

Hydrozoa (Cnidaria) of Iceland collected by the BIOICE programme

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SARSIA



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This study summarises the findings of benthic hydrozoans (Cnidaria, Hydrozoa, including Hydroidea and Siphonophora) collected around Iceland during the BIOICE programme. The vertical distribution of the encountered species is examined. Species diversity is highest in the upper 200 m and then decreases with increasing depth. Two new species were found: *Eudendrium islandicum* and *Cladocarpus paraformosus*. The following 15 species are new records for Iceland: *Amphinema biscayana*, *Hydractinia borealis* (polyp), *Gymnogonos crassicaulis*, *Acaulis primarius*, *Acryptolaria conferta*, *Campanulina panicula*, *Modeeria rotunda* (polyp), *Lovenella producta*, *Cladocarpus paraventricosus*, *Abietinaria pulchra*, *Abietinaria thuiarioides*, *Diphasia margareta*, *Sertularia similis*, *Kirchenpaueria bonnevieveae*, and *Stephalia corona*. The gonophores of *Garveia biscayana* Browne, 1907 and *Stegopoma plicatile* (M. Sars, 1863) are described for the first time. Both species produce free medusae. *Garveia biscayana* is transferred from the family Bougainvillidae to the Pandeidae as *Amphinema biscayana* comb. nov. *Campanularia groenlandica* Levinsen, 1893 is here recognised as a valid species and removed from synonymy with *Campanularia volubilis*.

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INTRODUCTION

The marine hydroids of Iceland have been the subject of a number of systematic studies, reaching as far back as 1772. The detailed history of these earlier studies was outlined by Kramp (1938). Three systematic studies treated the Icelandic hydroids in particular depth, namely Broch (1916, 1918) and Kramp (1938). Both authors reviewed and re-examined nearly all records of benthic hydrozoans found around Iceland. Kramp (1938) estimated that about 96 hydroid species were known from Iceland at that time. However, numerous taxon names have changed since the last review of Kramp (1938) and a considerable number of nominal species have been found to be conspecific with others. This makes the use of the mentioned studies nearly obsolete for non specialists. Therefore, I started with a major taxonomic revision of the hydroids of Iceland and Greenland and I plan to provide a full taxonomic account of all species known from the region in forthcoming publications.

The goal of the present publication is to provide a summary of the hydrozoan species encountered during the BIOICE programme (Benthic Invertebrates of Icelandic Waters). The BIOICE programme took place from 1991 to 1994 and was an international project with the objec-

tive of gaining a comprehensive knowledge of the marine animals present within the exclusive economic zone of Iceland. The sampling area (Fig. 1) covers 758 000 km² and spans a depth range of 17 m to 2400 m on both sides of the Greenland-Scotland ridge which marks the biogeographic boundary between the cold Arctic Ocean and the warmer North Atlantic. All distribution and environmental data produced by the BIOICE programme will be stored electronically. This will form an invaluable source of information allowing analyses of present day and future distributions, i.e. enabling us to monitor possible responses of the marine fauna to changes in the global climate (for more details see Gudmundsson 1998; Tendal 1998). First results of the BIOICE programme have already been published, e.g. for the Foraminifera (Gudmundsson 1998) and Amphipoda (Berge & Vader 1997).

MATERIAL AND METHODS

This study is based almost entirely on material collected for the BIOICE project. Some additional reference material of the museums of natural history of Copenhagen and Geneva was used.

Data on the samples of the BIOICE collection are

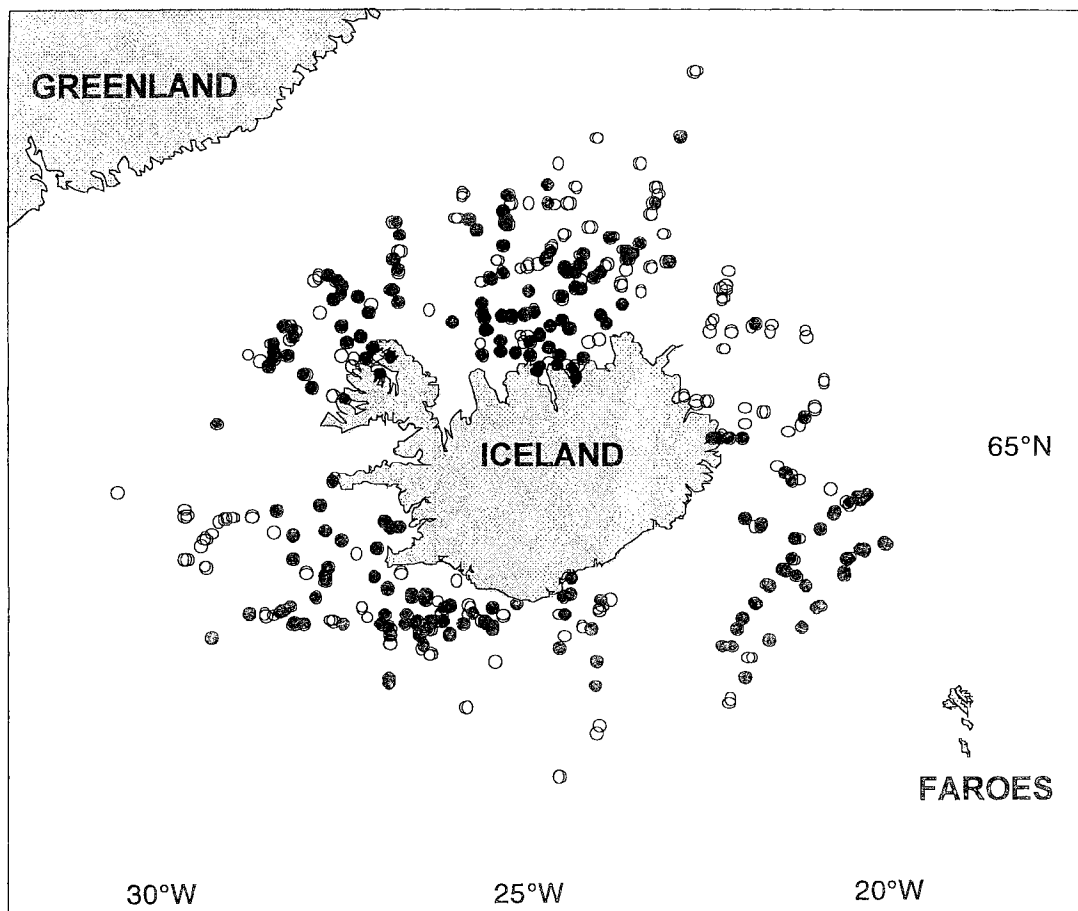


Fig. 1. Distribution of BIOICE sampling sites (circles) and sites where hydrozoans were found (filled circles).

given in the appendix. Specimens were examined with a dissecting and a compound microscope. Nematocysts were examined of the genera *Eudendrium* and *Obelia* as described in Schuchert (1996). Drawings were either made with the aid of a camera lucida equipment or from photographs. It is thus possible for comparisons with other material to make direct measurements in the figures given. If not indicated otherwise, species were identified largely based on either the original descriptions or the following accounts: Hincks (1868), Bonnevie (1898, 1899), Nutting (1900, 1901, 1904), Broch (1909, 1916, 1918), Jäderholm (1909), Brinckmann-Voss (1970), Naumov (1969), Calder (1970, 1972, 1991), Cornelius (1975, 1979, 1982, 1995a, 1995b), Millard (1975), Östman (1982), Marinopoulos (1992), Ramil & Vervoort (1992), Vervoort (1959, 1966, 1972).

All examined material was returned to the Icelandic Museum, Reykjavík, but some microslide preparations are also deposited at the Natural History Museum of Geneva.

Abbreviations. MHNG: Muséum d'Histoire Naturelle Genève; r: ratio length / breadth of nematocysts; RP sledge: Rothlisberg & Percy epibenthic sledge; s: ratio shaft / capsule length in discharged heteroneme nematocysts; ZMUC: Zoological Museum Copenhagen, Denmark.

GENERAL RESULTS AND DISCUSSION

For the BIOICE programme, more than 800 samples were collected all around Iceland (Fig. 1, open circles). Of these, 260 contained material identifiable as hydrozoans (Fig. 1, filled circles).

Among the 260 samples, 940 identifications of a total of 77 species were made (Table 1). The samples were mostly obtained by dredging which often severely fragments hydroid colonies. Fragmentation and the presence of juvenile specimens often did not allow a full identification and 102 identifications could therefore be made to the genus level only.



Sample numbers taken per depth interval – a measure of the search effort – were not equal, as their numbers decreased considerably in the deeper intervals (Fig. 2A). This certainly reflects the difficulties and costs of sampling in deeper waters. Figure 2B shows the percentage of samples that contained hydrozoans, a measure of the sampling success. The values show an apparent maximum around 400 to 500 m, which could be interpreted as the density of hydroids being highest at this depth. At first, this seems to contradict the generally accepted notion that hydroid abundance is greatest near the surface (Gili & Hughes 1995). But the percentage of hydroid positive samples probes only for spatial density and regularity of distribution, not for the abundance in terms of

biomass or colony numbers. Thus, while their abundance might be higher in shallower waters, hydroids are perhaps more evenly distributed or collectable in depths of 400 m. This is easily understandable as the heterogeneity of the sea floor is greatest in shallow waters.

In order to gain an idea of the species diversity found at different depths, the total species number in each depth interval of 100 m was determined. Specimens identified to genus level were included only if there were no other records of the same genus within this depth interval. The species richness in terms of species number per depth interval decreased dramatically with depth (Fig. 2C). Maximum species numbers were observed in the interval 100–200 m, but the first interval would certainly con-

Table 1. List of species found in the BIOICE material.

Order Anthothecata	
<i>Hydractinia borealis</i> (Mayer, 1900)	<i>Grammaria borealis</i> (Levinsen, 1893)
<i>Amphinema biscayana</i> (Browne, 1907)	<i>Lafoea dumosa</i> (Fleming, 1820)
<i>Eudendrium annulatum</i> Norman, 1864	<i>Zygophylax brownei</i> Billard, 1924
<i>Eudendrium rameum</i> (Pallas, 1766)	<i>Zygophylax pinnata</i> (G.O. Sars, 1874)
<i>Eudendrium ramosum</i> (Linnaeus, 1758)	<i>Abietinaria abietina</i> (Linnaeus, 1758)
<i>Eudendrium islandicum</i> new spec.	<i>Abietinaria filicula</i> (Ellis & Solander, 1786)
<i>Acaulis primarius</i> Stimpson, 1854	<i>Abietinaria fusca</i> (Johnston, 1847)
<i>Corymorpha glacialis</i> M. Sars, 1859	<i>Diphasia fallax</i> (Johnston, 1847)
<i>Corymorpha groenlandica</i> (Allman, 1876)	<i>Diphasia margareta</i> Hassall, 1841
<i>Gymnogonos crassicornis</i> (Bonnievie, 1898)	<i>Abietinaria pulchra</i> (Nutting, 1904)
<i>Ectopleura larynx</i> (Ellis & Solander, 1786)	<i>Abietinaria thuiarioides</i> (Clark, 1876)
<i>Tubularia indivisa</i> Linnaeus, 1758	<i>Hydrallmania falcata</i> (Linnaeus, 1758)
	<i>Sertularella gayi</i> (Lamouroux, 1821)
	<i>Sertularella tenella</i> (Alder, 1856)
	<i>Sertularia fabricii</i> Levinsen, 1893
	<i>Sertularia similis</i> (Clark, 1876)
	<i>Symplectoscyphus tricuspidatus</i> (Alder, 1856)
	<i>Tamarisca tamarisca</i> (Linnaeus, 1758)
	<i>Thuiaria alternitheca</i> Levinsen, 1893
	<i>Thuiaria articulata</i> (Pallas, 1766)
	<i>Thuiaria laxa</i> Allman, 1874
	<i>Thuiaria thuja</i> (Linnaeus, 1758)
	<i>Halopteris catharina</i> (Johnston, 1833)
	<i>Schizotracha frutescens</i> (Ellis & Solander, 1786)
	<i>Kirchenpaueria bonnievieae</i> (Billard, 1906)
	<i>Nemertesia antennina</i> (Linnaeus, 1758)
	<i>Nemertesia norvegica</i> (G.O. Sars, 1874)
	<i>Nemertesia ramosa</i> (Lamarck, 1816)
	<i>Plumularia setacea</i> (Linnaeus, 1758)
	<i>Polyplumaria flabellata</i> G.O. Sars, 1874
	<i>Polyplumaria gracillima</i> (G.O. Sars, 1873)
	<i>Cladocarpus bonnievieae</i> Jäderholm, 1909
	<i>Cladocarpus formosus</i> Allman, 1874
	<i>Cladocarpus integer</i> (G.O. Sars, 1874)
	<i>Cladocarpus paraventricosus</i> R. & V., 1992
	<i>Cladocarpus pectiniferus</i> Allman, 1883
	<i>Cladocarpus ramuliferus</i> (Allman, 1874)
	<i>Cladocarpus paraformosus</i> new species
Order Leptothecata	
<i>Campanularia groenlandica</i> Levinsen, 1893	
<i>Campanularia hincksii</i> Alder, 1856	
<i>Campanularia integra</i> MacGillivray, 1842	
<i>Campanularia volubilis</i> (Linnaeus, 1758)	
<i>Clytia gracilis</i> (M. Sars, 1850)	
<i>Clytia hemisphaerica</i> (Linnaeus, 1767)	
<i>Gonothyrea loveni</i> (Allman, 1859)	
<i>Obelia dichotoma</i> (Linnaeus, 1758)	
<i>Obelia longissima</i> (Pallas, 1766)	
<i>Rhizocaulus verticillatus</i> (Linnaeus, 1758)	
<i>Modeeria rotunda</i> (Qoy & Gaimard, 1827)	
<i>Stegopoma plicatile</i> (M. Sars, 1863)	
<i>Eutonina indicans</i> (Romanes, 1876)	
<i>Campanulina panicula</i> (G.O. Sars, 1874)	
<i>Calycella syringa</i> (Linnaeus, 1767)	
<i>Lafoeina maxima</i> Levinsen, 1893	
<i>Lovenella producta</i> (G.O. Sars, 1874)	
<i>Halecium beanii</i> (Johnston, 1838)	
<i>Halecium curvicaule</i> von Lorenz, 1886	
<i>Halecium halecinum</i> (Linnaeus, 1758)	
<i>Halecium labrosum</i> Alder, 1859	
<i>Halecium muricatum</i> (Ellis & Solander, 1786)	
<i>Halecium tenellum</i> Hincks, 1861	
<i>Acryptolaria conferta</i> (Allman, 1877)	
<i>Filellum serpens</i> (Hassall, 1848)	
<i>Grammaria abietina</i> (M. Sars, 1850)	
	Order Siphonophora
	<i>Stephalia corona</i> Haeckel, 1888

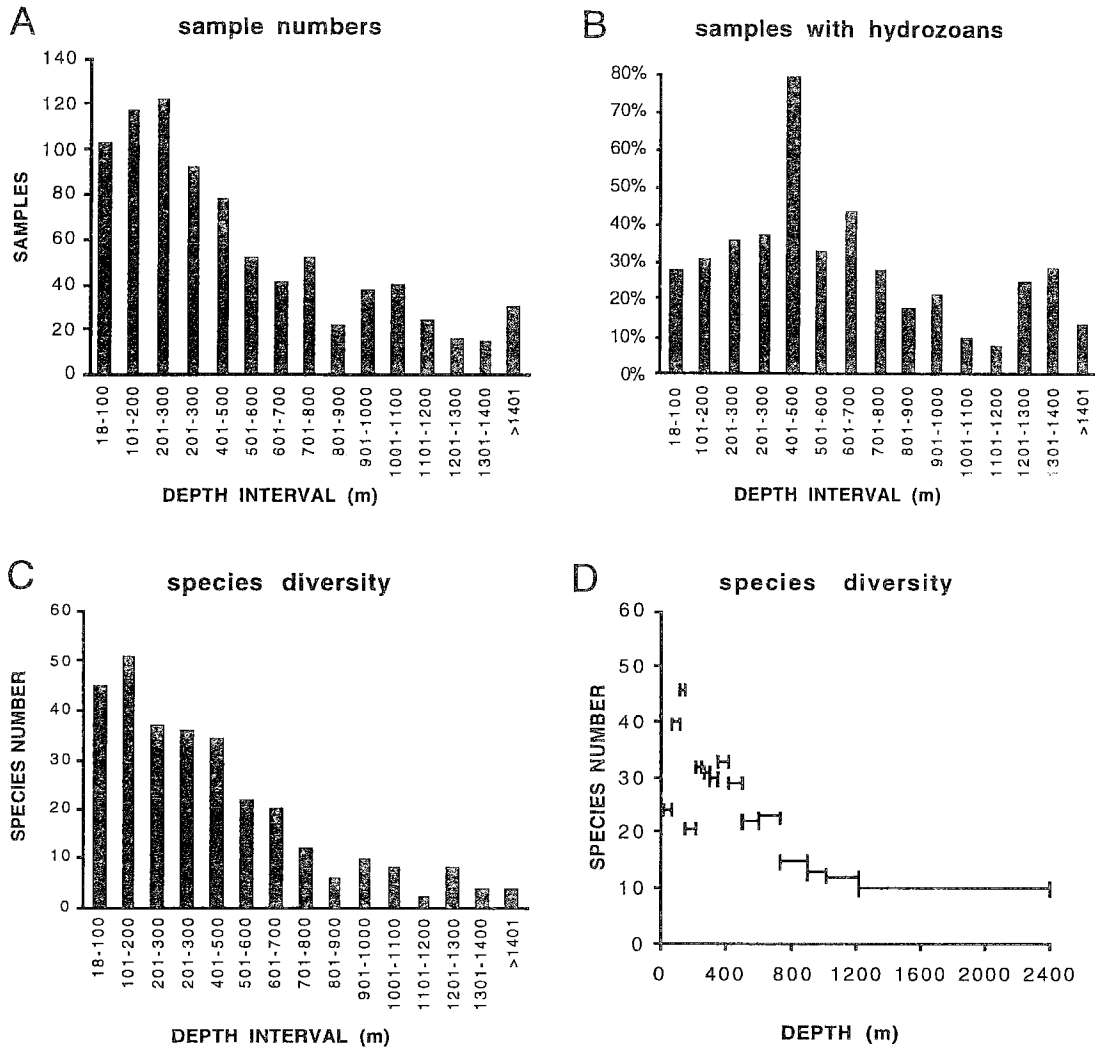


Fig. 2. Analysis of species diversity along depth gradient. A, total sample numbers per 100 m depth interval. B, percentage of samples per interval that contained hydrozoans. C, species numbers per depth interval of 100 m. D, species numbers per depth interval with constant sample numbers (ca. 55), the length of the horizontal bars indicates the extent of depth interval, their position on the y axis the species number for the corresponding interval.

tain more species as sampling started at 18 metres only. A few species restricted to the intertidal zone are thus not represented. This species diversity curve must be interpreted with some caution, as the search effort was not equal for all intervals and the number of samples taken per interval decreases with depth (Fig. 2A). It must be assumed that the number of discovered species depends on the search effort. This is so, because more samples would potentially reveal also the presence of very rare species. The species diversity gradient given in Fig. 2C therefore somewhat underestimates the diversity at

greater depths due to the diminishing search effort.

Depth intervals can also be defined so that they represent equal sample numbers, hence equal search effort. For the present study depth intervals corresponding to about 55 samples were defined and analysed (14 intervals with 55 samples, last interval 59 samples, total 829 samples). This equalisation of the search effort will lead to unequal depth intervals. The intervals range from 34 m to 1193 m and they generally increase towards deeper waters (Fig. 2D, horizontal bars). Interestingly, species diversity with equalised sampling effort reaches a maxi-



imum at about 200 m and then decreases rapidly with depth. This is in accordance with observations made for hydroids of the arctic seas north of Russia (Stepanjants 1989, figures reproduced in Gili & Hughes 1995). Calder (1998) made a similar analysis for the hydroids of the Bermuda region and found that species diversity is highest in the first 100 m.

The diversity gradient of the hydroids is not congruent with the overall species diversity gradient of benthic marine animals. Total species richness increases with depth and reaches a maximum at about 2000–3000 m, after which it decreases again (Nybakken 1993). This global species diversity, however, is severely dominated by deposit feeders, a resource found at nearly all depths. The Hydrozoa with their reliance on planktonic food seem thus to follow other rules. Bryozoa, another sessile group relying on planktonic food, show a pattern comparable to the one seen in the hydrozoans (Ryland 1970). For the bryozoans, the lack of solid substrata was put forward as explanation for the diminishing diversity with increasing depth. Although the lack of solid substrates in deeper waters certainly also accounts for the decrease of species diversity in hydrozoans, it cannot be the sole reason. A number of hydroids are well able to colonise soft substrata and Calder (1998) found that hydroids were scarce below 500 m, even though suitable hard substrata were available. Low hydroid diversity in deeper waters around Bermuda thus appeared due to other factors than simply the paucity of suitable substrates.

Factors that potentially limit the hydroids from colonising deeper waters are perhaps the scarcity of food, the sedentary mode of life, and the lack of currents that transport food.

TAXONOMIC SECTION

The classification and diagnosis of the supraspecific taxa used in this study follows Cornelius (1995a, 1995b) and Schuchert (1996). The Stylasteridae, although included in the taxon Anthoathecata, are not treated here. The BIOICE material of this group is presently studied by Dr H. Zibrowius (Marseilles) and his results will be published separately. The following account must be seen as a preliminary summary only as the available space did not allow the publishing of all taxonomic information and species records. Therefore, only new species, new records or otherwise crucial species are treated in the following. Table 1 lists all species found in this study. A complete list with all species records and station data was deposited at the Museum of Natural History of Geneva and is available upon request. Definitions and meanings of technical terms used in this study can be found in Millard (1975), Cornelius (1995a, 1995b), and Schuchert (1996, 1997).

Order Anthoathecata

Family Hydractiniidae

Hydractinia borealis (Mayer, 1900)

Podocoryne borealis – Edwards 1972:111, figs 4–6.

Material. BIOICE sample 2313, growing on cauli of *Tubularia indivisa*, with medusae buds.

Remarks. Polyp colonies of *Hydractinia carnea* (Sars, 1846) and *H. borealis* are difficult to distinguish. The present material was identified as *H. borealis* due to its occurrence on *Tubularia indivisa*, the perisarc beaker at the base of the hydranths, and the newly released medusa with eight well developed tentacles and the absence of gonad tissue (comp. Edwards 1972). Although characteristic for this species, the basal perisarc beakers are difficult to observe in preserved material. These are best seen in regions where there is still a reticulate hydrorhiza. The sample had numerous medusae buds and some medusae were apparently preserved at the moment of hatching.

The adult medusa of *H. borealis* is already known to occur around Iceland (Edwards 1972), but the polyp phase is here recorded for the first time.

Family Pandeidae

Amphinema biscayana (Browne, 1907) comb. nov. (Fig. 3A–E)

Bimeria biscayana Browne, 1907:19, pl. 1 figs 4–5.

Type locality. Gulf of Biscay, 48°07'N 08°13'W, 751 m.

Material. BIOICE 2855, about 20 colonies, 1 cm to 4 cm; BIOICE 2556, 2 colonies of 1 cm; MHNG INVE25967, 1 colony 3 cm in alcohol, 1 slide preparation with medusae buds, both derived from BIOICE 2855.

Description. Colonies erect, up to 4 cm high, grey, stem and branches stout, silt covered. Thin stolons forming a dense rooting structure (rhizoid) for anchoring in soft substrata, rhizoid length may reach 2 cm. Alternatively, stolons can be creeping on solid substrata (polychaete tubes). Colony highly polysiphonic, profusely branched, only most distal part monosiphonic. Polysiphonic part thick (up to 3 mm), composed of a thick (400 µm) axial tube surrounded by thinner (100 µm), tightly packed parallel auxiliary tubes. Axial tubes of side branches normally originate from an auxiliary tube of main branch and not from main axial tube. The axial tube is branching only at most distal monosiphonic parts. Distal monosiphonic outgrowths are as thick as axial tubes, composed of long main branches (1 cm) with mostly short

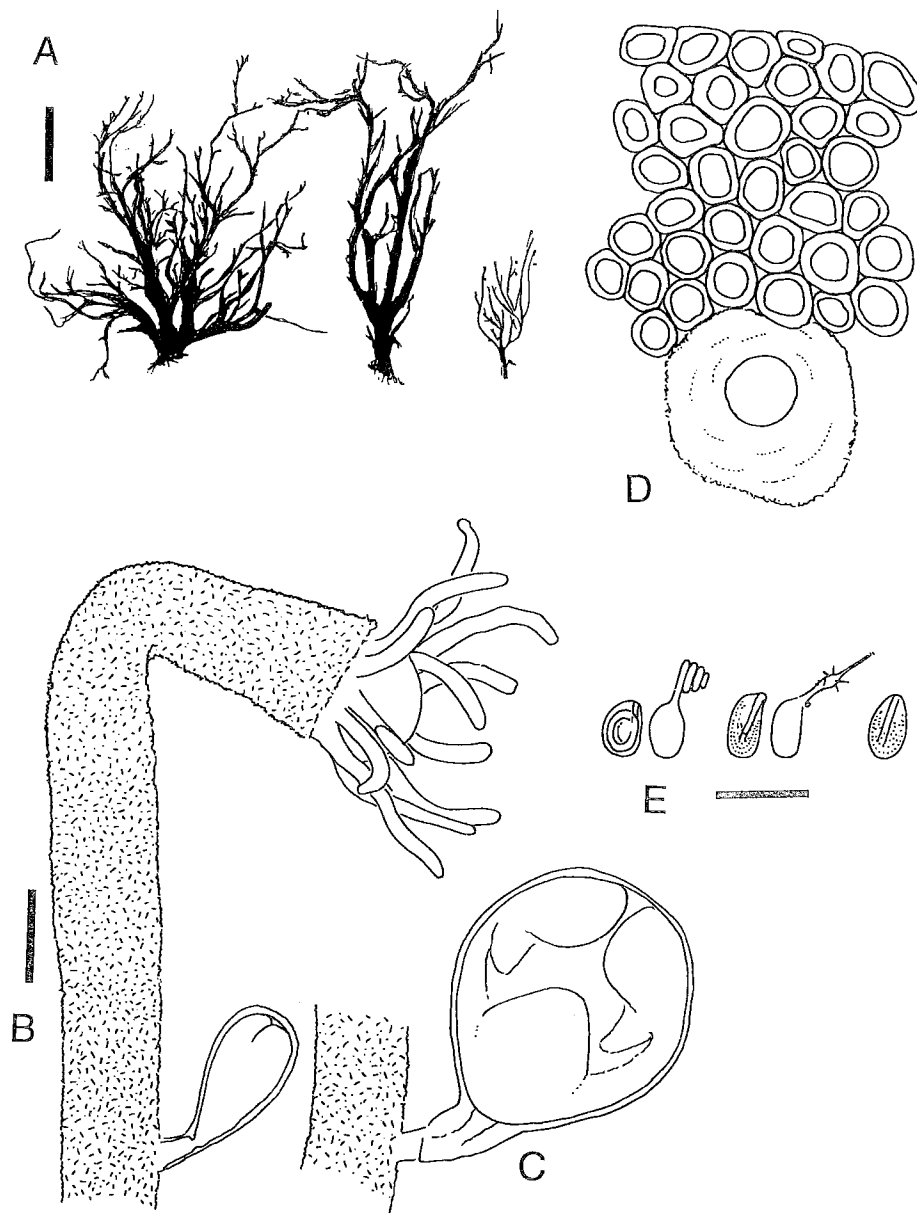


Fig. 3. *Amphinema biscayana* (Browne, 1907), BIOICE 2855. A, typical colony forms, the small colony is probably only a distal fragment of a larger one, scale bar 1 cm. B, hydranth with pseudohydrotheca and young medusa bud, scale bar 0.2 mm. C, advanced stage of medusa bud, same scale as B. D, cross section of polysiphonic branch showing axial tube (bottom) and peripheral auxiliary tubes (not all shown), same scale as B. E, nematocysts: desmoneme, same discharged, microbasic eurytele, same discharged, heteroneme found only in medusa stage, scale bar 10 μ m.

side branches, all with hydranths. Some hydranths on short pedicels also grow out of auxiliary tubes on lower polysiphonic parts of colony.

Hydranth body covered with adhering pseudohydrotheca terminating below tentacle whorl, infested with fine

silt particles. Hydranth with cylindrical body, one whorl of 10 to 12 filiform tentacles, hypostome conical. Some hydranths bent back to axis.

Gonophores arise singly far below hydranths in perisarc covered zone. Young gonophores pear-shaped, older



ones spherical, enclosed in thin perisarcal envelope. Gonophore develops into normal medusa. The oldest medusae observed had a simple manubrium without appendages, four broad radial canals, two opposite strongly developed and large tentacle bulbs, elongated, conical, presumably without ocelli, each with one long tentacle without desmonemes. Other bulbs small or absent. Between larger tentacles (presumably at interradial positions) two very small tentacles (totally 4), their tips provided with desmonemes.

Nematocysts of polyp (size and shape see Figure 3E): desmoneme; asymmetric microbasic eurytele. Nematocysts of medusa: like polyp and an additional egg-shaped heteroneme (Fig 3E).

Remarks. This hydroid almost certainly belongs to *Bimeria biscayana*, a species described in detail by Browne (1907). The Iceland material has the unique branching pattern of this species. The axial tubes of the side branches are normally produced by a tube that grows out of an auxiliary tube of the original branch, and not by a branching axial tube itself. This latter, more common branching pattern is known from e.g. *Garveia arborea* (Browne 1907). The Icelandic colonies differ from Browne's material in that the distal axial tubes – and only these ones – also show some branching. These side branches are normally short hydranth pedicels and presumably few of them would develop into polysiphonic side branches. The usual branching pattern via auxiliary tubes is, however, also observed in the distal parts of the colony. This difference from the observations of Browne (1907) may be explained by the fact that Browne had an immature colony.

This species cannot yet be allocated to the correct genus, as information on the mature medusa is not available. The genus *Amphinema* used here is only a guess, as the colonies could belong to any other member of the family Pandeidae. Some of the hydranths were bent back, a posture characteristic of *Amphinema* (see Schuchert 1996), but in this case it might as well be a fixation artifact.

The young medusae had to be dissected out of their envelope with fine needles to reveal their anatomy. The two large conical marginal bulbs growing into long tentacles immediately identified them as a member of the Pandeidae and not Bougainvilliidae, the family it was placed in originally. The number and position of the small tentacles between the large opposite pair could not be seen accurately, but there were most probably four of them present in interradial positions. They differed in structure from the large pair by having their tip covered with desmonemes. Such clusters were not seen in the normal tentacle pair.

Browne (1907) expected that this species would have

fixed sporosacs as gonophores. Surprisingly for such a large colony from deeper waters, this seems now not to be the case. Although unusual, there are other examples of large hydroid colonies from deeper waters producing medusae, e.g. *Stegopoma plicatile* (see below).

Speculating on the possible adult medusa of *A. biscayana*, and considering only pandeid medusae known from the North Atlantic having no ocelli and possessing tentacles, *Amphinema krampi* Russell, 1956a and *Merga reesi* Russell, 1956b seem to be good candidates (see Russell 1970). Both are deep water medusae known from off the English Channel, thus close to the type locality of *Amphinema biscayana*. However, only rearing experiments or DNA sequence comparisons can give us valid answers.

Distribution. Heretofore, *Amphinema biscayana* has been known only from its type locality off the Bay of Biscay. The new records are from south of Iceland from a depth of about 2075 m.

Family Eudendriidae

Eudendrium islandicum sp. nov.

(Fig. 4A-E)

Material examined. Holotype, BIOICE 2168, 66.306°N 19.205°W, 86–88 m, 9.7.1992, 4 cm colony with female gonophores; Paratype, BIOICE 2330, 63.083°N 11.333°W, 452–453 m, 3.5.1993, fertile male. BIOICE samples 2056; 2097; 2161; 2583; 2592, with female gonophores; 2313.

Description. Colonies up to 5 cm, irregularly branched, shape often elongate with long stem and short branches. Hydrorhiza branching tubules. Stem monosiphonic, mostly smooth but occasional annulations present, diameter about 200 µm; branches about 150 µm in diameter, with occasional stretches of annulations, especially near origin. Hydranth pedicels also annulated at origin, sometimes corrugated distally, total length up to 2 mm. Perisarc of stem dark brown, branches light brown to yellow. Hydranths typical for genus, with 20 to 25 tentacles.

Female gonophores develop in one whorl on body of a normally developed hydranth, gonophores initially with a simple curved spadix. Older female gonophores on pedicels of hydranths, without spadix and covered by thin periderm capsule.

Male gonophores two-chambered, arising as single whorl from base of normal hydranths.

Nematocysts:

a) smaller microbasic eurytele, mainly on tentacles, almond shaped, (7–8) × (3–4) mm, $r = 2.0\text{--}2.7$.

b) macrobasic eurytele, size (26–27) × (10–14) mm,

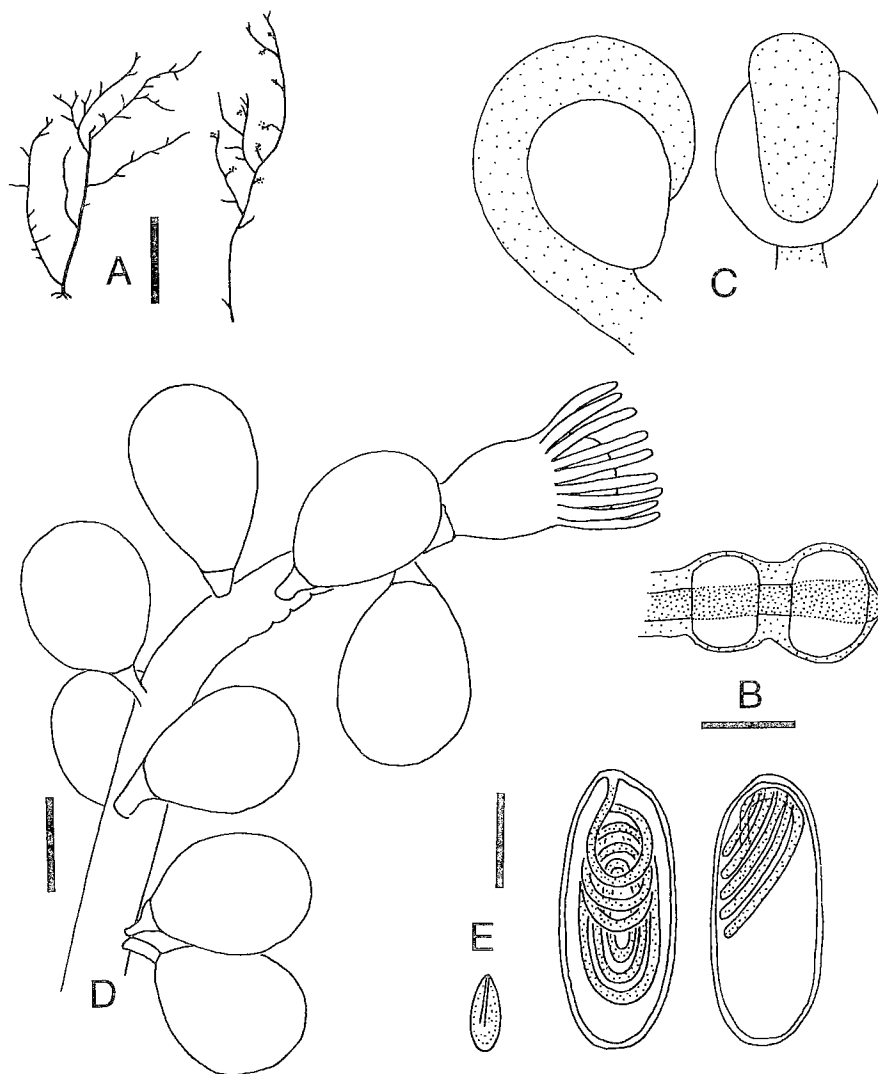


Fig. 4. *Eudendrium islandicum* new spec. A, paratype and holotype colonies, scale bar = 1 cm. B, male gonophore, paratype, scale bar = 0.2 mm; C, young female gonophores with simple spadix, BIOICE 2592; same scale as B. D, hydranth pedicel of holotype with mature female gonophores (eggs), scale bar 0.2 mm; E, nematocysts, BIOICE 2592, from left to right: microbasic eurytele, macrobasic euryteles in different views, scale bar 10 μ m.

$r = 2.0-2.7$, $s > 9$, with short, helically arranged barbs along the whole length of the shaft. The shaft in the undischarged capsule is coiled several times (more than 5 times). Viewing the capsule from the side, the shaft fills only about half of the capsule (Fig. 5E last figure). Coiling pattern depends on angle of view and varies also between individual capsules.

Etymology. The name *islandicum* refers to the provenance of this species.

Remarks. The characteristic large macrobasic eurytele renders *Eudendrium islandicum* rather easily identifiable among the *Eudendrium* species of the region, but the colony morphology of *E. islandicum* resembles *E. capillare* Alder, 1856. Some earlier Icelandic records of *Eudendrium capillare* given by Broch (1916) and Kramp (1938) may therefore actually belong to *Eudendrium islandicum*. *Eudendrium islandicum* not only differs from *E. capillare* by its large macrobasic eurytele, but also by their blastostyles. The male



sporosacs *Eudendrium islandicum* are on fully developed hydranths, while those of *E. capillare* have their tentacles completely atrophied.

There are several *Eudendrium* species possessing large macrobasic euryteles, but all sufficiently well described species did not match the present population and the new name *Eudendrium islandicum* is proposed here.

Eudendrium currumbense Watson, 1985 from Queensland (tropical Australia) comes closest to *E. islandicum*, but the former has capsules with its shaft coiled only 4 to 5 times in the form of a number eight and additionally it forms much smaller colonies. Furthermore, the geographic distance and the different climatic zone argue strongly against any conspecificity. *Eudendrium fragile* Motz-Kossowska, 1905 from the Mediterranean has a large macrobasic eurytele with 3 transverse coils only (Marinopulos 1992) and the colonies are mostly stolonal or only slightly branched (up to four hydranths). *Eudendrium motzkossowskiae* Picard, 1951 is also quite similar, but can immediately be ruled out as it has a characteristic sperm capsule on the spadix of the female gonophore. *Eudendrium glomeratum* Picard, 1951, occurring in the Mediterranean, Great Britain and Ireland (Boero & Cornelius 1987), is also similar, but its large macrobasic eurytele has only 2 1/2 coils and their colonies can grow to large (20 cm), polysiphonic colonies (Boero et al. 1986; Marinopulos 1992; own unpublished observations). Allman (1877) also described a number of *Eudendrium* species from off Florida. Allman's descriptions are entirely insufficient and his samples are currently being re-examined by A. Marques (Sao Paulo, Brazil). According to a personal communication from A. Marques, none of Allman's species match *Eudendrium islandicum*.

Distribution. Recorded mainly between Iceland and Greenland, from off the south east corner of Iceland and near Reykjanes, in depths from 87 - 606 m, bottom types: mostly sand and stones, but also on sand or silt and then presumably epizoically.

Acaulis primarius Stimpson, 1854

Acaulis primarius Stimpson, 1854:10, pl. 1 fig. 4; Fraser 1944:87, pl. 15 fig. 62; Berrill 1952:17, fig. 6; Bouillon 1971:342, pl. 4.

Acaulis primaris – Naumov 1969:243, fig. 112.

Material examined. BIOICE 2096, one specimen, immature; BIOICE 2124, 4 specimens, 2 with gonophores; BIOICE 2201, 2 fertile specimen; BIOICE 2221, 1 fertile specimen; BIOICE 2451, 2 damaged specimens, fertile.

Remarks. This is the first record of *Acaulis primarius* Stimpson, 1854 for Iceland, although the present records lie within the known distribution of this species.

Order Leptothecata

Family Campanulariidae

Campanularia groenlandica Levinsen, 1893
(Fig. 5A-D)

Campanularia groenlandica Levinsen, 1893:168, pl. 5 figs 10-12; Broch 1909:187, fig. 41; Broch 1918:157, fig. 72; Naumov 1969:273, figs 16-17; Calder 1970:1518, pl. 4 fig. 1.

Material. Holotype of *Campanularia groenlandica*, ZMUC, in three pieces, on *Lafoea dumosa*, damaged, probably dried out at some stage, gonothecae present, calyx length 0.9 mm. – Iceland: BIOICE samples 2056, with gonothecae; 2067; 2074; 2097; 2349; 2356; 2358; 2377, with gonothecae; 2493, with gonothecae; 2508, with gonothecae; 2514; 2595; 2710.

Description. Colony stolonal, hydrothecae on long (up to 4 mm) pedicels. Pedicels smooth proximally, distal end with distinct oblique rings, subhydrothecal spherule present. Hydrotheca bell-shaped, sides nearly parallel, about 1.5 times as long as broad, 0.8-1 mm deep, near bottom a stalk-like appendage forming a basal chamber (see Fig. 5D). Hydrothecal rim with about 10 rounded cusps, embayments between them also rounded and slightly everted. From the bottom of these embayments, sharp crease lines run longitudinally along the outside of the hydrotheca, length of lines 3/4 or more of hydrothecal length. Hydrotheca polygonal in cross-section.

Gonothecae bottle-shaped, about 1.5 mm high, connected to stolons by short stalk, mostly smooth surface with some crinkles, distal end drawn into a long tube. In younger gonothecae the distal tube is missing.

Nematocysts:

- a) almond-shaped microbasic mastigophore, (6-7) × (1.5-2) mm, $r = 3.3-4.0$, $s = 1$.
- b) oval microbasic mastigophore, (13-15) × (3-4) mm, $r = 3.5-4.8$, $s = 0.8-1.2$.

Remarks. The present material agreed so well with the type material of this species, that they doubtlessly belong to the same species. Contrary to some other authors, the pedicels are not spirally grooved, but the perisarc is sculptured in distinctly oblique rings.

Cornelius (1982) re-examined syntype material of *Campanularia groenlandica* and concluded that it must be referred to *Campanularia volubilis*. He based his assertion on the presence of spirally sculptured hydrothecal

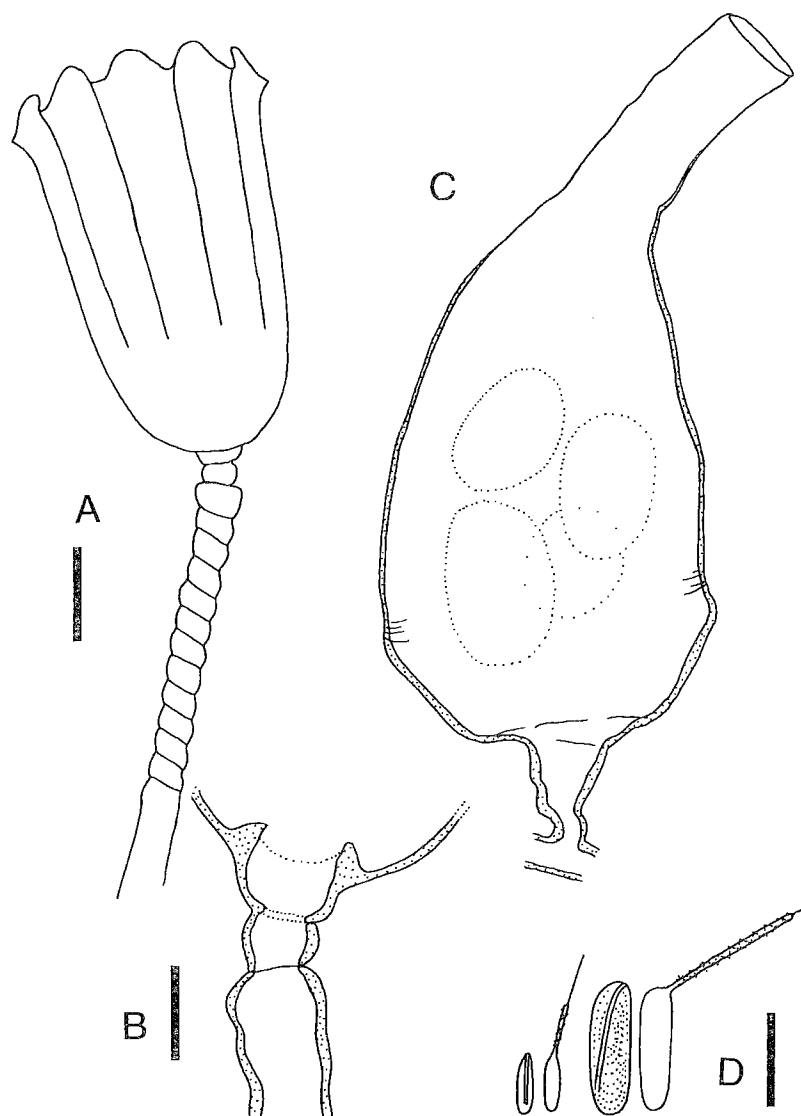


Fig. 5. *Campanularia groenlandica* Levinsen, 1893. A, Hydrotheca with upper part of caulus, BIOICE 2356, scale bar 100 μ m. B; base of hydrotheca showing basal chamber, subhydrothecal spherule, and caulus, BIOICE 2356, scale bar 50 μ m. C, female gonotheca with four eggs, BIOICE 2493, same scale as A. D, nematocysts: smaller microbasic mastigophore, same discharged, larger microbasic mastigophore, same discharged, BIOICE 2493, scale bar 5 μ m.

pedicels, blunt cusps and the shape of the gonotheca. While these characters are indeed identical in *C. volubilis* and separate it from *C. hincksii*, Cornelius did not mention the characteristic crease lines training down from the embayments of the hydrothecal margin. These sharp folds were clearly depicted by Levinsen (1893) and the re-examination of Levinsen's type material confirmed the accuracy of his drawings. Viewed from above, the hydrotheca is not round but polygonal due to these keels.

Furthermore, Cornelius (1982, 1995) explicitly states that *C. volubilis* only occasionally has lines originating from the cusps and not from the embayments as in *C. hincksii*. The size of the hydrotheca of *C. volubilis* is also only about half the size of that of *C. groenlandica* (Icelandic material). *Campanularia groenlandica* and *C. volubilis* were here also found together growing on a stem of *Eudendrium*, which proves that they are different species and not mere geographic variants. It is therefore clear



that *C. groenlandica* is neither referable to *C. volubilis* (crease lines different, but mostly absent in *C. volubilis*) nor to *C. hincksii* (differences: obliquely ringed pedicels, blunt cusps, and different gonothecae). *Campanularia groenlandica* is here considered a valid species with characteristics intermediate between *C. hincksii* and *C. volubilis*, although it appears closer to *C. hincksii*. Also the geographic distribution seem to differ. While *C. hincksii* occurs in more temperate waters, at Iceland only reaching the southern coast, *C. groenlandica* is a circumpolar species. The distribution of both species seems to overlap at Iceland near Vesturhorn (see Broch 1918; Kramp 1938).

Family Tiarannidae

Modeeria rotunda (Quoy & Gaimard, 1827)

Modeeria rotunda – Edwards 1973:573, figs 1-3; Millard 1975:137, fig. 45A; Ramil & Vervoort 1992:29, fig. 4a-b; Cornelius 1995b:109, fig. 24.

Material. BIOICE samples 2431, with gonotheca; 2463, with gonotheca; 2849, with gonotheca.

Remarks. The polyp phase of this species is a new record for Iceland, but it lies within the known distribution range of the medusa (Edwards 1973).

Stegopoma plicatile (M. Sars, 1863)

Stegopoma plicatile – Kramp 1913:15, figs 1-2; Broch 1918:26, fig. 8; Vervoort 1966:112, fig. 13; Naumov 1969:341, fig. 207, pl. 2 fig. 2; Edwards 1973:590; Cornelius 1995a:114, fig. 25.

Material. BIOICE samples 2085; 2114; 2117; 2124; 2136; 2137; 2185; 2303; 2315; 2317, with gonotheca; 2318, with gonotheca, a permanent slide was made from this material (MHNG INVE25508); 2319; 2320; 2321; 2323; 2327; 2330; 2346; 2361; 2362, with gonotheca; 2364, with gonotheca; 2418; 2493; 2514; 2575, with gonotheca; 2583; 2610; 2613; 2744, with gonotheca; 2824.

Remarks. The contents of the gonotheca of *Stegopoma plicatile* have not been described so far. Some of the present samples (BIOICE 2318 and 2575) had gonothecae with gonophores that evidently would have been liberated as medusae. The most advanced gonophore was microdissected. It proved to be a medusa with a very deep bell, a cross-shaped manubrium, four radial canals and four large tentacular bulbs on the margin. The tentacles had apparently not yet developed. Between each pair of the large bulbs there were three protuberances, the

middle one being slightly larger. The manubrium was rather large and filled the upper third of the bell cavity. No statocysts could be detected.

Although the observed medusa is far too young to be identified, it compares favourably with young medusae of *Modeeria rotunda* depicted by Edwards (1973, fig. 1A). *Modeeria rotunda* has a polyp phase closely resembling the one of *Stegopoma plicatile* and it was formerly known under the name *Stegopoma fastigatum*. The polyp phases differ only in colony structure. *Modeeria rotunda* is now placed in the family Tiarannidae, together with *Chromatonema rotunda* Fewkes 1882 (see Russell 1953; Kramp 1959). It could well be that *Stegopoma plicatile* encompasses the latter species. Rearing experiments or DNA sequencing are needed to elucidate the relationships.

Family Eirenidae

Eutonina indicans (Romanes, 1876) (Fig. 6A-D)

Eutonina indicans – Russell 1953:374, figs 240-245, pl. 22 fig. 2; Werner 1968a:384, figs 1-15; Arai & Brinckmann-Voss 1980:110, figs 62-63; Cornelius 1995a:234, fig. 54.

Eirene indicans – Naumov 1969:346, figs 210-211.

Material. BIOICE samples 2187, with gonothecae; 2189, numerous stems, with gonothecae, some growing on polychaete tubes made from sand; 2193, with gonothecae.

Description. Colonies arising from ramified creeping stolons. Stems erect, up to 10 mm in height, branching, ending in four to ten hydranths. Perisarc of stems and branches annulated throughout, about 110 to 130 µm in diameter, side branches originate at right angles and then immediately bend upwards, producing slender cormoids with most branches more or less parallel, branches rather long.

Branches end in diaphragm, above which there is a ring of desmocytes along the inside of the hydrotheca. Hydrothecae thin, often crinkled, young ones about 0.5 mm in height, with cylindrical base and conical operculum. Elements of operculum ill-defined, irregular. Older hydrothecae often torn and wrinkled, operculum and distal part eroded away.

Hydranths large, up to 1 mm (contracted), body swollen in middle, constricted below tentacle region, amphicoronate tentacles, conical or flat hypostome. Older hydranths larger than hydrotheca, even when contracted.

Gonothecae originate from stems, one to four per cormoid, on annulated pedicels. Gonotheca 1.5 to 2 mm in length, club-shaped with flat, truncated end, sometimes slightly curved, perisarc thin. Gonozooid with four

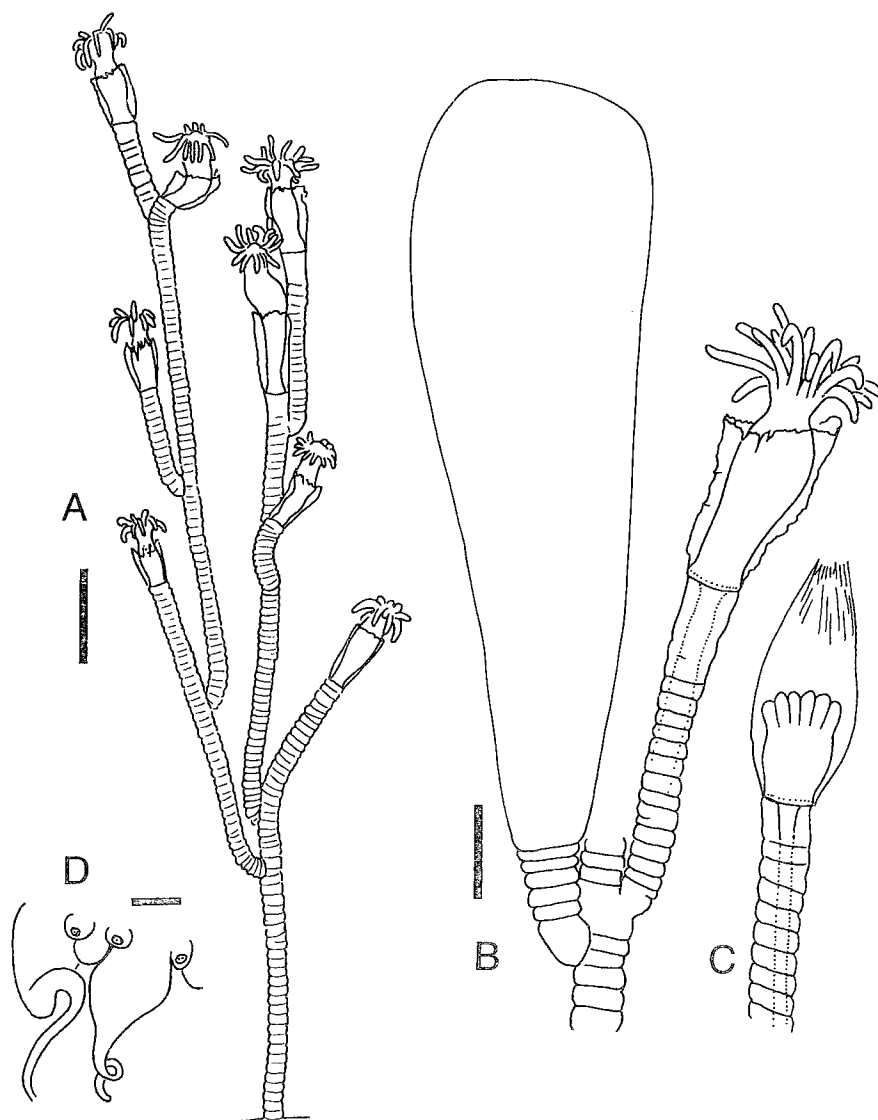


Fig. 6. *Eutonina indicans* (Romanes, 1876), BIOICE 2189. A, one cormoid, scale bar 0.5 mm. B, part of branch with gonothea, scale bar 0.2 mm. C, young hydranth with intact hydrotheca, same scale as B. D, margin of young medusa showing two perradial bulbs with tentacles, one smaller bulb between them, and statocysts with concretions, same scale as B.

medusa buds of progressive age towards distal end, most distal medusa filling nearly last third of gonothea.

Young medusa spherical, with four large perradial bulbs bearing tentacles and four small interradial bulbs without tentacles, a statocyst (8 in total) with one concretion occurring between each pair of bulbs.

Remarks. The abundant material and numerous gonothecae allowed me to dissect medusae that were preserved

in the gonothecae just before their release. The present material fits rather well the description given by Werner (1968b) and Cornelius (1995a), the only difference being the higher number of hydranths per stem. Werner (1968b) had only five hydranths per stem, while in the present material there were up to 10. However, not much significance can be attributed to this, especially as Werner studied cultivated material.

There are some other hydroids that closely resemble



Eutonina indicans. It can easily be confounded with *Phialella quadrata* (Forbes, 1848) and *Eucheilota maculata* Hartlaub, 1894. The colonies, and in particular the hydranths, hydrothecae, and gonothecae of *Phialella quadrata* attain about only half the size of *Eutonina indicans*. More importantly, the hydrothecae of *P. quadrata* remain neatly intact and even older hydranths are able to retract into them. Additionally, the young medusae have statocysts with two to three concretions (Russell 1953). The hydroid stage of *Eucheilota maculata* resembles even more *Eutima indicans* and both may be inseparable in the absence of information on the medusa stage. The newly released medusa of *Eucheilota maculata* has only two opposite tentacles contrary to four in *Eutonina indicans*, additionally it has four marginal cirri (Werner 1968a, 1968b).

Although it is very probable that the described hydroid is thus *Eutonina indicans*, it may also belong to another Leptomedusa with unknown life cycle. The identification should therefore be treated cautiously. For a secure identification, medusae must be cultivated to maturity.

This is the first record of the polyp stage of *Eutonina indicans* for Iceland, but the adult medusa of *Eutonina indicans* is already known from here (Kramp 1959). For a description of the adult medusa, see Cornelius (1995a), Werner (1968a), or Russell (1953).

Family Campanulinidae Hincks, 1868
Campanulina panicula (G.O. Sars, 1874)

Campanulina panicula G.O. Sars, 1874:95, pl. 5 figs 9-13; Cornelius 1995a:190, fig. 43.

Opercularella panicula – Ramil & Vervoort 1992:25, fig. 3a-d; Cornelius 1995a:191, fig. 43.

Opercularella denticulata – Gili, Vervoort & Pagès 1989:76, fig. 6a.

Material. BIOICE 2303, infertile.

Remarks. *Campanulina panicula* has not been recorded from Iceland before. The new record extends the known range of this otherwise widespread species.

Lovenella producta (G.O. Sars, 1874)

Calycella producta G.O. Sars, 1874:118, pl. 5 figs 6-8.

Lovenella producta – Fraser 1944:175, fig. 149a-c; Cornelius 1995a:166, fig. 37.

Material. BIOICE 2442, BIOICE 2710.

Remarks. *Lovenella producta* is here recorded for the first time for Iceland. These new records fit well into its broad distribution in the North Atlantic.

Family Lafoeidae

Acryptolaria conferta (Allman, 1877)

Grammaria conferta – in part Broch 1918:17.

Acryptolaria conferta – Millard 1975:169, fig. 56; Calder 1991:33, figs 19-20.

Acryptolaria conferta conferta – Ramil & Vervoort 1992:41, fig. 7a-b.

Acryptolaria conferta minor Ramil & Vervoort, 1992:43, figs 8a-c, 9a-c.

Acryptolaria conferta australis – Vervoort 1966:115, fig. 15; Rees & Vervoort 1987:37, fig. 6e.

Material. BIOICE samples 2107; 2257; 2288; 2291; 2849.

Remarks. *Acryptolaria conferta* has not been recorded from Iceland so far, but Broch (1918) recorded it relatively close by. Kramp (1932) re-examined Broch's material and found it to be composed of *A. conferta* and *Grammaria borealis*.

Zygophylax brownei Billard, 1924
(Fig. 7A-D)

? *Lafoea halecioides* Allman, 1874:472, pl. 66 figs 1, 1a.

Lictorella halecioides – Pictet & Bedot 1900:4, 16, pl. 3 figs 4-5.

Lafoea pinnata – Browne 1907:16, 18, 2-29; Billard 1923, 14, fig. 1A.

Zygophylax brownei – Rees & Vervoort 1987:76; Ramil & Vervoort 1992:65, 13a-d, 14a-c.

not *Zygophylax brownei* – Millard 1977:106, 114, fig. 4.

Type locality. 47°20'N 06°10'W (Ramil & Vervoort 1992).

Material. BIOICE 2348, several plumes growing on old *Eudendrium* stem, with coppinia.

Description. Colonies up to 2 cm high, branched, stem and some branches polysiphonic. Polysiphonic branches also bearing hydrothecae, these arising from several tubes and not just one main tube. Monosiphonic parts with occasional nodes. Hydrothecae sit on short apophyses on lateral sides of axis, hydrothecae in one plane or more often slightly inclined towards frontal.

Hydrothecae about 0.5 mm in depth (diaphragm to opening), diameter 250-300 µm, more or less cylindrical but often asymmetric as adaxial side usually more convex than abaxial one, margin slightly but distinctly everted. Hydrotheca narrowing basally almost imperceptibly into pedicel, pedicel about 150 to 250 µm in length,

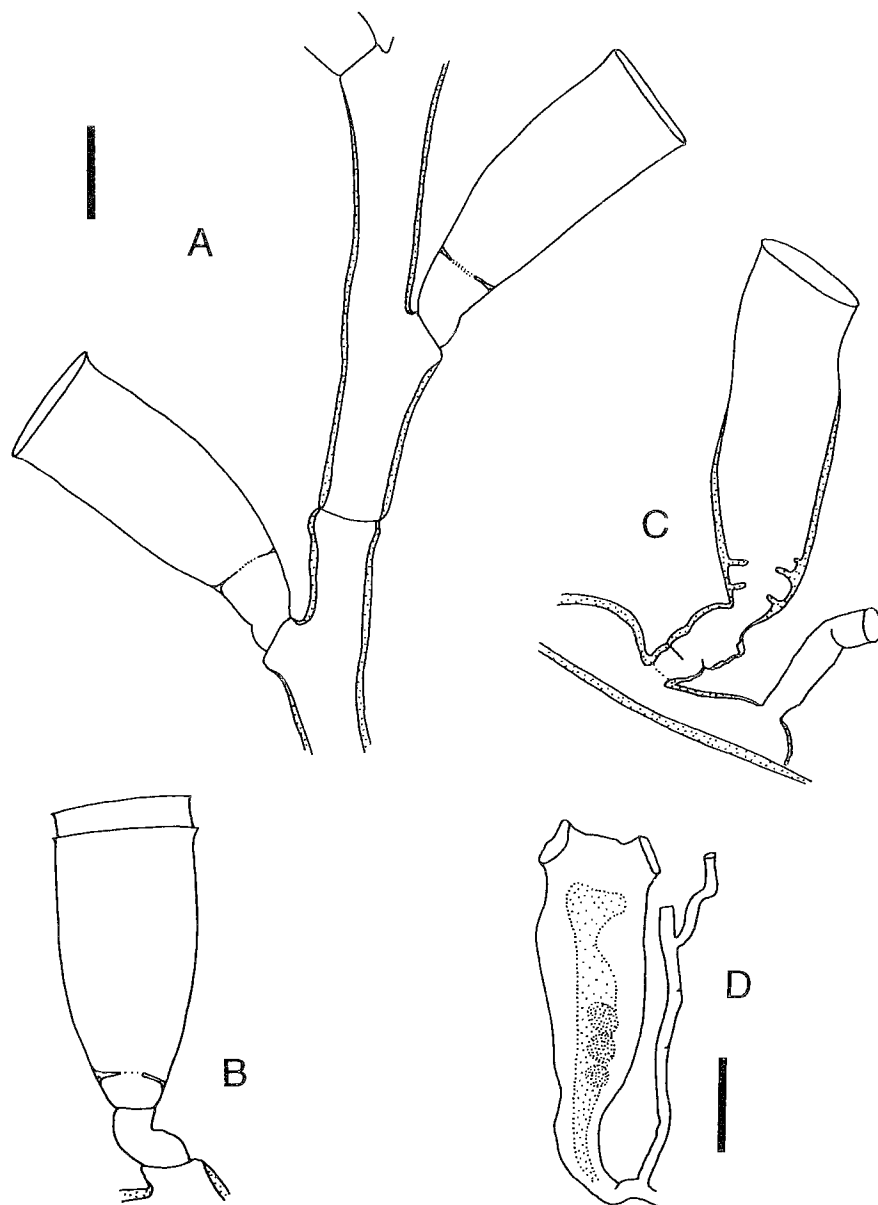


Fig. 7. *Zygophylax brownei* Billard, 1921, BIOICE 2348. A, internodes with two hydrothecae, scale bar 0.2 mm. B, another hydrotheca with pronounced kink in pedicel, same scale as a. C, hydrotheca and nematotheca (?) in polysiphonic part of colony, same scale as a. D, gonotheca, presumably male, with branched nematophorous ramules, scale bar 0.5 mm.

at border of pedicel transverse diaphragm, sometimes several ones.

Pedicels of hydrothecae often curved or kinked (Fig. 7A-C), but straight ones also occur.

Nematothecae very scarce, only one found (Fig. 7C),

cylindrical; holes of lost nematothecae also not observed.

Gonothecae aggregated into coppinia, but individual gonothecae not adnate. Between the gonothecae thin, branched nematophorous ramules, reaching the same height as the gonothecae, sometimes beyond. Ramules



tubular, nearly isodiametric, without nematothecae. Gonothecae 0.6 to 0.9 mm in height, irregularly club-shaped with broad end directed away; distal end with two lateral, short, tubular processes with opening. Distal part of gonothecae often damaged or perhaps eroded naturally. Gonothecae contain a reduced gonozooid with three spherical packets in a longitudinal row, these are presumably male gonads.

Remarks. Billard (1924) allocated some material he had previously identified as *Zygophylax pinnata* to a new species named *Zygophylax brownei*, the sole difference to *Z. pinnata* being the presence of some rare nematothecae. Later, Ramil & Vervoort (1992) referred material described by Pictet & Bedot (1900) as *Lictorella halecioides* to *Z. brownei* and they also re-examined part of the type material. Ramil & Vervoort (1992) further excluded from this species reproductive colonies from the Indian Ocean previously identified by Millard (1975) as *Zygophylax brownei*, an opinion also shared by myself.

Possible syntype material of *Lafoea halecioides* Allman, 1874 from the North Atlantic was re-examined by Rees & Vervoort (1987). They found occasional nematothecae not mentioned by Allman (1874). The presence of these nematothecae is here seen as evidence that this species is conspecific with *Z. brownei* rather than with *Z. pinnata*. *Zygophylax halecioides* was therefore included as a questionable synonym of *Z. brownei*. If this synonymy will become substantiated in future, *Zygophylax halecioides* Allman, 1874 must be used as correct name for the present species.

The present material was – with some hesitation – assigned to *Zygophylax brownei* Billard, 1924. The trophosome appears hardly distinguishable from *Z. pinnata* (G.O. Sars, 1874), but the presence of nematophorous ramules in the coppinia ruled out *Z. pinnata* if one follows the present concept of the species (see Cornelius 1995a).

The allocation of the present material to *Zygophylax brownei* was largely influenced by the description of Ramil & Vervoort (1992). The pedicels with their frequent kinks as well as the rare nematothecae induced me to do so. It must be emphasised, however, that the kinks are not diagnostic as they may also occur in *Z. pinnata*.

Unfortunately, the type material of *Z. brownei* is sterile (see Ramil & Vervoort 1992) and thus its identification will remain problematic until new, fertile material from the type locality can be obtained. The coppinia observed in this study did not agree with any of the Atlantic species with known coppinia (comp. Ramil & Vervoort 1992; Calder & Vervoort 1998). This may be seen as further evidence that the present material likely belongs to *Zygophylax brownei*.

Distribution. known from Bay of Biscay (134 to 753 m). The present material was found between Iceland and the Faroe Islands in 405 metres depth growing on a species of *Eudendrium*.

Family Sertulariidae

Diphasia margareta Hassall, 1841

Diphasia pinaster – Hincks, 1868:252, pl. 50 fig. 1; Cornelius 1995b:50, fig. 10.

Diphasia margareta – Cornelius 1979:263, fig. 11; Ramil & Vervoort 1992:201, figs 52a-c, 53a-g, 54a-e, 55a-c, 56c-e, 57a, 58a-d.

Material. BIOICE samples 2418; 2493; 2495; 2514; 2823.

Remarks. To my knowledge, the present records are the first ones for Iceland. The localities lie south and west of Iceland, in depths of 122–653 m.

Abietinaria pulchra (Nutting, 1904)

(Figs 8A–D, 9A–C)

Diphasia pulchra Nutting, 1904:111, pl. 31 figs 1–3; Jäderholm 1908:17, pl. 3 figs 1–6; Calder 1970:1527, pl. 5 fig. 8.

Abietinaria pulchra – Naumov 1969:427, fig. 289.

Type locality. 48°58'N 123°10'W, 123 m, Vancouver Island, Canada.

Material examined. BIOICE samples 2124; 2128, with gonothecae; 2135; 2136; 2273; 2318; 2320; 2325; 2327; 2330; 2360; 2376; 2377; 2379; 2570; 2573; 2583; 2588. – ZMUC, *Sertularia fabricii*, Ingolf stations 2, 3, and 4, all described by Broch (1918) as *S. fabricii*.

Description. Colonies 8 cm and more. Stems monosiphonic, zigzag, rather thin and soft, hydrocladia arranged spirally. Stem divided by regular transverse nodes, segments short, each with an apophysis for the attachment of a hydrocladium at proximal end and three hydrothecae, one axially and two distally placed (Fig. 8A). On lower part of stem hydrocladia broken off.

Hydrocladia ramified several times, nodes present only occasionally, hydrothecae alternate or sub-opposite, variable even within same branch (Fig. 8C).

Hydrothecae elongated, vasisiform in frontal view, in side view nearly tubular basally and distal end narrowing, slightly curved or straight, adaxial side adnate for 2/3 of length. Hydrothecal margin sometimes renovated and much elongated, often ill defined or soft (Fig. 9D), adaxial side with broad sinus of variable depth, but mar-

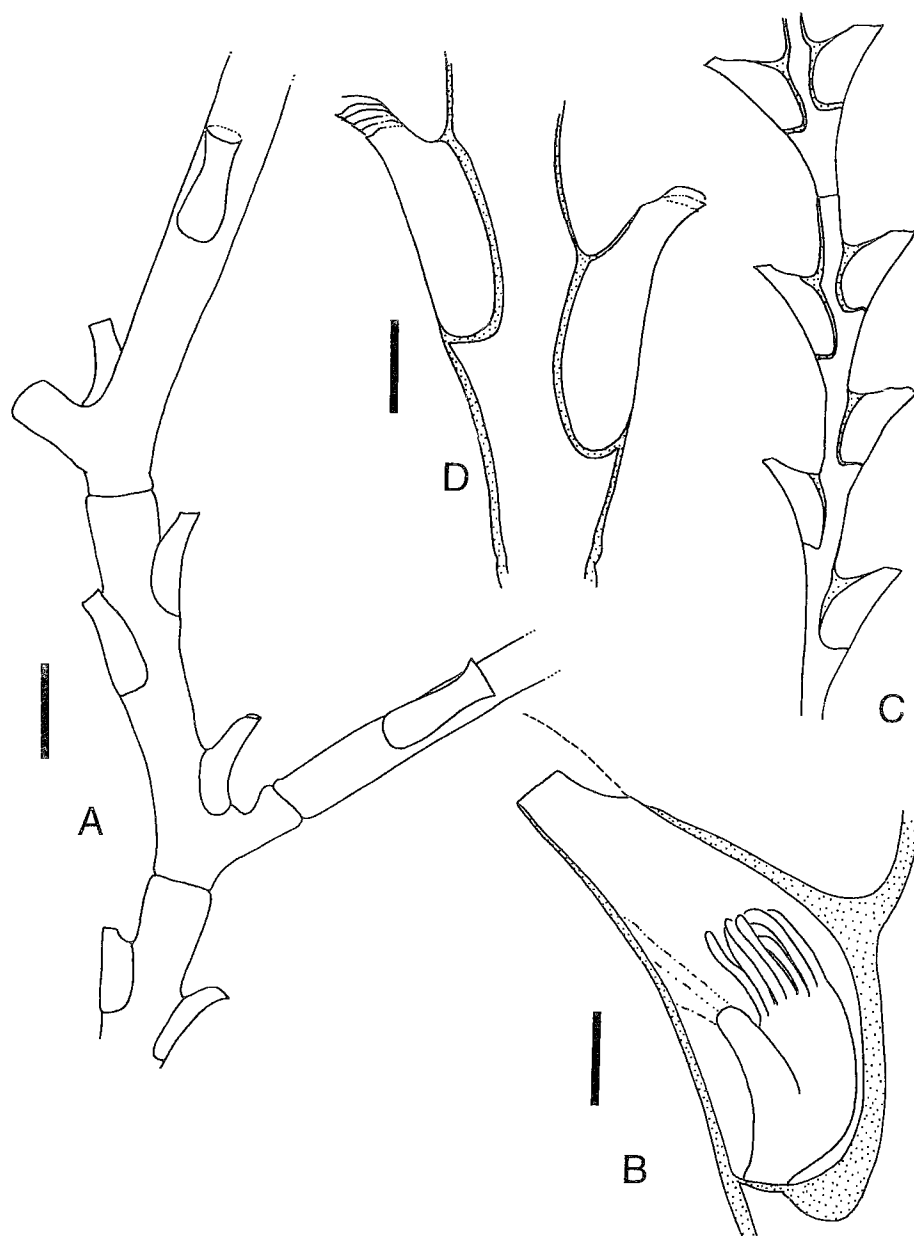


Fig. 8. *Abietinaria pulchra* (Nutting, 1904). A, BIOICE 2330, part of stem with one hydrocladium, scale bar 0.5 mm. B, BIOICE 2583, hydrotheca with hydranth, note abaxial caecum, scale bar 100 μ m. C, BIOICE 2583, hydrocladium, note change of hydrothecal arrangement from alternate to sub-opposite, same scale as A. D, BIOICE 2330, hydrothecae, note renovations of margin, scale bar 0.2 mm.

gin mostly not clearly demarcated from operculum. Operculum composed of one adaxial valve, size variable, base not well demarcated from hydrotheca, often renovated and multiplied. At least some hydranths with abaxial caecum, some hydranths lack it (Fig. 8B).

Gonothecae on branches, flattened, elongated trian-

gular in broad view, club-shaped in side view, on middle of broad distal end a small neck with circular aperture. Aperture flanked by two large spines, often of unequal size.

Remarks. This is the first record of *Abietinaria pulchra*

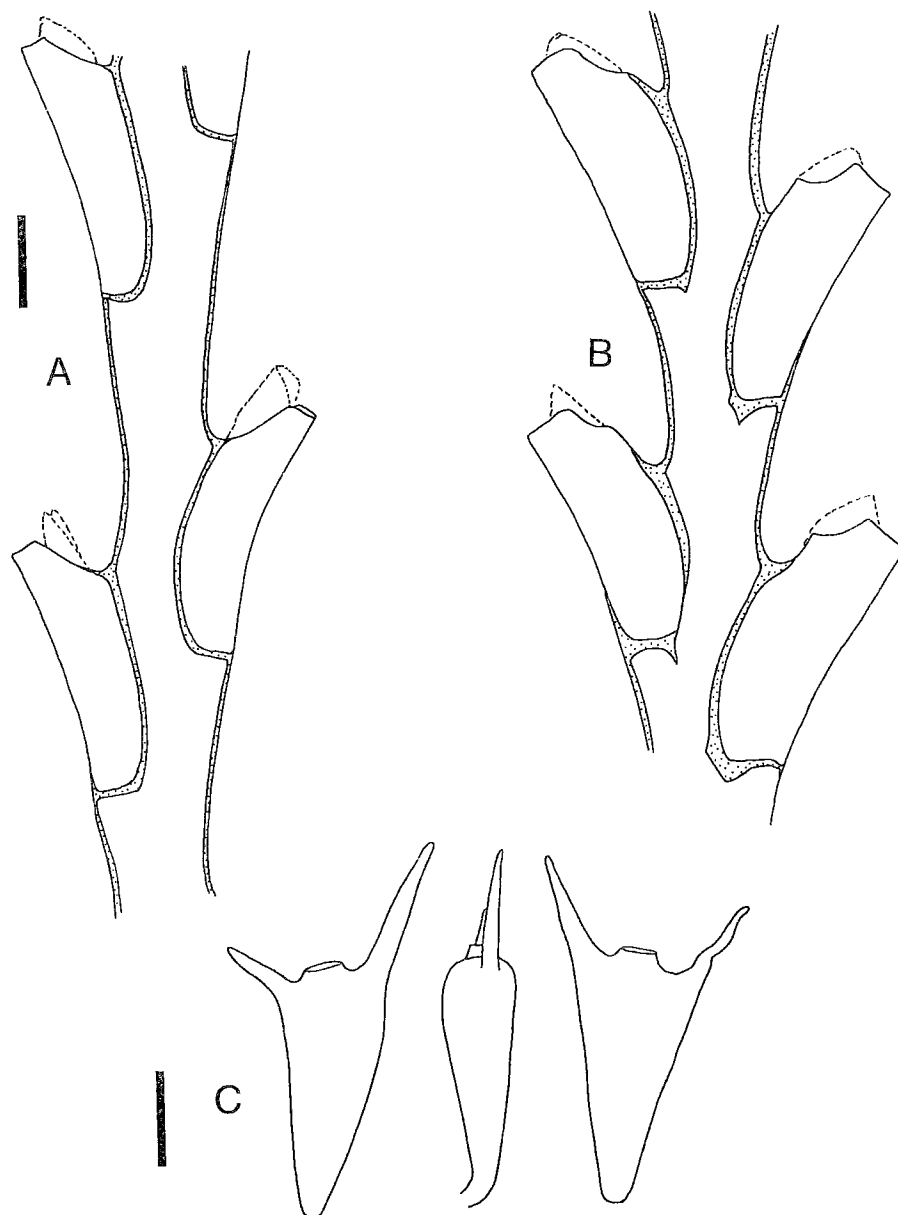


Fig. 9. *Abietinaria pulchra* (Nutting, 1904). A. BIOICE 2320, part of hydrocladium, scale bar 0.2 mm. B, BIOICE 2136, part of hydrocladium, note difference in hydrothecal shape compared to A, same scale as A. C, gonothecae, middle one in side view, scale bar 0.5 mm.

for Iceland, but this is well compatible with the nearly circumpolar occurrence of this species.

Examination of several hydranths clearly showed that at least some of them have an abaxial caecum (blindsack, diverticulum) (Fig. 8B). Because of this, the species was placed in the genus *Abietinaria*. Kramp (1932) could not find such a caecum in material from Greenland and there-

fore used the genus *Diphasia*. By placing it in the genus *Abietinaria*, Naumov (1969) implicitly acknowledges the presence of a caecum, although he does not mention it his description. Especially in dredged and therefore invariably damaged material, it is often difficult to observe the soft tissue (comp. Calder 1970).

Owing to the broad abaxial notch in the hydrothecal



margin, the hydrothecae of *A. pulchra* resemble much more *Diphasia* species than other *Abietinaria* species.

Abietinaria pulchra – especially fragmented material – can be mistaken for biseriata *Hydrallmania falcata*, but the latter has a more rounded hydrothecal opening (in frontal view) and normally there are always some regions with uniseriate hydrothecae (comp. Broch 1918).

Sertularia fabricii and *Sertularia argentea* are deceptively similar to *A. pulchra*, but higher magnifications using a compound microscope will show the lateral teeth and the bi-valved operculum of the former *Sertularia* species. The margin of *A. pulchra* is often ill defined or renovated, but lacks the distinct lateral teeth of *Sertularia*, although the adaxial sinus of the hydrotheca can feign the presence of them. Multiple renovations of the margin can give the hydrotheca a duck-beak appearance.

Some material identified by Broch (1918) as *S. fabricii* was re-examined for this study and certain specimens proved to be *A. pulchra*.

Distribution. Vancouver Island, Bering Sea, Sea of Okhotsk, Chukchi Sea, East Siberian Sea, Laptev Sea, Kara Sea, White Sea, Barents Sea, Spitsbergen, west Greenland, northern Canada (Nutting 1904; Calder 1970). At Iceland recorded from many localities along the north and east coast, few from the west. It was conspicuously absent from the south coast.

Abietinaria thuiarioides (Clark, 1876)
(Fig. 10A-C)

Sertularia thuiarioides Clark, 1876:223, pl. 7 figs 38-39.

Thuiaria thuiarioides – Nutting 1904:64, pl. 8 figs 1-6.

Diphasia thuiarioides – Broch 1909:182, fig. 37.

Abietinaria thujarioides – Naumov 1969:425, figs 287-288.

Type locality. Five miles off West Cape of Nunivak Island, Bering Sea, and Chignik Bay, Alaska Peninsula (Clark 1876).

Material. BIOICE 2570, three damaged stems, max. 5 cm, without gonothecae.

Description. Colonies 5 cm and more, forming erect plumose stems with alternate branches, these hydrocladia branched again, all in one plane. Basal region without hydrocladia. Stem mostly segmented by more or less distinct nodes. Each internode with three alternating hydrothecae in two lateral rows and one apophysis for hydrocladium originating below most distal hydrotheca. Hydrocladia with occasional nodes only, hydrothecae alternate, in two rows along side and

in same plane as hydrocladia.

Hydrotheca about 0.4 mm long, abaxial wall s-shaped to nearly straight, adaxial wall adnate for 4/5 of its length, adnate part concave, free part convex. Aperture and operculum semi-circular, operculum fixed on adaxial side which is nearly straight to slightly curved. Hydropore near abaxial wall. Hydranth with abaxial caecum.

Gonothecae not seen, after Naumov (1969) flabellate, with two lateral spines and an opening on a short neck (compare *A. pulchra* above).

Remarks. The semi-circular opening and operculum of the hydrothecae are quite characteristic (Fig. 10C) and match perfectly the description of Clark (1876). The figures and descriptions of Nutting (1904) and Fraser (1944) are somewhat superficial in that respect. As this species grows to a size of 20 cm and then has hydrocladia all around the stem, the present smaller plumes (originally > 5 cm) are probably juvenile (see Naumov 1969).

Distribution. Arctic species, known from Alaska, Bering Sea, Sea of Okhotsk, Sea of Japan, Barents Sea, Kara Sea, Laptev Sea, Chukchi Sea (Naumov 1969). In the Atlantic Ocean known from northern Canada (Fraser 1944). The present new record is the first one east of Greenland. The locality lies between north-west Iceland and Greenland, depth 374 m.

Sertularia similis (Clark, 1876)
(Fig 11A-C)

Thuiaria similis Clark, 1876:219, pl. 15 fig. 56; Nutting 1904:69, pl. 10 figs 7-9; ? not Fraser 1944:307 fig. 294.

Sertularia tubuliformis – Broch 1918:132, fig. 71.

Sertularia similis – Naumov 1969:384, fig. 247; Calder 1970:1535, pl. 7 fig. 10.

Type locality. Hagmeister Island, Alaska.

Material. BIOICE samples 2562; 2097; 2558, all without gonothecae.

Description. Colony forming 3 cm high pinnate stems (max. 7 cm, Naumov 1969), hydrocaulus monosiphonic, stem thicker than branches, geniculate, regularly divided by distinct nodes. Internodes having a proximal apophysis with an axillary hydrotheca and two distally placed subopposite hydrothecae. Apophysis given off alternately from opposite sides of hydrocaulus at an angle of 60° with the main axis. Hydrocladia in one plane, broad side of branches vertical, thus all hydrothecae in plane of ramification. Hydrocladia with occasional nodes, unbranched or branched. Hydrothecae subopposite, curved outward, abaxial wall straight or concave, length 0.3-0.35 mm,

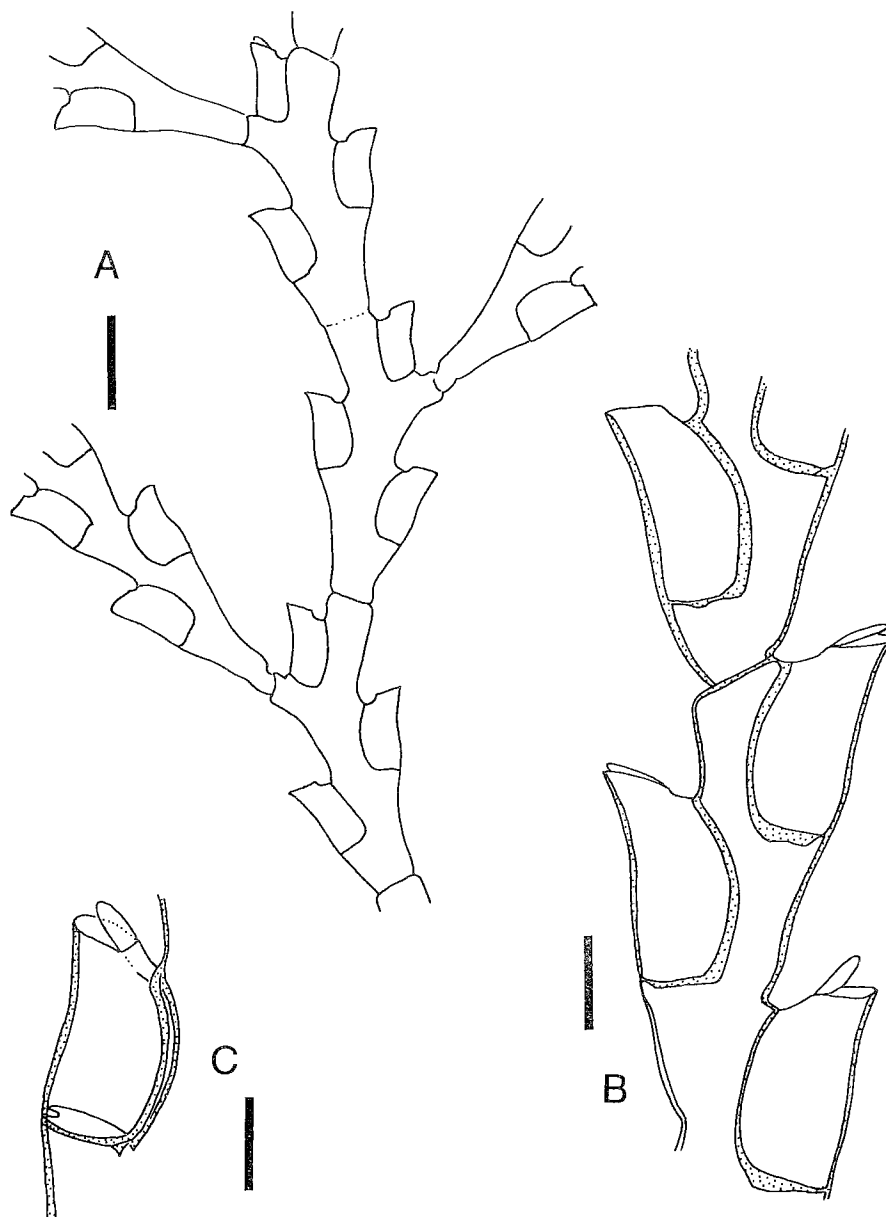


Fig. 10. *Abietinaria thuiarioides* (Clark, 1876), BIOICE 2570. A, part of stem with hydrocladia, scale bar 0.5 mm. B, part of hydrocladium, scale bar 0.2 mm. C, hydrotheca, note shape of operculum, scale bar 100 μ m.

adaxial wall convex, adnate for more than half its length, length of free part 0.15–0.2 mm. Margin with two distinct lateral teeth.

Gonothecae not present, according to Calder (1970) obovate, irregularly oval in cross-section, arising near the base of the hydrothecae, walls smooth, aperture terminal, circular, on an indistinct neck, well developed marginal teeth along inside of aperture.

Remarks. *Sertularia similis* is characterised by its pinnate growth with all hydrothecae in one plane and the subopposite arrangement of its hydrothecae. Fragmented material can be difficult to distinguish from other *Sertularia* species.

Broch misidentified material of *Sertularia similis* from near Iceland as *Sertularia tubuliformis* Marktanner-Turneretscher, 1890 (a synonym of *Dynamena crisioides*

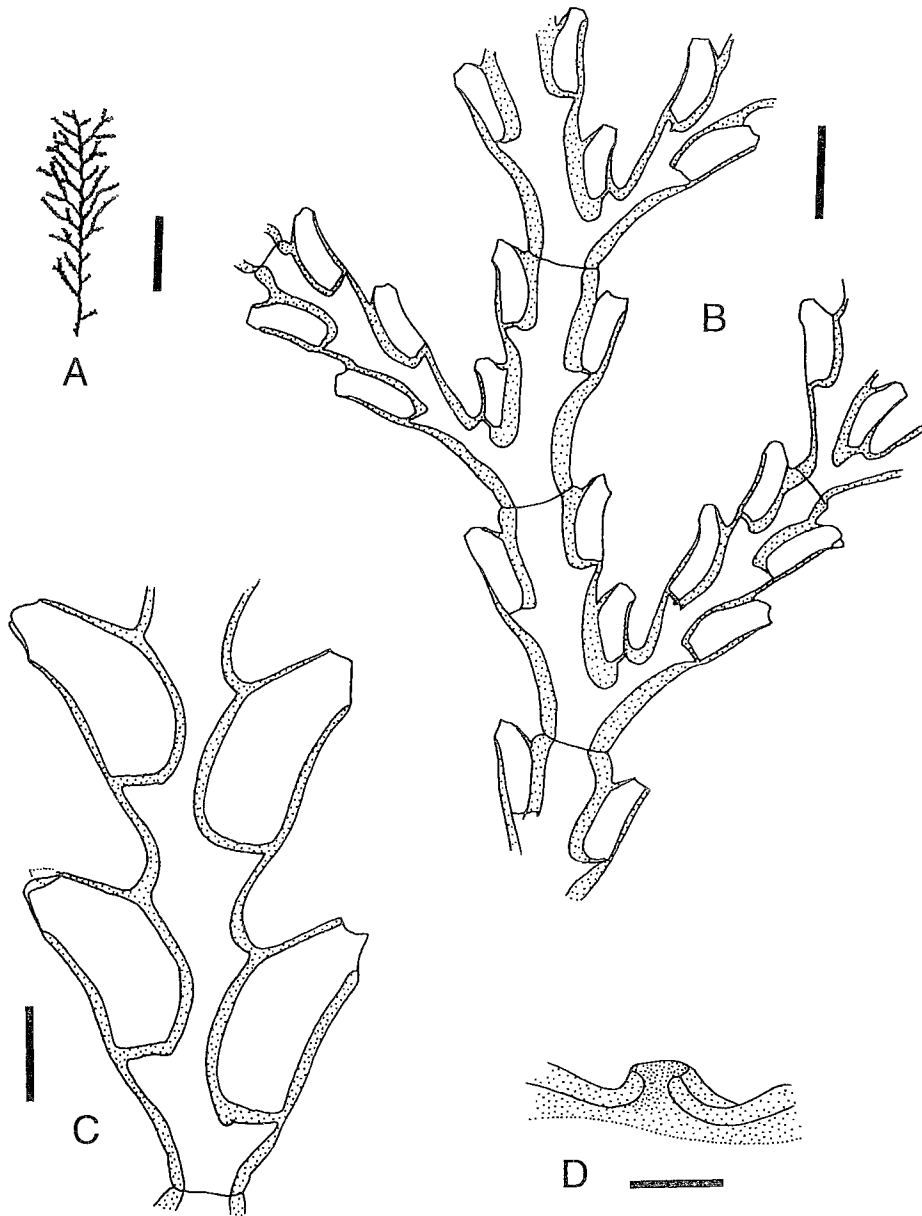


Fig. 11. *Sertularia similis* (Clark, 1876), BIOICE 2558. A, colony, scale bar 1 cm. B, part of stem and hydrocladia, scale bar 0.5 mm. C, part of hydrocladium, scale bar 0.2 mm. D, hydropore in frontal view, scale bar 50 µm.

Lamouroux, 1824). Calder (1991) realised that Broch's identification was probably incorrect because *D. crisioides* is a tropical to subtropical shallow water form and has unbranched hydrocladia (see Millard 1975, Calder 1991 for descriptions of *D. crisioides*). The description and figure of Broch (1918) leave no doubt that he actually had *Sertularia similis*. His description and the present material match very well the accounts of Clark

(1876), Nutting (1904), and Calder (1970). Fraser's (1944) figures seem atypical as the caulus is unsegmented and the hydrocladia unbranched. Probably this is a different species.

Distribution. Northern Canada, Sea of Okhotsk, Sea of Japan, Chukchi Sea, Bering Sea, Alaska. This is the first time that this arctic species is also recorded for Iceland.



The samples came from the north and north-west of Iceland, depth range 30–110 m.

Family Kirchenpaueriidae

Kirchenpaueria bonnevieae (Billard, 1906)

Plumularia rubra Bonnevie, 1899:90, pl. 7 fig. 2.

Plumularia triangulata Totton, 1930:225, fig. 61; Vervoort 1966:136, figs 38–39.

Kirchenpaueria triangulata – Millard, 1975:375, fig. 119E–H; Rees & Vervoort 1987:129, fig. 27.

Kirchenpaueria bonnevieae – Ramil & Vervoort 1992:151, figs 39d–g, 40b, c; Ramil, Vervoort & Ansin 1998:32.

Kirchenpaueria bonnevieae simplex – Ramil & Vervoort 1992:156, figs 39a–c; 40a, c–d.

Material. BIOICE samples 2097; 2272, one plume infertile; 2273, 1 plume ca. 4 cm, with female gonothecae.

Remarks. *Kirchenpaueria bonnevieae* is a rather well known species with a wide distribution. Some deviant morphotypes have been given a subspecies status, which is incorrect as they are sympatric with the normal forms. These forms are either separate species or mere variants. The present records are the first ones for Iceland, but they fit well into the known range of this circumglobal species.

Family Plumulariidae

Nemertesia norvegica (G.O. Sars, 1874)

Heteropyxis norvegica G.O. Sars, 1874:104, pl. 3 figs 15–22.

Nemertesia norvegica – Cornelius 1995b:152, fig. 35.

Material. BIOICE samples 2215; 2270; 2273, with gonothecae; 2401; 2442; 2454, with gonothecae; 2462; 2713; 2818, with gonothecae; 2823.

Remarks. *Nemertesia norvegica* is here recorded for the first time from Iceland. It may well be that it has been misidentified by previous authors as a juvenile *Nemertesia ramosa* or a *Plumularia* species.

Family Aglaopheniidae

Cladocarpus paraventricosus Ramil & Vervoort, 1992 (Fig. 12A–C)

Cladocarpus paraventricosus Ramil & Vervoort, 1992:111, fig. 27b–d.

Material. BIOICE sample 2299, 2 cm stem fragment with two hydrocladia, no gonothecae.

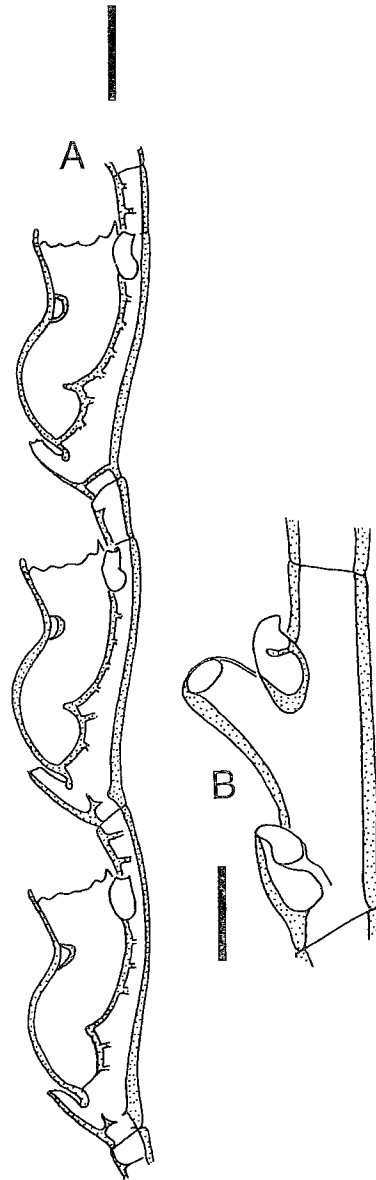


Fig. 12. A–B, *Cladocarpus paraventricosus* Ramil & Vervoort 1992, BIOICE 2299. A, three segments of hydrocladium in side view, scale bar 0.2 mm. B, segment of caulus, scale bar 100 µm.

Remarks. this is the first record of *Cladocarpus paraventricosus* outside its type locality. Although no phylactocarps were present in the Icelandic material, the trophosome is so characteristic and in perfect agreement with the description of Ramil & Vervoort (1992), that there is little doubt on the affinity of this colony.



Cladocarpus pectiniferus Allman, 1883

Cladocarpus pectiniferus – Ramil & Vervoort 1992:114, figs 28a-h, 29a-j, 30a-g.

Aglaophenopsis (?) *pharetra* Broch, 1918:80, fig. 42.

Material. BIOICE samples 2097; 2257; 2299; 2337; 2410; 2415; 2415; 2474; 2475.

Remarks. Ramil & Vervoort (1992) included *Aglaophenopsis* (?) *pharetra* Broch, 1918 in the synonymy of this species. Although no phylactocarps are so far known from Iceland, the perfect congruence of the BIOICE material and the description of Broch (1918) with the material described by Ramil & Vervoort (1992) leaves little doubt that *Aglaophenopsis pharetra* Broch, 1918 actually belongs to *C. pectiniferus*.

Cladocarpus paraformosus sp. nov.
(Fig. 13A-E)

Type locality. 67.836°N 19.555°W, 905 m.

Material. Holotype, BIOICE sample 2107, ca. 2 cm plume fragment with gonothecae and phylactocarps, part of this material (schizoholotype) as slide preparation MHNG INVE26300.

Description. Pinnate colonies, > 2 cm, distal parts monosiphonic, proximal parts unknown. Hydrocladia alternate in one plane.

Caulus segmented by distinct nodes, each segment at distal third with a short apophysis for the attachment of hydrocladium and with five nematothecae, two median below apophysis, two near upper axil of apophysis and one on side of apophysis. This latter nematotheca somewhat different from the other four, with circular aperture, perhaps a reduced hydrotheca. The other cauline hydrothecae short, gutter-shaped, rounded base.

Hydrocladia segmented by distinct transverse nodes, longest hydrocladia reach 2 cm and have 16 segments. Each segment with internal thickenings forming internal ribs, 4–8 along hydrotheca, 2 below median inferior nematotheca. Hydrotheca deeply beaker-shaped, about twice as deep as broad, adaxial wall nearly straight and completely adnate, abaxial wall slightly curved, hydrothecal margin with 13–15 distinct cusps, median abaxial cusp sharp, about 40 µm, lateral cusps becoming gradually shallower towards rear but remaining distinct. At lower part of hydrotheca sometimes a transverse semi-circular or nearly circular ridge along inside of hydrotheca (see Fig. 13B, upper hydrotheca). Lateral nematothecae oval, margin reaching slightly over hydrothecal margin, margin finely dentated, adaxial side deeply

emarginated. Median inferior nematotheca clearly below level of hydrotheca, straight, gutter-shaped, ovoid in frontal view, margin finely dentated.

Gonothecae borne on phylactocarps and on stem, one to three per phylactocarp, shaped oval to roughly triangular, flattened, on short peduncle, aperture subterminally and narrowly oval, directed towards front. Phylactocarps relatively short, arising from first segment of hydrocladium just below hydrotheca, consisting of dichotomously ramified branches, with more or less distinct nodes. Two types of segments present: central elements with apophysis and about three nematothecae, and terminal elements which are elongated, tapering, ending in nematotheca-like opening and with two to four pairs of opposite nematothecae. Nematothecae of phylactocarps resembling median inferior nematothecae of hydrocladium.

Measurements – hydrocladial segments 1.0–1.1 mm, abaxial length of hydrotheca 0.51–0.72 mm, diameter of hydrotheca 0.30–0.37 mm, length of gonotheca 1.0–1.2 mm.

Remarks. Material here assigned to a new species *Cladocarpus paraformosus* has close affinities to several other species. *Cladocarpus paraformosus* resembles *C. formosus* in many respects, and may in fact turn out to be only a variant of it once more material becomes available. The available material, however, differs clearly from *C. formosus* by having its median inferior nematotheca below the hydrotheca, by having more and distinct hydrothecal teeth, and by having five instead of three nematothecae per cauline segment (Fig. 13A). Less similar species occurring at Iceland are *Cladocarpus campanulatus*, *C. integer*, and *C. diana*. The former two differ from *C. paraformosus* by having another type of phylactocarp, and *C. diana* has rounded hydrothecal cusps and a differently shaped median inferior nematotheca. *Cladocarpus sigma* (Allman, 1877), a species from warmer Atlantic waters (see Ramil & Vervoort 1992), also resembles *Cladocarpus paraformosus*, but the latter has only occasionally a transverse intrathecal ridge, while in *C. sigma* it is a constant feature and it is either oblique or curved. Furthermore, *C. sigma* has only three nematothecae per cauline segment. The same arguments are also valid to separate *C. elongatus* from it (see Ramil, Vervoort & Ansin, 1998). While the trophosome of *Cladocarpus verrilli* also resembles somewhat *C. paraformosus*, its phylactocarp is very different as it bears hydrothecae (comp. Nutting 1900, as *Aglaophenopsis verrilli*).

The specific name *paraformosus* was chosen to underline the similarity to *C. formosus*.

Distribution. Known only from one locality far off the north coast of Iceland.

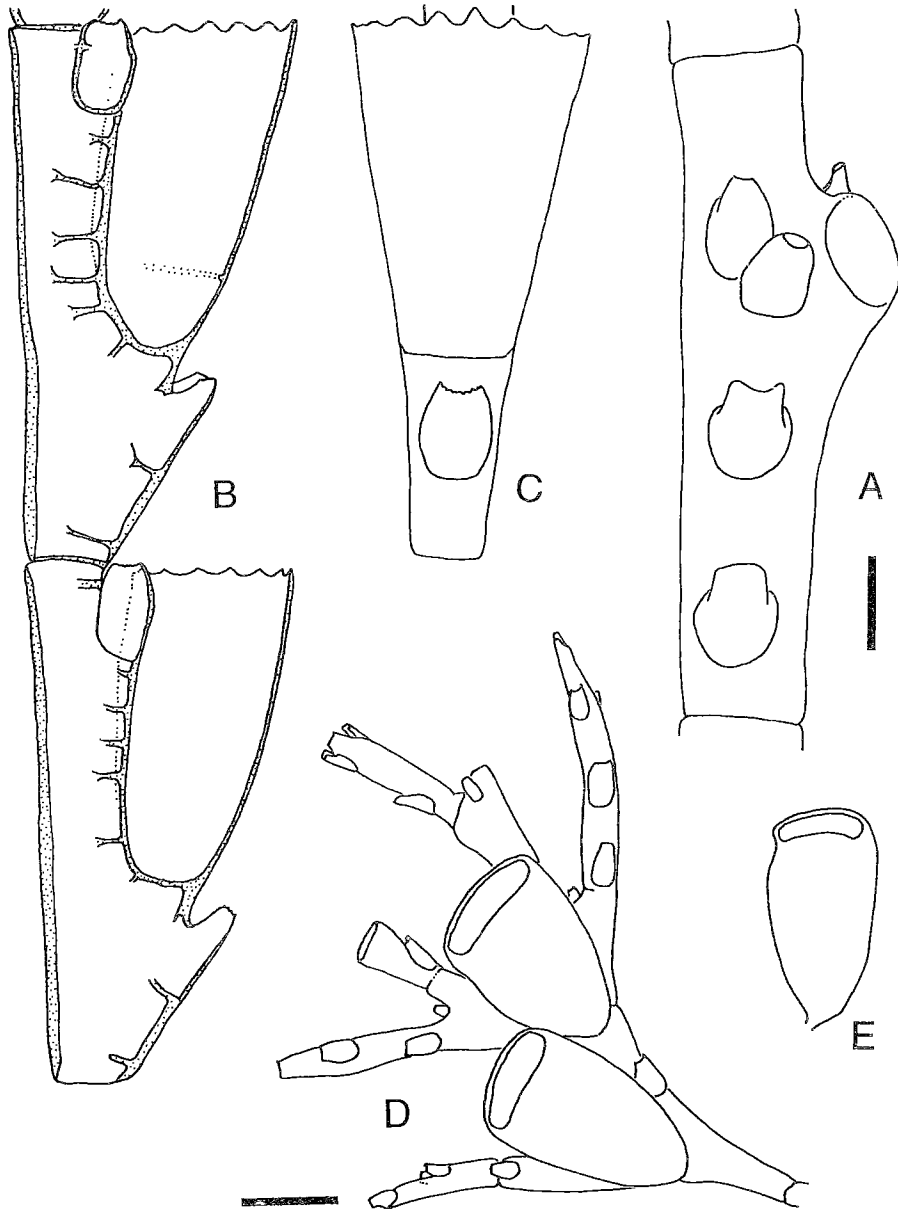


Fig. 13. *Cladocarpus paraformosus* new species, after holotype material. A, segment of stem, scale bar 0.2 mm. B, two segments of hydrocladium, same scale as A. C, hydrocladial segment in frontal view, same scale as A. D, phylactocarp with two gonothecae, scale bar 0.5 mm. E, single gonotheca in oblique side-view, same scale as D.

Order Siphonophora
Family Rhodaliidae
Stephalia corona Haeckel, 1888

Type locality. Wyville Thomson Ridge, north-west of Scotland.

Material. BIOICE 2472, 6 specimen, some mature.

Stephalia corona – Totton 1965:92, fig. 51, pl. 18 figs 1-4; Pugh 1983:197, figs 7-12; Kirkpatrick & Pugh 1984:44, fig. 13.

Description. See Kirkpatrick & Pugh (1984) or the monograph of the family by Pugh (1983).



Remarks. Some *Stephalia corona* of the BIOICE collection are in a rather exceptionally good state and allowed a quite reliable identification. It was a surprise to find a siphonophore among dredged material, an animal group normally found only in the plankton and known for its extreme fragility. However, the Rhodalidae are characterised by their benthic mode of living (see Pugh 1983).

Distribution. North Atlantic and off north-west African coast. The present record is from off south-west of Ice-

land from a depth of 666 metres. This record extends the known range of this species.

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Appendix. BIOICE sample data for samples mentioned in taxonomic section. Coded as follows: **sample number**, collection date, co-ordinates, depth range, bottom temperature, collection gear, bottom type.

2056, 10 Jul 1992, 66.284°N 18.814°W, 120-108 m, 5.3 °C, detr. sledge (Sneli), few stones, hard bottom.	2317, 02 May 1993, 64.117°N 09.050°W, 996-1020 m, RP sledge.
2067, 02 Jul 1992, 66.143°N 17.607°W, 196-202 m, 3.8 °C, RP sledge.	2318, 02 May 1993, 64.033°N 09.617°W, 772-775 m, detr. sledge (Sneli), sandy silt.
2074, 03 Jul 1992, 66.673°N 17.919°W, 201-171 m, 2.7 °C, detr. sledge (Sneli), silty sand.	2319, 02 May 1993, 64.017°N 09.617°W, 776-760 m, RP sledge.
2085, 04 Jul 1992, 67.261°N 17.440°W, 754-761 m, -0.4 °C, Agassiz trawl, soft sediment, few pebbles.	2320, 02 May 1993, 64.033°N 09.733°W, 758-757 m, Agassiz trawl.
2097, 05 Jul 1992, 66.615°N 18.240°W, 110-116 m, 4.9 °C, RP sledge, sand and stones.	2321, 03 May 1993, 63.933°N 10.000°W, 639-628 m, detr. sledge (Sneli), sandy silt.
2107, 06 Jul 1992, 67.836°N 19.555°W, 905-903 m, -0.6 °C, RP sledge, sandy mud.	2323, 03 May 1993, 63.917°N 10.083°W, 623-622 m, RP sledge.
2114, 07 Jul 1992, 67.696°N 19.460°W, 489-493 m, -0.5 °C, RP sledge.	2325, 03 May 1993, 63.750°N 10.183°W, 555-564 m, RP sledge.
2117, 07 Jul 1992, 67.472°N 19.530°W, 405-383 m, -0.3 °C, detr. sledge (Sneli), oz.	2327, 03 May 1993, 63.350°N 10.850°W, 430-429 m, detr. sledge (Sneli), gravely sand with stones/boulders.
2128, 08 Jul 1992, 66.984°N 18.833°W, 203-202 m, 2.7 °C, RP sledge.	2330, 03 May 1993, 63.083°N 11.333°W, 453-452 m, RP sledge, sand.
2135, 08 Jul 1992, 66.740°N 18.955°W, 418-412 m, 0.6 °C, detr. sledge (Sneli), muddy gravel.	2337, 05 May 1993, 62.450°N 12.917°W, 1099-1105 m, RP sledge, silty sand.
2136, 08 Jul 1992, 66.726°N 18.953°W, 417-399 m, 0.6 °C, RP sledge, soft bottom.	2346, 06 May 1993, 63.383°N 12.633°W, 501-497 m, RP sledge, sand.
2137, 08 Jul 1992, 66.719°N 19.325°W, 297-293 m, 2.1 °C, RP sledge.	2348, 06 May 1993, 63.600°N 12.250°W, 407-403 m, detr. sledge (Sneli), sandy gravel.
2161, 09 Jul 1992, 66.288°N 20.106°W, 130-129 m, 5.3 °C, detr. sledge (Sneli), gravel and stones.	2349, 06 May 1993, 63.617°N 12.283°W, RP sledge.
2168, 09 Jul 1992, 66.306°N 19.205°W, 86-88 m, 5.4 °C, detr. sledge (Sneli).	2356, 07 May 1993, 63.917°N 11.617°W, 327-324 m, RP sledge, sand.
2185, 10 Jul 1992, 66.285°N 18.000°W, 68-68 m, 5.4 °C, detr. sledge (Sneli), stony gravel.	2358, 07 May 1993, 64.167°N 11.533°W, 318-330 m, RP sledge.
2187, 10 Jul 1992, 66.160°N 18.051°W, 23-29 m, detr. sledge (Sneli), shell-sand.	2360, 07 May 1993, 64.283°N 10.817°W, 391-395 m, RP sledge, silty sand.
2201, 02 Sep 1992, 64.367°N 22.815°W, 69-75 m, 8.0 °C, RP sledge.	2361, 07 May 1993, 64.450°N 10.450°W, 498-494 m, detr. sledge (Sneli), sandy silt.
2215, 03 Sep 1992, 64.261°N 24.434°W, 213-219 m, 6.9 °C, RP sledge.	2362, 07 May 1993, 64.483°N 10.433°W, 495-496 m, RP sledge.
2257, 05 Sep 1992, 63.244°N 26.486°W, 1209-1212 m, 4.1 °C, RP sledge, clay + shell sand.	2364, 08 May 1993, 64.583°N 10.050°W, 605-606 m, RP sledge, sandy silt.
2270, 08 Sep 1992, 63.139°N 24.986°W, 317-318 m, 7.0 °C, triangle dredge, gravelly mud with stones.	2376, 10 May 1993, 64.850°N 11.617°W, 356-355 m, triangle dredge, gravely silt.
2272, 08 Sep 1992, 63.138°N 24.988°W, 316-319 m, 7.0 °C, detr. sledge (Sneli), muddy sand.	2377, 10 May 1993, 64.400°N 12.883°W, 146-147 m, triangle dredge, silty gravel.
2273, 08 Sep 1992, 63.140°N 24.983°W, 313-316 m, 7.0 °C, RP sledge.	2379, 10 May 1993, 64.317°N 12.483°W, 310-303 m, triangle dredge, gravel and stones/boulders.
2288, 09 Sep 1992, 62.387°N 22.677°W, 1390-1410 m, 3.4 °C, detr. sledge (Sneli), gravel and boulders.	2401, 01 Jul 1993, 63.123°N 22.898°W, 520-612 m, 6.7 °C, RP sledge.
2291, 09 Sep 1992, 62.464°N 22.673°W, 1206-1207 m, 3.9 °C, detr. sledge (Sneli), muddy gravel, pebbles, stones.	2410, 02 Jul 1993, 62.860°N 21.735°W, 1074-1075 m, 4.0 °C, RP sledge, silty sand.
2299, 10 Sep 1992, 63.002°N 22.660°W, 775-804 m, 5.5 °C, RP sledge, sand.	2415, 02 Jul 1993, 63.003°N 21.009°W, 819-5.4 °C, RP sledge.
2303, 10 Sep 1992, 63.065°N 22.687°W, 600-612 m, 6.8 °C, RP sledge, muddy sand.	2418, 02 Jul 1993, 63.166°N 21.201°W, 256-280 m, 7.1 °C, RP sledge.
2313, 11 Sep 1992, 63.706°N 23.058°W, 96-134 m, 7.6 °C, triangle dredge, mostly dead shells.	2431, 03 Jul 1993, 63.068°N 19.856°W, 1207-1120 m, 4.5 °C, detr. sledge (Sneli), sandy silt with stones.
2315, 02 May 1993, 64.100°N 09.050°W, 991-980 m, detr. sledge (Sneli), sandy silt.	2442, 04 Jul 1993, 63.267°N 20.393°W, 138-116 m, triangle dredge, silty sand with gravel, stones, and rock.
	2454, 04 Jul 1993, 63.335°N 21.170°W, 152-153 m, 7.2 °C, RP sledge.
	2462, 05 Jul 1993, 63.423°N 21.665°W, 133-7.1 °C, detr. sledge (Sneli), stones.
	2463, 05 Jul 1993, 63.423°N 21.665°W, 133-7.1 °C, detr. sledge (Sneli), silty sand with gravel.
	2472, 05 Jul 1993, 63.112°N 21.627°W, 666-6.1 °C, RP sledge.

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Appendix. (continued)

2474, 05 Jul 1993, 63.068°N 21.588°W, 791-834 m, 5.5 °C, detr. sledge (Sneli), sandy silt.	2588, 16 Jul 1993, 67.331°N 22.532°W, 356-357 m, -0.5 °C, detr. sledge (Sneli), sandy silt.
2475, 05 Jul 1993, 63.070°N 21.582°W, 842-780 m, 5.5 °C, RP sledge, sandy silt.	2592, 16 Jul 1993, 67.209°N 22.424°W, 333-331 m, 0.1 °C, detr. sledge (Sneli).
2493, 11 Jul 1993, 66.170°N 25.937°W, 275-275 m, 5.7 °C, detr. sledge (Sneli), gravely sand and stones.	2595, 16 Jul 1993, 67.002°N 22.570°W, 203-205 m, 5.4 °C, RP sledge.
2495, 12 Jul 1993, 66.176°N 25.988°W, 333-321 m, 5.9 °C, triangle dredge, sandy gravel and stones/boulders.	2610, 10 Jul 1994, 67.004°N 17.417°W, 248-238 m, 3.0 °C, RP sledge, sandy silt.
2508, 12 Jul 1993, 66.275°N 25.442°W, 150-150 m, 5.6 °C, detr. sledge (Sneli), sand.	2613, 11 Jul 1994, 67.136°N 17.025°W, 362-381 m, -0.4 °C, RP sledge, silty sand.
2514, 13 Jul 1993, 66.568°N 25.228°W, 465-476 m, -0.3 °C, detr. sledge (Sneli), black gravely sand with stones.	2710, 06 Sep 1994, 64.842°N 24.217°W, 220-230 m, 7.1 °C, detr. sledge (Sneli), shell-sand.
2556, 14 Jul 1993, 66.363°N 23.103°W, 20-20 m, 7.2 °C, RP sledge.	2713, 06 Sep 1994, 64.572°N 24.542°W, 273-273 m, 6.2 °C, RP sledge, silty sand.
2558, 14 Jul 1993, 66.376°N 23.128°W, 30-30 m, 7.2 °C, detr. sledge (Sneli).	2744, 30 Jul 1995, 67.749°N 20.474°W, 729-732 m, RP sledge.
2562, 14 Jul 1993, 66.504°N 23.446°W, 91-91 m, 5.7 °C, RP sledge, fine sand.	2818, 25 Aug 1995, 63.244°N 17.845°W, 206-207 m, 7.2 °C, RP sledge, silty sand.
2570, 15 Jul 1993, 67.051°N 23.986°W, 370-377 m, -0.2 °C, detr. sledge (Sneli), gravely sand and stones/boulders.	2823, 25 Aug 1995, 63.504°N 17.700°W, 120-125 m, 7.2 °C, detr. sledge (Sneli), gravel with rocks.
2573, 15 Jul 1993, 67.099°N 24.078°W, 489-489 m, -0.5 °C, RP sledge.	2824, 25 Aug 1995, 63.502°N 17.701°W, 120-123 m, 7.2 °C, RP sledge, gravely sand.
2575, 15 Jul 1993, 67.161°N 24.322°W, 800-794 m, -0.5 °C, RP sledge.	2849, 27 Aug 1995, 62.830°N 18.007°W, 976-1000 m, 3.3 °C, RP sledge, silty sand.
2583, 16 Jul 1993, 67.598°N 22.387°W, 605-607 m, -0.5 °C, RP sledge.	2855, 28 Aug 1995, 62.340°N 16.997°W, 2074-2076 m, 2.3 °C, Agassiz trawl.
