Reference: *Biol. Bull.*, 149: 287–315. (October, 1975)

BIOTIC CENSUS OF CAPE COD BAY: HYDROIDS[1]

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The Biotic Census of Cape Cod Bay was initiated in 1965 by the Systematics-Ecology Program at the Marine Biological Laboratory, Woods Hole, Massachusetts. Completed in 1969, the census involved qualitative and quantitative sampling of the benthos to determine the species occurring in the bay, and to provide information about their ecology. This report is an account of the hydroids collected during the project.

The hydroids of the northeast have received greater attention than those from any other geographic area of North America. Over 75 papers bearing on the taxonomy and distribution of hydroids from New England and Atlantic Canada have been published since Stimpson's (1854) synopsis of the marine invertebrates of Grand Manan Island. Among those not already cited in Fraser's (1944) monograph are papers by Ruebush (1939), Crowell (1945, 1947), Fraser (1945), Berrill (1948), Merrill (1967), Bush and Zinn (1970), Templeman (1973), and Calder (1974), in which one or two species have been discussed. Others, including Préfontaine (1932), Prat (1933), Procter (1933), Dexter (1944, 1947), Fuller (1946), Woods Hole Oceanographic Institution (1952), Bousfield and Leim (1960), Brunel (1962, 1963, 1970), Préfontaine and Brunel (1962), Caddy (1970), and Bourget and Lacroix (1973), have included hydroids in a general biotic survey or in a study on fouling organisms. Vervoort (1972) included several species of hydroids from the northeast collected during cruises from the Lamont-Doherty Geological Observatory. A number of hydroid species from Newfoundland and Anticosti Island have been described by Leloup (1939, 1960), and papers on the hydroids of northern Canada by Calder (1970, 1972) included a number of species from the Strait of Belle Isle. Further sources of information on hydroids of the northeast include Fraser's (1946) book on distribution and relationship in American hydroids, and the identification manuals of Miner (1950), Smith (1964), and Gosner (1971). Despite this volume of work, little specific information is available concerning the hydroids of Cape Cod Bay.

The collection of hydroids from the biotic census was relatively small; Cape Cod Bay apparently does not have an especially rich hydroid fauna. Nevertheless, a number of interesting hydroids were present in the collection, particularly those species adapted to substrates of mud and sand.

The systematic arrangement used in this report differs significantly from that employed by Fraser (1944). While Fraser's contributions to North American hydroid taxonomy and zoogeography remain of monumental value, the system of classification in his 1944 monograph is little advanced over that used 75 years earlier. Unfortunately, no comprehensive treatise on the hydroids of North

[1] Contribution No. 44 from the South Carolina Marine Resources Center, Charleston, South Carolina 29412.

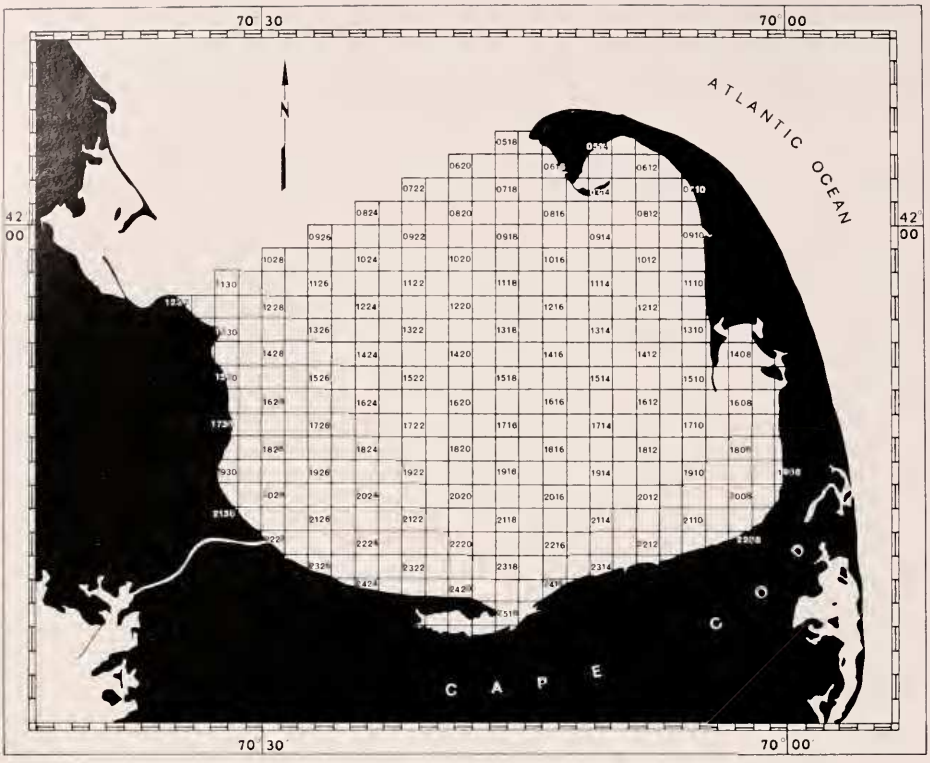

FIGURE 1. Cape Cod Bay, showing the sampling quadrats of the biotic census.

America under a modern classification is available. For an appreciation of contemporary trends in hydrozoan classification, one must refer to papers such as those of Brinckmann-Voss (1968), Millard (1962, 1964, 1966), Rees (1956, 1957, 1966), Vervoort (1968, 1972), Hirohito (1974), and Leloup (1974).

MATERIALS AND METHODS

In establishing a sampling pattern for the Biotic Census, Cape Cod Bay was divided into a grid of one-mile squares; those quadrats chosen for sampling were assigned four-digit numbers (Fig. 1). Qualitative samples were taken within each designated quadrat using an epibenthic sled, a modified clam dredge, and a naturalist's dredge. Hauls were made toward the center from the corners of the quadrat. Quantitative samples were taken at each corner and from the center of each sampling quadrat using a 0.10 m^2 Smith-McIntyre grab. Qualitative and quantitative samples were sieved through a 1.0 mm screen. Specimens were relaxed in 0.015% propylene phenoxytol, fixed in 10% seawater formalin for 48 hours, and preserved in 85% ethanol.

Salinity and temperature data in Table I are based on bottom readings. Water temperature was recorded using a bathythermograph, and salinity samples were

taken with a Van Dorn bottle. Depth data are given in Table I only for those areas of each quadrat where hydroids were collected.

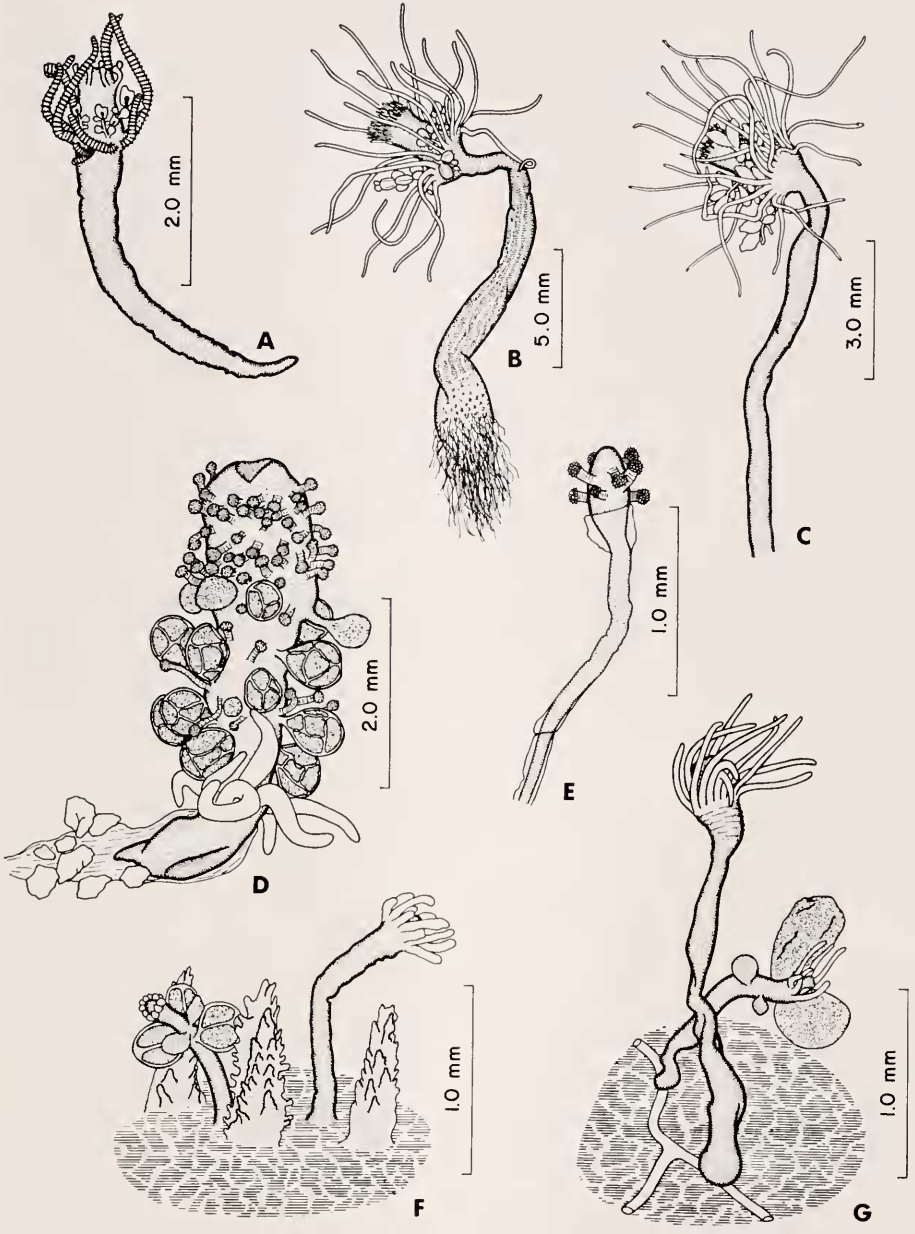

FIGURE 2. Athecate hydroids from Cape Cod Bay. A shows *Euphysa farcta,* 1028; B, *Corymorpha pendula,* 1522; C, *Tubularia larynx,* 2314; D, *Acaulis primarius,* 1012; E, *Sarsia tubulosa,* 2028; F, *Hydractinia echinata,* 2318; G, *Stylactis arge,* 1808.

TABLE I

List of stations in Cape Cod Bay where hydroids were collected.

Station	Date	Depth (m)	Temperature (C)	Salinity (‰)	Bottom type	Number species
0518	14-V-68	51–55	3.5	32.02	sand, silty sand	2
0616	18-VIII-69	8	21.6	31.25	sand	2
0620	18-IV-67	55	2.9	32.32	sand silt clay	1
0710	16-X-69	12	15.5	31.61	sand	2
0714	16-X-69	41	11.1	32.03	—	1
0718	6-I-69	50–54	3.1	32.55	silty sand	3
0824	28-VI-67	46–48	5.6	31.75	clayey silt, sandy silt	1
0910	19-VIII-69	9	22.7	31.20	gravel	1
0922	27-III-68	44	1.7	32.14	clayey silt	1
1012	7-IX-67	18–25	7.2	31.52	sand	6
1016	19-VIII-68	32–37	7.0	31.86	—	1
1028	21-IV-69	34–40	4.2	32.40	—	6
1114	11-III-69	31	1.5	32.48	—	1
1118	30-IX-68	40	4.4	31.97	—	1
1126	12-V-69	42	4.8	32.08	—	1
1130	22-I-68	15–35	0.7	31.84	sand, silty sand	7
1216	19-XII-67	32	6.5	31.67	clayey silt	1
1220	26-VIII-68	34	6.2	31.94	clayey silt	4
1228	10-V-67	27–33	4.8	31.47	silty sand	4
1232	16-X-69	12	14.0	31.74	sand	1
1310	10-IX-68	0	17.5	31.61	sand	1
1314	23-IV-68	30	5.0	31.99	clayey silt	2
1318	14-VI-67	33–35	5.7	31.58	clayey silt	3
1322	24-VII-67	34–38	4.8	31.78	clayey silt	3
1330	21-VII-69	6	12.9	31.35	rocky	2
1412	11-VI-68	11–14	7.0	31.53	sand	2
1416	1-X-68	29–30	9.5	31.90	sand silt clay	2
1428	13-V-69	25	4.8	32.04	silty sand	3
1510	11-IX-69	2–5	19.4	30.98	sand	3
1514	19-I-67	18	2.2	31.99	sand	2
1522	19-VIII-68	31–32	7.0	31.92	—	2
1526	21-I-69	24–34	1.6	32.47	silty sand	2
1530	21-XI-67	10	—	—	sand	2
1608	6-IX-67	2–4	18.7	30.44	sand	2
1612	13-V-69	2–9	12.0	30.16	sand	3
1616	22-IV-68	27	5.1	31.99	—	1
1624	13-V-68	32–33	5.5	31.49	sandy silt	4
1628	26-III-68	20–25	1.8	32.15	silty sand	8
1710	11-IX-69	3–6	19.5	31.18	—	2
1714	21-I-69	11	0.8	32.22	—	2
1718	29-X-68	26–28	13.1	31.99	silty sand	1
1808	19-VIII-69	3–5	23.5	31.21	sand	3
1812	20-II-68	2	1.0	31.96	sand	2
1816	13-V-69	15–19	6.5	31.45	sand	1
1820	1-X-68	25–27	7.1	31.96	—	2
1824	1-X-68	22	8.0	31.95	—	1
1828	11-III-69	13–23	1.5	32.28	silty sand	3
1910	17-V-67	5	10.5	30.86	sand	1
1914	18-XI-68	13	8.0	31.96	—	3
1918	4-VIII-66	21	6.8	31.92	sand	1
1922	14-VIII-67	23–26	6.6	31.73	silty sand	4

TABLE I (*continued*)

Station	Date	Depth (m)	Temperature (C)	Salinity (‰)	Bottom type	Number species
1926	19-XI-68	21	9.5	31.95	sandy silt	2
2008	23-IV-68	4–6	7.1	31.90	sand	2
2016	12-VI-68	16–18	8.1	31.33	sand	2
2024	27-III-68	23	1.8	32.20	—	1
2028	21-III-66	7	3.0	32.49	—	2
2110	11-IX-69	8–9	20.0	30.87	—	1
2114	25-X-67	7–13	11.5	31.53	sand	5
2118	15-X-68	17	13.6	31.90	sand	5
2126	7-II-66	21	1.0	—	—	1
2212	23-IV-68	3	5.2	31.89	sand	4
2220	7-I-69	16–17	1.5	32.12	—	3
2224	27-III-69	19	3.5	32.29	—	1
2314	18-VIII-69	8–10	20.4	31.36	—	2
2318	13-X-66	13–15	15.0	31.83	—	4
2326	21-VII-69	10–14	17.0	31.17	sand	2
2416	18-VIII-69	10	21.6	31.22	—	1
2420	18-VIII-69	8–10	17.0	31.45	sand	4

Descriptions, measurements, and illustrations in this report are based entirely on material from Cape Cod Bay. Terminology is largely as defined by Hyman (1940). The reported distribution refers to the North American Atlantic only. The synonymy list for each species includes the original author and any references relevant to the northeast not already cited by Fraser (1944). Representative specimens have been deposited in the Gray Museum, Marine Biological Laboratory, Woods Hole, Massachusetts.

SYSTEMATIC ACCOUNT

Order ANTHOMEDUSAE/ATHECATA
Suborder Capitata
Family Corymorphidae

Euphysa farcta (Miles, 1937)
Figure 2A

Dahlgrenella farcta Miles, 1937, p. 327, plates 1–4; Fraser, 1944, p. 102, fig. 75, 1945, p. 61, figs. 1–6.

Collection records: 0620, 0922, 1028, 1126, 1314, 1318, 1624, 1922.

Description: Polyps solitary, 1.5–9.0 mm high; hydrocaulus enclosed by a typically wrinkled and loosely-fitting tube of perisarc; perisarc extending a short distance over hydranth base; end of tube beyond tip of hydrocaulus occasionally frayed out into anchoring filaments. Hydranth club-shaped when extended, 0.8–1.7 mm long, 0.3–1.1 mm wide in preserved specimens; large specimens with as many as 25 or more papillae near point where hydranth merges with hydrocaulus. Tentacles in two whorls; oral tentacles 5–10 in number, small, capitate in smaller specimens, moniliform in larger ones; aboral tentacles moniliform, 8–17 in number. Buds and asexual bodies absent.

Medusa buds borne in small clusters on a whorl of short blastostyles arising just distal to aboral tentacles. Buds at first globular, later bell-shaped; tentacle bulbs four, one of these bearing a single tentacle.

Remarks: This hydroid was originally described as *Dahlgrenella farcta* by Miles (1937) from specimens collected in the Mount Desert Island region of Maine. Noting the similarity between hydroids of *D. farcta* and *Corymorpha aurata,* Rees (1938) placed *Dahlgrenella* in synonymy with *Corymorpha.* Later, *D. farcta* and *C. aurata* were removed to the genus *Euphysa* by Rees (1957). According to Kramp (1961), the only medusa of *Euphysa* ranging as far south as Cape Cod in the western Atlantic is *E. aurata.* Life history studies will probably reveal that *E. farcta* is a synonym of this species. Yet, hydroids in the present collection differed from descriptions of *E. aurata* by Rees (1938, 1946, 1957), Naumov (1960), and Brinckmann-Voss (1968) in having greater numbers of basal papillae. Cape Cod Bay specimens of *E. farcta* were typically much larger than the polyps of *Euphysa* sp. reported by Calder (1972) from Hudson Strait.

Reported distribution: Maine to Cape Cod Bay.

Corymorpha pendula L. Agassiz, 1862
Figure 2B

Corymorpha pendula L. Agassiz, 1862, p. 276, plate 26, figs. 7–17; Procter, 1933, p. 117; Dexter, 1944, p. 357; Fraser, 1944, p. 89, fig. 64; Dexter, 1947, p. 291; Bousfield and Leim, 1960, p. 13; Smith, 1964, p. 17; Brunel, 1970, p. 18.

Collection records: 0710, 0824, 1012, 1130, 1216, 1228, 1318, 1322, 1412, 1416, 1522, 1526, 1624, 1628, 1816, 1922, 2024, 2114, 2318.

Description: Hydroids solitary, ranging in height from 4–70 mm; hydrocaulus parenchymatous, coursed by branching and anastomosing gastrodermal canals; base of hydrocaulus bulbous with numerous papillae situated distal to a tangle of anchoring filaments; hydrocaulus tapering distally, narrowest just below hydranth; perisarc thin, closely fitting. Hydranth distinctly demarcated from hydrocaulus, reaching about 8 mm in length; tentacles all filiform, a single whorl of large aboral tentacles and a distal tuft of smaller, scattered oral tentacles; tentacle number varying with polyp size, about 50 aboral and 100 or more oral tentacles in larger specimens.

Blastostyles reaching about 10 mm long, arising just distal to aboral whorl of tentacles; gonophores sessile, oval, eumedusoid, with four radial canals frequently evident; tentacles four, rudimentary, occasionally difficult to discern.

Remarks: Descriptions by Agassiz (1862), Fraser (1944), and others indicate that the gonophores of *C. pendula* have one moderately large and three rudimentary marginal tentacles. Such tentacles were all vestigial in preserved material from Cape Cod Bay, and tentacles were frequently not discernable at all on the larger, ripe gonophores.

This species differs from *C. groenlandica,* reported from northern Canada (Calder, 1972), in having eumedusoid rather than cryptomedusoid gonophores. *C. glacialis,* occurring in the northeastern Atlantic, is distinguishable from *C. pendula* in lacking any trace of tentacles on the gonophores.

C. pendula was one of the most abundant hydroids in census collections, although most of the specimens were in rather poor condition.

Reported distribution: Gulf of St. Lawrence to Rhode Island.

Family Tubulariidae

Tubularia larynx Ellis and Solander, 1786
Figure 2C

Tubularia larynx Ellis and Solander, 1786, p. 31; Fraser, 1944, p. 99, fig. 72; Smith, 1964, p. 19; Brunel, 1970, p. 18.

Thamnocnidia spectabilis L. Agassiz, 1862, p. 271, plate 22, figs. 1–20.

Thamnocnidia tenella L. Agassiz, 1862, p. 275, plate 22, figs. 21–30.

Tubularia spectabilis Fraser, 1944, p. 100, fig. 73; Dexter, 1947, p. 291; Bousfield and Leim, 1960, p. 13.

Tubularia tenella Procter, 1933, p. 117; Fraser, 1944, p. 101, fig. 74; Brunel, 1963, p. 82; 1970, p. 18.

Collection records: 1012, 2314, 2318, 2326.

Description: Colonies growing in tangled masses reaching about 7 cm high. Hydrocaulus sinuous, irregularly branched, maximum diameter 0.7 mm; better-preserved specimens with bulb-like dilation at base of hydranth. Perisarc adherent, moderately thick, thinning out toward base of hydranth, usually twisted at origin of branches, extensively wrinkled, with annulations at irregular intervals. Hydranths small, reaching 3 mm high; tentacles filiform, 20–23 in an aboral whorl, these reaching 5 mm long; oral tentacles 15–20, shorter.

Gonophores sessile, oval, occasionally with 3–4 small, blunt, nematocyst-bearing tentacular rudiments evident; radial canals absent; actinulae produced. Blastostyles occasionally branched, arising just distal to aboral tentacles.

Remarks: Fraser (1944) included eight species of *Tubularia* from the Atlantic coast of Canada and the United States; several of these require comment. The account of *T. cristata,* quoted from McCrady's (1857) original description, indicates that the gonophores were deeply campanulate medusae, octagonal in cross-section and having eight meridional lines of "thread cells" (nematocysts) running up the exumbrella. From this description, and from the account of the hydroid, *T. cristata* McCrady, 1857 is regarded here as a synonym of *Ectopleura dumortieri* (van Beneden, 1844). An examination of Fraser's (1941) type specimens of *T. crassa* (U.S.N.M. No. 22746) revealed that the species is based on specimens of *Corymorpha pendula.* Two other species, *T. spectabilis* and *T. tenella,* were regarded as synonyms of *T. larynx* by Vervoort (1946). The status of *T. couthouyi* should also be subjected to close scrutiny.

T. larynx is distinguishable from *T. indivisa* in having branched stems with wrinkled and annulated perisarc, and gonophores with three to four tentacular rudiments and no radial canals. In *T. crocea,* the stems are generally unbranched and much less wrinkled and annulated than in *T. larynx.* Female gonophores of *T. crocea* have 6–10 laterally compressed ridges rather than tentacular rudiments.

Reported distribution: Newfoundland to Long Island Sound.

Family Acaulidae

Acaulis primarius Stimpson, 1854
Figure 2D

Acaulis primarius Stimpson, 1854, p. 10, plate 1, fig. 1; Procter, 1933, p. 117, fig. 29; Fraser, 1944, p. 87, fig. 62; Bousfield and Leim, 1960, p. 13; Smith, 1964, p. 17.

Collection records: 1012, 1016, 1118, 1220, 1322, 1416, 1522, 1612, 1624, 1820, 1922, 1926, 2016.

Description: Polyp solitary, vermiform, 1.0–11.0 mm high, occupying a small fraction of length of perisarcal tube; perisarc thin, loosely fitting, gelatinous, with adhering sand and silt particles, terminating below the filiform tentacles; end of tube occasionally frayed, forming anchoring filaments. Hydranth club-shaped, 0.7–9.0 mm long, having an irregular whorl of 8–13 large filiform tentacles proximally; remainder of hydranth with numerous scattered, capitate tentacles. Hydrocaulus reduced, conical, 0.3–3.0 mm long.

Gonophores sporosacs, borne in large numbers on short stalks among the capitate tentacles; ring canal, radial canals, and tentacles lacking.

Remarks: Thirty specimens of this unusual species were found in the samples from Cape Cod Bay. As with *Corymorpha* and *Euphysa*, hydroids of *Acaulis* are well-adapted for existence in a sandy or muddy substrate.

Reported distribution: Bay of Fundy to Cape Cod Bay.

Family Corynidae

Sarsia tubulosa (M. Sars, 1835)
Figure 2E

Oceania tubulosa M. Sars, 1835, p. 25, plate 5, fig. 11.

Syncoryna sarsii Loven, 1836, p. 275, plate 8, figs. 7–10.

Coryne mirabilis L. Agassiz, 1862, p. 185, plate 17, figs. 1–16; plate 18, figs. 1–25; plate 19, figs. 1–27.

Syncoryne mirabilis Leloup, 1939, p. 1, fig. 1; Fraser, 1944, p. 41, fig. 14.

Sarsia tubulosa Smith, 1964, p. 18.

Collection record: 2028.

Description: Hydroid fragmentary and small (2 mm high), with one hydranth. Perisarc of hydrocaulus occasionally wrinkled but not distinctly annulated, expanded into a thin, wrinkled covering over hydranth base. Hydranth oval, 560 μ long, 200 μ wide; hypostome dome-shaped; tentacles 10, scattered, capitate; terminal knobs about 70 μ wide.

Medusa buds absent.

Remarks: Identification of this small, sterile specimen was made after comparison with hydroids of *S. tubulosa* examined previously from Chesapeake Bay (Calder, 1971) and northern Canada (Calder, 1972). This is a cold water species; records of it as *Syncoryne mirabilis* in tropical and subtropical waters are almost certainly erroneous and are not included in the range below.

Reported distribution: Northern Canada to Chesapeake Bay.

Suborder Filifera
Family Hydractiniidae

Hydractinia echinata (Fleming, 1828)
Figure 2F

Alcyonium echinatum Fleming, 1828, p. 517.
Hydractinia polyclina Procter, 1933, p. 116.
Hydractinia echinata Fraser, 1944, p. 78, fig. 55; Crowell, 1945, p. 207; Dexter, 1947, p. 291; Bousfield and Leim, 1960, p. 13; Préfontaine and Brunel, 1962, p. 245; Smith, 1964, p. 18, plate 2, fig. 17; Merrill, 1967, p. 281.
Collection records: 1012, 1130, 1310, 1510, 1514, 1628, 1710, 1808, 1918, 1922, 1926, 2008, 2110, 2114, 2118, 2212, 2220, 2318, 2326, 2420.

Description: Colony with individual stolons distinguishable only in very young colonies. Typical colonies with encrusting base having numerous small prickles and large chitinous spines; spines reaching 1.4 mm high, consisting of a series of vertical, jagged ridges; coenosarc extending up between ridges. Gastrozooids columnar, arising individually from encrusting base, highly contractile, reaching 10 mm in length but usually less than 5 mm; manubrium conical. Tentacles filiform, number highly variable, generally between 10–25. When extended, longer, larger, upward-directed tentacles alternating with shorter, smaller, outward-directed ones. Slender dactylozooids occasionally present at aperture of shell, reaching 2.5 mm high; tentacles reduced to nematocyst-bearing knobs.

Gonozooids cylindrical, slender, reaching 4 mm in length but usually less than 1.5 mm; tentacles reduced to a series of knobs densely armed with nematocysts. Gonophores cryptomedusoid, occasionally as many as 10 or more developing concurrently on distal half of gonozooid.

Remarks: This well-known, eurythermal species was common in Cape Cod Bay on gastropod shells, most or all of which probably had been occupied by pagurid crabs. In addition to Fraser's (1944) distribution records, numerous collections of this species from Georges Bank and the coast off the middle Atlantic states were made by Merrill (1967).

Reported distribution: Labrador to Florida.

Stylactis arge Clarke, 1882
Figure 2G

Sytlactis (sic) *arge* Clarke, 1882, p. 138, figs. 18–20.
Stylactis sp. Crowell, 1947, p. 206.
Collection record: 1808.

Description: Hydroid with a slender, creeping hydrorhiza overlain by a thin sheet of perisarc; spines absent. Gastrozooids arising individually from hydrorhiza, reaching 3 mm high. Tentacles filiform, up to 20 in number, arising above a bulbous and somewhat rugose hydranth base; hypostome elongate.

Dactylozooids absent.

Gonozooids slender, up to 2.2 mm high; hydranth base neither bulbous nor rugose. Hypostome club-shaped; tentacles filiform, up to 10 in number. Medusa buds large, developing along distal quarter of gonozooid, too poorly preserved to permit description.

Remarks: In a previous report (Calder, 1971), this species was placed in the genus *Hydractinia* on the basis of studies by Kramp (1932), who suggested that

Stylactis merited no more than subgeneric rank. However, the differences in the structure of the hydrorhiza appear sufficient to warrant recognition of *Stylactis* as a valid genus. In fact, Kramp (1959, 1961) has retained the name *Stylactis*

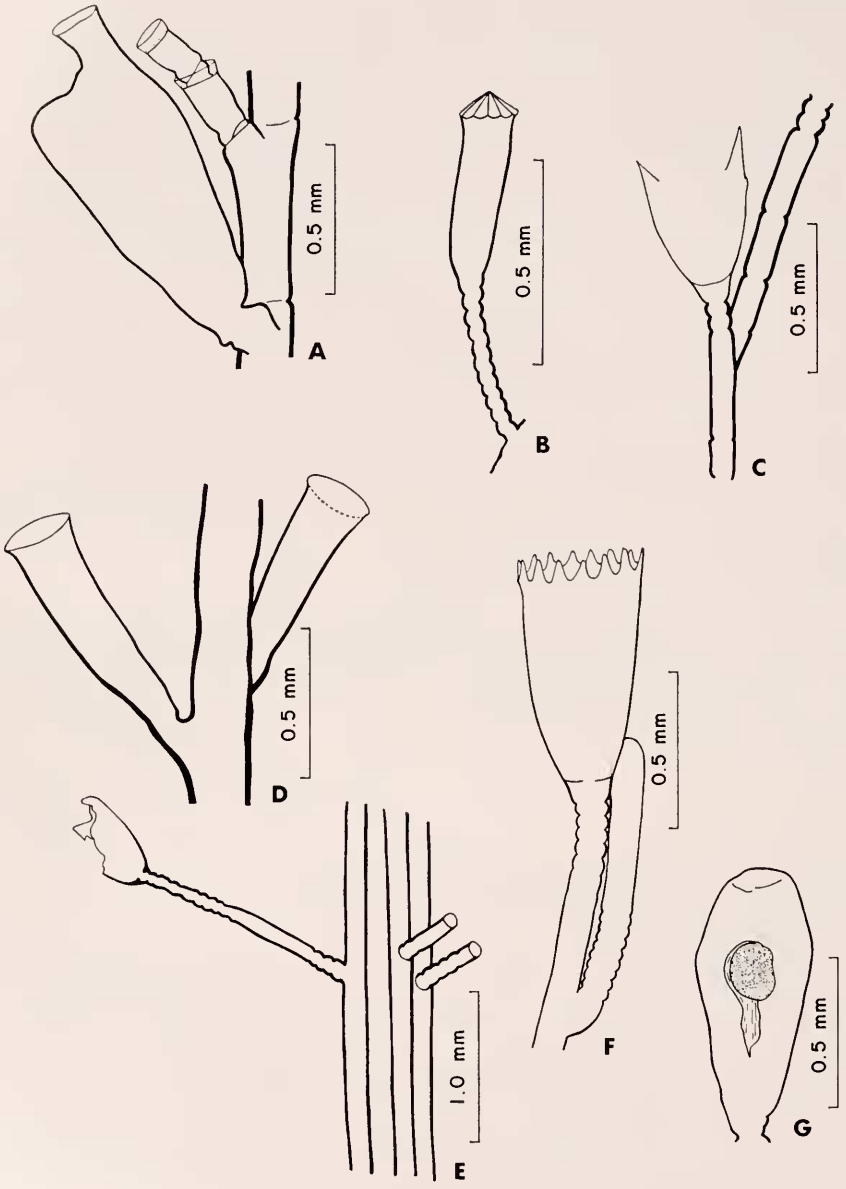

FIGURE 3. Thecate hydroids from Cape Cod Bay. A shows *Halecium halecinum,* 1322; B, *Calycella syringa,* 1130; C, *Lovenella gracilis,* 0616; D, *Lafoea dumosa,* 1028; E, *Campanularia verticillata,* 1530; F, *Clytia gracilis,* 1608; G, *Clytia gracilis,* gonotheca, 1608.

for the medusa stage of these hydrozoans. Bouillon (1971) discussed the status of the genus and summarized the characteristics of the various species described to date.

There is little apparent difference between descriptions of this species and *S. hooperi.* Asexual reproduction by hydranth autotomy has been observed in *S. arge* but not *S. hooperi;* small spines have been observed in *S. hooperi* but not *S. arge.* Medusae of the two species are inseparable from present descriptions. In both species the medusae are degenerate, short-lived, and released in greatest numbers at dusk (Clarke, 1882; Sigerfoos, 1899; Calder, 1971).

S. arge was represented in the present collection by a single colony.

Reported distribution: Cape Cod Bay to South Carolina.

Order LEPTOMEDUSAE/THECATA
Family Haleciidae

Halecium halecinum (Linnaeus, 1758)
Figure 3A

Sertularia halecina Linnaeus, 1758, p. 809.
Halecium gracile Verrill, 1874, p. 328.
Halecium halecinum Procter, 1933, p. 118; Fraser, 1944, p. 194, fig. 172; Bousfield and Leim, 1960, p. 14; Smith, 1964, p. 18, plate 2, figs. 18, 19; Vervoort, 1972, p. 25, fig. 3a.

Collection records: 1322, 1628, 1914.

Description: Hydrocaulus reaching 4.8 cm high, polysiphonic proximally, monosiphonic distally, divided into internodes at regular intervals by nodes sloping alternately from side to side. Each internode with a single, prominent, distal apophysis. Apophyses given off alternately from opposite sides of hydrocaulus at angles of less than 45°. Perisarc of hydrocaulus thick, annulations absent. Branches monosiphonic, arising from apophyses, arranged pinnately, divided into internodes at regular intervals by nodes that slope alternately from side to side. Length of internodes 632–828 μ, diameter at nodes 152–175 μ. Each internode with a single, distal apophysis. Apophyses arranged alternately on opposite sides of branch, each bearing a primary hydrotheca; secondary, tertiary and quaternary hydrothecae occasionally present. Branches occasionally rebranched; secondary branches arising from apophyses below primary hydrotheca. Primary hydrothecae frequently damaged or obliterated in present specimens; hydrophores of secondary, tertiary and quaternary hydrothecae relatively deep. All hydrothecae shallow, 35–58 μ deep; margin flaring but little, diameter at margin 135–163 μ, diameter at diaphragm 111–146 μ; distinct ring of puncta just distal to distinct diaphragm; pseudodiaphragm absent.

Single fertile colony female; gonothecae cone-shaped, 1109–1284 μ long to tip of neck; maximum width 478–548 μ; borne on branches. Pedicels short, not annulated, arising from apophyses adjacent to or in place of primary hydrothecae. Aperture at end of a short, somewhat flaring neck; neck situated at distal end and towards adcauline side of gonotheca.

Remarks: *Halecium halecinum* is similar to, but can be distinguished from, *H. beanii* in having a pinnate rather than a bushy colony form, and female gonothecae with a distal rather than a lateral aperture. Published descriptions indicate that the differences between *H. gracile* Verrill, 1874 and *H. halecinum* are minimal. Type specimens of *H. gracile* (U.S.N.M. 29076) differ from *H. halecinum* described here only in being somewhat less robust, and the two species are regarded as synonymous.

Fraser's (1944) record of this species (as *H. gracile*) from the Gulf of Mexico is considered doubtful.

Reported distribution: Labrador to Chesapeake Bay.

Family Calycellidae

Calycella syringa (Linnaeus, 1767)
Figure 3B

Sertularia syringa Linnaeus, 1767, p. 1311.

Calycella syringa Procter, 1933, p. 122; Fraser, 1944, p. 166, fig. 138; Bousfield and Leim, 1960, p. 14; Smith, 1964, p. 17, plate 2, fig. 14; Calder, 1970, p. 1516, plate 3, fig. 7.

Calicella syringa Vervoort, 1972, p. 36.

Collection record: 1130.

Description: Colony with a creeping hydrorhiza, giving rise to upright, unbranched pedicels of varying length; pedicels annulated in a close spiral throughout. Hydrothecae tubular, somewhat asymmetrical, 350–431 μ long from base to margin; margin slightly flaring, 123–146 μ in diameter; diaphragm absent. Operculum a folded cylindrical membrane forming a conical roof, separated from hydrothecal wall by a distinct, scalloped margin.

Gonophores lacking.

Remarks: *C. syringa* is very common in northeastern North America, yet it was found only once in the census collections.

Reported distribution: Northern Canada to Long Island Sound.

Family Lovenellidae

Lovenella gracilis Clarke, 1882
Figure 3C

Lovenella gracilis Clarke, 1882, p. 139, figs. 25–39; Fraser, 1944, p. 174, fig. 147.

Lovenella clausa Fraser, 1912, p. 5.

Collection records: 0616, 1510.

Description: Species represented by three young, unbranched colonies reaching a maximum height of 2.3 mm. Hydrocaulus monosiphonic, divided into rectangular internodes by more or less regularly located constrictions; diameter of hydrocaulus at nodes 76–93 μ. Perisarc of moderate thickness basally, thinner distally; that of the hydrotheca very thin. Annulations present only on hydranth pedicels and at base of hydrocaulus. Apophyses curving abruptly outward and upward beyond hydranth pedicels, giving hydroid a straight colony form. Hydrothecae turbinate,

about 600 μ high, 300 μ wide, borne on short pedicels having two annulations; distance between hydrothecae about 1.2 mm. Operculum a folded continuation of hydrothecal wall, lacking any line of demarcation from rest of hydrotheca; number of opercular facets indeterminable. Diaphragm thin, basal chamber deep.

Gonothecae absent.

Remarks: Unlike the European *Lovenella clausa, L. gracilis* lacks a line separating the operculum from the rest of the hydrotheca; reports to the contrary are erroneous. In describing the species from Chesapeake Bay, Clarke (1882) neither reported observing a basal opercular line nor illustrated it in his figures. Specimens examined later from Chesapeake Bay also lacked any separation between hydrotheca and operculum (Calder, 1971). Specimens from Cape Cod Bay conformed to the descriptions given for material from the Chesapeake.

Reported distribution: Cape Cod Bay to North Carolina; northern Gulf of Mexico.

Family Lafoeidae

Lafoea dumosa (Fleming, 1828)
Figure 3D

Sertularia dumosa Fleming, 1828, p. 83.

Lafoea dumosa Procter, 1933, p. 123; Fraser, 1944, p. 221, fig. 205; Leloup, 1960, p. 221; Brunel, 1962, p. 40; 1970, p. 18.

Collection record: 1028.

Description: Hydrorhiza creeping, giving rise either to individual upright hydrothecae or hydrocauli. Hydrocauli short, up to 4 mm high, monosiphonic in present specimens; hydrothecae arising from all sides of hydrocaulus at an angle of less than 45°. Hydrothecae 700–839 μ long, somewhat asymmetrical, tapering gradually from margin to base, merging almost imperceptably with pedicel. Pedicel short, twisted or constricted beneath hydrotheca but not annulated; diaphragm lacking. Margin entire, often distinctly flaring, 210–256 μ wide. Perisarc of rhizocaulus, hydrocaulus, and hydrotheca thick.

Coppinia absent.

Remarks: Several studies have been made on morphological variability in species of *Lafoea*, the most recent by Vervoort (1972). Based on an examination of material from both the North and South Atlantic, Vervoort recognized *L. fruticosa* as distinct from *L. dumosa; L. gracillima* was considered a synonym of the former species.

Reported distribution: Northern Canada to the Caribbean Sea.

Family Campanulariidae

Campanularia verticillata (Linnaeus, 1758)
Figure 3E

Sertularia verticillata Linnaeus, 1758, p. 811.

Campanularia verticillata Fraser, 1944, p. 129, fig. 103; Bousfield and Leim, 1960, p. 14; Calder, 1970, p. 1519, plate 4, fig. 4.

Collection record: 1530.

Description: Specimen fragmentary, 1.1 cm long; rhizocaulus polysiphonic, 443–606 μ in diameter. Pedicels given off in verticils, most broken off near base, annulated throughout distal half and at base; a distinct ball-like annulation occurring just below hydrotheca. Hydrotheca with an annular thickening basally; basal chamber small.

Gonothecae absent.

Remarks: Despite the poor condition of this specimen, it was readily distinguishable as *C. verticillata* in possessing a polysiphonic rhizocaulus with the pedicels arranged in verticils.

Reported distribution: Northern Canada to Long Island Sound.

Clytia gracilis (M. Sars, 1851)
Figure 3F, G

Laomedea gracilis M. Sars, 1851, p. 138.

Gonothyraea gracilis Fraser, 1944, p. 148, fig. 121.

Collection records: 1608, 1808.

Description: Colony consisting of a creeping hydrorhiza and upright, branched or unbranched pedicels. Branched colonies up to 10 mm high; unbranched pedicels plus hydrotheca 5 mm high. Pedicels annulated proximally and distally, smooth elsewhere. Branches resembling primary pedicel and directed immediately upward from a short, curved apophysis situated a short distance below the hydrotheca of the pedicel from which it arises. Hydrothecae cone-shaped, 560–851 μ long, 327–385 μ wide at margin. Margin with about 14 sharp, deeply-cut teeth separated by U-shaped incisions. Diaphragm thin; basal chamber of moderate size, cup-shaped. Perisarc thin.

One club-shaped gonotheca containing a single medusa bud present, 950 μ long, 400 μ wide, truncate distally; walls smooth, perisarc thin, pedicel short.

Remarks: Hydroids of this species are known to produce a free medusa stage (Stechow, 1923a; Vervoort, 1972; Sandifer, Smith, and Calder, 1974). These medusae possess four tentacles at liberation, indicating that this hydrozoan belongs in the genus *Clytia*. Rees and Thursfield (1965) regarded this species as a synonym of *C. hemisphaerica*.

Reported distribution: Nova Scotia to the Caribbean Sea.

Clytia hemisphaerica (Linnaeus, 1767)
Figure 4A, B

Medusa hemisphaerica Linnaeus, 1767, p. 1098.

Campanularia johnstoni Alder, 1856, p. 359, fig. 8.

Clytia johnstoni Fraser, 1944, p. 138, fig. 111; Smith, 1964, p. 17, plate 2, fig. 4.

Collection records: 2314, 2416.

Description: Pedicels arising from a creeping hydrorhiza; colony either unbranched or branched, with as many as 6 branches present. Branched colonies reaching 12 mm high; unbranched pedicels plus hydrotheca up to 7 mm high,

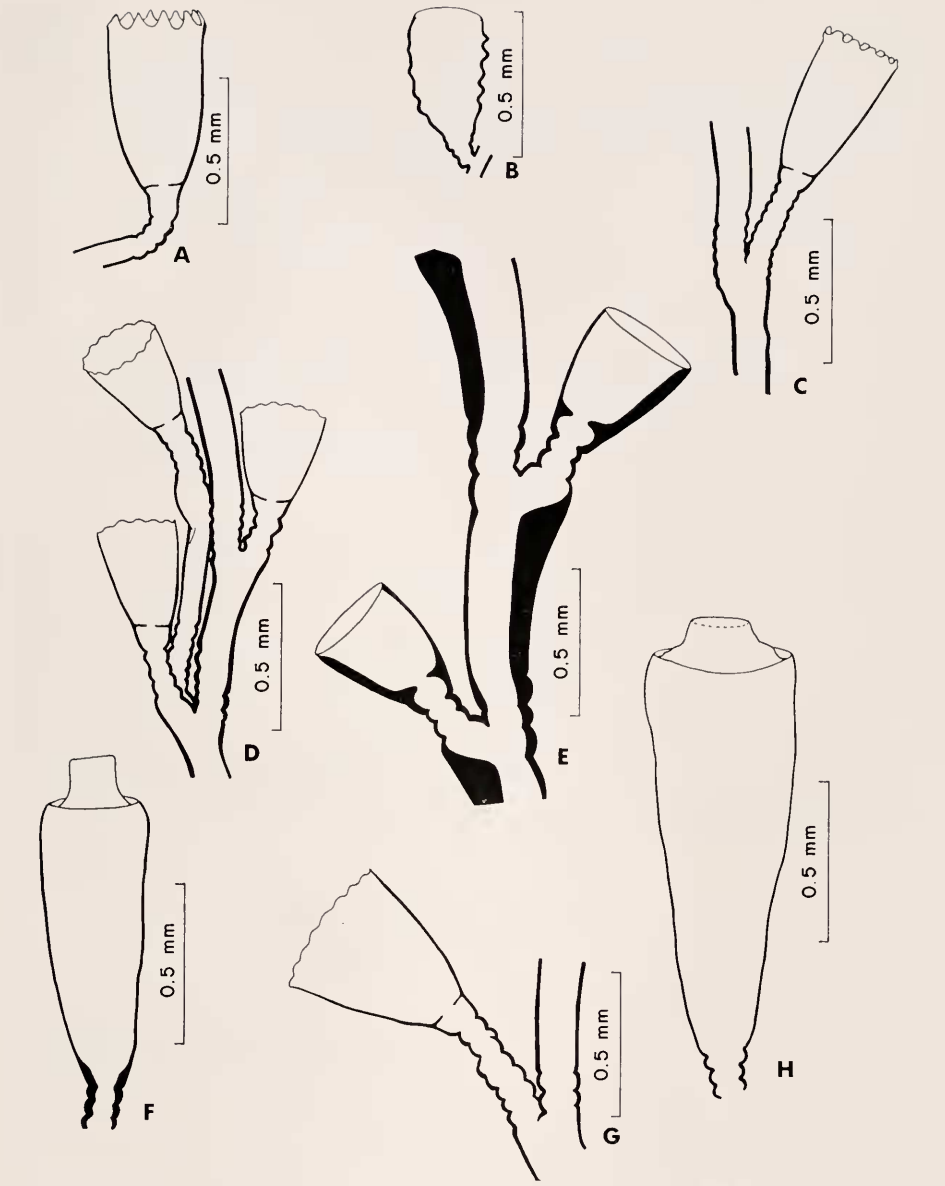

FIGURE 4. Thecate hydroids from Cape Cod Bay. A shows *Clytia hemisphaerica*, 2314; B, *Clytia hemisphaerica*, gonotheca, 2314; C, *Gonothyraea loveni*, 1910; D, *Obelia dichotoma*, 1012; E, *Obelia geniculata*, 1228: F, *Obelia geniculata* gonotheca, 2420; G, *Obelia longissima*, 1318; H, *Obelia longissima*, gonotheca, 0518.

One, two, or even three branches may arise from a single pedicel or branch; each branch resembling primary pedicel and directed immediately upward from a short, curved apophysis located a short distance below hydrotheca of pedicel

from which it arises. Primary pedicels annulated at origin from hydrorhiza and below hydranth, typically smooth or with a few irregular annulations or wrinkles elsewhere; branches annulated above apophysis and below hydrotheca, usually smooth elsewhere. Cone-shaped hydrothecae 525–816 μ deep, 292–373 μ wide at margin, with walls slightly convex above diaphragm. Margin with about 10–14 sharply pointed, triangular, deeply-cut teeth separated by semicircular incisions. Diaphragm thin; basal chamber relatively large, cup-shaped. Perisarc of moderate thickness, being somewhat thicker proximally than distally on colonies.

Gonothecae about 600 μ high, 300 μ wide, arising from a short pedicel on upright parts of colony or hydrorhiza. Distal end truncate; walls strongly ribbed in a close spiral, resembling a chinese lantern.

Remarks: *Clytia johnstoni* has been known for some time to be the hydroid of the medusa *Phialidium hemisphaericum*. Rees and Thursfield (1965) and Millard (1966) united the two stages under the name *Clytia hemisphaerica*. Millard observed that the generic name *Clytia* Lamouroux, 1812 predates *Phialidium* Leuckart, 1856, while the specific name *hemisphaerica* Linnaeus, 1767 predates the name *johnstoni* Alder, 1856, and she designated *C. hemisphaerica* as the type species of the genus *Clytia*.

This is a morphologically variable species, as noted by Ralph (1957). She found that hydroids of *C. johnstoni* along the New Zealand coast varied widely in colony height and hydrotheca length and tooth shape, as well as in height and degree of annulation of the gonotheca. Various forms of Ralph's specimens resembled descriptions of *C. cylindrica, C. edwardsi,* and *C. minuta,* and she suggested that the three species may prove to be synonyms of *C. johnstoni*. To this list of probable synonyms Millard (1966) added *C. gracilis*, but Vervoort (1968) did not concur with this, having never seen intermediates between the two. He observed that the hydrotheca of *C. gracilis* is undulating in cross-section and that the gonotheca is invariably smooth, unlike *C. hemisphaerica*.

Reported distribution: Labrador to Florida.

Gonothyraea loveni (Allman, 1859)
Figure 4C

Laomedea loveni Allman, 1859, p. 138.

Gonothyraea loveni Préfontaine, 1932, p. 206; Procter, 1933, p. 121; Fraser, 1944, p. 149, fig. 123; Bousfield and Leim, 1960, p. 14; Préfontaine and Brunel, 1962, p. 245; Smith, 1964, p. 18; Calder, 1970, p. 1520, plate 4, fig. 6.

Collection records: 0910, 1012, 1028, 1220, 1330, 1514, 1812, 1910, 2008, 2114, 2118, 2420.

Description: Colonies reaching 1.7 cm high, growth sympodial; hydrocaulus monosiphonic; perisarc variable in thickness. Internodes of moderate length, each annulated basally and with an apophysis distally. Apophyses alternating from side to side, bearing hydrothecal pedicels, branches, or both; branches resembling hydrocaulus. Pedicel length variable but typically short and annulated throughout. Hydrothecae cone-shaped, 489–804 μ long, 245–443 μ wide at margin; marginal teeth truncate or bluntly rounded, occasionally with a slight notch medially and

separated by relatively shallow incisions. Diaphragm thin, basal chamber usually large.

Gonothecae absent.

Remarks: Specimens of this species were readily identified, despite the absence of gonothecae, on the basis of their distinctive tooth shape. While the teeth were slightly notched in some specimens, none showed the median furrow that bisects each tooth in hydrothecae of *G. hyalina.*

Known distribution: Northern Canada to Chesapeake Bay.

Obelia dichotoma (Linnaeus, 1758)
Figure 4D

Sertularia dichotoma Linnaeus, 1758, p. 812.

Obelia dichotoma Préfontaine, 1932, p. 206; Procter, 1933, p. 120; Fraser, 1944, p. 155, fig. 127; Fuller, 1946, p. 153; Bousfield and Leim, 1960, p. 14; Préfontaine and Brunel, 1962, p. 245; Brunel, 1970, p. 18.

Laomedea dichotoma Leloup, 1960, p. 222.

Collection records: 1012, 1510, 1608, 1710.

Description: Sympodial colonies reaching 1 cm high above a creeping hydrorhiza. Hydrocaulus monosiphonic, zigzag; internodes relatively short, each with several annulations proximally and an apophysis distally. Apophyses alternating from side to side, each supporting a hydrothecal pedicel. Branches, when present, arising from apophyses near origin of hydrothecal pedicels; branch internodes resembling those of hydrocaulus. Hydrothecal pedicels with 2–10 annulations; developing branch internodes resembling pedicels but smooth in middle. Hydrothecae cone to bell-shaped, 327–431 μ deep, 265–315 μ wide at margin; margin with numerous low, rounded teeth; diaphragm thin, transverse or distinctly oblique; basal chamber usually small and wide relative to its height.

Gonothecae elongate, about 750 μ long and 300 μ wide, truncate distally with a terminal collar; perisarc not distinctly thickened basally. Pedicels short, annulated throughout.

Remarks: This species matures and regresses at a much smaller size than *O. longissima,* and it is improbable that the two are synonymous as Naumov (1960) indicated. The hydrothecae of *O. dichotoma* are also distinctly smaller than those of *O. longissima.*

Millard (1966) considered *O. dubia,* described by Nutting (1901) from Alaska, to be synonymous with *O. dichotoma.*

Reported distribution: Newfoundland to the Gulf of Mexico.

Obelia geniculata (Linnaeus, 1758)
Figure 4E, F

Sertularia geniculata Linnaeus, 1758, p. 812.

Obelia geniculata Préfontaine, 1932, p. 206; Procter, 1933, p. 120; Fraser, 1944, p. 158, fig. 130; Bousfield and Leim, 1960, p. 14; Préfontaine and Brunel, 1962, p. 246; Smith, 1964, p. 18.

Collection records: 1228, 1330, 1412, 1612, 1828, 2028, 2114, 2212, 2420.

Description: Colony sympodial, reaching 1.3 cm high, arising from a creeping hydrorhiza. Hydrocaulus monosiphonic, zigzag, unbranched or irregularly

branched, divided into internodes 548–1050 μ long, 175–489 μ wide at apophyses. First internode with 2–4 annulations at juncture with hydrorhiza; remaining internodes with 0–4 annulations at proximal end. Perisarc very thick, especially on side bearing hydrotheca, forming a distinctive, knee-like projection into lumen of internode just below hydrotheca. Each internode with a distal apophysis; apophyses given off alternately from side to side, each supporting a hydrotheca *via* a pedicel consisting of from 2–10 annulations. Hydrotheca cup-shaped, depth 268–525 μ, width at margin 245–443 μ, margin entire; perisarc thick, particularly along abcauline wall, and a prominent annular thickening basally; basal chamber of moderate size.

Gonothecae lanceolate, arising from apophyses *via* short pedicels having 2–4 annulations; distal end truncate, provided with a narrow collar. Perisarc of moderate thickness except basally where a distinct thickening occurs. Gonotheca length 735–1167 μ, maximum width 256–466 μ.

Remarks: Variation in the colony form of *O. geniculata* was studied by Ralph (1956), who observed differences in size and degree of branching from different latitudes along the New Zealand coast. Variability in hydrotheca and internode morphology was discussed and illustrated by Leloup (1974). Specimens from Cape Cod Bay varied widely in internode length and width, hydrotheca size, perisarc thickness, and degree of annulation. In none of the specimens was the perisarc as thin as that observed in hydroids of *O. geniculata* from Chesapeake Bay (Calder, 1971).

Reported distribution: Northern Canada to the Caribbean Sea.

Obelia longissima (Pallas, 1766)
Figure 4G, H

Sertularia longissima Pallas, 1766, p. 119.
Obelia longissima Préfontaine, 1932, p. 206; Procter, 1933, p. 120; Fraser, 1944, p. 162, fig. 133; Préfontaine and Brunel, 1962, p. 246; Bourget and Lacroix, 1973, p. 872.
Obelia flabellata Fraser, 1944, p. 157, fig. 129.
Laomedea longissima Leloup, 1960, p. 222.
Laomedea (*Obelia*) *longissima* Vervoort, 1972, p. 93, fig. 27.
Collection records: 0518, 1220, 1318, 1624, 1628, 1820, 2212, 2420.

Description: Colony sympodial, reaching 15 cm high and regularly branched; hydrocaulus monosiphonic. Internodes very long, bearing several distinct annulations proximally and a single apophysis distally; apophyses alternating from side to side. Perisarc thick, becoming progressively thicker and darker in color towards older portions of colony. Apophyses giving rise to a hydrothecal pedicel initially, and later to one or more branches. Branches similarly divided into internodes and rebranched in like fashion. Hydrothecal pedicels of varying length, usually annulated throughout. Hydrothecae cone-shaped, 572–793 μ deep, 385–501 μ wide at margin, margin undulating; diaphragm thin, transverse or occasionally somewhat oblique. Basal chamber of varying size but usually moderately large and cup-shaped.

Gonothecae lanceolate, 992–1656 μ long, 420–560 μ wide, borne on short, annulated pedicels arising from apophyses or in one colony directly from hydro-

thecal pedicels; distal end truncate with a small terminal collar. Perisarc relatively thin, not provided with any distinct basal thickening.

Remarks: *Obelia flabellata* Hincks, 1866, reported from Cape Cod Bay by Fraser (1944), is a synonym of *O. longissima* (Bonnevie, 1899; Broch, 1918; Naumov, 1960).

Colonies of this species often attain considerable length, sometimes reaching 50–60 cm (Fraser, 1944).

Known distribution: Northern Canada to Chesapeake Bay.

Family Sertulariidae

Dynamena pumila (Linnaeus, 1758)
Figure 5A

Sertularia pumila Linnaeus, 1758, p. 807; Préfontaine, 1932, p. 206; Prat, 1933, p. 107; Procter, 1933, p. 123; Dexter, 1944, p. 356; Fraser, 1944, p. 286, fig. 274; Dexter, 1947, p. 291; Préfontaine and Brunel, 1962, p. 246; Smith, 1964, p. 18, plate 2, fig. 10.

Dynamena pumila Leloup, 1939, p. 6, fig. 4; Calder, 1970, p. 1528, plate 6, fig. 1.

Sertularella pumila Bourget and Lacroix, 1973, p. 872.

Collection records: 1114, 1130, 1314, 1428, 1628, 1718, 1824, 2118, 2126, 2220.

Description: Colonies largely fragmentary, largest reaching 7 mm high; hydrocaulus monosiphonic. Two very short athecate internodes basally, their nodes oblique with end of one internode extending onto next and tapering to a point. Remaining internodes thecate, bearing 1–2 pairs of hydrothecae; internode length with one pair of hydrothecae 466–758 μ, with two pairs 1085–1307 μ. Only one colony branched; branch arising just below a hydrotheca on proximal portion of internode, passing outward almost perpendicularly to axis of hydrocaulus. Hydrothecae opposite, well-separated front and back, nearly cylindrical and curving outward. Abcauline wall concave, 187–292 μ long; adcauline wall convex, 350–501 μ long. Base of hydrotheca 129–198 μ wide in profile. Hydrothecal aperture large; margin with two prominent lateral teeth and a smaller median adcauline tooth; operculum of two valves, abcauline valve larger.

Gonothecae absent.

Remarks: *D. pumila* typically occurs in the intertidal zone, and all the specimens in the present collection consisted of empty skeletons. This is a common species in boreal waters on both sides of the Atlantic.

Reported distribution: Labrador to New Jersey.

Hydrallmania falcata (Linnaeus, 1758)
Figure 5B

Sertularia falcata Linnaeus, 1758, p. 910.

Hydrallmania falcata Préfontaine, 1932, p. 206; Procter, 1933, p. 124; Fraser, 1944, p. 250, fig. 236; Bousfield and Leim, 1960, p. 14; Leloup, 1960, p. 223; Préfontaine and Brunel, 1962, p. 245.

Collection records: 1228, 1828.

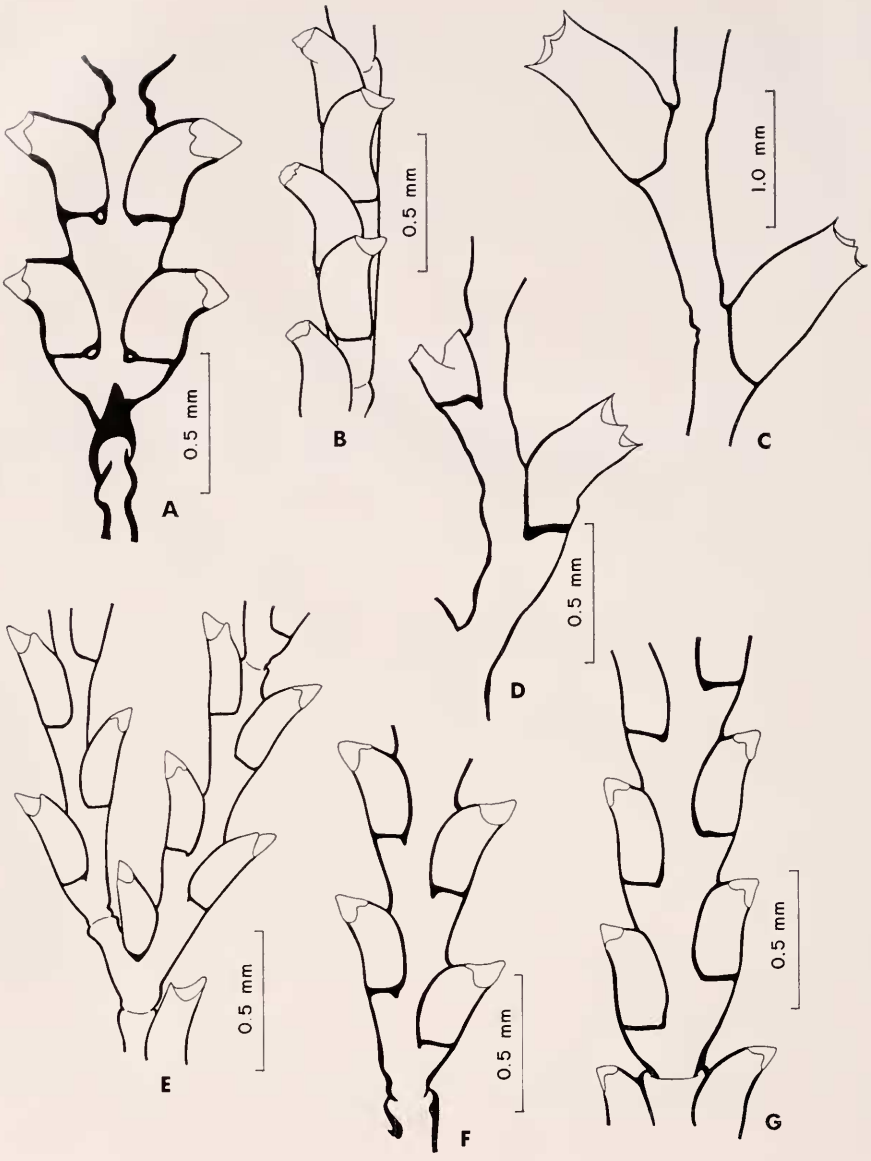

FIGURE 5. Thecate hydroids from Cape Cod Bay. A shows *Dynamena pumila,* 1628; B, *Hydrallmania falcata,* 1228; C, *Sertularella polyzonias,* 1028; D, *Symplectoscyphus tricuspidatus,* 0718; E, *Sertularia argentea,* 1616; F, *Sertularia cupressina,* 2224; G, *Sertularia latiuscula,* 2114.

Description: Species represented by two fragmentary branches having 4 and 24 hydrothecae respectively. Nodes distinct, oblique; internodes varying in length, each with 3–4 hydrothecae. Hydrothecae flask-shaped, crowded in a single row; margins oval, turned alternately from side to side; abcauline wall 420–466 μ long from base to tip of tooth; teeth two; operculum of one valve.

Gonothecae absent.

Remarks: Fully-developed colonies of this species are easily identified because the hydrothecae occur on one side of the branch only. However, in younger colonies, the hydroid has alternately-placed hydrothecae in two rows on the branches (Broch, 1918), and could easily be mistaken for a species of *Sertularia*. Broch observed that such colonies were sometimes distinguishable as *Hydrallmania* in having hydrothecae with the adcauline sinus deeper than the abcauline.

H. falcata is common in boreal waters of the North Atlantic, and has some commercial importance in parts of Europe, being sold as "coral moss" or "white weed" for decorative purposes (Hancock, Drinnan and Harris, 1956; Naumov, 1960).

Reported distribution: Southern Labrador to Long Island Sound.

Sertularella polyzonias (Linnaeus, 1758)
Figure 5C

Sertularia polyzonias Linnaeus, 1758, p. 813; Brunel, 1970, p. 18.

Sertularella polyzonias Préfontaine, 1932, p. 206; Procter, 1933, p. 124; Fraser, 1944, p. 268, fig. 258; Leloup, 1960, p. 223; Préfontaine and Brunel, 1962, p. 246; Caddy, 1970, table 1, p. 1.

Sertularella gigantea Fraser, 1944, p. 264, fig. 250.

Collection records: 1028, 2118.

Description: Unbranched or irregularly branched colonies reaching 2 cm high with monosiphonic, slightly zigzag hydrocaulus; branches similar to hydrocaulus, arising from internode just below hydrotheca. Hydrocaulus and branches marked at regular intervals by oblique nodes sloping alternately in opposite directions; diameter at nodes 223–326 μ. Internodes 1000–1567 μ long, each with a single, distally-located hydrotheca. Hydrothecae alternate, walls smooth or with a few faint transverse wrinkles. Abcauline wall 1062–1190 μ long; length adcauline wall free 921–1062 μ; total depth 1073–1167 μ. Hydrothecal margin opening quadrate, 454–489 μ wide, occasionally renovated with four distinct and equal teeth. Operculum of four faintly striated, triangular valves, closing to form a pyramid-shaped lid. Internal submarginal teeth absent. Perisarc thick, annulated at base of hydrocaulus and branches, bulging above node at proximal end of each internode.

Gonothecae absent.

Remarks: *S. polyzonias* occurs in a robust and a fine growth form (Broch, 1918; Vervoort, 1946). The former has been recognized by several authors (Nutting, 1904; Fraser, 1944; Naumov, 1960) as a distinct species, *S. gigantea* Mereschkowsky, 1878.

Reported distribution: Northern Canada to Georgia.

Symplectoscyphus tricuspidatus (Alder, 1856)
Figure 5D

Sertularia tricuspidata Alder, 1856, p. 356, plate 13, figs. 1, 2.

Sertularella tricuspidata Préfontaine, 1932, p. 206; Procter, 1933, p. 124; Fraser, 1944, p. 274, fig. 264; Bousfield and Leim, 1960, p. 14; Leloup, 1960, p. 224; Préfontaine and Brunel, 1962, p. 246; Calder, 1970, p. 1531; plate 6, figs. 7, 8.

Symplectoscyphus tricuspidatus Vervoort, 1972, p. 166, fig. 54.

Collection record: 0718.

Description: Specimen fragmentary, unbranched, 3.2 mm high, bearing six hydrothecae. Hydrocaulus monosiphonic, zigzag, 117–152 μ wide at nodes; internodes 408–525 μ long, each with a single hydrotheca. Hydrothecae alternate, all but one damaged. Intact hydrotheca long, tubular, smooth and curved outward. Abcauline wall concave, length to tip of tooth 385 μ; adcauline wall convex, adnate portion 245 μ long, free portion to tip of tooth 420 μ. Margin 221 μ wide, parallel to axis of internode; teeth three, separated by deep sinuses; internal submarginal teeth absent. Operculum and hydranth missing.

Gonothecae absent.

Remarks: The genus *Symplectoscyphus* Marktanner-Turneretscher, 1890 is recognized here for those species of Sertulariidae, formerly placed in the genus *Sertularella,* that have three marginal teeth. The splitting of *Sertularella* into two genera was proposed by Stechow (1923b), and has been adopted by Ralph (1961), Millard (1964, 1967, 1968, 1971), Vervoort (1972). Leloup (1974), and others.

S. tricuspidatus is a common hydroid in boreal and arctic waters but was collected only once during the Biotic Census of Cape Cod Bay.

Reported distribution: Northern Canada to New Jersey.

Sertularia argentea Linnaeus, 1758
Figure 5E

Sertularia argentea Linnaeus, 1758, p. 809.

Thuiaria argentea Procter, 1933, p. 124; Fraser, 1944, p. 293, fig. 280; Smith, 1964, p. 18.

Sertularia cupressina f. *argentea* Leloup, 1960, p. 224.

Collection records: 1130, 1616, 1628, 2212.

Description: Hydroids all either small or fragmentary, the largest reaching 4 cm high. Hydrocaulus monosiphonic, divided at more or less regular intervals by distinct nodes. Internodes of moderate length with one, two, or three branch-bearing apophyses, each apophysis with an axillary hydrotheca; occasional internodes with an additional pair of subopposite hydrothecae distally. Perisarc thick and horn-colored in older portions of colony. Branches relatively short, dichotomously rebranched, given off alternately from opposite sides of the hydrocaulus or occasionally tending towards a spiral arrangement. Branches in all but young colonies twisted basally, the broad surface being horizontal, divided into internodes having from one to three pairs of hydrothecae. Hydrothecae slender, fusiform, subopposite to subalternate. Distance between hydrothecae on same side of a given internode 187–478 μ. Hydrothecae immersed somewhat over half their length, with distal portion curving outward and upward. Abcauline wall concave, 233–327 μ long; adcauline wall convex, 187–280 μ adnate, 117–198 μ free. Margin with two prominent teeth; operculum of two unequal valves.

Gonothecae arrowhead-shaped, 1.1–1.5 mm long from base to rim of orifice, arising from upper surface of branches near bases of hydrothecae. Distal end with two large spines; orifice round, at end of short collar; well-developed submarginal teeth present.

Remarks: Maturo (1973) observed that intercolony variation in bryozoans causes difficulties for the systematist, who must decide whether such specimens represent separate species, a single broadly variable species, or a single variable species having several varieties or forms. This dilemma is also frequently encountered by the hydroid systematist; the genus *Sertularia* with its species *S. argentea* and *S. cupressina* represents an example. The two have been regarded as distinct species by some authors (Hincks, 1868; Nutting, 1904; von Reitzenstein, 1913; Fraser, 1944; Hancock, Drinnan and Harris, 1956; Rees and Thursfield, 1965; Calder, 1971) and synonyms by others (Broch, 1918; Kramp, 1929, 1938; Vervoort, 1946, 1972; Naumov, 1960). Until a clarifying study of the relationship of these two is published, I prefer to follow Hancock, Drinnan and Harris (1956) in recognizing the two as distinct species.

This hydroid is important in the "white weed" fishery of Britain (Hancock, Drinnan and Harris, 1956).

Reported distribution: Northern Canada to North Carolina; Louisiana.

Sertularia cupressina Linnaeus, 1758
Figure 5F

Sertularia cupressina Linnaeus, 1758, p. 808; Calder, 1970, p. 1531, plate 7, fig. 1; Vervoort, 1972, p. 183.

Thuiaria cupressina Procter, 1933, p. 124; Fraser, 1944, p. 298, fig. 283; Bousfield and Leim, 1960, p. 14.

Collection records: 0518, 0616, 0710, 0714, 0718, 1028, 1130, 1228, 1232, 1428, 1526, 1530, 1612, 1628, 1714, 1812, 1828, 1914, 2220, 2224.

Description: Hydroids mostly fragmentary, largest colony 11.5 cm high. Hydrocaulus monosiphonic with distinct, somewhat irregularly spaced nodes. Internodes moderately long, each having one to three (usually two) branch-bearing apophyses, each apophysis with an axillary hydrotheca; occasional internodes with an additional hydrotheca or a pair of subopposite hydrothecae distally. Perisarc thick and horn-colored in older portions of colony. Branches moderately long, arching upward and outward, dichotomously rebranched, usually given off alternately from opposite sides of hydrocaulus but occasionally arising in opposite or nearly opposite pairs. Branches in all but younger colonies twisted basally, the broad surface being horizontal; internodes having from two to five pairs of hydrothecae, distance between hydrothecae on same side of a given internode 187–245 μ. Hydrothecae subopposite, immersed for much of their length; distal portion curving outward and occasionally somewhat upward. Adcauline wall convex, 268–345 μ adnate, 47–105 μ free; abcauline wall concave, 245–350 μ long. Margin with two distinct teeth; operculum consisting of an adcauline and a larger abcauline valve.

Gonothecae similar in size and morphology to those of *T. argentea*.

Remarks: Specimens of this species may be easily confused with *S. argentea*. Based on the work of Hancock, Drinnan and Harris (1956), *S. cupressina* can be distinguished from *S. argentea* in having (1) branches that arise in one plane, are less regularly rebranched, and more elongated, and (2) hydrothecae that are

more deeply immersed and less divergent distally. The hydrothecae of *S. cupressina* are more robust than those of *S. argentea*.

Reported distribution: Labrador to New Jersey.

Sertularia latiuscula Stimpson, 1854
Figure 5G

Sertularia latiuscula Stimpson, 1854, p. 8.

Thuiaria latiuscula Fraser, 1944, p. 303, fig. 289; Brunel, 1962, p. 40; 1970, p. 18.

Collection records: 0718, 1028, 1130, 1220, 1428, 1628, 1714, 1914, 2016, 2114, 2118, 2318.

Description: Colonies largely fragmentary, reaching 8.5 cm high. Hydrocaulus monosiphonic, with several very short internodes at proximal end; divided elsewhere at more or less regular intervals by distinct nodes. Internodes of moderate length, each with one or two branch-bearing apophyses having axillary hydrothecae and up to three pairs of subopposite hydrothecae. Perisarc thick, horn-colored in older portions of colony. Branches moderately long, unbranched or dichotomously subdivided once and given off alternately from opposite sides of hydrocaulus; twisted at base in distal portions of colony and directed upward nearly parallel to hydrocaulus. Distal portion of branch straight or curving gradually outward. Branch internodes each with one to 12 pairs of hydrothecae; distance between adjacent hydrothecae on same side of a given internode 105–304 μ. Hydrothecae subopposite or subalternate, immersed for much of their length except in young colonies and curved outward relatively little, their main axis nearly parallel to that of the branch. Adcauline wall convex, 256–396 μ adnate, 23–117 μ free; abcauline wall more or less convex basally, concave distally, 221–350 μ long. Margin with two teeth; operculum of an adcauline and a larger abcauline valve.

Gonothecae absent.

Remarks: Existing descriptions of this species, and particularly the original description by Stimpson (1854), are rather meagre. As a result, these specimens were identified as *S. latiuscula* only after considerable study. Although the the type specimens could not be located, the hydroids from Cape Cod Bay were compared with material identified as this species from the type locality of Grand Manan Island, New Brunswick (U.S.N.M. No. 29255); specimens from the two areas were virtually identical in morphology. Fraser (1944) was evidently mistaken in describing the operculum of *S. latiuscula* as consisting of an abcauline valve only, because hydroids from both Cape Cod Bay and Grand Manan had a small adcauline in addition to the larger abcauline valve.

Cape Cod Bay hydroids of *S. latiuscula* are readily distinguishable from *S. argentea* and *S. cupressina* in their colony form. Branches in these specimens were either unbranched or dichotomously branched but once, and the branch internodes were generally longer and had a larger number of hydrothecal pairs. Hydroids identified as possibly this species from Georges Bank by A. E. Verrill (U.S.N.M. No. 29253) were more branched, particularly toward the distal end of the colonies, so that some approached the colony form of *S. cupressina*.

Reported distribution: Gulf of St. Lawrence to Virginia.

Additional Records

The species of hydroids listed below have been reported from Cape Cod Bay in the literature but were absent in samples from the biotic census. Together with records from the present collection, these bring the number of hydroid species identified from Cape Cod Bay to 33.

Family Tubulariidae

Tubularia couthouyi L. Agassiz, 1862. Fraser, 1944, p. 94, fig. 68.
Tubularia crocea (L. Agassiz, 1862). Fraser, 1944, p. 97, fig. 70.

Family Pandeidae

Leuckartiara octona (Fleming, 1823). Fraser, 1944, p. 58, fig. 29 (as *Perigonimus repens*).

Family Haleciidae

Halecium muricatum (Ellis and Solander, 1786). Fraser, 1944, p. 197, fig. 176.

Family Campanulariidae

Eulaomedea flexuosa (Hincks, 1861). Fraser, 1944, p. 116, fig. 87 (as *Campanularia flexuosa*).
Eulaomedea neglecta (Alder, 1856). Fraser, 1944, p. 126, fig. 98 (as *Campanularia neglecta*).

Family Sertulariidae

Diphasia fallax (Johnston, 1847). Fraser, 1944, p. 242, fig. 227.
Thuiaria lonchitis (Ellis and Solander, 1786). Fraser, 1944, p. 304, fig. 290.

My gratitude is extended to Dr. M. R. Carriker, Dr. A. D. Michael and Ms. M. A. Mills for placing the hydroid collection from Cape Cod Bay at my disposal. I am indebted to Dr. D. L. Pawson, Ms. M. E. Downey, and Mr. M. Carpenter of the U. S. National Museum and Dr. C. T. Shih of the Canadian Oceanographic Identification Centre for the loan of materials. I also wish to thank Dr. K. W. Petersen of the Universitetets Zoologiske Museum, Copenhagen, for his helpful comments regarding various species of *Corymorpha*. The Biotic Census of Cape Cod Bay was supported by contracts from the Office of Naval Research (Nonr 3070–03), the Massachusetts Division of Water Pollution Control, and the Environmental Protection Agency.

Summary

1. Twenty-five species of hydroids were identified in samples taken during the Biotic Census of Cape Cod Bay. Of these, only *Corymorpha pendula, Acaulis primarius, Hydractinia echinata, Gonothyraea loveni, Sertularia cupressina,* and

S. latiuscula were particularly common. Eleven of the 25 species were found only once or twice. Bottom type throughout much of the bay is sand or silty-sand, and the general paucity of firm substrates is evidently a primary factor limiting hydroid abundance and diversity in the area.

2. Eleven species are recorded from Cape Cod Bay for the first time. Present records extend the known distribution of *Euphysa farcta* and *Acaulis primarius* southward, and that of *Stylactis arge* and *Lovenella gracilis* northward. As expected, the hydroid fauna of Cape Cod Bay is characteristically boreal in its zoogeographic affinity, and many of the species represented are amphi-Atlantic.

3. *Halecium gracile* Verrill, 1874 is placed in synonymy with *H. halecinum* (Linnaeus, 1758), *Tubularia cristata* McCrady, 1857 is regarded as a synonym of *Ectopleura dumortieri* (van Beneden, 1844), and *Tubularia crassa* Fraser, 1941 is synonymous with *Corymorpha pendula* L. Agassiz, 1862.

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