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Additions to the hydroids (Cnidaria, Hydrozoa) of the Bay of Fundy, northeastern North America, with a checklist of species reported from the region

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Table of contents

Abstract

Two new species of hydroids, *Eudendrium bleakneyi* and *Halecium praeparvum*, are described from the Bay of Fundy. Fourteen others, *Tubularia acadiae* Petersen, 1990, *Coryne pusilla* Gaertner, 1774, *Sarsia lovenii* (M. Sars, 1846), *Zanclea implexa* (Alder, 1856), *Corydendrium dispar* Kramp, 1935, *Rhizogeton fusiformis* L. Agassiz, 1862, *Bougainvillia muscus* (Allman, 1863), *Rhizorhagium roseum* M. Sars, in G.O. Sars, 1874, *Hydractinia symbiolongicarpus* Buss & Yund, 1989, *Eudendrium vaginatum* Allman, 1863, *Tiaropsis multicirrata* (M. Sars, 1835), *Obelia bidentata* S.F. Clark, 1875, *Halecium marsupiale* Bergh, 1887, and *Sertularella gigantea* Hincks, 1874, are reported, with collection data, for the first time from the bay. All but *Coryne pusilla*, *Rhizorhagium roseum*, *Eudendrium vaginatum*, and *Sertularella gigantea* are also new to Atlantic Canada, while *Zanclea implexa*, *Corydendrium dispar*, and *Halecium marsupiale* are reported for the first time in the western North Atlantic. Two of those species, *Hydractinia symbiolongicarpus* and *Obelia bidentata*, are disjunct in distribution, with core populations occurring in warmer waters to the south of Cape Cod, Massachusetts. Both were discovered in Minas Basin, a hydrographically distinct embayment where surface water temperatures are much warmer during summer than in the perpetually cold lower Bay of Fundy. *Rhizorhagium roseum* and the subfamily Rhizorhagiinae are transferred from family Bougainvilliidae Lütken, 1850 to Pandeidae Haeckel, 1879. An annotated checklist of hydroids from the Fundy region, based on previously published reports and on new records of species, is added as an appendix. Included in the checklist are 43 species of anthoathecates and 75 species of leptothecates, referable to 30 families and 56 genera. Families with the most species were Sertulariidae (23), Haleciidae (13), Eudendriidae (11), and Obeliidae (10). Biogeographically, the aggregate hydroid fauna of the bay conforms with that occurring in other parts of the Western Atlantic Boreal Region. *Halecium permodicum* is proposed as a replacement name for *Halecium minor* Fraser, 1935, an invalid junior homonym of *H. minor* Pictet, 1893.

Key words: Anthoathecata, Hydroidolina, Leptothecata, marine invertebrates, Medusozoa, Minas Basin, Passamaquoddy Bay, taxonomy, zoological nomenclature

Introduction

Reports of hydroids from the east coast of North America date as far back as the early 19th century (e.g., Bosc 1802; Gould 1841). However, the first comprehensive faunistic account of the group in the western North Atlantic was provided by Stimpson (1853) in a publication on marine invertebrates from locations at the mouth of the Bay of Fundy. William Stimpson (1832–1872), a student of Louis Agassiz (1807–1873) at Harvard College, undertook dredging in the bay during July 1851 around the island of Grand Manan, New Brunswick, Canada, and near Eastport, Maine, USA, and he returned for three months during the summer of 1852 to collect again in the area (Mayer 1918). His well-known and widely cited report on the fauna was based on those collections.

Subsequent accounts of hydroids from the Bay of Fundy appeared sporadically over the next half-century (Fuller 1862a, b; L. Agassiz 1862; A. Agassiz 1865; Verrill 1871, 1874, 1875, 1878; S.F. Clark 1875; Smith & Harger 1875; Fewkes 1890; Ganong 1890a). A major stimulus for research on biota of the region came from the founding, at the turn of the 20th century, of a biological station at St. Andrews, New Brunswick. Contributions by Stafford (1912) and Fraser (1918, 1924, 1944), based in part on collecting and research undertaken at that station (now known as the St. Andrews Biological Station), added substantially to knowledge of the group in western parts of the bay and especially in Passamaquoddy Bay. On the Nova Scotia side of the Bay of Fundy, hydroids appear to be diverse in St. Mary's Bay near Briar Island, Nova Scotia (Fraser 1918: 330). Information on hydroids of the general study area also appeared in other publications during the first half of the 20th century (Mayer 1910a, b; Bigelow 1914; Fraser 1943).

Fieldwork on hydroids in Nova Scotia was undertaken by hydrozoan specialist Kay W. Petersen of the Universitetets Zoologiske Museum (now the Zoologisk Museum, Statens Naturhistoriske Museum), Copenhagen, from July to December 1970. With a base at Acadia University in Wolfville, Nova Scotia, his focus was on species in Minas Basin, an embayment at the northeastern extremity of the Bay of Fundy. That region is of particular interest hydrographically in that water temperatures are warmer in summer and colder in winter than in the bay proper and especially in western regions. As a result, its fauna consists of a mix of warm temperate, boreal, and Arctic species, including some that are amphi-Atlantic (Bromley & Bleakney 1985). Collections were also made by Petersen elsewhere in the bay, as well as on the Atlantic coast of Nova Scotia. Sampling was particularly successful at a location in Petit Passage at the western tip of Digby Neck, a peninsula extending into the western Bay of Fundy, with collections from there deposited at the Statens Naturhistoriske Museum, Copenhagen.

Although nothing was published by Petersen on any of these collections except for a brief mention of *Acaulis primarius* Stimpson, 1853 from near Grand Manan (Petersen 1990: 147), records of hydroid species in Bromley (1979) and Bromley & Bleakney (1979, 1985) are based to a significant extent on his identifications. So too is a record of *Tubularia indivisa* Linnaeus, 1758 from the Bay of Fundy by Schuchert (2010). Earlier reports of hydroids from Minas Basin and Minas Channel were given by Fraser (1924, 1944) and Bousfield & Leim (1960).

Various studies over the period since 1950 have reported one or more hydroid species from the bay (Caddy 1970; Calder 1971; Bleakney 1972; Brinkhurst *et al*. 1976; Linkletter *et al*. 1977; Bromley & Bleakney 1979, 1985; Thomas 1983; Thomas *et al*. 1983; Logan *et al*. 1983, 1984; Buzeta & Singh 2008; Logan 1988; Henry 2002; Henry & Kenchington 2004b; Trott 2004b). Particularly noteworthy are accounts of species from commercial scallop grounds by Henry (2003) and Henry & Kenchington (2004a), and from Cobscook Bay, Maine, by Trott (2004a), with records in the latter having been based on published and unpublished literature.

An account is given here of two new species of hydroids from the Bay of Fundy in collections at the Royal Ontario Museum (ROM). Also included are 14 others, reported with collection data from the bay for the first time, from collections at the ROM, the Zoologisk Museum, Statens Naturhistoriske Museum, Copenhagen, Denmark, and the Atlantic Reference Centre, Huntsman Marine Science Centre, St. Andrews, New Brunswick, Canada. It is unlikely that any are recently invasive to the region. A checklist of hydroid species reported from the bay in published literature, and from new records added here, is included as an appendix (Appendix 1).

Materials and methods

Hydroids from the Bay of Fundy were examined in collections at the Royal Ontario Museum, Toronto, Ontario, Canada, and the Atlantic Reference Centre, Huntsman Marine Science Centre, St. Andrews, New Brunswick, Canada. Specimens of several species were also obtained on loan from the Zoologisk Museum, Statens Naturhistoriske Museum, Copenhagen, Denmark. Records of species new to the bay are reported herein. Synonymy lists include the publication in which the name of each taxon was first made available nomenclaturally, whether of the hydroid or medusa stage. Other citations are of works providing primary records of the hydroid stages of these species from the Bay of Fundy region or of important senior synonyms. Each reference has been traced and verified from original publications. Except for original descriptions, references to illustrations are included only if they were unmistakably based on specimens from the Bay of Fundy.

The classification system of hydrozoans adopted herein generally follows Schuchert (2012) for anthoathecates, and Leclère *et al*. (2009), Peña Cantero *et al*. (2010), and Maronna *et al*. (2016) for leptothecates.

Examinations of nematocysts were made from preserved material using a Zeiss Axioscop microscope. Most specimens had been fixed originally in formalin, and later transferred to ethanol.

Some abbreviations used in this work are as follows:

ARC	Atlantic Reference Centre, Huntsman Marine Science Centre (St. Andrews, New Brunswick, Canada)
fm	fathoms
ICZN	International Commission on Zoological Nomenclature/International Code of Zoological Nomenclature
MCZ	Museum of Comparative Zoology, Harvard University (Cambridge, Massachusetts, USA)
ME	State of Maine (USA)
NB	Province of New Brunswick (Canada)
NMNH	National Museum of Natural History, Smithsonian Institution (Washington, DC, USA)
NS	Province of Nova Scotia (Canada)
ROM	Royal Ontario Museum (Toronto, Ontario, Canada)
ROMIZ	Royal Ontario Museum, Invertebrate Zoology Collections
SNM	Zoologisk Museum, Statens Naturhistoriske Museum (Copenhagen, Denmark)
WoRMS	World Register of Marine Species (http://www.marinespecies.org)
YPM	Peabody Museum of Natural History, Yale University (New Haven, Connecticut, USA)

Systematic Account

Phylum Cnidaria Verrill, 1865

Subphylum Medusozoa Petersen, 1979

Class Hydrozoa Owen, 1843

Subclass Hydroidolina Collins, 2000

Order Anthoathecata Cornelius, 1992

Suborder Aplanulata Collins, Winkelman, Hadrys & Schierwater, 2005

Family Tubulariidae Fleming, 1828

Genus *Tubularia* Linnaeus, 1758

Tubularia acadiae Petersen, 1990

Figs. 1, 2, 4a

Tubularia acadiae Petersen, 1990: 198, figs. 39, 40.

Tubularia couthouyi.—Bleakney, 1972: 933.–Bromley & Bleakney, 1985: 11, unnumbered figure [not *Tubularia couthouyi* L. Agassiz, 1860].

Type locality. USA: Massachusetts, Vineyard Haven (Petersen 1990: 198).

Material examined. NS: Minas Basin, 26.iv.1967, 4°C, two solitary hydroids, up to 7 cm high, one with female and one with male gonophores, coll. J.S. Bleakney, ROMIZ B629.

Description. Examined hydroids solitary, comprising fragments of three hydrocauli with hydranths. Hydrocauli unbranched, 5 cm and 7 cm long, maximum diameter 2 mm, mostly straight with a few irregular bends, incised by a few nodes marking points of growth and regeneration, gradually increasing in diameter from proximal part to distal end, each bearing a terminal hydranth above a bulbous neck; longitudinal peripheral canals about 7 in number, with one being wider than others, these canals sometimes branched and anastomosing. Perisarc on hydrorhiza thick except at distal end, extending over and appearing filmy around neck region, terminating at base of hydranth, smooth except for irregularly located nodes, golden- to amber-coloured in thick areas, thin and clear over neck region. Hydranths pear-shaped with slender hypostome, separated from bulbous neck region by a prominent circumferential groove, reaching 1.2 cm high from groove to tip of hypostome, maximum diameter 1.0 cm; tentacles occurring in aboral and oral whorls. Aboral tentacles about 55 in number, crowded, slightly staggered, laterally flattened at base, gradually tapering from proximal end to tip, about 1.3 mm long in preserved material, merging with ridges extending down over basal region of hydranth. Oral tentacles about 60 in number, tapering from proximal end to tip, to 5 mm long in preserved specimens, scattered within a narrow band around hypostome, bases adnate to hypostome and forming longitudinal ridges on it.

Gonophores fixed sporosacs, borne on 10-12 thick blastostyles arising from hydranth just above aboral tentacles; blastostyles with unbranched main stem approximately as long as hydranth when fully developed, each one with several short, slender side branches bearing gonophores; sporosacs of both sexes borne on long pedicels. Female sporosacs oval; distal end with orifice surrounded by 4-5 laterally flattened, fin-shaped crests extending from one-third to half-way or more down outer wall of sporosac, commonly with 2-3 developing embryos or actinulae that do not entirely fill sporosac cavity; spadix long, sausage-shaped. Male sporosacs subspherical, lacking lateral crests, terminal appendages, and radial canals; spermatic tissue nearly filling sporosac cavity.

Cnidome (Fig. 2)
desmonemes (n = 10): 6.0–6.3 µm long × 3.6–4.0 µm wide (undischarged)
large haplonemes (n = 5): 10.4–11.1 µm long × 6.5–7.3 µm wide (undischarged)
small haplonemes (n = 3): 6.8–7.5 µm long × 4.0–4.3 µm wide (undischarged)

large stenoteles (n = 6): 12.5–13.2 µm long × 10.3–11.8 µm wide (undischarged)
small stenoteles (n = 10): 9.7–10.8 µm long × 7.0–7.9 µm wide (undischarged)
heteronemes (n = 10): 11.2–13.2 µm long × 3.8–4.3 µm wide (undischarged)

FIGURE 1. *Tubularia acadiae*, hydranth with male gonophores, Minas Basin, Nova Scotia. Photograph by J.S. Bleakney.

Remarks. *Tubularia acadiae* Petersen, 1990 was originally described from material collected at several locations near Woods Hole, Massachusetts, during the winter and early spring of 1964 (Petersen 1990). That account provides the only published record of the species, and only female colonies were mentioned. Petersen found the species again in 1970 while undertaking field work in Minas Basin, NS, during a visit to Acadia University (recorded as "*Tubularia acadiae* n.sp." in a letter to Prof. J.S. Bleakney, received 24 January 1977). However, the latter record was never published, and it was not mentioned in his original description of the species. While no etymology of the specific name was given, it could refer either to Acadia University or to the geographic region known as Acadia ("Acadie" in French) that was once a colony of France in northeastern North America. Both of these possibilities suggest a link to the Bay of Fundy region.

Hydroids of *T. acadiae* are decidedly robust, and hydrocauli of the species are marked by nodes. These "joints" appear to be sites marking extension points of the hydrocaulus, and at least some likely represent locations where hydranths once existed. In Fraser's (1944) key to species of *Tubularia* Linnaeus, 1758 from the Atlantic coast of North America, possession of a "jointed stem" was a prime character leading to identification of *T. couthouyi* L. Agassiz, 1860. In that regard, and in its large size as well, *T. acadiae* might easily be confounded for *T. couthouyi*. Indeed, records of *T. couthouyi* from Minas Basin (Bleakney 1972; Bromley & Bleakney 1985), the same location as material examined here, are taken to have been based on the morphologically similar *T. acadiae*. As for *Tubularia couthouyi*, it is close to and possibly conspecific with *T. indivisa* Linnaeus, 1758 (Petersen, 1990; Schuchert 2010).

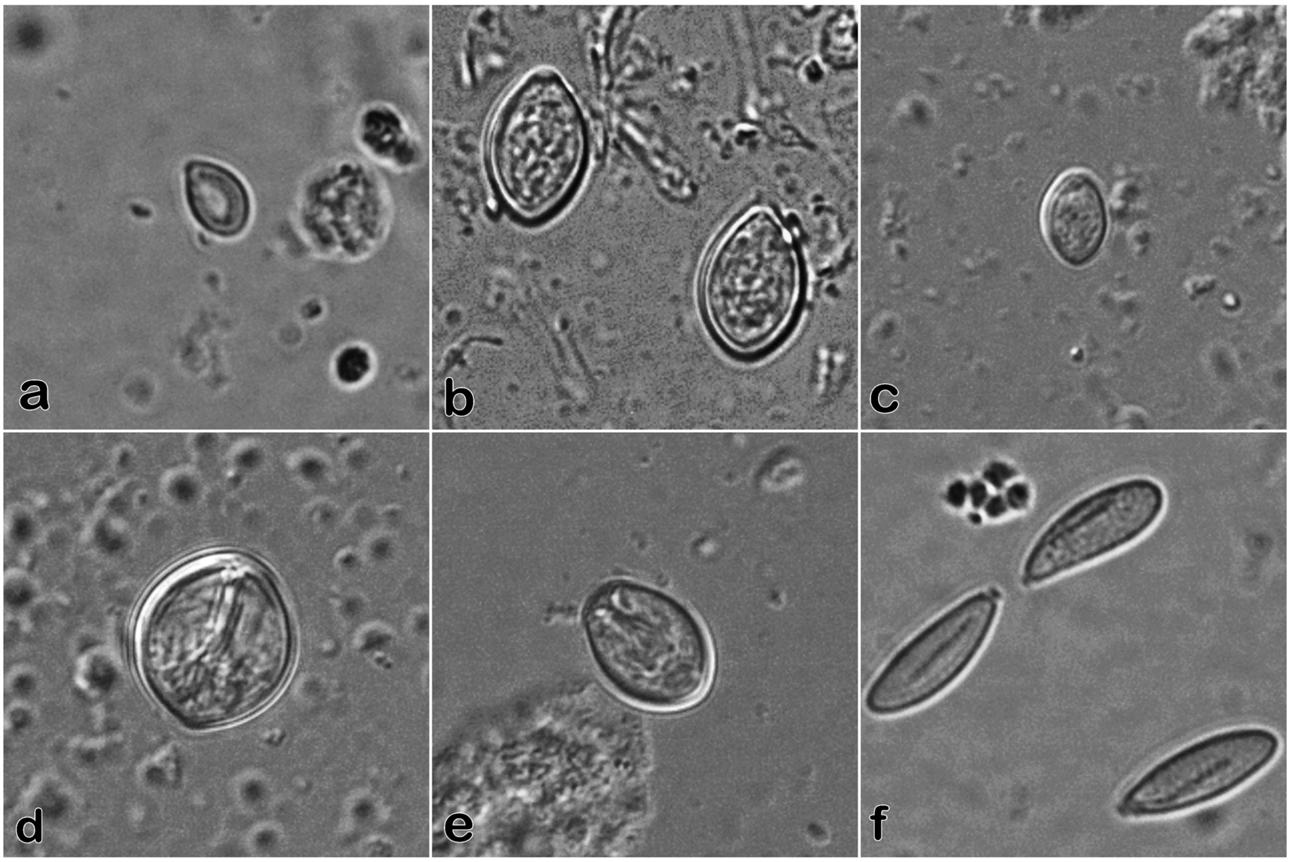

FIGURE 2. *Tubularia acadiae*, nematocysts, ROMIZ B629. a, desmoneme, from aboral tentacle. b, large haplonemes, from aboral tentacle. c, small haploneme, from oral tentacle. d, large stenotele, from oral tentacle. e, small stenotele, from oral tentacle. f, heteronemes, from aboral tentacle.

Tubularia acadiae differs from both *T. couthouyi* and *T. indivisa* in the morphology of its female gonophores. Those of *T. acadiae* have 4-5 fin-shaped crests at the distal end of the sporosac wall, while such crests are lacking in the other two species. Female sporosacs of *T. regalis* Boeck, 1860 have similar crests, but that species differs from *T. acadiae* in having blastostyles that lack side branches, sporosacs that either lack pedicels or occur on very short ones, and hydroids that grow as entwined clusters rather than as single polyps (Petersen 1990). The basal disc of *T. regalis* is also broadly lobed and dome-shaped rather than circular with a crenulated margin. Meanwhile, *T. couthouyi* has been distinguished from *T. indivisa* largely on the basis of its “jointed” stem. Such nodes and regular annulations are rare in *T. indivisa* (Schuchert 2010). It is unclear whether joints in the hydrocaulus of that species are formed as typical nodes or as points of hydranth regeneration. Hydroids assigned to *T. couthouyi* are also said to be more robust than those of the better-known Linnean species. According to Fraser (1944), hydrocauli of the species reach 15 cm high, while the diameter across hydranths and extended tentacles sometimes attains 3–4 cm. He reported that hydranths of *T. couthouyi* bore as many as 30-40 aboral tentacles and 50 oral tentacles. Yet these measurements and tentacle numbers scarcely if at all exceed those reported in *T. indivisa* (see Schuchert, 2010). Another difference, according to Fraser (1947a: 147), is the existence in *T. couthouyi* of a series of deep annulations on the hydrocaulus immediately beneath the hydranth. However, these structures are not mentioned or illustrated in the original description of the species (L. Agassiz 1862). Finally, Agassiz believed that his species differed from *T. indivisa* in being an inhabitant of brackish waters, although *T. indivisa* has been found in salinities as low as 18‰ (Schönborn *et al*. 1993).

Male gonophores of *T. acadiae*, previously undescribed, were observed in examined material (ROMIZ B629) and have been described herein. They are much as in *T. indivisa* and *T. regalis*, although perhaps somewhat more nearly round in shape than in those species (Fig. 1). Also previously undescribed is the cnidome of the species, illustrated here (Fig. 2).

Phylogenetic studies by Nawrocki *et al.* (2013) support the hypothesis that Tubulariidae Fleming, 1828 is monophyletic. Three lineages were recognized within the family, with one of them including the genera *Tubularia* and *Hybocodon* L. Agassiz, 1862, another including *Ectopleura* L. Agassiz, 1862, and a third comprising *Ralpharia* Watson, 1980 and *Zyzzyzus* Stechow, 1921a. Hydroids assigned to *Tubularia*, *Hybocodon*, and *Ectopleura* are quite similar in morphology. All three genera have been reported in the Bay of Fundy, although the sole representative of *Hybocodon* (*H. prolifer* L. Agassiz, 1860) is known there only from its medusa stage (Fish & Johnson 1937). Several characters distinguish these three genera (Table 1).

TABLE 1. Some characters distinguishing the hydroid stages of species of *Ectopleura*, *Hybocodon*, and *Tubularia*.

Character	*Ectopleura*	*Hybocodon*	*Tubularia*
Hydroid form	colonial	solitary (may appear colonial due to larval aggregation)	solitary (may appear colonial due to larval aggregation)
Oral tentacles	in one whorl	in two close whorls	in two or more whorls
Hydrocaulus diameter	usually uniform	usually tapering from distal to proximal end	usually tapering from distal to proximal end
Base of hydrocaulus	arising from a stolon	arising from a stolon	arising from a stolon or a basal disc
Lumen of hydrocaulus	hollow	hollow	filled with parenchymal cells
Longitudinal peripheral canals in hydrocaulus	absent	present	present
Aboral tentacular ridges on base of hydranth	absent	present	present
Gonophores	fixed sporosacs, or free and radially symmetrical medusae	free and bilaterally symmetrical medusae	fixed sporosacs

Species of *Tubularia* and *Hybocodon* are held to differ from those of *Ectopleura* in being solitary rather than colonial. Cornelius (1995a) noted that current definitions of the term “colony” do not adequately differentiate the various types of colonies that are now known to exist in hydrozoans. Within the group, a colony is usually understood to constitute an assemblage of interconnected polypoid and/or medusoid individuals derived asexually from a single larval stage (Cornelius 1995a; Bouillon *et al*. 2006; Nawrocki & Cartwright 2012; Brinckmann-Voss & Calder 2013). However, colony formation of a distinctly different kind is known to occur in *Ectopleura larynx* (Ellis & Solander, 1786). Nawrocki & Cartwright (2012) discovered that colonies in that species were formed through the fusion of sexually generated polyps rather than by asexual propagation.

Tubularia acadiae has been reported at depths from extreme low water spring (Bleakney 1972, as *T. couthouyi*) to 30 m (Petersen 1990). Type material, comprising 31 specimens reaching a maximum of 8 cm high, was collected on stones and shells in the area around Woods Hole, Massachusetts. It is a species of boreal waters, having been found during winter and spring both at its type locality and in Minas Basin.

Recorded distribution. Bay of Fundy: recorded for the first time as *Tubularia acadiae.* Kingsport, Minas Basin, NS (Bleakney 1972, as *Tubularia couthouyi* L. Agassiz, 1860); Minas Basin, NS (Bromley & Bleakney 1985, as *T. couthouyi*).

Eastern North America: Minas Basin, NS (reported herein) to the Woods Hole area, Massachusetts (Petersen 1990).

Elsewhere: as above.

Suborder Capitata Kühn, 1913

Family Corynidae Johnston, 1837

Genus *Coryne* Gaertner, 1774

Coryne pusilla Gaertner, 1774

Fig. 3, 4b

Coryne pusilla Gaertner, 1774: 40, pl. 4, figs. 8a, A.

Type locality. UK: England, coast of Cornwall, with question (Allman 1872: 266).

Material examined. NS: Petit Passage, south of East Ferry, on mussels (*Mytilus edulis*) in *Laminaria* zone, 14.x.1970, without gonophores, coll. K.W. Petersen, SNM HYD-000455.—NS: Petit Passage, south of East Ferry, on mussels (*Mytilus edulis*), intertidal, 14.x.1970, without gonophores, coll. K.W. Petersen, SNM HYD-000457.—NS: Petit Passage, south of East Ferry, on mussels (*Mytilus edulis*), extreme low tide, 14.x.1970, without gonophores, coll. K.W. Petersen, SNM HYD-000459.

Description. Hydroid colonies tending to grow in dense, straggly clumps, with some stolonal parts but mostly having erect stems, reaching about 1 cm high, arising from a creeping, branched and anastomosing stolonal system sometimes occurring as a dense network of overgrown tubes; stolonal tubes quite thick, perisarc wrinkled. Hydrocaulus monosiphonic, sparingly and irregularly branched, not forming an elongate main stem, often bent or twisted, relatively thick but of varied diameter, branches and pedicels similar in form. Perisarc quite thick basally, thinning out somewhat distally, golden- to straw-coloured, terminating at hydranth base, wrinkled to somewhat annulated throughout, although annulations mostly quite shallow and seldom regular. Hydranths clavate, about 0.7-1.3 mm long, 0.3–0.4 mm wide; hypostome large, dome-shaped. Tentacles all capitate, solid, about 18-23 in number, occurring over all but extreme basal part of hydranth, scattered except for a whorl of 4-6 around hypostome, with proximalmost ones the shortest; acrosphere nearly round except for slightly flattened proximal side, heavily armed throughout with nematocysts. Proximal filiform tentacles absent.

Gonophores not seen.

Cnidome (Fig. 3)

Hydranths—

small stenoteles (n = 10): 13.0–14.0 µm long × 8.2–8.9 µm wide (undischarged)

large stenoteles (n = 10): 23.4–24.8 µm long × 15.2–16.9 µm wide (undischarged)

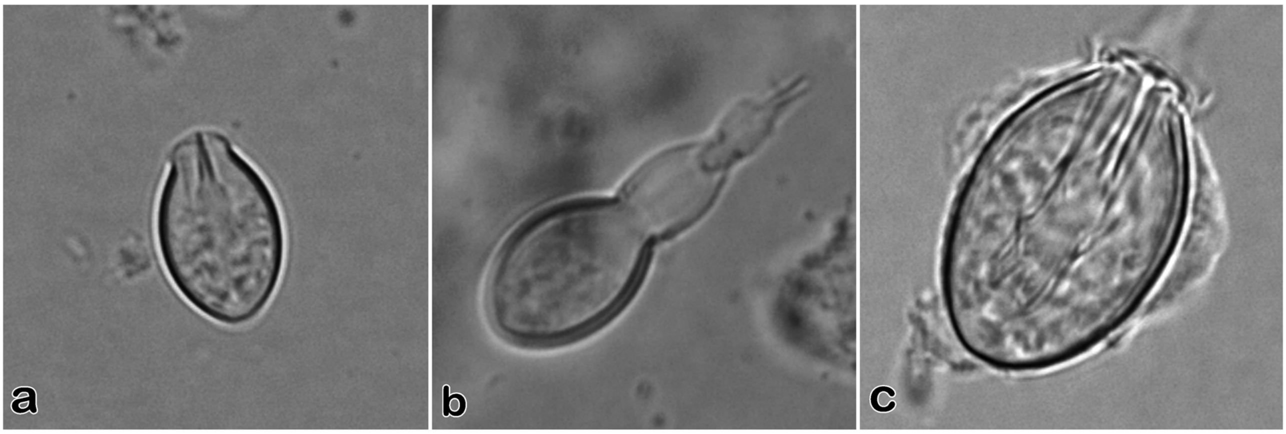

FIGURE 3. *Coryne pusilla*, nematocysts, SNM HYD-000455. a, small stenotele. b, small stenotele, partially discharged. c, large stenotele.

Remarks. The identity of the hydroid described as *Coryne pusilla* by Gaertner (1774) is somewhat uncertain. Allman (1872: 266) noted that Gaertner's illustration of it was rudimentary, and that his account does not accord fully with any known species. He nevertheless concluded that the hydroid later known as *C. pusilla* was likely identical with that of Gaertner, whose species is thought to have been collected from the coast of Cornwall, UK. According to Allman, that hydroid agrees with the original description as well as any, and it is also locally abundant and widely distributed around the British Isles. The contemporary concept of the species (e.g., Schuchert 2001b; 2012), type species of *Coryne* Gaertner, 1774 by monotypy, coincides with that of Allman.

Coryne pusilla was regarded by Allman (1872) as a species of the intertidal zone, commonly found on fucoid algae and often in association with *Clava multicornis* (Forsskål, 1775). It was found near low water in the Fundy region by K.W. Petersen on blue mussels in Petit Passage, NS (SNM HYD-000455, SNM HYD-000457, SNM HYD-000459), and those specimens are described here. That location is influenced by unusually strong tidal water currents (see Remarks below on *Corydendrium dispar* Kramp, 1935).

Molecular studies by Schuchert (2010) have confirmed the hypothesis of Broch (1916) and others that *Coryne vermicularis* Hincks, 1866 is conspecific with *C. pusilla*. The species of Hincks had been reported from waters of northern Canada (Port Burwell, Ungava Bay) by Fraser (1931). Other records of *C. pusilla* from northern Canada, by Calder (1972), were thought by Schuchert (2001b) to have been based on the cold-water species *C. hincksii* Bonnevie, 1898. That species has much less annulated perisarc, however, and the identity of the hydroids described by both Fraser and Calder from subarctic Canada remains uncertain. Reports of *C. pusilla* in waters of Atlantic Canada include those of Whiteaves (1873, 1875), Vervoort (1972a), and Brunel *et al.* (1998) from the Gulf of St. Lawrence and the Strait of Belle Isle. In the northeastern North Atlantic, it is known from Norway and Iceland to Brittany, France (Schuchert 2001b, 2012).

When fertile, *C. pusilla* can be distinguished from *C. hincksii* in having gonophores that arise in the upper axils of the tentacles rather than being independent of them (Schuchert 2001a, b). Moreover, gonophores of *C. pusilla* lack a circular canal. In terms of nematocyst sizes, the stenoteles of *C. hincksii* (16–18 x 11–12 um and 28–29 x 18–20 um), as measured by Schuchert (2001b), are considerably larger than those of *C. pusilla* observed here.

Another boreal species in the North Atlantic that is similar to *C. pusilla*, and one that also extends into the lower intertidal zone, is *C. eximia* Allman, 1859a. It differs in having much smoother perisarc and a free medusa stage rather than fixed sporosacs. Its nematocysts, comprising stenoteles measuring 12–14 x 8.5–10 um and 10–10.5 x 6–7 um (Schuchert 2001b), are also much smaller than those of *C. pusilla* from the Bay of Fundy.

Coryne pusilla has been reported from many localities worldwide, but evidence now exists that a species complex exists under that name. Using partial 16S sequences, Schuchert (2005b) demonstrated that populations assigned to the species from Japan, Korea, and the Mediterranean Sea were widely dispersed phylogenetically from that of the northeastern North Atlantic. Of these populations, only the latter is likely to be identical with the species of Gaertner (1774), and the distribution of *C. pusilla* is certain to be much more restricted than records imply.

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: Frozen Strait, Nunavut (Calder 1970), to Gulf of St. Lawrence and St. Lawrence River, mid-estuary (Brunel *et al.* 1998), southwards to the Bay of Fundy (this study).

Worldwide: widely reported, from the North Atlantic, North Pacific, Indian Ocean, and New Zealand (Schuchert 2001a). As noted above, however, a species complex likely exists under the name *Coryne pusilla* (Schuchert 2005b: 198, 2010: 513).

Genus *Sarsia* Lesson, 1843

Sarsia lovenii (M. Sars, 1846)

Figs. 4c, d, 5

Syncoryna ramosa.—Lovén, 1836: 275, pl. 8, figs. 1–6 [not *Hydra ramosa* Fabricius, 1780 = *Coryne pusilla* Gaertner, 1774].
Syncoryna lovenii M. Sars, 1846: 2 [replacement name for *Syncoryna ramosa* sensu Lovén, 1836]

Type locality. Sweden: west coast (Lovén 1836, as *Syncoryna ramosa*; M. Sars, 1846).

Material examined. NS: Minas Basin, Kingsport, at ELWS, in slushy seawater, 19.iii.1992, several colonies, ca. 1 cm high, with immature medusoids, coll. J.S. Bleakney, ROMIZ B4223.—NB: Letete, Tucker's Brook, 45°02'52"N, 66°53'36"W, intertidal, in brook, 32.5‰, 10°C, 24.v.1999, one clump, 0.8 cm high, on rocks and fucoids, with female medusoids, coll. D. Calder, ROMIZ B3106.—NB: Back Bay, 45°03'20"N, 66°51'49"W, on pontoon slip of public wharf, 5–10 cm below surface, 32.5‰, 9°C, 25.v.1999, two clumps, 1 cm high, on *Mytilus edulis*, with male medusoids, coll. D. Calder, ROMIZ B3096.

Description. Athecate hydroids with colonies predominantly erect, mostly growing in tangled masses of stolons, stems, and branches, reaching up to 2.5 cm high; erect colonies sparingly and irregularly branched, with hydrocaulus and branches monosiphonic and similar in form; tendrils occasionally present. Perisarc moderately thin, golden- to straw-coloured, terminating at hydranth base, mostly wrinkled but with some smooth parts, usually wrinkled at bases of pedicels or stems. Hydranths clavate, about 0.7-1.3 mm long, 0.3–0.5 mm wide, proximal end with narrow annular epidermal thickening, distal part of fully-developed hydranths with about 12-20 tentacles; tentacles solid, capitate, in 3-4 irregular whorls, those of one whorl alternating with those of adjacent whorl or whorls, tapering towards distal end from relatively broad base, becoming narrowest just below terminal acrosphere, distal tentacles usually longer than proximal ones; acrosphere nearly round except for slightly flattened proximal side, heavily armed throughout with nematocysts; hypostome large, dome-shaped, endoderm flesh-coloured to reddish orange. Proximal filiform tentacles absent.

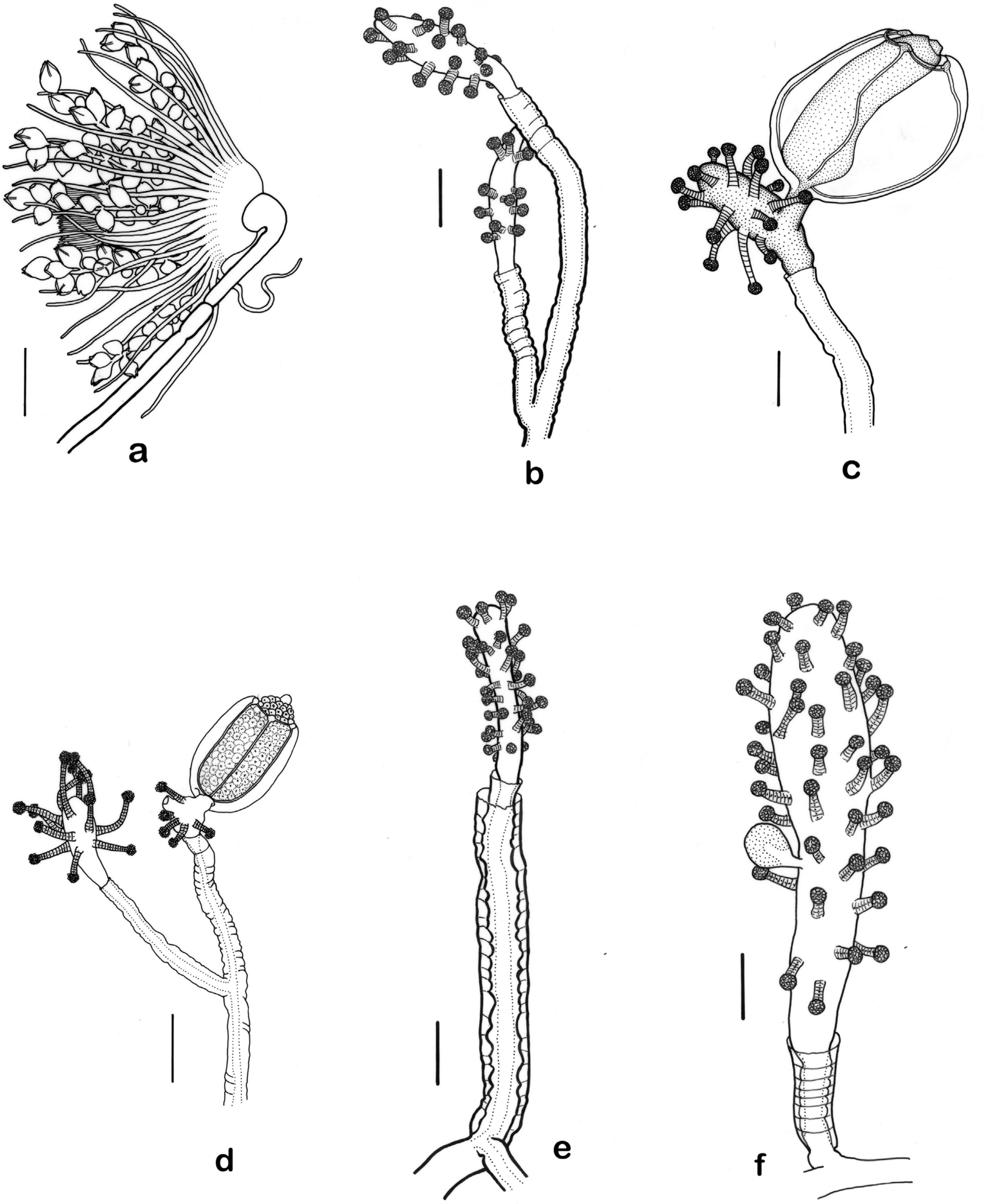

FIGURE 4. Capitate hydroids. a, *Tubularia acadiae*, hydranth with female gonophores, ROMIZ B629. Scale equals 5 mm. b, *Coryne pusilla*, part of colony with two hydranths, SNM HYD-000455. Scale equals 0.5 mm. c, *Sarsia lovenii*, hydranth with male gonophore, ROMIZ B3096. Scale equals 0.5 mm. d, *Sarsia lovenii*, hydranth with female gonophore, ROMIZ B3106. Scale equals 0.5 mm. e, *Zanclea implexa*, long pedicel with hydranth, SNM HYD-000493. Scale equals 0.25 mm. f, *Zanclea implexa*, short pedicel with hydranth and developing medusa bud, SNM HYD-001058. Scale equals 0.25 mm.

Gonophores fixed medusoids, arising from hydranths just below tentacles on short, thick peduncles; fertile hydranths sometimes reduced, even to form of a blastostyle, usually one medusoid per hydranth or blastostyle but sometimes more. Medusoids ovoid to elongate ovoid, with thin mesoglea, about 1.1–1.8 mm long, 0.6–1.4 mm wide when fully developed; radial canals usually four; tentacle bulbs rudimentary, usually four in number; marginal tentacles and ocelli lacking; ring canal slender; velum indistinct; manubrium extending nearly to or slightly beyond velar opening; gonad on manubrium, large, filling subumbrellar cavity of developing medusoid prior to late expansion of medusoid bell.

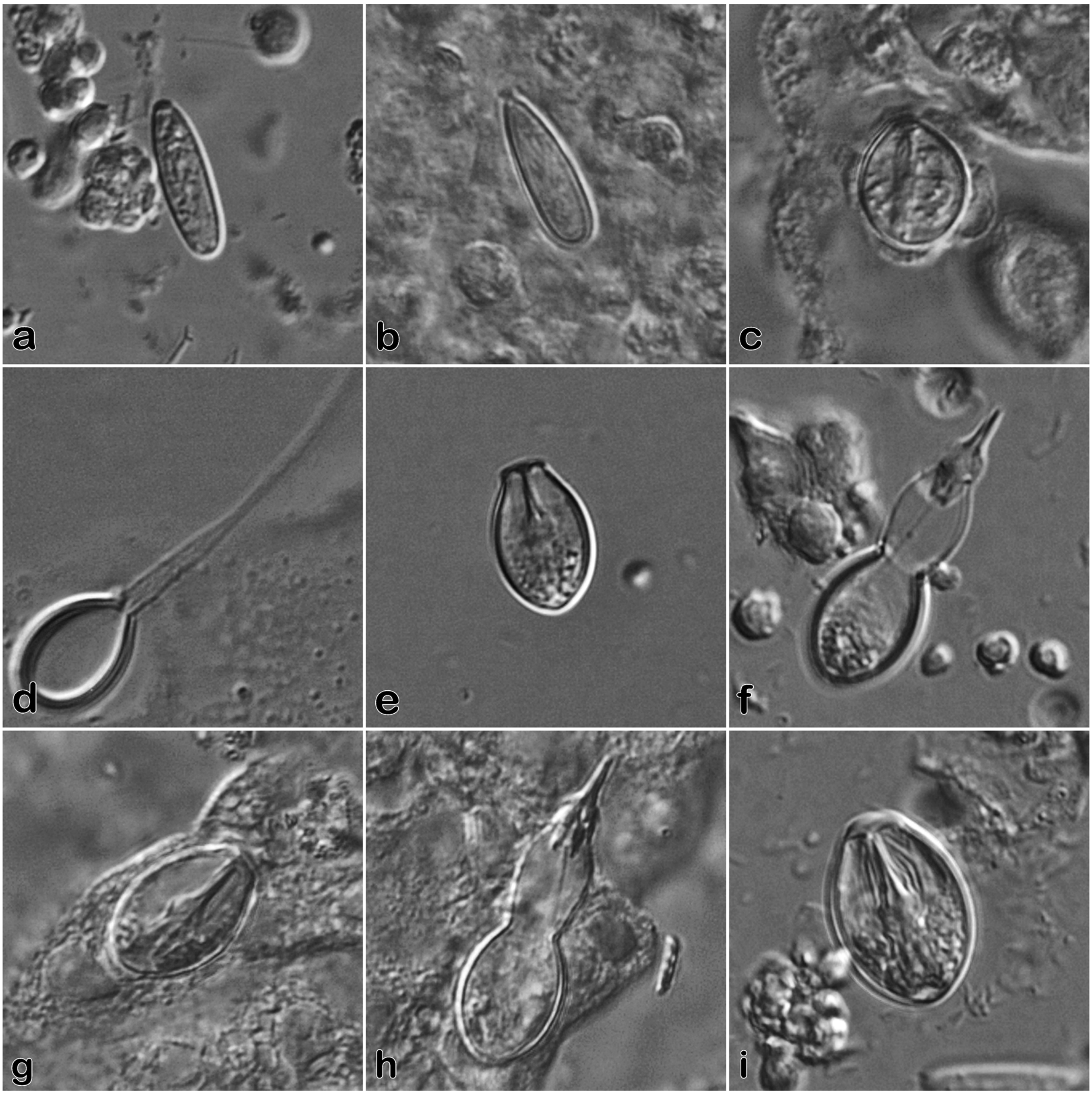

FIGURE 5. *Sarsia lovenii*, nematocysts, ROMIZ B3096. a, isorhiza, from hydranth. b, isorhiza, from medusoid. c, microbasic mastigophore, from medusoid. d, microbasic mastigophore, discharged, from medusoid. e, small stenotele, from hydranth. f, small stenotele, partially discharged, from hydranth. g, small stenotele, from medusoid. h, small stenotele, partially discharged, from medusoid. i, large stenotele, from hydranth.

Cnidome (Fig. 5)
Hydranths—
isorhizas (n = 10): 13.7–14.8 µm long × 4.0–4.9 µm wide (undischarged)
small stenoteles (n = 10): 12.5–13.8 µm long × 8.0–8.8 µm wide (undischarged)

large stenoteles (n = 10): 15.5–18.9 µm long × 11.2–12.7 µm wide (undischarged)
Medusoids—
isorhizas (n = 6): 13.2–14.8 µm long × 4.4–5.1 µm wide (undischarged)
mastigophores (n = 10): 11.5–14.8 µm long × 8.4–9.9 µm wide (undischarged)
small stenoteles (n = 8): 13.0–15.2 µm long × 8.2–10.0 µm wide (undischarged)

Remarks. This species was first described and illustrated from the west coast of Sweden by Lovén (1836) as "*Syncoryna ramosa* Ehrenb" (=*Hydra ramosa* Fabricius, 1780, a junior subjective synonym of *Coryne pusilla* Gaertner, 1774). It was recognized as a distinct species by M. Sars (1846), who proposed the binomen *S. lovenii* for it. *Syncoryna lovenii* M. Sars, 1846, a species in which mature medusoids usually remain attached to the hydroid (Broch 1916; Hartlaub 1916; Edwards 1978, 1983; Schuchert 2001b, 2012), is now assigned to *Sarsia* Lesson, 1843. Molecular studies support that classification (Collins *et al*. 2005; Nawrocki *et al*. 2010), with *S. lovenii* being genetically close to *S. tubulosa* (M. Sars, 1835), type species of *Sarsia* by monotypy.

Significant crypsis is known to exist within *Sarsia* (Edwards 1978, 1983; Brinckmann-Voss 1980, 1989, 2000), and hydroids of the various species can be difficult to distinguish on the basis of trophosome morphology alone (Schuchert 2001b, 2012). At least three species in the genus, *S. lovenii*, *S. tubulosa*, and *S. occulta* Edwards, 1978, occur in boreal waters of eastern North America. Their hydroids can be identified with confidence only when gonophores are present, with those of *S. lovenii* remaining attached as fertile medusoids, those of *S. tubulosa* being liberated as free but immature medusae that ripen in the plankton, and those of *S. occulta* being released as free medusae with at least partly developed gonads (although ripe medusae may infrequently be retained on the hydranths) (Edwards 1978, 1983; Schuchert 2001b, 2012). While it is likely that all three species occur in the Bay of Fundy, only *S. tubulosa* and *S. lovenii* are currently known from there (see Appendix 1). Hydroids of *Sarsia occulta*, identified from fertile material, are known both north (Labrador: Red Bay, 51°43'47"N, 56°26'20"W, on algae at low tide, 25 June 2000, 4°C, 32‰, coll. D. Calder, ROMIZ B3290) and south (New Jersey: Barnegat Inlet near Barnegat lighthouse, 39°45'51"N, 74°06'24"W, on rocks and algae from rock rip-rap near low tide, 12 March 2002, 6°C, 32‰, coll. D. Calder, ROMIZ B3517) of the bay. Other records of *S. occulta* in the western North Atlantic, according to Edwards (1978: 293), include some of the hydroids identified as *Syncoryne mirabilis* by L. Agassiz (1860: pl. 17, fig. 12) from Massachusetts and by Berrill (1953: figs. 1E, 2B) from Maine. *Sarsia occulta* differs from *S. lovenii* in having colonies that are predominantly stolonal rather than upright and branched, and medusa buds with marginal tentacles that are well developed instead of undeveloped or vestigial.

Given the morphological similarity of hydroid stages of these three species, taxonomic confusion has prevailed about them for many decades. Russell (1953), Edwards (1978), and Schuchert (2001b) noted that hydroids of *Sarsia lovenii* have often been assigned by mistake to *S. tubulosa* or its synonyms. Indeed, illustrations of specimens from Massachusetts that were labelled as *Coryne mirabilis* (L. Agassiz, 1850) (=*S. tubulosa*) by L. Agassiz (1860, pl. 17, figs, 10, 11, 13–16), and H.J. Clark (1865b: fig. 42), and probably those of A. Agassiz (1865: figs. 286, 288) and Nutting (1901a: figs. 3, 3A) as well, correspond instead with fertile specimens of *S. lovenii*. So too do hydroids identified as *Sarsia mirabilis* from Massachusetts in an illustration by Mayer (1910a: pl. 3, fig. 5) and as *Syncoryne eximia* (Allman, 1859a) (=*Coryne eximia*) from the Gulf of Maine by Berrill (1953: fig. 10). Authors including L. Agassiz (1862: 189–190, 203–204), H.J. Clark (1865: 77–79), and Mayer (1910a: 54, 55) maintained that *Coryne mirabilis* released immature free medusae during winter in southern New England, but that gonophores of the species became mature while still attached to the hydroid as water temperatures rose in spring. Similar observations were reported by Berrill (1953: 276–279) in studies of corynids from Maine. Based on life cycle studies undertaken in the laboratory, however, Edwards (1978: 310) presented evidence that gonophore types in *S. tubulosa*, *S. lovenii*, and *S. occulta* do not change with varying temperatures. He concluded that Agassiz, Mayer, and Berrill had made observations on a complex of species rather than on a single one. The opinions of Edwards are followed here, although taxonomic questions remain about species of *Sarsia* on this coast.

The identity of hydroids identified as *Syncoryne mirabilis* from Newfoundland by Leloup (1939: fig. 1B), is uncertain. At least some reports of *S. mirabilis* from the boreal western North Atlantic, including the Bay of Fundy (see Fraser 1944) may have been based in whole or in part on *Sarsia lovenii*. In the absence of detailed descriptions and illustrations, however, it is impossible to determine which ones might have been based on that species. Meanwhile, Fraser's (1912) report of *Syncoryne mirabilis* from floating *Sargassum* at Beaufort, North Carolina, is more likely to have been based on specimens of *Coryne sargassicola* Calder, 1988, a warm water species prevalent on the same pelagic substrate.

Broch (1916) justifiably regarded *S. lovenii* as a cold water species, with the most luxurient colonies occurring toward the northern limits of the boreal zone. Colonies kept in the laboratory by Edwards (1978) in Scotland developed gonophores during spring and early summer at temperatures from 8.4–11.8°C. Common substrates include fucoids, stones, and mussels occurring in shallow waters (Broch 1916; Edwards 1978; Schuchert 2001b). In the Bay of Fundy region, dense colonies of *S. lovenii* with well-developed medusoids were discovered on rocks and fucoids during late spring in an intertidal brook running from a brackish pond into Passamaquoddy Bay near Letete, NB (ROMIZ B3106). Fertile colonies were also collected just below the water surface on mussels (*Mytilus edulis*) from a floating pontoon slip of a wharf at Back Bay, NB (ROMIZ B3096). At the head of the bay, in Minas Basin, NS, hydroids of *S. lovenii* with a few immature medusoids were obtained at ELWS in slushy seawater during late winter near Kingsport (ROMIZ B4226). *Sarsia lovenii* is known to tolerate reduced salinities (Schuchert 2001b, 2012), and the appearance of the hydroid colony can vary depending on the strength of water currents (Vervoort & Faasse 2009).

On the Atlantic coast of Canada beyond the Bay of Fundy, specimens of *Sarsia lovenii* have been collected northwards to western Newfoundland (south of St. Paul's, ROMIZ B1307; Raleigh Harbour, ROMIZ B3274; north of Sally's Cove on wreck of S.S. *Ethie*, ROMIZ B3281) and southern Labrador (L'Anse Amour, ROMIZ B3285, ROMIZ B3286). The known range of the species in the western North Atlantic thus extends from localities in the Strait of Belle Isle to Massachusetts. In the eastern Atlantic, it has been reported from the White Sea to the English Channel (Schuchert 2012). It is also known from Iceland and Greenland (Schuchert 2001a, 2012). The reported bathymetric range is 0-200 m (Naumov 1960).

The cnidome of specimens examined here corresponded with that reported by Schuchert (2001b) in material of the species from Europe. Isorhizas and stenoteles of two size classes were present in hydranths, while isorhizas, microbasic mastigophores, and stenoteles were found in medusoids (Fig. 5). Slight differences noted in size were not considered taxonomically significant, with overlaps occurring in most of the measurements.

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: Greenland (Schuchert 2001a); Newfoundland (reported herein) to Massachusetts (L. Agassiz 1860, 1862, as *Coryne mirabilis*, in part).

Worldwide: northwest North Atlantic (Edwards 1978); northeast North Atlantic (Naumov 1960; Schuchert 2001b, 2012).

Family Zancleidae Russell, 1953

Genus *Zanclea* Gegenbaur, 1856

Zanclea implexa (Alder, 1856b)

Figs. 4e, f, 6

Tubularia implexa Alder, 1856b: 439.
?*Zanclea costata*.—Trott 2004a: 271 [not *Zanclea costata* Gegenbaur, 1856].

Type locality. UK: England, Northumberland, North Sea, 30 miles east of Holy Island (Alder 1856b).

Material examined. NS: Sandy Cove, Digby Neck, 22.vii.1970, intertidal, on mussel shell (*Mytilus edulis*), one hydranth with a medusa bud, coll. K.W. Petersen, SNM HYD-001058.—NS: Petit Passage, south of East Ferry, 14.x.1970, water's edge at extreme low tide, on mussel shells (*Mytilus edulis*) and adhering algae, several colonies, without gonophores, coll. K.W. Petersen, SNM HYD-000493.—Petit Passage, NS, south of East Ferry, datum + 6 cm, 14.x.1970, coll. K.W. Petersen, SNM HYD-001050.

Description. Hydroid colonies stolonal, rarely with a pedicel having a single small branch, arising from a branched and anastomosing hydrorhiza overgrowing mussel shells and algae. Hydrorhizal stolons mostly creeping but occasionally detached from substrate to form a tangle of hydrorhizae and hydranth pedicels. Pedicels varying from short to very long for the genus, as much as 4 mm high, 0.2 mm wide, narrowest at insertion with hydrorhiza, usually widest at or near distal end, each bearing a terminal hydranth; perisarc moderately thin, straw-coloured, occurring in present specimens as a double tube, with a wavy inner layer and a less-wrinkled outer layer, constricted at pedicel base, terminating distally at base of hydranth. Hydranths elongate, slender, cylindrical to capitate, reaching 1.75 mm long, 0.4 mm wide; hypostome dome-shaped. Tentacles solid, capitate, slender, fairly short, as many as 50 or more, scattered over nearly all of hydranth and with a whorl of 5 to 7 around manubrium; acrosphere nearly spherical except for slightly flattened proximal side.

One developing gonophore observed, presumably a medusa bud, borne on a distinct pedicel, arising amongst tentacles on proximal half of hydranth.

Cnidome (Fig. 6)

Hydranths—

small stenoteles (n =10): 7.0–7.9 µm long × 4.8–5.2 µm wide (undischarged)

large stenoteles (n =10): 12.2–13.1 µm long × 10.3–11.1 µm wide (undischarged)

macrobasic euryteles (n =10): 21.0–22.1 µm long × 8.2–9.4 µm wide (undischarged)

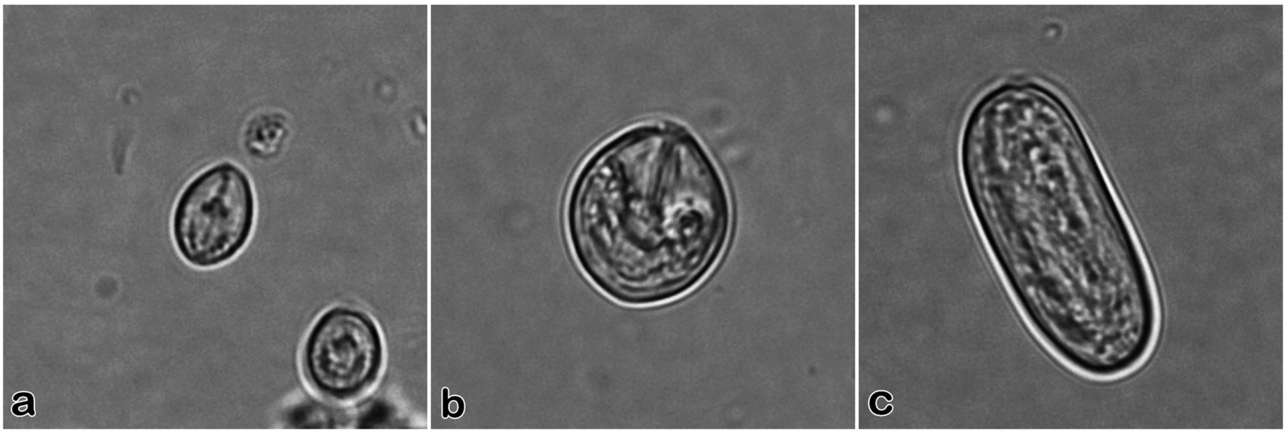

FIGURE 6. *Zanclea implexa*, nematocysts, SNM HYD-000493. a, small stenotele. b, large stenotele. c, macrobasic eurytele.

Remarks. Alder (1856b) briefly described *Zanclea implexa* (as *Tubularia implexa*) from hydroids growing on an old anchor taken at a depth of 40 fathoms (73 m) off Holy Island, northeast England. No illustrations of it were provided until the following year (Alder 1857). Allman (1864) assigned the species to *Zanclea* Gegenbaur, 1856, and Hincks (1868) included an account of it in his book on British hydroid zoophytes. Detailed information also appeared in the monograph on gymnoblastic hydroids by Allman (1872: 223–226 and 290–292, as *Gemmaria implexa*). A contemporary synonymy of *Z. implexa* is given in Schuchert (2010), and the nomenclatural status of the genus name *Zanclea* has been discussed earlier (Calder 1988, 1992, 2013). According to Cornelius & Garfath (1980), syntype material of the species exists at the Hancock Museum (now the Great North Museum: Hancock), Newcastle-upon-Tyne, England. The life cycle of the species is still incompletely known, with the medusa stage not having yet been reared to maturity (Schuchert 2010).

Confusion over species limits in *Zanclea* deepened following studies by Russell and Rees (1936) on the life cycle of specimens identified as *Z. implexa*. They determined, correctly, that some of the characters employed earlier in distinguishing zancleid species and genera varied depending on the stage of development, and were of little or no taxonomic value. Several binomena that had been applied to both hydroid and medusa stages were thereupon referred by them to the synonymy of *Z. implexa*. Russell (1953), Kramp (1961), Brinckmann-Voss (1970), and others followed by including *Z. implexa* as a synonym of *Z. costata* Gegenbaur, 1856, and both of those names were assigned in turn to the synonymy of *Z. alba* (Meyen, 1834) by Calder (1988). Petersen (1990) observed that identification of species assigned to *Zanclea* was extremely difficult, and that their delimitation at the time was in a state of chaos. As the 20th century came to a close, several new or seldom-used characters were adopted to better distinguish zancleid taxa. Meanwhile, the species studied by Russell and Rees (1936) is now believed by Schuchert (2010) to have been *Z. sessilis* (Gosse, 1853) rather than *Z. implexa*.

Species diversity within the genus *Zanclea* had been greatly underestimated until the work of Gravili *et al.* (1996) and Boero *et al.* (2000) on adaptive radiation in zancleids from the Mediterranean Sea, Papua New Guinea, and California. Particular emphasis was given in their studies to differences in cnidome and to symbiotic relationships between zancleids and their substrates, particularly Bryozoa. The validity of several named species was confirmed, and eight new ones were described. More than 30 species of *Zanclea* are currently recognized as valid in the WoRMS (Schuchert 2017) list, with one of them being *Z. implexa*. In a recent review of the group by

Schuchert (2010), *Z. costata* is regarded as a species of the Mediterranean, a resurrected *Z. implexa* is found in the North Sea, and *Z. alba* is a species of the warm North Atlantic and Gulf Stream, common on pelagic *Sargassum*.

Hydroids referable to *Zanclea* from the Bay of Fundy (SNM HYD-000493, SNM HYD-001058) have been assigned in this study to *Z. implexa*. Specimens were collected by K.W. Petersen at low tide in Petit Passage and Sandy Cove, NS. No way was found to differentiate them from North Sea specimens of the species as described by Schuchert (2010), and *Z. implexa* is therefore believed here to be amphi-Atlantic in distribution. As with the account of *Z. implexa* by Schuchert, specimens examined here from the Fundy region were distinguished by the following: (1) hydranth pedicels varied from short to long (up to 4 mm high) and were covered with perisarc; (2) hydranths were small (up to 1.75 mm long); (3) macrobasic eurytele nematocysts were present, with their capsules forming a dense ring around the hypostome; (4) no microbasic mastigophores were observed; (5) hydroids occurred on various substrates (both mussel shells and algae), but not on bryozoans. Also of note, pedicels consisted of two tubes, with an inner wavy layer connected to an outer smoother layer by "regularly disposed, radiating offsets" (Allman 1877: 224) of perisarc (Figs. 4e, f).

Morphologically, the species is much like *Z. giancarloi* Boero, Bouillon & Gravili, 2000 from the Mediterranean Sea, but it apparently differs in having double-layered perisarc surrounding the pedicels. *Zanclea giancarloi* is also likely a species of warmer waters than the decidedly boreal *Z. implexa.* Molecular studies are needed to confirm whether Fundy specimens are indeed conspecific with *Z. implexa*, or whether they represent a new species.

Specimens reported as *Zanclea costata* by Trott (2004a) from Cobscook Bay, ME, in the Fundy region (see Appendix 1), were likely based on *Z. implexa* as well. His record was based on an entry in an unpublished checklist by Prof. Norman Meinkoth. As noted above, *Z. costata* is now thought to be restricted in distribution to the Mediterranean Sea. That species differs from *Z. implex*a in having larger hydranths (2–5 mm vs. <2 mm high), a different substrate (infaunal bivalves), and microbasic mastigophore nematocysts (Schuchert 2010).

Fraser (1944) included accounts of hydroids assigned to two species, *Zanclea costata* and *Z. gemmosa* McCrady, 1859, from the Atlantic coast of North America. All records were from south of Cape Cod, Massachusetts, and none is likely to have been based on the cold water *Z. implexa*. Reports of *Z. costata* from the region, a species regarded as endemic to the Mediterranean Sea (Schuchert (2010), likely constitute misidentifications. Meanwhile, the original description of *Z. gemmosa* by McCrady (1859) was based solely on medusae from Charleston Harbor, South Carolina. Given the absence of life cycle studies on that species, reports of hydroids identified as *Z. gemmosa* remain doubtful. At least some records of both *Z. costata* and *Z. gemmosa* from the western North Atlantic, especially those from pelagic *Sargassum*, were probably based instead on *Z. alba*. In light of studies on *Zanclea* from Europe, cited above, it is likely that diversity within the genus along the east coast of North America has been underestimated.

As noted above, the skeleton surrounding pedicels of specimens examined here consisted of a pair of perisarcal tubes of different diameter, described early on in the species by authors including Alder (1856b: 440; 1857: 108, pl. 9, figs. 5, 6), Wright (1859: 107–108), and Hincks (1868: 60, pl. 9, figs. 3a, b). Allman (1872) concluded that this was a misinterpretation, believing that the supposed inner layer was simply the outer wall of the coenosarcal tube. Russell & Rees (1936) confirmed the existence of two layers of perisarc in hydroids identified as *Z. implexa* (but regarded as *Z. sessilis* by Schuchert 2010), and suggested that the inner layer was formed during renovation of the hydranth as a new tube developed around it within the old tube. This explanation accords at least in part with observations made here, with the inner tube often extending beyond the orifice of the outer and older tube to reach the base of the hydranth (Fig. 4e).

Macrobasic euryteles in present material were scattered throughout the hydranth body and in the coenosarcal tubes, but were especially concentrated in a band around the hypostome. A hypostomal band of euryteles was also noted in hydroids of *Z. implexa* from Europe by Schuchert (2010).

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: recorded for the first time.

Worldwide: Northwest Europe, from Norway to northeastern England (Schuchert 2010); Atlantic Canada (this study).

Suborder Filifera Kühn, 1913

Family Oceaniidae Eschscholtz, 1829

Genus *Corydendrium* Van Beneden, 1844a

Corydendrium dispar Kramp, 1935

Figs. 7a, b, 8

Corydendrium dispar Kramp, 1935: 3, figs. 1a, b, 2a–d, 3, unnumbered plate, figs. 1a, b, 2–8.

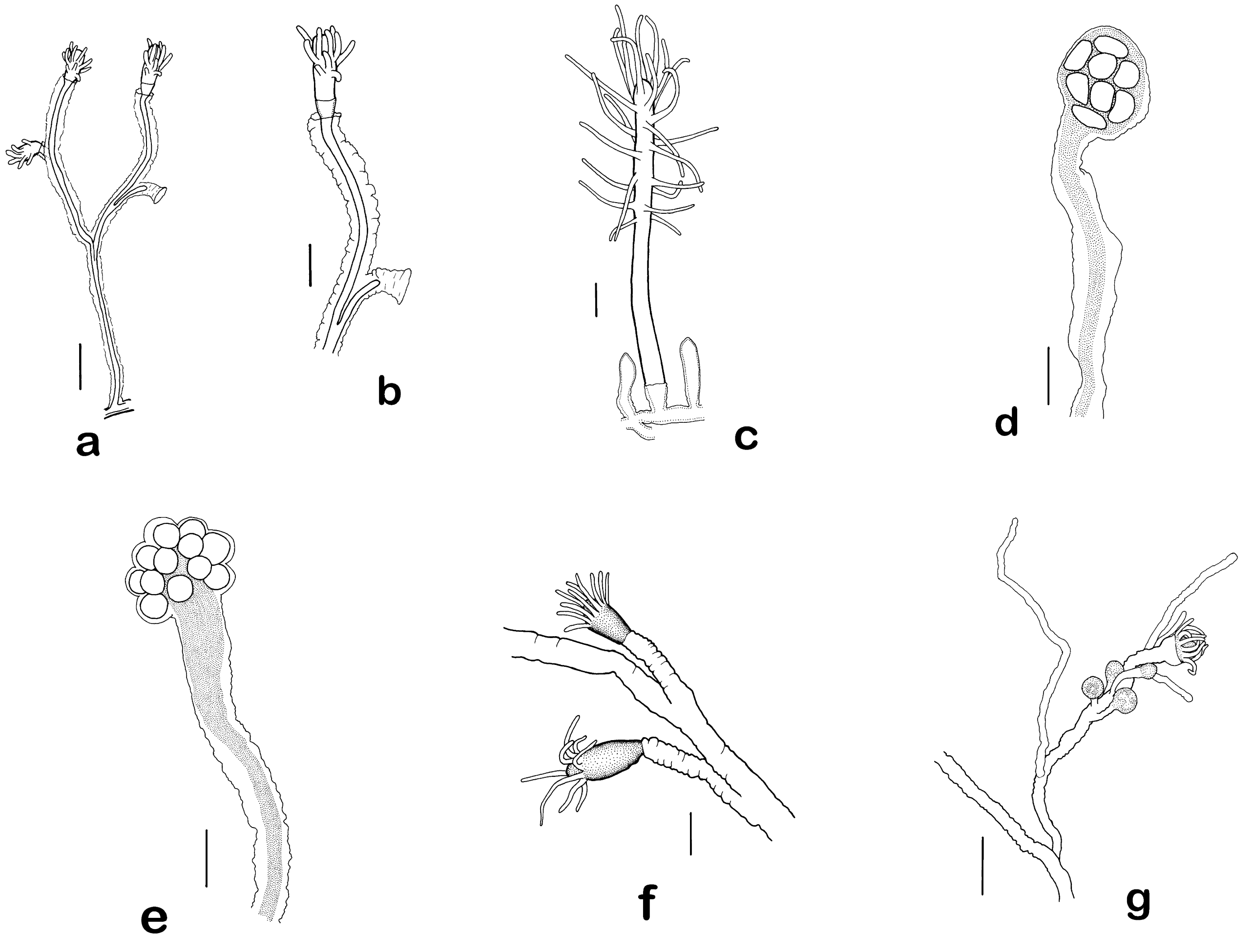

FIGURE 7. Filiferan hydroids. a, *Corydendrium dispar*, colony with three hydranths, SNM HYD-000871. Scale equals 0.5 mm. b, *Corydendrium dispar*, distal end of hydrocaulus with a hydranth, SNM HYD-000871. Scale equals 0.25 mm. c, *Rhizogeton fusiformis*, hydranth and young female gonophores, ROMIZ B3101. Scale equals 0.5 mm. d, *Rhizogeton fusiformis*, developing female gonophores, ROMIZ B3101. Scale equals 0.25 mm. e, *Rhizogeton fusiformis*, female gonophores, ROMIZ B3101. Scale equals 0.25 mm. f, *Bougainvillia muscus*, part of colony with two hydranths, ROMIZ B3120. Scale equals 0.25 mm. g, *Bougainvillia muscus*, part of colony with medusa buds and tendrils, ROMIZ B3120. Scale equals 0.5 mm.

Type locality. Sweden: Kattegat, Kungsbackafjord, 26 m (Kramp 1935).

Material examined. NS: Petit Passage, south of East Ferry, datum + 5 cm, 14.x.1970, on a mussel shell (*Mytilus edulis*) with other hydroids, one colony, without gonophores, coll. K.W. Petersen, SNM HYD-000871.

Description. Hydroid colony minute, up to 4 mm high, with both stolonal and erect parts, arising from a creeping hydrorhiza; growth monopodial with terminal hydranths. Hydrocaulus when present monosiphonic, curved and twisted, slender basally, very gradually expanding distally, giving off a few irregular branchlets or a branch. Branches and branchlets adnate to axis for a short distance at proximal end before diverging, with branches similar in form to main axis; ultimate branchlets mostly short, slender basally, expanding distally, about 0.15–0.20

mm in diameter terminally. Perisarc thin, double-layered, this especially noticeable towards base of hydrocaulus or pedicel, with inner layer thicker, outer layer filmy, more or less wrinkled throughout. Hydranths terminal, clavate, up to 0.5 mm long, 0.15 mm wide, partially surrounded basally by perisarc; hypostome dome-shaped. Tentacles filiform, scattered, about 10-14 in number.

Gonophores not seen.

Cnidome (Fig. 8)

Hydranths—

desmonemes (n = 10): 4.5–5.2 µm long × 2.7–3.1 µm wide (undischarged)

microbasic euryteles (n = 10): 8.0–9.9 µm long × 4.0–4.9 µm wide (undischarged)

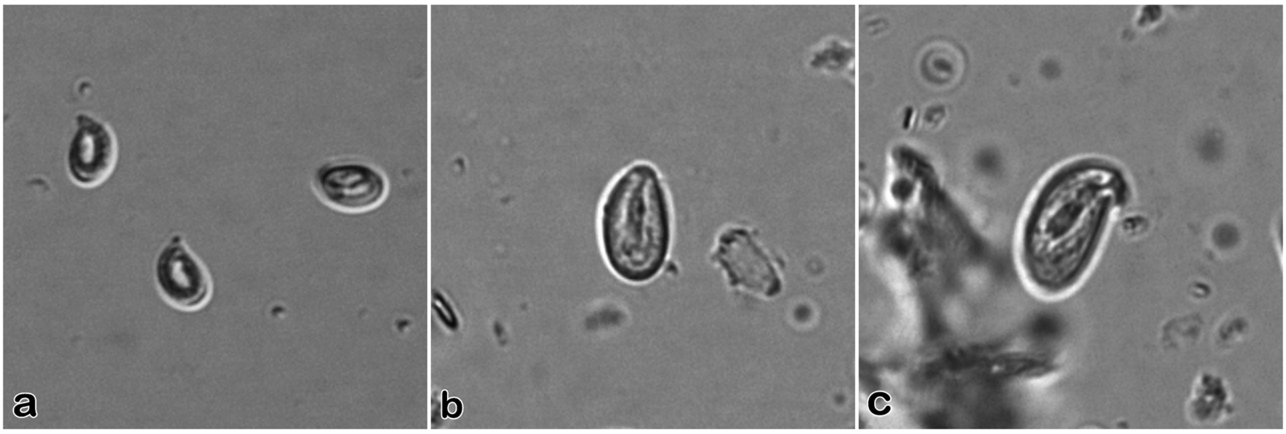

FIGURE 8. *Corydendrium dispar*, nematocysts, SNM HYD-000871. a, desmonemes. b, microbasic eurytele. c, microbasic eurytele, unusual shape and size.

Remarks. Kramp (1935) discovered this boreal species during an examination of hydroids collected in the Skagerrak and Kattegat by L.A. Jägerskiöld of the Göteborgs Naturhistoriska Museum, Sweden. He recognized that it was similar to but specifically distinct from *Corydendrium parasiticum* (Linnaeus, 1767), a warm water species, and established the binomen *C. dispar* for it. Specimens from Norway, identified earlier by Bonnevie (1899b) as *C. parasiticum*, were examined by Kramp and found to be *C. dispar*. Gonophores arise as oval to nearly spherical external outgrowths of the stem, branches, and branchlets, and are not contained within perisarcal tubes of stem and branches during development as in *C. parasiticum* (Kramp 1935). Males of the species are much more highly reduced in structure than females.

An infrequently encountered hydroid, *Corydendrium dispar* has been reported most often from the Kattegat, in both Swedish (Kramp 1935; Jägerskiöld 1971; Schuchert 2004) and Danish (Dahl *et al*. 2009) waters. Elsewhere, it has been found along the west coast of Norway as far north as the Trondheimfjord (Kramp 1935), and from the Faroes (Jensen & Frederiksen 1992; Schuchert 2004). This is the first record of the species from the Atlantic coast of North America.

Specimens of *Corydendrium dispar* examined here were collected by K.W. Petersen (SNM HYD-000871) on a mussel shell in Petit Passage, Nova Scotia. The location is characterized by powerful tidal currents that flow through a narrow channel connecting St. Mary's Bay and the Bay of Fundy. With a vertical tidal range in the region of about 7 m, maximum surface currents exceed 3 m/second during an average spring tide (Durand *et al*. 2008). The colony, or colonies, were small, inconspicuous, and partially obscured by the growth of other hydroid species. Discovery of the species near low water at this unusual site is noteworthy in that previous records of *C. dispar* (Kramp 1935; Jägerskiöld 1971; Jensen & Frederiksen 1992; Schuchert 2004) are from greater depths (26–260 m).

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: recorded for the first time.

Worldwide: Scandinavia, from the Trondheimfjord to the Kattegat (Kramp 1935); Faroe Islands (Jensen & Frederiksen 1992; Schuchert 2004); Atlantic Canada (this study).

Genus *Rhizogeton* L. Agassiz, 1862

Rhizogeton fusiformis L. Agassiz, 1862
Figs. 7c–e, 9

Rhizogeton fusiformis L. Agassiz, 1862: 224, pl. 20, figs. 17–23.—Linkletter *et al.* 1977: 6.—Calder, 2010: 13.

Type locality. USA: Massachusetts, Nahant, in tide pools (L. Agassiz 1862: 224).

Material examined. NB: St. Andrews, Biological Station wharf, pontoon, 10.vii.1972, <1 m, one colony, with male gonophores, coll. A. Brinckmann-Voss, ARC 8650057.—NB: Richardson, Deer Island, 44°59'42"N, 66°56'45"W, wharf, pontoon slip, just below surface, on *Mytilus edulis*, 19.xii.1988, 5°C, 34‰, one colony, without gonophores, coll. D. Calder, ROMIZ B1022.—NB: Stuart Town, Deer Island, 45°01'07"N, 66°56'16"W, <1 m, on *Ascophyllum nodosum*, 24.v.1999, 34‰, 9° C, one colony, without gonophores, coll. D. Calder, ROMIZ B3091.—NB: Letete, Tucker's Brook, 45°02'52"N, 66°53'36"W, intertidal, in brook, on *Ascophyllum nodosum*, 24.v.1999, 23‰, 12° C, two colonies with female gonophores, coll. D. Calder, ROMIZ B3101.—NB: Letete, Tucker's Brook, 45°02'52"N, 66°53'36"W, intertidal, in brook, on *Ascophyllum nodosum*, 30.v.1999, 23‰, 16° C, two colonies, with male gonophores, coll. D. Calder, ROMIZ B3102.

Description. Athecate hydroids forming stolonal, monomorphic colonies, arising from a creeping and often reticular hydrorhiza. Stolons of hydrorhiza covered by thin perisarc, sometimes forming a complex network of tubes. Hydranths sessile, elongate, club-shaped to cylindrical to tapering from end to end, up to about 1 cm high, naked except for a short collar of thin perisarc at proximal end, while sometimes widely separated, under optimal conditions forming dense aggregations of polyps up to several cm long; tentacles as many as 10-30 or more, filiform, tapering from broader base to slender tip, appearing scattered but tending to occur in several irregular whorls over distal half to 2/3 of hydranth, with those of one whorl alternating with those of adjacent whorl or whorls, distal tentacles longer than proximal ones; hypostome elongate, dome-shaped. Hydrorhizal spines absent; nematophores absent. Colour orange to ochre-red.

Gonophores fixed sporosacs, arising on peduncles of varying length from hydrorhizal stolons. Male gonophores initially almost round, on short peduncle, becoming elongate-oval to fusiform with longer peduncle, about 1 mm high, entire structure covered with thin, filmy perisarc; white to deep orange in colour. Female gonophores spherical, on short peduncle, later becoming sac-shaped and borne on a long peduncle; perisarc thin, filmy, eventually shed over distal end to expose developing embryos on spadix.

Cnidome (Fig. 9)

desmonemes (n = 10): 5.0–6.3 µm long × 3.2–3.8 µm wide (undischarged)

microbasic euryteles (n = 10): 7.9–8.2 µm long × 2.9–3.3 µm wide (undischarged)

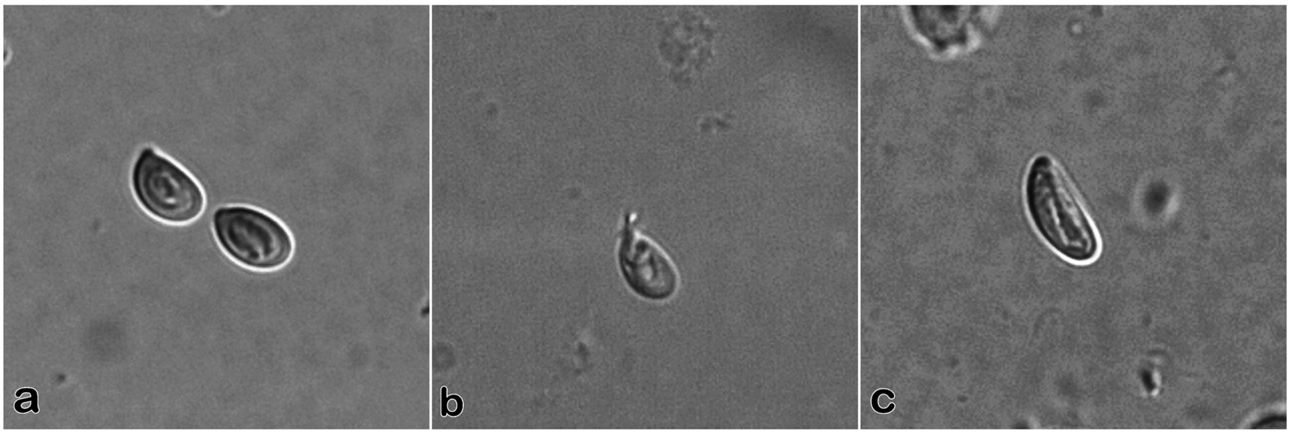

FIGURE 9. *Rhizogeton fusiformis*, nematocysts, ROMIZ B3101. a, desmonemes. b, desmoneme, partially discharged. c, heterotrichous microbasic eurytele.

Remarks. *Rhizogeton fusiformis* L. Agassiz, 1862 was originally described from hydroids growing on rocks and stones in intertidal pools at Nahant, Massachusetts (L. Agassiz 1862). Type specimens (MCZ 52) from that location were collected during the month of July (A. Agassiz 1865). Only two other reports provide original observations on the species in the western North Atlantic. Notes and an illustration of the trophosome of *R. fusiformis* were provided in a widely overlooked work by H.J. Clark (1865b). He also complemented a description of male gonophores of the species by L. Agassiz (1862) with the first account of female gonophores and their development (H.J. Clark 1865a, 1865b). Subsequent references to the species by Verrill (1879), Hargitt (1901), Kingsley (1910), and Fraser (1944, 1947a) appear to have been based on the original description of *R. fusiformis* by L. Agassiz (1862). Other than a listing of the species in a Bay of Fundy checklist (Linkletter *et al*. 1977), and a brief note of its occurrence in Passamaquoddy Bay, Canada (Calder 2010), this is the first published record of *R. fusiformis* from the northeast coast of North America since the accounts of Louis Agassiz, Alexander Agassiz, and Henry James Clark in the 1860s. Macroscopically, hydroids of *R. fusiformis* generally resemble those of *Clava multicornis* (Forsskål, 1775), and the two species were found together during this study in the Bay of Fundy region, even occurring at times on the same thallus of the fucoid alga *Ascophyllum nodosum*.

The description of *R. fusiformis* given here is based in part on the original account of L. Agassiz (1862), and in part on new observations of specimens from the Bay of Fundy. Type material (MCZ 52) from Nahant, Massachusetts, examined previously (Calder 1988), is in poor condition and of little use in characterizing the species. The finest specimens examined here were found on thalli of *A. nodosum* in an intertidal brook running into Passamaquoddy Bay from a brackish pond near Letete, NB (ROMIZ B3101, ROMIZ B3102). These colonies, collected during late spring (24 May 1999, 30 May 1999), bore gonophores in the form of fixed sporosacs. Development of embryos and release of planula larvae were described by H.J. Clark (1865b) from specimens collected during May farther south in Massachusetts. A statement by L. Agassiz (1862: 226) that spent gonophores of *R. fusiformis* metamorphose into hydranths was disputed by H.J. Clark (1865a: 342, 1865b: 76, 77). He believed that spent gonophores likely wither and are resorbed, and that hydranths may then develop from the base of the old gonophore pedicel.

Rhizogeton fusiformis is the type species, by monotypy, of *Rhizogeton* L. Agassiz, 1862. Five nominal species are currently assigned to the genus (WoRMS), including *R. nudus* Broch, 1910, *R. ezoense* Yamada, 1964, *R. sterreri* (Calder, 1988), and *R. conicus* Schuchert, 1996, together with *R. fusiformis*. According to Schuchert (2012), an unnamed species of *Rhizogeton*, similar to *R. nudus* but distinct genetically, occurs in the English Channel and the Mediterranean Sea. He also noted that Arctic populations differ from *R. nudus* in the number of eggs borne by female gonophores, and might consititute a distinct species. In addition, the identity of a species of *Rhizogeton* occurring across the tropical Indo-Pacific region remains uncertain (Calder, 2010). *Rhizogeton nematophorus* Antsulevich, in Antsulevich & Polteva, 1986 is distinctive in having nematophores, and has been assigned instead to *Similomerona* Schuchert, 2004, as *S. nematophora*.

Although poorly known, *Rhizogeton* is a genus having an essentially worldwide distribution, with species reported from the Arctic (Schuchert 2001a), North Atlantic (Schuchert 2004), South Atlantic (Genzano *et al*. 2009), North Pacific (Antsulevich 2015), South Pacific (Schuchert 1996), and Indian oceans (Millard 1975). It extends across the tropical Indo-Pacific in neritic waters from Mozambique to Hawaii (Calder 2010), and is represented by a species comprising part of the pelagic *Sargassum* fauna in the open North Atlantic (Calder 1988).

Morphological characters seem generally inadequate as a means of resolving current questions about validity of the various putative species of *Rhizogeton*. Nematocysts of *R. conicus* appear to be larger than in other known species (Cooke 1975; Kubota 1976; Calder 1988; Schuchert 1996, 2004), but the complement of categories (desmonemes; microbasic euryteles) is the same throughout. Molecular studies are needed to resolve taxonomic issues within the genus. *Rhizogeton ezoense* Yamada, 1964, best known from the northwest North Pacific (Hirohito 1988) but also reported from the northeast North Pacific (Brinckmann-Voss 1996), has been regarded by some (Antsulevich & Polteva 1986; Antsulevich 1987, 2015; Park 1997) as conspecific or likely conspecific with *R. fusiformis*. *Rhizogeton fusiformis* and *R. nudus* have long been maintained as distinct species (e.g., Kramp 1911; Dons 1012; Calder 1972; Antsulevich & Polteva 1986; Stepanjants 1989; Schuchert 2001a, 2004, 2012; Ronowicz *et al*. 2013; Antsulevich 2015) even though there is little to separate them morphologically. If the conclusion of Park (1997) is correct that they are conspecific, the range of the species would be extended well beyond the western North Atlantic. Meanwhile, a record of *R. fusiformis* in European waters by Browne (1897) was thought by Schuchert (2004) to have been based on *R. nudus* instead. Schuchert (2012) included *R. nudus*, but not *R. fusiformis*, in his guidebook on north-west European athecate hydroids. As for the specific name of the former species, it has been spelled in the literature as both *nudum* and *nudus*. Dons (1912) and Schuchert (2004) noted that the latter is nomenclaturally correct because this Latin adjective must agree in gender with the masculine generic name *Rhizogeton* (ICZN Art. 31.2).

Advances in the classification of hydrozoans are currently being made through application of molecular methods. One early hypothesis (Cartwright *et al.* 2008) has included the genus *Rhizogeton* within Gonoproxima Cartwright *et al.* 2008, a group of Filifera in which gonophores arise from hydrocauli, pedicels, or stolons rather than from hydranths. That clade was said to comprise *Dicoryne* Allman, 1859b together with the families Bougainvilliidae Lütken, 1850, Oceaniidae Eschscholtz, 1829, Pandeidae Haeckel, 1879, and Rathkeidae Russell, 1953. *Rhizogeton nudus* was included amongst a total of 110 taxa of Hydrozoa in the analysis. Molecular work has yet to be done on *R. fusiformis*.

Recorded distribution. Bay of Fundy, mentioned without data: Bay of Fundy (Linkletter *et al.* 1977); Passamaquoddy Bay, NB (Calder 2010).

Eastern North America: Newfoundland (reported herein) to Nahant, Massachusetts (L. Agassiz 1862).

Worldwide: As above, and possibly extending to the northwestern North Pacific.

Family Bougainvilliidae Lütken, 1850

Genus *Bougainvillia* Lesson, 1830

Bougainvillia muscus (Allman, 1863)

Figs. 7f, g, 10

Perigonymus muscus Allman, 1863: 12 [incorrect subsequent spelling of *Perigonimus* M. Sars, 1846]

?*Bougainvillia superciliaris*.—Verrill 1874: 733 [not *Bougainvillia superciliaris* (L. Agassiz, 1850)].

?*Bougainvillia carolinensis*.—Stafford 1912: 72.—Fraser 1918: 338.—Brinkhurst *et al*., 1976: 10, unnumbered figure [not *Bougainvillia carolinensis* (McCrady, 1859].

?*Bougainivillia superciliaris*.—Henry & Kenchington 2004a: 127 [incorrect subsequent spelling of *Bougainvillia* Lesson, 1830] [not *Bougainvillia superciliaris* (L. Agassiz, 1850)].

Type locality. England: Devon, Torquay (Torbay) (Allman 1863: 12).

Material examined. NS: Annapolis Basin, Annapolis Royal, on mooring line, 19.ix.1984, three polysiphonic colony fragments, up to 2.5 cm high, without hydranths, with tendrils, one fragment with medusa buds, coll. J.S. Bleakney, ROMIZ B511.—NB: St. Andrews, Brandy Cove, on algae on wharf piling, intertidal, 21.viii.1984, two polysiphonic colonies, up to 4.1 cm high, without medusa buds, with tendrils, coll. D. Calder, ROMIZ B605.—NB: Letete, on pontoon slip of wharf, just below surface, 14.viii.1988, 12.5° C, 31.5‰, coll. D. Calder, ROMIZ B4135.—NB: St. Andrews, pontoon slip at public wharf, 45°04'17"N, 67°03'17"W, <1 m, on *Ascophyllum nodosum*, 32.5‰, 9°C, 27.v.1999, one monosiphonic colony, up to 1.9 cm high, without medusa buds, with tendrils, coll. D. Calder, ROMIZ B3083.—NB: Richardson, Deer Island, 44°59'42"N, 66°56'45"W, on pontoon slip of wharf, <1 m, on *Mytilus edulis*, 34‰, 9° C, 22.v.1999, colony without medusa buds, coll. D. Calder, ROMIZ B3087.—NB: St. Andrews, pontoon slip of public wharf, 45°04'17"N, 67°03'17"W, just below surface, 16° C, 20.viii.1999, two monosiphonic colonies, up to 3.2 cm high, with medusa buds and tendrils, coll. D. Calder, ROMIZ B3120.—ME: Cobscook Bay, near Estes Head, 44°53'36"N, 66°59'37"W, 07.viii.2005, on aquaculture float, <1 m, several fragments of a polysiphonic colony, up to 2.5 cm high, without medusa buds, with tendrils, coll. D. Calder, ROMIZ B4129.

Description. Hydroid colonies erect, up to 4.1 cm high, arising from a creeping hydrorhiza; distal parts of colony with vermiform tendrils of various lengths. Hydrocaulus monosiphonic or polysiphonic, crooked to nearly straight, at least basally, irregularly to more or less alternately branched, widest at base, narrowest distally; main branches tortuous to nearly straight, usually more slender than hydrocaulus; terminal branchlets slender proximally, short ones gradually increasing in diameter from proximal to distal end, long ones mostly cylindrical above base, proximal end wrinkled; perisarc of hydrocaulus relatively thick basally, thinner elsewhere, mostly wrinkled but with some smooth parts, commonly overgrown with diatoms and protozoans; perisarc of main branches mostly wrinkled, nowhere regularly annulated; perisarc of tendrils very thin, slightly wrinkled; perisarc of branchlets wrinkled, extending distally as a cup-shaped pseudohydrotheca over base of contracted hydranth, not extending as a sheath over bases of tentacles or over hypostome, pseudohydrotheca not so apparent when hydranths extended. Hydranths cylindrical to fusiform to sac-shaped; tentacles solid, filiform but tapering from slender tip to broader base, up to 16 in number, amphicoronate, arranged in two close whorls around distal end of hydranth; hypostome conical.

Gonophores free medusae. Medusa buds subspherical to pyriform, borne at end of stalks arising singly from branchlets below hydranths, stalks often quite long; entire structure invested in thin perisarc.

Cnidome (Fig. 10)
desmonemes (n = 10): 4.1–4.4 µm long × 2.5–2.8 µm wide (undischarged)
microbasic euryteles (n = 10): 5.8–6.7 µm long × 2.9–3.2 µm wide (undischarged)

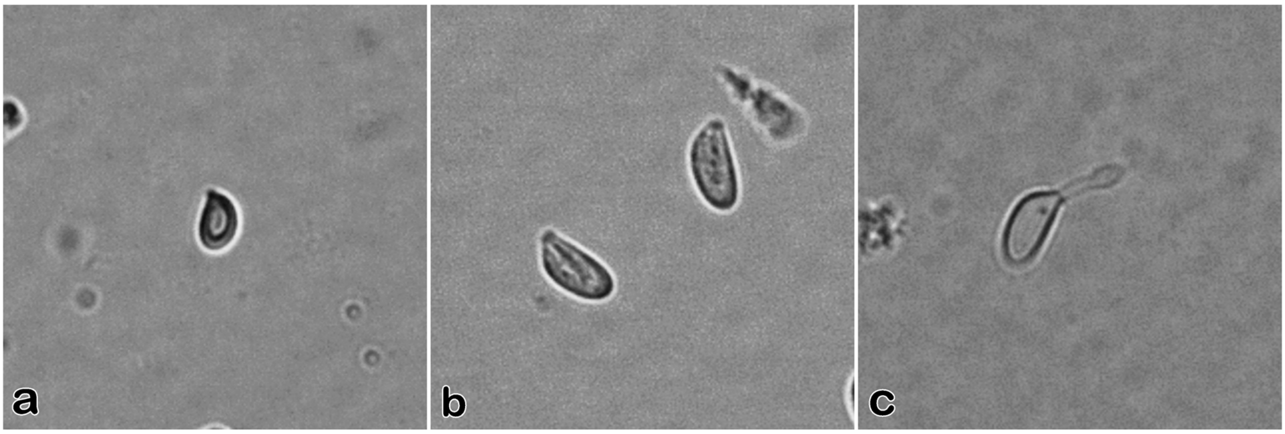

FIGURE 10. *Bougainvillia muscus*, nematocysts of hydroid, ROMIZ B3120. a, desmoneme. b, two heterotrichous microbasic euryteles. c, heterotrichous microbasic eurytele, discharged.

Remarks. Hydroids referable to *Bougainvillia* Lesson, 1830 were frequent during this study on floating structures in Passamaquoddy Bay, including pontoon slips of wharves (ROMIZ B3083, ROMIZ B3087, ROMIZ B3120), aquaculture floats (ROMIZ B4129), and mooring lines (ROMIZ B511). Although medusae were not raised from any of the colonies, the specimens otherwise conformed with accounts of *B. muscus* (Allman, 1863). As with populations of the species from European waters (Schuchert 2007; Calder 2012), both polysiphonic and monosiphonic colonies were observed, and tendrils (apical or terminal stolons) were frequent on them. Medusa buds on fertile colonies arose singly from ultimate branchlets rather than being grouped on branched stalks, as in the morphologically similar trophosomes of *B. pyramidata* (Forbes & Goodsir, 1853). Medusa production in hydroids of *B. muscus* from the lower Bay of Fundy appears to occur during late summer. Specimens from Annapolis Royal, NS (ROMIZ B511), collected on 19 September 1984, bore medusa buds, as did material from St. Andrews, NB (ROMIZ B3120), collected on 20 August 1999.

Although this is the first report of *B. muscus* from the Bay of Fundy, and from Atlantic Canada, at least some earlier reports of hydroids of *B. superciliaris* (L. Agassiz, 1850) and *B. carolinensis* (McCrady, 1859) from the Fundy region may have been based on misidentifications of this species. While the medusa stage of *B. superciliaris* has indeed been reported from the Bay of Fundy (e.g., Stimpson 1853, as *Hippocrene superciliaris*; Bigelow 1914; Fish & Johnson 1937; Shih *et al*. 1971; Trott 2004a), its hydroid is now known to occur as stolonal colonies unlike the erect and branched forms mistakenly attributed to the species in older literature on hydrozoans (e.g., L. Agassiz 1862; A. Agassiz 1865; Mayer 1910a; Fraser 1944; Berrill 1949). Reliable accounts of the hydroid of *B. superciliaris*, described as stolonal and obscure, were provided for the first time in the 1960s (Uchida & Nagao 1960; Werner 1961; Nagao 1964; Edwards 1966). Of particular note, Werner (1961) followed the complete life cycle of the species from medusa to stolonal hydroid and back to medusa in the laboratory. Hartlaub (1911) had earlier outlined the life cycle of a stolonal species that he thought was *B. superciliaris*, but his account is now known to have been based instead on *B. principis* (Steenstrup, in Lütken, 1850) (Vannucci & Rees, 1961; Edwards 1966; Schuchert 2007).

Misconceptions in the North American literature about the hydroid stage of *B. superciliaris* having an erect and branched colony of moderate size originate from the works of L. Agassiz (1862) and A. Agassiz (1865), and confusion has persisted until recent times. Clarifying the identity of the species entails going back to its establishment, as *Hippocrene superciliaris*, based solely on a medusa population from Massachusetts, USA (L. Agassiz, 1850: 273, pls. 1–3). Years later, a hydroid was subjectively linked to it by L. Agassiz (1862) and A. Agassiz (1865). No type material exists (medusae and hydroids identified as *B. superciliaris* at MCZ were all collected after the original description), but there is little uncertainty about the identity of the medusa. However, the hydroid that L. and A. Agassiz linked to the medusa of *B. superciliaris* had an erect and branched colony form. Life cycle studies noted above (Uchida & Nagao 1960; Werner 1961; Nagao 1964) clearly demonstrated that hydroids of the species are stolonal. Subsequent identifications of hydroids based on the erroneous early descriptions of *B. superciliaris* by the Agassizs are therefore unsound. Questions then arise whether the hydroids they described and illustrated can be recognized as those of another known species. Hartlaub 1911: 174) suggested that they might be conspecific with either *B. ramosa* (sensu Van Beneden, 1844b) (=*B. muscus*) or *B. carolinensis*. Vannucci & Rees (1961: 87) also thought the hydroid and young medusa stages might be identical with *B. ramosa* (=*B. muscus*). Schuchert (2007) considered that identification unlikely because older medusae described in the work of A. Agassiz bore at least seven tentacles per marginal bulb, and adults of *B. muscus* usually have fewer (Russell 1953, as *B. ramosa*; Kramp 1961, as *B. ramosa*; Schuchert 2007). However, it was not made clear in the younger Agassiz's monograph, or in an earlier paper by him (A. Agassiz 1862), how development of the medusa was followed, whether from cultures in the laboratory or more likely from specimens captured in the plankton and assumed to be the same species. In any case, the identity of the hydroid in question remains unclear. Taxonomic and life cycle investigations are warranted to better resolve the identity of one or more species of hydroids referable to the genus *Bougainvillia* occurring along the boreal coast of northeastern North America. Meanwhile, records of *B. superciliaris* from the Bay of Fundy are included here with question in the synonymy list of *B. muscus*, a species reported herein. As for *B. carolinensis*, it is a warm-temperate species ranging from southern Florida and the Gulf of Mexico northwards to Massachusetts (Mayer 1910a; Bigelow 1914; Kramp 1961; Petersen 1964; Segura-Puertas *et al*. 2009) and is unlikely to occur in cold waters of the Bay of Fundy. *Bougainvillia rugosa* S.F. Clarke, 1882, a species with large hydroid colonies and with medusae that are fertile at liberation, is unreported north of Chesapeake Bay on the east coast of the USA (Calder 1971).

Detailed taxonomic accounts of *B. muscus* are given by Vannucci & Rees (1961, as *B. ramosa*), Calder (1988), and Schuchert (2007). Of particular note, molecular evidence was provided by Schuchert in support of the supposed wide geographic distribution of the species.

Nomenclaturally, the specific name *muscus* is a Latin noun meaning "moss." Originally combined with *Perigonimus* M. Sars, 1846 (gender: masculine), it remains unchanged when combined with the genus *Bougainvillia* (gender: feminine) (ICZN Art. 31.2).

Recorded distribution. Bay of Fundy: recorded for the first time as *Bougainvillia muscus*. Bay of Fundy (?Verrill 1874, as *Bougainvillia superciliaris*); St. Andrews, NB (?Stafford 1912, as *B. carolinensis*); Katy Cove and Joe's Point, St. Andrews, NB (?Fraser 1918, as *B. carolinensis*); Passamaquoddy Bay (?Brinkhurst *et al*. 1976, as *B. carolinensis*); Bay of Fundy (?Henry & Kenchington 2004a, as *Bougainivillia superciliaris*).

Eastern North America: Bay of Fundy to southern New England and Bermuda (Calder 2010); medusa stage reported southwards to the Carolinas (Allwein 1967; Calder & Hester 1978).

Elsewhere: believed to be essentially circumglobal (Schuchert 2007; Calder 2010, 2012).

Family Pandeidae Haeckel, 1879

Genus *Rhizorhagium* M. Sars, in G.O. Sars, 1874

Rhizorhagium roseum M. Sars, in G.O. Sars, 1874

Figs. 11, 12

Rhizorhagium roseum M. Sars, in G.O. Sars, 1874: 129.

Type locality. Norway: Mangerfjord, "Bongnestrømmen" (Bognestrømmen), 20 fm (37 m) on *Tubularia indivisa* (Rees 1956: 114).

Material examined. NS: Bay of Fundy, 8 km NE of Centreville, 27.v.1936, on *Halecium muricatum*, five colonies or fragments of a colony or colonies, all with female gonophores, coll. J. Stevenson, ARC 8650054.–NS: Bay of Fundy, 8 km NE of Centreville, 27.v.1936, on *Halecium muricatum*, one fragment of a colony or colonies, with female gonophores, coll. J. Stevenson, ROMIZ B4220.

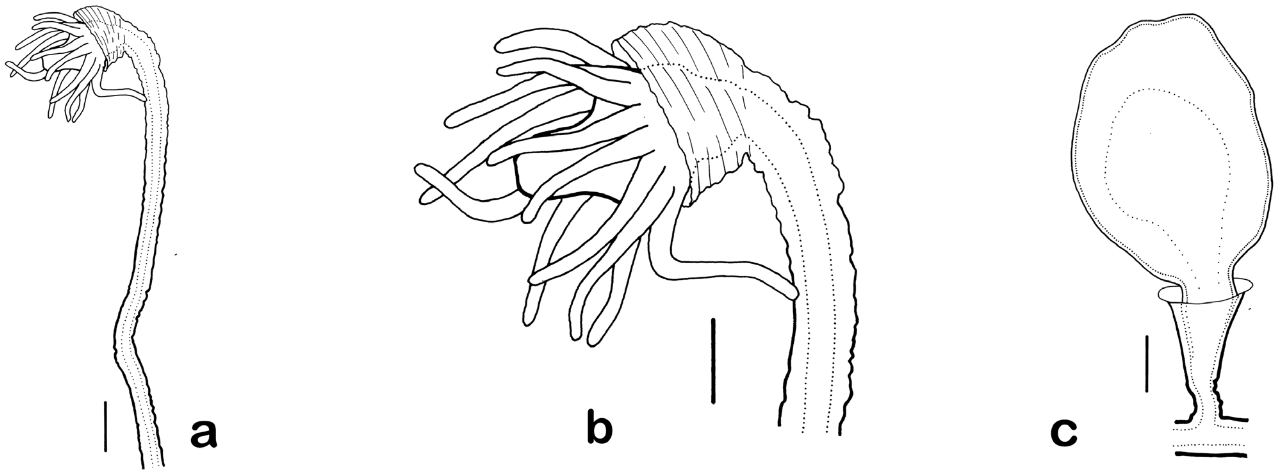

FIGURE 11. *Rhizorhagium roseum*, parts of a colony. a, pedicel with hydranth, ARC 8650054. Scale equals 0.5 mm. b, hydranth with enveloping pseudohydrotheca, ARC 8650054. Scale equals 0.25 mm. c, female gonophore, ARC 8650054. Scale equals 0.2 mm.

Description. Hydroid colonies stolonal, arising from a hydrorhiza of creeping stolons. Hydranth pedicels unbranched, of varied length but mostly long, approaching 1 cm high, somewhat curved or twisted in preserved specimens, of uniform diameter or widening only slightly towards distal end; perisarc of pedicel mostly wrinkled, some parts more distinctly so than others, but not regularly annulated, thickest basally, gradually thinning out distally, extending as a filmy covering over base of hydranth, forming a large, loose, goblet-shaped, somewhat rugose pseudohydrotheca, perisarc not extending as tubes over bases of tentacles or hypostome. Hydranths quite large, vasiform to sac-shaped; tentacles filiform, tapering from slender tip to broad base, about 10-12 in number, arranged around distal end of hydranth; hypostome nipple-shaped, exceptionally large relative to size of hydranth.

Gonophores fixed sporosacs. Female sporosacs borne on short, slender, tapered pedicels arising from stolons of hydrorhiza, sometimes occurring in a dense cluster; spadix enveloped by a large, balloon-shaped, transparent membrane covered with thin perisarc; several planulae developing from sides of spadix within spacious cavity of gonophore capsule. Male gonophores not seen.

Cnidome (Fig. 12)
desmonemes (n = 10): 3.9–4.2 µm long × 2.4–2.8 µm wide (undischarged)
small microbasic euryteles (n = 10): 5.9–6.8 µm long × 2.9–3.5 µm wide (undischarged)
large microbasic euryteles (n = 10): 8.0–8.8 µm long × 4.0–4.5 µm wide (undischarged)
unidentified nematocyst (n = 1): 12.0 µm long × 6.4 µm wide (undischarged)

Remarks. Although the generic name *Rhizorhagium* and the species name *R. roseum* were made available in a publication by G.O. Sars (1874), authorship of both names was attributed therein solely to M. Sars. That original account, a preliminary one without illustrations, included a diagnosis of the genus (in Latin) and comments on occurrences in Norwegian waters of its only included species. Michael Sars had encountered the hydroid near Bergen, and Georg Ossian Sars reported finding it at Lofoten. An exhaustive description, accompanied by illustrations, was provided later (M. Sars 1877). In that work, the generic name was spelled *Rhizoragium*, which must be taken to be an incorrect subsequent spelling (ICZN Art. 33.3). Both Broch (1916, as *Perigonimus roseus*) and Rees (1938) added to taxonomic knowledge of the species, and Rees (1956) determined that the type material was from Bognestrømmen in the Mangerfjord, Norway. A recent synonymy list and overview is given by Schuchert (2007). Noteworthy amongst the synonyms is *Garveia groenlandica* Levinsen, 1893, and it was under that name that the species was recorded from the east and west coasts of the North American continent during the first half of the twentieth century (Fraser 1937, 1944, 1947a).

This, the first record of *Rhizorhagium roseum* from the Bay of Fundy, is based on material (ARC 8650054) from Minas Channel, Nova Scotia. The specimens, collected in 1936, were somewhat deteriorated and the colour of the colony or colonies had faded, but they appear to have been robust and thriving at the time of collection. Numerous female gonophores were present. The specimens were found on *Halecium muricatum*, and other hydroids appear from literature records to be frequent substrates of the species (e.g., Schuchert 2007; Calder 2012). Although scant collection data were available with the sample, water temperatures in the bay at the time of collection (May) would have been cold (<10°C).

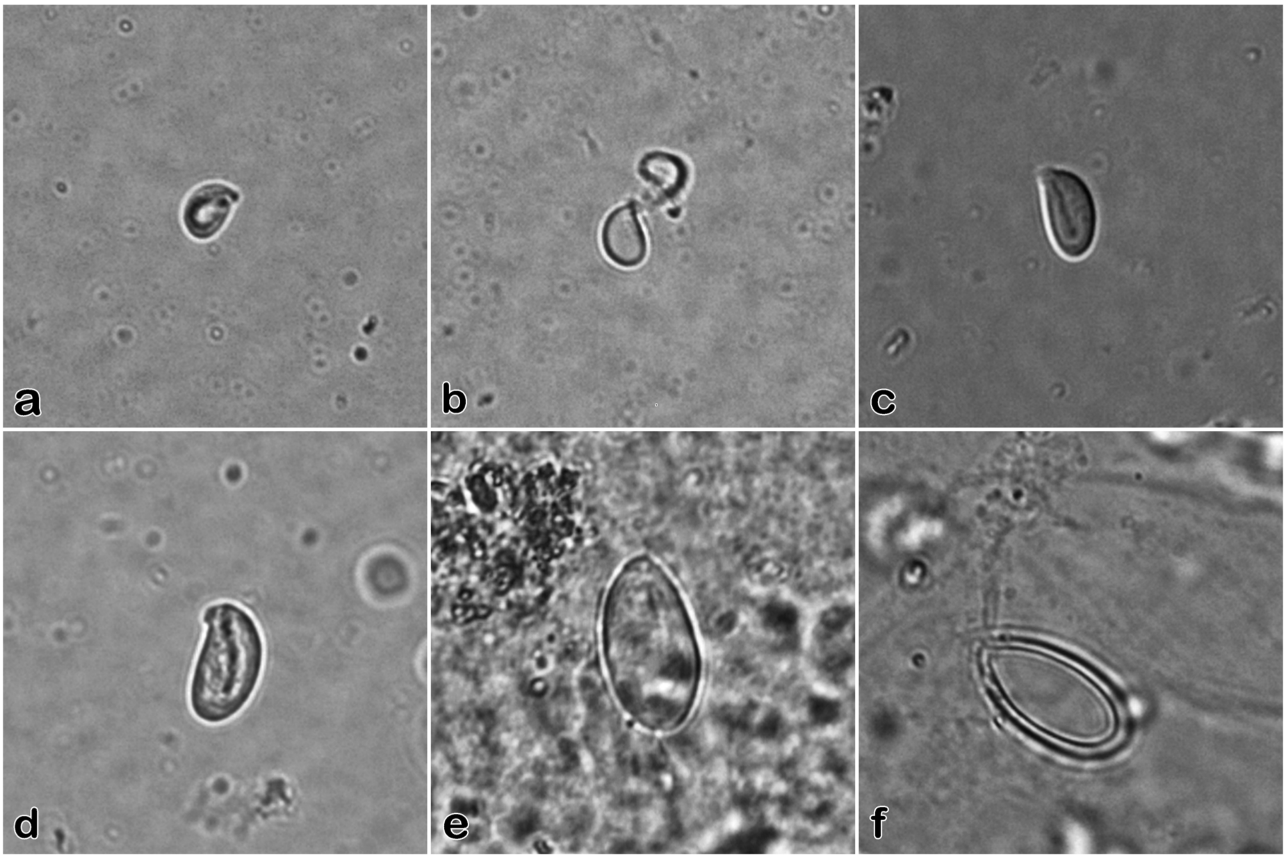

FIGURE 12. *Rhizorhagium roseum*, nematocysts of hydroid, ROMIZ B4220. a, desmoneme, undischarged. b, desmoneme, discharged. c, small microbasic eurytele. d, large microbasic eurytele. e, unidentified nematocyst, undischarged. f, unidentified nematocyst, discharged.

Rhizorhagium roseum has usually been assigned to the family Bougainvilliidae Lütken, 1850 (e.g., Rees 1956; Calder 1972, 2012; Bouillon *et al.* 2006; Schuchert 2007, 2012; Antsulevich 2015; WoRMS). In an earlier work (Calder 1988), the genera *Rhizorhagium* M. Sars, in G.O. Sars, 1874 and *Parawrightia* Warren, 1907 were grouped within Bougainvilliidae as a new subfamily, Rhizorhagiinae Calder, 1988. Hydroids assigned to the subfamily were distinguished from other bougainvilliids in having hydranths that were vasiform and enveloped by distinct pseudohydrothecae, hypostomes that were unusually prominent and nipple-shaped, tentacles that were arranged in two or more close whorls, and gonophores (where known) that were fixed sporosacs (Calder 1988). Their hydroids morphologically resemble those of some genera (e.g., *Leuckartiara* Hartlaub, 1914, *Neoturris* Hartlaub, 1914, *Halitholus* Hartlaub, 1914) assigned to Pandeidae Haeckel, 1879. Moreover, a recent phylogram in Prudkovsky *et al.* (2016) indicates that *R. roseum* has a much closer affinity with Pandeidae Haeckel, 1879 than with Bougainvilliidae. Included in a clade with *R. roseum* were *Leuckartiara octona* (Fleming, 1823), *L. nobilis* Hartlaub, 1914, *Neoturris breviconis* (Murbach & Shearer, 1902), *Hydrichthys boycei* Warren, 1916, *Catablema vesicarium* (A. Agassiz, 1862), and *Garveia nutans* Wright, 1859. All are regarded as pandeids except *G. nutans*, currently and likely erroneously taken be a bougainvilliid. Considerable divergence was apparent between this clade and others that included various species of *Bougainvillia* Lesson, 1830. As for *G. nutans*, it strongly resembles *R. roseum* morphologically in having a vasiform hydranth enveloped by a pseudohydrotheca, an exceptionally large hypostome, and fixed sporosacs of similar morphology. Based on morphological characters, and especially on the molecular evidence of Prudkovsky *et al*. noted above, *R. roseum* and the subfamily Rhizorhagiinae are transferred here from Bougainvilliidae to Pandeidae. Also assigned herewith to the subfamily, along with *Rhizorhagium* and *Parawrightia*, is *Garveia* Wright, 1859. Meanwhile, the possible taxonomic makeup and nomenclatural status of Rhizorhagiinae needs further consideration, as its scope may encompass one or more genera already assigned to Pandeidae. Recent diagnoses of Pandeidae include those of Schuchert (2007) and Calder (2010), but the family as presently conceived is likely polyphyletic (Daly *et al*. 2007).

Garveia, *Rhizorhagium*, and *Parawrightia* are obviously much alike, and characters that have been highlighted in differentiating them need to be reassessed. Schuchert (2007) earlier noted the inadequacy of contemporary diagnoses in distinguishing *Garveia* and *Rhizorhagium*, and suggested that molecular phylogenies were needed to sort out their relationships. Based on current evidence it seems almost certain that those two genera will prove to be identical because of the close resemblance of their type species, *G. nutans* and *R. roseum*. If so, then *Rhizorhagium* would become a junior subjective synonym of *Garveia*, and *R. roseum* would be assigned the binomen *Garveia rosea*. Certain other species now assigned to both *Rhizorhagium* and *Garveia* are probably also misclassified. For example, *Rhizorhagium arenosum* (Alder, 1862) has been shown to have affinities with Bougainvilliidae rather than with *R. roseum*, the genus *Rhizorhagium*, and the family Pandeidae (Prudkovsky 2016). Similarly, *Garveia franciscana* resembles bougainvilliids more closely than *Garveia* and its type species *G. nutans*. It may warrant removal to *Calyptospadix* Clarke, 1882, an obscure bougainvilliid genus. As noted by Schuchert (2007) earlier, however, it seems best to maintain current usage until more information is available on these genera.

In terms of identification, hydroids of *Rhizorhagium roseum* are distinctive in the prominence and shape of their hypostomes, their stolonal or mostly stolonal colonies, the considerable length of their pedicels, the pronounced development of their pseudohydrothecae, their balloon-shaped sporosacs that arise only from the hydrorhiza, and in life by the rosy to reddish colour of their colonies (e.g., Sars 1877; Rees 1938; Schuchert 2007, 2012). As with hydroids of species of the pandeid genus *Amphinema* Haeckel, 1879, and of *Garveia nutans*, hydranths bend over sharply on being disturbed (Wright 1859; Schuchert 2007; Calder 2012).

The cnidome of *Rhizorhagium roseum* in material examined here appears to comprise desmonemes, small and large microbasic euryteles, and a rare category that could not be identified (Fig. 12). Three of the latter kind were seen discharged, along with one that was undischarged, but it was impossible to determine the character of the thread in either case. The other three kinds of nematocysts were common to abundant.

Distributionally, *Rhizorhagium roseum* has been considered a circumpolar Arctic-boreal species (Schuchert 2012). Although recorded on this coast as far south as Vineyard Sound, Massachusetts, by Fraser (1944, as *Garveia groenlandica*), that record warrants verification. In waters of eastern Canada, it is known from Bay of Islands, Newfoundland (Fraser 1918, as *G. groenlandica*), Sugluk Creek (Sugluk Inlet), Hudson Strait (Fraser 1931, as *G. groenlandica*), SE Hudson Bay (Calder 1972), and the Saguenay River, Quebec (Calder 1972). The reported bathymetric distribution of the species is from 10–200 m (Schuchert 2007; Antsulevich 2015). It was recorded by Brinckmann-Voss (1996) from an intertidal tidepool at Race Rocks, British Columbia, and from infralittoral and subtidal areas nearby.

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: Foxe Basin and Greenland to southern Massachusetts (Fraser 1944, 1947a, as *Garveia groenlandica*; Calder 1970; Schuchert 2007).

Worldwide: Northeast Atlantic from the White and Barents seas to western Scotland; Iceland; Faroes; Svalbard; Northeast Pacific from Alaska to southern Vancouver Island (Brinckmann-Voss 1996; Schuchert 2001a, 2007; Calder 2012; Ronowicz *et al*. 2013; Antsulevich 2015).

Family Hydractiniidae L. Agassiz, 1862

Genus *Hydractinia* Van Beneden, 1844a

Hydractinia symbiolongicarpus Buss & Yund, 1989

Fig. 13a

Hydractinia symbiolongicarpus Buss & Yund, 1989: 863, figs. 1, 2.

Type locality. USA: Long Island Sound, Connecticut, Guilford, Harrison Point, 41°16'N, 72°44' W (Buss & Yund 1989: 868).

Material examined. NS: Kingsport, 19.vii.1966, low tide, one colony, on gastropod shell occupied by *Pagurus longicarpus*, with gastrozooids and gonozooids, gonozooids with female gonophores, coll. J.S. Bleakney & K.H. Bailey, ROMIZ B643.

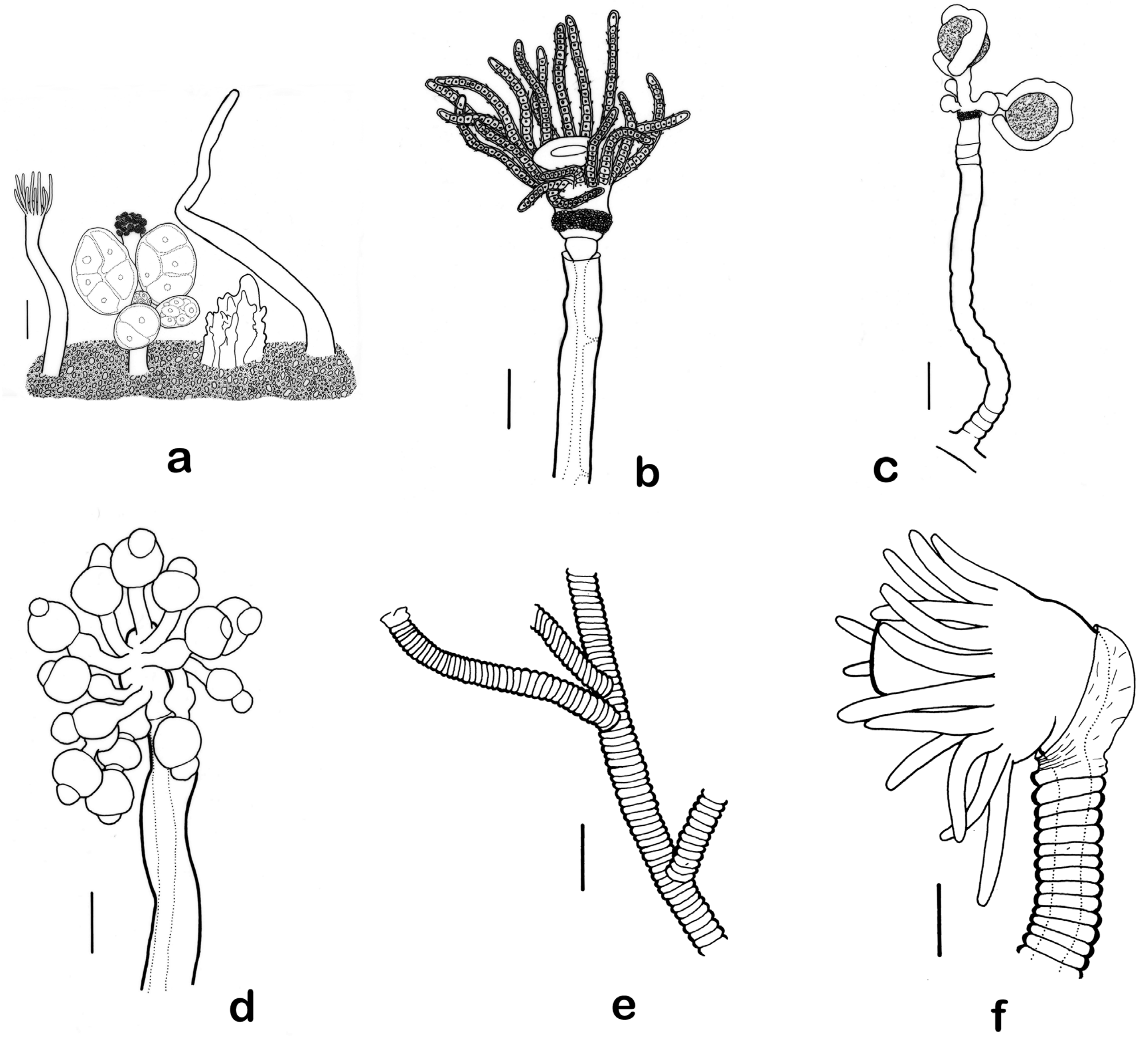

FIGURE 13. Filiferan hydroids, continued. a, *Hydractinia symbiolongicarpus*, part of colony with gastrozooid, gonozooid with female gonophores, spine, and dactylozooid, ROMIZ B643. Scale equals 0.25 mm. b, *Eudendrium bleakneyi*, sp. nov., hydranth, holotype, ROMIZ B1473. Scale equals 0.1 mm. c, *Eudendrium bleakneyi*, female gonophores, paratype, ROMIZ B1381. Scale equals 0.1 mm. d, *Eudendrium bleakneyi*, male gonophores, holotype, ROMIZ B1473. Scale equals 0.1 mm. e, *Eudendrium vaginatum*, part of a stem with hydranth pedicels, SNM HYD-001053. Scale equals 0.5 mm. f, *Eudendrium vaginatum*, tip of a pedicel with hydranth, bent over, SNM HYD-001053. Scale equals 0.2 mm.

Description. Hydroid encrusting a gastropod shell occupied by pagurid crab *Pagurus longicarpus*. Colony stolonal, with a dense aggregation zooids arising from an encrustation of naked coenosarc dotted by innumerable small perisarcal spines and a lesser number of much larger, jagged perisarcal spines, grooves of these spines filled with naked coenosarc. Zooids naked, polymorphic, in poor condition but with distinguishable gastrozooids, gonozooids, and dactylozooids. Gastrozooids columnar, varying in height but about 2–3 mm high, terminating in an elongated hypostome; tentacles in a staggered but narrow ring at distal end, tapering from base to tip, about 20 in number, appearing amphicoronate, with ones in upper whorl larger than those in lower whorl. Gonozooids columnar, shorter, lacking tentacles, terminating with a cap of bulbous nematocyst batteries. Dactylozooids tentacle-shaped, tapering from proximal to distal end, located inside orifice of shell adjacent to hermit crab. Colony female, with each gonozooid bearing several gonophores in a whorl.

Gonophores fixed sporosacs lacking tentacles and canals, varying from nearly spherical to oval to irregular in shape, each one with several eggs.

Cnidome. Undescribed.

Remarks. Difficulties identifying species of *Hydractinia* Van Beneden, 1844a on the basis of traditional morphology alone have long been apparent. For example, Nutting (1901a) compared hydroids from Plymouth, UK, and Woods Hole, USA, and concluded that European populations assigned to *H. echinata* (Fleming, 1828) were readily distinguishable from American populations referred to *H. polyclina* L. Agassiz, 1860 based on the much larger size of their polyps and the smaller number of tentacles on gastrozooids. Fraser (1912) came to a different conclusion after examining specimens from Massachusetts (Vineyard Haven, Tarpaulin Cove, Woods Hole), Maine (South Harpswell), North Carolina (Beaufort), Nova Scotia (Canso), and New Brunswick (Grand Manan), and comparing them with colonies from Devon, England (Plymouth). No consistent differences of taxonomic importance could be found by him between populations from the two sides of the North Atlantic, and he referred them all to a single species, *H. echinata* (Fleming, 1828).

Alternative methods have helped in resolving the taxonomy of this difficult genus. Utilizing breeding experiments, electrophoretic analyses, and morphometrics, Buss & Yund (1989) demonstrated that hydroids commonly identified as *Hydractinia echinata* from northeastern North America comprised a sibling species group. Moreover, none of these sibling species was conspecific with the European *H. echinata*. One of the American populations, found as epibionts on shells inhabited predominantly by the hermit crab *Pagurus longicarpus* between Freeport, Maine, and Guilford, Connecticut, was established as a new species, *H. symbiolongicarpus* Buss & Yund, 1989.

Two other species were recognized in the complex. A population sampled between Starboard, Maine, and Nahant, Massachusetts, growing as epibionts on shells of *Littorina littorea* inhabited by the hermit crab *Pagurus acadianus*, was referred by Buss and Yund (1989) to *H. polyclina* L. Agassiz, 1860. A lectotype of that species, designated as MCZ 9010-b, was selected by them from what is taken to have been Louis Agassiz's syntype material at the Museum of Comparative Zoology (MCZ). While collection localities of the species were not specified in the original accounts of L. Agassiz (1860, 1862), A. Agassiz (1865) listed material at MCZ from Grand Manan Island, NB, in the Bay of Fundy, as well as from Massachusetts (Chelsea Beach, Swampscott, Nantucket Shoals, and Nahant). The lectotype specimen was taken from an original collection (MCZ 55) obtained at Grand Manan during 1859 by A.E. Verrill. Remaining material from that collection, together with specimens in another lot obtained at Grand Manan (MCZ 56), form part of the paralectotype series. The second species, also recognized as new (*H. symbiopollicaris* Buss & Yund, 1989), occurred on shells occupied by hermit crabs identified as *P. pollicaris*. Colonies of that species were collected at Woods Hole, Massachusetts, and Guilford, Connecticut. Of the three species distinguished by Buss & Yund, *H. polyclina* appears to have a stronger boreal affinity. Hydractiniid hydroids identified earlier from cold waters of the lower Bay of Fundy as *H. echinata* were most likely based on H. *polyclina*, a conclusion supported by the collection locality of the lectotype of that species. Hydroids of *Hydractinia symbiolongicarpus* occurring northwards to estuaries of central Maine were thought to represent either recent introductions or disjunct populations of a species occurring predominantly south of Cape Cod (Folino & Yund 1998). The species has been shown here to extend even further north into Minas Basin, NS, in the upper Bay of Fundy, where it is also likely disjunct. As for *Hydractinia symbiopollicaris*, it is not known to occur north of Cape Cod (Buss & Yund 1989; Cunningham *et al*. 1991).

Trophosome morphology was found by Buss & Yund (1989) to be of less utility in distinguishing the three sibling species than the identity of the pagurid crabs occupying their substrate shells. Nevertheless, there was a tendency for the chitinous skeleton of the hydroid to grow beyond the shell margin in *H. polyclina* but not in the others. Colonies of both *H. polyclina* and *H. symbiopollicaris* also occasionally included unusual gastrozooids having 3–5 tentacles with significantly thickened bases, alternating with 2-4 shorter tentacles of normal shape. Such polyps were not seen by them in *H. symbiolongicarpus*.

Questions remain over the taxonomy and biogeography of these putative species. According to Miglietta *et al*. (2009), preliminary molecular studies suggest that *H. symbiopollicaris* may be conspecific with *H. polyclina*. Confirmation of this conclusion is warranted, and both species are currently recognized as valid in WoRMS.

Moreover, Miglietta *et al*. proposed that *H. polyclina* is in fact an amphi-Atlantic species, occurring on the coasts of Belgium and Denmark as well as northeastern North America. At those locations in Europe, the species was thought by the authors to have been misidentified previously as *H. echinata*. That conclusion, too, merits re-examination. *Hydractinia polyclina* was not included in an account of northwest European anthoathecates by Schuchert (2012).

The occurrence of *Hydractinia symbiolongicarpus* in Minas Basin is biogeographically noteworthy in that its known distribution elsewhere is entirely to the south of the region. Nevertheless, the basin is hydrographically distinct from much of the rest of the Bay of Fundy, in part because of significantly warmer surface water temperatures during summer. As a result, several species of marine invertebrates, isolated from their primary populations along the Atlantic coast of the United States, are known to occur there (Ganong 1890b; Bousfield & Leim 1960: 26). Notably, one of the species included in the list of Bousfield and Leim was the hermit crab *Pagurus longicarpus*. To the list of disjunct species in Bousfield and Leim may be added the relatively warm-water hydroids *H. symbiolongicarpus* and *Obelia bidentata* S.F. Clark, 1875, both reported herein. *Eudendrium album* Nutting, 1896, identified during this study from Minas Basin, may be another. Although reported earlier by Fraser (1918) from perpetually cold waters of the lower Bay of Fundy, its actual distribution in the bay may be restricted to areas having seasonally warmer water temperatures. Other similar species occurring near the mouth of the Bay of Fundy (*E. capillare* Alder, 1856a; *E. bleakneyi*, **sp. nov.**), could easily be mistaken for *E. album*.

As noted elsewhere (e.g., Schuchert 2001a, 2008a; Cartwright *et al*. 2008; Calder *et al*. 2014), molecular studies have revealed that the genera *Hydractinia* and *Clava* Gmelin, 1791 are closely related and should be referred to the same family. A nomenclatural problem arises from this discovery because widely used family names (Clavidae McCrady, 1859; Hydractiniidae L. Agassiz, 1862) have been based on the two genera. Prevailing usage so far this century has been to combine them in Hydractiniidae and to abandon Clavidae. While this is counter to the Principle of Priority in nomenclature, it has been justified given the greater number of species assigned to Hydractiniidae and to the supposed greater familiarity of that name. A ruling on the issue from the ICZN is needed in the interests of nomenclatural stability. Meanwhile, prevailing usage has been maintained here.

The binomen *H. polyclina* has often been attributed to L. Agassiz (1862). Although the species was first described in that publication, the specific name was made nomenclaturally available two years earlier. The name *Hydractinia polyclina* was used by L. Agassiz (1860) in association with illustrations of the species, thereby meeting criteria of availability (ICZN Art. 12.2.7).

A substantial literature exists on the genetics of allorecognition, and rejection or fusion, of merging conspecific colonies of sessile invertebrates. *Hydractinia symbiolongicarpus* has been used extensively a model organism in such studies (see Rosengarten *et al*. 2011, Powell *et al*. 2011).

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: Bay of Fundy (this study) to Beaufort, North Carolina (Miglietta *et al*. 2009).

Worldwide: As above.

Family Eudendriidae L. Agassiz, 1862

Genus *Eudendrium* Ehrenberg, 1834

Eudendrium bleakneyi, sp. nov.

Figs. 13b–d, 14, 15

Material examined. HOLOTYPE. NB: St. Croix River, St. Andrews, off Joe's Point, 45°04'30"N, 67°05'20"W, 16 m, scallop drag, 06.ix.1984, several colony fragments, up to 11 mm high, with male gonophores, coll. D. Calder, ROMIZ B1473.

PARATYPES. NB: St. Croix River, St. Andrews, off Joe's Point, 45°04'30"N, 67°05'20"W, 16 m, scallop drag, 06.ix.1984, one colony, 1.1 mm high, with single blastostyle having two female gonophores, coll. D. Calder, ROMIZ B1381.

NB: St. Croix River, St. Andrews, off Joe's Point, 45°04'30"N, 67°05'20"W, 16 m, scallop drag, 06.ix.1984, one colony, 6 mm high, one blastostyle with male gonophores, coll. D. Calder, ROMIZ B1472.

NB: St. Croix River, St. Andrews, off Joe's Point, 45°04’30”N, 67°05’20”W, 16 m, scallop drag, 06.ix.1984, one colony, 5.5 mm high, without gonophores, coll. D. Calder, ROMIZ B1475.

Etymology. The specific name honours Dr. J.S. Bleakney of Acadia University, an esteemed mentor who contributed greatly to the content of this work.

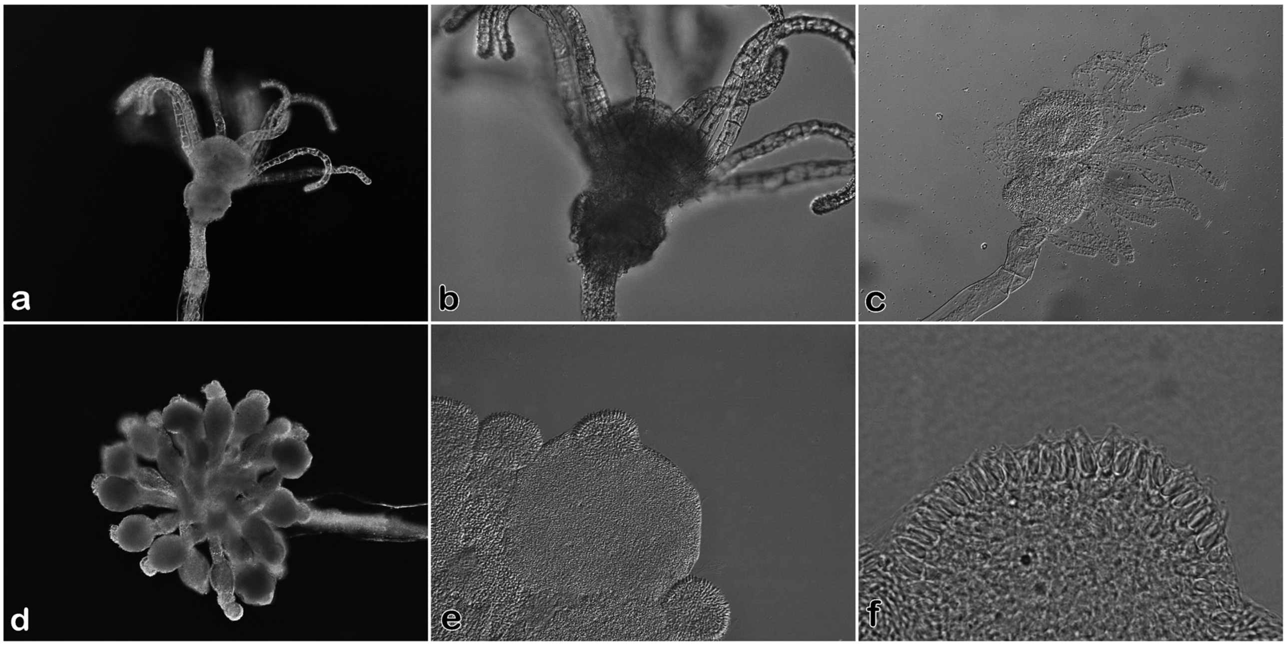

FIGURE 14. *Eudendrium bleakneyi*, **sp. nov.**, paratype, ROMIZ B1472. a, hydranth, low magnification, darkfield. b, hydranth, medium magnification. c, hydranth, cleared, medium magnification, showing nematocyst band. d, male gonophores, low magnification, darkfield. e, tip of male gonophore, medium magnification, with nematocyst battery at tip. f, nematocyst battery, high magnification, showing arrangement of microbasic euryteles.

Description. All parts of hydroid exceptionally minute. Colonies mostly erect, arising from a creeping hydrorhiza, reaching 11 mm high, occasional parts of colony bearing single pedicels. Hydrocaulus monosiphonic, contorted, sparsely and irregularly branched, about 0.05–0.09 mm in diameter, with branches resembling hydrocaulus. Perisarc thin, amber-coloured in older parts, clear in younger parts, covering all parts of colony except hydranth distal to perisarc groove, annulated at bases of hydrocauli, branches, and ultimate branchlets, with occasional wrinkles elsewhere but mostly smooth. Hydranths cup-shaped to tumbler-shaped, about 0.2 mm long from perisarc groove to hypostome, 0.1 mm wide at level of tentacles, with distinct perisarc groove basally and knob-shaped to flared hypostome distally. Tentacles solid, filiform, in one whorl, about 18–20 in number; tentacular nematocysts arranged obliquely. Base of hydranth immediately above perisarc groove with a variably elevated nematocyst belt containing an extraordinarily dense aggregation of microbasic euryteles. Nematophores absent. Nematocysts of tentacles, hypostome, and nematocyst belt comprising microbasic euryteles only.

Colonies gonochoristic; gonophores fixed sporosacs arising from reduced hydranths. One tiny female colony with a single reduced hydranth having two gonophores, each gonophore with an unbranched, knobby spadix curving over egg, with knobs containing batteries of nematocysts. Male gonophores occurring in a cluster on reduced hydranths having no tentacles, such blastostyles bearing gonophores having 1–3 round to oval chambers, multiple chambers when present in a linear series, terminal chamber bearing a prominent cap or projection heavily armed with microbasic euryteles.

Cnidome (Fig. 15)

Hydranths—microbasic euryteles (n = 4): 6.2–8.8 µm long × 2.6–3.1 µm wide (undischarged)

Terminal nematocyst cap, male gonophores—microbasic euryteles (n = 10): 6.6–7.1 µm long × 2.0–2.5 µm wide (undischarged)

Remarks. Species of the anthoathecate hydroid genus *Eudendrium* Ehrenberg, 1834 are readily distinguished by the characteristic morphology of their hydranths and gonophores. Hydranths are usually large and urn-shaped, with a perisarc groove basally, a single whorl of solid filiform tentacles near the distal end, and a prominent, knob-shaped to flaring hypostome beyond. Gonophores arise at least initially from the gastric column of the hydranth, and are fixed sporosacs in all known species of the genus. With certain exceptions, those of the male are arranged in a linear series of bead-like chambers while those of the female consist of a spadix enveloping a single egg. Morphological and molecular evidence both support the hypothesis that the genus is monophyletic (Marques, Peña Cantero *et al*. 2000; Moura *et al*. 2008).

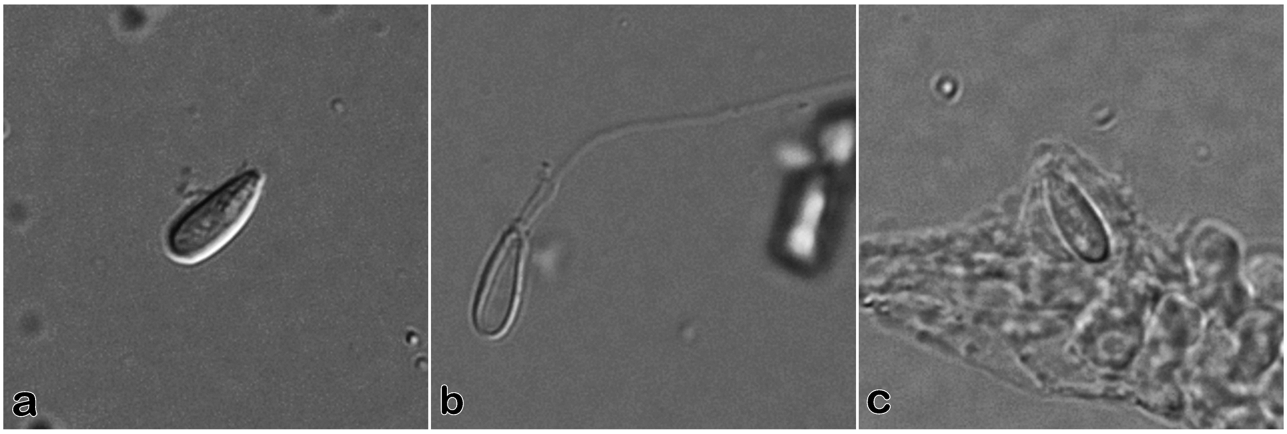

FIGURE 15. *Eudendrium bleakneyi*, **sp. nov.**, nematocysts, paratype, ROMIZ B1472. a, microbasic eurytele, from hydranth. b, microbasic eurytele, from hydranth, discharged. c, microbasic eurytele, from gonophore.

Although the genus *Eudendrium* is highly distinctive, the numerous nominal species assigned to it can be exceedingly difficult to identify on the basis of morphology alone. Many of them were founded on sterile specimens or on unreliable characters, and are now considered *species inquirendae*. Characters accorded particular taxonomic importance include the structure of the gonophores, particularly those of the female, the extent of retrogression of reproductive hydranths, and more recently the complement, distribution, shape, and size of nematocysts (Picard 1951; Watson 1985; Calder 1988, 2010; Marques, Mergner *et al*. 2000; Marques, Peña Cantero *et al*. 2000; Puce *et al*. 2005; Bouillon *et al*. 2006; Schuchert 2008b). Also perceived to be helpful in the identification of certain species is the presence or absence of buttons or a continuous band of nematocysts around the gastric column of the hydranth, the presence or absence of nematophores, the prominence of the perisarc groove on the hydranth, and the orientation of nematocysts on the tentacles, whether tending to be parallel or oblique to the tentacular axis (Schuchert 2008b).

As for *Eudendrium bleakneyi*, **sp. nov.**, its diminutive colony size aligns it with a group of small species included within a so-called "*E. capillare* group" (e.g., Watson 1985; Marques, Mergner *et al*. 2000). That group appears to be morphologically diverse, however, so comparisons were made here with all recognized species of the genus. Particular attention was given to the cnidome, although other morphological characters were considered as well.

Within the genus *Eudendrium*, 73 nominal species are currently recognized as valid worldwide in WoRMS. With the identity of two of them (*E. attenuatum* Allman, 1877; *E. laxum* Allman, 1877) being regarded as doubtful (e.g., Puce *et al*. 2005), 71 species were considered during this study in making comparisons with *E. bleakneyi*. Of these, 48 are distinctly different from the new species in having "complementary" nematocysts (Table 2), a designation given to nematocysts in addition to small microbasic euryteles, which are believed to occur in all species of the genus. Therefore, these 48 need not be considered further here in relation to *E. bleakneyi*.

Of the remaining 23 species, at least 11 resemble *E. bleakneyi* in having a cnidome comprising only small microbasic euryteles (*E. antarcticum* Stechow, 1921b; *E. armatum* Tichomiroff, 1887; *E. capillare* Alder, 1856a; *E. corrugatum* Watson, 1985; *E. deciduum* Millard, 1957; *E. deforme* Hartlaub, 1905; *E. japonicum* Yamada, 1954; *E. nambuccense* Watson, 1985; *E. pennycuikae* Watson, 1985; *E. terranovae* Watson, 1985; *E. vervoorti* Marques & Migotto, 1998). However, all of these species differ from *E. bleakneyi* in one or more morphological characters. For example, a prominent nematocyst belt, such as that encircling the base of the hydranth in *E. bleakneyi*, is lacking in all except *E. nambuccense* and possibly *E. antarcticum* (Millard 1975; Watson 1985, 2003; Hirohito 1988; Marques, Mergner *et al*. 2000; Schuchert 2008b). Moreover, unlike in *E. bleakneyi*, colonies of *E. armatum*, *E. corrugatum*, *E. deciduum*, and *E. terranovae* are relatively large and polysiphonic (Millard 1975; Watson 1985;

Schuchert 2008b). Other noteworthy differences from *E. bleakneyi* include the presence of nematophores in *E. armatum* and *E. japonicum* (Hirohito 1988; Schuchert 2008b), the existence of a branched spadix in *E. deciduum* (Millard 1957, 1975); the lack of a spadix over the ovum in *E. vervoorti* (Marques & Migotto 1998), and the paired chains of chambers in male gonophores of *E. deforme* (Watson 2003). Notably too, some colonies of *E. capillare* have complementary nematocysts in the form of small isorhizas (Schuchert 2008b). *Eudendrium bleakneyi* is very close in morphology to *E. nambuccense*, differing from the original account of that species (Watson 1985) in: (1) being sparsely rather than profusely branched, (2) having small microbasic euryteles that are proportionally more slender, (3) having at least some male gonophores with two chambers rather than a single one, (4) having female gonophores on atrophied rather than on partially atrophied hydranths, (5) having hydranths with about 18–20 rather than 24–28 tentacles. Meanwhile, it is unclear from existing descriptions and illustrations whether a nematocyst belt exists in *E. antarcticum*, although it seems possible (see Marques, Mergner *et al*. 2000: fig. 9). Nevertheless, that species differs from *E. bleakneyi* in having female gonophores arising from hydranths that are little if at all reduced (Stechow 1921b, 1925).

The cnidomes of the remaining 12 species are currently undescribed. Of primary interest in this heterogeneous group is the identity of *E. cingulatum* Stimpson, 1853, unreported since its original description from Bay of Fundy at Grand Manan Island, NB. Stimpson's (1853) account of the species was lacking in detail, and no illustration was provided. Fraser (1918) thought it might be identical with *E. annulatum* Norman, 1864, but later simply questioned its validity (Fraser 1944, 1947a). Earlier, A. Agassiz (1865) had included it, with question, in the synonymy of *Bougainvillia superciliaris* (L. Agassiz, 1850). The hydroid was described by Stimpson as "small," but no measurements were given. There was no indication that his colonies were fertile, and gonophores of the species remain unknown. The specific name *cingulatum*, meaning "belted" or "girdled," is intriguing. While it might refer to a belt of nematocysts on the hydranths, such as that found in *E. bleakneyi* and certain other species of the genus, Stimpson provided no explanation for his choice of the name, and it is unknown what character the Latin adjective was describing. His species seems to differ from *E. bleakneyi* in colony form, with branches "…somewhat as in *E. rameum*…" rather than being sparsely branched or stolonal, and in having pedicels that were strongly annulated, sometimes completely so, rather than being mostly smooth beyond the base. No record of the species was found in a search of online catalogues of the MCZ, NMNH, or YPM, and no type is known to exist. *Eudendrium cingulatum* is regarded here as a *nomen dubium*.

None of the other species included in the genus appear from their descriptions to match *E. bleakneyi*. In the size and habit of their colonies, only two (*E. irregulare* Fraser, 1922; *E. rugosum* Fraser, 1940) resemble this new species. Those of the remainder (*E. armstrongi* Stechow, 1909; *E. caricum* Jäderholm, 1908; *E. certicaule* Fraser, 1938a; *E. cochleatum* Allman, 1877; *E. dispar* L. Agassiz, 1862; *E. distichum* S.F. Clarke, 1879; *E. maldivense* Borradaile, 1905; *E. nodosum* Fraser, 1938a; *E. speciosum* Fraser, 1945) differ in having colonies that are larger and more branched. Other reported differences setting these species apart include (1) the occurrence, on non-aborted hydranths, of male and female gonophores in *E. certicaule* and *E. dispar*, and of male gonophores in *E. maldivense* and *E. speciosum*; (2) the presence of oblique annulations at the bases of stems and branches in *E. cochleatum*; (3) the existence of nodes at irregular intervals on stems and branches in *E. nodosum* (L. Agassiz 1862; Allman 1877; Borradaile 1905; Fraser 1938a, 1945). Finally, stems and branches of *E. irregulare* differ from those of *E. bleakneyi* in having occasional wrinkles but no annulations (Fraser 1922), while those of *E. rugosum* differ in being strongly wrinkled throughout (Fraser 1940).

Nine species of *Eudendrium* have been reported from the Bay of Fundy (see Appendix 1), with two of those (*E. cingulatum* Stimpson, 1853; *E. tenellum* Allman, 1877) regarded as *species inquirendae*. *Eudendrium bleakneyi*, described as new here, is added as a tenth species from the bay.

Microbasic euryteles borne on nematocyst caps of the male gonophores of this species appeared to be slightly smaller and more slender than those of the tentacles and nematocyst ring on the hydranth.

Eudendrium bleakneyi was dredged during late summer (06 September 1984) in relatively shallow waters (16 m) from a commercial scallop [(*Placopecten magellanicus* (Gmelin, 1791)] ground in the St. Croix River off St. Andrews, NB. Salinities in that region of the estuary are typically in the polyhaline range (18–30‰), and water temperatures that time of year are normally between 10–15° C (personal observations).

TABLE 2. Species of *Eudendrium* Ehrenberg, 1834 listed as valid in WoRMS (early 2016), with information on complementary nematocysts from one or more primary references. Also included is *E. bleakneyi*, sp. nov., described herein. Excluded are two species in the WoRMS list (*E. attenuatum* Allman, 1877; *E. laxum* Allman, 1877) that have been considered *species inquirendae* (Puce *et al*. 2005). Small microbasic euryteles, believed to be part of the cnidome of all species of the genus, are not mentioned here. Criteria used in distinguishing microbasic and macrobasic euryteles may be inconsistent from one author to another.

Species	Type Locality	Complementary Nematocysts	Reference
E. album Nutting, 1896	UK: Plymouth	large macrobasic euryteles	Schuchert 2008b
E. angustum Warren, 1908	South Africa: Algoa Bay	large unidentified nematocysts[1]	Millard 1975
E. annulatum Norman, 1864	UK: Shetland Is.	large microbasic euryteles	Schuchert 2008b
E. antarcticum Stechow, 1921b	Bouvet Is.	absent	Peña Cantero & Gili 2006
E. arbuscula Wright, 1859	UK: Queensferry	large microbasic euryteles	Schuchert 2008b
E. armatum Tichomiroff, 1887	Mediterranean Sea	absent	Schuchert 2008b
E. armstrongi Stechow, 1909	India and Myanmar	cnidome undescribed	
E. aylingae Watson, 1985	AUS: Great Detached Reef	large macrobasic euryteles	Watson 1985; Puce *et al*. 2006
E. balei Watson, 1985	AUS: Western Port	large microbasic mastigophores	Watson 1985
E. bathyalis Marques & Calder, 2000	Bermuda: Hungry Bay Bight	large microbasic euryteles	Marques & Calder 2000
E. bentart Peña Cantero, 2013	Low Is. (Southern Ocean)	large (?) isorhizas	Peña Cantero 2013
E. bermudense Calder, 1988	Bermuda: Hamilton Parish	large macrobasic euryteles	Calder 1988
E. biseriale Fraser, 1935	Japan: Sagami Bay	large bean-shaped nematocysts	Hirohito 1988
E. bleakneyi, sp. nov.	Canada: St. Andrews, NB	absent	described herein
E. boreale Yamada, 1954	Japan: Hokkaido	large (& medium) microbasic euryteles	Kubota 1976
E. breve Fraser, 1938a	Ecuador: Galápagos Is.	large isorhizas[2]	Cooke 1975
E. calceolatum Motz-Kossowska, 1905	France: Banyuls-sur-Mer	large microbasic euryteles	Schuchert 2008b
E. californicum Torrey, 1902	USA: California	large microbasic euryteles	Weill 1934
E. capillare Alder, 1856a	UK: Embleton Bay	absent, or with small isorhizas	Schuchert 2008b
E. capillaroides Schuchert 2008b	France: Baie de Morlaix	medium microbasic euryteles	Schuchert 2008b
E. caraiuru Marques & Oliveira, 2003	Brazil: São Sebastião	large mesobasic euryteles	Marques & Oliveira 2003
E. caricum Jäderholm, 1908	Russia: Arctic seas	cnidome undescribed	
E. carneum S.F. Clarke, 1882	USA: Hampton Roads, VA	large heterotrichous anisorhizas	Calder 1988
E. certicaule Fraser, 1938a	Ecuador: Galápagos Is.	cnidome undescribed	
E. cingulatum Stimpson, 1853	Canada: Grand Manan Is.	cnidome undescribed	
E. cnidoferum Stechow, 1919	Sweden: Bohuslän	large macrobasic euryteles	Schuchert 2008b
E. cochleatum Allman, 1877	USA: Cape Fear, NC	cnidome undescribed	
E. corrugatum Watson, 1985	AUS: N Stradbroke Is.	absent	Watson 1985

……*continued on the next page*

TABLE 2. (Continued)

Species	Type Locality	Complementary Nematocysts	Reference
E. currumbense Watson, 1985	AUS: Currumbin	large (?) macrobasic euryteles	Watson 1985
E. cyathiferum Jäderholm, 1904	South Georgia	large euryteles	Watson 2003
E. deciduum Millard, 1957	South Africa: False Bay	absent	Millard 1975
E. deforme Hartlaub, 1905	Chile: Calbuco	absent	Watson 2003
E. dispar L. Agassiz, 1862	USA: Massachusetts	large microbasic euryteles[3]	described herein
E. distichum S.F. Clarke, 1879	Mexico: Isla Holbox[4]	cnidome undescribed	
E. exiguum Allman, 1877	USA: Florida Reef	present; category undetermined	Puce *et al*. 2005
E. eximium Allman, 1877	USA: Florida Reef	large microbasic euryteles	Puce *et al*. 2005
E. fruticosum Allman, 1877	USA: Key West, FL	large microbasic euryteles	Puce *et al*. 2005
E. garis Puce *et al*., 2006	Indonesia: Siladen	large microbasic euryteles	Puce *et al*. 2006
E. generale von Lendenfeld, 1885b	AUS: Port Phillip Bay	large microbasic euryteles	Watson 1985
E. glomeratum Picard, 1952	France: Banyuls-sur-Mer	large macrobasic euryteles	Schuchert 2008b
E. infundibuliforme Kirkpatrick, 1890	AUS: NNW of Warrior Is.	large macrobasic euryteles & small (?) macrobasic euryteles	Watson 1985
E. irregulare Fraser, 1922	Canada: near Gabriola, BC	cnidome undescribed	
E. jaederholmi Puce *et al*., 2002	South Georgia	large unidentifiable nematocysts	Puce *et al*. 2002
E. japonicum Yamada, 1954	Japan: Sagami Bay	absent	Hirohito 1988
E. kirkpatricki Watson, 1985	AUS: Murray Is.	large microbasic euryteles	Watson 1985
E. klausi Puce *et al*., 2005	Belize: Carrie Bow Cay	large microbasic euryteles	Puce *et al*. 2005
E. macquariensis Watson, 2003	Macquarie Is.	unidentified bean-shaped capsules	Watson 2003
E. magnificum Yamada, 1954	Japan: Sagami Bay	large unidentified nematocysts	Hirohito 1988
E. maldivense Borradaile, 1905	Maldives	cnidome undescribed	
E. maorianus Schuchert, 1996	New Zealand: Wellington	medium microbasic euryteles	Schuchert 1996
E. merulum Watson, 1985	AUS: S of Clonmel Is.	large microbasic euryteles	Watson 1985
E. minutum Watson, 1985	AUS: Port Phillip Heads	medium & large microbasic euryteles	Watson 1985
E. moulouyensis Marques, Peña Cantero & Vervoort, 2000	Morocco: Chafarinas Is.	large microbasic euryteles	Schuchert 2008b
E. mucronatum Billard, 1926	Egypt: Suez Canal	(?) atrichous anisorhizas	Marques, Peña Cantero & Vervoort 2000
E. nambuccense Watson, 1985	AUS: Nambucca Heads	absent[5]	Watson 1985
E. nodosum Fraser, 1938a	Ecuador: off Santa Elena	cnidome undescribed	

……*continued on the next page*

TABLE 2. (Continued)

Species	Type Locality	Complementary Nematocysts	Reference
E. novaezelandiae Marktanner-Turneretscher, 1890	New Zealand: Auckland	large & medium microbasic euryteles	Schuchert 1996
E. pennycuikae Watson, 1985	AUS: Bundaberg	absent	Watson 1985
E. pocaruquarum Marques, 1995	Brazil: São Sebastião	large microbasic euryteles	Marques 1995
E. racemosum (Cavolini, 1785)	Italy: Golfo di Napoli	small isorhizas	Schuchert 2008b
E. rameum (Pallas, 1766)	Mediterranean Sea	large microbasic euryteles	Schuchert 2008b
E. ramosum (Linnaeus, 1758)	UK: Whitstable, Kent	large microbasic euryteles	Schuchert 2008b
E. ritchiei Millard, 1975	South Africa: Cape Town	large mesobasic euryteles	Millard 1975; Schuchert 1996
E. rugosum Fraser, 1940	Flemish Cap, North Atlantic	cnidome undescribed	
E. scotti Puce *et al*., 2002	Antarctica: Tethys Bay	large macrobasic euryteles	Puce *et al*. 2002
E. simplex Pieper, 1884	Croatia: Dalmatian coast	large macrobasic euryteles	Schuchert 2008b
E. speciosum Fraser, 1945	USA: Pensacola, FL	cnidome undescribed	
E. terranovae Watson, 1985	New Zealand: North Cape	absent	Watson 1985; Schuchert 1996
E. tottoni Stechow, 1932	Antarctica: McMurdo Sound	unspecified nematocyst category	Marques & Migotto 1998
E. unispirum Schuchert 2008b	UK: Plymouth	large microbasic euryteles	Schuchert 2008b
E. vaginatum Allman, 1863	UK: Shetland Is.	large microbasic euryteles	Schuchert 2008b
E. vervoorti Marques & Migotto, 1998	The Netherlands: Zeeland	absent	Marques & Migotto 1998

[1] Complementary nematocysts of *Eudendrium angustum* Warren, 1908 were thought by Millard (1975) to be either macrobasic euryteles or isorhizas, and not microbasic euryteles. Puce *et al*. (2005) regarded them as large microbasic euryteles.

[2] Cooke (1975) regarded specimens examined by him as questionably referable to *Eudendrium breve*.

[3] The cnidome of *Eudendrium dispar* was examined during this study in syntype material from Nahant, Massachusetts (MCZ COEL 34). Complementary nematocysts, in a band around the base of the hydranth, were large microbasic heteronemes, most likely microbasic euryteles.

[4] The collection locality of *Eudendrium distichum* was said by S.F. Clarke (1879) to be “Ten miles north of Zoblos Island.” “Zoblos Island” was taken to be Holbox Island, Mexico, by Calder (2013: 59).

[5] According to Watson (1985), microbasic euryteles on gonophores of *E. nambuccense* are slightly larger than those on hydranths.

Eudendrium vaginatum **Allman, 1863**

Figs. 13e, f, 16

Eudendrium vaginatum Allman, 1863: 10.

Type locality. UK: Shetland, tidepools at extreme low water spring (Allman 1863).

Material examined. NS: Sandy Cove, Digby County, south side, 22.vii.1970, one colony, 2.3 cm high, without gonophores, coll. J.S. Bleakney, SNM HYD-001053.

Description. Colony erect, bristly, bushy, stiff, 2.3 cm high, arising from a dense network of creeping hydrorhizal tubes. Tubes of hydrorhiza contorted but not annulated. Hydrocaulus polysiphonic over proximal region, base covered with a tangle of stolons and with numerous short, twisted branches and pedicels lacking hydranths; hydrocaulus becoming monosiphonic distally, curved and irregularly branched; branches frequent, of different lengths, some of them rebranched, bent upwards at insertion with hydrocaulus, resembling an old stove-pipe entering a chimney. One of two hydrocauli, and several branches, with clear signs of renovation. Ultimate branchlets of varied length, resembling hydrocaulus and branches but shorter and usually more slender. Perisarc over most of colony quite thick and rusty-brown, thinner and honey-coloured in younger parts, covering all parts of colony up to a filmy envelope resembling a pseudohydrotheca over proximal half of each hydranth; all parts of hydrocaulus, branches, and ultimate branchlets distinctly, closely, regularly, and strikingly annulated. Hydranths not well-preserved in examined colony but apparently cup-shaped, about 0.5 mm long from base to tip of hypostome, 0.35 mm wide at level of tentacles; perisarc groove indistinct in present material; hypostome knob-shaped. Tentacles filiform, in one whorl, about 18 in number. Nematophores absent. Nematocysts comprising small microbasic euryteles and complementary large microbasic euryteles, the latter on hypostome and scattered on trunk of hydranth.

Gonophores not seen.

Cnidome (Fig. 16)

Hydranths—

small microbasic euryteles (n = 10): 6.7–7.1 µm long × 2.8–3.2 µm wide (undischarged)

large microbasic euryteles (n = 10): 21.0–23.0 µm long × 8.7–10.0 µm wide (undischarged)

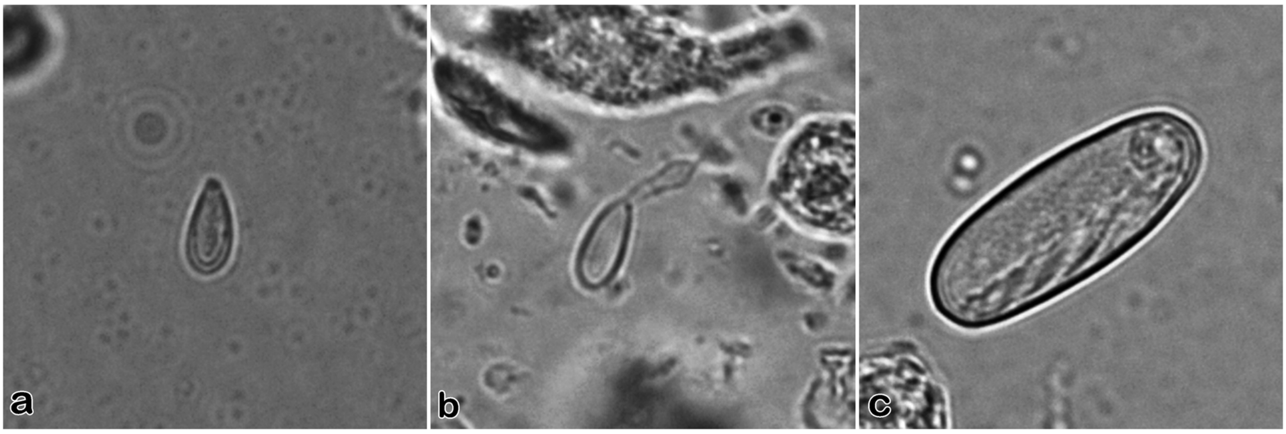

FIGURE 16. *Eudendrium vaginatum*, nematocysts, SNM HYD-001053. a, small microbasic eurytele, from hydranth. b, small microbasic eurytele, from hydranth, discharged. c, large microbasic eurytele, from hydranth.

Remarks. Allman (1863) described *Eudendrium vaginatum* from Shetland, UK, based on sterile colonies found in rock pools at extreme low water on a spring tide during August 1862. The species was not illustrated until later, in his monograph on gymnoblastic hydroids (Allman 1872). A combination of several trophosomal characters appear to distinguish the species, with perisarc being deeply and regularly annulated throughout, with hydranths having a perisarc groove that is usually located some distance up the hydranth column, and with hydranths partially enclosed within a pseudohydrotheca. The proximal end of polysiphonic stems may be overgrown by a convoluted mass of tubes, creating a bark-like covering. The nematocyst complement consists of small and large microbasic euryteles, the latter having a small coil in the shaft at the distal end of the capsule (Schuchert 2008b). Hydranths are vermilion in colour (Allman 1863), and the perisarc is deep reddish-brown (Allman 1872), at least in older parts.

In re-describing the species, Schuchert was unable to locate Allman's type material, but little doubt exists about its identity. *Eudendrium annulatum* Norman, 1864 has sometimes been included or questionably included in the synonymy of *E. vaginatum* (e.g., Cornelius 1995a: 292; Marques, Mergner *et al*. 2000: 107), but evidence exists for recognizing both as valid (Schuchert 2008b). In *E. annulatum*, the perisarc is incompletely annulated, and annulations are much less pronounced. Material examined and illustrated by Marques, Mergner *et al*., and attributed to *E. vaginatum*, is a mix of the two species. Recent synonymy lists are given by Schuchert (2008b) and Antsulevich (2015).

Gonophores were absent in the colony examined here (SNM HYD-001053). According to Schuchert (2008b, 2012), reproductive hydranths vary from normal to somewhat atrophied. Male gonophores are are two-chambered, with more than 10 on a given hydranth. Female gonophores have an unbranched spadix, with six or more of them appearing on a hydranth. Ripe embryos become encapsulated in perisarc and may occur down the hydranth pedicel.

The cnidome of *Eudendrium vaginatum* from the Bay of Fundy included both small and large microbasic euryteles. Undischarged capsules of large euryteles are distinctive in having a small loop in the shaft near the distal end of the capsule (Fig. 16c), as noted above for the species. The sizes of nematocysts observed here, in preserved material, are similar to those recorded by Schuchert (2008b).

This is the first record of *Eudendrium vaginatum* from the Bay of Fundy. Reliable identifications of the species exist to the north in Newfoundland and western Greenland (Leloup 1939; Schuchert 2008b). To the south, an identification of *E. vaginatum* from the coast of Maine by Berrill (1952) appears to be correct, and Fraser (1944) reported it from Quicks Hole, west of Martha's Vineyard, Massachusetts. Most records of the species have been from boreal waters of the eastern North Atlantic. Although considered to be an Arctic to northern boreal species by Schuchert (2008b), he believed that records of it from Alaska and elsewhere in the North Pacific needed verification. Its distribution in that region, according to Antsulevich (2015), is from the Bering Sea and the Sea of Okhotsk to Japan and Alaska. Fraser (1937, 1947a) included a record of it from the coast of Oregon. The bathymetric range of *E. vaginatum* is reported to be 0–180 m (Schuchert 2008b; Antsulevich 2015).

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: Hudson Strait (Fraser 1931) and Greenland (Schuchert 2008b) to Boothbay Harbor, Maine (Berrill 1952), and possibly to Quicks Hole, Massachusetts (Fraser 1944).

Elsewhere: northeastern North Atlantic from the White Sea, Norway, Jan Mayen Island, Svalbard, and Iceland to the Shetland Islands (Schuchert 2008b; Ronowicz *et al*. 2013; Antsulevich 2015); North Pacific from the Bering Sea to Japan (Antsulevich 2015); possibly from Alaska to Oregon (Fraser 1937). Records of the species from the North Pacific by Nutting (1901b), Stechow (1913) and Fraser (1937) were considered questionable by Schuchert (2008b).

Order Leptothecata Cornelius, 1992

Suborder Statocysta Leclère, Schuchert, Cruaud, Couloux, & Manuel, 2009

Family Tiaropsidae Boero, Bouillon, & Danovaro, 1987

Genus *Tiaropsis* L. Agassiz, 1850

Tiaropsis multicirrata (M. Sars, 1835)
Figs. 17a, b

Thaumantias multicirrata M. Sars, 1835: 26, pl. 5, figs. 12 a–c [medusa].

Type locality. Norway: near Bergen (M. Sars 1835).

Material examined. NB: Richardson, Deer Island, 44°59'42"N, 66°56'45"W, on pontoon slip of wharf, <1 m, on *Mytilus edulis*, 34‰, 9° C, 22.v.1999, one colony, without gonophores, coll. D. Calder, ROMIZ B3089.

Description. Colony stolonal, with hydrorhiza entangled in filamentous algae growing on a mussel. Hydrorhiza mostly smooth, 0.1 mm in diameter, lacking internal septa, bearing pedicellate hydrothecae. Hydrothecal pedicels very short, less than 0.15 mm high, appearing irregularly annulated, supporting a hydrotheca at distal end. Hydrothecae erect, slender, deep, subcylindrical with smooth walls, without a distinct diaphragm basally, infrequently renovated, capped by a long cone-shaped operculum, hydrothecal walls typically widening very gradually from proximal to distal end, total length of hydrothecae from base to tip of operculum 0.4–0.8 mm, width at base of operculum about 0.15 mm and at insertion with pedicel 0.10 mm. Operculum a folded continuation of hydrothecal wall having about 10 pleats when closed, not distinctly demarcated from hydrothecal wall. Perisarc everywhere moderately thin but not flimsy. Nematothecae absent.

Gonothecae not seen.

Remarks. *Tiaropsis multicirrata* (M. Sars, 1835) was originally described from a medusa discovered in Norway. Knowledge of its hydroid remained obscure until a colony was linked to *T. multicirrata* in studies by Rees (1941) at Millport, Scotland. Rees found the hydroid on an old *Buccinum* shell, and based his identification on a medusa liberated from it in the laboratory. Later, Korsakova (1949) and Naumov (1951) raised similar hydroids from planulae released by medusae of the species. Based on the morphology of its trophosome, Naumov (1960) concluded that the hydroid was identical with one described earlier as *Cuspidella mollis* Spasskii, 1929 from the Russian coast of the Barents Sea. The species differs from *Cuspidella* Hincks, 1866, as defined by its type species *C. humilis* Hincks, 1866, in having pedicellate instead of sessile hydrothecae. As noted by Rees (1941), L. Agassiz (1850: 296) reported raising a "campanularioid polypidom" from planulae liberated by a medusa of *Tiaropsis diademata* L. Agassiz, 1850, but he did not describe or illustrate it. The medusa *T. diademata*, from the east coast of North America, was shown by Kramp (1919) to be conspecific with the European *T. multicirrata*.

While the inconspicuous hydroid of *Tiaropsis multicirrata* has not been reported before from the Bay of Fundy, its medusa stage has long been known from the area (e.g., Whiteaves 1901; Bigelow 1914; Fish & Johnson 1937; Shih *et al*. 1971; Shih 1977; Linkletter *et al*. 1977). Elsewhere on the east coast of North America, medusae of the species have been reported from Rhode Island (Mayer 1910b, caption to fig. 11, pl. 31, as *T. diademata*) to the Canadian Arctic, including Baffin Island (Dunbar 1942; Barry 1974) and Foxe Basin (Grainger 1959, 1962). On the west coast, it is known to occur from southern British Columbia (Arai & Brinckmann-Voss 1980) to the Bering Sea (Bigelow 1913, as *T. diademata*) and on into the Beaufort Sea (Grainger 1975). Although hydroids of this species have been reported infrequently and are poorly known, Arai & Brinckmann-Voss reported them to be "very common" on wharves at Departure Bay and French Creek, British Columbia, Canada. Based on knowledge of its medusa, *T. multicirrata* has been described as a northern boreal species (Russell 1953) and as a subarctic-boreal species (Barry 1974).

In terms of seasonality, Mayer (1910b) reported that medusae of the species (as *Tiaropsis diademata*) appear in great numbers on the coast of New England during March. By mid-May, numbers there decline significantly, and medusae disappear during summer. More recently, the species was observed from February to April in the Eel Pond at Woods Hole, Massachusetts (Costello & Mathieu 1995). To the north, medusae are described as being frequent to abundant, at least seasonally, along the east coast of Newfoundland (Kramp 1920; Pinhey 1927, as *T. diademata*). Observed seasonality is similar in British Columbia (Arai & Brinckmann-Voss 1980), with young medusae appearing in March and adults being present until early June. In Britain, medusae first appear in late winter or early spring and are mature by July (Russell 1953).

Other aspects of the biology of *Tiaropsis multicirrata* have been reviewed by authors including Russell (1953), Naumov (1960), Arai & Brinckmann-Voss (1980), and Cornelius (1995a). An exhaustive account of the morphology and development of the medusa is given by Russell. According to Naumov, fertilized eggs are retained in the gonad of the female medusa and are released into the water as planula larvae. Some of the diverse food items known to be ingested by medusae were listed by Arai & Brinckmann-Voss. For the most part, both hydroid and medusa stages are inhabitants of shallow waters, although Barry (1974) reported medusae over a depth range of 0–150 m in waters of northern Canada.

As might be expected, molecular data summarized by Maronna *et al*. (2016) confirm a close relationship between *Tiaropsis multicirrata* and several so-called "campanulinoids." In their phylograms, the species appears particularly close to *Tiaropsidium kelseyi* Torrey, 1909 (family Tiaropsidae Boero *et al*., 1987), *Opercularella pumila* S.F. Clark 1875 and *Phialella quadrata* (Forbes, 1848) (family Phialellidae Russell, 1953), *Racemoramus panicula* (G.O. Sars, 1874) (questionably to family Phialellidae), *Mitrocomella brownei* (Kramp, 1930) and *M. niwai* Bouillon & Barnett, 1999 (family Mitrocomidae Haeckel, 1879), and *Calycella syringa* (Linnaeus, 1767) (family Calycellidae Kramp, 1913).

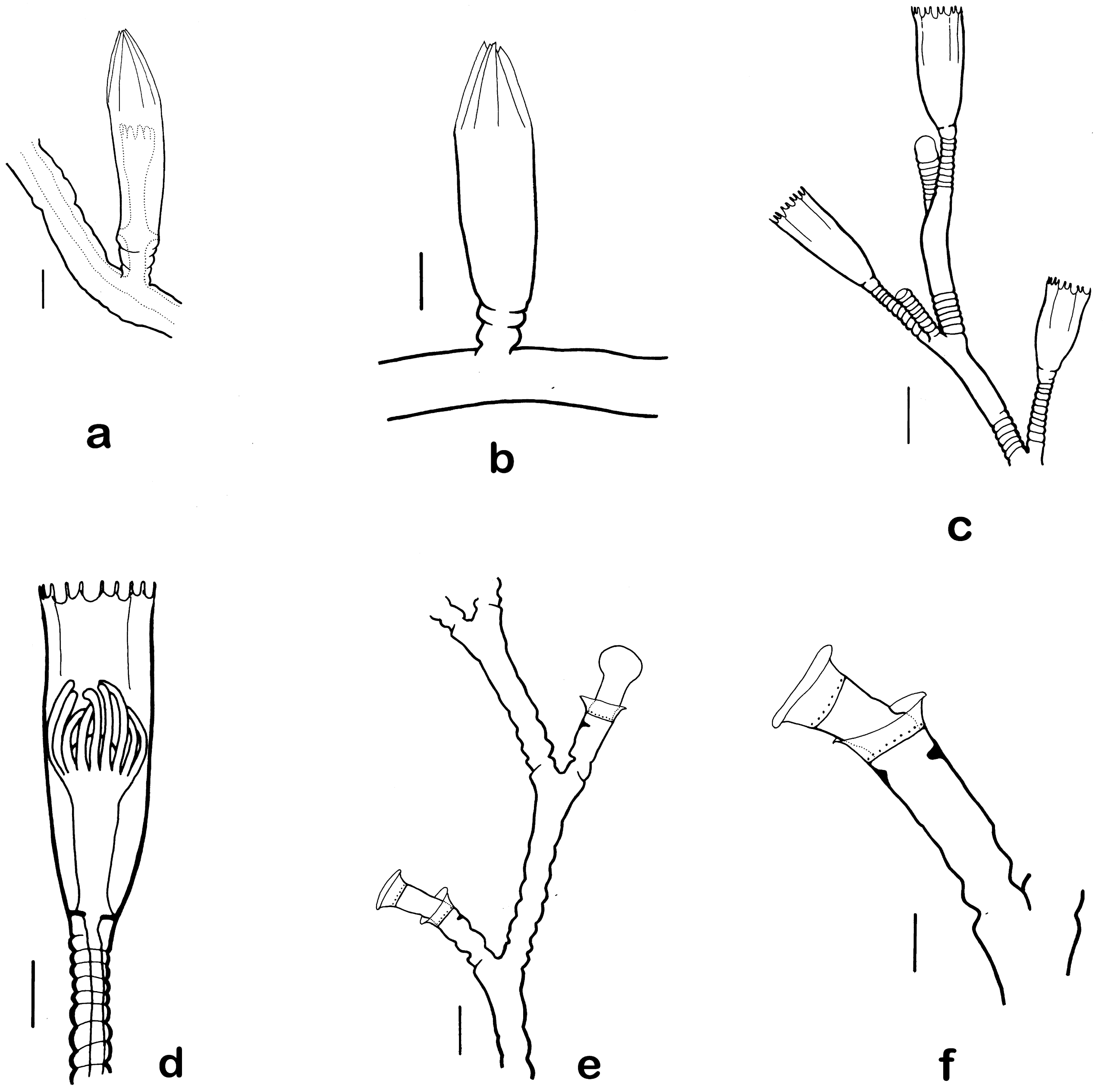

FIGURE 17. Thecate hydroids. a, *Tiaropsis multicirrata*, stolon and pedicellate hydrotheca, ROMIZ B3089. Scale equals 0.1 mm. b, *Tiaropsis multicirrata*, stolon and pedicellate hydrotheca, ROMIZ B3089. Scale equals 0.1 mm. c, *Obelia bidentata*, part of colony, with three hydrothecae, ROMIZ B3121. Scale equals 0.25 mm. d, *Obelia bidentata*, hydrotheca and hydranth, ROMIZ B3121. Scale equals 0.1 mm. e, *Halecium marsupiale*, part of hydrocaulus with hydrophores and three hydrothecae, ROMIZ B4132. Scale equals 0.2 mm. f, *Halecium marsupiale*, hydrophore and hydrotheca with one renovation, ROMIZ B4132. Scale equals 0.1 mm.

Detailed synonymy lists of the medusa stage of *Tiaropsis multicirrata* are given in Russell (1953), Kramp (1961), and Arai & Brinckmann-Voss (1980).

Recorded distribution. Bay of Fundy: hydroid recorded for the first time. Medusa recorded from Bay of Fundy (Whiteaves 1901; Fish & Johnson 1937); Eastport, ME (Bigelow 1914).

Eastern North America: western Greenland to New England (Cornelius 1995a; Shih *et al.* 1971).

Elsewhere: circumpolar in cool waters (Cornelius 1995a), including the eastern North Atlantic (Brittany to the White Sea) and North Pacific (British Columbia to the Bering Sea, and the Yellow Sea and northern Japan to the eastern and northern seas of the Russian Federation) (Naumov 1960; Arai & Brinckmann-Voss 1980; Yamada & Hirano 1983; Antsulevich 2015).

Family Obeliidae Haeckel, 1879

Genus *Obelia* Péron & Lesueur, 1810

Obelia bidentata S.F. Clark, 1875

Figs. 17c, d

Obelia bidentata S.F. Clark, 1875: 58, pl. 9, fig. 2.

Type locality. USA: New York, Long Island, Greenport, on wharf piles at low water (S.F. Clark 1875: 59).

Material examined. NS: Minas Basin, Kingsport, low intertidal, on bryozoan and hydroid stems on a stone, 20.viii.1970, one young colony, up to 1 cm high, without gonophores, coll. K.W. Petersen, SNM HYD-001061.—NS: Minas Basin, Medford Beach near Kingsport, on sandy silt near low water, 28.viii.1984, five colonies, up to 7.5 cm high, without gonophores, coll. J.S. Bleakney, ROMIZ B507.—NS: Minas Basin, Kingsport, low tide, --.ix.1999, underside of sandstone overhang, two colonies or colony fragments, up to 5.4 cm high, without gonophores, coll. J.S. Bleakney, ROMIZ B3121.

Description. Colonies erect, bottle-brush-shaped, up to 7.5 cm high, arising from a creeping hydrorhiza (SNM HYD-001061; ROMIZ B3121) or from a root-like mass of tangled stolons with adhering fine sediments (ROMIZ B507). Hydrocaulus single and not forked, straight to slightly geniculate, bearing regular branches, strongly polysiphonic basally, gradually becoming thinner, with monosiphonic distal end. Central axis of hydrocaulus divided into long internodes, each internode annulated basally, smooth elsewhere, distal end with large apophysis supporting bases of two branches as well as a single pedicel terminating in a hydranth. Perisarc of moderate thickness. Branches of hydrocaulus at proximal end of colony sometimes fascicled basally but usually monosiphonic, given off on alternate sides of central axis of hydrocaulus, usually with a pair of branches originating very close together, these diverging from each other at an angle of about 90 degrees; two closest branch pairs arising on opposite sides of hydrocaulus, the two pairs thereby sending out branches into four quadrants around hydrocaulus; branch internodes annulated basally, smooth elsewhere. Primary branches quite short, up to 0.8 cm long, each either unbranched and giving off alternate pedicels or more often alternately branched; secondary branches very short, directed upwards and outwards, bearing 2-4 alternate pedicels with terminal hydrothecae; in addition, a single pedicel with terminal hydrotheca usually given off near base of each secondary branch and directed laterally. Pedicels of varied length within a single colony, either annulated throughout or smooth in middle and annulated proximally and distally, supporting a hydrotheca at terminal end. Hydrothecae deeply campanulate, about 0.45–0.55 mm long, 0.18–0.22 mm at margin, 0.7–0.8 mm wide at diaphragm, tapering basally, slightly flaring at distal end, adcauline wall at basal end somewhat more convex than abcauline wall. Vertical pleats extending part-way down hydrothecal wall from incision between adjoining marginal cusps. Hydrothecal margin with about 10–12 cusps separated by U-shaped incisions, each cusp with two sharp-pointed lateral keels extending into hydrothecal cavity. Hydrothecal diaphragm thin, appearing straight to slightly oblique, basal chamber fairly large, cup-shaped.

Gonophores and gonothecae not seen.

Cnidome

England (Östman 1999)—pseudo-microbasic b-mastigophores, sB_b-type: 8.0–9.0 µm x 2.5–3.0 µm (undischarged)

Brazil (Migotto 1996; Östman 1999)—

pseudo-microbasic b-mastigophores, A-type: 6.0–6.5 µm x 2.0–2.5 µm (undischarged)

isorhizas (I_D-type?): 5.0–5.5 µm x 2 µm (undischarged)

isorhizas (I_d -type?): 5.0–6.5 µm x 1.0–1.5 µm (undischarged)

Remarks. *Obelia bidentata* S.F. Clark, 1875 and *O. bicuspidata* S.F. Clark, 1875 have long been regarded as conspecific (e.g., Jäderholm 1903; Fraser 1912, 1944; Nutting 1915; Cornelius 1975, 1982, 1990, 1995b; Calder 1991; Medel & Vervoort 2000). Of the two simultaneously established names, precedence was assigned to *O. bidentata* by Jäderholm (1903), acting as First Reviser (ICZN Art. 24.2). His selection was widely overlooked, with usage of the name *O. bicuspidata* prevailing for much of the 20th century, until correct nomenclature of the species was restored by Cornelius (1975). Since then, the valid name *O. bidentata* has gained near universal adoption. Both nominal species were originally described from Long Island Sound, on the Atlantic coast of the United States, by S.F. Clark (1875). The type locality of *O. bidentata* is Greenport, New York, while that of *O. bicuspidata* is nearby at the Thimble Islands, Connecticut. S.F. Clark differentiated the two based on differences in colony habit, in the relative diameter and depth of their hydrothecae, and in the length of their hydrothecal pedicels, but such differences have been widely viewed as taxonomically insignificant. An extensive synonymy list of the species was given by Medel & Vervoort (2000).

While there is little reason to suspect that *Obelia bidentata* and *O. bicuspidata* are distinct, the possibility exists that multiple species may have been combined under the currently accepted name since S.F. Clark's (1875) original account. *Obelia bidentata*, now reported to be essentially cosmopolitan (Medel & Vervoort 2000; Peña Cantero & Gili 2006), seems more likely to be a largely temperate to warm-temperate species with a more restricted distribution than presently assumed. A population of hydroids meeting the currently accepted broad concept of this species from warm waters off the east cost of Florida, USA, has already been treated as distinct (Calder 2013: 59). Although hydrothecae of specimens from locations including the Caribbean Sea (Vervoort 1968), Bermuda (Calder 1991), and Brazil (Migotto 1996) appear essentially identical in morphology with those examined here, certain hydroids from those tropical and subtropical areas tend to be small, unbranched or irregularly branched, and with monosiphonic or weakly polysiphonic hydrocauli rather than being large (5–10 cm or more), extensively and regularly branched, and with strongly polysiphonic hydrocauli as in populations from temperate waters. Such differences are usually dismissed as merely phenotypic variations within the species. Of possible taxonomic significance, however, is the discovery by Östman (1999) of cnidome differences in hydroids identified as *O. bidentata* from Brazil (with small monosiphonic colonies) and England (with large polysiphonic colonies). As for possible molecular evidence of genetic distance in populations assigned to the species, see remarks given two paragraphs below. Meanwhile, on the basis of biogeography and apparent temperature tolerances of the species, records of *O. bidentata* from the Antarctic Ocean (reviewed in Peña Cantero & Gili 2006) seem open to reconsideration. In the northern hemisphere, this hydroid is primarily a temperate zone species that does not penetrate far into boreal waters (Fraser 1944; Cornelius 1988, 1990, 1995b; this study), and it is completely absent in subarctic and Arctic regions (Naumov 1960; Calder 1970; Schuchert 2001a; Antsulevich 1915). Also worthy of further investigation is the identity of a population of hydroids resembling *O. bidentata*, but having very small colonies (<1 cm) and small hydrothecae, that inhabits oligohaline areas at the head of estuaries on the Atlantic coast of the United States. Similar colonies have been observed in the upper reaches of a small tropical estuary in Brazil (Calder & Maÿal 1998). The species was reported across a salinity range from 0.5–34‰ in estuaries of South Carolina (Calder 1976), but the identity of hydroids occurring in areas of very low salinity needs to be reexamined.

Specimens examined here from Minas Basin (SNM HYD-001061, ROMIZ B507, ROMIZ B3121) correspond closely with the original account of *Obelia bidentata* by S.F. Clark (1875). In addition to the identical morphology of their hydrothecae, two of the colonies were large (reaching more than 7 cm high) and had strongly polysiphonic stems. In having branches extending outwards from four sides of the stem, the colonies are somewhat similar in overall appearance to those of *Hartlaubella gelatinosa* (Pallas, 1766), a species also recorded from the Bay of Fundy. That resemblance has already been noted by Cornelius (1982, 1995b). Trophosomes of those two species can be readily distinguished by the shape of the lateral spines on cusps of their hydrothecae. Those of *O. bidentata* are slender, elongate, keel-shaped, and separated by U-shaped incisions, whereas those of *H. gelatinosa* are blunt, triangular, and separated by V-shaped incisions. In addition, gonophores of *O. bidentata* are free medusae while those of *H. gelatinosa* are fixed sporosacs. Gonophores and gonothecae were absent in colonies examined during this study, but distinctive trophosomal characters leave no doubt about their identity.

Molecular studies based on specimens from northwestern Europe and North Carolina (e.g., Govindarajan *et al.* 2006; Leclère *et al.* 2009; Peña Cantero *et al.* 2010; Maronna *et al.* 2016) have yielded conflicting and confusing results about the affinities of *O. bidentata*. Analyses have suggested that the species occupies a clade that is quite distant from others assigned to the genus *Obelia* Péron & Lesueur, 1810. Its inclusion in *Obelia* is nevertheless supported by the morphology of the medusa stage, which is typical of the genus (Nutting 1915; Hamond 1957; Cornelius 1982). Most phylograms to date have included the species as part of a cluster also comprising *Laomedea flexuosa* Alder 1857, *Gonothyraea inornata* Nutting, 1901b, and *Obelia longissima* (Pallas, 1766). Meanwhile, hydroids attributed to *O. bidentata* from Europe and North America appear genetically quite distant in the analyses, possibly lending further support to the idea that a species complex exists under the name. More molecular work is needed on hydroids ascribed to *O. bidentata*, ideally including specimens collected near its type locality and conforming with the original description of S.F. Clark (1875).

In Long Island Sound, S.F. Clark (1875) found *O. bidentata* "…in considerable abundance…" on 05 August 1874, while specimens referred by him to *O. bicuspidata* were collected 23 September 1874. Specimens in this study from Minas Basin (ROMIZ B507; ROMIZ B3121) were collected during the same months, at a time of year when water temperatures are still relatively warm in the area. In estuaries of South Carolina, the species is active for much of the year except for a few weeks during the coldest part of the winter, when water temperatures drop to 10° C or below (Calder, 1990). Coinciding with such hibernal conditions, colonies become dormant. As with colonies examined here, S.F. Clark found his specimens at shallow depths [*O. bidentata* on wharf pilings at low water; *O. bicuspidata* on "reefs" at 3–5 fm (5–9 m)]. Similar hydroids were described from the intertidal zone in pools at Holme-next-the-Sea near Hunstanton, Norfolk, UK, by Cornelius (1988). Illustrations of a complete young colony of the species in Cornelius (1990: 548, fig. 1a; 1995b: 293, fig. 68A) were based on a specimen from that area. Hydroids from Minas Basin are similar in colony form. One lot of those specimens (ROMIZ B507), taken at low water on a flat of fine sediments, were anchored to the soft substrate by a root-like mass of tangled stolons. This type of hydrorhiza was also observed on colonies from sandy substrates by Cornelius (1975: 261).

As with *Hydractinia symbiolongicarpus* Buss & Yund, 1989, discussed above, the occurrence of *O. bidentata* in Minas Basin appears to be disjunct in geographic distribution. It is not known from elsewhere in the Bay of Fundy or from any other location in Atlantic Canada. The centre of distribution of the species along the east coast of North America is in warmer waters south of Cape Cod. The nearest reported population of *O. bidentata*, from Casco Bay, Maine (Fraser 1944, as *O. bicuspidata*), appears to be disjunct as well.

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: Minas Basin, NS (reported herein) to the Caribbean Sea (Galea 2010b).

Elsewhere: Worldwide, tropical and temperate waters (Medel & Vervoort 2000).

Suborder Macrocolonia Leclère, Schuchert, Cruaud, Couloux, & Manuel, 2009

Family Haleciidae Hincks, 1868

Genus *Halecium* Oken, 1815

Halecium marsupiale Bergh, 1887

Figs. 17e, f

Halecium marsupiale Bergh, 1887: 334, pl. 28, figs. 2a, b.

Type locality. Russian Federation: Kara Sea, 20 fm (37 m) (Bergh 1887: 334).

Material examined. NB: Passamaquoddy Bay, off the northwestern side of Deer Island, on *Hydrallmania falcata* in a lobster trap, 19.vi.1985, three colonies, up to 1 cm high, without gonophores, coll. D. Calder, ROMIZ B4132.

Description. Hydroid colonies erect, up to about 1 cm high, arising from a creeping, smooth to somewhat wrinkled hydrorhiza. Hydrocaulus monosiphonic, unbranched or sparingly branched, annulated at insertion with hydrorhiza, divided into internodes of varying length by distinct nodes, older hydrocauli of larger plumes straight basally, with 1-4 internodes bearing neither branches nor hydrothecal pedicels, geniculate beyond basal region, with internodes annulated basally or throughout, annulations strongest over proximal end, each internode widening at distal end in form of a Y and bearing two apophyses, with one apophysis supporting internode above and the other supporting a hydrophore or a branch, branches or hydrophores given off alternately from opposite sides of hydrocaulus. Perisarc mostly quite thin and glassy. Branches, when present, resembling distal parts of hydrocaulus. Young hydrophores with a swelling or an annulation or two above a basal node separating them from apophysis of hydrocaulus, occasionally with a deep constriction proximally, slightly wrinkled or smooth and gradually widening distally, bearing a terminal hydrotheca or primary hydrotheca; a pseudodiaphragm sometimes evident on hydrophore just below hydrotheca, with its development greater on the adcauline side; primary hydrophores commonly supporting shorter secondary or tertiary ones arising from diaphragm of hydrotheca below. All hydrothecae borne on hydrophores clearly set off from internodes of hydrocaulus, with none being sessile; hydrothecae quite deep for the genus, with a diaphragm below a ring of distinct desmocytes, hydrothecal cavity widening distally; margin flaring, often everted; hydrothecal wall more distinctly concave on adcauline side, hydrothecal depth to 0.07 mm from diaphragm to margin, diameter at diaphragm to 0.12 mm, at margin to 0.2 mm. Hydranths relatively large, some strongly constricted in mid-region, with a distal whorl of about 16-20 filiform tentacles; basal web not observed in preserved specimens; proboscis prominent, dome-shaped.

Gonophores and gonothecae not seen.

Remarks. *Halecium marsupiale* Bergh, 1887, previously known only from waters of the Russian Federation, is described as "rather rare" (Naumov 1960) or "rare" (Antsulevich 2015). Russian authors have recorded it from the Barents Sea in the west to the Bering Sea in the east. It was originally described from the Kara Sea by Bergh (1887) in collections from the Danish Dijmphna (Dymphna) Expedition.

Halecium marsupiale is easily distinguished from its congeners even in the absence of gonophores. No hydrothecae occur at the distal ends of its cauline internodes, as in most species of the genus *Halecium* Oken, 1815. Instead, they are borne at the tips of well-developed hydrophores that are separated from cauline internodal apophyses by distinct nodes. That morphology is similar in several other species of the genus, including *H. muricatum* (Ellis & Solander, 1786) from boreal and Arctic waters, *H. muricatum* forma *abyssale* Broch, 1918 from bathyal waters north of Iceland, and *H. filicula* Allman, 1877 from the Straits of Florida. All three differ from *H. marsupiale* in lacking pronounced annulations on the cauline internodes, and in having much larger trophosomes with polysiphonic stems and branches. Another is *H. groenlandicum* Kramp 1911, a robust, polysiphonic species from boreal and Arctic regions of the northern hemisphere. Unlike in *H. marsupiale*, its colonies have long, straight, smooth internodes, each with several apophyses, and its hydrothecae are shallow and only slightly flaring. *Halecium* sp., described from the Mid-Atlantic Ridge by Calder & Vervoort (1998), differs in having long and mostly smooth cauline internodes.

According to Naumov (1960), hydroids of *Halecium marsupiale* occur predominantly at depths between 50–100 m, although they have been found over a bathymetric range of 11–245 m. Biogeographically, the species extends from Arctic regions into the boreal zone. Its discovery in the boreal Bay of Fundy expands its known geographic range to waters of northeastern North America. Literature on the species is given in the synonymy list of Antsulevich (2015).

Gonophores were lacking in specimens examined from the Bay of Fundy. As described by Naumov (1960) and Antsulevich (2015), gonothecae of the species are sac-shaped, laterally flattened, and smooth, with a short stalk and a small terminal aperture. When ripe, gonophores are extruded though the aperture into a spherical marsupium.

Recorded distribution. Bay of Fundy: recorded for the first time.

Eastern North America: recorded for the first time.

Elsewhere: Barents Sea, White Sea, Kara Sea, Laptev Sea, Chukchi Sea, Bering Sea, Sea of Okhotsk, Sea of Japan (Naumov 1960; Antsulevich 2015).

***Halecium praeparvum*, sp. nov.**

Figs. 18–20

Material examined. HOLOTYPE

ME: Cobscook Bay, Eastport, near Estes Head, 44°53'36"N, 66°59'37"W, 07.viii.2005, from aquaculture pen, on kelp holdfast, <1 m, one colony, to 0.3 mm high, with gonothecae, coll. D. Calder, ROMIZ B4111.

Etymology. The specific name is taken from the Latin adjective *praeparvum*, meaning very small, minute, tiny, in reference to the minuscule size of this hydroid.

Description. Hydroid colonies minute, stolonal, or erect but with no continuous main hydrocaulus, up to 0.3 mm high, arising from a creeping hydrorhiza that is smooth rather than wrinkled or annulated. Stolonal parts of colony with very short pedicels, occasionally with renovated hydrothecae. Erect colonies comprising no more than three hydrothecae; secondary hydrothecae at the end of a short hydrophore arising from within primary hydrotheca, hydrophore with a basal bulge; any side branches bearing hydrothecae merely comprising pedicels of varied length, each with a proximal bulge, otherwise smooth, arising from lateral wall of a lower pedicel at a point below hydrothecal diaphragm. Hydrothecae fairly shallow, much wider than deep, hydrothecal walls curving outwards from diaphragm to margin, hydrothecal margin strongly flaring, base of hydrotheca with distinct diaphragm below a ring of prominent desmocytes; hydrothecal depth 0.03–0.05 mm, diameter at margin 0.12–0.16 mm, at diaphragm 0.09–0.11 mm. Perisarc of moderate thickness. Hydranths much larger than hydrothecae; hypostome conical; tentacles filiform, about 20–25 in number, in one whorl, armed with small microbasic mastigophores and larger pseudostenoteles. Nematophores, nematothecae, nematodactyls, apical stolons, opercula, pseudodiaphragms, and zooxanthellae absent.

Gonophores fixed sporosacs, encased by solitary gonothecae arising from stolon, from a hydrophore proximal to hydrotheca, or directly from within a hydrotheca; gonothecae solitary, not part of a glomulus. Female gonothecae irregularly obovate, tapering proximally, widest near distal end, both walls convex but side opposite orifice more curved distally; orifice distolateral, accommodating two protruding hydranths; orifice comprising a pair of modified hydrothecae with a ring of desmocytes just below rim; adjoining adthecal process prominent; gonothecae 0.7 mm long, maximum width 0.4 mm, laterally flattened, with no annulations, crease lines, or latitudinal grooves, containing 4–6 eggs or embryos. Male gonophores not seen.

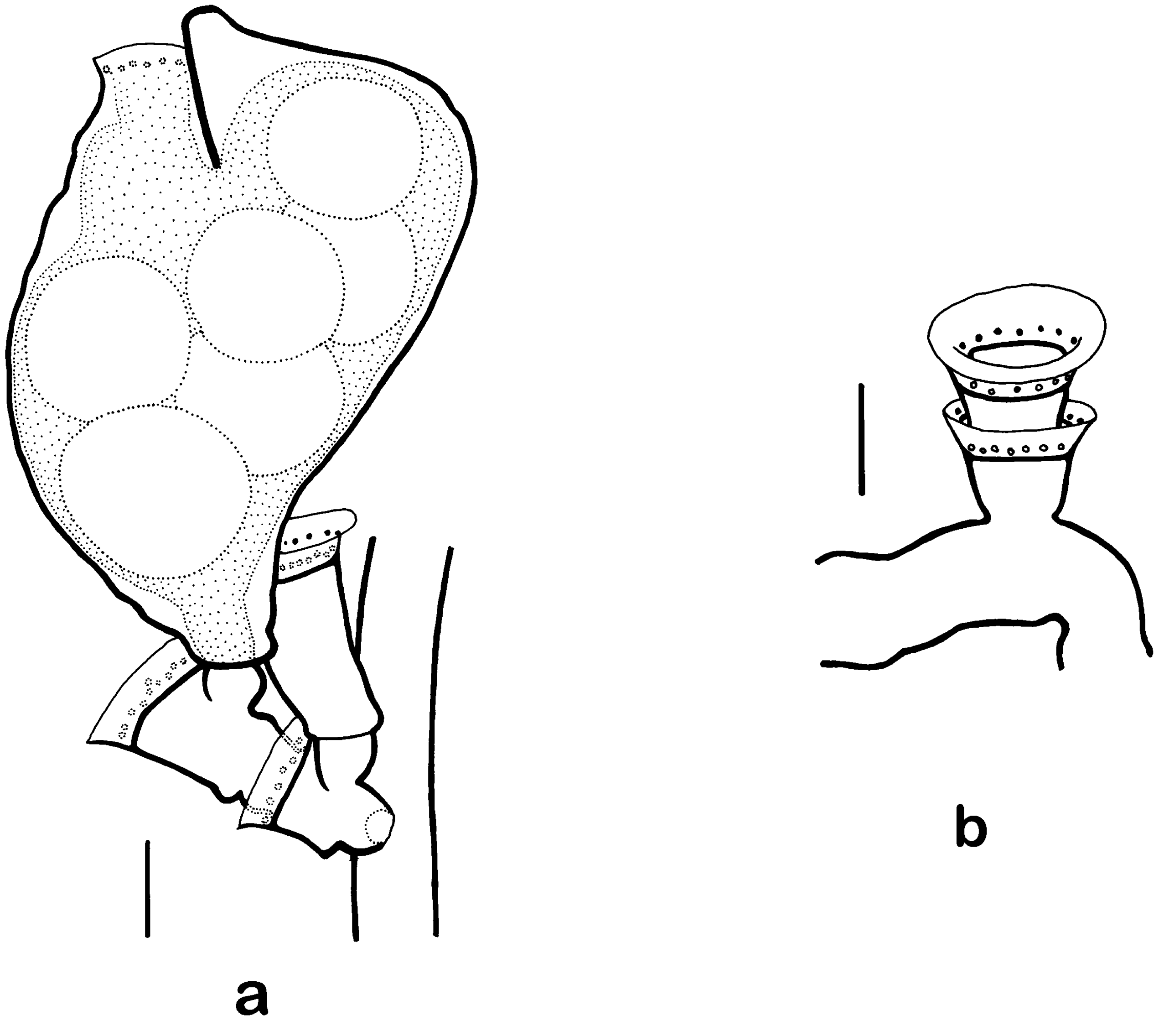

FIGURE 18. *Halecium praeparvum,* **sp. nov.**, holotype, ROMIZ B4111. a, hydrothecae arising from hydrorhizal stolon, and female gonotheca. Scale equals 0.1 mm. b, *Halecium praeparvum*, two hydrothecae, and hydrorhizal stolon. Scale equals 0.1 mm.

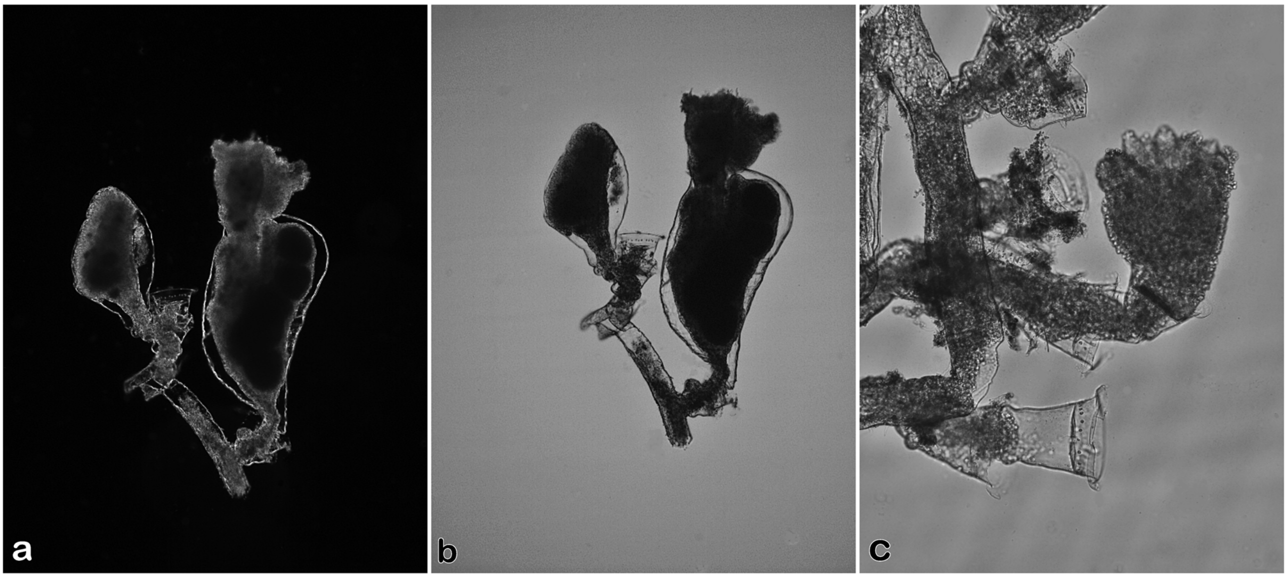

FIGURE 19. *Halecium praeparvum*, **sp. nov.**, holotype, ROMIZ B4111. a, part of colony with hydrothecae and two gonophores, one immature (left) and another fully developed (right), low magnification, darkfield. b, same, brightfield. c, part of colony with hydrorhiza, hydrothecae and a hydranth, medium magnification.

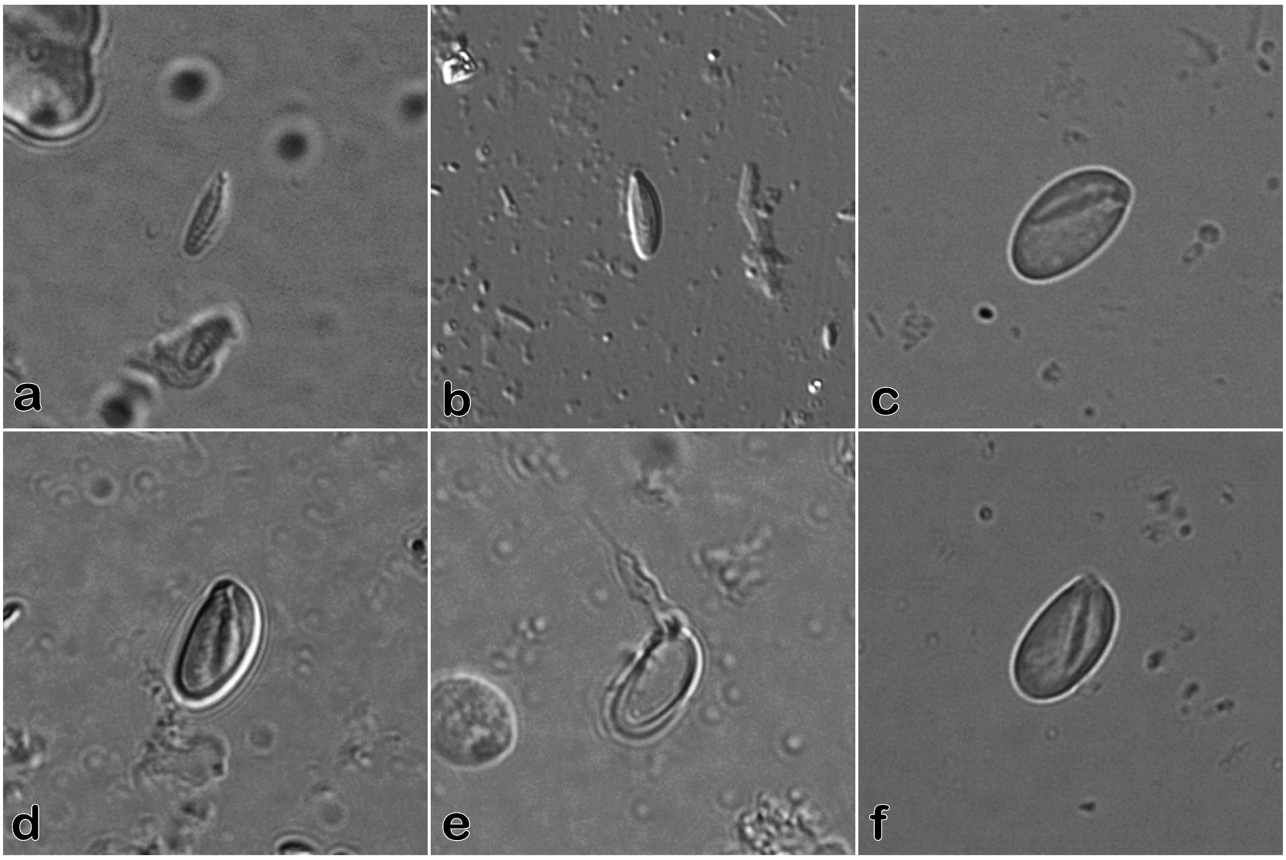

FIGURE 20. *Halecium praeparvum*, **sp. nov.**, nematocysts, holotype, ROMIZ B4111. a, microbasic mastigophore, from hydranth. b, microbasic mastigophore, from hydranth issuing from a gonotheca. c, pseudostenotele, from hydranth issuing from a gonotheca. d, pseudostenotele, from hydranth. e, pseudostenotele, discharged, from hydranth. f, pseudostenotele, from hydranth.

Cnidome (Fig. 20)

Hydranths—

microbasic mastigophores (n = 15): 5.9–6.8 µm long × 1.7–2.2 µm wide (undischarged)
pseudostenoteles (n = 13): 9.0–10.0 µm long × 3.9–5.1 µm wide (undischarged)
Hydranths issuing from female gonothecae—
microbasic mastigophores (n = 15): 6.0–6.8 µm long × 1.7–2.4 µm wide (undischarged)
pseudostenoteles (n = 6): 9.1–10.0 µm long × 4.7–5.4 µm wide (undischarged)

Remarks. As with the genus *Eudendrium* Ehrenberg, 1834 discussed above, synonymies of species of *Halecium* Oken, 1815 are seldom complex because gonophores are fixed, and no free medusa stage is known to occur in the group. Yet the genus is problematic because of the large number of species assigned to it (>100), the limited number of taxonomically useful characters available for scrutiny (including the lack of a medusa stage), the variations in morphology that occur intraspecifically, and the incompleteness of some early descriptions, especially accounts of putative species based on infertile specimens. Recent attention has been given to the nematocyst complement of species within the group, but the cnidome has been examined in so few species to date that it is presently of limited aid in identification.

A character of prime importance in differentiating species of *Halecium* is the morphology of the female gonothecae. In *H. halecinum* (Linnaeus, 1758), type species of the genus, and in at least 39 other species besides *H. praeparvum* (Table 3), such gonothecae may be broadly described as irregularly obovate, bilaterally symmetrical, and with an aperture for hydranths that is lateral rather than terminal. By contrast, female gonothecae in many other species of the genus are lenticular structures of varied shape and ornamentation that have an aperture at the distal end. Whether these differences are of taxonomic significance at the generic level remains to be explored in detail and confirmed through molecular studies.

Within the group resembling *H. halecinum* in the general form of their female gonothecae, variations of particular note in the structure include presence or absence of: (1) a chimney-like tube or tubes of varied length and shape leading to one or more lateral apertures; (2) longitudinal or latitudinal crease lines on the gonothecal walls; (3) an adthecal process flanking the orifice; (4) aggregated gonothecae in the form of a glomulus (e.g., *H. groenlandicum* Kramp, 1911). In addition, their gonothecae may vary interspecifically from paddle-shaped to reniform to clavate to mitten-shaped to nearly spherical (e.g., *H. ralphae* Watson & Vervoort, 2001), and the location of the aperture may occur laterally, distolaterally, or even proximolaterally (again, see *H. ralphae*). Moreover, gonothecal walls may differ in thickness from one side to the other, ridges or crease lines, if present, may vary in extent and prominence, and the walls may be rounded or even polygonal in cross-section. The aperture itself varies from a single or a pair of openings (variably modified hydrothecae) that may be separate or fused, and if fused, they may or may not be separated by a median septum. A hood-like cover over the aperture exists in some species (*H. scutum* S.F. Clark, 1877), and a wide opening may appear during development along a lateral wall (e.g., *H. bermudens*e Congdon, 1907). The number of eggs occurring within the gonothecae may also differ from species to species.

Female gonothecae of *H. praeparvum* (Figs. 18a, 19a, b) correspond in morphology with those occurring in the group containing *H. halecinum* and 39 others (Table 3). Within this cluster of species, however, only eight [*H. pusillum* (Sars, 1857); *H. dichotomum* Allman, 1888; *H. mirabile* Schydlowsky, 1902; *H. repens* Jäderholm, 1907; *H. pygmaeum* Fraser, 1911; *H. minor* Fraser, 1935; H. *vasiforme* Fraser, 1935; *H. tabulatum* Watson, 2005; *H. xanthellatum* Galea, 2013] approach *H. praeparvum* in having the following combination of characters: (1) hydroids minute; (2) colonies stolonal or if erect, consisting of a short, irregular, monosiphonic series of pedicels and/or hydrophores rather than a continuous hydrocaulus; (3) hydrothecae widening distinctly from diaphragm to margin, and with rims that may be everted. Others in the cluster are unlike the new species described here in one or more of these characters and are excluded from further discussion. Meanwhile, each of the eight similar species listed above differs from *H. praeparvum* in various ways. For example, in *H. pusillum*, both pedicels and female gonothecae are strongly annulated, the aperture of the female gonotheca is lateral, and apical stolons are frequent (Gravili *et al.* 2015). *Halecium dichotomum* stands apart in having long, slender pedicels and internodes, occasional dichotomous branching, hydrothecae that are less flaring, and female gonothecae that are prominently annulated, more slender, and possess a lateral aperture (Allman 1888; Millard 1975). In *H. pygmaeum* Fraser, 1911, the orifice of the female gonotheca is a half-moon-shaped opening on the gonothecal wall rather than at the end of a chimney-like tube (Fraser 1937). *Halecium minor* Fraser, 1935 (not *H. minor* Pictet, 1893) from Japan is usually stolonal, although erect colonies comprising as many as five pedicels may occur. Its female gonothecae are reniform in shape and resemble those of *H. beanii* (Johnston, 1838) in having a lateral aperture (Fraser 1935). The little-known *H. vasiforme*, also from Japan, is a species having stolonal colonies, female gonothecae with a lateral aperture, and hydranths with about 16–18 tentacles (Fraser 1935; Hirohito 1995). *Halecium tabulatum* from Australia forms small colonies that are sometimes dichotomously branched and lightly polysiphonic basally; the aperture of its female gonotheca is lateral (Watson 2005). The Caribbean species *H. xanthellatum* is distinct in having wrinkles at the bases of the pedicels, zooxanthellae in the coenosarc, and female gonothecae that are slender, tubular, and coarsely annulated on the dorsal wall (Galea 2013). *Halecium mirabile* from the White Sea and *H. repens* from the nearby Kola Peninsula have long been regarded as conspecific or likely conspecific (Linko 1911; Naumov 1960; Antsulevich 2015). As originally described by Schydlowsky (1902), *H. mirabile* was based on sterile, stolonal material, and its identity is therefore somewhat uncertain. Illustrations of female gonothecae attributed to it in the literature are those of Jäderholm (1909) for *H. repens*. They are described as being irregularly oval, with about 5–8 semicircular grooves on the dorsal wall (Naumov 1960; Antsulevich 2015), and there is no prominent adjoining adthecal process as in *H. praeparvum*. In turn, *H. mirabile* and *H. repens* have often been considered synonyms or questionable synonyms of *H. curvicaule* Lorenz, 1886 (Dons 1912; Broch 1918; Schuchert 2001a), a hydroid of Arctic and higher boreal waters. That species differs from *H. praeparvum* in having female gonothecae with a lateral aperture and with pronounced ribs on the dorsal wall, internodes that are long and slender, and hydrothecae with nearly straight walls (Naumov 1960; Calder 1970; Schuchert 2001b; Antsulevich 2015). Curiously, illustrations of the female gonothecae of hydroids identified as *H. curvicaule* by Dons (1912: figs. D, G) are much more like those of *H. praeparvum* than *H. curvicaule*, although their trophosomes (figs. D–F) resemble the latter in that hydrothecal pedicels are long and hydrothecal walls flare relatively little. Variations attributed by Dons to *H. curvicaule* seem extraordinarily large for a single species.

Halecium praeparvum is clearly distinct from all 59 of the species having female gonothecae of a decidedly different shape than *H. halecinum* (Table 3), and no further comparisons with them are made here. As for the remaining 40 species included in the genus, female gonothecae are either unknown at present, or the gender of described gonothecae has not been confirmed as female from existing descriptions. However, other morphological characters can be used to distinguish *H. praeparvum* from each of them. From information summarized in Table 3, only eight [*H. humile* Pictet, 1893; *H. ornatum* Nutting, 1901b; *H. diminutivum* Fraser, 1940; *H. fragile* Hodgson, 1950; *H. perexiguum* Hirohito, 1995; *H. pearsonense* Watson, 1997; *H. elegantulum* Watson, 2008; *H. tubatum* Watson, 2008] resemble *H. praeparvum* in having minute colonies that are stolonal or if erect, lack a continuous, true hydrocaulus. They also have hydrothecae that are at least somewhat flaring, and hydrothecal rims that may be recurved. Some differences nevertheless exist that differentiate them from *H. praeparvum*. A morphologically simple species, there is little to set *H. humile* apart beyond its tropical distribution, although its hydrothecae are wider at both the diaphragm (0.15 mm) and the rim (0.22 mm) (Pictet 1893; Schuchert 2003). *Halecium ornatum* is similar in colony form to *H. praeparvum*, but its pedicels are decidedly longer with a few irregularly located nodes, and the rim of the hydrotheca appears to be much more strongly recurved (Nutting, 1901b). Colonies of *H. diminutivum* are stolonal or minimally erect, with one or two additional pedicels given off in sequence. Notably, all pedicels are long and distinctively annulated or segmented throughout (Fraser 1940). *Halecium fragile*, also with both stolonal and sparingly erect colonies, differs in having very long, slender, and flexuous pedicels that are marked at irregular intervals by nodes (Hodgson 1950; Watson & Vervoort 2001). *Halecium perexiguum* is a mostly stolonal species with few characters to differentiate it. However, it appears to differ in having two annulations at the base of its hydrothecal pedicels, renovation of hydrothecae appears to be more extensive, and the appearance of secondary pedicels from the side of the primary ones is very rare (Hirohito 1995). Hydroids of *H. pearsonense* occur as short (1–2 mm), erect colonies having from 2–7 hydrothecae. The margins of its hydrothecae are not everted, and secondary hydrothecae are infrequent. Internodes and pedicels of the species are often marked by deep ridges (Watson 1997). *Halecium elegantulum* is a striking species with colonies that are either stolonal, or erect as a linear series of hydrophores each arising from the base of the hydrotheca below. Pedicels and hydrophores are long, very slender, and lack nodes. Hydrothecae are relatively deep and trumpet-shaped (Watson 2008; Peña Cantero 2014). Colonies of *H. tubatum* resemble those of *H. elegantulum* in having long, slender, cylindrical pedicels, although pedicels may be wrinkled or annulated basally. Its hydrothecae flare strongly from diaphragm to margin, the hydrothecal rim is distinctly everted, and secondary hydrophores and hydrothecae occasionally arise from within the hydrothecal cavity (Watson 2008; Peña Cantero 2014). Finally, one other species with undescribed female gonothecae, *Halecium exaggeratum* Peña Cantero, Boero & Piraino, 2013, deserves mention. While its colonies are also small (up to 15 mm high), a continuous hydrocaulus with long, thin internodes readily distinguishes it from *H. praeparvum*.

TABLE 3. Species of *Halecium* Oken, 1815 listed as valid in WoRMS (early 2016), with type localities, shapes of female gonophores (if known), colony forms and hydrothecal shapes, and one or more primary references. Also included is *H. praeparvum*, sp. nov., described herein. Under ♀ Gonotheca,” “similar” = gonotheca resembling that of the type species of the genus, *H. halecinum* (i.e., irregularly obovate, bilaterally symmetrical, presence of a lateral opening for one or more hydrothecae); “dissimilar” = gonotheca distinctly different from that of *H. halecinum*; “unknown” = female gonotheca unknown or identity uncertain. Under “Colony Form,” “CT” = colony tiny (<1 cm), “CS” = colony small (1–5 cm), “CL” = colony large (>5 cm); “M” = hydrocaulus typically monosiphonic or without a true hydrocaulus, “P” = hydrocaulus typically polysiphonic, “S” = colony stolonal; “IL” = stem internodes long, “IM” = stem internodes medium length, “IS” = stem internodes short, “IV” = stem internodes highly varied. Under hydrothecal shape, “RR” = hydrotheca strongly flaring with margin often recurved, “RS” = hydrotheca not strongly flaring and margin infrequently recurved; “HD” = hydrotheca relatively deep, “HS” = hydrotheca shallow. *Halecium flexile* Allman, 1888, not listed in WoRMS, was recognized as valid following Galea (2010a) and Galea *et al*. (2014). Also included herein is *Halecium pygmaeum* Fraser, 1911 because of its morphological similarity.

Species	**Type Locality**	**♀ Gonotheca**	**Colony Form**	**Hydrotheca Shape**	**Reference(s)**
H. amphibolum Watson, 1993	AUS: Queenscliff	dissimilar	CT; M; IM	RR; HD	Watson 1993
H. annulatum Torrey, 1902	USA: Coronado, CA	dissimilar	CT; M; IS	RR; HD	Fraser 1937
H. annuliforme Galea & Schories, 2012	Chile: Lennox Is.	dissimilar	CT; M; IL	RR; HD	Galea & Schories 2012
H. antarcticum Vanhöffen, 1910	Antarctica: Gauss Station	dissimilar	CL; P; IM	RR; HS	Peña Cantero 2014
H. arcticum Ronowicz & Schuchert, 2007	Spitzbergen: Hornsund Fjord	dissimilar	CT; M; IS	RR; HD	Ronowicz & Schuchert 2007
H. argenteum S.F. Clarke, 1894	Panama: 07°31'30”N, 79°14'W	unknown	CS; P; IM	RS; HS	Fraser 1947a
H. articulosum S.F. Clark, 1875	USA: New England coast	similar	CL; P; IS	RS; HS	Fraser 1944
H. banyulense Motz-Kossowska, 1911	France: Banyuls-sur-Mer	dissimilar	CL; P; IL	RR; HS	Schuchert 2005a
H. banzare Watson, 2008	Antarctica: 65°48'S, 53°16'E	dissimilar	CL; P; IM	RR; HS	Peña Cantero 2014
H. beanii (Johnston, 1838)	UK: near Scarborough	similar	CL; P; IM	RS; HS	Schuchert 2005a
H. bermudense Congdon, 1907	Bermuda: “shores of Bermuda”	similar	CL; P; IM	RS; HS	Calder 1991
H. birulai Spasskii, 1929	Russia: Murmansk coast	dissimilar	CS; M/P; IL	RS; HD	Schuchert 2001a
H. bithecum Watson, 2005	AUS: Isles of St. Francis	similar	CT; M/P; IM	RS; HS	Watson 2005
H. brashnikowi Linko, 1911	Russia: Shantar Is.	unknown (?)	CL; P; IS	RS; HS	Antsulevich 2015
H. brevithecum Watson, 2008	Antarctica: 65°48'S, 53°16'E	unknown	CL(?); P; IM	RS; HS	Peña Cantero 2014
H. bruniensis Watson, 1975	AUS: Bruny Is.	dissimilar	CS; P; IM	RR; HD	Watson 1975
H. calderi Galea, 2010b	Guadeloupe: Grande-Terre	dissimilar	CS; P; IL	RR; HS	Calder 2013
H. capillare (Pourtalès, 1867)	USA: Sand Key, Florida Straits	dissimilar	CS; P; IM	RS; HS	Allman 1877
H. conicum Stechow, 1919	France: Banyuls-sur-Mer	dissimilar	CT; M; IM	RR; HD	Motz-Kossowska 1911, as *H. minutum*
H. corrugatissimum Trebilcock, 1928	New Zealand: Dunedin	similar	CS; M; IM	RS; HS	Trebilcock 1928; Schuchert 2005a
H. corrugatum Nutting, 1899	USA: Puget Sound	dissimilar	CT; S	RR; HS	Fraser 1947a
H. crinis Stechow, 1913	Japan: Sagami Bay	dissimilar	CL; M; IL	RS; HS	Hirohito 1995
H. curvicaule Lorenz, 1886	Jan Mayen	similar	CS; M; IL	RS; HS	Schuchert 2001a

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TABLE 3. (Continued)

Species	**Type Locality**	**♀ Gonotheca**	**Colony Form**	**Hydrotheca Shape**	**Reference(s)**
H. cymiforme Allman, 1888	Chile: Puerto del Hambre	dissimilar	CS; M; IL	RR; HD	Galea *et al*. 2009
H. cymosum Fraser, 1935	Japan: Sagami Bay	dissimilar	CT; M; IM	RS; HS	Hirohito 1995
H. delicatulum Coughtrey, 1876	New Zealand: Dunedin	dissimilar	CL; M/P; IV	RR; HS	Vervoort & Watson 2003
H. densum Calkins, 1899	USA: Bremerton, WA	dissimilar	CS; P; IV	RR; HS	Fraser 1937
H. dichotomum Allman, 1888	South Africa: Cape of Good Hope	similar	CL/T; P; IL	RS; HS	Millard 1975
H. diminutivum Fraser, 1940	USA: Nantucket Shoals	unknown	CT; S/M; IV	RR; HS	Fraser 1944
H. discoidum Galea, 2013	Martinique	dissimilar	CT; S/M; IV	RR; HS	Galea 2013
H. dubium Fraser, 1941	USA: E of New York, 3235 m	unknown	CS; P; IL	RS; HS	Fraser 1941
H. dufresneae Millard, 1977	Archipel Crozet	dissimilar	CL; P; IM	RS; HS	Peña Cantero 2014
H. dyssymetrum Billard, 1929	Indonesia	dissimilar	CT; M; IM	RR; HD	Galea 2010b
H. edwardsianum (d'Orbigny, 1842)	Argentina: S of Rio Negro	similar	CS; P; IM	RS; HS	d'Orbigny 1842, 1847
H. elegantulum Watson, 2008	Antarctica: 67°03'S, 74°29'E	unknown	CT; S/M; IM	RR; HD	Peña Cantero 2014
H. erratum Galea *et al*., 2014	Chile: Piti Palina Fjord	dissimilar	CL; P; IM	RS; HS	Galea *et al*. 2014
H. exaggeratum Peña Cantero *et al*., 2013	Antarctica: Tethys Bay	unknown	CT/S; M; IL	RR; HS	Peña Cantero 2014
H. exiguum Fraser, 1948	Ecuador: Galápagos Is.	unknown	CS; M; IM	RR; HS	Fraser 1948
H. expansum Trebilcock, 1928	New Zealand: Dunedin	similar	CT; M; IV	RS; HS	Vervoort & Watson 2003
H. fasciculatum Fraser, 1938a	Ecuador: Galápagos Is.	dissimilar	CS; P; IM	RR; HS	Fraser 1938a, 1948
H. fijiensis Watson, 2015	Kermadec Is.	unknown	CT; M; IS	RR; HS	Watson 2015
H. filicula Allman, 1877	USA: S of the Marquesas, FL	unknown	CL; P; IM	RR; HS	Fraser 1944
H. fjordlandicum Galea, 2007	Chile: Fjord Comau	similar	CS; P; IL	RS; HS	Galea & Schories 2012
H. flabellatum Fraser, 1935	Japan: Shionomisaki	dissimilar	CL; P; IM	RS; HS	Hirohito 1995
H. flexile Allman, 1888	South Africa: Marion Is.	dissimilar	CL; P; IL	RR; HD	Totton 1930; Galea *et al*. 2014
H. flexum Fraser, 1948	Ecuador: Santa Elena Bay	unknown	CT; M; IM	RR; HS	Fraser 1948
H. fragile Hodgson, 1950	AUS: D'Entrecasteaux Channel	unknown	CT; M; IL	RR; HS	Watson & Vervoort 2001
H. fraseri Ralph, 1958	Canada: Nanoose Bay, BC	unknown	CS; P; IM	RS; HS	Fraser 1914, as *H. flexile*; Ralph 1958
H. frigidum Peña Cantero, 2010	Antarctica: Peter I Is.	unknown	CS; P; IL	RS; HS	Peña Cantero 2014
H. fruticosum Fraser, 1943	USA: off Cape Fear, NC	unknown	CS; P; IV	RR; HS	Fraser 1947a
H. galeatum Billard, 1937	Indonesia: off W coast of Kei Is.	similar	CS; P; IM	RS; HS	Billard 1937
H. groenlandicum Kramp, 1911	Greenland: NE, near Maroussia	similar	CS/L; P; IL	RS; HS	Calder 1970
H. halecinum (Linnaeus, 1758)	UK: Whitstable, Kent	similar	CL; P; IL	RS; HS	Cornelius 1995a

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TABLE 3. (Continued)

Species	**Type Locality**	**♀ Gonotheca**	**Colony Form**	**Hydrotheca Shape**	**Reference(s)**
H. harrimani Nutting, 1901c	USA: Glacier Bay, AK	unknown	CL; P; IM	RS; HS	Nutting 1901b, as *H. robustum*
H. humeriformis Galea & Schories, 2014	Chile: Taltal	dissimilar	CT; M; IM	RR; HD	Galea *et al*. 2014
H. humile Pictet, 1893	Indonesia: Ambon	unknown	CT; S/M; IV	RR; HS	Schuchert 2003
H. incertum Naumov & Stepanjants, 1962	Antarctica: off Enderby Land	unknown	CL; P; IS	RS; HS	Soto Àngel & Peña Cantero, 2015
H. inhacae Millard, 1958	Mozambique: Inhaca Is.	similar	CT; M; IS	RS; HS	Millard 1975
H. insolens Fraser, 1938a	Mexico: Isla Isabel	similar	CS; M; IV	RS; HS	Calder *et al*. 2009
H. interpolatum Ritchie, 1907	South Orkney Is.	unknown	CS; P; IV	RR; HD	Watson 2008; Peña Cantero 2014
H. irregulare Bonnevie, 1899b	North Atlantic: locality unknown	unknown	CL; P; IM	RS; HS	Bonnevie 1899b
H. jaederholmi Vervoort, 1972a	Argentina: 44°19'S, 59°52'W	similar	CL; P; IM	RS; HS	Peña Cantero 2014
H. kofoidi Torrey, 1902	USA: San Diego, CA; Catalina Is., CA	unknown	CS; IM	RS; HS	Fraser 1937
H. labiatum Billard, 1933	Egypt: Gulf of Suez	similar	CS; M; IM	RS; HS	Galea & Ferry 2015
H. labrosum Alder, 1859	British Isles	dissimilar	CL; P; IV	RR; HS	Schuchert 2005a
H. laeve Kramp, 1932	Greenland: Bredefjord	dissimilar	CL;P; IL	RR; HS	Schuchert 2001a
H. lamourouxianum (d'Orbigny, 1842)	Argentina: S of Rio Negro	unknown	CS; ?; IV	RS; HS?	d'Orbigny, 1842
H. lankesterii (Bourne, 1890)	UK: Plymouth area	similar	CT; M; IV	RS; HS	Schuchert 2005a
H. lenticulare Trebilcock, 1928	New Zealand: Bluff Harbour	dissimilar	CT; M; IV	RR; HS	Ralph 1958
H. lightbourni Calder, 1991	Bermuda: Flatts Inlet	similar	CT; M; IM	RS; HS	Galea & Ferry 2015
H. linkoi Antsulevich, 1980b	Russia: Kuril Is.	unknown	CS; M; IL	RS; HD	Antsulevich 2015
H. liouvillei Billard, 1934	Morocco: near Agadir	similar	CL; M/P; IM	RS; HS/D	Medel *et al*. 1998
H. lucium Antsulevich, 1980a	Russia: south Kuril region	similar	CS; M; IV	RS; HS	Antsulevich 2015
H. luteum Watson, 1975	AUS: Bruny Is.	unknown	CS; P; IV	RR; HS	Watson 1975
H. macrocaulus Watson, 2008	Antarctica: 66°45'S, 62°03'E	dissimilar	CL; P; IM/S	RS; HS	Peña Cantero 2014
H. macrocephalum Allman, 1877	USA: Sand Key, Florida Straits	similar	CS; P; IM	RS; HS	Vervoort *et al*. 2011
H. marsupiale Bergh, 1887	Russia: Kara Sea	dissimilar	CS; M/P; IM	RR; HD	Antsulevich 2015
H. maximum Galea & Schories, 2014	Chile: Corral	dissimilar	CL; M; IV	RR; HD	Galea *et al*. 2014
H. mediterraneum Weismann, 1883[1]	Italy: Naples	dissimilar	CS; M/P; IM	RR; HS	Schuchert 2005a
H. minor Pictet, 1893	Indonesia: Ambon Bay	unknown	CS; P; IS	RS; HS	Schuchert 2003
H. minor Fraser, 1935[2]	Japan: Sagami Bay	similar	CT; S/M; IM	RR; HS	Fraser 1935
H. minutum Broch, 1903	North Sea	dissimilar	CT/S; M; IL	RR; HD	Schuchert 2001a
H. mirabile Schydlowsky, 1902	Russia: White Sea	similar	CT; S/M; IV	RR/S; HD	Naumov 1960
H. mirandum Antsulevich & Regel, 1986	Russia: Middle Kuril Is.	dissimilar	CT; S/M; IS	RS; HS	Antsulevich 2015

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TABLE 3. (Continued)

Species	Type Locality	♀ Gonotheca	Colony Form	Hydrotheca Shape	Reference(s)
H. modestum Galea & Schories, 2014	Chile: Niebla	dissimilar	CL; P; IM	RR; HD	Galea *et al*. 2014
H. muricatum (Ellis & Solander, 1786)	UK: Aberdeen	dissimilar	CL; P; IM	RR; HS	Cornelius 1995a
H. nanum Alder, 1859	34°48'N, 34°25'W, on *Sargassum*	similar	CT; M; IS	RS; HS	Calder 1991
H. nullinodum Fraser, 1935	Japan: Okinose	similar	CL; P; IM	RS; HS	Fraser 1935
H. ochotense Linko, 1911	Russia: Sea of Okhotsk	dissimilar	CL; P; IV	RS; HS	Antsulevich 2015
H. ornatum Nutting, 1901b	USA: Glacier Bay, AK	unknown	CT; M/S; IV	RR; HS	Fraser 1937
H. ovatum Totton, 1930	Antarctica: Cape Adare	dissimilar	CS; P; IV	RR; HD	Vervoort 1972b; Peña Cantero 2014
H. pallens Jäderholm, 1904	South Georgia	dissimilar	CL; P; IM	RS; HS	Peña Cantero 2014
H. patagonicum (d'Orbigny, 1842)	Argentina: near Rio Negro	?	CL; P?; IL	RS; HS	d'Orbigny, 1842
H. paucinodum (Fraser, 1947b)	USA: WNW of Anacapa Is., CA	?	CL; P; IM	RS; HS	Calder *et al*. 2009
H. pearsonense Watson, 1997	AUS: Houtman Abrolhos Is.	unknown	CT; M; IV	RS; HS	Watson 1997
H. perexiguum Hirohito, 1995	Japan: Koiso, Sagami Bay	unknown	CT; S/M	RR; HS	Hirohito 1995
H. petrosum Stechow, 1919	France: near Banyuls-sur-Mer	similar	CS; M; IV	RS; HS	Schuchert 2005a
H. planum Bonnevie, 1901	Norway: fjord near Bergen	similar	CL; P; IM	RS; HS	Bonnevie 1901
H. platythecum Galea *et al*., 2014	Chile: Comau	dissimilar	CS; M; IL	RR; HS	Galea *et al*. 2014
H. plicatocarpum Vervoort & Watson, 2003	New Zealand: Three Kings Is.	dissimilar	CL; P; IL	RR; HS	Vervoort & Watson 2003
H. plicatum Galea, 2015	Martinique: Le Vauclin	similar	CT; M; IV	RS; HS	Galea & Ferry 2015
H. plumosum Hincks, 1868	Ireland	unknown	CL; P; IM	RS; HS	Hincks 1868
H. praeparvum, sp. nov.	USA: Eastport, ME	similar	CT; M/S; IS	RR; HS	described herein
H. profundum Calder & Vervoort, 1998	Mid-Atlantic Ridge, @ 15°N	similar	CS; P; IL	RS; HS	Calder & Vervoort 1998
H. pseudodelicatulum Peña Cantero, 2014	Antarctica: Low Island	dissimilar	CL; P; IM	RR; HS	Peña Cantero 2014
H. pseudoincertum Peña Cantero, 2014	Antarctica: Bellingshausen Sea	dissimilar	CL; P; IM	RR; HS	Peña Cantero 2014
H. pusillum (Sars, 1857)	Italy: Tyrrhenian Sea	similar	CT; M/S; IS	RR; HS	Gravili *et al*. 2015
H. pygmaeum Fraser, 1911	USA: San Juan Is., WA	similar	CT; M; IM	RS; HS	Fraser 1937
H. pyriforme Hirohito, 1995	Japan: Maruyama-dashi	dissimilar	CT; S/M; IS	RR; HS	Hirohito 1995
H. ralphae Watson & Vervoort, 2001	AUS: seamount S of Tasmania	similar	CS; P; IL	RS; HS	Watson & Vervoort 2001
H. reduplicatum (Fraser, 1935)	Japan: Sagami Bay	dissimilar	CT; M; IM	RR; HD	Hirohito 1995, as *Sagamihydra*
H. regulare Fraser, 1938a	Panama: off Jicarita Is.	unknown	CT; M; IS	RS; HS	Calder *et al*. 2009
H. repens Jäderholm, 1907	Russia: Kola Peninsula	similar	CT; M/S	RR; HS	Jäderholm 1909
H. reversum Nutting, 1901b	USA: Juneau, AK	dissimilar	CS/L; P; IV	RR; HS	Naumov 1960

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TABLE 3. (Continued)

Species	Type Locality	♀ Gonotheca	Colony Form	Hydrotheca Shape	Reference(s)
H. scalariformis Billard, 1929	Indonesia	dissimilar	CT; M; IS	RS; HS	Billard 1929
H. scandens Nutting, 1905	USA: Laysan Is., HI	dissimilar[3]	CT; M; IL	RR; HD (?)	Nutting 1905
H. scutum S.F. Clark, 1877	USA: Alaska	similar	CL; P; IM	RS; HS	Schuchert 2005a
H. secundum Jäderholm, 1904	Antarctica: Seymour Is.	unknown	CS; P; IS	RS; HS	Peña Cantero 2014
H. sessile Norman, 1867	UK: in the Minch, Hebrides	similar	CL; P; IV	RS; HS	Cornelius 1995a
H. sibogae Billard, 1929	Indonesia	dissimilar (?)	CL; P; IM	RR; HS	(?) Gibbons & Ryland 1989
H. sibogae marocanum Billard, 1934	Morocco: Ras Cantin	dissimilar	CL; P; IV	RR; HS	Medel & Vervoort 2000
H. singulare (Billard, 1929)	Indonesia	?	C?; P; IM	RS; HD?	Billard 1929
H. spatulum Watson, 2000	AUS: Port of Darwin	dissimilar	CT; P; IM	RS; HS	Watson 2000
H. speciosum Nutting, 1901b	USA: Yakutat Bay, AK	similar	CL; P; IV	RS; HS	Naumov 1960
H. stoloniferum Soto Àngel & Peña Cantero, 2015	Antarctica: Burdwood Bank	dissimilar	CT; M; IL	RR; HS	Soto Àngel & Peña Cantero 2015
H. tabulatum Watson, 2005	AUS: New Island, WA	similar	CT; M	RR; HS	Watson 2005
H. tehuelchum (d'Orbigny, 1842)	Argentina: near Rio Negro	?	CS; P?; IL	R?; H?	d'Orbigny, 1842
H. telescopicum Allman, 1888	AUS: off Port Jackson	unknown	CL; P; IL	RS; HS	Allman 1888
H. tenellum Hincks, 1861	UK: Salcombe Bay	dissimilar	CT/S; M; IL	RR; HS	Cornelius 1995a
H. tensum Fraser, 1941	USA: Martha's Vineyard, MA	unknown	CS/L; P; IL	RS; HS	Fraser 1947a
H. tenue Fraser, 1938b	Ecuador: Galápagos Is.	dissimilar	CT/S; M; IL	RR; HS	Fraser 1947a
H. textum Kramp, 1911	Greenland: NE, off Maroussia	dissimilar	CT/S; M; IL	RR; HD	Schuchert 2001a
H. tortile Bonnevie, 1899a	Norway: Ballstad	similar	CL; P; IM	RS; HS	Bonnevie 1899b
H. tortum Fraser, 1938a	Mexico: Tenacatita Bay	unknown	CS; P; IM	RS; HS	Fraser 1947a
H. tubatum Watson, 2008	Antarctica: 67°46'S, 67°03'E	unknown	CT; S	RR; HD	Peña Cantero 2014
Halecium undulatum Billard, 1922	Belgium: Ostende	dissimilar	CS; M; IV	RR; HS	Cornelius 1995a; Schuchert 2001a
H. vagans Fraser, 1938a	Ecuador: off La Plata Is.	unknown	CS; M; IL	RS; HS	Fraser 1947a
H. vasiforme Fraser, 1935	Japan: Sagami Bay	similar	CT; S	RR; HS (?)	Hirohito 1995
H. washingtoni Nutting, 1901c	USA: Puget Sound, WA	dissimilar	CS; M/P; IL	RR; HS	Nutting 1899, as *H. geniculatum*
H. wilsoni Calkins, 1899	USA: Bremerton, WA	dissimilar	CS; P; IM	RR; HS	Fraser 1937
H. xanthellatum Galea, 2013	Martinique	similar	CT; S/M; IV	RR; HS	Galea 2013

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[1] Weismann (1883) established this name as "*Halecium tenellum*, var. *meditteranea*." The variety was elevated to the rank of species by Stechow (1919), as *H. mediterraneum*, not *meditteraneum* as per the original spelling. Prevailing usage, following Stechow and others, has been maintained here.

[2] The name *Halecium minor* Fraser, 1935 is an invalid junior homonym of *H. minor* Pictet, 1893. A replacement name, *H. permodicum*, has been proposed for the junior homonym herein.

[3] Nutting (1905: 942) considered it possible that a medusa might be produced in *Halecium scandens*. Also, the lenticular gonophores arose from the hydrothecal cavity rather than from the stems or hydrorhiza, as in *Sagamihydra* Hirohito, 1995. The generic affinities of *H. scandens* remain uncertain.

The genus *Halecium* is well-represented in the Bay of Fundy, with 13 species besides *H. praeparvum* having been reported from the area (Appendix 1). Most common of these are the typically boreal hydroids *H. articulosum* S.F. Clark, 1875, *H. beanii* (Johnston, 1838), *H. halecinum* (Linnaeus, 1758), and *H. muricatum* (Ellis & Solander, 1786). Their presence reflects the boreal character of the bay and its waters.

Halecium praeparvum was found during the summer of 2005 on *Laminaria* growing just below the surface of the water on a salmon aquaculture pen near Eastport, ME. It was inconspicuous because of its diminutive size, and obscure in growing amongst tangles of the algal holdfast. Salinities in the area are thought to have been in the euhaline range (>30‰).

Finally, a nomenclatural problem exists with the binomen *Halecium minor* (Table 3). With *H. halecinum* var. *minor* Pictet, 1893 justifiably elevated to the rank of species, as *H. minor* Pictet, 1893, the name *Halecium minor* Fraser, 1935 becomes an invalid junior homonym of it. A replacement name for the junior homonym, *H. permodicum*, nom. nov., is proposed here. The specific name is derived from the Latin adjective *permodicum*, meaning "very small".

Family Sertulariidae Lamouroux, 1812

Genus *Sertularella* Gray, 1848

Sertularella gigantea Hincks, 1874

Fig. 21

Sertularella polyzonias var. *gigantea* Hincks, 1874: 151, pl. 7, figs. 11, 12.

Sertularia polyzonias.—Stimpson, 1853: 9.—Fuller, 1862a: 129; 1862b: 91 [not *Sertularella polyzonias* (Linnaeus, 1758)].

Cotulina polyzonias.—A. Agassiz, 1865: 146 [not *Sertularella polyzonias* (Linnaeus, 1758)].

Sertularella polyzonias.—Stafford 1912: 73.—Fraser 1918: 358.—Fraser 1944: 268.—Caddy, 1970: 12.—Linkletter *et al.* 1977: 8.—Fuller *et al.* 1998: 15, 23.—Henry 2003: 129.—Henry & Kenchington 2004a: 127.—Trott 2004a: 273 [not *Sertularella polyzonias* (Linnaeus, 1758)].

Type locality. Greenland: Frederickshaab (Paamiut). This hydroid, originally thought to have been from Iceland (Hincks 1874), was later reported to have been from Greenland (Hincks 1877).

Material examined. NS: off Digby, 119–123 m, scallop dredge, --.v.1966, several colony fragments, up to 2.1 cm high, with gonophores, coll. J.F. Caddy, ARC 8650161; ROMIZ B636.—NB: St. Croix River, at entrance of Oak Bay, 23.viii.1984, one colony, 3.2 cm high, without gonophores, coll. D. Calder, ROMIZ B656.—NB: St. Andrews, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, one young colony, 5 mm high, without gonophores, coll. D. Calder, ROMIZ B1989.—NB: St. Andrews, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, one young colony, 5 mm high, without gonophores, coll. D. Calder, ROMIZ B1993.—NB: St. Andrews, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, one young colony, 7 mm high, without gonophores, coll. D. Calder, ROMIZ B1995.—ME: Passamaquoddy Bay, off Frost Cove near Perry, 58 m, 27.viii.1988, 11°C, 33‰, one colony, 4 cm high, without gonophores, coll. D. Calder, ROMIZ B4134.—NB: St. Andrews, off Brandy Cove, 13 m, 27.viii.1988, 13°C, 32‰, scallop dredge, several colonies and colony fragments, up to 2.7 cm high, without gonophores, coll. D. Calder, ROMIZ B4138.—ME: Passamaquoddy Bay, American side opposite Northern Harbour, NB, 58 m, 28.viii.1988, one colony, 2 cm high, without gonophores, ROMIZ B4136.

Description. Hydroid colonies erect, up to 3.2 cm high, unbranched or sparingly and irregularly branched, with branches seldom rebranched; perisarc quite thick except in youngest parts of colony. Hydrocaulus monosiphonic, arising from a creeping hydrorhiza, with from one to several annulations at base, slightly to distinctly zigzag, divided into rather short, stout internodes by distinct nodes sloping alternately in opposite directions; internodes 925–1425 um long, 200–325 wide at nodes, often with an annulation or slight swelling at base, each one beyond basal region bearing a hydrotheca, internodal walls widening from proximal end to base of hydrotheca, then tapering again to distal node. Branches usually short, given off at a wide angle, resembling hydrocaulus in form, arising from internode immediately below base of a hydrotheca. Hydrothecae large, deep, in shape of a bent flask, curving slightly outwards, arranged alternately on opposite sides of hydrocaulus, walls smooth to somewhat undulating, adnate to internode for less than half their length, with axis oblique to that of hydrocaulus; hydrothecal walls widest near point of departure from hydrocaulus, narrowing basally, narrowing again towards margin before expanding again at rim, length abcauline wall 875–1125 um, length adcauline wall adnate 275–400 um, length adcauline wall free 750–1000 um, both adcauline and abcauline walls convex over much of their length, concave at distal end; hydrothecal base 200–350 um wide. Hydrothecal margin with four distinct, pointed, equally developed cusps, margin infrequently renovated from 1-3 times; hydrothecal orifice 375–475 um wide, quadrate in shape; hydrothecal cavity enclosed by an operculum of four faintly striated triangular valves; submarginal cusps absent. Hydranths with an abcauline diverticulum.

Gonophores fixed sporosacs. Gonothecae 1.5–2.2 mm long, 0.9–1.3 mm maximum diameter, elongate-oval in lateral view, resembling a cocoon, nearly round in cross-section, each borne on a very short, stout pedicel arising from hydrocaulus opposite basal end of a hydrotheca, gonotheca arching upwards and inwards over adjacent hydrotheca and cauline internode; perisarc quite thick. Gonothecal walls with about 5–7 prominent spiral ribs that become less developed at proximal end; margin 0.4–0.5 mm wide, bearing four prominent, horn-shaped spines; each spine about 0.20–0.24 mm long. Sex undetermined.

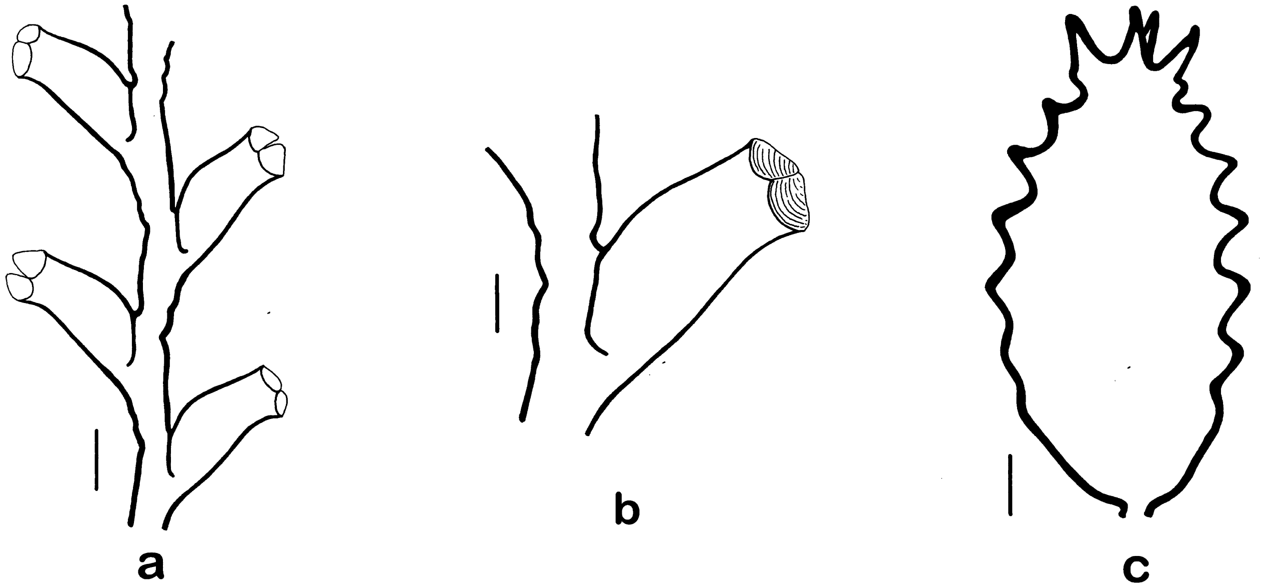

FIGURE 21. *Sertularella gigantea*, parts of the hydroid colony. a, hydrocaulus with four hydrothecae, ROMIZ B4134. Scale equals 0.5 mm. b, hydrotheca, ROMIZ B4134. Scale equals 0.25 mm. c, gonotheca, ROMIZ B636. Scale equals 0.25 mm.

Remarks. This species was first recognized and identified by M. Sars (1857) as a robust northern form of *Sertularella polyzonias* (Linnaeus, 1758). It was described and named later by Hincks (1874), as *S. polyzonias* var. *gigantea*. Hincks initially believed that material examined by him was from Iceland, as reported in the title of his paper, but discovered later that it was from Fredrickshaab, Greenland (Hincks 1877). Considered by Hincks to be a northern variety of *S. polyzonias*, the hydroid was said to be marked by its "robust habit and gigantic calycles (hydrothecae)." Mereschkowsky (1878) was first to regard it as a distinct species, "*Sertularella gigantea* Mihi" from the White Sea region. The binomen he thereby created is invalid as both a junior homonym and a junior subjective synonym of *S. gigantea* Hincks, 1874 (ICZN Arts. 45.6.4; 46.1).

Authors including Kirchenpauer (1884), Broch (1918), and Bedot (1925) remained unconvinced that *Sertularella gigantea* was a distinct species. With some exceptions (e.g., Nutting 1904; Jäderholm, E. 1909; Fraser 1944; Naumov 1960), the concept that it was simply a variety of *S. polyzonias* persisted throughout the twentieth century. Recent accounts (e.g., Antsulevich 2015; Choong 2015) provide evidence for recognizing *S. gigantea* as distinct. After comparing specimens in this study with those of *S. polyzonias* from northwestern Europe (Calder 2012), I agree. Morphological characters distinguishing trophosomes and gonosomes of the two species have been summarized by Choong (2015: 399), and partial synonymies of *S. polyzonias* and *S. gigantea* are given by Antsulevich (2015). Because of earlier misconceptions that the two were conspecific, it is difficult to establish accurate collection records and geographic distributions of both *S. polyzonias* and *S. gigantea*. However, it is clear that *S. gigantea* occurs at higher latitudes (Antsulevich 2015) and in colder waters than *S. polyzonias*.

Fraser (1944) recognized *Sertularella gigantea* as distinct, yet his description and illustrations of *S. polyzonias* from the northwestern North Atlantic were almost certainly based on the former species as well. The same error exists in Fraser's (1937) account of the species from Alaska and the Pacific coast of Canada (Choong 2015; Antsulevich 2015). Likewise, my records of *S. polyzonias* from the Canadian north (Calder 1970), from Cape Cod Bay (Calder 1975), and from Northumberland Strait (Calder 2004) were based instead on *S. gigantea*. No specimens corresponding with *S. polyzonias* were observed during this study in collections from the Bay of Fundy, whereas hydroids of *S. gigantea* were frequent. As reflected in the synonymy list above, earlier records of *S. polyzonias* from the bay are believed here to have been based on misidentifications. Indeed, if *S. polyzonias* exists in the boreal Northwest Atlantic, confirmation is needed.

Mereschkowsky (1878), with Nutting (1904) and Fraser (1944) following him, emphasized that hydrothecal margins of *Sertularella gigantea* in fully mature colonies from the White Sea were always repeatedly renovated. That character is not mentioned in more recent descriptions of Russian material by Naumov (1960) and Antsulevich (2015). Only a small percentage of hydranths examined during this study had renovated margins, and in no case was the renovation particularly conspicuous.

Although *Sertularella gigantea* has been reported over a bathymetric range from 5–4820 m (Naumov 1960; Antsulevich 2015), it is most frequently encountered at depths between 20–200 m. In studies on the Russian hydroid fauna, Naumov noted that it is often abundant in the upper 100 m. A circumpolar species extending southwards into boreal waters, it is common in the lower Bay of Fundy. The only material with gonothecae in the present collection was dredged during May 1966 at a depth of 119–123 m off Digby, NS (ARC 8650161; ROMIZ B636). While no water temperature data exist for this collection, it is certain to have been below 10° C given the location, depth, and time of year (Petrie & Jordan 1993).

Recorded distribution. Bay of Fundy: recorded for the first time as *Sertularella gigantea*. Grand Manan, NB (Stimpson 1853, as *Sertularia polyzonias*); Treat's Island, near Eastport, ME (Fuller 1862a; 1862b; both as *S. polyzonias*); Eastport, ME (A. Agassiz 1865, as *Cotulina polyzonias*); St. Andrews, NB (Stafford 1912, as *Sertularella polyzonias*); Passamaquoddy Bay area (Fraser 1918, as *S. polyzonias*); Grand Manan, NB, off Cherry Island, NB, Eastport, ME (Fraser 1944, as *S. polyzonias*); Bay of Fundy (Linkletter *et al*. 1977; Henry 2003; Henry & Kenchington 2004a, all as *S. polyzonias*); Lower Bay of Fundy, commercial scallop grounds (Fuller *et al*. 1998, as *S. polyzonias*); Cobscook Bay, ME (Trott 2004a, as *S. polyzonias*).

Eastern North America: Greenland (Hincks 1874, as *Sertularella polyzonias* var. *gigantea*); Northern Foxe Basin (Calder 1970, as *S. polyzonias*) to Nantucket, Massachusetts (Fraser 1944).

Elsewhere: Spitzbergen, Chukchi Sea, Bering Sea, Kuril Islands, Sea of Okhotsk, Sea of Japan, Alaska to Vancouver Island (Kramp 1911; Naumov 1960; Antsulevich 2015; Choong 2015).

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References

Agassiz, A. (1862) On the mode of development of the marginal tentacles of the free medusæ of some hydroids. *Proceedings of the Boston Society of Natural History*, 9, 88–101.

Agassiz, A. (1865) North American Acalephae. *Illustrated catalogue of the Museum of Comparative Zoölogy, at Harvard College*, No. 2, 1–234.

Agassiz, L. (1850) Contributions to the natural history of the Acalephae of North America. Part I. On the naked-eyed medusae of the shores of Massachusetts, in their perfect state of development. *Memoirs of the American Academy of Arts and Sciences*, New Series, 4, 221–316. [Vol. 4, Part II, in which this article appeared, is dated 1850 on the Title page].

Agassiz, L. (1860) *Contributions to the natural history of the United States of America. Vol. III.* Little, Brown & Company, Boston, 301 pp.

Agassiz, L. (1862) *Contributions to the natural history of the United States of America. Vol. IV.* Little, Brown & Company, Boston, 380 pp.

Alder, J. (1856a) A notice of some new genera and species of British hydroid zoophytes. *Annals and Magazine of Natural History*, Series 2, 18, 353–362.
https://doi.org/10.1080/00222935608697652

Alder, J. (1856b) Descriptions of three new British zoophytes. *Annals and Magazine of Natural History*, Series 2, 18, 439–441.
https://doi.org/10.1080/00222935608697669

Alder, J. (1857) A catalogue of the zoophytes of Northumberland and Durham. *Transactions of the Tyneside Naturalists' Field Club*, 3, 93–162.

Alder, J. (1859) Descriptions of three new species of sertularian zoophytes. *Annals and Magazine of Natural History*, Series 3, 3, 353–356.

Alder, J. (1862) Observations on British zoophytes. *Edinburgh New Philosophical Journal*, New Series, 15, 144.

Allman, G.J. (1859a) Notes on the hydroid zoophytes. I. *Laomedea flexuosa*, Hincks. II. The extra-capsular medusiform sporosacs ("meconidia") of *Laomedea*, and the determination of the species in which they are found. III. *Coryne eximia*, nov. sp., and its medusa. *Annals and Magazine of Natural History*, Series 3, 4, 137–144.

Allman, G.J. (1859b) Notes on the hydroid zoophytes. *Annals and Magazine of Natural History*, Series 3, 4, 367–370.

Allman, G.J. (1863) Notes on the Hydroida. I. On the structure of *Corymorpha nutans*. II. Diagnoses of new species of Tubularidae obtained, during the autumn of 1862, on the coasts of Shetland and Devonshire. *Annals and Magazine of Natural History*, Series 3, 11, 1–12.

Allman, G.J. (1864) On the construction and limitation of genera among the Hydroida. *Annals and Magazine of Natural History*, Series 3, 13, 345–380.

Allman, G.J. (1872) *A monograph of the gymnoblastic or tubularian hydroids. Conclusion of Part I, and Part II, containing descriptions of the genera and species of the Gymnoblastea*. Ray Society, London, pp. 155–450.

Allman, G.J. (1874) Report on the Hydroida collected during the expeditions of H.M.S. 'Porcupine.' *Transactions of the Zoological Society of London*, 8, 469–481.
https://doi.org/10.1111/j.1096-3642.1874.tb00566.x

Allman, G.J. (1877) Report on the Hydroida collected during the exploration of the Gulf Stream by L. F. de Pourtalès, assistant, United States Coast Survey. *Memoirs of the Museum of Comparative Zoölogy at Harvard College*, 5 (2), 1–66.

Allman, G.J. (1888) Report on the Hydroida dredged by H.M.S. Challenger during the years 1873–76. Part II—The Tubularinae, Corymorphinae, Campanularinae, Sertularinae, and Thalamophora. *Report on the Scientific Results of the Voyage of H.M.S. Challenger during the Years 1873–76, Zoology*, 7 (23), 1–90.

Allwein, J. (1967) North American hydromedusae from Beaufort, North Carolina. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening*, 130, 117–136.

Antsulevich, A.E. (1980a) Novyi vid gidroidov roda *Halecium* (Leptolida, Haleciidae) iz yuzhno-kurilskogo raiona. *Zoologicheskiї Zhurnal*, 59, 137–139.

Antsulevich, A.E. (1980b) O dvukh dalnevostochnykh vidakh gidroidov (Leptolida, Thecaphora). *Zoologicheskiї Zhurnal*, 59, 615–617.

Antsulevich, A.E. (1987) Gidroidy shelfa Kurilskykh ostrovov. *Zoologicheskiї Institut, Akademiya Nauk SSSR*, 1–165.

Antsulevich, A.E. (2015) *Hydrozoa (hydroids and hydromedusae) of Russian seas*. St. Petersburg University Press, St. Petersburg, 860 pp. [in Russian]

Antsulevich, A.E. & Polteva, D.G. (1986) Gidroidy roda *Rhizogeton* (Athecata, Clavidae) v faune SSSR. *Zoologicheskii Zhurnal*, 65, 965–972.

Antsulevich, A.E. & Regel, K.V. (1986) Dva novykh vida gidroidov (Hydroidea, Thecaphora) iz melkovodiї srednikh

Kurilskikh ostravov. *Zoologicheskiĭ Zhurnal*, 65, 929–932.

Arai, M.N. & Brinckmann-Voss, A. (1980) Hydromedusae of British Columbia and Puget Sound. *Canadian Bulletin of Fisheries and Aquatic Sciences*, 204, 1–192.

Barry, B. (1974) *Hydromedusae of the Canadian eastern Arctic*. M.Sc. Thesis, McGill University, Montreal, 146 pp.

Bedot, M. (1925) Matériaux pour servir à l'histoire des hydroïdes. 7me période (1901 à 1910). *Revue Suisse de Zoologie*, 32 (Fascicule Supplémentaire), 1–657.

Bergh, R.S. (1887) Goplepolyper (Hydroider) fra Kara-Havet. *In*: Lütken, C.F. (Ed.), *Dijmphna-Togtets zoologisk-botaniske Udbytte*. H. Hagerup, Kjøbenhavn, pp. 329–338.

Berrill, N.J. (1949) Growth and form in gymnoblastic hydroids. I. Polymorphic development in *Bougainvillia* and *Aselomaris*. *Journal of Morphology*, 84, 1–30.
https://doi.org/10.1002/jmor.1050840102

Berrill, N.J. (1952) Growth and form in gymnoblastic hydroids. II. Sexual and asexual reproduction in *Rathkea*. III. Hydranth and gonophore development in *Pennaria* and *Acaulis*. IV. Relative growth in *Eudendrium*. *Journal of Morphology*, 90, 1–32.
https://doi.org/10.1002/jmor.1050900102

Berrill, N.J. (1953) Growth and form in gymnoblastic hydroids. VII. Growth and reproduction in *Syncoryne* and *Coryne*. *Journal of Morphology*, 92, 273–302.
https://doi.org/10.1002/jmor.1050920204

Bigelow, H.B. (1913) Medusae and Siphonophorae collected by the U.S. Fisheries Steamer "Albatross" in the northwestern Pacific, 1906. *Proceedings of the United States National Museum*, 44, 1–119.
https://doi.org/10.5479/si.00963801.44-1946.1

Bigelow, H.B. (1914) Fauna of New England. 12. List of the Medusae Craspedotae, Siphonophorae, Scyphomedusae, Ctenophoridae. *Occasional Papers of the Boston Society of Natural History*, 7, 1–37.

Billard, A. (1922) Note sur deux espèces d'hydroïdes du littoral d'Ostende. *Annales de la Société Royale Zoologique et Malacologique de Belgique*, 52, 135–139.

Billard, A. (1926) Cambridge Expedition to the Suez Canal, 1924. IV. Rapport sur les hydroïdes. *Transactions of the Zoological Society of London*, 22, 85–103.
https://doi.org/10.1111/j.1096-3642.1926.tb00323.x

Billard, A. (1929) Note sur un genre nouveau et quelques espèces nouvelles d'Halecidae. *Bulletin de la Société Zoologique de France*, 54, 305–307.

Billard, A. (1933) Les hydroïdes des golfes de Suez et d'Akaba. *In: Mission Robert Ph. Dollfus en Égypte. Mémoires présentés à L'Institut d'Égypte et publiés sous les auspices de sa Majesté Fouad Ier, Roi d'Égypte*, 21, 1–30.

Billard, A. (1934) Note sur quelques hydroïdes du Maroc. *Bulletin de la Société Zoologique de France*, 59, 227–231.

Billard, A. (1937) Note sur une nouvelle espèce de *Halecium* (*Halecium galeatum*). *Bulletin de la Société Zoologique de France*, 62, 292–293.

Bleakney, J.S. (1972) Ecological implications of annual variation in tidal extremes. *Ecology*, 53, 933–938.
https://doi.org/10.2307/1934311

Bleakney, J.S. (1996) *Sea slugs of Atlantic Canada and the Gulf of Maine*. Nimbus Publishing and the Nova Scotia Museum, Halifax, 216 pp.

Boeck, C. (1860) Omhandlede en Tubularie fra Belsund paa Spitzbergen – *Tubularia regalis*. *Forhandlinger i Videnskabs-Selskabet i Christiania*, 1859, 114–117.

Boero, F., Bouillon, J. & Danovaro, R. (1987) The life cycle of *Tiaropsidium roseum* (Tiaropsidae fam. nov., Leptomedusae, Cnidaria). *Indo-Malayan Zoology*, 4, 293–302.

Boero, F., Bouillon, J. & Gravili, C. (2000) A survey of *Zanclea*, *Halocoryne* and *Zanclella* (Cnidaria, Hydrozoa, Anthomedusae, Zancleidae) with description of new species. *Italian Journal of Zoology*, 67, 93–124.
https://doi.org/10.1080/11250000009356301

Bonnevie, K. (1898) Zur Systematik der Hydroiden. *Zeitschrift für Wissenschaftliche Zoologie*, 63, 465–495.

Bonnevie, K. (1899a) Neue norwegische Hydroiden. *Bergens Museums Aarbog*, 1898, 5, 1–16.

Bonnevie, K. (1899b) Hydroida. *Den Norske Nordhavs-Expedition 1876-1878. Zoologi*, 7 (26), 1–103.

Bonnevie, K. (1901) Hydroiden. *In*: Appellöf, A. (Ed.), *Meeresfauna von Bergen. Heft I*. Bergen, John Grieg, pp. 1–15.

Borradaile, L.A. (1905) Hydroids. *The Fauna and Geography of the Maldive and Laccadive Archipelagoes*, 2, 836–845.

Bosc, L.A.G. (1802) *Histoire naturelle des vers, contenant leur description et leurs moeurs; avec figures dessinées d'après nature. Tome 3*. Guilleminet, Paris, 270 pp.
https://doi.org/10.5962/bhl.title.64025

Bouillon, J. & Barnett, T.J. (1999) The marine fauna of New Zealand: hydromedusae (Cnidaria: Hydrozoa). *National Institute of Water and Atmospheric Research Biodiversity Memoir*, 113, 1–136.

Bouillon, J., Gravili, C., Pagès, F., Gili, J.-M. & Boero, F. (2006) An introduction to Hydrozoa. *Mémoires du Muséum National d'Histoire Naturelle*, 194, 1–591.

Bourne G.C. (1890) Notes on the hydroids of Plymouth. *Journal of the Marine Biological Association of the United Kingdom*, 1, 391–398.
https://doi.org/10.1017/S0025315400057866

Bousfield, E.L. & Leim, A.H. (1960) The fauna of Minas Basin and Minas Channel. *National Museum of Canada Bulletin*, 166, 30 pp. [This reference has been variously dated as 1958, 1959, and 1960. A note on page 30 states "The Queen's Printer and Controller of Stationery Ottawa, 1960".]

Brinckmann-Voss, A. (1970) Anthomedusae/Athecatae (Hydrozoa, Cnidaria) of the Mediterranean. Part I. Capitata. *Fauna e Flora del Golfo di Napoli, Monografia*, 39, 1–96.

Brinckmann-Voss, A. (1980) A new species of the genus *Sarsia* (Hydrozoa, Corynidae) from Vancouver Island and Puget Sound. *Royal Ontario Museum Life Sciences Occasional Papers*, 34, 1–4.

Brinckmann-Voss, A. (1989) *Sarsia cliffordi* n.sp. (Cnidaria, Hydrozoa, Anthomedusae) from British Columbia, with distribution records and evaluation of related species. *Canadian Journal of Zoology*, 67, 685–691.
https://doi.org/10.1139/z89-099

Brinckmann-Voss, A. (1996) Seasonality of hydroids (Hydrozoa, Cnidaria) from an intertidal pool and adjacent subtidal habitats at Race Rocks, off Vancouver Island, Canada. *Scientia Marina*, 60, 89–97.

Brinckmann-Voss, A. (2000) The hydroid and medusa of *Sarsia bella* sp. nov. (Hydrozoa, Anthoathecatae, Corynidae), with a correction of the "life cycle" of *Polyorchis penicillatus* (Eschscholtz). *Scientia Marina*, 64, 189–195.
https://doi.org/10.3989/scimar.2000.64s1189

Brinckmann-Voss, A. & Calder, D.R. (2013) *Zyzzyzus rubusidaeus* (Cnidaria, Hydrozoa, Tubulariidae), a new species of anthoathecate hydroid from the coast of British Columbia, Canada. *Zootaxa*, 3666 (3), 389–397.
https://doi.org/10.11646/zootaxa.3666.3.9

Brinkhurst, R.O., Linkletter, L.E., Lord, E.I., Connors, S.A. & Dadswell, M.J. (1976) *A preliminary guide to the littoral and sublittoral marine invertebrates of Passamaquoddy Bay*. Biological Station, St. Andrews, New Brunswick, 166 pp.

Broch, H. (1903) Die von dem norwegischen Fischereidampfer „Michael Sars" in den Jahren 1900–1902 in dem Nordmeer gesammelten Hydroiden. *Bergens Museums Aarbog*, 1903 (9), 1–14.

Broch, H. (1910) Die Hydroiden der Arktischen Meere. *Fauna Arctica*, 5, 127–248. [dating of this publication follows evidence provided by Cornelius (1995b)]

Broch, H. (1916) Hydroida (Part I.). *The Danish Ingolf Expedition*, 5 (6), 1–66.

Broch, H. (1918) Hydroida (Part II.). *The Danish Ingolf Expedition*, 5 (7), 1–205.

Bromley, J.E.C. (1979) A preliminary checklist of marine fauna of Minas Basin and Minas Channel. *Proceedings of the Nova Scotian Institute of Science*, 29, 517–541.

Bromley, J.E.C. & Bleakney, J.S. (1979) Taxonomic survey of benthic fauna in estuarine saltmarsh pools, Minas Basin, Bay of Fundy. *Proceedings of the Nova Scotian Institute of Science*, 29, 411–446.

Bromley, J.E.C. & Bleakney, J.S. (1985) *Keys to the fauna and flora of Minas Basin*. National Research Council of Canada, Ottawa, 366 pp.

Browne, E.T. (1897) The hydroids of Valencia Harbour, Ireland. *Irish Naturalist*, 6, 241–246.

Brunel, P., Bossé, L. & Lamarche, G. (1998) Catalogue des invertébrés marins de l'estuaire et du golfe du Saint-Laurent. Catalogue of the marine invertebrates of the estuary and Gulf of St. Lawrence. *Canadian Special Publication of Fisheries and Aquatic Sciences*, 126, 1–405.

Buss, L.W. & Yund, P.O. (1989) A sibling species group of *Hydractinia* in the north-eastern United States. *Journal of the Marine Biological Association of the United Kingdom*, 69, 857–874.
https://doi.org/10.1017/S0025315400032215

Buzeta, M.-I. & Singh, R. (2008) Identification of ecologically and biologicaly significant areas in the Bay of Fundy, Gulf of Maine. Vol. 1. Areas identified for review, and assessment of the Quoddy Region. *Canadian Technical Report of Fisheries and Aquatic Sciences*, 2788, 1–80.

Caddy, J.F. (1970) Records of associated fauna in scallop dredge hauls from the Bay of Fundy. *Fisheries Research Board of Canada Technical Report*, 225, 1–37.

Calder, D.R. (1970) Thecate hydroids from the shelf waters of northern Canada. *Journal of the Fisheries Research Board of Canada*, 27, 1501–1547.
https://doi.org/10.1139/f70-175

Calder, D.R. (1971) Hydroids and hydromedusae of southern Chesapeake Bay. *Virginia Institute of Marine Science Special Papers in Marine Science*, 1, 1–125.

Calder, D.R. (1972) Some athecate hydroids from the shelf waters of northern Canada. *Journal of the Fisheries Research Board of Canada*, 29, 217–228.
https://doi.org/10.1139/f72-040

Calder, D.R. (1975) Biotic Census of Cape Cod Bay: hydroids. *Biological Bulletin*, 149, 287–315.
https://doi.org/10.2307/1540528

Calder, D.R. (1976) The zonation of hydroids along salinity gradients in South Carolina estuaries. *In:* Mackie, G.O. (Ed.), *Coelenterate ecology and behavior*. Plenum Press, New York, pp. 165–174.
https://doi.org/10.1007/978-1-4757-9724-4_18

Calder, D.R. (1988) Shallow-water hydroids of Bermuda: the Athecatae. *Royal Ontario Museum Life Sciences Contributions*, 148, 1–107.

Calder, D.R. (1990) Seasonal cycles of activity and inactivity in some hydroids from Virginia and South Carolina, U.S.A. *Canadian Journal of Zoology*, 68, 442–450.

https://doi.org/10.1139/z90-065

Calder, D.R. (1991) Shallow-water hydroids of Bermuda. The Thecatae, exclusive of Plumularioidea. *Royal Ontario Museum, Life Sciences Contributions*, 154, 1–140.

Calder, D.R. (1992) *Zanclea costata* Gegenbaur, 1856 (Cnidaria, Hydrozoa): proposed conservation of both generic and specific names. *Bulletin of Zoological Nomenclature*, 49, 184–186.

Calder, D.R. (2004) Subtidal hydroids (Cnidaria) of Northumberland Strait, Atlantic Canada, with observations on their life cycles and distributions. *Canadian Field-Naturalist*, 117, 555–564. (although dated 2003 in the journal, this article did not appear until 2004)

Calder, D.R. (2010) Some anthoathecate hydroids and limnopolyps (Cnidaria, Hydrozoa) from the Hawaiian archipelago. *Zootaxa*, 2590, 1–91.

Calder, D.R. (2012) On a collection of hydroids (Cnidaria, Hydrozoa, Hydroidolina) from the west coast of Sweden, with a checklist of species from the region. *Zootaxa*, 3171, 1–77.

Calder, D.R. (2013) Some shallow-water hydroids (Cnidaria: Hydrozoa) from the central east coast of Florida, USA. *Zootaxa*, 3648 (1), 1–72.
https://doi.org/10.11646/zootaxa.3648.1.1

Calder, D.R., Carlton, J.T. & Choong, H.H.C. (2014) *Clava multicornis* (Forsskål, 1775): rediscovery of a North Atlantic hydroid (Cnidaria, Hydrozoa, Anthoathecata) on the Pacific coast of North America. *BioInvasions Records*, 3, 71–76.
https://doi.org/10.3391/bir.2014.3.2.03

Calder, D.R. & Hester, B.S. (1978) Phylum Cnidaria. *In*: Zingmark, R.G. (Ed.), *An annotated checklist of the biota of the coastal zone of South Carolina*. University of South Carolina Press, Columbia, pp. 87–93.

Calder, D.R. & Maÿal, E.M. (1998) Dry season distribution of hydroids in a small tropical estuary, Pernambuco, Brazil. *Zoologische Verhandelingen*, 323, 69–78.

Calder, D.R. & Vervoort, W. (1998) Some hydroids (Cnidaria: Hydrozoa) from the Mid-Atlantic Ridge, in the North Atlantic Ocean. *Zoologische Verhandelingen*, 319, 1–65.

Calder, D.R., Vervoort, W. & Hochberg, F.G. (2009) Lectotype designations of new species of hydroids (Cnidaria, Hydrozoa), described by C.M. Fraser, from Allan Hancock Pacific and Caribbean Sea Expeditions. *Zoologische Mededelingen*, 83, 919–1058.

Calkins, G.N. (1899) Some hydroids from Puget Sound. *Proceedings of the Boston Society of Natural History*, 28, 333–367.

Cartwright, P., Evans, N.M., Dunn, C.W., Marques, A.C., Miglietta, M.P., Schuchert, P. & Collins, A.G. (2008) Phylogenetics of Hydroidolina (Hydrozoa: Cnidaria). *Journal of the Marine Biological Association of the United Kingdom*, 88, 1663–1672.
https://doi.org/10.1017/S0025315408002257

Cavolini, F. (1785) *Memorie per servire alla storia de' polipi marini*. s.n., Napoli, 279 pp.

Choong, H.H.C. (2015) Hydroids of the genus *Sertularella* (Cnidaria: Hydrozoa: Sertulariidae) from the Pacific coast of Canada in the collection of the Royal Ontario Museum, with descriptions of four new species. *Zootaxa*, 3925 (3), 387–408.
https://doi.org/10.11646/zootaxa.3925.3.4

Clark, H.J. (1865a) Discovery of the female of *Rhizogeton fusiformis*, Ag. *Proceedings of the Boston Society of Natural History*, 9, 342.

Clark, H.J. (1865b) *Mind in nature; or the origin of life, and the mode of development of animals*. D. Appleton & Company, New York, 322 pp.
https://doi.org/10.5962/bhl.title.105867

Clark, S.F. (1875) Descriptions of new and rare species of hydroids from the New England coast. *Transactions of the Connecticut Academy of Arts and Sciences*, 3, 58–66.

Clark, S.F. (1877) Report on the hydroids collected on the coast of Alaska and the Aleutian Islands, by W. H. Dall, U.S. Coast Survey, and party, from 1871 to 1874 inclusive. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 1876, 28, 209–238. [dating of this article follows Cornelius (1982: 129), who correctly discovered that it was published during early January 1877 (apparently in two parts, on 02 and 09 January) as per a note on p. ii of the journal volume].

Clarke, S.F. (1879) Report on the Hydroida collected during the exploration of the Gulf Stream and Gulf of Mexico by Alexander Agassiz, 1877–78. *Bulletin of the Museum of Comparative Zoölogy at Harvard College*, 5, 239–252.

Clarke, S.F. (1882) New and interesting hydroids from Chesapeake Bay. *Memoirs of the Boston Society of Natural History*, 3, 135–142.

Clarke, S.F. (1894) Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U.S. Fish Commission steamer "Albatross," during 1891, Lieut. Commander Z.L. Tanner, U.S.N. commanding. The hydroids. *Bulletin of the Museum of Comparative Zoology at Harvard College, in Cambridge*, 25, 71–77.

Cockerell, T.D.A. (1911) The nomenclature of the hydromedusae. *Proceedings of the Biological Society of Washington*, 24, 77–86.

Collins, A.G. (2000) Towards understanding the phylogenetic history of Hydrozoa: hypothesis testing with 18S gene sequence data. *Scientia Marina*, 64 (Suplemento 1), 5–22.
https://doi.org/10.3989/scimar.2000.64s15

Collins, A.G., Winkelmann, S., Hadrys, H. & Schierwater, B. (2005) Phylogeny of Capitata and Corynidae (Cnidaria, Hydrozoa) in light of mitochondrial 16S rDNA data. *Zoologica Scripta*, 34, 91–99. https://doi.org/10.1111/j.1463-6409.2005.00172.x

Congdon, E.D. (1907) The hydroids of Bermuda. *Proceedings of the American Academy of Arts and Sciences*, 42, 463–485. https://doi.org/10.2307/20022242

Cooke, W.J. (1975) Shallow water hydroids from Enewetak Atoll, Marshall Islands. *Micronesica*, 11, 85–108.

Cornelius, P.F.S. (1975) The hydroid species of *Obelia* (Coelenterata, Hydrozoa: Campanulariidae), with notes on the medusa stage. *Bulletin of the British Museum (Natural History)*, *Zoology*, 28, 249–293.

Cornelius, P.F.S. (1982) Hydroids and medusae of the family Campanulariidae recorded from the eastern North Atlantic, with a world synopsis of genera. *Bulletin of the British Museum (Natural History), Zoology*, 42, 37–148.

Cornelius, P.F.S. (1988) Hydroid collecting from intertidal pools at Holme next the Sea, Norfolk. *Transactions of the Norfolk and Norwich Naturalists' Field Society*, 28, 72–78.

Cornelius, P.F.S. (1990) European *Obelia* (Cnidaria, Hydroida): systematics and identification. *Journal of Natural History*, 24, 535–578.
https://doi.org/10.1080/00222939000770381

Cornelius, P.F.S. (1992) Medusa loss in leptolid Hydrozoa (Cnidaria), hydroid rafting, and abbreviated life-cycles among their remote-island faunae: an interim review. *Scientia Marina*, 56, 245–261.

Cornelius, P.F.S. (1995a) North-west European thecate hydroids and their medusae. Part 1. Introduction, Laodiceidae to Haleciidae. *Synopses of the British Fauna*, New Series, 50, 347 pp.

Cornelius, P.F.S. (1995b) North-west European thecate hydroids and their medusae. Part 2. Sertulariidae to Campanulariidae. *Synopses of the British Fauna*, New Series, 50, 386 pp.

Cornelius, P.F.S. & Garfath, J. (1980) The coelenterate taxa of Joshua Alder. *Bulletin of the British Museum (Natural History), Zoology*, 39, 273–291.

Costello, J.H. & Mathieu, H.W. (1995) Seasonal abundance of medusae in Eel Pond, Massachusetts, USA during 1990–1991. *Journal of Plankton Research*, 17, 199–204.
https://doi.org/10.1093/plankt/17.1.199

Coughtrey, M. (1876) Critical notes on the New-Zealand Hydroida, suborder Thecaphora. *Annals and Magazine of Natural History*, Series 4, 17, 22–32.
https://doi.org/10.1080/00222937608681891

Cunningham, C.W., Buss, L.W. & Anderson, C. (1991) Molecular and geologic evidence of shared history between hermit crabs and the symbiotic genus *Hydractinia*. *Evolution*, 45, 1301–1316.
https://doi.org/10.2307/2409881

Dahl, K., Stenberg, C., Lundsteen, S., Støttrup, J., Dolmer, P. & Tendal, O.S. (2009) *Ecology of Læsø Trindel – a reef impacted by extraction of boulders. National Environmental Research Institute Technical Report No. 757*. Aarus University, Aarhus 48 pp.

Daly, M., Brugler, M.R., Cartwright, P., Collins, A.G., Dawson, M.N., Fautin, D.G., France, S.C., McFadden, C.S., Opresko, D.M., Rodriguez, E., Romano, S.L. & Stake, J.L. (2007) The phylum Cnidaria: a review of phylogenetic patterns and diversity 300 years after Linnaeus. *Zootaxa*, 1668, 127–182.

Dons, C. (1912) Hydroid-Bemerkungen. I. *Rhizogeton nudus* Broch und *Halecium curvicaule* Lorenz neu für die Fauna Norwegens. *Tromsø Museums Aarshefter*, 34, 51–70.

Dunbar, M.J. (1942) Marine macroplankton from the Canadian eastern Arctic. II. Medusae, Siphonophora, Ctenophora, Pteropoda, and Chaetognatha. *Canadian Journal of Research*, 20D, 71–77.
https://doi.org/10.1139/cjr42d-008

Durand, N., Cornett, A. & Bourban, S. (2008) 3D modelling and assessment of tidal current energy resources in the Bay of Fundy. *National Research Council of Canada, Canadian Hydraulics Centre Technical Report*, CHC-TR-052, 1–110.

Edwards, C. (1966) The hydroid and the medusa *Bougainvillia principis*, and a review of the British species of *Bougainvillia*. *Journal of the Marine Biological Association of the United Kingdom*, 46, 129–152.
https://doi.org/10.1017/S0025315400017604

Edwards, C. (1972) The hydroids and the medusae *Podocoryne areolata*, *P. borealis* and *P. carnea*. *Journal of the Marine Biological Association of the United Kingdom*, 52, 97–144.
https://doi.org/10.1017/S0025315400018609

Edwards, C. (1978) The hydroids and medusae *Sarsia occulta* sp.nov., *Sarsia tubulosa* and *Sarsia loveni*. *Journal of the Marine Biological Association of the United Kingdom*, 58, 291–311.
https://doi.org/10.1017/S0025315400027995

Edwards, C. (1983) The hydroids and medusae *Sarsia piriforma* sp.nov. and *Sarsia striata* sp.nov. from the west coast of Scotland, with observations on other species. *Journal of the Marine Biological Association of the United Kingdom*, 63, 49–60.
https://doi.org/10.1017/S0025315400049791

Ehrenberg, C.G. (1834) Beiträge zur physiologischen Kenntniss der Corallenthiere im allgemeinen, und besonders des rothen Meeres, nebst einem Versuche zur physiologischen Systematik derselben. *Abhandlung der Königlichen Akademie der Wissenschaften zu Berlin*, 1, 225–380.

Ellis, J. & Solander, D. (1786) *The natural history of many curious and uncommon zoophytes, collected from various parts of* *the globe by the late John Ellis… Systematically arranged and described by the late Daniel Solander*. Benjamin White & Son, and Peter Elmsly, London, 206 pp.

Eschscholtz, F. (1829) *System der Acalephen. Eine ausfürliche Beschreibung aller medusenartigen Strahltiere*. Ferdinand Dümmler, Berlin, 190 pp.

Fabricius, O. (1780) *Fauna Groenlandica*. Rothe, Hafniae & Lipsiae, 452 pp.

Fewkes, J.W. (1890) A zoölogical reconnoissance in Grand Manan. *American Naturalist*, 24, 423–438.
https://doi.org/10.1086/275123

Fish, C.J. & Johnson, M.W. (1937) The biology of the zooplankton population in the Bay of Fundy and Gulf of Maine with special reference to production and distribution. *Journal of the Biological Board of Canada*, 3, 189–322.
https://doi.org/10.1139/f37-015

Fleming, J. (1820) Observations on the natural history of the *Sertularia gelatinosa* of Pallas. *Edinburgh Philosophical Journal*, 2, 82–89.

Fleming, J. (1823) Gleanings of natural history, gathered on the coast of Scotland during a voyage in 1821. *Edinburgh Philosophical Journal*, 8, 294–303.

Fleming, J. (1828) *A history of British animals, exhibiting the descriptive characters and systematical arrangement of the genera and species of quadrupeds, birds, reptiles, fishes, Mollusca, and Radiata of the United Kingdom*. Bell & Bradfute, Edinburgh, 565 pp.
https://doi.org/10.5962/bhl.title.12859

Folino, N.C. & Yund, P.O. (1998) The distribution of hydroid sibling species on hermit crabs in estuaries in the Gulf of Maine. *Estuaries*, 21, 829–836.
https://doi.org/10.2307/1353284

Forbes, E. (1846) On the pulmograde medusae of the British seas. *Annals and Magazine of Natural History*, 18, 284–287.
https://doi.org/10.1080/037454809494431

Forbes, E. (1848) *A monograph of the British naked-eyed medusae: with figures of all the species*. Ray Society, London, 104 pp.

Forbes, E. & Goodsir, J. (1851) On some remarkable marine Invertebrata new to the British seas. *Transactions of the Royal Society of Edinburgh*, 20, 307–315.
https://doi.org/10.1017/S0080456800033202

Forbes, E. & Goodsir, J. (1853) On some remarkable marine Invertebrata new to the British seas. *Transactions of the Royal Society of Edinburgh*, 20, 307–315.
https://doi.org/10.1017/S0080456800033202

Forsskål, P. (1775) *Descriptiones animalium avium, amphibiorum, piscium, insectorum, vermium; quae in itinere orientali observavit Petrus Forskål. Prof. Haun. Post mortem auctoris edidit Carsten Niebuhr*. Mölleri, Hauniae, 140 pp.

Fraser, C.M. (1911) The hydroids of the west coast of North America with special reference to those of the Vancouver Island region. *Bulletin from the Laboratories of Natural History of the State University of Iowa*, 6 (1), 3–91.

Fraser, C.M. (1912) Some hydroids of Beaufort, North Carolina. *Bulletin of the United States Bureau of Fisheries*, 30, 339–387.

Fraser, C.M. (1913) Hydroids from Nova Scotia. *Canada Geological Survey, Victoria Memorial Museum Bulletin*, 1, 157–186.

Fraser, C.M. (1914) Some hydroids of the Vancouver Island region. *Transactions of the Royal Society of Canada*, Section 4, Series 3, 8, 99–216.

Fraser, C.M. (1918) Hydroids of eastern Canada. *Contributions to Canadian Biology*, 1917–1918, 329–367.

Fraser, C.M. (1921) Key to the hydroids of eastern Canada. *Contributions to Canadian Biology*, 1918–1920, 137–180.

Fraser, C.M. (1922) A new *Hydractinia* and other west coast hydroids. *Contributions to Canadian Biology*, New Series, 1, 97–100.
https://doi.org/10.1139/f22-007

Fraser, C.M. (1924) *Acaulis primarius* Stimpson. *Transactions of the Royal Society of Canada*, Series 3, Section 5, 18, 167–173.

Fraser, C.M. (1931) Biological and oceanographic conditions in Hudson Bay. 3. Hydroids of Hudson Bay and Hudson Strait. *Contributions to Canadian Biology and Fisheries*, 6, 477–481.
https://doi.org/10.1139/f31-025

Fraser, C.M. (1935) Some Japanese hydroids, mostly new. *Transactions of the Royal Society of Canada*, Series 3, Section 5, 29, 105–112.

Fraser, C.M. (1937) *Hydroids of the Pacific coast of Canada and the United States*. University of Toronto Press, Toronto, 207 pp.

Fraser, C.M. (1938a) Hydroids of the 1934 Allan Hancock Pacific Expedition. *Allan Hancock Pacific Expeditions*, 4, 1–105.

Fraser, C.M. (1938b) Hydroids of the 1932, 1933, 1935, and 1938 Allan Hancock Pacific Expeditions. *Allan Hancock Pacific Expeditions*, 4, 129–153.

Fraser, C.M. (1940) Seven new species and one new genus of hydroids, mostly from the Atlantic Ocean. *Proceedings of the United States National Museum*, 88, 575–580.
https://doi.org/10.5479/si.00963801.88-3090.575

Fraser, C.M. (1941) New species of hydroids, mostly from the Atlantic Ocean, in the United States National Museum. *Proceedings of the United States National Museum*, 91, 77–89.

https://doi.org/10.5479/si.00963801.91-3125.77

Fraser, C.M. (1943) Distribution records of some hydroids in the collection of the Museum of Comparative Zoölogy at Harvard College, with description of new genera and new species. *Proceedings of the New England Zoölogical Club*, 22, 75–98.

Fraser, C.M. (1944) *Hydroids of the Atlantic coast of North America*. University of Toronto Press, Toronto, 451 pp.

Fraser, C.M. (1945) Notes on some recently collected hydroids in the United States National Museum, with descriptions of three new species. *Journal of the Washington Academy of Sciences*, 35, 21–23.

Fraser, C.M. (1947a) *Distribution and relationship in American hydroids*. University of Toronto Press, Toronto, 464 pp. [although dated "1946" on the title page, this book was not published until February 1947]

Fraser, C.M. (1947b) Hydroids of the 1939 Allan Hancock Caribbean Sea Expedition. *Allan Hancock Atlantic Expedition*, 4, 1–24.

Fraser, C.M. (1948) Hydroids of the Allan Hancock Pacific Expeditions since March, 1938. *Allan Hancock Pacific Expeditions*, 4, 179–343.

Fuller, C.B. (1862a) Report on marine zoology. *In*: *Second annual report upon the natural history and geology of the state of Maine, 1862*. Augusta, Maine, pp. 129–133.

Fuller, C.B. (1862b) Observations upon the animals found at low water mark at Treat's Island in Eastport Harbor. *Proceedings of the Portland Society of Natural History*, 1, 91.

Fuller, S., Kenchington, E., Davis, D.S. & Butler, M. (1998) Associated fauna of commercial scallop grounds in the lower Bay of Fundy. *Marine Issues Committee Special Publication*, 2, 1–40.

Gaertner, J. (1774) *Coryne pusilla* Gaertner. In litteris. *In*: Pallas, P.S. (Ed.), *Spicilegia zoologica quibus novae imprimus et obscurae animalium species*. *Fasc. 10*. August Lange, Berolini, pp. 40–41.

Galea, H.R. (2007) Hydroids and hydromedusae (Cnidaria: Hydrozoa) from the fjords region of southern Chile. *Zootaxa*, 1597, 1–116.

Galea, H.R. (2010a) Note on a small collection of thecate hydroids (Cnidaria: Hydrozoa) from Tristan da Cunha, south Atlantic. *Zootaxa*, 2336, 1–18.

Galea, H.R. (2010b) Additional shallow-water thecate hydroids (Cnidaria: Hydrozoa) from Guadeloupe and Les Saintes, French Lesser Antilles. *Zootaxa*, 2570, 1–40.

Galea, H.R. (2013) New additions to the shallow-water hydroids (Cnidaria: Hydrozoa) of the French Lesser Antilles: Martinique. *Zootaxa*, 3686 (1), 1–50.
https://doi.org/10.11646/zootaxa.3686.1.1

Galea, H.R. & Ferry, R. (2015) Notes on some hydroids (Cnidaria) from Martinique, with descriptions of five new species. *Revue Suisse de Zoologie*, 122, 213–246.

Galea, H.R., Häussermann, V. & Försterra, G. (2009) New additions to the hydroids (Cnidaria: Hydrozoa) from the fjords region of southern Chile. *Zootaxa*, 2019, 1–28.

Galea, H.R. & Schories, D. (2012) Some hydrozoans (Cnidaria) from central Chile and the Strait of Magellan. *Zootaxa*, 3296, 19–67.

Galea, H.R., Schories, D., Försterra, G. & Häussermann, V. (2014) New species and new records of hydroids (Cnidaria: Hydrozoa) from Chile. *Zootaxa*, 3852 (1), 1–50.
https://doi.org/10.11646/zootaxa.3852.1.1

Ganong, W.F. (1890a) Zoological notes. *Bulletin of the Natural History Society of New Brunswick*, 9, 46–59.

Ganong, W.F. (1890b) Southern invertebrates on the shores of Acadia. *Transactions of the Royal Society of Canada*, Section 4, 8, 167–185.

Gegenbaur, C. (1856) Versuch eines Systemes der Medusen, mit Beschreibung neuer oder wenig gekannter Formen; zugleich ein Beitrag zur Kenntniss der Fauna des Mittelmeeres. *Zeitschrift für Wissenschaftliche Zoologie*, 8, 202–273. [dating of this article follows evidence given in Calder 2013: 65]

Genzano, G.N., Giberto, D., Schejter, L., Bremec, C. & Meretta, P. (2009) Hydroid assemblages from the southwestern Atlantic Ocean (34–42° S). *Marine Ecology*, 30, 33–46.
https://doi.org/10.1111/j.1439-0485.2008.00247.x

Gibbons, M.J. & Ryland, J.S. (1989) Intertidal and shallow water hydroids from Fiji. I. Athecata to Sertulariidae. *Memoirs of the Queensland Museum*, 27, 377–432.

Gmelin, J.F. (1791) *Caroli a Linné, systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis. Editio decima tertia, aucta reformata. Tomus 1. Pars 6*. G.E. Beer, Lipsiae, 1100 pp. [pp. 3021–4120]

Goldfuss, G.A. (1820) *Handbuch der Zoologie. I. Abtheilung*. Johann Leonhard Schrag, Nürnberg, 696 pp.

Gosse, P.H. (1853) *A naturalist's rambles on the Devonshire coast*. John van Voorst, London, 451 pp.

Gould, A.A. (1841) *Report on the Invertebrata of Massachusetts, comprising the Mollusca, Crustacea, Annelida, and Radiata*. Folsom, Wells & Thurston, Cambridge, 373.

Govindarajan, A.F., Boero, F. & Halanych, K.M. (2006) Phylogenetic analysis with multiple markers indicates repeated loss of the adult medusa stage in Campanulariidae (Hydrozoa, Cnidaria). *Molecular Phylogenetics and Evolution*, 38, 820–834.
https://doi.org/10.1016/j.ympev.2005.11.012

Grainger, E.H. (1959) The annual oceanographic cycle at Igloolik in the Canadian Arctic. 1. The zooplankton and physical and chemical observations. *Journal of the Fisheries Research Board of Canada*, 16, 453–501.

https://doi.org/10.1139/f59-039

Grainger, E.H. (1962) Zooplankton of Foxe Basin in the Canadian Arctic. *Journal of the Fisheries Research Board of Canada*, 19, 377–400.
https://doi.org/10.1139/f62-022

Grainger, E.H. (1975) Biological productivity of the southern Beaufort Sea: the physical-chemical environment and the plankton. *Beaufort Sea Technical Report*, 12a, 1–82.

Gravili, C., Boero, F. & Bouillon, J. (1996) *Zanclea* species (Hydroidomedusae, Anthomedusae) from the Mediterranean. *Scientia Marina*, 60, 99–108.

Gravili, C., De Vito, D., Di Camillo, C.G., Martell, L., Piraino, S. & Boero, F. (2015) The non-siphonophoran Hydrozoa (Cnidaria) of Salento, Italy with notes on their life-cycles: an illustrated guide. *Zootaxa*, 3908 (1), 1–187.
https://doi.org/10.11646/zootaxa.3908.1.1

Gray, J.E. (1848) *List of the specimens of British animals in the collection of the British Museum. Part I. Centroniae or radiated animals*. British Museum, London, 173 pp.

Greeff, R. (1869) *Protohydra leuckarti*. Eine marine Stammform der Coelenteraten. *Zeitschrift für Wissenschaftliche Zoologie*, 20, 37–54. [published 1 December 1869: page iii of the journal]

Haeckel, E. (1879) Das System der Medusen. Erster Theil einer Monographie der Medusen. *Denkschriften der Medicinisch-Naturwissenschaftlichen Gesellschaft zu Jena*, 1, 1–360.

Hamond, R. (1957) Notes on the Hydrozoa of the Norfolk coast. *Journal of the Linnean Society of London, Zoology*, 43, 294–324.
https://doi.org/10.1111/j.1096-3642.1957.tb01555.x

Hand, C. & Hendrickson, J.R. (1950) A two-tentacled, commensal hydroid from California (Limnomedusae, *Proboscidactyla*). *Biological Bulletin*, 99, 74–87.
https://doi.org/10.2307/1538753

Hargitt, C.W. (1901) Synopses of North-American invertebrates. XIV. The hydromedusae—Part I. *American Naturalist*, 35, 301–315.
https://doi.org/10.1086/277905

Hartlaub, C. (1905) Die Hydroiden der magalhaensischen Region und chilenischen Küste. *Zoologische Jahrbücher*, Supplement-Band 6, Fauna Chilensis, Dritter Band, 497–714.

Hartlaub, C. (1911) XII. Craspedote Medusen. I. Teil. 2. Lief.: Familie III Margelidae. *Nordisches Plankton*, 6, 137–235.

Hartlaub, C. (1914) XII. Craspedote Medusen. I. Teil. 3. Lief.: Familie IV Tiaridae. *Nordisches Plankton*, 6, 237–363.

Hartlaub, C. (1916) Ueber das Altern einer Kolonie von *Syncoryne* und damit verbundene Knospungen am Hydranthenköpfchen. *Wissenschaftliche Meeresuntersuchungen herausgegeben von der Kommission zur Wissenschaftlichen Untersuchung der Deutschen Meere in Kiel und der Biologischen Anstalt auf Helgoland*, Neue Folge, 11, 91–125.

Hassall, A.H. (1841) Supplement to a catalogue of Irish zoophytes. *Annals and Magazine of Natural History*, 7, 276–287.
https://doi.org/10.1080/03745484109442700

Hassall, A.H. (1848) Definitions of three new British zoophytes. *Zoologist*, 6, 2223.

Henry, L.-A. (2002) Intertidal zonation and seasonality of the marine hydroid *Dynamena pumila* (Cnidaria: Hydrozoa). *Canadian Journal of Zoology*, 80, 1526–1536.
https://doi.org/10.1139/z02-146

Henry, L.-A. (2003) *Impacts of bottom fishing on colonial epifauna in the Bay of Fundy and on the Scotian Shelf*. Ph.D. Dissertation, Dalhousie University, Halifax, Nova Scotia, 272 pp.

Henry, L.-A. & Kenchington, E. (2004a) Differences between epilithic and epizoic hydroid assemblages from commercial scallop grounds in the Bay of Fundy, northwest Atlantic. *Marine Ecology Progress Series*, 266, 123–134.
https://doi.org/10.3354/meps266123

Henry, L.-A. & Kenchington, E. (2004b) Ecological and genetic evidence for impaired sexual reproduction and induced clonality in the hydroid *Sertularia cupressina* (Cnidaria: Hydrozoa) on commercial scallop grounds in Atlantic Canada. *Marine Biology*, 145, 1107–1118.
https://doi.org/10.1007/s00227-004-1400-0

Hincks, T. (1861) A catalogue of the zoophytes of south Devon and South Cornwall. *Annals and Magazine of Natural History*, Series 3, 8, 251–262.

Hincks, T. (1866) On new British Hydroida. *Annals and Magazine of Natural History*, Series 3, 18, 296–299.

Hincks, T. (1868) *A history of the British hydroid zoophytes*. John van Voorst, London, 338 pp.
https://doi.org/10.5962/bhl.title.1322

Hincks, T. (1874) On deep–water Hydroida from Iceland. *Annals and Magazine of Natural History*, Series 4, 13, 146–153.
https://doi.org/10.1080/00222937408680828

Hincks, T. (1877) Note on lists of Arctic Hydroida and Polyzoa published in the 'Annals' for February 1874 and January 1877. *Annals and Magazine of Natural History*, Series 4, 20, 66–67.

Hirohito, The Showa Emperor (1988) *The hydroids of Sagami Bay. Part I. Athecata*. Biological Laboratory, Imperial Household, Tokyo, 179 pp.

Hirohito, The Showa Emperor (1995) *The hydroids of Sagami Bay. Part II. Thecata*. Biological Laboratory, Imperial

Household, Tokyo, 355 pp.

Hodgson, M.M. (1950) A revision of the Tasmanian Hydroida. *Papers and Proceedings of the Royal Society of Tasmania*, 1949, 1–65.

Jäderholm E. (1903) Aussereuropäische Hydroiden im schwedischen Reichsmuseum. *Arkiv för Zoologi*, 1, 259–312. [a note in Swedish at the bottom of page 312 states "Tryckt den 31 december 1903" (printed 31 December 1903). That has been taken here to be the date of publication]

Jäderholm, E. (1904) Mitteilungen ueber einige von der Schwedischen Antarctic-Expedition 1901–1903 eingesammelte Hydroiden. *Archives de Zoologie Expérimentale et Générale*, notes et revue, Série 4, 3, i–xiv.

Jäderholm, E. (1907) Über einige nordische Hydroiden. *Zoologischer Anzeiger*, 32, 371–376.

Jäderholm, E. (1908) Die Hydroiden des Sibirischen Eismeeres, gesammelt von der Russischen Polar-Expedition 1900–1903. *Zapiski Imperatorskoï Akademii Nauk po Fiziko-Matematicheskomu Otdeleniyu*, Series 8, 18 (12), 1–28.

Jäderholm, E. (1909) Northern and Arctic invertebrates in the collection of the Swedish State Museum (Riksmuseum). IV. Hydroiden. *Kungliga Svenska Vetenskapsakademiens Handlingar*, ny följd, 45 (1), 1–124.

Jägerskiöld, L.A. (1971) A survey of the marine benthonic macro-fauna along the Swedish west coast 1921–1938. *Acta Regiae Societatis Scientiarum et Litterarum Gothobergensis*, *Zoologica*, 6, 1–146.

Jensen, A. & Frederiksen, R. (1992) The fauna associated with the bank-forming deepwater coral *Lophelia pertusa* (Scleractinaria) on the Faroe Shelf. *Sarsia*, 77, 53–69.
https://doi.org/10.1080/00364827.1992.10413492

Johnston, G. (1837) A catalogue of the zoophytes of Berwickshire. *Proceedings of the Berwickshire Naturalists' Club*, 1, 107–108. [Dating of this reference follows Cornelius 1995b: 360].

Johnston, G. (1838) *A history of the British zoophytes*. W.H. Lizars, Edinburgh, 341 pp.

Johnston, G. (1847) *A history of the British zoophytes. 2nd Edition*. John Van Voorst, London, 488 pp.

Kingsley, J.S. (1910) A synopsis of the fixed hydroids of New England. *Tufts College Studies*, 3, 13–38.

Kirchenpauer, G.H. (1884) Nordische Gattungen und Arten von Sertulariden. *Abhandlungen aus dem Gebeite der Naturwissenschaften herausgegeben vom Naturwissenschaftlichen Verein in Hamburg*, 8 (3), 93–144.

Kirkpatrick, R. (1890) Reports on the zoological collections made in Torres Straits by Professor A. C. Haddon, 1888–1889. Hydroida and Polyzoa. *Scientific Proceedings of the Royal Dublin Society*, New Series, 6, 603–626.

Korsakova, G. (1949) Rannie stadii drobleniya u *Tiaropsis*. *Doklady Akademii Nauk SSSR*, 65, 413–415.

Kramp, P.L. (1911) Report on the hydroids collected by the Danmark Expedition at north-east Greenland. *Meddelelser om Grønland*, 45, 341–396.

Kramp, P.L. (1913) Hydroids collected by the "Tjalfe" expedition to the west coast of Greenland in 1908 and 1909. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i København*, 66**,** 1–36.

Kramp., P.L. (1919) Medusæ. Part I. Leptomedusæ. *Danish Ingolf-Expedition*, 5 (8), 1–111.

Kramp, P.L. (1920) Anthomedusae and Leptomedusae from the "Michael Sars" North Atlantic Deep-Sea Expedition 1910. *Report on the Scientific Results of the "Michael Sars" North Atlantic Deep-Sea Expedition 1910*, 3 (2), 1–14.

Kramp, P.L. (1930) Hydromedusae collected in the south-western part of the North Sea and in the eastern part of the Channel in 1903–1914. *Mémoires du Musée Royal d'Histoire Naturelle de Belgique*, 45, 1–55.

Kramp, P.L. (1932) Hydroids collected in west-Greenland fjords in 1911 and 1912. *Meddelelser om Grønland*, 91 (3), 1–35.

Kramp, P.L. (1935) *Corydendrium dispar*, a new athecate hydroid from Scandinavian seas, with remarks on classification. *Göteborgs Kungliga Vetenskaps- och Vitterhets-Samhälles Handlingar*, femte följden, Series B, 4 (11), 1–15.

Kramp, P.L. (1961) Synopsis of the medusae of the world. *Journal of the Marine Biological Association of the United Kingdom*, 40, 1–469.
https://doi.org/10.1017/S0025315400007347

Kubota, S. (1976) Notes on the nematocysts of Japanese hydroids, I. *Journal of the Faculty of Science, Hokkaido University*, Series 6, Zoology, 20, 230–243.

Kühn, A. (1913) Entwicklungsgeschichte und Verwandtschaftsbeziehungen der Hydrozoen. I. Teil: Die Hydroiden. *Ergebnisse und Fortschritte der Zoologie*, 4, 1–284.

Kuzirian, A.M. (1979) Taxonomy and biology of four New England coryphellid nudibranchs (Gastropoda: Opisthobranchia). *Journal of Molluscan Studies*, 45, 239–261.

Lamouroux, J.V.F. (1812) Extrait d'un mémoire sur la classification des polypiers coralligènes non entièrement pierreux. *Nouveau Bulletin des Sciences, par la Société Philomatique de Paris*, 3, 181–188.

Leclère, L., Schuchert, P., Cruaud, C., Couloux, A. & Manuel, M. (2009) Molecular phylogenetics of Thecata (Hydrozoa, Cnidaria) reveals long-term maintenance of life history traits despite high frequency of recent character changes. *Systematic Biology*, 58, 509–526.
https://doi.org/10.1093/sysbio/syp044

Leloup, E. (1939) Notes sur quelques hydropolypes exotiques. *Bulletin du Musée Royal d'Histoire Naturelle de Belgique*, 15 (51), 1–19.

Lendenfeld, R. von (1885a) The Australian hydromedusae. Part I. The classification of the Hydromedusae. *Proceedings of the Linnean Society of New South Wales*, 9, 206–241.

Lendenfeld, R. von (1885b) The Australian hydromedusae. Continued. Part II. Plate VI. The 1st subordo Hydropolypinæ. *Proceedings of the Linnean Society of New South Wales*, 9, 345–353.

Lesson, R.P. (1830) Voyage autour du monde, pendant les années 1822, 1823, 1824 et 1825. Zoologie. Description des zoophytes échinodermes. *Voyage de la Coquille II, II*, 20, 155 pp.

Lesson, R.P. (1843) *Histoire naturelle des zoophytes. Acalèphes*. Librairie Encyclopédique de Roret, Paris, 596 pp.

Levinsen, G.M.R. (1893) Meduser, ctenophorer og hydroider fra Grønlands vestkyst, tilligemed bemærkninger om hydroidernes systematik. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjøbenhavn*, Series 5, 4, 143–220.

Linkletter, L.E., Lord, E.I. & Dadswell, M.J. (1977) *A checklist of marine fauna and flora of the Bay of Fundy*. Huntsman Marine Laboratory, St. Andrews, New Brunswick, 68 pp.

Linko, A.K. (1911) Gidroidy (Hydroidea). Tom I. Haleciidae, Lafoëidae, Bonneviellidae i Campanulariidae. *Fauna Rossii i Supredelnykh Stran*, 1, 1–250.

Linnaeus, C. (1758) *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species cum characteribus, differentiis, synonymis, locis*. Editio decima, reformata. Laurentii Salvii, Holmiae, 823 pp.

Linnaeus, C. (1767) *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. *Tomus I. Pars II. Editio duodecima, reformata.* Laurentii Salvii, Holmiae, pp. 533–1317.

Logan, A. (1988) A sublittoral hard substrate epibenthic community below 30 m in Head Harbour Passage, New Brunswick, Canada. *Estuarine, Coastal and Shelf Science*, 27, 445–459.
https://doi.org/10.1016/0272-7714(88)90099-6

Logan, A., MacKay, A.A. & Noble, J.P.A. (1983) Sublittoral hard substrates. *In*: Thomas, M.L.H. (Ed.), Marine and coastal systems of the Quoddy Region, New Brunswick. *Canadian Special Publication of Fisheries and Aquatic Sciences*, 64, pp. 119–139.

Logan, A., Page, F.H. & Thomas, M.L.H. (1984) Depth zonation of epibenthos on sublittoral hard substrates off Deer Island, Bay of Fundy, Canada. *Estuarine, Coastal and Shelf Science*, 18, 571–592.
https://doi.org/10.1016/0272-7714(84)90091-X

Lorenz, L. von (1886) Polypomedusen von Jan Mayen. Gesammelt von Dr. F. Fischer. *Die Internationale Polarforschung 1882–1883. Die Österreichische Polarstation Jan Mayen*, 3, 25–28.

Lovén, S. (1836) Bidrag till kännedomen af slägtena *Campanularia* och *Syncoryna*. *Kongl. Vetenskaps-Academiens Handlingar*, för År 1835, 260–281.

Lütken, C. (1850) Nogle bemærkninger om medusernes systematiske inddeling, navnlig med hensyn til Forbes's history of Brittish naked-eyed medusae. *Videnskabelige Meddelelser fra den Naturhistoriske Forening i Kjöbenhavn*, 1850, 15–35.

Macgillivray, J. (1842) Catalogue of the marine zoophytes of the neighbourhood of Aberdeen. *Annals and Magazine of Natural History*, 9, 462–469.
https://doi.org/10.1080/03745484209445365

Marktanner-Turneretscher, G. (1890) Die Hydroiden des k. k. naturhistorischen Hofmuseums. *Annalen des Kaiserlich-Königlichen Naturhistorischen Hofmuseums*, 5, 195–286.

Maronna, M.M., Miranda, T.P., Peña Cantero, Á.L., Barbeitos, M.S. & Marques, A.C. (2016) Towards a phylogenetic classification of Leptothecata (Cnidaria, Hydrozoa). *Scientific Reports*, 6, 18075. [published online]
https://doi.org/10.1038/srep18075

Marques, A.C. (1995) *Eudendrium pocaruquarum* n.sp. (Hydrozoa, Eudendriidae) from the southeastern coast of Brazil, with remarks on taxonomic approaches to the family Eudendriidae. *Contributions to Zoology*, 65, 35–40.

Marques, A.C. & Calder, D.R. (2000) *Eudendrium bathyalis*, a new species of hydroid (Hydrozoa: Anthomedusae: Eudendriidae) from Bermuda. *Proceedings of the Biological Society of Washington*, 113, 124–128.

Marques, A.C., Mergner, H., Höinghaus, R., Santos, C.M.D. & Vervoort, W. (2000) Morphological study and taxonomical notes on Eudendriidae (Cnidaria: Hydrozoa: Athecatae/Anthomedusae). *Zoologische Mededelingen*, 74, 75–118.

Marques, A.C. & Migotto, A.E. (1998) A new species of *Eudendrium* (Hydrozoa: Anthomedusae: Eudendriidae) from the Netherlands. *Zoologische Verhandelingen*, 323, 149–154.

Marques, A.C. & Oliveira, O.M.P. (2003) *Eudendrium caraiuru* sp. n. (Hydrozoa; Anthoathecata; Eudendriidae) from the southeastern coast of Brazil. *Zootaxa*, 307 (1), 1–12.
https://doi.org/10.11646/zootaxa.307.1.1

Marques, A.C., Peña Cantero, A.L. & Vervoort, W. (2000) Mediterranean species of *Eudendrium* Ehrenberg, 1834 (Hydrozoa, Anthomedusae, Eudendriidae) with the description of a new species. *Journal of Zoology*, 252, 197–213.
https://doi.org/10.1111/j.1469-7998.2000.tb00615.x

Mayer, A.G. (1910a) Medusae of the world. Volume I. The hydromedusae. *Carnegie Institution of Washington*, Publication 109, 1–230.

Mayer, A.G. (1910b) Medusae of the world. Volume II. The hydromedusae. *Carnegie Institution of Washington*, Publication 109, 231–498.

Mayer, A.G. (1918) Biographical memoir of William Stimpson 1832–1872. *National Academy of Sciences of the United States of America, Biographical Memoirs*, 8, 419–433.

McCrady, J. (1859) Gymnopthalmata of Charleston Harbor. *Proceedings of the Elliott Society of Natural History*, 1, 103–221.

McLean, M.F., Dadswell, M.J. & Stokesbury, M.J.W. (2013) Feeding ecology of Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus* Mitchill, 1815 on the infauna of intertidal mudflats of Minas Basin, Bay of Fundy. *Journal of Applied Ichthyology*, 29, 503–509.

https://doi.org/10.1111/jai.12175

Medel, M.D., García, F.G. & Vervoort, W. (1998) The family Haleciidae (Cnidaria: Hydrozoa) from the Strait of Gibraltar and nearby areas. *Zoologische Mededelingen*, 72, 29–50.

Medel, M.D. & Vervoort, W. (2000) Atlantic Haleciidae and Campanulariidae (Hydrozoa, Cnidaria) collected during the CANCAP and Mauritania-II expeditions of the National Museum of Natural History, Leiden, The Netherlands. *Zoologische Verhandelingen*, 330, 1–68.

Mereschkowsky, C. (1878) Studies on the Hydroida. *Annals and Magazine of Natural History*, Series 5, 1, 322–340.

Meyen, F.J.F. (1834) Beiträge zur Zoologie, gesammelt auf einer Reise um die Erde. Fünfte Abhandlung. Über das Leuchten des Meeres und Beschreibung einiger Polypen und anderer niederer Thiere. *Novorum Actorum Academiae Caesareae Leopoldino-Carolinae Naturae Curiosorum*, 16, 125–216.

Miglietta, M.P., Schuchert, P. & Cunningham, C.W. (2009) Reconciling genealogical and morphological species in a worldwide study of the family Hydractiniidae (Cnidaria, Hydrozoa). *Zoologica Scripta*, 38, 403–430.
https://doi.org/10.1111/j.1463-6409.2008.00376.x

Migotto, A.E. (1996) Benthic shallow-water hydroids (Cnidaria, Hydrozoa) of the coast of São Sebastião, Brazil, including a checklist of Brazilian hydroids. *Zoologische Verhandelingen*, 306, 1–125.

Millard, N.A.H. (1957) The Hydrozoa of False Bay, South Africa. *Annals of the South African Museum*, 43, 173–243.

Millard, N.A.H. (1958) Hydrozoa from the coasts of Natal and Portuguese East Africa. Part I. Calyptoblastea. *Annals of the South African Museum*, 44, 165–226.

Millard, N.A.H. (1962) The Hydrozoa of the south and west coasts of South Africa. Part I. The Plumulariidae. *Annals of the South African Museum*, 46, 261–319.

Millard, N.A.H. (1975) Monograph on the Hydroida of southern Africa. *Annals of the South African Museum*, 68, 1–513.

Millard, N.A.H. (1977) Hydroids from the Kerguelen and Crozet shelves, collected by the Cruise MD.03 of the *Marion–Dufresne*. *Annals of the South African Museum*, 73, 1–47.

Motz-Kossowska, S. (1905) Contribution à la connaissance des hydraires de la Méditerranée occidentale. I. – Hydraires gymnoblastiques. *Archives de Zoologie Expérimentale et Générale*, Série 4, 3, 39–98.

Motz-Kossowska, S. (1911) Contribution à la connaissance des hydraires de la Méditerranée occidentale. II. – Hydraires calyptoblastiques. *Archives de Zoologie Expérimentale et Générale*, 5me Série, 6, 325–352.

Moura, C.J., Harris, D.J., Cunha, M.R. & Rogers, A.D. (2008) DNA barcoding reveals cryptic diversity in marine hydroids (Cnidaria, Hydrozoa) from coastal and deep-sea environments. *Zoologica Scripta*, 37, 93–108.

Murbach, L. & Shearer, C. (1902) Preliminary report on a collection of medusae from the coast of British Columbia and Alaska. *Annals and Magazine of Natural* History, Series 7, 9, 71–73.

Nagao, Z. (1964) The life cycle of the hydromedusa, *Nemopsis dofleini* Maas, with a supplementary note on the life-history of *Bougainvillia superciliaris* (L. Agassiz). *Annotationes Zoologicae Japonenses*, 37, 153–162.

Naumov, D.V. (1951) Nekotorye dannye o zhiznennykh tsiklakh metageneticheskikh meduz. *Doklady Akademii Nauk SSSR*, 76, 747–750.

Naumov, D.V. (1960) Gidroidy i gidromeduzy morskikh, solonovatovodnykh i presnovodnykh basseinov SSSR. *Akademiya Nauk SSSR, Opredeliteli po Faune SSSR*, 70, 1–626.

Naumov, D.V. & Stepanjants, S.D. (1962) Gidroidy podotryada Thecaphora, sobrannye v antarkticheskikh i subantarkticheskikh vodakh sovetskoi antarkticheskoi ekspeditsiei na dizel-elektrokhode "Ob". Resultaty Biologicheskikh Issledovanii Sovetskoi Antarkticheskoi Ekspeditsii (1955–1958), Volume 1. *Issledovaniya Fauny Morei*, 1, 69–104.

Nawrocki, A.M. & Cartwright, P. (2012) A novel mode of colony formation in a hydrozoan through fusion of sexually generated individuals. *Current Biology*, 22, 825–829.
https://doi.org/10.1016/j.cub.2012.03.026

Nawrocki, A.M., Collins, A.G., Hirano, Y.M., Schuchert, P. & Cartwright, P. (2013) Phylogenetic placement of *Hydra* and relationships within Aplanulata (Cnidaria: Hydrozoa). *Molecular Phylogenetics and Evolution*, 67, 60–71.
https://doi.org/10.1016/j.ympev.2012.12.016

Nawrocki, A.M., Schuchert, P. & Cartwright, P. (2010) Phylogenetics and evolution of Capitata (Cnidaria: Hydrozoa), and the systematics of Corynidae. *Zoologica Scripta*, 39, 290–304.
https://doi.org/10.1111/j.1463-6409.2009.00419.x

Newcombe, C.L. (1935) A study of the community relationships of the sea mussel, *Mytilus edulis* L. *Ecology*, 16, 234–243.
https://doi.org/10.2307/1932430

Norman, A.M. (1864) On undescribed British Hydrozoa, Actinozoa, and Polyzoa. *Annals and Magazine of Natural History*, Series 3, 13, 82–90.

Norman, A.M. (1867) Report of the committee appointed for the purpose of exploring the coasts of the Hebrides by means of the dredge.—Part II. On the Crustacea, Echinodermata, Polyzoa, Actinozoa, and Hydrozoa. *Report of the Thirty-Sixth Meeting of the British Association for the Advancement of Science; held at Nottingham in August 1866; Reports on the State of Science*, 1867,193–206.

Nutting, C.C. (1896) Notes on Plymouth hydroids. *Journal of the Marine Biological Association of the United Kingdom*, New Series, 4, 146–154.
https://doi.org/10.1017/S0025315400060379

Nutting, C.C. (1899) Hydroida from Alaska and Puget Sound. *Proceedings of the United States National Museum*, 21, 741–

753.
https://doi.org/10.5479/si.00963801.21-1171.741

Nutting, C.C. (1900) American hydroids. Part I. The Plumularidae. *Smithsonian Institution, United States National Museum Special Bulletin*, 4 (1), 1–285.

Nutting, C.C. (1901a) The hydroids of the Woods Hole region. *Bulletin of the United States Fish Commission*, 19, 325–386.

Nutting, C.C. (1901b) Papers from the Harriman Alaska Expedition. XXI. The hydroids. *Proceedings of the Washington Academy of Sciences*, 3, 157–216.

Nutting, C.C. (1901c) Correspondence. *American Naturalist*, 35, 789.
https://doi.org/10.1086/278005

Nutting, C.C. (1904) American hydroids. Part II. The Sertularidae. *Smithsonian Institution, United States National Museum Special Bulletin*, 4 (2), 1–325.

Nutting, C.C. (1905) Hydroids of the Hawaiian Islands collected by the steamer Albatross in 1902. *Bulletin of the United States Fish Commission for 1903*, 1905, pp. 931–959. [A note in the Table of Contents of the bulletin records that this article, variously dated in the literature, was "Issued December 23, 1905"]

Nutting, C.C. (1915) American hydroids. Part III. The Campanularidae and the Bonneviellidae. *Smithsonian Institution, United States National Museum Special Bulletin*, 4 (3), 1–126.

Oken, L. (1815) *Okens Lehrbuch der Naturgeschichte. III. Theil. Zoologie. Vol. 1.* Oken, Jena, 842 pp.

Orbigny, A. d' (1842, 1847) *Voyage dans l'Amérique Méridionale (le Brésil, la République orientale de l'Uruguay, la République Argentine, La Patagonie, la République du Chili, la République de Bolivia, la République du Pérou), exécuté pendant les années 1826, 1827, 1828, 1829, 1830, 1831, 1832 et 1833. Atlas. Livraison 58. Tome 5. 4^e Partie. Zoophytes*. Levrault, Strasbourg, 7–28. [dating of this reference follows Sherborn & Griffin (1934), with the plates published in 1842 and the text in 1847]

Östman, C. (1999) Nematocysts and their value as taxonomic parameters within the Campanulariidae (Hydrozoa). A review based on light and scanning electron microscopy. *Zoosystematica Rossica*, 1 (Supplement), 17–28.

Owen, R. (1843) *Lectures on the comparative anatomy and physiology of the invertebrate animals: delivered at the Royal College of Surgeons, in 1843*. Longman, Brown, Green, & Longmans, London, 392 pp.

Pallas, P.S. (1766) *Elenchus zoophytorum sistens generum adumbrationes generaliores et specierum cognitarum succinctas descriptiones cum selectis auctorum synonymis*. Franciscum Varrentrapp, Hagae, 451 pp.
https://doi.org/10.5962/bhl.title.6595

Pallas, P.S. (1771) *Reise durch verschiedene Provinzen des russischen Reichs*. Erster Theil. Kayserliche Academie der Wissenschaften, St. Petersburg, 504 pp.

Park, J.H. (1997) Four athecate hydroids from Korean waters. *Korean Journal of Systematic Zoology*, 13, 83–92.

Peña Cantero, Á.L. (2010) Benthic hydroids (Cnidaria: Hydrozoa) from Peter I Island (Southern Ocean, Antarctica). *Polar Biology*, 33, 761–773.
https://doi.org/10.1007/s00300-009-0754-7

Peña Cantero, Á.L. (2013) Benthic hydroids from off Low Island (Southern Ocean, Antarctica). *Marine Ecology*, 34 (Supplement 1), 123–142.
https://doi.org/10.1111/maec.12031

Peña Cantero, Á.L. (2014) Revision of the Antarctic species of *Halecium* Oken, 1815 (Cnidaria, Hydrozoa, Haleciidae). *Zootaxa*, 3790 (2), 243–280.
https://doi.org/10.11646/zootaxa.3790.2.2

Peña Cantero, Á.L., Boero, F. & Piraino, S. (2013) Shallow-water benthic hydroids from Tethys Bay (Terra Nova Bay, Ross Sea, Antarctica). *Polar Biology*, 36, 731–753.
https://doi.org/10.1007/s00300-013-1299-3

Peña Cantero, Á.L. & Gili, J.M. (2006) Benthic hydroids (Cnidaria, Hydrozoa) from off Bouvet Island (Antarctic Ocean). *Polar Biology*, 29, 764–771.
https://doi.org/10.1007/s00300-006-0113-x

Peña Cantero, Á.L., Sentandreu, V. & Latorre, A. (2010) Phylogenetic relationships of the endemic Antarctic benthic hydroids (Cnidaria, Hydrozoa): what does the mitochondrial 16S rRNA tell us about it? *Polar Biology*, 33, 41–57.
https://doi.org/10.1007/s00300-009-0683-5

Péron, F. & Lesueur, C.A. (1810) Tableau des caractères génériques et spécifiques de toutes les espèces de méduses connues jusqu'à ce jour. *Annales du Muséum d'Histoire Naturelle*, 14, 325–366.

Petersen, K.W. (1964) The sessile Hydrozoa. *In*: Smith, R.I. (Ed.), *Keys to marine invertebrates of the Woods Hole region*. Systematics-Ecology Program, Marine Biological Laboratory, Woods Hole, Contribution Number 11, pp. 8–20.

Petersen, K.W. (1979) Development of coloniality in Hydrozoa. *In*: Larwood, G. & Rosen, B.R. (Eds.), *Biology and systematics of colonial animals*. Academic Press, New York, pp. 105–139.

Petersen, K.W. (1990) Evolution and taxonomy in capitate hydroids and medusae (Cnidaria: Hydrozoa). *Zoological Journal of the Linnean Society*, 100, 101–231.
https://doi.org/10.1111/j.1096-3642.1990.tb01862.x

Petrie, B. & Jordan, F. (1993) Nearshore, shallow-water temperature atlas for Nova Scotia. *Canadian Technical Report of Hydrography and Ocean Sciences*, 145, 1–84.

Picard, J. (1951) Note sur les hydraires littoraux de Banyuls-sur-Mer. *Vie et Milieu*, 2, 338–349.

Pictet, C. (1893) Voyage de Mm. M. Bedot et C. Pictet dans l'Archipel Malais. Étude sur les hydraires de la Baie d'Amboine. *Revue Suisse de Zoologie et Annales du Musée d'Histoire Naturelle de Genève*, 1, 1–64.

Pieper, F.W. (1884) Ergänzungen zu "Heller's Zoophyten etc. des Adriatischen Meeres." *Zoologischer Anzeiger*, 7, 164–169.

Pinhey, K.F. (1927) Entomostraca of the Belle Isle Strait Expedition, 1923, with notes on other planktonic species: Part II; and a record of other collections in the region. *Contributions to Canadian Biology and Fisheries*, 3, 331–346. https://doi.org/10.1139/f26-013

Pourtalès, L.F. de (1867) Contributions to the fauna of the Gulf Stream at great depths. *Bulletin of the Museum of Comparative Zoölogy at Harvard College, in Cambridge*, 1, 103–120.

Powell, A.E., Moreno, M., Gloria-Soria, A, Lakkis, F.G., Dellaporta, S.L. & Buss, L.W. (2011) Genetic background and allorecognition phenotype in *Hydractinia symbiolongicarpus*. *G3: Genes, Genomes, Genetics*, 1, 499–503. https://doi.org/10.1534/g3.111.001149

Prudkovsky, A.A., Nikitin, M.A., Berumen, M.L., Ivanenko, V.N. & Reimer, J.D. (2016) On the paraphyly of Cytaeididae and placement of *Cytaeis* within the suborder Filifera (Hydrozoa: Anthoathecata). *Marine Biodiversity*, 18 June 2016, 1–8. [published online] https://doi.org/10.1007/s12526-016-0534-x

Puce, S., Cerrano, C. & Bavestrello, G. (2002) *Eudendrium* (Cnidaria, Anthomedusae) from the Antarctic Ocean with description of two new species. *Polar Biology*, 25, 366–373.

Puce, S., Cerrano, C., Di Camillo, C., Bavestrello, G. & Marques, A.C. (2006) *Eudendrium* (Cnidaria: Hydrozoa) from Bunaken Marine Park, Sulawesi Sea, Indonesia. *Zoological Studies*, 45, 616–625.

Puce, S., Cerrano, C., Marques, A.C. & Bavestrello, G. (2005) *Eudendrium klausi* (Cnidaria, Hydrozoa), a new species of hydroid from Belize. *Journal of the Marine Biological Association of the United Kingdom*, 85, 291–305. https://doi.org/10.1017/S0025315405011185h

Ralph, P.M. (1958) New Zealand thecate hydroids. Part II.—Families Lafoeidae, Lineolariidae, Haleciidae and Syntheciidae. *Transactions of the Royal Society of New Zealand*, 85, 301–356.

Rees, W.J. (1938) Observations on British and Norwegian hydroids and their medusae. *Journal of the Marine Biological Association of the United Kingdom*, 23, 1–42. https://doi.org/10.1017/S0025315400053923

Rees, W.J. (1941) Notes on British and Norwegian hydroids and medusae. *Journal of the Marine Biological Association of the United Kingdom*, 25, 129–141. https://doi.org/10.1017/S002531540001434X

Rees, W.J. (1956) A revision of some northern gymnoblastic hydroids in the Zoological Museum, Oslo. *Nytt Magasin for Zoologi*, 4, 109–120.

Rees, W.J. & Vervoort, W. (1987) Hydroids from the John Murray Expedition to the Indian Ocean, with revisory notes on *Hydrodendron*, *Abietinella*, *Cryptolaria* and *Zygophylax* (Cnidaria: Hydrozoa). *Zoologische Verhandelingen*, 237, 1–209.

Ritchie, J. (1907) The hydroids of the Scottish National Antarctic Expedition. *Transactions of the Royal Society of Edinburgh*, 45, 519–545. https://doi.org/10.1017/S0080456800022821

Romanes, G.J. (1876) An account of some new species, varieties, and monstrous forms of medusae. *Journal of the Linnean Society, Zoology*, 12, 524–531. https://doi.org/10.1111/j.1096-3642.1876.tb00228.x

Ronowicz, M. & Schuchert, P. (2007) *Halecium arcticum* (Cnidaria: Hydrozoa), a new species of hydroid from Spitzbergen. *Zootaxa*, 1549, 55–62.

Ronowicz, M., Włodarska-Kowalczuk, M. & Kukliński, P. (2013) Depth- and substrate-related patterns of species richness and distribution of hydroids (Cnidaria, Hydrozoa) in Arctic coastal waters (Svalbard). *Marine Ecology*, 34 (Supplement 1), 165–176. https://doi.org/10.1111/maec.12034

Rosengarten, R.D., Moreno, M.A., Lakkis, F.G., Buss, L.W. & Dellaporta, S.L. (2011) Genetic diversity of the allodeterminant *alr2* in *Hydractinia symbiolongicarpus*. *Molecular Biology and Evolution*, 28, 933–947. https://doi.org/10.1093/molbev/msq282

Russell, F.S. (1953) *The medusae of the British Isles. Anthomedusae, Leptomedusae, Limnomedusae, Trachymedusae and Narcomedusae*. Cambridge University Press, Cambridge, 530 pp.

Russell, F.S. & Rees, W.J. (1936) On rearing the hydroid *Zanclea implexa* (Alder) and its medusa *Zanclea gemmosa* McCrady, with a review of the genus *Zanclea*. *Journal of the Marine Biological Association of the United Kingdom*, New Series, 21, 107–130. https://doi.org/10.1017/S002531540001122X

Sars, M. (1877) Nye og mindre bekjendte Coelenterater. New and little known coelenterates. *In*: Koren, J. & Danielssen, D.C. (Eds.), *Fauna littoralis Norvegiae. 3^{die} Hefte*. J.D. Beyer, Bergen, pp. 1–48.

Sars, G.O. (1874) Bidrag til kundskaben om norges hydroider. *Forhandlinger i Videnskabs-Selskabet i Christiania*, 1873, 91–150.

Sars, M. (1835) *Beskrivelser og iagttagelser over nogle maerkelige eller nye i havet ved den Bergenske kyst levende dyr af* *polypernes, acalephernes, radiaternes, annelidernes og molluskernes classer, med en kort oversigt over de hidtil af forfatteren sammesteds fundne arter og deres forekommen*. Thorstein Hallagers Forlag, Bergen, 81 pp. https://doi.org/10.5962/bhl.title.13017

Sars, M. (1846) *Fauna littoralis Norvegiae oder Beschreibung und Abbildungen neuer oder wenig bekannten Seethiere, nebst Beobachtungen über die Organisation, Lebensweise u. Entwickelung derselben*. Erstes Heft. Johann Dahl, Christiania, 94 pp.

Sars, M. (1850) Beretning om en i Sommeren 1849 foretagen zoologisk Reise i Lofoten og Finmarken. *Nyt Magazin for Naturvidenskaberne*, 6, 121–211.

Sars, M. (1857) Bidrag til kundskaben om Middelhavets littoral-fauna, reisebemærkninger fra Italien. *Nyt Magazin for Naturvidenskaberne*, 9, 110–164.

Schönborn, C., Arndt, E.A. & Gosselck, F. (1993) Bestimmungsschlüssel der benthischen Hydrozoen der Ostsee. *Mitteilungen aus dem Zoologischen Museum in Berlin*, 69, 201–253. https://doi.org/10.1002/mmnz.19930690203

Schuchert, P. (1996) The marine fauna of New Zealand: athecate hydroids and their medusae (Cnidaria: Hydrozoa). *New Zealand Oceanographic Institute Memoir*, 106, 1–159.

Schuchert, P. (2001a) Hydroids of Greenland and Iceland (Cnidaria, Hydrozoa). *Meddelelser om Grønland, Bioscience*, 53, 1–184.

Schuchert, P. (2001b) Survey of the family Corynidae (Cnidaria, Hydrozoa). *Revue Suisse de Zoologie*, 108, 739–878. https://doi.org/10.5962/bhl.part.80165

Schuchert, P. (2003) Hydroids (Cnidaria, Hydrozoa) of the Danish expedition to the Kei Islands. *Steenstrupia*, 27, 137–256.

Schuchert, P. (2004) Revision of the European athecate hydroids and their medusae (Hydrozoa, Cnidaria): families Oceanidae and Pachycordylidae. *Revue Suisse de Zoologie*, 111, 315–369. https://doi.org/10.5962/bhl.part.80242

Schuchert, P. (2005a) Taxonomic revision and systematic notes on some *Halecium* species. *Journal of Natural History*, 39, 607–639. https://doi.org/10.1080/00222930400001319

Schuchert, P. (2005b) Species boundaries in the hydrozoan genus *Coryne*. *Molecular Phylogenetics and Evolution*, 36, 194–199. https://doi.org/10.1016/j.ympev.2005.03.021

Schuchert, P. (2006) The European athecate hydroids and their medusae (Hydrozoa, Cnidaria): Capitata Part 1. *Revue Suisse de Zoologie*, 113, 325–410. https://doi.org/10.5962/bhl.part.80356

Schuchert, P. (2007) The European athecate hydroids and their medusae (Hydrozoa, Cnidaria): Filifera Part 2. *Revue Suisse de Zoologie*, 114, 195–396. https://doi.org/10.5962/bhl.part.80395

Schuchert, P. (2008a) The European athecate hydroids and their medusae (Hydrozoa, Cnidaria): Filifera Part 3. *Revue Suisse de Zoologie*, 115, 221–302. https://doi.org/10.5962/bhl.part.80426

Schuchert, P. (2008b) The European athecate hydroids and their medusae (Hydrozoa, Cnidaria): Filifera Part 4. *Revue Suisse de Zoologie*, 115, 677–757. https://doi.org/10.5962/bhl.part.80453

Schuchert, P. (2010) The European athecate hydroids and their medusae (Hydrozoa, Cnidaria): Capitata Part 2. *Revue Suisse de Zoologie*, 117, 337–555. https://doi.org/10.5962/bhl.part.117793

Schuchert, P. (2012) North-west European athecate hydroids and their medusae. *Synopses of the British Fauna*, New Series, 59, 1–364.

Schuchert, P. (2017) Hydrozoa. Accessed through: World Register of Marine Species. Available from: http://www.marinespecies.org/aphia.php?p=taxdetails&id=1337 (accessed 8 March 2017)

Schydlowsky, A. (1902) Matériaux relatifs à la faune des polypes hydraires des mers arctiques. I—Les hydraires de la Mer Blanche le long du littoral des Jles Solowetsky. *Travaux de la Société des Naturalistes à l'Université Impériale de Kharkov*, 36, 1–276.

Segura-Puertas, L., Celis, L. & Chiaverano, L. (2009) Medusozoans (Cnidaria: Cubozoa, Scyphozoa, and Hydrozoa) of the Gulf of Mexico. *In*: Felder, D.L. & Camp, D.K. (Eds.), *Gulf of Mexico–Origins, Waters, and Biota. Vol. 1. Biodiversity.* Texas A&M University Press, College Station, Texas, pp. 369–379.

Shih, C.-T. (1977) A guide to the jellyfish of Canadian Atlantic waters. *National Museum of Natural Sciences, National Museums of Canada, Natural History Series*, 5, 90 pp.

Shih, C.-T., Figueira, A.J.G. & Grainger, E.H. (1971) A synopsis of Canadian marine zooplankton. *Fisheries Research Board of Canada Bulletin*, 176, 1–264.

Sisson, C.G. (2005) Life history dynamics and biogeography of a nudibranch with contrasting developmental modes: a hypothesis for the evolution of larval types. *Journal of Natural History*, 39, 1719–1733. https://doi.org/10.1080/00222930400024709

Smith, S.I. & Harger, O. (1875) Report on the dredgings in the region of St. George's Banks, in 1872. *Transactions of the Connecticut Academy of Arts and Science*, 3, 1–57.

Soto Àngel, J.J. & Peña Cantero, Á.L. (2015) On the benthic hydroids from the Scotia Arc (Southern Ocean): new insights into their biodiversity, ecology and biogeography. *Polar Biology*, 38, 983–1007. https://doi.org/10.1007/s00300-015-1660-9

Spasskii, N. (1929) K faune gidroidov Kol'skogo zaliva i yugo-zapadnoĭ chasti Barentseva morya. *Raboty Murmanskoi Biologicheskoi Stantsii*, 3, 1–48.

Stafford, J. (1912) On the fauna of the Atlantic coast of Canada. Fourth report. *Contributions to Canadian Biology, 1906–1910*, 69–78.

Stechow, E. (1909) Beiträge zur Naturgeschichte Ostasiens. Herausgegeben von Dr. F. Doflein. Hydroidpolypen der japanischen Ostküste. I. Teil: Athecata und Plumularidae. *Abhandlungen der Mathematisch-Physikalischen Klasse der Königlichen Bayerischen Akademie der Wissenschaften*, Supplement-Band, 1 (6), 1–111.

Stechow, E. (1913) Hydroidpolypen der japanischen Ostküste. II. Teil: Campanularidae, Halecidae, Lafoeidae, Campanulinidae und Sertularidae, nebst Ergänzungen zu den Athecata und Plumularidae. *Abhandlungen der Mathematisch-Physikalischen Klasse der Königlichen Bayerischen Akademie der Wissenschaften*, 3, Supplement-Band 2, 1–162. https://doi.org/10.5962/bhl.title.11621

Stechow, E. (1919) Zur Kenntnis der Hydroidenfauna des Mittelmeeres, Amerikas und anderer Gebiete, nebst Angaben über einige Kirchenpauer'sche Typen von Plumulariden. *Zoologische Jahrbücher, Abteilung für Systematik, Geographie und Biologie der Tiere*, 42, 1–172.

Stechow, E. (1921a) Neue Genera und Species von Hydrozoen und anderen Evertebraten. *Archiv für Naturgeschichte*, Abteilung A, 3, Heft, 87, 248–265.

Stechow, E. (1921b) Über Hydroiden der Deutschen Tiefsee-Expedition, nebst Bemerkungen über einige andre Formen. *Zoologischer Anzeiger*, 53, 223–236.

Stechow, E. (1925) Hydroiden der Deutschen Tiefsee-Expedition. *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer „Valdivia" 1898–1899*, 17, 383–546.

Stechow, E. (1932) Neue Hydroiden aus dem Mittelmeer und dem Pazifischen Ozean, nebst Bemerkungen über einige wenig bekannte Formen. *Zoologischer Anzeiger*, 100 (34), 81–92.

Stepanjants, S. (1989) Hydrozoa of the Eurasian Arctic seas. *In*: Herman, Y. (Ed.), *The Arctic seas. Climatology, oceanography, geology, and biology*. Van Nostrand Reinhold Co., New York, pp. 397–430. https://doi.org/10.1007/978-1-4613-0677-1_16

Stimpson, W. (1853) Synopsis of the marine Invertebrata of Grand Manan: or the region about the mouth of the Bay of Fundy, New Brunswick. *Smithsonian Contributions to Knowledge*, 6 (5), 1–67.

Thomas, M.L.H. (1983) Tide pool systems. *In*: Thomas, M.L.H. (Ed.), Marine and coastal systems of the Quoddy Region, New Brunswick. *Canadian Special Publication of Fisheries and Aquatic Sciences*, 64, pp. 95–106.

Thomas, M.L.H., Arnold, D.C. & Taylor, A.R.A. (1983) Rocky intertidal communities. *In*: Thomas, M.L.H. (Ed.), Marine and coastal systems of the Quoddy Region, New Brunswick. *Canadian Special Publication of Fisheries and Aquatic Sciences*, 64, pp. 35–73.

Tichomiroff, A.A. (1887) K istorii razvitija gidroidov. *Izvestiya Imperatorskago Obshchestva Lyubiteleĭ Estestvoznaniya, Antropologii i Etnografii, pri Imperatorskom Moskovskom Universitete*, 50 (Appendix 1), 1–69.

Torrey, H.B. (1902) The Hydroida of the Pacific coast of North America, with especial reference to the species in the collection of the University of California. *University of California Publications in Zoology*, 1, 1–104.

Torrey, H.B. (1909) Contributions from the Laboratory of the Marine Biological Association of San Diego. XXIV. The Leptomedusae of the San Diego region. *University of California Publications in Zoology*, 6, 11–31.

Totton, A.K. (1930) Coelenterata. Part V.–Hydroida. *British Antarctic ("Terra Nova") Expedition, 1910. Natural History Report, Zoology*, 5 (5), 131–252.

Trebilcock R.E. (1928) Notes on New Zealand Hydroida. *Proceedings of the Royal Society of Victoria*, New Series, 41, 1–31.

Trott, T.J. (2004a) Cobscook Bay inventory: a historical checklist of marine invertebrates spanning 162 years. *Northeastern Naturalist*, 11 (Special Issue 2), 261–324.

Trott, T.J. (2004b) Late 20th-century qualitative intertidal faunal changes in Cobscook Bay, Maine. *Northeastern Naturalist*, 11 (Special Issue 2), 325–354.

Uchida, T. & Nagao, Z. (1960) The life-history of the hydromedusa, *Bougainvillia superciliaris* (L. Agassiz). *Annotationes Zoologicae Japonenses*, 33, 249–253.

Van Beneden, P.-J. (1844a) Sur les genres Eleuthérie et Synhydre. *Bulletins de l'Académie Royale des Sciences et Belles-Lettres de Bruxelles*, 11 (2), 305–314.

Van Beneden, P.-J. (1844b) Recherches sur l'embryogénie des tubulaires, et l'histoire naturelle des différents genres de cette famille qui habitent la Côte d'Ostende. *Nouveaux Mémoires de l'Académie Royale des Sciences et Belles-Lettres de Bruxelles*, 17 (6), 1–72.

Vanhöffen, E. (1910) Die Hydroiden der Deutschen Südpolar-Expedition 1901–1903. *Deutsche Südpolar-Expedition 1901–1903*, 11, Zoologie 3, 269–340.

Vannucci, M. & Rees, W.J. (1961) A revision of the genus *Bougainvillia* (Anthomedusae). *Boletim do Instituto Oceanográfico*, 11 (2), 57–100.

https://doi.org/10.1590/S0373-55241961000100003

Verrill, A.E. (1865) Classification of polyps: (extract condensed from a synopsis of the Polypi of the North Pacific Exploring Expedition, under Captains Ringgold and Rodgers, U.S.N.). *Proceedings of the Essex Institute*, 4, 145–152.

Verrill, A.E. (1871) Marine fauna of Eastport, ME. *Proceedings of the Essex Institute*, 3, 2–6.

Verrill, A.E. (1873) Brief contributions to zoölogy, from the Museum of Yale College. No. XXIII.—Results of recent dredging expeditions on the coast of New England. *American Journal of Science and Arts*, Series 3, 5, 1–16.

Verrill, A.E. (1874) Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region. *Report of the Commissioner of Fisheries for 1871–1872*, 295–747.

Verrill, A.E. (1875) Brief contributions to zoology from the Museum of Yale College. No. XXXIII.—Results of dredging expeditions off the New England coast in 1874. *American Journal of Science and Arts*, Series 3, 10, 36–43.

Verrill, A.E. (1878) Notice of recent additions to the marine fauna of the eastern coast of North America, No. 2. *American Journal of Science and Arts,* Series 3, 16, 371–378.
https://doi.org/10.2475/ajs.s3-16.93.207

Verrill, A.E. (1879) *Preliminary check-list of the marine Invertebrata of the Atlantic coast, from Cape Cod to the Gulf of St. Lawrence*. Tuttle, Morehouse & Taylor, New Haven, Connecticut, 32 pp.

Verrill, A.E. & Rathbun, R. (1880) List of marine Invertebrata from the New England coast, distributed by the U. S. Commission of Fish and Fisheries. *Proceedings of the United States National Museum*, 2, 227–232.
https://doi.org/10.5479/si.00963801.82.227

Vervoort, W. (1968) Report on a collection of Hydroida from the Caribbean region, including an annotated checklist of Caribbean hydroids. *Zoologische Verhandelingen*, 92, 1–124.

Vervoort, W. (1972a) Hydroids from the Theta, Vema and Yelcho cruises of the Lamont-Doherty Geological Observatory. *Zoologische Verhandelingen*, 120, 1–247.

Vervoort, W. (1972b) Hydroids from submarine cliffs near Arthur Harbour, Palmer Archipelago, Antarctica. *Zoologische Mededelingen*, 47, 337–357.

Vervoort, W. & Faasse, M. (2009) Overzicht van de Nederlandse Leptolida (=Hydroida) (Cnidaria: Hydrozoa). *Nederlandse Faunistische Mededelingen*, 32, 1–207.

Vervoort, W., Henry, L.-A. & Nizinski, M.S. (2011) Resdescription of the leptothecate hydroid *Halecium macrocephalum* Allman, 1877 (Cnidaria: Hydrozoa). *Journal of Natural History*, 45, 2095–2104.
https://doi.org/10.1080/00222933.2011.582967

Vervoort, W. & Watson, J.E. (2003) The marine fauna of New Zealand: Leptothecata (Cnidaria: Hydrozoa) (thecate hydroids). *National Institute of Water and Atmospheric Research Biodiversity Memoir*, 119, 1–538.

Warren, E. (1907) On *Parawrightia robusta* gen. et sp. nov., a hydroid from the Natal coast; and also an account of a supposed schizophyte occurring in the gonophores. *Annals of the Natal Government Museum*, 1, 187–208.

Warren, E. (1908) On a collection of hydroids, mostly from the Natal coast. *Annals of the Natal Government Museum*, 1, 269–355.

Warren, E. (1916) On *Hydrichthys boycei*, a hydroid parasitic on fishes. *Annals of the Durban Museum*, 1, 172–187.

Watson, J.E. (1975) Hydroids of Bruny Island, southern Tasmania. *Transactions of the Royal Society of South Australia*, 99, 157–176.

Watson, J.E. (1980) The identity of two tubularian hydroids from Australia with a description and observations on the reproduction of *Ralpharia magnifica* gen. et sp. nov. *Memoirs of the National Museum of Victoria*, 41, 53–63.

Watson, J.E. (1985) The genus *Eudendrium* (Hydrozoa: Hydroida) from Australia. *Proceedings of the Royal Society of Victoria*, 97, 179–221.

Watson, J.E. (1993) Two new species of Haleciidae (Hydrozoa: Hydroida) from southern Australia. *Proceedings of the Royal Society of Victoria*, 105, 81–84.

Watson, J.E. (1997) The hydroid fauna of the Houtman Abrolhos Islands, Western Australia. *In*: Wells, F.E. (Ed.), *The marine flora and fauna of the Houtman Abrolhos Islands, Western Australia*. Western Australian Museum, Perth, pp. 503–546.

Watson, J.E. (2000) Hydroids (Hydrozoa: Leptothecatae) from the Beagle Gulf and Darwin Harbour, northern Australia. *The Beagle, Records of the Museums and Art Galleries of the Northern Territory*, 16, 1–82.

Watson, J.E. (2003) Deep-water hydroids (Hydrozoa: Leptolida) from Macquarie Island. *Memoirs of Museum Victoria*, 60, 151–180.

Watson, J.E. (2005) Hydroids of the Archipelago of the Recherche and Esperance, Western Australia: annotated list, redescription of species and description of new species. *In*: Wells, F.E., Walker, D.I. & Kendrick, G.A. (Eds.), *The marine flora and fauna of Esperance, Western Australia*. Western Australian Museum, Perth, pp. 495–611.

Watson, J.E. (2008) Hydroids of the BANZARE expeditions, 1929 – 1931: the family Haleciidae (Hydrozoa, Leptothecata) from the Australian Antarctic Territory. *Memoirs of Museum Victoria*, 65, 165–178.

Watson, J.E. (2015) Hydroids (Cnidaria, Hydrozoa: Hydroidolina) from the Kermadec Islands. *In*: Trnski, T. & Schlumpf, H.A. (Eds.), *Kermadec Biodiscovery Expedition 2011. Bulletin of the Auckland Museum*, 20, pp. 325–335.

Watson, J.E. & Vervoort, W. (2001) The hydroid fauna of Tasmanian seamounts. *Zoologische Verhandelingen*, 334, 151–187.

Weill, R. (1934) Contribution à l'étude des cnidaires et de leurs nématocystes. II. Valeur taxonomique du cnidome. *Travaux de la Station Zoologique de Wimereux*, 11, 351–701.

Weismann, A. (1883) *Die Entstehung der Sexualzellen bei den Hydromedusen. Zugleich ein Beitrag zur Kenntniss des Baues* *und der Lebenserscheinungen dieser Gruppe*. Gustav Fischer, Jena, 295 pp.

Werner, B. (1961) Morphologie und Lebensgeschichte, sowie Temperaturabhängigkeit der Verbreitung und des jahreszeitlichen Auftretens von *Bougainvillia superciliaris* (L. Agassiz) (Athecatae-Anthomedusae). *Helgoländer Wissenschaftliche Meeresuntersuchungen*, 7, 206–237.
https://doi.org/10.1007/BF01880277

Whiteaves, J.F. (1873) Report on a second deep-sea dredging expedition to the Gulf of St. Lawrence, with some remarks on the marine fisheries of the Province of Quebec. Appendix K. *In*: *Annual Report of the Department of Marine and Fisheries, for the Year Ending the 30th June, 1872*. I.B. Taylor, Ottawa, pp. 113–132.

Whiteaves, J.F. (1875) Notes on a deep-sea dredging-expedition round the island of Anticosti, in the Gulf of St. Lawrence. *Canadian Naturalist and Quarterly Journal of Science*, New Series, 7, 86–100.

Whiteaves, J.F. (1901) Catalogue of the marine Invertebrata of eastern Canada. *Geological Survey of Canada Separate Report*, 722, 1–271.
https://doi.org/10.4095/216086

Wright, T.S. (1858) Observations on British zoophytes. *Edinburgh New Philosophical Journal*, New Series, 7, 282–287.

Wright, T.S. (1859) Observations on British zoophytes. *Edinburgh New Philosophical Journal*, New Series, 10, 105–114.

Yamada, M. (1954) Species of the genus *Eudendrium* from Japan. *Publications from the Akkeshi Marine Biological Station*, 2, 1–19.

Yamada, Y. (1964) *Rhizogeton ezoense* n.sp., a new hydroid from Hokkaido, Japan. *Journal of the Faculty of Science, Hokkaido University*, Series 6, Zoology, 15, 395–397.

Yamada, M. & Hirano, Y. (1983) Records of two hydromedusae from Akkeshi Bay. *Proceedings of the Japanese Society for Systematic Zoology*, 25, 7–10.

APPENDIX 1. Checklist of species of hydroids reported in published literature, and identified in collections examined here, from the Bay of Fundy, Atlantic Canada.

ORDER ANTHOATHECATA Cornelius, 1992

Family Tubulariidae Fleming, 1828

Ectopleura crocea (L. Agassiz, 1862).—Katy Cove, St. Andrews, NB; L'Etang Head, NB; St. Andrews Island (now Navy Island), NB (Fraser 1918: 342, as *Tubularia crocea*).—Bay of Fundy (Fraser 1944: 97, as *T. crocea*).—Atlantic Biological Station wharf pilings, St. Andrews, NB (Newcombe 1935: 237, as *T. crocea*).—Minas Basin, NS (Bousfield & Leim 1960: 13; Bromley 1979: 519; Bromley & Bleakney 1985: 12; all as *T. crocea*).—Bay of Fundy (Linkletter *et al.* 1977: 6, as *Tubularia crocea*).—Sherrod's Beach, Passamaquoddy Bay, NB, 2 m; Bay of Fundy (Henry 2003: 129; 142; Henry & Kenchington 2004a: 131; 127).—Cobscook Bay, ME (Trott 2004a: 271). **Note**: at least some records of *E. crocea* from the Bay of Fundy may have been based on *E. larynx*.

Ectopleura larynx (Ellis & Solander, 1786).—Grand Manan, NB (Stimpson 1853: 9, as *Tubularia larynx*).—Eastport, ME (A. Agassiz 1865: 195, as *Thamnocnidia tenella*; Sisson 2005: 1725, as *Tubularia larynx*).—Bay of Fundy (Verrill 1874: 736, as *T. tenella*).—St. Andrews, NB (Stafford 1912: 72, as *Thamnocnida larnyx*).—Near Bliss Island, NB (Fraser 1918: 342, as *Tubularia spectabilis*).—St. Andrews Island (Navy Island), NB (Fraser 1918: 342, as *Tubularia tenella*).—Minas Channel, NS; Minas Basin, NS (Fraser 1944: 100; Bousfield & Leim 1960: 13; both as *Tubularia spectabilis*).—Bay of Fundy (Linkletter *et al.* 1977: 6, as *Tubularia larynx*, *T. spectabilis*, and *T. tenella*).—Eastport, ME (Kuzirian 1979: 249, as *Tubularia spectabilis*).—Minas Basin, NS (Bromley 1979: 519; Bromley & Bleakney 1985: 13; both as *Tubularia larynx* and *T. spectabilis*).—Deer Island, NB (Logan *et al.* 1984: 582, as *Tubularia spectabilis*).—Head Harbour Passage, NB (Logan 1988: 450, as *Tubularia spectabilis*).—Eastport, ME, 15 m, on rocks and cobbles (Bleakney 1996: 133, as *Tubularia spectabilis*).—Sherrod's Beach, Passamaquoddy Bay, NB, 2 m (Henry 2003: 142; Henry & Kenchington 2004a: 131).—Cobscook Bay, ME (Trott 2004a: 271; 2004b: 340).—Petit Passage, NS, south of East Ferry, datum + 6 cm, 14.x.1970, coll. K.W. Petersen, SNM HYD-001050.—St. Andrews, NB, Tongue Shoal, 28.viii.1973, 15 m, coll. F.W. Schueler, ARC 8650070.—St. Andrews, NB, Brandy Cove, 29.viii.1973, ARC 8650071.—St. Andrews, NB, Brandy Cove, 18.ix.1974, on salmon floats, coll. S. Waddy & A. Sutterlin, ARC 8650069.—Deer Island, NB, from mesh on salmon cages, --.x.1978, coll. P. Harmon, ARC 8650075.—Annapolis Basin, NS, at Bear River bridge, 24.ix.1984, coll. J.S. Bleakney, ROMIZ B505, ROMIZ B512.—St. Andrews, NB, at Brandy Cove, on algae attached to wharf piling, intertidal, 21.viii.1984, coll. D. Calder, ROMIZ B610.—Richardson, Deer Island, NB, on *Mytilus edulis* on pontoon slip of wharf, <1 m, 22.v.1999, coll. D. Calder (ROMIZ B3093).—Eastport, ME, Cobscook Bay off Estes Head, on aquaculture float, >1 m, 07.viii.2005, coll. D. Calder, ROMIZ B4118.

Hybocodon prolifer L. Agassiz, 1862.—Bay of Fundy (Linkletter *et al.* 1977: 6).

Tubularia acadiae Petersen, 1990.—Kingsport, Minas Basin, NS (Bleakney 1972: 933, as *T. couthouyi* L. Agassiz, 1860).—

Minas Basin, NS (Bromley & Bleakney 1985: 11, as *T. couthouyi* L. Agassiz, 1860).—Minas Basin, NS, 26.iv.1967, coll. J.S. Bleakney, ROMIZ B629.—Kingsport, Minas Basin, NS, at ELWS, in slushy seawater, 19.iii.1992, coll. J.S. Bleakney, ROMIZ B4225.—**Note**: specimens identified as *T. couthouyi* in collections at ARC (8 km NE of Centreville, NS, 27.v.1936, coll. J. Stevenson, ARC 8650077) resemble *T. acadiae*, but gonophores are too undeveloped for them to be reliably identified.

Tubularia couthouyi L. Agassiz, 1860.—Grand Manan, NB (A. Agassiz 1865: 196).—Kingsport, Minas Basin, NS (Bleakney 1972: 933).—Bay of Fundy (Linkletter *et al.* 1977: 6).—Minas Basin, NS (Bromley & Bleakney 1985: 11).—Lower Bay of Fundy, commercial scallop grounds (Fuller *et al.* 1998: 23, as *T. couthoyi*). **Note**: *Tubularia couthouyi* has been included as a synonym (Petersen 1990) or questionable synonym (Schuchert 2010) of *T. indivisa* Linnaeus, 1758. Records of the species from Minas Basin (Bleakney 1972; Bromley & Bleakney 1985) are referred here to *T. acadiae* Petersen, 1990. While the binomen *Tubularia couthouyi* is usually credited to L. Agassiz (1862), the name appeared earlier in association with an illustration of its gonophores (L. Agassiz, 1860), and appears to be available from that date (ICZN Art. 12.2.7).

Tubularia indivisa Linnaeus, 1758.—Grand Manan, NB (Stimpson 1853: 9).—St. Andrews, NB (Stafford 1912: 72).—Joe's Point, St. Andrews, NB; Deer Island, NB; L'Etang Head, NB (Fraser 1918: 342).—Bay of Fundy (Linkletter *et al.* 1977: 6).—Minas Basin, NS (Bromley 1979: 519; Bromley & Bleakney 1985: 12, as *T. indivisia*).—Cobscook Bay, ME (Trott 2004a: 271).—Eastport, ME (Sisson 2005: 1725).—Sandy Cove, NS (Schuchert 2010: 343).—Lorneville, NB, 06.vi.1973, coll. D.J. Scarratt, ARC 8650078.—Lorneville, NB, 07.vi.1973, coll. D.J. Scarratt, ARC 8650073.

Family Corymorphidae Allman, 1872

Corymorpha pendula L. Agassiz, 1862.—West Quoddy Head, ME; Welch Pool (now Welshpool), Campobello Island, NB; Low Duck Island, Grand Manan, NB; 4–15 fm (7–27 m) (Stimpson 1853: 9, as *C. nutans*).—Todd's Head, near Eastport, ME (Fuller 1862a: 131, as *C. nutans*).—Bay of Fundy (Verrill 1874: 736).—Rodger's Island, Oak Bay, NB (Ganong 1890a: 59).—St. Andrews, NB (Stafford 1912: 73, as *Monocaulus glacialis*).—St. Andrews, NB; The Wolves, NB; Harbour Island (Navy Island?), NB, 25 fm (46 m) (Fraser 1918: 341).—Minas Basin, NS (Bousfield & Leim 1960: 13; Bromley 1979: 519; Bromley & Bleakney 1985: 11).—Bay of Fundy (Linkletter *et al.* 1977: 6).—Passamaquoddy Bay, sublittoral hard substrates (Logan *et al.* 1983: 125, 128, as *Coryomorpha pendula*).—Head Harbour Passage, NB (Logan 1988: 450, as *Coryomorpha pendula*).—Scots Bay, NS, sand flat, low tide, 02 August 1977 (Bleakney 1996: 125).—Cobscook Bay, ME (Trott 2004a: 271, as *C. nutans*; Trott 2004a: 271, as *C. pendula*).—Nubble Island and Sandy Island, east of Deer Island, NB (Buzeta & Singh 2008: 19, 20).—St. Andrews, NB, S end of Navy Island, 6–9 m, mud, coll. R.A. Chandler & J.F. Caddy, ARC 8650076.—Chamcook, NB, McCann Cove, 9 m, mud/gravel, 28.viii.1970, ARC 9751549.—St. Andrews, NB, Tongue Shoal, 31.viii.1972, coll. J. Machin, ARC 9751550.—Letang, NB, Lime Kiln 1, --.ix.2015, juvenile, ARC 80000.

Family Candelabridae Stechow, 1921a

Candelabrum phrygium (Fabricius, 1780).—Grand Manan, NB (L. Agassiz 1862: 341).—Eastport, ME, questionable identification of an apparent juvenile (Verrill 1878: 374, as *Blastothela rosea*).—Eastport, ME (Fewkes 1890: 432, misidentified as *Acaulis*).—Bay of Fundy (Linkletter *et al.* 1977: 6, as *Myriothela phrygia*).—Cobscook Bay, ME (Trott 2004a: 271).

Family Acaulidae Fraser, 1924

Acaulis primarius Stimpson, 1853.—Grand Manan, NB, 5–15 fm (9–27 m) (Stimpson 1853: 10).—Treat Island, near Eastport, ME, 10–15 fm (18–27 m) (Verrill 1871: 4).—Scotsman Bay (now Scots Bay), NS (Fraser 1924: 167).—Minas Channel, NS; Scots Bay, NS (Bousfield & Leim 1960: 13; Bromley 1979: 519; Bromley & Bleakney 1985: 9).—Bay of Fundy (Linkletter *et al.* 1977: 6; Petersen 1990: 147).—Cobscook Bay, ME (Trott 2004a: 271).

Family Protohydridae Allman, 1888

Protohydra leuckarti Greeff, 1869.—Minas Basin, NS (Bromley 1979: 519; Bromley & Bleakney 1985: 9, as *Protohydra* (*leuckartii*)).

Family Corynidae Johnston, 1837

Coryne pusilla Gaertner, 1774.—Petit Passage, NS, south of East Ferry, *Laminaria* zone, 14.x.1970, coll. K.W. Petersen, SNM

HYD-000455.—Petit Passage, NS, south of East Ferry, intertidal, 14.x.1970, coll. K.W. Petersen, SNM HYD-000457.—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-000459.—Petit Passage, NS, south of East Ferry, datum + 5 cm, 14.x.1970, coll. K.W. Petersen, SNM HYD-000871.

Sarsia lovenii (M. Sars, 1846).—Letete, NB, Tucker's Brook, 45°02'52"N, 66°53'36"W, intertidal, in brook, coll. D. Calder, ROMIZ B3106.—Back Bay, NB, 45°03'20"N, 66°51'49"W, on pontoon slip of public wharf, 5–10 cm below surface, 25.v.1999, coll. D. Calder, ROMIZ B3096.—Kingsport, Minas Basin, NS, at ELWS, in slushy seawater, 19.iii.1992, coll. J.S. Bleakney, ROMIZ B4226.

Sarsia tubulosa (M. Sars, 1835).—Bay of Fundy (Verrill 1874: 735, as *Coryne mirabilis*).—Katy Cove, St. Andrews, NB (Fraser 1918: 338, as *Syncoryne mirabilis*).—Bay of Fundy (Linkletter *et al*. 1977: 6, as *S. tubulosa* and *Syncoryne mirabilis*; Henry 2003: 130; Henry & Kenchington 2004a: 127).—Minas Basin, NS (Bromley 1979: 519, as *Coryne tubulosa*; Bromley & Bleakney 1985: 10, as *Coryne sarsi*).—Cobscook Bay, ME (Trott 2004a: 271).—St. Andrews, NB, Biological Station, pontoon slip, 15.vii.1972, 1 m, coll. A. Brinckmann-Voss, ARC 8650061.

Stauridiosarsia producta (Wright, 1858).—Minas Basin, NS (Bromley 1979: 519; Bromley & Bleakney 1985: 10; both as *Staurocoryne producta*).

Family Pennariidae McCrady, 1859

Pennaria disticha Goldfuss, 1820.—Deer Island, NB (Logan *et al*. 1984: 582, as *Pennaria tiarella*). The record of this tropical and warm-temperate species in the cold Bay of Fundy region is taken here to have been based on a misidentification.

Family Zancleidae Russell, 1953

Zanclea implexa (Alder, 1856b).—Cobscook Bay, ME (Trott 2004a: 271, as *Z. costata*).—Sandy Cove, Digby Neck, NS, 22.vii.1970, intertidal, coll. K.W. Petersen, SNM HYD-001058.—Petit Passage, NS, south of East Ferry, 14.x.1970, water's edge at extreme low tide, coll. K.W. Petersen, SNM HYD-000493.—Petit Passage, NS, south of East Ferry, datum + 6 cm, 14.x.1970, coll. K.W. Petersen, SNM HYD-001050.

Family Oceaniidae Eschscholtz, 1829

Corydendrium dispar Kramp, 1935.—Petit Passage, NS, south of East Ferry, datum + 5 cm, 14.x.1970, coll. K.W. Petersen, SNM HYD-000871.

Rhizogeton fusiformis L. Agassiz, 1862.—Bay of Fundy (Linkletter *et al*. 1977: 6).—Passamaquoddy Bay, NB (Calder, 2010: 13).—St. Andrews, NB, Biological Station wharf, pontoon, 10.vii.1972, <1 m, coll. A. Brinckmann-Voss, ARC 8650057.—Richardson, Deer Island, NB, 44°59'42"N, 66°56'45"W, wharf, pontoon slip, 19.xii.1988, just below surface, coll. D. Calder, ROMIZ B1022.—Stuart Town, Deer Island, NB, 45°01'07"N, 66°56'16"W, 24.v.1999, <1 m, coll. D. Calder, ROMIZ B3091.—Letete, NB, Tucker's Brook, 45°02'52"N, 66°53'36"W, 24.v.1999, intertidal, in brook, coll. D. Calder, ROMIZ B3101.—Letete, NB, Tucker's Brook, 45°02'52"N, 66°53'36"W, 30.v.1999, intertidal, in brook, coll. D. Calder, ROMIZ B3102.

Family Cordylophoridae von Lendenfeld, 1885a

Cordylophora caspia (Pallas, 1771).—St. Andrews, NB (Stafford 1912: 72, as *C. lacurtris*).—Bay of Fundy (Linkletter *et al*. 1977: 6, as *C. lacustris*).—**Note**: these records are questionable.

Family Bougainvilliidae Lütken, 1850

Bougainvillia carolinensis (McCrady, 1859).—St. Andrews, NB (Stafford 1912: 72).—Katy Cove and Joe's Point, St. Andrews, NB (Fraser 1918: 338).—Bay of Fundy (Linkletter *et al*. 1977: 6). **Note**: these records of what is likely a warm-temperate species need verification.

Bougainvillia muscus (Allman, 1863).—St. Andrews, NB, Biological Station wharf, floating dock, 07.viii.1974, coll. T. Lacalli, ARC 8650055.—St. Andrews, NB, Brandy Cove, wharf piling, 21.viii.1984, intertidal, coll. D. Calder, ROMIZ B605.—Annapolis Basin, Annapolis Royal, NS, on mooring line, 19.ix.1984, coll. J.S. Bleakney, ROMIZ B511.—Letete, NB, pontoon slip of wharf, just below surface, 14.viii.1988, coll. D. Calder, ROMIZ B4135.—Richardson, Deer Island, NB, 44°59’42”N, 66°56’45”W, on pontoon slip of wharf, <1 m, 22.v.1999, coll. D. Calder, ROMIZ B3087.—St. Andrews, NB, pontoon slip at public wharf, 45°04’17”N, 67°03’17”W, <1 m, 27.v.1999, coll. D. Calder, ROMIZ B3083.—St. Andrews, NB, pontoon slip of public wharf, 45°04’17”N, 67°03’17”W, just below surface, 20.viii.1999, coll. D. Calder, ROMIZ B3120.—Cobscook Bay, ME, near Estes Head, 44°53’36”N, 66°59’37”W, 07.viii.2005, on aquaculture float, <1 m, coll. D. Calder, ROMIZ B4129.

Bougainvillia superciliaris (L. Agassiz, 1850).—Bay of Fundy (Verrill 1874: 733; Linkletter *et al*. 1977: 6; Henry 2003: 129; Henry & Kenchington 2004a: 127, as *Bougainivillia superciliaris*).—Cobscook Bay, ME (Trott 2004a: 270).

Dicoryne conferta (Alder, 1856a).—St. Andrews, NB (Stafford 1912:72, as *D. flexuosa*).—Minister’s Island, near St. Andrews, NB (Fraser 1918: 338).—Bay of Fundy (Linkletter *et al*. 1977: 6, as *D. conferta* and *D. flexuosa*). **Note**: *Dicoryne flexuosa* G.O. Sars, 1874 is considered conspecific with *D. conferta* (Schuchert 2007).

Garveia brevis (Fraser, 1918).—Katy Cove, St. Andrews, NB (Fraser 1918: 338, as *Bimeria brevis*). **Note**: this is justifiably regarded as a *species inquirenda* in Schuchert (2013).

Rhizorhagium roseum M. Sars, in G.O. Sars, 1874.—Bay of Fundy, 8 km NE of Centreville, NS, 27.v.1936, coll. J. Stevenson, ARC 8650054.

Family Pandeidae Haeckel, 1879

Leuckartiara octona (Fleming, 1823).—Minas Basin, NS (Bromley 1979: 519).

Family Hydractiniidae L. Agassiz, 1862

Clava multicornis (Forsskål, 1775).—Grand Manan, NB (Stimpson 1853: 11).—Eastport, ME (Verrill 1874: 734, as *Clava leptostyla*).—St. Andrews, NB (Stafford 1912: 72, as *C. leptostyla*; Fraser 1918: 337, as *C. leptostyla*).—Bay of Fundy (Linkletter *et al*. 1977: 6, as *Clava leptostyla* and *C. squamata*).—Minas Basin, NS (Bromley 1979: 519; Bromley & Bleakney 1985: 14).—Cobscook Bay, ME (Trott 2004a: 270).—Fairhaven, Deer Island, NB, <1 m, on floating algae, 08.ix.1966, coll. D. Calder, ROMIZ B637.—St. Andrews, NB, 29.viii.1970, ARC 8650060.—St. Andrews, Biological Station wharf, 29.vi.1973, coll. Sara Brinkhurst, ARC 86030059.—St. Andrews, NB, on algae on wharf piling at biological station, intertidal, 21.viii.1984, coll. D. Calder, ROMIZ B648.—Deer Island Point, Deer Island, NB, intertidal, on *Ascophyllum*, 22.v.1999, coll. D. Calder, ROMIZ B3084.—Minas Basin, NS, Starr’s Point, Town Plot, underside of sandstone overhangs, 2-3 m above low water, 24.v.1999, coll. J.S. Bleakney, ROMIZ 3123.—Letete, NB, Tucker’s Point, mid-tide level in intertidal brook, on *Ascophyllum*, 45°02’52”N, 66°53’39”W, 24.v.1999, coll. D. Calder, ROMIZ B3100.—Eastport, ME, at Harris Point, on *Ascophyllum nodosum*, <1 m, 07.viii.2005, coll. D. Calder, ROMIZ B4113. **Note**: on rocky shores of Atlantic Canada and New England, *Clava multicornis* is conspicuous on fucoid algae, and especially on thalli of *Ascophyllum nodosum*. It also occurs on rocks, mussels, barnacles, pilings, and certain other hard substrates in lower intertidal and shallow subtidal zones. The species is most abundant in moderately sheltered areas influenced by tidal currents, and it is tolerant of reduced salinities. Remarkable colonies, comprising hundreds of hydranths, were discovered on the undersides of sandstone overhangs in creeks of Minas Basin, NS (J.S. Bleakney, personal communication, June 1999).

Hydractinia polyclina L. Agassiz, 1860.—Grand Manan, NB (Stimpson 1853: 11, as *H. echinata*; A. Agassiz 1865: 198).—Bay of Fundy (Verrill 1874: 736).—St. Andrews, NB (Stafford 1912: 73, as *H. echinata*).—High Duck Island, near Grand Manan, NB (Fraser 1918: 341, as *H. echinata*).—Scotsman Bay (now Scots Bay), NS (Fraser 1944: 79, as *H. echinata*).—Scots Bay, NS, intertidal (Bousfield & Leim 1960: 13, as *H. echinata*).—Bay of Fundy (Linkletter *et al*. 1977: 6, as *H. echinata*).—Minas Basin, NS (Bromley 1979: 519; Bromley & Bleakney 1985: 15; both as *H. echinata*).—Cobscook Bay, ME (Trott 2004a: 270, as *H. echinata*).—Grand Manan, NB, designation of lectotype and paralectotype specimens (Buss & Yund 1989).—St. Mary’s Bay, NS, sand flats, 06.vi.1936, ARC8650066.—The Wolves, NB, on *Neptunea decemcostata* inhabited by *Pagurus acadianus*, 29.x.1976, 40 fm (73 m), ARC 0056378.

Hydractinia symbiolongicarpus Buss & Yund, 1989.—Kingsport, NS, 19.vii.1966, low tide, one colony, on gastropod shell, coll. J.S. Bleakney & K.H. Bailey, ROMIZ B643.

Hydractinia valens Fraser, 1941.—Minas Basin, NS (Bromley 1979: 519; Bromley & Bleakney 1985: 15).
Podocoryna americana Edwards, 1972.—Minas Basin, NS (Bromley 1979: 519, as *Podocoryne carnea*; Bromley & Bleakney 1985: 14, as *Hydractinia carnea*).—Cobscook Bay, ME (Trott 2004a: 270, as *Hydractinia americana*).

Family Proboscidactylidae Hand & Hendrickson, 1950

Proboscidactyla stellata (Forbes, 1846).—Minas Basin, NS (Bromley & Bleakney 1985: 8, as *Lar sabellarum*).

Family Eudendriidae L. Agassiz, 1862

Eudendrium album Nutting, 1896.—Many locations between Deer Point, Campobello Island, NB, and Dochet Island (now St. Croix Island), ME; off Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 339; Fraser's "Deer point, Campobello island" is taken here to be Deer Island Point, Deer Island, NB).—Bay of Fundy (Linkletter *et al.* 1977: 7).—Kingsport, NS, 19.vii.1966, low tide, coll. J.S. Bleakney & K. Bailey, ROMIZ B640. Kingsport, NS, Longspell Point, 16.ix.1970, low tide, M.E. Petersen, SNM HYD-001057. **Note**: while reports of *E. album* from locations in the lower Bay of Fundy by Fraser (1918) may be questionable, material from Kingsport, Minas Basin, NS (ROMIZ B640) was identified after examination of both male and female colonies, and from the cnidome [microbasic euryteles (n = 7): 6.5–7.4 µm long × 3.5–4.0 µm wide (undischarged); macrobasic euryteles (n = 6): 24.0–26.0 µm long × 8.5–10.0 µm wide (undischarged)].

Eudendrium annulatum Norman, 1864.—Brier Island, NS, 25 fm (46 m) (Fraser 1918: 339).—Petit Passage, NS, south of East Ferry, low water, 14.x.1970, coll. K.W. Petersen, SNM HYD-001050, SNM HYD-001052.

Eudendrium arbuscula Wright, 1859.—Minas Basin (Bromley 1979: 520; Bromley & Bleakney 1985: 16; both as *E. arbusculum*). As a noun in apposition, the specific name is spelled "*arbuscula*."

Eudendrium capillare Alder, 1856a.—Bay of Fundy (Verrill 1874: 734, as *E. tenue*).—St. Andrews, NB (Stafford 1912: 72, as *E. capillare*; 72, as *E. tenue*).—St. Andrews Island (now Navy Island), NB; off L'Etang Head, NB, 12 fm (22 m) (Fraser 1918: 339); many points from St. Andrews, NB, to L'Etang Head, NB; Brier Island, NS (Fraser 1918: 339, as *E. tenue*).—Scotsman Bay, NS (now Scots Bay), and Minas Basin, NS (Fraser 1944: 75, as *E. tenue*).—Minas Channel, NS; Minas Basin, NS (Bousfield & Leim 1960: 13, as *E. tenue*).—Bay of Fundy (Linkletter *et al.* 1977: 7, as *E. capillare* and *E. tenue*).—Minas Basin, NS (Bromley 1979: 520, as *E. capillare* and *E. tenue*; Bromley & Bleakney 1985: 18, as *E. capillare*; 19, as *E. tenue*).—Bay of Fundy (Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 270).

Eudendrium cingulatum Stimpson, 1853.—Duck Island, near Grand Manan, NB, 20 fm (37 m) (Stimpson 1853: 9).—Bay of Fundy (Linkletter *et al.* 1977: 7).—Cobscook Bay, ME (Trott 2004a: 270, as *E. cochleatum*). Fraser (1944) doubted the validity of this species, which has not been reported since its original description. No records of it were found during this study in a search of the online catalogues of the Museum of Comparative Zoology, Harvard University, the Yale Peabody Museum of Natural History, or the National Museum of Natural History, Smithsonian Institution. It is regarded here as a *species inquirenda*.

Eudendrium dispar L. Agassiz, 1862.—Eastport, ME (A. Agassiz 1865: 159).—Bay of Fundy (Verrill 1874: 734).—St. Andrews, NB (Stafford 1912: 72).—Head Harbour Island (off Campobello Island), NB; McMaster Island, NB; St. Andrews Island (now Navy Island), NB; Joe's Point and Niger Reef off St. Andrews, NB (Fraser 1918: 340; note: Niger Reef is named for HMS *Niger*, which grounded on the sandstone reef in 1866).—Bay of Fundy (Linkletter *et al.* 1977: 7).—Cobscook Bay, ME (Trott 2004a: 270).

Eudendrium bleakneyi, **sp. nov.** St. Andrews, NB, off Joe's Point, 45°04'30"N, 67°05'20"W, 16 m, scallop drag, 06.ix.1984, coll. D. Calder, ROMIZ B1381, ROMIZ B1472, ROMIZ B1473, ROMIZ B1475.

Eudendrium rameum (Pallas, 1766).—Two Islands, near Seal Cove, Grand Manan, NB, 5–10 fm (9–18 m); L'Etang Head, NB; Joe's Point, St. Andrews, NB; St. Andrews Island (now Navy Island), NB (Fraser 1918: 340).—Bay of Fundy (Linkletter *et al.* 1977: 7).—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 17).

Eudendrium ramosum (Linnaeus, 1758).—Bay of Fundy, 6–100 fm (11–183 m) (Verrill 1874: 734).—St. Andrews, NB (Stafford 1912: 72).—Many locations between Two Islands, near Seal Cove, Grand Manan, NB, to St. Andrews Point, NB; Brier Island, NS (Fraser 1918: 340).—Minas Basin, NS (Bromley 1979: 520, as *E. insigne* and *E. ramosum*; Bromley & Bleakney 1985: 16, as *E. ramosum*; 17, as *E. insigne*).—Bay of Fundy (Linkletter *et al.* 1977: 7, as *E. ramosum* and *E. insigne*; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 270).—St. Andrews, NB, Brandy Cove, on wharf piling, -5 m, 21.viii.1984, coll. D. Calder, ROMIZ B655.—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B1387, ROMIZ B1461, ROMIZ B1462, ROMIZ B1463, ROMIZ B4131.

Eudendrium tenellum Allman, 1877.—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 18). *Eudendrium tenellum* is considered a *species inquirenda* (Schuchert 2013). Moreover, the identification of this species, originally described from the warm Straits of Florida (Allman 1877) is unlikely to occur in boreal waters of the Bay of Fundy.

Eudendrium vaginatum Allman, 1863. Sandy Cove, Digby County, NS, south side, 22.vii.1970, coll. J.S. Bleakney, SNM HYD-001053.

ORDER LEPTOTHECATA Cornelius, 1992

Family Melicertidae L. Agassiz, 1862

Melicertum octocostatum (M. Sars, 1835).—Cobscook Bay, ME (Trott 2004a: 271). **Note**: Trott (2004a) attributed the published records of Verrill (1871) and Bigelow (1914) for the occurrence of this species, both based on the medusa stage. The hydroid has yet to be identified from the Bay of Fundy.

Family Calycellidae Kramp, 1913

Calycella syringa (Linnaeus, 1767).—Grand Manan, NB, off Duck Island (Stimpson 1853, as *Campanularia syringa*).—St. Andrews, NB (Stafford 1912: 73).—Bay of Fundy, widespread (Fraser 1918: 350).—Minas Basin, NS; St. John River estuary, NB (Fraser 1944: 167).—Minas Basin, NS (Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 23).—Bay of Fundy (Linkletter *et al*. 1977: 7; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 271).—Off Digby, NS, 128 m, scallop dredge, May 1966, coll. J.F. Caddy, ROMIZ B641.—Sandy Cove, Digby Neck, NS, 22.vii.1970, intertidal, coll. K.W. Petersen, SNM HYD-001058.—Petit Passage, south of East Ferry, NS, 21.vii.1970, coll. K.W. Petersen, SNM HYD-001062.—Petit Passage, NS, south of East Ferry, *Laminaria* zone, 14.x.1970, coll. K.W. Petersen, SNM HYD-000455.—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-000459, SNM HYD-000493, SNM HYD-001049.—Petit Passage, NS, south of East Ferry, low water, 14.x.1970, coll. K.W. Petersen, SNM HYD-001050, SNM HYD-001051, SNM HYD-001052.—Lorneville, NB, 30.v.1973, coll. D.J. Scarratt, ARC 8650089.—St. Andrews, NB, on pontoon slip of wharf at biological station, <1 m, 22.viii.1984, coll. D. Calder, ROMIZ B649.—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B1536, ROMIZ B1537, ROMIZ B1538, ROMIZ B1539.—Eastport, ME, Cobscook Bay off Estes Head, on holdfast of *Laminaria* on aquaculture float, 07.viii.2005, coll. D. Calder, ROMIZ B4122.

Family Phialellidae Russell, 1953

Opercularella lacerata (Johnston, 1847).—St. Andrews, NB (Stafford 1912: 73).—St. Andrews, NB (Niger Reef; Navy Island); Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 351).—St. John River estuary, NB (Fraser 1944: 176).—Bay of Fundy (Linkletter *et al*. 1977: 7).—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 23; both as *Campanulina lacerata*).—Sherrod's Beach, NB, 2 m (Henry 2003: 142; Henry & Kenchington 2004a: 131).—Black Rock, Canada Creek, NS, in tidepool on algae, 19.viii.1970, Coll. K.W. Petersen, SNM HYD-000844.—Petit Passage, NS, south of East Ferry, *Laminaria* zone, 14.x.1970, coll. K.W. Petersen, SNM HYD-000455.—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-000459, SNM HYD-000493, SNM HYD-001050, SNM HYD-001051.—Richardson, Deer Island, NB, on *Mytilus edulis* on pontoon slip of wharf, <1 m, 22.v.1999, coll. D. Calder, ROMIZ B3088.—Stuart Town, Deer Island, NB, on *Mytilus edulis* on pontoon slip of public wharf, <1 m, 24.v.1999, coll. D. Calder, ROMIZ B3092.—Eastport, ME, inner basin of breakwater, <1 m, on *Ascophyllum nodosum*, 07.viii.2005, coll. D. Calder, ROMIZ B4121.

Opercularella pumila S.F. Clark, 1875.—Navy Island, St. Andrews, NB (Fraser 1918: 351).—Bay of Fundy (Linkletter *et al*. 1977: 7).

Family Tiaropsidae Boero, Bouillon, & Danovaro, 1987

Tiaropsis multicirrata (M. Sars, 1835).—Richardson, Deer Island, NB, 44°59'42"N, 66°56'45"W, on pontoon slip of wharf, <1 m, on *Mytilus edulis*, 22.v.1999, coll. D. Calder, ROMIZ B3089.

Family Incertae Sedis

Cuspidella costata Hincks, 1868.—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 24). This is believed to be the hydroid of the medusa *Laodicea undulata* (Forbes & Goodsir, 1851) (family Laodiceidae L. Agassiz, 1862).

Cuspidella grandis Hincks, 1868.—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 24). This is believed to be the hydroid of the medusa *Mitrocomella polydiademata* (Romanes, 1876) (family Mitrocomidae Haeckel, 1879), known to occur in the Bay of Fundy (Shih *et al*. 1971).

Cuspidella humilis Hincks, 1866.—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 25).

Keratosum maximum (Levinsen, 1893).—Bay of Fundy (Henry 2003: 130; Henry & Kenchington 2004a: 127).

Family Campanulariidae Johnston, 1837

Campanularia groenlandica Levinsen, 1893.—Brier Island, NS, 22 fm (40 m); Passamaquoddy Bay region, NB: Quoddy River; E of Spruce Island, 17 fm (31 m); between White and Spruce islands; off Head Harbour Island, 25 fm (46 m); off Deer Island Point; Campobello Island (Fraser 1918: 343).—Eastport harbor, ME (Fraser 1944: 120).—Bay of Fundy (Linkletter *et al*. 1977: 7).—Cobscook Bay, ME (Trott 2004a: 272).—Richardson, Deer Island, NB, on *Mytilus edulis* on pontoon slip of wharf, <1 m, 22.v.1999, coll. D. Calder, ROMIZ B3090.

Campanularia volubilis (Linnaeus, 1758).—Bay of Fundy, 0–60 fm (0–110 m) (Verrill 1874: 726).—St. Andrews, NB (Stafford 1912: 73).—Grand Manan, NB, to head of Passamaquoddy Bay (Fraser 1918: 345).—Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 345).—Bay of Fundy (Linkletter *et al*. 1977: 7; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272). Bigelow's (1914: 16) report of this species (as *Clytia volubilis*) from the vicinity of Eastport, ME, is considered incorrect, having been based on a species with a medusa stage (likely close to *Clytia hemisphaerica*). *Campanularia volubilis* has fixed gonophores.—Off Digby, NS, 128 m, scallop dredge, May 1966, coll. J.F. Caddy, ROMIZ B633.—Western Passage off Fairhaven, Deer Island, NB, 24.viii.1984, coll. D. Calder, ROMIZ B652.

Orthopyxis integra (Macgillivray, 1842).—Bay of Fundy, low water to 30 fm (0–55 m) (Verrill 1874: 726, as *Orthopyxis caliculata*).—Spruce Island, Passamaquoddy Bay, NB; Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 344, as *Campanularia integra*).—Eastport, ME (Fraser 1944: 122, as *C. integra*).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *Campanularia integra*).—Cobscook Bay, ME (Trott 2004a: 272).—Sandy Cove, Digby Neck, NS, 22.vii.1970, intertidal, coll. K.W. Petersen, SNM HYD-001058.—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-000459, SNM HYD-000493, SNM HYD-001049, SNM HYD-001050, SNM HYD-001051.—Point Lepreau, NB, in tidepool, lower intertidal, on rocks, coralline algae, *Mytilus*, 24.viii.1988, coll. D. Calder, ROMIZ B4020.

Rhizocaulus verticillatus (Linnaeus, 1758).—St. Andrews, NB (Stafford 1912: 73, as *Campanularia verticillata*).—L'Etang Head, NB, to the northern tip of Campobello Island, NB (Fraser 1918: 344, as *C. verticillata*).—Minas Basin, NS (Fraser 1944: 130; Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 19; all as *C. verticillata*).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *Campanularia verticillata*; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272).—Off Red Beach, Deer Island, NB, on crab in lobster trap, May 1962, coll. D. Calder, ROMIZ B644.—Lorneville, NB, 01.vi.1973, coll. D.J. Scarratt, ARC 8650085.—Pendleton Island, NB, --vii.1990, 8 m, on *Boltenia ovifera*, coll. C. Hatfield, ROMIZ B4219.—Eastport, ME, just offshore from Hotel East, 8 m, on rocks, 06.viii.2005, coll. Larry G. Harris, ROMIZ B4119.

Family Clytiidae Cockerell, 1911

Clytia gigantea (Hincks, 1866).—St. Croix River, NB, 5–10 fm (9–18 m) (Fraser 1918: 343, as *Campanularia gigantea*).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *Campanularia gigantea*).

Clytia gracilis (M. Sars, 1850).—Chamcook Harbour, NB, 5 fm (9 m); off Bliss Island, NB (Fraser 1918: 345, as *Clytia cylindrica*).—High Duck Island, between Two and Three islands, and off Swallowtail Light, 30–40 fm (55–73 m), all near Grand Manan, NB; St. Andrews Point, NB; off Joe's Point, St. Andrews, NB; off Dochet Island (St. Croix Island), ME (Fraser 1918: 348, as *Gonothyraea gracilis*).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *Gonothyraea gracilis*).—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 21; both as *Laomedea gracilis*).—Black Rock, Canada Creek, NS, in tidepool on algae, 19.viii.1970, Coll. K.W. Petersen, SNM HYD-000844.—Eastport, ME, inner basin of breakwater, <1 m, on *Boltenia ovifera* and algae, 07.viii.2005, coll. D. Calder, ROMIZ B4124.

Clytia hemisphaerica (Linnaeus, 1767).—Eastport, ME; Grand Manan, NB (A. Agassiz 1865: 78, as *Clytia bicophora*).—Bay of Fundy (Verrill 1874: 725, as *C. johnstoni*).—St. Andrews, NB (Stafford 1912: 73, as *C. johnstoni*).—Grand Manan, NB, to the head of Passamaquoddy Bay; Brier Island, NS, 22 fm (40 m) (Fraser 1918: 345, as *C. johnstoni*).—St. Andrews Point, NB (Fraser 1918: 345, as *C. edwardsi*).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *C. edwardsi* and *C. johnstoni*).—Sherrod's Beach, Passamaquoddy Bay, NB, 2 m; Bay of Fundy (Henry 2003: 129; 142; Henry & Kenchington 2004a: 127; 131).—Cobscook Bay, ME (Trott 2004a: 272).—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W.

Petersen, SNM HYD-000459, SNM HYD-001050, SNM HYD-001051, SNM HYD-001054.—Richardson, Deer Island, NB, 44°59'42"N, 66°56'47"W, on *Ascophyllum nodosum* on pontoon slip of public wharf, <1 m, 34‰, 9° C, 26.v.1999, coll. D. Calder, ROMIZ B3095.

Clytia noliformis (McCrady, 1859).—Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 347). The record of this warm-water species in deeper waters of the decidedly boreal lower Bay of Fundy is held here to be erroneous.

Family Obeliidae Haeckel, 1879

Gonothyraea loveni (Allman, 1859a).—St. Andrews, NB (Stafford 1912: 73).—Off Niger Reef and Joe's Point, St. Andrews, NB; off Head Harbour Island, NB; Cumming's Cove, Deer Island, NB, 5–40 fm (9–73 m) (Fraser 1918: 348).—Minas Basin, NS (Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 21; the latter two as *Laomedea loveni*).—Bay of Fundy (Linkletter *et al*. 1977: 7).—Sherrod's Beach, Passamaquoddy Bay, NB, 2 m; Bay of Fundy (Henry 2003: 129; 142; Henry & Kenchington 2004a: 127; 131).—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-001049.—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B1756, ROMIZ B1758, ROMIZ B1759.—Green's Point, near Letete, NB, in high-water lagoon at Tucker's Point, 15.viii.1998, coll. D. Calder, ROMIZ B4130.—Letete, NB, Tucker's Point, in intertidal brook, on rock, 45°02'52"N, 66°53'36"W, 24.v.1999, 32.5‰, 10° C, coll. D. Calder, ROMIZ B3105.—Eastport, ME, inner harbor on floating dock, <1 m, 07.viii.2005, coll. D. Calder, ROMIZ B4117.

Hartlaubella gelatinosa (Pallas, 1766).—Grand Manan, NB (Stimpson 1853: 8, as *Laomedea gelatinosa*).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *Campanularia gelatinosa*).—Minas Basin, NS (Bromley & Bleakney 1985: 20, as *Campanularia gelatinosa*).—Kingsport, NS, 19.vii.1966, coll. J.S. Bleakney, ROMIZ B630.—Minas Basin, NS, Starr's Point, underside of sandstone overhang, 24.v.1999, coll. J.S. Bleakney, ROMIZ B3122.—Digby, NS, mouth of Bear River near Joggin Bridge, on old railway bridge pilings, 44°36'03"N, 65°44'40"W, low water, 29‰, 12° C, 31.v.1999, coll. D. Calder, ROMIZ B3098.

Laomedea amphora L. Agassiz, 1862.—Grand Manan, NB (A. Agassiz, 1865: 93).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *Campanularia amphora*).

Laomedea flexuosa Alder 1857.—Eastport, ME (Verrill 1874: 726, as *Campanularia flexuosa*).—Bay of Fundy (Verrill & Rathbun 1880: 230, as *C. flexuosa*).—St. Andrews, NB (Stafford 1912: 73, as *C. flexuosa*).—St. Andrews Island (Navy Island), NB (Fraser 1918: 343, as *C. flexuosa*).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *Campanularia flexuosa*).—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 20).—Cobscook Bay, ME (Trott 2004a: 272).—Fairhaven, Deer Island, NB, <1 m, on floating algae, 08.ix.1966, coll. D. Calder, ROMIZ B646.—Letete, NB, at lighthouse, --.vii. 1973, coll. G. Davis & F. Spiro, ARC 8650084.—Kingsport, NS, underside of sandstone overhang, intertidal, 18.ix.1984, coll. J.S. Bleakney, ROMIZ B506.—Deer Island Point, Deer Island, NB, intertidal, on *Ascophyllum*, 22.v.1999, coll. D. Calder, ROMIZ B3085.—Letete, NB, Tucker's Point, in intertidal brook, on *Ascophyllum nodosum*, 45°02'52"N, 66°53'36"W, 24.v.1999, 32.5‰, 10° C, coll. D. Calder, ROMIZ B3103.—Eastport, ME, Cobscook Bay off Comstock Point, on floating *Ascophyllum nodosum*, 08.viii.2005, coll. D. Calder, ROMIZ B4123.

Laomedea neglecta Alder, 1856b.—St. Andrews, NB (Stafford 1912: 73, as *Campanularia neglecta*).—Grand Manan, NB, to St Croix River, NB; Brier Island, NS (Fraser 1918: 344, as *C. neglecta*).—Bay of Fundy (Linkletter *et al*. 1977: 7, as *Campanularia neglecta*).

Obelia articulata (A. Agassiz, 1865).—St. Andrews, NB (St. Croix River, near biological station; off Joe's Point; off St. Andrews Point; Chamcook Harbour, Minister's Island); The Wolves, NB; Grand Manan, NB, off Swallowtail Light (Fraser 1918: 348).—Grand Manan, NB (Fraser 1943: 88).—Eastport, ME (Fraser 1944: 152).—Bay of Fundy (Linkletter *et al*. 1977: 7).—Passamaquoddy Bay, off western end of Deer Island, NB, on *Boltenia ovifera* in a lobster trap, 19.vi.1985, coll. D. Calder, ROMIZ B4126. **Note**: until examining ROM specimens (ROMIZ B4126), I had regarded *Obelia articulata* as identical with *Obelia longissima* (Pallas, 1766). However, hydrothecae differ in being much deeper relative to their width, marginal cusps are much more deeply cut, and the colony is much finer. Hydrothecal characters of *O. articulata* strongly resemble those of *Gonothyraea loveni* (Allman, 1859a), and my material was thought to be that species until gonophores with developing medusae were observed. The original description of *O. articulata* by A. Agassiz (1865) is inadequate; Fraser's (1918) interpretation of that species has been adopted in this study.

Obelia bidentata S.F. Clark, 1875.—Minas Basin, Kingsport, NS, low intertidal, on bryozoan and hydroid stems on a stone, 20 August 1970, coll. K.W. Petersen, SNM HYD-001061.—Minas Basin, Medford Beach near Kingsport, NS, on sandy silt near low water, 28.viii.1984, coll. J.S. Bleakney, ROMIZ B507.—Minas Basin, Kingsport, NS, low tide, ix.1999, underside of sandstone overhang, coll. J.S. Bleakney, ROMIZ B3121.

Obelia dichotoma (Linnaeus, 1758).—Grand Manan, NB (A. Agassiz 1865: 88, as *Eucope pyriformis*).—Eastport, ME (Verrill 1874: 728; Bigelow 1914: 16).—St. Andrews, NB (Stafford 1912: 72).—St. Andrews, NB, off Joe's Point, 17 fm (31 m); Brier Island, NS, 33–39 fm (60–71m) (Fraser 1918: 349).—Minas Basin, NS (Fraser 1944: 155; Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 22; the latter two as *Laomedea dichotoma*).—Bay of Fundy (Linkletter *et al.* 1977: 7; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 271).—Eastport, ME, at Harris Point, on *Ulva* sp., <1 m, 07.viii.2005, coll. D. Calder, ROMIZ B4116.

Obelia geniculata (Linnaeus, 1758).—Bay of Fundy (Verrill 1874: 727).—St. Andrews, NB (Stafford 1912: 72).—Grand Manan, NB (High Duck Island, Horse Island, Whale Cove, off Swallowtail light); The Wolves, NB; north of Green Island, NB; Bliss Island, NB; Deer Island, NB; St. Andrews, NB (off Joe's Point) (Fraser 1918: 350).—Minas Basin, NS; Scots Bay, NS; Cobequid Bay, NS; Eastport, ME (Fraser 1944: 159).—Minas Basin, NS; Bass River, NS, intertidal; Scots Bay, NS, intertidal (Bousfield & Leim 1960: 14).—Deer Island, NB (Calder 1971: 57).—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 22; both as *Laomedea geniculata*).—Bay of Fundy (Linkletter *et al.* 1977: 7; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272).—Eastport, ME (Sisson 2005: 1725).—Fairhaven, Deer Island, NB, <1 m, on kelp, summer 1961, coll. D. Calder, ROMIZ B634.—Sandy Cove, Digby Neck, NS, 22.vii.1970, intertidal, coll. K.W. Petersen, SNM HYD-001058.—Black Rock, Canada Creek, NS, in tidepool on algae, 19.viii.1970, Coll. K.W. Petersen, SNM HYD-000844.—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-000459, SNM HYD-001050.—St. Andrews, NB, on pontoon slip of wharf at biological station, <1 m, 22.viii.1984, coll. D. Calder, ROMIZ B600.—Westport, Brier Island, NS, on kelp on floating dock, <1 m, 16.viii.1988, coll. D. Calder, B4128.—Richardson, Deer Island, NB, on pontoon slip of wharf, <1 m, 22.v.1999, on *Agarum cribrosum*, coll. D. Calder, ROMIZ B3094.—Eastport, ME, at Harris Point, on *Ascophyllum nodosum* and *Laminaria* sp., <1 m, 07.viii.2005, coll. D. Calder, ROMIZ B4115.

Obelia longissima (Pallas, 1766).—Grand Manan, NB (L. Agassiz 1862: 351; A. Agassiz 1865: 91: both as *Obelia commissuralis*).—Bay of Fundy (Verrill 1874: 728).—Eastport, ME (Mayer 1910b: 244; Bigelow 1914: 15; both as *O. commissuralis*).—St. Andrews, NB (Stafford 1912: 73, as *O. flabellata* and *O. longissima*).—Between White and Spruce islands, NB (Fraser 1918: 349, as *O. flabellata*).—Off Bliss Island, NB; Indian Head Bay, Charlotte County, NB; St. Andrews, NB, off Joe's Point (Fraser 1918: 350).— St. John River estuary (Fraser 1944: 162).—Bay of Fundy (Linkletter *et al.* 1977: 7, as *O. commissuralis*, *O. flabellata*, and *O. longissima*).—Sherrod's Beach, Passamaquoddy Bay, NB, 2 m; Bay of Fundy (Henry 2003: 129; 142; Henry & Kenchington 2004a: 127; 131).—Cobscook Bay, ME (Trott 2004a: 272).—St. Andrews, NB, off Joe's Point, 23.x.1973, 9–12 m, coll. T. Lacalli, ARC 8650082.—St. Andrews, NB, on pontoon slip of wharf at biological station, <1 m, 22.viii.1984, coll. D. Calder, ROMIZ B606.—Annapolis River estuary, NS, on test plates, 28.viii.1984, coll. J.S. Bleakney, ROMIZ B508.—Annapolis Basin, NS, on mooring line, 19.ix.1984, coll. J.S. Bleakney, ROMIZ B509, ROMIZ B510.—Westport, Brier Island, NS, on floating dock, <1 m, 16.viii.1988, coll. D. Calder, B4127.—Richardson, Deer Island, NB, pontoon slip of public wharf, just below surface, on *Laminaria*, 19.xii.1988, coll. D. Calder, ROMIZ B1024.—Eastport, ME, at Harris Point, on *Ascophyllum nodosum*, <1 m, 07.viii.2005, coll. D. Calder, ROMIZ B4112.

Family Lafoeidae A. Agassiz, 1865

Filellum serpens Hassall, 1848.—Common from north end of Campobello Island, NB, to head of Passamaquoddy Bay and up the St. Croix River; Brier Island, NS, 22 fm (40 m) (Fraser 1918: 354).—Off Grand Manan, NB, 40–55 fm (73–101 m) (Fraser 1944: 215).—Bay of Fundy (Linkletter *et al.* 1977: 8; Henry 2003: 129; Henry & Kenchington 2004a: 127). Off Green Island, Charlotte County, NB, 30.iii.1966, on *Abietinaria abietina*, coll. J.F. Caddy, ROMIZ B638.—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-001054.—Pendleton Island, NB, --vii.1990, 8 m, on *Boltenia ovifera*, coll. C. Hatfield, ROMIZ B4222.

Grammaria abietina (M. Sars, 1850).—Grand Manan, NB (Stimpson 1853: 9, as *Grammaria robusta*).—Bay of Fundy (Linkletter *et al.* 1977: 8; Henry 2003: 130; Henry & Kenchington 2004a: 127).

Grammaria borealis (Levinsen, 1893).—Bay of Fundy (Henry 2003: 129; Henry & Kenchington 2004a: 127). *Cryptolaria triserialis* Fraser, 1913, from Chedabucto Bay on the Atlantic coast of Nova Scotia, is considered conspecific.

Grammaria gracilis Stimpson, 1853.—Grand Manan, NB (Stimpson 1853: 9).—Bay of Fundy (Linkletter *et al.* 1977: 8).

Lafoea dumosa (Fleming, 1820).—St. Andrews, NB (Stafford 1912: 73, as *Lafoea robusta*; Fraser 1918: 353, as *Hebella* (?) *pocillum*).—Passamaquoddy Bay, common throughout; Brier Island, NS, 22 fm (40 m) (Fraser 1918: 354).—Eastport, ME (Fraser 1944: 207, as *Hebella* (?) *pocillum*).—Bay of Fundy (Linkletter *et al.* 1977: 8; as *Hebella pocillum* and *Lafoea dumosa*; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272).—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B1596.—Passamaquoddy Bay, ME, opposite Northern Harbour, Deer Island, NB, 58 m, 28.viii.1988, coll. D. Calder, ROMIZ B 4137.

Lafoea fruticosa (M. Sars, 1850).—Chamcook Harbour, NB, 5 fm (9 m) (Fraser 1918: 355).—Cherry Island, NB, 20–25 fm (37–46 m) (Fraser 1944: 223).—Bay of Fundy (Linkletter *et al*. 1977: 8; Henry 2003: 130; Henry & Kenchington 2004a: 127).

Lafoea gracillima (Alder, 1856a).—Bay of Fundy (Smith & Harger 1875: 53).—Brier Island, NS (Fraser 1918: 355).—Off Grand Manan, NB, 40–55 fm (73–101 m) (Fraser 1944: 224).

Family Haleciidae Hincks, 1868

Halecium articulosum S.F. Clark, 1875.—Eastport, ME (S.F. Clark 1875: 63).—Bay of Fundy (Verrill 1875: 42).—St. Andrews, NB (Stafford 1912: 73).—The Wolves, NB; between White and Spruce islands, N of Campobello Island, NB; SW of Deer Island, NB; St. Andrews, NB: off Sand Reef Light, 15 fm (27 m); off Harbour Island (Navy Island?), 25 fm (46 m); off Joe's Point, 10 fm (18 m); reef near biological station (Fraser 1918: 352).—Bay of Fundy (Linkletter *et al*. 1977: 8).—Cobscook Bay, ME (Trott 2004a: 271).—Passamaquoddy Bay, off northwestern end of Deer Island, NB, on *Boltenia ovifera* in a lobster trap, 19.vi.1985, coll. D. Calder, ROMIZ B4125.

Halecium beanii (Johnston, 1838).—Bay of Fundy (Verrill 1875: 43).—St. Andrews, NB (Stafford 1912: 73, as *Halecium beani*).—Many points from south end of Grand Manan, NB, to head of Passamaquoddy Bay (Fraser 1918: 352, as *H. beani*).—Minas Basin, NS; Cobequid Bay, NS; Eastport, ME (Fraser 1944: 186, as as *H. beani*).—Minas Basin, NS; Bass River, NS, intertidal (Bousfield & Leim 1960: 14, as *H. beani*).— Bay of Fundy (Linkletter *et al*. 1977: 8, as *H. beani*).—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 25; both as *H. beani*).—Cobscook Bay, ME (Trott 2004a: 272).

Halecium corrugatum Nutting, 1899.—Bay of Fundy (Henry 2003: 130; Henry & Kenchington 2004a: 127).

Halecium curvicaule Lorenz, 1886.—St. Andrews, NB, off Joe's Point; off Deer Island, NB; off Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 352).—Bay of Fundy (Linkletter *et al*. 1977: 8).

Halecium halecinum (Linnaeus, 1758).—Eastport, ME (A. Agassiz 1865: 148).—St. Andrews, NB (Stafford 1912: 73, as *Halecium halecium* and *H. gracile*).—St. Andrews, NB (Fraser 1918: 352, as *H. halecinum* and *H. gracile*); off Deer Island, NB (Fraser 1918: 352).—Minas Basin, NS; Eastport, ME (Fraser 1944: 194).—Minas Basin, NS; Scots Bay, NS, intertidal (Bousfield & Leim 1960: 14).—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 26).—Bay of Fundy (Linkletter *et al*. 1977: 8).—Cobscook Bay, ME (Trott 2004a: 272).

Halecium labrosum Alder, 1859.—Bay of Fundy (Linkletter *et al*. 1977: 8; Henry 2003: 130; Henry & Kenchington 2004a: 127).—Western Passage off Fairhaven, Deer Island, NB, 24.viii.1984, coll. D. Calder, ROMIZ B653.

Halecium marsupiale Bergh, 1887.—Passamaquoddy Bay, off northwestern side of Deer Island, NB, on *Hydrallmania falcata* in a lobster trap, 19.vi.1985, coll. D. Calder, ROMIZ B4132.

Halecium praeparvum, **sp. nov.—**Eastport, ME, near Estes Head, 44°53'36"N, 66°59'37"W, 07.viii.2005, from aquaculture pen, on kelp holdfast, <1 m, coll. D. Calder, ROMIZ B4111.

Halecium minutum Broch, 1903.—Brier Island, NS, 22 fm (40 m), July 2013 (Fraser 1918: 352).—off Digby, NS, 73–84 m, May 1966, coll. J.F. Caddy, ROMIZ B632. **Note**: differences between *Halecium minutum* and *H. textum* Kramp, 1911 appear to be minor. Identifications are most reliable when made from fertile colonies. Specimens examined here lacked gonophores, but resembled fertile colonies described earlier from Wakeham Bay (Kangiqsujuaq), Quebec (Calder 1970: pl. 2, figs. 6, 8, 9) as *H. undulatum* Billard, 1922. Those are now believed to be *H. minutum* based on morphology of the gonotheca (Schuchert 2001b).

Halecium muricatum (Ellis & Solander, 1786).—Eastport, ME (A. Agassiz 1865: 147; Fraser 1944: 197).—St. Andrews, NB (Stafford 1912: 73).—Quoddy River, 23–47 fm (42–86 m); Head Harbour Island, NB; Deer Island, NB; off Spruce Island, NB, 11–35 fm (20–64 m); Grand Manan, NB (between Big Duck and Cheyne islands; between Two and Three islands); Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 353).—Bay of Fundy (Linkletter *et al*. 1977: 8; Caddy 1970: 12; Henry 2003: 130; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272).—Bay of Fundy, 8 km NE of Centreville, NS, 27.v.1936, ARC 8650096.—Letang Estuary, NB, 4.xii.1970, ARC 8650093.

Halecium sessile Norman, 1867.—Bay of Fundy (Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272).—St. Andrews, NB, St Croix River off Joe's Point, 16 m, 06 September 1984, scallop drag, coll. D. Calder, ROMIZ B1601. **Note**: this species closely resembles *H. articulosum* S.F. Clark, 1875 and the two have sometimes been confused (for differences between them, see Calder 2012).

Halecium tenellum Hincks, 1861.—St. Andrews, NB (Stafford 1912: 73).—Common, from N end of Campobello Island, NB, to head of Passamaquoddy Bay; Brier Island, NS (Fraser 1918: 353).—Bay of Fundy (Linkletter *et al*. 1977: 8).

Halecium undulatum Billard, 1922.—Bay of Fundy (Henry 2003: 129; Henry & Kenchington 2004a: 127). **Note**: this species is close to and possibly conspecific with *H. textum* Kramp, 1911.

Family Sertulariidae Lamouroux, 1812

Abietinaria abietina (Linnaeus, 1758).—St. Andrews, NB (Stafford 1912: 73).—Off Swallowtail Lighthouse, Grand Manan, NB; SW of Deer Island, NB; Head Harbour, Campobello Island, NB; McMaster Island, near Deer Island, NB; St. Andrews, NB, off Joe's Point (Fraser 1918: 355).—Minas Basin, NS (Fraser 1944: 238; Bousfield & Leim 1960: 14: Bromley 1979: 520; Bromley & Bleakney 1985: 28; McLean *et al*. 2013: 506).—Bay of Fundy (Linkletter *et al*. 1977: 8; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272).—Off Green Island, Charlotte County, NB, 30.iii.1966, coll. J.F. Caddy, ROMIZ B638.—Western Passage off Fairhaven, Deer Island, NB, 24.viii.1984, coll. D. Calder, ROMIZ B608.—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B2087.

Abietinaria filicula (Ellis & Solander, 1786).—Grand Manan, NB, 20 fm (37 m) (Stimpson 1853: 8).—Bay of Fundy (Linkletter *et al*. 1977: 8; Henry 2003: 129; Henry & Kenchington 2004a: 127).

Diphasia fallax (Johnston, 1847).—Grand Manan, NB, deep water (Stimpson 1853: 9, as *Sertularia fallax*).—Eastport, ME (A. Agassiz 1865: 142).—Bay of Fundy, 20–55 fm (37–101 m) (Verrill & Rathbun 1880: 230).—St. Andrews, NB (Stafford 1912: 73).—Passamaquoddy Bay, NB, common throughout; Brier Island, NS, 22 fm (40 m) (Fraser 1918: 356).—Eastport, ME (Fraser 1943: 92).—Scots Bay, NS; Minas Basin, NS; Cobequid Bay, NS; Grand Manan, NB, 28–52 and 97–110 fm (51–95 m and 177–201 m); Eastport, ME, 18 fm (33 m) (Fraser 1944: 242).—Minas Channel, NS; Scots Bay, NS; Minas Basin, NS; Bass River, NS, intertidal (Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 29).—Lower Bay of Fundy (Caddy 1970: 12).—Bay of Fundy (Linkletter *et al*. 1977: 8; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272).—Bay of Fundy, 8 km NE of Centreville, NS, 27.v.1936, coll. J. Stevenson, ARC 86500136.—Off Digby, NS, 59–77 m, May 1966, scallop dredge, coll. J.F. Caddy, ROMIZ B3810.—Off Digby, NS, 73–77 m, scallop dredge, May 1966, coll. J.F. Caddy, ARC 8650137.—Off Digby, NS, 84–86 m, May 1966, scallop dredge, coll. J.F. Caddy, ARC 8650141.—Off Digby, NS, 82 m, May 1966, scallop dredge, coll. J.F. Caddy, ARC 8650144.—Off Digby, NS, 90–95 m, scallop dredge, May 1966, coll. J.F. Caddy, ARC 8650145.—Off Digby, NS, 73–84 m, scallop dredge, May 1966, coll. J.F. Caddy, ARC 8650146.—Off Digby, NS, 128 m, scallop dredge, May 1966, coll. J.F. Caddy, ROMIZ B639, ARC 8650140.—Lorneville, NB, 31.v.1973, coll. D.J. Scarratt, ARC 8650172.—Lorneville, NB, 31.v.1973–04.vi.1973, coll. D.J. Scarratt, ARC 8650171.—Head Harbour Passage, NB, 20.viii.2002, 170 ft (52 m), on *Boltenia ovifera*, coll. G. Pohle, ROMIZ 4216.

Diphasia margareta (Hassall, 1841).—Bay of Fundy (Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272, as *D. pinastrum*).

Diphasia rosacea (Linnaeus, 1758).—St. Andrews, NB (Stafford 1912: 74).—Deer Island, NB, 15 fm (27 m); Quoddy River off Frost Ledges, ME; between White and Spruce islands off Campobello Island, NB; between Two and Three islands off Grand Manan, NB; Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 356).—Minas Basin, NS; Grand Manan, NB, 97–110 fm (177–201 m) (Fraser 1944: 247).—Minas Basin, NS; Bass River, NS, intertidal (Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 29).—Bay of Fundy (Linkletter *et al*. 1977: 8; Henry 2003: 130; Henry & Kenchington 2004a: 127).—Lower Bay of Fundy, commercial scallop grounds (Fuller *et al*. 1998: 23, as *Diphasia rosaceae*).—Petit Passage, NS, south of East Ferry, *Laminaria* zone, 14.x.1970, coll. K.W. Petersen, SNM HYD-000455.—Petit Passage, NS, south of East Ferry, datum + 5 cm, 14.x.1970, coll. K.W. Petersen, SNM HYD-000871.—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-001049.—Deer Island, NB, Deer Island Point, in intertidal tide pool, unattached, 15.ix.2016, coll. D. Calder, ROMIZ B4217.

Dynamena pumila (Linnaeus, 1758).—Grand Manan, NB (A. Agassiz 1865: 141).—St. Andrews, NB (Stafford 1912: 73, as *Sertularia pumila*).— High Duck Island, near Grand Manan, NB; The Wolves, NB; Indian Head Bar, Indian Island (Charlotte County), NB (Fraser 1918: 359, as *S. pumila*).—Bay of Fundy (Linkletter *et al*. 1977: 8, as *S. pumila*).—Minas Basin, NS (Bromley 1979: 520; Bromley & Bleakney 1985: 28).—Passamaquoddy Bay, NB (Holey Point; Brandy Cove; Joe's Point; Woodstock Point; Letete Point; Pea Point) (Thomas *et al*. 1983: 54, as *Sertularia pumilla*; 40, 43, 56, 58, 60, 64, 66, 68, as *S. pumila*).—Passamaquoddy Bay, NB, tide pools (Thomas 1983: 100, as *S. pumila*).—Passamaquoddy Bay, NB (Holey Point; Holmes Cove Point; Green's Point No. 1; Green's Point No. 2; Pea Point) (Henry 2002: 1526).—Cobscook Bay, ME (Trott 2004a: 272).—West Quoddy Head, ME (Sisson 2005: 1725, as *S. pumila*).—Black Rock, Canada Creek, NS, in tidepool on algae, 19.viii.1970, Coll. K.W. Petersen, SNM HYD- 000844.—St. Andrews, NB, Indian Point, 08.vii.1972, intertidal, ARC 8650150, ARC 8650151.—Lorneville, NB, 01.vi.1973, coll. D.J. Scarratt, ARC 8650153.—Letete, NB, lighthouse, --.vii.1973, coll. F. Spiro & G. Davis, ARC 8650148.—St. Andrews, NB, Bar Road, 09.vi.1974, mid-intertidal, coll. T. Lacalli, ARC 8650152.—St. Andrews, NB, intertidal, on *Ascophyllum*, 31.viii.1984, coll. M. Reddy, ROMIZ B663.—Kingsport, NS, 28.viii.1984, on *Fucus*, coll. J.S. Bleakney, ROMIZ B504.—St. Andrews, NB, at Bar Road, intertidal channel, 21.viii.1988, coll. D. Calder, ROMIZ B2835.—Deer Island Point, Deer Island, NB, intertidal, on *Ascophyllum*, 22.v.1999, coll. D. Calder, ROMIZ B3086.—Eastport, ME, at Harris Point, on *Ascophyllum nodosum*, <1 m, 07.viii.2005, coll. D. Calder, ROMIZ B4114. **Note**: the report of this largely intertidal species (as *Sertularia pumila*) from commercial scallop grounds in the lower Bay of Fundy by Fuller *et al*. (1998) is questionable.

Hydrallmania falcata (Linnaeus, 1758).—Grand Manan, NB: on the hake ground, 35 fm (64 m) (Stimpson 1853: 8, as *Plumularia falcata*); off N point of Duck Island, 25 fm (46 m) (Stimpson 1853: 8, as *P. tenerrima*).—Grand Manan, NB; Eastport, ME (A. Agassiz 1865: 144, as *Sertularia falcata*).—Bay of Fundy, abundant, low water to 110 fm (201 m) (Verrill 1874: 733).—Bay of Fundy (Verrill & Rathbun 1880: 230).—St. Andrews, NB (Stafford 1912: 74).—Passamaquoddy Bay, common (Fraser 1918: 357).—Grand Manan, NB, 97–110 fm (177–201 m) (Fraser 1944: 250).—Minas Channel, NS; Minas Basin, NS; Bass River, NS, intertidal (Fraser 1944: 250; Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 27).—Minas Basin, NS, low tide, on stones (Bleakney 1996: 134).—Lower Bay of Fundy, commercial scallop grounds (Fuller *et al*. 1998: 15, 23).—Bay of Fundy (Linkletter *et al*. 8; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 273).—Bay of Fundy, 13 km NW of Gullivers Head, Digby County, NS, 30.v.1936, ARC 8650121.—St. Andrews, NB, Upper Green Point, 30.iii.1966, coll. J.F.Caddy, ARC 8650109.—Off Digby, NS, 59–77 m, May 1966, scallop dredge, coll. J.F. Caddy, ROMIZ B3814.—Off Digby, NS, 60–77 m, May 1966, scallop dredge, coll. J.F. Caddy, ROMIZ B642.—Off Digby, NS, 65–76 m, May 1966, scallop dredge, coll. J.F. Caddy, ARC 8650110.—Off Digby, NS, 65–74 m, May 1966, scallop dredge, coll. J.F. Caddy, ARC 8650112.—Off Digby, NS, 79–84 m, May 1966, scallop dredge, coll. J.F. Caddy, ARC 8650113.—Off Digby, NS, 128 m, May 1966, scallop dredge, coll. J.F. Caddy, ARC 8650120.—Off Digby, NS, 119–123 m, May 1966, scallop dredge, coll. J.F. Caddy, ARC 8650123.—Lorneville, NB, 30.v.1973, coll. D.J. Scarratt, ARC 8650107.—Lorneville, NB, 31.v.1973, coll. D.J. Scarratt, ARC 8650116.—Lorneville, NB, 30.v.1973–07.vi.1973, coll. D.J. Scarratt, ARC 8650118.—Letete Passage, NB, 55 m, 05.iii.1974, coll. T. Lacalli, ARC 8650115.—St. Andrews, NB, off Joe's Point, 03.xii.1974, coll. Capt. Wright, ARC 8650108.—St. Croix River, NB, at entrance to Oak Bay, 23.viii.1984, coll. D. Calder, ROMIZ B602.—Western Passage off Fairhaven, Deer Island, NB, 24.viii,1984, coll. D. Calder, ROMIZ B603.—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B1972, ROMIZ B1974.—Owen Basin, east of Campobello Island, NB, 44°53'N, 66°49'W, 160 m, on scallop shell, 28.v.1999, coll. D. Calder, ROMIZ B3097.

Pericladium mirabile (Verrill, 1873).—Grand Manan, NB (Fraser 1944: 254, as *Selaginopsis mirabilis*).—Bay of Fundy, 13 km NW of Gullivers Head, Digby County, NS, 30.v.1936, coll. J. Stevenson, ARC 8650165.

Sertularella gigantea Hincks, 1874.—Bay of Fundy, off Digby Gut, NS (Caddy 1970: 12, as *Sertularella polyzonias*).—Bay of Fundy, 8 km NE of Centreville, NS, 27.v.1936, coll. J. Stevenson, ARC 8650159.—Off Digby, NS, 60–77 m, scallop dredge, --.v.1966, coll. J.F. Caddy, ARC 8650162.—Off Digby, NS, 119–123 m, scallop dredge, --.v.1966, coll. J.F. Caddy, ROMIZ B636, ARC 8650160, ARC 8650161.—Lorneville, NB, 01.vi.1973, coll. D.J. Scarratt, ARC 8650157.—St. Andrews, NB, Navy Island, 25.x.1973, 21 m, coll. T. Lacalli, ARC 8650158.—St. Croix River, NB, at entrance of Oak Bay, 23.viii.1984, coll. D. Calder, ROMIZ B656.—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B1989, ROMIZ B1993, ROMIZ B1995.—Passamaquoddy Bay, off Frost Cove near Perry, ME, 58 m, 27.viii.1988, coll. D. Calder, ROMIZ B4134.—St. Andrews, NB, off Brandy Cove, 13 m, 27.viii.1988, coll. D. Calder, ROMIZ B4138.—Passamaquoddy Bay, ME, opposite Northern Harbour, Deer Island, NB, 58 m, 28.viii.1988, coll. D. Calder, ROMIZ B4136.

Sertularella polyzonias (Linnaeus, 1758).—Grand Manan, NB, 10–40 fm (18–73 m) (Stimpson 1853: 9, as *Sertularia polyzonias*).—Treat's Island, near Eastport, ME, low water (Fuller 1862a: 129; 1862b: 91; both as *S. polyzonias*).—Eastport, ME (A. Agassiz 1865: 146, as *Cotulina polyzonias*).—St. Andrews, NB (Stafford 1912: 73).—Passamaquoddy Bay area, common (Fraser 1918: 358).—Grand Manan, NB, 10–40 fm (18–73 m) and 97–110 fm (177–201 m); off Cherry Island, NB, 20–25 fm (37–46 m); Eastport, ME (Fraser 1944: 268).—Bay of Fundy (Linkletter *et al*. 1977: 8; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Lower Bay of Fundy, commercial scallop grounds (Fuller *et al*. 1998: 15, 23).—Cobscook Bay, ME (Trott 2004a: 273). **Note**: records of this species in the Bay of Fundy are believed to have been based instead on *Sertularella gigantea* Hincks, 1874. See text.

Sertularella rugosa (Linnaeus, 1758).—Grand Manan, NB (Stimpson 1853: 9, as *Sertularia rugosa*).—High Duck Island, off Grand Manan, NB; between White and Spruce islands, near Campobello Island, NB; Cumming's Cove, Deer Island, NB; West Quoddy Head, Lubec, ME; St. Croix Island, ME (Fraser 1918: 358).—Minas Basin, NS (Fraser 1944: 271; Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 31).—Bay of Fundy (Linkletter *et al*. 1977: 8).—Cobscook Bay, ME (Trott 2004a: 273).—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-000459, SNM HYD-001050.—Pendleton Island, NB, 8 m, --.vii. 1990, on *Boltenia ovifera*, coll. C. Hatfield, ROMIZ B4221.

Sertularia argentea Linnaeus, 1758.—Grand Manan, NB, common, 4–6 fm (7–11 m), on stones (Stimpson 1853: 8).—Treat's Island, near Eastport, ME, low water (Fuller 1862a: 129).—Bay of Fundy (Verrill 1874: 732; Linkletter *et al*. 1977: 8, as *Thuiaria argentea*).—St. Andrews, NB (Stafford 1912: 73, as *Thuiaria argentea*).—Deer Island, NB; Grand Manan, NB (Fraser 1918: 359, as *T. argentea*).—Eastport, ME (Fraser 1943: 93, as *T. argentea*).— Cobscook Bay, ME (Trott 2004a: 273).

Sertularia cupressina Linnaeus, 1758.—Eastport, ME (A. Agassiz 1865: 143).—Bay of Fundy, tidepools and 1–110 fm (2–201 m) (Verrill 1874: 732).—St. Andrews, NB (Stafford 1912: 73, as *Thuiaria cupressina*).—St. Croix River; St. Andrews, NB, off Joe's Point; McMaster Island, NB; Quoddy River, off Deer Island, NB; Whale Cove, Grand Manan, NB, 20–30 fm (37–55 m); Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 359, as *T. cupressina*).—E of Grand Manan, NB, 28–52 fm (51–95 m) (Fraser 1944: 298, as *T. cupressina*).—Minas Basin, NS; Bass River, NS, intertidal (Fraser 1944: 298; Bousfield & Leim 1960: 14; both as *T. cupressina*).—Minas Basin, NS (Bromley 1979: 520, as both *S. cupressina* and *T. cupressina*; Bromley & Bleakney 1985: 30).—Bay of Fundy (Linkletter *et al*. 1977: 8, as *T. cupressina*; Henry 2003: 129; Henry & Kenchington 2004a: 127; 2004b: 1107).—Cobscook Bay, ME (Trott 2004a: 273).—Bay of Fundy, 13 km W of Gullivers Head, NS, 30.v.1936, coll. J. Stevenson, ARC 8650135.—Lorneville, NB, 31.v.1973, coll. D.J. Scarratt, ARC 8650138.—Lorneville, NB, 04.vi.1973, 18 m, coll. D.J. Scarratt, ARC 8650168.—St. Croix River, NB, at entrance of Oak Bay, 23.viii.1984, coll. D. Calder, ROMIZ B654.—Western Passage off Fairhaven, Deer Island, NB, 24.viii.1984, coll. D. Calder, ROMIZ B604.—Annapolis Basin, NS, at Bear River bridge, 24.ix.1984, coll. J.S. Bleakney, ROMIZ B505.—Kingsport, Minas Basin, NS, at ELWS, 19.iii.1992, coll. J.S. Bleakney, ROMIZ B4223; ROMIZ B4224.

Sertularia fabricii Levinsen, 1893.—St. Andrews, NB (Fraser 1918: 360, as *Thuiaria fabricii*).—Bay of Fundy (Fraser 1944: 301, as *T. fabricii*; Henry 2003: 129; Henry & Kenchington 2004a: 127).

Sertularia latiuscula Stimpson, 1853.—Grand Manan, NB, laminarian zone (Stimpson 1853: 8).—St. Andrews, NB (Fraser 1918: 360, as *Thuiaria latiuscula*).—Bay of Fundy (Linkletter *et al*. 1977: 8, as *T. latiuscula*; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 273).—Deer Island, NB, Calder's Head off Red Beach, on crab in lobster trap, 5 m, May 1962, with gonothecae, coll. D. Calder, ROMIZ B647.—Off Digby, NS, 60–77 m, May 1966, scallop dredge, coll. J.F. Caddy, ROMIZ B635, ARC 8650154, ARC 8650156.—Letang Estuary, NB, 04.xii.1970, ARC 8650163.—Lorneville, NB, 31.v.1973, coll. D.J. Scarratt, ARC 8650167, ARC 8650176.—Lorneville, NB, 01.vi.1973, coll. D.J. Scarratt, ARC 8650170.—Lorneville, NB, 04.vi.1973, coll. D.J. Scarratt, ARC 8650166.—Lorneville, NB, --.vi.1973, coll. D.J. Scarratt, ARC 8650173.—Letang Estuary, NB, 20.viii.1975, coll. D. Wildish, ARC 8650177.—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B2082, ROMIZ B2083, ROMIZB2085.—Deer Island, NB, Deer Island Point, on unattached *Mytilus edulis* near low tide, 19.xii.1988, coll. D. Calder, ROMIZ B1019.—St. Andrews, NB, St. Croix River off Brandy Cove, 12 m, 19.viii.1989, coll. D. Calder, ROMIZ B2824.—Passamaquoddy Bay, off Frost Cove near Perry, ME, 58 m, 27.viii.1988, coll. D. Calder, ROMIZ B4133.—St. Andrews, NB, off Joe's Point, 45°05'N, 67°05'W, on rocks, 8 m, 28.v.1999, coll. D. Calder, ROMIZ B3099. **Note**: *Sertularia latiuscula*, with long, unbranched or little branched hydrocladia, sometimes approaches *S. cupressina* in morphology. The relationship between the two needs to be assessed.

Sertularia plumulifera (Allman, 1877).—Bay of Fundy (Linkletter *et al*. 1977: 8, as *Thuiaria plumulifera*). **Note**: this record was based on a colony of *Sertularia latiuscula*, now in collections at ARC (ARC 8650164). There were no location data with the sample. *Sertularia plumulifera* has not otherwise been reported north of Cape Cod and is unlikely to occur in the Bay of Fundy.

Sertularia robusta (S.F. Clark, 1877).—Bay of Fundy, off Digby Gut, NS, 40–45 fm (73–82 m) (Fraser 1944: 307, as *Thuiaria robusta*).

Sertularia similis S.F. Clark, 1877.—St. Croix River; Quoddy River; West Quoddy Head, ME; Head Harbour Island, off Campobello Island, NB, 25 fm (46 m); Whale Cove, Grand Manan, NB; Brier Island, NS, 22 fm (40 m) (Fraser 1918: 360, as *Thuiaria similis*).—Minas Basin, NS (Fraser 1944: 307; Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 30; all as *T. similis*).—Bay of Fundy (Fraser 1944: 307, as *T. similis*; Linkletter *et al*. 1977: 8, as *T. similis*; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 273).

Sertularia tenera G.O. Sars, 1874.—St. Andrews, NB; Brier Island, NS (Fraser 1918: 360, as *Thuiaria tenera*).—Bay of Fundy (Linkletter *et al*. 1977: 8, as *T. tenera*; Henry 2003: 129; Henry & Kenchington 2004a: 127). At least some records of this species in the western North Atlantic are erroneous (Calder 2012). Those reported from Ungava Bay and Northern Foxe Basin by Calder (1970), and those illustrated in Fraser (1921: 176, fig. 100; 1944: 308, pl. 65, fig. 295; both as *Thuiaria tenera*), are referable instead to *Sertularia spitzbergensis* (Jäderholm, 1909).

Tamarisca tamarisca (Linnaeus, 1758).—Grand Manan, NB (Stimpson 1853: 8, as *Sertularia producta*).—Eastport, ME (Fraser 1944: 348, as *Diphasia tamarisca*).—Bay of Fundy (Linkletter *et al*. 1977: 8, as *Diphasia tamarisca*).—Cobscook Bay, ME (Trott 2004a: 273).

Thuiaria articulata (Pallas, 1766).—St. Andrews, NB (Fraser 1918: 360, as *T. lonchitis*).—Eastport, ME (Fraser 1944: 304, as *T. lonchitis*).—Bay of Fundy, off Digby Gut, NS (Caddy 1970: 12, as *T. lonchitis*).—Bay of Fundy (Linkletter *et al*. 1977: 8, as *T. lonchitis*; Henry 2003: 130; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 273).

Thuiaria laxa Allman, 1874.—St. Croix River; between Green and Three islands, off Grand Manan, NB; between Mohawk and Adam islands, off Deer Island, NB, 35 fm (64 m); off Deer Island, NB; McMaster Island, NB; off Brier Island, NS, 22 fathoms (40 m) (Fraser 1918: 360, as *Thuiria immersa*).—Bay of Fundy (Linkletter *et al*. 1977: 8, as *Thuiaria immersa*).

Thuiaria thuja (Linnaeus, 1758).—McMaster Island, NB, 30 fm (55 m) (Fraser 1918: 361).—Bay of Fundy (Linkletter *et al.* 1977: 8).

Family Symplectoscyphidae Maronna *et al.*, 2016

Symplectoscyphus tricuspidatus (Alder, 1856a).—Eastport, ME (A. Agassiz 1865: 146, as *Cotulina tricuspidata*).—Bay of Fundy, 50–55 fm (91–101 m) (Verrill & Rathbun 1880: 230, as *Sertularella tricuspidata*).—St. Andrews, NB (Stafford 1912: 73, as *Sertularella tricuspidata*).—Passamaquoddy Bay, common everywhere; Brier Island, NS, 33–39 fm (60–71 m) (Fraser 1918: 358, as *Sertularella tricuspidata*).—Grand Manan, NB, 40–50 fm (73–91 m) and 97–110 fm (177–201 m); Eastport, ME, 18 fm (33 m) (Fraser 1944: 274, as *Sertularella tricuspidata*).—Scots Bay, NS; Minas Basin, NS; Bass River, NS, intertidal (Fraser 1944: 274; Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 31; all as *Sertularella tricuspidata*).—Bay of Fundy (Linkletter *et al.* 1977: 8, as *Sertularella tricuspidata*; Henry 2003: 129; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 273).—Off Digby, NS, 119–123 m, scallop dredge, May 1966, coll. J.F. Caddy, ARC 8650125.—Off Digby, NS, 90–95 m, scallop dredge, May 1966, coll. J.F. Caddy, ROMIZ B645, ARC 8650127.—Off Digby, NS, 73–84 m, scallop dredge, May 1966, coll. J.F. Caddy, ARC 8650124.—Sandy Cove, Digby Neck, NS, 22.vii.1970, intertidal, coll. K.W. Petersen, SNM HYD-001058.—Petit Passage, NS, south of East Ferry, *Laminaria* zone, 14.x.1970, coll. K.W. Petersen, SNM HYD-000455.—Petit Passage, NS, south of East Ferry, extreme low tide, 14.x.1970, coll. K.W. Petersen, SNM HYD-000459.—Petit Passage, NS, south of East Ferry, low water, 14.x.1970, coll. K.W. Petersen, SNM HYD-001050, SNM HYD-001052.—Lorneville, NB, 31.v.1973, coll. D.J. Scarratt, ARC 8650128.—Lorneville, NB, 01.vi.1973, coll. D.J. Scarratt, ARC 8650175.—Western Passage off Fairhaven, Deer Island, NB, 24.viii.1984, coll. D. Calder, ROMIZ B657.—St. Andrews, NB, off Joe's Point, 16 m, scallop dredge, 06.ix.1984, coll. D. Calder, ROMIZ B1997, ROMIZ B1998, ROMIZ B1999, ROMIZ B2000, ROMIZ B2030, ROMIZ B2031.

Family Plumulariidae McCrady, 1859

Nemertesia americana (Nutting, 1900).—St. Andrews, NB (Fraser 1918: 361, as *Antennularia americana*).—Scots Bay, NS (Fraser, 1944: 322; Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 26; all as *A. americana*).—Bay of Fundy (Linkletter *et al.* 1977: 8, as *Antennularia americana*; Henry 2003: 130; Henry & Kenchington 2004a: 127).—Cobscook Bay, ME (Trott 2004a: 272).—Digby scallop bed, off Digby, NS, 1952, coll. J.C. Medcof & J.A. Rommel, ARC 8650105.—Western Passage off Fairhaven, Deer Island, NB, 24.viii.1984, coll. D. Calder, ROMIZ B601.—St. Croix River, NB, at entrance to Oak Bay, 23.viii.1984, coll. D. Calder, ROMIZ B607.

Nemertesia antennina (Linnaeus, 1758).—Bay of Fundy, 10–60 fm (18–110 m) (Verrill 1874: 730, as *Antennularia antennina*).—St. Andrews, NB (Stafford 1912: 74, as *A. antennina*).—Off White Horse Island, NB (Fraser 1918: 361, as *A. antennina*).—Minas Basin, NS (Fraser 1944: 323; Bousfield & Leim 1960: 14; Bromley 1979: 520; Bromley & Bleakney 1985: 27; all as *A. antennina*).—Bay of Fundy (Linkletter *et al.* 1977: 8, as *Antennularia antennina*).—Passamaquoddy Bay, NB, 05.vii.1972, ARC 8650106.

Family Halopterididae Millard, 1962

Polyplumaria gracillima (G.O. Sars, 1973).—Eastport, ME, 10–20 fm (18–37 m) (S.F. Clark 1875: 64, as *Plumularia verrillii*).—Grand Manan, NB (Stafford 1912: 74, as *Schizotricha gracillina*).—Bay of Fundy (Linkletter *et al.* 1977: 8, as *Schizotricha gracillima*).—Cobscook Bay, ME (Trott 2004a: 272, as *Plumularia gracillima*).

Family Aglaopheniidae Marktanner-Turneretscher, 1890

Lytocarpia myriophyllum (Linnaeus, 1758).—Eastport, ME (A. Agassiz 1865: 145, as *Sertularia myriophyllum*).—Cobscook Bay, ME (Trott 2004a: 272).