HYDROIDS FROM THE THETA, VEMA AND YELCHO CRUISES OF THE LAMONT-DOHERTY GEOLOGICAL OBSERVATORY

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with 83 text-figures

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INTRODUCTION

The material reported upon below was received in 1968 from the American Museum of Natural History, New York, U.S.A., and constisted of 124 lots of unidentified hydroids, the majority of which originated from the continental shelf bordering the Atlantic coasts of the American continent. A very significant part of the collection comprises material from localities along the Atlantic coast of southern Argentina, the Estrecho de Magellanes and Tierra del Fuego, an area of great zoogeographical interest and with a badly known though richly developed hydroid fauna. The hydroid material in the present collection in many instances consisted of small fragments or had been badly compressed, so that a fairly high percentage could not properly be identified. The localities, with some exceptions, are widely spaced, ranging from the deep sea to a few metres depth. I do not feel justified, therefore, to draw more than a few very tentative zoogeographical conclusions, expecting that the extension of the distributional range of certain species recorded below can later on be used when a more complete survey of the hydroid fauna of the southern part of South America is undertaken, preferably including material from more Pacific localities than at present I have at my disposal.

I want to extend my sincere gratitude to Dr. Ernst Kirsteuer and Mr. Gerald W. Thurmann, both of the American Museum of Natural History, New York, who made the collection available to me. The majority of the material is now preserved in the Rijksmuseum van Natuurlijke Historie, Leiden; duplicates have been deposited in the American Museum of Natural History.

For the loan of some additional material I am indebted to Dr. P. F. S. Cornelius, British Museum (Natural History), London, and Dr. D. L. Pawson, United States National Museum (Smithsonian Institution), Washington.

LIST OF THE STATIONS *)

Theta 1-6, 31°41'-31°43'N, 68°08'W, 26.9.1956, EBT, 5159 m (sub-tropical Atlantic, Bermuda area): *Aglaophenia* cf. *perpusilla* Allman; unidentifiable species (probably *Halecium* and *Sertularella*).

Theta 1-7, 32°21.5'-32°16.4'N, 69°13.4'-69°08.8'W, 27.9.1956, EBT, 5352 m (sub-tropical Atlantic, Bermuda area): unidentifiable species (probably *Halecium*).

Vema 12-8, 22°41'S, 03°16'E, 9.5.1957, SBT, 4981 m (tropical south-eastern Atlantic): unidentifiable species.

Vema 14-1, 40°26'S, 61°13.5'W, 30.1.1958, SBT, 37 m (shelf off Bahía Blanca, Buenos

*) EBT = epibenthic trawl; SBT = standard bottom trawl.

Aires, Argentina): unidentifiable species.

Vema 14-6, 46°47.7'S, 62°47'W, 4.2.1958, SBT, 105 m (shelf east of Cabo Blanco, Santa Cruz, Argentina): *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 14-10, 53°14'S, 68°20'W, 8.2.1958, SBT, 17 m (coastal waters of Tierra del Fuego, near Punta Arenas, Argentina): *Laomedea (Obelia) bicuspidata* (Clarke).

Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m (shelf north of Peninsula Mitre, Tierra del Fuego): *Lafoea fruticosa* (M. Sars); *Abietinella operculata* (Jäderholm); *Laomedea (Obelia) bicuspidata* (Clarke); *Amphisbetia operculata* (L.); *Sertularella picta* (Meyen); *Sertularella geodiae* Totton; *Sertularella robusta* Coughtrey; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Symplectotoscyphus magellanicus* (Marktanner-Turneretscher).

Vema 14-19, 52°41'S, 59°09'W, 22.2.1958, SBT, 108 m (south-western Atlantic between the Falklands Islands and Burdwood Bank): *Acryptolaria conferta conferta* (Allman); *Sertularella geodiae* Totton; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher).

Vema 14-28, 45°34'S, 06°02'E, 28.3.1958, SBT, 4618 m (south-eastern Atlantic south-west of South Africa): unidentifiable species.

Vema 14-29, 41°03'S, 07°49'E, 30.3.1958, SBT, 4961 m (south-eastern Atlantic south-west of Cape of Good Hope, South Africa): *Halisiphonia megalotheca* Allman.

Vema 14-32, 34°35'S, 17°31'E, 6.4.1958, SBT, 1861 m (south-eastern Atlantic south-west of Cape of Good Hope, South Africa): *Cladocarpus distomus* Clarke; unidentifiable species.

Vema 14-34, 34°05.5'S, 18°06'E, 6.4.1958, SBT, 179 m (off Cape of Good Hope, South Africa): *Dicoryne* spec.

Vema 14-35, 29°44'S, 37°15'E, 26.4.1958, SBT, 5013 m (Indian Ocean east of Natal): unidentifiable species.

Vema 14-38, 20°10'S, 56°23.5'E, 7.5.1958, SBT, 1421-1750 m (Indian Ocean east of Madagascar): *Diphasia digitalis* (Busk).

Vema 14-40 II, 11°59.4'N, 44°21'E, 11.6.1958, SBT, 1261 m (Gulf of Aden): unidentifiable species.

Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m (sub-tropical western Atlantic east of Georgia): *Zygophylax convallaria* (Allman); *Diphasia paarmanni* Nutting; *Sertularella gayi robusta* Allman; *Aglaophenopsis hirsuta* Fewkes; *Cladocarpus carinatus* Nutting; *Cladocarpus paradiseus* Allman; *Cladocarpus sigma* (Allman); *Thecocarpus distans* (Allman); *Nemertesia antennina* (L.); *Halopteris catharina* (Johnston); unidentifiable species.

Vema 15-3, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m (sub-tropical western Atlantic east of Georgia): *Sertularella gayi robusta* Allman; *Aglaophenopsis hirsuta* Fewkes; *Cladocarpus paradiseus* Allman; *Cladocarpus sigma* (Allman).

Vema 15-5, 20°30'N, 73°16'W, 4.11.1958, SBT, 4798 m (Windward Passage north of Haiti): *Eucuspidella pedunculata* (Allman).

Vema 15-21, 09°46.3'N, 79°37.5'W, 10.11.1958, SBT, 938 m (Caribbean Sea north of Colon, Panama): unidentifiable species.

Vema 15-22, 09°46.3'N, 79°37.5'W, 10.11. 1958, SBT, 974 m (Caribbean Sea north of Colon, Panama): unidentifiable species.

Vema 15-27, 07°45'N, 79°03'W, 13.11.1958, 152-320 m (Gulf of Panama): *Laomedea (Obelia) longicyatha* (Allman, 1877); unidentifiable species.

Vema 15-44, 09°23'N, 89°06'W, 20.11.1958, SBT, 3496-3501 m (tropical East Pacific south-west of Nicaragua): *Leuckartiara abyssi* (G.O. Sars).

Vema 15-46, 09°22'N, 89°33'N, 20.11.1958, SBT, 3517-3528 m (tropical East Pacific south-west of Nicaragua): ? *Opercularella denticulata* (Clarke).

Vema 15-60, 06°21'N, 85°17'W, 30.11.1958, SBT, 1892-1016 m (tropical East Pacific south of Costa Rica): unidentifiable species.

Vema 15-65, 07°35'S, 81°24'W, 6.12.1958, SBT, 5825-5841 m (tropical East Pacific south-west of Punta Negra, Peru): ? *Opercularella denticulata* (Clarke).

Vema 15-69, 10°13'S, 80°05'W, 9.12.1958, SBT, 6324-6328 m (tropical East Pacific west of Peru): *Cryptolarella flabellum* (Allman).

Vema 15-74, 07°32'S, 81°26'W, 19.12.1958, SBT, 5759-5760 m (tropical East Pacific south-west of Punta Negra, Peru): unidentifiable species.

Vema 15-76, 07°31'S, 81°27'W, 20.12.1958, 5750-5748 m (tropical East Pacific south-west of Punta Negra, Peru): ? *Opercularella denticulata* (Clarke).

Vema 15-85, 32°29'S, 72°28'W, 1.1.1959, SBT, 4532-4097 m (sub-tropical East Pacific off Valparaiso): *Halecium* spec.

Vema 15-91, 51°01'S, 68°32.5'W, 19.2.1959, 82 m (Bahía Grande, southern part Patagonian shelf): *Tubularia* spec.

Vema 15-93, 50°17'S, 66°50'W, 20.2.1959, 82 m (shelf east of the town of Santa Cruz, Argentina): *Sertularella geodiae* Totton; *Sertularella conica* Allman; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher). *Synthecium robustum* Nutting.

Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m (south-western Atlantic between Tierra del Fuego and Falkland Islands (Burdwood Bank): ? *Filellum serratum* (Clarke); *Abietinella operculata* (Jäderholm); *Sertularella antarctica* Hartlaub; *Sertularella picta* (Meyen); *Sertularella geodiae* Totton; *Sertularella cylindritheca* (Allman); *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher); *Synthecium robustum* Nutting.

Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m (south-western Atlantic between Tierra del Fuego and Falkland Islands): *Grammaria magellanica* Allman; *Hebella striata* Allman; *Lafoea fruticosa* (M. Sars); *Campanularia (Orthopyxis) everta* Clarke; *Parascyphus repens* (Jäderholm); *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); unidentifiable species.

Vema 15-100, 53°08'S, 65°07.5'W, 4.3.1959, 126 m (south-western Atlantic between Tierra del Fuego and Falklands Islands): *Symplectoscyphus milneanus* (d'Orbigny).

Vema 15-102, 52°53.3'S, 65°35'W, 5.3.1959, 108 m (south-western Atlantic between Tierra del Fuego and Falkland Islands): *Grammaria magellanica* Allman; *Abietinella operculata* (Jäderholm); *Symplectoscyphus magellanicus* (Marktanner-Turnerescher); unidentifiable species.

Vema 15-103, 53°12'S, 65°30'W, 5.3.1959, 106 m (south-western Atlantic between Tierra del Fuego and Falkland Islands): *Symplectoscyphus milneanus* (d'Orbigny).

Vema 15-105, 54°06.6'S, 66°20'W, 6.3.1959, 55 m (south-western Atlantic between Tierra del Fuego and Falkland Islands): *Grammaria magellanica* Allman; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher); *Synthecium robustum* Nutting.

Vema 15-106, 54°10.2'S, 65°44'W, 6.3.1959, 79 m (south-western Atlantic between Tierra del Fuego and Falkland Islands): *Abietinella operculata* (Jäderholm); *Sertularella robusta* Coughtrey; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Synthecium robustum* Nutting.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m (south-western Atlantic between Tierra del Fuego and Falkland Islands): ? *Filellum serratum* (Clarke); ? *Filellum* spec.;

Hebella striata Allman; *Lafoea fruticosa* (M. Sars); *Abietinella operculata* (Jäderholm); *Sertularella picta* (Meyen); *Sertularella geodiae* Totton; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher); *Synthecium robustum* Nutting; unidentifiable species.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m (south-western Atlantic between Tierra del Fuego and Falkland Islands): *Halecium delicatulum* Coughtrey; ? *Filellum serratum* (Clarke); *Grammaria magellanica* Allman; *Hebella striata* Allman; *Abietinella operculata* (Jäderholm); *Sertularella picta* (Meyen); *Sertularella geodiae* Totton; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher); *Synthecium robustum* Nutting.

Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m (south-western Atlantic between Isla de los Estados and Falkland Islands): *Stegopoma fastigiatum* (Alder); ? *Filellum serratum* (Clarke); *Grammaria magellanica* Allman; *Hebella striata* Allman; *Amphisbetia operculata* (L.); *Sertularella picta* (Meyen); *Sertularella geodiae* Totton; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectotoscyphus milneanus* (d'Orbigny); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher).

Vema 15-110, 54°10'S, 63°20.2'W, 7.3.1959, 284 m (south-western Atlantic between Tierra del Fuego and Falkland Islands): *Abietinella operculata* (Jäderholm); *Synthecium robustum* Nutting.

Vema 15-112, 56°40'S, 67°26'W, 13.3.1959, 134 m (south-western Atlantic South of Cabo de Hornos (Drake Passage): *Amphisbetia operculata* (L.); *Sertularella geodiae* Totton; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny).

Vema 15-116, 55°42.9'S, 64°21.6'W, 15.3.1959, 3824 m (south-western Atlantic south of Isla de los Estados): unidentifiable species.

Vema 15-119, 57°04'S, 61°25'W, 17.3.1959, 3987 m (Drake Passage, north of South Shetland Islands): *Branchiocerianthus norvegicus* Brattström.

Vema 15-163, 32°34'N, 74°21.5'W, 9.7.1959, SBT, 4681 m (sub-tropical Atlantic east of South Carolina): *Acryptolaria longitheca* (Allman).

Vema 16-15, 45°00'S, 45°46'E, 8.1.1960, SBT, 1622 m (south-western Indian Ocean between Prince Edward and Crozet Islands): *Nemertesia incerta* Bedot.

Vema 16-37, 51°52'S, 67°01'W, 16.5.1960, SBT, 101 m (shelf east of Cabo Virgenes, Santa Cruz, Argentina): *Abietinella operculata* (Jäderholm); *Amphisbetia operculata* (L.); *Synthecium robustum* Nutting.

Vema 16-39, 50°53'S, 62°35'W, 19.5.1960, SBT, 157 m (south-western Atlantic north-west of Falkland Islands): *Sertularella conica* Allman; *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 16-40, 42°48'S, 63°11'W, 27.5.1960, SBT, 70 m (shelf south-east of Peninsula Valdés, Argentina): ?*Filellum serratum* (Clarke); *Hebella striata* Allman; *Amphisbetia operculata* (L.); *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus flexilis* (Hartlaub); *Synthecium robustum* Nutting; *Aglaophenia acacia* Allman.

Vema 16-45, 50°53'N, 52°26'W, 15.8.1960, SBT, 265 m (north-eastern Atlantic north of Newfoundland): *Stegopoma plicatile* (M. Sars); unidentifiable species.

Vema 16-48, 60°10'N, 47°08'W, 21.8.1960, SBT, 300 m (off south point of Greenland): *Grammaria abietina* (M. Sars); *Grammaria borealis* (Levinsen); *Lafoea fruticosa* (M. Sars); *Symplectoscyphus tricuspidatus* (Alder); *Sertularia tenera* G. O. Sars; *Tamarisca tamarisca* (L.).

Vema 16-49, 60°10'N, 47°10'W, 21.8.1960, SBT, 274 m (off south point of Greenland): *Grammaria borealis* (Levinsen); *Symplectoscyphus tricuspidatus* (Alder).

Vema 16-52, 55°37'N, 56°08'W, 29.8.1960, SBT, 2078 m (north-western Atlantic east of Labrador): *Lafoea fruticosa* (M. Sars); *Diphasia fallax* (Johnston); *Sertularia robusta* (Clarke); *Thuiaria thuja* (L.); *Dymella laxa* (Allman).

Vema 16-55, 55°48'N, 56°00'W, 30.8.1960, SBT, 2452 m (north-western Atlantic east of Labrador): *Thuiaria hippuris* Allman.

Vema 16-61, 51°18'N, 56°52'W, 5.9.1960, SBT, 101 m (Strait of Belle Isle, Newfoundland): *Halecium halecinum* (L.); *Halecium muricatum* (Ellis & Solander); *Abietinaria abietina* (L.); *Symplectoscyphus tricuspidatus* (Alder); *Sertularia tenera* G. O. Sars; *Thuiaria alternitheca* Levinsen.

Vema 16-62, 51°01'N, 57°10'W, 5.9.1960, SBT, 57 m (Strait of Belle Isle, Newfoundland): *Coryne pusilla* Gaertner; *Calicella syringa* (L.); *Filellum serpens* (Hassall); *Lafoea fruticosa* (M. Sars); *Campanularia (Campanularia) groenlandica* Levinsen; *Abietinaria abietina* (L.).

Vema 16-63, 51°09'N, 57°23'W, 6.9.1960, SBT, 91 m (Strait of Belle Isle, Newfoundland): *Filellum serpens* (Hassall); *Campanularia (Campanularia) groenlandica* Levinsen; *Abietinaria abietina* (L.).

Vema 17-12, 43°30'S, 74°55'W, 23.3.1961, SBT, 112 m (south-eastern Pacific, off Isla de Chiloé, Chile): *Thecocarpus myriophyllum* (L.) var. *orientalis* Billard.

Vema 17-13, 46°59.5'S, 75°54'W, 24.3.1961, SBT, 2657-2470 m (south-eastern Pacific off Golfo de Penas, Chile): *Symplectoscyphus bathyalis* nov. spec.; unidentifiable species.

Vema 17-18, 53°55.5'S, 71°16.8'W, 28.3.1961, SBT, 248-262 m (Estrecho de Magellanes): ? *Filellum serratum* (Clarke); *Synthecium robustum* Nutting; *Nemertesia cymodocea* (Busk).

Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m (Estrecho de Magellanes): *Halecium delicatulum* Coughtrey; *Phialella chilensis* (Hartlaub); *Campanularia (Orthopyxis) everta* Clarke; *Amphisbetia operculata* (L.); *Sertularella antarctica* Hartlaub; *Sertularella geodiae* Totton; *Sertularella robusta* Coughtrey; *Sertularella parvula* (Allman); *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbiny); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher).

Vema 17-20, 53°21'S, 70°36'W, 29.3.1961, SBT, 247 m (Estrecho de Magellanes): *Halecium delicatulum* Coughtrey; *Lafoea fruticosa* (M. Sars); *Amphisbetia operculata* (L.); *Sertularella antarctica* Hartlaub; *Sertularella geodiae* Totton; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher).

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m (Estrecho de Magellanes): *Halecium beanii* (Johnston); *Opercularella* spec.; *Stegopoma fastigiatum* (Alder); *Stegopoma plicatile* (M. Sars); *Lafoea fruticosa* (M. Sars); *Campanularia (Campanularia) laevis* Hartlaub; *Laomedia (Obelia) longissima* (Pallas); *Parascyphus repens* (Jäderholm); *Amphisbetia operculata* (L.); *Sertularella antarctica* Hartlaub; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher); *Nemertesia cymdocea* (Busk); *Halopteris catharina* (Johnston).

Vema 17-22, 52°38'S, 70°50.5'W, 29.3.1961, SBT, 249-392 m (Estrecho de Magellanes): unidentifiable species.

Vema 17-24, 53°37.7'S, 69°54.6'W, 29.3.1961, SBT, 42 m (Estrecho de Magellanes): ? *Filellum* spec.; *Hebella striata* Allman; *Laomedea (Clytia) pelagica* (van Breemen); *Sertularella robusta* Coughtrey; *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m (Estrecho de Magellanes):

Leuckartiara octona (Fleming); *Halecium beanii* (Johnston);? *Filellum* spec.; *Parascyphus repens* (Jäderholm); *Amphisbetia operculata* (L.); *Sertularella antarctica* Hartlaub; *Sertularella geodiae* Totton; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Nemertesia cymodocea* (Busk).

Vema 17-29, 52°43.7'S, 69°53.7'W, 1.4.1961, SBT, 24 m (Estrecho de Magellanes): *Halecium beanii* (Johnston); *Parascyphus repens* (Jäderholm); *Amphisbetia operculata* (L.); *Sertularella antarctica* Hartlaub; *Symplectoscyphus milneanus* (d'Orbigny); *Synthecium robustum* Nutting; *Nemertesia cymodocea* (Busk).

Vema 17-30, 52°40.2'S, 69°51.5'W, 1.4.1961, SBT, 24 m (Estrecho de Magellanes): *Halecium jaederholmi* nov. spec.; *Amphisbetia operculata* (L.); *Sertularella antarctica* Hartlaub; *Sertularella conica* Allman; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny).

Vema 17-32, 52°42.3'S, 69°44.5'W, 1.4.1961, SBT, 48 m (Estrecho de Magellanes); *Amphisbetia operculata* (L.); *Sertularella antarctica* Hartlaub; *Sertularella robusta* Coughtrey; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Nemertesia cymodocea* (Busk).

Vema 17-33, 52°49'S, 67°35'W, 2.4.1961, SBT, 66 m (shelf south-east of Cabo Virgenes, Santa Cruz, Argentina): *Symplectoscyphus milneanus* (d'Orbigny); *Synthecium robustum* Nutting.

Vema 17-38, 53°35.4'S, 70°23.5'W, 3.4.1961, SBT, 132 m (Estrecho de Magellanes): *Stegopoma fastigiatum* (Alder); *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 17-45, 62°33'S, 59°26'W, 23.4.1961, SBT, 600-604 m (Bransfield Strait near South Shetland Islands, Graham Land region): *Stegopoma plicatile* (M. Sars); *Billardia subrufa* (Jäderholm); *Symplectoscyphus elongatus* (Jäderholm).

Vema 17-47, 55°07.2'S, 66°29.3'W, 4.5.1961, SBT, 71 m (south-western Atlantic south of Peninsula Mitre, Tierra del Fuego): *Laomedea (Obelia) longissima* (Pallas); *Sertularella picta* (Meyen); *Sertularalla conica* Allman; *Sertularella robusta* Coughtrey; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher); *Nemertesia cymodocea* (Busk).

Vema 17-48, 55°10'S, 66°23'W, 4.5.1961, SBT, 42 m (south-western Atlantic south of Peninsula Mitre, Tierra del Fuego): *Halecium delicatulum* Coughtrey; *Sertularella picta* (Meyen); *Sertularella robusta* Coughtrey; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Nemertesia cymodocea* (Busk); unidentifiable species.

Vema 17-57, 54°57'S, 63°04'W, 8.5.1961, SBT, 1904-1895 m (south-western Atlantic east of Isla de los Estados): unidentifiable species.

Vema 17-59, 54°53.5'S, 60°26.5'W, 10.5.1961, SBT, 432-426 m (south-western Atlantic south of Burdwood Bank): *Nemertesia ramosa* Lamouroux.

Vema 17-62, 54°41'S, 55°35'W, 12.5.1961, SBT, 1199-1165 m (south-western Atlantic south-east of Falkland Islands): *Sertularella edentula* Bale; *Thecocarpus myriophyllum* (L.) var. 2.

Vema 17-63, 54°23'S, 55°00'W, 12.5.1961, SBT, 2155-2154 m (south-western Atlantic south-east of Falkland Islands): *Plumularia* spec.

Vema 17-66, 50°08'S, 54°14'W, 15.5.1961, SBT, 1511 m (south-western Atlantic north-east of Falkland Islands): *Symplectoscyphus milneanus* (d'Orbigny).

Vema 17-67, 41°39'S, 59°53'W, 18.5.1961, SBT, 73 m (shelf south-east of Bahía Blanca, Buenos Aires, Argentina): unidentifiable species.

Vema 17-69, 40°56'S, 60°10'W, 18.5.1961, SBT, 68 m (shelf south-east of Bahía Blanca, Buenos Aires, Argentina): *Eudendrium laxum* Allman; *Sertularella conica* Allman.

Vema 17-72, 39°21'S, 61°08'W, 19.5.1961, SBT, 15 m (shelf south-east of Bahía Blanca, Buenos Aires, Argentina): unidentifiable species.

Vema 17-75, 41°41'S, 59°19'W, 23.5.1961, SBT, 82 m (shelf south-east of Bahía Blanca, Buenos Aires, Argentina): unidentifiable species.

Vema 17-76, 41°57'S, 59°03'W, 23.5.1961, SBT, 81 m (shelf south-east of Bahía Blanca, Buenos Aires, Argentina): *Halecium delicatulum* Coughtrey; *Sertularella gayi gayi* Lamouroux); unidentifiable species.

Vema 17-78, 42°28'S, 58°31'W, 24.5.1961, SBT, 227-229 m (continental slope east of Bahía Blanca, Argentina): *Halecium delicatulum* Coughtrey; *Lafoea fruticosa* (M. Sars); *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 17-79, 42°28'S, 58°31'W, 24.5.1961, SBT, 251-262 m (continental slope south-east of Bahía Blanca, Buenos Aires, Argentina): *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 17-88, 45°11'S, 60°55'W, 11.6.1961, SBT, 110 m (shelf south-east of Peninsula Valdés, Argentina): *Grammaria magellanica* Allman; *Hebella striata* Allman; *Lafoea fruticosa* (M. Sars); *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 17-89, 45°02'S, 61°18'W, 11.6.1961, SBT, 102 m (shelf south-east of Peninsula Valdés, Argentina): *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 17-91, 44°45'S, 62°11'W, 11.6.1961, SBT, 98 m (shelf south-east of Peninsula Valdés, Argentina): *Symplectoscyphus subdichotomus* (Kirchenpauer); unidentifiable species.

Vema 17-92, 44°37'S, 62°40'W, 12.6.1961, SBT, 93 m (shelf south-east of Peninsula Valdés, Argentina): unidentifiable species.

Vema 17-100, 44°23'S, 59°53'W, 13.6.1961, SBT, 166-177 m (continental slope south-east of Peninsula Valdés, Argentina): *Halecium delicatulum* Coughtrey; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher).

Vema 17 RD 12, 44°19'S, 59°52'W, 13.6.1961, rock dredge, 183-366 m (shelf south-east of Peninsula Valdés, Argentina): *Halecium jaederholmi* nov. spec.; *Tulpa tulipifera* (Allman); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher).

Vema 17-102, 34°25'S, 52°19'W, 27.6.1961, SBT, 73 m (shelf east of Santa Vitória do Palmar, Rio Grande do Sul, Brazil): unidentifiable spceies.

Vema 17-107, Western Bank, 5.8.1961, SBT, 48 m: *Hydractinia echinata* (Fleming).

Vema 17 RD 18, 44°14'N, 59°03.5'W, 12.8.1961, rock dredge, 183-192 m (south-western Atlantic east of Nova Scotia): *Hebella* spec.; *Lafoea fruticosa* (M. Sars); *Laomedea (Obelia) longissima* (Pallas); *Sertularia cupressina* L.; *Sertularia tenera* G. O. Sars; *Thuiaria lonchitis* (Ellis & Solander).

Vema 17 RD 29, 60°27'N, 48°31'W, 4.9.1961, rock dredge, 366-326 m (off south point of Greenland, near entrance to Davis Strait): *Grammaria abietina* (M. Sars); *Diphasia fallax* (Johnston); *Symplectoscyphus tricuspidatus* (Alder); *Tamarisca tamarisca* (L.); *Aglaophenopsis cornuta* (Verrill); *Nemertesia antennina* (L.).

Vema 17-118, 57°50'N, 54°06'W, 8.9.1961, SBT, 3369 m (north-western Atlantic, east of Labrador): unidentifiable species.

Vema 17-119, 54°27'N, 54°08'W, 10.9.1961, SBT, 218 m (north-western Atlantic east of Labrador): *Halecium muricatum* (Ellis & Solander);*Lafoea fruticosa* (M. Sars).

Vema 18-9, 36°17'S, 53°21'W, 4.2.1962, SBT, 676-547 m (continental slope south-east of Montevideo, Uruguay): unidentifiable species.

Vema 18-12, 47°09'S, 60°38'W, no date (February, 1962), SBT, 424-428 m (continental

slope east of Deseado, Santa Cruz, Argentina): *Tulpa tulipifera* (Allman); *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus paulensis* Stechow; *Thecocarpus myriophyllum* (L.) var. 1.

Vema 18-14, 47°13'S, 61°30'W, 17.2.1962, SBT, 132-130 m (shelf east of Golfo de San Jorge, Argentina): ? *Filellum serratum* (Clarke); *Grammaria magellanica* Allman; *Lafoea fruticosa* (M. Sars); *Symplectoscyphus subdichotomus* (Kirchenpauer); unidentifiable species.

Vema 18-15, 47°22'S, 62°06'W, 18.2.1962, SBT, 135-137 m (shelf east of Golfo de San Jorge, Argentina): *Symplectoscyphus subdichotomus* (Kirchenpauer).

Vema 18-16, 47°30'S, 62°39'W, 18.2.1962, SBT, 123 m (shelf east of Deseado, Santa Cruz, Argentina): *Parascyphus repens* (Jäderholm); *Sertularella picta* (Meyen); *Sertularella robusta* Coughtrey; *Symplectoscyphus subdichotomus* (Kirchenpauer); *Synthecium robustum* Nutting.

Vema 18-18, 47°55'S, 63°41'W, 18.2.1962, SBT, 108 m (shelf east of Deseado, Santa Cruz, Argentina): *Parascyphus repens* (Jäderholm); *Amphisbetia operculata* (L.); *Sertularella picta* (Meyen); *Sertularella gayi gayi* (Lamouroux); *Sertularella robusta* Coughtrey; *Synthecium robustum* Nutting.

Vema 18-23, 52°25'S, 68°11'W, 20.2.1962, SBT, 22 m (shelf south-east of Cabo Virgenes, Santa Cruz, Argentina): *Amphisbetia operculata* (L.); *Symplectoscyphus subdichotomus* (Kirchenpauer); *Symplectoscyphus milneanus* (d'Orbigny); *Symplectoscyphus magellanicus* (Marktanner-Turneretscher).

Vema 18-27, 52°41'S, 75°21'W, 24.2.1962, SBT, 470-562 m (Pacific entrance to Estrecho de Magellanes, off Cabo Pilar, Chile): *Thecocarpus myriophyllum* (L.) var. 1.

Yelcho 2-9, 64°08'S, 64°05'W, 5.3.1962, 527 m (Palmer Island region, Graham Land): *Staurotheca antarctica* Hartlaub.

Yelcho 2-11, 63°40'S, 64°08'W, 5.3.1962, 240 m (Palmer Island region, Graham Land): *Symplectoscyphus plectilis* (Hickson & Gravely).
Burdwood Bank, RD, 1/2 (no further data): *Eudendrium rameum* (Pallas); *Filellum* spec.; *Grammaria magellanica* Allman; *Synthecium robustum* Nutting.

Taxonomic report

Family Corymorphidae

Subfamily Branchiocerianthinae

Branchiocerianthus norvegicus Brattström, 1956

Branchiocerianthus norvegicus Brattström, 1956: 1360; Brattström, 1957: 3-9, pls. 1-2; Ankel, 1962: 357, fig. 10; Vervoort, 1966: 100.

Material. — Vema 15-119, 57°04'S, 61°25'W, 17.3.1959, 3987 m. One specimen.

Description. — The total length of the present specimen, which lacks the basal bulb, is 45 mm. The hydrocaulus is of uniform thickness throughout and has longitudinal perisarcal canals, distinctly visible through the thin periderm. There is no distal constriction of the hydrocaulus under the hydranth.

The hydranth shows distinct bilateral symmetry. It consists of a swollen

and broad basal disc, shaped like a tennis racket and attached to the hydrocaulus at its pointed, proximal, ventral edge; the disc points obliquely upwards. The proximal tentacles are attached along the margin of the disc-shaped basal part of the hydranth. These marginal tentacles, in spite of their considerable degree of contraction, are long and slender. Their number is about 50 and in the present specimen they form a tangled mass. The tentacles inserting near the place of attachment of the hydrocaulus are shorter than the remaining tentacles, though no tentacles of microscopical dimensions have been observed. The radial canals, running from the place of attachment of the marginal tentacles in the direction of the hypostome, are unbranched.

The hypostome of the hydranth rises from the upper third of the disc; it is directed upwards (in the same general direction as the hydrocaulus) and thus forms a sharp angle with the rest of the disc. The hypostome is conical and about 4 mm long at the side facing the pointed end of the disc, but its apical part, including some of the rows of distal tentacles, is damaged. As a result of this damage I cannot give the accurate number of distal tentacles, which has been estimated at about 50.

There are no blastostyles; the specimen consequently is sterile and probably quite young.

Measurements (in mm). —

	Hardangerfjord (Brattström, 1957)	Vema 15-119
Total length of specimen	120	45
Hydrocaulus, length	110	40
diameter below hydranth	2	1.6
Hydranth, total length	9	4
maximal diameter	7.5	3
Number of marginal tentacles	54	± 50
Length longest marginal tentacle	65	35
Number of distal tentacles	40-60	—
Length of distal tentacles	4	2-3

Remarks. — For a discussion of the various species of *Branchiocerianthus* I refer to Brattström (1957: 5) and Vervoort (1966: 100). The present specimen agrees in all essential details with Brattström's description of *Branchiocerianthus norvegicus*, though the absence of blastostyles in the Vema specimen hampers certain identification. However, the agreement in the vegetative parts is so complete that I feel practically certain of its identity.

Branchiocerianthus norvegicus was described, after a single specimen, from Indre Samlenfjord, a part of the Hardangerfjord, off Hesthammer, Norway, 60°26'05"N, 06°33'50"E, at a depth of 210-240 m; bottom composed of muddy sand and stones. The present specimen originates from

Drake Strait, north of the South Shetland Islands (Vema 15-119), where it was obtained from great depth (3987 m).

Family TUBULARIIDAE

Tubularia spec.

Material. — Vema 15-91, 51°01'S, 68°32.5'W, 19.2.1959, 82 m. Two hydrocauli of about 20 mm length, each bearing a single, badly preserved, sterile hydranth.

Remarks. — This fragmentary material does not permit specific identification, though the specimens resemble slender sepcimens of *Tubularia larynx* Ellis & Solander, 1786. The hydrocauli have thin, transparent periderm; the perisarc has disappeared from the greater part of the tubes. The proximal tentacles are placed on a distinctly dilated part of the hydranth and number about 20. The hydranths are greatly contracted, so that the number of aboral tentacles could not be ascertained; they border a conical hypostome. The Vema specimens originate from Bahía Grande, southern part of the Patagonian shelf. I have been unable to trace records of *T. larynx* Ellis & Solander from that area.

Family CORYNIDAE

Coryne pusilla Gaertner, 1774

Coryne pusilla Gaertner, 1774: 40, pl. 4 fig. 8; Vervoort, 1946, p. 90, fig. 36.

Material. — Vema 16-62, 51°01'N, 57°10'W, 5.9.1960, SBT, 57 m. Four sterile hydranths rising from a stolon creeping on *Abietinaria abietina* (L.), together with *Calicella syringa* (L.), *Lafoea fruticosa* (M. Sars), *Filellum serpens* (Hassall) and *Campanularia groenlandica* Levinsen.

Remarks. — The creeping stolonial fibres are 0.15 mm thick and a rich brownish-yellow. The stalks rise directly from the stolon and are 2.5-3 mm long; they are ringed at their origin and under the hydranth; the rest of the periderm is irregularly wrinkled. The hydranths are slender, elongated oval, with a lengthened hypostome and 1.5 mm long. They bear about 20 capitate tentacles, arranged in 5 more or less distinct rows. No gonophores have been observed, so that the identification is slightly doubtful. The specimens cannot be distinguished from sterile specimens of *C. pusilla* Gaertner.

The Vema material originates from the Strait of Belle Isle, Newfoundland, where *C. pusilla* is quite common.

Family BOUGAINVILLIIDAE

Dicoryne spec.

Material. — Vema 14-34, 34°05.5'S, 18°06'E, 6.4.1958, SBT, 179 m. Three monosiphonic fragments, 45-60 mm long, rising from a stolon creeping on Bryozoa.

Description. — Each fragment is composed of a very short, monosiphonic hydrocaulus, covered with very thick, strongly wrinkled periderm. There are only three hydranths, borne on short stalks, springing from the hydrocaulus. The hydranth is claviform, not covered with periderm and has about 8 tentacles, placed in a whorl on the apical part of the hydranth. All hydranths are strongly contracted, so that the exact number of tentacles could not be ascertained. They are filiform, though slightly swollen apically because of strong contraction.

Besides the three hydranths there are several slender, clavate blastostyles, all placed at the end of short side-branches of the hydrocauli. Only one of the blastostyles is fertile; it has a cluster of developing, small and globular gonophores on its body.

Measurements (in microns). —

	Vema 14-34
Diameter of hydrocaulus	145
Diameter of blastostyle	55-100
Length of blastostyle	220-385
Diameter of gonophores	50-60
Length of hydranth	310
diameter	145

Remarks. — In the genus *Dicoryne* Allman, 1859, the following species have been described: *Eudendrium confertum* Alder, 1856: 354, pl. 12 figs. 5-8; *Dicoryne annulata* Von Lendenfeld, 1884: 491, pl. 17 fig. 30; *Dicoryne flexuosa* G. O. Sars, 1874: 128, pl. 5 figs. 21-26 and *Dicoryne valdiviae* Stechow, 1923: 2. *Heterocordyle conybearei* Allman, 1864: 59, pl. 2, has fixed gonophores but for the rest it is quite near to the species of *Dicoryne*. Of the above mentioned species *D. conferta* is the best known; it is widely distributed in the temperate and boreal Atlantic and has recently been discovered off the southern coast of South Africa, 34°48'S, 22°06'E (Millard, 1966: 451). My material is too scanty to warrant certain identification, though there is very little contradicting its conspecificity with *D. conferta*. The strongly wrinkled periderm reminds of *D. annulata*, but this species has never been properly redescribed and is very imperfectly known. Von Lendenfeld states that "the generative zooids are similar to those of the European species", but they very probably have been observed in preserved material. The position of this species in the genus *Dicoryne* must be considered

doubtful; it shows a certain resemblance with *Heterocordyle conybearei* and might, after its rediscovery, prove to be congeneric with that species.

The present specimens originate from off Cape of Good Hope, South Africa (Vema 14-34), in almost the same area Millard's specimens of *D. conferta* were found.

Hydractinia echinata (Fleming, 1828) (fig. 1)

Alcyonium echinatum Fleming, 1828: 517.
Hydractinia echinata, Vervoort, 1946: 130, fig. 51.

Material. — Vema 17-107, Western Bank, 5.8.1961, SBT, 48 m. A shell of *Natica* spec., completely covered with a male colony.

Remarks. — The hydranths of this specimen are strongly contracted. The male gonophores are abundantly present; they occur on reduced hydranths, being found in a verticel around the body of blastostyles, of which the tentacles are completely reduced and represented by clusters of nematocysts. Spirally curved "spiralzooids" occur along the aperture of the shell and are loaded with nematocysts. The spines are heavy and only slightly shorter than the (contracted) polyps; they are strongly chitinized and of a dark brown colour. Each spine has many acutely pointed spinules, placed on longitudinal carinae (fig. 1).

The colour of the preserved specimen is reddish-brown, though the fully mature male gonophores are opaque and yellow.

There can be no reasonable doubt that this is a specimen of the well known species, which is very widely distributed in boreal parts of the Atlantic, preferably occurring on shells inhabited by pagurids.

Leuckartiara octona (Fleming, 1823)

Geryonia octona Fleming, 1823: 299.
Leuckartiara octona, Rees, 1938: 12, figs. 3-5.
Eudendrium repens Wright, 1858: 448.
Atractylis repens, Wright, 1858: 450, pl. 22 figs. 4, 5.
Perigonimus repens, Jäderholm, 1910: 1; Jäderholm, 1916-1917: 4; Vervoort, 1946: 141, figs. 54, 55.
(?) *Perigonimus repens,* Hartlaub, 1905: 530, figs. L, M.
Eudendrium pusillum Wright, 1857: 84, 90, pl. 2 figs. 8, 9.

Material. — Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m. Sterile, sparingly branched, 15-30 mm high colonies on shell fragments.

Description. — The short, monosiphonic stems rise from a reticulate stolon, consisting of 0.05-0.07 mm thick fibres, forming an irregular network on both sides of shell fragments. The stolonal fibres have firm, yellowish-brown periderm. The hydrocauli consist of sparingly branched tubes, covered by thin, irregularly wrinkled periderm, running along the

Fig. 1. *Hydractinia echinata* (Fleming), Vema 17-107, part of colony with hydranths, blastostyles with male gonophores, and spines. × 50. (Drawn by J. J. A. M. Wessendorp).

hydranth and forming a loosely fitting, hyaline covering of the basal part of the hydranth and reaching as far as the base of the tentacles. The hydranths are found on side-branches of the hydrocauli or directly on the hydrorhiza. Only very little mud adheres to the periderm. All hydranths are badly preserved; those best preserved are ovoid, with 8 to 10 filiform tentacles, placed in a single row around a more or less conical proboscis. No gonophores have been observed.

Remarks. — The present colonies agree in detail with Rees' (1938: 12-19) description of the hydroids of this slightly variable species, particularly

with the specimens met with on *Corystes cassivelaunus* (Pennant) at Plymouth.

The present locality is in the Estrecho de Magellanes; nearly identical specimens are described by Hartlaub (1905: 530, figs. L, M) as (?) *Perigonimus repens* from Puerto Toro and Puerto Bridges, both localities in Tierra del Fuego, Argentina. Additional, better developed and more strongly branched colonies are mentioned by Hartlaub (1904) from Port Stanley, Falkland Islands, where they were found growing on algae and Bryozoa. Jäderholm (1910) records the species from the Falkland Islands (Sparrow Cove, East Falkland); Jäderholm (1916-1917) from Punta Arenas, Chile.

Leuckartiara abyssi (G. O. Sars, 1874)

Perigonimus abyssi G. O. Sars, 1874: 96, 126, pl. 5 figs. 27-30; Broch, 1916: 53, fig. Q; Naumov, 1960: 186, fig. 70.
Leuckartiara abyssi, Rees, 1938: 19, fig. 6.

Material. — Vema 15-44, 09°23'N, 89°06'W, 20.11.1958, SBT, 3496-3501 m. A small colony growing on the external surface of a nuculid.

Description. — The stolonal tubules are 0.05-0.06 mm in diameter and are covered by thick, yellowish periderm. They form an open network on the periostracum, from which the stalked hydranths rise directly, principally along the sides of the shell. The pedicels are maximally 1.2 mm long, very thin at the base and gradually widening near the apex. On the body of the hydranth the periderm is visible as a tightly fitting, cup-shaped pseudopedicel and pseudohydrotheca is wrinkled, the wrinkles becoming very marked on the pseudohydrotheca; no rings have been observed. The surface of the periderm is rough because of the presence of many mud particles adhering to it. The shape of the hydranth is clavate; the hypostome is distinct in some hydranths only and then it is represented by a conical prominence, surrounded by a whorl of 6 filiform tentacles. In my specimen the hydranths are very strongly contracted, as are also the tentacles.

No gonophores have been observed.

Remarks. — It is impossible to be certain of the identification because of the absence of gonophores. The present colony agrees very closely with Rees' (1938) description of Norwegian specimens of *Perigonimus abyssi* and this has induced me to record the Vema specimens under that name.

This species almost exclusively occurs on living Mollusca (*Dentalium, Nucula, Nuculana*) and it does not seem to mind to be partially covered with mud. The present locality is from very deep water of the East Pacific, southwest of Nicaragua. The species chiefly occurs in deep water of the northern

Atlantic and the seas of the North Polar area (Barents Sea, Naumov, 1960). Its occurrence in deep, cold water of the Pacific is not surprising.

The exact nature of the full-grown medusae of *Leuckartiara abyssi* is still unknown, but it is probably either a species of *Leuckartiara,* several of which occur in the Pacific, or *Neoturris pileata* (Forskål, 1775).

Family EUDENDRIIDAE

Eudendrium laxum Allman, 1877

Eudendrium laxum Allman, 1877: 7, pl. 3; Fraser, 1934: 87; Fraser, 1944: 71, pl. 11 fig. 46.

Material. — Vema 17-69, 40°56'S, 60°10'W, 18.5.1961, SBT, 68 m. One 20 mm high fragment with some well preserved hydranths, some of which bear male gonophores.

Description. — The hydrocaulus is visible throughout the whole colony; it is 0.25 mm thick, covered with smooth, rich brown periderm and it is monosiphonic over its entire length. The side-branches are irregularly arranged, long and slender, pointing away from the hydrocaulus, either directly bearing a hydranth or giving rise to several diverging pedicels. Side-branches and pedicels have some distinct rings at their base; for the rest of their length they are quite smooth and covered by yellowish-brown periderm and in diameter slightly inferior to that of the hydrocaulus. The whole, loose pattern of ramification strongly resembles Allman's figure of his *Eudendrium laxum* (Allman, 1877, pl. 3 figs. 1, 2). The hydranths are about 0.4 mm high, with an adoral whorl of 16 filiform tentacles.

The (male) gonophores occur on the body of normally developed hydranths, that have 16 normally developed tentacles and a well developed proboscis. The gonophores are arranged in a whorl above the tentacles; each has two globular masses of developing spermatocytes: the apical is the larger and has a diameter of 100 microns.

Remarks. — Allman (1877: 7), in his description of this species, mentions the presence of clear, spherical bodies in the lower parts of the hydrocaulus and in the hydrorhiza. In my specimen the basal parts of the colony and the hydrorhiza are missing, so that I cannot confirm Allman's observations. This species has originally been described by Allman (1877) from the Caribbean area (Sand Key, Florida, 100 fms (= 183 m)); additional specimens have been mentioned by Fraser (1943) from south of Marquesas Key, 24°17'30"N, 83°11'15"W, 140 fms (= 256 m). Fraser does not redescribe his specimens, but one of the figures from his 1944 paper (pl. 11 fig. 46a) must be original, the other (pl. 11 fig. 46b) being copied from Allman (1877, pl. 3 fig. 2).

I am not fully convinced of the validity of this species. The female gonophores are still unknown but the male hydrants are indistinguishable from those of *Eudendrium rameum* (Pallas, 1766: 83). I would not be surprised if this species turned out to be the young (male) colony of *E. rameum* or the broken top part of older colonies.

The present locality is from the shelf south-east of Bahía Blanca, Argentina (Vema 17-69).

Eudendrium rameum (Pallas, 1766)

Tubularia ramea Pallas, 1766: 83.
Eudendrium rameun, Allman, 1888: 4, pl. 2; Broch, 1916: 57, fig. S; Vervoort, 1946: 150, figs. 24e, 60, 61.

Material. — Burdwood Bank, RD, 1/2 (no further details). One large, 20 cm high, strongly branched and polysiphonic colony without a single hydranth.

Remarks. — The shape of the present colony agrees completely with that of *Eudendrium rameum,* though the identification, in absence of the hydranths, cannot be certain.

E. rameum has on several occasions been recorded from sub-Antarctic waters. Allman (1888) records the species from Cumberland Bay, Kerguelen Islands, 105 fms (= 192 m); Jäderholm (1905) from Cumberland Bay, South Georgia, 250 m. The present colony originates from south of the Falkland Islands.

Family HALECIIDAE

Halecium jaederholmi nov. spec. (fig. 2)

Halecium arboreum, Jäderholm, 1905: 11, pl. 5 fig. 4; Naumov & Stepan'yants, 1962: 97 (not Allman, 1888).
Halecium robustum, Ritchie, 1907: 524 (not Allman, 1888).
Halecium macrocephalum, Ritchie, 1913: 18, fig. 4; Stechow, 1925: 402; Rees & Thursfield, 1965: 108 (not Allman, 1877).

Material. — Vema 17-30, 52°40.2'S, 69°51.5'W, 1.4.1961, SBT, 24 m. Ten strongly fascicled hydrocauli of 5-7 cm height and some fragments. No gonothecae. This material represents one much broken colony (paratype).

Vema 17 RD 12, 44°19'S, 59°52'W, 13.6.1961, rock dredge, 183-366 m. A large number of fragments, representing a large, strongly fascicled colony with basally a diameter of about 5 mm. Some of the finer branches are monosiphonic and have undamaged hydrophores. Some female gonothecae are present (holotype).

Description. — The general structure of the colony is coarse, with a thick, irregularly branched, strongly fascicled hydrocaulus of a rich brown colour. The side-branches are very irregularly arranged and point in all directions. Only some of the side-branches are monosiphonic, usually they are covered by secundary tubes. The structure of the hydrothecae is only visible on the monosiphonic parts of the colony, where the branch is divided into short

internodes, separated by slightly oblique septa. The basal part of the internode may have a faint ring. Each internode has an almost apical hydrophore and an apophysis, supporting the next internode. The thickening of the internode is very gradual; as a result they are of slender appearance (fig. 2c). The apophysis projects slightly though distinctly above the level of the hydrophore. The plane of the hydrotheca is almost perpendicular to the length axis of the internode, though in some hydrothecae it is very slightly tilted, making an angle of about 80° with the length axis. The hydrotheca

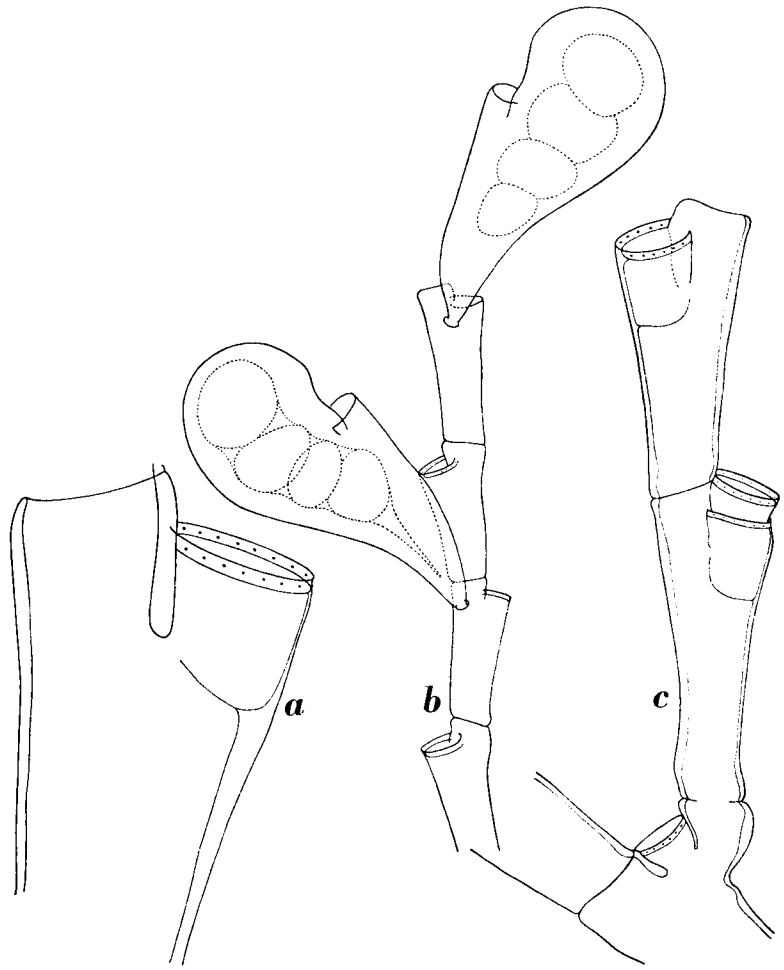

Fig. 2. *Halecium jaederholmi* nov. spec. a, b, Vema 17 RD 12, holotype; a, apical part of internode with hydrophore; b, top part of branch with female gonothecae. c, Vema 17-30, paratype, part of hydrocaulus with side-branch. a, × 135; b, 30; c, × 55.

is a very low, hyaline ring placed at the end of a supporting part of the internode (hydrophore); it has a row of small, hyaline puncta that have served the attachment of the hydranth (fig. 2a). In the older internodes, where the periderm is thicker, a chamber under the hydrophore is distinctly visible. Renovation of the hydrotheca occurs sporadically; the renovated hydrotheca is short and cup-shaped. Only primary renovations have been observed (fig. 2c).

The specimen carries the gonothecae at the end of some of the finer branches; female gonothecae only have been observed. The general shape of the (female) gonothecae resembles that of *Halecium beanii* (Johnston): they are bean- or more or less kidney-shaped, narrowing at the base, with the apex broadly rounded, the short funnel for the pair of hydranths at the middle of the internal border (fig. 2b). They are attached to the distal part of the internode, just under the axil between hydrotheca and apophysis. The presence of a circular hole in the internodes shows that more gonothecae must have been present.

Measurements (in microns). —

	Vema 17-30	Antarctic (Naumov & Stepan'yants, 1962)
Internode, length	480-585	700-800
diameter at internode	120-155	
Hydrotheca, depth	100-110	150-180
diameter	110-120	150-180
Female gonotheca, length	1.320	
maximal diameter	550	

Remarks. — It seems to me that three very different species have been thrown together, viz., *Halecium robustum* Allman (1888: 10, pl. 4 figs. 1-3 = *H. arboreum* in the explanation of pl. 4); *Halecium macrocephalum* Allman (1877: 16, pl. 12 figs. 1-5) and a third species, that I have named *Halecium jaederholmi*, as it has first been described by Jäderholm (1905: 11, pl. 5 fig. 4). The confusion has been brought about for several reasons. Allman (1888: 10) described a large *Halecium* from Cumberland Bay, Kerguelen, as *Halecium robustum*, but when his report on the Challenger hydroids was being published he discovered that the name was preoccupied (by *Halecium robustum* Verrill, 1873a: 9) and he consequently changed the name (in the explanation of his plate 4) into *Halecium arboreum*. Billard (1910: 4) re-inspected the Challenger specimen in the British Museum and reported the presence of nematothecae, transferring the species to *Ophiodes* as *O. arboreus*. Hickson & Gravely (1907: 27, pl. 4 figs. 27-29) some years previously described the gonothecae that, in contradistinction to those of

Halecium, occur in coppinia-like aggregates, densely armed with nematothecae, and placed on the stem and the branches. It is quite clear now that this species is not a *Halecium* but must stand as *Ophiodissa arborea* (Allman, 1888); the synonymy and distribution of this species are given on page 25. Naumov & Stepan'yants (1962: 97) appear to have overlooked the fact that Billard (1910) described the presence of nematothecae in the Challenger specimen of *Halecium arboreum*. I have recently (November, 1970) inspected a schizoholotype slide in the British Museum (Natural History) (numbered 88.11.19.98) from Challenger Station 149 J, Kerguelen, 105 fms (= 192 m); here the nematothecae are such a conspicuous feature that it is astonishing that they have been overlooked by Allman. Naumov & Stepan'yants are certainly incorrect in their assumption that their specimens, that have no nematothecae, are identical with those of Allman. In my opinion the specimens described by Naumov & Stepan'yants belong to a different species, that has first been described and figured by Jäderholm and that also occurs in the Vema collection. It has been described above as *Halecium jaederholmi*; it is, in my opinion, different from a third species, *Halecium macrocephalum* Allman (1877: 16, pl. 12 figs. 1-5). *H. macrocephalum*, which may have the same fascicled colonial structure and the same irregular distribution of the side-branches, differs by the very slender internodes, the sudden widening of the internode under the hydrophore and apophysis, and the greatly slanting position of the hydrothecal aperture, that makes an angle of about 45° with the length axis of the internode. Synonymy and distribution of *H. macrocephalum* are discussed below. The female gonothecae of *Halecium macrocephalum* greatly resemble those of *H. jaederholmi*.

H. jaederholmi is known from Antarctic and sub-Antarctic localities. In the Antarctic it has been observed off Coats Land, 74°01'S, 22°00'W, 161 fms (= 294 m) (Ritchie, 1907) and off Enderby Land, 90-104 m depth (Naumov & Stepan'yants, 1962). Jäderholm (1905) mentions the following sub-Antarctic localities: Falkland Islands, east of Port Stanley, 150 m; south of Falkland Islands, 52°29'S, 60°36'W, 197 m, and South Georgia, Cumberland Bay, 75 m. The present specimens originate from the shelf south-east of Peninsula Valdès, Argentinà (Vema 17 RD 12) and from the entrance to the Estrecho de Magellanes (Vema 17-30). The specimen from Vema 17 RD 12, 44°19'S, 59°52'W, is here designated as the holotype.

Halecium macrocephalum Allman, 1877

Halecium macrocephalum Allman, 1877: 16, pl. 12 figs. 1-5; Fewkes, 1881: 128; Nutting, 1895: 223; Fraser, 1943: 89; Fraser, 1944: 196, pl. 36 fig. 174; Vervoort, 1968: 95.

Remarks. — This species is essentially Caribbean; all localities so far known are listed by Vervoort (1968: 95). This species is badly in need of a critical redescription, establishing its differences with *H. jaederholmi.*

Ophiodissa arborea (Allman, 1888)

Halecium robustum Allman, 1888: 10, pl. 4 figs. 1-3; Vanhöffen, 1910: 319, fig. 35.
Halecium arboreum Allman, 1888, explanation of pl. 4 figs. 1-3; Hickson & Gravely, 1907: 27, pl. 4 figs. 27-29.
Ophiodes arboreus, Billard, 1910: 4; Ritchie, 1913: 15, figs. 2, 3; Stechow, 1913: 87; Billard, 1914: 8.
Ophiodissa arborea, Stechow, 1919: 42; Totton, 1930: 142, fig. 2.
Hydrodendron arborea, Rees & Thursfield, 1965: 110.

Remarks. — I have provisionally retained this species in the genus *Ophiodissa* Stechow 1919: 41 (type *Ophiodes mirabilis* Hincks, 1866a: 422, pl. 14) because of the presence of distinct nematothecae. In *Hydrodendron* Hincks, 1874: 131 (type *Halecium gorgonoide* G. O. Sars, 1874: 112, pl. 4 figs. 9-15) the nematophore is completely nude.

Ophiodissa arborea has now been recorded from Cumberland Bay, Kerguelen, 192 m (type locality, Allman, 1888), from various localities in McMurdo Sound (Hickson & Gravely, 1907, 18-238 m; Totton, 1930, 92-550 m); from Gauss Station, 66°02′S, 89°38′E (Vanhöffen, 1910), and from the Peltier Channel, between the islands Goetschy and Doumer, Palmer Archipelago, off Graham Land, 92 m (Billard, 1914). The species is almost exclusively Antarctic in its distribution and I am inclined, therefore, to consider Stechow's records (Okinose Bank, Sagami Bay, Japan, Stechow, 1913) with some doubt. Ritchie (1913: 19) considers Vanhöffen's *Halecium robustum* as belonging to *H. sessile* Norman, 1867: 196; no other Antarctic records of *H. sessile* are available.

Halecium halecinum (Linnaeus, 1758) (fig. 3a)

Sertularia halecina Linnaeus, 1758: 809.
Halecium halecium, Broch, 1918: 36, figs. 11, 12; Vervoort, 1946: 158, figs. 29a, 63, 64; Vervoort, 1959: 225.

Material. — Vema 16-61, 51°18′N, 56°52′W, 5.9.1960, SBT, 101 m. Two small, irregularly developed colonies of 15 and 20 mm height. Hydrothecae badly damaged. No gonothecae.

Remarks. — The identification of the present material is doubtful, only one of the (renovated) hydrothecae is undamaged and this has been figured (fig. 3a).

The species is very widely distributed in boreal parts of the Atlantic Ocean. The present colonies originate from the Strait of Belle Isle, Newfoundland (Vema 16-61), where the species is known to occur abundantly.

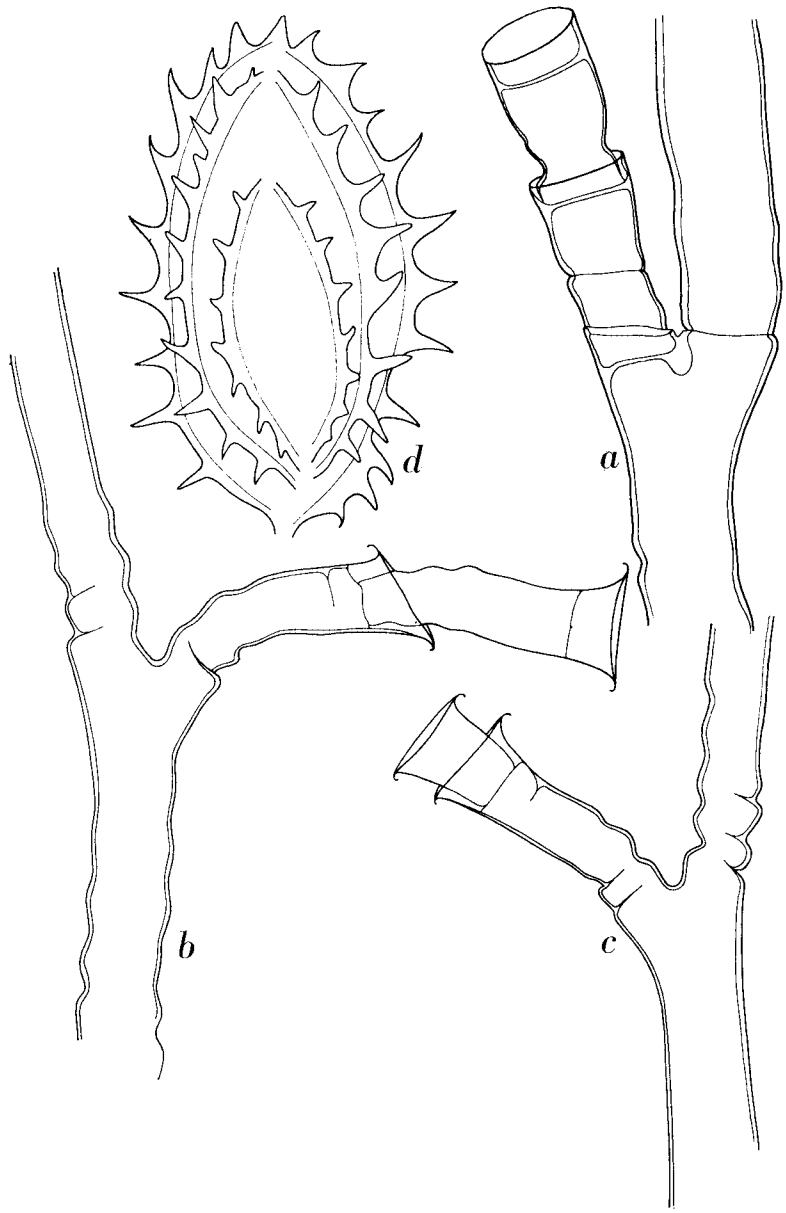

Fig. 3. a, *Halecium halecinum* (L.), Vema 16-61, part of branch with renovated hydrotheca. b-d, *Halecium muricatum* (Ellis & Solander); b, c, Vema 16-61, renovated hydrothecae; d, Vema 17-119, gonotheca. a-c, × 70; d, × 40.

Halecium muricatum (Ellis & Solander, 1786) (fig. 3b-d)

Sertularia muricata Ellis & Solander, 1786: 59, pl. 7 figs. 3, 4.
Halecium muricatum, Broch, 1918: 42, fig. 17; Vervoort, 1946: 163, fig. 67.

Material. — Vema 16-61, 51°18'N, 56°52'W, 5.9.1960, SBT, 101 m. One 10 mm high, monosiphonic fragment.
Vema 17-119, 54°27'N, 54°08'W, 10.9.1961, SBT, 218 m. One 30 mm long, polysiphonic fragment, with gonothecae. Covered with *Lafoea fruticosa* (M. Sars).

Remarks. — This species is easily recognized by the characters of hydrotheca and gonotheca (fig. 3b-d). The present specimens are from the Strait of Belle Isle, Newfoundland (Vema 16-61) and from the north-western Atlantic east of Labrador (Vema 17-119); both are in the distributional area of this species, viz., the northern and arctic parts of the Atlantic Ocean.

Halecium delicatulum Coughtrey, 1876 (figs. 4, 5)

Halecium delicatula Coughtrey, 1876: 299.
? *Halecium tenellum* var. *mediterranea* Weismann, 1883: 160, pl. 11 figs. 5, 6.
Halecium flexile Allman, 1888: 11, pl. 5 figs. 2, 2a; Hartlaub, 1905: 611, figs. J^3, K^3.
Halecium gracile Bale, 1888: 759, pl. 14 figs. 1-3.
Halecium parvulum Bale, 1888: 760, pl. 14 figs. 4, 5; Millard, 1957: 189, fig. 4; Vervoort, 1959: 227, fig. 7.
Halecium balei Fraser, 1911: 46.
Halecium delicatulum, Ralph, 1958: 334, figs. 11e, h-n, 12 a-p.

Material. — Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. One small colony of 40 mm height. No gonothecea.
Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. One small, 4 mm high, monosiphonic colony, detached from substratum. No gonothecae.
Vema 17-20, 53°21'S, 70°36'W, 29.3.1961, SBT, 247 m. One well preserved, 5 mm high, monosiphonic colony. No gonothecae.
Vema 17-48, 55°10'S, 66°23'W, 4.5.1961, SBT, 42 m. A monosiphonic, 7 mm long fragment with few hydrothecae. No gonothecae.
Vema 17-76, 41°57'S, 59°03'W, 23.5.1961, SBT, 81 m. Three monosiphonic fragments of 10 to 15 mm length. No gonothecae.
Vema 17-78, 42°28'S, 58°31'W, 24.5.1961, SBT, 227-229 m. Small monosiphonic colonies creeping on *Lafoea fruticosa* (M. Sars). No gonothecae.
Vema 17-100, 44°23'S, 59°53'W, 13.6.1961, SBT, 166-177 m. A single monosiphonic fragment of 10 mm length, detached from substratum and without gonothecae.

Description. — For a critical discussion of the synonymy of this species and a description of the polysiphonic and monosiphonic growth forms I refer to Ralph (1958: 334-338). The present material, with the exception of the small colony from Vema 15-108, is very fragmentary and unfit for redescription. Some of the best developed hydrothecae have been figured to show the variability of the Vema material (figs. 4, 5).

The colony from Vema 15-108 is composed of a fascicled hydrocaulus, basally about 1.5 mm thick, and some irregularly distributed branches,

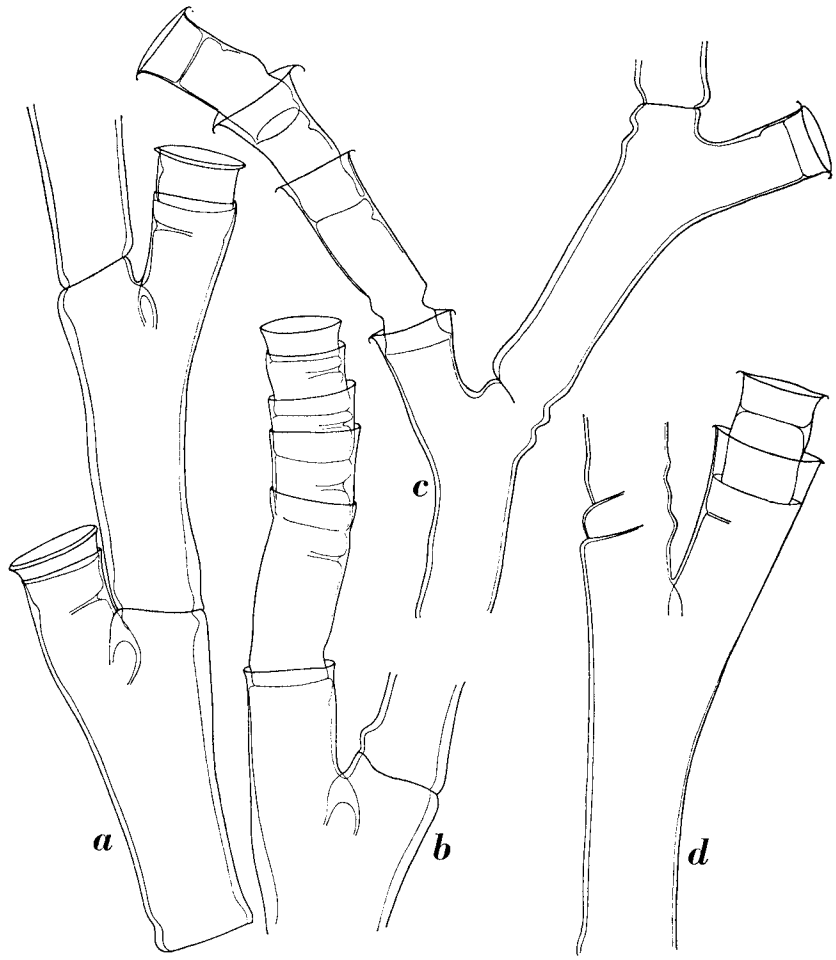

Fig. 4. *Halecium delicatulum* Coughtrey. a, b, Vema 15-108, fragments of branches with hydrothecae; c, Vema 17-48, renovated hydrotheca with flaring margin; d, Vema 17-76, monosiphonic stem fragment. a-d, × 90.

usually monosiphonic, but in some instances covered by secondary tubes. The monosiphonic parts are split up into internodes, with the nodes sloping alternately in opposite directions; the basal part of an internode may be irregularly constricted, without formation of distinct rings (fig. 4a). The hydrothecae occur at the end of distinct apophyses, projecting a considerable distance above the level of the node and in many instances closely adpressed to the internode. The apophysis (or the hydrophore) usually has a distinct adcauline peridermal thickening some distance under the line of puncta.

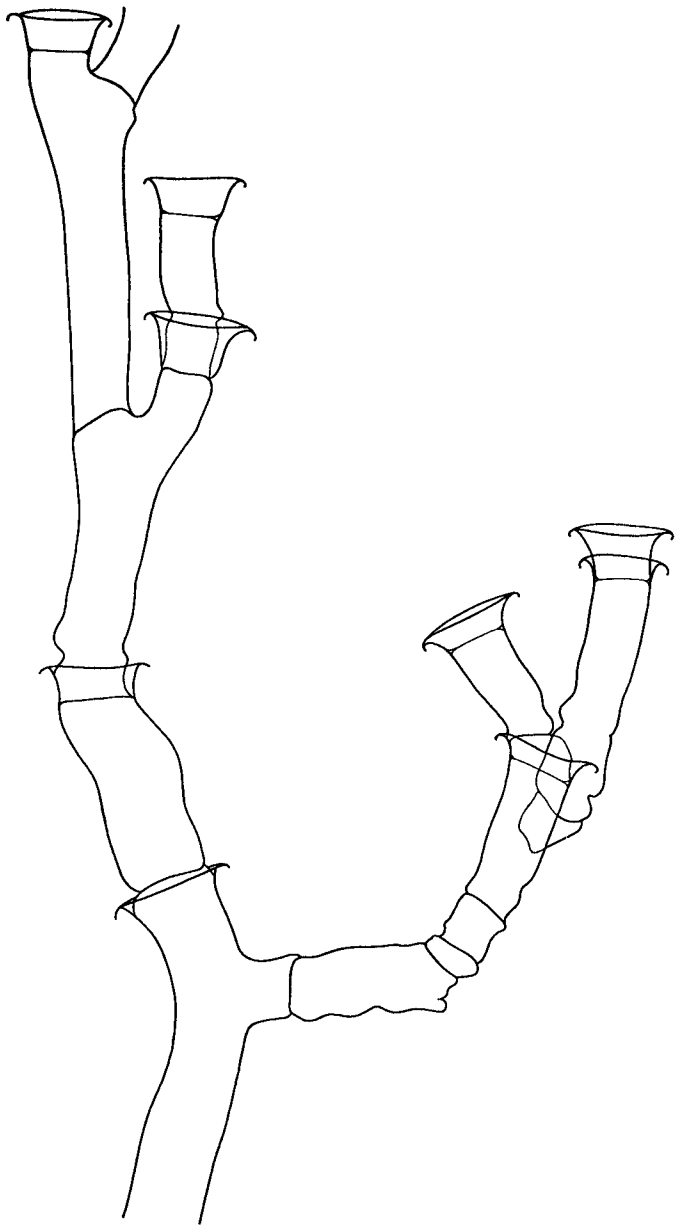

Fig. 5. *Halecium delicatulum* Coughtrey, Vema 17-19, monosiphonic fragment. × 70.

The hydrotheca, measured from the line of punctae to the margin, is very shallow; the margin flares distinctly in some hydrothecae, while others from the same specimen are funnel-shaped. Renovations of the hydrotheca occur repeatedly, resulting in long series of hydrothecae of variable length, each attached to the preceding at the diaphragm. Usually the renovated hydrothecae have a distinct annular constriction below the diaphragm, best developed at the adcauline side (fig. 4a, b).

The fragments from the other stations differ from the above described polysiphonic colony by the fact that usually the margin of the hydrotheca has a slightly tilted position and that it flares distinctly. The apophyses bearing hydrophore and hydrotheca point obliquely upwards and laterally; the "stem" is twisted in zig-zag fashion (fig. 4c, d).

Measurements (in microns). —

	New Zealand (Ralph, 1958)	Vema 15-108
Internode, total length	500-870	540-740
diameter at node	100-180	540-740
Primary hydrotheca, length	50-75	47-54
diameter	140-190	122-135

Distribution. — *H. delicatulum* can be characterized as a species with a circumpolar distribution on the southern hemisphere, penetrating deep into subtropical and tropical waters (Gulf of Mannar; Indo-China; Gulf of Guinea). It has also been recorded from Japan (Stechow, 1913) and from Morocco (Billard, 1906). It is known to occur along the coasts of Patagonia, being recorded from Port Famine, Patagonia, 53°37'30"S, 70°65'0"W (Allman, 1888, as *H. flexile*) and from Punta Arenas, Estrecho de Magellanes, Chile (Hartlaub, 1905). The present records extend its area of distribution in that area: shelf and continental slope south-east of Bahía Blanca, Argentina (Vema 17-76 and 17-78), continental slope south-east of Peninsula Valdés, Argentina (Vema 17-100), the Estrecho de Magellanes (Vema 17-19 and 17-20), the south-western Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-108) and the extreme south-western Atlantic to the south of Peninsula Mitre, Tierra del Fuego.

Halecium beanii (Johnston, 1838) (figs. 6, 7)

Thoa Beanii Johnston, 1838: 120, pl. 7 figs. 1, 2.

Halecium beanii, Ritchie, 1907: 523; Vervoort, 1959: 214, fig. 6; Vervoort, 1966: 103, fig. 3.

Halecium beani p.p. Naumov, 1960: 447, figs. 19, 336.

Halecium edwardsianum d'Orbigny, 1846: 25, pl. 12 figs. 6-8; Hartlaub, 1905: 604, figs. Y^2, Z^2, A^3 and B^3 (the last two figures as *H. beanii*).

Material. — Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. One 6 mm high, monosiphonic fragment with some empty, male gonothecae. A fragment of a hydrocaulus may also belong to this species.

Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m. Several small, 5 mm high, monosiphonic colonies on hydrocauli of *Nemertesia cymodocea* (Busk, 1851).

Vema 17-29, 52°43.7'S, 69°53.7'W, 1.4.1961, SBT, 24 m. A tuft of several, about 30 mm high, polysiphonic colonies, attached to a rock fragment. No gonothecae.

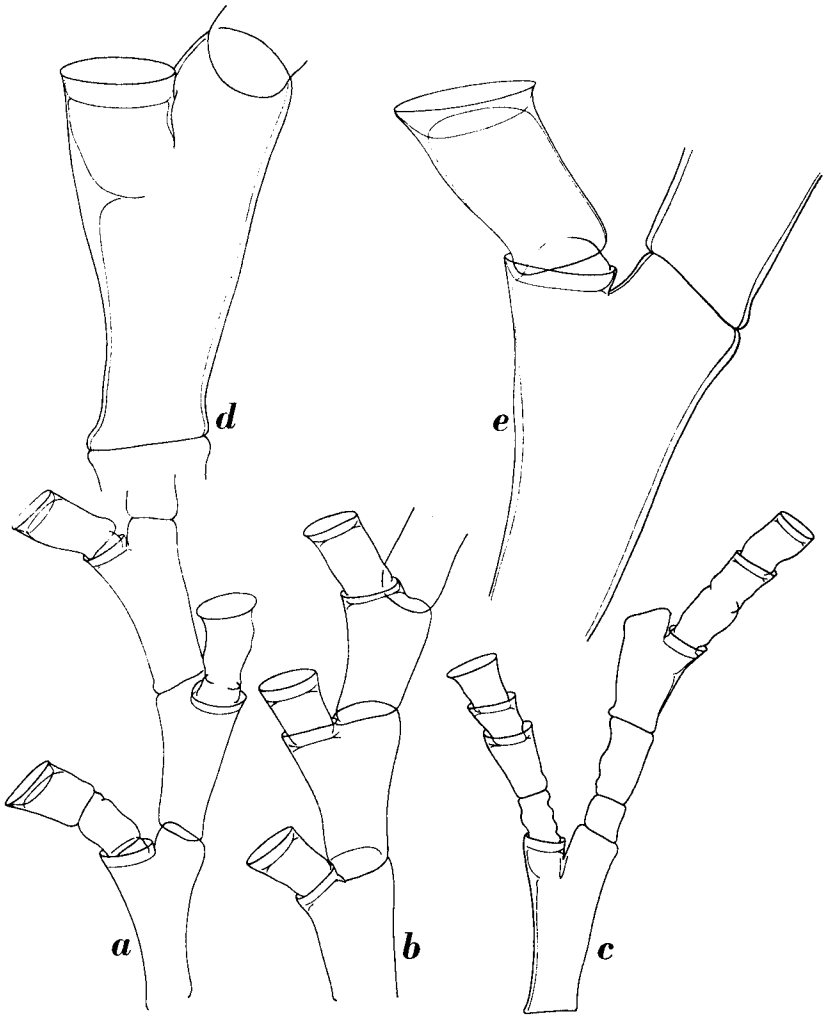

Fig. 6. *Halecium beanii* (Johnston), Vema 17-29. a, fragment of branch with alternating hydrothecae; b, fragment of branch with frontally directed hydrothecae; c, fragment of branch with strongly renovated hydrothecae; d, internode with hydrophore and primary hydrotheca; e, internode with renovated hydrotheca. a-c, × 55; d, e, × 135.

Description. — The colony from Vema 17-29 is characterized by short internodes, sometimes interrupted by non-hydrothecate internodes or a succession of such internodes. Usually the hydrothecae on the internodes are alternately directed to the left or right sides of the hydrocaulus (fig. 6a), but in some parts of the colonies their position is more or less oblique, being directed also in frontal direction (fig. 6b). This, combined with the short internodes, gives some parts of the colonies a great resemblance with *Halecium secundum* Jäderholm (1904: 3; 1905: 11, pl. 4 figs. 4-7); the greater part of the colony, nevertheless, is quite normal in appearance. The renovated hydrophores are asymmetrical, particularly the basal part; the hydrotheca has an oblique position (fig. 6e). The number of renovations of each hydrotheca is limited to four or five, but is usually much less, while some of the secondary hydrophores are preceded by a short internode (fig. 6c).

The colony from Vema 17-21 is at once remarkable by the very long and extremely slender internodes; moreover the number of renovations of the hydrothecae is considerable, at times as many as 10 are present (fig. 7a, b). The puncta, in this specimen, are better visible than those of the preceding colony. Some empty male gonothecae are present, borne on the hydrothecate internodes a short distance under the hydrotheca (fig. 7a). They are about as long as an internode and of an elongated oval shape. A circular opening in the periderm under the hydrotheca, present on the majority of the internodes, indicates that the number of gonothecae must have been much larger.

Measurements (in microns). —

	Vema 17-29	Vema 17-21
Stem, diameter at node	95-160	95-120
length of internode	335-420	600-700
Hydrophore, length from origin on previous hydrophore	95-200	110-245
diameter	95-160	110-135
Hydrotheca, length (diaphragm-margin)	35-55	25-40
diameter at margin	120-150	95-120

Remarks. — The geographical distribution of *Halecium beanii* is almost cosmopolitan, though the species predominates in sub-Arctic, sub-Antarctic and temperate waters. Naumov (1960: 447) has synonymized this species with *Halecium scutum* Clarke (1877: 218, pl. 10 figs. 13, 14) and *Halecium boreale* Von Lorenz (1886: 26, pl. 2 figs. 1, 2), a procedure with which I cannot agree.

The present localities, Vema 17-21, 17-25 and 17-29 are all from the Estrecho de Magallanes. Additional records from the western South Atlantic

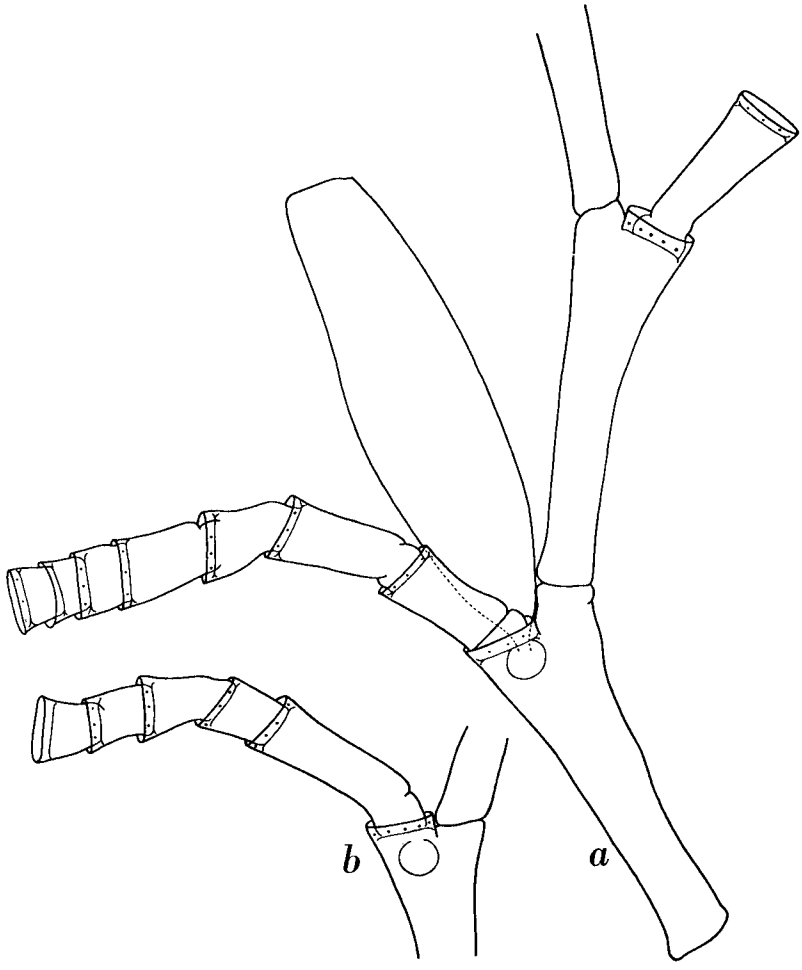

Fig. 7. *Halecium beanii* (Johnston), Vema 17-21. a, top part of internode with strongly renovated hydrotheca; b, idem, with male gonotheca. a, b, × 70.

are from the Enseñada de Ros, south of the Rio Negro, Patagonia, Argentina (d'Orbigny, 1839, 1846, as *Thoa* (*Danaea*) *edwardsiana*); Rio Seco, eastern part of Tierra del Fuego, Argentina (Hartlaub, 1905), and Burdwood Bank (Ritchie, 1907). The material from Vema 17-21, collected at a depth of 150 m, particularly agrees with Hartlaub's figure (1905, fig. A^3, B^3) of the Rio Seco material.

Halecium spec. (fig 8)

Material. — Vema 15-85, 32°29'S, 72°28'W, 1.1.1959, SBT, 4532-4097 m. One 15 mm high, slightly branched, monosiphonic colony without polyps. Three empty gonothecae (?) are present.

Description. — The fragment consists of a hydrocaulus with three basal ramifications. The stems are broken up into very slender internodes, that have almost the same diameter throughout. The apical portion of each internode widens slightly and bears a scarcely developed hydrophore, supporting the primary hydrotheca, and a short apophysis, bearing the next internode. The apophysis projects slightly above the (primary) hydrotheca. The primary hydrotheca is extremely shallow and has no everted margins; the whole structure, hydrophore and hydrotheca, is only very little developed and slightly pushes aside the apophysis (fig. 8a). Some of the primary hydrothecae have renovations. These are shallow, cup-shaped structures, the shape of which appears in fig. 8b. Neither the primary hydrotheca nor the renovated hydrothecae have puncta.

The ramifications originate through the development of an internode from a primary hydrotheca.

The gonothecae (?) are very slender, cylindrical structures with ruptured apex, considerably longer than the internodes (fig. 8a). They originate from a slit-like opening in the periderm under the (primary) hydrophore. Only three of such cylindrical bodies are present, though the presence of a larger number of slits indicates that their number has originally been greater. All gonothecae are completely empty.

Measurements (in microns): —

	Vema 15-85
Internode, total length	1,010-1,280
diameter at base	95-135
Primary hydrotheca, depth (margin-diaphragm)	25-30
diameter at margin	150-175
Gonotheca, total length	1,890
diameter at apex	540

Remarks. — I have been unable to identify this fragmentary colony with any of the described species of *Halecium*. Though the structure of the colony almost excludes confusion with other genera, the shape of the gonothecae (if the cylindrical structures really represent generative bodies, which seems very likely) is quite different from the type so far met with in *Halecium*. The specimen was obtained from deep water of the eastern Pacific, off Valparaiso, Chile (Vema 15-85).

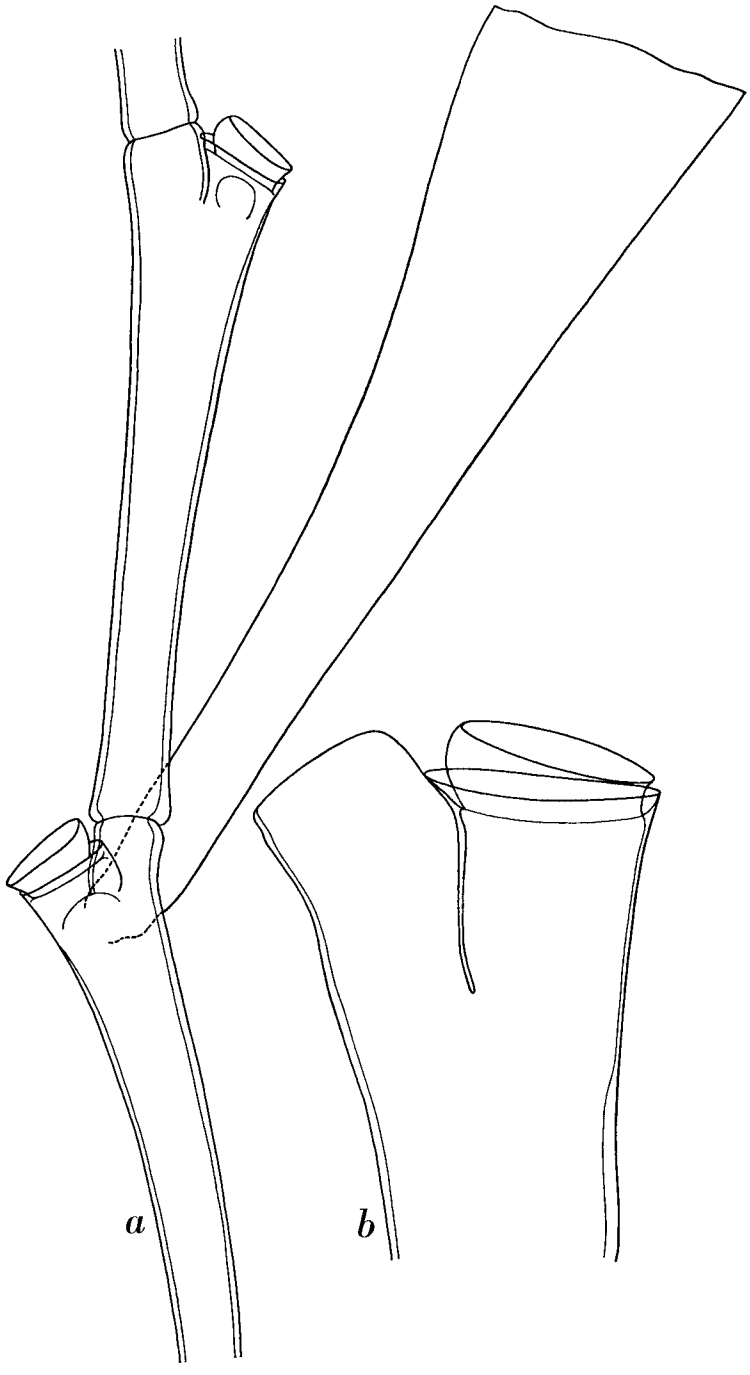

Fig. 8. *Halecium* spec., Vema 15-85. a, fragment of stem with two hydrothecae and a gonotheca (?); b, top part of internode showing renovated hydrotheca. a, × 70; b, × 180.

Family CAMPANULINIDAE

Calicella syringa (Linnaeus, 1767)

Sertularia syringa Linnaeus, 1767: 1311.
Calicella syringa, Vervoort, 1946: 216, figs. 92, 93.

Material. — Vema 16-62, 51°01'N, 57°10'W, 5.9.1960, SBT, 57 m. Some isolated hydrothecae on *Abietinaria abietina* (Linnaeus), between hydrothecae of *Filellum serpens* (Hassall). No gonothecae.

Remarks. — The present record of this very common, widely distributed cosmopolitan species is from the Strait of Belle Isle, Newfoundland. For a discussion of the distribution of this species in the northern Atlantic I refer to Broch, 1918: 32-34.

Eucuspidella pedunculata (Allman, 1877) (fig. 9)

Cuspidella pedunculata Allman, 1877: 13, pl. 8 figs. 5, 6.
Eucuspidella pedunculata, Fraser, 1944: 172, pl. 31 fig. 145; Vervoort, 1968: 98.

Material. — Vema 15-5, 20°30'N, 73°16'W, 4.11.1958, SBT, 4798 m. A small fragment of a larger colony, composed of only three empty hydrothecae.

Description. — The fragment consists of some fine tubules, partly contiguous, partly intertwining, the majority of which ends in circular openings that probably represent broken pedicels. Only three tubules form pedicels for long and slender, almost tubular hydrothecae, the shape of which can best be seen from fig. 9. All hydrothecae are empty and have collapsed, they may consequently have been slightly swollen. The pedicels, from their origin on the tubules, very gradually and imperceptibly run into the hydrothecae; there is nothing to demarcate the limit between theca and pedicel. The apical portion of the hydrotheca has a number of thickened, triangular strips; the whole closing apparatus forms an irregularly pyramidal, roof-shaped structure; it is not sharply demarcated from the rest of the hydrotheca.

Measurements (in microns). —

	Vema 15-5
Hydrotheca, total length, including pedicel	1,280-1,420
diameter	95-110

Remarks. — The identification of the present fragment with Allman's species is quite provisional because of the paucity of Allman's description and the scarcity of my material. Allman's species is described in the following way (Allman, 1877: 13, 14) "Hydrosoma very minute. Hydrothecae springing by rather long peduncles from a creeping filament, very delicate

and filmy, deep, tapering toward the base, where they gradually pass into the peduncle without any definite line of demarcation". There is nothing in Allman's description which contradicts the identification of the present material with his species and there is a fair agreement in the shape of the hydrothecae, that, according to Allman's figure, must have been about 1 mm long. Allman's description, nevertheless, is altogether too short to make the identification certain.

Fraser (1944: 172) created the new genus *Eucuspidella* for the reception of this species; his motives being largely based on the pedunculate condition of the hydrothecae, whilst in *Cuspidella* Hincks (1866: 298) the hydrothecae are considered to be sessile. Ignorance of the gonothecae seriously hampers the definition of genera in the Campanulinidae and Lovenellidae. I have provisionally retained the genus *Eucuspidella* Fraser, 1944, for such species of Campanulinidae and Lovenellidae in which the gonosome is unknown,

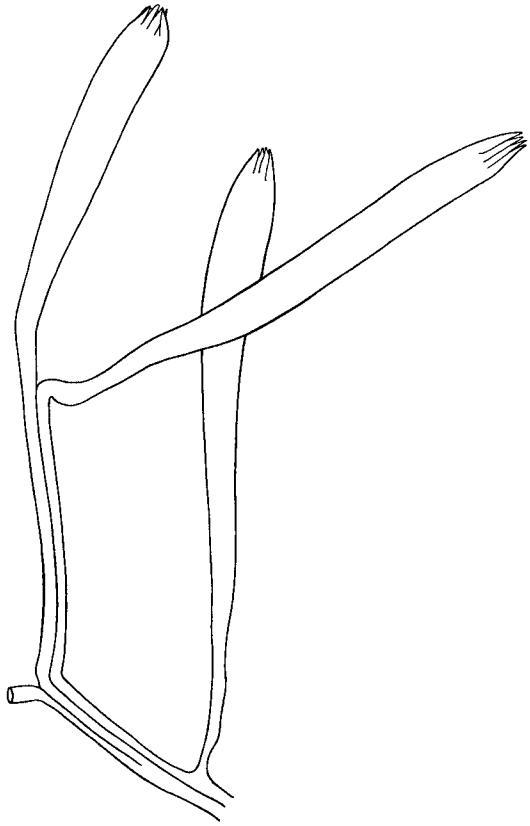

Fig. 9. *Eucuspidella pedunculata* (Allman), Vema 15-5, fragment of colony. × 55.

that have no demarcation between pedicel and hydrotheca and that have no nematophores. Its inclusion in the family Campanulinidae near to *Opercularella* Hincks (1868: 193) is also provisional.

Allman (1877: 14) originally recorded this species from deep water south of Tortugas, depth 475 m. The Vema specimen has been obtained from the Windward Passage north of Haiti, depth 4798 m.

Phialella chilensis (Hartlaub, 1905) (fig. 10)

Campanulina chilensis Hartlaub, 1905: 589, figs. L^2, M^2b, N^2; Jäderholm, 1905: 20, pl. 7 figs. 11, 12; Billard, 1906: 12; Ritchie, 1909: 74; Naumov & Stepan'yants, 1962: 76, fig. 3.

Opercularella chilensis, Rees, 1939: 444.

Material. — Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. About 8 mm high, monosiphonic colonies on *Symplectoscyphus milneanus* (d'Orbigny).

Description. — The monosiphonic, sympodially built hydrocauli rise from a fine hydrorhiza creeping on *Symplectoscyphus milneanus*. Usually the pedicels arise in pairs at each twist of the hydrocaulus. The periderm of the hydrocauli and that of the pedicels is ringed, particularly at the base of each hydrocaulus, just after each twist and throughout the entire length of the pedicels (fig. 10a). Certain intermediate portions of the internodes of the hydrocauli are wrinkled rather than ringed, whilst at the pedicels the arrangement of rings is at times replaced by spirally twisted periderm. Throughout the colonies the periderm is firm, thinning out gradually under the hydrothecae. The shape of the hydrothecae can best be described by referring to fig. 10b. They are firmly attached to the pedicel; the basal portion has straight, conical walls, widening slightly from the base onwards. There is no distinct rim separating the apical portion of the hydrotheca from the rest, but that apical portion in spite of that is distinctly thinner than the rest of the hydrotheca and folded, apparently loosely, over the hydrothecal aperture to form a conical roof. The number of triangular segments in the apical membrane varies between 8 and 12, in some hydrothecae they terminate acutely, in others they are bluntly pointed. The basal portion of the hydrotheca is asymmetrical and separated from the rest of the hydrotheca by a straight, thin diaphragm. Polyps are present though none is extended, so that the presence of a web between the tentacles could not be observed.

No gonothecae are present.

Measurements (in microns). —

	Vema 17-19
Hydrotheca, total length, including basal chamber	235-270
length from diaphragm onwards	185-215
diameter	90-100

Remarks. — This species has been synonymized with *Phialella quadrata* Forbes (1848: 43, pl. 9 fig. 2 = *Campanulina repens* Allman, 1864: 61) by Naumov & Stepan'yants (1962: 76). For a discussion of the synonymy of *Phialella quadrata* Forbes (= *Campanulina repens* Allman) I refer to Rees (1939: 440) and Ralph (1957: 848). Though I agree with Naumov & Stepan'yants that the two species are closely allied there are small differences

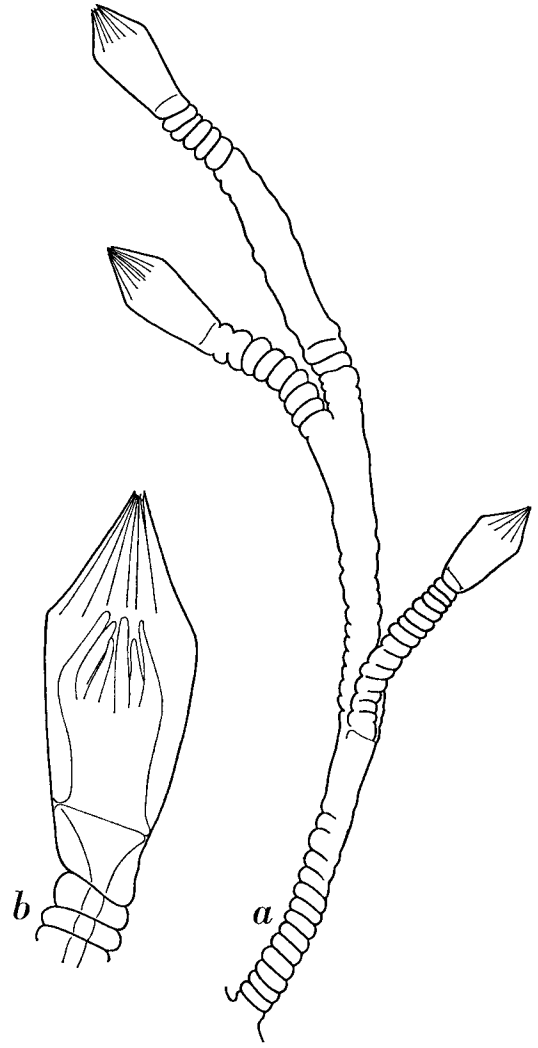

Fig. 10. *Phialella chilensis* (Hartlaub), Vema 17-19. a, monosiphonic fragment; b, hydrotheca. a, × 70; b, × 180.

in the general shape of the hydrotheca (that might be explained by variability of both species), that make it desirable to keep both species separate, at least until the identity of *Phialella chilensis* with *P. quadrata* has been irrefutably proved by raising its medusae. The discovery of *P. chilensis* off New Zealand, from which area *P. repens* has been recorded by Ralph (1957: 848), by the Soviet Antarctic Expedition 1955-1958 has made this identity more likely, without, however, proving it.

Phialella chilensis has originally been described from Calbuco, Chile (Hartlaub, 1905). Additional records are from Burdwood Bank (Jäderholm, 1905), Burdwood Bank, 54°25'S, 57°32'W (Ritchie, 1909), from Flanders Bay and Boot-Wandel Island, off Graham Land (Billard, 1906) and from south of New Zealand, about 50°S, 166°W (Naumov & Stepan'yants, 1962).

? **Opercularella denticulata** (Clarke, 1907) (fig. 11a)

Campanulina denticulata Clarke, 1907: 12, pl. 8; Stechow, 1913: 122, fig. 92; Rees, 1939: 443, 445.

? *Opercularella denticulata*, Vervoort, 1966: 104, figs. 4, 5.

Campanulina (?) *indivisa* Fraser, 1948: 216, pl. 24 fig. 7.

Material. — Vema 15-46, 09°22'N, 89°33'W, 20.11.1958, SBT, 3517-3528 m. One colony of 30 mm height on a worm tube. Several 20 mm high colonies on fragments of debris. No gonothecae.

Vema 15-65, 07°35'S, 81°24'W, 6.12.1958, SBT, 5825-5841 m. One 15 mm high colony with a single complete hydrotheca on a worm tube. No gonothecae.

Vema 15-76, 07°31'S, 81°27'W, 20.12.1958, SBT, 5750-5748 m. A fragment of 12 mm height with damaged hydrothecae and rests of hydranths. No gonothecae.

Measurements (in microns). —

	Vema 15-46	Albatross, East Pacific (Vervoort, 1966)	Galathea, Indian Oeacn (Vervoort, 1966)
Hydrocaulus, diameter	110-135	100	100-120
Hydrotheca, length pedicel from insertion tot diaphragm	400-500	600-700	335-410
length theca from diaphragm to apex of closing apparatus	470-500	560-700	400-540
diameter	135-160	140-160	160-240

Remarks. — This species has recently been redescribed from Indian Ocean material collected by the Galathea Expedition (Vervoort, 1966: 104, figs. 4, 5). The present specimens are in complete agreement with that material. Complete hydrothecae occur in the specimen from Vema 15-46 (fig. 11a), though only in small numbers. The apical portion of the hydrotheca, forming the closing apparatus, is very hyaline and apparently very fragile; in the specimen from Vema 15-76 none of the hydrothecae are complete, though nearly all hydrothecae have remnants of polyps.

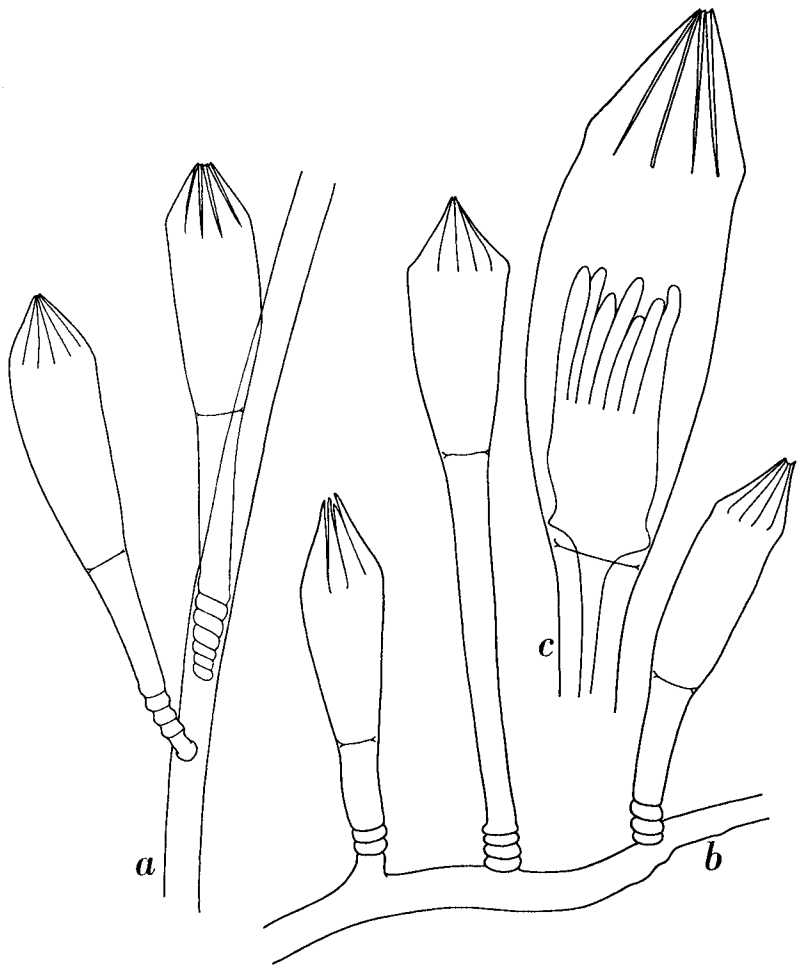

Fig. 11. a, ? *Opercularella denticulata* (Clarke), Vema 15-46, fragment of colony. b, c, *Opercularella* spec., Vema 17-21; b, fragment of creeping colony; c, hydrotheca. a, b, × 70; c, × 180.

The distribution of this species may be summarized as follows:

East Pacific. Off California, 33°02′15″N, 120°42′W, 3990-2468 m (Vervoort, 1966); east of Long Point, Santa Catalina Is., off California, 635-488 m (Fraser, 1948); 09°22′N, 89°33′W, 3517-3528 m (present record); 07°35′S, 81°24′W, 5825-5841 m (present record); 07°31′S, 81°27′W, 5750-5748 m (present record), and 13°11.6′S, 78°18.3′W, about 730 m (Clarke, 1907).

West Pacific. Sagami Bay, littoral zone (Stechow, 1913).

Indo-Westpacific. Indian Ocean between Seychelles and Ceylon, 5°32'N, 78°41'E, 4040 m (Vervoort, 1966).

Opercularella spec. (fig. 11b, c)

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. Colonies creeping on various hydroids, e.g., *Symplectoscyphus subdichotomus* (Kirchenpauer) and *Campanularia laevis* Hartlaub. No gonothecae.

Description. — The colonies consist of a thin, creeping hydrorhiza, loosely attached to the supporting hydroid, with smooth or slightly wrinkled periderm. The pedicels rise fairly close together; they are invariably unbranched and have a few rings at the base (fig. 11b). They immediately give rise to the hydrothecae, or continue for some distance as a smooth stalk, widening imperceptibly into the hydrotheca. The transition from pedicel to hydrotheca is marked by a fine, perpendicular diaphragm. The hydrotheca is slightly conical or, in some instances, very slightly swollen (fig. 11b, c). The apical portion of the hydrotheca is folded to form a conical roof, formed by 8 to 10 triangular sections of the hydrothecal wall. In all hydrothecae observed the folding of the hydrothecal membrane is quite regular. All hydrothecae have a completely retracted hydranth, bearing 12 tentacles. No gonothecae have been observed.

Measurements (in microns). —

	Vema 17-21
Hydrotheca, length from diaphragm onwards	400-430
maximum diameter	120-135

Remarks. — The absence of the gonosome makes the reference to the genus *Opercularella* Hincks (1868: 193) doubtful. The material, probably young and certainly immature, cannot properly be identified. It has been collected in the Estrecho de Magellanes (Vema 17-21).

Family Lovenellidae

Stegopoma fastigiatum (Alder, 1860)

Campanularia fastigiata Alder, 1860: 73, pl. 5 fig. 1.

Stegopoma fastigiatum, Totton, 1930: 155, fig. 11; Ralph, 1957: 850, fig. 8 n-o; Naumov, 1960: 315, fig. 206.

Stegopoma gilberti Nutting, 1905: 943, pl. 3 fig. 1, pl. 9 fig. 1; Stechow, 1913: 122.

Stegopoma gracile Nutting, 1905: 944, pl. 3 fig. 2, pl. 8 figs. 8, 9.

Stegopoma plumicolum Nutting, 1905: 944, pl. 3 fig. 3, pl. 9 figs. 2, 3.

Material. — Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. Several hydrothecae rising from a stolon creeping on various other hydroids. No gonothecae.

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. Solitary hydrothecae rise from a stolon creeping on various hydroids, e.g., *Symplectoscyphus subdichotomus* (Kirchenpauer), *Campanularia laevis* Hartlaub and *Halecium* spec. No gonothecae.

Vema 17-38, 53°35.4'S, 70°23.5'W, 3.4.1961, SBT, 132 m. Solitary hydrothecae rising from a stolon creeping on *Symplectoscyphus subdichotomus* (Kirchenpauer). No gonothecae.

Remarks. — The hydrothecae in the present material are identical with those from Norwegian coastal waters, with which I have compared the Vema specimens. Stechow (1914: 135, fig. 9) already drew attention to the great variability in overall length of the hydrotheca and length of the pedicel; he synonymized three of Nutting's "species" from the Hawaiian area with the well distributed North Atlantic species.

Though the principal area of distribution of this species is in the sub-Arctic and boreal Atlantic, it has also been recorded from sub-Arctic parts of the Pacific Ocean (Naumov, 1960), from the Hawaiian Islands region (Nutting, 1905, as *Stegopoma gilberti, S. gracile* and *S. plumicolum*), from Sagami Bay, Japan (Stechow, 1913, as *S. gilberti*), and from the New Zealand area (Totton, 1930; Ralph, 1957). The Vema records are from the extreme southern part of South America, viz., the south-western Atlantic between the Falkland Islands and Isla de los Estados (Vema 15-109), and the Estrecho de Magellanes (Vema 17-21 and 17-38); they apparently constitute new records of this species for that area.

Stegopoma plicatile (M. Sars, 1863)

Lafoea plicatilis M. Sars, 1863: 31.
Stegopoma plicatile, Vervoort, 1966: 112, fig. 13.
Lictorella (?) operculata Hartlaub, 1904: 12, pl. 1 figs. 6, 7.
Stegopoma operculata, Vanhöffen, 1910: 310, fig. 30.

Material. — Vema 16-45, 50°53'N, 52°26'W, 15.8.1960, SBT, 265 m. Two small, 8 and 10 mm high fragments. No gonothecae.

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. One 15 mm high, complete, polysiphonic colony rising from a small stone and a slightly larger fragment. No gonothecae.

Vema 17-45, 62°33'S, 59°26'W, 23.4.1961, SBT, 600-604 m. One polysiphonic, 10 mm high fragment with some well preserved hydrothecae. No gonothecae.

Remarks. — This species has recently been redescribed (Vervoort, 1966: 112, fig. 13) after material from the Tasman Sea, 42°10'S, 170°10'E, collected by the Galathea Expedition. This material proved to be identical with colonies from the Trondheimsfjord, Norway. The present material, both from north- and south-western Atlantic, shows no differences with the Norwegian and Galathea materials; it is identical in the shape of the hydrothecae and has the same structure of the colony.

I see no reason any longer to separate *Lictorella* (?) *operculata* Hartlaub,

1904, from *Stegopoma plicatile*; in my opinion it is based on a poorly preserved fragment of that species.

The main area of distribution of *S. plicatile* is still in Arctic and boreal parts of the Atlantic and Pacific Oceans (Kramp, 1935; Naumov, 1960). The material from Vema 16-45 originates from the north-eastern Atlantic north of Newfoundland. On the southern hemisphere the species is now known to occur in the Tasman Sea, 42°10'S, 170°10'E, 610 m depth (Vervoort, 1966); in the Estrecho de Magellanes (Vema 17-21), in Bransfield Strait, Graham Land region (Vema 17-45), in the extreme southern Pacific Ocean, 70°00'S, 80°48'W, depth 550 m (Hartlaub, 1904, as *Lictorella* (?) *operculata*), and in the extreme southern Indian Ocean, Gauss Station, 66°02'S, 89°38'E, depth 385 m (Vanhöffen, 1910, as *Stegopoma operculata*).

Family LAFOEIDAE

Acryptolaria conferta conferta (Allman, 1877) (fig. 12a)

Cryptolaria conferta Allman, 1877: 17, pl. 12 figs. 6-10; Stechow, 1925: 459.
Acryptolaria conferta conferta, Millard, 1964: 7, fig. 1 A-C, E.

Material. — Vema 14-19, 52°41'S, 59°09'W, 22.2.1958, SBT, 108 m. Two 15 mm long fragments with damaged hydrothecae. No coppiniae.

Description. — The stems of the fragments are monosiphonic over the greater part of their length; the basal part only shows some accessory tubules. In the monosiphonic parts the hydrothecae are biserially arranged; they are tubular for the greater part of their length. Basally the hydrothecae narrow distinctly and there communicate with the stem through a circular opening. There is no basal diaphragm. The majority of the hydrothecae curves gracefully, ultimately pointing away at right angles from the length axis of the stem; the plane of the aperture is parallel with that of the length axis (fig. 12a). The free part of the adcauline wall, even in non-renovated hydrothecae, is longer than the adnate part. The basal part of the communal adcauline wall of hydrotheca and axis is distinctly thickened. The aperture of the hydrotheca is circular and very slightly everted. A number of renovations (maximum three) occurs.

Measurements (in microns). —

	Vema 14-19	South Africa (Millard, 1964)
Hydrotheca, length adnate part adcauline wall	475-540	330-490
length free part adcauline wall, incl. renovations	285-335	120-750
diameter at base	110-120	60-100
diameter at margin	185-200	130-160

Remarks. — The identification of these fragments is somewhat doubtful because of the poor condition of the material. *Acryptolaria conferta conferta* is a characteristic Atlantic deep water species, that has also been recorded from several localities in the Indian Ocean and from the eastern Pacific. Stechow (1925) and Millard (1964) have discussed the geographical distribution of this species at some length. The present record is from moderately deep water of the south-western Atlantic between the Falkland Islands and Burdwood Bank (Vema 14-19).

Acryptolaria longitheca (Allman, 1877) (fig. 12b, c)

Cryptolaria longitheca Allman, 1877: 19, pl. 13 figs. 4, 5; Clarke, 1879: 244, pl. 2 figs. 7-13; Fewkes, 1881: 128.
Acryptolaria longitheca, Fraser, 1943: 78, 90; Fraser, 1944: 212, pl. 41 fig. 192; Vervoort, 1968: 99.

Material. — Vema 15-163, 32°34'N, 74°21.5' W, 9.7.1959, SBT, 4681 m. One 25 mm high, unbranched colony with some basal fibres and a smaller fragment. No coppiniae.

Description. — Both colony and fragment are mainly monosiphonic; in the colony the basal part of the hydrocaulus is covered by several accessory tubules that do not reach the end of the stem; in the fragment there is only one extra tubule. The structure of the hydrocaulus is sympodial; it is slightly though distinctly bent in zig-zag fashion. The hydrothecae are large and horn-shaped; they are narrow at the place of origin and widen gradually towards the aperture, at the same time curving slightly (fig. 12c). They are biserially arranged in two strictly opposite rows and coalescent with the axis for slightly more than half the adcauline thecal wall. The aperture is circular and very slightly everted, one to five renovations may occur. The arrangement of the hydrothecae and their exact shape appear best in fig. 12b, c. The single accessory tubule in the fragment can be followed throughout the length of the axis, to which it closely adheres, communicating with the axis through circular holes, one at each hydrothecal base. In the colony the number of accessory tubes is larger and an increased number of perforations occurs.

No coppiniae are present.

Measurements (in microns). —

	Vema 15-163
Hydrotheca, total length	1,800-2,080
length adnate part adcauline wall	1,050-1,215
length free part adcauline wall	900-980
diameter at base	90-95
diameter at aperture	365-405

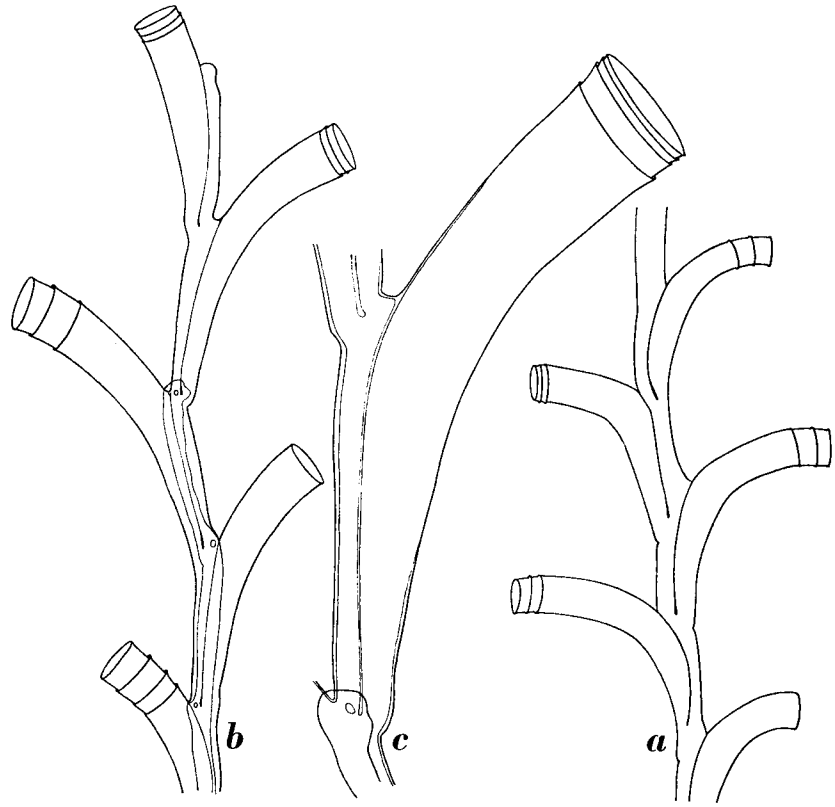

Fig. 12. a, *Acryptolaria conferta conferta* (Allman), Vema 14-19, monosiphonic fragment. b, c, *Acryptolaria longitheca* (Allman), Vema 15-163; b, monosiphonic fragment; c, hydrotheca with renovations. a, b, × 20; c, × 45.

Remarks. — The coppiniae of this species have been described by Clarke (1879: 244, pl. 2 figs. 11-13); there can be no reasonable doubt that this is a species of *Acryptolaria* Norman (1875: 172; type *Acryptolaria andersoni* Totton, 1930: 161).

A. longitheca occurs in deep water of the tropical and subtropical western Atlantic: off Double Headed Shot Key, 315 fms (= 576 m) (Allman, 1877); off Tortugas, 25°33'N, 84°21'W, 101 fms (= 185 m) (Clarke, 1879); Dominica, 76 fms (= 139 m), Martinique, 334 fms (= 610 m), and Barbados, 103 fms (= 188 m) (Fewkes, 1881); south of Florida Keys, 24°18'N, 80°58.5'W, 324 fms (= 553 m), and 13°11'65"N, 59°38'45"W, off Barbados, 73 fms (= 133 m) (Fraser, 1943). The present locality is from deep water of the temperate western Atlantic east of South Carolina (Vema 15-63).

Cryptolaria crassicaulis Allman (1888: 41, pl. 19 figs. 3, 3a), an Indo-Pacific deep water species, has many points in common with the present species. This particularly holds for the material described by Millard (1967: 172, fig. 2A) from the south-western Indian Ocean, which material also has almost the same measurements. A re-inspection of Allman's type of *C. crassicaulis* seems imperative at this stage.

Cryptolarella flabellum (Allman, 1888) (fig. 13a, b)

Cryptolaria flabellum Allman, 1888: 40, pl. 19 fig. 1.
Acryptolaria flabellum, Vervoort, 1968: 99.

Material. — Vema 15-69, 10°13'S, 80°05'W, 9.12.1958, SBT, 6324-6328 m. A large number of fragments, together forming a much damaged colony of several centimeters height. Some "gonothecae" are present.

Description. — The thickest fragments, apparently representing the broken hydrocaulus, have a diameter of 800 microns and consequently are still fairly thin. There are many finer, monosiphonic branches, representing the ultimate ramifications of the colony, that will be described first of all. These finer ramifications are remarkable by the presence of very long and slender, tubular hydrothecae, that have a tendency towards biserial arrangement in pairs (fig. 13a). The hydrothecae of one pair are not strictly opposite, emerging at a slightly different height from the axial tubule. At the place of origin from the axial tubule the hydrothecae are slightly constricted but they rapidly become tubular and have the same diameter throughout, curving gracefully towards both sides of the axis. A considerable portion of the adcauline wall of each hydrotheca is fused with the axis, but the free part is even longer, its length depending on the number of renovations being present. Usually the hydrothecae form a quart circle, but in some instances the regular growth of the hydrotheca has apparently been interrupted and irregularly curved hydrothecae, still largely tubular, have resulted. The hydrothecal aperture is circular and parallel to the length axis of the branch; there are usually many renovations. In the older branches the axial tubule becomes rapidly covered by accessory tubules, in the same fashion as occurs in *Acryptolaria* (vide Totton, 1930: 162, and Ralph, 1958: 312). The accessory tubules rapidly cover the basal portions of the axial hydrothecae and, as they also carry hydrothecae, obscure the biserial arrangement of the original hydrothecae. The older branches, consequently, are polysiphonic and have hydrothecae in many rows, some of which are basally completely covered by secondary tubules, whilst others are nearly completely free. All hydrothecae have in common a long, gracefully

curved, apical part, that is characterized by the presence of a circular, scarcely everted opening and a fairly large number of renovations.

Some of the fragments have structures that I think are the gonothecae. The flask-shaped bodies adhere to the axial tubules and some of the hydrothecae, narrow very slightly apically and have a circular, slightly everted opening at the end of a curved neck (fig. 13b). The wall of the "gonotheca" has the same staining properties as that of the hydrothecae; it has a very fine, transverse striation. The majority of the "gonothecae" is completely empty, but one of the "gonothecae" has some internal structures left, reminiscent of a gonophore; they certainly do not represent commensal worms. There can, in my opinion, be no doubt that the "gonothecae" are produced by the accessory tubules, with which they are in protoplasmic continuity.

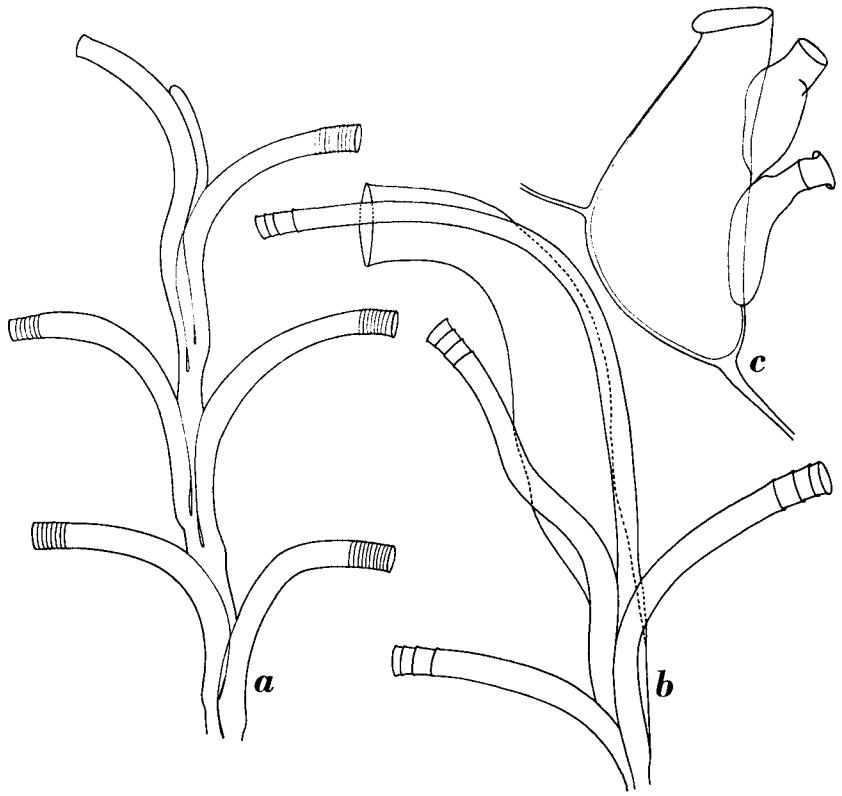

Fig. 13. a, b, *Cryptolarella flabellum* (Allman); a, top part of branch; b, part of branch with "gonotheca". c, *Filellum serpens* (Hassall), Vema 16-62, two hydrothecae on hydrotheca of *Abietinaria abietina* (L.). a, b, × 20; c, × 70.

Measurements (in microns). —

	Vema 15-69
Hydrotheca, total length, including renovations	1,720-1,900
length adnate part adcauline wall	860-1,075
length free part adcauline wall	1,100-1,590
diameter at base	67-94
diameter at aperture	190-200
Gonotheca, approximate length	3,800
maximum diameter	680
diameter at opening	520

Remarks. — This is a decidedly rare species. It was originally recorded by Allman (1888: 40) from off Culebra, Virgin Islands, 18°38′30″N, 65°95′30″W, 390 fms (= 713 m); the present record is from deep water of the tropical eastern Pacific west of Peru (Vema 15-69). In spite of the fact that I have not inspected Allman's type there can, in my opinion, be scarcely any doubt that the Vema specimens belong to Allman's very characteristic species.

Naumov (1960: 278, text-fig. 168, pl. 1 fig. 2), under the name *Cryptolaria flabellum* Allman, records specimens from the Bering and Okhotsk Seas that are not conspecific with the present species. Naumov's material differs in the length of the hydrothecae, that though tubular are much shorter than those of *C. flabellum*, particularly the free distal part of the hydrotheca. The hydrothecae, moreover, are more closely packed and lack the initial arrangement in slightly displaced pairs. In the older hydrothecae the number of renovations is extremely high, so as to give the distal hydrothecal wall a ringed appearance. Naumov's specimens represent a new species, closely related to but specifically different from *Cryptolarella flabellum* (Allman).

Filellum serpens (Hassall, 1848) (fig. 13c)

Campanularia serpens Hassall, 1848: 2223.
Reticularia immersa Thomson, 1853: 443, pl. 16 figs. 2, 3.
Filellum serpens, Hincks, 1868: 214, pl. 41 fig. 4; Jäderholm, 1905: 22, pl. 8 fig. 3; Broch, 1910: 160, 210, fig. 21; Billard, 1914: 11, fig. 6; Leloup, 1960: 220; Blanco, 1967a: 103.
Lafoea serpens, Vanhöffen, 1910: 311.
Grammaria serpens, Broch, 1918: 16.
Reticularia serpens, Millard, 1957: 203; Rees & Thursfield, 1965: 87.

Material. — Vema 16-62, 51°01′N, 57°10′W, 5.9.1960, SBT, 57 m. Colonies with coppiniae on *Abietinaria abietina* (L.), together with *Coryne pusilla* Gaertner, *Calicella syringa* (L.), *Lafoea fruticosa* (M. Sars) and *Campanularia groenlandica* Levinsen.

Vema 16-63, 51°09′N, 57°23′W, 6.9.1960, SBT, 91 m. Some hydrothecae creeping on hydrocaulus of *Abietinaria abietina* (L.). No coppiniae.

Description. — The almost tubular hydrothecae are very slightly widened in the basal, adhering part and therefore at times slightly flask-shaped. They are connected by means of a very thin, at times scarcely visible, round hydrorhizal tube. The basal two-thirds of the hydrotheca adheres to the substratum, the apical part of the hydrotheca is slightly everted and placed at the end of an almost funnel-shaped, free hydrothecal portion, curving away from the coalescent part. In some hydrothecae from Vema 16-62 the hydrothecal margin is particularly strongly everted, but such thecae occur along with those with completely non-everted margin on the same hydrorhiza (fig. 13c). The total hydrothecal length is 400-425 microns, the diameter of the aperture varies between 80 and 110 microns.

Some coppiniae occur in the material from Vema 16-62; the hydrothecal tubes in the coppiniae, though strongly curved, are simple and not forked at the apex.

Remarks. — The various species of *Filellum* are at times referred to the genus *Reticularia* Thomson (1853: 443, type *Reticularia immersa* Thomson, 1853 = *Campanularia serpens* Hassall, 1848). It should be pointed out, as has also been done by Blanco (1967a: 105) that this name is not available for a genus of hydroids, as it is preoccupied by *Reticularia* McCoy, 1844; the latter being still in use for a genus of fossil Brachiopoda. The generic name *Reticularia* Thomson has recently been used (Rees & Thursfield, 1965: 85) in a much wider sense to include also the rhizocaulomic type of colonies, formerly brought to *Grammaria*. I think it advisable to use the generic name *Grammaria* Stimpson (1854: 9, type *Grammaria robusta* Stimpson, 1854 = *Campanularia abietina* M. Sars, 1851) exclusively for species with the rhizocaulomic type of colonies, irrespective of the fact that they pass through a prostrate, juvenile stage, and to reserve the generic name *Filellum* Hincks (1868: 214, type *Campanularia serpens* Hassall) for such colonies that have hydrothecae that are coalescent with the substratum and as a result are prostrate.

The separation of *F. serpens* from the much more abundant *F. serratum* (Clarke, 1879) in the present material is exclusively based on the condition of the basal (coalesced) part of the hydrotheca: it is smooth in *F. serpens* and has a fine, transversal striation in *F. serratum*.

Filellum serpens is a cosmopolitan species, its distributional area ranging from the Arctic (Broch, 1910) to the Antarctic (Vanhöffen, 1910) Oceans. The present colonies are from the Strait of Belle Isle, Newfoundland.

? **Filellum serratum** (Clarke, 1879) (fig. 14a, b)

Lafoëa serrata Clarke, 1879: 242, pl. 4 fig. 25; Hartlaub, 1905: 595, fig. Q².
Filellum serratum, Stechow, 1913: 111, fig. 85; Millard, 1967: 175, fig. 2D.
Reticularia serrata, Ralph, 1958: 312, figs. 2j, 3a; Rees & Thursfield, 1965: 86.

Material. — Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m. Hydrothecae creeping on hydrocaulus of a species of *Sertularella*. No coppiniae.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. Many hydrothecae covering some branches of *Symplectoscyphus subdichotomus* (Kirchenpauer). No coppiniae.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. Many hydrothecae covering fragments of *Symplectoscyphus subdichotomus* (Kirchenpauer), together with *Hebella striata* (Allman). No coppiniae.

Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. Many hydrothecae rise from a hydrorhiza creeping on a fragment of *Sertularella geodiae* Totton. No coppiniae.

Vema 16-40, 42°48'S, 63°11'W, 27.5.1960, SBT, 70 m. A large number of hydrothecae on a colony of *Symplectoscyphus subdichotomus* (Kirchenpauer) together with *Hebella striata* Allman. No coppiniae.

Vema 17-18, 53°55.5'S, 71°16.8'W, 28.3.1961, SBT, 248-262 m. Hydrothecae from a hydrorhiza creeping on hydrocaulus of unrecognizable hydroid. No coppiniae.

Vema 18-14, 47°13'S, 61°30'W, 17.2.1962, SBT, 132-130 m. Some hydrothecae rise from a hydrorhiza creeping on stem of unrecognizable hydroid. No coppiniae.

Description. — Colonies of identical appearance as *F. serpens*, with a fine, tubular hydrorhiza creeping on other hydroids. The hydrothecae, that arise along the hydrorhiza, are tubular, with the basal portion adnate to hydrorhiza or substratum. The coalesced basal part is one half or one third of the total hydrothecal length, at times it is very slightly swollen (but usually much less so than in *F. serpens*) and possesses a very fine transversal striation, about 15 very fine ribs being present (fig. 14a, b). The apical portion of the hydrotheca curves away fairly abruptly from the basal part of the hydrotheca; it is strictly tubular, sometimes with the margin very slightly everted.

The present material, all from the south-western Atlantic, shows an extreme degree of variability. The colony from Vema 15-98 is almost indistinguishable from the material of *F. serpens* described above, but the hydrothecal base is finely, though indistinctly striated. The colonies from Vema 15-107 (fig. 14b) are at once remarkable by the great diameter of the hydrothecae; the hydrothecae are generally larger and the curvature between adnate and free hydrothecal portion is very abrupt; the free hydrothecal part is fairly long. The colony from Vema 16-40 (fig. 14a) resembles the previous colony, but it is much finer in every respect; the striation is very distinct. The colony from Vema 18-14, at last, is remarkable by the very large number of renovations, as a result of which the hydrothecae are much longer.

The variability of the material also appears from the following measurements (in microns):

	Vema 15-98	Vema 15-107	Vema 16-40	Vema 18-14
Hydrotheca, length				
free part	270-340	270-540	135-270	470-540
length adnate part	340-400	340-400	270-340	270-400
diameter	110-135	190-215	110-135	160-200

Fig. 14. a, b, ? *Filellum serratum* (Clarke); a, Vema 16-40, hydrotheca on *Symplectoscyphus subdichotomus* (Kirchenpauer); b, Vema 15-107, hydrothecae on stem of *Symplectoscyphus subdichotomus* (Kirchenpauer). c, ? *Filellum* spec., Vema 15-107, hydrotheca in *Symplectoscyphus subdichotomus* (Kirchenpauer). a, b, × 55; c, × 135.

Remarks. — This species differs from *F. serpens* principally by the presence of a fine, transversal striation on the basal, adnate portion of the hydrotheca. Though it has repeatedly been observed, at times in great profusion, its gonothecae or mode of reproduction are still unknown. Its place in *Filellum,* therefore, is quite provisional and exclusively based on its great conformity with the type of that genus.

The distribution of this species, which is almost worldwide, has been summarized by Ralph (1958: 312): West Indies, Mediterranean, Red Sea, East Indes, Indo-China, Philippines, Japan, and New Zealand. It is also recorded from the extreme southern part of Chile (Smythe Channel, Long Island, Hartlaub, 1905, as *Lafoëa serrata*), a locality not cited by Ralph. The present specimens all originate from the south-western Atlantic, viz., the Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-98, 15-107, 15-108 and 15-109), from the shelf south-east of Peninsula Valdés, Argentina (Vema 16-40), the shelf east of the Golfo de San Jorge, Argentina (Vema 18-14) and the Estrecho de Magallanes (Vema 17-18); the depths at these localities varies between 70 and 403 m.

Filellum spec. (fig. 15)

Filellum serpens Hartlaub, 1905: 596, fig. R²

Material. — Vema, Burdwood Bank, RD, 1/2. Many colonies creeping on stems of *Eudendrium rameum* (Pallas). No coppiniae.

Description. — The stems of *Eudendrium* are covered by a dense, brownish matting of hydrorhizal tubes, in which the individual tubules are very hard to see. The hydrothecae rise from this matting in all directions of the stems, the adnate part of the hydrothecae being visible in some cases only, where it appears to be comparatively short. The free part of the hydrotheca curves away from the stems at right angles; this part is tubiform with the aperture very slightly everted (fig. 15). The hydrothecae are remarkable by the high number of renovations. The hydranths are badly preserved.

Measurements (in microns). —

	Vema, Burdwood Bank
Hydrotheca, length adnate part	335-405
length free part	380-540
diameter at aperture	110-160

Remarks. — This specimen has been kept separate from the specimens identified as *F. serpens* because of differences in the shape and size of the hydrothecae. In the latter the adnate part of the hydrotheca usually is shorter than the free part; the curvature of the free part is much less abrupt than

in the present specimen. The length and diameter of the hydrotheca in *F. serpens* are less than in the specimen recorded here as *Filellum* spec.

The specimen described above approaches *Filellum antarcticum* (Hartlaub, 1904) (= *Lafoea antarctica* Hartlaub, 1904: 11, pl. 2 fig. 2) very closely in the shape of the hydrothecae, particularly its manyfold renovations. *F. antarcticum*, however, can only with certainty be distinguished from *F. serpens* when the gonosome is present; I have therefore refrained from a definite identification.

I feel almost certain that my material is conspecific with that recorded by Hartlaub (1905: 596) from the south-eastern Pacific Ocean off Calbuco, Chile, and from Juan Fernandez Island as *Filellum serpens*. Hartlaub's colonies were sterile; they have in common the shape of the hydrothecae and the presence of a matting of hydrorhizal tubules on their host. *Filellum antarcticum* is essentially Antarctic, though its presence has also been established off the south coast of South Africa (Millard, 1964: 10).

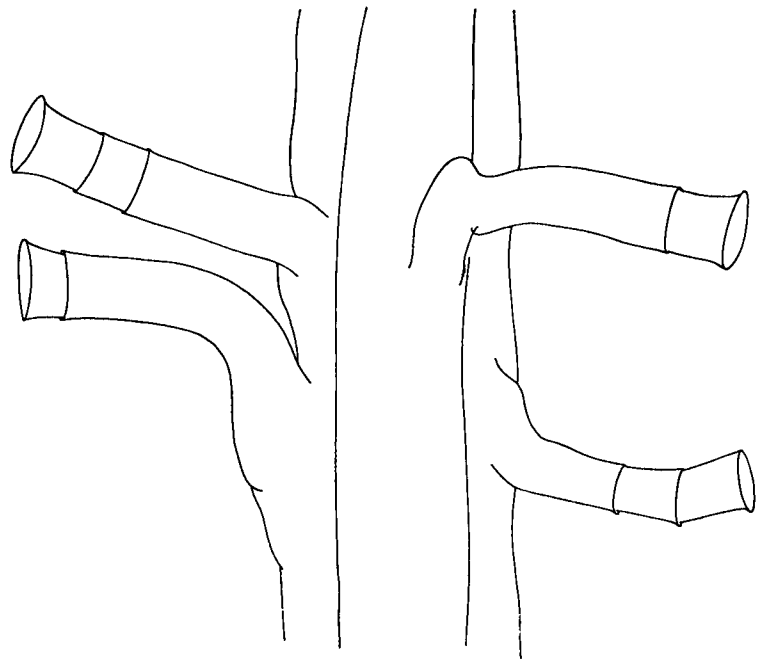

Fig. 15. *Filellum* spec., Vema, Burdwood Bank, RD, 1/2, several hydrothecae on stem of *Eudendrium rameum* (Pallas). × 70.

? **Filellum** spec. (fig. 14c)

Material. — Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. Specimens creeping on *Symplectoscyphus subdichotomus* (Kirchenpauer). No hydranths, no gonothecae.

Vema 17-24, 53°37.7'S, 69°54.6'W, 29.3.1961, SBT, 42 m. Specimens creeping on stems of *Symplectoscyphus subdichotomus* (Kirchenpauer). No hydranths or gonothecae.

Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m. A few specimens creeping on stems of *Symplectoscyphus subdichotomus* (Kirchenpauer). No hydranths or gonothecae.

Description. — Though this species is very easily overlooked it is of very characteristic appearance. The stolon consists of a fine, round tube, creeping on the stem of *Symplectoscyphus subdichotomus* and visible on the internodes and particularly in the axil of internode and hydrotheca; its diameter varies between 33 and 38 microns. The stolon continues on the adcauline side of the (empty) hydrotheca and enters the cavity of the hydrotheca at one of the sides of the adcauline marginal tooth. It can then be followed for some distance inside the hydrotheca, again mainly alongst the (inside of the) adcauline hydrothecal wall. It gives rise to a tubular hydrotheca, that nearly fills the whole of the hydrotheca of its host above the thin septum in the hydrotheca marking the attachment of the original hydranth. In some specimens this part of the hydrotheca is nearly completely filled; in others a portion of the space is not occupied by the invading hydroid (fig. 14c). The hydrothecal mouth of the invading hydroid projects outside the original hydrotheca and usually curves away at a slight angle from the part concealed in the hydrotheca of the host. The tubular mouth of the invading hydroid widens very slightly towards the aperture, which is perfectly circular. In some cases the hydrotheca has been renovated. The total length of the hydrotheca is 385-440 microns; the diameter, at the aperture, is 110-135 microns.

Remarks. — As pointed out above this parasitic or commensal hydroid is of very characteristic appearance, but unfortunately neither hydranths nor gonothecae have been observed. It is quite easily overlooked when the hydroid colonies are cursorily inspected under the stereo-microscope but the species is easily observed in the stained slides. I have provisionally placed it in the genus *Filellum* with which it agrees in the shape of the hydrotheca. I realize than its place there must be quite provisional, pending the discovery of additional material. The notes given above and the drawings will suffice, I hope, to recognize this curious form. The material originates from the south-western Atlantic Ocean between Tierra del Fuego and the Falkland Islands (Vema 15-107) and from the Estrecho de Magallanes (Vema 17-24, and 17-25).

Grammaria abietina (M. Sars, 1851)

Campanularia abietina M. Sars, 1851: 131.
Grammaria abietina, Broch, 1910; 161, 210, pl. 3 fig. 8; Kramp, 1914: 1030; Broch, 1918: 18, figs. 5, 6; Stechow, 1919: 81; Kramp, 1932: 34; Kramp, 1935: 127, fig. 55; Vervoort, 1942: 288; Fraser, 1944: 217, pl. 44 fig. 20; Naumov, 1960: 283, figs. 20, 46E, 174, pl. 1 fig. 3.
Reticularia abietina, Rees & Thursfield, 1965: 85.
Grammaria robusta Stimpson, 1854: 9, pl. 1 fig. 3.

Material. — Vema 16-48, 60°10'N, 47°08'W, 21.8.1960, SBT, 300. A fragment of 10 mm length. No coppiniae.
Vema 17 RD 29, 60°27'N, 48°31'W, 4.9.1961, rock dredge, 366-326 m. A fragmentary colony of 36 mm height at the base of a large colony of *Agaophenopsis cornuta* (Verrill) and covered with some colonies of *Symplectoscyphus tricuspidatus* (Alder). No coppiniae.

Remarks. — The material of this species in the present collection is too poor to allow a redescription. The hydrothecae, in the larger colony, are arranged in four rows along the hydrocaulus, the two rows of opposite sides lying in decussate planes. The tubuliform hydrothecae in one plane are opposite, their basal portion covered by the secondary tubules. The free part of the hydrotheca is fairly long and curved; the hydrothecal margin is very slightly everted. Renovations are quite common. In some of the younger branches of the colony the arrangement of the hydrothecae is in three longitudinal rows.

The principal area of distribution of this species is in the boreal parts of the Atlantic, penetrating farther to the north and occasionally living under purely Arctic conditions. The present localities (Vema 17 RD 29 and Vema 16-48) are from the entrance to Davis Strait, off the southern point of Greenland. Localities from that particular area are given by Kramp (1914, 1932).

Grammaria borealis (Levinsen, 1893) (fig. 16a)

Cryptolaria (?) borealis Levinsen, 1893: 173, pl. 5 fig. 21.
Cryptolaria borealis, Linko, 1911: 122, fig. 22; Naumov, 1960: 279, figs. 46g, 169.
Grammaria borealis, Stechow, 1923a: 147; Kramp, 1932: 34, figs. 15, 16.
Cryptolaria triserialis Fraser, 1913: 170, pl. 13 figs. 1, 2.
Cryptolaria triserialis, Stechow, 1923a: 147.
Grammaria conferta p. p. Broch, 1918: 17.

Material. — Vema 16-48, 60°10'N, 47°08'W, 21.8.1960, SBT, 300 m. A fragment of a monosiphonic stem, 10 mm long. No coppiniae.
Vema 16-49, 60°10'N, 47°10'W, 21.8.1960, SBT, 274. A small, 15 mm high colony, basally with some ascessory tubes, attached to a fragment of rock; several smaller fragments. No coppiniae.

Description. — The greater part of the present material is monosiphonic; here the hydrothecae are arranged in decussate pairs. The level of the base of each pair is slightly above the level of the upper margin of the preceding pair. The hydrothecae of each pair, though strictly opposite, do not originate at the same level of the axis (fig. 16a). The hydrothecae are tubular, fairly narrow at the base, gradually widening and curving outwards; they are slightly though distinctly bulging at the adcauline side. The apical part of the hydrothecae is tubular, with a circular aperture that makes an acute angle with the length axis of the stem. The insertion of each hydrotheca on the axis can best be seen in fig. 16a; the greater part of the adcauline wall has completely fused with the axis. The extreme base of the communal wall is distinctly thickened, but there is no space between axis and adcauline hydrothecal wall at that point. There is no internal hydrothecal diaphragm or septum. The hydrothecal margin is slightly everted and renovated in some hydrothecae.

In the colony from Vema 16-49 the basal part of the colony has some accessory tubules, that cover the axis and basal parts of the hydrothecae. These tubules have no additional hydrothecae; the quadriserial arrangement of the hydrothecae has not been disturbed.

No coppiniae have been observed.

Measurements (in microns). —

	Vema 16-48
Hydrotheca, total length	750-875
length adnate part adcauline wall	400-540
length free part adcauline wall	340-400
diameter at base	81-95
diameter at aperture	175-200
maximum diameter	200-230

Remarks. — For a discussion of the synonymy of this rare species I refer to Kramp (1932: 34-37). Ignorance of the gonosome makes the classification of this species doubtful, though in its vegetative aspects it approaches the genus *Grammaria* Stimpson (1854: 9) in which it has been provisionally placed, pending the discovery of the coppiniae. The species is exclusively northern Atlantic; its distribution there can be summarized as follows: Davis Strait, without exact locality, 150 m depth (type locality, Levinsen, 1893); Davis Strait, 66°35'N, 55°44'W, 160 m depth (Broch, 1918, as *Grammaria conferta*, fide Kramp, 1932); Davis Strait, near mouth Hamilton Inlet, 55°00'N, 56°34'W, 314 m depth (Kramp, 1932); Barents Sea, 69°45.5'N, 36°07.5'E, 192 m depth (Linko, 1911), and the Barents and Kasrasko Seas, without exact localities (Naumov, 1960). An additional

record comes from near the east point of Nova Scotia, 36 m depth (Fraser, 1913, as *Cryptolaria triserialis*). The present records are from near the south point of Greenland (Vema 16-48 and 16-49).

Grammaria magellanica Allman, 1888 (fig. 16b)

Grammaria magellanica Allman, 1888: 48, pl. 23 figs. 2, 2a, 2b; Hartlaub, 1905: 598, fig. U²; Ritchie, 1907: 531, pl. 1 figs. 4, 4a; Jäderholm, 1905: 23, pl. 8 figs. 6-8, pl. 9 fig. 1; Jäderholm, 1926: 4; Naumov & Stepan'yants, 1962: 75.
Reticularia magellanica, Rees & Thursfield, 1965: 86.

Material. — Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m. Three fragments, 5 to 10 mm long. No coppiniae.
Vema 15-102, 52°53.3'S, 65°35'W, 5.3.1959, 108 m. One fragment of 15 mm length. No coppiniae.
Vema 15-105, 54°06.6'S, 66°20'W, 6.3.1959, 55 m. One fragment of 15 mm length. No coppiniae.
Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. Many fragments, together forming a fairly complete colony of 60 mm height. No coppiniae.
Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. Two fragments of about 8 mm length. No coppiniae.
Vema 17-88, 45°11'S, 60°55'W, 11.6.1961, SBT, 110 m. Several 30 to 40 mm long fragments of a larger colony. No coppiniae.
Vema 18-14, 47°13'S, 61°30'W, 17.2.1962, SBT, 132-130 m. One complete colony of 40 mm height. No coppiniae.
Vema, Burdwood Bank, RD, 1/2. One fair fragment of 30 mm height. No coppiniae.

Description. — The colonies are more or less pinnate, with unbranched or slightly branched main stems of about 610 microns diameter. The side-branches are opposite, sub-opposite or alternately arranged along the hydrocaulus and with the main stems arranged in one plane, so that the general shape of the colony is pinnate. The side-branches, at their point of origin at the main stem, are very much contracted; the end of such branches is smoothly rounded as the secondary tubes all terminate at the same height.

The tubuliform hydrothecae are arranged in six rows and placed in three longitudinal planes, that make an angle of 120°. In a cross section of the hydrocaulus, consequently, three hydrothecae are arranged in one row, the hydrothecae of the subsequent row alternate with that of the preceding row. The hydrothecae are tubular, the greater part adnate to the primary tube and gradually covered by secondary tubules (fig. 16b). The exact length of the hydrotheca or the total length of the free portion is therefore difficult to measure. The diameter of the opening of the hydrotheca varies between 270 and 300 microns; the length of the free part of the hydrotheca (projecting between the secondary tubules) is 540 to 675 microns. The aperture of the hydrotheca is circular, in some renovated hydrothecae very slightly everted,

though never so much as appears to be the case in *Grammaria stentor* Allman, 1888.

The arrangement in six longitudinal rows is the condition generally met with in this species. Some of the younger branches in my specimens have a tetrastichal arrangement of the hydrothecae; some of the older stems appear to have an increased number of hydrothecal rows (8 in some cases or an irregular arrangement of the hydrothecae). In my opinion the hydrothecae do not exclusively originate from the "primary" tube, but may also arise from secondary, thecae-bearing tubules.

The differences of the present species with *Grammaria stentor* Allman (1888: 48, pl. 23 figs. 1, 1a = *G. intermedia* Pfeffer, 1889: 53) and particularly *G. insignis* Allman (1888: 49, pl. 23 figs. 3, 3a, 3b) are not clearly established and need further study.

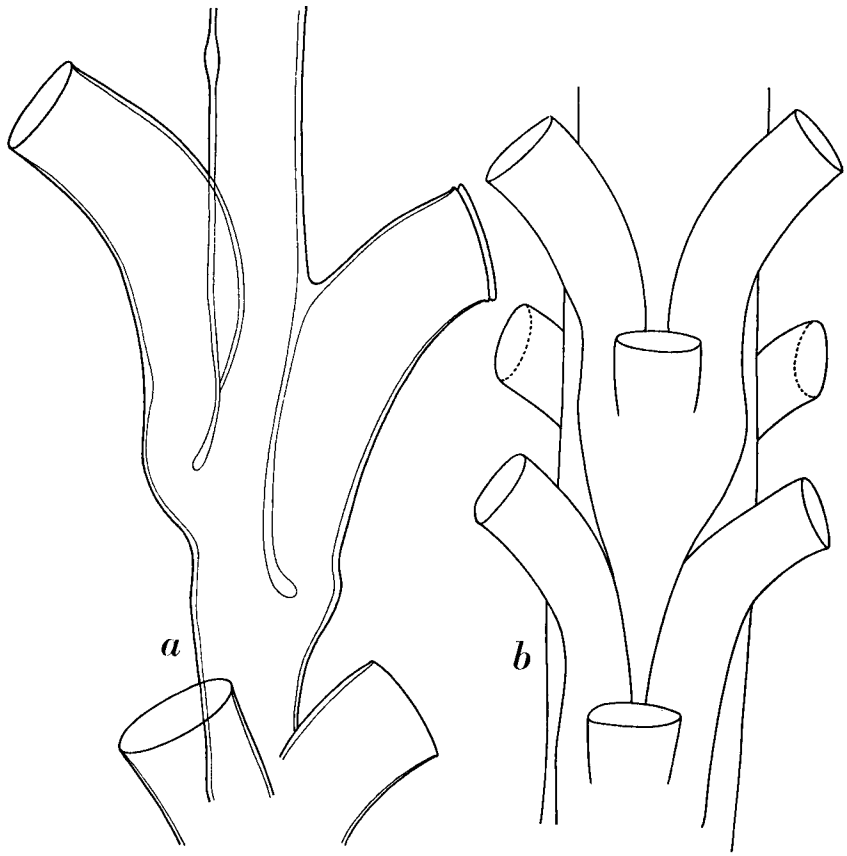

Fig. 16. a, *Grammaria borealis* (Levinsen), Vema 16-48, monosiphonic fragment. b, *Grammaria magellanica* Allman, Vema 15-99, fragment of branch. a, × 70; b, 40.

G. magellanica has originally been described from the south-western Atlantic near the Falkland Islands, 51°05'S, 65°39'W, 70 fms (= 128 m) (Allman, 1888, type locality). Additional records are all from the south-western Atlantic: Port Stanley, Falkland Islands (Hartlaub, 1905); Port William, Falkland Islands (Jäderholm, 1905); Burdwood Bank, 54°25'S, 57°32'W, 56 fms (= 102 m) (Ritchie, 1907); south Patagonia, Estrecho de le Maire, 100 m (Jäderholm, 1926, the original reference gives "Strait de la mère"), and between the Falkland Islands and Tierra del Fuego, 136-138 m (Naumov & Stepan'yants, 1962). The present records are all from the same area, viz., the shelf south-east of Peninsula Valdés, Argentina (Vema 17-88), the shelf east of Golfo de San Jorge, Argentina (Vema 18-14), from the south-eastern Atlantic between the Falkland Islands and Tierra del Fuego (Vema 15-99, 15-102, 15-105, and 15-109) and from the Burdwood Bank.

Halisiphonia megalotheca Allman, 1888 (fig. 17a)

Halisiphonia megalotheca Allman, 1888: 31, pl. 16 figs. 1, 1a; Stechow, 1925: 452.
Lafoea megalotheca, Billard, 1910: 5.

Material. — Vema 14-29, 41°03'S, 07°49'E, 30.3.1958, SBT, 4961 m. Five hydrothecae and one young gonotheca rise from a stolon creeping on a Hexactinellid.

Description. — The colony consists of a fine, tubular hydrorhiza, creeping along a bundle of Hexactinellid spicules. The hydrothecae rise from distance to distance from that hydrorhiza and are supported by a smooth pedicel, of the same length as or slightly longer than the hydrotheca. The pedicels widen almost imperceptibly into the hydrotheca; the basal portion of the hydrotheca is very slightly swollen and at the margin of theca and pedicel with a ring of slightly thickened periderm. The hydrothecae widen very slightly and gradually towards the aperture, that is smooth and almost imperceptibly everted (fig. 17a). Some hydrothecae are renovated and such thecae are scarcely everted. Remnants of the hydranths are present; they are attached to the basal part of the hydrotheca by means of a fine lamella that may create the impression of a diaphragm. There are no puncta. The periderm of the hydrotheca thins out very gradually towards the hydrothecal margin; the apical portion of the theca collapses very easily.

There is one spatulate, strongly laterally compressed body that might represent a young gonotheca (fig. 17a). During preparation it became slightly distorted; it opens, however, by means of a fold along the extreme apical border.

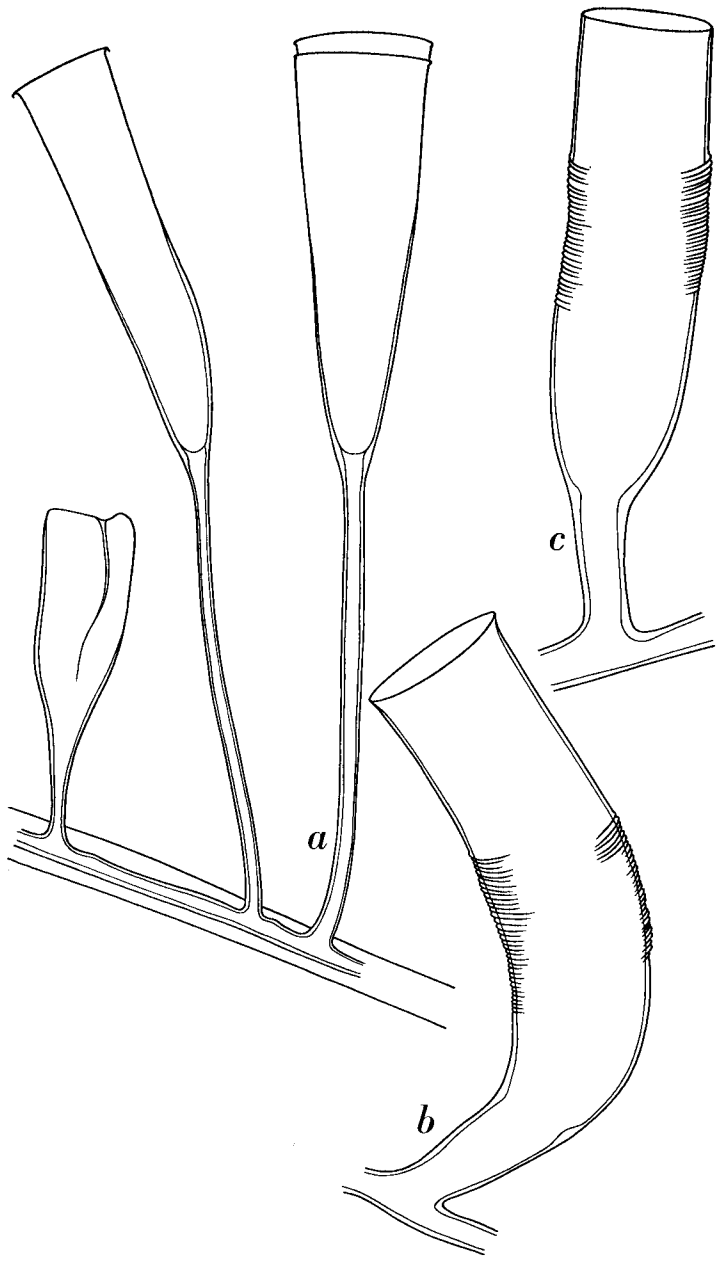

Fig. 17. a, *Halisiphonia megalotheca* Allman, Vema 14-29, fragment of colony with young gonotheca. b, c, *Hebella striata* Allman, Vema 15-107, two hydrothecae.
a, × 25; b, c, × 70.

Measurements (in microns). —

	S. of Australia (Allman, 1888, fide Vervoort, 1966)	S. Indian Ocean (Stechow, 1925)	S. Atlantic Vema 14-29
Pedicel, length	1,300-2,010	740-1,200	1,320-2,600
diameter	160-170	65-800	120-160
Hydrotheca, total length	2,100-2,600	1,000-1,360	1,900-2,000
diameter at "diaphragm"	140-160	80-130	160-200
diameter at aperture	640-660	200-330	480-650
Gonotheca, total length	2,200		1,350
total width	1.160		1,040
thickness at base	610		—

Remarks. — This species was originally described by Allman (1888) from south of Australia, 42°42'S, 134°10'E, depth 2600 fms (3753 m). Allman's type, still in the British Museum (Natural History) was redescribed by Billard (1910) and Vervoort (1966). Additional specimens were recorded by Stechow (1925) from east of St. Paul, southern Indian Ocean, 38°40'S, 77°38.6'E, 672 m depth. The present material agrees well with the Challenger material, with which it also agrees in measurements. Stechow's material seems to have been much smaller. Stechow (1925: 452) states that the measurements of his material agree well with the measurements of Allman's type as given by Billard. Billard must have made a mistake when calculating the size of the specimens; Allman (1888: 31), though he gives no accurate measurements, refers to the hydrothecae alone as being "one tenth of an inch" (about 0.25 mm), which agrees very closely with the size of the larger hydrotheca of the Challenger specimen (2600 microns).

The Vema specimen originates from the south-eastern Atlantic south-west of Cape of Good Hope, South Africa, 4961 m depth.

Hebella striata Allman, 1888 (fig. 17b, c)

Hebella striata Allman, 1888: 30, pl. 15 figs, 3, 3a; Hartlaub, 1905: 587, fig. K²; Jäderholm, 1905: 19; Ritchie, 1907: 529, pl. 1 fig. 7; Vanhöffen, 1910: 313; Totton, 1930: 156.

Lafoea striata, Jäderholm, 1903: 275.

Material. — Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m. Some isolated hydrothecae on a fragment of *Symplectoscyphus subdichotomus* (Kirchenpauer). No gonothecae.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. A large number of hydrothecae rising from a stolon creeping on *Symplectoscyphus subdichotomus* (Kirchenpauer). No gonothecae.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. Many hydrothecae rising from a

stolon creeping on *Symplectoscyphus subdichotomus* (Kirchenpauer) and *Abietinella operculata* (Jäderholm). No gonothecae.

Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. Several hydrothecae from a stolon creeping on unrecognizable hydroid. No gonothecae.

Vema 16-40, 42°48'S, 63°11'W, 27.5.1960, SBT, 70 m. Some hydrothecae rising from a stolon creeping, together with *Filellum serratum* (Clarke), on *Symplectoscyphus subdichotomus* (Kirchenpauer). No gonothecae.

Vema 17-24, 53°37.7'S, 69°54.6'W, 29.3.1961, SBT, 42 m. Several hydrothecae rising from a stolon creeping on *Symplectoscyphus subdichotomus* (Kirchenpauer). No gonothecae.

Vema 17-88, 45°11'S, 60°55'W, 11.6.1961, SBT, 110 m. A single hydrotheca with hydranth on *Lafoea fruticosa* (M. Sars).

Description. — Creeping colonies on *Symplectoscyphus subdichotomus* (Kirchenpauer) (preferably) or on other hydroids. The hydrothecae rise singly from a creeping, tubular stolon and are cylindrical or at times curved and corniform. The length of the pedicel is variable; it may reach the length of the hydrotheca but usually it is slightly shorter. It is separated from the hydrotheca by an internal peridermal ring; at that level the hydrotheca begins to widen gradually but distinctly, without showing a swollen basal portion. The remaining hydrothecal wall is cylindrical over the greater part of its length; the aperture is circular and perpendicular to the length axis of the hydrotheca; the margin is very slightly everted. Renovations of the margin are scarce but at times a single renovated hydrotheca may be observed. The periderm of pedicel and hydrotheca is firm; towards the hydrothecal margin it thins out only very gradually; consequently the apical portion of the hydrotheca is firm. The surface of the periderm, over the greater part of the hydrothecal body, shows a pattern of fine, concentric rings, originating from fine, circular grooves in the periderm (fig. 17b, c). The extent of the ringed part on the hydrothecae varies, but usually the apical fourth of the hydrothecal wall is quite smooth; the rings usually extending to the beginning of the pedicel.

The hydranth, which has 12 tentacles, is attached to the interior of the hydrotheca by means of a circular lamella, attached to the ring of periderm. There is no internal septum and no puncta have been observed.

The gonothecae of this species have been described by Hartlaub (1905); they do not occur in the present material.

Measurements (in microns). —

	Vema 15-107	Vema 16-40
Hydrotheca, length ring-aperture	810-960	650-700
diameter at aperture	245-285	190-215
diameter at ring	110-120	80-95
Pedicel, length	270-540	130-335
diameter	65-70	80

Remarks. — This species is easily recognizable from the ringed structure of the hydrotheca. It is, however, very variable in the external appearance of the hydrotheca, the extent of the ringed hydrothecal portion, the length of the pedicel, etc.

The chief area of distribution of this species is the ocean around the extreme southern point of South America. It was originally recorded from Port Famine, Estrecho de Magellanes, 53°38'S, 70°56'W, 10-15 fms (= 18-27 m) (Allman, 1888). Additional records are from Bahía Inutile, Tierra del Fuego (Jäderholm, 1903); Smythe Channel, Long Island, Chile (Hartlaub, 1905); Stanley Harbour, Falkland Islands (Hartlaub, 1905); S.W. of the Falkland Islands, 52°23'S, 63°50'W, 125 fms (= 229 m) (Totton, 1930); Burdwood Bank, 54°25'S, 57°32'W, 56 fms (= 102 m) (Ritchie, 1907), and Burdwood Bank, 137-150 m (Jäderholm, 1905). The species has also been recorded from Observatory Bay, Kerguelen (Vanhöffen, 1910) and from off Oates Land, Antarctica, 69°43'S, 163°24'E, 180-200 fms (329-366 m) (Totton, 1930). The majority of the present material is from the south-western Atlantic between the Falkland Islands and Tierra del Fuego (Vema 15-99; 15-107; 15-108) and the Falkland Islands and Isla de los Estados (15-109); there is also material from the Estrecho de Magellanes (Vema 17-24) and from the shelf south-east of Peninsula Valdés, Argentina (Vema 16-40 and 17-88).

Hebella spec. (fig. 18)

Material. — Vema 17 RD 18, 44°14'N, 59°03.5'W, 12.8.1961, rock dredge, 183-192 m. Some hydrothecae rising from stolon creeping, with *Lafoea fruticosa* (M. Sars), on the stem of a *Sertularia*. Hydranths well preserved; no gonothecae.

Description. — The hydrothecae arise separately from a smooth, tubuliform hydrorhiza creeping on a *Sertularia* stem. The pedicels are short though invariably present, one third to one half the length of the hydrotheca and with a varying number of spiral twists; no smooth or ringed pedicels have been observed. The hydrothecae are nearly cylindrical bodies; the basal part of the hydrotheca is rounded but not or scarcely inflated (fig. 17). The boundary between hydrotheca and pedicel is marked by a slight thickening of the periderm; a thin diaphragma below that peridermal ring is visible in all hydrothecae. The hydrothecal aperture is nearly circular, usually oblique; the margin is very slightly everted and renovated once in many hydrothecae. The periderm of pedicel and hydrotheca is firm; along the hydrothecal walls it gradually thins out towards the hydrothecal aperture.

The hydranths have about 16 tentacles and are attached to the interior of the hydrotheca at the ring-shaped peridermal thickening.

The gonosome is not present.

Measurements (in microns). —

	Vema 17 RD 18
Hydrotheca, total length	600-660
diameter at aperture	230-245
diameter at diaphragm	67-95
Pedicel, total length	175-270
diameter	80-95

Remarks. — The material of this species is too scanty to afford specific identification, which is also hampered by the absence of the gonosome. I believe this species to be different from *Hebella scandens* (Bale, 1888) or *Hebella calcarata* (L. Agassiz, 1862); these two species might turn out to be identical. In the Vema specimen the hydrothecae are much larger than in either *H. scandens* or *H. calcarata* and the general shape of the hydrothecae is different. It approaches both *Hebella cylindrata* Marktanner-

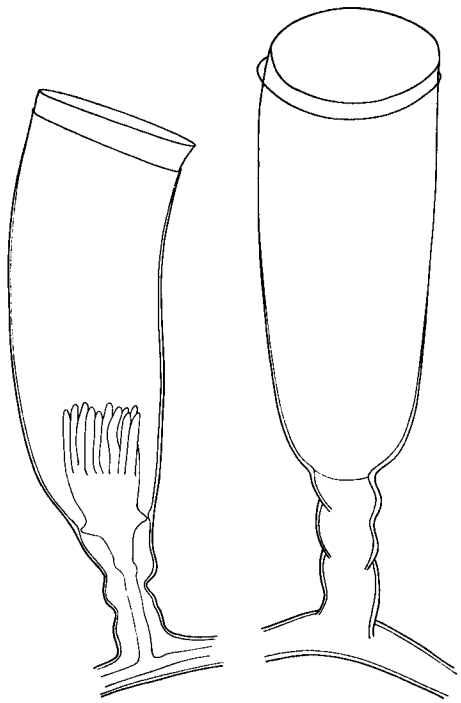

Fig. 18. *Hebella* spec., Vema 17 RD 18, two hydrothecae from creeping colony. × 90.

Turneretscher, 1890, and *Hebella cylindrica* (Von Lendenfeld, 1885) very closely. The hydrothecae are different, nevertheless, from those of Atlantide specimens of *H. cylindrata* (Vervoort, 1959: 241, fig. 15).

The Vema specimen originates from the north-western Atlantic east of Nova Scotia.

Lafoea fruticosa (M. Sars, 1851) (figs. 19-21)

Campanularia fruticosa M. Sars, 1851: 138.

Lafoea fruticosa, G. O. Sars, 1874: 114, pl. 4 figs. 16-18; Broch, 1908: 35, fig. 4; Broch, 1910: 158, 208, fig. 19; Broch, 1918: 12; Stechow, 1925: 456, fig. 24B; Totton, 1930: 157, fig. 13; Naumov, 1960: 275, fig. 164; Naumov & Stepan'yants, 1962: 76; Millard, 1964: 13, fig. 3; Vervoort, 1966: 126, fig. 29; Millard, 1967: 175, fig. 2 C.

Campanularia gracillima Alder, 1856: 361, pl. 14 figs. 5, 6.

Lafoea gracillima, G. O. Sars, 1874: 115, pl. 4 figs. 19-21; Jäderholm, 1903: 273; Hartlaub, 1904: 6; Hartlaub, 1905: 594, fig. P^2; Jäderholm, 1905: 21, pl. 9 figs. 2, 3; Ritchie, 1907: 531; Broch, 1908: 37, fig. 5; Broch, 1910: 156, 208, figs. 17, 18; Vanhöffen, 1910: 312; Billard, 1914: 10; Broch, 1918, 9; Stechow, 1925: 457, fig. 24C; Totton, 1930: 158, fig. 15; Ralph, 1958: 310, fig. 1 y, 2 a-c; Blanco, 1967: 246, pl. 1 figs. 1-4.

Lafoea capillaris G. O. Sars, 1874: 115, pl. 4 figs. 22-24.

Calycella obliqua Hincks, 1847a: 149, pl. 6 figs. 4, 5.

Toichopoma obliquum, Levinsen, 1893: 176, 178; Broch, 1910: 159, 210, fig. 20.

Localities. — Vema 14-14, 52°23'S, 65°35'W, 19.2.1958, SBT, 75 m. One 15 mm long fragment of a colony, slightly branched. No coppiniae.

Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m. Several fragments, varying in height from 5 to 15 mm. No coppiniae.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. Two polysiphonic fragments, 20 and 8 mm high. No coppiniae.

Vema 16-48, 60°10'N, 47°08'W, 21.8.1960, SBT, 300 m. A fragment of branched colony, 15 mm high. No coppiniae.

Vema 16-52, 55°37'N, 56°08'W, 29.8.1960, SBT, 2078 m. Two small colonies, 8 and 10 mm high, on a small stone. No coppiniae.

Vema 16-62, 51°01'N, 57°10'W, 5.9.1960, SBT, 57 m. Some isolated hydrothecae rising from a stolon creeping on *Abietinaria abietina* (L.), with *Filellum serpens* (Hassall), *Campanularia groenlandica* (Levinsen) and other hydroids.

Vema 17-20, 53°21'S, 70°36'W, 29.3.1961, SBT, 247 m. One slightly branched, 12 mm high fragment. No coppiniae.

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. One 20 mm high colony and several smaller fragments. No coppiniae.

Vema 17-78, 42°28'S, 58°31'W, 24.5.1961, SBT, 227-229 m. A large number of 20 to 50 mm high, polysiphonic colonies. No coppiniae.

Vema 17-88, 45°11'S, 60°55'W, 11.6.1961, SBT, 110 m. Several 10 to 20 mm high, mono- and polysiphonic fragments, without coppinia.

Vema 17 RD 18, 44°14'N, 59°03.5'W, 12.8.1961, rock dredge, 183-192 m. Small colonies, 5 to 10 mm high, growing, with *Hebella* spec., on *Sertularia* spec. No coppiniae.

Vema 17-119, 54°27'N, 54°08'W, 10.9.1961, SBT, 218 m. A small, monosiphonic colony on *Halecium muricatum* (Ell. et Sol). No coppiniae.

Vema 18-14, 47°13'S, 61°30'W, 17.2.1962, SBT, 132-130 m. A beautiful, branched, polysiphonic colony of 30 mm height. No coppiniae.

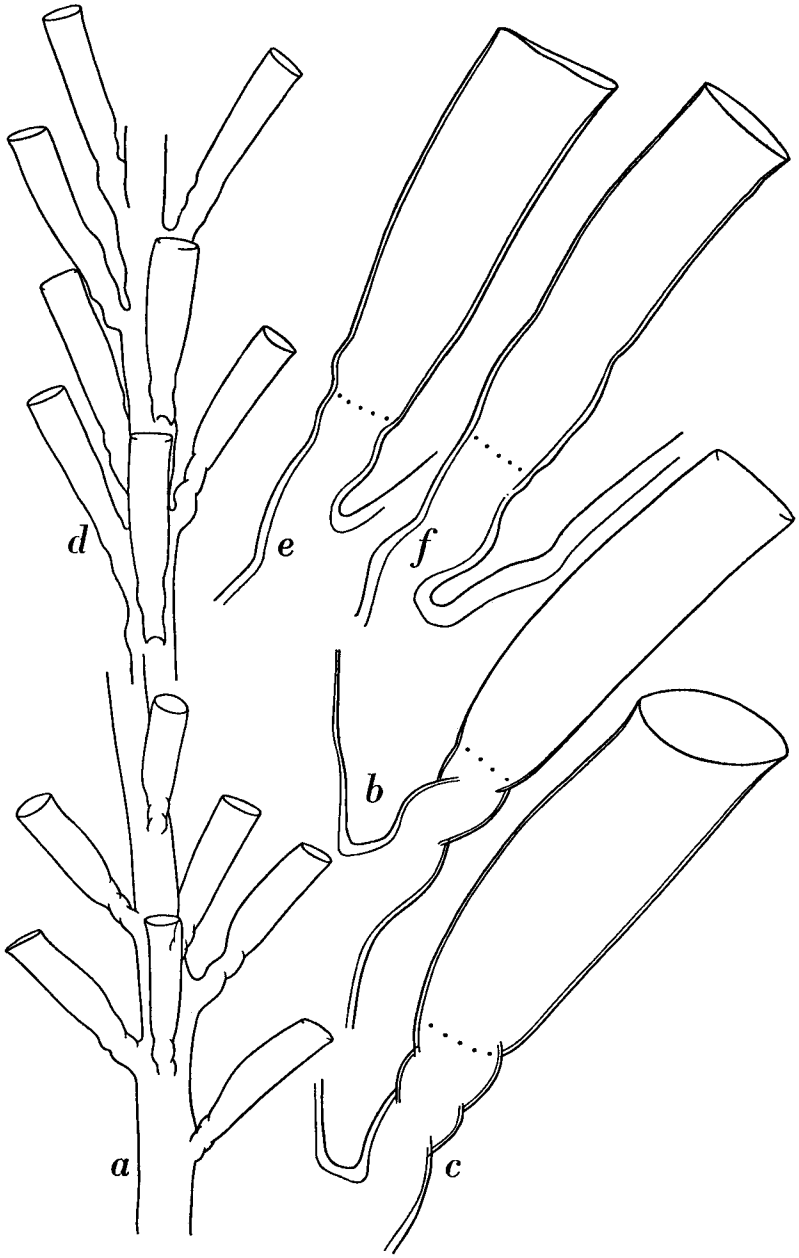

Fig. 19. *Lafoea fruticosa* (M. Sars). a, Vema 14-14, part of monosiphonic branch; b, c, Vema 15-107, two hydrothecae; d-f, Vema 15-99; d, part of monosiphonic branch; e, f, two hydrothecae. a, d, × 40; b, c, e, f, × 120.

Description. — The range of variability exhibited by the present material is considerable. I have thought it wise to describe briefly the more characteristic colonies of the present material, comprising both North- and South Atlantic colonies. These descriptions are presented below in the sequence of the station numbering given above.

Vema 14-14 (fig. 19a). The colony is rhizocaulomic, with an irregularly branched, polysiphonic main stem, basally about 400 microns thick. The terminal portions of branches and hydrocaulus are monosiphonic and 130-140 microns thick. The hydrothecae are very irregularly arranged along the axis and are fairly closely packed, at times assuming a pseudo-verticillate arrangement. The pedicels leave the axis at an angle of about 60°; they are composed of 1 of 2 loose spirally twisted whorls, gradually widening into the hydrotheca. These hydrothecae are tubiform, with the abcauline wall nearly perfectly straight and the adcauline wall slightly convex in its basal third. The aperture of the hydrotheca is circular and slightly tilted in adcauline direction; the margin is practically ineverted. No renovations have been observed.

Measurements (in microns). —

	Vema 14-14
Hydrotheca, length puncta-aperture	375-405
diameter at aperture	120-125
maximal diameter	125-130
Pedicel, total length	160-175

Vema 15-99 (fig. 19d-f). The fragments consist of a rhizocaulomic part of a larger colony, polysiphonic at the base, monosiphonic and fairly thick (130-160 microns) at the end of branches and stem. The hydrothecae are tightly packed along all sides of the axis, sometimes with pseudo-verticillate arrangement. The pedicels leave the axis at a sharp angle (about 30°) and consist of 1 or 2 indistinct twists, or an indistinctly undulated pedicel is present. The hydrothecae are tubiform or slightly conical and remarkable by the fact that the undulations or coils of the pedicel continue for some distance on the hydrotheca, gradually fading away. This is particularly visible in hydrothecae that are slightly conical; such thecae have a slightly convex abcauline margin and a slightly concave adcauline margin. Hydrothecae of the type described from Vema 14-14, however, are also present and dominate in the older parts of the colony. The hydrothecal aperture is circular and perpendicular to the length axis or slightly tilted in adcauline direction. Renovations are only rarely met with and are restricted to a single renovation of the older hydrothecae.

Measurements (in microns). —

	Vema 15-99
Hydrotheca, length puncta-aperture	550-580
diameter at aperture	120-135
Pedicel, total length	110-245

Vema 15-107 (fig. 19b, c). The polysiphonic fragments structurally resemble those from Vema 14-14, but with differences in the shape of the hydrothecae. These are larger and have the adcauline margin distinctly convex; the abcauline margin is almost straight. The aperture of the hydrothecae is circular and slightly but distinctly everted; in the majority of the hydrothecae it is distinctly tilted in adcauline direction; in a smaller number it is perpendicular to the length axis. Renovations are scarce, but occasionally one of the older hydrothecae shows a single renovation. The pedicels, compared with those from Vema 14-14, are longer and composed of 2 to 3 distinct, spirally twisted whorls.

Measurements (in microns). —

	Vema 15-107
Hydrotheca, length puncta-aperture	420-500
diameter at aperture	160-175
diameter in basal third	145-150
Pedicel, total length	225-285

Vema 16-48 (fig. 20a, b). The fragment is irregularly branched, with basally a polysiphonic axis and monosiphonic ramuli, 120 microns thick. The hydrothecae are widely dispersed; the pedicels leave the axis at an angle of about 45° and have 3 to 5 distinct spirally twisted whorls. The hydrothecae are small and tubular, with the adcauline margin slightly though distinctly convex; the adcauline margin is S-shaped or almost straight. The hydrothecal aperture is circular and exactly perpendicular to the hydrothecal length axis; the margin is not everted. No renovations are observed.

Measurements (in microns). —

	Vema 16-48
Hydrotheca, length puncta-aperture	340-405
diameter at margin	95-105
maximal diameter	110
Pedicel, total length	175-230

Vema 16-52 (fig. 20c, d). The hydrocauli of the small colonies are sparingly branched and only basally they are slightly polysiphonic; for the rest they are monosiphonic and there about 110 microns thick. The hydrothecae are aggregated in groups of 2 to 4 thecae, these groups are widely dispersed. The pedicels leave the hydrocaulus at a very sharp angle (about

Fig. 20. *Lafoea fruticosa* (M. Sars). a, b, Vema 16-48; a, monosiphonic fragment; b, hydrotheca; c, d, Vema 16-52; c, monosiphonic fragment; d, hydrotheca with hydranth. a, c, × 40; b, d, × 120.

30°) and have 1 or 2 very indistinct spirally twisted whorls. The hydrothecae are tubiform, with the basal third of the adcauline wall distinctly convex; the adcauline wall is distinctly S-shaped; the hydrotheca, as a result, is more or less swollen basally, though only to a very moderate degree; the hydrothecae, nevertheless, are distinctly curved. The plane of the circular aperture is distinctly tilted in adcauline direction. Renovations are quite common, usually a single renovation is present, though the number may also be 2 or 3.

Measurements (in microns). —

	Vema 16-52
Hydrotheca, length puncta-aperture, including renovations	500-610
diameter at aperture	150-200
Length of pedicel	135-190

Vema 16-62. This is a young colony with the hydrothecae rising directly from a creeping stolon. The hydrothecae are exactly as in 16-52, but have a longer pedicel, with 3 to 5 spiral twists.

Vema 17-20. This fragment agrees in structure with 15-99.

Vema 17-21 (fig. 21a). These specimens agree with Vema 18-11, but the hydrothecae are larger, with slightly everted margin and usually with a single renovation.

Measurements (in microns). —

	Vema 17-21
Hydrotheca, length puncta-aperture, including renovations	580-650
diameter at aperture	175-200
Pedicel, total length	245-270

Vema 17-78. The structure of the colony and size and shape of the hydrothecae are as in Vema 17-21.

Vema 17-88. These fragments are in agreement with the colony described under Vema 18-14.

Vema 17 RD 18. The colonies agree with Vema 16-48.

Vema 17-119. This fragmentary specimen agrees with Vema 16-48 in the shape and size of the hydrothecae.

Vema 18-14 (fig. 21b, c). This is the best developed colony of the whole lot. The hydrocaulus, basally 700 microns thick and heavily polysiphonic, branches repeatedly and mostly in one plane. The ultimate ramuli are monosiphonic, and 150 microns thick. The hydrothecae are dispersed along hydrocaulus and ramuli, without signs of aggregation or formation of pseudoverticils. The pedicels leave the axis at an angle of about 30° and have 2 or 3 loose, spirally twisted whorls. The hydrothecae are tubiform, with the adcauline wall distinctly convex and the adcauline wall slightly S-shaped. As a result the hydrothecae are slightly swollen basally and there they reach

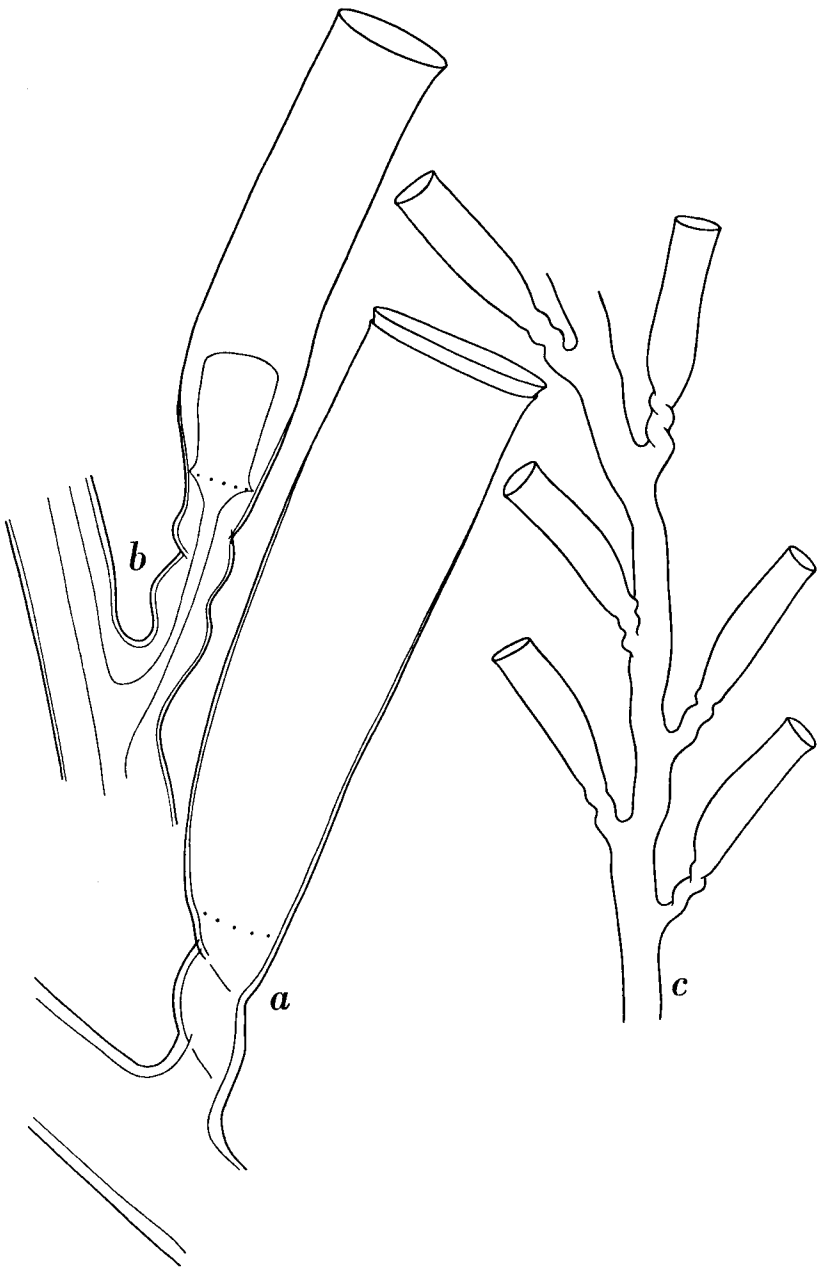

Fig. 21. *Lafoea fruticosa* (M. Sars). a, Vema 17-21, hydrotheca; b, c, Vema 18-14; b, hydrotheca; c, monosiphonic fragment. a, b, × 120; c, × 40.

their greatest diameter. The hydrothecae as a whole are slightly curved, though in some hydrothecae the curvature is slight. The aperture is perpendicular to the length axis or slightly tilted in adcauline direction; the margin is very slightly everted.

Measurements (in microns). —

	Vema 18-14
Hydrotheca, length puncta-margin	480-490
diameter at aperture	120-135
greatest diameter	130-140
Pedicel, total length	215-245

Remarks. — The degree of variability exhibited by the material described above is considerable. Practically all material from one station represents a form different from that of any other station, while in that material the size and shape of the hydrothecae varies considerably. I have followed Naumov (1960: 275) in his assumption to consider *Lafoea fruticosa* (M. Sars), *L. gracillima* (Alder) and *L. capillaris* G. O. Sars as one variable, cosmopolitan species, this in spite of Stechow's statement (Stechow, 1925: 458) that *L. fruticosa* and *L. gracillima* can be readily separated ("Wer beide Species einmal nebeneinander gesehen hat, wird sie nie wieder verwechseln"). Broch, in various publications, has devoted considerable attention to the species of *Lafoea* and though his general conclusion was that *L. dumosa*, *L. fruticosa* and *L. gracillima* (into which species *L. capillaris* had already been included) are enormously variable, he thought they could still be separated by certain characteristics of the hydrothecae. Broch (1903) even divided *L. gracillima* into two formae (forma *typica* and forma *elegantula*). Broch's point of view, which is largely based upon the North Atlantic representatives of *Lafoea* and which has considerably influenced the taxonomy of the North Atlantic species of *Lafoea*, cannot possibly be correct; if it were accepted it would be necessary to introduce a much larger number of taxa to cover all available salient forms, only some of which have been studied by Broch. On the contrary, all available evidence points to the fact that the various species of *Lafoea*, when considered over the whole large area of their geographical distribution, are even more variable than has originally been suggested, a circumstance also promoted by their great vertical distribution.

The distribution of *Lafoea fruticosa* s.l. is cosmopolitan, covering the Arctic, sub-Arctic and Antarctic regions, as well as the deep waters of temperate, sub-tropical and tropical seas. The species has repeatedly been recorded from the seas surrounding the extreme southern point of South America, as the following summary distinctly shows: 37°55'S, 55°01'W

(Blanco, 1967, as *L. gracillima*); east of Port Stanley, Falkland Islands, 150 m (Jäderholm, 1905); west of Falkland Islands, 52°23'S, 63°50'W, 125 fms (= 229 m) (Totton, 1930); between the Falkland Islands and Tierra del Fuego, 136-130 m (Naumov & Stepan'yants, 1962); Burdwood Bank, 137-150 m (Jäderholm, 1905); Burdwood Bank, 54°25'S, 57°32'W, 56 fms (= 102 m) (Ritchie, 1907); Port Famine, Estrecho de Magellanes, 53°37'S, 70°56'W, 9-15 fms (= 16-27 m) (Allman, 1888); Field Anchorage, Estrecho de Magellanes (Hartlaub, 1905), three localities in the Estrecho de Magellanes (Bahia Inútil, 20-30 fms (= 37-55 m); Romanche Bay, 11 fms (= 20 m), and Cape Valentyn, 150 fms (= 272 m) (Jäderholm, 1903, as *L. gracillima*), and the western exit of the Estrecho de Magellanes, 100 m (Naumov & Stepan'yants, 1962).

The Vema material originates from the following localities: north-western Atlantic off the south point of Greenland (Vema 16-48), id., east of Labrador (Vema 16-52 ad 17-119); Strait of Belle Isle, Newfoundland (Vema 16-62), north-western Atlantic east of Nova Scotia (Vema 17 RD 18); continental slope south-east of Bahía Blanca, Argentina (Vema 17-78); shelf south-east of Peninsula Valdés, Argentina (Vema 17-88); Golfo de San Jorge, Argentina (Vema 18-14); Estrecho de Magellanes (Vema 17-20, and 17-21); south-western Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-99 and 15-107), and the shelf north of Peninsula Mitre, Tierra del Fuego, Argentina (Vema 14-14).

Zygophylax convallaria (Allman, 1877) (figs. 22, 23)

Lafoea convallaria Allman, 1877: 12, pl. 9; Clarke, 1879: 243, pl. 4 fig. 23; Fewkes, 1881: 128, 129; Clarke, 1894: 74.
Lictorella convallaria, Fraser, 1943: 91; Fraser, 1944: 229, pl. 47 fig. 213.
Zygophylax convallaria, Totton, 1930: 165.
Lictorella cervicornis Nutting, 1905: 946, pl. 4 fig. 1, pl. 5 figs. 5-9; Fraser, 1918: 134; Fraser, 1937: 123, pl. 26 fig. 141; Fraser, 1938: 48; Fraser, 1938b: 134.
Zygophylax cervicornis, Totton, 1930: 165.

Material. — Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. Many fragments of a large colony, some of the fragments about 50 mm high. One of the stems with a coppinia.

Description. — The best preserved fragment consists of a 50 mm high, polysiphonic stem with sub-opposite side-branches; the basal portion is missing. The hydrocaulus consists of a primary tube, covered by parallel accessory tubules; it carries apophyses alternately pointing left and right and arranged in groups of two in such a fashion that the interval between the two apophyses of one group is much smaller than that between two groups.

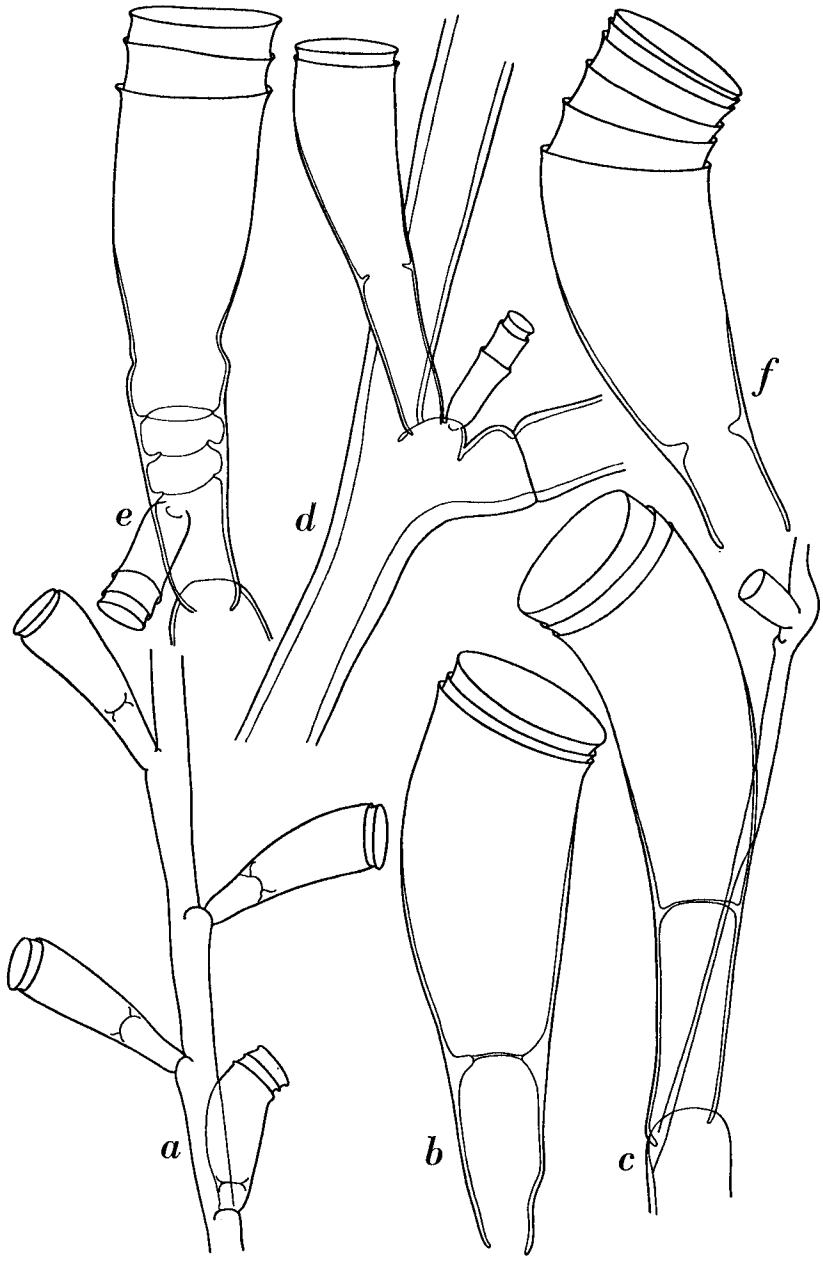

Fig. 22. *Zygophylax convallaria* (Allman), Vema 15-1. a, monosiphonic top part of branch; b, c, two hydrothecae; d, branching with axillary hydro- and nematotheca; e, renovated hydrotheca with nematotheca at the pedicel; f, top part of strongly renovated hydrotheca. a, × 40; b, c, e, f, × 120; d, × 70.

Nodes occur at irregular intervals in the primary tube. Hydrothecae occur exclusively on the apophyses of the primary tube, but not all apophyses also support side-branches. No hydrothecae have been observed on the accessory tubules. The side-branches occur on the majority of the apophyses of the primary tube and are directed left and right in more or less alternate fashion; they are fairly long, placed, with the hydrocaulus, in one plane so that as a result the colony is pinnate. The division of the side-branches into internodes is indistinct and irregular. There are, on each side-branch, two rows of apophyses, arranged in alternate fashion and pointing obliquely forward. The hydrothecae, placed on the apophyses of hydrocaulus and side-branches, all face the frontal part of the colony (fig. 22a).

The hydrothecae, though fairly variable in their shape, are more or less cornucopia-like, with a fairly long pedicel, continuing without distinct demarcation in the hydrotheca. The shape of the hydrotheca can best be seen in fig. 22b-f. The adcauline wall is nearly straight but may have a fairly distinct and abrupt concavity some distance under the margin; the abcauline margin is convex. As a result the majority of the hydrothecae is distinctly curved, with the plane of the circular aperture tilted in adcauline direction. The margin of the hydrotheca is slightly but distinctly everted. There is a very distinct peridermal ring at the base of the hydrotheca, indicating the demarcation between pedicel and theca. In many thecae this ring-shaped diaphragm is funnel-shaped and points upwards. The pedicel has about half the length of the hydrotheca. The shape of the hydrotheca is greatly influenced by the number of renovations, many of which (up to 8) may occur in one theca. These renovations may be restricted to the aperture, or the whole theca may have been renovated, in which case a curiously shaped hydrotheca with renovated margin and diaphragm results (fig. 22e). Some hydrothecae are only very slightly curved and nearly symmetrical.

Nematothecae are present, though their number is small. When present they occur on the apophyses, inserting separately from, but very close to the hydrotheca, on the primary and secondary tubes, and on the internodes (fig. 22c, d). Exceptionally a nematotheca has been observed directly on the pedicel of a hydrotheca (fig. 22e); some apophyses bear two nematothecae. All nematothecae are cup-shaped, with a circular aperture with slightly everted margin. Some nematothecae are renovated.

Gonosome in the shape of a coppinia: an elongated, dense cluster of gonothecae covering the stem for a length of about 15 mm. The gonothecae rise singly from the tubules forming the stem; they are very closely packed and directed exteriorly with the apical portions carrying the orifices. Both male and female gonothecae occur simultaneously in the coppinia and do not

appear to have a special distribution; they also have the same shape. The gonotheca is ovoid, very slightly laterally compressed, longer than wide. The apical part is produced into a curiously curved, anchor-shaped portion as the two orifices present in that apical part are each placed at the end of a downward curved, short funnel (fig. 23a). In addition some of the gonothecae have a third opening in the communal portion of the two funnels, sometimes also provided with a short, curved neck (fig. 23b). The female gonothecae contain several small eggs; the male gonothecae have a cluster of developing gonocytes. Occasionally the tubules carrying the gonothecae elongate, penetrate between the gonothecae and project beyond the surface of the gonothecae for some distance, at times lying on or curving over the gonothecae, forming more or less "protecting" nematothecae or tubules. The occurrence of such protecting tubules is very local and developed only to a moderate degree.

Measurements (in microns). —

	Vema 15-1
Hydrocaulus, basal diameter	340
Primary tube, diameter	135
Hydrotheca, length diaphragma-aperture, including renovations	375-470
diameter at aperture	160-190
Pedicel, length	200-245
Nematotheca, length	80-135
diameter at aperture	40-55
Gonotheca, length	715-745
greatest diameter	460
smallest diameter	310

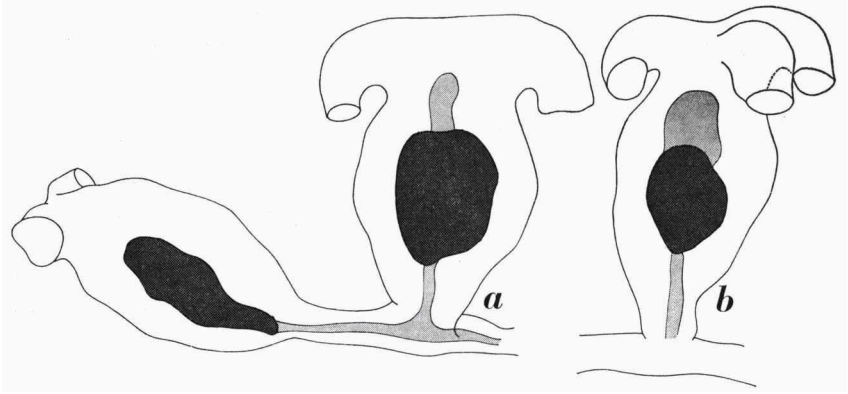

Fig. 23. *Zygophyllax convallaria* (Allman), Vema 15-1. a, two isolated gonothecae with a double aperture; b, gonotheca with triple aperture. a, b, × 55.

Remarks. — I have provisionally followed Fraser's (1944: 229) suggestion to synonymize *Lafoea convallaria* Allman, 18777 and *Lictorella cervicornis* Nutting, 1905. Unfortunately I have no Pacific material of the latter for comparison. The Vema specimen differs from Allman's original account (Allman, 1877) by the shorter pedicels; in Allman's colony, according to both description and figure, they must have been as long as the hydrotheca, measured from diaphragm to aperture. Allman did not mention the nematothecae, which does not mean that necessarily they have also been absent, as in the present specimen too they are only found after careful examination of the colony.

Fraser's (1944: 229) description of *Lictorella convallaria* is entirely based on Pacific specimens of *Lictorella cervicornis*; here a nematotheca seems to be almost invariably present on the apophyses supporting hydrothecae and side-branches.

I am not entirely convinced about the correctness of Fraser's move to unite both species, as there are considerable differences in the shape of the coppiniae between Nutting's Pacific specimens of *Lictorella cervicornis* and the present specimens, the first fertile specimen from the Atlantic. Nutting describes and figures the coppiniae in *L. cervicornis* as triangular masses, provided with a dense network of accessory or protective tubules; in fact they differ considerably from the coppinia observed here. *L. cervicornis* seems to have as a rule gonothecae provided with three openings, two at the end of a curved neck, one, without tubule, on the communal portion of both necks. In the Vema specimen gonothecae with three orifices are quite rare. The Pacific and the Atlantic "forms" may however be linked by intermediate specimens.

I have accepted Totton's (1930: 164) definition of the genus *Zygophylax* Quelch (1885: 4), type *Zygophylax profunda* Quelch, 1885: 4, pl. 1 fig. 4, thus including *Lafoea convallaria* Allman, previously included in *Lictorella* Allman (1888: 35).

Z. convallaria was originally described from Florida Reef, 152 fms (= 278 m) (Allman, 1877). Additional records from the tropical western Atlantic are: off Havana, Cuba, 160-177 fms (= 292-326 m) and 25°33'N, 84°21'W, 101 fms (= 185 m) (Clarke, 1879); Barbados, 76 and 94 fms (139 and 172 m); Martinique, 76 fms (= 139 m), and Guadeloupe, 150 fms (= 274 m) (Fewkes, 1881); 13°05'50"N, 59°37'05"W, off Barbados, 94 fms (= 172 m), and 23°09'N, 81°27'30"W, N.E. of Havana, Cuba, 190 fms (= 347 m) (Fraser, 1943).

The following Pacific records are available: between Molokai and Maui, Hawaiian Islands, 138 fms (= 252 m) (Nutting, 1905, as *Lictorella*

cervicornis); 100 miles south of Panama City, 485 fms (= 886 m) (Clarke, 1894); north of Wenman Isl., Galapagos, 120-150 fms (= 219-274 m), and between Charles and Indefatigable Islands, Galapagos, 60 fms (= 110 m) (Fraser, 1938); Sulivan Bay, I. Santiago, Galapagos, 35-40 fms (= 63-73 m), off Daphne Minor Isl., Galapagos, 70-80 fms (= 128-146 m), off Barrington Isl., Galapagos, 73 fms (= 133 m) and north of Hood Isl., Galapagos, 20-40 fms (= 37-73 m); north of Gabriola Isl., north of Snake Isl., Canadian west coast; Kaison Bank, Moresby Isl., Canadian west coast, and Mill Creek, Alaska, at these three localities between 30 and 110 fms (= 55-200 m) (Fraser, 1918: 1937). The Pacific records, with the exception of that by Clarke, 1894, are as *Lictorella cervicornis*.

The present record is from deep water of the sub-tropical Atlantic east of Georgia (Vema 15-1).

Abietinella operculata (Jäderholm, 1903) (fig. 24)

Zygophylax operculata Jäderholm, 1903: 276, pl. 12 figs. 7, 8.
Abietinella operculata, Levinsen, 1913: 294, pl. 4 figs. 21, 22a; Naumov & Stepan'yants, 1962: 78, fig. 4.

Material. — Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m. One 60 mm high colony and some fragments. No gonosome.

Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m. One colony of 50 mm height. No gonosome.

Vema 15-102, 52°53.3'S, 65°35'W, 5.3.1959, 108 m. One fragment of 20 mm length and some smaller fragments. No gonosome.

Vema 15-106, 54°10.2'S, 65°44'W, 6.3.1959, 79 m. Two fragments, 15 and 3 mm length. No gonosome.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. Various fragments of a 40 mm high colony. No gonosome.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. Terminal parts, 10-15 mm long, of a larger colony, covered with *Hebella striata* (Allman) and *Filellum serratum* (Clarke). No gonosome.

Vema 15-110, 54°10'S, 63°20.2'W, 7.3.1959, 284 m. Two colonies of 30 and 40 mm height and a damaged colony; many fragments. No gonosome.

Vema 16-37, 51°52'S, 67°01'W, 16.5.1960, SBT, 101 m. A fragment of 10 mm length No gonosome.

Description (largely based on the specimen from Vema 15-106). — The colonies are pinnate, with a straight, distinct main axis, unbranched in the smaller, branched in the larger specimens. This hydrocaulus is monosiphonic in the majority of the colonies, though in some of the older colonies there are secondary tubes that cover the basal part of the hydrocaulus. There is no division into internodes. Side-branches are given of in sub-alternate fashion by the hydrocaulus or its ramifications; these are borne on distinct stem apophyses. Two stem apophyses, one bearing the left, the other the right

branch, form one group and are separated by a short gap without hydrothecae; from the next group of apophyses they are separated by a much larger gap, bearing two (one right and one left) hydrothecae. The side-branches are very indistinctly and irregularly divided into interodes; usually, at the base of each side-branch, there is a small athecate internode, the septa of which may be very indistinct. The side-branches bear alternately arranged hydrothecae. All hydrothecae are, with the hydrocaulus and side-branches, arranged in one plane (fig. 24a).

The shape of the hydrothecae can best be seen in fig. 24b; they are more or less tubular, with almost straight abcauline wall, showing a small inward

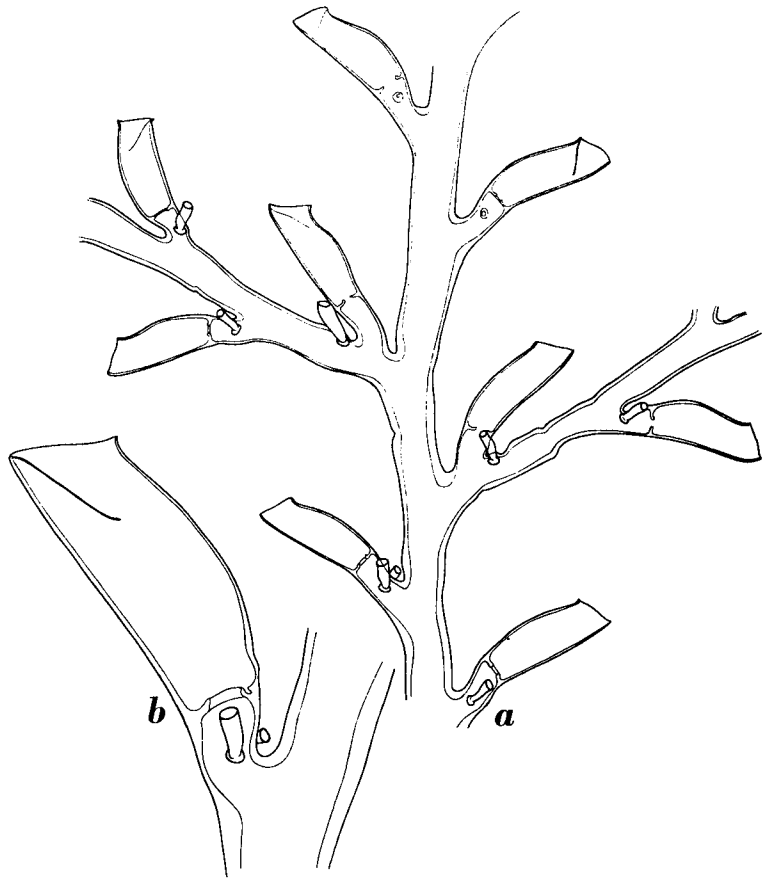

Fig. 24. *Abietinella operculata* (Jäderholm), Vema 15-106. a, monosiphonic fragment; b, hydrotheca with pair of basal nematothecae. a, × 30; b, × 90.

curvature near the aperture, and a distinctly convex, S-shaped adcauline wall. As a result the hydrotheca is slightly swollen basally; the aperture is circular and its plane is very oblique. The majority of the hydrothecae has a circular, flap-shaped operculum, attached to the end of the abcauline wall and projecting into the thecal cavity. The hydrotheca is separated from the pedicel by means of a very distinct and strongly developed ring-shaped diaphragm, the opening in it is slightly funnel-shaped and oval in outline. The hydrothecal pedicel is short and runs smoothly into the body of the hydrotheca. There are two nematothecae on the pedicel, one projecting frontally, the other backward. These nematothecae are cylindrical, with rounded base, and monothalamic; the place of attachment to the pedicel is marked by a circular depression. Hydrothecae also occur on the stem apophyses; such hydrothecae have a slightly longer pedicel; the nematothecae, that are usually slightly longer, occur on the apophyses (on the frontal and backward aspect of the colony), not on the pedicel. No renovations have been observed. The hydranth has a large, abcauline blind-sack and 8-10 tentacles.

The gonosome of this species is unknown.

Measurements (in microns). —

	Patagonia (Jäderholm, 1903)	S. W. Atlantic (Naumov & Stepan'yants, 1962)	Vema 15-106
Hydrotheca, length diaphragm-aperture	440-510	520-620	460-490
diameter at aperture		200-220	160-165
maximal diameter	160-200		
Pedicel, total length		110-150	110-200
Nematotheca, length	150	200-230	100-175
diameter	62-73	42	40-55

Remarks. — This species was originally described in the genus *Zygophylax* Quelch, 1885, by Jäderholm (1903) as *Z. operculata*. It agrees with the species of *Zygophylax* in the shape and structure of the colony, the shape of the hydrotheca, the presence of nematothecae and it has the adcauline blind-sac in common with such species of *Zygophylax* of which the hydrants are sufficiently known. It was placed in the new genus *Abietinella*, of which it must be considered the type, by Levinsen (1913: 294), being at the same time removed from the Lafoeidae to the Sertulariidae. Motivation for doing so was taken by Levinsen from the great general resemblance of the colonies with those of such Sertularian genera as *Abietinaria* Kirchenpauer, 1884, and *Diphasia* L. Agassiz, 1862, the presence of an operculum in *Z. operculata* that agrees completely with that of *Abietinaria*, and the shape of the

opening in the diaphragm of the hydrothecae (pear-shaped in both *Z. operculata* and *Abietinaria*). Levinsen has been followed by Naumov & Stepan'yants (1962) on account of the same arguments. Yet in my opinion there are grave objections against such an action. First of all the gonosome of *Abietinella operculata* is completely unknown; should it be discovered, not only the external appearance of the individual gonothecae but also their structure and their arrangement must be taken into consideration. Secondly, there are no unquestionable Sertularian hydroids with nematothecae. Thirdly, the development of secondary tubes in *Abietinella* is quite different from the increase in diameter of the stem in Sertulariidae, particularly *Abietinaria* and *Diphasia*. The available facts, in my opinion, only justify the conclusion that the families Lafoeidae and Sertulariidae are related, which relationship is particularly marked in such genera of Lafoeidae as *Zygophylax* and *Abietinella* and of Sertulariidae as *Abietinaria* and *Diphasia*.

There is a second species of *Abietinella* originally described as *Zygophylax grandis* Vanhöffen (1910: 315, fig. 33), differing from *A. operculata* only in the larger size of the hydrothecae (total length 640-700 microns, diameter 250 microns) and the fine, transverse striation of the hydrothecae. This species, after careful re-inspection, may prove to be identical with *A. operculata*.

A. operculata was originally recorded from Cape Valentyn, Patagonia, 150 fms (= 274 m) (Jäderholm, 1903, type locality). Additional records are from the Atlantic Ocean between the Falkland Islands and Tierra del Fuego (Naumov & Stepan'yants, 1962, and the records Vema 15-98, 15-102, 15-106, 15-107, 15-108, and 15-110). The material from Vema 14-14, shelf north of Peninsula Mitre, Tierra del Fuego, Argentina, and Vema 16-37, Patagonian shelf east of Cabo Virgenes, Santa Cruz, Argentina, was collected in adjacent regions.

Family CAMPANULARIIDAE

Billardia subrufa (Jäderholm, 1904) (fig. 25d)

Campanularia subrufa Jäderholm, 1904a: 5; Jäderholm, 1905: 15, pl. 6 figs. 4-6; Vanhöffen, 1910: 296, fig. 16 a-c; Nutting, 1915: 42, pl. 5 figs. 2, 3.

Billardia subrufa, Totton, 1930: 151, fig. 8b; Briggs, 1939: 18; Blanco, 1967: 252, pl. 1 figs. 5-8.

Material. — Vema 17-45, 62°33'S, 59°26'W, 23.4.1961, SBT, 600-604 m. Three monosiphonic stems of 25 mm height. No gonothecae.

Description. — The colonies are sympodially built, with a completely monosiphonic stem, composed of internodes. The internodes in the basal

portion of the stems have two apophyses, those of the higher parts of the colony have only one. The apophyses, that are distinctly elongated, alternately point to left or right. They either bear a hydrotheca or another apophysis, thus providing a branch of the original colony. The periderm of the stem, which is generally thin, is slightly thickened on the adcauline side of the apophyses just under the attachment of the hydrotheca. The hydrothecae are large and campanulate, almost symmetrical, with the abcauline basal wall slightly bulging and the adcauline basal wall thickened (fig. 25d). The degree of thickening of the adcauline thecal wall varies considerably and in some hydrothecae it is almost invisible. The periderm of the hydrotheca is exceedingly thin and the thecae consequently collapse very easily. Only one of the hydrothecae in my specimens is in fair condition; this theca has been figured. In this hydrotheca the margin of the aperture is not thickened; the aperture is almost circular. Many of the hydrothecae have a badly preserved hydranth. There is no diaphragm in the hydrotheca and the hydranth does not appear to be attached to the thecal wall but it is in direct continuity with the perisarc of the internode. I could not observe the number of tentacles.

No gonothecae have been observed.

Measurements (in microns). —

	Vema 17-45
Internode with two apophyses, total length	2,000-4,440
Internode with one apophysis, total length	1,000-1,080
Hydrotheca, total length	1,080
diameter	560

Remarks. — In absence of the gonosome I am unable to differentiate between *Billaria subrufa* (Jäderholm, 1904) and *B. intermedia* Blanco (1967b: 117, figs. 1-5), as I have been unable to lift differences between the hydrothecae of the two species from the relevant rescriptions. Blanco's species is based on a single colony bearing, as far as I can make out, one single gonotheca. This — apparently male — gonotheca originates from the apophysis of an internode, which also bears a hydrotheca. The gonotheca is an elongated oval, smooth structure, 1.564 mm long and 0.350 mm thick. In *B. subrufa* the gonothecae are uniformly annulated, the number of thickened rings varying between 12 and 20. They usually have a smooth conical apex and, according to Totton (1930: 152) may vary in length between 1.15 and 3.70 mm, with a diameter between 0.80 and 1.30 mm. The possibility that Blanco's *Billardia intermedia* is based on a young specimen or an aberrant colony can, I think, not altogether be excluded.

B. subrufa, as the following list of references shows, has mainly been

recorded from the Antarctic; though it also penetrates sub-Antarctic regions, particularly along the coasts of South America. Jäderholm (1905) originally recorded the species from Seymour Island, Cape Seymour, Graham Land region; south-west of Snow Hill, Graham Land region; Shag Rocks, west of South Georgia, and north of Joinville Land, Graham Land region, depths varying between 104 and 160 m. Vanhöffen (1910) records the species from Gauss station, 66°02'S, 89°38'E, 385 m depth and from off Gaussberg, Kaiser Wilhelm II Land, Antarctica, 150 m depth. Totton (1930) gives various localities in McMurdo Sound, Antarctica (at the east end of the Great Ice Barrier, 183 m; 77°05'S, 164°17'E, 140 fms (= 256 m) and 77°13'S, 164°18'E, 207 fms (= 379 m) and one locality from south-west of the Falkland Islands, 52°23'S, 63°50'W, 175 fms (= 229 m)). Briggs (1939) records the species from Commonwealth Bay, King George Land, 35-60 fms (= 64-110 m), from 66°32'S, 141°37'E, 157 fms (= 287 m) and 60°08'S, 94°17'E, 120 fms (= 220 m). Blanco's *Billardia intermedia* was recorded from Bahía Esperanza, 56°24'S, 56°59'W, 140 m depth. The present specimens originate from Bransfield Strait, Graham Land region (Vema 17-45).

Campanularia (Campanularia) groenlandica Levinsen, 1893

Campanularia groenlandica Levinsen, 1893: 26, pl. 5 figs. 10-12; Broch, 1910: 187, 226, fig. 41; Broch, 1918: 157.

Campanularia levinseni Shidlovskii, 1902: 130, figs. 23, 24.

Campanularia lineata Nutting, 1899: 744, pl. 62 figs. 3-3b.

Material. — Vema 16-62, 51°01'N, 57°10'W, 5.9.1960, SBT, 57 m. Some isolated hydrothecae on *Abietinaria abietina* (L.), together with *Filellum serpens* (Hassall) and *Lafoea fruticosa* (M. Sars). No gonothecae.

Vema 16-63, 51°09'N, 57°23'W, 6.9.1960, SBT, 91 m. Some multilated hydrothecae on a fragment of *Abietinaria abietina* (L.). No gonothecae.

Remarks. — The material in the Vema collection is in poor shape and sterile; the species can be recognized because of the strongly annulated pedicel, terminating in a globular segment under the hydrotheca, the undulations of the hydrothecal border and the undulated cross section of the hydrotheca just under the aperture. The undulations of the hydrothecal surface continue for some distance downwards on the hydrotheca and may give the impression of fine longitudinal striae.

This species has been synonymized by Naumov (1960: 252) with *Campanularia hincksii* Alder (1856: 360, pl. 13 fig. 9) (= *Campanularia volubilis* var. Hincks, 1853: 180). In that species the hydrothecae are generally polygonal in cross-section, with fine striae on the hydrothecal surface running downward from the incisions of the, distinctly obtuse,

hydrothecal teeth. Though there is general agreement in the shape of the gonosome I hesitate to unite both forms because of distinct differences in the shape of the hydrothecae in the material I have at my disposal. Should the species, after the study of a more copious material than I have available, turn out to be identical, Alder's name must have priority. For the time being I leave both species separate.

Campanularia groenlandica is distinctly an Arctic species, its main area of distribution being in the northern Arctic Sea, penetrating southwards in the Atlantic along the coasts of eastern North America and Norway. Along the American coast it has been recorded as far south as Puget Sound on the west coast (Nutting, 1915) and Passamaquoddy Bay on the east coast (Fraser, 1944). Along the Norwegian coast it goes as far southward as Trondheimsfjord (Broch, 1918). The present localities are from the Strait of Belle Isle, Newfoundland (Vema 16-62 and 16-63).

Campanularia (Campanularia) laevis Hartlaub, 1905 (fig. 25a-c)

Campanularia laevis Hartlaub, 1905: 565, fig. P1.

Material. — Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. One fragment without gonothecae.

Description. — The present material consists of a single 16 mm high colony with four hydrothecae and without gonothecae. There is one primary pedicel of about 14 mm length, of nearly the same diameter throughout its length and apparently detached from the substratum. It has slightly firmer and thicker periderm basally, with the indication of a ringed structure. It runs almost straight to the base of the hydrotheca but it is interrupted some distance below the hydrotheca, where the diameter narrows fairly suddenly, suggesting the presence of a renovation. The pedicel has four distinct rings just under the hydrotheca (fig. 25a). The remaining three pedicels branch from the primary pedicel a small distance from its base; they have some basal and terminal rings. Some of these pedicels also show the occurrence of renovations.

The hydrothecae are very large and campanulate, the basal portion fairly broadly rounded and the rest of the walls nearly parallel. The basal chamber is small and separated from the rest of the hydrotheca by means of a thin, straight diaphragm. The hydrothecal margin has 14 square-topped teeth, separated by rounded incisions, about as deep as the teeth are broad or slightly deeper. The hydrothecae are undulated in cross-section just under the border, the incisions between the hydrothecal teeth being curved outward.

The undulations are visible on the hydrothecal wall as fine, longitudinal striae, running downward and petering out very gradually (fig. 25a-c).

All hydrothecae have badly preserved, small hydranths; the number of tentacles could not be ascertained.

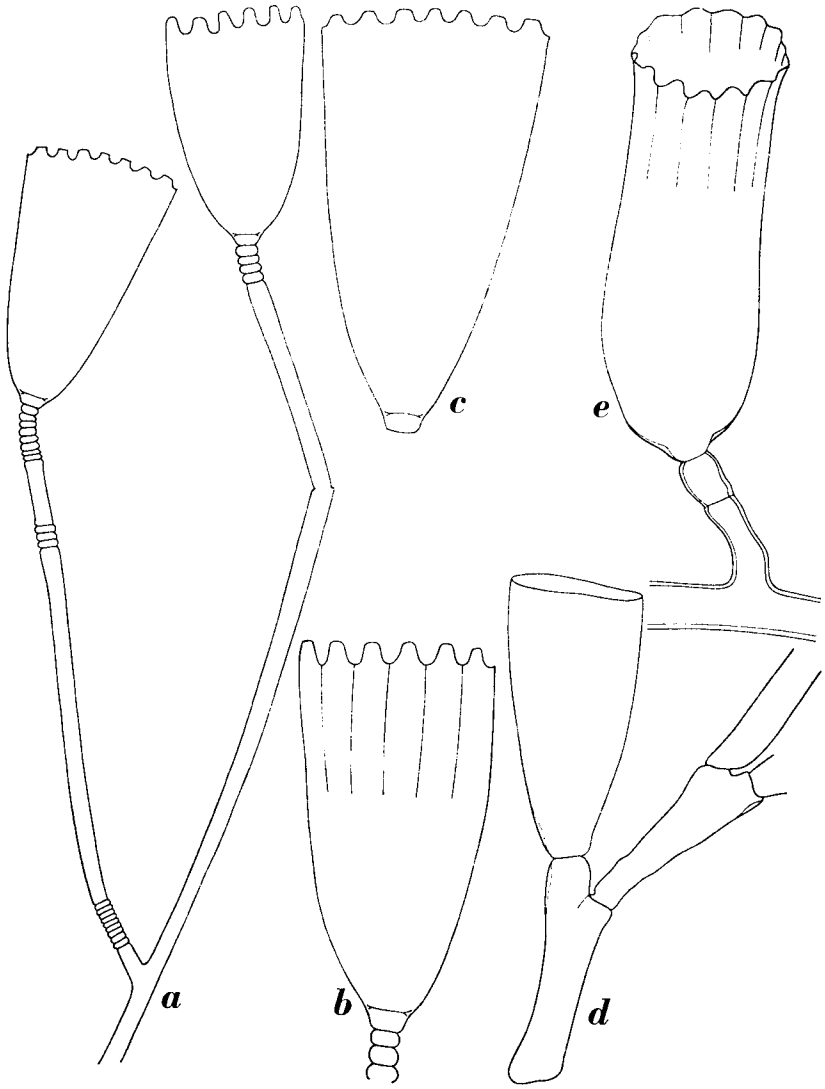

Fig. 25. a-c, *Campanularia (Campanularia) laevis* Hartlaub, Vema 17-21; a, branched pedicel; b, c, two hydrothecae to show variation in hydrothecal margin. d, *Billardia subrufa* (Jäderholm), Vema 17-45, monosiphonic fragment with hydrotheca. e, *Tulpa tulipifera* (Allman), single hydrotheca. a, e, × 20; b-d, × 30.

Measurements (in microns). —

	Vema 17-21
Hydrotheca, total length, including basal chamber	1,640-1,720
maximal diameter	720-800
height basal chamber	48-80
diameter of diaphragm	160-200

Remarks. — This species is somewhat insufficiently described by Hartlaub (1905: 565) and compared by that author with *Campanularia hincksii* Alder, 1856. No measurements are given in Hartlaub's description, but his figure P1 is magnified about 12 ×, which implies that the hydrothecae, the basal chamber included, must have been about 2 mm long, which is much larger than is generally found in *C. hincksii*. The shape of the hydrothecal teeth in both species is identical, but the hydrothecal cross-section in *C. hincksii* is polygonal. Hartlaub's specimens were unbranched, with 10-14 mm high pedicels. The mode of ramification of the present colonies is as in *Laomedea* (*Clytia*) *pelagica* (Van Breemen, 1905) (= *Laomedea gracilis* M. Sars, 1851).

This species was originally recorded from the coast of Chile (Calbuco, about 41°S, 71°W, Hartlaub, 1905). The present record is from the Estrecho de Magellanes (Vema 17-21), where it was obtained at 150 m depth. The depth at which Hartlaub's specimens were obtained is unknown.

Campanularia (Orthopyxis) everta Clarke, 1877 (fig. 26a, b)

Campanularia everta Clarke, 1877: 253, pl. 39 fig. 4; Torrey, 1902: 51, pl. 4 figs. 35-37; Torrey, 1904: 12; Fraser, 1914: 133.

Eucopella everta, Fraser, 1911: 37; Fraser, 1935: 144; Fraser, 1936: 124.

Orthopyxis everta, Nutting, 1915: 67, pl. 16 figs. 6-8; Blanco, 1967: 258, pl. 2 figs. 1, 2, 6, 7, 8.

Campanularia Lennoxensis Jäderholm, 1903: 268, pl. 12 figs. 4, 5.

? *Eucopella crenata* Hartlaub, 1905: 568, fig. Q1.

Material. — Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m. Some hydrothecae rising from a stolon creeping on an unrecognizable hydroid. No gonothecae.

Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. Isolated hydrothecae rising from a stolon creeping on *Symplectoscyphus milneanus* (d'Orbigny). No gonothecae.

Description. — The pedicels spring from a thin, irregularly wrinkled hydrorhiza, creeping on other hydroids and of the same diameter as those pedicels. They are slightly longer than the hydrotheca, irregularly wrinkled, with the indication of rings basally and with one distinct, globular, slightly compressed segment under the basal chamber of the hydrotheca. The hydrotheca is cylindrical, with almost parallel walls, broadly rounded basally and with a distinctly set off, rounded basal chamber, separated from the rest of the theca by a thick diaphragm. The hydrothecal margin is regularly

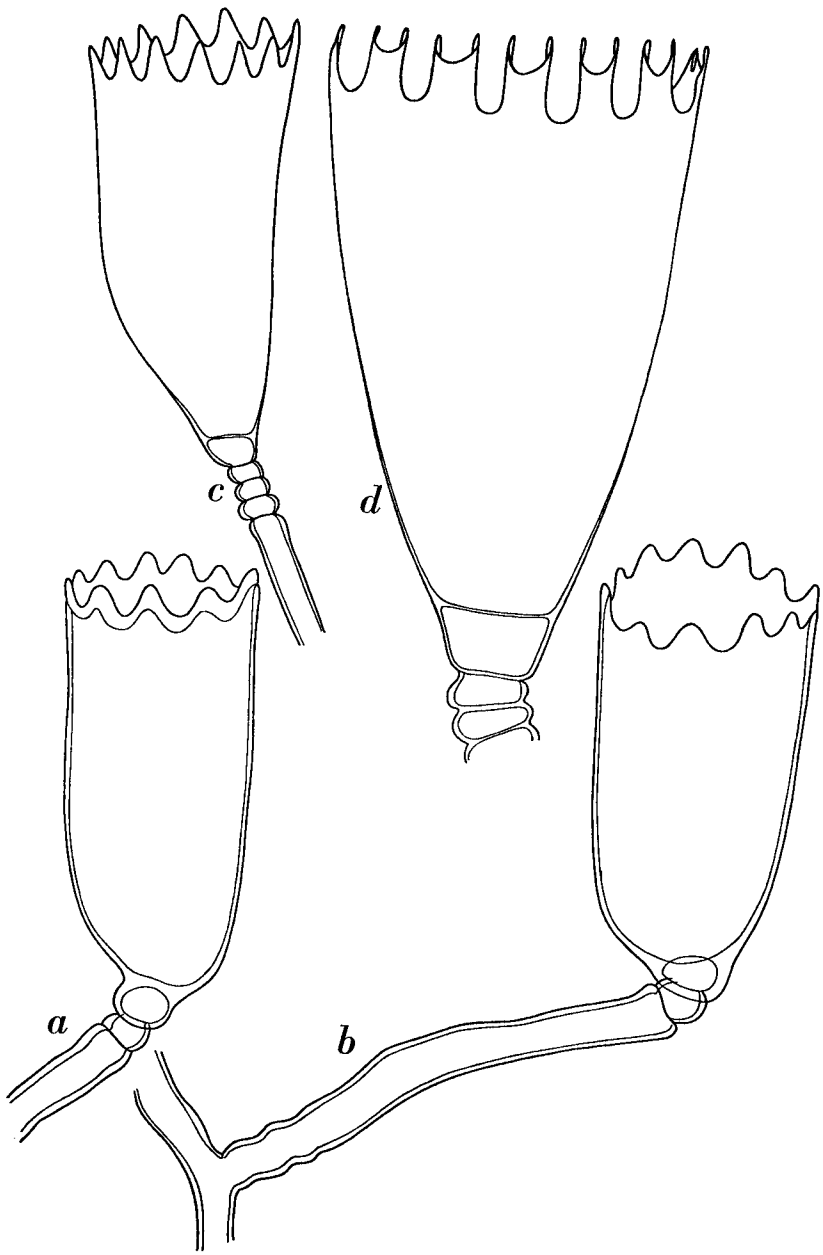

Fig. 26. a, b, *Campanularia (Orthopyxis) everta* Clarke, Vema 17-19, two hydrothecae. c, *Laomedea (Clytia) pelagica* (Van Breemen), Vema 17-24, hydrotheca. d, *Laomedea (Obelia) bicuspidata* (Clarke), Vema 14-14, slightly flattened hydrotheca. a, b, × 120; c, × 70; d, × 175.

undulated and produced into 12-14 rounded teeth, separated by rounded incisions (fig. 26a, b). The cross-section of the hydrotheca just under the margin is circular. The periderm on pedicel and hydrotheca is firm but not particularly thick, though it increases in diameter near the base of the hydrotheca. The hydrothecal margin is firm but not thickened. Some of the hydrothecae have the margin renovated (fig. 26a). One of the hydrothecae from Vema 15-99 is completely renovated, the bottom (diaphragm) of the renovated hydrotheca is found in the middle of the older theca; no basal chamber has been renovated.

Measurements (in microns). —

	Vema 17-19
Hydrotheca, total length, including basal chamber	435-500
maximal diameter	200-215
height of basal chamber	40-65
diameter of diaphragm	65-80
Pedicel, total length	540-670
diameter	55-60

Remarks. — The identification of the present specimens, in absence of the gonosome, must remain doubtful. My specimens agree particularly well with the description of *Orthopyxis everta* (Clarke, 1877) by Blanco (1967: 258) and I have, for the time being at least, accepted her identification of the specimens from the Atlantic coast of Argentina (Puerto Madryn), with this mainly East-Pacific species. I have, however, excluded the specimens described by Hickson & Gravely (1907: 24) as *Campanularia everta* (= *Orthopyxis frigida* Stechow (1923a: 104)). I have included Hartlaub's *Eucopella crenata* from southern Tierra del Fuego (Hartlaub, 1905: 568, fig. Q1).

C. everta's main area of distribution is along the Pacific coast of North America, occurring from the Vancouver Island region in the north to the San Diego region in the south (Fraser, 1937). Several localities in the southern Atlantic are also known: west of Puerto Pantalon, southern Tierra del Fuego, 7 fms (= 13 m) (Hartlaub, 1905, as *Eucopella crenata)*; Lennox Island, south of Tierra del Fuego, 10-25 fms (= 18-46 m) (Jäderholm, 1903, as *Campanularia lennoxensis*). Blanco's specimens are from farther north along the Atlantic coast of Argentina (Puerto Madryn, about 43°N, 65°W, Blanco, 1967). The present specimens are from the south-western Atlantic between the Falkland Islands and Tierra del Fuego (Vema 15-99) and from the Estrecho de Magellanes (Vema 17-19).

Tulpa tulipifera (Allman, 1888) (fig. 25e)

Campanularia tulipifera Allman, 1888: 20, pl. 10 figs. 1, 1a, 1b.
Tulpa tulipifera, Stechow, 1921: 254; Ralph, 1957: 843, 844.

Material. — Vema 17 RD 12, 44°19'S, 59°52'W, 13.6.1961, rock dredge, 183-366 m. Five up to 40 mm long fragments of a colony, with many complete hydrothecae. No gonothecae.

Vema 18-12, 47°09'S, 60°38'W, no date (February, 1962), SBT, 424-428 m. A fragment of a hydrocaulus with one collapsed hydrotheca and two hydrothecal remnants. No gonothecae.

Description. — The (broken) stems are monosiphonic and about 0.5 mm thick, covered by firm, 50 microns thick periderm of brownish colour. The pedicels arise irregularly from the stems and are shorter than or as long as the hydrothecae. They are smooth and have firm, 45 microns thick periderm. Some of the pedicels show distinct signs of renovation, as a result of which some of the pedicels have nodes or "joints". There is, however, no indication of rings or spirally structures on the pedicels. The hydrothecae are very large, 3.2 mm long and deeply tumbler-shaped, with a rounded, slightly ventricose base, maximal diameter 1.2 mm (fig. 25e). There is no diaphragm, but a basal chamber is more or less separated off from the rest of the theca by means of a peridermal ring, serving the attachment of the fairly small hydranth. Towards the aperture the hydrotheca narrows very slightly to expand again near the aperture. The hydrothecal margin is undulated, the undulations producing 14 to 16 rounded teeth. The incisions between the teeth are rounded and from their deepest point a fine line runs downwards for about one third the length of the theca. The periderm of the tooth is distinctly thicker than on the rest of the hydrotheca, but only very few thecae have distinct internal hydrothecal bosses as described and figured for *Tulpa diverticulata* by Totton (1930: 145, fig. 5). The hydrothecal cross-section just under the aperture is sinuous. The periderm on the hydrothecae is very thin and the thecae, consequently, collapse very easily. The hydranth has about 24 long, filiform tentacles.

Remarks. — The genus *Tulpa* was originally described by Stechow (1921: 254) for the reception of *Campanularia tulipifera* Allman (1888: 20, pl. 10 figs. 1, 1a, 1b). There are three further species, viz., *Campanularia crenata* Allman (1876: 258, pl. 11 figs. 1, 2 (25.2.1876) = *Campanularia speciosa* Clark, 1877: 214, pl. 9 fig. 11 (2.1.1877)); *Campanularia magnifica* Fraser (1913: 164, pl. 11 figs. 1-3) and *Tulpa diverticulata* Totton (1930: 145, fig. 5). These three further species are all stolonal, *T. tulipifera* being the only species with a distinct stem. Gonothecae are known of *T. crenata, T. magnifica* and *T. diverticulata*; in *T. magnifica* and *T. diverticulata* they are large, flask-shaped and running into a distinct neck, in *T. crenata* they

are described as "obconical", with a flattened top and much smaller than the hydrothecae. The hydrothecae in *T. crenata* are smaller and less elongated than those in *T. magnifica*; the hydrorhiza is ringed.

Ralph (1957: 844) in a discussion of *T. diverticulata*, does not exclude the possibility that this species is only a form of *T. tulipifera*. It seems to me that the differences with the remaining two species, viz., *T. crenata* and *T. magnifica*, are also ill-founded. The ringed structure of the hydrothecal pedicel or the hydrocaulus can scarcely be considered as a very important criterion and the differences in shape of the hydrothecae and gonothecae can be explained as differences in age between the various colonies. We must, nevertheless, await the discovery of more material before a definite judgement can be reached.

The Vema specimens are in good agreement with Allman's description of Challenger specimens, though the number of undulations along the hydrothecal margin is slightly larger. The specimens differ from Totton's description of *Tulpa diverticulata* by the almost complete absence of internal bosses at the hydrothecal margin that, according to Totton's figure 5a, must be distinctly visible in oblique view of the hydrotheca. In my material, as appears quite distinctly at inspection of complete, unmounted specimens under the high power stereo-microscope, the hydrothecal margin is undulated, with the incisions between the teeth curving outwards and the rounded teeth curving inwards.

T. tulipifera was originally obtained off Heard Island, 52°04'S, 71°22'E (type locality) at 150 fms (= 274 m) depth. *T. diverticulata* has exclusively been obtained around New Zealand (Totton, 1930; Ralph, 1957). *T. crenata* (= *C. speciosa*) was originally described from Japan, without further indication of the locality; further specimens were obtained in the Gulf of St. Lawrence and in Hudson Strait, Atlantic coast of Canada (Fraser, 1944). *T. magnifica* has exclusively been found in Newfoundland waters (Fraser, 1944). The present specimens are from the slope of the Patagonian continental shelf, south-east of Peninsula Valdés, Argentina (Vema 17 RD 12) and east of Deseado, Santa Cruz, Argentina (Vema 18-12).

Laomedea (Clytia) pelagica (Van Breemen, 1905) (fig. 26c) [1]

Laomedea gracilis M. Sars, 1851: 138.

Gonothyraea gracilis, Hartlaub, 1905: 583, figs. F², G², H², J²; Blanco, 1967: 265, pl. 1 figs. 9-15.

1) Stechow (1923: 433) has conclusively demonstrated that the gonophores of *Laomedea gracilis* M. Sars (1851: 138; 1857: 160, pl. 2 figs. 1-3, 5) develop into free medusae with four primary tentacles, that unquestionably place this species in *Clytia* Lamouroux,

Campanularia (Clytia) pelagica Van Breemen, 1905: 205, fig. 18.
Laomedea (Phialidium) pelagica, Vervoort, 1959: 313, fig. 55b, c; Vervoort, 1968: 15, fig. 5.

Material. — Vema 17-24, 53°37.7'S, 69°54.6'W, 29.3.1961, SBT, 42 m. Two solitary hydrothecae on *Symplectoscyphus subdichotomus* (Kirchenpauer), together with *Hebella striata* (Allman). No gonothecae.

Description. — The hydrothecae rise from a creeping, fine hydrorhiza by means of a slender pedicel, twice as long as the hydrotheca. There are some rings at the base, near the insertion of the pedicel on the hydrorhiza, and just under the hydrotheca. The hydrotheca is very slender, 810 microns long, with conical walls, gradually widening from the basal chamber onwards. The basal chamber is fairly spacious, separated from the rest of the theca by means of a thin diaphragm. The hydrothecal margin is provided with 12 acute, sharply triangular teeth, separated by rounded incisions (fig. 26c). The hydrothecal cross-section, just under the margin, is sinuous. The periderm on the hydrotheca is exceedingly thin and the hydrothecae, consequently, are collapsible.

Remarks. — Though the identification of this species, in absence of the gonosome, remains questionable, the conformity of the hydrothecae of the present specimen with those of the well known Atlantic species is very striking. I have previously (Vervoort, 1959, 1968) discussed in more detail the extensive distribution of this species in tropical, sub-tropical and temperate parts of the Atlantic. Several localities in South American waters are also known: Mar del Plata, 37°31'S, 57°05'W, 14 m (Blanco, 1967); Puerto Toro, Island Navarino, south of Tierra del Fuego, tibal zone (Hartlaub, 1905), Calbuco, Chile (Hartlaub, 1905) and off the island of Juan Fernandez in the southern Pacific, 30-40 fms (= 55-73 m) (Hartlaub, 1905). The present specimen originates from the Estrecho de Magellanes (Vema 17-24).

Laomedea (Obelia) bicuspidata (Clarke, 1875) (fig. 26d)

Obelia bicuspidata Clarke, 1875: 58, pl. 9 fig. 1.
Laomedea (Obelia) bicuspidata, Vervoort, 1968: 19, fig. 7.
Obelia bidentata Clarke, 1875: 58, pl. 9 fig. 2.
Campanularia (?) spinulosa Bale, 1888: 756, pl. 12 figs. 5-7.
Laomedea spinulosa var. *minor* Leloup, 1935: 26.
Obelia (?) *oxydendata* Stechow, 1914: 131, fig. 7.
Obelia (?) sp. Clarke, 1907: 10, pl. 5 figs. 5-7.

1812 (= *Phialidium* Leuckart, 1856), where its synonymy with *Campanularia pelagica* Van Breemen, 1905, cannot be refuted. M. Sars' statement and accompanying illustration (M. Sars,1857: 160, pl. 2 fig. 4) that the species develops sessile gonophores must be due to a mistake. Stechow's observations seem to have escaped Naumov's attention (Naumov, 1960: 266, note).

Material. — Vema 14-10, 53°14'S, 68°20'W, 8.2.1958, SBT, 17 m. Several 15-20 mm high, polysiphonic colonies without gonothecae and some fragments.

Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m. Three large, 5 cm high polysiphonic colonies without gonothecae.

Remarks. — The structure of the hydrothecae in this species is so characteristic that they can be recognized without difficulty. The hydrothecae are slightly larger than in the Caribbean material described previously (Vervoort, 1968: 19, fig. 7), being 415-445 microns, a further point of difference is the polysiphonic structure of the lower parts of the hydrocaulus. The species is widely distributed along the American east coast, but published records only bring it as far south as the Santos area at the Brazilian coast (Vannucci, 1946). Also I have been unable to trace any reference from Argentina. The present records are from the south-western Atlantic north of Peninsula Mitre, Tierra del Fuego (Vema 14-14) and from the coastal waters of Tierra del Fuego, near Punta de Arenas (Vema 14-10).

Laomedea (Obelia) longicyatha (Allman, 1877)

Obelia longicyatha Allman, 1877: 10, pl. 7 figs. 4, 5.
Laomedea (Obelia) longicyatha, Vervoort, 1968: 21, fig. 8.

Material. — Vema 15-27, 07°45'N, 79°03'W, 13.11.1958, 152-320 m. A monosiphonic fragment of 5 mm height with only a few hydrothecae.

Remarks. — This species, as the preceding, can be recognized at once by the shape of the hydrothecae. Both species agree in the structure of the hydrothecal aperture, though in *L. longicyatha* the hydrothecae are nearly twice as large.

I have previously (Vervoort, 1968: 22) discussed the distribution of this species in the tropical Atlantic, Pacific and Indian Oceans. It seems to be widely distributed in the Caribbean area and is also found in the eastern tropical Pacific. The present record is from the Gulf of Panama (Vema 15-27).

Laomedea (Obelia) longissima (Pallas, 1766) (fig. 27)

Sertularia longissima Pallas, 1766: 119.
Obelia longissima, Billard, 1906: 11; Ritchie, 1907: 528; Hartlaub, 1905: 582, fig. E²; Ralph, 1957: 831, figs. 4j, k, 5a-h; Blanco, 1964: 160, pl. 2 figs. 1-3; Blanco, 1967a: 106, pl. 1 figs. 9, 10.
Laomedea longissima, Vervoort, 1946: 288, fig. 127.

Localities. — Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. A fragment of 15 mm length, bearing some hydrothecae of *Stegopoma fastigiatum* (Alder). No gonothecae.

Vema 17-47, 55°07.2'S, 66°29.3'W, 4.5.1961, SBT, 71 m. A small colony of about 8 mm length with a few hydrothecae. No gonothecae.

Vema 17 RD 18, 44°14'N, 59°03.5'W, 12.8.1961, rock dredge, 183-192 m. Several 3-5 mm high colonies on *Sertularia tenera* G. O. Sars. No gonothecae.

Description. — All colonies are monosiphonic and have the usual sympodial structure. The North Atlantic specimen (Vema 17 RD 18) has fairly slender and long hydrothecae with slightly oblique diaphragm; the hydrothecal border has 10-12 flat-topped teeth, separated by rounded incisions (fig. 27e, f). The hydrothecal cross section is circular. The South Atlantic colonies have smaller hydrothecae; in the specimen from Vema 17-21 the hydrothecae are cup-shaped, the hydrothecal border is almost straight and the diaphragm slightly oblique (fig. 27a, b). The colony from

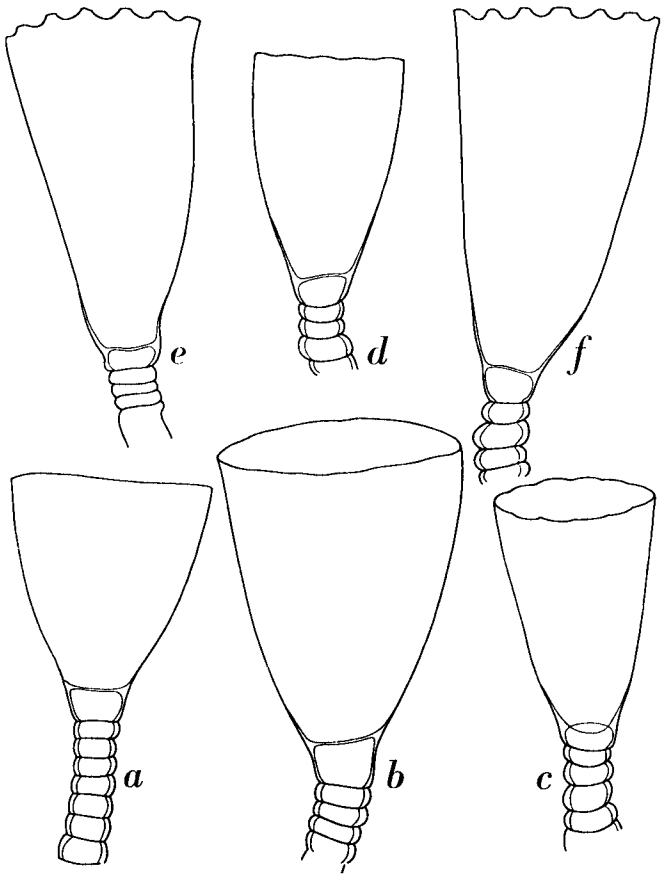

Fig. 27. *Laomedea (Obelia) longissima* (Pallas). a, b, Vema 17-21, two hydrothecae; c, d, Vema 17-47, two hydrothecae; e, f, Vema 17 RD 18, two hydrothecae. a-f, × 70.

Vema 17-47 has small, slender hydrothecae with oblique diaphragm and an indistinctly sinuous hydrothecal border (fig. 27c, d). In both specimens the hydrothecae are circular in cross-section just under the margin.

Measurements (in microns). —

	Vema 17-21	Vema 17-47	Vema 17 RD 18
Hydrotheca, total length	445-600	420-445	660-700
diameter at margin	310-405	255-275	310-325

Remarks. — *Laomedea longissima* is a cosmopolitan species with a particularly wide distribution in the Atlantic. From the south-western Atlantic the following localities are now known: 38°23'S, 57°46'W, 40 m depth (Blanco, 1967a); Puerto Madryn, Argentina (Blanco, 1964); Punta Arenas, Estrecho de Magellanes (Hartlaub, 1905); MacDougall Bay and Scotia Bay, South Orkneys (Ritchie, 1907) and Flandes Bay and Booth-Wandel Island, Graham Land region (Billard, 1906). In addition the species has been recorded from off Calbuco, Chile, by Hartlaub (1905). The present localities are from the Estrecho de Magellanes (Vema 17-21), from the south-western Atlantic south of Peninsula Mitre, Tierra del Fuego, Argentina (Vema 17-47) and from the north-western Atlantic east of Nova Scotia (Vema 17 RD 18).

Family SERTULARIIDAE

Parascyphus repens (Jäderholm, 1904) (fig. 28)

Thyroscyphus repens Jäderholm, 1904: 7; Jäderholm, 1905: 19, pl. 7 figs. 8-10.
Parascyphus repens, Splettstösser, 1929: 95, 126, figs. 89-91, map 2.

Localities. — Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m. A fragment of 10 mm length with a few hydrothecae only. No gonothecae.

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. Several 15-20 mm long, monosiphonic hydrocauli with hydrothecae in fair condition.

Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m. Several 5-8 mm high monosiphonic hydrocauli rising from a creeping stolon. Hydrothecae in bad condition. No gonothecae.

Vema 17-29, 52°43.7'S, 69°53.7'W, 1.4.1961, SBT, 24 m. Two fragments of hydrocauli, 8 and 15 mm long. Hydrothecae in good condition; one (female?) gonotheca.

Vema 18-16, 47°30'S, 62°39'W, 18.2.1962, SBT, 123 m. One 5 mm high, monosiphonic colony on Bryozoa. Hydrothecae in fair condition, no gonothecae.

Vema 18-18, 47°55'S, 63°41'W, 18.2.1962, SBT, 108 m. Several 15 mm high, monosiphonic colonies and some fragment. No gonothecae.

Description. — The colonies have a sympodial structure; the monosiphonic hydrocaulus is divided into regular internodes, marked by constrictions of the thick periderm and 470 to 600 microns long. A septum is not always

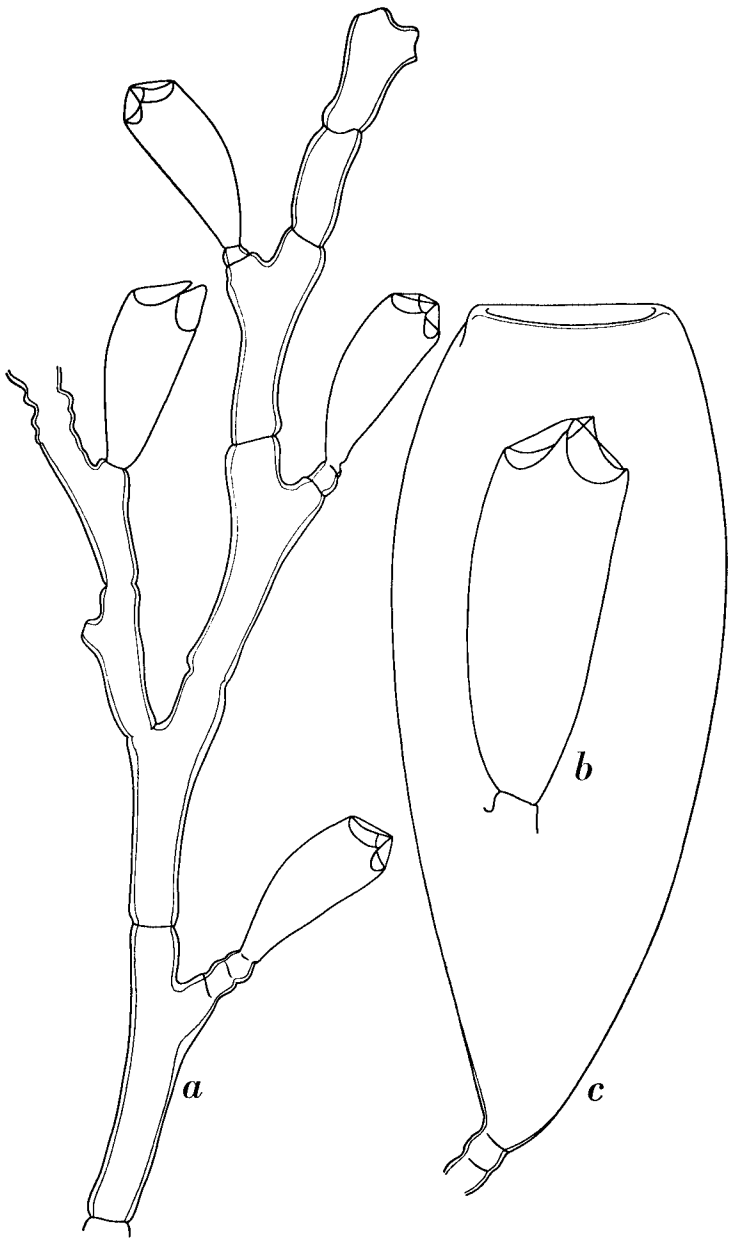

Fig. 28. *Parascyphus repens* (Jäderholm). a, b, Vema 15-99; a, monosiphonic fragment of colony; b, hydrotheca; c, Vema 17-29, gonotheca. a, × 40; b, c, × 70.

distinctly developed. The internodes, slightly below the distal extremity, have a well developed apophysis, supporting the hydrotheca. The apophyses alternately point left and right (fig. 28a). Branching of the colony occurs by the development of a node on an apophysis; this node forms the first of a series of secundary nodes, all supporting hydrothecae. At times the regular sequence of internodes is interrupted by the development of internodes without apophysis. The hydrothecae are more or less tubular, with an almost straight abcauline and a swollen adcauline wall. As a result they appear to be slightly curved (fig. 28b). Originally the hydrothecae originate directly from the apophyses, but as a result of renovation short, ringed pedicels, composed of 1 to 3 rings, are present in many instances. There is no basal diaphragm in the hydrotheca; the margin has four triangular teeth. The lateral teeth are much longer and acutely pointed; the ad- and abcauline teeth are smaller and blunt. The closing apparatus is composed of four hyaline plates, firmly attached to the hydrothecal wall. The periderm of the hydrothecae is very thin; the thecae collaps very easily. Some of the hydrothecae have well preserved hydranths, that have a very distinct abcauline blindsac. The hydranths are very extensible and in many instances project far beyond the thecal aperture.

The colony from Vema 17-29 has one gonotheca. It occurs on a normal apophysis and has a pedicel of 2 rings. It is a large, ovoid structure, gradually narrowing near the base (fig. 28c). At the apex it has a large, circular opening. The contents are badly preserved; there is a central axis with two tissue concentrations that might represent developing ova.

Measurements (in microns). —

	Tierra del Fuego (Splettstösser, 1929)	Vema 17-29
Pedicel, total length	80	65-75
diameter	70	75-80
Hydrotheca, total length	520-600	540-555
maximal diameter	170-210	200-250
diameter at aperture	170-200	175-200
Gonotheca, length		1,485
diameter		620

Remarks. — This rare species was originally described by Jäderholm (1904: 7) from the North Beagle Canal, south of Slogget Bay, Tierra del Fuego, 100 m depth. The Vema records considerably extend the distributional range of this species, which is here also recorded from the shelf east of Deseado, Santa Cruz, Argentina (Vema 18-16 and 18-18), from the Estrecho de Magellanes (Vema 17-21, 17-25, and 17-29) and from the Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-99).

Abietinaria abietina (Linnaeus, 1758)

Sertularia abietina Linnaeus, 1758: 808.
Abietinaria abietina, Vervoort, 1946: 237, figs. 103, 104, 105; Naumov, 1960: 375, figs. 13V, 16D, 19A, 264, pl. 3 fig. 2.

Material. — Vema 16-61, 51°18'N, 56°52'W, 5.9.1960, SBT, 101 m. One fragment of 10 mm length. No gonothecae.
Vema 16-62, 51°01'N, 57°10'W, 5.9.1960, SBT, 57 m. Several fragments of 2 to 5 cm length, associated with: *Coryne* spec., *Calicella syringa* (L.), *Filellum serpens* (Hassall), *Lafoea fruticosa* (M. Sars) and *Campanularia groenlandica* Levinsen. No gonothecae.
Vema 16-63, 51°09'N, 57°23'W, 6.9.1960, SBT, 91 m. One 15 mm high fragment, associated with *Filellum serpens* (Hassall) and *Campanularia groenlandica* Levinsen. No gonothecae.

Remarks. — The material of this well known form in the Vema collection, though recognizable, is scanty. *A. abietina* has a very wide distribution in the northern Atlantic and Pacific Oceans. It is usually replaced by other species under purely Arctic conditions and penetrates far to the south in boreal regions. The present records are all from the Strait of Belle Isle, Newfoundland, where the species is known to occur quite commonly.

Amphisbetia operculata (Linnaeus, 1758)

Sertularia operculata Linnaeus, 1758: 808; Allman, 1888: 61, pl. 30 figs. 1, 1a; Nutting, 1904: 54, pl. 2 figs. 3-5; Hartlaub, 1905: 664, figs. Y^4, Z^4, A^5, B^5, C^5; Jäderholm, 1905: 23; Ralph, 1961: 775, fig. 8 i-k; Blanco, 1963: 166, figs. 1, 2.
Sertularia usneoides Palles, 1766: 132.
Dynamena pulchella d'Orbigny, 1846: 26, pl. 11 figs. 9-11.
Sertularia furcata Trask, 1857: 112, pl. 5.

Material. — Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m. Several fragments, up to 20 mm high, some with gonothecae.
Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. A small, tangled colony and several fragments. No gonothecae.
Vema 15-112, 56°40'S, 67°26'W, 13.3.1959. 134 m. Four fragments of 8 to 10 mm length. No gonothecae.
Vema 16-37, 51°52'S, 67°01'W, 16.5.1960, SBT, 101 m. Three fragments of 10 to 25 mm length. No gonothecae.
Vema 16-40, 42°48'S, 63°11'W, 27.5.1960, SBT, 70 m. Several fragments, 10 to 20 mm length, some with gonothecae.
Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. Many 3 to 6 cm high colonies and a large number of fragments, bearing some gonothecae.
Vema 17-20, 53°21'S, 70°36'W, 29.3.1961, SBT, 247 m. One tangled bunch of 20 mm height and some fragments. No gonothecae.
Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. Two fragments of 15 and 20 mm length. No gonothecae.
Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m. Several small fragments, some with gonothecae.
Vema 17-29, 52°43.7'S, 69°53.7'W, 1.4.1961, SBT, 24 m. Two small stems growing on the base of a colony of *Halecium beanii* (Johnston). No gonothecae.

Vema 17-30, 52°40.2'S, 69°51.5'W, 1.4.1961, SBT, 24 m. Many tangled, about 30 mm high colonies and a large number of fragments, bearing many gonothecae.

Vema 17-32, 52°42.3'S, 69°44.5'W, 1.4.1961, SBT, 48 m. Several fragments of 10-15 mm length.

Vema 18-18, 47°55'S, 63°41'W, 18.2.1962, SBT, 108 m. Several fragments of 20 to 25 mm height. No gonothecae.

Vema 18-23, 52°25'S, 68°11'W, 20.2.1962, SBT, 22 m. Many fragments of 10 to to 20 mm length, some rising from stolons. No gonothecae.

Remarks. — *S. operculata* is abundantly represented in the Vema collection. I have been particularly careful to separate this species from the closely allied *Amphisbetia bispinosa* (Gray, 1843: 294), which has also been recorded from the Atlantic east of South America (Nutting, 1904: 56; 51°34'S, 68°W). I have used the characters of the hydrothecae as recorded by Ralph (1961) to discreminate between the two species. I have also paid special attention to the shape of the gonothecae. All Vema specimens, as far as they bear gonothecae, have large, ovoid gonothecae with a smooth external surface; no lateral spines flanking the gonothecal aperture have been observed.

A. operculata is quite common in the Atlantic east of the southern point of South America, in the Falkland Islands region and at the Burdwood Bank (Nutting, 1904; Hartlaub, 1905; Jäderholm, 1905; Blanco, 1963). The present localities are from the shelf south-east of Peninsula Valdés, Argentina (Vema 16-40), from the shelf east of Deseado, Santa Cruz, Argentina (Vema 18-18), from the shelf east and south-east of Cabo Virgenes, Santa Cruz, Argentina (Vema 16-37 and 18-23), from the Estrecho de Magellanes (Vema 17-19, 17-20, 17-21, 17-25, 17-29, 17-30, and 17-32), from the shelf north of Peninsula Mitre, Tierra del Fuego, Argentina (Vema 14-14), from the south-western Atlantic between the Falkland Islands and Isla de los Estados (Vema 15-109) and from the south-western Atlantic south of Cabo de Hornos (Drake Passage) (Vema 15-112).

Diphasia digitalis (Busk, 1852) (fig. 29)

Sertularia digitalis Busk, 1852: 393.
Diphasia digitalis, Billard, 1925: 209; Vervoort, 1959: 254, fig. 22.
Desmoscyphus longitheca Allman, 1877: 26, pl. 14 figs. 3-6.
Desmoscyphus acanthocarpus Allman, 1888: 73, pl. 35 fig. 2 a-c.

Material. — Vema 14-38, 20°10'S, 56°23.5'E, 7.5.1958, 1421-1750 m. A single 8 mm high stem with some basal hydrorhiza fibres fixed on a small pebble. No gonothecae.

Description. — The colony is composed of a single monosiphonic, unbranched stem. There is one basal articulation in the shape of an oblique joint, separating a basal athecate portion of the stem from the thecate part. The hydrothecae are strictly arranged in pairs; they point laterally and

slightly anteriorly. They can best be described as tubular, with the apical portion curving outwards at about two-thirds their length. On the frontal aspect of the colony the hydrothecae are contiguous with the basal two-thirds of their adcauline hydrothecal wall (fig. 29a); on the back of the colony the thecae are separated by a large portion of the internode (fig. 29b). The basal pair of hydrothecae forms an exception as here the hydrothecae are also separated by the internode on the frontal part of the colony. Each hydrotheca has a distinct thickening of the abcauline hydrothecal wall in the region of the curvature. The hydrothecal aperture has two rounded and fairly indistinct lateral teeth; the roof-shaped operculum is only present on

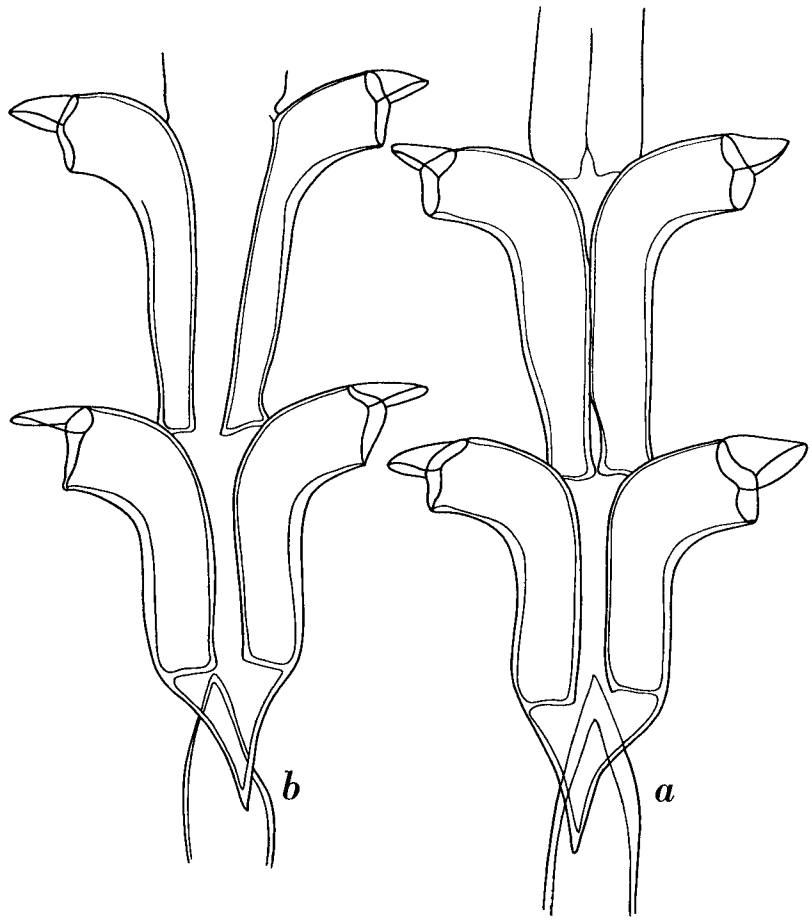

Fig. 29. *Diphasia digitalis* (Busk), Vema 14-38. a, basal part of stem, frontal aspect; b, idem, dorsal aspect. × 70.

the adcauline side and is distinct in all thecae. The hydrothecae of the various pairs approach each other so closely that the base of each theca touches the adcauline wall of the preceding pair in the region of the curvature. There are no carinae on the hydrotheca.

Remarks. — Though the specimen has a certain resemblance to *Diphasia orientalis* Billard (1920: 146, fig. 1d-e) I believe it to be a young specimen of *D. digitalis*. It differs from *D. orientalis* by the fact that the hydrothecae have no longitudinal grooves or carinae and are contiguous on the frontal part of the stem. There is no internal ridge on the abcauline hydrothecal wall, though this does not appear to be a constant feature in *D. orientalis*.

D. digitalis is widely distributed over the tropical Indian and Pacific Oceans, though it has also been found in the tropical Atlantic (Vervoort, 1959). The present locality (Vema 14-38) is from the Indian Ocean east of Madagascar, where it was found at a considerable depth (1431-1750 m).

Diphasia paarmanni Nutting, 1904 (fig. 30a-c)

Diphasia paarmanni Nutting, 1904: 111, pl. 31 fig. 4-6; Fraser, 1943: 92; Fraser, 1944: 245, pl. 51 fig. 229.

Material. — Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. Two colonies of 15 and 20 mm height on a stem of *Cladocarpus sigma* (Allman); one of the colonies with male gonothecae.

Description. — Colonies with a fairly firm stem, rising directly from a thick hydrorhiza fibre attached to *Cladocarpus sigma* (Allman). The hydrocaulus is divided into regular internodes, the septa are poorly visible but each node is marked by distinct constrictions of the thick, yellowish periderm. The hydrothecae of the stem are arranged in pairs basally, but gradually, towards the top part of the colony, they become sub-alternate; always two hydrothecae, forming a pair, are to be found on each internode (fig. 30a). The side-branches originate from the internode directly under a stem hydrotheca; they are basally distinctly constricted. They are divided into internodes by poorly visible, oblique septa; the nodes are also marked by constrictions. Each internode of a side-branch has a single hydrotheca; the hydrothecae of the various side-branches are alternately arranged. The side-branches point left and right and give the colony a slightly rigid appearance; their arrangement, however, is not regular and in many instances they do not alternate.

The shape of the hydrothecae can best be seen from fig. 30b; it is more or less tubular, with an aperture shaped like a scuttle. The abcauline wall is quite smooth and has no internal ridge; the periderm is thin and

slightly thickened near the aperture. The fused part of the adcauline wall is about twice as long as the free part. The operculum consists of a single, rounded flap, attached to the adcauline wall.

One of the colonies has male gonothecae on the frontal side of the colony and attached to the internodes of the side-branches just under a hydrotheca. These gonothecae are comparatively small, pear-shaped structures, gradually narrowing basally and swollen apically. The aperture is placed at the end

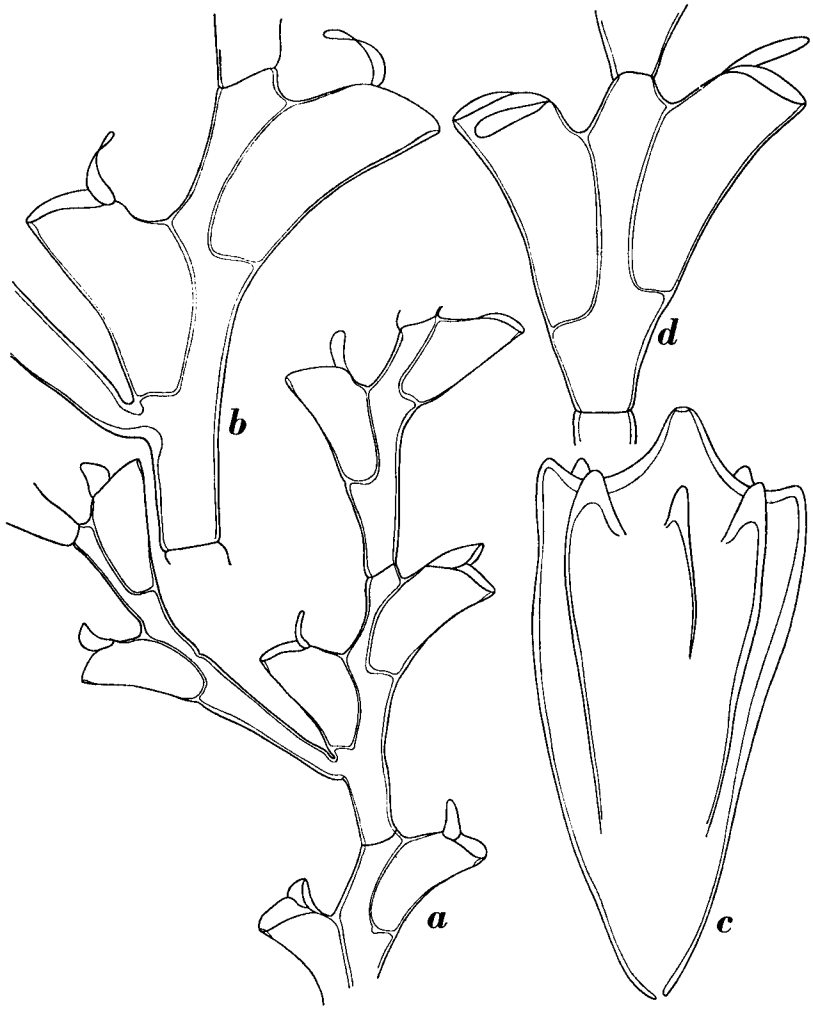

Fig. 30. a-c, *Diphasia paarmanni* Nutting, Vema 15-1. a, fragment of colony; b, stem internode with pair of hydrothecae and branch; c, male gonotheca. d, *Diphasia fallax* (Johnston), Vema 16-52, internode from young colony. a, × 30; b-d, × 55.

of a small cone in the centre of the swollen apical portion; it is surrounded by 8 blunt teeth that are terminations of longitudinal ribs on the body of the gonotheca (fig. 30c).

Measurements (in microns). —

	Vema 15-1
Hydrotheca, length of free part adcauline wall	185-215
length of fused part adcauline wall	325-350
length of abcauline wall	525-565
total depth	565-595
diameter at opening	185-215
Male gonotheca, total length	1,350
maximal diameter	620

Remarks. — This very characteristic species is restricted in its distribution to a very limited area of the western temperate Atlantic, where it was obtained between 250 and 440 fms (457-804) depth: 30°44'N, 79°26'W; 30°47.5'N, 79°49'W; 30°58.5'N, 79°38.5'W, and 30°58'N, 79°34'W (Nutting, 1904; Fraser, 1943; Fraser, 1944; all localities are off Georgia). Also 29°39'N, 79°49'W, off St. Augustine, Florida (Nutting, 1904) and 30°27'N, 79°52'W, off Jacksonville, northern Florida (Fraser, 1943, 1944). The present locality off the east coast of Georgia is in the immediate vicinity of those listed above (Vema 15-1).

Diphasia fallax (Johnston, 1847) (figs. 30d, 31)

Sertularia fallax Johnston, 1847: 73, pl. 11 figs. 2, 5, 6.

Diphasia fallax, Broch, 1918: 108; Kramp, 1932: 49, fig. 21; Fraser, 1944: 242, pl. 50 fig. 227; Vervoort, 1946: 234, fig. 101; Naumov, 1960: 333, figs. 223, 224.

Material. — Vema 16-52, 55°37'N, 56°08'W, 29.8.1960, SBT, 2078 m. Three small, young colonies of 4-8 mm height on the base of *Thuiaria laxa* Allman. No gonothecae.

Vema 17 RD 29, 60°27'N, 48°31'W, 4.9.1961, rock dredge, 366-326 m. One 18 mm high colony on the base of *Aglaophenopsis cornuta* (Verrill). No gonothecae.

Description. — The colony from Vema 17 RD 29 has a fairly thick, monosiphonic stem and regularly arranged, alternate side-branches. The hydrocaulus is divided into short internodes, each bearing a pair of opposite hydrothecae. The nodes are marked by distinct constrictions and the septa are distinctly visible (fig. 31a). The side-branches originate from the internodes just under a hydrotheca; they are not greatly constricted basally. Like the hydrocaulus the side-branches are divided into internodes, but these are much slenderer than those of the stem and bear a pair of sub-opposite hydrothecae.

The hydrothecae resemble those of *D. paarmanni,* but are shorter, with

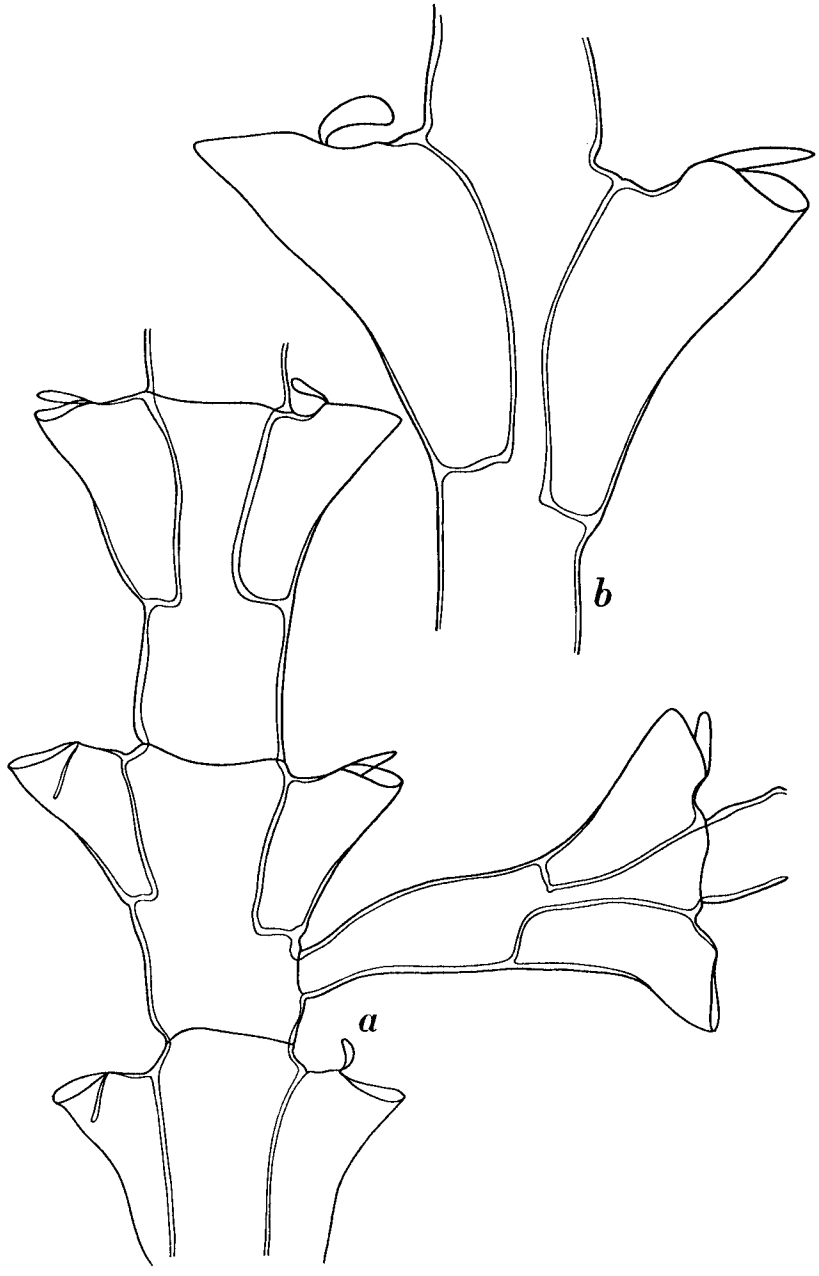

Fig. 31. *Diphasia fallax* (Johnston), Vema 17 RD 29. a, fragment of hydrocaulus with side-branch; b, branch internode with pair of hydrothecae. a, × 40; b, × 70.

the free part of the adcauline wall about one third or one fourth the length of the fused part. The mouth of the hydrotheca is shaped like a scuttle and closed by a single flap, attached to the adcauline wall of the hydrotheca (fig. 31b).

The periderm on stem and side-branches is firm and thick; it thins out very rapidly on the hydrothecae, which as a result are easily damaged. The operculum too is very thin and fragile; in many thecae it is folded inside and visible in the hydrotheca as an inwardly projecting flap.

The colonies from Vema 16-52 are very young, being composed of a hydrocaulus without side-branches and divided into 3 to 8 internodes. Each internode has a pair of sub-opposite hydrothecae, that resemble those of the adult colonies but have the free part of the adcauline wall slightly longer in some cases (fig. 30d). The colonies resemble those of *D. rosacea* (Linnaeus, 1758) but differ in the sub-opposite arrangement of the hydrothecae and the complete absence of grooves or carinae on the abcauline hydrothecal wall.

Measurements (in microns). —

	Vema 17 RD 29
Hydrotheca, length of free part adcauline wall	105-120
length fused part adcauline wall	540-605
length abcauline wall	675-700
total depth	700-725
diameter at opening	215-270

Remarks. — This is a boreo-Atlantic species, the distribution of which has been discussed by Broch (1918), Fraser (1944) and Naumov (1960). The present localities are in the entrance to Davis Strait, off the south point of Greenland (Vema 17 RD 29) and the north-western Atlantic east of Labrador (Vema 16-52).

Sertularella antarctica Hartlaub, 1900 (figs. 32, 33)

Sertularella unilateralis Allman, 1876a: 114; Allman, 1879: 282, pl. 18 figs. 10, 11.
Sertularia unilateralis Allman, 1888: 53.
Sertularia secunda Allman, 1888, pl. 25 fig. 2.
Sertularella Allmani Hartlaub, 1900: 81, pl. 5 figs. 12, 13, pl. 6 figs. 1, 8.
Sertularella antarctica Hartlaub, 1900: 82, pl. 6 figs. 27, 28; Hartlaub, 1905; 650, figs. P^4, Q4; Jäderholm, 1905: 32; Blanco, 1963: 170, figs. 5, 6.
Sertularella allmani Nutting, 1904: 84, pl. 18 figs. 3-6.

Material. — Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m. Many 10-15 mm high monosiphonic colonies rising from a stolon creeping on stem of unrecognizable hydroid. No gonothecae.

Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. Large tufts of tangled, monosiphonic hydrocauli, up to 50 mm high. Some colonies grow on *Symplectoscyphus milneanus* (d'Orbigny). No gonothecae.

Vema 17-20, 53°21'S, 70°36'W, 29.3.1961, SBT, 247 m. Small colonies of about 20 mm height on *Symplectoscyphus milneanus* (d'Orbigny). No gonothecae.

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. Several fragments of about 15 mm height. No gonothecae.

Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m. A fragment of about 20 mm length. No gonothecae.

Vema 17-29, 52°43.7'S, 69°53.7'W, 1.4.1961, SBT, 24 m. A fragment of 25 mm length and a smaller fragment. No gonothecae.

Vema 17-30, 52°40.2'S, 69°51.5'W, 1.4.1961, SBT, 24 m. A fragment of 20 mm length. No gonothecae.

Vema 17-32, 52°42.3'S, 69°44.5'W, 1.4.1961, SBT, 48 m. Several 15-20 mm high fragments without gonothecae.

Challenger Sta. 149, Accessible Bay, Kerguelen, 20 fms (= 37 m). Holotype of *Sertularia secunda* Allman (= *Sertularia unilateralis* Allman), British Museum (Natural History) no. 1888.11.13.101. Several fragments of a larger colony, between 20 and 30 mm height. Many gonothecae are present.

Description of the Vema material. — The colonies are strongly and irregularly branched, forming dense, tangled tufts. The hydrocaulus originates directly from the creeping stolon and is divided into short internodes; it is entirely monosiphonic and has almost the same diameter basally as apically. Each internode from the stem is thecate; the hydrothecae are found on the apical part of each internode; the side-branches originate from a short apophysis directly under the hydrotheca and usually have one basal, athecate internode. The hydrothecae of the stem are alternately arranged in two rows lying in planes that make an acute angle; consequently they all face the frontal part of the colony, moreover, they point obliquely upwards and forwards (fig. 32a). The apophyses and the side-branches are also arranged in the same plane as the hydrothecae; the hydrothecae (and branches) of the primary side-branches face the upper part of the colony. The mode of branching is repeated several times, though in the ultimate parts of the colony the branching may give the impression of being dichotomous. The internodes of the side-branches are slightly shorter, those of the stems slightly longer than the hydrothecae; the septa on the main stem are indistinct, those of the branches are distinct. The basal internode of the stem has a few distinct rings; the remaining internodes of stem and branches are basally slightly wrinkled or have the indication (but no more) of a ring. The hydrothecae are slightly variable in size; the adcauline wall is distinctly swollen and is either quite smooth or distinctly wrinkled, forming two transversal ring-shaped constriction on the hydrothecae (fig. 32b). All transitions between these two extremes are present in a large colony. The adnate part of the adcauline wall is short, being about one third the length of the free part. The abcauline hydrothecal wall is straight or very slightly convex. The basal part of the hydrotheca is slightly but distinctly swollen. The hydrothecal

margin is distinctly tilted in adcauline direction; it has four acute and fairly long teeth of variable size. Normally the abcauline tooth is the largest and the adcauline tooth the smallest; there are hydrothecae, however, where the development of the teeth is nearly equal. The closing apparatus is composed of four triangular plates. Internal hydrothecal teeth have not been observed; the whole margin in the majority of hydrothecae is slightly though distinctly thickened; such a marginal thickening is absent in hydrothecae on the younger parts of the colony.

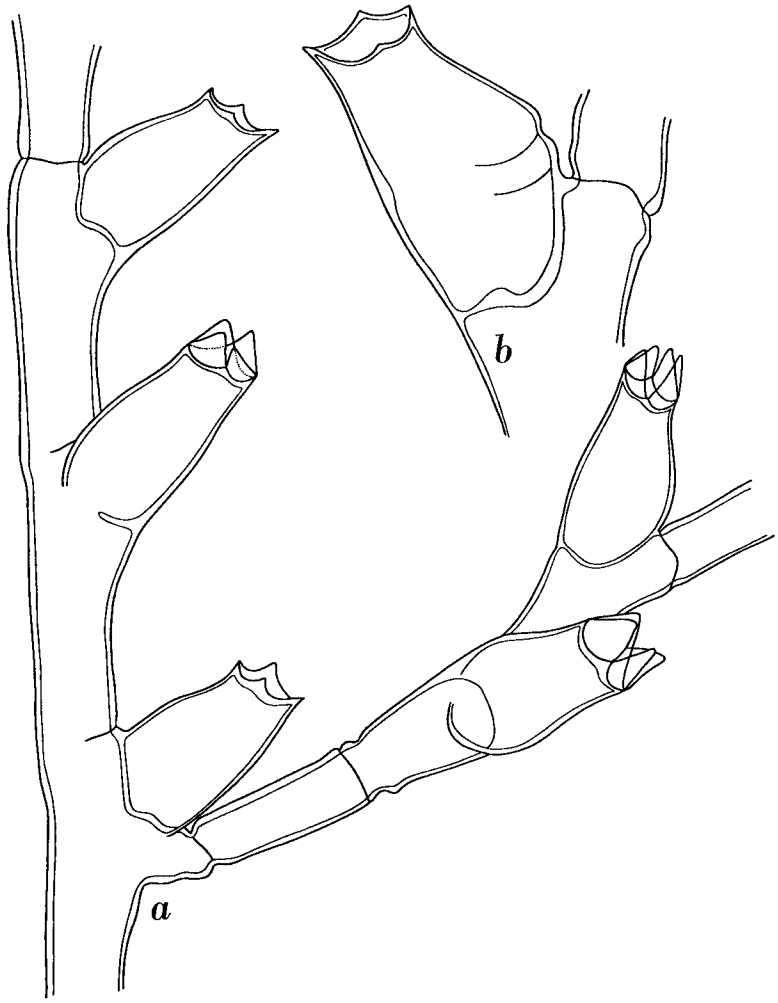

Fig. 32. *Sertularella antarctica* Hartlaub, Vema 17-19. a, fragment of hydrocaulus with branch; b, single hydrothecae. a, × 40; b, × 70.

The periderm of the whole colony is fairly thick and firm, being of a yellowish-brown colour in the internodes. The hydrothecal wall too is thick, particularly on the abcauline side; a notable thickening occurs halfway the internal abcauline wall.

Description of the holotype of *Sertularia secunda* Allman, 1888. — The material from Challenger Sta. 149 consists of several fragments; the following description is based on a 15 mm high top-part of a colony, richly bearing gonothecae. The structure of this fragment is in no ways different from that of the Vema specimens.

The hydrocaulus is monosiphonic and divided into short, thecate internodes by means of indistinct septa; the basal part of the internode is indistinctly wrinkled. The hydrothecae on the hydrocaulus are arranged in two planes that meet under an acute angle (fig. 33a); moreover the side-branches, originating from short apophyses directly under the cauline hydrothecae, are placed in almost the same planes. As a result the fragment has a distinct front and back; on the back the hydrocaulus is distinctly visible; on the frontal aspect of the colony it is almost hidden by the large number of side-branches and their gonothecae. The side-branches may be branched once or twice in a similar fashion as the hydrocaulus; they are divided into short internodes; the septa are fairly distinct. All internodes of primary, secondary or tertiary side-branches are thecate, with the exception of the basal internode. The hydrothecae are exactly as those described from the Vema colonies and quite variable in appearance. Usually the plane of the aperture is tilted in adcauline direction (fig. 33b). The adcauline hydrothecal wall is slightly convex; the abcauline wall is either straight, very slightly S-shaped or provided basally with two indistinct undulations. The basal portion of the hydrotheca is slightly swollen, usually best marked on the adcauline side, with occasionally two ring-shaped depressions best visible on the abcauline side. There are four marginal teeth. In the majority of hydrothecae the abcauline tooth is large and usually slightly curved inward; the adcauline tooth may be slightly larger than the two lateral teeth. A closing apparatus is present, though usually in damaged condition, in spite of the presence of normally developed hydranths. In perfect condition the closing apparatus is composed of four triangular plates with rounded apices, forming a low conical roof.

The periderm on the whole colony is quite firm and brownish. It does not thin out along the hydrothecal wall; on the contrary it becomes slightly thicker near the thecal aperture, where it forms a thickened collar. In many hydrothecae the presence of this thickened marginal ring coincides with the presence of many renovations inside the hydrotheca. I have the impression

that the marginal thickening of the hydrothecal periderm is brought about by renovation of the hydrotheca; the renovated hydrothecae are seen to project into the interior of the hydrotheca when viewed in slightly oblique position.

A large number of hydrothecae has been inspected for the presence of

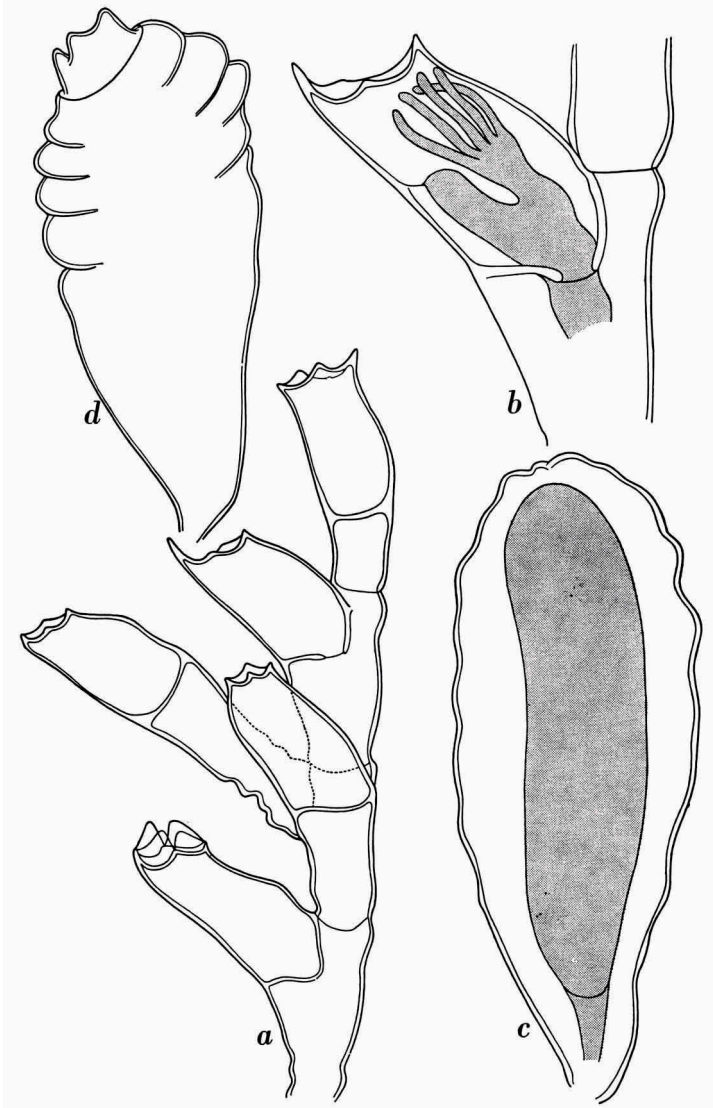

Fig. 33. *Sertularia secunda* Allman (= *Sertularella antarctica* Hartlaub), Challenger Exped., Sta. 149, holotype. a, fragment of colony; b, hydrotheca with hydranth; c, gonotheca with developing gonophore; d, empty gonotheca. a, c, d, × 40; b, × 70.

intrathecal teeth. In only one instance the periderm under the abcauline tooth shows a small notch that may either represent a small internal tooth or a peridermal thickening. The occurrence of intrathecal teeth, consequently, is by no means regular.

Hydranths are present in many hydrothecae. They have a large, abcauline coecum, attached to the abcauline internal hydrothecal wall by means of a ligament. There are 8 to 10 tentacles.

Gonothecae are abundantly present. These are oval or slightly clavate bodies originating from the internode just under a hydrotheca. They are found on both stem and branches. There is a very short pedicel; from the base onward they widen very gradually, reaching their greatest diameter at about two-thirds their length. There are a number of circular, shallow depressions in the body of the gonotheca; on the upper third of the gonotheca those depressions may have the character of distinct grooves (fig. 33d). In many gonothecae, nevertheless, no grooves are visible and only weak undulations of the periderm are apparent (fig. 33c). The apex of the gonotheca may be provided with a short, wide neck bearing three blunt teeth, surrounding a small aperture. In other thecae no neck has been developed, while the development of the teeth varies, apparently with age of the theca. All gonothecae are male and contain a large oval mass of developing spermatocytes. The periderm on the gonothecae is just as thick as on the hydrothecae.

Measurements (in microns). —

	Vema 17-19	Challenger Sta. 149
Stem internode, total length	875-1,210	600-950
diameter at node	230-255	190-215
Hydrotheca, length abcauline wall	645-675	615-730
length adnate part adcauline wall	270-285	270-335
length free part adcauline wall	460-485	405-500
total depth	660-700	770-890
maximal diameter	350-380	335-375
diameter at aperture	245-270	270-300
Gonotheca, total length		2,200-2,400
maximal diameter		880-1,100

Remarks. — There can in my opinion be no reasonable doubt that *Sertularella antarctica* Hartlaub, 1900 (= *Sertularella unilateralis* Allman, 1876) and *Sertularella allmani* Hartlaub, 1900 (= *Sertularia unilateralis* Allman, 1888; = *Sertularia secunda* Allman, 1888) are synonymous; the binomen *Sertularella antarctica* is here indicated as the valid name. There is complete conformity between the Vema material and the type of *Sertularia secunda* Allman (= *S. unilateralis* Allman, 1888). I have not been able to trace the type of *Sertularella unilateralis* Allman, but the material I have available

at present conforms completely to the description of that species by Allman (1876a: 114; 1879: 282, pl. 18 figs. 10, 11) and Hartlaub (1900: 82, pl. 6 figs. 27, 28, as *S. antarctica*). All the material inspected for the present study is monosiphonic, but Hartlaub describes a polysiphonic structure of the basal part of the stems in both *S. allmani* and *S. antarctica*; it is fair to conclude therefore that in older colonies the stem may become polysiphonic, though this is by no means a normal condition.

The type locality of the species is Swain's Bay, Kerguelen (Allman, 1876a, 1879, as *Sertularella unilateralis*). Additional specimens originate from Accessible Bay, Kerguelen, 20 fms (= 37 m) (Allman, 1888, as *Sertularia unilateralis*), from Dungeness Point, Estrecho de Magellanes (Hartlaub, 1905), from Punta Penas, Puerto de San Julian, Patagonia (Blanco, 1963), and from Cumberland Bay, South Georgia (Jäderholm, 1905). Nutting (1904, as *S. allmani*) records the species from the Estrecho de Magellanes. Here, judging from the present records, the species seems to be quite common (Vema 17-19, 17-20, 17-21, 17-25, 17-29, 17-30, and 17-32). It has also been obtained from the south-western Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-98).

Sertularella picta (Meyen, 1834) (figs. 34, 35)

Sertularia picta Meyen, 1834: 201, pl. 34 figs. 1-3.

Sertularella picta, Hartlaub, 1900: 77, pl. 5 fig. 4, pl. 6 figs. 17, 18, 20; Nuttting, 1904: 90, pl. 20 figs. 5-7; Hartlaub, 1905: 645, fig. L^4; Stechow, 1920: 32, fig. 3; Billard, 1922: 106, fig. 2B; Stechow,1923: 188a, fig. B^1; Blanco, 1963: 175, figs. 3, 4; Blanco, 1967a: 112, figs. 1-7.

Material. — Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m. Two fragments, 10 and 15 mm long, monosiphonic and slightly branched. No gonothecae.

Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m. Several small tufts, about 15 mm high, and many fragments, all monosiphonic. No gonothecae.

Vema 15-107, 54°10.2'S, 57.5' W, 6.3.1959, 101 m. Several 15-20 mm long, sparingly branched, monosiphonic fragments. No gonothecae.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. Several small, 3-5 mm high, monosiphonic fragments. No gonothecae.

Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. Several 15-20 mm long, monosiphonic fragments. No gonothecae.

Vema 17-47, 55°07.2'S, 66°29.3'W, 4.5.1961, SBT, 71 m. One 20 mm long, monosiphonic fragment. No gonothecae.

Vema 17-48, 55°10'S, 66°23'W, 4.5.1961, SBT, 42 m. Several, up to 20 mm long fragments. No gonothecae.

Vema 18-16, 47°30'S, 62°39'W, 18.2.1962, SBT, 123 m. A large, about 50 mm high colony with many empty gonothecae. Many fragments.

Vema 18-18, 47°55'S, 63°41'W, 18.2.1962, SBT, 108 m. Many, 15-20 mm long fragments of a larger colony. No gonothecae.

Description. — The following description is based on the above mentioned material with the exception of that from Vema 14-14, which differs slightly

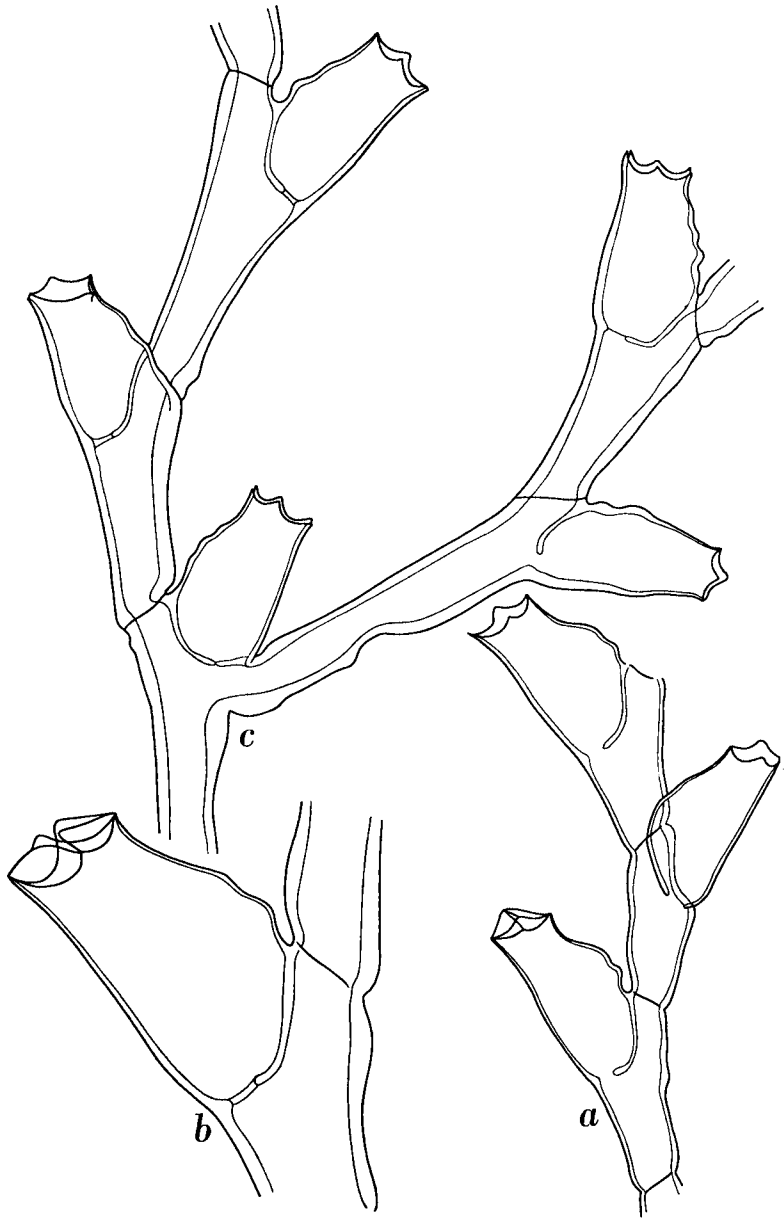

Fig. 34. *Sertularella picta* (Meyen). a, b, Vema 18-16; a, fragment of branch; b, hydrotheca; c, Vema 18-18, fragment of colony. a, c, × 40; b, × 70.

in hydrothecal structure and will also be described below. The rest of the material is of a uniform structure.

The complete colonies, as occur at Vema 18-16, consist of monosiphonic, slender hydrocauli and many, repeatedly branched, side-branches. The stems are divided into internodes of slightly variable length; the basal internode, which is usually hydrothecate, has some basal rings. Each following internode is hydrothecate; the hydrothecae occur on the distal part of each internode and are alternately directed obliquely upwards and laterally. They are arranged in two planes, that make a very obtuse angle (fig. 34a). The side-branches originate from short apophyses immediately below each hydrotheca and occur in the same planes as the stem hydrothecae. On the side-branches the arrangement of the hydrothecae is as on the stems; they face the upper surface of the side-branch (fig. 34a). As a result irregularly intertwining, fine, bushy colonies are formed, composed of entirely monosiphonic stems and branches. Septa, separating the internodes, are only occasionally visible and if present are very oblique; usually the nodes are indicated by slight constrictions of the periderm. The length of the internodes varies; in some colonies these are about twice as long as the depth of the hydrotheca, in others they have about the same length. The shape of the hydrothecae can best be described by reference to fig. 34b; the abcauline wall is almost completely straight. The free part of the adcauline wall is about 1.5-2 times the length of the fused part; it is distinctly undulated, though the mode of development of the undulations is variable. Usually two or three smooth waves are present; the undulations of the hydrothecal wall fade away rapidly towards the abcauline part of the hydrotheca. The basal part of the theca is distinctly swollen. The hydrothecal margin is produced into four unequally developed teeth, that on the abcauline side being larger. The plane of the aperture is distinctly tilted in adcauline direction; the operculum is composed of four thin triangular valves, absent on many hydrothecae. Renovations of the hydrothecal aperture occur to a limited extent; no renovations of the closing apparatus have been observed. The development of the periderm is considerable on the internodes; on the hydrothecae it is much thinner. No thickening of the hydrothecal border and no intrathecal teeth have been observed.

The (empty) gonothecae occur in great profusion at Vema 18-16; they are pear-shaped bodies, narrowing basally and swelling considerably in the upper third. There are 6 equidistant ribs transversally over the distal half of the gonotheca, separating shallow, rounded grooves. There are no peridermal frills. At the top there is a small, circular opening, surrounded

by four short, conical teeth (fig. 35c). The gonothecae are attached to the internodes just below the hydrotheca by means of a short pedicel.

The two fragments from Vema 14-14 differ mainly in the structure of the hydrothecae; probably they represent fragments of an older colony. They consist of a monosiphonic stem and some side-branches, both of which are divided into regular internodes, separated by very oblique septa. The septa are at times very obscure, especially on the side-branches, where their presence is indicated by indistinct constrictions of the periderm. With the exception of the basal internode of one of the stems there are no rings; the internode in question has three more or less distinct rings (in addition to the hydrotheca) and probably was the first internode, directly rising from the hydrorhiza. The stem internodes are short, about as long as the hydrotheca; on the side-branches they are distinctly longer. The hydrothecae are placed at the end of each internode and are alternately directed to the left or right sides (fig. 35a). In addition they are slightly directed towards the frontal part of the colony; the angle between the two planes in which the hydrothecae are placed is very obtuse. The abcauline hydrothecal wall is straight or very slightly convex; the adcauline wall is distinctly swollen basally and has two or three shallow undulations. The hydrothecae are distinctly swollen basally and considerably contracted just under the aperture; the adcauline wall can best be described as undulatory; no distinct rings are visible (fig. 35b). The plane of the hydrothecal aperture is very slightly tilted in adcauline direction. There are four marginal teeth of unequal development. Usually the abcauline tooth is better developed and longer than the lateral teeth, but its development is variable; in some hydrothecae the development of the marginal teeth is equal. Renovations or reduplications of the hydrothecal aperture are frequent. None of the hydrothecae has the closing apparatus in perfect condition; it must have consisted of four triangular plates.

The development of the periderm is considerable. The internodes have thick walls; the hydrothecae have thick periderm, particularly the abcauline wall is greatly thickened. The hydrothecal aperture is distinctly thickened, with the exception of the youngest hydrothecae. There are, in the older thecae, three intrathecal teeth, one on the abcauline side and two lateral teeth.

The side-branches, in my specimens, originate from a short apophysis just under the hydrotheca of a stem internode. No hydranths are present.

Measurements (in microns). —

	Vema 18-16	Vema 14-14
Stem internode, total length	580-675	475-540
diameter at node	110-135	175
Hydrotheca, length abcauline wall	515-565	420-485

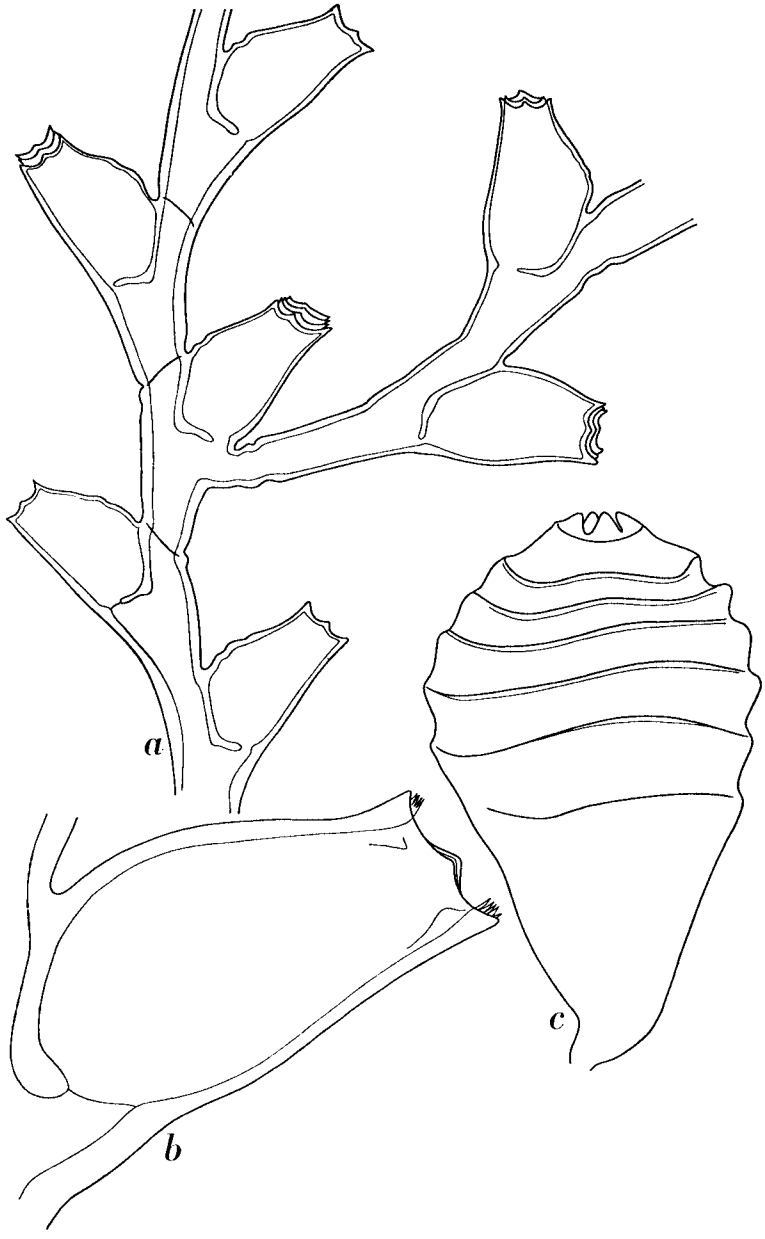

Fig. 35. *Sertularella picta* (Meyen). a, b, Vema, 14-14; a, fragment of colony; b, hydrotheca; c, Vema 18-16, gonotheca. a, c, × 40; b, × 120.

length free part adcauline wall	325-365	390-425
length adnate part adcauline wall	240-270	230-245
total depth	565-610	540-555
maximal diameter	270-310	310-325
diameter at aperture	175-190	190-215
Gonotheca, total length	1,485-1,825	
diameter	1,015-810	

Remarks. — This species has a superficial resemblance with *S. antarctica* Hartlaub, 1900. It can be recognized, however, by the fact that the planes into which the hydrothecae are arranged, meet at a very obtuse angle. There are additional small differences in the development of the periderm and the shape of the hydrothecae.

S. picta was originally described from Cabo de Hornos (Cape Horn), south of Tierra del Fuego (Meyen, 1834). Additional records are: Isla Navarino and Isla Lennox, south of Tierra del Fuego (Hartlaub, 1905), west of Puerto Pantalon, Tierra del Fuego (Hartlaub, 1905), Puerto Madryn, Chubut, Argentina (Blanco, 1963) and Mar del Plata (Blanco, 1967a). The present records are from the Patagonian shelf east of Deseado, Santa Cruz, Argentina (Vema 18-16, 18-18), the south-western Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-98 and 15-107), the south-western Atlantic between Tierra del Fuego and Isla de Los Estados (Vema 15-109), the shelf north of Peninsula Mitre, Tierra del Fuego, Argentina (Vema 14-14), and the south-western Atlantic south of Peninsula Mitre, Tierra del Fuego, Argentina (Vema 17-47 and 17-48).

Sertularella gayi gayi (Lamouroux, 1821) (fig. 36a, b)

Sertularia gayi Lamouroux, 1821: 12.

Sertularella gayi, Hincks, 1868: 237, fig. 29, pl. 46 fig. 2; Hartlaub, 1900: 61; Nutting, 1904: 78, pl. 14 figs. 1-7; Ritchie, 1907: 536; Ritchie, 1911: 78; Fraser, 1944: 262, pl. 56 fig. 248; Vervoort, 1959: 273, figs. 33b, c, 34b; Naunov & Stepan'yants, 1962: 86; Vervoort, 1966: 127, fig. 30.

Sertularella gayi forma *gayi* Ralph, 1961: 833, fig. 24 d-f.

Material. — Vema 17-76, 41°57'S, 59°03'W, 25.3.1961, SBT, 81 m. Several fragments of 15-20 mm length. No gonothecae.

Vema 18-18, 47°55'S, 63°41'W, 18.2.1962, SBT, 108 m. A fragment of a polysiphonic stem and some smaller fragments. No gonothecae.

Description. — The polysiphonic stem is too mutilated to be described, but the monosiphonic fragments are well preserved. The division into internodes is very indistinct; no septa are visible, but there are indistinct constrictions of the periderm just above the beginning of the free part of the adcauline wall, separating the internodes. Each internode has a hydrotheca and occasionally a side-branch, originating from the internode at the hydrothecal base (fig. 36a). The internodes are slender but fairly short, only slightly

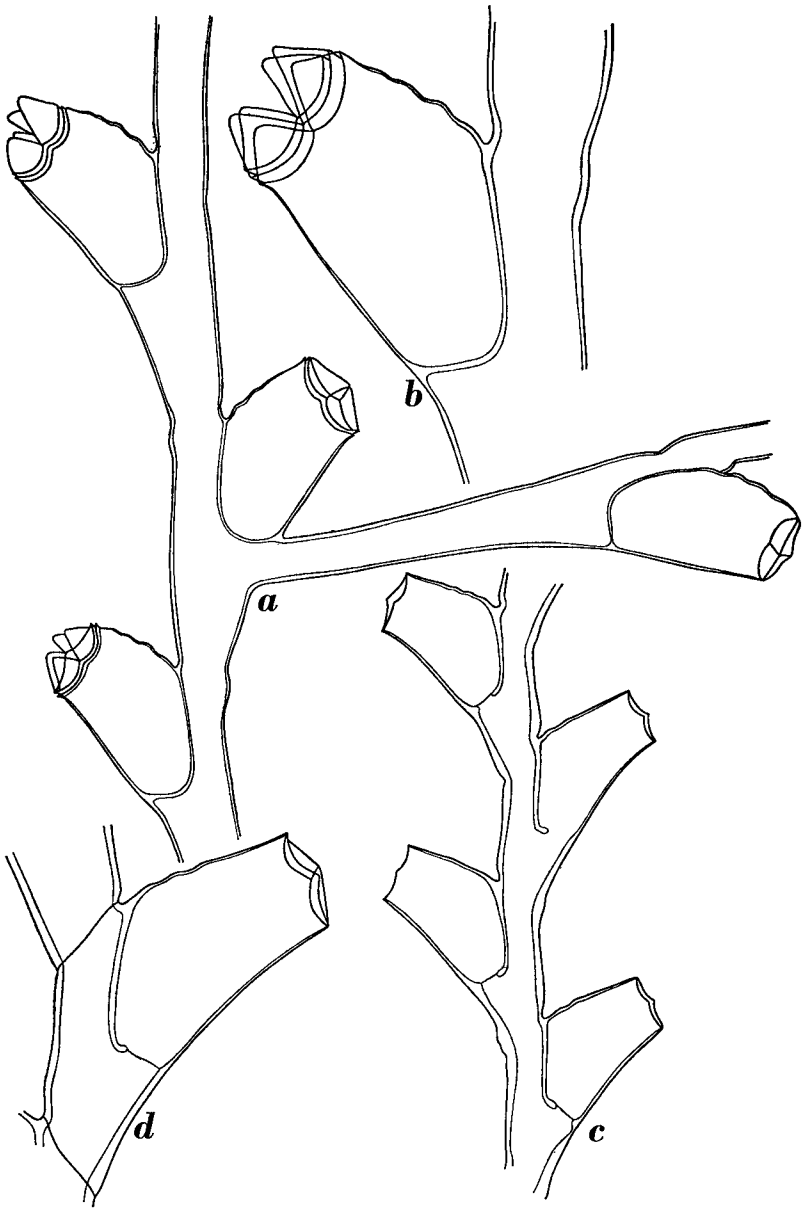

Fig. 36. a, b, *Sertularella gayi gayi* (Lamouroux). a, monosiphonic fragment; b, hydrotheca. c, d, *Sertularella gayi robusta* Allman; c, monosiphonic fragment; d, hydrotheca. a, d, × 30; b, × 55; c, × 20.

longer than the total depth of the hydrotheca. Those hydrothecae are alternately arranged in one plane, pointing either left or right and obliquely upwards. The abcauline wall is straight or nearly so; the adcauline wall is basally slightly swollen. The adnate part of the adcauline hydrothecal wall is slightly longer than the free part, the length of which is slightly variable. The angle between the free part of the adcauline wall and the internode varies between 45° and 60°; the free adcauline hydrothecal wall has distinct undulations resulting from depressions in the adcauline hydrothecal portion. These depressions gradually fade out near the abcauline part of the theca and consequently do not have the character of rings (fig. 36b). The hydrothecal aperture is perpendicular to the length axis of the theca; there are four low teeth of equal development. Many hydrothecae show signs of repeated renovations of the hydrothecal aperture, including renovations of the four opercular flaps. The periderm of the internode is firm though not particularly thick; on the hydrothecae it is comparatively thin.

Measurements (in microns). —

	Vema 17-76
Internode, total length	1,095-1,175
diameter at node	175-215
Hydrotheca, length abcauline wall	580-635
length free part adcauline wall	405-420
length adnate part adcauline wall	495-500
total depth	675-715
maximal diameter	430-445
diameter at aperture	325-350

Remarks. — *Sertularella gayi gayi* is a (mainly) Atlantic species with a vast distributional range in the tropical, sub-tropical and temperate parts of that ocean, occurring both along the American coast and the coasts of Europe and West Africa. It penetrates into the colder seas and has also been found in the New Zealand area (Ralph, 1961). The present records are both from the south-western Atlantic, viz., the self south-east of Bahía Blanca, Argentina (Vema 17-76) and the shelf east of Deseado, Santa Cruz, Argentina (Vema 18-18). Naumov & Stepan'yants (1960) record the species from the Atlantic between the Falkland Islands and Tierra del Fuego, 136-138 m depth; Ritchie (1907) mentions specimens from the Gough Island area, 40°20'S, 9°56'W, 100 fms (= 183 m).

Sertularella gayi robusta Allman, 1873 (fig. 36c, d)

Sertularella gayi var. *robusta* Allman 1873: 186; Allman, 1874: 471, pl. 66 figs. 3, 3a; Allman, 1877: 22, pl. 15 figs. 3-5.

Material. — Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. Several fragments, together forming a colony of about 60 mm height with polysiphonic stem. One mutilated gonotheca present.

Vema 15-3, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. One colony of about 40 mm height and many fragments. No gonothecae.

Description. — The main stem is basally about 1.5 mm thick and composed of a large number of parallel fibres, apparently covering the primary stem with its hydrothecae. The top part of the stem is monosiphonic and composed of internodes. The side-branches leave the main stem at irregular intervals and in all directions; they have irregular secundary side-branches with a tendency towards pinnate arrangement. The side-branches are largely monosiphonic. All monosiphonic parts of the colony are composed of internodes, separated by oblique septa, that are externally indicated by constrictions of the periderm but are very hard to see (fig. 36c). Each internode apically bears a large hydrotheca; the internode is shorter than the depth of the hydrotheca. The hydrothecae are large, more or less cylindrical and very slightly externally curved. The abcauline wall is straight or almost so; the adcauline wall is very slightly swollen and either smooth or undulated, the undulations resulting from four or five weak rings, present only on the adcauline part of the hydrotheca. The hydrothecae are only very moderately swollen and not contracted orally. The aperture has four low teeth; its plane is exactly perpendicular to the longitudinal axis of the hydrotheca (fig. 36d). The closing apparatus is composed of four hyaline flaps of triangular outline, forming, when closed, a low roof-shaped structure. The cross-section of the hydrotheca just under the aperture is quadrangular. The periderm of the colony is thick, particularly on the internodes, but it thins out considerably on the hydrothecal walls. The thecal aperture is only very moderately thickened; there are no internal hydrothecal teeth.

The gonothecae originate from the articles just opposite the diaphragm of the hydrotheca. Though nearly all gonothecae have disappeared the place of attachment is still discernible as a lenticular hole in the periderm.

Measurements (in microns). —

	Vema 15-1
Internode, total length	945-1,015
diameter at node	335-380
Hydrotheca, length abcauline wall	840-880
length adnate part adcauline wall	565-635
length free part adcauline wall	675-730
total depth of hydrotheca	945-985
diameter at margin	390-430
maximal diameter	540-605

Remarks. — I have somewhat hesitatingly referred the above mentioned

colonies to the large, deep-water form of *Sertularella gayi*, at the same time raising it to subspecific rank. I have been unable to find a complete diagnosis of it in the literature at my disposal, so that I have described it in some more detail. I also feel handicapped by the absence of measurements of this well defined subspecies.

My material has a certain resemblance to *Sertularella megastoma* Nutting (1904: 90, pl. 20 figs. 8, 9), a species redescribed by Fraser (1944: 265, pl. 57 fig. 253), particularly in the quadrangular cross-section of the hydrotheca near the aperture. *S. megastoma* seems to have completely smooth hydrothecae while the shape of the colony is strictly pinnatiform. The colony from Vema 15-3, which is fairly complete, greatly resembles Allman's figure of *Sertularella gayi* var. *robusta* (Allman, 1874, pl. 66 fig. 3).

S. gayi robusta has originally been described from deep water of the eastern part of the North Atlantic, between 59°56′ and 61°10′N, 2°21′ and 6°27′W, depth 203-605 fms (= 371-1,187 m); it has subsequently been found in numbers in the West Indian region (Allman, 1877; Nutting, 1904). The present records (Vema 15-1 and 15-3) are from the sub-tropical western Atlantic east of Georgia, U.S.A., also from comparatively great depths.

Sertularella geodiae Totton, 1930 (fig. 37)

Sertularella geodiae Totton, 1930: 196, fig. 43, pl. 3 figs. 7, 8;
?*Sertularella geodiae* Naumov & Stepan'yants, 1960: 86, fig. 10.

Material. — Vema 14-14, 54°23′S, 65°35′W, 19.2.1958, SBT, 75 m. One branched fragment of 35 mm height. No gonothecae.

Vema 14-19, 52°41′S, 59°09′W, 22.2.1958, SBT, 108 m. One small, monosiphonic colony of 15 mm height and several fragments. No gonothecae.

Vema 15-93, 50°17′S, 66°50′W, 20.2.1959, 82 m. One small, 15 mm high, monosiphonic stem and some fragments. No gonothecae.

Vema 15-98, 54°24′S, 63°29′W, 3.3.1959, 198 m. Monosiphonic fragments of 5-15 mm length. No gonothecae.

Vema 15-107, 54°10.2′S, 65°57.5′W, 6.3.1959, 101 m. Three fragments of 15 to 25 mm length. No gonothecae.

Vema 15-108, 54°10′S, 64°19′W, 6.3.1959, 110 m. One small fragment, 10 mm length. No gonothecae.

Vema 15-109, 54°11.5′S, 62°36′W, 7.3.1959, 403 m. Several 20-30 mm long fragments, one a polysiphonic hydrocaulus attached to a shell fragment. Partly covered with *Filellum serratum* (Clarke). No gonothecae.

Vema 15-112, 56°40′S, 67°26′W, 13.3.1959, 134 m. Several fragments of about 30 mm length and some smaller fragments. No gonothecae.

Vema 17-19, 52°58.6′S, 70°30.8′W, 29.3.1961, SBT, 90 m. Monosiphonic fragments of 12 mm length with several hydrothecae. No gonothecae.

Vema 17-20, 53°21′S, 70°36′W, 29.3.1961, SBT, 247 m. Monosiphonic unbranched fragment of 15 mm length. No gonothecae.

Vema 17-25, 53°20.5′S, 69°32.8′W, 29.3.1961, SBT, 44 m. Two small, about 35 mm high colonies with polysiphonic base. No gonothecae.

Description. — The polysiphonic stem rises from some fibres attached

to a shell fragment; it is about 0.7 mm thick and has some side-branches. The remaining fragments are all monosiphonic and irregularly branched in one plane. The stems are divided into internodes; septa are very indistinct and oblique, marked by constrictions of the periderm (fig. 37a). The internodes are short, the basal athecate part shorter than the total depth of the hydrotheca. The hydrothecae are alternately arranged along the stems; they are placed in one plane, alternately pointing left and right and placed at the end of an internode. A side-branch, when present, springs from a short apophysis directly under a hydrotheca. The hydrothecae are variable in shape but generally resemble those of *Sertularella polyzonias* (L.). They

Fig. 37. *Sertularella geodiae* Totton, Vema 15-112. a, monosiphonic fragment; b, hydrotheca. a, × 40; b, × 70.

are slightly though distinctly swollen basally and point obliquely upwards and laterally. The abcauline wall is straight or slightly convex, usualy with a distinct, sudden flexure some distance under the hydrothecal aperture. The free part of the adcauline wall is usually slightly shorter than the fused part, but the length of the free part varies considerably and is sometimes as long as the adnate part. The free part of the adcauline wall is either smooth or with two to five distinct undulations, with all intermediate conditions realized in the various hydrothecae. In some of the hydrothecae the undulations of the free adcauline wall are particularly strong and are brought about by distinct grooves in the hydrothecal wall; such grooves or deepened rings, however, are exclusively restricted to the adcauline part of the hydrotheca and are never visible on the abcauline part. The hydrothecal aperture has four low, broadly triangular teeth; the development is usually quite symmetrical, but in some thecae the abcauline tooth is slightly longer. The hydrothecal aperture shows signs of repeated renovations. Renovation is apparently restricted to the hydrothecal aperture; no complete hydrothecae are renovated (fig. 37b). The plane of the aperture is slightly tilted in adcauline direction. The closing apparatus, visible in some thecae only, is composed of four triangular flaps forming, when closed, a high, conical structure.

Measurements (in microns). —

	Vema 15-112
Internode, total length	1,010-1,350
diameter at node	280-285
Hydrotheca, length abcauline wall	650-715
length free part adcauline wall	405-485
length adnate part adcauline wall	515-540
total depth	810-850
maximal diameter	445-470
diameter at aperture	350-365

Remarks. — This species was originally described by Totton (1930) from two localities off New Zealand, viz., off Three Kings Island, 100 fms (= 183 m) and off North Cape, 70 fms (= 128 m); it was subsequently redescribed in more detail after the same material by Ralph (1961). I have hesitatingly identified my material with Totton's species, with which it is in general agreement, in spite of complete absence of gonothecae, being prompted in this respect by the figure that Naumov & Stepan'yants give of a specimen collected south of Isla Desolación, near the western entrance to the Estrecho de Magellanes, at 100 m depth. Naumov & Stepan'yants' material was also collected without gonothecae and was consequently doubtfully referred to Totton's species. I am quite certain that the Vema specimens are conspecific

with those recorded by Naumov & Stepan'yants in spite of the short description these authors give of their material. There is complete agreement in shape of the hydrothecae and the measurements are nearly identical.

The Vema material shows a considerable amount of variability in the shape of the hydrothecae; some fragments approach *Sertularella conica* Allman, 1877, in many respects except size. It originates from the Patagonian shelf east of the town of Santa Cruz, Argentina (Vema 15-93), from the Estrecho de Magellanes (Vema 17-19, 17-20 and 17-25), from the south-western Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-98, 15-107 and 15-108), from the south-western Atlantic between the Falkland Islands and Isla de los Estados (Vema 15-109), the shelf north of Peninsula Mitre, Tierra del Fuego, Argentina (Vema 14-14), from the south-western Atlantic between the Falkland Islands and Burdwood Bank (Vema 14-19) and from the south-western Atlantic (Drake Passage) south of Cabo de Hornos (Vema 15-112).

Sertularella conica Allman, 1877 (fig. 38)

Sertularella conica Allman, 1877: 21, pl. 15 figs. 6, 7; Nutting, 1904: 79, pl. 15 figs. 1, 2; Stechow, 1925: 473, fig. 33; Leloup, 1935: 44; Fraser, 1937: 151, pl. 34 fig. 179; Fraser, 1944: 258, pl. 54 fig. 243; Van Gemerden-Hoogeveen, 1965: 32, fig. 7.

Material. — Vema 15-93, 50°17'S, 66°50'W, 20.2.1959, 82 m. One monosiphonic fragment of 15 mm length. No gonothecae.

Vema 16-39, 50°53'S, 62°35'W, 19.5.1960, SBT, 157 m. One fragment of 15 mm length with badly damaged hydrothecae probably belongs to this species.

Vema 17-30, 52°40.2'S, 69°51.5'W, 1.4.1961, SBT, 24 m. A single, 15 mm long fragment. No gonothecae.

Vema 17-47, 55°07.2'S, 66°29.3'W, 4.5.1961, SBT, 71 m. Several about 20 mm long fragments. No gonothecae.

Vema 17-69, 40°56'S, 60°10'W, 18.5.1961, SBT, 68 m. Several, up to 20 mm long, branched and unbrached fragments, all monosiphonic. No gonothecae.

Albatross Sta. 2771, off Cabo Virgenes (Cape Virgins on label), 51°34'S, 68°W,50.5 fms (= 92 m), one sample preserved in alcohol, United States National Museum no. 20469. A large number of about 25 mm high colonies, together with *Sertularella magellanica* Marktanner-Turneretscher (= *Symplectoscyphus magellacinus*) and *Amphisbetia operculata* (L.) Labelled *Sertularella magellanica*. Maximal height 30 mm; no gonothecae.

Description. — The colonies are composed of a monosiphonic stem, detached from the substratum and with the basal part missing, and a few side-branches. Branching, however, occurs very sporadically; the side-branches are not re-branched. The stems and side-branches are divided into internodes by means of alternately sloping septa; the place of the node is also marked by a constriction of the periderm (fig. 38a). The length of the internode is variable; usually it is very short, but in the colony from Vema 16-39 the internodes are fairly long; in the former they are much shorter

than the total depth of the hydrotheca; in the latter they are almost twice as long. The hydrotheca is placed at the distal end of the internode; they are alternately directed obliquely upwards and laterally, being arranged

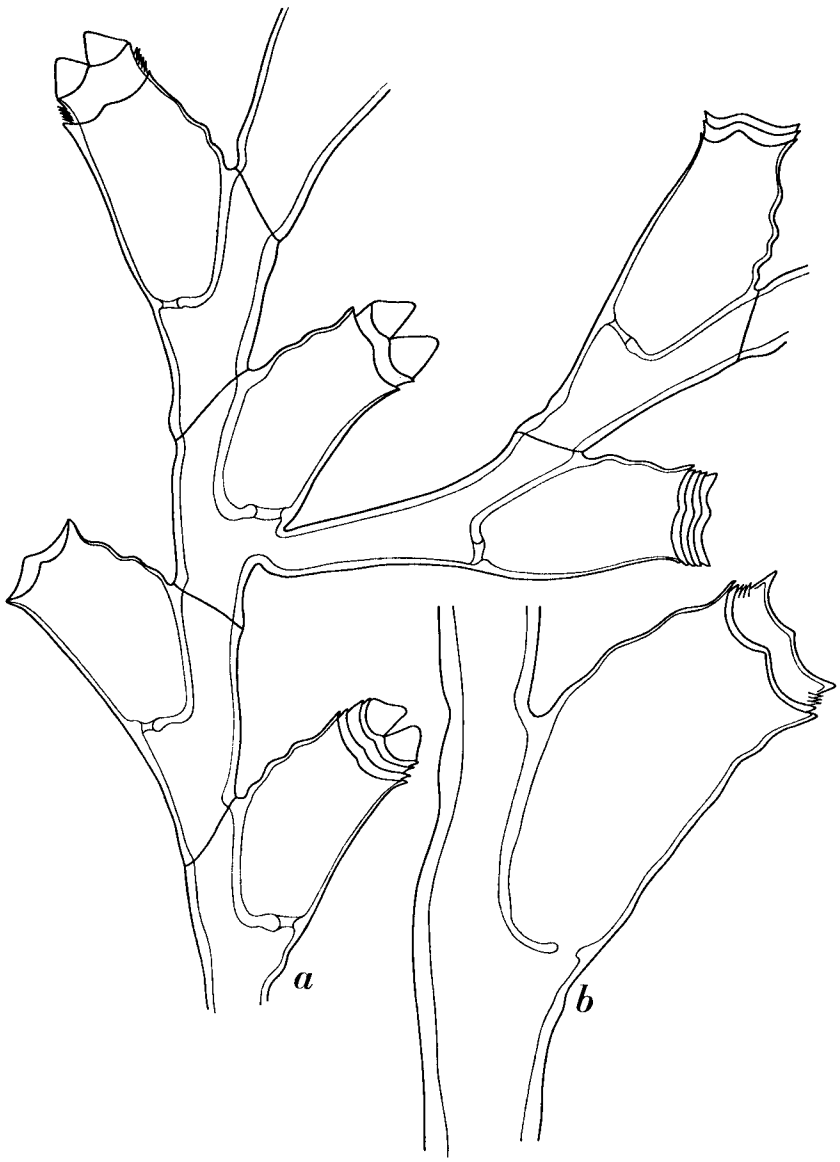

Fig. 38. *Sertularella conica* Allman. a, Vema 17-30, part of hydrocaulus with side-branch; b, Vema 16-39, hydrotheca. a, × 40; b, × 70.

strictly in one place. The hydrothecae are almost cylindrical, only very slightly swollen basally, with the distal portion slightly but distinctly everted (fig. 38b). The abcauline wall is almost straight, but just under the distal end there is a distinct outward curvature. The length of the free part of the adcauline wall is longer than that of the fused part; the free portion has three to five deep undulations as a result of the wavy surface of the adcauline part of the hydrotheca. The waves are distinct but usually do not have the character of complete rings on the hydrotheca; in some hydrothecae, however, the waves are particularly deep and also reflected in shallow undulations of the abcauline hydrothecal wall. The plane of the hydrothecal aperture is distinctly perpendicular to the length axis of the theca; it has four distinct teeth of equal development. Repeated renovations of the hydrothecal aperture are quite common; usually the closing apparatus, composed of four triangular plates, is also repeatedly renovated, so that the aperture is surrounded by many rows of hyaline closing plates. The development of the periderm is considerable, especially on the internodes. The hydrothecal walls, particularly in renovated hydrothecae, are thick. The margin of the aperture, in both renovated and primary hydrothecae, may also be thickened.

Side-branches, where present, originate from the internode just under a hydrotheca; they have the same structure as the stems with the exception of the basal internode, which is longer.

Measurements (in microns). —

	Vema 16-39	Vema 17-30
Internode, total length	1,230	610-675
diameter at node	200	190-255
Hydrotheca, length abcauline wall, including renovations	730	580-650
length free part adcauline wall	460-540	460-500
length adnate part adcauline wall	420-435	420-430
total depth	700-825	780-875
maximal diameter	335-405	400-410
diameter at aperture	285-325	300-405

Remarks. — I have convinced myself that my material is conspecific with that recorded under the same name by Van Gemerden-Hoogeveen (1965) from the West Indies. The Vema material also greatly resembles that described and figured as *Sertularella conica* by Nutting (1904) and Stechow (1925). Allman's type material from Tortugas is still present in the Museum of Comparative Zoology, Cambridge, Massachusetts, but it has never been redescribed. The hydrothecae figured by Allman (1877, pl. 15 figs. 6, 7) are slightly slenderer than those recorded by other authors and appear to have

a longer free adcauline wall with an increased number of undulations. I agree with Stechow (1925: 475) that a closer inspection of specimens recorded under that name, e.g., by Fraser (1937), is necessary before the occurrence of this species in Pacific waters can be safely accepted. Fraser's figure (1937, pl. 34 fig. 179, the same figure occurs in his 1944 paper dealing with Atlantic hydroids, pl. 54 fig. 243), does suggest that this author at least was dealing with another species.

S. conica has its main area of distribution in the sub-tropical Atlantic bordering America, particularly in the Gulf of Mexico, in the Caribbean Sea and in West Indian waters (Nutting, 1904; Leloup, 1935; Van Gemerden Hoogeveen, 1965). It has also been recorded from the Cape Verde Islands by Stechow (1925). Nutting (1904) also records specimens from off the Patagonian coast, viz., 51°34'S, 68°W. The present records are from the shelf south-east of Bahía Blanca, Argentina (Vema 17-69), from the shelf east of the town of Santa Cruz, Argentina (Vema 15-93), from the south-western Atlantic north-west of the Falkland Islands (Vema 16-39), from the Estrecho de Magellanes (Vema 17-30) and from the south-western Atlantic south of Peninsula Mitre, Tierra del Fuego, Argentina (Vema 17-47).

Sertularella cylindritheca (Allman, 1888) (fig. 39a)

Sertularia cylindritheca Allman, 1888: 59, pl. 29 figs. 1, 1a; Versluys, 1899: 36, fig. 5.
Sertularella cylindritheca, Nutting, 1904: 87, pl. 19 fig. 4; Billard, 1931: 676, fig. 2; Vervoort, 1959: 266, figs. 30, 31.

Material. — Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m depth. One small fragment with a few hydrothecae without hydranths. No gonothecae.

Remarks. — I have previously (Vervoort, 1959: 266) redescribed this highly characteristic species from West African material. The present specimen is a dead fragment, which may have been transported over a considerable distance. The structure of the very large hydrotheca makes confusion with another species quite impossible; the total depth of the hydrotheca, a drawing of which is presented in fig. 39a, is 1.88 mm. The species occurs along both tropical sides of the Atlantic, viz., off Bahía, Brazil (Allman, 1888), Testigos Islands, West Indies (Versluys, 1899) and Trinidad (Nutting, 1904) for the western tropical Atlantic, and the African west coast from Cape Spartel to the mouth of the river Niger (Vervoort, 1959) for the eastern tropical Atlantic. The occurrence of living specimens as far south as the south-western Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-98) seems unlikely.

Sertularella edentula Bale, 1924 (fig. 39b-d)

Sertularella edentula Bale, 1924: 237, fig. 6; Totton, 1930: 200, fig. 46, pl. 3 fig. 6; Ralph, 1961: 834, fig. 25.

Material. — Vema 17-62, 54°41'S, 55°35'W, 12.5.1961, SBT, 1199-1165 m, Several about 50-60 mm long, partly branched fragments of a larger colony. No gonothecae.

Description. — The fragments are all monosiphonic stems, some of which have one ramification. The stems are fronto-dorsally compressed and oval in cross-section, with the hydrothecae inserting along the narrow sides and placed in one plane. There is, in my specimens, no division of the stems into internodes; the side-branches, if present, originate directly from the small section of stem between two successive hydrothecae. The hydrothecae are deeply sunken into the stems (fig. 39b); they are tubular, slightly curved outwards near the apex and with a circular opening, almost perpendicular to the length axis of the hydrotheca. The abcauline and the adcauline walls run almost parallel; in some thecae the adcauline wall is slightly convex. Nearly the whole adcauline wall is adnate to the stem, only a very small portion of that wall is free; though in some hydrothecae even this free adcauline stretch is not present. The hydrothecae are flanked, on the adcauline side, by two folds, one frontal, one dorsal, covering a portion of the hydrotheca; these are folds of the lateral wall of the stem partly investing the hydrotheca. The proximal end of the adcauline wall has a distinct basal swelling; the hydrothecal bottom consists of a straight plate with a large circular hole through which a large mass of perisarc passes (fig. 39d). The hydrothecal aperture is circular and not thickened (fig. 39c). Some hydrothecae have remnants of a closing apparatus, consisting of several (maximum three) thin, hyaline flaps; the majority, however, has no opercular plates whatever. Several fragments have well preserved though greatly contracted hydranths with a distinct abcauline blind-sac. The hydranth is attached to the abcauline hydrothecal wall by means of a strip of (muscular) tissue running from the apex of the blind sac to a point at two-thirds the abcauline wall from the margin. Several fragments have circular holes in the periderm just under a hydrotheca, indicating that gonothecae have been present.

The hydrothecae are alternately or sub-oppositely arranged and very closely approximated; there usually is only a very small stretch of stem between two successive hydrothecae on one side, but that distance is variable; in some fragments the distal end of the adcauline wall of a hydrotheca almost touches the proximal end of the abcauline wall of the next hydrotheca.

The periderm of the fragments is firm and yellowish; the hydrothecal walls too are firm, but the hydrothecal aperture is not thickened.

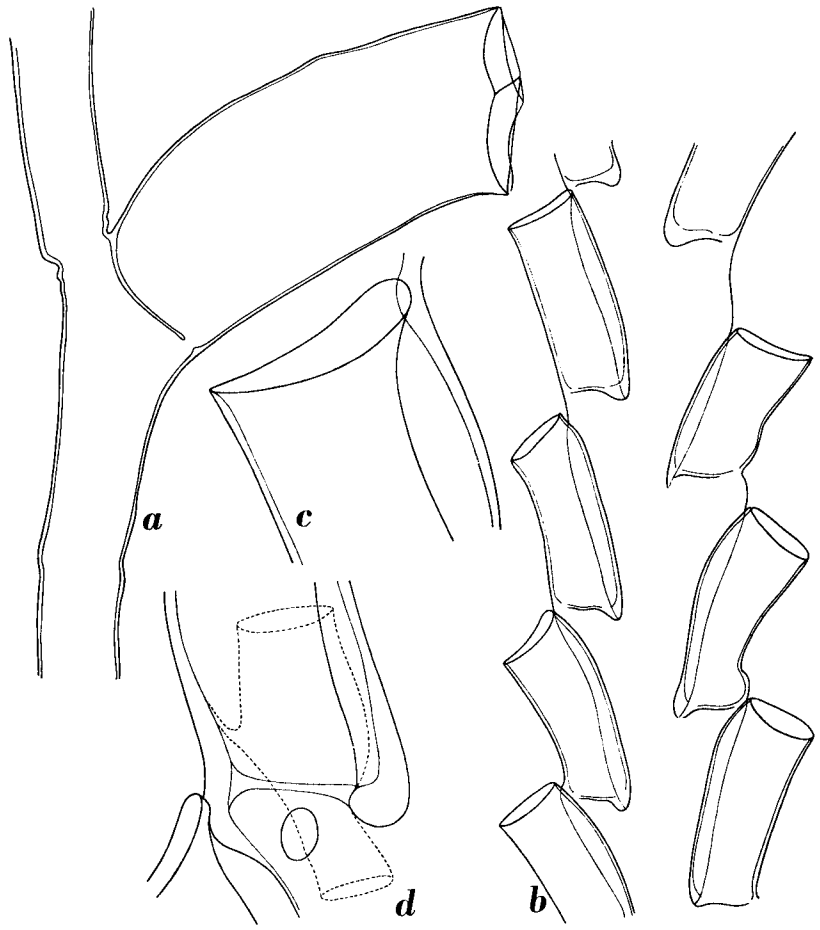

Fig. 39. a, *Sertularella cylindritheca* (Allman), Vema 15-98, single hydrotheca. b-d, *Sertularella edentula* Bale; b, fragment of stem with hydrothecae; c, apical part of hydrotheca; d, basal part of hydrotheca to show position of diaphragm. a, × 30; b, × 20; c, d, × 55.

Measurements (in microns). —

	Vema 17-62
Maximal diameter of stem, including the hydrothecae	2,000
Hydrotheca, abcauline wall	1,110-1,120
length free part adcauline wall	40-80
length adnate part adcauline wall	1,350-1,365
total depth	1,400-1,440
diameter at aperture	520-560

Remarks. — *Sertularella edentula* was originally described from off Cape Maria van Diemen, 10 miles north-west, at a depth of 50 fms (= 91 m)

(Bale, 1924); his type material was subsequently redescribed by Ralph (1961: 834, fig. 25). My specimens differ from those described by Bale and Ralph by the larger size of the hydrothecae, moreover, I have been unable to observe the "pendent folds flanking the hydrophore and the base of the hydrotheca". Distinct septa appear to have been present in the type material of this species. Additional specimens have been described and figured by Totton (1930: 200, fig. 46, pl. 3 fig. 6) from off Three Kings Island, New Zealand, at 100 fms (= 183 m) depth. In these specimens the distance between the hydrothecae is much larger than in the Vema specimens. The appearance of the species, however, is so characteristic, that there can scarcely be any doubt concerning the conspecificity of the material. The present record extends the distributional range of this species to the south-western Atlantic, where it was found in deep water south-east of the Falkland Islands (Vema 17-62).

Sertularella robusta Coughtrey, 1876 (figs. 40, 41a)

Sertularella robusta Coughtrey, 1876: 300; Totton, 1930: 195; Pennycuik, 1959: 195, pl. 6 fig. 3; Ralph, 1961: 824, fig. 22 a-d.

Sertularella microgona Von Lendenfeld, 1884: 416, pl. 7 figs. 1-3.

Sertularella angulosa Bale, 1894: 102, pl. 4 fig. 6.

Sertularella tenella Hartlaub, 1901: 370; Jäderholm, 1905: 31, pl. 12 fig. 8.

Material. — Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m. A 6 mm long fragment on *Symplectoscyphus milneanus* (d'Orbigny), without gonothecae.

Vema 15-106, 54°10.2'S, 65°44'W, 6.3.1959, 79 m. Two small, 5 and 10 mm long, monosiphonic fragments without gonothecae.

Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. One small, 3 mm high colony with 5 hydrothecae on *Symplectoscyphus milneanus* (d'Orbigny), together with *Phialella chilensis* (Hartlaub). No gonothecae.

Vema 17-24, 53°37.7'S, 69°54.6'W, 29.3.1961, SBT, 42 m. Two colonies of about 3 mm height rising from a stolon creeping on *Symplectoscyphus subdichotomus* (Kirchenpauer). No gonothecae.

Vema 17-32, 52°42.3'S, 69°44.5'W, 1.4.1961, SBT, 48 m. Three hydrocauli of about 10 mm height, one of which has a branch. No gonothecae.

Vema 17-47, 55°07.2'S, 66°29.3'W, 4.5.1961, SBT, 71 m. A single colony composed of an unbranched hydrocaulus with some hydrothecae. No gonothecae.

Vema 17-48, 55°10'S, 66°23'W, 4.5.1961, SBT, 42 m. A single unbranched hydrocaulus of 12 mm height. No gonothecae.

Vema 18-16, 47°30'S, 62°39'W, 18.2.1962, SBT, 123 m. One 30 mm high, branched, monosiphonic fragment without gonothecae.

Vema 18-18, 47°55'S, 63°41'W, 18.2.1962, SBT, 108 m depth. A single 5 mm high hydrocaulus rising from a stolon. No gonothecae.

Description. — The hydrocauli are composed of internodes of variable length. The first internode, rising from the stolon, has one or two indistinct basal annulations; the remaining internodes are separated by oblique septa and alternately directed left or right, so that the hydrocaulus is curved in

zig-zag fashion (fig. 40a). Each internode basally has an indistinct ring, with the exception of the internodes of the young colonies, where the septa are indistinct and the annulations almost invisible; the internodes here are very slender. The hydrothecae are attached to the distal end of the internode and point laterally and very slightly upwards. The free part of the adcauline wall is slightly longer than the fused part. They are barrel-shaped, with the aperture perpendicular to the length axis of the hydrotheca. They have three to five annular constrictions, completely encircling the hydrotheca and best developed on the adcauline side (fig. 40b). The maximal diameter of the hydrotheca is in the basal third; their smallest diameter is just under the aperture. They have four distinct but low marginal teeth, separated by

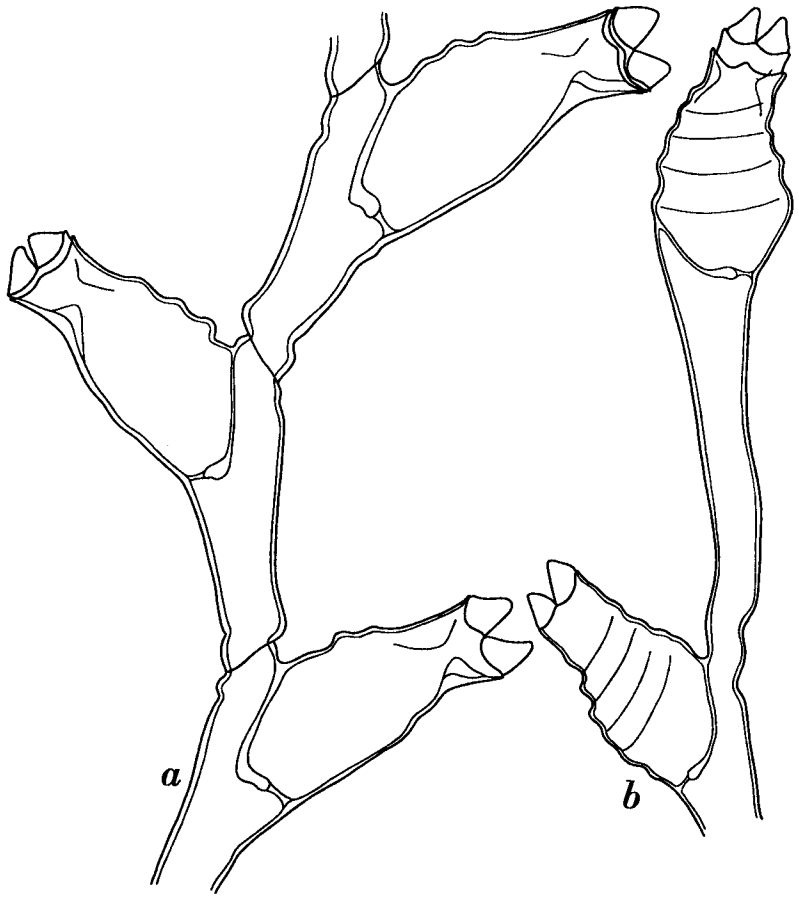

Fig. 40. *Sertularella robusta* Coughtrey. a, Vema 17-48, part of hydrocaulus; b, Vema 18-18, top part of hydrocaulus. a, b, × 70.

shallow, rounded incisions. The closing apparatus is composed of four hyaline, triangular flaps; in very few thecae only it is complete. Each hydrotheca has three very strong, strongly chitinized internal teeth, two in the adcauline embayments of the margin and one below the abcauline marginal tooth. Renovations of the hydrothecal margin are frequent, though the number of renovations is usually restricted to two or three (fig. 41a). The periderm of the colonies is strong though not particularly thick.

No gonothecae have been observed.

Measurements (in microns). —

	Vema 17-48	Vema 18-18
Internode, total length	460-890	1,740
diameter at base	95-135	810
Hydrotheca, length abcauline wall	460-530	810
length free part adcauline wall	350-365	270
length adnate part adcauline wall	245	215
total depth	540-555	420
maximal diameter	245-255	230
diameter at aperture	150-165	110

Remarks. — No gonothecae of this species are present in my material; the identification, therefore, is largely based on characters of the internodes and hydrothecae. The present specimens agree closely with those described by Ralph (1961: 824, fig. 22a-d) from the New Zealand area and with those described by Jäderholm (1905: 31, pl. 12 fig. 8) from the Tierra del Fuego region (as *S. tenella*). The distribution of this species is summarized by Ralph in the following way: New Zealand, Australia, Tasmania, Tierra del Fuego and Indonesia. The only South American record is that by Jäderholm (1905), who recorded the species (as *S. tenella*) from the mouth of the Beagle Channel, south of Slogget Bay, Tierra del Fuego, 100 m depth. The present records are from the shelf east of Deseado, Santa Cruz, Argentina (Vema 18-16 and 18-18), from the Estrecho de Magellanes (Vema 17-19, 17-24 and 17-32), from the south-western Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-106), from the south-western Atlantic south of Peninsula Mitre, Tierra del Fuego, Argentina (Vema 17-47 and 17-48) and from the shelf north of Peninsula Mitre, Tierra del Fuego (Vema 14-14). The localities Vema 17-47 and 17-48 are in the immediate vicinity of Slogget Bay, the locality from where Jäderholm's specimens were obtained.

Sertularella parvula (Allman, 1888) (fig. 41b, c)

Calamphora parvula Allman, 1888: 29, pl. 10 figs. 3, 3a.

Sertularella parvula, Hartlaub, 1900: 49, 50, 52, 54, 62, 113, fig. 30; Billard, 1910: 9; Vervoort, 1968: 46, fig. 22.

Thryoscyphus intermedius Congdon, 1907: 482, figs. 33-36; Bennitt, 1922: 251; Fraser, 1944: 181, pl. 33 fig. 156.

Thyroscyphus intermedius f. *peculiaris* Leloup, 1935: 33, figs. 15-17.

Material. — Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. A large number of single hydrothecae rising from a stolon creeping on a fragment of *Symplectoscyphus subdichotomus* (Kirchenpauer).

Description. — The solitary hydrothecae rise from a smooth, tubular stolon by means of short, irregularly ringed pedicels. In some specimens the pedicels are fairly slender and regularly ringed, in others there is a short, thick pedicel of which the periderm is irregularly folded. The hydrothecae are barrel-shaped and symmetrical, they are separated from the pedicel by a distinct peridermal diaphragm, perforated to allow for the passage of the coenosark. The hydrothecae have their greatest diameter at their middle or in the lower third; they swell fairly strongly from base to middle and taper gradually towards the apical portion. There are 8 to 10 distinct circular depressions, separated by more or less distinct rings, that do not have the character of frills or peridermal lists (fig. 41b, c). The apical portion of the hydrotheca is quadrangular in cross section, very slightly widening at the extreme end. The aperture is provided with four low teeth, separated by very shallow, rounded incisions. The closing apparatus is roof-shaped and composed of four triangular plates, tightly fitted together in the majority of the hydrothecae. Some of the hydrothecae have no closing apparatus, that either has not been developed or has become lost; in such hydrothecae the five internal teeth can easily be observed (fig. 41c). Though the periderm of the hydrothecae is strong, it thins out near the hydrothecal aperture, where it becomes transparent, so that the internal teeth, if present, can also be observed exteriorly. The development of the internal marginal teeth differs greatly: in some hydrothecae no trace of internal teeth can be observed, in others some of the teeth are quite distinct whilst the remaining teeth can only be observed with considerable difficulty.

Measurements (in microns). —

	Vema 17-19
Pedicel, total length	55-175
diameter	80-95
Hydrotheca, total depth	340-350
maximal diameter	190-215
diameter at opening	135-175

Remarks. — Though the present specimens are smaller than those previously recorded from the West Indies (Leloup, 1935, as *Thyroscyphus intermedius* f. *peculiaris*; Vervoort, 1968) the agreement in appearance is so close that the specimens in my opinion are conspecific. The principal records

for this species are from Bass Strait, Australia, from Bermuda and from the West Indies. So far it has not been observed in the southern Atlantic; its present record (Vema 17-19) is from the entrance to the Estrecho de Magellanes. The relations of the species to the closely allied, if not identical species *Sertularella solitaria* Nutting (1904: 89, pl. 20 figs. 10, 11) and *S. campanulata* Warren (1908: 300, pl. 47 figs. 21, 22) has previously been discussed (Vervoort, 1968). I have kept in mind the possibility that the present specimens might represent the young colonies of *S. robusta* Coughtrey, a species found to occur in the Estrecho de Magellanes (vide supra), but the shape of the hydrothecae here is strongly different from that observed in *S. robusta*. The hydrothecae are smaller, have a larger number of very deep annular constrictions and a well set-off apical portion of quadrangular cross-section.

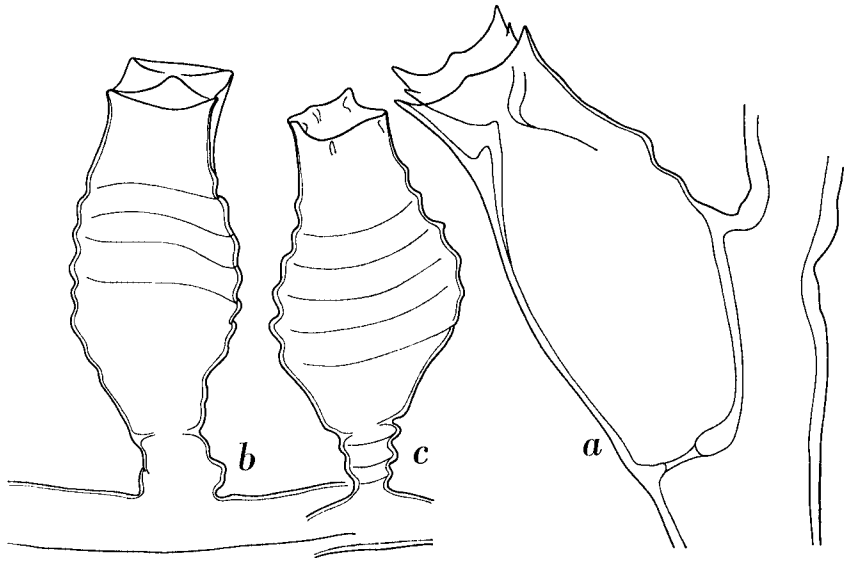

Fig. 41. a, *Sertularella robusta* Coughtrey, Vema 17-48, hydrotheca with renovation. b, c, *Sertularella parvula* (Allman), Vema 17-19, two hydrothecae rising from creeping stolon. a-c, × 120.

Symplectoscyphus plectilis (Hickson & Gravely, 1907) (fig. 42)

Sertularella plectilis Hickson & Gravely, 1907: 20, pl. 3 fig. 21; Ritchie, 1913: 30, figs. 8, 9; Jäderholm, 1916-1917: 10, pl. 1 fig. 8; Jäderholm, 1926: 5.
Symplectoscyphus plectilis, Totton, 1930: 193, fig. 41, pl. 2 figs. 4, 5.
Sertularella glacialis Vanhöffen, 1910: 325, figs. 40a-c.

Material. — Yelcho 2-11, 63°40'S, 64°08'W, 5.3.1962, 240 m. A single 8 mm high fragment without gonothecae.

Description. — The fragment consists of a single, monosiphonic hydrocaulus with eight hydrothecae. The division of the hydrocaulus into internodes is indicated, but no distinct septa are present; the internodes being marked by peridermal constrictions just above each hydrotheca (fig. 42a). The internodes follow each other in a straight line; no zig-zag curvature being apparent. The hydrothecae are of a very characteristic shape, that can best be described as being tubular, with the basal portion swollen, particularly on the abcauline side. They narrow towards the middle of each theca and from then on have an almost uniform cylindrical shape. The apical part of the hydrotheca curves away fairly suddenly from the internode, the curvature being distinctly marked on the abcauline side. The free part of the adcauline wall is one and a half times longer than the adnate part and either almost straight or slightly convex. The hydrothecal aperture is produced into three large, bluntly pointed teeth, separated by deep, rounded embayments. The adcauline tooth is very prominent, the lateral teeth are smaller. Some of the hydrothecae show the occurrence of very frequent renovations, in some of the thecae occurring in such numbers that the hydrothecal apex looks almost scaly (fig. 42b). As a result of the repeated renovations the thickness of the hydrothecal periderm increases; in the renovated hydrothecae the old (primary) hydrothecal border is marked by a ring of periderm. In spite of this the structure of the hydrothecae is fairly weak, as a result of which some hydrothecae have a collapsed apex with scarcely discernible marginal teeth. The closing apparatus is composed of three triangular flaps, visible in some of the hydrothecae only. Remnants of hydranths are also present.

No gonothecae have been observed.

Measurements (in microns). —

	Yelcho 2-11
Internode, length	420-540
diameter	95-120
Hydrotheca, length abcauline wall	335-365
length free part adcauline wall	300-350
length fused part adcauline wall	250-215
total depth	390-405
maximal diameter	135-160
diameter aperture	95-110

Remarks. — This species has previously been recorded from various localities in McMurdo Sound, Ross Sea, including Cape Royds, 36.5-457 m depth (Hickson & Gravely, 1907; Totton, 1930; Ritchie, 1913), from Gauss Station, 66°02'S, 89°38'E (Vanhöffen, 1910); from Discovery Inlet, Ross Sea, 550 m (Jäderholm, 1926), and from off Cumberland, South Georgia, 252-310 m, the only sub-Antarctic locality (Jäderholm, 1916-1917). The

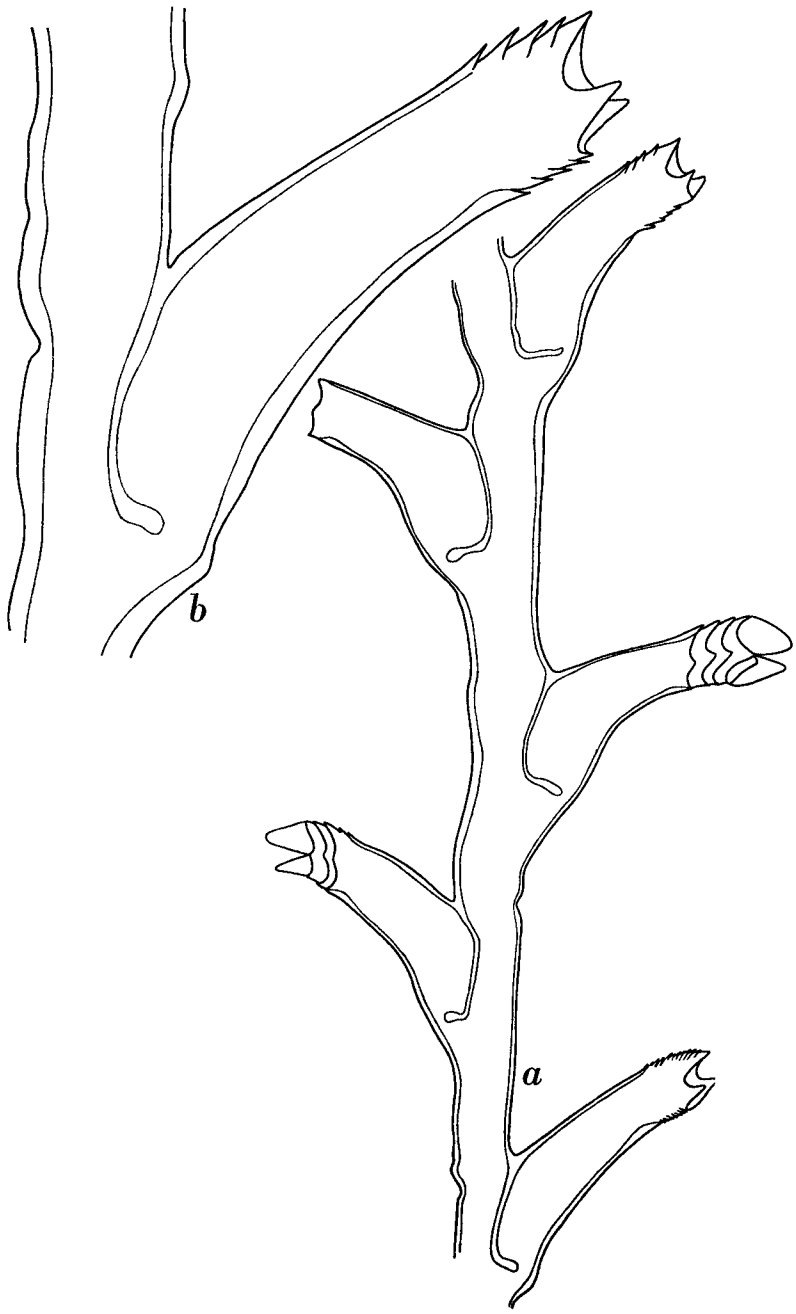

Fig. 42. *Symplectoscyphus plectilis* (Hickson & Gravely), Yelcho 2-11. a, fragment of hydrocaulus; b, hydrotheca with renovations. a, × 70; b, × 320.

present record is from 63°40'S, 64°08'W, Palmer Island region, Graham Land region, north of the Antarctic circle.

Symplectoscyphus elongatus (Jäderholm, 1904) (figs. 43, 44a)

Sertularia articulata Allman, 1888: 61, pl. 29 figs. 3, 3a.
Sertularella articulata, Hartlaub, 1900: 24, fig. 14; Jäderholm, 1905: 29, pl. 11 fig. 4, pl. 12 figs. 1-3; Billard, 1910: 10; Vanhöffen, 1910: 328, fig. 42 a-d; Billard, 1914: 20; Jäderholm, 1916-1917: 9, pl. 1 fig. 7.
Sertularella elongata Jäderholm, 1904: 10; Totton, 1930: 199; Naumov & Stepan'yants, 1962: 80, fig. 5.
Sertularella spiralis Hickson & Gravely, 1907: 19, pl. 3 figs. 19, 20; Totton, 1930: 197, fig. 14 b-d, pl. 1 fig. 7, pl. 3 fig. 5.
Sertularella bifurca Billard, 1914: 22, fig. 13.
Symplectoscyphus articulatus Briggs, 1939: 30.

Material. — Vema 17-45, 62°33'S, 59°26'W, 23.4.1961, SBT, 600-604 m. Two fragments, of 10 and 20 mm length, the largest is twice branched. No gonothecae.
Terra Nova Expedition, Sta. 339, McMurdo Sound, 77°05'S, 164°17'E, 24.1.1912, 140 fms (= 256 m), several fragments of a larger colony, without gonothecae. British Museum (Natural History) no. 1929.10.28.157.

Description of the Vema material. — The fragments are entirely monosiphonic; the stems are divided into short internodes by means of oblique septa; the internodes follow each other in a straight line. The septa of the internodes are slanting in alternate fashion: the place of the septum is indicated by a peridermal constriction both above and below the septum (fig. 43a). The hydrothecae are only very slightly shorter than the total length of the internode; they are alternately arranged, one to each internode, with a slight, though unmistakable tendency towards an arrangement in two planes making a very obtuse angle. The shape of the hydrothecae can best be described as cylindrical, with the greatest diameter at the middle and slightly tapering towards both base and apex. The length of the adnate part of the adcauline hydrothecal wall is about the same as that of the free part; the whole margin has a uniformly curved, convex appearance. The abcauline margin is slightly convex. The hydrothecal aperture is perpendicular to the length axis of the hydrotheca and has three large, obtusely pointed teeth, separated by deep, rounded embayments. The adcauline tooth is slightly larger than the two lateral teeth. The closing apparatus is composed of three flaps, that form a low, triangular roof over the aperture (fig. 44a). The periderm of the colony is thin but quite firm, as no collapsed hydrothecae have been observed. Along the abcauline wall of the hydrotheca it thickens slightly to form a small rounded knob a short distance below the hydrothecal margin; otherwise there is no evidence of intrathecal teeth. Some of the hydrothecae are renovated, though the actual number of renovations of a

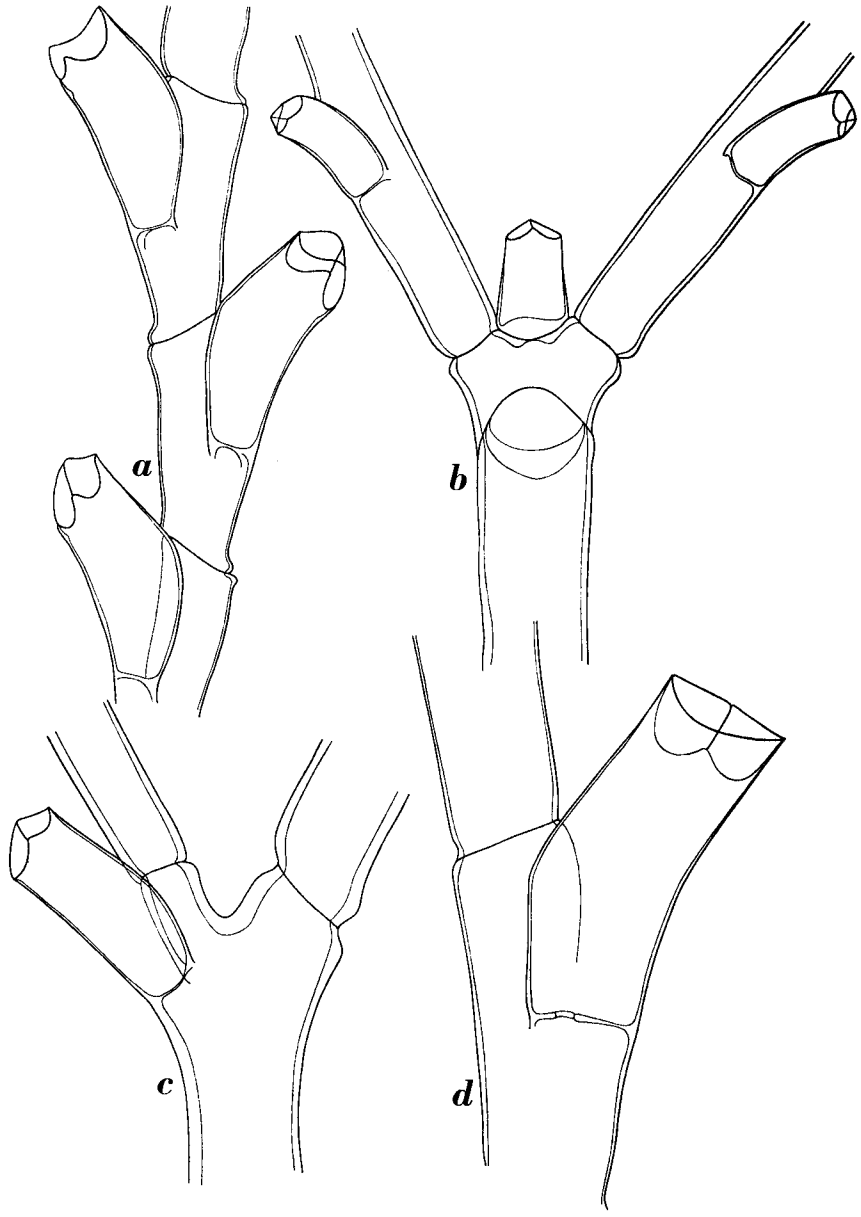

Fig. 43. *Symplectoscyphus elongatus* (Jäderholm). a, Vema 17-45, fragment of a branch; b-d, Terra Nova Exped., Sta. 339; b, insertion of side-branches on stem internode; c, branching of side-branch; d, hydrotheca. a, c, × 55; b, × 30; d, × 90.

single hydrotheca is reduced to three or four. Ramifications are brought about by the formation of a (hydrothecate) internode rising from a (hydrothecate) internode just under the hydrotheca.

Description of the Terra Nova material. — Though I have only fragments at my disposal the structure of the colony is quite clear and corresponds closely to Jäderholm's illustration of the very characteristic appearance of this species (Jäderholm, 1905, pl. 11 fig. 4). The stem is composed of long, spirally arranged internodes; it remains completely monosiphonic throughout life. Each stem-internode has an apical apophysis supporting the following internode and an almost apical hydrotheca. In the axil of hydrotheca and apophysis there is a pair of smaller apophyses, pointing left and right, supporting the side-branches (fig. 43b). The number of stem-internodes that I have been able to inspect is limited; their length varies between 6 and 8 mm. The side-branches, with the exception of their basal parts, are broken up into long and slender internodes by means of slightly oblique septa; each has one apical hydrotheca. Rebranching of the side-branches occurs repeatedly, usually at every third internode; the secondary branch originating from an apophysis opposite the hydrothecae (fig. 43c). Branching may take place alternately on both sides, resulting in feather-like sympodia, or be restricted to one side, resulting in scorpioid sympodia. Occasionally a side-branch is formed, that has the same structure as the stem.

Structure and insertion of the hydrothecae is exactly as in the Vema material and need not be redescribed in detail here (fig. 44a). The periderm, on stem and branches, is fairly thick and firm; its colour is yellowish. On the hydrothecae it thins out very rapidly; the apical portion of the hydrothecae is thin and easily collapsible. A closing apparatus is usually present, though generally in damaged condition. The arrangement of the hydrothecae in two planes making a very obtuse angle is quite apparent in the Terra Nova material. Though I have inspected a large number of hydrothecae no intrathecal teeth have been observed. Occasionally there is a small peridermal notch just under the abcauline tooth.

Measurements (in microns). —

	Vema 17-45	Terra Nova Sta. 339
Internode of side-branch, total length	540-970	875-1,120
diameter at node	175-200	110-165
Hydrotheca, length abcauline wall	380-430	485-515
length free part adcauline wall	245-310	285-300
length fused part adcauline wall	280-365	255-260
total depth	460-500	500-525
maximal diameter	215-245	205-215
diameter at aperture	175-190	160-175

Remarks. — The synonymy of this species is complicated. It was originally described from Kerguelen by Allman (1888: 61, pl. 29 figs. 3, 3a) as *Sertularia articulata*. Allman's specimen was no more than a fragment; both description and drawing are inadequate. Additional material was described by Jäderholm (1904: 10) from South Georgia as *Sertularella elongata*. Billard (1910: 10) firmly established the conformity of Allman's and Jäderholm's material after the inspection of Allman's type in the British Museum (Natural History). This type (1929.10.28.157) has again been inspected by Totton (1930: 199) and by myself. There can, in my opinion, be no reasonable doubt that the material described by Allman (1888, as *Sertularia articulata*); Jäderholm (1905), Vanhöffen (1910), Billard (1914), Jäderholm (1916-1917, all as *Sertularella articulata*); Totton (1930), Naumov & Stepan'yants (1962, all as *Sertularella elongata*), and Briggs (1939, as *Symplectoscyphus articulatus*) is conspecific. The proper name for this species is *Symplectoscyphus elongatus* (Jäderholm, 1904); *Sertularia articulata* Allman, 1888, being preoccupied by *Sertularia articulata* Pallas, 1766: 137.

I have synonymized *Sertularella spiralis* Hickson & Gravely, 1907, with *Symplectoscyphus elongatus*, though Totton (1930: 199) seems to have been disinclined to do so. The only differences between the two species that I have been able to find are the more pronounced tendency towards uniserial arrangement of the hydrothecae (the planes in which they are arranged meet at a very acute angle) and the presence of three intrathecal teeth in *S. spiralis*. Totton has already drawn attention to the fact that the arrangement of the hydrothecae (in *S. spiralis*) is variable as he describes a colony of that species with intrathecal teeth and a biserial arrangement of the hydrothecae. In the Terra Nova material of *S. elongatus* the arrangement of the hydrothecae is slightly variable: in the older side-branches they are placed in two planes meeting at an obtuse angle; in the ultimate branches they are biserially arranged. The variability in arrangement is in keeping with the condition observed in such species as *Sertularella antarctica* Hartlaub, 1900. Though I have never observed intrathecal teeth in my material of *S. elongatus* I am disinclined to attach undue importance to this character, as the development of such teeth is variable in a fair number of species of *Sertularella* and *Symplectoscyphus*. In this particular instance the complete conformity in structure of the highly characteristic colony and the identical structure of the hydranths and their attachment inside the hydrotheca (described in detail by Totton for *S. spiralis* and also observed in the Terra Nova specimen of *S. elongatus* that I have inspected) must in my opinion be considered decisive. *Sertularella bifurca* Billard, 1914, is a junior synonym of *Sertularella spiralis*

Hickson & Gravely, 1907; the latter again must fall in favour of *Sertularella elongata* Jäderholm, 1904. I have referred this species to the genus *Symplectoscyphus*, characterized by the presence of three marginal hydrothecal teeth and an operculum composed of three triangular flaps. I do not understand why Totton, who accepted the institution of a separate genus *Symplectoscyphus* Marktanner-Turneretscher, 1890, for such Sertularellids that have three marginal hydrothecal teeth, left this species (as well as *S. spiralis*) in *Sertularella*.

S. elongatus has been found in the Graham Land region (Erebus and Terror Gulf, 360 m, Jäderholm, 1905; Deception Island, South Shetland Islands and 62°55'S, 63°00'W, 170-140 m, Billard, 1914; 12 miles east of Robertson Island, 410 m, Jäderholm, 1916-1917, all as *S. articulata*); from various localities around South Georgia, 75-310 m (Jäderholm, 1905); from various localities in McMurdo Sound, Ross Sea, between 73 and 378 m (Hickson & Gravely, 1907, as *S. spiralis*; Totton, 1930, as *S. spiralis* and *S. elongata*), off Oastes Land, Antarctica, 69°43'S, 163°24'E, 329-366 m (Totton, 1930, as *S. spiralis*); Royal Sound, Kerguelen, 28-60 fms (= 51-110 m) (Allman, 1888, as *S. articulata*, type locality); Kerguelen, 59 m (Naumov & Stepan'yants, 1962); Gauss Station, 66°02'S, 89°38'E (Vanhöffen, 1910, as *S. articulata*), Commonwealth Bay, King George V Land, Antarctica (Briggs, 1939, as *S. articulatus*). The present locality (Vema 17-45) is from Bransfield Strait in the Graham Land region.

Symplectoscyphus subdichotomus (Kirchenpauer, 1884) (figs. 44b-d, 45)

Sertularella subdichotoma Kirchenpauer, 1884: 46, pl. 16 fig. 1; Hartlaub, 1900: 33, pl. 1 figs. 3, 4, 6-9, 11-16, pl. 2 figs. 10-17, 51, 52, pl. 3 figs. 3, 4, 13, 14; Hartlaub, 1904: 6; Nutting, 1904: 96, pl. 22 figs. 8-12; Hartlaub, 1905: 629, figs. V^3, W^3; Jäderholm, 1905: 25, pl. 9 fig. 8; Jäderholm, 1926: 6.

Symplectoscyphus subdichotomus, Ralph, 1961: 813, fig. 20 c-j; Blanco, 1967: 273, pl. 3 figs. 6-11, pl. 4 figs. 1, 2; Blanco, 1967a: 118, pl. 4 figs. 5-10.

Sertularella divaricata var. *sub-dichotoma* Jäderholm, 1916-1917: 9.

Sertularella johnstoni p.p. Naumov & Stepan'yants, 1962: 82, fig. 6.

Material. — Vema 14-6, 46°47.7' S, 62°47'W, 4.2.1958, SBT, 105 m. Many fragments from a larger colony, 10-25 mm long. No gonothecae.

Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m. A fragment of 15 mm length. No gonothecae.

Vema 14-19, 52°41'S, 59°09'W, 22.2.1958, SBT, 108 m. Fragments of a larger colony, 10-20 mm high, one of these fragments with a gonotheca.

Vema 15-93, 50°17'S, 66°50'W, 20.2.1959, SBT, 82 m. Three fragments of 10-15 mm length. No gonothecae.

Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m. Two fragments, one a 10 mm high, branched specimen, the other a 8 mm long, unbranched fragment. No gonothecae.

Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m. Several fragments, up to 10 mm length, without gonotheca. Covered with *Hebella striata* Allman.

Vema 15-105, 54°06.6' S, 66°20'W, 6.3.1959, 55 m. One about 15 mm long branch and some smaller fragments with many stolons. No gonothecae.

Vema 15-106, 54°10.2'S, 65°44'W, 6.3.1959, 79 m. One small, 10 mm high, branched fragment without gonothecae.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. Several small, 15-20 mm high fragments, partly covered with *Hebella striata* Allman. One gonotheca present.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. Some small branches of 15-20 mm length. Covered with *Hebella striata* Allman and *Filellum serratum* (Clarke). No gonothecae.

Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. Several 5-15 mm high fragments. No gonothecae.

Vema 15-112, 56°40'S, 67°26'W, 13.3.1959, 134 m. One 15 mm high colony and a fragment. No gonothecae.

Vema 16-39, 50°53'S, 62°35'W, 19.5.1960, SBT, 157 m. A fair number of 10-15 mm high fragments without gonothecae.

Vema 16-40, 42°48'S, 63°11'W, 27.5.1960, SBT, 70 m. Two fragments of 10 and 12 mm height, without gonothecae. Covered with *Filellum serratum* (Clarke) and *Hebella striata* Allman.

Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. A small tuft of 20 mm high colonies and some fragments. Three gonothecae are present.

Vema 17-20, 53°21'S, 70°36'W, 29.3.1961, SBT, 247 m. Several small colonies and fragments. No gonothecae.

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. A great number of 20-30 mm high colonies and many fragments. Associated with colonies of *Stegopoma fastigiatum* (Alder) and *Operculariella* spec. Several gonothecae are present.

Vema 17-24, 53°37.7'S, 69°54.6'W, 29.3.1961, SBT, 42 m. A large number of strongly branched, more or less pinnate colonies with many gonothecae. Height 30-40 mm. Covered with *Hebella striata* Allman, *Filellum* spec. and *Laomedea pelagica* (Van Breemen).

Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m. Many fragments of 10-20 mm length, some very strongly branched. No gonothecae.

Vema 17-30, 52°40.2'S, 69°51.5'W, 1.4.1961, SBT, 24 m. Some fragments of 8-15 mm length. No gonothecae.

Vema 17-32, 52°42.3'S, 69°44.5'W, 1.4.1961, SBT, 48 m. Some fragments of 8-15 mm length. No gonothecae.

Vema 17-38, 53°35.4'S, 70°23.5'W, 3.4.1961, SBT, 132 m. Many fragments of 10-25 mm length. No gonothecae. Partly covered with *Stegopoma fastigiatum* (Alder).

Vema 17-47, 55°07.2'S, 66°29.3'W, 4.5.1961, SBT, 71 m. One fragment of 8 mm height and some smaller branches. No gonothecae.

Vema 17-48, 55°10'S, 66°23'W, 4.5.1961, SBT, 42 m. Several fragments of about 15 mm length, without gonothecae.

Vema 17-78, 42°28'S, 58°31'W, 24.5.1961, SBT, 227-229 m. Several 15 mm long fragments. No gonothecae.

Vema 17-79, 42°28'S, 58°31'W, 24.5.1961, SBT, 251-262. Five small, 15 mm high fragments, without gonothecae.

Vema 17-88, 45°11'S, 60°55'W, 11.6.1961, SBT, 110 m. Several fragments of about 10 mm height. No gonothecae.

Vema 17-89, 45°02'S, 61°18'W, 11.6.1961, SBT, 102 m. A very large number of small colonies, 10-20 mm high and many fragments. No gonothecae.

Vema 17-91, 44°45'S, 62°11'W, 11.6.1961, SBT, 98 m. Two fragments of 10 and 15 mm height. No gonothecae.

Vema 17-100, 44°23'S, 59°53'W, 13.6.1961, SBT, 166-177 m. A small patch of 15-20 mm high colonies and some fragments. A single gonotheca is present.

Vema 18-12, 47°09'S, 60°38'W, no date (February, 1962), SBT, 424-428 m. Several fragments of 10-20 mm height. No gonothecae.

Vema 18-14, 47°13'S, 61°30'W, 17.2.1962, SBT, 132-130 m. One small colony of 25 mm height. No gonothecae.

Vema 18-15, 47°22'S, 62°06'W, 18.2.1962, SBT, 135-137 m. One fragment of 15 mm height and several smaller fragments. No gonothecae.

Vema 18-16, 47°30'S, 62°39'W, 18.2.1962, SBT, 123 m. A single, 3 mm long fragment. No gonothecae.

Vema 18-23, 52°25'S, 68°11'W, 20.2.1962, SBT, 22 m. One fragment of 15 mm height, without gonothecae.

Description. — Monosiphonic colonies of greatly varying appearance, but usually either pinnate, the side-branches arranged along a monosiphonic stem bent in zig-zag fashion, or pseudodichotomously branched, i.e., only one of the side-branches from a bifurcation branching again or the dichotomous branching is continued for a short distance only on the opposite side of the bifurcation. Both stems and side-branches are indistinctly divided into internodes, usually no septa are developed, but the nodes are marked by constrictions of the periderm, thickened at the origin of the internode. Just above the constriction the basal part of the internode widens slightly; the swollen part is usually distinctly asymmetrical (figs. 44b, 45a). The number of hydrothecae per internode varies between one and three. Side-branches originate from a distinct apophysis just under a hydrotheca; that hydrotheca thereby becomes axillary and slightly displaced. The hydrothecae are arranged in two opposite rows, they are slightly curved towards the frontal aspect of the colony (fig. 45c). As the length of the internodes varies considerably the distance between the hydrothecae too is subject to considerable variation; in some colonies (Vema 17-24) the internodes are short and the basal part of a hydrotheca is at the level of the aperture of the preceding hydrotheca (fig. 45c). In others (Vema 14-16) the internodes are extremely long and slender and the distance between the hydrothecae is considerable.

The hydrothecae can best be described as tubular, with widened basal portion. The abcauline wall is usually distinctly concave, with a distinct flexure in the middle of its length. In some colonies the basal abcauline wall is slightly convex, in others more or less straight. The free part of the adcauline wall is almost straight, with the exception of the apical part, and of very variable length. In some colonies it has a length of about half that of the adnate part of the adcauline wall (fig. 45d), in others it is one and a half times as long (fig. 45b). All transitional lengths are present in the material I have at my disposal and are sometimes realized in the specimens from one station. The variable length of the free part of the adcauline wall has con-

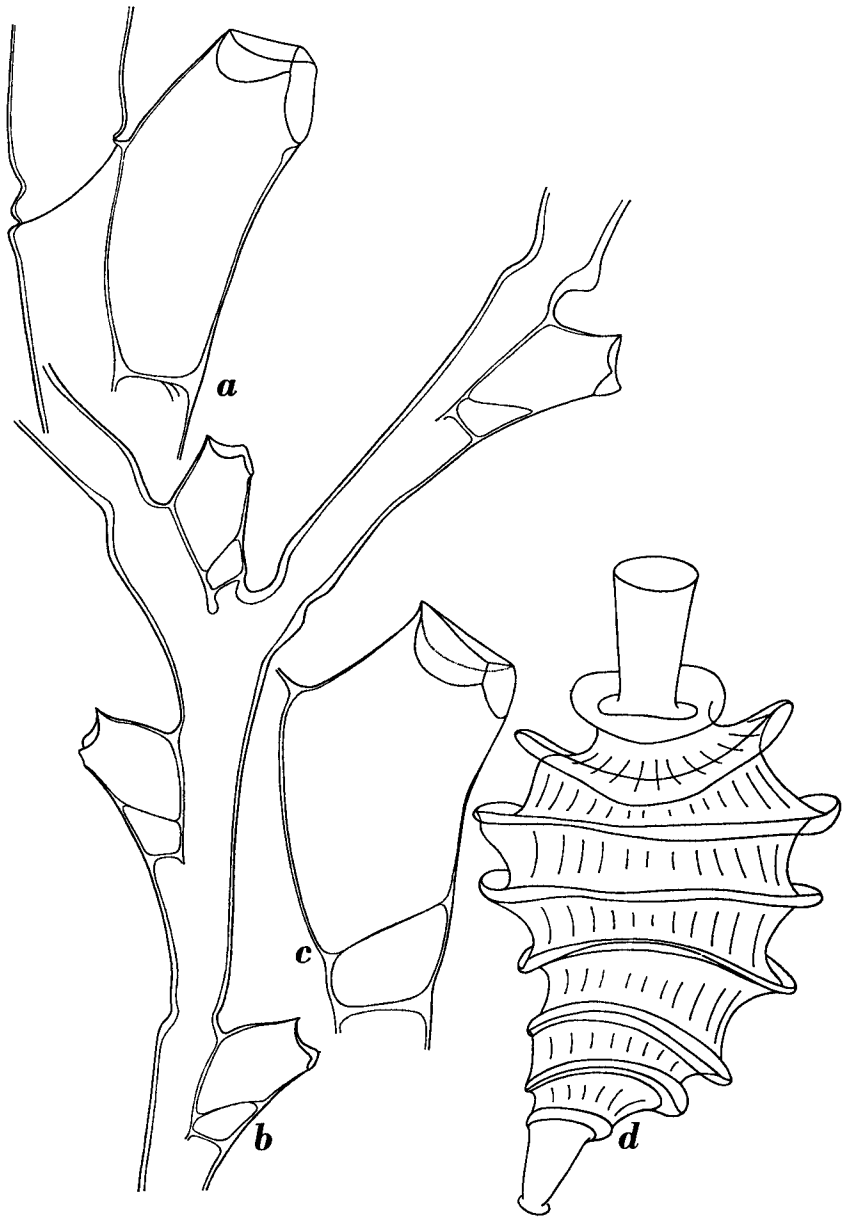

Fig. 44. a, *Symplectoscyphus elongatus* (Jäderholm), Vema 17-45, hydrotheca. b-d, *Symplectoscyphus subdichotomus* (Kirchenpauer); b, Vema 14-16, fragment of colony; c, Vema 14-16, fragment of colony; c, Vema 14-16, hydrotheca; d, Vema 14-19, gonotheca. a, × 90; b, d, × 55, c, × 135.

siderable consequences for the ultimate shape of the hydrotheca; in some specimens the apical portion is fairly short, in others it is considerably elongated and at times slightly tubular, particularly in hydrothecae with renovated apertures. The aperture of the hydrotheca is at right angles to the hydrothecal length axis, thus making a very acute angle with the length axis of the internode. The margin is produced into three obtuse marginal teeth, separated by rounded incisions of variable depth, but usually fairly deep. There is one, slightly upturned adcauline tooth and a pair of lateral teeth. The closing apparatus is composed of three triangular plates (fig. 44c). Renovations of the hydrothecal aperture are of common occurrence; but the number is restricted, five being the maximum observed. Usually the hydrotheca shows a distinct, oblique internal septum, running from the point of flexure in the abcauline margin to the adnate part of the adcauline wall, a short distance above the bottom of the hydrotheca. This is apparently not a complete septum, but a perforated membrane serving the attachment of the hydranth in the cavity of the hydrotheca, as appears very distinctly from hydrothecae with hydranths. In some hydrothecae such a septum is invisible and apparently has disappeared completely as a result of desintegration.

Gonothecae occur on some of the colonies. The shape of the gonotheca is more or less ovoid, gradually narrowing towards the base and there with a short pedicel. In my material there are 7 or 8 very distinct, transverse rings, produced into distinct frills and turned upwards, enclosing a circular, rounded space above each ring (fig. 44d). The terminal aperture is surrounded by a very characteristic, fairly long, slightly flaring funnel. The periderm of the gonotheca is longitudinally striated. The gonothecae are attached to the internodes at the base of a hydrotheca; circular holes in many internodes indicate that a larger number of gonothecae has originally been present.

Measurements (in microns). —

	Vema 14-16	Vema 17-21	Vema 17-24
Internodes of stem, length	605-945	605-810	515-540
diameter at node	120-160	80-110	95-165
Hydrotheca, length abcauline wall	255-300	255-285	285-310
length free part adcauline wall	150-190	215-230	135-175
length adnate part adcauline wall	255-300	215-245	325-335
total depth	325-365	325-350	390-420
maximal diameter	175-190	120-125	190-200
diameter at aperture	120-135	160-165	150-165

The gonotheca is about 1.35 mm long (funnel included) and has, with the frills, a maximum diameter of 890 microns.

Remarks. — The present material shows the great variability of this species in the following respects:

Fig. 45. *Symplectoscyphus subdichotomus* (Kirchenpauer). a, b, Vema 17-21; a, fragment of colony; b, hydrotheca. c, d, Vema 17-24; c, fragment of stem; d, hydrotheca. a, c, × 55; b, × 135; d, × 220.

1. Length of the internode. Colonies with very short internodes occur besides colonies with extremely slender, long internodes. This greatly influences the shape of the colony, as also does the variable development of the periderm. In one colony the older parts of the stems have short internodes with thick, orange-brown periderm; the finer ramifications have slender internodes with the periderm of a light, horny colour.

2. Length of the free part of the abcauline hydrothecal wall. Usually that length varies in one colony, being about half that of the adnate part of the adcauline wall in the older stem internodes, and almost as long as, or slightly longer than that fused part in the hydrothecae of the ramifications. There are colonies, nevertheless, where the length of the free portion of the adcauline wall is quite uniform, being either short or long.

3. Shape of the colony. Usually irregularly pseudodichotomous colonies, bushy in appearance, are found. Some colonies are regularly pinnate. No polysiphonic stems occur in the very abundant material, though the stems of some of the older colonies are heavily invested by stolons of other hydroids.

The number of gonothecae in my material is restricted, and they all have the shape described above, with the exception of some gonothecae that, as a result of pressure against the internode, have a flattened or hollowed portion where no frills are visible. The frills, in my material, are circular; there is no spiral arrangement. Data from literature suggest that the shape of the hydrotheca may be more variable than appears from my observations.

I have kept this species separate from *Symplectoscyphus johnstoni* Gray (1843: 294) mainly because of Ralph's arguments that the two species can be separated. I am convinced, nevertheless, that both Totton (1930) and Ralph (1961) have not fully taken into account the very considerable variability of both species. My material of *S. johnstoni* is very restricted and as I cannot completely exclude the possibility that the two species can be distinguished because of differences in the gonosome, I have left them separate. They have recently been united by Naumov & Stepan'yants (1962: 82). Some of the species described by Totton (e.g., *Symplectoscyphus spiritualis* Totton, 1930: 184, fig. 34; *S. confusus* Totton: 184, fig. 35, pl. 1 figs. 4, 6; *S. epizooticus* Totton, 185, fig. 36a, b, pl. 1 figs. 5, 6; *S. tuba* Totton, 1930: 186, fig. 37a, b, and *S. vanhoeffeni* Totton, 1930: 187, fig. 38a-d) approach *S. subdichotomus* very closely and are very much in need of a critical re-examination, bearing in mind the considerable variability of *S. johnstoni* and *S. subdichotomus*.

As a result of the confusion regarding the specific limitations of the various closely allied species it is impossible to state the area of distribution with some degree of accuracy. It is evident, however, that *S. subdichoto-*

mus, as defined above, occurs quite commonly along both Atlantic and Pacific coasts of southern America; on the Atlantic coast it penetrates as far north as 37°55'S, 56°01'W (Blanco, 1967, 1967a); along the Pacific coast it reaches as far as Calbuco, Chile (Hartlaub, 1905). There are also records from the Falkland Islands (Jäderholm, 1905), from the Burdwood Bank (Jäderholm, 1905) and from isolated localities in Antarctic seas (e.g., Weddell Sea, 64°S, 57°W, Blanco, 1967a). I am inclined, for the present at least, to regard purely Antarctic records for this species with some doubt.

The present records confirm the distributional pattern outlined above. The species has been recorded from the continental shelf and slope from Bahía Blanco in the north to Peninsula Mitre, Tierra del Fuego, in the south, including the area to the north-west of the Falkland Islands (Vema 14-6, 14-14, 15-93, 16-39, 16-40, 17-78, 17-79, 17-88, 17-89, 17-91, 17-100, 18-12, 18-14, 18-15, 18-16 and 18-23); from the Estrecho de Magellanes (Vema 17-19, 17-20, 17-21, 17-24, 17-25, 17-30, 17-32 and 17-38); the south-western Atlantic between Tierra del Fuego, Isla de los Estados and the Falkland Islands (Vema 14-19, 15-98, 15-99, 15-105, 15-106, 15-107, 15-108 and 15-109) and the south-western Atlantic south of Peninsula Mitre and Cabo de Hornos (Vema 15-112, 17-47, and 17-48). The depth range extends to at least 400 m.

Symplectoscyphus milneanus (d'Orbigny, 1846) (figs. 46-50, 51d)

Sertularia Milneana d'Orbigny, 1846: 26, pl. 11 figs. 6-8.
Sertularella milneana, Hartlaub, 1900: 39, fig. 18; Nutting, 1904: 98, pl. 24 figs. 2-5; Hartlaub, 1905: 639, fig. D^4, E^4; Jäderholm, 1905: 26.
Symplectoscyphus milneanus, Stechow, 1923: 172.
Sertularella plana Jäderholm, 1903: 279, pl. 12 fig. 9, pl. 13 figs. 1, 2.
Sertularella meridionalis Nutting, 1904: 98, pl. 23 figs. 8, 9; Hartlaub, 1905: 641, fig. G^4; Jäderholm, 1920: 6, pl. 2 fig. 1.
Symplectoscyphus meridionalis, Stechow, 1923: 172; Blanco, 1967: 264, pl. 3 figs. 1, 2.

Material. — Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m. One fairly large, 50 mm long fragment and several smaller fragments. No gonothecae.

Vema 15-93, 50°17'S, 66°50'W, 20.2.1959, 82 m. Some 15-20 mm long, unbranched fragments. No gonothecae.

Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m. One fragment of 8 mm length, without gonothecae.

Vema 15-100, 53°08'S, 65°07.5'W, 4.3.1959, 126 m. Eight fragments of 3 to 8 mm length. No gonothecae.

Vema 15-103, 53°12'S, 65°30'W, 5.3.1959, 106 m. One fragment of 12 mm length. No. gonothecae.

Vema 15-105, 54°06.6'S, 66°20'W, 6.3.1959, 55 m. Two colonies, 30 and 60 mm high and various fragments. No gonothecae.

Vema 15-106, 54°10.2'S, 65°44'W, 6.3.1959, 79 m. Several small, 15-25 mm high, branched colonies and a large number of small fragments. No gonothecae.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. Two fragments of 10 mm length. No gonothecae.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. One fragmentary colony, without gonothecae.

Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. One small colony and a large number of fragments. No gonothecae.

Vema 15-112, 56°40'S, 67°26'W, 13.3.1959, 134 m. One fragment of 10 mm length. No gonothecae.

Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. Several 80 mm high, well developed colonies and various fragments. No gonothecae. The colonies are partly covered with *Phialella chilensis* (Hartlaub), *Sertularella robusta* Coughtrey and *Campanularia* (*Orthopyxis*) *everta* Clarke.

Vema 17-20, 53°21'S, 70°36'W, 29.3.1961, SBT, 247 m. Several 50 mm high colonies and many fragments. No gonothecae.

Vema 17-29, 52°43.7'S, 69°53.7'W, 1.4.1961, SBT, 24 m. Several 60 mm high, branched colonies and many fragments. No gonothecae.

Vema 17-30, 52°40.2'S, 69°51.5'W, 1.4.1961, SBT, 24 m. Several 15-20 mm high fragments. No gonothecae.

Vema 17-32, 52°42.3'S, 69°44.5'W, 1.4.1961, SBT, 48 m. Some 15-20 mm long fragments. No gonothecae.

Vema 17-33, 52°49'S, 67°35'W, 2.4.1961, SBT, 66 m. A single fragment of 8 mm length. No gonothecae.

Vema 17-66, 50°08'S, 54°14'W, 15.5.1961, SBT, 1511 m. An unbranched stem of 15 mm length with badly damaged hydrothecae. No gonothecae.

Vema 18-23, 52°25'S, 68°11'W, 20.2.1962, SBT, 22 m. Several small colonies of 25 mm height and a large number of fragments. No gonothecae. Covered with *Hebella striata* Allman.

Albatross Sta. 2776, 52°41'S, 69°55.5'W, 21 fms (= 38.4 m), two slides from the United States National Museum, Washington, nos. 19769 and 19770, labelled "*Sertularella meridionalis* Nutting" and marked "type"; here designated as the lectotype) and Albatross Sta. 2777, 52°38'S, 70°10.5'W, 19.75 fms (= 36 m), one spirit specimen from United States National Museum, Washington, no. 20487, labelled "*Sertularella milneana* d'Orbigny".

Albatross Sta. 2783, 51°02.5'S, 74°08.5'W (South Chilean coastal waters), 122 fms (= 223 m), two slides, United States National Museum no. 19767 (labelled "*Sertularella meridionalis* Nutting" and marked "type"; here designated as the lectotype) and United States National Museum no. 19768 (labelled "*Sertularella meridionalis* Nutting" and here designated as the paralectotype).

Description. — The Vema material will first be described; the Albatross material is separately described later on.

Symplectoscyphus milneanus, as appears from the Vema material, is an exceedingly variable species, in which the young colonies do not resemble the older specimens. The full-grown colonies in my material are not larger than 60 mm and have a characteristic way of branching (cf. Jäderholm, 1903, pl. 12 fig. 9). The colonies are irregularly feather-shaped with a main axis that, though it can be distinguished throughout the colony, is scarcely thicker than the branches and remains entirely monosiphonic. The branching is quite irregular, but in one plane; at times it is more or less dichotomous,

at others many short branches occur on one side of a branch and may bear additional ramifications. The branches are slightly compressed, though in the older parts of the colonies they may be round in cross-section. The division into internodes is indistinct and irregular, internodes may bear as

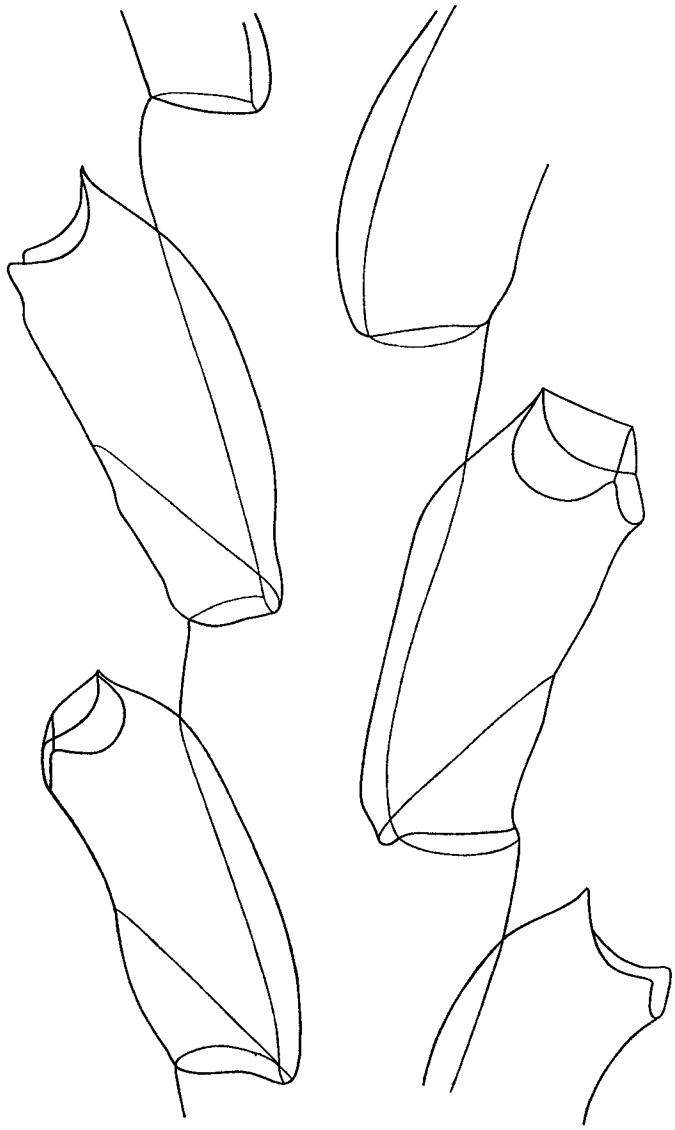

Fig. 46. *Symplectoscyphus milneanus* (d'Orbigny), Vema 14-14, fragment of branch. × 70.

few as four or as many as ten hydrothecae; the side-branches originate from an short apophysis under a hydrotheca, that becomes displaced and axillary (fig. 47b). In the basal part of the hydrocaulus additional septa may be present, that divide that part of the axis into thecate or athecate internodes. The hydrothecae on the thecate internodes may be greatly damaged or deeply sunken into the internode. At the extreme base of the hydrocaulus rings may be present. The nodes are best marked by a considerable constriction of the (thickened) periderm; septa usually are obscure.

The hydrothecae are tubular and slightly curved, deeply sunken into the internode, though the degree of immersion is variable. They are alternately arranged in two opposite rows, pointing strictly laterally (fig. 46). They may, in the older internodes, be fairly closely packed, so that the distance between two successive hydrothecae (free portion of the internode) is about half the total height of the hydrotheca. They may, however, be much wider spaced. In the older colonies with flattened internodes, the hydrothecae are deeply embedded and free for about a third or a fourth of the length of the adcauline wall (fig. 47b). This adcauline wall is straight or slightly convex; the abcauline wall is slightly convex with an indistinctly marked flexure about halfway that border. The aperture of the hydrotheca stands at right angles to the general length axis of the hydrotheca; the margin does not flare, though the adcauline tooth is distinctly upturned. The hydrothecal margin has three distinct, fairly sharp teeth, separated by rounded incisions of variable depth. The teeth are of equal development, though the adcauline tooth is upturned, the lateral teeth are straight. The closing apparatus, present in complete condition in a few hydrothecae only, is composed of three triangular flaps, closing to form a low roof (fig. 47a). The interior of the hydrotheca has a distinct, oblique membrane, serving the attachment of the hydranth and desintegrated in many hydrothecae. The periderm on the colony is firm, yellowish in the older parts of the colony, transparent in the rest. The hydrothecal periderm is thin; the thecae, consequently, are easily damaged. Many hydrothecae are renovated, though the number of renovations is restricted to two or three.

The young colonies are more or less regularly dichotomous, with non-compressed internodes and widely spaced hydrothecae, sunken into the internode for about half the length of the adcauline wall (fig. 48a). Such colonies are striking by the quite different appearance and by the widely spaced hydrothecae with a considerable free portion, diverging from the internode under an angle of about 60°. The basal part of such colonies has some athecate internodes of variable length, often considerably ringed. In the course of development of such colonies the branching becomes more irregular,

Fig. 47. *Symplectoscyphus milneanus* (d'Orbigny). a, Vema 14-14, hydrotheca; b, Vema 17-19, branched fragment; c, d, Albatros Sta. 2776; c, fragment of hydrocaulus; d, gonotheca. a, × 90; b, d, × 30; c, × 55.

the hydrothecae tend to segregate, with the internodes becoming broader and flatter. Though the degree of immersion into the internode is variable they are usually fairly deeply sunken into the internodes, though the axillary hydrothecae still resemble the hydrothecae found in the younger colonies. My material comprises small colonies, of several mm height and dichotomously branched, and larger colonies that fully agree with Jäderholm's description of *Sertularella plana.*

No gonothecae have been observed, though some of the colonies have circular holes just under a hydrotheca, indicating that gonothecae have originally been present.

The following description of the Albatross material identified by Nutting as *Sertularella milneana* is based on the specimen preserved on slide U.S.N.M. no. 19770. This is a branched top-part of a larger colony, about 40 mm high, bearing many gonothecae. The general structure of this fragment is so near to that of the lectotype of *Sertularella meridionalis* that I will only point out the differences. Both the lecto- and paralectotype of *Sertularella meridionalis* are completely described on pag. 155-158.

The shape of the colony is slightly more elegant, as the diameter of stem and branches is less than in Nutting's type of *S. meridionalis*, with the hydrothecae more deeply sunken into the internodes. The mode of branching, however, is identical (fig. 48b). Nodes are mainly observed near the points of articulation, though additional septa have also been observed. The stems, as mentioned above, are thinner than those in Nutting's type of *S. meridionalis*: the hydrothecae have the same shape but are slightly smaller and usually fairly deeply imbedded into the internodes, so that only a small portion of the adcauline wall remains free (fig. 47c). The length of this free part, nevertheless, is subject to considerable variation, as has already been observed by Nutting (1904: 99). In the majority of the hydrothecae the free part of the adcauline wall is one third to one fourth the length of the adnate part; there are hydrothecae, nevertheless, in which that free part is considerably longer, approaching the length of the adnate part. The development of the three marginal hydrothecal teeth in the two specimens is identical.

The gonothecae, that occur in profusion, are slightly longer than those observed in the type of *S. meridionalis*, though they have the same general appearance (fig. 47d). The number of rings and depressions in the apical part may be slightly larger (five to seven), though it must be remembered that only three gonothecae occur in the holotype of *S. meridionalis*. All gonothecae are empty, so that the sex could not be ascertained.

The periderm of the whole colony is less strong than that in the holotype

of *Sertularella meridionalis* Nutting, 1904, (vide infra); it is perfectly hyaline.

The spirit specimen is a much broken colony with gonothecae, that in structure agrees completely with the slides. It will not be described here.

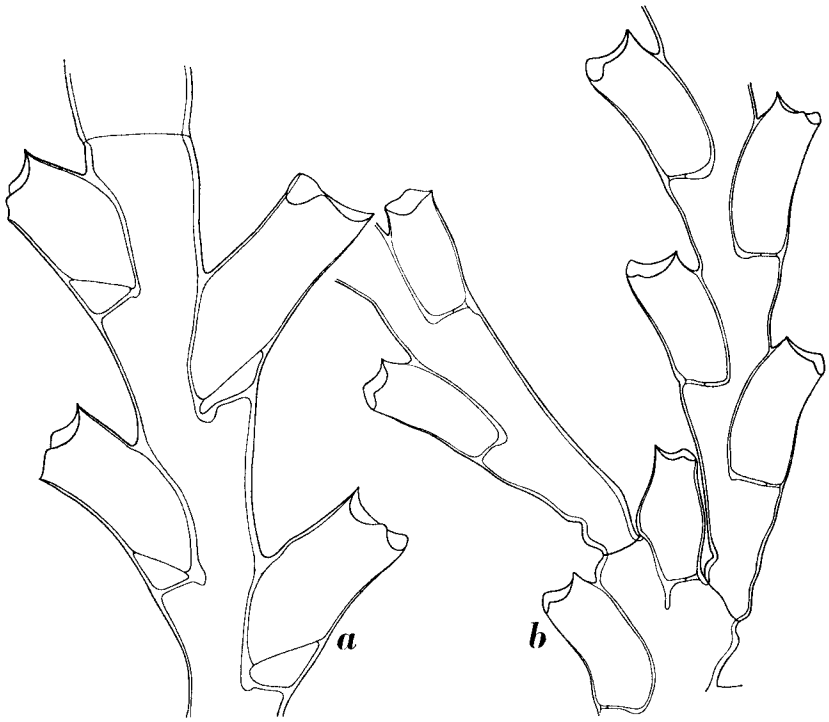

Fig. 48. *Symplectoscyphus milneanus* (d'Orbigny). a, Vema 15-100, fragment of colony; b, Albatross Sta. 2776, branched fragment. a, b, × 30.

Measurements (in microns). —

	Vema 14-14	Vema 15-100	Albatross Sta. 2776
Stem internodes, total length	2,400-3,000		
diameter	475		405-460
Hydrotheca, length abcauline wall	580-690	675-700	460-500
length free part adcauline wall	205-350	405-455	135-270
length adnate part adcauline wall	525-660	595-650	350-540
total depth	810-945	890-945	595-620
maximal diameter	295-365	380-405	245-270
diameter at aperture	215-270	295-340	230-245
Gonotheca, total length, including funnel			2,700
maximal diameter			810-880

Remarks. — Though this is, in well developed condition, a very

characteristic and easily recognized species, there is considerable variability in the length of the free part of the hydrotheca. Young colonies, with a considerable portion of the hydrotheca free from the internode and differing in appearance from that of older colonies, are easily misidentified. Though at a first glance the specimens mentioned by Nutting as *S. meridionalis* and *S. milneana* appear to differ, particularly in the structure of the colony, I have no doubt that both are conspecific. In the description of the Vema specimens of *S. milneana* I have pointed to the great variability in the shape of the colonies, depending on the state of development. The variability in the degree of fusion of the adcauline hydrothecal wall has already been observed by Nutting, though apparently lack of material prevented him to synonymize both species. There is also nearly complete conformity in the shape of the gonothecae; the slightly larger number of ribs and the greater length of the gonotheca of Nutting's specimens of *S. milneana* can scarcely be considered to be of real importance.

S. milneanus was originally described from South Patagonia, probably Bahía de Ros south of Rio Negro (d'Orbigny, 1846). Additional specimens have been recorded from the Estrecho de Magellanes (52°41'S, 69°55.5'W, 38.4 m, and 52°38'S, 70°10.5'W, 360 m, Nutting, 1904), from South Chile, near Isla Hanover (51°02.5'S, 74°08.5'W, 223 m, Nutting, 1904, as *S. meridionalis*), from Martha Bank, Patagonia, 128.8 m (Jäderholm, 1903, as *S. plana*), from Santa Cruz, Patagonia (Jäderholm, 1920, as *S. meridionalis*), from Punta Penas, Argentina (Blanco, 1967, as *S. meridionalis*), and from Port William, Falkland Islands, 40 m (Jäderholm, 1905). The present records are from a restricted area in the south-western Atlantic, with the exception of Vema 17-66, originating from deep water north-east of the Falkland Islands. The remaining records are from the shelf east of the town of Santa Cruz, Argentina (Vema 17-33 and 18-23), from the Estrecho de Magellanes (Vema 17-19, 17-20, 17-29, 17-30 and 17-32), from the south-western Atlantic between Tierra del Fuego and the Falkland Islands (Vema 15-99, 15-100, 15-103, 15-105, 15-106, 15-107 and 15-108), from the shelf north of Peninsula Mitre, Tierra del Fuego (Vema 14-14), from the south-western Atlantic between Isla de los Estados and the Falkland Islands (Vema 15-109) and the south-western Atlantic south of Cabo de Hornos (Vema 15-112). The specimen from Vema 17-66 is in bad shape and may have been transported over a considerable distance.

Sertularella meridionalis Nutting has been synonymized with *Symplectoscyphus milneanus* d'Orbigny, the latter name having priority. The description of lecto- and paralectotype, as complete as the material permits, is appended here.

Sertularella meridionalis. The lecto- and paralectotype are unstained canada halsam slides; the lectotype will be described first. It consists of a 22 mm

Fig. 49. *Sertularella meridionalis* Nutting (= *Symplectoscyphus milneanus* (d'Orbigny)), Albatross Sta. 2783, lectotype. a, fragment of stem with branch and gonotheca; b, hydrotheca. a, × 35; b, × 65.

long fragment, branched twice and bearing two gonothecae, the sex of which cannot be ascertained. The fragment is entirely monosiphonic; septa are only present at the bases of the stems originating from a bifurcation. The stems are compressed and bear two rows of hydrothecae that are alternately arranged in one plane. The distance between the hydrothecae varies slightly. The distance between the point where the free part of the adcauline hydrothecal wall joins the stem and the beginning of the next hydrotheca (marked by a peridermal thickening) on the same side, is usually less than the total length of the adcauline hydrothecal wall and only occasionally, usually at the base of the stems, that distance exceeds the length of the adcauline wall. The hydrothecae are tubular, usually deeply imbedded into the compressed internode, with the adcauline wall smoothly concave. The free part of the abcauline wall is usually much shorter than the fused part, being about half that length or slightly shorter (fig. 49a). Some hydrothecae, nevertheless, have a slightly longer free portion, though never as long as the fused part (fig. 49b). The free portion is straight or slightly concave. The hydrothecal margin has three teeth, one adcauline and slightly upturned, and two lateral. In the majority of the hydrothecae the teeth are moderately obtuse; in others they are sharply pointed. No closing apparatus has been observed on any of the hydrothecae, though it must have been composed of three triangular plates, fitting into the rounded incisions between the hydrothecal teeth.

The gonothecae are distinctly compressed by pressure of the cover glass; they are elongated ovoid, attached with a short pedicel to the hydrocaulus just beneath a hydrotheca. Basally they narrow very gradually; at the apex they are rounded and provided with four circular depressions, separated by distinctly elevated ribs. The apex of the gonothecae has a short, flaring funnel (fig. 49a).

The periderm of the whole colony is fairly thick and yellowish: on the gonothecae it is fairly thin.

The paralectotype generally has the same structure. There is one branched fragment of 16 mm length and a 10 mm long, unbranched fragment. The branched fragment has four empty gonothecae.

The paralectotype differs from the lectotype only in the shape of the hydrothecae, that are generally provided with a longer free portion and diverge slightly from the stems (fig. 50b). As a result the adcauline hydrothecal wall is more distinctly concave, as is the free part of the abcauline wall. The length of that free part may be as long as that of the fused portion or slightly longer or shorter: the abcauline marginal tooth is very distinctly upturned (fig. 51d).

The gonothecae are slightly slenderer than in the lectotype; here they are

Fig. 50. *Sertularella meridionalis* Nutting (= *Symplectoscyphus milneanus* (d'Orbigny)), Albatross Sta. 2783, paralectotype. a, fragment of stem with branch and gonotheca; b, hydrotheca. a, × 40; b, × 70.

the lectotype they are slenderer; the stucture of the apical portion with its four ribs and short, flaring funnel is identical with that in the gonothecae of the lectotype (fig. 50a).

In both lecto- and paralectotype there are remnants only of the hydranths. These are attached to the inside of the hydrotheca by means of an oblique hyaline membrane, running from the internal abcauline corner of the hydrotheca to a point halfway the internal adcauline wall. In some hydrothecae this membrane is distinctly visible; in others it has desintegrated almost completely.

Measurements (in microns). —

	Lectotype	Paralectotype
Stem, maximal diameter	445-500	515
Hydrotheca, length abcauline wall	540-595	540-555
length free part adcauline wall	175-285	245-475
length fused part adcauline wall	525-595	325-445
total depth	660-770	670-675
diameter at aperture	245-285	245-270
maximal diameter	270-325	335-340
Gonotheca, total length, including funnel	2,090-2,160	2,430-2,440
maximal diameter	1,240-1,285	1,015-1,020

Remarks. — At first inspection there are considerable differences in the shape of the gonothecae between lectotype and paralectotype. Nutting's figure (1904, pl. 23 fig. 8) evidently has been made after the paralectotype. In the lectotype the hydrothecae are much deeper imbedded into the internodes, but even in the paralectotype there are some deeply sunken hydrothecae, that cannot be distinguished from those of the lectotype, while in the lectotype there are some hydrothecae with fairly long free apical portion, approaching those of the paratype. Apparently Nutting saw no reason to distinguish between both types of fragments, neither do I now. Nutting's figure, nevertheless, has created a faulty conception of this species. Though it differs in several respects from the material attributed by Nutting to *Sertularella milneana* (d'Orbigny, 1846) it is my opinion that the two species cannot possibly be separated, as the abundant material from the Vema collection conclusively shows.

Symplectoscyphus magellanicus (Marktanner-Turneretscher, 1890) (figs. 51a-c, 52, 53)

Calyptothuaria magellanica Marktanner-Turneretscher, 1890: 244, pl. 5 fig. 7.
Sertularella magellanica Hartlaub, 1900: 22, 39, fig. 17; Nutting, 1904: 99, pl. 24 fgis. 6-8; Hartlaub, 1905: 632, figs. X^3, Y^3.

Material. Vema 14-14, 54°23'S, 65°35'W, 19.2.1958, SBT, 75 m. A few unbranched

colonies growing from a stolon creeping on *Symplectoscyphus milneanus* (d'Orbigny) and some branched fragments. No gonothecae.

Vema 14-19, 52°41'S, 59°09'W, 22.2.1958, SBT, 108 m. A fragment of about 10 mm length with a single side-branch. No gonothecae.

Vema 15-93, 50°17' S, 66°50'W, 20.2.1959, SBT, 82 m. Several 8-75 mm long fragments, all monosiphonic and branched. No gonothecae.

Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m. A 10 mm long fragment in bad condition probably belongs to this species. No gonothecae.

Vema 15-102, 52°53.3'S, 65°35'W, 5.3.1959, 108 m. A single 12 mm long fragment. No gonothecae.

Vema 15-105, 54°06.6'S, 66°20'W, 6.3.1959, 55 m. A branched stem of 15 mm length and a 5 mm long fragment, all monosiphonic. No gonothecae.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. Several 15-20 mm high, monosiphonic fragments. No gonothecae.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. Three fragments, one a branched, 15 mm long stem and two unbranched fragments. All monosiphonic and without gonothecae.

Vema 15-109, 54°11.5'S, 62°36'W, 7.3.1959, 403 m. Several branched and unbranched monosiphonic fragments of 15-20 mm height. No gonothecae.

Vema 17-19, 52°58.6'S, 70°30.8'W, 29.3.1961, SBT, 90 m. A 35 mm high, pinnate colony, monosiphonic and without gonothecae.

Vema 17-20, 53°21'S, 70°36'W, 29.3.1961, SBT, 247 m. A 20 mm high, branched, monosiphonic fragment. No gonothecae.

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. Two branched monosiphonic fragments, 15 and 20 mm high. No gonothecae.

Vema 17-47, 55°07.2'S, 66°29.3'W, 4.5.1961, SBT, 71 m. Several monosiphonic fragments, 15-40 mm long. Branching on one side of stem only. No gonothecae.

Vema 17-100, 44°23'S, 59°53'W, 13.6.1961, SBT, 166-177 mm. A small, mutilated colony of about 30 mm height, attached to a stone, and some fragments. All monosiphonic and without gonothecae.

Vema 17 RD 12, 44°19'S, 59°52'W, 13.6.1961, rock dredge 183-366 m. A single monosiphonic fragment of 20 mm length. No gonothecae.

Vema 18-23, 52°25'S, 68°11'W, 20.2.1962, SBT, 22 m. A large number of fragments of a larger colony, some of the fragments 20 mm long. No gonothecae.

Albatros Sta. 2771, off Cabo Virgenes (Cape Virgins on label), 51°34'S, 68°W, 50.5 fms (= 92 m), one sample preserved in alcohol, United States National Museum no. 20469. Labelled *Sertularella magellanica* Marktanner-Turneretscher (fragments without gonothecae, greatest height 15 mm), but also containing large colonies of *Amphisbetia operculata* (L.) and several colonies of *Sertularella conica* Allman, 1877.

Description. — The Vema material will first be described; the material from the U.S. National Museum is separately described (pag. ...).

The colonies in the Vema material are all monosiphonic and of variable appearance. Usually there is a main stem bearing regularly alternating side-branches of the same diameter and character, that may have secondary ramifications. Some colonies are more irregularly branched and have all the side-branches on one side of the stem. Both stems and side-branches are divided into internodes, that are separated by slightly oblique septa and distinct constrictions of the periderm. The septa usually are visible in the older stems

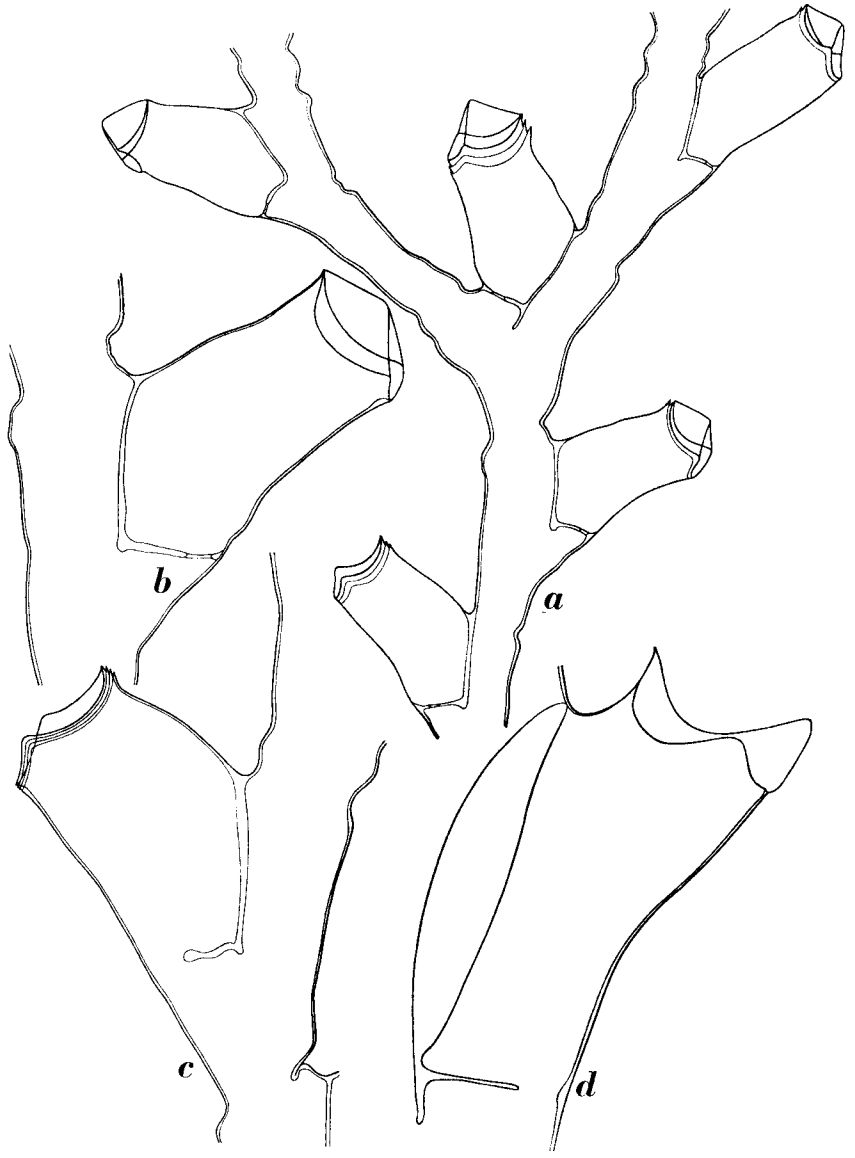

Fig. 51. a-c, *Symplectoscyphus magellanicus* (Marktanner-Turneretscher), Vema 15-105. a, branched fragment; b, c, two hydrothecae. d, *Sertularella meridionalis* Nutting (= *Symplectoscyphus milneanus* (d'Orbigny)), Albatross Sta. 2783, paratype, hydrotheca from stem. a, × 30; b, c, × 70; d, × 90.

only; in the younger stems and the majority of the side-branches the nodes are only indicated by peridermal constrictions that are not particularly deep. The length of the internodes varies greatly, in some colonies they are short, in others, or in other parts of the same colony, they are longer and slender. The number of hydrothecae borne by the internodes also varies greatly between the various colonies and in one colony. The usual condition seems to be one hydrotheca per internode, but as many as 8 hydrothecae per internode have been counted. The variability in length of the internodes and the variability in the number of hydrothecae per internode gives the colonies a greatly changing appearance. In some colonies, or parts of a colony, the hydrothecae are closely packed, in others they are widely spaced.

Side-branches originate from the stem internodes directly under a hydrotheca. The axillary hydrotheca may become slightly displaced; in other colonies there is a fair distance between place of origin of the side-branch and the bottom of the (axillary) hydrotheca. There is usually no septum dividing apophysis from side-branch, the athecate part of the side-branch may be comparatively long (i.e., twice or thrice the depth of a hydrotheca); it is usually irregularly wrinkled basally (fig. 51a).

The hydrothecae are fairly large, wide and apically everted, alternately arranged along stems and branches; the base of a hydrotheca sometimes is just above the level of jointing between adcauline wall and stem of the preceding hydrotheca, in other colonies separated by a considerable length of internode. The hydrothecae are more or less tubular, slightly widening basally, the apical portion cylindrical or slightly narrowing, at the aperture slightly but distinctly everted. The fused portion of the adcauline wall may be about as long as or slightly longer than the free portion of that wall (fig. 51c); in other hydrothecae the free part is almost one and a half times as long (fig. 51b). The abcauline wall is almost straight or slightly concave; it may be slightly sinuous. The free portion of the adcauline wall is straight or slightly convex; it may also have some indistinct undulations. The margin has three equally developed, sharp teeth, one adcauline, two lateral, separated by shallow, rounded incisions. The everted condition of the aperture is particularly noticeable in the adcauline marginal tooth, that appears to be slightly upturned. The closing apparatus is composed of three triangular, hyaline plates, fitting together to form a low roof. The hydrothecal margin may be repeatedly renovated. In the older parts of the colonies there is a distinct foramen under each hydrotheca. The periderm on stem and branches is firm though not particularly thick; on the stems it is faintly yellowish. It thins out on the hydrothecal walls that are easily collapsible. Many hydrothecae have a thin internal septum running from a point halfway the (internal) abcauline wall to a point slightly

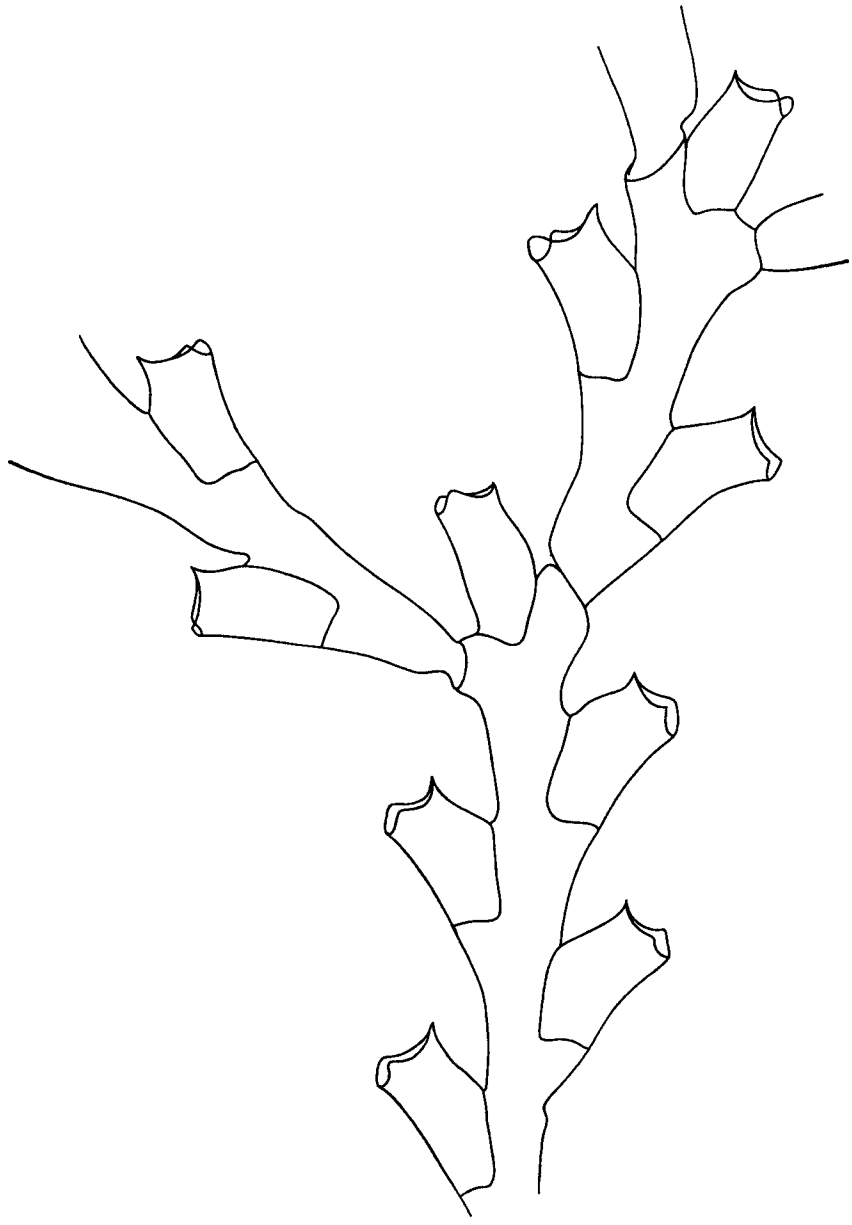

Fig. 52. *Symplectoscyphus magellanicus* (Marktanner-Turneretscher), Albatross Sta. 2771, branched fragment. ×25.

above the bottom of the (internal) adcauline wall. This septum is the rest of a membrane serving the attachment of the hydranth inside the hydrothecal cavity; it is completely invisible in empty hydrothecae.

No gonothecae have been observed.

The colonies in the material from the U.S. National Museum are also monosiphonic, with a fairly distinct, though not particularly thickened main stem. The side-branches are alternately arranged and may rebranch, the stem is divided into internodes and slightly geniculated. The internodes of the main stem are of variable length, but usually they have a basal and apical oblique septum and three hydrothecae. The side-branch originates from a short apophysis under the distal hydrotheca, that has thus become axillary (fig. 52). The number of hydrothecae on the stem internodes may increase considerably. The diameter of the stem in the basal parts of the colony is slightly less than that in higher parts of the colony; basally there may also be some rings. The stem and branches in the higher parts of the colony are not compressed. The division of the side-branches into internodes is very indistinct. The hydrothecae are arranged in two series along stems and branches; moreover, they have an alternate arrangement (fig. 53b). The distance between two successive hydrothecae on one side of the stem or branch is as much as or more than the length of the abcauline hydrothecal wall. The hydrothecae are more or less tubular, greatest diameter in the middle, narrowing both proximally and distally. They are fairly large and diverge distinctly from the internode; the abcauline wall is slightly though distinctly concave, as is the free part of the adcauline wall (fig. 53a). The length of that free part varies considerably, but it is usually as long as or slightly shorter than the fused portion of the abcauline wall (fig. 53c). The hydrothecal aperture has three pointed teeth, separated by deep, rounded embayments. The adcauline tooth is distinctly upturned. The place of the hydrothecal aperture is perpendicular to the length axis of the hydrotheca. The closing apparatus, if present, is composed of three triangular plates, forming a sharply pointed roof-like structure. Renovations of the hydrotheca are present, though not particularly frequent and are restricted to one or two renovations. Many hydrothecae have contracted polyps, attached in the hydrotheca by means of an oblique hyaline membrane, running from the adcauline wall (from a point slightly under the middle of that wall) to the adcauline proximal corner of the hydrotheca. No gonothecae have been observed.

The periderm on the colony is quite firm and yellowish brown. It thins out on the hydrothecae, but on the inside of the abcauline wall it usually forms a slight swelling just under the hydrothecal aperture.

Fig. 53. *Symplectoscyphus magellanicus* (Marktanner-Turneretscher), Albatross, Sta. 2771. a, fragment of stem with ramification; b, part of branch; c, hydrotheca, a, b, × 30; c, × 70.

	Vema 15-105	Albatross Sta. 2771
Stem, length of internode	880-1,150	
diameter at node	175-205	295-405
Upper branches, maximal diameter		475-540
Hydrotheca, length abcauline wall	580-650	540-610
length free part adcauline wall	420-540	295-380
length adnate part adcauline wall	420-460	485-555
total depth	745-770	730-755
maximal diameter	380-430	390-405
diameter	340-380	325-380

Remarks. — Through the kindness of Dr. E. Kritscher and Dr. O. Paget, Naturhistorisches Museum, Zoologische Abteilung, Wien, I have been informed that Marktanner-Turneretscher's type of *Calyptothuaria magellanica* is no longer extant. Nutting does not emphatically state that he has seen Marktanner-Turneretscher's type but he seems to have been convinced that his material is identical with *C. magellanica.* A comparison of Nutting's material with Marktanner-Turneretscher's description reveals no points against such an identification; the size of the hydrothecae (0.8-0.9 mm long with a maximal diameter of 0.30-0.45 mm according to Marktanner-Turneretscher) very strongly points in that direction. Though the status of this species is still strongly hampered by the unfamiliarity with the gonothecae, I have, at least temporarily, accepted it as valid. I can hardly understand why Hartlaub (1905: 638) thought *S. magellanicus* to be identical with *S. subdichotomus* (Kirchenpauer), the great size of the hydrothecae, distinctly stated in Marktanner-Turneretscher's description, strongly points against such a conclusion.

Symplectoscyphus magellanicus is undoubtedly closely related to *S. milneanus* (d'Orbigny, 1846); particularly the young colonies of the latter at times greatly resemble those of *S. magellanicus.* The mode of ramification, however, is quite different while the hydrothecae in *S. milneanus* usually are deeply sunken into the (compressed) internodes.

Sertularella affinis Hartlaub (1900 : 43) in my opinion cannot reasonably be separated from *Symplectocyphus magellanicus,* with which I have now synonymized it. Nutting (1904 : 97) has synonymized *S. affinis* with *Sertularella quadrifida* Hartlaub (1900 : 120) (= *Thuiaria quadridens* Allman, 1888 : 66, pl. 31 figs. 2, 2a), a move which I consider to be incorrect. *S. quadrifida* is a badly known species, urgently in need of a critical re-examination, but different in my opinion from *Symplectoscyphus magellanicus.*

S. magellanicus was originally described from the Estrecho de Magellanes by Marktanner-Turneretscher, 1890 (no exact locality stated). Additional

specimens were described by Nutting (1904) from off Cabo Virgenes, Santa Cruz, Argentina. Hartlaub (1905, as *Sertularella affinis*), records the species from Stanley Harbour, Falkland Islands. The present records are from the continental slope south-east of Peninsula Valdés, Argentina (Vema 17-100 and 17 RD 12), from the shelf east of the town of Santa Cruz, Argentina (Vema 15-93), from the shelf south-east of Cabo Virgenes, Santa Cruz, Argentina (Vema 18-23), from Estrecho de Magellanes (Vema 17-19, 17-20 and 17-21), from the south-western Atlantic between Tierra del Fuego, Isla de Los Estados and the Falklands Islands (Vema 15-98, 15-102, 15-105, 15-107, 15-108 and 15-109), from the shelf north of Peninsula Mitre, Tierra del Fuego (Vema 14-14), from the south-western Atlantic between the Falkland Islands and Burdwood Bank (Vema 14-19), and from the south-western Atlantic south of Peninsula Mitre, Tierra del Fuego (Vema 17-47).

Symplectoscyphus tricuspidatus (Alder, 1856) (fig. 54)

Sertularia tricuspidata Alder, 1856: 356, pl. 13 figs. 1, 2.
Sertularella tricuspidata, Hincks, 1868: 239, pl. 47 fig. 1; Nutting, 1904: 100, pl. 25 figs. 3-7; Broch, 1910: 168, 214, fig. 25; Broch, 1918: 98; Naumov, 1960: 348, fig. 240.
Symplectoscyphus tricuspidatus, Stechow, 1923a: 173.

Material. — Vema 16-48, 60°10'N, 47°08'W, 21.8.1960, SBT, 300 m. Several branched fragments of 10-15 mm length. No gonothecae.
Vema 16-49, 60°10'N, 47°10'W, 21.8.1960, SBT, 274 m. Various 10-20 mm long, partly branched fragments, one with an empty gonotheca.
Vema 16-61, 51°18'N, 56°52'W, 5.9.1960, SBT, 101 m. Several 10-15 mm long fragments, branched but without gonothecae.
Vema 17 RD 29, 60°27'N 48°31'W, 4.9.1961, rock dredge, 366-326 m. One small colony attached to the base of *Aglaophenopsis cornuta* (Verrill). No gonothecae.

Description. — The material available here is entirely monosiphonic, but probably represents fragments from older colonies. A main stem can usually be distinguished, though it has the same diameter and appearance as the side-branches. The side-branches are alternately arranged and face the opposite directions of the stem, which between the branches is geniculated. The branches originate from a short apophysis under a cauline hydrotheca; the basal part of a branch is slightly swollen (fig. 54a). The number of hydrothecae between two successive branches is variable, but usually amounts to three or five. Both stem and branches are divided into internodes by means of constrictions of the periderm; septa are rare. Each internode has one distal hydrotheca, that can best be described as tubular and slightly curved. The abcauline wall is distinctly concave. The free portion of the adcauline wall is about twice as long as the fused part, but the degree of freedom of the adcauline wall is variable to some extent. The adcauline wall is slightly convex

Fig. 54. *Symplectoscyphus tricuspidatus* (Alder), Vema 16-48. a, branched fragment; b, hydrotheca. a, × 40; b, × 120.

but at the distal end it is concave, so that the adcauline marginal tooth is distinctly upturned. The hydrothecal aperture has three fairly sharp teeth, separated by deep, rounded incisions; its plane is almost parallel to that of the length axis of the internode. The closing apparatus is composed of three triangular plates, fitting together to form a low roof (fig. 54b). The hydrothecal margin may be slightly thickened, but no internal teeth have been observed. Renovations occur sparingly and may be restricted to one or two. The periderm of the colony is hyaline and strong, thinning out on the hydrothecae.

The gonotheca is ovoid, with six transverse, elevated rings; the aperture is terminal and surrounded by a short funnel that has the shape of an inverted cone. The gonotheca exactly resembles Naumov's figure (1960, fig. 240).

Measurements (in microns). —

	Vema 16-48
Stem internode, total length	715-875
diameter at node	150-165
Hydrotheca, length abcauline wall	310-350
length free part adcauline wall	310-325
length fused part adcauline wall	215-245
total depth	460-485
maximal diameter	230-245
diameter at aperture	200-215

Remarks. — This is a circumpolar, boreo-arctic species, widely distributed and very common in northern parts of Atlantic and Pacific Oceans, penetrating deep into boreal regions along the coasts of the continents. Its geographical distribution has been summarized by Broch (1910, 1918) and Naumov (1960) and will not be dealt with in detail here. The present localities are from the north-eastern Atlantic off the south point of Greenland (Vema 16-48, 16-49, and 17 RD 29) and from the Strait of Belle Isle, Newfoundland (Vema 16-61). There are repeated references to the occurrence of this species in southern, sub-Antarctic waters, lately by Naumov & Stepan'yants (1962: 83) who record the species from the Atlantic between Tierra del Fuego and the Falkland Islands and from the Pacific entrance to the Estrecho de Magellanes. I am inclined to regard such records with considerable doubt. Not a single specimen of this species is present in the extensive Vema collection from southern waters.

Symplectoscyphus flexilis (Hartlaub, 1900) (figs. 55, 57a)

Sertularella flexilis Hartlaub, 1900: 44, pl. 3 fig. 2, pl. 4 fig. 28; Jäderholm, 1904: 5; Hartlaub, 1905: 703.

Symplectoscyphus flexilis, Stechow, 1923a: 171.

? *Sertularella tricuspidata* Ritchie, 1907: 536; Naumov & Stepan'yants, 1962: 83.
Symplectoscyphus glacialis Blanco, 1967: 265, pl. 4 figs. 3-6, 9-12.

Material. — Vema 16-40, 42°48'S, 63°11'W, 27.5.1960, SBT, 70 m. A 20 mm high, tangled colony consisting of branched hydrocauli rising from creeping stolonal fibres. No gonotheca.

Description. — The branching in the present specimen is very irregular. The stems at irregular intervals give off side-branches, that run parallel with the stems. Both stems and branches may carry shorter, pinnate ramifica-

Fig. 55. *Symplectoscyphus flexilis* (Hartlaub), Vema 16-40, part of stem with branch. × 55.

tions; the whole mass of fine shoots intertwines strongly and gives the colony a bushy appearance. Side-branches originate from the internodes, and spring directly from the internode under a hydrotheca; no apophysis has been observed (fig. 55). Internodes of the stems are shorter and separated by fairly distinct, oblique septa; in addition a peridermal constriction is present. Those of the side-branches are slenderer; septa usually are not present but peridermal constrictions mark the limits of those internodes. In some instances the basal part of the internode, near the constriction, is twisted.

The hydrothecae greatly resemble those of *S. tricuspidatus*, but are at once remarkable by the great number of renovations, that may considerably elongate and ultimately narrow the apical part of the hydrotheca. The shape of the hydrotheca may be described as more or less tubular, the apical part is everted (fig. 57a). They are arranged in two series, alternately pointing left or right, and attached to the distal part of the internodes. The two series are strictly in one plane. The abcauline wall of the hydrotheca is distinctly concave; the proximal portion is a smooth continuation of the wall of the internode, without re-entrance angle; the curvature is in the middle of the abcauline wall. The free part of the adcauline wall is as long as to one and a half times as long as the fused part, renovations not included. This adcauline wall is straight or slightly convex. The hydrothecal margin has three fairly obtuse teeth, one adcauline and slightly upturned, two lateral.

The closing apparatus is present in some thecae only and is composed of three hyaline flaps, closing to form a high, sharply pointed roof. The basal wall of the hydrotheca is completely closed by a peridermal plate with circular perforation to permit the passage of the perisarcal tissue. A distinct fenestra is present. Hydranths are in bad condition, but the hyaline membrane attaching the hydranth is visible in many hydrothecae as an oblique septum in the interior of the hydrotheca.

Measurements (in microns). —

	Vema 16-40
Stem internode, total length	475-610
diameter at node	135-160
Hydrotheca, length abcauline wall	380-485
length free portion adcauline wall	380-445
length adnate portion adcauline wall	190-245
total depth	555-595
maximal diameter	230-245
diameter at aperture	185-205

Remarks. — This species has originally been described from Calbuco, Chile, by Hartlaub (1900: 44, pl. 3 fig. 2, pl. 4 fig. 28); I have been unable to trace redescriptions of this species based on original material. There is

complete conformity of the Vema specimens with Hartlaub's fairly short description; the conformity of the colonial structure and particularly the shape of the hydrothecae is very striking. Gonothecae of *S. flexilis* are unknown and the Vema material is sterile; the identification consequently must remain provisional.

This species seems me to be very near to *Sertularella modesta* Hartlaub (1900: 42, pl. 1 fig. 1, pl. 2 fig. 28), described from Ushuaia, southern coast of Tierra del Fuego; both species undoubtedly are allied to *Symplectoscyphus tricuspidatus* (Alder, 1856). The latter has been recorded from Burdwood Bank, 54°25'S, 57°32'W, 56 fms (= 102 m) by Ritchie (1007), from the Atlantic between Tierra del Fuego and the Falkland Islands, 136 m (Naumov & Stepan'yants, 1962), and from the Pacific entrance to the Estrecho de Magellanes, 100 m (Naumov & Stepan'yants, 1962) (vide supra). Ritchie's specimens have subsequently been referred to *Symplectoscyphus elongatus* (Jäderholm, 1904) by Rees & Thursfield (1965: 127, as *Symplectoscyphus articulatus*); this, however, must be due to an error.

S. flexilis has much in common with *Symplectoscyphus glacialis* (Jäderholm, 1904), so much so that I suspect that Blanco (1967: 265, pl. 4 figs. 3-6, 9-12) has confused both species. Blanco's material originates from Puerto Madryn, Chubut, Argentina. I have thought it advisable to include a short description of *S. glacialis*, taken from Terra Nova specimens, though the purely Antarctic species it not represented in the Vema collection.

The present material of *S. flexilis* originates from the shelf south-east of Peninsula Valdés, Argentina (Vema 16-40).

Symplectoscyphus glacialis (Jäderholm, 1904) (figs. 56, 57b, c)

Sertularella glacialis Jäderholm, 1904: 9; Jäderholm, 1905: 26, pl. 10 figs. 3-7; Billard, 1906: 3; Ritchie, 1913: 29, fig. 10; Billard, 1914: 23; Jäderholm, 1916-1917: 11, pl. 1 fig. 9: Jäderholm, 1926: 5; Naumov & Stepan'yants, 1962: 82.

Symplectoscyphus glacialis, Stechow, 1923a: 174; Stechow, 1925: 403; Totton, 1930: 188, fig. 39, pl. 1 figs. 8, 9, pl. 2 fig. 7; Briggs, 1939: 32; Broch, 1948: 11, figs. 2d, e, 3a.

Material. — Terra Nova Expedition, Sta. 229, off Cape Adare, mouth of Robertson's Bay, Ross Sea, 45-50 fms (82-92 m). Canada balsam slide of a 10 mm high specimen, with young gonothecae.

Description. — The fragment consists of a 10 mm high, monosiphonic stem with several side-branches. The stem is divided into internodes by means of strong constrictions of the periderm; there are no complete septa. The basal portion of each stem internode is wrinkled. All stem internodes are hydrothecate; the hydrothecae are to be found on the distal part of the inter-

nodes, alternately pointing obliquely forward and to left or right. The arrangement, consequently, is in two planes, meeting at an acute angle, a condition resembling that observed in *Sertularella antarctica* Hartlaub. The side-branches spring from apophyses under the stem-hydrothecae (fig. 57b) and, like those hydrothecae, are arranged in two planes. The resulting colony is bushy, with a distinct frontal aspect, where the side-branches are to be observed, and a posterior aspect where the stem can best be observed (fig. 56). The side-branches may bear secondary branches.

The hydrothecae are more or less tubular, gently curving away from the

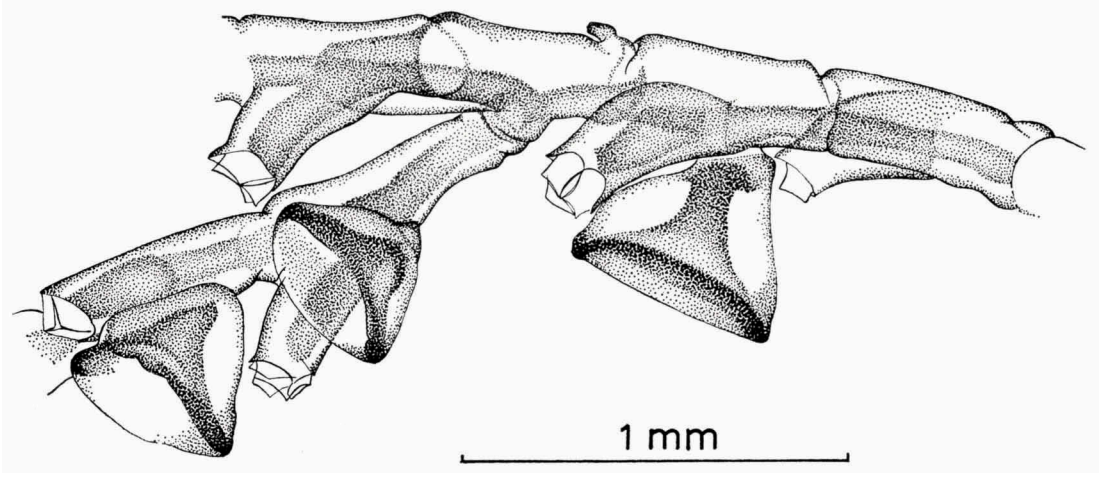

Fig. 56. *Symplectoscyphus glacialis* (Jäderholm), Terra Nova Exped., Sta. 200, branched fragment with young gonothecae. × 55. (Drawn by W. C. G. Gertenaar).

internode. The abcauline wall is gently and smoothly curved; about half of the adcauline wall is fused with the internode; the free part, usually slightly longer than the fused part, is straight or very slightly convex. The greatest diameter of the hydrotheca is at its middle. The aperture is perpendicular to the length axis of the hydrotheca; there are three marginal teeth of nearly equal development, one of which is adcauline; the remaining two are lateral. The closing apparatus, present in the majority of the hydrothecae, is composed of three triangular flaps closing to form a low, roof-like structure (fig. 57c). Renovations of the hydrothecal aperture are common but restricted to one or two. The periderm on internodes and hydrothecae is firm; along the hydrothecal borders it thins gradually, but forms a slightly thickened ring around the thecal aperture. In lateral view this thickened ring is visible as small peridermal knobs under the marginal teeth. Under the hydrotheca there usually is a distinct fenestra.

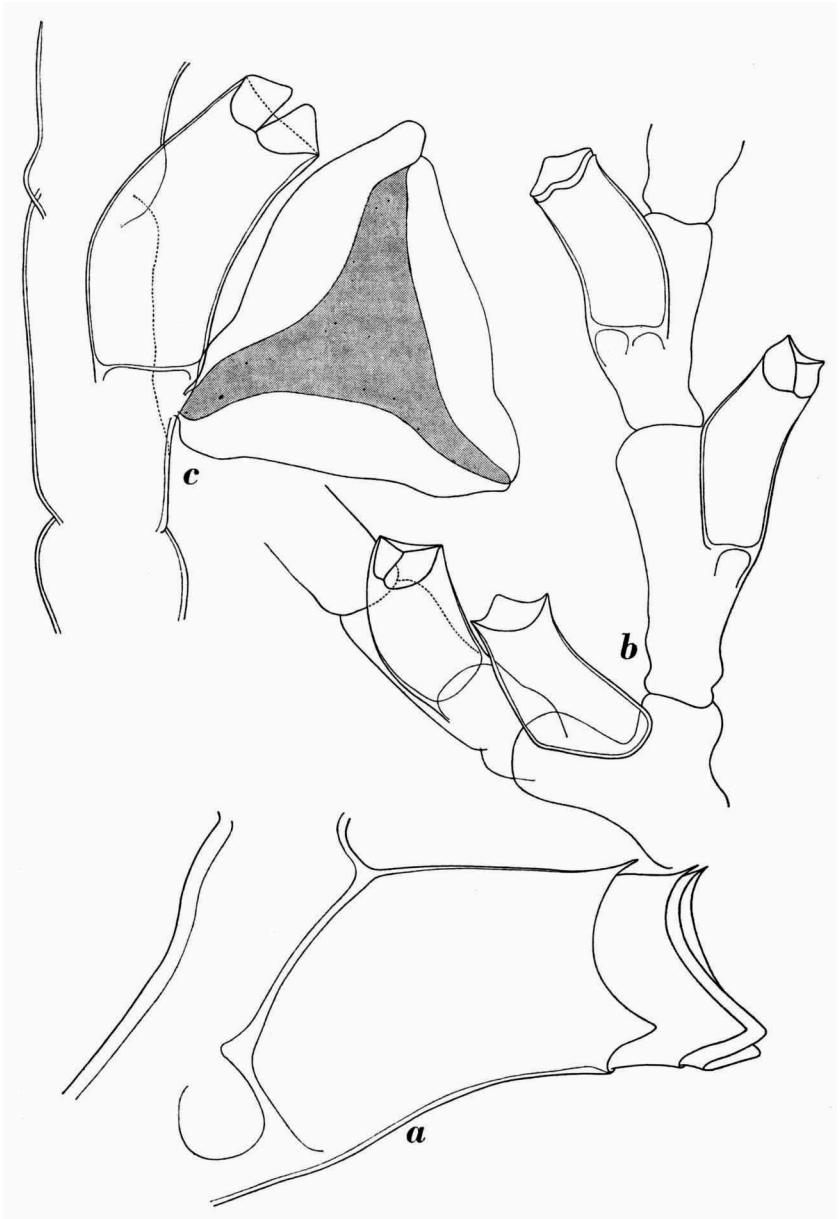

Fig. 57. a, *Symplectoscyphus flexilis* (Hartlaub), Vema 16-40, hydrotheca. b, c, *Symplectoscyphus glacialis* (Jäderholm); b, fragment of stem with branch; c, hydrotheca and young gonotheca. a, × 135; b, × 55; c, × 90.

The hydranths are in bad condition, but their attachment inside the hydrotheca is by means of an oblique membrane, running from the adcauline corner of the hydrothecal bottom to a point halfway the abcauline margin.

Gonothecae occur on the internodes of both stem and branches. These are short, conical structures with truncate apical part and sharply narrowing towards a short pedicel by means of which they are attached just under a hydrotheca (figs. 56, 57c). These gonothecae undoubtedly are very young.

Measurements (in microns). —

	Terra Nova Sta. 220
Stem internode, total length	475-620
diameter at node	160-190
Hydrotheca, length abcauline wall	340-420
length free portion adcauline wall	245-295
length adnate portion adcauline wall	230-245
total depth	405-445
maximal diameter	190-215
diameter at aperture	160-180
Young gonotheca, length	445-485
diameter at apex	475-515

Remarks. — This quite characteristic species has generally only been met with at Antarctic and sub-Antarctic localities. These, arranged in chronological order, are: Seymour Island near Cape Seymour, Graham Land area, 150 m (Jäderholm, 1905); various localities near Cape Royds, McMurdo Sound, Ross Sea, 10-80 fms (= 18.5-146 m); Marguerite Bay, between Jenny Island and Adélaide Land, 67°45'S, 70°45'42"W, 253 m (Billard, 1914); Graham Land, south of Snow Hill, 125 m (Jäderholm, 1916-1917); Discovery Inlet, Ross Sea, 550 m (Jäderholm, 1926); McMurdo Sound and its entrance, 50-250 fms (= 91.5-457 m); Cape Adare, Ross Sea, 45-50 fms (82.5-91.5 m); off Oates Land, 180-200 fms (= 329-549 m) (Totton, 1930); Commonwealth Bay, King George V Land, 350-400 fms (= 630-731 m); 66°08'S, 94°17'E, 120 fms (= 219.5 m) (Briggs, 1939); off Bouvet Island, 200 and 30 m; Peter I Island, 86 m (Broch, 1948); off Queen Mary Land; off Cape Poinsett, Dudd Coast; off Banzare Coast, and off Kemp Land, 90-322 m (Naumov & Stepan'yants, 1962, localities not specified in paper but taken from chart).

Symplectoscyphus bathyalis nov. spec. (figs. 58, 59, 60)

Material. — Vema 17-13, 46°59.5'S, 75°54'W, 24.3.1961, SBT, 2657-2470 m. One fragment with six hydrothecae, no gonothecae.

Bay of Biscay, 48°04'N, 9°23'W, 1,000 fms (1,828 m), cable ship "Monarch", leg. J. M. S. Lowe, Esq., British Museum (Natural History), 1950.2.10.1. Two canada balsam

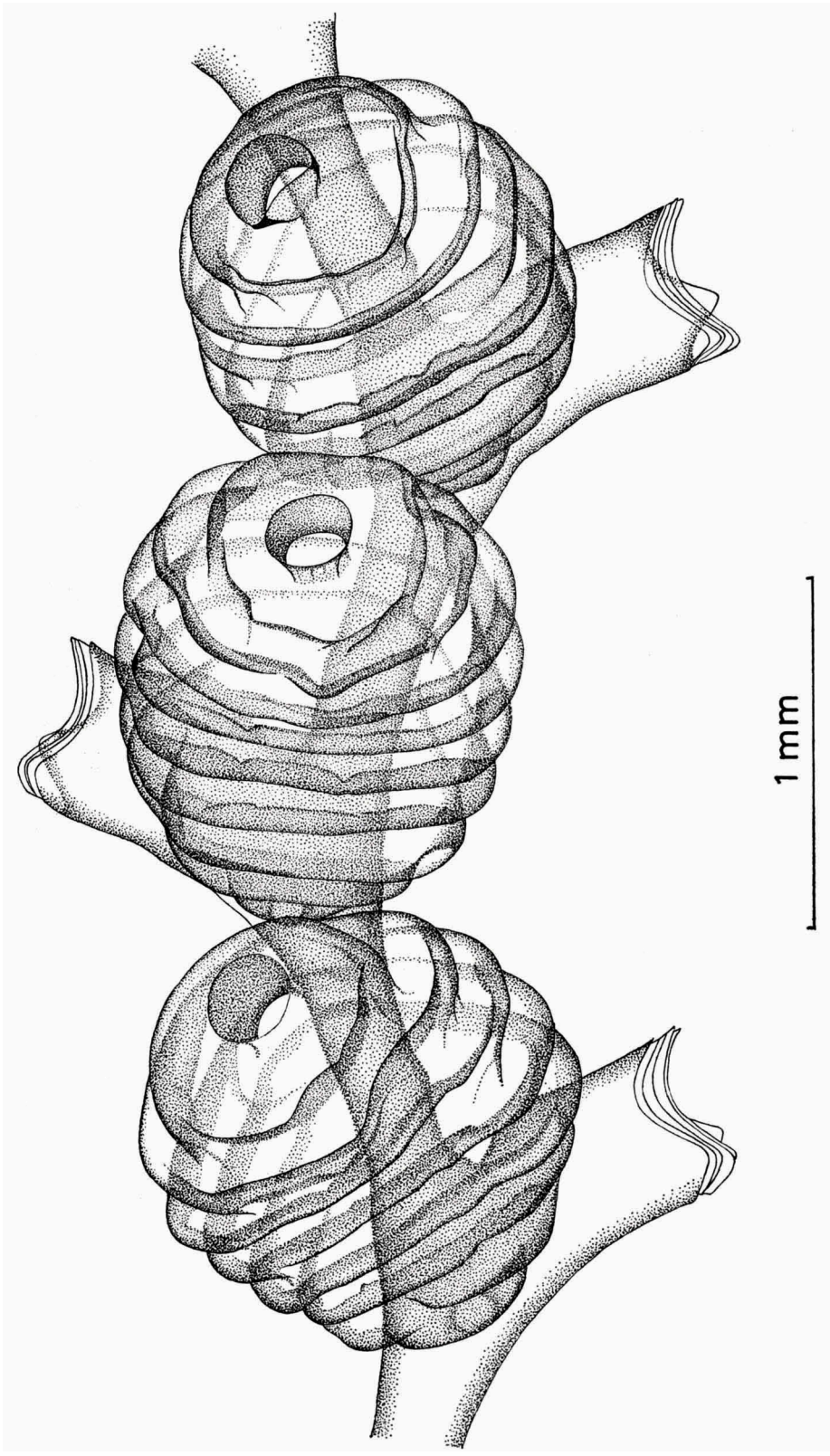

Fig. 58. *Symplectoscyphus bathyalis* nov. spec., Bay of Biscay, paratype, stem fragment with gonothecae. × 50. (Drawn by W. C. G. Gertenaar).

slides, one with a 15 mm high colony with two side-branches (holotype), the other with a 12 and a 15 mm high fragment (paratype). Both holo- and paratype have gonothecae.

Description. — The material from the British Museum (Natural History) will first be described.

The holotype is entirely monosiphonic. Stem and side-branches consist of a series of long and slender internodes, strongly geniculate (fig. 58) and separated by constrictions of the periderm. No septa have been observed. The side-branches insert on short apophyses under the hydrothecae and make an angle of about 80° with the stem (fig. 59a). All hydrothecae and side-branches are arranged in one plane, alternately pointing left and right. The hydrothecae are to be found at the end of the slender internodes and are large and cylindrical, gently curving away from the internode. The abcauline wall is slightly concave to almost straight (fig. 59 b). The free portion of the adcauline wall is smoothly convex; the adnate portion of that wall is about half the length of the free part, with very little variation in the primary hydrothecae. The maximal diameter of the hydrotheca (in the lower third) differs only very slightly from that at the orifice. The hydrothecal aperture has three equally developed teeth, one adcauline and two lateral, separated by shallow embayments. No complete closing apparatus has been observed on any of the hydrothecae, though in some cases isolated, triangular plates adhere to the hydrothecal margin. The periderm on the internode is firm, but it thins out along the hydrothecal walls. No collapsed hydrothecae have been observed. Renovations of hydrothecae frequently occur, the number may be as high as eight. The hydrothecae, as a result of repeated renovations, may be considerably lengthened, disturbing the fairly constant proportion in length between adnate and free parts of the adcauline wall. No hydranths are present, though in some thecae the oblique membrane serving their attachment is still present, running from the adcauline corner of the bottom to a point halfway the abcauline margin.

Gonothecae occur on both stem and side-branches. These are pear-shaped bodies, with their greatest diameter in the upper third (fig. 58). They are attached to the internode just under the hydrotheca; the place of attachment remains visible on the internode as a circular hole in the periderm, closed by means of a thin membrane. There are 7 circular, rib-like frills, thickened at the margin and of medium height. At the apex of the gonotheca there is a short, flaring funnel (fig. 59). No contents have been observed.

The paratype consists of a 12 mm long fragment with many gonothecae, and a branched fragment with two gonothecae. Structure of internodes, hydrothecae and gonothecae is as in the holotype.

The Vema specimen is no more than a fragment of a geniculate, mono-

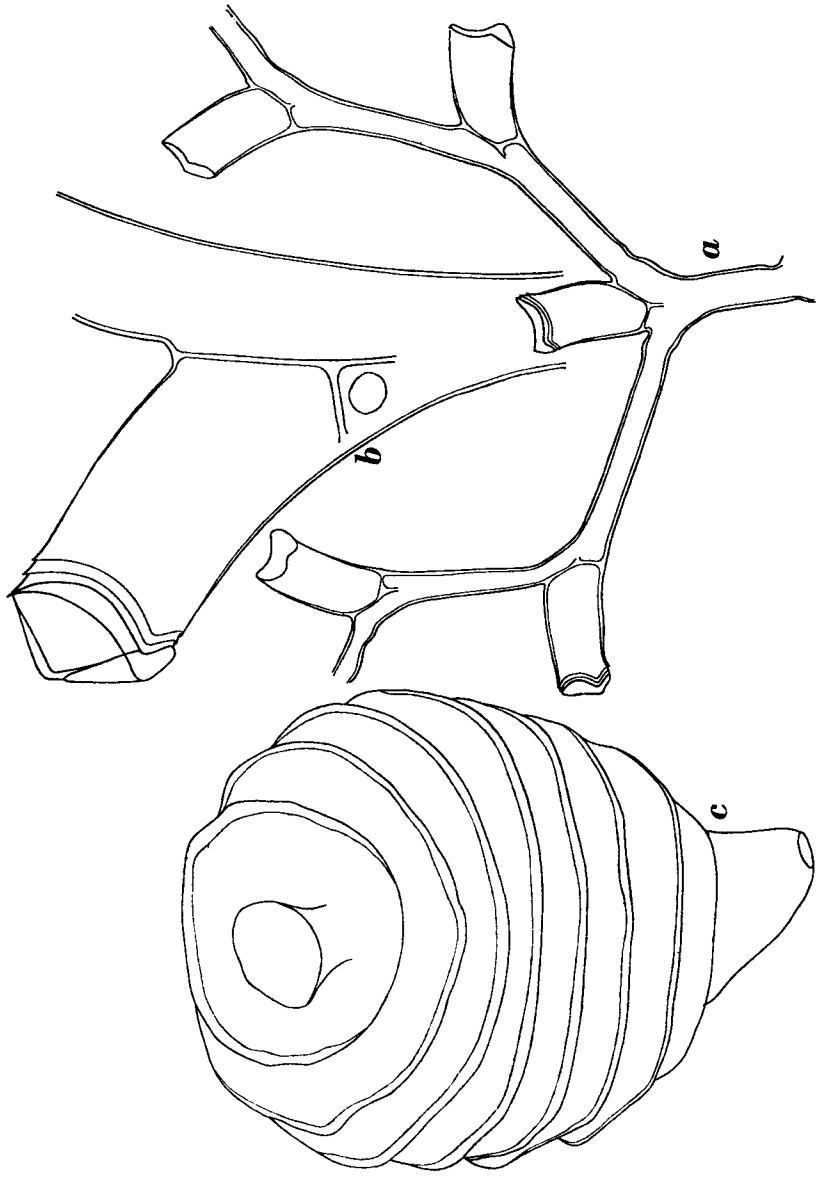

Fig. 59. *Symplectoscyphus bathyalis* nov. spec., Bay of Biscay, holotype. a, branched fragment; b, hydrotheca from stem; c, gonotheca. a, × 20; b, × 60; c, × 55.

siphonic stem, with six alternately arranged hydrothecae. The stem is thin and indistinctly divided into internodes. No septa are present, but the nodes are all marked by constrictions of the periderm; the stem, between the attachment of the hydrothecae, is geniculated (fig. 60a). The hydrothecae are attached to the distal end of the internodes; they strongly diverge, are large and are attached to the internode with a short portion of the abcauline wall only. They can best be described as cylindrical and slightly curved; the adcauline wall is concave with the convex abcauline wall running equidistant from the adcauline wall. The adnate portion of the adcauline wall is short, the free part is two and a half times longer than the adnate portion. The hydrothecal margin has three obtuse teeth, separated by shallow, rounded incisions; one of the teeth is adcauline, the two remaining teeth are lateral. No closing apparatus is present, probably as a result of damage. The hydrothecal margin is slightly thickened and in several hydrothecae it is repeatedly renovated. There are no internal teeth and no intrathecal septum has been observed.

The periderm of the stem is quite firm, but it thins out considerably on the hydrothecal walls, that easily collaps.

Measurements (in microns). —

	Bay of Biscay	Vema 17-13
Internode, total length	1,215-2,025	1,150-1,285
diameter at node	205-270	135-175
Hydrotheca, length abcauline wall	610-675	725-745
length free part adcauline wall	595-675	850-865
length adnate part adcauline wall	285-310	330-340
total length	745-760	875-945
maximal diameter	390-430	430-475
diameter at aperture	350-375	440-450
Gonotheca, length, including funnel	1,350-1,480	
maximal diameter	1,010-1,150	

Remarks. — I can not properly identify the fragment in the Vema collection with any of the know species of *Symplectoscyphus* Marktanner-Turneretscher, 1890. It is, in my opinion, different from the material described below as *Symplectoscyphus paulensis* Stechow, though it approaches the colonies recorded under that name by Millard (1967: 183, fig. 4G, H) very closely. It is identical in my opinion with two unnamed slides from the collection of the British Museum (Natural History) and obtained in the Bay of Biscay; this material richly bears gonothecae. All the material recorded here as *Symplectoscyphus bathyalis* is principally separated from *S. paulensis* on account of the shape of the gonothecae; a proper evaluation of the two species is seriously hampered by the scarcity of material. *S. paulensis* is a polysiphonic species with hydrothecae of almost the same size and shape as those

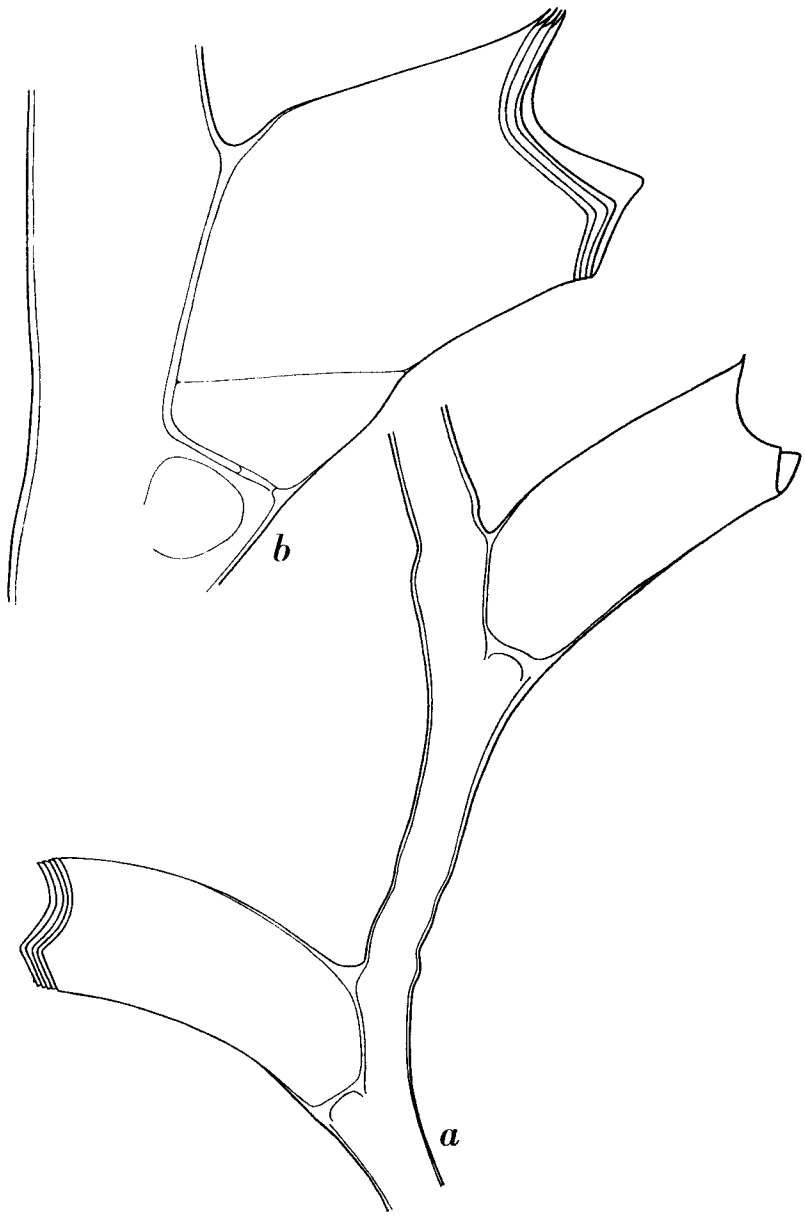

Fig. 60. a, *Symplectoscyphus bathyalis* nov. spec., Vema 17-13, fragment of branch. b, *Symplectoscyphus paulensis* Stechow, Vema 18-12, hydrotheca. a, × 40; b, × 70.

of *S. bathyalis;* the free part of the adcauline wall, however, is generally longer (proportions more variable than in *S. bathyalis*). Stems and side-branches are only geniculate in the young parts of the colony and straight in the older parts. *S. bathyalis*, as it appears from the material available, is monosiphonic, with strongly geniculate stems and branches; the proportions between free and adnate parts of the adcauline wall are constant (about 2: 1). The principal difference, however, is in the gonothecae. Those in *S. bathyalis*, that have every appearance of being mature and of which I have inspected a dozen, all have seven rib-like frills with thickened margin; in *S. paulensis* (only one gonotheca known) it has five light corrugations around the distal half and a slender terminal neck with slightly everted margin.

The specific name *bathyalis* has been derived from the greek word *bathys* = deep.

The Vema specimen of *S. bathyalis* originates from very deep water of the south-eastern Pacific off Golfo de Penas, Chile (Vema 17-13); holo- and paratype originate from the Bay of Biscay.

Symplectoscyphus paulensis Stechow, 1923 (figs. 60b, 61)

Symplectoscyphus paulensis Stechow, 1923: 8; Stechow, 1923a: 172; Stechow, 1925: 467, fig. 28; Millard, 1967: 183, fig. 4 G, H.

Material. — Vema 18-12, 47°09'S, 60°38'W, no date (February, 1962), SBT, 424-428 m. Top part of a branched, monosiphonic colony, 20 mm length, and various monosiphonic fragments. No gonothecae.

Description. — All fragments are entirely monosiphonic; the stem is divided into internodes by means of oblique constrictions of the periderm; no septa are visible (fig. 61a). The side-branches too are divided into internodes by means of peridermal constrictions, but here the internodes are slenderer (fig. 61b). Each internode has a distal hydrotheca; the side-branches originate from an indistinct apophysis just under a hydrotheca, that becomes axillary. The stem is faintly geniculated between the insertion of the side-branches. The hydrothecae are of a very characteristic shape, that can best be described as curved and tubular, with a free portion of considerable, though variable length, and a sharply three-pointed margin with many renovations (figs. 60b, 61c). The hydrothecae are smoothly curved outward and upward, arranged in two series that lie almost in one plane. At closer inspection, however, there is a slight though unmistakable tendency to point also slightly forward, that is almost lost in the older parts of the colony. The hydrothecae are almost imperceptibly widened basally, but the free portion has the same diameter throughout and is circular in cross-section. The free portion of the adcauline

Fig. 61. *Symplectoscyphus paulensis* Stechow, Vema 18-12. a, hydrocaulus with branch; b, fragment of branch; c, hydrotheca. a, b, × 30; c, × 55.

wall is longer than the adnate portion, sometimes almost twice that length and smoothly convex. The abcauline wall is smoothly concave. The hydrothecal margin has three fairly sharp teeth; the adcauline tooth is slightly upturned. The teeth are separated by rounded incisions of moderate depth. The hydrothecal margin shows signs of repeated renovations, the renovated theca being only slightly longer than its precursor (fig. 60b). The closing apparatus is composed of three hyaline triangular plates, closing to form a fairly high roof; it is visible on the younger thecae only. The basal portion of the hydrotheca is nearly completely closed; the bottom has a circular hole to permit the passage of the perisarcal tissue. The older hydrothecae have a distinct fenestra at the hydrothecal base. Some hydrothecae have small, contracted hydranths with a large abcauline coecum, attached to the internal hydrothecal wall by means of an oblique hyaline membrane, that is still visible in some of the empty hydrothecae. The periderm on the internodes is quite firm, though not particularly thick; it thins out rapidly on the hydrothecae, that are thin and hyaline.

Measurements (in microns). —

	St. Paul (Stechow, 1925)	Vema 18-12
Stem internode, total length		1,285-1,430
diameter at node		340-405
Hydrotheca, length abcauline wall [1])	960-1,250	675-755
length free part adcauline wall	850-1,040	595-835
length adnate part adcauline wall	500-550	500-580
total depth		920-1,055
maximal diameter	530	460-485
diameter at aperture	460	365-475

Remarks. — This characteristic species has previously been recorded from 7 km east of the island of St. Paul, southern Indian Ocean, 38°40′S, 77°38.6′E, 672 m. Additional Indian Ocean records are those by Millard (1967): 24°40′S, 35°28′E, 347 m; 29°45′S, 31°40′E, 440 m, and 36°48′S, 52°08′E, 400 m. The present record is from the continental slope, east of Deseado, Santa Cruz, Argentina. Though the Vema specimen shows more variability in length and shape of the hydrothecae than might appear from Stechow's rather schematic drawing (Stechow, 1925, fig. 28), there is fair agreement with the colonies described by Millard. The identification of the Vema material, which is sterile, must remain doubtful.

Symplectoscyphus columnarius (Briggs, 1914) (= *Sertularella columnaria*

[1]) These two series are probably not entirely comparable. In my specimen the length of the abcauline wall has been measured in a straight line from the hydrothecal bottom to the embayment between the lateral hydrothecal teeth.

Briggs, 1914: 293, fig. 1), though undoubtedly closely related, has here been considered as a separate species. There are distinct differences in shape and proximity of the hydrothecae, as appears from a comparison of my figure with those of *S. columnarius* as published by Ralph (1961, fig. 15 d-h).

Sertularia cupressina Linnaeus, 1758

Sertularia cupressina Linnaeus, 1758: 808; Broch, 1918: 124, figs. 65, 66; Vervoort, 1946: 243, figs. 107, 108, 114a; Naumov, 1960: 361, fig. 252.
Thuiaria cupressina, Nutting, 1904: 72, pl. 13 figs. 1-3.
Sertularia argentea Linnaeus, 1758: 809; Nutting, 1904: 71, pl. 12 figs. 3-9.

Material. — Vema 17 RD 18, 44°14'N, 59°03.5'W, 12.8.1961, rock dredge, 183 m. Three colonies of 3-4 cm height and some fragments. No gonothecae. Partly covered with *Lafoea fruticosa* (M. Sars) and *Hebella* spec.

Remarks. — One of the colonies is a 4 cm high stem, with the side-branches spirally arranged along the geniculated hydrocaulus. The side-branches are repeatedly dichotomously branched; the whole colony has a spread of 25 mm. The two remaining colonies are young colonies with pinnately arranged side-branches. This species is widely distributed in temperate northern Atlantic and boreo-Atlantic waters, where it also has a considerable vertical range. For details concerning the geographical distribution I refer to Broch (1918) and Nutting (1904). The present specimens are from the western Atlantic east of Nova Scotia, where the species has previously been recorded by Nutting (1904).

Sertularia robusta (Clarke, 1876)

Thuiaria robusta Clarke, 1876: 227, pl. 15 figs. 53-55; Naumov, 1960: 364, figs. 13D, 19G, 255, pl. 8 fig. 3.
Sertularia fabricii Levinsen, 1892: 190, pl. 6 figs. 14-17; Hartlaub, 1901: 354; Broch, 1918: 130, figs. 69, 70.
Thuiaria fabricii, Nutting, 1904: 71, pl. 12 figs. 1, 2.

Material. — Vema 16-52, 55°37'N, 56°08'W, 29.8.1960, SBT, 2078 m. Two fragments of 15 and 20 mm length. No gonothecae.

Remarks. — Though no more than a few fragments are present this species can easily be recognized by the characteristic shape and arrangement of the hydrothecae. *S. robusta* is a circumboreal species, known to occur in the Kara Sea, around Iceland, between Iceland and the Faeroes, around Jan Mayen and along the West Greenland coast (Broch, 1918), along both Atlantic and Pacific coasts of North America (Nutting 1904, as *Thuiaria fabricii*), and in the Bering Sea, Sea of Okhotsk and around Japan (Naumov, 1960). Is does not occur under purely Arctic conditions. Though it seems to prefer the littoral region down to a depth of about 100 m it has also been

met with in much deeper water (Naumov, 1960, 500 m depth). The present record is from very deep water of the western North Atlantic east of the Labrador coast, near the entrance to Davis Strait (Vema 16-52).

Sertularia tenera G. O. Sars, 1874

Sertularia tenera G. O. Sars, 1874: 108, pl. 4 figs. 1-4; Broch, 1910: 171, 217, figs. 27, 28, pl. 2 fig. 5; Broch, 1918: 127, figs. 67, 68; Naumov, 1960: 353, fig. 244.
Thuiaria tenera, Nutting, 1904: 70, pl. 11 figs. 9, 12.
Sertularia arctica Allman, 1874: 179; Allman, 1876: 264, pl. 14 figs. 1, 2.

Material. — Vema 16-48, 60°10'N, 47°08'W, 21.8.1960, SBT, 300 m. One pinnate colony of 25 mm length and various fragments. No gonothecae.
Vema 16-61, 51°18'N, 56°52'W, 5.9.1960, SBT, 101 m. Several fragments of 8-10 mm length. No gonothecae.
Vema 17 RD 18, 44°14'N, 59°03.5'W, 12.8.1961, rock dredge, 183-192 m. One fragment of about 8 mm height, no gonothecae, with *Laomedea* (*Obelia*) *longissima* (Pallas).

Remarks. — The material of this species in the Vema collection is scanty. The pinnate colony is evidently a young colony and consists of a stem, composed of internodes bearing three alternately arranged hydrothecae each. The side-branches only occur in the upper part of the colony; the internodes of these branches have a variable number of hydrothecae. The distance between two successive hydrothecae varies greatly in the various fragments and in the colony, being almost alternate in the colony and sub-opposite in some of the fragments. At the end of the branches of the colony the direction of the hydrothecae gradually turns towards the frontal plane of the colony.

S. tenera is a boreo-Arctic species with a considerable distribution in Arctic and boreal Atlantic and Pacific waters. Both localities given above are from the north-western Atlantic, from where the species has repeatedly been recorded (Nutting, 1904; Broch, 1918), viz., the Atlantic off the south point of Greenland (Vema 16-48) and the Strait of Belle Isle, Newfoundland (Vema 16-61). The species preferably lives in the littoral zone, though occasionally it penetrates into greaters depth (589 fms = 1,076.5 m; Broch, 1918).

Tamarisca tamarisca (Linnaeus, 1758)

Sertularia tamarisca Linnaeus, 1758: 808.
Diphasia tamarisca, Nutting, 1904: 108, pl. 28 figs. 6, 7.
Sertularella tamarisca, Broch, 1910: 170, 214; Broch, 1918: 96, fig. 51.
Sertomma tamarisca, Kramp, 1932: 52, fig. 22; Vervoort, 1946: 222, fig. 65.
Tamarisca tamarisca, Naumov, 1960: 328, fig. 218.

Material. — Vema 16-48, 60°10'N, 47°08'W, 21.8.1960, SBT, 300 m. One fragment of 10 mm length with 5 pairs of hydrothecae. No gonothecae.
Vema 17 RD 29, 60°27'N, 48°31'W, 4.9.1961, rock dredge, 366-326 m. One fragment of 25 mm length. No gonothecae.

Remarks. — Though only fragments are present the species can easily be recognized by the characteristic hydrothecae. Both fragments are from living colonies with complete closing apparatus and retracted hydranths. This species can probably best be characterized as a boreal species, capable of penetrating into warmer waters of the temperature zone but also capable to live occasionally under Arctic conditions. It never seems to occur in abundance. The present records are from the northwestern Atlantic off the south point of Greenland (Vema 16-48 and 17 RD 29); from that area the species has previously been recorded by Kramp (1932).

Thuiaria alternitheca Levinson, 1893

Thujaria alternitheca Levinsen, 1893: 52, pl. 7 figs. 15-20.
Selaginopsis alternitheca, Nutting, 1904: 133, pl. 40 figs. 5-7.
Thuiaria alternitheca, Kudelin, 1914: 314, fig. 103; Broch, 1918: 143, fig. 78; Naumov, 1960: 422, fig. 49B, 309, pl. 12 fig. 6.

Material. — Vema 16-61, 51°18'N, 56°52'W, 5.9.1960, SBT, 101 m. Two fragmentary hydroclades of about 15 mm length. No gonothecae.

Remarks. — My material of this rare though characteristic species is too scanty to permit a redescription. The hydrothecae are packed in two opposite rows along the branches; the hydrothecae of one row alternately are directed forward or backward. They are completely immersed into the hydroclades, leaving only the aperture or a very short apical portion free. Contracted hydranths with a distinct coecum are present. The periderm is brownish.

T. alternitheca has previously been recorded from Davis Strait, 100 fms (= 182.8 m) (Levinsen, 1893), from the west and south coasts of Greenland (Broch, 1918), from the west coast of Greenland (Broch, 1918) and from the Sea of Okhotsk, 125-180 m (Naumov, 1960). The present record is from the Strait of Belle Isle, Newfoundland (Vema 16-61).

Thuiaria thuja (Linnaeus, 1758)

Sertularia thuja Linnaeus, 1758: 809.
Thuiaria thuja, Fleming, 1828: 545; Nutting, 1904: 62, pl. 7 figs. 1-3; Broch, 1910: 220; Broch, 1918: 139, fig. 75; Kramp, 1932: 47; Vervoort, 1946: 259, figs. 114b, 115a; Naumov, 1960: 417, figs. 13E, 305, pl. 13 figs. 1, 2.

Material. — Vema 16-52, 55°37'N, 56°08'W, 29.8.1960, SBT, 2078 m. Several dichotomously branched side-branches. No gonothecae.

Remarks. — Though the material of this well known form in the Vema collection is very incomplete it could be identified with certainty through comparison with undisputable colonies from the Norwegian coast. *T. thuja* can

best be characterized as a boreal, circumpolar species, capable of penetrating into southern waters and occasionally living under sub-Arctic conditions. It is very common in the northern Atlantic, particularly in de deeper littoral zone along the coasts of Norway, Iceland, Great Britain and northern America. It is rare along the coasts of Greenland, particularly the east coast. The present record is from the north-western Atlantic off Labrador, near the entrance to Davis strait (Vema 16-52), where the species was obtained from a considerable depth (2078 m). Kramp (1932) described material from the Atlantic north of the present locality, whilst Broch (1918) records the species from a depth of 752 fms (= 1375 m).

Thuiaria lonchitis (Ellis & Solander, 1786)

Sertularia lonchitis Ellis & Solander, 1786: 42.
Thuiaria lonchitis, Nutting, 1904: 66, pl. 9 figs. 5-8; Vervoort, 1946: 262, fig. 115b.
Thuiaria lonchitis, Broch, 1910: 174, 220, fig. 30; Broch, 1918: 146.

Material. — Vema 17 RD 18, 44°14'N, 59°03.5'W, 12.8.1961, rock dredge, 183-192 m. Two colonies of 35-40 mm height, without gonothecae.

Remarks. — The affinities of this species to *Sertularia articulata* Pallas (1766: 137 = *Dymella articulata* (Pallas, 1766) are not quite clear. *Dymella articulata* has even been brought to a separate genus by Stechow (1923: 8) because of the absence of an abcauline coecum in the hydranth. Both species have been synonymized by Naumov (1960: 408), who apparently either overlooked Stechow's observations or did not attach much importance to the presence or absence of a blindsac. I hesitate to unite both species as long as Stechow's observations have not been positively refuted. The material recorded above agrees with Broch's description of this species (Broch, 1918: 146), with the exception of the greater distance between two successive hydrothecae on the same side of a side-branch, being twice or thrice the diameter of the hydrothecal opening. This, however, I think to be largely due to the youth of the colonies.

In my material the hydranths are well preserved and have a distinct abcauline coecum.

Because of the frequent confusion of this species with its allies and its uncertain affinities with *Dymella articulata* the geographical distribution cannot accurately be given. The species appears, nevertheless, to be Arctic and circumpolar, widely distributed in the northern Atlantic and penetrating to the south along the coasts of western Europe and eastern North America. The present record is from the north-western Atlantic east of Nova Scotia (Vema 17 RD 18). Nutting (1904: 66) records the species from the Gulf

of St. Lawrence. It appears to live preferably in the deeper parts of the littoral zone, occasionally penetrating into deeper waters.

Thuiaria hippuris Allman, 1874 (fig. 62)

Thuiaria hippuris Allman, 1874: 473, pl. 65 figs. 2, 2a; Kramp, 1913: 26; Broch, 1918: 141, fig. 76; Kramp, 1932: 47; Naumov, 1960: 416, fig. 303, pl. 13 fig. 4.

Material. — Vema 16-55, 55°48'N, 56°00'W, 30.8.1960, SBT, 2452 m. One pinnate colony of 30 mm height. No gonothecae.

Description. — The colony consists of a slender, 40 mm long stem and 6 side-branches, three left and three right, of 15-20 mm length. The basal part of the stem consists of some internodes separated by straight septa; the rest of the stem, bearing the side-branches, has no internodes; it is only very slightly thicker than the branches. The side-branches are alternately arranged on short apophyses; there are three hydrothecae between two successive apophyses (fig. 62a). The branches too have no division into internodes, they leave the stem under an almost straight angle. The hydrothecae are alternately arranged along stem and branches; they are placed in two rows and in one plane, coinciding with the plane of symmetry of the whole colony. On the stem one of the three hydrothecae between two apophyses (that on the proximal side) becomes axillary (fig. 62b). The shape of the hydrotheca can best be described as vase-shaped; they are deeply though not completely imbedded into the stem or branch that is slightly geniculated between the successive hydrothecae. The adcauline wall is smoothly curved almost over its entire length; the basal part may be more or less straight. A small portion of the adcauline wall is free, equalling about half the diameter of the aperture (fig. 62c). The basal part of the hydrothecae is rounded with a distinct hole to permit the passage of perisarcal tissue; the abcauline wall is straight with a distinct concavity under the opening, or slightly S-shaped, with slightly convex basal part. There is a distinct peridermal thickening on the abcauline side just under the opening. The hydrothecal aperture is almost perfectly circular, but has a distinct abcauline sinus for the attachment of the closing plate. The direction of the plane of the aperture is variable, but generally more or less parallel to the length axis of stem or branch. The distance between the hydrothecae is considerable though slightly variable; the distance between two hydrothecae on the same side is about twice to thrice the height of the hydrotheca; as a result the bottom of the next hydrotheca (on the opposite side) is some distance above the level of the preceding hydrotheca. Each hydrotheca has a well preserved hydranth with a small though distinct adcauline coecum.

No gonothecae are present.

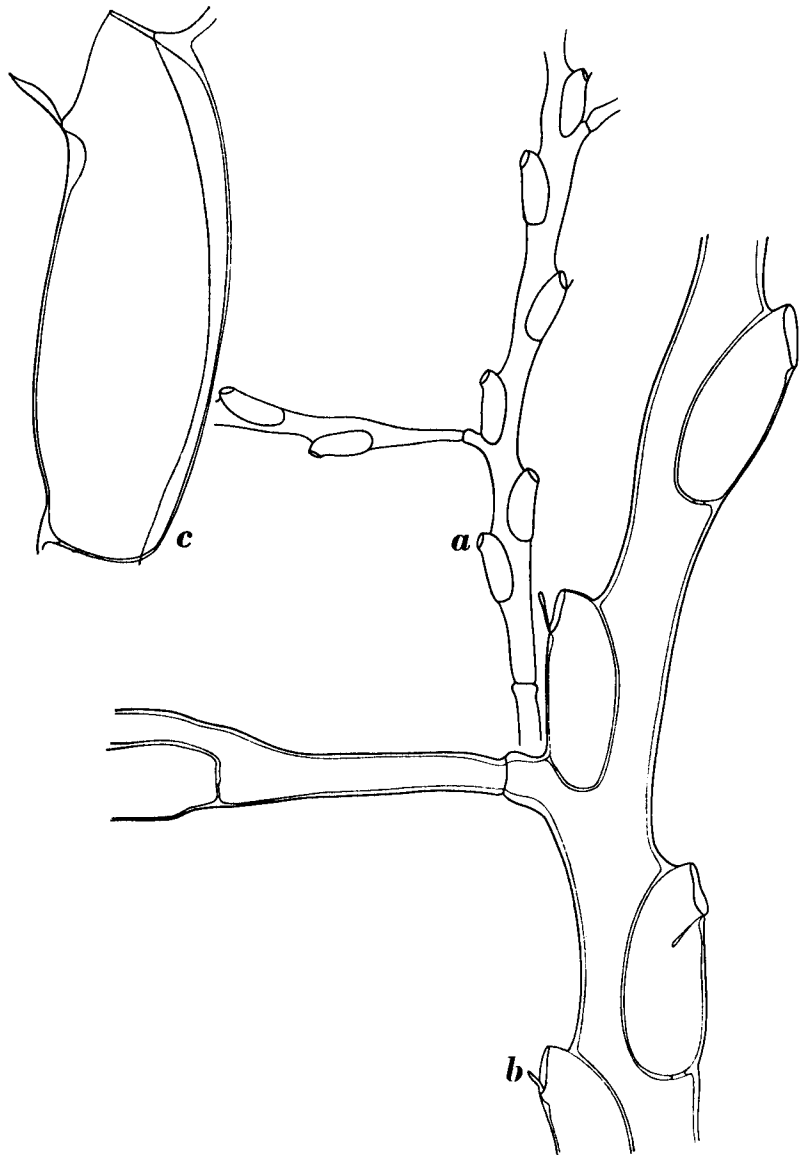

Fig. 62. *Thuiaria hippuris* Allman, Vema 16-55. a, part of stem with side-branch; b, idem; c, hydrotheca from stem. a, × 20; b, × 55; c, × 135.

Measurements (in microns). —

	Vema 16-55
Stem diameter, including the hydrotheca	270
idem, between two successive hydrothecae	205
Hydroclade, diameter including hydrotheca	260-270
idem, between two successive hydrothecae	135-175
Hydrotheca, length abcauline wall	375-390
length adcauline wall, including free part	485-500
length free part adcauline wall	55-70
diameter at aperture	120-125
maximal diameter	190-205

Remarks. — The present specimen agrees in detail with Broch's description of *Thujaria* sp. aff. *hippuris* (Broch, 1918: 141, fig. 76), which is now generally considered to represent the young stage of *Thuiaria hippuris* Allman. This is a rare species, that was originally described from the area between the Shetlands and Faeroes, 61°21'N, 03°44'W, 640 fms (= 1170 m) (Allman, 1874). The species was subsequently recorded from the west coast of Greenland, 66°44'N, 56°08'W, 319 m and 66°42'N, 56°12'W, 245 m (Kramp, 1913); from Davis Strait, 63°06'W, 56°00'W, 2260 m (Broch, 1918); from off Hamilton Islet, Labrador, 55°00'N, 56°34'W, 314 m (Kramp, 1932), and from the Pacific side of the northern Kurile Islands (Naumov, 1960). The present record is from the north-western Atlantic east of Labrador, not far from the locality from where the species was recorded by Kramp (1932).

Dymella laxa (Allman, 1874) (figs. 63, 64)

Thuiaria laxa Allman, 1874: 472, pl. 45 fig. 1; Broch, 1910: 175, 221; Broch, 1918: 142; Kramp, 1932: 47; Kramp, 1943: 37; Naumov, 1960: 416, figs. 16E, 46N, 304, pl. 11 fig. 3.

Thuiaria lonchitis Marktanner-Turneretscher, 1890: 236; Marktanner-Turneretscher, 1895: 422.

Thuiaria Hjorti Broch, 1903: 7, pl. 3 figs. 11-14.

Thuiaria immersa Nutting, 1904: 66, pl. 9 figs. 3-4.

Material. — Vema 16-52, 55°37'N, 56°08'W, 29.8.1960, SBT, 2078 m. Two fragments of 30 mm height and many loose side-branches. No gonothecae. Base of one of the colonies with *Diphasia fallax* (Johnston).

Description. — The pinnate colony has a strong, brownish, slightly compressed hydrocaulus, slightly geniculated between the attachment of the side-branches. Those branches originate from short apophyses and are alternately directed left and right; there are usually three cauline hydrothecae between two successive apophyses, one axillary, one supra-axillary and one on the opposite side just under the next apophysis (from the opposite side) (fig. 63).

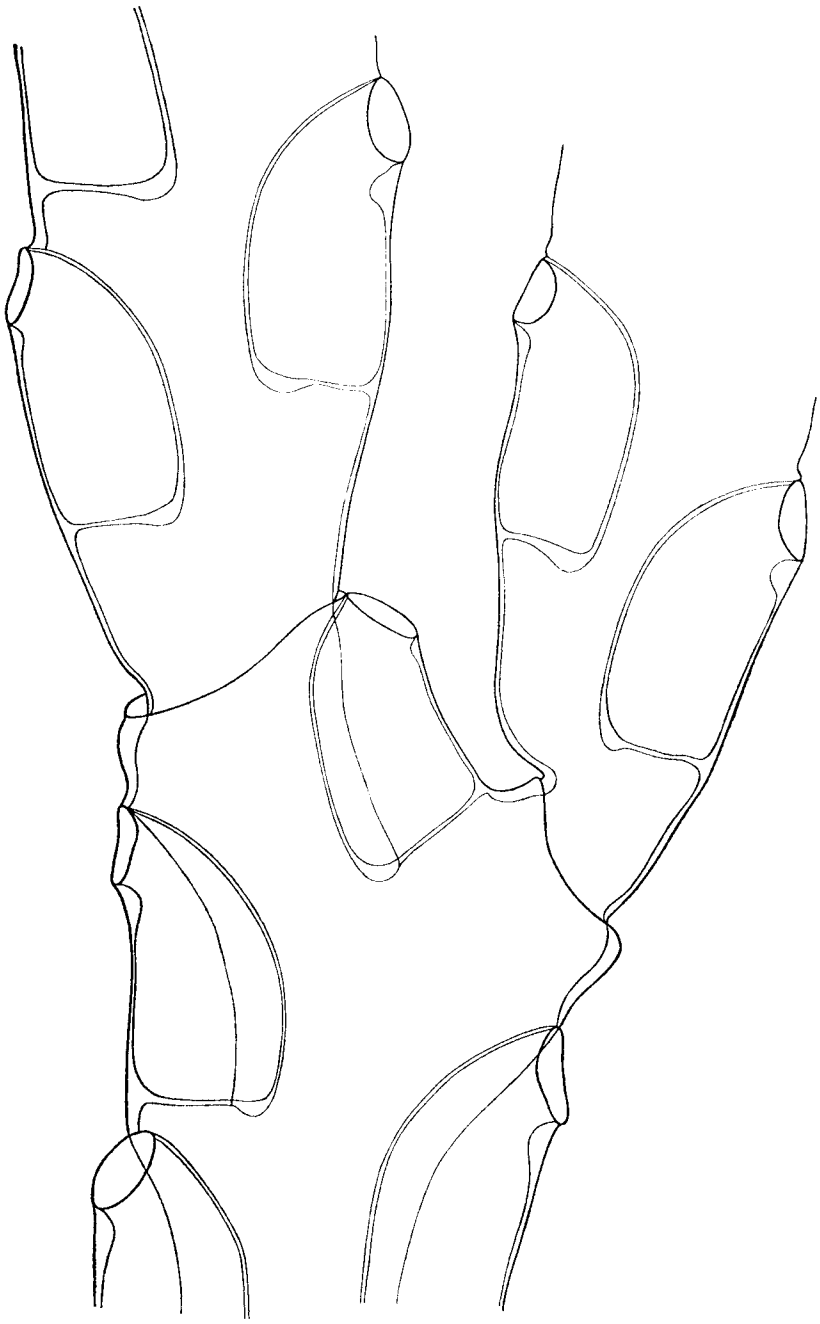

Fig. 63. *Dymella laxa* (Allman), Vema 16-52, fragment of stem with branch. × 70.

The hydrocaulus has thick, brown periderm and the hydrothecae are deeply sunken (fig. 64a). Only quite occasionally there are slightly oblique septa, dividing the hydrocaulus into irregular internodes. The (mainly loose) branches are 20 to 25 mm long and only occasionally show a septum. At the insertion of the branch it is distinctly narrowed; the rest of the branch is flattened into the plane of the hydrocaulus. The hydrothecae are arranged in two series along the branches, the plane into which they are arranged coincides with that of the hydrocaulus and its side-branches. They are originally alternately arranged and separated from the consecutive hydrotheca on the same side by a very short distance, that maximally has the length of the oral diameter. In many branches the hydrothecae are closely approximated and so densely packed that the upper surface of the aperture touches the bottom of the next hydrotheca of that series. In such branches the arrangement of the hydrothecae could better be described as sub-opposite. The shape of the hydrotheca appears best from fig. 64b; it is completely or almost completely embedded in the branch. In some hydrothecae a very small portion of the apex is free. The abcauline wall of the hydrotheca is straight, with an almost imperceptible outward curve at the distal end. The apical part of the adcauline wall is smoothly curved, with the basal part straight or very slightly concave. The hydrothecal bottom is straight, with a hole to permit the passage of the perisarcal tissue. The adcauline corner of the bottom is thickened. The aperture is perfectly circular, a distinct peridermal notch is visible at the abcauline wall just under the aperture. The plane of the aperture varies slightly, but usually it is parallel to the length axis of the side-branch. A circular closing plate attached to the abcauline side of the aperture is visible in some hydrothecae only. Hydranths are visible in the majority of hydrothecae. There is no abcauline coecum; the hydranths communicate with the perisarcal tissue of the hydroclade through the afore mentioned hole in the hydrothecal bottom, furthermore there is an attachment to the proximal portion of the adcauline wall. Each hydranth has a large adcauline protective plate or flap, heavily loaded with nematocysts (fig. 64b). Some of the (loose) branches show the beginning of dichotomous branching.

No gonothecae have been observed.

Measurements (in microns). —

	Vema 16-52
Diameter of stem	780-800
Diameter of side-branch	540-620
Hydrotheca, length abcauline wall	420-435
length adcauline wall	540-580
diameter of aperture	135-150
maximal diameter	230-270

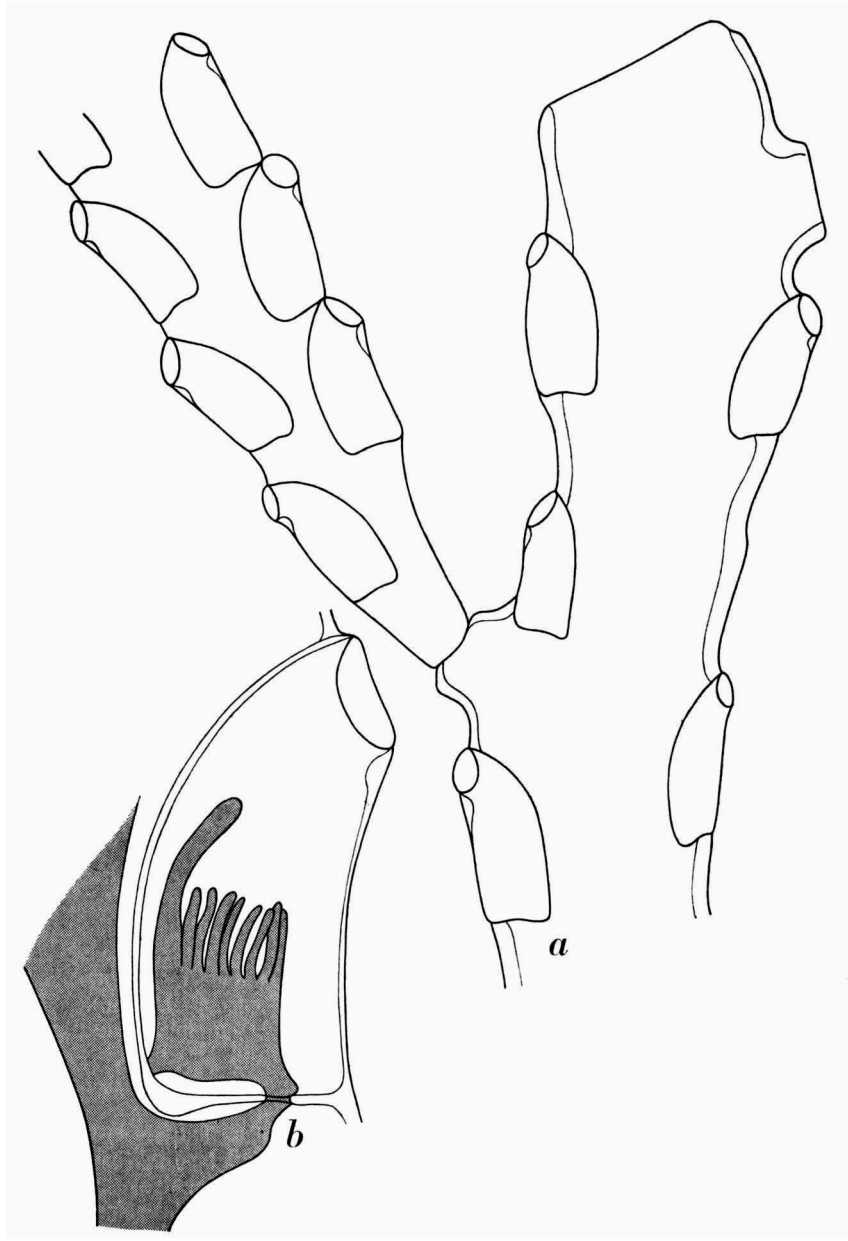

Fig. 64. *Dymella laxa* (Allman), Vema 16-52. a, fragment of stem with branch; b, hydrotheca from branch with hydranth. a, × 40; b, × 300.

Remarks. — I have described this colony in some detail because of the very close packing of the hydrothecae, in which the material approaches *Dymella articulata* (Pallas, 1766). It differs, nevertheless, from that species in the structure of the colony and the plumb hydrothecae with a prominent acauline swelling near the opening.

The complete absence of an abcauline coecum makes it necessary to remove this species to the genus *Dymella* Stechow, 1923. *D. laxa* is a circumpolar, Arctic species, recorded from the North Atlantic between 60° and 70° N, including the coasts of Iceland, the west coast of Greenland, Davis Strait and Smith Sound, and the Atlantic off Labrador (Broch, 1918; Kramp, 1932). Additional records are known from the White Sea, Barents Sea, Kara Sea, East Siberian waters, Sea of Okhotsk, Japan Sea and the North Pacific (Naumov, 1960). It lives in the deepest parts of the littoral zone, penetrating to great depths (545 fms = 996.5 m; Broch, 1918). The present record is from deep water of the north-western Atlantic east of Labrador (Vema 16-52).

Family SYNTHECIIDAE

Synthecium robustum Nutting, 1904 (figs. 65, 66, 68a)

Synthecium robustum Nutting, 1904: 136, pl. 41 figs. 4-6; Hartlaub, 1905: 673, fig. H[5]; Ritchie, 1907: 537, pl. 1 fig. 6; Ritchie, 1909: 67; Fraser, 1943: 136; Fraser, 1944: 236, pl. 49 fig. 221; Vervoort, 1968: 101.

Synthecium chilense Hartlaub, 1905: 671, fig. E[5], F[6], G[5]; Ritchie, 1907: 538.

Material. — Vema 15-98, 54°24'S, 63°29'W, 3.3.1959, 198 m. Several 50 mm high colonies and many fragments. Gonothecae are present.

Vema 15-105, 54°06.6'S, 66°20'W, 6.3.1959, 55 m. Several 10-15 mm long fragments. No gonothecae.

Vema 15-106, 54°10.2'S, 65°44'W, 6.3.1959, 79 m. Several 15-20 mm long fragments with several gonothecae. A fragment of a hydrocaulus with some branches; no gonothecae.

Vema 15-107, 54°10.2'S, 65°57.5'W, 6.3.1959, 101 m. Several 15-20 mm long fragments. Several gonothecae are present.

Vema 15-108, 54°10'S, 64°19'W, 6.3.1959, 110 m. Fragments of stems and branches, together forming a fair number of broken specimens. No gonothecae.

Vema 15-110, 54°10'S, 63°20.2'W, 7.3.1959, 284 m. A 30 mm long fragment of a hydrocaulus. No gonothecae.

Vema 16-37, 51°52'S, 67°01'W, 16.5.1960, SBT, 101 m. A great number of 50 mm high colonies and many fragments. Many gonothecae are present.

Vema 16-40, 42°48'S, 63°11'W, 27.5.1960, SBT, 70 m. A large number of 40-50 mm high colonies attached to thick hydrorhiza fibres. No gonothecae.

Vema 17-18, 53°55.5'S, 71°16.8'W, 28.3.1961, SBT, 248-262 m. Basal parts of 20-30 mm height, no branches are present. No gonothecae.

Vema 17-29, 52°43.7'S, 69°53.7'W, 1.4.1961, SBT, 24 m. A single colony of 55 mm height. No gonothecae.

Vema 17-33, 52°49'S, 67°35'W, 2.4.1961, SBT, 66 m. A pinnate fragment of 12 mm length. No gonothecae.

Vema 18-16, 47°30'S, 62°39'W, 18.2.1962, SBT, 123 m. Several about 50 mm high colonies and many fragments. Gonothecae abundantly present.

Vema 18-18, 47°55'S, 63°41'W, 18.2.1962, SBT, 108 m. A dense mass of hydrorhiza fibres supporting several small colonies, maximally about 40 mm long. No gonothecae.

Burdwood Bank, RD, 1/2 (no further details). Four colonies of about 50 mm height. No gonothecae.

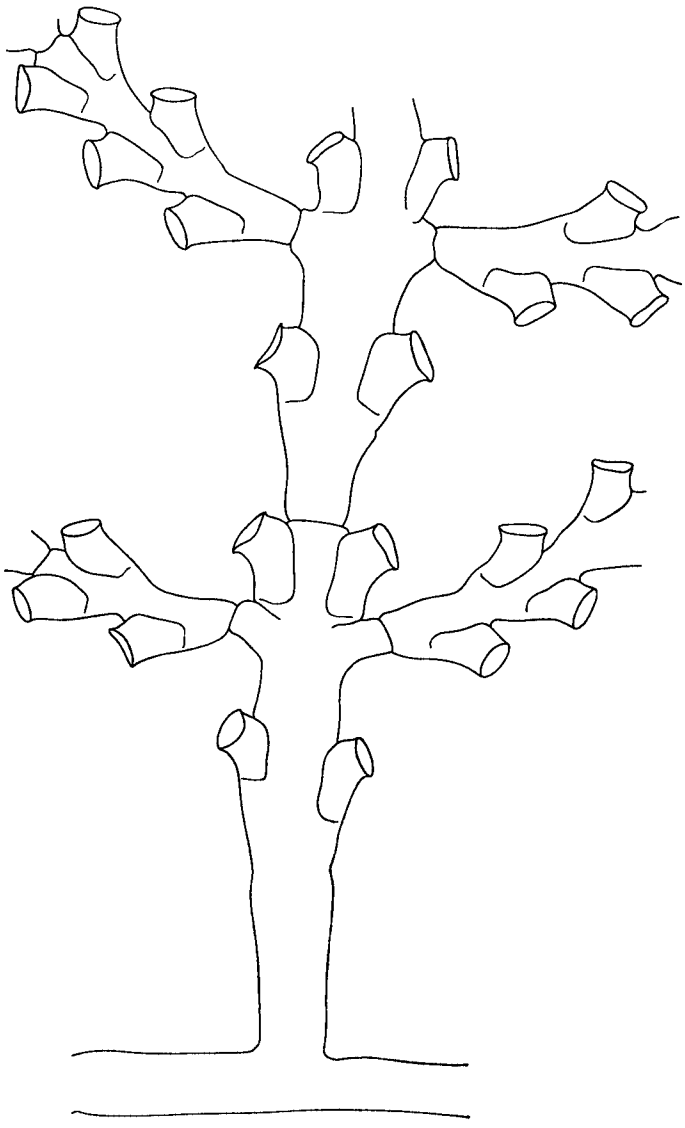

Fig. 65. *Synthecium robustum* Nutting, Vema 16-40, basal part of colony. × 20.

Description. — The pinnate colonies are strictly branched in one plane, have opposite side-branches and originate from thick hydrorhiza fibres. The hydrorhiza is very firm, being a rich brown, hollow tube, covered with thick periderm. The hydrocauli rise directly from the hydrorhiza fibres; in the young colonies they are circular in cross-section; the older hydrocauli are slightly compressed. The division of the hydrocauli into internodes is very indistinct; only occasionally straight septa may be discovered, but these are absent in many colonies. The hydrocaulus is set with pairs of hydrothecae; the basal part of the hydrocaulus has no hydrothecae. In older colonies the basal part of the colony is fairly long and is composed of a portion of the stem with damaged hydrothecae and apophyses from which the branches have disappeared, almost completely sunken into the thick, brown periderm. The side-branches are supported by short internodes and are strictly opposite. In young colonies there is one pair of (not quite opposite) hydrothecae beneath the first pair of apophyses, followed by a pair of axillary hydrothecae and a septum (fig. 65). The ensuing internodes may have a basal pair of hydrothecae, a pair of apophyses and a pair of axillary hydrothecae, or the number of hydrothecae and apophyses may be increased, up to a total disappearance of the septa. The cauline hydrothecae (as well as the hydrothecae of the side-branches) are all arranged in the plane of branching, which at the same time is the plane of symmetry of the colony (fig. 66a).

The side-branches are indistinctly divided into internodes. Usually there is one septum in the basal part of the side-branch, separating a basal internode from the rest of the branch. This basal internode has one unpaired hydrothecae, facing the basal side of the colony, and one pair of not strictly opposite hydrotheca. In the rest of the internode the arrangement of the hydrothecae is strictly in pairs. The side-branches in the majority of the colonies do not rebranch and are from 15 to 25 mm long; they are branched, however, in one of the colonies from the Burdwood Bank; branching occurs strictly in the plane of symmetry and the secondary branches are short, 5-8 mm long.

The hydrothecae can best be described as irregularly tubular, partly embedded in hydrocaulus or internodes, with the lines of fusion of the periderm of internode or hydrocaulus visible on the hydrothecae. The implantation of a pair of hydrothecae is heralded by a fairly sudden widening of the diameter of stem or branch, some distance under the hydrotheca. This widening continues smoothly until some distance under the hydrothecal border, where a distinct concavity occurs. The adnate part of the adcauline border is nearly straight, with a distinct, rounded flexure towards the free part, which leaves the internode under an angle of about 60°. The bottom of the hydrotheca is

only partly closed; the lumen of the hydrotheca widens some distance under the aperture. The hydrothecal opening is circular and very slightly, though distinctly, everted; the plane of opening making an angle of 30° with the length axis of internode or stem (fig. 66b). Renovations of the hydrothecal opening occur frequently, particularly in the older colonies, as a result the free portion of the hydrotheca may become lengthened. The periderm of the hydrothecal walls is thin, sometimes slightly thickening on the abcauline side and just under the hydrothecal aperture.

Gonothecae occur frequently; they insert on the stems and the basal part of the side-branches, always originating from either the orifice of the cauline hydrothecae or the basal hydrothecae on the internode. Observations of many gonothecae make me believe that their shape has not correctly been described

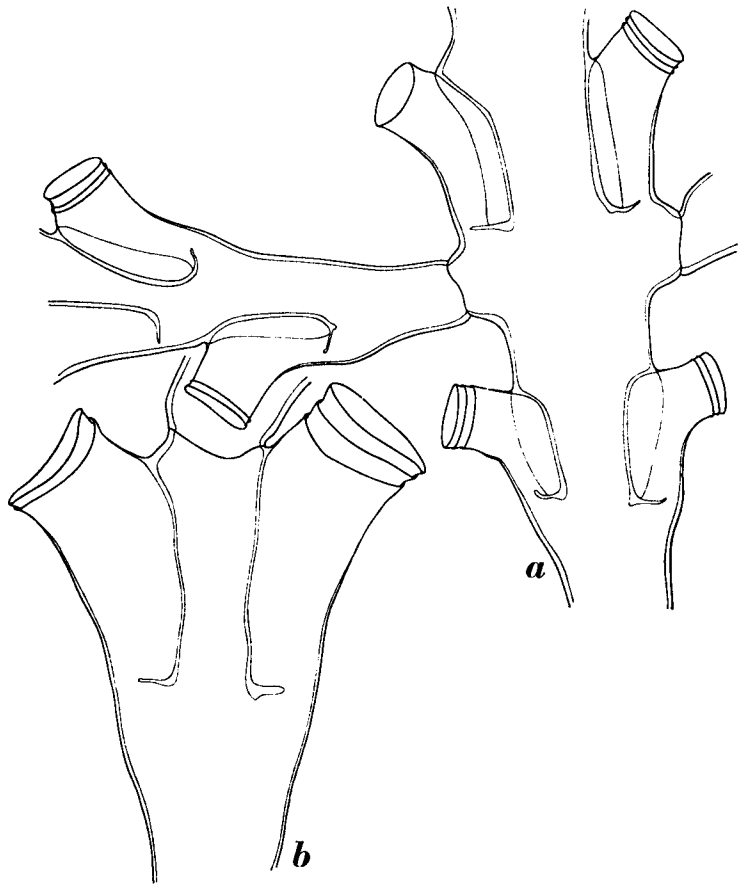

Fig. 66. *Synthecium robustum* Nutting, Vema 16-37. a, part of hydrocaulus with branch; b, internode from stem. a, × 30; b × 55.

by Nutting (1904: 136, pl. 41 fig. 4, partly reconstructed after dried specimens) or Fraser (1944: 236, pl. 49 fig. 221c, d). They are originally more or less pear-shaped, round bodies, but in the course of development they lengthen and become compressed in a plane perpendicular to the plane of branching. There are 6 to 8 circular elevations or ribs, that in the course of development become more expressed and develop into more or less distinct frills, rounded in cross-section and thus differing in character from those observed on the gonotheca of species of *Symplectoscyphus*. The basal 4 to 6 rings stay perfectly circular, but the topmost rings, by the process of compression, take an undulated course, lower on the broad side of the gonothecae, higher on the shorter side. At the top of the mature gonotheca there is a circular opening on the surface of the gonotheca (consequently not placed at the end of a funnel or short neck), surrounded by two shallow ridges. The gonothecae are shortly stalked (fig. 68a). Convergence of the rings towards one of the surfaces of the gonotheca, as described by Fraser, has not been observed, though incomplete development of the rings in cauline gonothecae as a result of pressure against the hydrocaulus has been observed. A terminal funnel is definitely not present.

Measurements (in microns). —

	Vema 15-98	Vema 16-37
Diameter of stem between 2 pairs of hydrothecae		600-1,000
diameter of branch, idem		325-390
Hydrotheca, length abcauline wall (including renovations)		485-540
length adnate part adcauline wall		555-585
length free part adcauline wall (including renovations)		150-220
total depth (including renovations)		565-620
diameter at aperture		285-325
maximal diameter		310-340
Gonotheca (mature), total length	1,485	
maximal diameter	1,420	

Remarks. — I see no reason to separate this species from *Synthecium chilense* Hartlaub (1905: 671). There is complete conformity in the shape and size of the hydrothecae and in the principal structure of the colonies. The fact that *S. chilense* has no secondary ramifications cannot have any decisive effect since *S. robustum* has only quite occasionally re-branched side-branches. *S. robustum* was originally described from the Estrecho de Magellanes, 52°41′S, 69°55.5′W, 21 fms (= 38.5 m) (Nutting, 1904). Additional specimens have also been recorded from the Burdwood Bank (Ritchie, 1907) and from Chilean waters, viz., Calbuco, Chile (Hartlaub, 1905, as *S. chilense*). Fraser (1943, 1944) gives a number of tropical Atlantic localities, viz., off St. Vincent, 13°13′20″N, 61°18′45″W, 95 fms (= 173.5 m); off Barbados,

13°11′54″N, 59°38′45″W, 73 fms (= 133.5 m) and 13°03′50″N, 59°37′05″W, 94 fms (= 172 m), and off Grenada, 11°46′15″N, 61°48′45″W, 262 fms (= 479 m). Fraser's records need confirmation. The present records are from the shelf south-east of Peninsula Valdés, Argentina (Vema 16-40), from the shelf east of Deseado, Santa Cruz, Argentina (Vema 18-16 and 18-18), from the shelf east and south-east of Cabo Virgenes, Santa Cruz, Argentina (Vema 16-37 and 17-33), from the Estrecho de Magellanes (Vema 17-18 and 17-29), from the south-western Atlantic between the Falkland Islands and Tierra del Fuego (Vema 15-98, 15-105, 15-106, 15-107, 15-108, 15-110) and from Burdwood Bank.

Staurotheca antarctica Hartlaub, 1904 (figs. 67, 68b)

Staurotheca antarctica Hartlaub, 1904: 16, pl. 1 fig. 4, pl. 2 fig. 4; Vanhöffen, 1910: 329, fig. 43 a-c; Billard, 1914: 13, figs. 7, 8; Totton, 1930: 178, fig. 28, pl. 2 fig. 6; Briggs, 1939: 26; Naumov & Stepan'yants, 1962: 90.

Staurotheca dichotoma Jäderholm, 1905: 33, pl. 14 figs. 1, 2.

Material. — Yelcho 2-9, 64°08′S, 64°05′W, 5.3.1962, 527 m. A branched fragment of 12 mm height. No gonothecae.

Description. — The specimen consists of a 12 mm long, monosiphonic stem fragment, bearing 8 pairs of hydrothecae and a 6 mm long side-branch, originating directly from the stem under the uppermost pair of hydrothecae, and only slightly thinner (fig. 67). The fragment is best characterized by its hydrothecae. These are arranged in decussate pairs placed fairly close together, the distance between two successive pairs being no more than about the hydrothecal diameter. In a pair the two members are not strictly opposite, but the whole row of hydrothecae on the side facing the side-branch inserts slightly above those on the opposite side. On the side-branch too the arrangement of the hydrothecae is not strictly opposite, but distinctly sub-opposite, in the same way as those along the stem. The hydrothecae can best be described as tubular and smoothly curved; they are not completely embedded in the stems but an apical portion of variable length remains free (fig. 68b). The abcauline hydrothecal wall is smoothly concave, with a slight convexity at the proximal end. The attachment of the hydranth to the internal surface of the abcauline wall by means of a short filament is just above that convex portion of the wall. The adcauline wall is smoothly curved, the adnate portion continues without interruption in the free portion; the length of the free part is slightly smaller to slightly greater than the diameter of the hydrothecal aperture. The hydrothecal aperture is perfectly circular; the margin is slightly though distinctly everted. The plane of the opening makes a very sharp angle with the length axis of the stem. By repeated renovations the length of the apical part of the hydrotheca can become greatly increased and the plane of

the opening may change accordingly, becoming parallel to the length axis of the hydrotheca.

The periderm of both stem and hydrothecae is very thin and perfectly hyaline.

No gonothecae are present.

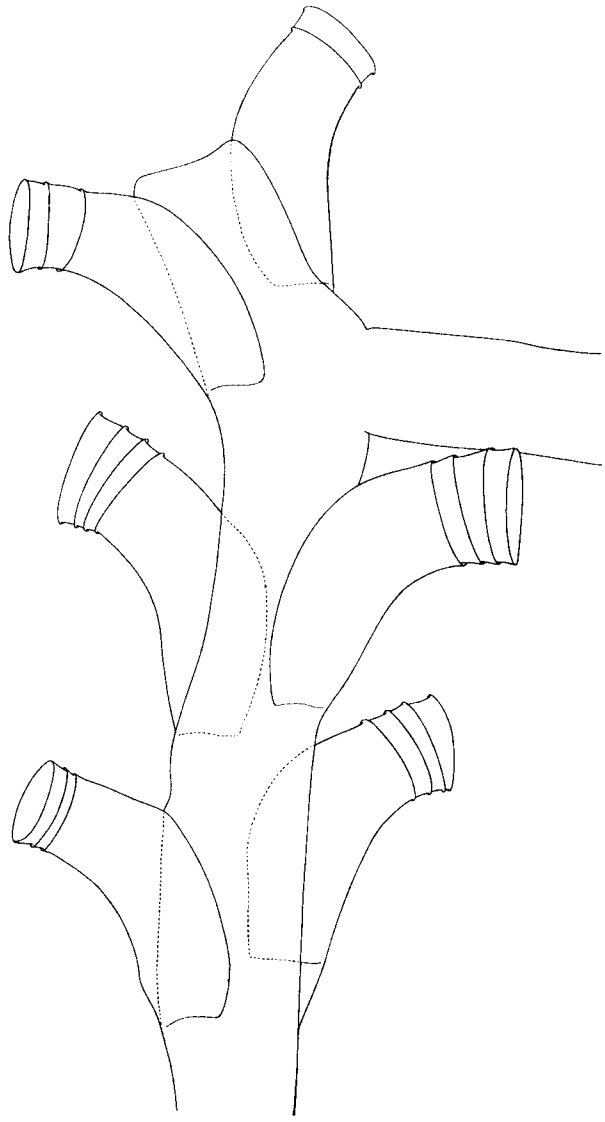

Fig. 67. *Staurotheca antarctica* Hartlaub, Yelcho 2-9, branched fragment. × 55.

Measurements (in microns). —

	Yelcho 2-9
Stem, diameter between pairs of hydrothecae	310-385
idem, diameter of branch	205-285
Hydrotheca, length abcauline wall, including renovations	515-540
length free part adcauline wall	295-405
length adnate part adcauline wall	485-515
total depth	715-745
diameter of aperture	230-245
maximal diameter	250-270

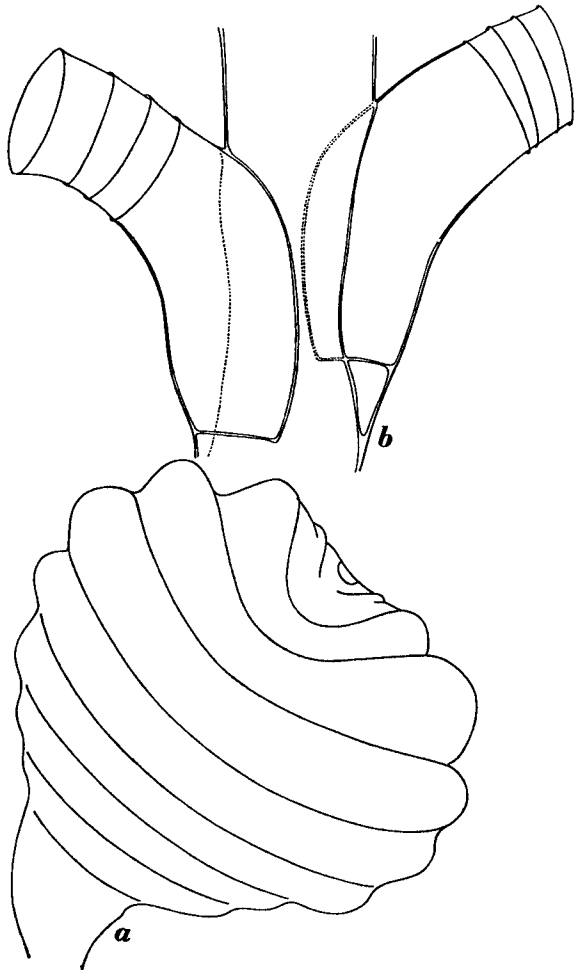

Fig. 68. a, *Synthecium robustum* Nutting, Vema 15-98, gonotheca. b, *Staurotheca antarctica* Hartlaub, Yelcho 2-9, pair of hydrothecae. a, × 50; b, × 70.

Remarks. — For the identification of this specimen I have based myself largely on Totton's (1930) description and table of measurements. I have no material for comparison and the present material is sterile and not extensive. The distribution of this species, as known at present, can be summarized in the following way: 70°23'S, 82° 47'W, 500 m (Hartlaub, 1904, southern Pacific Ocean off Graham Land); south of Snow Hill, Graham Land region, 125 m and South Georgia, various localities, 75-310 m (Jäderholm, 1905, as *Staurotheca dichotoma*) ; Posadowsky Bay, off Kaiser Wilhelm II Land, Antarctica (Vanhöffen, 1910); Marguerite Bay, Graham Land region, 176 m (Billard, 1914); off Oates Land, Antarctica, 69°43'S, 163°24'E, 180-200 fms (= 329-366 m), various localities in McMurdo Sound, Ross Sea, 140-250 fms (= 256-457 m), west of the Falkland Islands, 52°23'S, 63°50'W, 125 fms (= 229 m) (Totton, 1930); Commonwealth Bay, King George V Land, 350-400 fms (= 640-731 m) and 66°32'S, 141°37'E, 157 fms (= 287 m) (Briggs, 1939), and the extreme southern Indian Ocean, off Queen Maud Land, 430-525 m, and off King George V Land, Antarctica, 900 m (Naumov & Stepan'yants, 1962, localities not distinctly specified). The present locality is from the Palmer Islands region, Graham Land. *S. antarctica* may be characterized as a circum-Antarctic species, penetrating slightly to the north of the Antarctic circle.

Family PLUMULARIIDAE

Subfamily AGLAOPHENIINAE

Aglaophenia acacia Allman, 1883

? *Plumularia patagonica* d'Orbigny, 1846: 27, pl. 13 figs. 3-6.

Aglaophenia patagonica Kirchenpauer, 1872: 13, 26; Hartlaub, 1905: 688, figs. P^5, Q^5, R^5.

? *Aglaophenia cristata* McCrady, 1857: 202.

? *Aglaophenia trifida* L. Agassiz, 1862: 358; Kirchenpauer, 1872: 26; Nutting, 1900: 105; Fraser, 1944: 392.

Aglaophenia acacia Allman, 1883: 38, pl. 12 figs. 1-4; Marktanner-Turneretscher, 1890: 270, pl. 7 fig. 7; Billard, 1906a: 228; Bedot, 1919: 277, fig. 20; Blanco, 1967: 288, pl. 6 figs. 4-8.

Material. — Vema 16-40, 42°48'S, 63°11'W, 27.5.1960, SBT, 70 m. A large number of fragments, together representing a fairly big colony with many corbulae.

Remarks. — This species, particularly characterized by its mode of ramification, has recently been redescribed from the Mar del Plata region, Argentina, by Blanco (1967: 288, pl. 6 figs. 4-8). The Vema specimens, agreeing in every detail with Blanco's description, will not be described in detail here.

The synonymy of this species is complicated; in the list of synonyms given above I have largely followed Bedot (1921a: 338), excluding nevertheless

Aglaophenia rigida Allman (1877: 43, pl. 25 figs. 5-9), which I think is a different and well characterized species. It is very difficult or even impossible at this stage to give the geographical distribution of this species. Certain records are from the temperate Atlantic, 38°37'N, 28°30'W, 450 fms (= 823 m) (Allman, 1883), from the Azores (Billard, 1906), from Cape Bon, Tunesia, Mediterranean (Marktanner-Turneretscher, 1890), from Miramar, Buenos Aires, Argentina, 99 fms (= 181 m) and Quequen, Buenos Aires, Argentina (Blanco, 1967). D'Orbigny's (1846) record of *Plumularia patagonica* refers to southern Patagonia. The present record is from the southwestern Atlantic south-east of Peninsula Valdés, Argentina (Vema 16-40).

Aglaophenia cf. **perpusilla** Allman, 1877 (fig. 69)

Aglaophenia perpusilla Allman, 1877: 48, 56, pl. 29 figs. 5-7; Nutting, 1895: 225; Nutting, 1900: 98, pl. 21 figs. 4, 5; Wallace, 1909: 137; Fraser, 1943: 94; Fraser, 1944: 385, pl. 83 fig. 374; Vervoort, 1968: 113.

Material. — Theta 1-6, 31°41'-31°43'N, 68°08'W, 26.9.1956, EBT, 5159 m. Several about 8 mm high hydrocauli rising from a stolon. No corbulae.

Description. — The present material consists of a fragment of a stolon, detached from the substratum, from which rise three short hydrocauli each with two or three hydroclades. The stolon is tubular and not divided into internodes. The stems are monosiphonic; they have some basal internodes separated by straight septa and some intermediate internodes separated by oblique septa. The first hydroclade-bearing internode has basally an oblique septum and apically a more or less straight septum. It bears two apophyses; all the remaining internodes have one apophysis and are separated by more or less straight septa. The hydroclades have one or two hydrothecate internodes and are alternately directed obliquely left or right. The apophyses on the internodes have three large, sessile nematothecae, one median and two lateral, flanking the axil of the apophysis (fig. 69b). The hydrothecae are fairly deep and slender; the internodes are only slightly longer, so that the hydrothecae approach each other closely. Each internode has two septa, one at the level of the hydrothecal septum, one at the base of the lateral nematothecae. The hydrotheca has a distinct, slightly sloping septum in its basal third; the plane of the opening slopes very distinctly. The hydrothecal margin has 8 teeth: one unpaired anterior, one unpaired posterior and three pairs of lateral teeth. The lateral teeth are broadly rounded; the unpaired teeth are fairly sharp. There is a distinct though low median carina, terminating in an obtuse tooth just under the insertion of the unpaired anterior tooth. The median nematotheca is short; its apex does not reach the level of the frontal

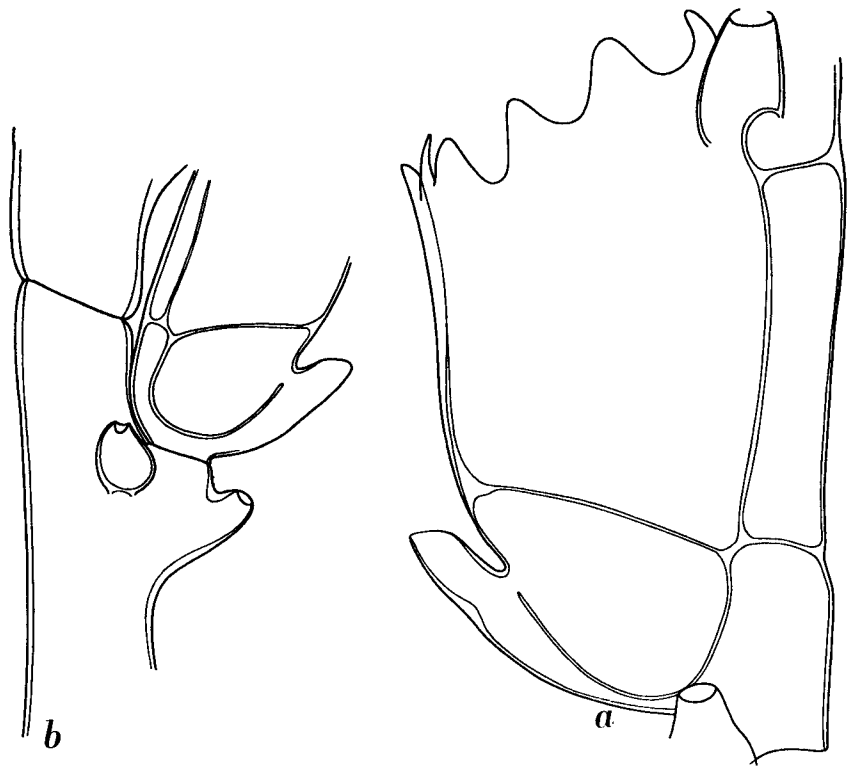

Fig. 69. *Aglaphenia* cf. *perpusilla* Allman, Theta 1-6. a, hydrotheca from hydroclade; b, origin of hydroclade on hydrocaulus. a, × 300; b, × 175.

insertion of the hydrothecal septum. The shape of the nematotheca can best be seen in fig. 69a; there is an indistinct constriction (or rather an internal thickening of the periderm) in the unpaired nematotheca near its communication with the basal chamber of the hydrotheca. The paired lateral nematothecae are short and scarcely project above the apex of the unpaired posterior marginal tooth. No septum has been observed in the paired nematothecae but a circular hole for communication with the hydrothecal cavity is very evident.

Measurements (in microns). —

	Theta 1-6
Hydrocladial internode, length	353
diameter at node	33
Hydrotheca, total depth	340
length free part abcauline wall	192
diameter at margin	155
Median nematotheca, length free part	40
Lateral nematotheca, total depth	72
diameter at aperture	22

Remarks. — The material at my disposal is too fragmentary to permit a satisfactory diagnosis; the specimen, nevertheless, agrees with the description of *A. perpusilla* but for the fact that only 8 marginal hydrothecal teeth are present (9 are stated to be present by Fraser, 1944: 386; this information, however, may be faulty). Also I have no material for comparison.

A. perpusilla is known from various localities in the Caribbean area (vide Vervoort, 1968: 113), extending from the surface down to a depth of 34 fms (= 62 m). The present record, Theta 1-6, is from the sub-tropical Atlantic in the Bermuda area but it seems unlikely that the specimen actually lived at the great depth at which it was recorded (5159 m); probably it was picked up by the dredge in superficial waters or a transported specimen has been accidentally captured by the dredge. The specimen has no hydranths; the hydrothecae are filled with dirt.

Aglaophenopsis cornuta (Verrill, 1879)

Cladocarpus cornutus Verrill, 1879: 310.
Aglaophenopsis cornuta, Nutting, 1900: 120, pl. 30 figs. 6-9; Jäderholm, 1909: 110; Kramp, 1914: 1059; Broch, 1918: 77, figs. 39-41; Fraser, 1918a: 361; Fraser, 1921: 177; Kramp, 1932: 56; Fraser, 1944: 395, pl. 85 fig. 382.

Material. — Vema 17 RD 29, 60°27'N, 48°31'W, 4.9.1961, rock dredge, 366-326 m. Fragments of a large, strongly branched colony. The basal part of the hydrocaulus is about 55 mm thick and has a compact mass of hydrorhiza fibres. Many phylactocarpia are present.

Remarks. — This very characteristic species has been described in detail by Broch (1918: 77, figs. 39-41); my specimens are in perfect agreement with that description, which need not be repeated here. The species is restricted to the deeper parts of the north-western Atlantic, as also appears from the following summary of its distribution: east of Gloucester, Mass., U.S.A., 42°32'N, 64°27'W, 170 fms (= 331 m) (Fraser, 1944); off Sable Island, Nova Scotia, 200 fms (= 366 m) (type locality, Verrill, 1879); Baffin Bay, about 750 m (Jäderholm, 1909); Julianahaab Bank and Bredefjord, both southern Greenland, 135 m and 310-700 m (Kramp, 1932); Davis Strait, 63°36'N, 55°15'W, 120 m (Kramp, 1932), 63°30'N, 54°25'W, 582 fms (= 1064 m) and 65°30'N, 55°36'W, 289 fms (= 529 m) (Broch, 1918), and Denmark Strait, 66°18'N, 25°29'W, 330 fms (= 603 m) and 65°38'N, 26°27'W, 138 fms (= 253 m) (Broch, 1918). The present locality (Vema 17 RD 29) is off the south point of Greenland, near the entrance to Davis Strait.

Aglaophenopsis hirsuta Fewkes, 1881 (fig. 70)

Aglaophenopsis hirsuta Fewkes, 1881: 133, pl. 1 figs. 2, 10, pl. 2 fig. 3; Nutting, 1900: 118, pl. 29 figs. 8-13; Fraser, 1943: 94; Fraser, 1944: 397, pl. 86 fig. 384; Vervoort, 1968: 113.

Material. — Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. Many fragments of a large colony. Many phylactocarpia and gonothecae are present.

Vema 15-3, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. A completely fragmentated, about 12 cm high colony. Basal diameter of hydrocaulus 4 mm. Many phylactocarpia and gonothecae are present.

Description. — Irregular, more or less pinnately branched colonies with erect, strongly polysiphonic main stem. The structure of the colony can best be described first from the higher, monosiphonic parts. The main stem and principal branches there are divided into internodes, that are strongly septate and bear a row of nematothecae on the frontal aspect. Each internode has four such nematothecae. The cauline nematothecae are broadly cup-shaped, the apical portion bifurcated, the basal, communal portion communicating with the interior of the internode by means of a circular hole. The apical portion is composed of a pair of funnels, directed left and right, each with a circular terminal opening. The distal nematotheca on each internode develops a large apophysis, placed between the two funnels of the apical portion. The apophyses of the successive internodes are alternately directed left or right and thus displace the funnel on the corresponding side. The cauline apophyses support the hydroclades. The colony, by the presence of a row of nematothecae, has a distinct frontal side, which remains visible even in polysiphonic stems. The polysiphony is brought about by development, from the hydrorhiza, of secundary tubes without nematothecae, fusing with the dorsal wall of the primary stem. In the thick, basal parts of the colony the secondary tubes form a cylindrical mass: the primary tube runs the full length of this cylinder of secondary tubules, the nematothecae are still quite free and all the hydroclades originate from the frontal aspect of the colony. The hydroclades are divided into regular, slightly curved internodes, always separated by distinct, straight septa. All (primary) internodes are hydrothecate; the hydrotheca can best be described as more or less elongated and cup-shaped, with the abcauline wall straight or slightly convex (fig. 70b). The hydrothecal aperture has four pairs of rounded teeth, separated by shallow, rounded incisions. The frontal wall of the hydrotheca is slightly thickened, the periderm running into the fairly strong, unpaired median tooth. There is no corresponding unpaired median tooth on the adcauline side of the hydrotheca. The interior of the hydrotheca has a distinct internal lip, projecting into the basal portion of the hydrotheca and originating from the adcauline side. There

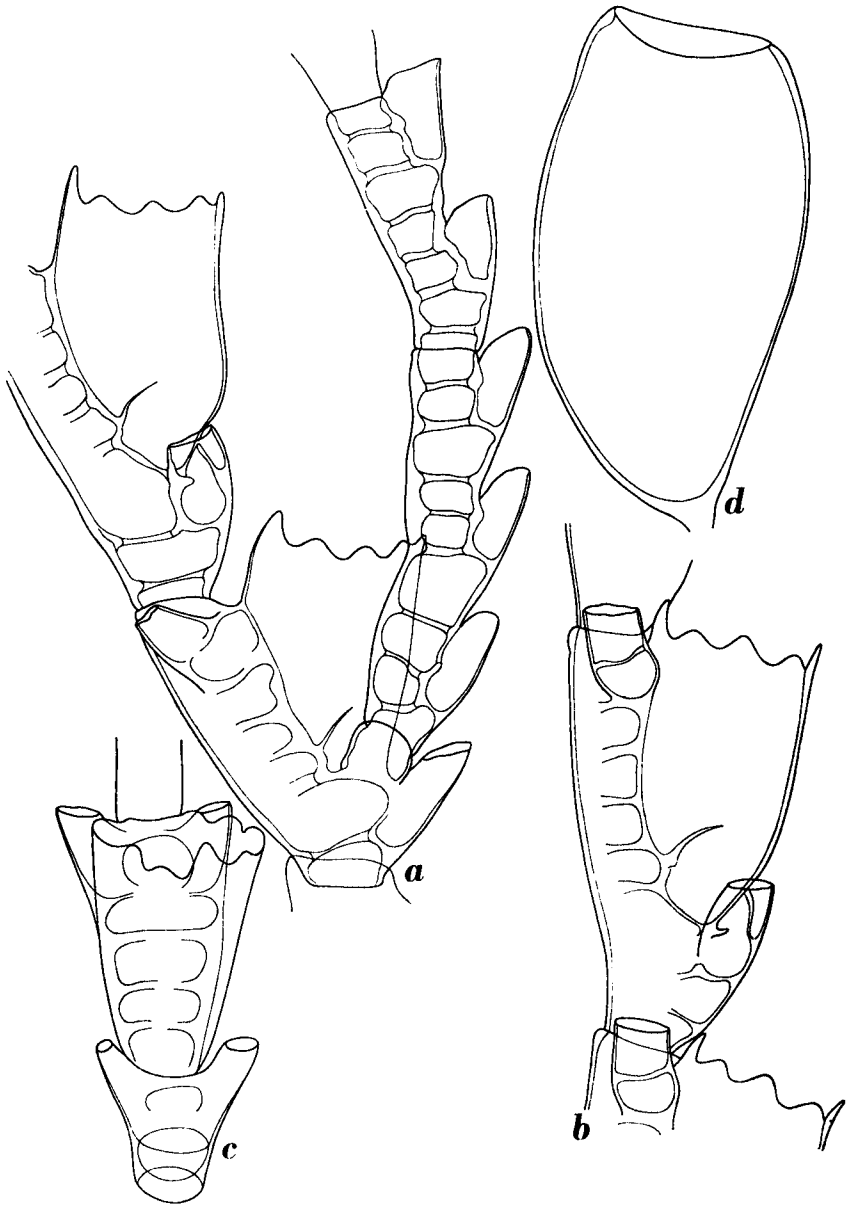

Fig. 70. *Aglaophenopsis hirsuta* Fewkes, Vema 15-3. a, origin of phylactogonium on hydroclade; b, hydrotheca from hydroclade, lateral view; c, idem, slightly oblique frontal view; d, gonotheca. a-d, × 135.

is a considerable variability in the shape and dentition of the hydrothecae. The basal hydrothecae of the hydroclades are directed obliquely forward, thus exposing a considerable portion of the adcauline hydrothecal wall. Gradually the hydrothecae change position: the ultimate hydrothecae of the primary hydroclades are almost parallel to the internodes; the free portion of the adcauline hydrothecal wall is very short. All transitions between the two extreme conditions, however, can be observed. In addition to the hydrotheca each internode bears a pair of lateral (flanking) nematothecae and an unpaired infracalycine nematotheca. The unpaired basal nematotheca is composed of a basal portion, communicating with the internode by means of a circular opening, and two funnels, each terminating in a rounded opening and pointing obliquely left and right (fig. 70c). The place of division of the nematotheca is marked by an imperfect septum in the nematotheca. The pair of flanking nematothecae points upwards or obliquely backwards; each nematotheca is, by a distinct septum, divided into a rounded basal portion and a short funnel with circular opening.

In each (primary) internode there are 7 imperfect septa, the position of which appears best from fig. 70b.

In the specimen that I have at my disposal the basal internode of all primary hydroclades supports a phylactogonium, rising from an apophysis that has replaced one of the funnels of the unpaired, infracalycine nematothecae. The phylactogonium is composed of a variable number of internodes, bearing nematothecae or occasionally, and mainly in the basal parts of the colony, a normal hydrotheca (fig. 70a).

By the development of the apophysis bearing the phylactogonium the hydrotheca on the first internode has becomes slightly displaced. The internodes of the phylactogonium are strongly septate and have three or two nematothecae. As far as I have been able to make out the basal internode has three, the remaining internodes have two nematothecae. The hydrotheca, if present, occurs on an absolutely normal internode and is complete with its nematothecae, but of slightly inferior size. The nematothecae of the phylactogonium are cup-shaped, with a large, oval aperture and without septum. The first internode has 8, the remaining internodes 6 strong, complete septa.

The gonotheca is ovoid, with a truncated apex and with a short pedicel attached to the apophysis supporting the phylactogonium. The sex of the gonothecae could not be ascertained, but probably they are male. The gonotheca opens by means of a circular lid at the flattened apical portion (fig. 70d).

Measurements (in microns). —

	Vema 15-3
Hydrocladial internode, length	390-410
diameter at node	65-80
Hydrotheca, total depth	280-290
length free part abcauline wall	230-235
diameter at margin	150-160
Median nematotheca, length free part	50-55
Lateral nematotheca, total length	80-95
diameter at aperture	40-50
Gonotheca, total length	485-500
maximal diameter	250-270

Remarks. — This species is intermediate between *Nematocarpus* Broch, 1918 and *Aglaophenopsis* Fewkes, 1881, as emended by Broch, 1918. As far as I can see the development of the "phylactogonium" on the basal hydrocladial internode is a normal condition here ("These phylactogonia are fully developed before there is any sign of the gonophore", Fraser, 1944: 397), while occasional hydrothecae are present on the phylactogonium. I agree with Bedot (1921a: 727) that a more complete study of *Nematocarpus* and *Aglaophenopsis* than has so far been possible would probably show that these genera cannot be separated from *Cladocarpus* Allman, 1874.

A. hirsuta is known from a restricted area of the western sub-tropical Atlantic viz., between 29°39'-32°07'N, and 78°37'-79°52'W, 229-440 fms (= 289-804 m); the present records (Vema 15-1 and 15-43) are in that area. There is only one record from outside that area, viz., off Sombrero Island, Leeward Islands, 240 fms (= 439 m) (Fraser, 1944, who also gives all the exact localities in the area mentioned above).

Cladocarpus carinatus Nutting, 1900 (figs. 71, 72)

Cladocarpus carinatus Nutting, 1900: 117, pl. 29 figs. 3-7; Wallace, 1909: 137; Fraser, 1943: 94; Fraser, 1944: 400, pl. 86 fig. 386; Vervoort, 1966: 149; Vervoort, 1968: 113.

Material. — Vema 15-1, 31°54'N, 79°05' W, 29.10.1948, SBT, 413 m. Several 20-30 mm long fragments, together forming a 12 cm high colony with phylactocarpium and gonothecae. Many hydrocladia.

Description. — The colony has an unbranched stem, with the hydroclades arranged along the upper part of the hydrocaulus, placed closely together and alternately directed to left and right. The higher parts of the colony are monosiphonic; the hydrocaulus here is composed of a tube, circular in cross-section and without division into internodes. The frontal part of the tube (and colony) is marked by the presence of a longitudinal row of nematothecae. These cauline nemotothecae are broadly funnel-shaped, with a circular opening and divided into two chambers by a distinct septum. The attachment

of the lower chamber to the stem is circular; moreover there is a circular hole by means of which the nematotheca communicates with the interior of the stem. Conspicuous apophyses are alternately arranged along the sides of the stem; there is always one of the cauline nematothecae close to the axil of apophysis and stem; this nematotheca may be slightly displaced (fig. 72d). Between two successive apophyses there is, leaving aside the axillary nematothecae, only a single cauline nematotheca. The periderm on the hydrocaulus is very thick and yellowish brown. In the lower parts of the colony a bundle

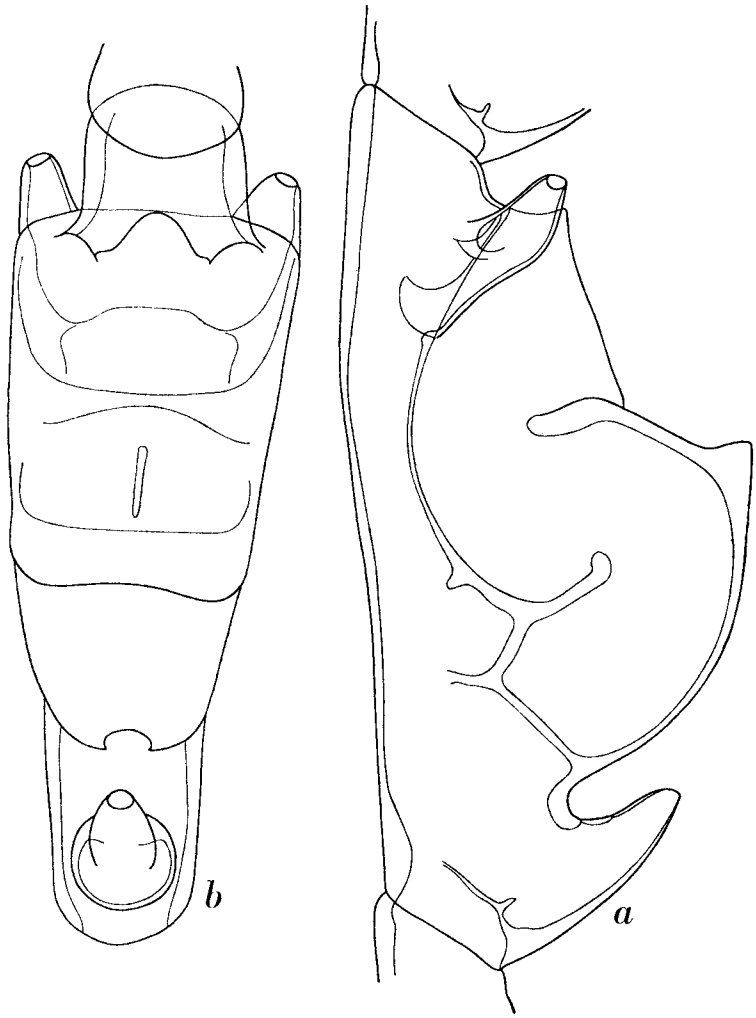

Fig. 71. *Cladocarpus carinatus* Nutting, Vema 15-1. a, hydrotheca from hydroclade, lateral view; b, idem, frontal view. a, b, × 175.

of secondary tubules is present, supporting the primary hydrotheca, which remains distinctly discernable throughout its length and runs on the frontal aspects of the much thicker bundle of secondary tubules. Nematothecae are abundantly present on the secondary tubules.

The apophyses support long hydroclades, that in my specimen must have had a length of about 20 mm and that are directed either left or right; the colony being rather flat. The hydroclades are divided into slender internodes by means of oblique septa. Each internode has a very characteristic hydrotheca, an unpaired basal nematotheca, and a pair of lateral nematothecae. The hydrotheca is curved like an S, with a strong adcauline ridge projecting into the lower third of the hydrotheca and a ridge just under the aperture projecting into the upper third of the hydrothecal cavity (fig. 71a). The basal part of the hydrotheca is strongly produced in abcauline direction; moreover it has a very characteristic, longitudinal carina, produced into a blunt point. The hydrothecal aperture is not circular but trapezoid; it has no teeth (fig. 71b).

The basal nematotheca is completely free from the hydrotheca and curved upwards; it is not particularly long. There are two openings, one circular at the apex and one oval near the hydrothecal base. The lateral nematothecae are directed obliquely upwards and forwards; they project above the hydrothecal margin. There is a distinct though incomplete septum about halfway the nematotheca and a circular opening through which it communicates with the internode. There are only two incomplete internodial septa, one at the base of the basal nematotheca and one slightly above that base. The periderm of internode and hydrotheca is quite firm.

There are several detached phylactocarpia in the sample. The phylactogonia arise from the space between hydrothecal base and infracalycine nematotheca on the first internode of certain hydrocladia, alternately on left and right side and project towards the medial side of the colony, thus forming a protective structure for the gonothecae. The first hydrotheca of hydroclades supporting phylactogonia is a slightly displaced, smaller hydrotheca; the unpaired nematotheca too is pressed aside. The phylactogonium is a curious structure, composed of flattened, ovoid leaflets, originating by bifurcation of alternate leaflets, resulting in four ovoid-lanceolate blades with large nematothecae along the inner margin. The exact structure of each phylactogonium can best be judged from fig. 72a, b; the size of the leaflets varies slightly, as does the number of marginal nematothecae (3 to 5). The gonothecae are compressed, ovoid structures, inserting on the apophyses that support the hydroclades with phylactogonia. I could not ascertain the sex of the gonothecae, but apparently they are male. At the apex there is a longitudinal slit (fig. 72c).

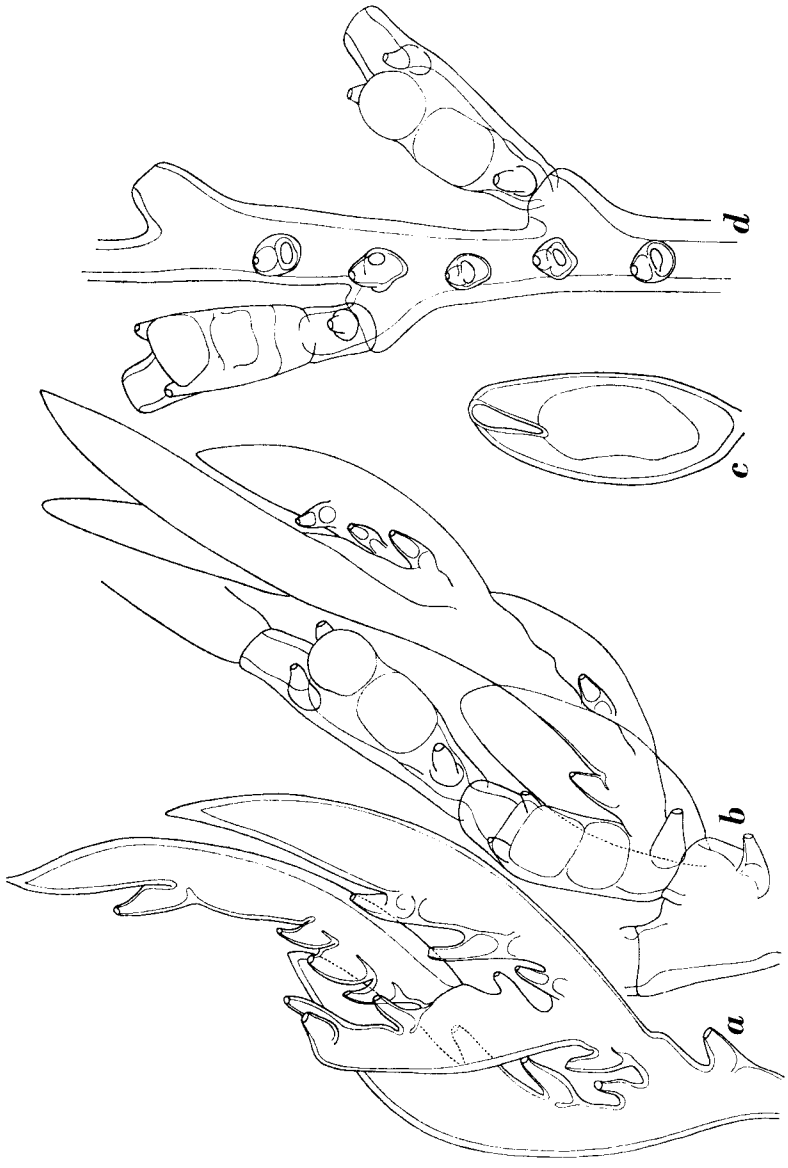

Fig. 72. *Cladocarpus carinatus* Nutting, Vema 15-1. a, phylactogonium, lateral view; b, origin of phylactogonium on hydroclade, with gonotheca; c, isolated gonotheca; d, fragment of hydrocaulus to show position of nematothecae and apophyses. a-c, × 55; d, × 30.

Measurements (in microns). —

	Vema 15-1
Hydrocladial internode, length	540-555
diameter at node	95-120
Hydrotheca, total depth	375-405
maximal diameter	245-270
diameter at apex	110-120
Median nematotheca, total length	95-110
diameter at aperture	25-30
Lateral nematotheca, total length	65-80
diameter at aperture	20-30
Gonotheca, length	645-730
maximal diameter	240-295

Remarks. — This is a very characteristic species, recorded from a restricted area of the western sub-tropical Atlantic, viz. 29°39'-30°59'N, 79°26'-79°52'N, 250-440 fms (= 457-804 m) (exact localities in Fraser, 1944). There is only one record from outside that area, viz., Tortugas, Florida, U.S.A. (Wallace, 1908). The present record too is slightly to the north of the above mentioned area (Vema 15-1, western Atlantic east of Georgia).

Cladocarpus distomus Clarke, 1907 (fig. 73a)

Cladocarpus distomus Clarke, 1907: 17, pl. 14; Bedot, 1921a: 326; Stechow, 1925: 506, fig. 47; Vervoort, 1966: 150, figs. 48-50.
Cladocarpus sibogae Billard, 1911: 70, fig. 15; Billard, 1913: 71, figs. 57, 58, pl. 4 fig. 39; Billard, 1918: 25; Bedot, 1921a: 321, 325.
Cladocarpella multiseptata Bale, 1915: 304, pl. 47 figs. 1-5; Bale, 1919: 336.
Cladocarpus plumularioides Jarvis, 1922: 352, fig. 3.
Cladocarpus distomus p.p. Millard, 1967: 188, fig. 6.

Material. — Vema 14-32, 34°35'S, 17°31'E, 6.4.1958, SBT, 1861 m. A single, 15 mm long hydroclade, bearing 11 hydrothecate internodes. No gonosome present.

Description. — The hydroclade is divided into long, slender internodes by means of slightly oblique septa. Each internode has a slender, deep hydrotheca, an unpaired nematotheca just under the hydrothecal base, a pair of lateral nematothecae and an unpaired nematotheca on the upper part of the internode just under the articulation with the succeeding internode. The hydrotheca is deep and slender; the abcauline margin is smoothly curved into the rounded basal portion; the apical part swings out slightly to terminate in a prominent median marginal tooth (fig. 73a). The hydrothecal aperture is more or less circular; besides the just mentioned median tooth there are no other marginal structures. There is no septum or ridge inside the hydrothecal cavity. The paired lateral nematothecae are bithalamic, with a distinct septum and project slightly above the level of the hydrothecal margin. The apical

portion is more or less conical, with a circular terminal aperture; the basal chamber communicates with the interior of the internode by means of a large circular opening. Each nematotheca has a large, leaf-like median expansion, extending along the hydrothecal border, terminating at the base of the median tooth and leaving the median portion of the hydrotheca uncovered. The unpaired basal nematotheca is monothalamic and cup-shaped; there is a slit-like opening just under the hydrothecal base. The distal part of the inter-

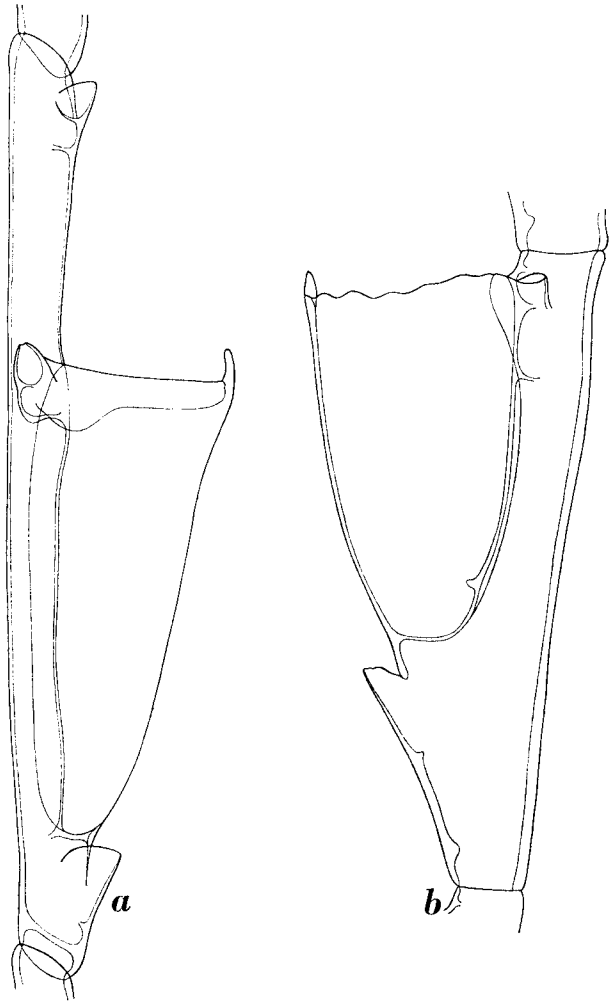

Fig. 73. a, *Cladocarpus distomus* Clarke, Vema 14-32, hydrocladial internode with hydrotheca, lataral view. b, *Thecocarpus distans* (Allman), Vema 15-1, hydrothecal internode with hydrotheca, lateral view. a, b, × 90.

node projects far above the hydrothecal margin; there is one unpaired nematotheca just under the articulation with the following internode; this nematotheca has a distinct septum at about half its length. There is only one complete internodal septum at the extreme base of the internode; in addition there is the indication of a septum at the base of both unpaired nematothecae.

Measurements (in microns). —

	Vema 14-32
Hydrocladial internode, length	1,375-1,420
diameter at node	55-70
Hydrotheca, total depth	580-700
diameter at aperture	215-245
Basal, unpaired nematotheca, length	105-110
Lateral nematotheca, length	130-135
diameter at aperture	7-9

Remarks. — The synonymy and variability of this species has been discussed previously (Vervoort, 1966: 150). In the meantime a further contribution towards the distribution and variability of this interesting species has been made by Millard (1967), though it seems to me that part of the material studied by Millard (that from sta. ABD 16B, figured as fig. 6 C) probably belongs to another species, possibly *Cladocarpus tenuis* Clarke, 1879.

C. distomus occurs in deep water of the tropical and sub-tropical parts of Atlantic, Indian and Pacific Oceans, viz., Great Australian Bight, Australia (Bale, 1915, as *C. multiseptata)*; eastern Pacific, 6°52'N, 81°42.5'W, 556 fms (= 1017 m) (Clarke, 1907); Arafura Sea, 5°33.8'S, 132°48.8'E, 560 m (Billard, 1913, as *C. sibogae*); south-eastern Atlantic, south-west of Cape of Good Hope, 1861 m (Vema 14-32); south-western Indian Ocean, 24°04'S, 36°15'E, 1610 m; 29°57'S, 31°31'E, 700 m; 30°09'S, 31°37'E, 930 m; 30°12'S, 32°01'E, 1360 m (Millard, 1967), 29°55'S, 31°13'E, 495 m (Vervoort, 1966); off East African coast, 2°58.5'N, 46°50.8'E, 1362 m; 6°18.8'N, 49°32.5'E, 1079 m (Stechow, 1925) and Cargados Garajos, Indian Ocean, 30 fms (= 55 m) (Jarvis, 1921, as *C. plumularioides*).

Cladocarpus paradiseus Allman, 1877 (fig. 74)

Cladocarpus paradisea Allman, 1877: 53, pls. 32, 33; Fewkes, 1881: 128; Nutting, 1895: 180; Nutting, 1900: 115, pl. 28 figs. 6, 7; Fraser, 1943: 95; Fraser, 1944: 406, pls. 88 and 89 fig. 394; Vervoort, 1968: 114.

Cladocarpus paradiseus, Vervoort, 1966: 149.

Material. — Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. One hydroclade composed of 5 hydrothecate articles.

Vema 15-3, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. One hydroclade composed of 6 hydrothecate internodes.

Description. — The hydroclade is divided into internodes by straight, distinct septa. The hydrothecal level reaches slightly over the septum; at the base of the unpaired nematotheca a small portion of the internode is free. The hydrotheca is large and deep; the shape can best be judged from fig. 74. The hydrothecal margin has two short, triangular teeth on both sides of the slightly thickened abcauline median zone; the rest of the hydrothecal margin is smooth, though gently curving towards the internode at the level of the septum. There is a distinct, short, projecting lip in the basal portion of the hydrothecal cavity; no further septa or lamellae in that cavity have been observed. The paired lateral nematothecae are large and broadly cup-shaped, with a distinct septum projecting into the cavity of the nematotheca from the back. The unpaired, median nematotheca is fairly large; it covers slightly less than

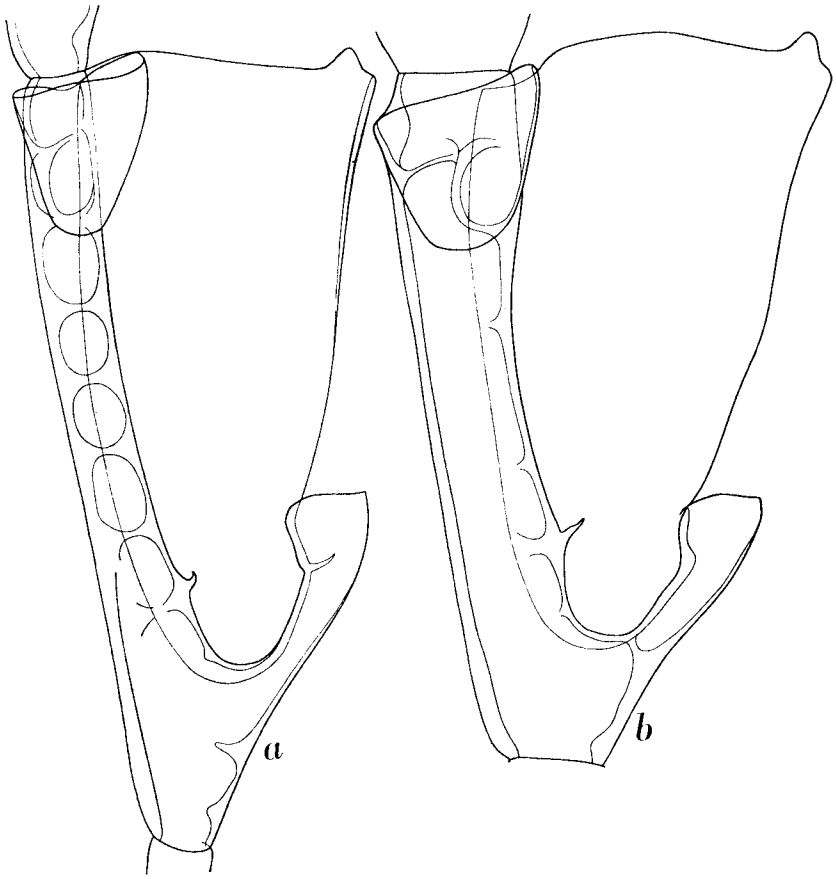

Fig. 74. *Cladocarpus paradiseus* Allman. a, Vema 15-1, hydrotheca from hydroclade, lateral view; b, Vema 15-3, hydrotheca from hydroclade, lateral view. a, b, × 70.

one third of the adcauline hydrothecal wall. It has an imperfect septum; the apical portion is cup-shaped and has a large, slit-like opening.

In the specimen from Vema 15-1 there are 7 internodial septa; there are indications of one more septum at the hydrothecal base, one at the base of the unpaired nematotheca and one at the extreme base of the internode (fig. 74a).

In the specimen from Vema 15-3 there are three distinct, though incomplete septa and indications of one more at the hydrothecal base and one at the extreme base of the internode (fig. 74b).

Measurements (in microns). —

	Vema 15-1	Vema 15-3
Hydrocladial internode, length	1,335-1,380	1,215-1,335
diameter at node	120-175	175-190
Hydrotheca, total depth	1,080-1,120	1,150-1,170
free part abcauline wall	730-780	770-835
diameter at aperture	470-525	580-620
Unpaired nematotheca, depth	330-340	365-380
diameter at aperture	135-160	120-130
Lateral nematotheca, length	270-285	270-275
diameter at aperture	285-340	350-365

Remarks. *C. paradiseus* occurs abundantly in the sub-tropical western Atlantic between 29°-39° N, 78°-80° W, usually in deep water. It also occurs in deep water off Florida and on the Pourtalès Plateau, Bahamas (see Fraser, 1944, and Vervoort, 1968, for exact localities). The present records (Vema 15-1 and 15-3) are in the above specified area of the western Atlantic.

Cladocarpus sigma (Allman, 1877) (fig. 75)

Aglaophenia sigma Allman, 1877: 45, pl. 26 figs. 9, 10.

Cladocarpus sigma, Nutting, 1895: 180; Nutting, 1900: 111, pl. 26 figs. 1, 2; Fraser, 1943: 95; Fraser 1944: 409, pl. 90 fig. 398; Vervoort, 1966: 149; Vervoort, 1968: 114.

Material. — Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. Many pinnate fragments, broken from a larger colony, and many loose hydroclades. No gonosome.

Vema 15-3, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. One pinnate, 7 cm high, complete colony and a fragment. No gonosome.

Description. — None of the colonies is complete. The colony from Vema 15-3 is probably juvenile, moreover, the top part has gone. All the remaining material consists of fragments. In these fragments the stems are polysiphonic basally and monosiphonic in the higher parts. The primary hydrocaulus is divided into regular internodes by means of slightly oblique septa. Each internode has an almost terminal apophysis, flanked by two more or less axillary nematothecae, and a basal nematotheca. The apophyses from the successive internodes are alternately directed obliquely forward and to left or right (fig.

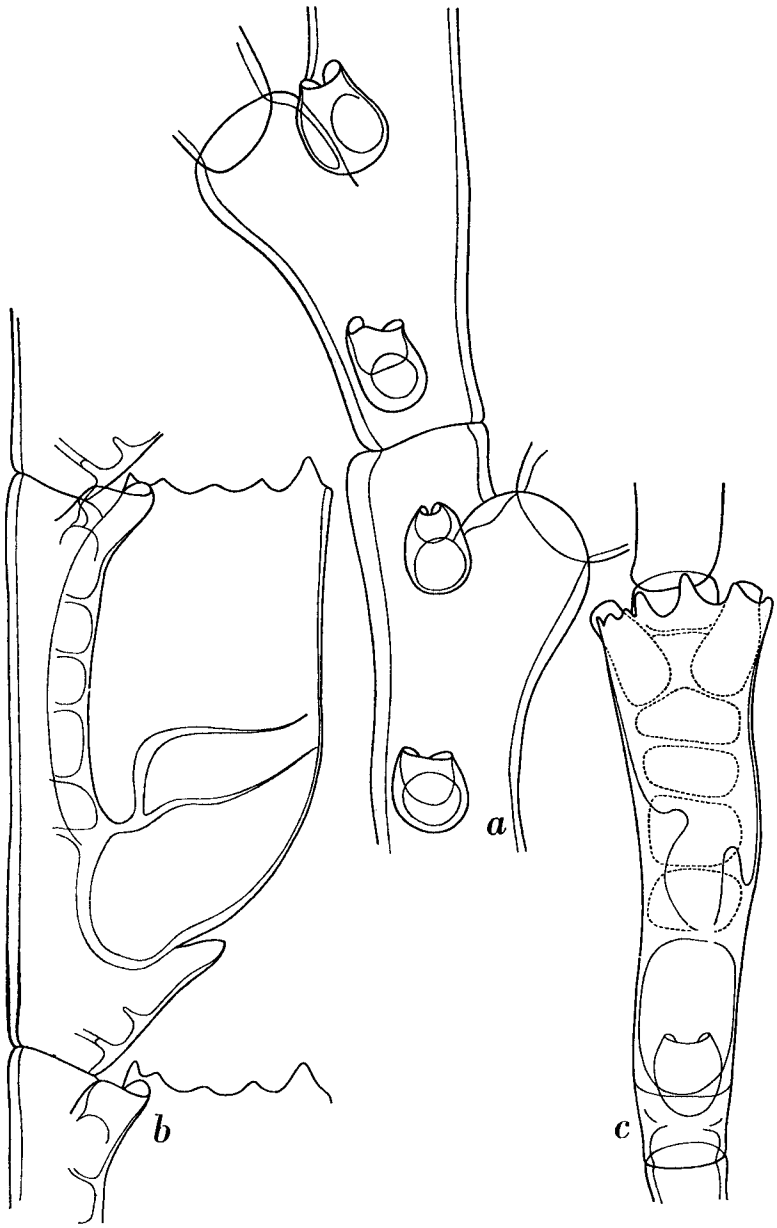

Fig. 75. *Cladocarpus sigma* (Allman), Vema 15-1. a, fragment of stem to show arrangement of apophyses and nematothecae; b, hydrotheca from hydroclade, lateral view; c, idem, dorsal view. a-c, × 120.

75a). The polysiphonic condition of the stem is brought about by unsegmented accessory tubules with nematothecae, running parallel to the primary stem at the back; the primary stem remains free throughout its course. The long and gracefully curved hydroclades insert on the apophyses; as they curve backwards they give the colony a very charming, feather-like appearance. The hydroclades are divided into internodes by means of distinct, slightly oblique septa; the internodes are straight and only slightly longer than the total depth of the hydrothecae. Each internode is provided with a fairly deep, cup-shaped hydrotheca, a pair of lateral nematothecae and an unpaired basal nematotheca. The abcauline hydrothecal wall is straight in its upper part; the proximal portion is smoothly curved. The hydrothecal aperture stands at a right angle to the length axis of the internode; there are 5 pairs of pointed marginal teeth, separated by shallow, rounded incisions. The two median teeth are slightly larger than the remaining teeth; the hydrothecal periderm is firm. Left and right interior hydrothecal wall have prominent, strongly curved chitinized ridges. In lateral view those ridges give the impression of a double intrathecal lamella (fig. 75b), but inspection of the hydrotheca in frontal aspect reveals that the structure of the hydrotheca is slightly asymmetrical, the right side slightly concave, the left side slightly convex. Both sides have an internal ridge at different height, that on the right side stronger and higher than that on the left side (fig. 75c). Both ribs meet at the adcauline intrathecal wall, where a short intrathecal lip is present. The paired nematothecae have a gutter-shaped opening and a very imperfect septum; they just reach the hydrothecal border. The basal nematotheca is very short and only covers a very small portion of the abcauline hydrothecal wall. Its opening it slit-like. The internode shows a variable number of internodal septa. Usually there are four or five complete internodal septa, the first just under the base of the lateral nematotheca; the fifth just under the level of the intrathecal rib. In addition more or less imperfect septa may also be present near the septum in the paired nematothecae, near the base of the unpaired nematotheca and at the extreme base of the internode. The highest number of septa observed was eight; only very rarely these were all complete septa.

Measurements (in microns). —

	Vema 15-1
Stem internode, length	430-600
diameter at node	150-165
Hydrocladial internode, length	600-620
diameter at node	95-110
Hydrotheca, total depth	500-540
length free part abcauline wall	470-500
diameter at aperture	215-245

Unpaired nematotheca, length	105-120
diameter at opening	47-54
Lateral nematotheca, depth	130-135
diameter at aperture	34-41

Remarks. — The nature of the "intrathecal ridge" (Nutting, 1900) is very distinctly exposed in lateral view of the hydrotheca. The hydranth is attached to the wall of the sack-shaped inferior portion of the hydrotheca, under the level of the hydrothecal ridges; there is ample room for it to pass between the folds of the hydrothecal walls.

C. sigma is exclusively known from the Caribbean area and the sub-tropical and temperate western Atlantic. It has been recorded from off Alligator Reef, Florida, 110 fms (= 201 m) (Allman, 1877); off Sand Key, Florida (116 fms = 212 m, Nutting, 1900; 129 fms = 236 m, Fraser, 1943); south-west of Sand Key, 24°20.5'N, 81°58.5'W 120 fms (= 219 m) (Fraser, 1943); off Havana, Cuba, 150-200 fms (= 274-366 m) (Fraser, 1943); Pourtalès Plateau, Bahamas (Nutting, 1895); 30°27'-31°26'N, 79°07'-79°52'W, 250-352 fms (457-649 m) (Nutting, 1900; Fraser, 1943); 34°26'N, 76°12'W, south-east of Cape Lookout, 22 fms (= 40 m) (Nutting, 1900); 37°21'N, 74°12'W, north-east of Chesapeake Bay, 860 fms (= 1572 m) (Fraser, 1943). The present records, in the sub-tropical, western Atlantic east of Georgia (Vema 15-1 and 15-3), are in the area where the species could be expected to occur.

Thecocarpus myriophyllum (Linnaeus, 1758) var. **orientalis** Billard, 1908 (fig. 76)

Thecocarpus myriophyllum var. *orientalis* Billard, 1908: 73, fig. 1; Billard, 1913: 91, figs. 76-78, pl. 5 fig. 43; Jäderholm, 1919: 25, pl. 6 fig. 5; Billard, 1922: 347, fig. 2; Vervoort, 1941: 231.

Material. — Vema 17-12, 43°30'S, 74°55'W, 23.3.1961, SBT, 112 m. Three complete colonies, 30-40 mm height and several fragments. One empty, detached corbula is present.

Description. — I have very little to add to the very complete description of colony, hydrothecae and corbulae by Billard (1913, 1922). In the present specimen there are normally three well developed internodal septa behind the hydrotheca. The lateral nematothecae are well developed and project above the hydrothecal margin. The median nematotheca covers more than half the length of the abcauline hydrothecal wall. This wall is considerably thickened and terminates in a well developed, median tooth. The denticulation of the hydrothecal margin is at times quite irregular (fig. 76).

The corbula fits the description by Billard (1913). It is 6 mm long and has 8 broadened ribs, that completely close the interior of the corbula. The corbula is broken from its base so that no peduncular hydrothecae are visible.

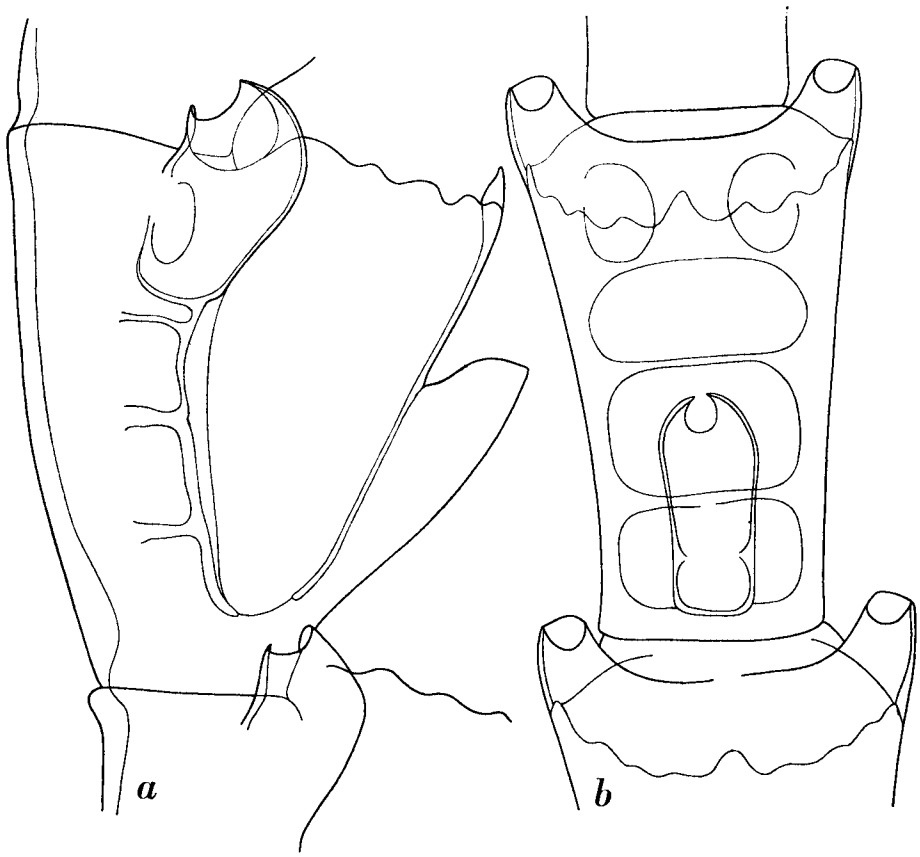

Fig. 76. *Thecocarpus myriophyllum* (L.) var. *orientalis* Billard, Vema 17-12. a, hydrotheca from hydroclade, lateral view; b, idem, frontal view. a, b, × 120.

Each rib has a slightly reduced hydrotheca, placed at the base of a very distinct and fairly long spur (gonohydrocladium). In addition each of the ribs has one or two spurs, each with nematothecae. On the first pair of ribs one of these spurs is broadened and forms a small leaf-like structure with marginal nematothecae. Both ribs of the last pair have, besides a spur with nematothecae, a broadened leaf-like structure. The rhachis of the corbula is also slightly produced so as to form a rib set with nematothecae.

Measurements (in microns). —

	Vema 17-12
Stem internode, total length	405-460
diameter	215-245
Hydrocladial internode, length	375-430
diameter at node	160-190

Hydrotheca, total depth	350-375
diameter at aperture	175-190
length free part abcauline wall	150-175
Median nematotheca, length	215-245
diameter at aperture	34-41
Lateral nematotheca, depth	160-175
diameter at aperture	40-55

Remarks. — This variety has been recorded from a number of localities distributed over the seas of the Malay Archipelago (Billard, 1913; Vervoort, 1941); it has also been recorded from Japan (Jäderholm, 1919). The present record is from the south-eastern Pacific, off the Isla de Chiloé, Chile (Vema 17-12).

Thecocarpus myriophyllum (Linnaeus, 1758) var. 1 (figs. 77a, 78)

Sertularia myriophyllum Linnaeus, 1758: 810.
Aglaophenia myriophyllum, Hincks, 1868: 290, pl. 64 fig. 2.
Thecocarpus myriophyllum, Nutting, 1900: 107, pl. 24 figs. 12, 13; Billard, 1922: 343-349, figs. 1-4; Broch, 1933: 42, fig. 16; Fraser, 1944: 425, pl. 94 fig. 416; Vervoort, 1946: 187, fig. 79.

Material. — Vema 18-12, 47°09'S, 60°38'W, no date (February 1962), SBT, 424-428 m.

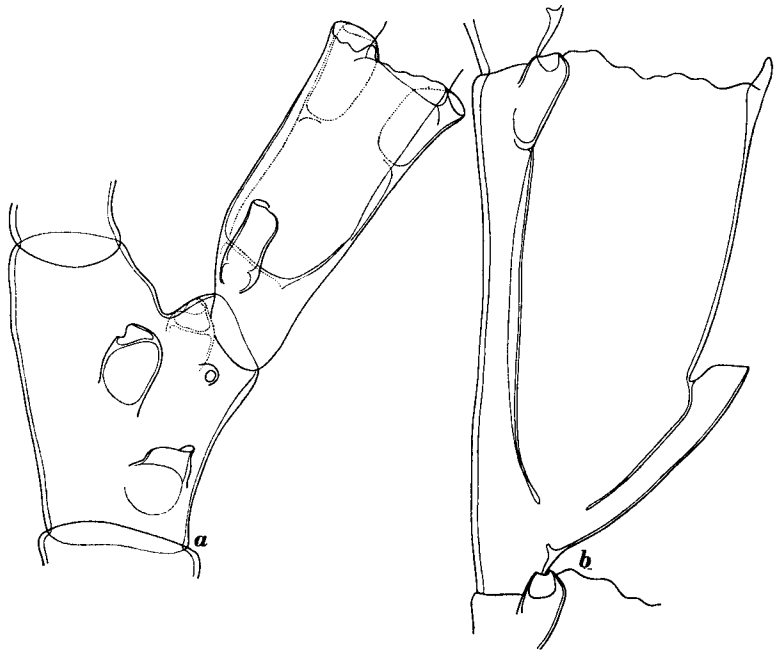

Fig. 77. a, *Thecocarpus myriophyllum* (L.), var. 1, Vema 18-12, insertion of hydroclade on stem internode. b, *Thecocarpus myriophyllum* (L.) var. 2, Vema 17-62, hydrotheca from hydroclade, lateral view. a, b, × 60.

Many loose hydroclades and a small fragment of a hydrocaulus with several hydroclades. No gonosome.

Vema 18-27, 52°41'S, 75°21'W, 24.2.1962, SBT, 470-562 m. One fragment of a hydrocaulus, 10 mm long, with several hydroclades. No gonosome.

Description. — The hydrocauli are both monosiphonical and composed of short internodes, separated by straight septa. Each internode has a well developed apophysis bearing the hydroclade and alternately pointing obliquely left and right and forward; the colony thus has a distinct frontal aspect. The hydroclades gracefully curve outward and are fairly long (20-25 mm). On the internodes of the hydrocaulus there are, besides the apophysis, three large nematothecae: two on the frontal aspect and one at the back in the axil of the apophysis. In addition there is a reduced nematotheca ("mamelon") on the frontal aspect of the apophysis, being no more than a circular hole surrounded by a slightly raised wall of periderm. The three large nematothecae are distinctly two-chambered (fig. 77a).

The hydroclades are broken up into very regular, slender internodes that are straight or slightly curved. The hydrothecae, one on each internode, are fairly closely packed and face the frontal aspect of the colony. They are large and slender, their shape is best described as tumbler-shaped, with a

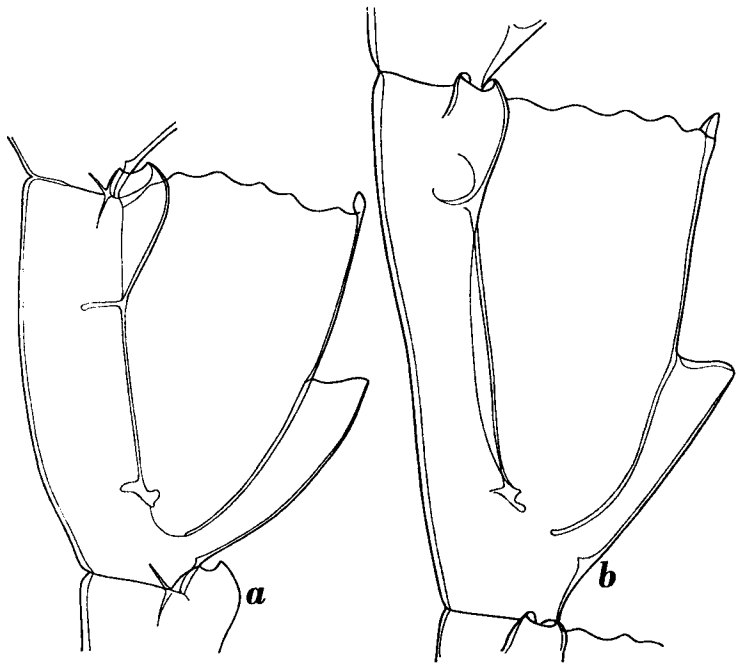

Fig. 78. *Thecocarpus myriophyllum* (L.) var. 1. a, Vema 18-12, hydrotheca from hydroclade, lateral view; b, Vema 18-27, hydrotheca from hydroclade, lateral view. a, b, × 90.

straight adcauline and distinctly convex abcauline wall. The hydrothecal aperture is circular, its plane is not perpendicular to the length axis of the internode, but slightly inclined in adcauline direction. There are five pairs of teeth, at times no more than slight undulations of the margin, on other thecae very distinctly visible, and a large, unpaired median abcauline tooth, being the continuation of the slightly thickened, abcauline hydrothecal wall (fig. 78). At the bottom of the hydrotheca the attachment of the hydranth to the abcauline wall is marked by a slightly protruding rib of periderm; slightly above that spot there is an incomplete internodal septum. A second incomplete internodal septum occurs at the base of the lateral nematotheca; these nematothecae are slightly swollen, project slightly above the hydrothecal margin and have a capacious, gutter-shaped aperture. The unpaired median nematotheca covers about half the abcauline hydrothecal wall; the free terminal portion is short and completely occupied by the gutter-shaped opening. The bottom of the median nematotheca is marked by a peridermal ridge or incomplete septum. The periderm on both internode and hydrothecae is thin.

Measurements (in microns). —

	Vema 18-12
Stem internode, total length	460-540
diameter at node	270-325
Hydrocladial internode, length	645-700
diameter at node	160-175
Hydrotheca, total depth	555-595
diameter at aperture	310-340
length free part adcauline wall	245-295
Median nematotheca, length from base	350-380
diameter at aperture	65-80
Lateral nematotheca, length	190-215
diameter	40-55

Remarks. — Though the present specimens are sterile and probably very young I feel confident that they belong to the polymorphic species *Thecocarpus myriophyllum* (L.), but the material is quite unfit to identify the variety to which it belongs. The specimens come very near to those described and figured by Billard (1913: 93, fig. 77) as young colonies of *T. myriophyllum* var. *orientalis* Billard, 1913, particularly to those figured as figs. 77A and 77B and originating from the Borneo Bank, Malay Archipelago. The present specimens are from the continental slope east of Deseado, Santa Cruz, Argentina (Vema 18-12) and from the Pacific entrance to the Estrecho de Magellanes, off Cabo Pilar, Chile (Vema 18-27); from both areas I found no previous records.

Thecocarpus myriophyllum (Linnaeus, 1758) var. 2 (fig. 77b)

Material. — Vema 17-62, 54°41'S, 55°35'W, 12.5.1961, SBT, 1199-1165 m. One complete, about 50 mm high colony with monosiphonic hydrocaulus and basal filaments. No gonosome.

Description. — This specimen differs from those recorded as var. 1 by the greater length of the hydrocladial internodes and the greater depth of the hydrotheca; for the rest the material is similar. The hydrocaulus, in the present specimen, is also divided into internodes, though the septa become less distinct in the basal part of the colony. Each internode has an apophysis bearing the hydroclades; the consecutive apophyses alternately point left and right and obliquely forward. In addition to the apophysis there are on each internode three nematothecae and a "mamelon", the arrangement of which is similar in the two varieties.

The hydrocladial internodes are slender and the hydrothecae here are nearly twice as large as those from the previous colonies (var. 1). The area of the abcauline hydrothecal wall covered by the median nematotheca is proportionally shorter, the free portion proportionally longer than in the previous variety (fig. 77b). The aperture of the median nematotheca is also gutter-shaped, though its free part is slightly longer. The lateral nematothecae are fairly slender and reach the hydrothecal margin; there are no internodal septa. The hydrothecal margin has a number of irregular undulations, at times forming five pairs of rounded, shallow teeth. In addition there is a quite distinct unpaired median tooth, being the continuation of the slightly thickened abcauline hydrothecal margin.

Measurements (in microns). —

	Vema 17-62
Hydrothecal internode, length	1,095-1,160
diameter at node	135-160
Hydrotheca, total depth	945-1,055
diameter at aperture	445-500
length free part abcauline wall	650-745
Median nematotheca, length	515-595
diameter at aperture	65-80
Lateral nematotheca, depth	245-295
diameter at opening	190-205

Remarks. — This specimen was obtained from deep water of the south-western Atlantic south-east of the Falkland Islands (Vema 17-62).

Thecocarpus distans (Allman, 1877) (figs. 73b, 79)

Aglaophenia distans Allman, 1877: 44, pl. 26 figs. 1-8; Clarke, 1879: 247.

Thecocarpus distans, Nutting, 1900: 108, pl. 24 figs. 14-16; Fraser, 1944: 424, pl. 94 fig. 415; Vervoort, 1968: 115.

Material. — Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. A 25 mm long top part of a hydrocaulus; no gonosome.

Description. — The present specimen is incomplete, it consists of a 25 mm long hydrocaulus, polysiphonic below, monosiphonic above, with 10-15 mm long hydroclades. The hydrocaulus is not divided into internodes; it has a frontal row of nematothecae and a series of apophyses, alternately directed obliquely forward and to left or right. There is usually only one single nematotheca between two successive apophyses; yet the apophyses are fairly widely spaced. In addition each apophysis has two axillary nematothecae, one on the front (the slightly displaced nematotheca of the frontal row on the stem) and one on the back (fig. 79). The periderm on the stem is quite firm and yellowish-brown. The polysiphonic condition of the stem is brought about by accessory tubules running parallel to the stem; in the basal

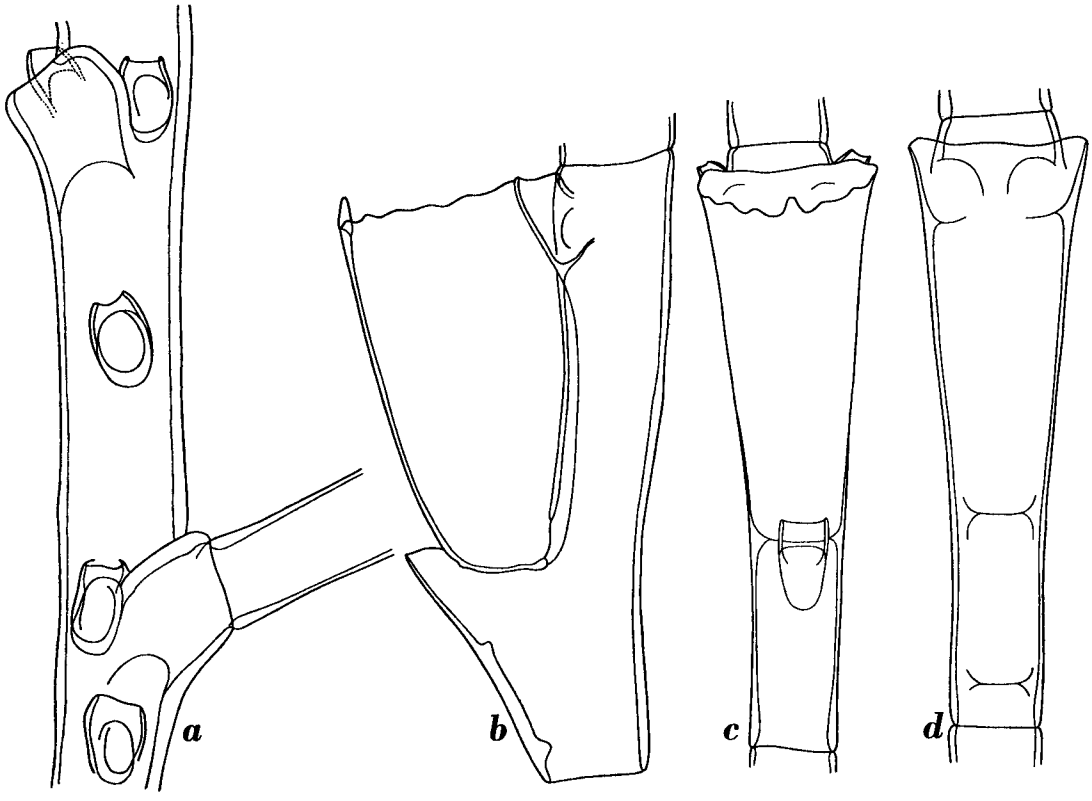

Fig. 79. *Thecocarpus distans* (Allman), Vema 15-1. a, fragment of stem to show arrangement of apophyses and nematothecae; b, hydrotheca from hydroclade, lateral view; c, idem, frontal view; d, idem, dorsal view. a-d, × 90.

part of the fragment they form a circular mass with the primary stem completely uncovered on the frontal aspect of the cylinder. The accessory tubulus have nematothecae.

The hydroclades are long and slender, gracefully curving left and right, giving the fragment a plume-shaped appearance. The internodes are separated by straight, well marked septa; each carries a slender, cup-shaped hydrotheca, an unpaired median nematotheca and a pair of lateral nematothecae. At the base of the hydrotheca there is still a considerable portion of the internode visible; the hydrothecae consequently are widely spaced. The distance between the hydrothecal margin and the bottom of the next hydrotheca is more than half the hydrothecal height. The exact shape of the hydrothecae varies slightly, but usually they narrow slightly at their base, with almost straight or slightly convex abcauline wall. Some hydrothecae are a bit more swollen, with distinctly convex abcauline wall. The hydrothecal margin is almost perpendicular to the internodal length axis; it is slightly tilted in abcauline direction. It has a conspicuous, rounded adcauline median tooth; the rest of the hydrothecal margin shows four or five pairs of undulations or weakly pronounced, rounded teeth, gradually ebbing away in adcauline direction. The periderm on the abcauline side of the hydrotheca is quite firm, thickening slightly under the median tooth. There is no intrathecal ridge or lip, but a slight peridermal notch may be visible just above the opening in the basal portion of the adcauline hydrothecal wall (figs. 73b, 79b). The paired nematothecae just reach the hydrothecal margin or very slightly surpass that border. They are monothalamic, with a large, gutter-shaped median opening and with a large hole opening into the interior of the internode. There is an incomplete septum at the base of the paired nematothecae. The position of the unpaired basal nematotheca varies. In hydrothecae of the basal internodes it covers a small fraction of the abcauline hydrothecal wall (fig. 79b); in the upper internodes it leaves the hydrothecal wall completely free (fig. 73b). All intermediate stages are realized within one hydroclade. The nematotheca itself is short, with a large, gutter-shaped opening with crenulated margin. There is no internal septum, but the base of the nematotheca is marked by a peridermal thickening of the abcauline internodal wall. There is a similar thickening of the abcauline wall near the internodal base, marking the place of an incomplete septum.

Measurements (in microns). —

	Vema 15-1
Hydrocladial internode, length	875-920
diameter at node	135-160
Hydrotheca, total length (including tooth)	595-610
length free part abcauline wall	510-595

diameter at aperture	270-295
Unpaired nematotheca, length	160-175
diameter at opening	190-205
Lateral nematotheca, depth	135-150
diameter at aperture	55-61

Remarks. — The only available description of this species, including that of the gonosome, is by Allman (1877); this diagnosis has been copied by both Nutting (1900) and Fraser (1944). There is nothing in Allman's description to contradict the identification of the Vema specimen with *T. distans*, though this identification, in absence of the gonosome, is somewhat doubtful.

This species has so far only been obtained from off Pacific Reef, Florida, 283 fms (= 517 m) (Allman, 1877) and from the Gulf of Mexico, northwest of Tortugas, 25°33'N, 84°35'W, 539 fms (= 985 m) (Clarke, 1879). The present record (Vema 15-1) is from the sub-tropical western Atlantic east of Georgia (Vema 15-1).

Subfamily PLUMULARIINAE

Plumularia spec. (fig. 80)

Material. — Vema 17-63, 54°23'S, 55°00'W, 12.5.1961, SBT, 2155-2154 m. A 30 mm high monosiphonic hydrocaulus with 3 hydrothecae, bearing a side-branch with 7 hydrothecae. No gonothecae.

Description — The fragment consists of a monosiphonic, 30 mm long hydrocaulus, snapped off at the base and broken at the apex, indistinctly divided into thecate internodes, of which the basal one bears a single side-branch, originating from a short, simple apophysis under the hydrotheca (fig. 80b). On the hydrocaulus the periderm is quite firm; the three hydrothecae are of uniform shape and very deeply campanulate, about 2.5 times as long as wide (fig. 80). The abcauline hydrothecal wall is very firm and thick; it is quite straight. The hydrothecal aperture is straight or very slightly curved towards the attachment to the hydrocaulus; the plane of the aperture is perpendicular to the length axis of the internode. Each hydrotheca is flanked by a pair of nematothecae, borne on short but distinct protuberances some distance below the hydrothecal margin. In addition there are unpaired nematothecae of identical shape on the internode. All nematothecae are conical or slightly curved structures with circular opening and distinct though thin diaphragm. They are loosely attached to the periderm of the internodes; their place of attachment is marked by a circular depression of the periderm. On

the side-branch the division into internodes is distinct, all internodes are apparently hydrothecate, though some small internodes, bearing neither hydrothecae nor nematothecae, are occasionally present. On the hydrothecate internodes there are two unpaired nematothecae below each hydrotheca (fig. 80a). The hydrothecae on the side-branch are like those on the stem, but the periderm, particularly on the abcauline wall of the hydrotheca, is much thinner.

Measurements (in microns). —

	Vema 17-63
Hydrotheca, depth	420-485
diameter at aperture	175-190
Paired nematotheca, length	80-110
diameter at aperture	50-55
Unpaired nematotheca, length	100-125
diameter at aperture	50-55

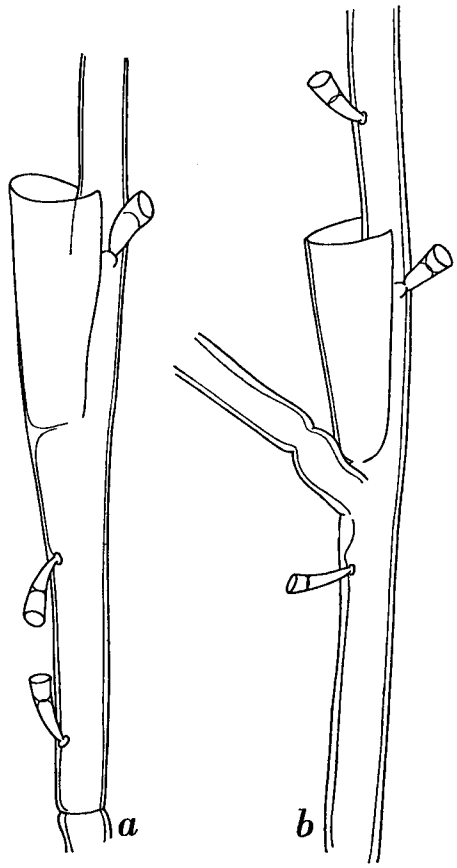

Fig. 80. *Plumularia* spec., Vema 17-63. a, hydrotheca from side-branch, lateral view; b, part of stem with side-branch. a, b, × 120.

Remarks. — The present material is too scanty to permit a proper identification. The hydrothecae have a certain resemblance to those of *Plumularia macrotheca* Allman, 1877: 30, pl. 18 figs. 3, 4, a species originally described from off Cojima, Cuba, 450 fms (= 823 m) and not rediscovered since its first record. In this species, however, judging from the description and figure by Allman, the abcauline hydrothecal wall is curved, so that the hydrothecal margin appears to be slightly everted, while thecate and athecate internodes regularly alternate. The present specimen originates from deep water of the south-western Atlantic south-east the Falkland Islands.

Nemertesia antennina (Linnaeus, 1758)

Sertularia antennina Linnaeus, 1758: 811.

Antennularia antennina, Nutting, 1900: 69, pl. 9 figs. 1, 2; Broch, 1910: 206; Fraser, 1944: 323, pl. 68 fig. 309.

Nemertesia antennina Lamouroux, 1812: 184; Broch, 1918: 64, figs. 30, 31; Vervoort, 1946: 179, figs. 74a, 75, 76a; Vervoort, 1959: 297.

Material. — Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. One 5 cm long fragment of a hydrocaulus with some hydroclades. No gonothecae.

Vema 17 RD 29, 60°27'N, 48°31'W, 4.9.1961, rock dredge, 366-326 m. Basal parts of four large colonies. Condition generally bad, as practically no hydroclades are present. No gonothecae.

Remarks. — It is unnecessary to give a redescription of this well-known boreo-Atlantic species. The material from Vema 15-1 originates from the sub-tropical western Atlantic off Georgia, an area from where the species has previously been recorded by Fraser (1944); the bulk of the material (Vema 17 RD 29) comes from off the southern extremity of Greenland, where it has also been found previously (Broch, 1918).

Nemertesia incerta Bedot, 1916 (fig. 81)

Nemertesia incerta Bedot, 1916: 2, fig.; Bedot, 1917, p. 44; Bedot, 1921: 20, pl. 3 figs. 19-21; Vervoort, 1959: 290, figs. 44, 45.

Material. — Vema 16-15, 45°00'S, 45°46'E, 8.1.1960, SBT, 1622 m. One colony of 60 mm height, composed of two plumes rising from a communal stem, and one smaller, pinnate colony. Larger colony with dense tuft of hydrorhiza fibres. No gonothecae.

Description. The hydrocaulus is largely monosiphonic and non-canalicutated; in the larger colony only the basal parts of the stems are covered by some secondary tubules. In that colony both plumes arise, probably as a result of regeneration, from a thick, polysiphonic stem fragment. The small colony is monosiphonic throughout and rises directly from some hydrorhiza fibres. The hydrocaulus is divided into internodes of variable length by means of straight septa; the internodes bear a variable number of apophyses. The arrangement of the apophyses is such that they are alternately arranged in

one plane along both sides of the stems; the number per internode is from one to five. The apophyses support long, slender hydroclades (fig. 81), gracefully curving downward; the whole colony thus becomes plume-shaped. The number of internodes in the undamaged hydroclades varies between 10 and 15; all hydroclades are homomerously segmented; the segmentation is distinct and the septa are slightly oblique. The first internode of each hydroclade invariably is a short, non-hydrothecate internode. The structure of the stem internodes is completely non-canaliculated, with fairly thick, yellowish-brown periderm. The apophyses are long and slender, bearing a pair of axillary, bithalamic, conical nematothecae and one unpaired sessile nematotheca ("mamelon"). The first, non-hydrothecate internode bears a single bithalamic nematotheca and has a proximal and a distal, incomplete though distinct septum. The hydrothecate internodes are slender, bearing one hydrotheca, a proximal bithalamic nematotheca and a distal bithalamic nematotheca, the latter placed halfway a considerable supracalycine portion of the internode. In addition a pair of bithalamic nematothecae flank the hydrotheca, placed on small elevations just under the attachment of hydrothecal margin to the internode. The hydrotheca is fairly deep, with straight abcauline border and circular aperture (fig. 81). Normally seven incomplete, distinct septa

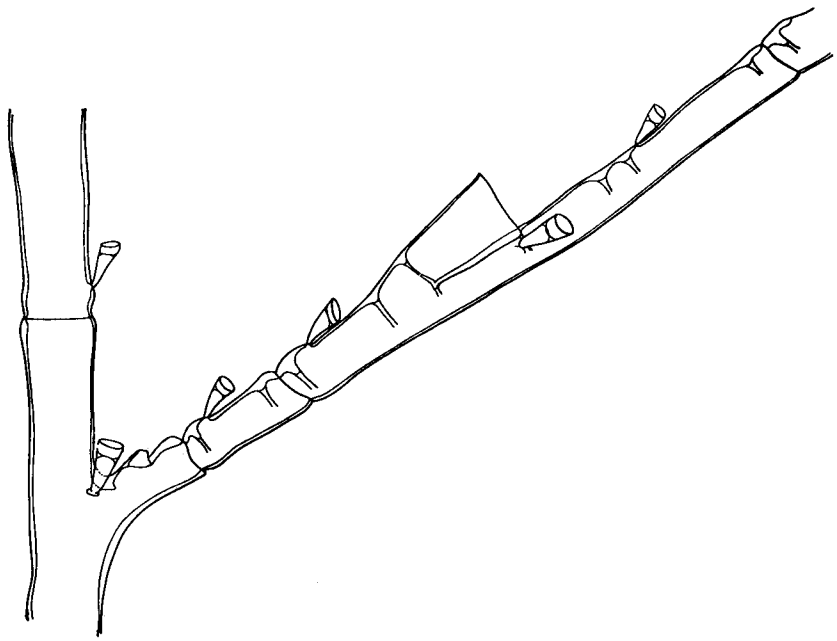

Fig. 81. *Nemertesia incerta* Bedot, Vema 16-15, fragment of hydrocaulus with hydroclade. × 70.

are present per hydrothecate internode. The number of septa, however, may be increased and their development is subject to some variability. There is also some variability in the shape of the bithalamic nematothecae. Normally these are conical structures with straight walls and circular aperture, perpendicular to the length axis, as is also the hyaline septum. Many nematotheca are slightly curved and horn-shaped, the aperture is slightly scooped out on the adcauline side.

Measurements (in microns). —

	Vema 16-15
Hydrocaulus, diameter at basal, monosiphonic part	135
space between two successive apophyses on same side	1,620-2,160
Hydrocladial, thecate internode, length	960-1,230
diameter at node	80-95
Hydrotheca, length abcauline wall	205-230
diameter at aperture	150-160
Bithalamic nematotheca, length	55-80
diameter at aperture	40-55

Remarks. — This is a poorly known, very rare species. The present material agrees well with that described in 1959 (Vervoort, 1959: 290) from off the coast of Senegal but for the fact that there is a distinct tendency towards fasciculated structure of the basal part of the hydrocaulus. Furthermore there is no distal nematotheca on the apophysis, but a nematotheca is present on the first (non-hydrothecate) internode. There is complete agreement in the structure of the internodes, up to the occasional separation of separate internodes from the distal part of the hydrothecate internode, which is also occasionally visible in the present colony.

So far this species has only been recorded from the Azores (Bedot, 1921) at 600-1250 m depth and from off Senegal (Vervoort, 1959), between 65 and 89 m depth. The present record (Vema 16-15) is from deep water of the south-western Indian Ocean, between Prince Edward and Crozet Islands.

Nemertesia cymodocea (Busk, 1851) (fig. 82)

Antennularia cymodocea Busk, 1851: 119.

Nemertesia cymodocea, Bedot, 1917: 43; Millard, 1957: 234; Ralph, 1961a: 49, fig. 6k; Millard, 1962: 299.

Nemertesia (*Antennularia*) *decussata* Kirchenpauer, 1876: 52, pl. 2 fig. 24, pl. 3 fig. 24, pl. 7 fig. 24.

Antennularia decussata, Marktanner-Turneretscher, 1890: 258, pl. 6 fig. 7.

Antennularia hartlaubi Ritchie, 1907: 542, pl. 3 figs. 4-4b.

Material. — Vema 17-18, 53°55.5'S, 71°16.8'W, 28.3.1961, SBT, 258-262 m. Three about 50 mm high, basally polysiphonic colonies and some fragments. No gonothecae.

Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. Several about 25 mm high fragments, partly polysiphonic, partly monosiphonic. No gonothecae.

Vema 17-25, 53°20.5'S, 69°32.8'W, 29.3.1961, SBT, 44 m. Three monosiphonic hydro-

cauli with very few hydrocladia, 30-40 mm high. Some of the hydrocauli with small colonies of *Halecium beanii* (Johnston).

Vema 17-29, 52°43.7'S, 69°53.7'W, 1.4.1961, SBT, 24 m. A single, 35 mm high, monosiphonic hydrocaulus with few hydroclades. No gonothecae.

Vema 17-32, 52°42.3'S, 69°44.5'W, 1.4.1961, SBT, 48 m. One monosiphonic hydrocaulus of 20 mm height without hydroclades. No gonothecae.

Vema 17-47, 55°07.2'S, 66°29.3'W, 4.5.1961, SBT, 71 m. One fragment of 25 mm length, monosiphonic, and several smaller fragments. Only few hydroclades and no gonothecae are present.

Vema 17-48, 55°10'S, 66°23'W, 4.5.1961, SBT, 42 m. A fragment of a monosiphonic hydrocaulus, supporting two branches. Only a few hydroclades and no gonothecae are present.

Description. — Slightly branched hydrocauli develop from a small tuft of

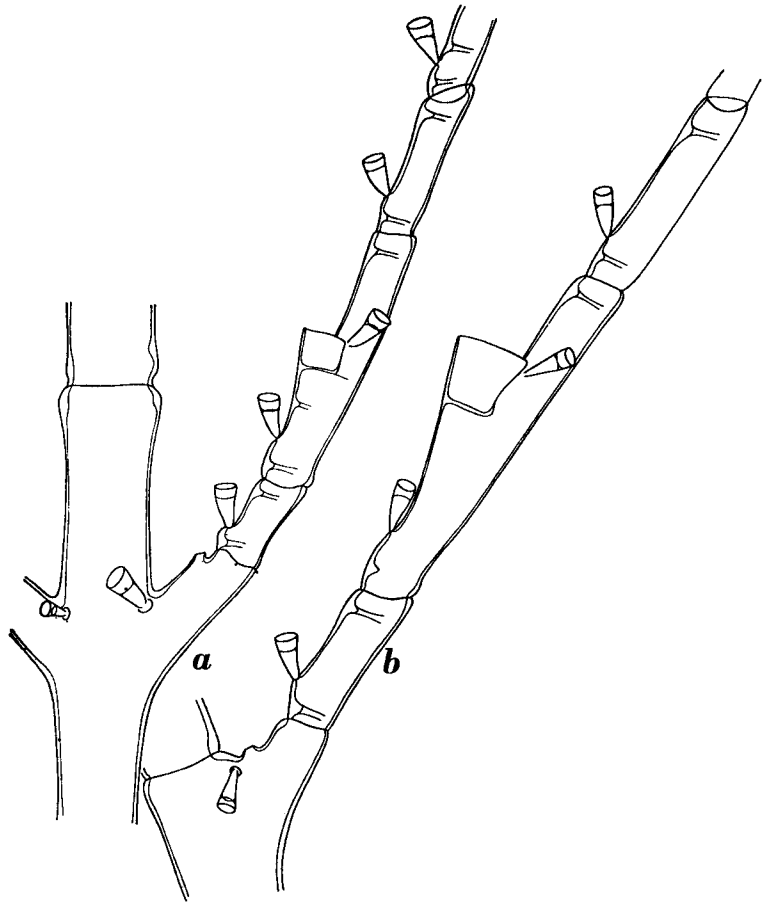

Fig. 82. *Nemertesia cymodocea* (Busk). a, Vema 17-18, part of hydrocaulus with hydroclade; b, Vema 17-21, part of hydrocaulus with hydroclade. a, b, × 90.

fine hydrorhiza fibres or are present as isolated fragments. The hydrocauli have a distinct tendency towards a polysiphonic condition because of the presence of several secondary tubules with nematothecae in the basal parts of some colonies. There is no indication of canaliculation in any of the colonies or fragments. All hydrocauli are divided into regular internodes by means of straight or very slightly oblique, distinct septa. The number of apophyses per stem internode is variable, as is the arrangement of the apophyses. Initially there is a quite regular division of the stems into short internodes, each bearing a fairly long, distal apophysis; the various apophyses are arranged in one plane and alternate. In older parts of colonies one pair of apophyses for each internode occurs, the apophyses still being arranged in one plane. In apparently even older fragments the pairs of apophyses have a decussate arrangement, resulting in the presence of four longitudinal rows of apophyses. The periderm on stem and apophyses is strong and brownish. Each apophysis has a pair of axillary, bithalamic nematothecae and a reduced nematotheca ("mamelon") (fig. 82a). The hydrocladia are short, probably as a result of damage, and have a maximum of 8 hydrothecate internodes; they are heteromerously segmented, the first article following the apophysis being an athecate internode, bearing a single bithalamic nematotheca. The hydrothecate internodes are of variable length, but usually fairly long and slender, with one cup-shaped hydrotheca with straight abcauline wall (fig. 82b). The hydrothecal aperture is circular and perpendicular to the length axis of the internode. In addition there is one proximal bithalamic nematotheca on the internode and a pair of such nematothecae flanking the hydrothecal aperture. These are shorter than the internodal fragment above the hydrothecal opening. Septa in the internodes are well developed, though subject to some variation. All colonies have two septa (one proximal and one distal) in the athecate internodes and four in the thecate internodes. In these thecate internodes the number of septa may be reduced, so that only a proximal and a distal septum are present.

Measurements (in microns). —

	Vema 17-18	Vema 17-21
Hydrocaulus, basal diameter	297	176
space between two successive apophyses on same side	745-945	1,215-1,310
stem internodes, length	1,390-1,490	660-745
Hydrocladial thecate internode, length	430-475	405-540
diameter at node	70-80	55-70
Hydrotheca, length abcauline wall	70-75	95-115
diameter at aperture	75-80	110-120
Athecate internode, length	215-230	205-245
Bithalamic nematotheca, length	55-80	55-60
diameter at aperture	34-40	39-44

Remarks. — The identification of the present material with *Nemertesia cymodocea* must be considered provisional, as all the material is either fragmentary or sterile. The distributional area of this species includes South African waters, the seas around New Zealand and southern Australia (Ralph, 1961). The present records are from the Estrecho de Magellanes (Vema 17-18, 17-21, 17-25, 17-29, 17-32) and the south western Atlantic south of Peninsula Mitre, Tierra del Fuego. I have been unable to trace previous records of any species of *Nemertesia* from southern Patagonian waters.

Nemertesia ramosa Lamouroux, 1816 (fig. 83)

Nemertesia ramosa Lamouroux, 1816: 164; Bedot, 1917: 46; Millard, 1957: 235; Millard, 1962: 299, fig. 7a-d; Vervoort, 1966: 139, fig. 41.
Antennularia ramosa var. *plumularioides* Billard, 1906: 215.
Nemertesia ramosa var. *plumularioides*, Bedot, 1917: 46; Vervoort, 1959: 293, figs. 46b, 47.

Material. — Vema 17-59, 54°53.5'S, 60°26.5'W, 10.5.1961, SBT, 432-426 m. One 50 mm high, polysiphonic colony with one side-branch. No gonothecae.

Description. — Colony with a straight main stem, rising from a dense tuft of fine hydrorhiza fibres, and with a single side-branch near the apex. The basal part of the stem is polysiphonic by the presence of a number of accessory tubes, that later on form the side-branch. Both hydrocaulus and branch are broken up into long internodes by means of straight septa. No canaliculated structure is evident. The hydroclades are borne on long apophyses, pointing obliquely upwards. The apophyses are arranged in two rows in one plane, alternately pointing obliquely left and right; the number of apophyses per internode being three or five. As a result of the biserial arrangement of the apophyses and hydroclades the colony is more or less plume-shaped with the hydroclades pinnately arranged along main stem and side-branches. The apophyses all have a pair of axillary bithalamic nematothecae, a reduced nematotheca ("mamelon") and an unpaired, distal, bithalamic nematotheca. In addition there are three internal septa in each apophysis (fig. 83). Bithalamic nematothecae also occur scattered along the stem and branch. The hydroclades have a maximal length of about 10 mm and have 10 to 16 hydrothecate internodes; they are homomerously segmented. Each hydrothecate internode has a proximal unpaired bithalamic nematotheca, two of such nematothecae flanking the hydrothecal aperture and one unpaired nematotheca on the distal portion of the internode. The hydrotheca is fairly deep, with straight abcauline wall; the aperture is either round and its plane is then perpendicular to the length axis of the internode, or scooped out towards the axis of the internode and consequently with slightly tilting plane of the aperture (fig. 83b). The bithalamic nematothecae on the whole colony

are more or less uniform; those flanking the hydrotheca may be slightly elongated and slenderer than those observed elsewhere. All are conical, with usually slightly curved walls, the opening either circular or slightly scooped out towards the axis. There is a distinct septum, separating the globular apical chamber from the rest. The thecate internodes throughout the colony have strongly developed internal septa; usually 10 are present, distributed as represented in fig. 83b. The periderm on the whole colony is strongly developed and yellowish-brown.

Measurements (in microns). —

	Vema 17-59
Hydrocaulus, basal diameter	610
distance between two successive apophyses on same side	1,230-1,255
stem internodes, length	1,910-2,365
Hydrocladial thecate internode, length	675-745
diameter at node	75-80

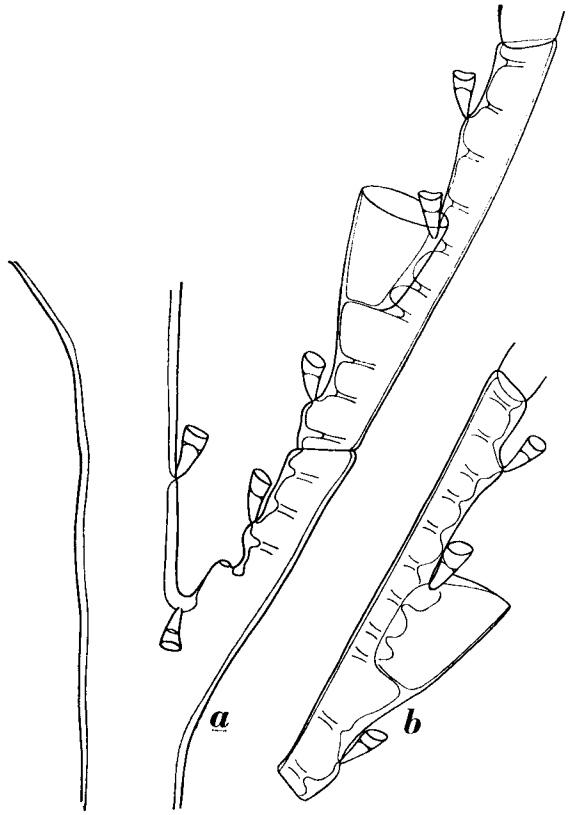

Fig. 83. *Nemertesia ramosa* Lamouroux, Vema 17-59. a, part of hydrocaulus with hydroclade; b, hydrothecal internode, lateral view. a, b, × 90.

Hydrotheca, length abcauline wall	190-215
diameter at aperture	120-135
Bithalamic nematotheca, length	70-95
diameter at aperture	40-55

Remarks. — The description of the Vema specimen resembles that of *N. ramosa* var. *plumularioides* (Billard, 1906) (cf. Vervoort, 1959: 293, figs. 46b, 47). However, I do agree with Millard (1962: 300) that this variety is somewhat loosely founded, bearing in mind the great variability of *N. ramosa* and the great changes that take place during the development of the young colony; therefore it could better be withdrawn. The principal area of distribution of *N. ramosa* is the tropical and temperate Atlantic, though the species penetrates into boreo-Atlantic waters. *N. ramosa* var. *plumularioides* has been observed along the African west coast. Records from the Indo-Pacific area are also available (Billard, 1913; Millard, 1962). Records from the southern Atlantic I have been unable to trace. The species is here recorded from the extreme south-western Atlantic, south of Burdwood Bank (Vema 17-59), occurring in moderately deep water.

Halopteris catharina Johnston, 1833

Plumularia catharina Johnston, 1833: 497, figs. 61, 62; Nutting, 1900: 60, pl. 3 figs. 1, 2; Broch, 1918: 58, figs. 25, 26; Fraser, 1944: 339, pl. 72 fig. 326.
Antennella catharina, Vervoort, 1942: 300; Vervoort, 1946: 174, figs. 69b, 72.
Halopteris catharina, Millard, 1962: 269.

Material. — Vema 15-1, 31°54'N, 79°50'W, 29.10.1958, SBT, 413 m. Several 10-15 mm high, unbranched colonies, some with a few (female) gonothecae.
Vema 17-21, 53°23'S, 70°54.6'W, 29.3.1961, SBT, 150 m. A single, 8 mm long fragment, unbranched, without gonothecae.

Description. — The material, though certainly conspecific, is in bad condition. The erect hydrocauli are monosiphonic and divided into thecate and athecate internodes, by means of alternatingly straight and oblique septa. On the thecate cauline internodes the hydrocladia originate in pairs from the internode just behind each hydrotheca; they point laterally and very slightly forward. In the higher parts of the larger colony some of the hydroclades are alternately arranged. The hydrocladia too are divided into athecate and thecate internodes by means of alternately straight and oblique septa; the first internode is a short internode separated by two straight septa, followed by an athecate internode with a straight proximal and an oblique distal septum. The hydrothecae are large and almost campanulate, with abcauline and adcauline wall nearly parallel; the adcauline wall is free for almost its whole length. The flanking nematothecae are placed on a pair of conspicuous apophyses and reach the hydrothecal border; in addition there is pair of much smaller nematothecae almost in the axil of adcauline hydrothecal wall and internode;

these are not always clearly visible. In addition a nematotheca occurs on the proximal portion of the thecate internode. Two or three of such nematothecae are found on the athecate hydrocladial internodes; they are irregularly distributed over the internodes of the stem, though each cauline hydrotheca is accompanied by lateral nematothecae. All nematothecae are bithalamic with circular, even aperture and a semi-globular apical chamber.

The gonothecae are pear-shaped and slightly curved in adcauline direction. By means of short pedicels they insert on the frontal aspect of the internode, just under the insertion of the hydrotheca; they have two nematothecae close to the insertion of the pedicel.

Remarks. — The present material, though scanty, is identical in every respect with undoubted material of this species from the North Sea area, where it frequently occurs. This species is widely distributed over the temperate and southern boreal Atlantic, occurring both on the eastern and on the western side along the coasts of the continents. The present localities are from the sub-tropical western Atlantic off Georgia (Vema 15-1), from which area the species has also been recorded by Fraser (1944), and from the Estrecho de Magellanes, (Vema 17-21) representing the first record from that area.

UNIDENTIFIABLE MATERIAL

Theta 1-6, 31°41'-31°43'N, 68°08'W, 26.9. 1956, EBT, 5159 m. Fragments of thecate hydroids (probably *Halecium* spec. and *Sertularella* spec.) with badly damaged hydrothecae.

Theta 1-7, 32°16.4'-32°21.5'N, 69°08.8'-69°13.4'W, 27.9.1956, EBT, 5352 m. Four fragments of thecate hydroids, one of which probably *Halecium* spec. Hydrothecae badly damaged.

Vema 12-8, 22°41'S, 03°16'E, 9.5.1957, SBT, 4981 m. Unrecognizable fragment of athecate hydroid, without hydranths.

Vema 14-1, 40°26'S, 61°13.5'W, 30.1.1958, SBT, 37 m. A 6 cm high colony of an athecate hydroid. No hydranths are present.

Vema 14-28, 45°34'S, 06°02'E, 28.3.1958, SBT, 4618 m. Fragment of a hydroid pedicel on a small stone.

Vema 14-32, 34°35'S, 17°31'E, 6.4.1958, SBT, 1861 m. Remnants of a small athecate hydroid colony. No hydranths are present.

Vema 14-35, 29°44'S, 37°15'E, 26.4.1958, SBT, 5013 m. A fragmentary athecate hydroid without hydranths.

Vema 14-40 II, 11°59.4'N, 44°21'E, 11.6.1958, SBT, 1261 m. A fragmentary athecate hydroid without hydranths.

Vema 15-1, 31°54'N, 79°05'W, 29.10.1958, SBT, 413 m. Several hydrocauli of an athecate hydroid, without hydranths.

Vema 15-21, 09°46.3'N, 79°37.5'W, 10.11.1958, SBT, 938 m. Fragment of an unrecognizable hydroid.

Vema 15-22, 09°46.3'N, 79°37.5'W, 10.11.1958, SBT, 974 m. Unrecognizable fragment of a tube-like structure.

Vema 15-27, 07°45'N, 79°03'W, 13.11.1958, 152-320 m. Unrecognizable thecate hydroid.

Vema 15-60, 06°21'N, 85°17'W, 30.11.1958, SBT, 1892-1016 m. Unrecognizable, 8 mm long hydrocaulus.

Vema 15-74, 07°32'S, 81°26'W, 19.12.1958, SBT, 5759-5760 m. Fragments of the least two species of hydroids, without hydranths or hydrothecae.

Vema 15-99, 54°07.8'S, 63°54'W, 3.3.1959, 119 m. An unrecognizable fragment with two empty hydrothecae.

Vema 15-102, 52°53.3'S, 65°35'W, 5.3.1959, 108 m. A 10 mm long, unrecognizable fragment of a thecate hydroid. A 12 mm long tube, possibly part of an athecate hydroid. No hydranths are present.

Vema 15-107, 54°10.2'N. 65°57.5'W, 6.3.1959, 101 m. A very large number of branched hydrocauli, probably of an athecate hydroid, without hydranths.

Vema 15-116, 55°42.9'S, 64°21.6'W, 15.3.1959, 3824 m. Several branched hydrocauli, probably of an athecate hydroid. No hydranths are present.

Vema 16-45, 50°53'N, 52°26'W, 15.8.1960, SBT, 265 m. Fragments of two species of athecate and one species of thecate hydroids. No hydranths or hydrothecae are present.

Vema 17-13, 46°59.5'S, 75°54'W, 24.3.1961, SBT, 2657-2470 m. Some fragments of hydrocauli, probably of an athecate hydroid.

Vema 17-22, 53°38'S, 70°50.5'W, 29.3.1961, SBT, 249-392 m. A large number of *Tubularia*-like tubes without hydranths.

Vema 17-48, 55°10'S, 66°23'W, 4.5.1961, SBT, 42 m. Fragments of an athecate hydroid, without hydranths.

Vema 17-57, 54°57'S, 63°04'W, 8.5.1961, SBT, 1904-1895 m. Unrecognizable remains of an athecate hydroid, no hydranths.

Vema 17-67, 41°39'S, 59°53'W, 18.5.1961, SBT, 73 m. Unrecognizable remains of *Tubularia*-like hydroid without hydranths.

Vema 17-72, 39°21'S, 61°08'W, 19.5.1961, SBT, 15 m. Two fragments of an unidentifiable hydroid, without hydranths or hydrothecae.

Vema 17-75, 41°41'S, 59°19'W, 23.5.1961, SBT, 82 m. One badly preserved, unrecognizable hydranth without gonosome.

Vema 17-76, 41°57'S, 59°03'W, 23.5.1961, SBT, 81 m. Unrecognizable remnants of athecate hydroids, no hydranths.

Vema 17-91, 44°45'S, 62°11'W, 11.6.1961, SBT, 98 m. Some 5 cm long, hollow, brownish tubes that may represent an athecate hydroid.

Vema 17-92, 44°37'S, 62°40'W, 12.6.1961, SBT, 93 m. Up to 40 mm long, hollow tubes that may represent the remains of an athecate hydroid.

Vema 17-102, 34°25'S, 52°19'W, 27.6.1961, SBT, 73 m. Two hydrocauli of an unidentifiable hydroid without hydranths.

Vema 17-118, 57°50'N, 54°06'W, 8.9.1961, SBT, 3369 m. Tubuliform structures that may represent a mass of hydrorhiza fibres.

Vema 18-9, 36°17'S, 53°21'W, 4.2.1962, SBT 676-547 m. Brownish tubes that may represent fragments of an athecate hydroid.

Vema 18-14, 47°13'S, 61°30'W, 17.2.1962, SBT, 132-130 m. A large number of fairly straight tubules of varying diameter and several tangled bundles of tubules, possibly representing remains of athecate hydroids.

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