

Plumularian hydroids (Cnidaria: Hydrozoa) from the Strait of Gibraltar and nearby areas

M.D. Medel & W. Vervoort

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Key words: Cnidaria; Hydrozoa; Hydroida; Plumularioidea; Strait of Gibraltar; relationships.

Twenty-four species of plumularian hydroids (Cnidaria: Hydrozoa) from the Strait of Gibraltar area are described and figured, including material from the coasts of southern Spain (between El Portil near the Spanish-Portuguese border and Adra, Mediterranean coast of Granada, c. 3°W) and from Ceuta in northern Africa. The geographical distribution of all species is briefly discussed and where relevant additional notes are added.

Contents

Introduction	4
List of localities and species collected	5
Taxonomic review	7
Superfamily Plumularioidea Hincks, 1868	7
Family Aglaopheniidae Broch, 1918	7
Genus <i>Aglaophenia</i> Lamouroux, 1812	7
<i>Aglaophenia acacia</i> Allman, 1883	7
<i>Aglaophenia kirchenpaueri</i> (Heller, 1868)	9
<i>Aglaophenia octodonta</i> (Heller, 1868)	11
<i>Aglaophenia parvula</i> Bale, 1882	13
<i>Aglaophenia picardi</i> Svoboda, 1979	15
<i>Aglaophenia pluma</i> (Linnaeus, 1758)	17
<i>Aglaophenia tubiformis</i> Marktanner-Turneretscher, 1890	20
<i>Aglaophenia tubulifera</i> (Hincks, 1861)	22
Genus <i>Streptocaulus</i> Allman, 1883	24
<i>Streptocaulus dollfusi</i> (Billard, 1924)	24
Genus <i>Gymnangium</i> Hincks, 1874	28
<i>Gymnangium montagui</i> (Billard, 1912)	28
Genus <i>Lytocarpia</i> Kirchenpauer, 1872	30
<i>Lytocarpia myriophyllum</i> (Linnaeus, 1758)	30
Family Halopterididae Millard, 1962	32
Genus <i>Antennella</i> Allman, 1877	32
<i>Antennella siliquosa</i> (Hincks, 1877)	32
<i>Antennella secundaria</i> (Gmelin, 1791)	35
Genus <i>Halopteris</i> Allman, 1877	37

<i>Halopteris diaphana</i> (Heller, 1868)	37
<i>Halopteris liechtensterni</i> (Marktanner-Turneretscher, 1890)	39
Family Kirchenpaueriidae Millard, 1962	41
Genus <i>Kirchenpaueria</i> Jickeli, 1883	41
<i>Kirchenpaueria pinnata</i> (Linnaeus, 1758)	41
Genus <i>Ventromma</i> Stechow, 1923	45
<i>Ventromma halecioides</i> (Alder, 1859)	45
Family Plumulariidae Hincks, 1868	48
Genus <i>Nemertesia</i> Lamouroux, 1812	48
<i>Nemertesia ramosa</i> (Lamarck, 1816)	48
<i>Nemertesia antennina</i> (Linnaeus, 1758)	50
<i>Nemertesia irregularis</i> (Quelch, 1885)	52
Genus <i>Plumularia</i> Lamarck, 1816	56
<i>Plumularia setacea</i> (Linnaeus, 1758)	56
Genus <i>Monothecha</i> Nutting, 1900	58
<i>Monothecha pulchella</i> (Bale, 1882)	58
Genus <i>Polyplumaria</i> G.O. Sars, 1874	61
<i>Polyplumaria flabellata</i> G.O. Sars, 1874	61
Genus <i>Pseudoplumaria</i> Ramil & Vervoort, 1992	63
<i>Pseudoplumaria marocana</i> (Billard, 1930)	63

Introduction

This study of the plumularian hydroids (families Aglaopheniidae, Halopteridae, Kirchenpaueriidae and Plumulariidae) from the Strait of Gibraltar is part of a taxonomic investigation of the hydroid fauna of that area that has been carried out over the last years. Though Ramil & Vervoort (1992) studied the deeper water hydroid fauna of both entrances to the Strait of Gibraltar, the more superficial waters bordering the coastal area from that geographically most interesting zone are still largely unstudied as far as the hydroid fauna is concerned. For the present study material has been obtained from the coastal area of southern Spain between El Portil near the Spanish-Portuguese border and Adra, Mediterranean coast of Granada, c. 3°W; additional material from the coastal region of Ceuta in North Africa has been included.

Collecting of the material has mainly been done by SCUBA diving (0-40 meters depth). Additional material resulted from oceanographic cruises carried out during the "Fauna I" expeditions of the project "Fauna Iberica" (Iberian Fauna), PB87-0397. This material originates from deeper waters, down to 1250 m depth.

The material described has been deposited in the collections of the 'Laboratorio de Biología Marina (Zoología)' of the University of Sevilla, Spain. A representative collection has been placed in the collections of the National Museum of Natural History (Nationaal Natuurhistorisch Museum, formerly Rijksmuseum van Natuurlijke Historie), Leiden, the Netherlands; this material is indicated by the registration number (RMNH Coel. and slide numbers).

In the descriptions 'thecate' means 'provided with a hydrotheca' or 'hydrothecate'; 'athecate' indicates a condition without hydrotheca, or 'ahydrothecate'.

List of the localities and species collected

Station/locality	coordinates	depth
Coastal stations		
C1. El Portil	37°12.40'N 07°07.50'W	0-1 m
<i>Aglaophenia pluma</i> (Linnaeus, 1758); <i>Halopteris diaphana</i> (Heller, 1868); <i>Kirchenpaueria pinnata</i> (Linnaeus, 1758); <i>Ventromma halecioides</i> (Alder, 1859).		
C2. Santa María del Mar	36°11.00'N 06°02.00'W	0-2 m
<i>Aglaophenia octodonta</i> (Heller, 1868); <i>Kirchenpaueria pinnata</i> (Linnaeus, 1758); <i>Plumularia setacea</i> (Linnaeus, 1758); <i>Monothecha pulchella</i> (Bale, 1882).		
C3. El Chato	36°31.00'N 06°16.00'W	0-1 m
<i>Kirchenpaueria pinnata</i> (Linnaeus, 1758)		
C4. Cabo Roche	36°17.60'N 06°08.00'W	0 m
<i>Aglaophenia octodonta</i> (Heller, 1868); <i>A. pluma</i> (Linnaeus, 1758); <i>Gymnangium montagui</i> (Billard, 1912); <i>Kirchenpaueria pinnata</i> (Linnaeus, 1758).		
C5. Caños de Meca	36°11.00'N 06°01.00'W	0 m
<i>Aglaophenia octodonta</i> (Heller, 1868); <i>A. parvula</i> (Bale, 1882); <i>Kirchenpaueria pinnata</i> (Linnaeus, 1758); <i>Plumularia setacea</i> (Linnaeus, 1758); <i>Monothecha pulchella</i> (Bale, 1882).		
C6. Torre de la Plata	36°05.50'N 05°50.00'W	2-10 m
<i>Aglaophenia picardi</i> Svoboda, 1979.		
C7. Isla de Tarifa	36°48.00'N 05°36.00'W	0-45 m
<i>Aglaophenia kirchenpaueri</i> (Heller, 1868); <i>A. octodonta</i> (Heller, 1868); <i>A. pluma</i> (Linnaeus, 1758); <i>Gymnangium montagui</i> (Billard, 1912); <i>Antennella siliquosa</i> (Hincks, 1877); <i>A. secundaria</i> (Gmelin, 1791); <i>Halopteris diaphana</i> (Heller, 1868); <i>Kirchenpaueria pinnata</i> (Linnaeus, 1758); <i>H. liechtensterni</i> (Marktanner-Turneretscher, 1890); <i>Plumularia setacea</i> (Linnaeus, 1758).		
C8. Punta Paloma	36°04.00'N 05°44.00'W	8 m
<i>Aglaophenia kirchenpaueri</i> (Heller, 1868).		
C9. Punta Carnero	36°04.36'N 05°25.36'W	0-25 m
<i>Aglaophenia kirchenpaueri</i> (Heller, 1868); <i>Antennella secundaria</i> (Gmelin, 1791).		
C10. La Ballenera-Getares(C)	36°04.54'N 05°25.36'W	3-15 m
<i>Aglaophenia kirchenpaueri</i> (Heller, 1868); <i>A. pluma</i> (Linnaeus, 1758).		
C11. San García	36°06.35'N 05°25.36'W	5-28 m
<i>Aglaophenia kirchenpaueri</i> (Heller, 1868); <i>A. pluma</i> (Linnaeus, 1758); <i>Gymnangium montagui</i> (Billard, 1912); <i>Antennella siliquosa</i> (Hincks, 1877); <i>A. secundaria</i> (Gmelin, 1791); <i>Halopteris liechtensterni</i> (Marktanner-Turneretscher, 1890); <i>Nemertesia ramosa</i> (Lamarck, 1816); <i>N. antennina</i> (Linnaeus, 1758); <i>Pseudoplumaria marocana</i> (Billard, 1930).		
C12. El Saladillo	36°07.26'N 05°25.75'W	5 m
<i>Aglaophenia kirchenpaueri</i> (Heller, 1868); <i>A. pluma</i> (Linnaeus, 1758).		
C13. Térmica	36°10.50'N 05°25.00'W	9-30 m
<i>Aglaophenia pluma</i> (Linnaeus, 1758); <i>Nemertesia irregularis</i> (Quelch, 1885).		
C14. C.E.P.S.A.	36°10.60'N 05°25.80'W	12-25 m
<i>Kirchenpaueria pinnata</i> (Linnaeus, 1758).		
C15. Crinavis	36°10.10'N 05°23.70'W	5-35 m
<i>Aglaophenia acacia</i> Allman, 1883; <i>A. pluma</i> (Linnaeus, 1758); <i>Plumularia setacea</i> (Linnaeus, 1758)		
C16. San Felipe	36°09.45'W 05°21.48'W	2-9 m
<i>Aglaophenia picardi</i> (Svoboda, 1979); <i>A. pluma</i> (Linnaeus, 1758); <i>Kirchenpaueria pinnata</i> (Linnaeus, 1758).		
C17. Puerto de Gibraltar	36°08.90'N 05°21.60'W	18-28 m
<i>Aglaophenia kirchenpaueri</i> (Heller, 1868).		
C18. La Atunara	36°10.54'N 05°20.00'W	40 m
<i>Halopteris liechtensterni</i> (Marktanner-Turneretscher, 1890).		
C19. Torre Carbonera	36°14.60'N 05°17.00'W	6 m
<i>Aglaophenia pluma</i> (Linnaeus, 1758).		

C20.	La Hacienda	36°14.30'N 05°18.60'W	2-3 m
	<i>Aglaophenia octodonta</i> (Heller, 1868); <i>A. pluma</i> (Linnaeus, 1758); <i>Halopteris diaphana</i> (Heller, 1868); <i>Plumularia setacea</i> (Linnaeus, 1758).		
C21.	La Herradura	36°43.90'N 03°43.70'W	14 m
	<i>Aglaophenia tubiformis</i> Marktanner-Turneretscher, 1890		
C22*.	Punta Almina	35°54.00'N 05°16.20'W	20-25 m
	<i>Aglaophenia kirchenpaueri</i> (Heller, 1868); <i>A. pluma</i> (Linnaeus, 1758); <i>A. tubulifera</i> (Hincks, 1861); <i>Gymnangium montagui</i> (Billard, 1912); <i>Antennella siliquosa</i> (Hincks, 1877); <i>A. secundaria</i> (Gmelin, 1791); <i>Halopteris liechtensterni</i> (Marktanner-Turneretscher, 1890).		
C24*.	Punta Sudiño	35°54.35'N 05°17.95'W	38 m
	<i>Aglaophenia kirchenpaueri</i> (Heller, 1868); <i>Antennella siliquosa</i> (Hincks, 1877); <i>A. secundaria</i> (Gmelin, 1791).		
C25*.	Aguja del Campo	35°54.20'N 05°19.65'W	20 m
	<i>Aglaophenia tubiformis</i> Marktanner-Turneretscher, 1890; <i>Halopteris liechtensterni</i> (Marktanner-Turneretscher, 1890); <i>Kirchenpaueria pinnata</i> (Linnaeus, 1758).		
C26*.	Punta del Desnarigado	35°53.50'N 05°16.20'W	10 m
	<i>Antennella siliquosa</i> (Hincks, 1877); <i>A. secundaria</i> (Gmelin, 1791).		
C27*.	El Pineo	35°52.81'N 05°19.65'W	8-12 m
	<i>Aglaophenia tubiformis</i> Marktanner-Turneretscher, 1890		
C28*.	Benzú	35°55.10'N 05°23.25'W	25 m
	<i>Aglaophenia kirchenpaueri</i> (Heller, 1868); <i>A. pluma</i> (Linnaeus, 1758); <i>A. tubiformis</i> Marktanner-Turneretscher, 1890; <i>Antennella siliquosa</i> (Hincks, 1877); <i>A. secundaria</i> (Gmelin, 1791).		
C29.	Punta Europa	36°06.00'N 05°21.00'W	5-18 m
	<i>Kirchenpaueria pinnata</i> (Linnaeus, 1758); <i>Plumularia setacea</i> (Linnaeus, 1758)		
C30.	Isla Cristina	37°11.86'N 07°11.16'W	8-12 m
	<i>Aglaophenia pluma</i> (Linnaeus, 1758)		

Campaign FAUNA I

F1.	Golfo de Huelva	36°51.62'N 07°10.27'W	190 m
	<i>Nemertesia antennina</i> (Linnaeus, 1758).		
F4.	Málaga	36°40.34'N 04°11.55'W	60 m
	<i>Streptocaulus dollfusi</i> (Billard, 1924).		
F5.	Vélez Málaga	36°41.93'N 04°04.88'W	67-68 m
	<i>Nemertesia irregularis</i> (Quelch, 1885).		
F8.	La Herradura (Granada)	36°41.06'N 03°48.36'W	238-291 m
	<i>Nemertesia irregularis</i> (Quelch, 1885).		
F13.	Cabo Sagra	36°40.89'N 03°22.59'W	62 m
	<i>Aglaophenia tubulifera</i> (Hincks, 1861); <i>Nemertesia ramosa</i> (Lamarck, 1816).		
F38.	opposite Estepona	36°18.25'N 05°13.25'W	60-62 m
	<i>Nemertesia irregularis</i> (Quelch, 1885).		
F57.	Trafalgar	36°04.84'N 06°01.00'W	76-80 m
	<i>Lytocarpia myriophyllum</i> (Linnaeus, 1758); <i>Nemertesia ramosa</i> (Lamarck, 1816).		
F58.	Trafalgar	36°08.60'N 06°01.20'W	33-34 m
	<i>Nemertesia ramosa</i> (Lamarck, 1816).		
F63.	Trafalgar-Tarifa	36°03.13'N 05°50.58'W	97-118 m
	<i>Lytocarpia myriophyllum</i> (Linnaeus, 1758); <i>Polyplumaria flabellata</i> G.O. Sars, 1874		

Campaign AR.SA.'92

A6.	opposite Chiclana	36°19.70'N 06°29.90'W	84 m
	<i>Streptocaulus dollfusi</i> (Billard, 1924)		
A13.	Golfo de Cádiz	36°58.50'N 08°00.00'W	84 m
	<i>Nemertesia ramosa</i> (Lamarck, 1816)		

[N.B.: Localities in North Africa are marked by asterisk*]

Taxonomic review

Superfamily Plumularioidea Hincks, 1868

Family Aglaopheniidae Broch, 1918

Genus *Aglaophenia* Lamouroux, 1812*Aglaophenia acacia* Allman, 1883

(fig. 1)

Aglaophenia acacia Allman, 1883: 38, pl. 12 figs 1-4; Svoboda, 1979: 79-82, figs 12d, 13d, 14b, 15d(1-5), 16d; Svoboda & Cornelius, 1991: 14-16, figs 1, 17a-b, 20a-b, 21a-b.

Aglaophenia elongata; Van Gernerden-Hoogeveen, 1965: 79-80, fig. 44.

Material.— C15: (21.i.1989), numerous hydrocauli with corbulae (RMNH Coel. no. 27144, three slides no. 2562).

Measurements (in mm)

Maximum height of hydrocaulus	146
Internodes of hydrocaulus, length	0.649-0.807
idem, diameter	0.157-0.342
Hydrocladial internodes, length	0.412-0.526
idem, diameter	0.070-0.096
Hydrotheca, length	0.324-0.403
idem, diameter at rim	0.149-0.245
Length free part adcauline hydrothecal wall	0.131-0.192
Corbula, number of ribs	6-8
idem, length	2.00-3.55
idem, diameter	0.925-1.295

Description.— Colony yellowish, composed of monosiphonic hydrocauli, bearing alternately arranged hydrocladia, each hydrocaulus with a basal athecate zone followed by a prosegment, separated by oblique nodes as are also present between remaining internodes forming the axis: those internodes bearing three nematothecae and an abortive hydrotheca. Some of the internodes bear ramifications, normally there are two at about the same level of the internode, directed left and right and forming an acute angle with main axis that is slightly curved backwards (fig. 1a, b). Secondary hydrocauli with some of the basal internodes without hydrocladia, but with cormidia almost similar to those of the hydrocladia; however, the median nematotheca is placed on the lower part of the internode, without contact with the abcauline hydrothecal wall. Basalmost cormidium with two median nematothecae, one basal, one in contact with the abcauline hydrothecal wall. Hydrocladia inserting on latero-distal apophyses of axial internodes and alternately turned left or right, each broken up into internodes (cormidia) separated by straight nodes; perisarc transparent, coenosarc colourless. Hydrocladial cormidia each with slightly elongated hydrotheca; hydrothecal rim with nine rounded, shallow cusps and a moderately developed adcauline septum in basal third of hydrothecal interior (fig. 1c). Median nematotheca short, reaching half length of hydrothecal abcauline wall; free part c. one-third of total nematothecal length, opening gutter-shaped. Lateral nematothecae

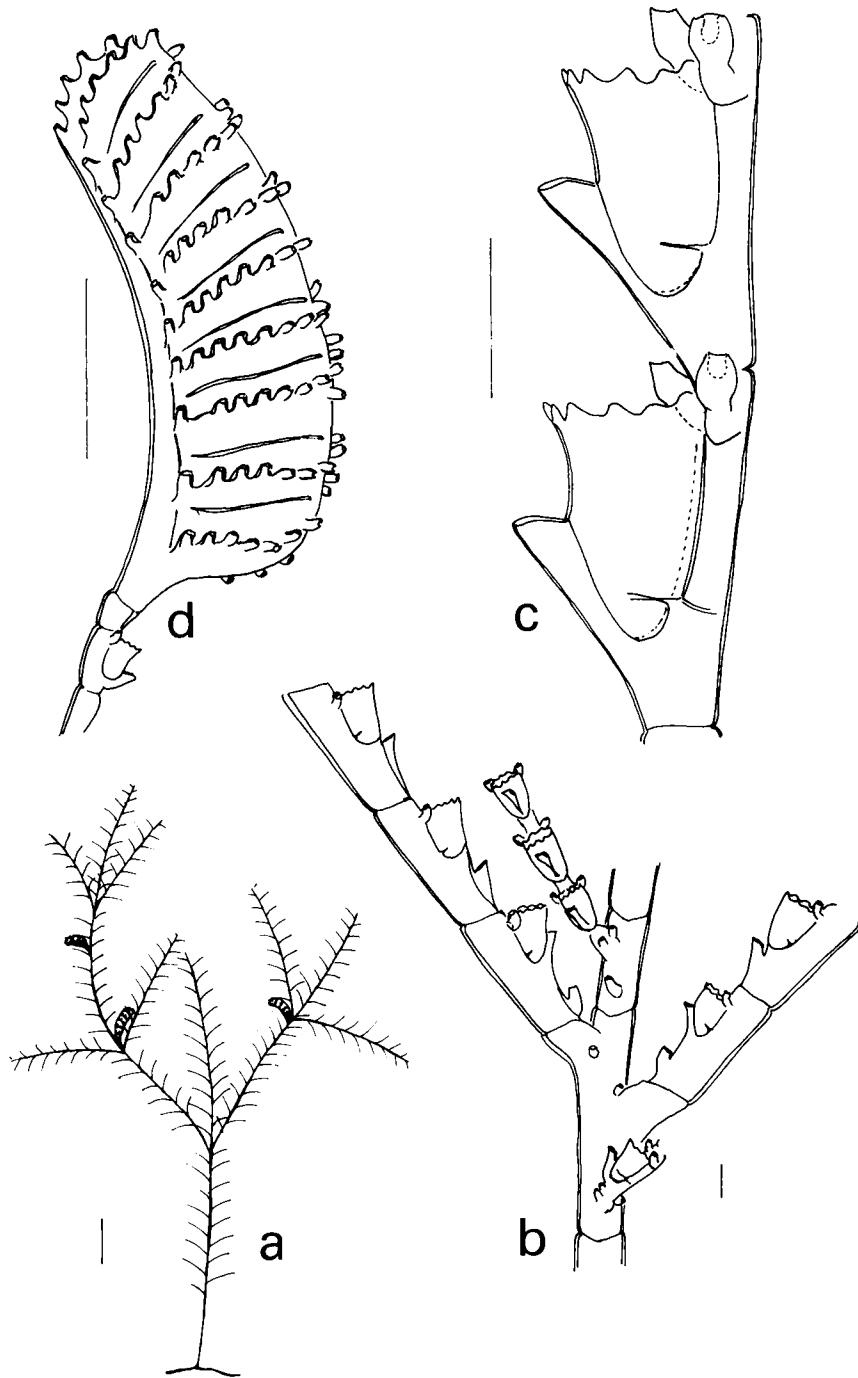


Fig. 1. *Aglaophenia acacia* Allman, 1883. a, colony; b, point of branching of main axis; c, two cormidia; d, (male) corbula. Scales: a, 1 cm; b, 0.5 mm; c, 0.15 mm; d, 1 mm.

surpassing hydrothecal rim, slightly swollen; rim with deep adcauline sinuosity.

Male corbulae only have been found. Costae completely fused; no free costae have been observed (fig. 1d).

Substratum.— Material referred to above found detached. According to Svoboda & Cornelius (1991) to be found on rocky substratum.

Distribution.— Tropical Atlantic (Boero & Bouillon, 1993). Distributed in the northern Atlantic from the coasts of the United States (North Carolina, Tortugas, Florida, Caribbean) (Svoboda & Cornelius, 1991) to the Canary Islands, the Azores and the coasts of Great Britain and Ireland. Also observed in the Mediterranean. Depth range 12-822 m (Svoboda & Cornelius, 1991).

Aglaophenia kirchenpaueri (Heller, 1868)
(fig. 2)

Plumularia Kirchenpaueri Heller, 1860: 40, 82, pl. 2 fig. 4.

Aglaophenia kirchenpaueri; Marktanner-Turneretscher, 1890: 263, pl. 7 figs 9, 22; Svoboda, 1979: 87-90, figs 12g, 13g, 14c, 15g(1-2), 16g, pl. 5 fig. f; Svoboda & Cornelius, 1991: 20-22, figs 4, 17c-d, 20d, 21c-d.

Aglaophenia septifera Broch, 1912: 66; Broch, 1913: 6-7, fig. 8.

Material.— C7: (9.vii.1990), 14 m, two colonies with corbulae; (10.vii.1990), 25 m, one colony without corbulae; (10.ix.1990), 25 m, ten colonies with corbulae.— C8: (20.viii.1991), 8 m, two colonies with corbulae.— C9: (19.viii.1991), 0-25 m, five colonies without corbulae.— C10: (26.vii.1990), 1-3 m, several colonies.— C11: (14.vii.1991), 3-5 m, nine colonies with corbulae; (30.vii.1991), 3 m, 40 colonies with corbulae (RMNH Coel. no. 27155, slide no. 2563); (29.x.1944), 6-9 m, many colonies with corbulae.— C12: (20.vii.1993), 5 m, six colonies with corbulae.— C17: (14.vii.1993), 10-18 m, several colonies with corbulae.— C22: (14.v.1986), 25 m, two colonies with corbulae; (13.v.1986), 35 m, one colony with corbulae.— C24: (6.v.1986), 38 m, four colonies with corbulae.— C28: (10.v.1986), 20 m, four colonies with corbulae.

Measurements (in mm)

Maximum height of hydrocaulus	57
Internodes of hydrocaulus, length	0.18-0.46
idem, diameter	0.10-0.27
Hydrocladial internodes, length	0.31-0.40
idem, diameter	0.11-0.14
Hydrotheca, length	0.28-0.39
idem, diameter at rim	0.21-0.29
idem, length free part adcauline wall	0.08-0.18
Corbula, number of ribs	5-11
idem, length	1.71-3.96
idem, diameter	0.93-1.40

Description.— Hydorrhiza reticulate, giving rise to monosiphonic, yellowish, unbranched hydrocauli. Basal part of axis athecate, followed by up to three prosegments, separated by oblique nodes and provided each with a frontal nematotheca. Rest of axis composed of hydrocladia bearing internodes, separated by oblique nodes and each bearing a latero-distal apophysis, three nematothecae, of which one median and two latero-distal, and an abortive hydrotheca or pseudonematotheca. Hydrocladia, inserting on apophyses, alternately turned left and right (fig. 2a).

Hydrocladia also yellowish, broken up into cormidia by means of transverse

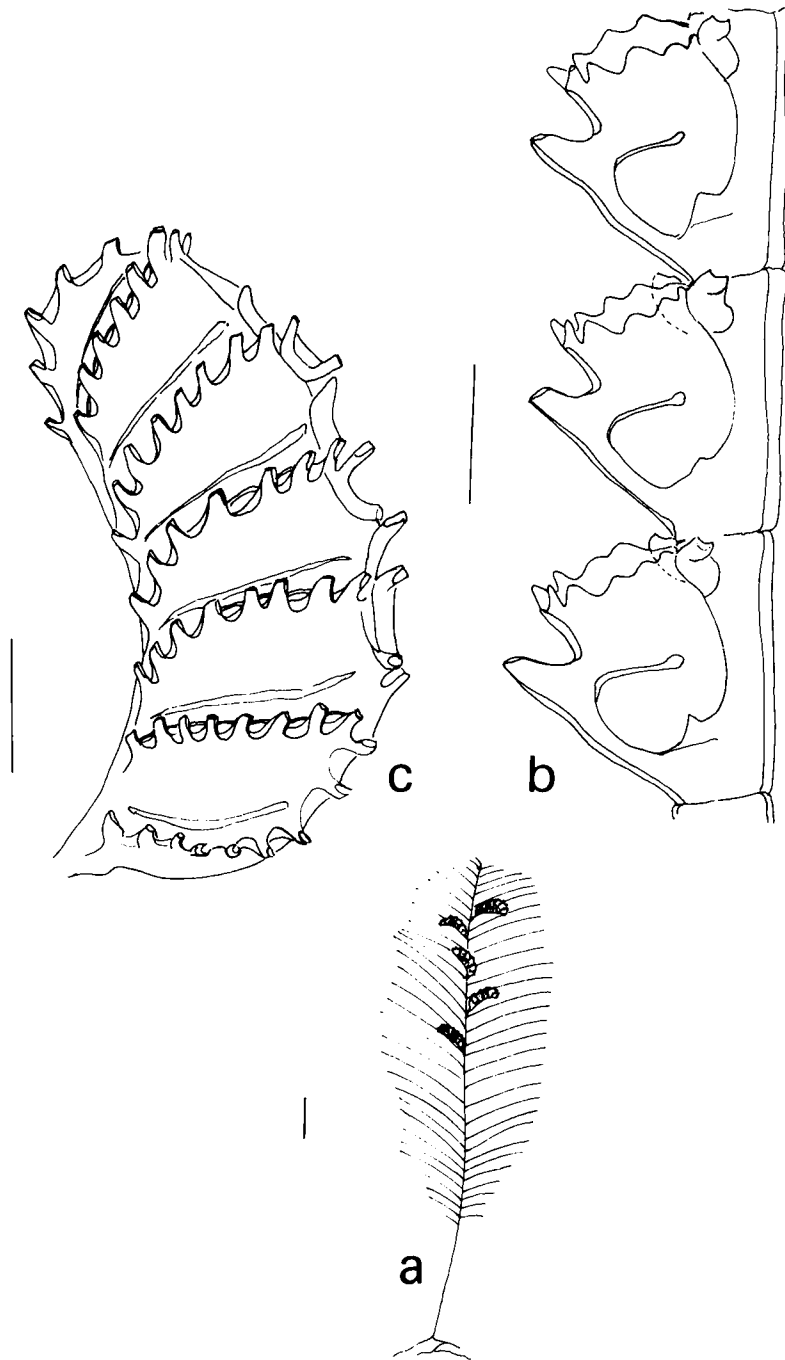


Fig. 2. *Aglaophenia kirchenpaueri* (Heller, 1868). a, colony; b, three cormidia; c, (male) corbula. Scales: a, 1 cm; b, 0.2 mm; c, 0.5 mm.

nodes, each with one hydrotheca and three nematothecae: one median, two lateral. Hydrotheca fairly shallow, with big abcauline septum almost transversing interior of hydrotheca; adcauline wall curved (fig. 2b). Hydrothecal rim with nine cusps, of which median is the largest. First pair on both sides distinct, remaining marginal cusps grading towards axis of cormidium. Median nematotheca not surpassing hydrothecal rim, adnate for about two-thirds of its length, opening gutter-shaped. Lateral nematothecae projecting slightly above hydrothecal rim; distal portion curved backwards, with gutter-shaped aperture.

Both male and female corbulae have been observed. Male corbulae partly open and without free costae (fig. 2c); female corbulae usually closed and with free costa.

Substratum.— Found associated with algae and on hard substrata like *Balanus*, Bryozoa and stones. Also found on Gorgonaria and calcareous algae (Svoboda & Cornelius, 1991).

Distribution.— Mediterranean and Lusitanian species (Ramil & Vervoort, 1992a). Recorded from the British coasts, Morocco, Cape Verde Islands and the Adriatic Sea (Patriiti, 1970; Svoboda & Cornelius, 1991). Frequent in the littoral zone. Maximum depth record 373 m (Ramil & Vervoort, 1992a).

Aglaophenia octodonta (Heller, 1868)
(fig. 3)

Plumularia octodonta Heller, 1868: 40, 82, pl. 2 fig. 3.

Aglaophenia helleri Marktanner-Turneretscher, 1890: 271, pl. 7 figs 3, 13-16 (including the variety).

Aglaophenia filicula; Kühn, 1909: 452, fig. Ua, pl. 21 figs 64-69, pl. 22 figs 40-74.

Aglaophenia adriatica Babić, 1911: 541, figs 1-2.

Aglaophenia pluma var. *helleri*; Bedot, 1919: 265.

Aglaophenia octodonta; Svoboda, 1979, 1979: 65-70, figs 12a, 13a, 15a, 16a, pl. 5c; Svoboda & Cornelius, 1991: 23-25, fig. 6.

Material.— C2: (19.viii.1989), intertidal zone, various colonies without corbulae; (3.iii.1991), intertidal zone, various colonies with corbulae (RMNH Coel. no. 27116, two slides no. 2564).— C4: (23.vii.1989), tidal pool, several colonies with corbulae; (12.xi.1989), tidal pool, 10 colonies without corbulae; (9.ix.1990), from material cast ashore, numerous colonies with corbulae; (17.vii.1993), tidal pool, several colonies with corbulae.— C5: (11.ii.1990), 0 m, various colonies with corbulae.— C7: (18.v.1990), 0 m, several colonies with corbulae; (17.ii.1991), 3-4 m, various colonies without corbulae.— C20: (3.ii.1991), 2-3 m, several colonies with corbulae.

Measurements (in mm)

Maximum height of hydrocaulus	40
Internodes of hydrocaulus, length	0.245-0.394
idem. diameter	0.122-0.219
Hydrocladial internodes, length	0.228-0.333
idem. diameter	0.060-0.087
Hydrothecae, total length	0.24-0.31
idem. diameter at rim	0.14-0.17
idem. length of free part abcauline wall	0.06-0.10
Corbula, number of costae	7-8
idem. total length	1.35-2.35
idem. diameter	0.80-1.80

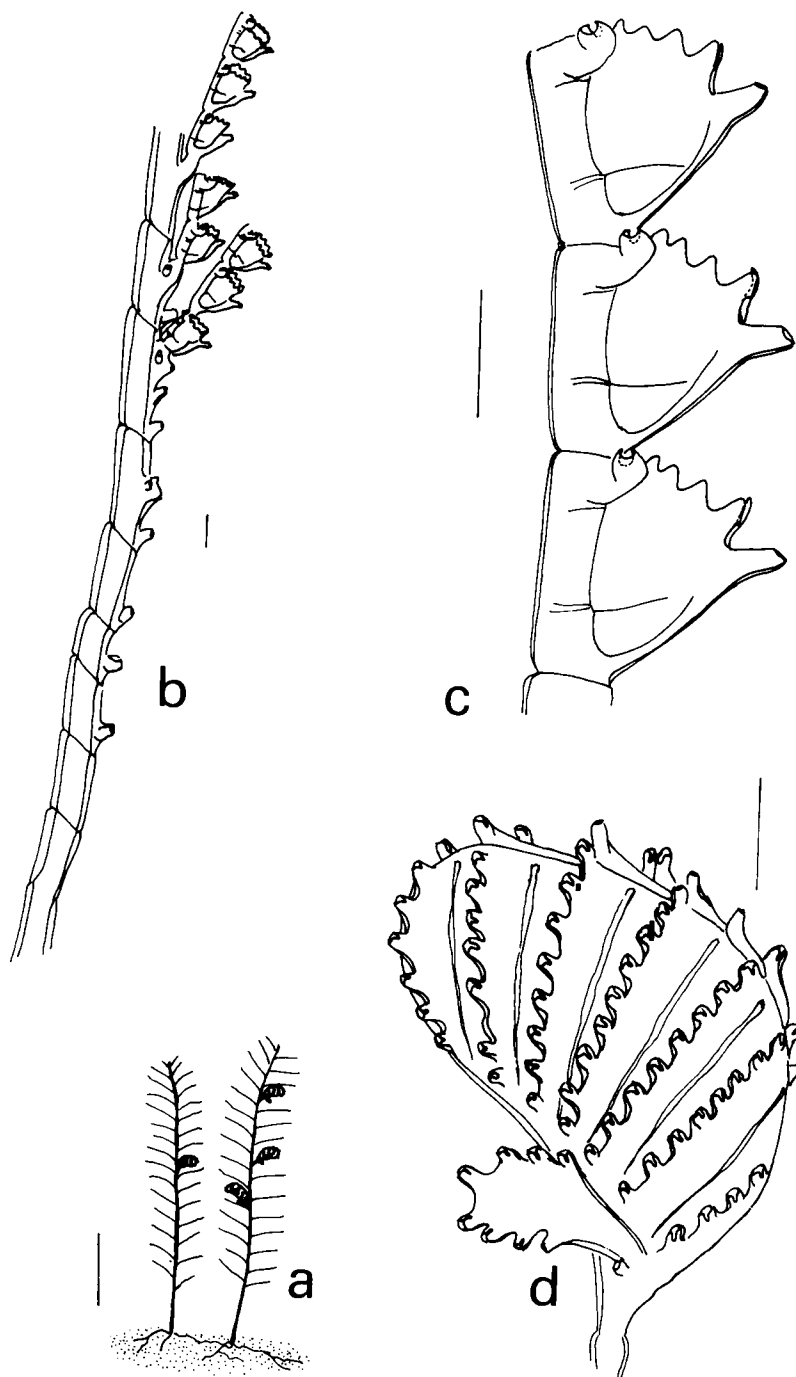


Fig. 3. *Aglaophenia octodonta* (Heller, 1868). a, two colonies; b, basal part of axis; c, three cormidia; d, (-female) corbula. Scales: a, 1 cm; b, c, 0.15 mm; d, 0.5 mm.

Description.—Hydrorhiza reticulate, giving rise to monosiphonic, yellow hydrocauli that normally are unbranched (fig. 3a). Basal part of hydrocaulus athecate, of varied length and with several transverse nodes, followed by 1-3 prosegments separated by oblique nodes (fig. 3b). Rest of hydrocaulus composed of hydrocladia bearing internodes separated by oblique nodes and bearing a latero-distal apophysis, three nematothecae and an abortive hydrotheca (pseudonematotheca).

Hydrocladia inserted on apophyses and alternately directed left or right (fig. 3a), transparent or yellowish, composed of cormidia separated by transverse nodes. Hydrotheca narrowing basally and thus of triangular shape. Hydrothecal rim with 9 strong cusps, of which unpaired abcauline tooth is occasionally curved interiorly. Well developed adcauline septum present in lower third of hydrothecal cavity (fig. 3c). Median nematotheca adnate for two-thirds of its length, covering large portion of abcauline hydrothecal wall: only a small part remains free. Opening of median nematotheca deep gutter-shaped; end of nematotheca almost at level of hydrothecal rim. Lateral nematothecae small, apical part swollen, reaching hydrothecal rim; aperture gutter-shaped.

Both male and female corbulae have been observed. Male corbulae without free costa and usually partly open; female corbulae usually fully closed, with one well developed free costa (fig. 3d).

Substratum.—On shells of *Mytilus*, on *Balanus*, stones and algae (e.g. *Sargassum*). Also recorded from sponges, *Cystoseira* spec. and *Posidonia* spec. (Svoboda & Cornelius, 1991), from *Ascidia* (Ramil, 1988) and from *Vermetus* spec., calcareous algae and from *Zostera* spec. (García-Carrascosa, 1981).

Distribution.—Northeastern Atlantic and Mediterranean. In the Atlantic occurring from the English coasts southward until Senegal (Svoboda & Cornelius, 1991). Maximum depth 30 m (Stechow, 1919), but much more common in shallow waters (Roca Martinez, 1986).

Aglaophenia parvula Bale, 1882
(fig. 4)

Aglaophenia parvula Bale, 1882: 35-36, pl. 14 fig. 3; Patrìti, 1970: 49, fig. 67; Svoboda & Cornelius, 1991: 25-29, figs 7-9, 10a-e, 13h, 18, 22-23.

Aglaophenia heterodonta Jäderholm, 1904, 296-297, pl. 13 fig. 10, pl. 14 fig. 1.

Aglaophenia pluma var. *parvula*; Millard, 1957: 239-240, fig. 15D-F.

Aglaophenia dichotoma var. *heterodonta*; Patrìti, 1970: 48, fig. 66.

Material.—C5: (22.xii.1991), 0 m, various colonies without corbulae.

Measurements (in mm)

Maximum height of hydrocaulus	17
Internodes of hydrocaulus, length	0.84-0.921
idem, diameter	0.175-0.192
Hydrocladial internodes, length	0.219-0.236
idem, diameter	0.061-0.070
Hydrothecae, total length	0.192-0.263
idem, diameter at rim	0.175-0.184
idem, length free part abcauline wall	0.061-0.078

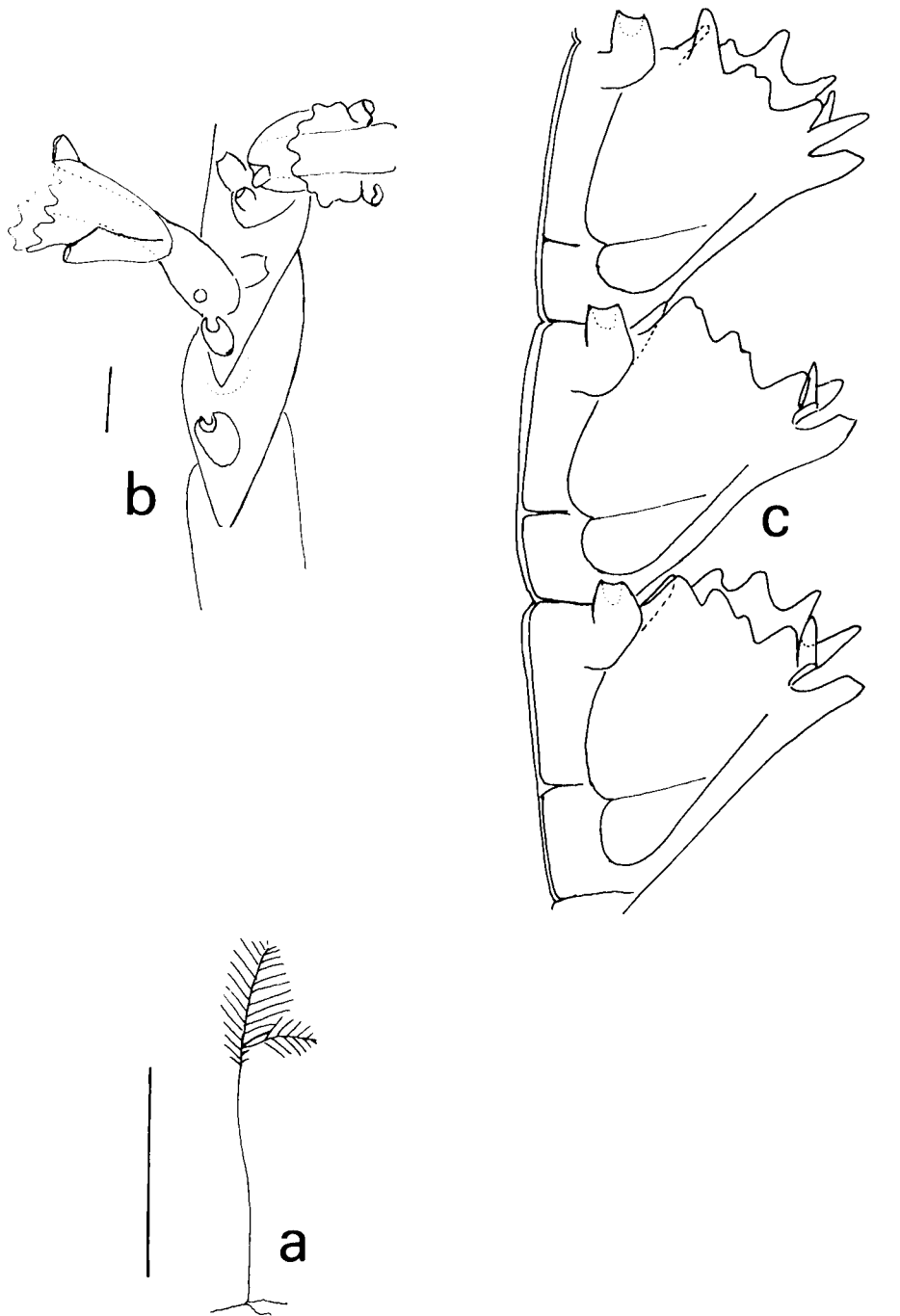


Fig. 4. *Aglaophenia parvula* Bale, 1882. a, colony; b, basal part of stem with prosegment and first hydrocladia; c, three cormidia. Scales: a, 1 cm; b, c, 0.1 mm.

Description.— Hydorrhiza reticulate, giving rise to monosiphonic, irregularly branched, yellow to brown hydrocauli (fig. 4a). Basal part of hydrocaulus athecate, with in older stems some transverse and one oblique node, followed by a prosegment limited by quite oblique nodes (fig. 4b). After this there is a normal sequence of hydrocladia bearing internodes each with a latero-distal apophysis, three nematothecae and one abortive hydrotheca (pseudonematotheca). Some hydrocauli are branched; the secondary axes each have a prosegment.

Hydrocladia supported by the apophyses, alternately directed left or right, and yellowish, broken up into cormidia separated by straight septa. Hydrothecae fairly deep, narrowing basally and consequently triangular; rim with nine quite unequal marginal teeth (fig. 4c). Median, abcauline tooth flexed interiorly, almost hidden by first pair of cusps; third pair with bifid apex, development of incision varied, sometimes fairly deep (giving the impression of 11 teeth being present), sometimes scarcely indicated. Basal third of interior of hydrotheca with distinct, well developed septum, almost reaching opposite hydrothecal wall. Lateral nematothecae short, not reaching hydrothecal rim.

No corbulae have been found.

Substratum.— On *Cacospongia* spec. According to Svoboda and Cornelius (1991) this species occurs frequently on sponges, though other substrata have also been recorded (algae, *Mytilus* shells, Cirripedia, etc.).

Distribution.— Eastern Atlantic, from the coasts of South Africa northward till the British coasts. Not known from the Mediterranean. Also common on southern Australian coasts (Svoboda & Cornelius, 1991; Gili, Vervoort & Pagès, 1989). Depth records from 0 meters (Ramil, 1988) to 350 m (Gili, Vervoort & Pagès, 1989).

Aglaophenia picardi Svoboda, 1979
(fig. 5)

Aglaophenia picardi Svoboda, 1979: 70-74, figs 12b, 13b, 15b, 16b; Svoboda & Cornelius, 1991: 29-30, fig. 11.

Material.— C6: (22.ix.1991), 6 m, 18 colonies with corbulae (RMNH Coel. no. 27177, slide no. 2565).— C16: (18.vii.1991), 3-5 m, 15 colonies with corbulae.

Measurements (in mm)

Maximum height of hydrocaulus	28
Internode of hydrocaulus, length	0.271-0.412
idem, diameter	0.087-0.175
Hydrocladial internode, length	0.280-0.342
idem, diameter	0.052-0.078
Hydrotheca, total length	0.245-0.280
idem, diameter at rim	0.14-0.16
idem, length free part abcauline wall	0.105-0.49
Corbula, number of costae	3-7
idem, total length	1.26-1.8
idem, diameter	0.62-0.8

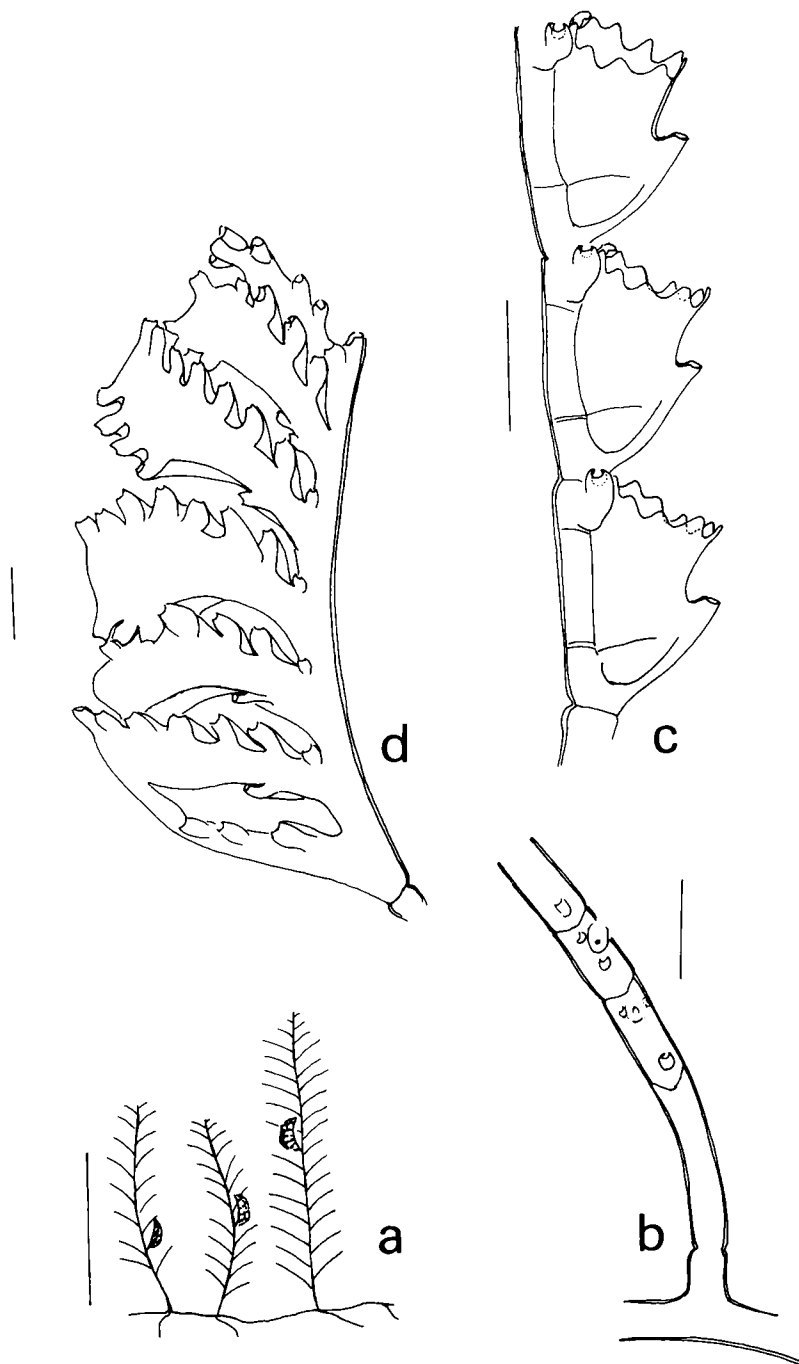


Fig. 5. *Aglaophenia picardi* Svoboda, 1979. a, three colonies springing from same stolon; b, basal part of axis; c, three cormidia; d, (male) corbula. Scales: a, 1 cm; b, 0.5 mm; c, 0.15 mm; d, 0.2 mm.

Description.—Hydrorhiza slightly reticulate, bearing unbranched, brown, monosiphonic hydrocauli (fig. 5a). Basal part of axis athecate, occasionally with irregularly occurring transverse nodes; there are no prosegments (fig. 5b). Rest of axis composed of hydrocladia bearing internodes that have a latero-distal apophysis, three nematothecae and a reduced hydrotheca (pseudonematotheca); they are separated by oblique nodes.

Hydrocladia born on the apophyses, alternately directed left and right, composed of cormidia with transparent perisarc separated by transverse nodes. Hydrotheca fairly deep, rim with nine distinct teeth, particularly on frontal side of hydrotheca usually sharply pointed, and separated by rounded embayments (fig. 5c). Adcauline septum in lower third of hydrotheca present though apparently occasionally reduced. Adnate part of median nematotheca covering slightly more than half length of abcauline hydrothecal wall; free portion short, not reaching hydrothecal rim, opening gutter-shaped. Lateral nematothecae also with gutter-shaped aperture, just reaching hydrothecal rim.

Corbulae inspected apparently male, being in majority open, i.e. with large openings between the pairs of opposite costae (fig. 5d). The female corbulae are closed with the proximal pair of ribs almost free.

Substratum.—On hard concretions, Cirripedia, etc. Also found on *Mytilus*, on sponges, on red algae and occasionally on *Posidonia oceanica* (Svoboda & Cornelius, 1991).

Distribution.—Northeastern Atlantic, in the Mediterranean and off Senegal; also observed in the Black Sea (Isasi Urdangarin, 1985; Svoboda & Cornelius, 1991). Though usually found between 3 and 10 m, it also lives at 30 m depth (Svoboda & Cornelius, 1991).

Aglaophenia pluma (Linnaeus, 1758)
(fig. 6)

Sertularia pluma Linnaeus, 1758: 811.

Aglaophenia pluma; Svoboda, 1979: 98-102, figs 15(1-4); Svoboda & Cornelius, 1991: 30-34, figs 10f, 12, 13a-g, 19a-b, 24a-b.

Aglaophenia pluma p.p. Hincks, 1868: 286-288, fig. 37, pl. 63 fig. 1

Plumularia cristata Lamarck, 1816: 125

Aglaophenia cristata; McCrady, 1859: 202-203.

Material.—C1: (9.xii.1988), intertidal zone, numerous colonies with corbulae; (5.iii.1989), intertidal zone, numerous colonies with corbulae.—C4: (20.x.1998), in material cast ashore, numerous colonies with corbulae; (5.vii.1992), in fishing nets, several colonies with corbulae.—C7: (8.viii.1993), 15 m, several colonies with corbulae.—C10: (6.viii.1991), 12 m, one colony with corbulae.—C11: (17.vii.1991), 5 m, one colony with corbulae.—C12: (20.vii.1993), 5 m, six colonies with corbulae.—C13: (27.i.1992), 8 m, numerous colonies with corbulae (RMNH Coel. no. 27188, three slides no. 2566).—C15: (3.vii.1990), 15 m, ten colonies with corbulae.—C16: (27.vii.1991), 6 m, 20 colonies with corbulae.—C19: (21.ix.1985), 6 m, two fragments without corbulae.—C20: (3.ii.1991), 2-3 m, various colonies with corbulae.—C22: (14.v.1986), 25 m, numerous colonies with corbulae.—C28: (10.v.1986), 25 m, several colonies with corbulae.—C29: (14.vii.1993), 5-18 m, various colonies with corbulae.—C30: (3.vii.1990), 8 m, numerous colonies with corbulae.

Measurements (in mm)

Maximum height of hydrocaulus	120
Internodes of hydrocaulus, length	0.447-0.552
idem, diameter	0.184-0.271
Hydrocladial internodes, length	0.280-0.426
idem, diameter	0.061-0.122
Hydrotheca, total length	0.29-0.35
idem, diameter at rim	0.15-0.23
idem, length free part abcauline wall	0.080-0.122
Corbula, number of costae	4-7
idem, total length	1.511-2.311
idem, diameter	0.638-1.298

Description.— Hydrocauli monosiphonic, unbranched or dichotomously branched, rising from hydrorhizal network usually on algae, but also on fixed objects (fig. 6a). Hydrocauli with basal athecate portion, followed by one or two prosegments; rest of hydrocaulus made up of internodes with latero-distal apophysis, three nematothecae and an abortive hydrotheca (pseudonematotheca). Prosegments and internodes separated by oblique nodes.

Hydrocladia inserting on apophyses and alternately directed left and right, composed of usually whitish cormidia separated by transverse nodes. Hydrothecae fairly deep, plane of rim oblique and inclined downwards, rim with nine distinct, more or less equal teeth (fig. 6b). Intrathecal adcauline septum in lower third of hydrothecal cavity usually well developed. Median nematotheca covering at least half the abcauline hydrothecal wall, short, not reaching hydrothecal rim, with gutter-shaped opening; foramen opening into hydrothecal cavity usually distinct. Lateral nematothecae reaching level of hydrothecal cusps, with deep embayment on axial side.

Corbulae often yellowish, male as well as female corbulae often with free costa. Male corbulae closed with slit like openings between the costae; female corbulae with fused costae and smaller slits (fig. 6c).

Substratum.— On rocky bottom, on algae and sponges. According to Svoboda & Cornelius (1991) common on the brown alga *Halidrys siliquosa*, but also on *Posidonia*, *Sargassum*, *Laminaria*, *Cystoseira* and *Gelidium*. Also found on shells, other hydroids, Crustacea and calcareous concretions.

Distribution.— Cosmopolitan (Ramil, 1988; Alvarez Claudio, 1993; Boero & Bouillon, 1993). From intertidal zone down to 100 m depth (Alvarez Claudio, 1993).

Discussion.— As Svoboda & Cornelius (1991) point out, this species has no special diagnostic characters. Because of this and its frequent occurrence, the differences with other species of *Aglaophenia* are not always quite clear. Many forms and varieties have been described in the course of time (Bedot, 1919; Millard, 1975), based on mode of ramification, length of the hydrotheca, development of marginal cusps and length of median nematotheca. According to Svoboda (1979) the absence of zooxanthellae in *A. pluma* distinguishes this species from the related *A. tubiformis*, where zooxanthellae are present. According to several authors (Roca Martinez, 1986; Alvarez Claudio, 1993) this character is insufficient and not absolutely discriminatory between the two species whilst Gili (1986) mentions observations on living *A. pluma* with zooxanthellae. Svoboda & Cornelius (1991) point out that the absence (or

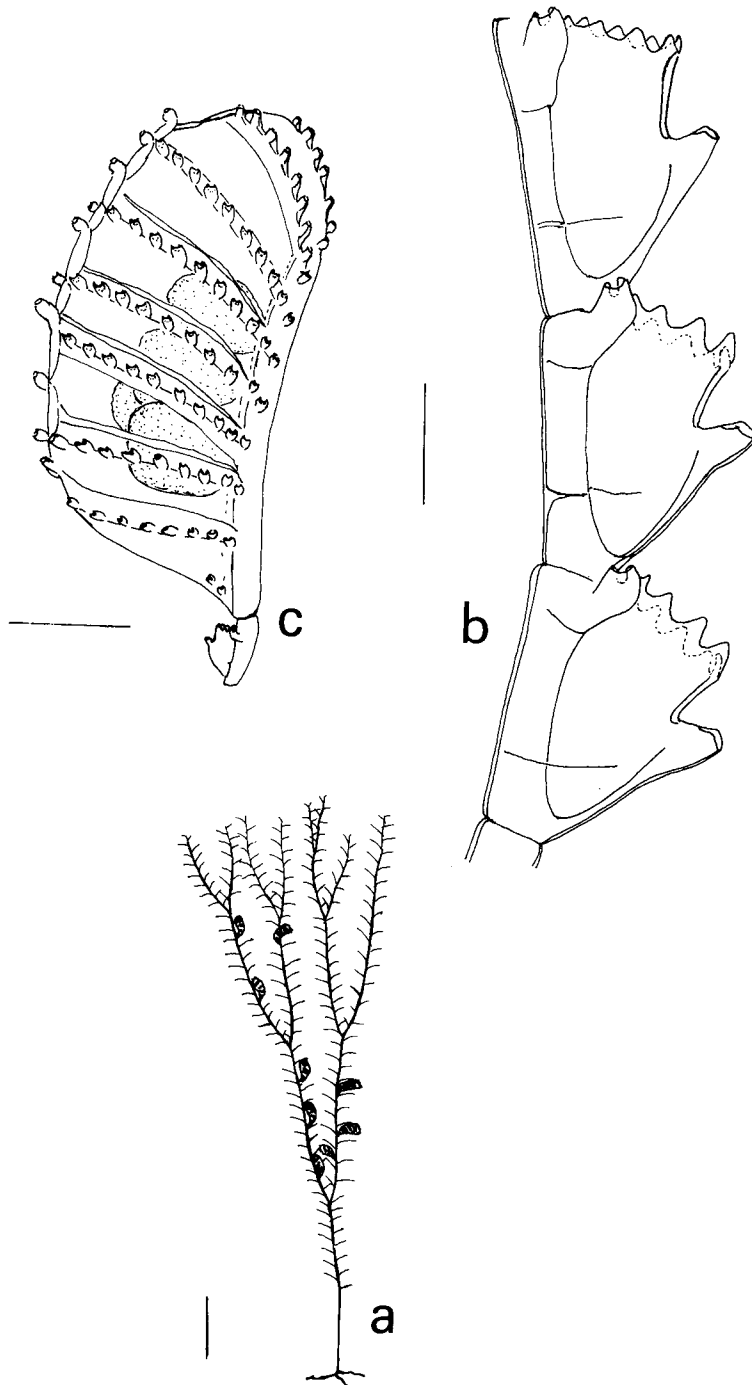


Fig. 6. *Aglaophenia pluma* (Linnaeus, 1758). a, colony; b, three cormidia; c, (female) corbula. Scales: a, 1 cm; b, 0.2 mm; c, 0.7 mm.

impossibility to demonstrate the presence) of zooxanthellae in preserved material cannot be considered conclusive evidence, nor is it in such cases where the tissue has become lost. This also applies to material treated with acids. Svoboda & Cornelius (1991: 46-47, tab. I) present a combination of characters to discriminate between the two species, but some of those characters show overlaps in our material.

Comparing our material with zooxanthellae with colonies without we observe that:

1, the index length versus diameter of the hydrotheca in general terms does not correspond to that given by Svoboda and Cornelius (1.3-1.5 in *A. pluma* and 1.5-2 in *A. tubiformis*);

2, the distance between the hydrocladia is different (shorter in *A. pluma* than in *A. tubiformis*), nor does the homogeneity of the marginal cusps fit (unequal in *A. pluma*, equal in *A. tubiformis*). As far as the number of prosegments is concerned: one is the most frequent number in both species, though two have occasionally been counted in *A. tubiformis* and up to four in *A. pluma* (1-3 in *A. pluma* and 1 in *A. tubiformis* according to Svoboda & Cornelius, 1991). The corbula in *A. pluma* usually has no free costa; such a costa is usually present in *A. tubiformis*, though with exceptions. A relatively constant feature is the difference in colour: in *A. pluma* the dark brown colour of the perisarc of the hydrocaulus contrasts with the yellowish colour or transparency of that of the hydrocladia both in living and freshly preserved material. The coenosarc is white to yellow. In *A. tubiformis* hydrocaulus and hydrocladia are yellowish. The coenosarc is yellowish in freshly preserved material and greenish in living colonies. Dichotomous ramification occurs in both species. This ramification, according to Svoboda (1976, 1979) depends upon the water temperature, which in both species has a decided influence on colony development. In our opinion distinction between both species rests with presence or absence of zooxanthellae and coloration, while presence or absence of a free corbula rib or number of prosegments are of secondary importance.

Aglaophenia tubiformis Marktanner-Turneretscher, 1980
(fig. 7)

Aglaophenia tubiformis Marktanner-Turneretscher, 1890: 269-270, pl. 7 figs 4, 5, 6, 17 (including variety); Svoboda, 1979: 90-95, figs 12h, 13h, 14d, 15h, 16h, pls 5a, b, 6, 8, 9a(1,2); Svoboda & Cornelius, 1991: 34-36, figs 14, 25a (complete synonymy).

Material.— C21: (27.vi.1993), 1-5 m, numerous hydrocauli with corbulae (RMNH Coel. no. 27119, two slides no. 2567).— C25: (5.v.1986), 20 m, 20 colonies without corbulae.— C27: (7.v.1986), 8-10 m, 15 colonies with corbulae.— C28: (9.v.1986), 0-3 m, six fragments with corbulae; (12.v.1986), 12 m, three colonies without corbulae; (8.v.1986), 10 m, several colonies with corbulae.

Measurements (in mm)

Maximum height of hydrocauli	114
Internodes of hydrocaulus, length	0.405-0.745
idem, diameter	0.184-0.315
Hydrocladial internodes, length	0.359-0.596
idem, diameter	0.070-0.140
Hydrotheca, total length	0.30-0.40

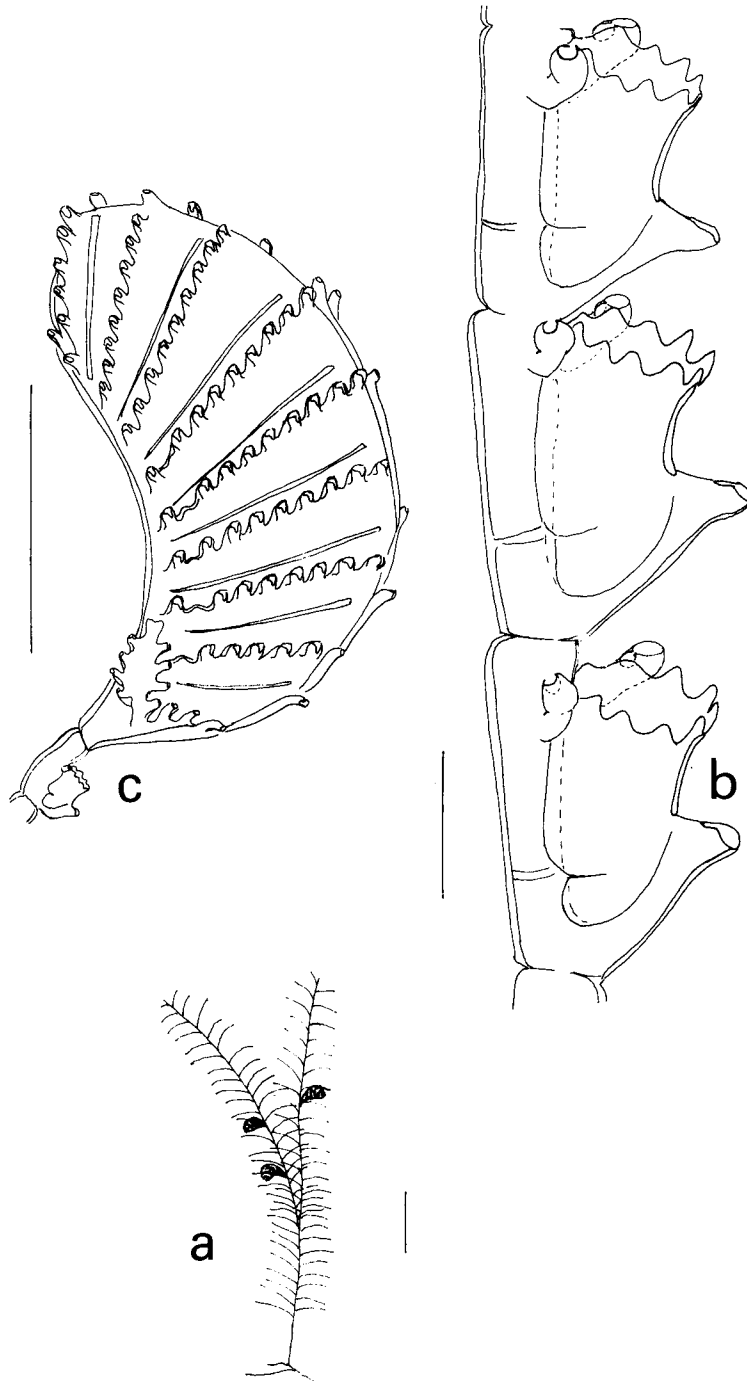


Fig. 7. *Aglaophenia tubiformis* Marktanner-Turneretscher, 1890. a, colony; b, three corbulae; c, (female) corbula. Scales: a, 1 cm; b, 0.15 mm; c, 1 mm.

idem, diameter at rim	0.15-0.22
length of free part adcauline wall	0.131-0.184
Corbula, number of ribs	7-11
total length	2.71-3.91
diameter	0.97-1.40

Description.— Colonies with reticulate hydrorhiza from which rise monosiphonic, dichotomously branched or unbranched, yellowish hydrocauli (fig. 7a). Basal portion of hydrocaulus athecate, with some transverse nodes, followed by one (or rarely two) prosegments separated by oblique node(s); the rest of the hydrocaulus being made up of internodes separated by transverse nodes and bearing the usually latero-distal apophysis, three nematotheca and a reduced hydrotheca (pseudonematotheca). The apophyses support yellowish hydrocladia alternately directed left or right and broken up into cormidia by means of straight nodes. Cormidium much as in *A. pluma*, with a deep hydrotheca with moderately developed adcauline septum in lower third of hydrothecal cavity; rim of hydrotheca with nine more or less equal cusps (fig. 7b). Median nematotheca covering half length of abcauline hydrothecal wall or slightly more; free portion pointing away from hydrotheca, of varied length and occasionally as long as free part abcauline wall; aperture gutter-shaped. Lateral nematothecae reaching level of marginal cusps or slightly surpassing. All coenosarc filled with brownish zooxanthellae.

Corbulae yellowish, male with slits between ribs; female gonothecae with almost completely fused ribs, only minor slits and a (basal) free costa (fig. 7c).

Substratum.— The present specimens were collected on algae; also found on *Cystoseira*, *Sargassum* and *Halidrys* as well as on rocky and sandy bottoms (Ramil, 1988; Svoboda & Cornelius, 1991).

Distribution.— Northeastern Atlantic from Morocco northward till the British coasts; also in the Mediterranean (Svoboda & Cornelius, 1991). For discussion see *A. pluma*.

Aglaophenia tubulifera (Hincks, 1861)
(fig. 8)

Plumularia tubulifera Hincks, 1861: 256, pl. 7 figs 1-2.

Aglaophenia tubulifera; Hincks, 1868: 288-289, pl. 63 fig. 2, pl. 64 fig. 3; Svoboda, 1979: 86-87, figs 12f, 13f, 15f(1-4), 16f, pl. 5 figs g-i; Svoboda & Cornelius, 1991: 36-38, figs 15-16, 19c-d, 24c-d.

Material.— C22: (14.v.1986), 25 m, three fragments without corbulae; (4.v.1986), 40-42 m, 5 colonies with corbulae (RMNH Coel. no. 27120, slide no. 2568).— F13: (11.vii.1989), several fragments with corbulae.

Measurements (in mm)

Maximum height of hydrocaulus	50
Internodes of hydrocaulus, length	0.245-0.570
idem, diameter	0.219-0.429
Hydrocladial internodes, length	0.298-0.377
idem, diameter	0.087-0.131
Hydrotheca, length	0.263-0.324
idem, diameter at rim	0.140-0.175

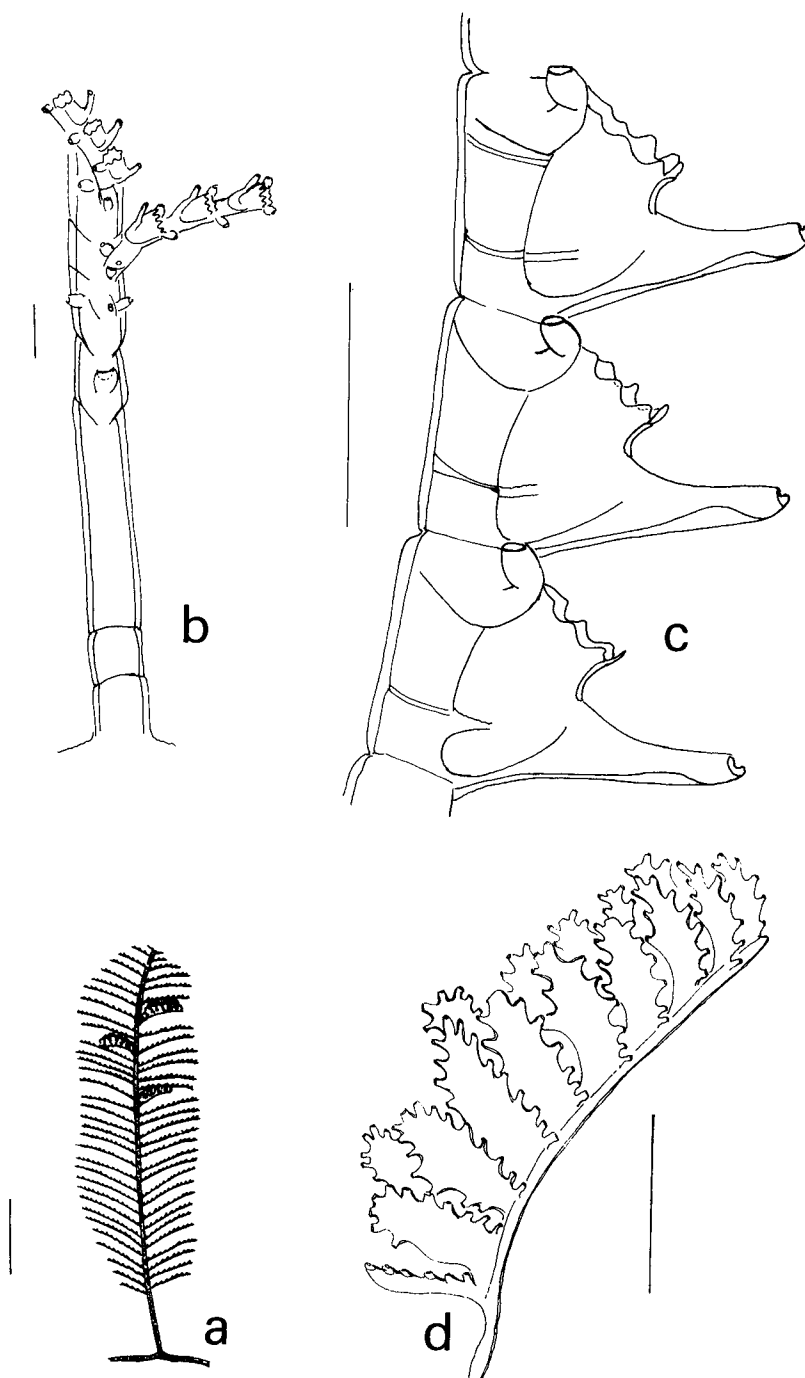


Fig. 8. *Aglaophenia tubulifera* (Hincks, 1861). a, colony; b, basal part of axis; c, three cormidia; d, (male) corbula. Scales: a, 1 cm; b, 0.2 mm; c, 0.3 mm; d, 1 mm.

idem, length of free part abcauline wall	0.114-0.157
Corbula, number of ribs	7-8
idem, total length	2.57-2.70
idem, diameter	1.0-1.2

Description.— Colony composed of monosiphonic, yellow or brown, unbranched hydrocauli rising from a creeping, occasionally branched hydrorhiza (fig. 8a). Axis basally with athecate portion, occasionally with some straight nodes, followed by a single prosegment with oblique nodes (fig. 8b). Rest of axis formed by short internodes separated by straight septa each with a latero- distal apophysis, three nematothecae and a reduced hydrotheca (pseudonematotheca). Hydrocladia, supported by the apophyses, are alternately directed left or right (fig. 8a) and are closely packed; each being composed of a large number of cormidia separated by transverse nodes. Hydrotheca only moderately deep, with weakly developed adcauline septum in the lower third of the hydrothecal cavity; hydrothecal rim with 9 marginal cusps of almost equal size (fig. 8c). Lateral and median nematothecae with circular rim without embayment. Median nematotheca covering c. half the abcauline hydrothecal wall or slightly more, directed away from hydrotheca; free part of varied length, usually much longer than free part abcauline wall (fig. 8c). Length of free portion of median hydrotheca varied in the hydrocladium and over the whole colony; the longest being found in the distal part. Distal third of free part median nematotheca with annular thickening. Lateral nematothecae projecting some distance above hydrothecal rim.

Male corbula with free costae (fig. 8d); female corbulae more closed by distal extension of costae; free ribs occasionally present in both sexes.

Substratum.— Detached hydrocauli only have so far been studied. The species has been observed on rocks, stones, algae, shells, other hydroids and tubes of polychaetes (Hincks, 1868; Ramil, 1988; Cornelius & Ryland, 1990).

Distribution.— Northeastern Atlantic, from the coasts of the British Isles southward until Guinea Bissau. Also cited from the Mediterranean, the Alboran Sea and eastern Morocco (Gili, Vervoort & Pagès, 1989; Templado et al., 1986; Svoboda & Cornelius, 1991). Maximum depth 1200 m (Ramil & Vervoort, 1992a).

Genus *Streptocaulus* Allman, 1883

Streptocaulus dollfusi (Billard, 1924) (figs 9, 10)

Cladocarpus dollfusi Billard, 1924: 87-89, fig. 1; Billard, 1934: 229-230, figs 3-4.

Cladocarpus ventricosus; Vervoort, 1959: 300-302, fig. 49.

Material.— A6: (11.x.1992), 84 m, several stems, one with single phylactocarp (RMNH Coel. no. 27121, slide no. 2569).— F4: (10.vii.1989), 60 m, one fragment.

Measurements (in mm)

Maximum height of hydrocaulus	400
Internodes of hydrocaulus, length	1.00-1.05

idem, diameter	0.15-0.16
Hydrocladial internodes, length	0.55-0.61
idem, diameter	0.08-0.10
Hydrothecae, total length	0.38-0.45
idem, diameter at rim	0.17-0.20
Gonotheca, length	0.68
idem, diameter	0.19
Phylactocarp, length	1.50

Description.— Hydrocauli long, polysiphonic, yellow and rarely irregularly branched. Only the central tube of hydrocaulus bearing hydrocladia (fig. 9a). This central axis is indistinctly divided into internodes by means of straight septa, at times scarcely visible. Each internode with a row a several (frontal) nematothecae and a lateral apophysis supporting the hydrocladium. Axial nematothecae with two apertures, one terminal and one basal at the adcauline wall. Number of nematothecae per internode variable, usually three to five. One of these nematothecae, of smaller size, in the axil of the apophysis, occasionally such a small nematotheca also occurs besides the apophysis. Hydrocladia alternately directed left or right (fig. 9a); some internodes without hydrocladia. Internodes of hydrocladia separated by slightly oblique nodes, all are thecate and beside the (large) hydrotheca also support three nematothecae: one median and two laterals. Interior of internode with a number of septa (rings): one at the bottom of the median nematotheca and five behind the hydrotheca, of which the more superior at the base of the lateral nematothecae. Occasionally basal septum (ring) doubled, bringing the total up to seven. Hydrotheca large, adcauline wall fully adnate, with internal septum at convexity in lower third of adcauline wall; above and below attachment of septum hydrothecal wall concave. Intrathecal septum projecting as far as middle of hydrothecal cavity, curving upwards. Abcauline border of hydrotheca convex in lower half, straight in upper half. Hydrothecal rim with distinct abcauline, median cusp and a weakly developed, rounded lateral cusp on each side, sometimes visible as a mere sinuosity (fig. 9b). Median nematotheca free from hydrothecal abcauline wall, short, with circular rim and large foramen opening into internode. Laterals tubiform, projecting above hydrothecal border, with circular rim and additional aperture in adcauline wall opening into hydrothecal cavity.

Only a single phylactocarp is present; it is slightly damaged and composed of eight segments, each with a pair of opposite nematothecae, almost as the lateral nematothecae but with bigger aperture. A single gonotheca occurs on the basal segment, inserting between the pair of nematothecae. Gonotheca oval, curved apically and there with oval aperture on the inner side (fig. 10).

Remarks.— Because of the structure of the phylactocarp this species should be removed to the genus *Streptocaulus* Allman, 1883 (Ramil & Vervoort, 1992b).

Substratum.— The colony studied was detached.

Distribution.— Atlantic coasts of Morocco, Sierra Leone and Senegal (Billard, 1924, 1934; Vervoort, 1959; Patriti, 1970). It is considered to be a boreal species by Boero & Bouillon (1993). Recorded depths vary between 70 and 380 m (Billard, 1934).

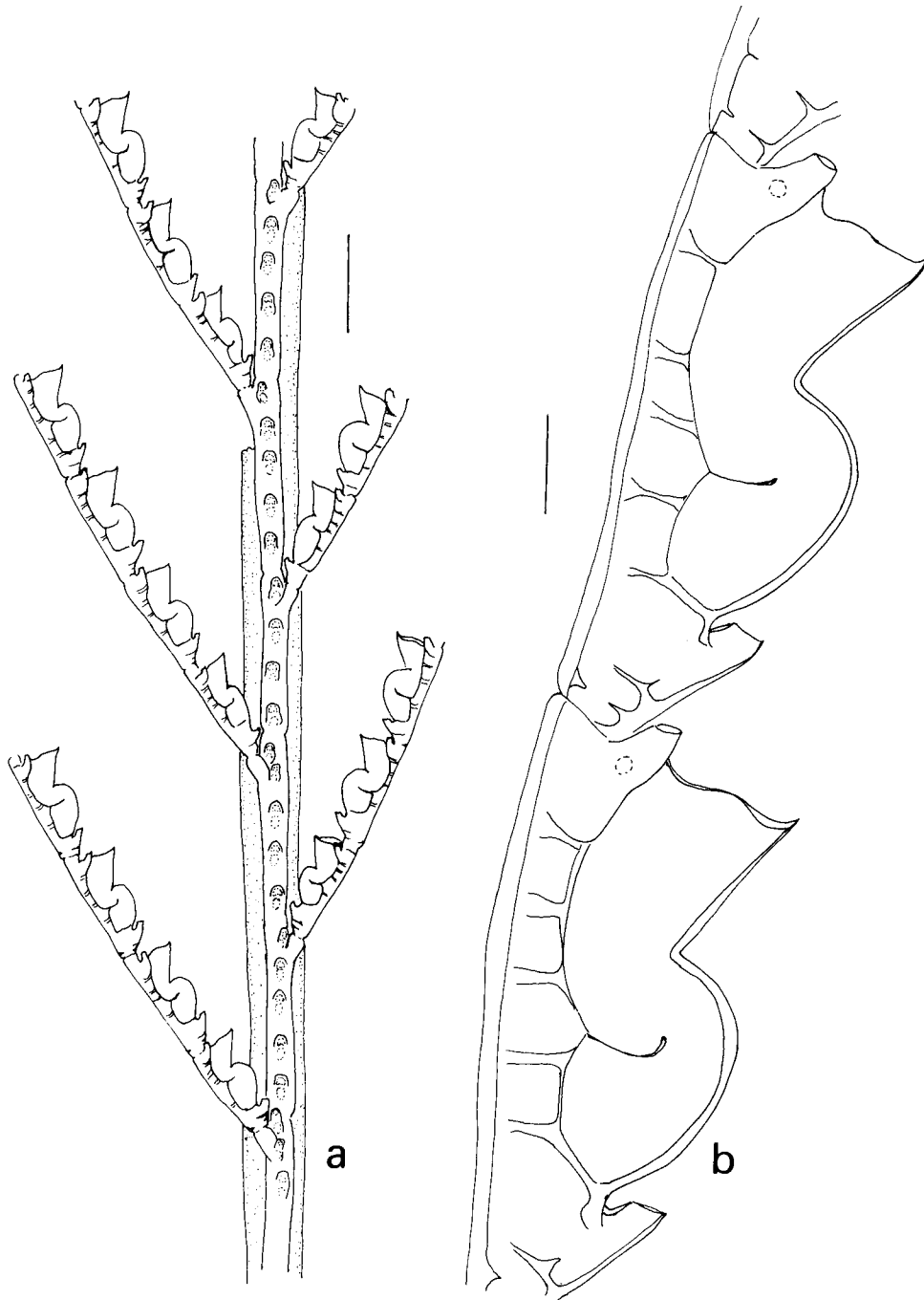


Fig. 9. *Streptocaulus dollfusi* (Billard, 1924). a, part of main axis with hydrocladia; b, two internodes with hydrothecae and nematothecae. Scales: a, 0.1 cm; b, 0.1 mm.

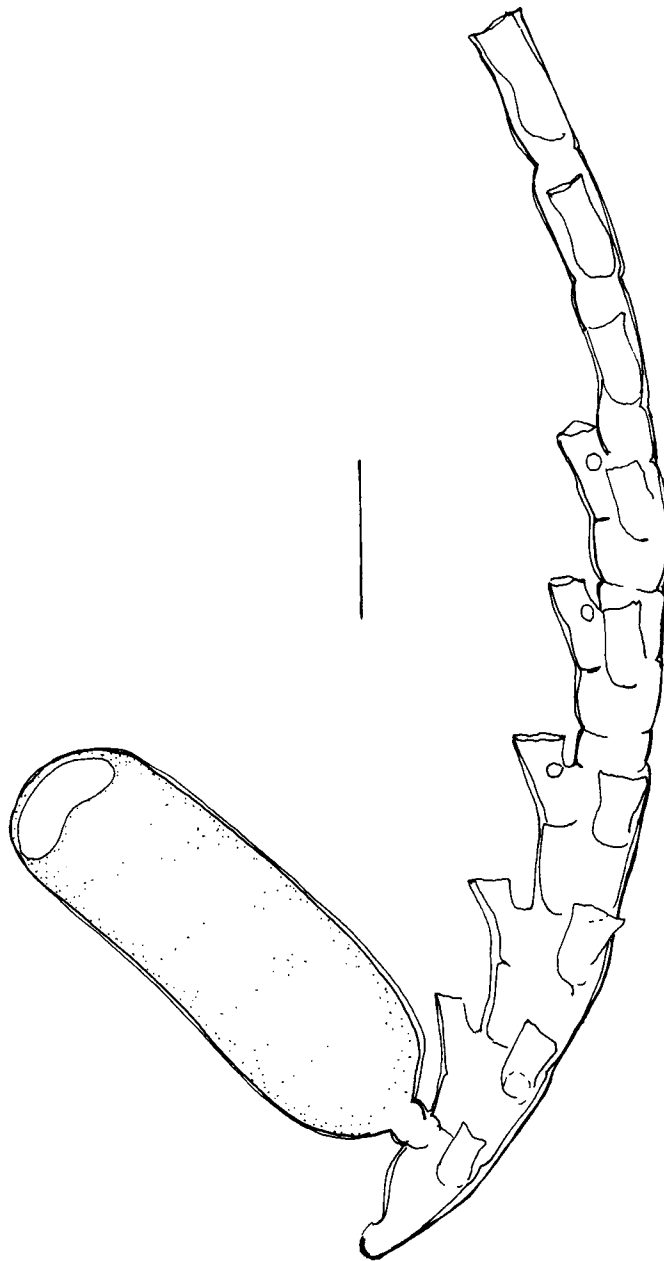


Fig. 10. *Streptocalus dollfusi* (Billard, 1924), phyllactocarp with single gonotheca. Scale: 0.2 mm.

Genus *Gymnangium* Hincks, 1874

Gymnangium montagui (Billard, 1912) (fig. 11)

Aglaophenia pennatula; Hincks, 1868: 292-294, fig. 33, pl. 63 fig. 3.

Halicornaria allmanii var. Marktanner-Turneretscher, 1890: 277-278, pl. 6 fig. 23.

Halicornaria pennatula; Ritchie, 1910: 225.

Halicornaria montagui Billard, 1912: 473, figs 6, 8.

Gymnangium montagui; Millard, 1975: 446, fig. 134F.

Material.— C4 (5.vii.1992), from fisherman, several colonies, no gonothecae.— C7: (23.xii.1984), 4 colonies, no gonothecae; (23.xii.1984), 6 colonies, no gonothecae; (9.v.1993), 8 m, numerous colonies with gonothecae (RMNH Coel. no. 27122, slide no. 2570).— C11: (21.vii.1991), 20 m, 14 colonies, no gonothecae.— C22: (14.v.1986), 25 m, 9 colonies, no gonothecae; (19.v.1986), 25 m, 10 colonies, no gonothecae.

Measurements (in mm)

Maximum height of colonies	120
Internodes of hydrocaulus, length	0.517-0.684
idem, diameter	0.245-0.535
Hydrocladial internodes, length	0.324-0.412
idem, diameter	0.175-0.324
Hydrothecae, total length	0.166-0.289
idem, diameter at rim	0.175-0.385
length of free part abcauline wall	0.166-0.289
Gonotheca, length	0.425-0.75
idem, diameter	0.4-0.5
number of gonothecae in one row	19-35

Description.— Erect, monosiphonic colonies rising from a thick hydrorhiza; colour light or dark yellow, depending upon age of colony (fig. 11a). Except for basal part, hydrocaulus (axis) divided into short internodes separated by slightly oblique nodes. Each axial internode with two short apophyses, one latero-basal and one latero-distal, pointing alternately right or left and supporting alternate hydrocladia 8-10 mm long. There are two cups-shaped nematothecae at the base of each apophysis, an upper and a lower; those of the basal and the distal apophyses of consecutive internodes forming two indistinct rows on frontal aspect of axis (fig. 11b).

Hydrocladia broken up into short internodes separated by almost transverse septa; each internode with one hydrotheca and three nematothecae. Hydrotheca spacious, cup-shaped, with two-thirds of concave adcauline wall adnate and a distinct, slightly curved abcauline internal septum at half length abcauline wall, dividing that wall into two convex portions. Hydrothecal aperture inclined downward, making an angle of 45° with axis of internode; rim sinuous, occasionally with indication of lateral cusp on each side (fig. 11c). Pair of flanking nematothecae also cup-shaped; abcauline wall curved, much longer than totally adnate adcauline wall. Median nematotheca much elongated, curved, surpassing hydrothecal border considerably, free part at least half length of adnate part or more, with gutter-shaped opening along whole free length.

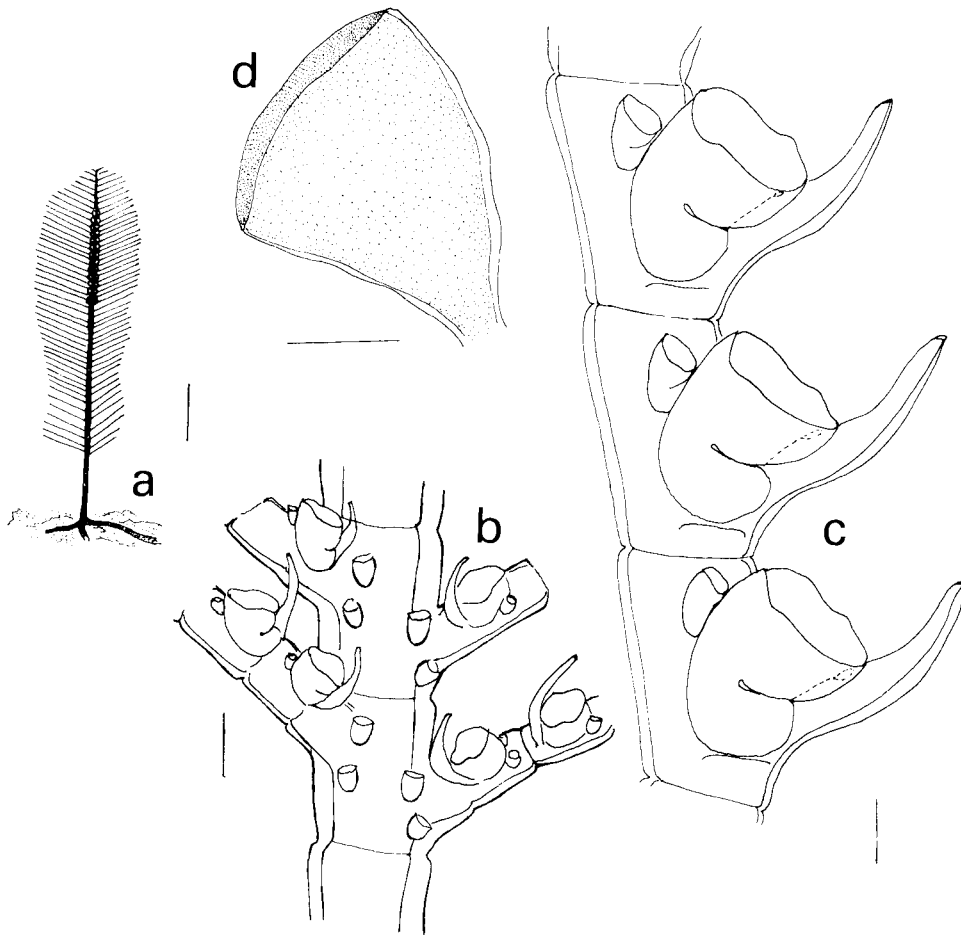


Fig. 11. *Gymnangium montagui* (Billard, 1912). a, colony; b, part of main axis with four hydrocladia; c, three internodes with hydrothecae and nematothecae; d, gonotheca. Scales: a, 2 mm; b, 0.2 mm; c, d, 0.1 mm.

Gonothecae in two rows on frontal aspect of colony, each attached to hydrocladial apophysis, colour white, in contrast with yellow-brown of rest of colony. Shape conical, with truncate top and there with concavity; narrowing proximally at attachment to internode, oval on cross section (fig. 11d).

Substratum.— On rocky escarpments, also on sponges, algae, *Bivalvia* and other hydroids (Ramil, 1988; Cornelius, 1990; Isasi Urdangarin, 1986).

Distribution.— Restricted to the Eastern Atlantic, where it is found from the coasts of Great Britain southward till South Africa (Ramil, 1988; Cornelius & Ryland, 1990; Millard, 1975). Until 20 m depth.

Genus *Lytocarpia* Kirchenpauer, 1872*Lytocarpia myriophyllum* (Linnaeus, 1758)
(fig. 12)*Sertularia myriophyllum* Linnaeus, 1758: 810.*Aglaophenia myriophyllum*; Hincks, 1868: 290-292, pl. 64 fig. 2.*Lytocarpus myriophyllum*; Marktanner-Turneretscher, 1890: 277, pl. 7 figs 10- 11.*Thecocarpus myriophyllum*; Billard, 1906: 226-227.*Lytocarpia myriophyllum*; Stechow, 1923: 246.*Aglaophenia radicellata* G.O. Sars, 1874: 9-10, pl. 2 figs 1-6.

Material.— F57: (20.vii.1989), 76-80 m, 10 colonies without corbulae (RMNH Coel. no. 27123, slide no. 2571).— F63: (20.vii.1989), 97-118 m, single colony without corbula.

Measurements (in mm)

Maximum height of hydrocaulus	150
Internodes of hydrocaulus, length	0.30-0.42
idem, diameter	0.18-0.21
Hydrocladial internodes, length	0.42-0.52
idem, diameter	0.13-0.22
Hydrothecae, total length	0.35-0.41
idem, diameter at rim	0.20-0.23
idem, length free part abcauline wall	0.21-0.32

Description.— Colony attached in substratum (usually sand bottom) by means of thick bundle of hydrorhizal fibres leaving the hydrocaulus (axis) over a considerable distance (fig. 12a). Hydrocaulus polysiphonic, yellow to brown, with up to four well marked, oblique nodes, distributed over non-hydrocladia bearing lower part of hydrocaulus (fig. 12b). Axis composed of frontal tube and many parallel secondary tubes, all with a longitudinal row of small cup-shaped nematothecae; on the frontal tube insert the hydrocladia, almost without visible apophysis; they are alternately directed left or right and basally more widely spaced than distally (fig. 12c). Normally there is one nematotheca between two successive apophyses; in addition there is one besides and one behind the apophysis; those nematothecae with deeply scooped adcauline wall.

Hydrocladia divided into internodes by means of transverse septa, each internode with a large hydrotheca and three nematothecae, one median and two laterals (fig. 12d). Hydrotheca of characteristic shape but of varied depth, with adcauline wall almost completely adnate and rounded bottom. From the curved end of the adcauline wall a transverse septum points into the hydrothecal cavity without closing it completely. Hydrothecal border almost perpendicular to internodal axis or slightly inclined downwards; rim with a number of rounded cusps of varied development, almost disappearing laterally. There is always a prominent median cusp on the abcauline side (fig. 12e). Median nematotheca short, almost completely adnate and with short free part with circular aperture. Lateral nematothecae slightly surpassing hydrothecal rim; adcauline wall deeply scooped out. There is a number of septa (rings) in the internode of varied development; in our specimens there are six:

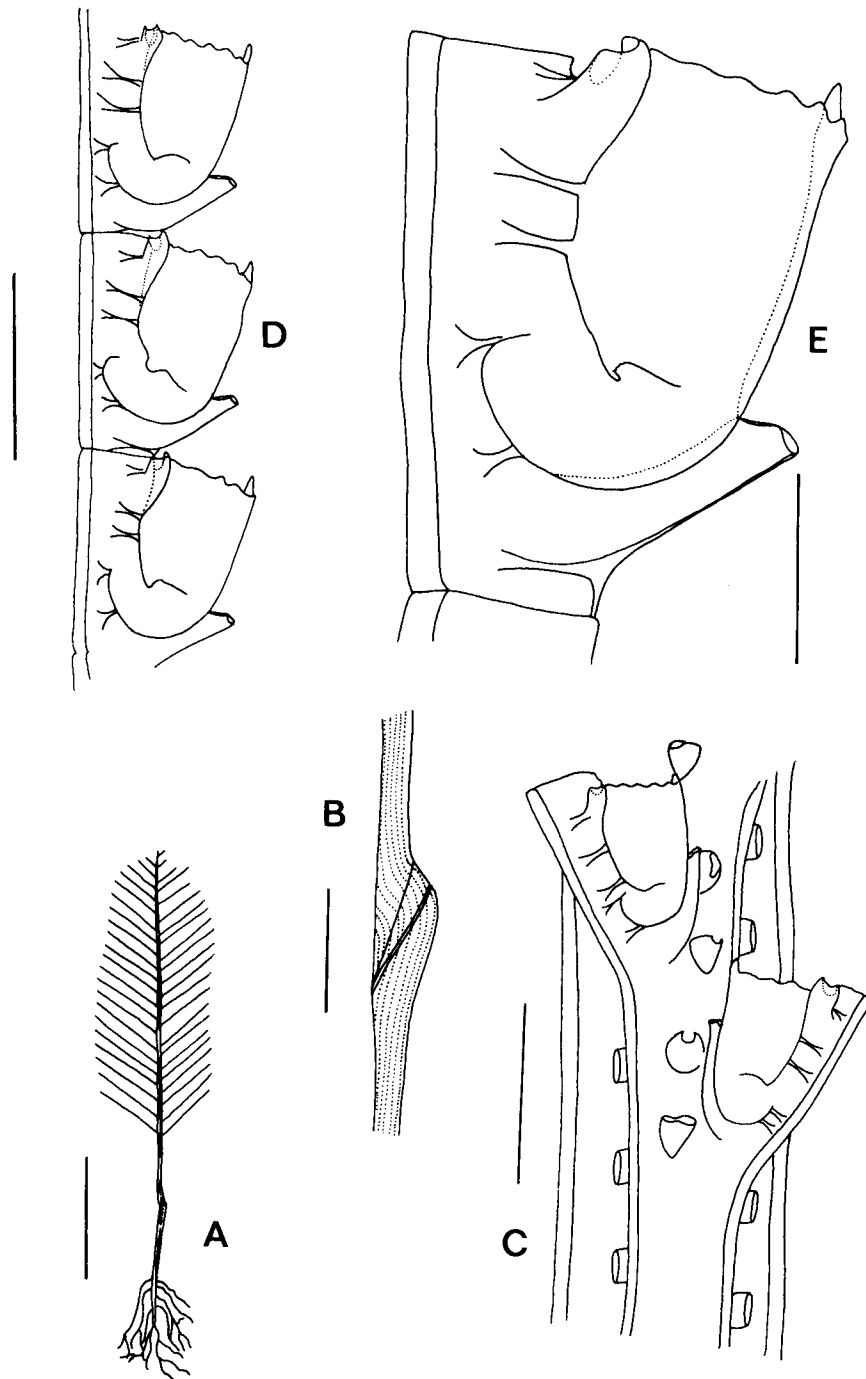


Fig. 12. *Lytocarpia myriophyllum* (Linnaeus, 1758). a, colony; b, oblique node in basal part of axis; c, part of axis showing frontal tube with hydrocladia; d, three internodes with hydrothecae and nematothecae; e, single hydrocladial internode in lateral view. Scales: a, 1.5 cm; b, 3 mm; c, d, 0.5 mm; e, 0.2 mm.

one above base of lateral nematothecae, two behind adnate adcauline hydrothecal wall, two at curved end of abcauline hydrothecal wall and one at base of median nematotheca.

All colonies observed were sterile; the species is known to have a large, open corbula; each of the costae with a basal hydrotheca.

Substratum.— On sublittoral sandy bottoms, often in great numbers (Cornelius & Ryland, 1990).

Distribution.— Atlantic species, distributed from the Arctic southward till Guinea Bissau; also in the Indo-Pacific (Gili, Vervoort & Pagès, 1989; Ramil & Vervoort, 1992a). Boero & Bouillon (1993) refer to the species as being cosmopolitan. The bathymetrical range is from 35 m (Gili, Vervoort & Pagès, 1989) down to 1592 m (Ramil & Vervoort, 1992a).

Family Halopterididae Millard, 1962

Genus *Antennella* Allman, 1877

Antennella siliquosa (Hincks, 1877) (fig. 13)

Plumularia siliquosa Hincks, 1877: 148, pl. 12 figs 2-6.

?*Antennella simplex* Bedot, 1914: 84-86, pl. 5 figs 2-5.

?*Antennella diaphana* f. *siliquosa*; Broch, 1933: 26-27.

Antennella diaphana f. *siliquosa*; Vervoort, 1959: 286-289, fig. 43.

Halopteris diaphana diaphana p.p. Vervoort, 1968: 58-61, fig. 27c.

Halopteris diaphana f. *siliquosa*; García-Corrales, Aguirre Inchaurre & González Mora, 1978: 45-46, fig. 19; Ramil & Vervoort, 1992a: 148-149, fig. 38a.

Antennella siliquosa; Patrìti, 1970: 58, fig. 82.

Antennella glutinosa; García-Corrales, Aguirre Inchaurre & González Mora, 1978: 40-42, fig. 17.

Material.— C7: (10.ix.1990), 20-25 m, 60 colonies with gonothecae.— C11: (31.vii.1991), 27 m, ten colonies without gonothecae.— C22: (13.v.1986), 35 m, numerous colonies with gonothecae (RMNH Coel. No. 27124, slide no. 2572); (14.v.1986), 25 m, various colonies with gonothecae.— C24: (6.v.1986), 38 m, numerous colonies without gonothecae.— C26: (8.v.1986), 10 m, numerous colonies without gonothecae.— C28: (10.v.1986), 25 m, numerous colonies with gonothecae.

Measurements (in mm)

Maximum height of hydrocladia (stems)	45
Hydrocladial thecate internodes, length	0.29-0.43
Hydrocladial athecate internodes, length	0.44-0.70
idem, diameter	0.08-0.14
Hydrothecae, total length	0.19-0.34
idem, diameter at rim	0.16-0.34
Male gonothecae, length	0.575-0.696
idem, diameter	0.242-0.303
Female gonotheca, length	1.515-1.66
idem, diameter	0.363-0.66

Description.— Unbranched hydrocladia rising from creeping hydrorhiza (fig. 13a); perisarc transparent; coenosarc whitish. Hydrocladia with athecate basal part of

varied length having several transverse nodes and some frontal nematothecae. Rest of hydrocladium with oblique and transverse nodes separating athecate and thecate internodes in regular alternation (fig. 13b); first athecate internode with basal transverse and terminal oblique septum. All athecate internodes with two nematothecae in one row. Those nematothecae scarcely movable, short and firmly attached, bithalamic and with a wide and deep embayment in the adcauline wall.

Thecate internodes with cylindrical hydrotheca, one median and two lateral nematothecae; there is no (reduced) nematotheca behind the adcauline hydrothecal wall. Walls of hydrotheca parallel, almost imperceptibly everted, about half of adcauline wall free; rim circular, smooth (fig. 13b). Median (basal) nematotheca short and strong, immovable, with adcauline wall deeply scooped out. Lateral nematothecae placed on short apophyses of slightly varied length (fig. 13c); they are short, do not reach the hydrothecal rim and are bithalamic, with swollen apical chamber and deeply scooped out adcauline wall. On the abcauline side there is an inferior emargination.

Female and male gonothecae found on same hydrocladium. Female gonothecae more or less cylindrical, with a short pedicel inserting just under the hydrotheca at the basal internodes. There are up to four nematothecae on the base; top with well marked, circular operculum (fig. 13d). Male gonothecae shorter, pyriform, with two basal nematothecae and inserting on the distal hydrocladial internodes; there is also an apical, circular operculum (fig. 13e).

Substratum.— Found on various types of hard substrata, on Bryozoa, Cirripedia, Ascidia, Gorgonaria and algae. Also found on worm tubes, on sponges and on other hydroids (Vervoort, 1959; Ramil & Vervoort, 1992a).

Distribution.— Mediterranean, Strait of Gibraltar, Atlantic coast of Morocco, Ivory coast (Ramil & Vervoort, 1992a). According to Boero & Bouillon (1993) a Mediterranean-Atlantic species. Depth distribution until 144 m depth (Ramil & Vervoort, 1992a).

Discussion.— This species has been considered a non-pinnate form of *Halopteris diaphana* (Heller, 1868): *Halopteris diaphana* f. *siliquosa* (Hincks, 1877). As *Halopteris diaphana* is also represented in our collection we have been able to compare the differences and on account of this comparison we reached the conclusion that both 'forms' are separable on the specific level. In the non-pinnate form, described above, the nematothecae differ considerably from those of the pinnate form. The laterals, in the non-pinnate form, have a globular apical chamber with a deep embayment on the adcauline side and a less deep one on the abcauline side; they usually do not reach the hydrothecal border. In the median nematothecae the adcauline wall of the basal chamber is almost completely fused with the internode, rendering that nematotheca fully immobile; the apical chamber is deeply scooped on the adcauline side. In the pinnate form, to be described presently as *Halopteris diaphana*, the laterals are conical and the embayment on the adcauline side, though present, is shallow; there is none on the abcauline side; the median nematotheca is movable. The non-pinnate form agrees with the definition for *Antennella* Allman, 1877 given by Millard (1962, 1975), the hydrocladia rising directly from the hydrorhiza, though an occasional branching may occur; it is recorded here as *Antennella siliquosa* (Hincks, 1877). In *Halopteris* Allman, 1877, a pinnate colony with cauline hydrothecae is the normal, adult condition,

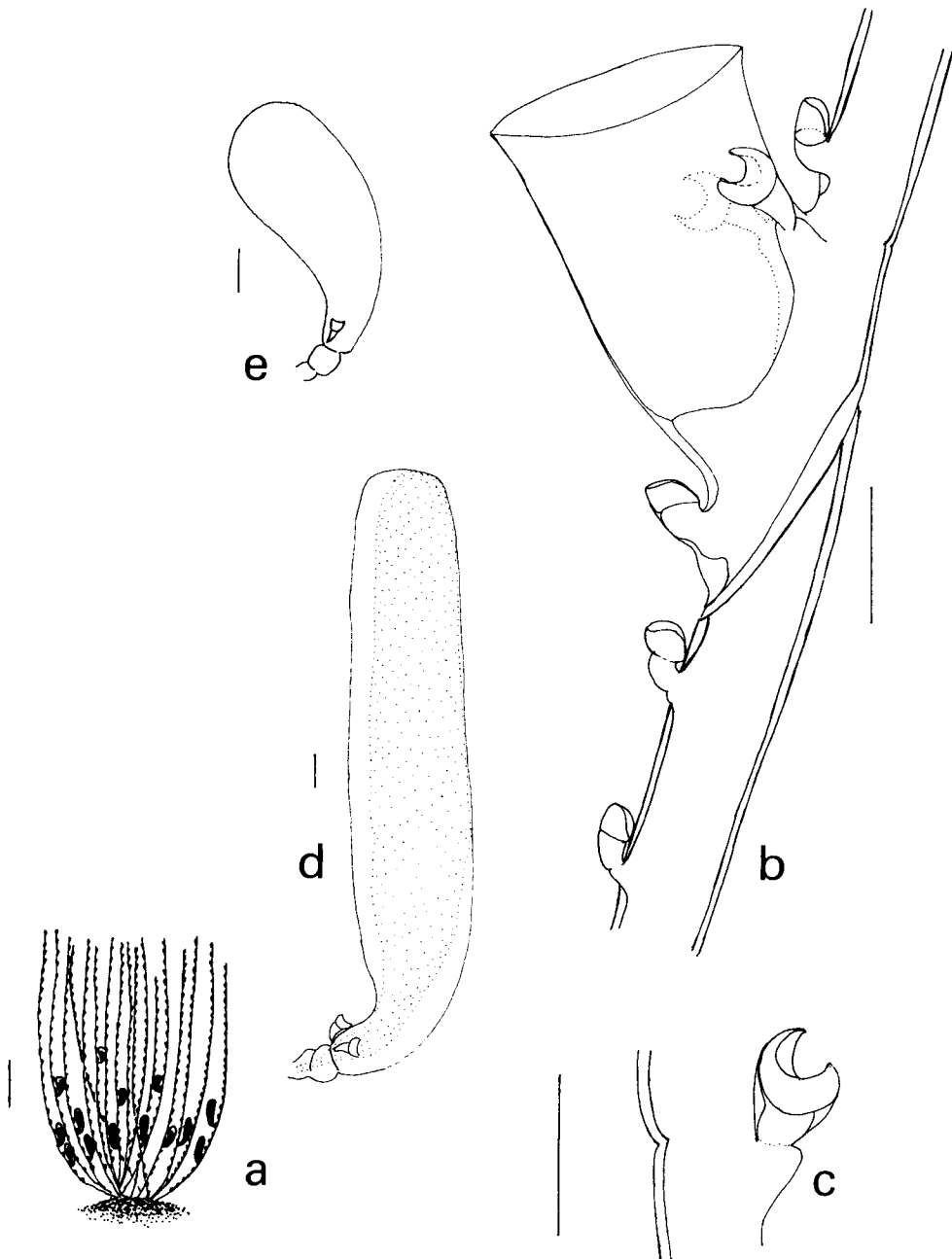


Fig. 13. *Antennella siliquosa* (Hincks, 1877). a, bundle of colonies; b, thecate and athecate internodes; c, lateral nematotheca on short apophysis; d, female gonotheca; e, male gonotheca. Scales: a, 1 cm; b-e, 0.1 mm.

though developing colonies may have a transient *Antennella* stage.

As indicated in the description the length of the apophyses supporting the lateral nematothecae is variable. García-Corrales et al. (1978) have recorded specimens with quite short apophyses as *Halopteris glutinosa* (Lamouroux, 1816). In our opinion these specimens, composed of hydrocladia rising directly from the stolon, belong in *Antennella siliquosa*.

García-Carrascosa (1981) separates *A. siliquosa* and *H. diaphana* by the morphology of the gonothecae and their number of nematothecae. We have not observed gonothecae in our specimens of *H. diaphana*, but the number of nematothecae on the gonotheca in *A. siliquosa* may be more than two, the number maintained for that species by García-Carrascosa. Moreover, García-Carrascosa states that the female gonothecae in *A. siliquosa* are globular and those of *H. diaphana* elongated. In our *A. siliquosa* the male gonothecae are globular and the female elongated. Given the recorded differences and the absence of gonothecae in our material of *H. diaphana* we refrain from attaching diagnostic value to the shape of those gonothecae.

Antennella secundaria (Gmelin, 1791)
(fig. 14)

Sertularia secundaria Gmelin, 1791: 3856.

Aglaophenia secundaria; Lamouroux, 1824: 19.

Plumularia secundaria; De Blainville, 1830: 442; Carus, 1884: 18; Pictet & Bedot, 1900: 27-28, pl. 6 fig. 7.

Anysocalyx secundarius; Costa, 1842: 12.

Schizotricha secundaria; Bedot, 1921a: 23; Blackburn, 1942: 108.

Antennella secundaria; Patrili, 1970: 57, fig. 81A-B.

Antennella secundaria; Millard, 1975: 332-334, fig. 10F-L; Ramil & Vervoort, 1992a: 143-145, fig. 37a-d.

Polyplumaria secundaria; Picard, 1955: 189.

Plumularia dubiaformis Mulder & Trebilcock, 1911: 119, pl. 2 fig. 7.

Material.— C7: (08.viii.1993, 15 m, several colonies with gonothecae.— C9: (25.ix.1991), 3 m, several colonies with gonothecae.— C11 (03.vii.1991), 3 m, various colonies with gonothecae.— C22: (13.v.1986), 35 m, 20 colonies with gonothecae (RMNH Coel. no. 27125, slide no. 2573).— C24: (06.v.1986), 38 m, 15 colonies without gonothecae.— C26: (08.v.1986), 10 m, several colonies with gonothecae.— C28: (10.v.1986), 25 m, several fragments without gonothecae.

Measurements (in mm)

Maximum height of hydrocladia	20
Thecate hydrocladial internodes, length	0.35-0.55
Athecate hydrocladial internodes, length	0.30-0.48
idem, diameter at node	0.06-0.10
Hydrothecae, length abcauline wall	0.16-0.30
idem, diameter at rim	0.21-0.28
Gonothecae, length	0.49-0.80
idem, maximum diameter	0.22-0.31

Description.— Colonies composed of creeping stolon (hydrorhiza) from which rise the, normally unbranched, hydrocladia with reddish coenosarc (fig. 14a). Basal part of hydrocladium athecate, composed of a varied number of internodes only bearing nematothecae and separated by transverse nodes. Rest of hydrocladia with

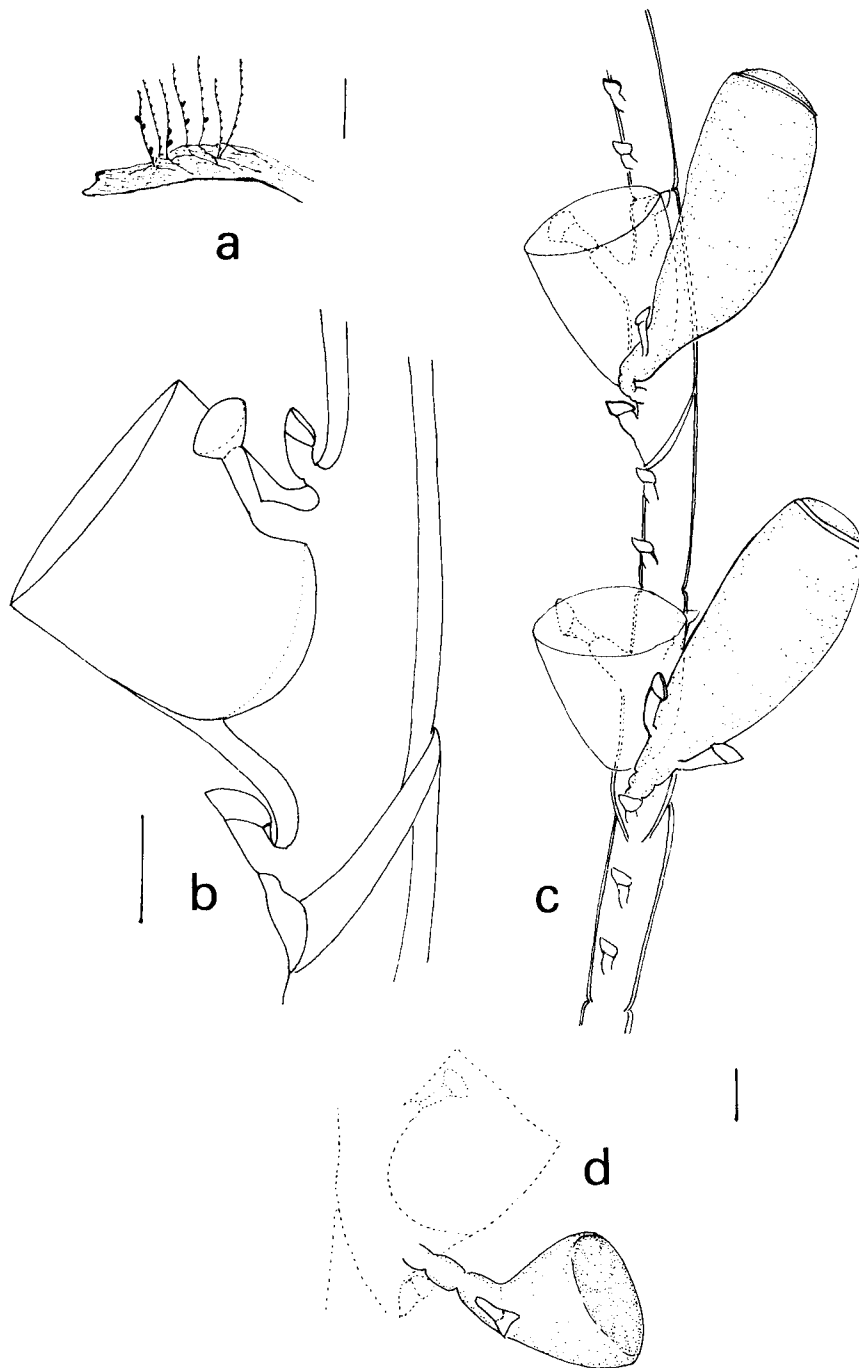


Fig. 14. *Antennella secundaria* (Gmelin, 1791). a, bundle of colonies; b, thecate internode; c, part of axis with female gonothecae; d, male gonotheca. Scales: a, 1 cm; b, c, d, 0.1 mm.

regularly alternating oblique and straight nodes, forming a sequence of athecate and thecate internodes, also alternately arranged (fig. 14c). Athecate internodes basally with straight, apically with oblique node and two nematothecae in a frontal row; those nematothecae two chambered and movable, adcauline wall slightly invaginated. Thecate internodes bearing one hydrotheca and four nematothecae: one on basal part of internode, a flanking pair on distinct apophyses and a fourth, small nematotheca behind the adcauline hydrothecal wall. Hydrotheca cylindrical, half of adcauline wall adnate, rim circular, non everted, perpendicular to hydrothecal long axis. Basal nematotheca curved; apical chamber with adcauline embayment. Distal nematotheca of about same shape but smaller. Lateral nematothecae with narrowed basal part, apical chamber cup-shaped, rim more or less circular, with shallow adcauline embayment (fig. 14b).

Female and male gonothecae found on separate hydrocladia, though springing from same stolon. Female gonothecae elongated pyriform, with circular lid and two opposite nematothecae on the narrowed basal portion (fig. 14c). The male gonothecae are conical with flattened top, also presenting a circular lid, and a pair of opposite nematothecae at the base (fig. 14d). All nematothecae on gonothecae are as the laterals.

Substratum.— On algae, sponges, tubes of Polychaeta and on Bryozoa.

Distribution.— Cosmopolitan species with a preference for warmer waters (Cornelius & Ryland, 1990; Ramil & Vervoort, 1992a; Boero & Bouillon, 1993); maximum recorded depth 1250 m (Bedot, 1921b; Alvarez Claudio, 1993).

Genus *Halopteris* Allman, 1877

Halopteris diaphana (Heller, 1868) (fig. 15)

- Anisocalyx diaphanus* Heller, 1868: 42, 82, pl. 2 fig. 5.
Plumularia diaphana; Bennitt, 1922: 254-255.
Schizotricha diaphana; Leloup, 1932: 163-164.
Antennella diaphana f. *typica* Broch, 1933: 24.
Thecocalus diaphanus; Vannucci-Mendes, 1946: 576, pl. 5 figs 46-47.
Antennella diaphana diaphana; Van Gemerden-Hoogeveen, 1965: 49-54, figs 23-28.
Plumularia tenella Verrill, 1873: 731.
Schizotricha tenella; Nutting, 1900: 80, pl. 4 figs. 4-5.
Plumularia alternata Nutting, 1900: 62, pl. 4 figs 1-2.

Material.— C1: (15.x.1989), 0 m, four colonies without gonothecae.— C7: (08.viii.1993), 15 m, several colonies without gonothecae.— C11: (29.x.1994), 6-9 m, five colonies without gonothecae.— C20: (03.ii.1990), 3 m (RMNH Coel no. 27126, all in slide no. 2574), four colonies without gonothecae.

Measurements (in mm)

Maximum height of hydrocaulus	10
Internodes of hydrocaulus, length thecate internode	0.22-0.78
idem, athecate internodes	0.27-0.55
idem, diameter at node	0.06-0.10
Hydrocladial internode, length of thecate internode	0.24-0.49

idem, length athecate internode	0.17-0.29
idem, diameter at node	0.04-0.05
Hydrotheca, total length	0.12-0.15
idem, diameter at rim	0.12-0.15
idem, length abcauline wall	0.12-0.15

Description.— Colony with erect, monosiphonic, unbranched, transparent hydrocauli, rising from creeping stolon (fig. 15a). Basal part of stem athecate, composed of varied number of internodes separated by transverse septa; there is a frontal row of nematothecae. Distal part of stem with regular succession of transverse

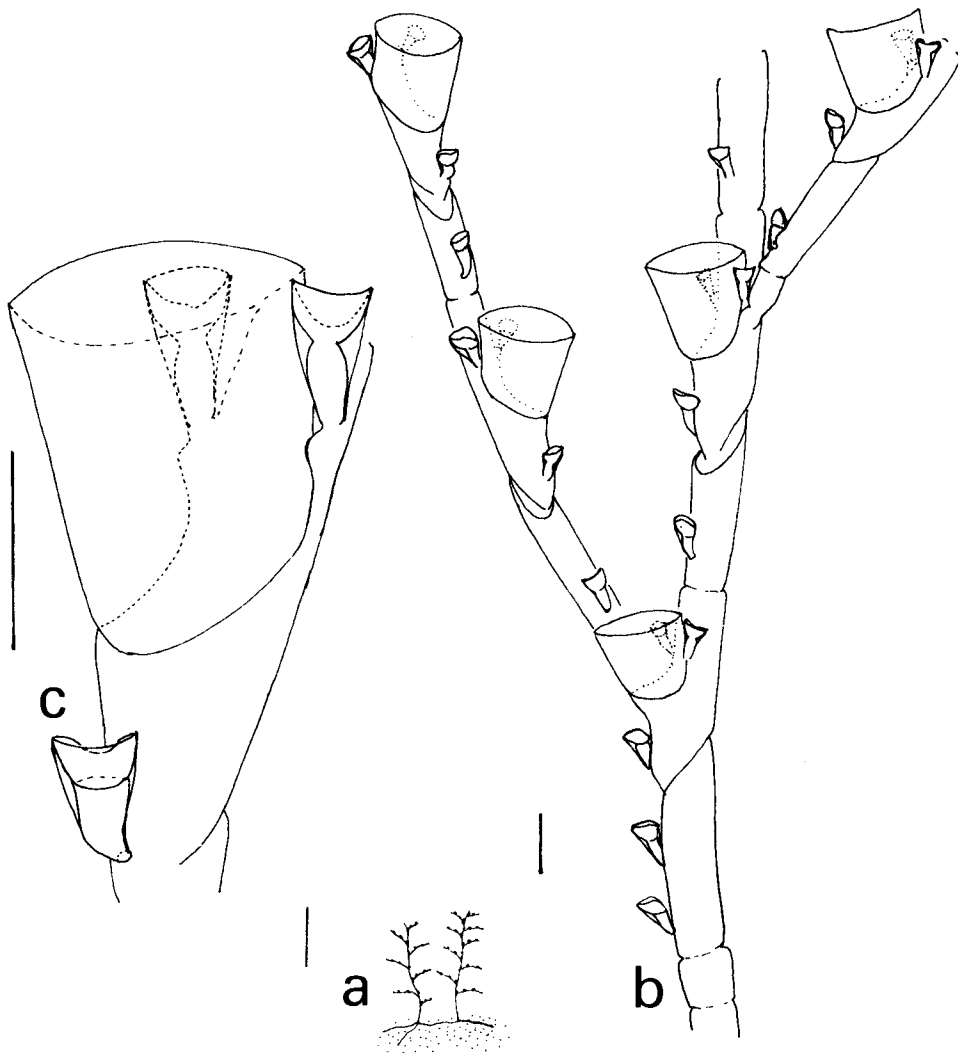


Fig. 15. *Halopteris diaphana* (Heller, 1868). a, two colonies springing from creeping stolon; b, part of axis with two hydrocladia; c, hydrocladial thecate internode in slightly oblique lateral view. Scales: a, 0.5 cm; b, c, 0.1 mm.

and oblique septa, separating a regular sequence of athecate and thecate internodes. Athecate internodes with basally a straight and distally an oblique node; one or two nematothecae are arranged in one row of the frontal surface (two is the normal condition). The thecate internodes, with basally an oblique and distally a straight septum, have the hydrotheca at about half its length, and three nematothecae, one median at the basal part of the internode and two flanking nematothecae placed on a minor elevation besides the hydrotheca. All nematothecae similar, conical, bithalamic, with distinct perisarcal ring limiting the apical chamber. Adcauline wall of all nematothecae with adcauline embayment; the laterals just reach the hydrothecal border. There is no (reduced) nematotheca behind the adcauline hydrothecal wall or on the distal part of the thecate internode. Hydrothecae directed obliquely forward, almost cylindrical, walls slightly widening, with half of adcauline wall adnate, rim not everted, circular; plane of aperture perpendicular to hydrothecal length axis. Hydrocladia inserting on apophyses of the thecate stem internodes, each apophysis just under the insertion of the lateral nematothecae of the axial hydrothecae. The first two hydrocladia form a pair; the remaining are alternately arranged and directed left and right (fig. 15b). Arrangement of internodes, hydrothecae and nematothecae of hydrocladia as on the stem (fig. 15c), but the athecate internodes usually have a single nematotheca.

No gonothecae have been observed.

Substratum.— Present material collected from hard substratum (rocks). Also found on other hydroids (*Halocordyle disticha*) (Vervoort, 1959).

Distribution.— Circumtropic (Vervoort, 1959; Boero & Bouillon, 1993).

Halopteris liechtensterni (Marktanner-Turneretscher, 1890)
(fig. 16)

Plumularia liechtensterni Marktanner-Turneretscher, 1890: 257-258, pl. 6 figs 2, 2a; Motz-Kossowska, 1908: LV, figs 1-3.

Polyplumaria liechtensterni; Picard, 1955: 188; Rossi, 1961: 78.

Halopteris liechtensterni; Boero & Bouillon, 1993: 264.

Material.— C7: (05.vii.1991), 3 m, several colonies, no gonothecae.— C11: (30.vii.1991), 3 m, 12 colonies with gonothecae.— C18: (01.iii.1985), 20-25 m, several colonies, no gonothecae.— C22: (13.v.1986), 35 m, several colonies, no gonothecae.— C25: (05.v.1986), 20 m, several colonies, no gonothecae,

Measurements (in mm)

Maximum height of hydrocaulus	30
Internodes of hydrocaulus, length	0.48-0.64
idem, diameter	0.08-0.17
Hydrocladial internodes, length of thecate internodes	0.24-0.31
idem, length of athecate internodes	0.15-0.24
idem, diameter at nodes	0.06-0.08
Hydrotheca, total length	0.22-0.24
idem, diameter at rim	0.20-0.22
length of abcauline wall	0.17-0.20
Gonotheca, length	1.00-1.13
idem, maximum diameter	0.33-0.40

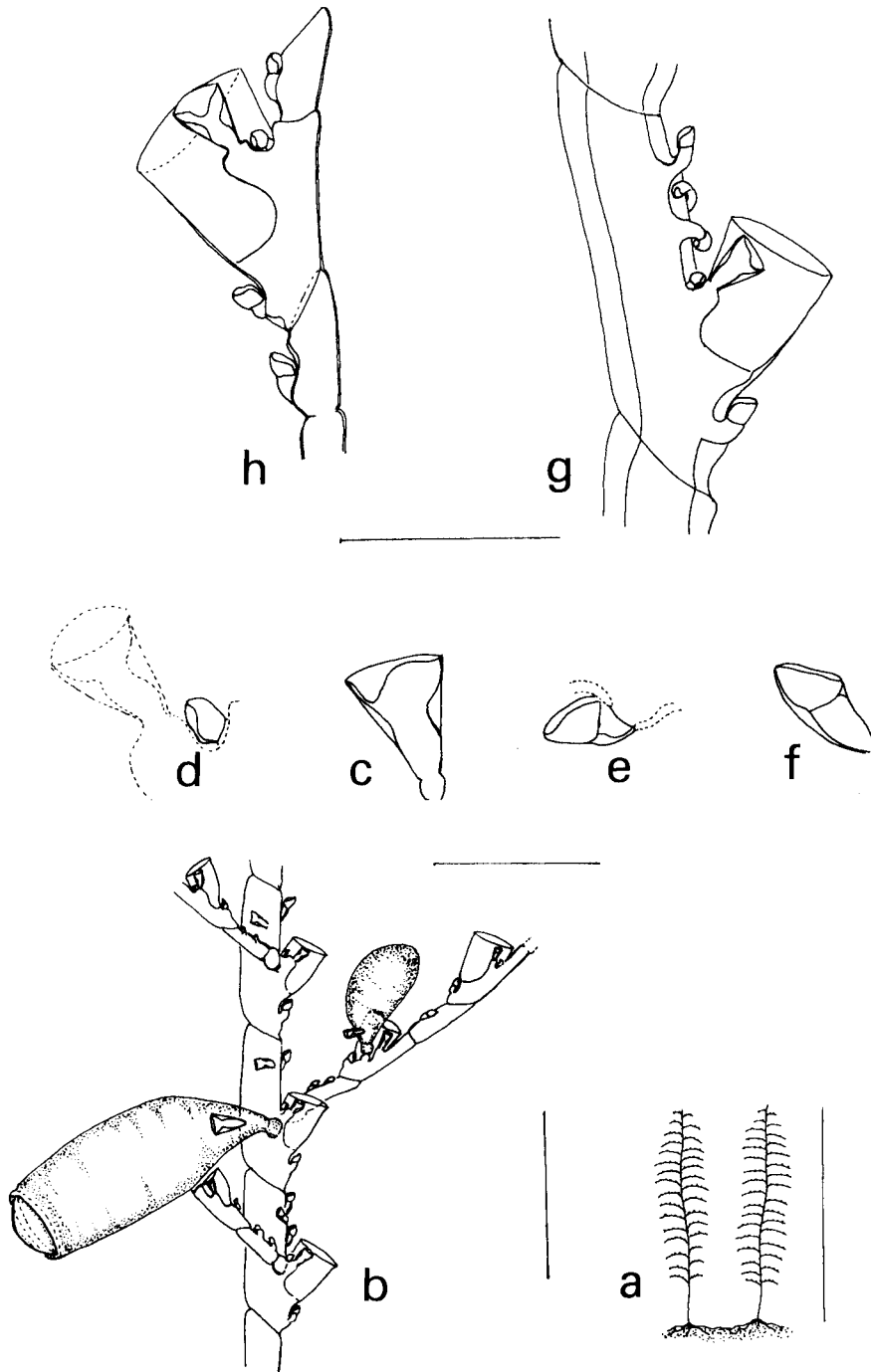


Fig. 16. *Halopterus liechtensteri* (Marktanner-Turneretscher, 1890). a, two colonies; b, part of axis with hydrocladia and gonothecae; c, flanking nematotheca; d, one of pair of reduced nematothecae behind lateral nematothecae; e, infracalycine nematotheca; f, nematotheca on athecate hydrocladial internode; g, stem internode with hydrotheca and nematothecae; h, three internodes of hydrocladium, two athecate and one thecate. Scales: a, 2.88 mm; b, 0.66 mm; c-f, 0.15 mm; g, h, 0.35 mm.

Description.— Colony composed of erect, monosiphonic, unbranched stems, rising from a reticulate hydrorhiza (fig. 16a). Basal part of stem athecate, composed of up to seven internodes separated by transverse septa, each of which may bear a pair of nematothecae. Rest of stem composed of thecate internodes separated by oblique septa, each with a hydrotheca and seven or eight nematothecae (fig. 16b). Axial hydrothecae cup-shaped, with straight, slightly diverging walls; rim circular, not everted (fig. 16g). Nematothecae bithalamic, in principal conical, but varied in size and shape according to position. Each axial internode with one median inferior nematotheca, two pairs of laterals and two or three nematothecae on the distal part of each internode. Median inferior (fig. 16e) and median distal nematothecae of reduced size, only more or less movable, with deep embayment of the adcauline wall. Distal nematothecae arranged in two frontal rows; three is the number usually found on distal internodes. Of the flanking nematothecae one pair is found inserted on apophyses on both sides of the hydrotheca; they are conical, with distinctly separated distal chamber with deep adcauline embayment and reaching the hydrothecal rim (fig. 16c, g). Second pair quite small, found in the axil of apophysis and internode (fig. 16d). Hydrocladia inserting on apophyses besides axial hydrothecae, alternately directed left and right; some of the basal hydrocladia may be branched. First internode of hydrocladium short, separated by straight nodes, athecate. Following internode athecate, with straight basal and oblique distal node and bearing one or two frontal nematothecae. Rest of hydrocladium composed of regular sequence of thecate and athecate internodes (fig. 16h). Thecate internodes with oblique basal and transverse distal node, one hydrotheca (as on stem internodes), one median inferior nematotheca and two pairs of flanking nematothecae. Athecate internodes usually with a single frontal nematotheca (fig. 16f), though two have occasionally been observed on basal internodes.

Female gonothecae large, cylindrical and apically truncate, with circular lid; basal part narrowed, with two or rarely three nematothecae, inserting by means of a short pedicel besides axial or hydrocladial hydrothecae (fig. 16b). Male gonothecae smaller, pyriform, with two nematothecae.

Substratum.— Sponges, algae and hard substratum (rocks); also found on balanids and tubes of Polychaeta (Roca Martinez, 1986, as *Halopteris* sp.).

Distribution.— Considered endemic for the Mediterranean (Rossi, 1961; Boero & Bouillon, 1993); it has been cited from Mediterranean coasts of Morocco, France, Italy, and from the Balears (Rossi, 1961; Roca Martinez, 1986). Recorded depths between 0 and 40 m (Rossi, 1961; Roca Martinez, 1986).

Family Kirchenpaueriidae Millard, 1962

Genus *Kirchenpaueria* Jickeli, 1883

Kirchenpaueria pinnata (Linnaeus, 1758) (figs 17, 18)

Sertularia pinnata Linnaeus, 1758: 813.

Plumularia pinnata; Hincks, 1868: 295-296, pl. 65 fig. 1.

Kirchenpaueria pinnata; Bedot, 1916: 645; Roca & Moreno, 1987: 20, figs 12, 39; Ramil & Vervoort, 1992a: 158-161, fig. 41a-c.

Plumularia echinulata Lamarck, 1816: 126; Hincks, 1868: 302-303, pl. 65 fig. 2.

Plumularia similis Hincks, 1859: 128; Hincks, 1868: 303-304, pl. 65 fig. 3.

Kirchenpaueria similis; Roca & Moreno, 1987a: 20, figs 13, 40.

Plumularia elegantula G.O. Sars, 1874: 103-104, pl. 3 figs 9-14.

Material.— C1: (25.v.1989), 0 m, numerous colonies with gonothecae; (02.vi.1989), 0 m, numerous colonies with gonothecae; (21.ii.1993), 0 m, numerous colonies with gonothecae (RMNH Coel. no. 27127, slide no. 2575).— C2 (03.iii.1991), 0 m, numerous colonies with gonothecae.— C3 (12.iv.1990), 0 m, ten colonies without gonothecae.— C4 (08.i.1989), 0 m, numerous colonies with gonothecae.— C5: (11.ii.1990), numerous colonies with gonothecae.— C7: (18.v.1990), 20 colonies with gonothecae.— C11: (29.x.1994), 6-9 m, 10 colonies without gonothecae.— C14: (15.vii.1993), 3-20 m, three colonies with gonothecae.— C16: (23.xi.1991), 2-5 m, 15 colonies without gonothecae.— C25: (5.v.1986), 20 m, four colonies without gonothecae.— C29: (14.vii.1993), 10-18 m, ten colonies without gonothecae.

Measurements (in mm)

Maximum height hydrocaulus	32
Internodes of hydrocaulus, length	0.219-0.524
idem, diameter	0.048-0.109
Hydrocladial internodes, length of thecate internodes	0.256-0.414
idem, length of athecate internodes	0.085-0.256
idem, diameter at node	0.048-0.060
Hydrotheca, length abcauline wall	0.060-0.109
idem, diameter at rim	0.100-0.158

Description.— Colony composed of erect, monosiphonic, unbranched or occasionally branched hydrocauli rising from an irregularly reticulate hydrorhiza (fig. 17a). Basal part of each axis not bearing hydrocladia, composed of varied number of internodes separated by straight septa. Rest of axis made up of internodes with apical apophysis, separated by straight nodes, the apophyses and hydrocladia alternately directed left and right. A 'naked' nematophore occurs on the adcauline side of each apophysis and a second is found on the axial internode just above the apophysis (fig. 17b). First internode of hydrocladium short, athecate, with straight basal and oblique distal node; occasionally two or three such basal internodes are present. Rest of hydrocladium made up of thecate internodes (fig. 18a, d), or of a regular (fig. 18b) or irregular (fig. 18c) sequence of thecate and athecate internodes, separated by straight septa. Thecate internodes with one hydrotheca and two nematophores; hydrotheca fairly low, cup-shaped, walls gradually widening, occasionally slightly convex; adcauline wall almost fully adnate. Nematophores in one row on front of internode, one completely 'nude' nematophore behind adcauline wall of hydrotheca, the second at the hydrothecal base, with minor frontal peridermal shield (fig. 17b).

Gonothecae inserting on hydrorhiza or in a row on the axis. Gonothecae barrel-shaped, with short pedicel, hexagonal in cross section and with six longitudinal carinae, bearing digitiform prolongations of widely varied development: long in some gonothecae (fig. 17c, c'), absent in others (fig. 17d, d'). In one colony the longest appendages are usually found on the female gonothecae.

Variability.— There is considerable variation in the build of the hydrocladia: some have a regular sequence of thecate internodes (fig. 18a, d), in others there is a regular or irregular sequence of thecate and athecate internodes (fig. 18b, c). There is

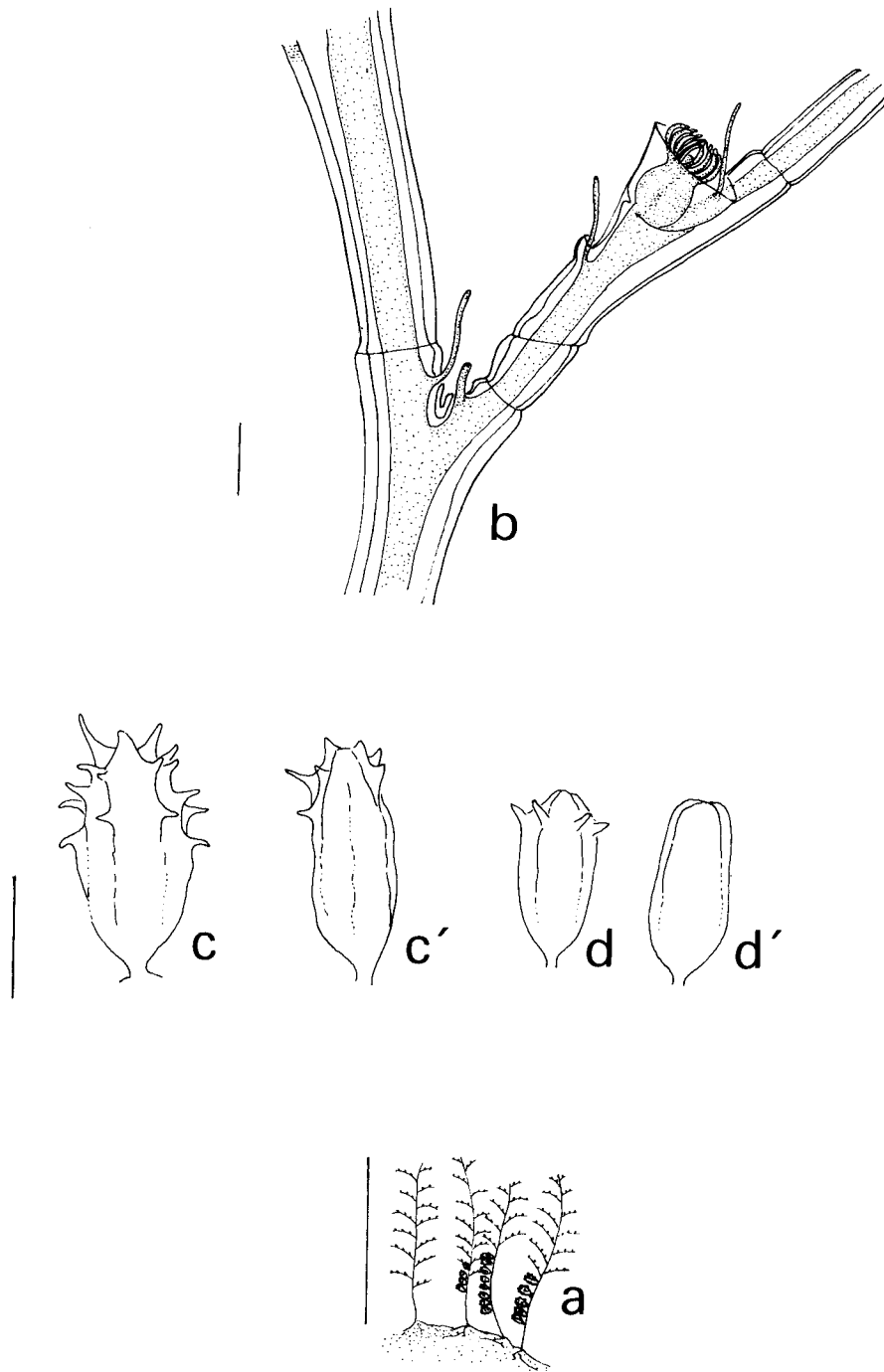


Fig. 17. *Kirchenpaueria pinnata* (Linnaeus, 1758). a, four colonies springing from creeping stolon; b, part of axis with basal part of hydrocladium; c, c', female and male gonothecae with long spines; d, d', female and male gonothecae with spines of reduced length. Scales: a, 2 cm; b, 0.1 mm; c, c', d, d', 0.5 mm.

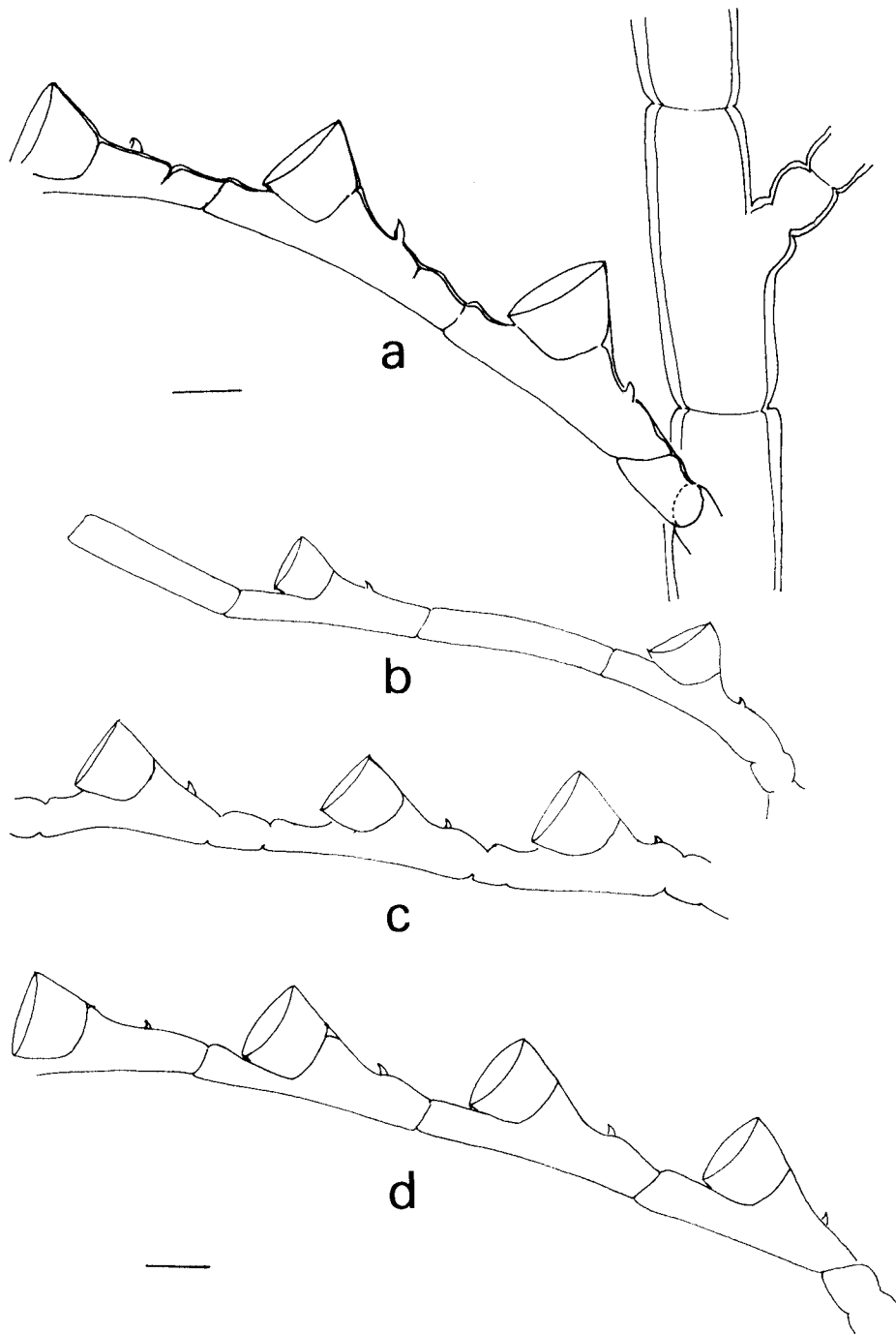


Fig. 18. *Kirchenpaueria pinnata* (Linnaeus, 1758). a-d, hydrocladia from various colonies to show variation in structure. Scalea: a, 0.1 mm; b-d, 0.1 mm.

also considerable difference in length of the athecate internodes: short internodes frequently occurring in colonies with irregular alternation of thecate and athecate internodes, while long (athecate) internodes predominate in colonies with a regular sequence (fig. 18b, c). The variation in development of the gonothecal 'spines' has already been indicated (fig. 17c, c' and 17d, d').

Substratum.— On algae, sponges, Bryozoa, stones and rocky bottoms. Also found on other hydroids, on polychaete tubes and on shells (Hincks, 1868; Leloup, 1952; Chas Brinquez & Rodriguez Babio, 1977; Alvarez Claudio, 1993).

Distribution.— *Kirchenpaueria pinnata* is mainly a tropical Atlantic species (Boero & Bouillon, 1993) that is quite common in the Mediterranean (Ramil & Vervoort, 1992a; Roca Martinez, 1986; Roca & Moreno, 1987b).

Discussion.— Given the considerable variability of the species as discussed above, it is scarcely astonishing that a number of species is recognized by some authors (Bedot, 1916; Da Cunha, 1944; García-Carrascosa, 1981; Roca & Moreno, 1987; Cornelius & Ryland, 1990), basing the distinguishing characters on presence or absence of athecate internodes and their regular alternation with hydrothecate internodes, the presence or absence of the distal nematophore (on the thecate internode), the number of hydrocladia supported by each axial internode and the development of the gonothecal armature [*K. pinnata* (Linnaeus, 1758), *K. echinulata* (Lamarck, 1816), *K. similis* (Hincks, 1859), and *K. elegantula* (G.O. Sars, 1874)]. Of those species only *K. pinnata* and *K. similis* are accepted by modern authors as Cornelius (1990, 1992) and Roca & Moreno (1987), though not with the same characteristics! Our material is characterized by the constant presence of a single hydrocladium per axial internode, all have a nematophore behind the hydrotheca and on the same colony both heavily 'spined' and 'nude' gonothecae occur. As far as the last character is concerned, we have observed, as did Millard (1975), that spinulation is dependent upon age and sex, the male gonothecae having more or less developed spines or being totally 'nude'. Our material demonstrates variation in the structure of hydrocladia:

a, short athecate internodes, often with scarcely visible nodes, that occur irregularly; b. no athecate internodes present; c, athecate internodes regularly alternating with thecate internodes and of almost the same length.

Colonies of the last category usually are finer and more slender than the others, though this does not appear from the measurements. With regard to the great variability in the above named characters we do not believe those to discriminate at the specific level.

Genus *Ventromma* Stechow, 1923

Ventromma halecioides (Alder, 1859) (fig. 19)

Plumularia halecioides Alder, 1859: 353, pl. 12.

Kirchenpaueria halecioides; Bedot, 1923: 227, 232; Billard, 1926: 98-99.

Ventromma halecioides; García-Corrales, Aguirre Inchaurre & González Mora, 1978: 51-53, fig. 23.

Anisocalyx bifrons Heller, 1868: 43, 82, pl. 2 fig. 6.

Plumularia inermis Nutting, 1900: 62-63, pl. 5 figs 1, 2, 2a; Fraser, 1912: 382, fig. 50; Bennett, 1922: 255-256, figs 3, 4.

Antennularia pinnata; Bennett, 1922: 252-254, fig. 2 (not *Antennularia pinnata* Nutting, 1900: 71-72, pl. 10 figs 5, 6)

Plumularia irregularis Millard, 1958: 210-212, fig. 13A-C.

Kirchenpaueria irregularis; Millard & Bouillon, 1974: 9.

Material.— C1: (21.v.1989), 0 m, numerous colonies with gonothecae; (02.vi.1989), numerous colonies with gonothecae; (18.viii.1989), numerous colonies with gonothecae (RMNH Coel. no. 27128, two slides no. 2576).

Measurements (in mm)

Maximum height of hydrocaulus	39
Internodes of hydrocaulus, length	0.330-0.535
idem, diameter	0.070-0.184
Hydrocladial internodes, length thecate internodes	0.359-0.622
idem, diameter	0.035-0.087
Hydrothecae, total length	0.070-0.096
idem, diameter at rim	0.096-0.122
idem, length of abcauline wall	0.131-0.201
Gonothecae, length	0.91-1.46
idem, diameter	0.511-0.822

Description.— Erect hydrocauli rising from a creeping stolon, weakly polysiphonic at the base, brown and transparent in the younger parts, with occasionally some ramifications (fig. 19a). With the exception of the basal part each hydrocaulus is composed of internodes separated by straight nodes, each internode bearing one lateral apophysis, alternately directed right or left, perisarc thin and transparent. Each apophysis has a 'nude' nematophore near the axil; the internode, above the insertion of the apophysis, has a laterally directed, bithalamic but immobile, cup-shaped nematotheca (fig. 19b). Hydrocladia with thin and hyaline perisarc, alternately directed left and right, each beginning with a short athecate internode followed by a regular succession of thecate and (shorter) athecate internodes separated by straight nodes. Thecate internodes each with cup-shaped hydrotheca and two nematothecae; all nematothecae of a hydrocladium frontally directed and in one line. Hydrotheca on distal half of internode, abcauline wall slightly convex; about one-third to one-fourth of adcauline wall free. One of nematothecae some distance below base of hydrotheca, the second just above hydrothecal rim; both nematothecae small, cup-shaped, indistinctly bithalamic and immobile (fig. 19b).

Gonothecae inserting on front of axis, more or less cylindrical, with thick periderm, truncate at the apex and there with circular lid; base narrowed towards short peduncle. Mature gonotheca with c. 10 transverse, rounded ribs (fig. 19c).

Substratum.— On sponges, Bryozoa, on rocks and on fine sand. Also on algae, phanerogames and on other hydroids (García-Carrascosa, 1981; Gili, 1986; Ramil, 1988).

Distribution.— Cosmopolitan (Ramil, 1988; Boero & Bouillon, 1993). According to Cornelius & Ryland (1990) primarily restricted to boreal and tropical waters. Depth from 0 to 20 m (Gili, 1986; Cornelius & Ryland, 1990).

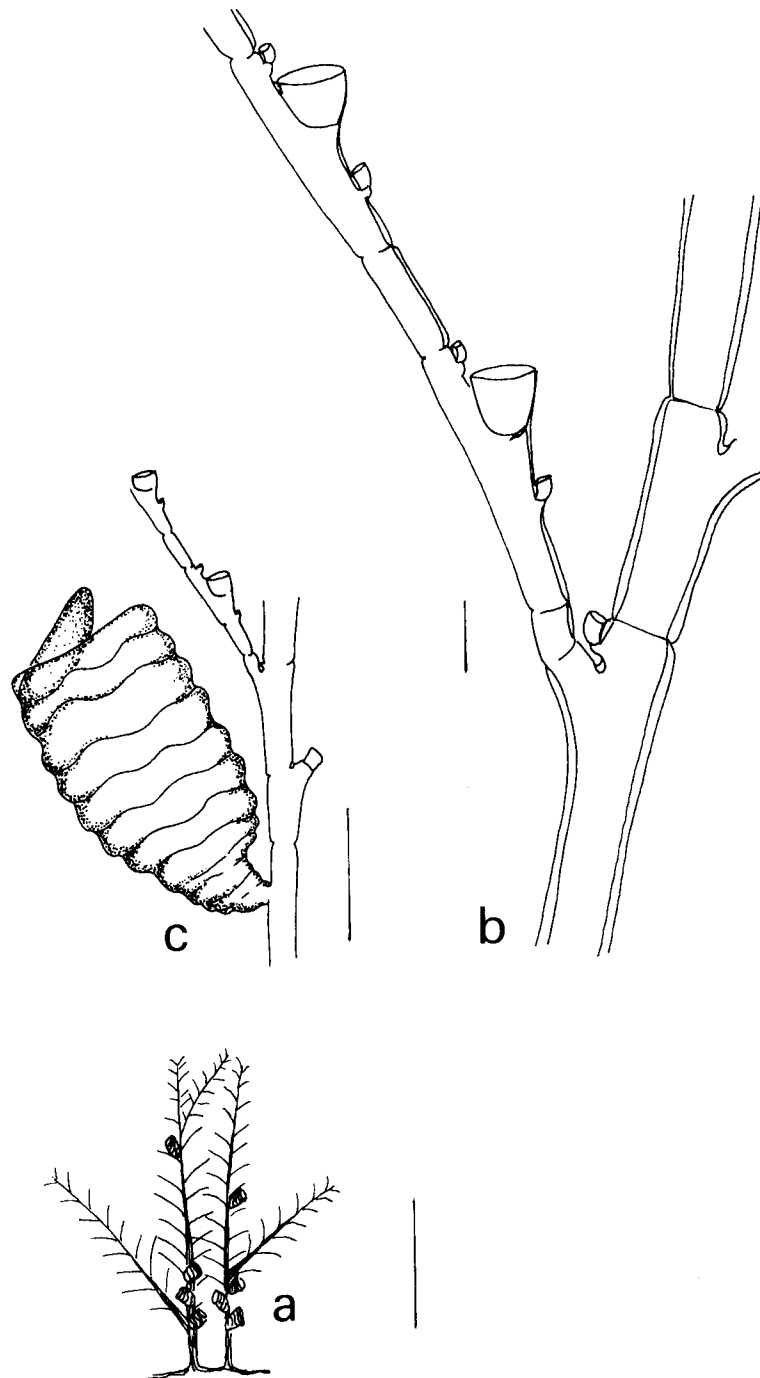


Fig. 19. *Ventromma halecioides* (Alder, 1859). a, two colonies; b, monosiphonic part of axis with hydrocladium; c, mature gonotheca. Scales: a, 1 cm; b, 0.1 mm; c, 0.5 mm.

Family Plumulariidae Hincks, 1868
Genus *Nemertesia* Lamouroux, 1812

Nemertesia ramosa (Lamarck, 1816)
 (figs 20, 23a)

- Antennularia ramosa* Lamarck, 1816: 123.
Nemertesia ramosa Lamouroux, 1816: 164.
Cymodocea ramosa; Lamouroux, 1816: 212, pl. 7 figs 1a, A.
Aglaophenia gracilis Lamouroux, 1816: 171.
Nemertesia Janini Lamouroux, 1816: 163, pl. 4 figs 3a, B, C.
Cymodocea comata Lamouroux, 1821: 15, pl. 67, figs 12, 13.
Sertularia seticornis Hogg, 1827: 33.
Antennularia Janini; De Blainville, 1830: 451.
Antennularia arborescens Hassal, 1843: 111.
Sertularia (Antennularia) ramosa; Dalyell, 1847: 202, pl. 39 figs 7-19, pl. 40.
Heteropyxis ramosa; Kirchenpauer, 1876: 29, 38, pl. 2 figs 22, 22a, pl. 3 fig. 22.
Plumularia gracilis Kirchenpauer, 1876: 30.
Antennularia simplex Allman, 1877: 34, pl. 21 figs 1-2.
Antennularia ramulosa Merejkowsky, 1882: 280.
Antennularia profunda Quelch, 1885a: 10, pl. 2 fig. 5.
Antennularia racemosa Fauvel, 1895: LXVII.
Antennularia variabilis Broch, 1903: 10-11, pl. 4 figs 22-25.

Material.— C11: (22.vii.1990), 5-28 m, two stems without gonothecae (RMNH Coel. no. 27129, slide no. 2577).— F13: (11.vii.1989), 62 m, one stem without gonothecae.— F57: (20.vii.1989), 76-80 m, several fragments with gonothecae (RMNH Coel. no. 27137, slide no. 2585).— F58: (20.vii.1989), 97-118 m, several fragments with gonothecae.— A13: (15.x.1992), single stem without gonothecae.

Measurements (in mm)

Maximum height of hydrocaulus	200
Internodes of hydrocaulus, length	0.66-0.67
idem, diameter at node	0.15-0.28
Hydrocladial internodes, length of thecate internodes	0.525-0.677
idem, diameter at node	0.084-0.135
Hydrotheca, length of abcauline wall	0.084-0.135
idem, diameter at rim	0.118-0.152
Lateral nematothecae, length	0.075-0.100
Gonotheca, total length	0.625-0.700
idem, diameter	0.325-0.400

Description.— Colony with thick, strongly intertwined hydrorhizal matting, formed by many ramified tubes, the polysiphonic yellowish-brown stems rising from this hydrorhizal mass (fig. 23a). Stems thick, branched, with thick perisarc, one of composing tubes of greater diameter and this tubes in higher, weakly polysiphonic and monosiphonic parts of colony gives rise to (verticils of) apophyses bearing hydrocladia; this central tube has little marked transverse nodes. These nodes have one or more frequently two verticils of apophyses; coenosarc composed of various tubes (canaliculated). Apophyses in youngest parts in opposite pairs (fig. 20a), in older parts in verticils of three or four, arrangement such that apophyses of succeed-

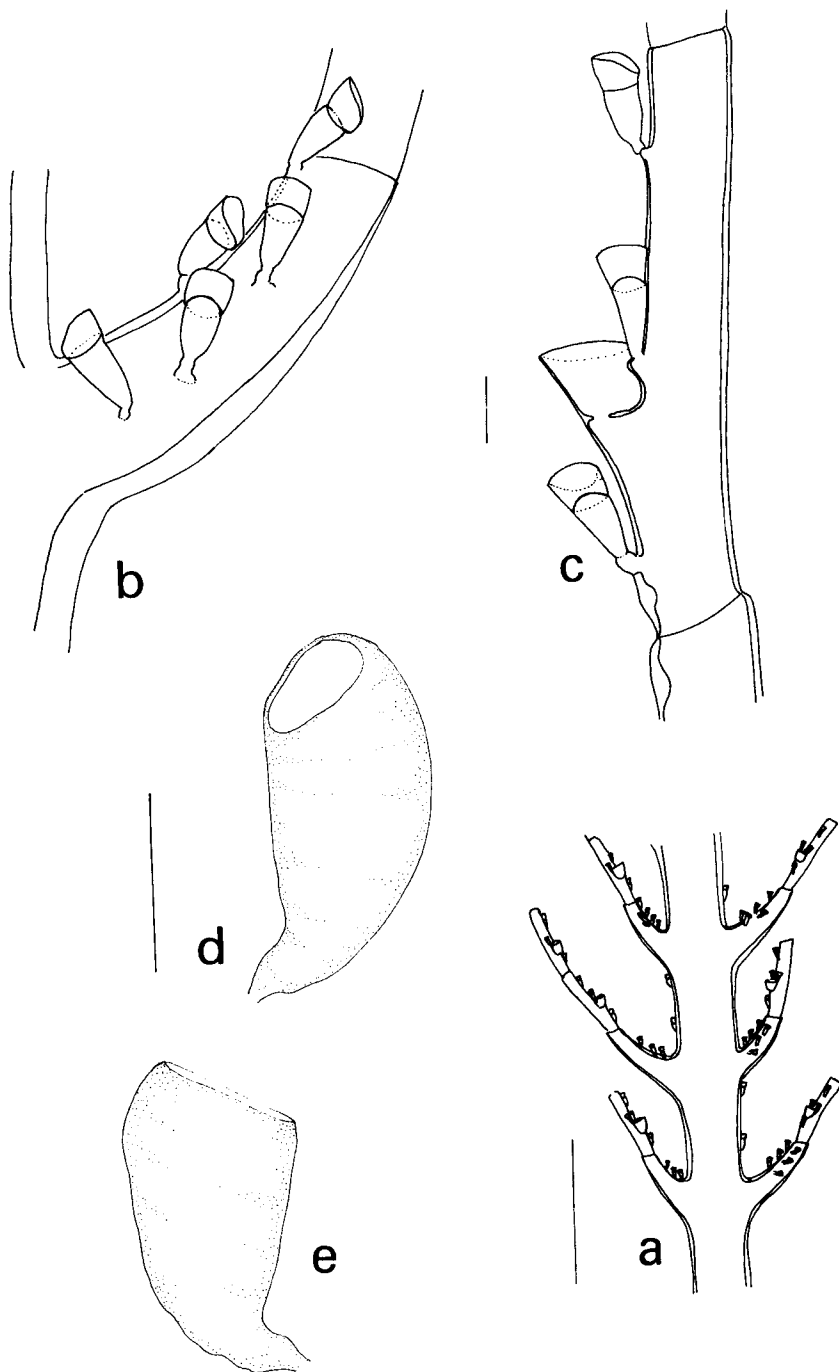


Fig. 20. *Nemertesia ramosa* (Lamarck, 1816). a, upper (young) part of stem with opposite apophyses; b, apophysis, 'mamelon' invisible; c, hydrocladial internode; d, female gonotheca; e, male gonotheca. Scales: a, 1 mm; b, c, 0.1 mm; d, e, 0.5 mm.

ing pairs alternate, resulting in twice the number of longitudinal rows of hydrocladia. Axial tubes irregularly set with nematothecae. Apophyses (fig. 20b) with thick periderm, contrary to the thin periderm of the hydrocladia, and have a 'mamelon' and a varied number of nematothecae, seven being the maximum. Hydrocladia transparent or yellowish, composed exclusively of thecate internodes, separated by almost transverse nodes. Each internode with one hydrotheca and four nematothecae: one basal, two laterals and one on the distal part of the internode; all unpaired nematothecae in one row. All nematothecae conical, bithalamic and with well marked adcauline embayment. Hydrotheca fairly small, cup-shaped with straight walls, rim circular, almost perpendicular to length axis of internode (fig. 20c).

Female and male gonothecae only slightly different, ovoid with obliquely truncate top, narrowing towards base and with short pedicel. Male gonotheca with large circular aperture, plane slightly oblique (fig. 20e). Female gonotheca larger, aperture more or less oval, more strongly inclined than in male gonotheca (fig. 20d). Both sexes insert on the apophyses.

Substratum.— The material inspected is composed of detached colonies. The species has been found attached to shells of bivalves and on muddy and sandy bottoms (García-Carrascosa, 1981).

Distribution.— Cosmopolitan species (Ramil, 1988; Alvarez Claudio, 1993), observed between 5 and 1425 m depth (Gili, 1986; Bedot, 1921b; Alvarez Claudio, 1993).

Nemertesia antennina (Linnaeus, 1758)
(figs 21, 23b)

Sertularia antennina Linnaeus, 1758: 811.

Antennularia antennina; Hincks, 1868: 280-281, pl. 61.

Nemertesia antennina; Bedot, 1917b: 42; Ramil & Vervoort, 1992a: 163-169, figs 42a-r, 43a-h.

Antennularia janini; Marktanner-Turneretscher, 1890: 259, pl. 6 figs 9, 9a [not *Nemertesia janini* Lamouroux, 1816 = *Nemertesia ramosa* (Lamarck, 1816)].

Antennularia octoseriata Jäderholm, 1896: 15-16, pl. 2 fig. 6.

Antennularia Perrieri var. *antennoides* Billard, 1904: 217-219.

Nemertesia irregularis p.p. Stechow, 1913: 93-94.

Nemertesia perrieri; Vervoort, 1966: 138-139, fig. 40.

Material.— C11: (03.vii.1991), 5-28 m, ten colonies without gonothecae.— C17: (26.viii.1981), 25 m, numerous colonies without gonothecae (RMNH Coel. no. 27130, slide no. 2578).— F1: (09.vii.1989), 190 m, 3 stems with gonothecae.— F2: (09.vii.1989), 116-118 m, two stems without gonothecae.

Measurements (in mm)

Maximum height of hydrocaulus	295
Internodes of hydrocaulus, length	0.45-1.50
idem, diameter	0.16-0.56
Hydrocladial internodes, length thecate internodes	0.29-0.49
idem, length athecate internodes	0.15-0.29
idem, diameter	0.05-0.06
Hydrotheca, total length	0.06-0.08
idem, diameter at rim	0.11-0.13
Lateral nematothecae, length	0.15-0.29
Gonothecae, total length	0.52-0.70
idem, maximum diameter	0.28-0.30

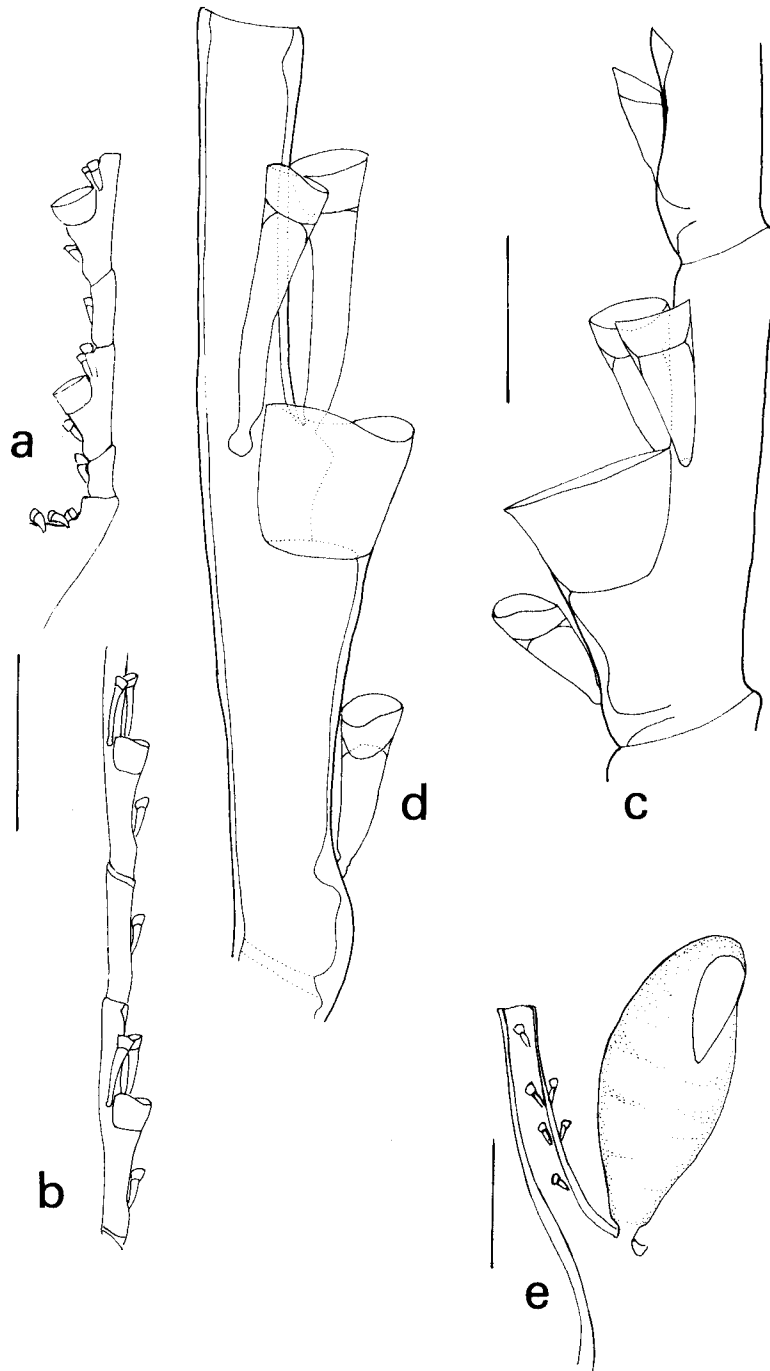


Fig. 21. *Nemertesia antennina* (Linnaeus, 1758). a, insertion of hydrocladium on apophysis; b, part of hydrocladium with lengthened nematothecae; c, normally developed thecate internode with hydrothecal rim ventrally inclined; d, thecate internode with lengthened nematothecae; e, female gonotheca inserting on apophysis. Scales: a, b, 0.5 mm; c, d, 0.1 mm; e, 0.3 mm.

Description.— Colonies with well developed mass of intertwining, much branched, whitish hydrorhizal fibres, springing from basal portion of stems and firmly anchoring colony in sediment or attaching it to substratum (fig. 23b). Axis firm and erect, monosiphonic, not branched, with thick, yellowish to brown perisarc and divided into little marked internodes by means of indistinct, transverse nodes; each internode with one or two verticils of apophyses; irregularly distributed nematothecae may occur. Coenosarc of axis composed of several tubes (canaliculated). Apophyses usually in verticils of four, those of succeeding verticils alternating, each with 'mamelon' on superior surface and up to seven nematothecae; perisarc firm. Hydrocladia with thin perisarc, composed of a regular succession of athecate and thecate internodes, the latter with a basal oblique and a distal almost transverse node. Basal part of hydrocladium with one or two short, athecate internodes each with a nematotheca (fig. 21a); those first articles may also be absent in which case the first internode of the hydrocladium is thecate. Athecate internodes usually with a frontal nematotheca, occasionally with two. Thecate internodes with a hydrotheca and three nematothecae, one median proximal and two laterals, inserting on the internode just under the hydrothecal rim (fig. 21c, d). All nematothecae conical, bithalamic and with distinctly separated apical chamber; adcauline wall with distinct embayment. Lateral nematothecae in some colonies greatly elongated (fig. 21b, d). Hydrotheca comparatively shallow, cup-shaped, with diverging walls; rim circular though sinuous in some colonies, proximally inclined compared to internodal length axis (fig. 21c).

Both female and male gonothecae observed, found attached to the upper surface of the apophyses. The female gonothecae are ovoid, with a convex and a flattened wall; the aperture is oval and placed on the upper part of the flattened side; it is closed by an operculum (fig. 21e).

Variability.— Some colonies have long apophyses and lengthened lateral nematothecae on the thecate internodes (fig. 21b, d).

Substratum.— On various types of bottom: sand, mud, gravel and shells. Also found on corals (Roca Martinez, 1986; Alvarez Claudio, 1993).

Distribution.— Cosmopolitan species (Boero & Bouillon, 1993; Alvarez Claudio, 1993).

Nemertesia irregularis (Quelch, 1885)
(figs 22, 23c)

Antennularia irregularis Quelch, 1885: 8-9, pl. 2 fig. 4 [Not *Antennularia irregularis* Fraser, 1938 = *Nemertesia fraseri* Ramil & Vervoort, 1992a].

Nemertesia irregularis; Ramil & Vervoort, 1992a: 170-173, fig. 48a.

Nemertesia irregularis p.p. Stechow, 1913: 93-94.

Antennularia Perrieri Billard, 1901: 73-74.

Antennularia dendritica Stechow, 1907: 195-196.

Nemertesia minor p.p. Stechow, 1923: 18.

Material.— C13: (05.vii.1991), 5 m, 16 colonies with gonothecae.— F4: (10.iv.1989), 11 colonies with gonothecae.— F5: (10.vii.1989), 67-68 m, seven colonies without gonothecae.— F8: (10.vii.1989), 238-291 m, ten colonies without gonothecae (RMNH Coel. no. 27131, slide no. 2579).— F38: (16.vii.1989), 60-62 m, seven colonies with gonothecae.

Measurements (in mm)

Maximum height of hydrocaulus	250
Internodes of hydrocaulus, length	0.57-1.37
idem, diameter	0.41-0.48
Hydrocladial internodes, length of thecate internodes	0.338-0.491
idem, length athecate internodes	0.338-0.474
idem, diameter at node	0.050-0.084
Hydrotheca, total length	0.084-0.118
idem, diameter at rim	0.118-0.152
Lateral nematotheca, length	0.118-0.152
Female gonotheca, total length	0.92
idem, maximum diameter	0.43

Description.— Matting of hydrorhiza fibres yellowish, springing from basal portion of axis and rooting colony in sediment or attaching it to substratum. Axis monosiphonic, yellow; perisarc thick; coenosarc with many parallel tubes (canalculated). Division into internodes indistinct, nodes transverse; each internode with one or two verticils of apophyses, number of apophyses per verticils two (youngest parts) to five (older parts), alternating with those of succeeding verticil; each apophysis with a 'mamelon' and up to six nematothecae, arranged in pairs. Hydrocladia with thecate and athecate internodes; nodes more or less oblique. First internode of hydrocladium short and athecate, with a single nematotheca; this internode absent in some colonies, where the first internode is a normal thecate internode with hydrotheca and three nematothecae, one median on proximal part and a pair of flanking nematothecae. In the rest of the hydrocladium there may be a regular sequence of thecate internodes, as described above, and athecate internodes bearing two frontal nematothecae, these may be separated by a node (fig. 22a). The thecate internode may have an incomplete septum (perisarc ring) under the insertion of the median nematotheca. Hydrotheca shallow, cup-shaped, with diverging walls, the adcauline wall being almost completely adnate; rim sinuous to circular. All nematothecae conical, bithalamic, with distinct apical chamber and fairly deep adcauline embayment (fig. 22b).

Only female gonothecae have been observed; these are ovoid, with superio-lateral, oval aperture, narrowing proximally (fig. 22c). They insert on the apophyses.

Substratum.— On bottoms of mixed sand and mud and on concretions of polychaete tubes.

Distribution.— Widely distributed in the eastern Atlantic, ranging from the Bay of Biscay to Senegal (Ramil & Vervoort, 1992a); also found in Japanese waters (Stechow, 1913).

Discussion.— According to Ramil & Vervoort (1992a) *N. irregularis* is less variable than *N. antennina* and differs by the presence of two nematothecae on the athecate internodes (though this internode may be divided), by the absence of nematothecae on the axis, and by the occurrence of a single basal internode per hydrocladium, bearing a single nematotheca. The occasional presence of more such internodes is explained by regeneration after damage.

In the present material the lack of variation is well demonstrated, but both *N. antennina* and *N. irregularis*, may have hydrocladia with two basal athecate internodes or have none. Axial nematothecae are absent in our material of both species,

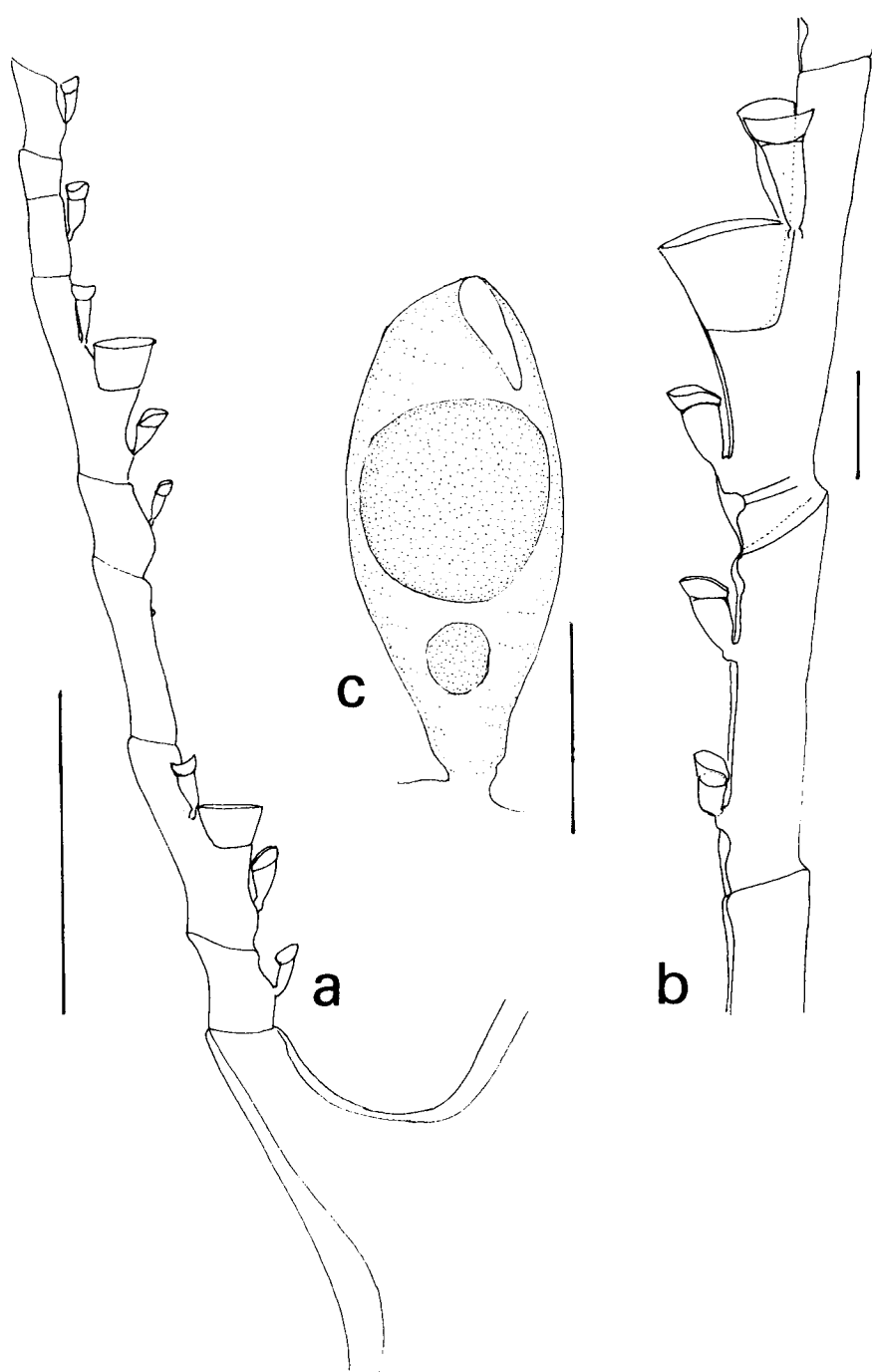


Fig. 22. *Nemertesia irregularis* (Quelch, 1885). a, apophysis with hydrocladium; b, athecate and thecate internodes from hydrocladium; c, female gonothecae. Scales: a, c, 0.5 mm; b, 0.1 mm.

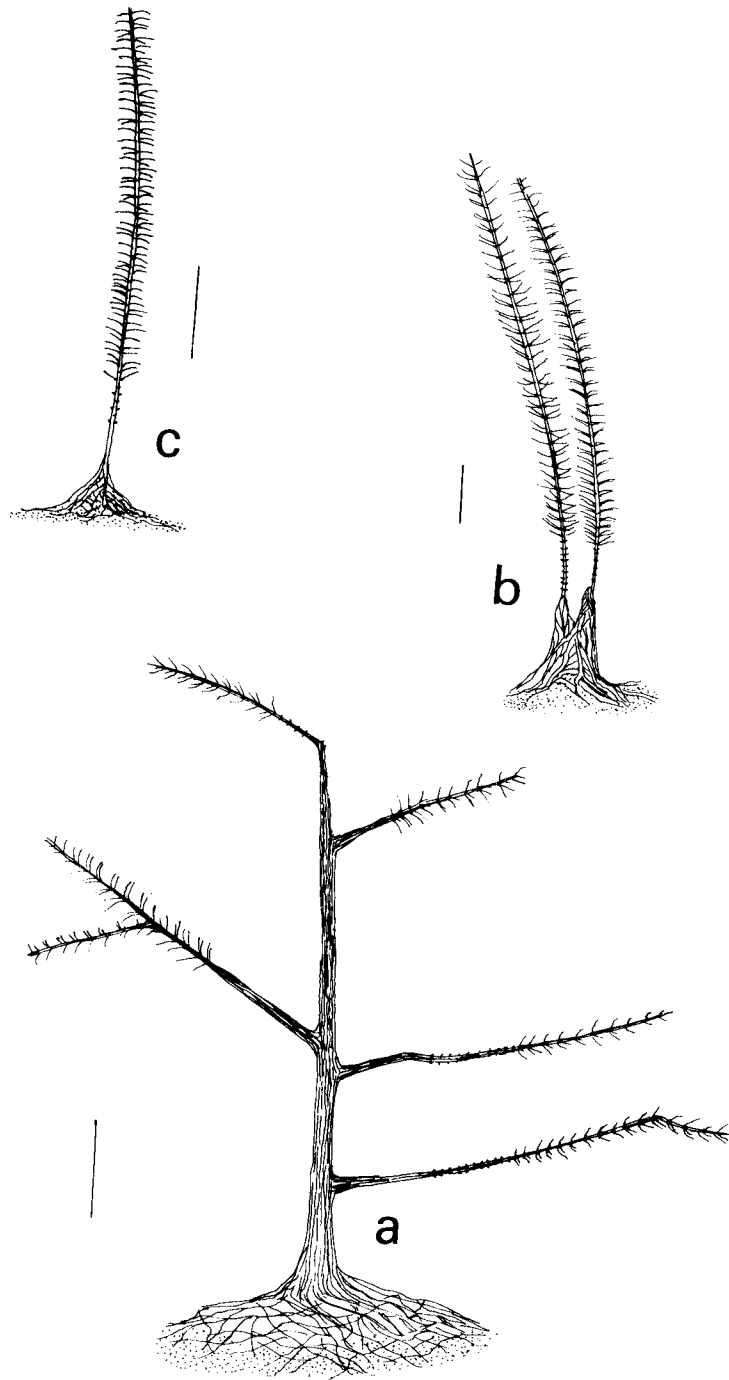


Fig. 23. a, *Nemertesia ramosa* (Lamarck, 1816), colony; b, *Nemertesia antennina* (Linnaeus, 1758), two stems; c, *Nemertesia irregularis* (Quelch, 1885), single stem. Scales: a, 1 cm; b, c, 2 cm.

while occasionally there are two nematothecae on the athecate internodes of *N. antennina*. However, the usual condition is one nematotheca on the athecate hydrocladial internodes in *A. antennina* against two in *N. irregularis*. For the moment both species are kept separate.

Genus *Plumularia* Lamarck, 1816

Plumularia setacea (Linnaeus, 1758) (fig. 24)

Sertularia setacea Linnaeus, 1758: 813.

Aglaophenia setacea; Lamouroux, 1816: 171.

Plumularia setacea; Johnston, 1847: 97, pl. 22 figs 3-5; Hincks, 1868: 296-299, pl. 66 fig. 1; Ramil & Vervoort, 1992a: 191-193, fig. 47f-i.

Aglaophenia Gaimardi Lamouroux, 1824: 611, pl. 95 figs 9, 10.

Plumularia tripartita Von Lendenfeld, 1885: 477, 626, pl. 12 figs 8-10.

Plumularia multinoda Allman, 1886: 157, pl. 27 figs 4-6.

Plumularia lagenifera Allman, 1886: 157-158, pl. 26 figs 1-3.

Plumularia turgida Bale, 1888: 779, 786, pl. 20 figs 12-13.

Plumularia corrugata Nutting, 1900: 64, pl. 6 figs 1-3.

Plumularia palmeri Nutting, 1900: 65, pl. 6 figs 4-5.

Plumularia milleri Nutting, 1905: 934, 951, pl. 5 fig. 1, pl. 12 figs 6-7.

Material.— C2 (03.iii.1991), 0 m, 60 colonies with gonothecae; (18.viii.1989), 0 m, numerous colonies with gonothecae (RMNH Coel. no. 27132, slide no. 2580.— C5: (11.02.1990), 0 m, abundant colonies with gonothecae.— C7: (07.vi.1992), 5 m, 18 colonies with gonothecae; (08.viii.1993), 15 m, 25 colonies, some with gonothecae. C26: (08.v.1986), 10 m, 15 colonies with gonothecae.— C15: (26.vii.1991), 3 m, seven colonies with gonothecae.— C20: (03.ii.1991), 0 m, 15 colonies with gonothecae.— C29: (14.vii.1993), 10-18 m, 11 colonies without gonothecae.

Measurements (in mm)

Maximum height of hydrocaulus	10
Internodes of hydrocaulus, length	0.22-0.48
idem, diameter	0.08-0.16
Hydrocladial internodes, length athecate internodes	0.110-0.260
idem, length thecate internodes	0.240-0.370
diameter at node	0.05-0.07
Hydrotheca, total length	0.08-0.10
idem, diameter at rim	0.10-0.13
Lateral nematothecae, length	0.05-0.06
Gonothecae, total length	0.65-0.85
idem, maximum diameter	0.12-0.35

Description.— Erect, monosiphonic and unbranched hydrocauli rising from a creeping stolon (fig. 24a); colour brown in oldest, transparent in younger parts. Hydrocaulus divided into internodes separated by straight nodes; each internode, except those at base of stem, with a latero-distal apophysis and two nematothecae, one at the basal part above the preceding apophysis, the second almost in the axil of the apophysis (fig. 24b). Hydrocladia inserted on apophyses, alternately directed left

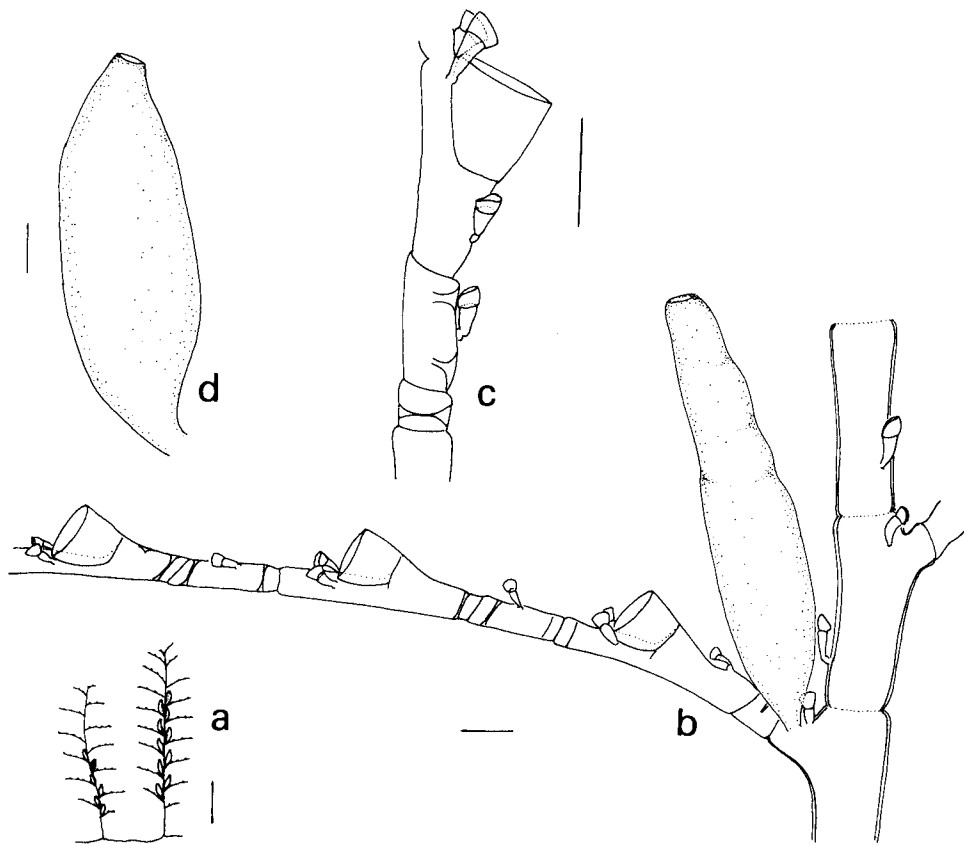


Fig. 24. *Plumularia setacea* (Linnaeus, 1758). a, two colonies rising from creeping stolon; b, part of axis with apophyses, hydrocladium and gonotheca (with collar-shaped apical part); c, thecate and athecate internodes, d, gonotheca. Scales: a, 1 cm; b-d, 0.1 mm.

and right, composed of regular succession of thecate and, shorter, athecate internodes; the first hydrocladial internode is short and athecate, with imperfect septum or ring (fig. 24b). Thecate internodes with cup-shaped hydrotheca and three nematothecae: one on basal part of internode and two flanking the hydrotheca. There may be an incomplete septum or ring under the basal nematotheca. Adcauline wall of hydrotheca almost completely adnate, rim circular and slightly tilted downwards. Athecate internodes with a single frontal nematotheca and two rings or septa: one basal, one distal (fig. 24b, c). All nematothecae conical, with distinct apical chamber and adcauline embayment.

Gonothecae elongated ovoid, narrowing basally towards short peduncle and inserted on apophyses; distally with small, circular aperture (fig. 24b, d). Some gonothecae narrowed apically to form a collar (fig. 24b). No differences between male and female gonothecae have been observed.

Substratum.— Occasionally found on hard, rocky surfaces, but quite common as

epizoite of other hydroids (*Aglaophenia tubiformis*, *A. octodonta*). Also found on algae, mussels, Ascidia, balanids, Bryozoa and tubes of Polychaeta (Roca Martinez, 1986; Ramil & Vervoort, 1992a; Alvarez Claudio, 1993).

Distribution.— Cosmopolitan. Found on both sides of the Atlantic, along the whole extent of the coasts. Also recorded from the Mediterranean, the Pacific, Indian and Arctic Oceans (Millard, 1975; Cornelius & Ryland, 1990; Boero & Bouillon, 1993). According to Cornelius & Ryland (1990) preferentially between 0 and 20 m, but also found at 740 m depth (Broch, 1918).

Genus *Monothea* Nutting, 1900

Monothea pulchella (Bale, 1882) (fig. 25)

Plumularia pulchella Bale, 1882: 42-43, pl. 15 fig. 6; Totton, 1930: 221-222, fig. 58a-d; Blanco, 1973: 73-76, figs 1-3; Millard, 1975: 398-399, fig. 125C-D.

Monothea pulchella; Stechow, 1923: 224.

Plumularia flexuosa Bale, 1894: 115-116, pl. 5 figs 6-10.

Plumularia (Monothea) flexuosa; Stechow, 1925: 499.

Plumularia oblica; Patriti, 1970: 58-59, fig. 83.

Plumularia femina García-Corrales, Aguirre Inchaurre & González Mora, 57-61, fig. 26.

Material.— C2: (18.viii.1989), 0 m, numerous colonies with gonothecae (RMNH Coel. no. 27133, slide no. 2581); (10.ii.1990), several colonies; (24.vii.1993), 0 m, 15 colonies with gonothecae.— C5: (23.xii.1991), 0 m, several colonies; (11.ii.1990), several colonies.

Measurements (in mm)

Maximum height of hydrocaulus	7
Internode of hydrocaulus, length	0.21-0.27
idem, diameter	0.05-0.06
Hydrocladial internodes, length thecate internode	0.19-0.20
idem, length of athecate internode	0.08-0.09
diameter at node	0.03-0.04
Hydrotheca, total length	0.12-0.15
idem, diameter at rim	0.12-0.13
idem, length abcauline wall	0.13-0.14
Gonotheca, total length	0.21-0.27
idem, diameter	0.05-0.06

Description.— Colonies composed of strong and reticulate hydrorhiza, from which rise erect, monosiphonic, occasionally slightly branched hydrocauli (fig. 25a). Periderm of hydrocauli and hydrocladia thin, brownish to transparent (in the youngest parts); hydrocauli divided into internodes by means of transverse septa, each with latero-terminal apophysis (fig. 25c). In addition each internode with three nematothecae: one in the lower half and two flanking the apophysis (fig. 25b). Those nematothecae have the shape of a slightly curved funnel; they are two-chambered, mobile; distal margin provided with distinct embayment. Hydrocladia inserting on the apophyses and alternately directed left and right; they lie more or less in the

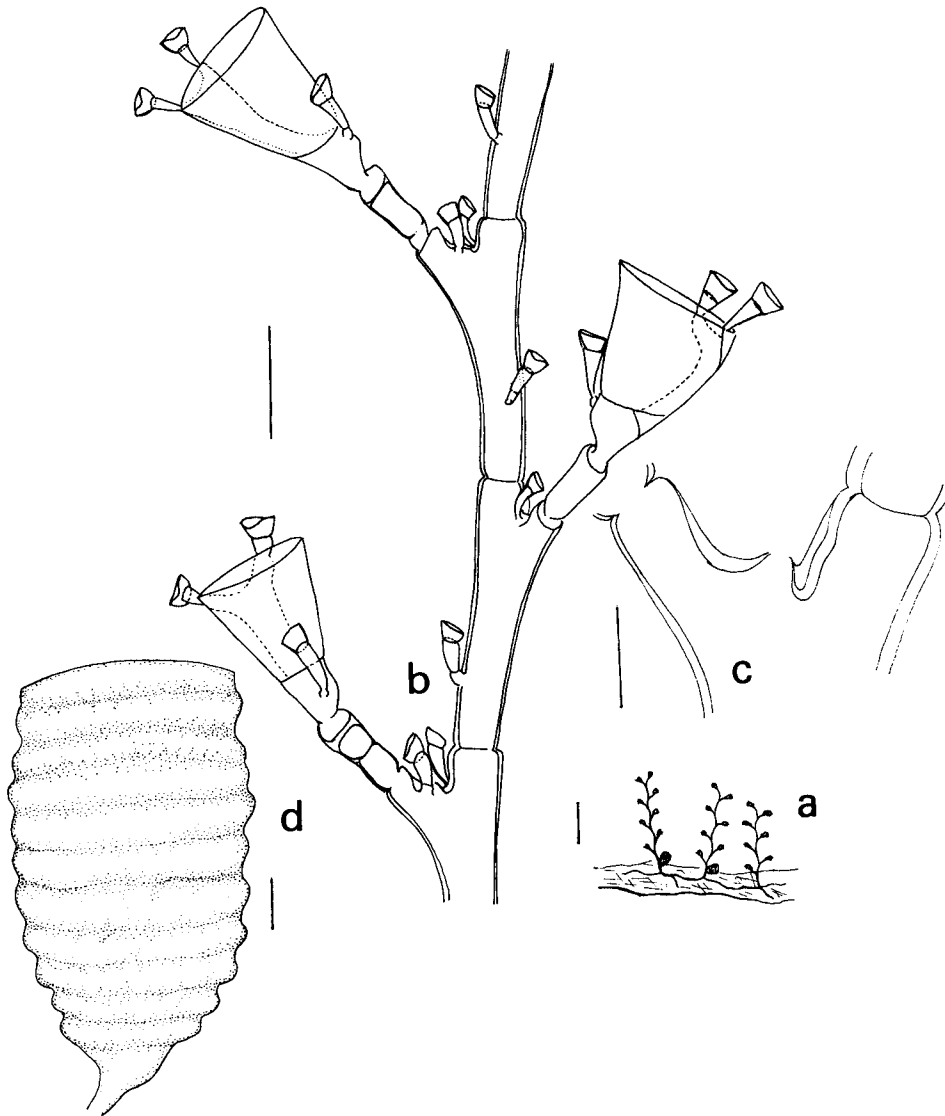


Fig. 25. *Monothecha pulchella* (Bale, 1882). a, three colonies rising from creeping stolon; b, part of axis with three hydrocladia; c, axial apophysis, nematothecae omitted; d, gonotheca. Scales: a, 3 mm; b, d, 0.1 mm; c, 0.05 mm.

same plane (fig. 25b). Each hydrocladium starts with a basal athecate internode separated by transverse nodes; in addition there is an internal perisarcular ring near the distal end. The athecate internode is followed by a single thecate internode, bearing, besides the hydrotheca, a pair of flanking nematothecae and an unpaired median nematotheca. Hydrotheca deep campanulate, adcaudally completely adnate to internode; margin straight and almost perpendicular to hydrocladial length axis, smooth and almost imperceptibly everted (fig. 25b). The three nematothecae are almost iden-

tical to those on internodes of hydrocaulus; they are also mobile. Laterals placed on distinct apophyses that reach the hydrothecal border.

Gonothecae inserting generally on basal internodes of hydrocaulus. They are big, cylindrical with flattened top and provided with thick, yellowish periderm with 8-10 transverse ribs over the whole length of the gonotheca (fig. 25d). In the mature gonotheca the truncate top has a circular operculum.

Substratum.— Observed on hard and soft substrata, the latter being composed chiefly of algae.

Distribution.— Australia (Bale, 1882, 1894), New Zealand (Totton, 1930; Ralph, 1961), Tasmania (according to Millard, 1975), Pearson Island (Watson, 1973), South Africa (Millard, 1975), Golfo San Matías, Argentine (Blanco, 1973), Iberian Peninsula (García Corrales et al., 1978; Roca & Moreno, 1987). Recorded from corals and shells of Gastropoda. Observed by Watson on red algae. The depth distribution is from 0 to 100 m (Millard, 1975).

Remarks and discussion.— Totton (1930) stated that the hydrorhiza of *M. pulchella* bears nematothecae. He did not explain his synonymy, only says that the trophosoma of *M. flexuosa* is smaller though very much like that of *M. pulchella* and that the gonosome is slightly different from that of *M. pulchella*; *M. flexuosa* falling well within the range of variation of *M. pulchella*.

Watson (1973) after the study of Bale's slides of *Plumularia pulchella* states that the species has a robust hydrocaulus, with several septa in the internodes and without caulinar nematothecae, while in Bale's slides *Plumularia flexuosa* has a slender hydrocaulus with caulinar nematothecae. According to Watson the gonotheca of *M. pulchella* has no internal cusps as are present in *M. flexuosa*.

As far as the robustness of the hydrocaulus is concerned; this character may very well be dependent upon the development of the colony. The development of internodal septa, according to Millard (1975) is also highly variable. It remains remarkable, however, that Watson (1973) did not observe caulinar nematothecae in *M. pulchella*. On the other hand, the presence or absence of internal cusps in the gonotheca, if it is not due to sexual dimorphism, is a character to be considered, as did Watson (1973). Finally the authors cited above (Watson, 1973, Ralph, 1961) state that the gonothecae of *M. pulchella* (Bale, 1882) are smooth or may have some irregular ribs (Millard, 1975). The gonothecae we have observed, as well as those of *Plumularia femina* described by García Corrales et al. (1978), have regular transverse ribs over the whole length. We have observed only female gonothecae. It is possible that sexual dimorphism plays a role and that the male gonothecae are smooth; these have been described with and without internal cusps!

In our opinion two distinct species could be involved, the first with cauline nematothecae and with a gonothecae with internal cusps and a second species without such cauline nematothecae and lacking the internal gonothecal cusps, though it is remarkable that Millard (1975) figures colonies with cauline nematothecae but without cusps in the gonothecae (which are also not mentioned in the description).

Castric-Fey (1970: 8-12, figs 10-14) described specimens of *Monotheca* from the Glénan Islands in the northern part of the Bay of Biscay as *Monotheca* sp. In her specimens the apophyses of the axial internodes also bear two nematothecae, but the specimens differ from ours by the stiffness of the hydrocaulus and the considerable development of the perisarc, particularly on the frontal wall of the hydrotheca. These

characters may be greatly influenced by tidal movements or wave action. Unfortunately the specimens were sterile; in the present context they are difficult to evaluate.

Genus *Polyplumaria* G.O. Sars, 1874

Polyplumaria flabellata G.O. Sars, 1874 (fig. 26)

Polyplumaria flabellata G.O. Sars, 1874: 101-102, pl. 2 figs 16-22; Ramil & Vervoort, 1992a: 193-197, fig. 50a-g.

Polyplumaria flabellata p.p. Gili, Vervoort & Pagès, 1989: 91-92.

Diplopteron insigne Allman, 1874: 479-480, pl. 68 fig. 2.

Polyplumaria pumila Allman, 1883: 31, pl. 4 figs 7-8.

Polyplumaria cantabra Arévalo, 1906: 89-97, pls 15-18.

Polyplumaria Billardi Bedot, 1921b: 14-17, pl 1 figs 4, 8-9, pl. 2 figs 12-16, pl. 3 figs 17-18.

Material.— F63: (21.vii.1989), one colony without gonothecae (RMNH Coel. no. 27134, slide no. 2582).

Measurements (in mm)

Maximum height of hydrocaulus	50
Internodes of principal axis of hydrocaulus, length	0.27-0.79
idem, diameter at node	0.12
Thecate hydrocladial internodes, length	0.18-0.36
idem, diameter at node	0.048-0.084
Hydrotheca, length abcauline wall	0.120-0.168
idem, length of adcauline wall	0.096-0.144
idem, diameter at rim	0.120-0.144
Lateral nematothecae, length	0.084-0.108
idem, diameter at rim	0.048-0.060

Description.— Hydrocauli erect, polysiphonic and branched, at the base with some thick stolonal fibres. Branches usually polysiphonic over part of their lengths, arranged opposite and in one plane (fig. 26a). Principal tube of stem and branches, as well as secondary tubes with nematothecae. Principal axis of branches indistinctly divided into internodes, bearing alternately arranged apophyses supporting hydrocladia directed frontally and making an angle of c. 45° with the axis. Apophyses with a large 'mamelon' and a pair of nematothecae (fig. 26b). Hydrocladia composed of thecate internodes separated by oblique nodes, with the exception of the first internode which is athecate and occasionally fused with the apophysis. Thecate internode with big hydrotheca, a basal nematotheca, a pair of flanking nematothecae and a fourth nematotheca above the hydrotheca; this nematotheca may occasionally be placed on a separate internode. Hydrotheca with c. one-third of adcauline wall adnate; walls of hydrotheca gradually widening, margin slightly everted, circular. Lateral nematothecae just reaching hydrothecal rim or slightly shorter; all nematothecae in the colony conical, with distinct, slightly cup-shaped apical chamber with deep embayment of the adcauline wall (fig. 26c). The hydrocladium may be branched, the branch originating from the first thecate internode; first internode of secondary hydrocladium without hydrotheca but with a single (apical) nematotheca (fig. 26b).

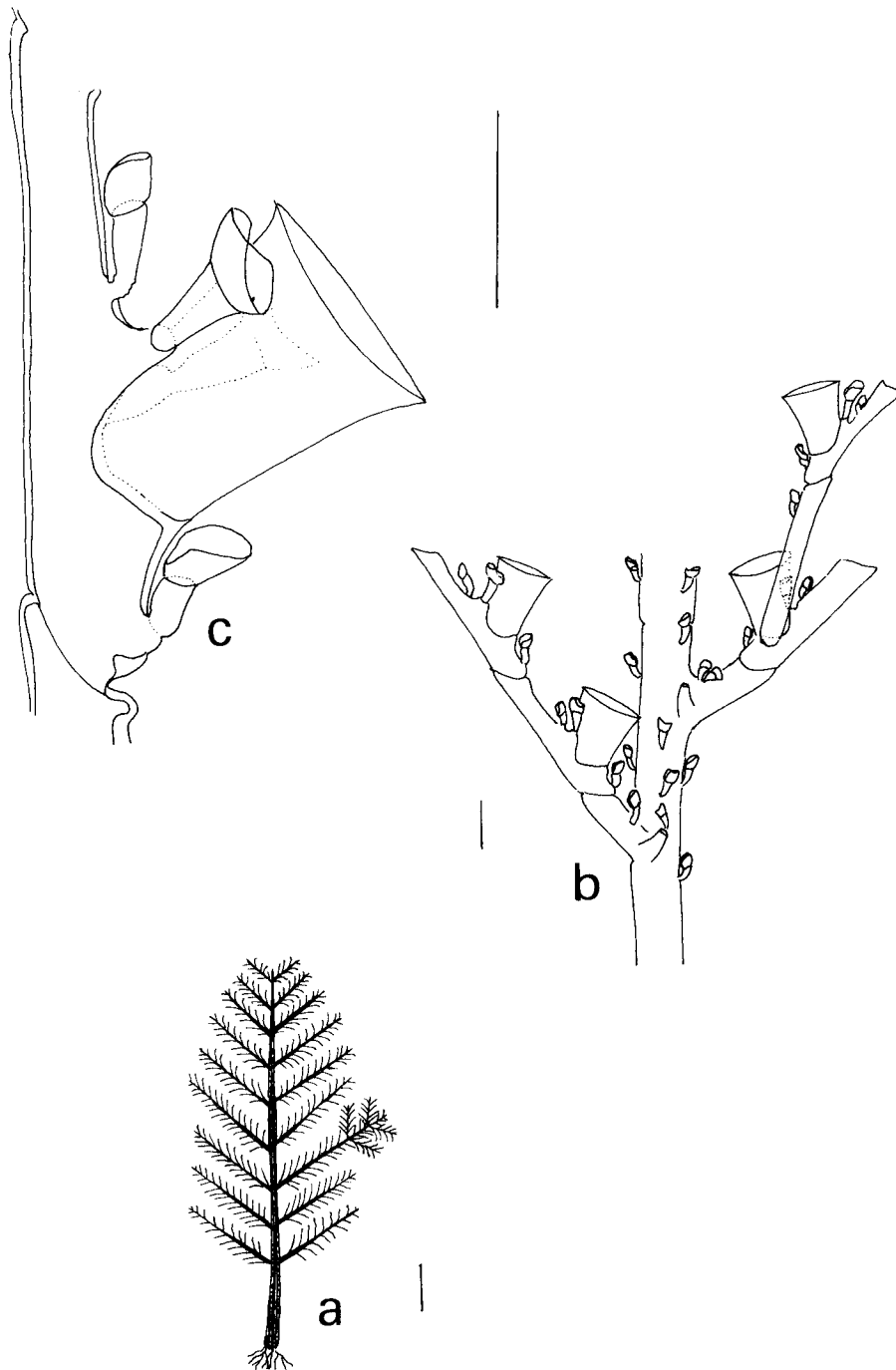


Fig. 26. *Polyplumaria flabellata* (G.O. Sars, 1874). a, small colony; b, part of monosiphonic branch with two hydrocladia, one of which is branched; c, thecate hydrocladial internode with hydrotheca and nematothecae (only one of laterals shown). Scales: a, 1 cm; b, c, 0.1 mm.

Distribution.— Species of deeper water of the temperate Atlantic (Vervoort, 1966; Gili, Ramil & Vervoort, 1992a).

Genus *Pseudoplumaria* Ramil & Vervoort, 1992b

Pseudoplumaria marocana (Billard, 1930) (figs 27, 28)

Plumularia marocana Billard, 1930: 79, fig. 1; Patrìti, 1970: 54-55, fig. 76; Ramil & Vervoort, 1992a: 186-191, figs 48b-d, 49a, b.

Pseudoplumaria marocana; Ramil & Vervoort, 1992c: 491-492, fig. 3.

?*Polyplumaria* Billardi var. *deloni* Bedot, 1921: 17-18, pl. 1 figs 7, 10-11; Patrìti, 1970: 56, fig. 79.

Polyplumaria flabellata p.p.; Gili, Vervoort & Pagès, 1989: 91-92, fig. 19.

Material.— C11: (31.vii.1991), 27 m, two colonies without gonothecae (RMNH Coel. no. 27135, slide no. 2583).

Measurements (in mm)

Maximum height of hydrocaulus	220
Internodes of hydrocaulus, length	0.79-1.41
idem, diameter	0.11-0.12
Hydrocladial internodes, length of thecate internode	0.37-0.45
idem, diameter	0.05-0.07
Hydrothecae, total length	0.16-0.19
idem, diameter at rim	0.16-0.18
idem, length of abcauline wall	0.16-0.19
Lateral nematothecae, length	0.08-0.10

Description.— Colony with thick, polysiphonic, much branched stem rising from thick matting of hydrorhizal fibres; branching all in one plane, with branches opposite or irregularly distributed (fig. 27). Axial tubes, as well as those of branches, parallel, indistinctly divided into internodes and with two longitudinal rows of small nematothecae. Principal tube found on front of colony, with short apophyses alternately pointing left and right and supporting the (alternate) hydrocladia, two to six are found per internode (fig. 28a). Opposite apophysis a large, elevated 'mamelon', surrounded by three nematothecae, one above, one beside the 'mamelon' at the centre of tube and one, more difficult to observe, behind the apophysis. Hydrocladia with one or two basal athecate internodes with a single nematotheca, followed by a regular sequence of thecate internodes separated by oblique nodes; the first septum, however, being transverse (fig. 28a). Each thecate internode with big, cylindrical hydrotheca and four nematothecae. Walls of hydrotheca cylindrical, margin non-everted. Pair of flanking nematothecae conical, slender, with thin ring separating both chambers; adcauline wall with minor embayment. Median inferior nematotheca bithalamic, short, immobile. Fourth nematotheca found in axil between free part adcauline wall and internode, reduced to from a peridermal scale (fig. 28b). Coenosarc of colony with many zooxanthellae.

Distribution.— Atlantic coast of Morocco and Strait of Gibraltar (Patrìti, 1970; Ramil & Vervoort, 1992a), maximum depth 1378 m (Ramil & Vervoort, 1992a).

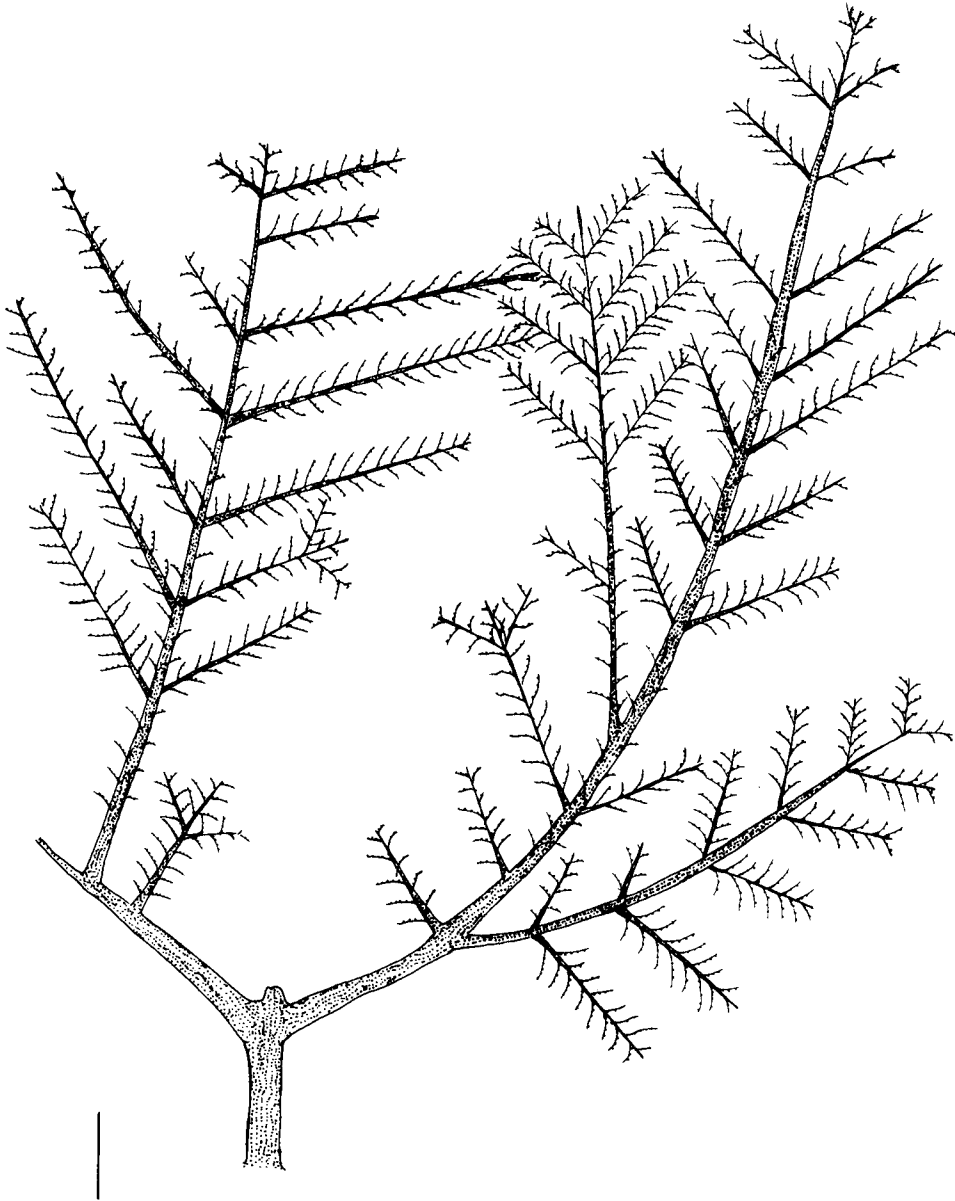


Fig. 27. *Pseudoplumaria marocana* (Billard, 1930), part of large colony. Scale: 1 cm.

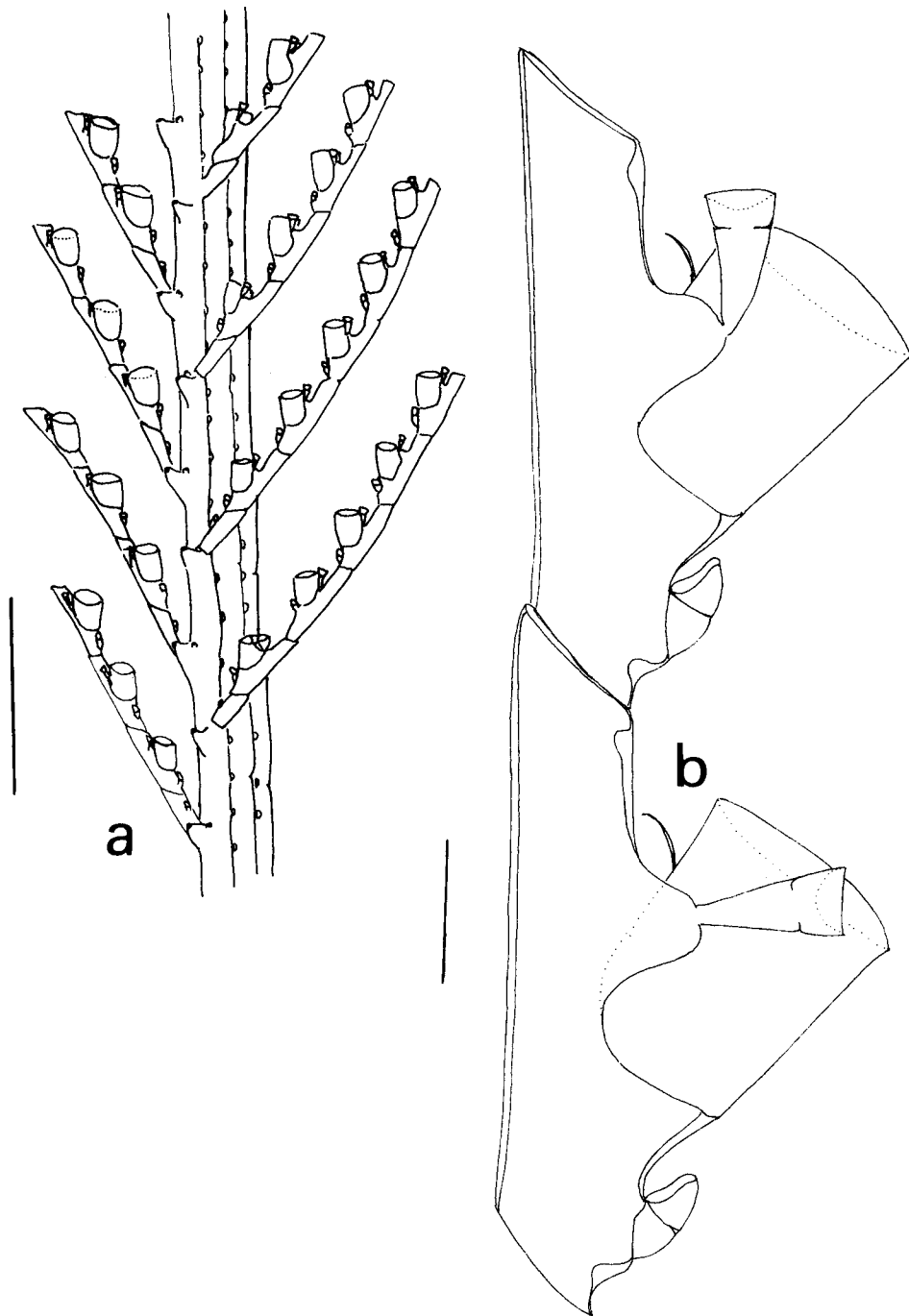


Fig. 28. *Pseudoplumaria marocana* (Billard, 1930). a, part of colony, frontal view; b, two thecate hydrocladia with hydrothecae and nematothecae. Scales: a, 1 mm; b, 0.1 mm.

Concluding biogeographical remarks

Of the twenty-four species studied eight are cosmopolites (*Aglaophenia pluma*, *Lytocarpia myriophyllum*, *Antennella secundaria*, *Kirchenpaueria pinnata*, *Ventromma halecioides*, *Nemertesia antennina*, *N. ramosa* and *Plumularia setacea*). Nine are Atlantic-Mediterranean (*Aglaophenia acacia*, *A. kirchenpaueri*, *A. octodonta*, *A. picardi*, *A. tubiformis*, *A. tubulifera*, *Streptocaulus dollfusi*, *Antennella siliquosa* and *Polyplumaria flabellata*). The species in these two groups are the most abundant.

The remaining seven species are restricted to the nearby zones of the Atlantic and Mediterranean. Of these seven species three are circumtropical (*Aglaophenia parvula*, *Halopteris diaphana* and *Nemertesia irregularis*). Of the remaining four, *Gymnangium montagui* has never been found in the Mediterranean proper; the Bay of Algeciras and Punta Almina near Ceuta, from where the species is now recorded, are both under Mediterranean influence and probably represent limits of the distribution of this Atlantic species in this area. The same may very well apply to *Pseudoplumaria marocana*; this Atlantic species is here recorded from the Bay of Algeciras. *Halopteris liechtensterni* is a purely Mediterranean species, penetrating into the Strait of Gibraltar. *Monothecha pulchella*, finally, is here considered as an Indo-Pacific species occurring at various places along the Mediterranean coast of Spain. It may have migrated through the Suez Canal (Lessepsian migration). The synonymy of this species, as has been pointed out above, is by no means certain.

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