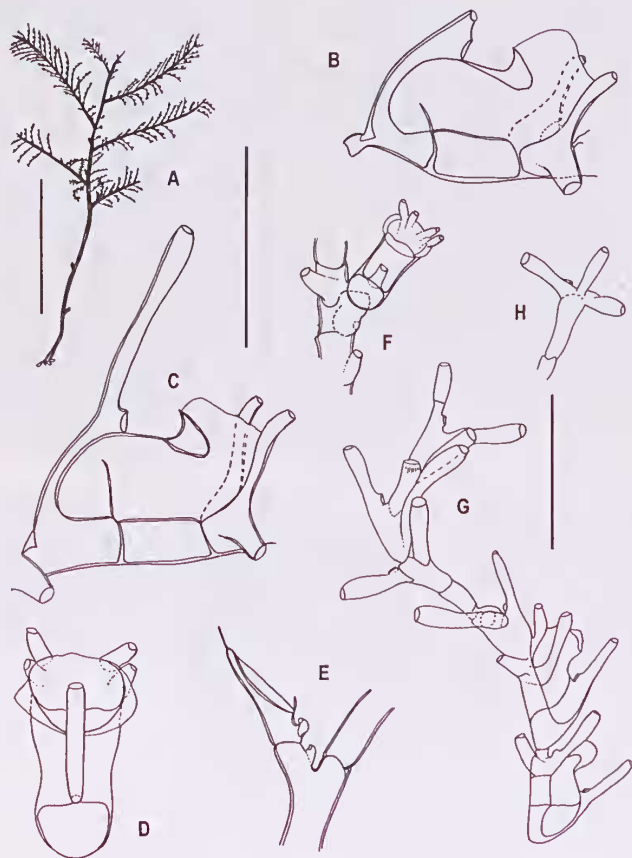


Fig. 56. *Macrorhynchia quadriarmata* sp. nov. A, holotype colony from Beagle Gulf. B, hydrotheca with truncated mesial nematotheca. C, hydrotheca with elongate mesial nematotheca. D, anterior view of hydrotheca. E, apophysis of stem with proximal hydrocladial internode and oblique hinge joint. F, cauline nematothecae. G, phylactocarp. H, distal end of phylactocarp with three nematothecae. Scale bars: A, 10 mm, B, C, D, 200 μ m; E - H, 300 μ m.

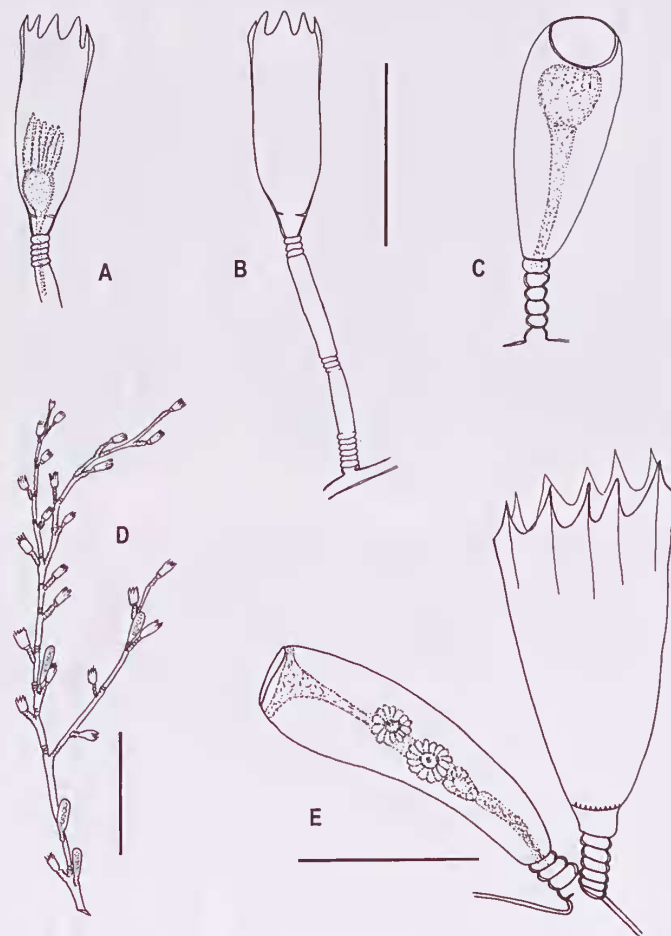


Fig. 57. A-C, *Clytia warreni*: A, B, hydrothecae from colony from Beagle Gulf. C, gonotheca from same colony. D, E, *Clytia linearis*: D, colony from Beagle Gulf. E, hydrotheca and gonotheca from same colony. Scale bars: A - C, E, 300 μ m; D, 1,000 μ m.

length of hydrothecal pedicel	200 - 880
diameter annulated hydrothecal pedicel	48 - 64
Hydrotheca	
length, diaphragm to margin	624
diameter at diaphragm	72 - 100
diameter at margin	336
Gonotheca	
length, excluding pedicel	488 - 640
distal diameter	120 - 200

Remarks. The specimens agree with dimensions of *C. linearis* given by Gibbons and Ryland (1989) and Migotto (1996). The perisarc is so frail that most hydrothecae collapse in mountant. The slight narrowing behind the distal end of the gonotheca shown by some authors (e.g. Gibbons and Ryland 1989, Migotto 1996) is not evident in the present material. There is a remarkable range in size of hydrothecae and if intergradations were not present on the same stem the extremes in size could be easily mistaken for two different species. The figured hydrotheca (Fig. 57E) was one of the largest found on the colonics.

Distribution. Tropical to warm temperate oceans and Fiji (Gibbons and Ryland 1989), Brazil (Migotto 1996). Not previously recorded from Australia.

Clytia sp. 1

Record and material. Infertile colony on aglaopheniid hydroid, Stn. 61.

Remarks. The few remaining hydrothecae are too badly crushed for identification.

Clytia sp. 2

Record and material. Infertile colony on bryozoan, Stn. 38.

Remarks. Stems simple, unbranched, annulated proximally and distally but the few remaining campanulate hydrothecae are crushed beyond recognition.

ACKNOWLEDGMENTS

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Appendix 1. Taxonomic index of leptotheccate hydroids from the Beagle Gulf

- Aglaophenia* 57
 AGLAOPHENIIDAE 57
alata sp. nov., *Salacia* 26
ambigua sp. nov., *Macrorhynchia* 70
amirantensis, *Lafoeina* 5
angulosa, *Lytocarpia* 64
Autemella 45
Anthohebella 7

badia, *Plumularia* 51
bedoti, *Plumularia* 54
bidentata sp. nov., *Salacia* 26
bilamellata sp. nov., *Dynamena* 15

 CAMPANULARIIDAE 73
 CAMPANULINIDAE 5
campylocarpum, *Synthecium* 40
Clytia 73
Clytia sp. 1 75
Clytia sp. 2 75
cornuta, *Polyplumaria* 56
costata, *Hebellopsis* 6
cylindrica, *Nemertesia* 49

darwinensis sp. nov., *Anthohebella* 8
decipiens, *Sertularella* 27
delicatula, *Aglaophenia* 57
diaphana, *Sertularella* 31
dichotomum, *Hydrodendron* 10
digitalis, *Diphasia* 14
Diphasia 12
Dynamena 15
dysymmetricum, *Halecium* 9

Filellum 5
flavidula sp. nov., *Salacia* 24
flexuosa, *Monothecca* 48
fruticosus, *Thyroscyphus* 38

Gymnangium 58

 HALECIIIDAE 9
Halecium 9
 HALOPTERIDAE 45
Halopteris 46
Hebella 7
Hebellopsis 6
hexodon, *Salacia* 21
hians, *Gymnangium* 58
Hydrodendron 10

Idiellana 19
irregularis, *Kirchenpaueria* 57

Kirchenpaueria 57
Kirchenpaueriidae 57

 LAFOEIDAE 5
Lafoeina 5
?laterocaudata, *Hebella* 7
lepida sp. nov., *Idiellana* 20

linearis, *Clytia* 73
longicorne, *Gymnangium* 60
Lytocarpia 64

macrocytharus, *Thyroscyphus* 37
Macrorhynchia 67
mertoni, *Dynamena* 16
Monothecca 48
mutulata, *Diphasia* 12

Nemertesia 49

operculata sp. nov., *Thuiaria* 35
orthogonium, *Synthecium* 41

parasitica, *Anthohebella* 8
panulum, *Synthecium* 43
philippina, *Macrorhynchia* 67
phoenicia, *Macrorhynchia* 68
phyteuma, *Lytocarpia* 65
pinnata, *Sertularella* 32
plagiocampa, *Halopteris* 47
Plumularia 51
 PLUMULARIIDAE 48
plumularioides sp. nov., *Thuiaria* 36
polymorpha, *Halopteris* 46
Polyplumaria 56
pristis, *Idiellana* 19

quadriarmata sp. nov., *Macrorhynchia* 72
quadridens, *Sertularella* 28
quadridentata, *Dynamena* 15

Salacia 21
scabra, *Plumularia* 52
scandens, *Hebellopsis* 6
secundaria, *Antennella* 45
?serratum, *Filellum* 5
Sertularella 27
Sertularia 33
 SERTULARIIDAE 12
setacea, *Plumularia* 53
sinuosa, *Salacia* 22
spatulum sp. nov., *Halecium* 10
 SYNTHECIIIDAE 39
Synthecium 39

tetracythara, *Salacia* 23
Thuiaria 35
Thyroscyphus 37
torresii, *Thyroscyphus* 37
Tridentata 18
Tridentata sp. 18
trigonostoma, *Sertularia* 33
tubacarpa sp. nov., *Plumularia* 55

undulatum sp. nov., *Gymnangium* 62
unjinense sp. nov., *Gymnangium* 62

?warreni, *Clytia* 73