The Occurrence and Distribution of the Hydroids of the Galveston Bay, Texas, Area

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ABSTRACT

The Occurrence and Distribution of the Hydroids of the Galveston Bay, Texas, Area

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Examination of approximately 210 collections of hydroids from the Galveston Bay, Texas, area resulted in the identification of twenty-nine species representing nineteen genera in ten families. Three of these species (Stylactis n. sp., Lovenella n. sp., and Campalecium n. sp.) are provisionally described as new, but are not assigned specific epithets for reasons stated in the text. Nine species (Perigonimus jonesi, Eudendrium exiguum, Eudendrium eximium, Clytia johnstoni, Lovenella gracilis, Lovenella grandis, Halecium bermudense, Sertularia mayeri, and Plumularia floridana) are new records for Texas waters, one species (Perigonimus repens) is new for the Gulf of Mexico, and one species (Clytia longitheca) is new for the Atlantic coast, having been previously reported only from the North American Pacific coast. The species collected are briefly discussed as belonging to one or more of three hydroid "faunas": a sargassum fauna (restricted to or common on sargassum); an invertebrate epifauna (common on other invertebrates, e.g., mollusks or crustaceans); and a typical hydroid fauna (occurring on

any suitable substrate). A brief zoogeographical discussion is presented, and it is concluded that the hydroid fauna of the area has affinities with both the southern U.S. Atlantic coast and the Caribbean, but is closer to the Atlantic coast. A key, verbal descriptions, and figures of the sixty-two species of hydroids now reported from the coasts of Texas and Louisiana are presented.

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INTRODUCTION

The order Hydroida (Gr. hydor, water + NL. oid, like) includes radially symmetrical, polymorphic, or wholly polypoid, or wholly medusoid cnidarians. The order is characterized by a life cycle which typically includes two generations: the sessile, asexual polyp and the free-swimming, sexual medusa. In many genera, however, one generation or the other may be suppressed. Two sub-orders are recognized: the Calyptoblastea or Leptomedusae, in which the sessile polyp bears hydranths protected by hydrothecae and gonophores protected by gonothecae; and the Gymnoblastea or Anthomedusae, in which both the hydranth and the gonophore are athecate. Both freshwater and marine representatives are known, although the marine forms are considerably more numerous and diverse. The group is comprehensively discussed by Hyman (1940).

The present study is concerned only with the occurrence of the hydroids (polyp generations) in and around Galveston Bay, Texas. The study was undertaken with two objectives in mind: to elucidate the occurrence and distribution (both spatial and seasonal) of the hydroids of the area, and to provide a sound taxonomic basis for any future experimental studies.

HISTORICAL REVIEW

Although the literature dealing with hydroids is voluminous, only a relatively small portion deals with the regions to be included in this review: the southern Atlantic coast of the United States, Bermuda, the Gulf of Mexico, and the Caribbean. For sake of brevity, those papers reporting hydroids from areas north of Cape Hatteras will generally not be considered. Exception will be made for a few important or interesting papers. Cape Hatteras was chosen as the northern limit since it is generally considered to be the northern boundary of the Carolinian Province. This zoogeographical province extends from Cape Hatteras to Cape Kennedy on the Atlantic coast, including Bermuda, and from Tampa Bay to the southern tip of Texas on the Gulf Coast (Hedgpeth, 1953; Cerame-Vivas and Gray, 1966). The remainder of the area reviewed is included in the Caribbean Province (Figure 1).

The Carolinian Province, Atlantic Coast

The earliest paper reporting hydroids from this region is McCrady's (1858) paper on the Gymnopthalmata of Charleston Harbor. Although McCrady dealt mainly with medusae, he noted the occurrence of several hydroids. Agassiz's (1865) monograph of the North American acalephs (a discontinued taxonomic unit including the presently recognized cnidaria and ctenophora) lists twenty-one species from Charleston, South Carolina and thirty-four species from the Caribbean. Verrill (1872), studying the Radiata of the North Carolina coast,

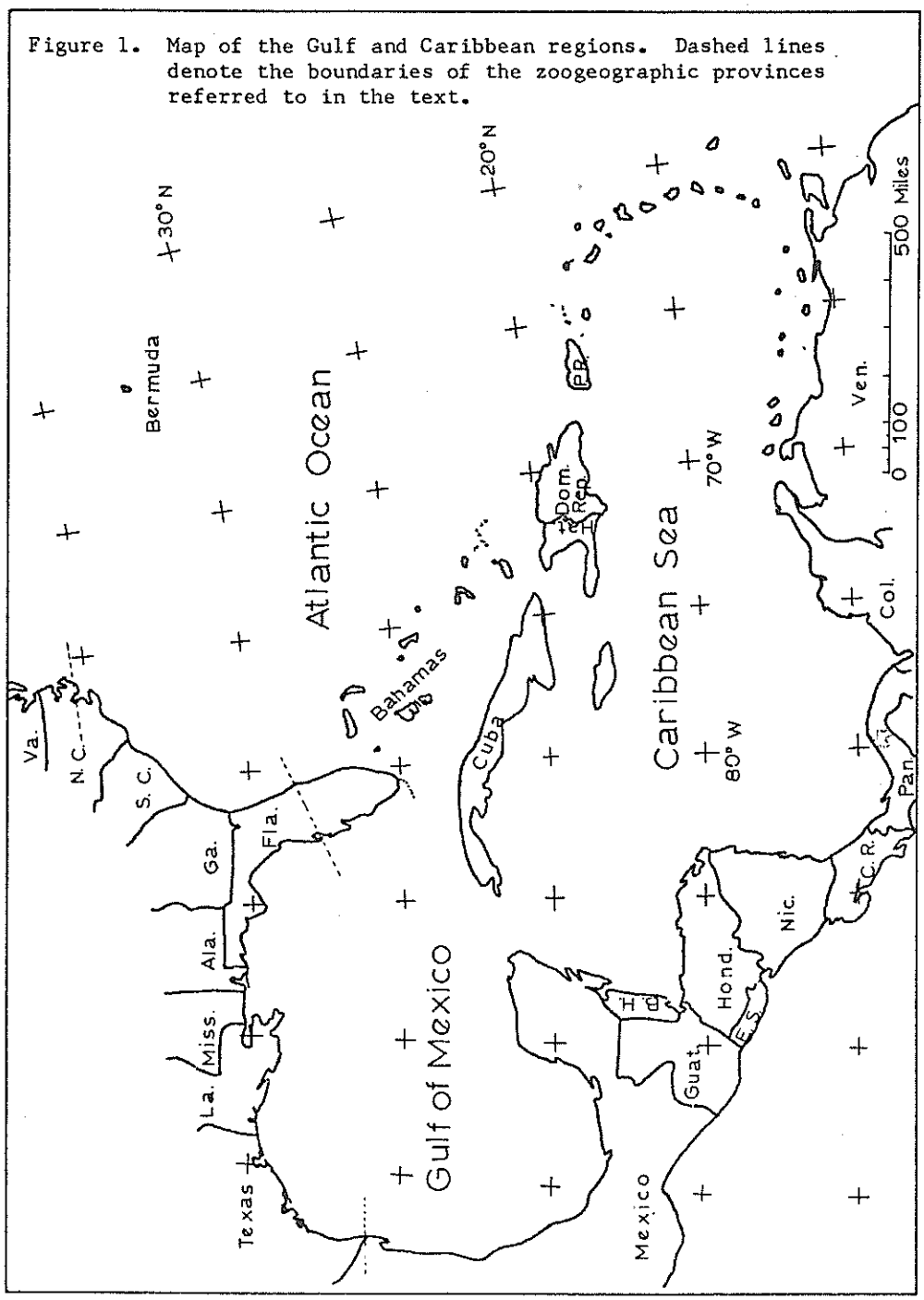


Figure 1. Map of the Gulf and Caribbean regions. Dashed lines denote the boundaries of the zoogeographic provinces referred to in the text.

reported six species, including one new species.

Allman (1877) described sixty-eight new species and seven established species from collections made by de Pourtales in the Gulf Stream. Although these were mostly from the Caribbean and from the Florida Straits, four species were collected off the coast of North Carolina. In a short paper, Clarke (1881) reported six hydroids from Chesapeake Bay, five of which were new species. In the same year, Fewkes (1881) described thirty-eight species from the Atlantic coast and Caribbean, including thirteen new species. Of these, six new and six established species were from the coast of North Carolina. Also from North Carolina, Brooks (1883, 1883a) described several hydroids and medusae from Beaufort, and Stechow (1912) reported one species from off Cape Hatteras.

In two major papers, Fraser (1912, 1943) described fifty-one species from Beaufort, North Carolina and listed new distribution records for one hundred and eleven species of hydroids in Harvard's Museum of Comparative Zoology. These included nine from Cape Hatteras, three from South Carolina, fourteen from Georgia, and twenty-two from northern Florida. The remainder were North Atlantic coastal, Caribbean, or Gulf forms. In his monograph of the hydroids of the Atlantic coast of North America, Fraser (1944) lists one hundred and sixty-three species as having been reported from Cape Hatteras to the Tortugas. In a minor paper (1945), he recorded three species from the Potomac River, three from South Carolina, and one from Georgia.

Cowles (1930) conducted a biological study of the offshore waters of Chesapeake Bay, and reported twenty hydroid and six hydromedusoid species from that area. Five species were reported by MacDougall (1943) in his monograph of sessile marine invertebrates on wooden pilings at Beaufort, North Carolina. In a series of minor papers, Frey (1946), Ferguson and Jones (1949), Maloney (1958), and Cory (1967) reported two to seven species each from the Chesapeake Bay area; Pearse (1951), Wells (1961), Wells, Wells, and Gray (1964), and Cerame-Vivas and Gray (1966) reported two to six species each from areas off the North Carolina coast; and Richards and Clapp (1944) reported Tubularia sp. from a fouling study at Daytona Beach, Florida. Stephenson and Stephenson (1952) reported Tubularia crocea from three sites in northern Florida and the Carolinas, and Burkenroad (1939) and Weis (1968) discussed fourteen and six species, respectively, of hydroids on floating sargassum from the Atlantic coast. In the major recent paper for the Atlantic coast, Wass (1963) listed thirty species of hydroids in his checklist of marine invertebrates of Virginia.

The Carolinian Province, Bermuda

The first paper dealing with hydroids from this area is by Verrill (1900). He mentioned collecting about ten species of attached hydroids, but identified only two of them. Congdon (1907) described seven new and twelve established species from the area, and Ritchie (1909) reported two species collected by the Challenger expedition. Smallwood (1910) mentioned six species in a paper devoted mainly to nudibranchs, and Stechow (1912) listed Pennaria tiarella as

occurring here.

The major paper for Bermuda is that of Bennitt (1922), who recorded and described thirty-seven species, including all the previous records. Fraser (1944) listed thirty-four species of hydroids as occurring here in his discussion of geographic distribution.

The Carolinian Province, Gulf Coast

The earliest paper from this area is that of Glaser (1904), who listed two species from Cameron, Louisiana. Cary and Spaulding (1909) included fourteen species, also from the Louisiana coast, in their checklist. These specimens were identified by C. C. Nutting. Stechow (1912) described four species collected in the Gulf of Mexico, from off the coast of Louisiana. In a paper dealing with shrimp ecology, Burkenroad (1934) mentioned that the characteristic bottom cover of areas just off the Louisiana coast consisted of hydroids (Bougainvillia sp.) and bryozoa.

Cross and Parks (1937) listed five species in their checklist of the flora and fauna of the Corpus Christi Bay, Texas, area, and Reed (1941) described four species from the Texas coast, without specifying a collection site.

In a series of publications, Fraser reported distribution records for two species from the Louisiana coast (1943), listed two hundred and two species recorded from the Gulf and Caribbean (1944), and listed one, two, and three species, respectively, from the coasts of Florida, Louisiana, and Alabama (1945).

Behre (1950) recorded fifteen hydroids from the Grand Isle, Louisiana, region in her annotated checklist. Deevey (1950) described eighteen species from the Texas coast and nine additional species from both the Texas and Louisiana coasts in a biogeographical paper. In the same year, Whitten, Rosene, and Hedgpeth (1950) listed seven species from a rather superficial survey of the invertebrate fauna of Texas coast jetties. Hedgpeth (1953) discussed the zoogeography of the northwestern Gulf, and mentioned a few hydroids from the Texas coast. Deevey (1954) reviewed the hydroids recorded from the Gulf, listing one hundred and eighty-three species reported in the literature. Of these, only fifty-five were from the northern Gulf coast. Unfortunately, his presentation is not as useful as it might be, since he does not indicate which species were reported by each author.

In a series of minor papers, Simmons (1959) and Breuer (1961) listed one and three species, respectively, for the Laguna Madre; Shidler (1960), Pullen (1961a), and Lyon (1962) reported one to four species each from Texas bays; Crowell and Darnell (1955), Gunter and Geyer (1955), and Dawson (1966) reported one to three species each from the Louisiana coast; and Fincher (1955), and Richmond (1962, 1968) reported eleven, one, and one species, respectively, from the Mississippi coast.

In Florida, Menzel (1956) included nine hydroids in a fairly extensive checklist of the flora and fauna of the Apalachee Bay area, while Gaille (1967) listed fourteen species and Pequegnat and

Pequegnat (1968) recorded forty-four species from a fouling study off Panama City. Wells (1969) discussed Podocoryne carnea from the Alligator Harbor area.

The Caribbean Province, The Caribbean Sea

The first major paper dealing with this area is Agassiz's (1865) monograph of the North American acalephs mentioned previously. In his discussion of the geographical distribution of these organisms, he listed thirteen species from the West Indies and thirteen species from the Florida Reef (the assemblage of reefs and keys at the southern tip of Florida). De Pourtales (1869), reporting on dredging operations in the Gulf Stream near Florida and Cuba, described five new species from depths of 100 fathoms or more.

Allman's (1877) report on the hydroids collected during the U.S. Coast Survey exploration of the Florida Straits is the major nineteenth century paper for this area. As mentioned previously, he described sixty-eight new and seven established species. Fifty of these species were represented at the Florida Reef, seven at the Dry Tortugas, and two off Cuba. For twelve he gave no locality.

Clarke's (1879) report on collections made by Alexander Agassiz includes ten new and sixteen established species. Of these, fifteen are from the Dry Tortugas, seven are from Zoblos Island, five are from Cuba, and two are from Yucatan. Fewkes (1881) described eight new and eighteen established species from the West Indies and four established species from the Florida Reef. Agassiz (1888) described hydroids collected by the "Blake" from Cuba and the Florida Keys,

from depths as great as 1240 fathoms. Nutting (1895, 1919) reported on hydroids collected during expeditions to the Bahamas and Lesser Antilles, and Versluys (1899) described eighteen species from the Caribbean, mostly from off the coasts of Colombia and Venezuela. Wallace (1909), in a brief but important paper, listed thirty-seven species collected at the Dry Tortugas, and Stechow (1912, 1920, 1924) described many species from various locations in the Bahamas, West Indies, and Gulf of Mexico.

In a series of papers, Fraser (1937a, 1940, 1943) reported forty-three species from the Caribbean Sea, twenty-eight species from the Dry Tortugas, ten species from Puerto Rico, four each from the Bahamas and Cuba, and one from the Yucatan Channel. As mentioned previously, he recorded two hundred and two species from the Gulf and Caribbean in his monograph on Atlantic coast hydroids.

In a series of minor papers, Weiss (1948), Smith, Williams, and Davis (1950), Voss and Voss (1955), and Gunter and Hall (1965) reported one to five species each from Biscayne Bay, the Florida Keys, and Caloosahatchee (Florida) Estuary; Mattox and Crowell (1951) described the hydroid Eugymnanthea ostrearum, an interesting commensal from the mantle cavity of Puerto Rican oysters; and Rodriguez (1959) reported one species from Margarita Island, Venezuela. In the most recent paper of major importance, Van Gemeden-Hoogeven (1965) described thirty species of hydroids from the Caribbean, Dry Tortugas, and Bahamas.

Table 1 summarizes the papers reviewed. As can be seen, only thirty-three papers report hydroids from the Carolinian Gulf Coast: Texas and Louisiana (NW Gulf) and Mississippi to Florida (NE Gulf). Of these, nineteen report five species or less; one is a literature review (Deevey, 1954); and four (Nutting, 1900, 1904, 1915; Fraser, 1944) are monographs containing relatively few new collection records for this area.

Table 1. Tabular summary of the papers reviewed. Numbers in parentheses are referred to in Table 2.

Author and Date	No. Spp.	Location	Region
McCrady, 1858	16	Charleston, S. C.	So. Atl. Coast
A. Agassiz, 1865	21	Charleston, S. C.	So. Atl. Coast
	13	Florida Reef	Caribbean
	13	Caribbean Sea	Caribbean
de Pourtales, 1869	4	Sand Key, Fla.	Caribbean
	2	Havana, Cuba	Caribbean
Verrill, 1872	6	North Carolina	So. Atl. Coast
Allman, 1877	4	North Carolina	So. Atl. Coast
	50	Florida Reef	Caribbean
	7	Dry Tortugas	Caribbean
	2	Cuba	Caribbean
	12	no locality given	
Clarke, 1879	15	Dry Tortugas	Caribbean
	7	Zoblos Island	Caribbean
	5	Cuba	Caribbean
	2	Yucatan	Caribbean
Clarke, 1881	6	Chesapeake Bay	So. Atl. Coast
Fewkes, 1881	12	North Carolina	So. Atl. Coast
	4	Florida Reef	Caribbean
	26	Caribbean Sea	Caribbean
Brooks, 1883, 1883a	11	Beaufort, N. C.	So. Atl. Coast.
A. Agassiz, 1888	5	Florida Keys	Caribbean
	1	Cuba	Caribbean
Nutting, 1895	?	Bahamas	Caribbean
Versluys, 1899	3	Off Bermuda	Bermuda
	15	Off Ven. & Col.	Caribbean
(1) Nutting, 1900	many	the Americas	
Verrill, 1900	2	Bermuda	Bermuda
(2) Glaser, 1904	2	Cameron, La.	NW Gulf

Table 1. Tabular summary of the papers reviewed. (Cont'd.)

Author and Date	No. Spp.	Location	Region
(3) Nutting, 1904	many	the Americas	
Congdon, 1907	19	Bermuda	Bermuda
Wallace, 1909	37	Dry Tortugas	Caribbean
(4) Cary and Spaulding, 1909	14	Louisiana coast	NW Gulf
Ritchie, 1909	2	Bermuda	Bermuda
Smallwood, 1910	6	Bermuda	Bermuda
Fraser, 1912	51	Beaufort, N. C.	So. Atl. Coast
(5) Stechow, 1912	1	Off Cape Hatteras	So. Atl. Coast
	4	Off Louisiana	So. Atl. Coast
	9	Bahamas, Antilles	Caribbean
(6) Nutting, 1915	many	the Americas	
Nutting, 1919	13	Barbados	Caribbean
Stechow, 1920	1	Bermuda	Bermuda
	many	Gulf and Caribbean	Caribbean
Bennitt, 1922	37	Bermuda	Bermuda
Stechow, 1924	many	Gulf and Caribbean	Caribbean
Cowles, 1930	26	Chesapeake Bay	So. Atl. Coast
(7) Burkenroad, 1934	1	Louisiana	NW Gulf
(8) Cross and Parks, 1937	5	Corpus Christi, Tex	NW Gulf
(9) Leloup, 1937	9	Tampa Bay	NE Gulf
Fraser, 1937a	10	Puerto Rico	Caribbean
Burkenroad, 1939	14	Atlantic Coast	So. Atl. Coast
Fraser, 1940	1	Yucatan Channel	Caribbean
(10) Reed, 1941	4	Texas coast	NW Gulf
(11) Fraser, 1943	18	No. of C. Hatteras	No. Atl. Coast
	9	Cape Hatteras	So. Atl. Coast
	3	South Carolina	So. Atl. Coast
	14	Georgia	So. Atl. Coast
	22	Northern Florida	So. Atl. Coast
	28	Florida Reef	Caribbean
	4	Bahamas	Caribbean
	13	Dry Tortugas	Caribbean
	2	Louisiana	NW Gulf
	4	Cuba	Caribbean
	43	Caribbean Sea	Caribbean
MacDougall, 1943	5	Beaufort, N. C.	So. Atl. Coast
(12) Fraser, 1944	163	Cape Hatteras to Tortugas	
	34	Bermuda	Bermuda
	202	Gulf of Mexico and Caribbean	
Richards and Clapp, '44	1	Daytona Beach, Fla.	So. Atl. Coast
(13) Fraser, 1945	3	Potomac River	So. Atl. Coast
	3	South Carolina	So. Atl. Coast
	1	Georgia	So. Atl. Coast
	1	Florida Gulf Coast	NE Gulf
	3	Alabama	NE Gulf

Table 1. Tabular summary of the papers reviewed. (Cont'd.)

Author and Date	No. Spp.	Location	Region
(13) Fraser, 1945	2	Louisiana	NW Gulf
Frey, 1946	3	Potomac River	So. Atl. Coast
Weiss, 1948	5	Biscayne Bay, Fla.	Caribbean
Ferguson and Jones, '49	7	Norfolk, Va.	So. Atl. Coast
(14) Behre, 1950	15	Grand Isle, La.	NW Gulf
(15) Deevey, 1950	9	Texas & Louisiana	NW Gulf
	18	Texas only	NW Gulf
Smith, Williams, and Davis, 1950	1	Miami, Fla.	Caribbean
(16) Whitten, Rosene, and Hedgpeth, 1950	7	Texas Coast	NW Gulf
Mattox and Crowell, 1951	1	Puerto Rico	Caribbean
Pearse, 1951	6	North Carolina	So. Atl. Coast
Stephenson and Stephenson, 1952	1	North Carolina	So. Atl. Coast
	1	South Carolina	So. Atl. Coast
	1	Northern Florida	So. Atl. Coast
(17) Hedgpeth, 1953	3	Texas Coast	NW Gulf
(18) Deevey, 1954	183	Gulf of Mexico	
(19) Crowell and Darnell, '55	1	L. Pontchartrain	NW Gulf
(20) Fincher, 1955	11	Mississippi Sound	NE Gulf
(21) Gunter and Geyer, 1955	3	Grand Isle, La.	NW Gulf
Voss and Voss, 1955	1	Florida Keys	Caribbean
(22) Menzel, 1956	9	Apalachicola Bay	NE Gulf
Maloney, 1958	3	Norfolk, Va.	So. Atl. Coast
Rodriguez, 1959	1	Margarita I., Ven.	Caribbean
(23) Simmons, 1959	1	Laguna Madre	NW Gulf
(24) Shidler, 1960	1	Galveston Bay	NW Gulf
(25) Breuer, 1961	3	Laguna Madre	NW Gulf
(26) Pullen, 1961a	2	Galveston Bay	NW Gulf
Wells, 1961	4	North Carolina	So. Atl. Coast
(27) Lyon, 1962	4	Matagorda Bay, Tex.	NW Gulf
(28) Richmond, 1962	1	Horn Island, Miss.	NE Gulf
Wass, 1963	30	Virginia	So. Atl. Coast
Wells, Wells, and Gray, 1964	6	North Carolina	So. Atl. Coast
Gunter and Hall, 1965	1	Southern Florida	Caribbean
Van Gemeden-Hoogeven, 1965	8	Bahamas	Caribbean
	17	Tortugas	Caribbean
	22	Caribbean Sea	Caribbean
Cerame-Vivas and Gray, 1966	2	North Carolina	So. Atl. Coast
(29) Dawson, 1966	1	Grand Isle, La.	NW Gulf
Cory, 1967	2	Patuxent R., Md.	So. Atl. Coast
(30) Gaille, 1967	14	Off Panama City	NE Gulf

Table 1. Tabular summary of the papers reviewed. (Cont'd.)

Author and Date	No. Spp.	Location	Region
(31) Pequegnat and Pequegnat, 1968	44	Off Panama City	NE Gulf
(32) Richmond, 1968	1	Horn Island, Miss.	NE Gulf
Weis, 1968	6	Off C. Hatteras	So. Atl. Coast
(33) Wells, 1969	1	Alligator Harbor	NE Gulf

It becomes clear, therefore, that (excluding the four previously mentioned monographs) only ten major papers giving original reports of hydroids collected in the northern Gulf of Mexico have been published: Cary and Spaulding (1909), Behre (1950), Deevey (1950), and Whitten, Rosene, and Hedgpeth (1950) for the Texas and Louisiana coasts; Fincher (1955) for the Mississippi coast; and Leloup (1937), Menzel (1956), Gaille (1967), and Pequegnat and Pequegnat (1968) for the Florida Gulf Coast. Furthermore, only eleven of the thirty-three papers (and only two of the ten major papers) are primarily concerned with hydroids, giving figures and/or descriptions. The remaining twenty-two papers are ecological studies or checklists which merely list the hydroids thought to have been found, often without expert identification. These papers are of less value than the hydroid papers since there is no way to check the validity of the identifications via figures or verbal descriptions. For example, Behre (1950) claims to follow the classification scheme of Fraser, but lists two hydroids (Aglaophenia late-carinata and A. minuta) which were placed into synonymy by Fraser (1944). Similarly, Simmons (1959) reports the

medusa Bougainvillia niobe Mayer from the Laguna Madre, and reports that the hydroid form was common. However, the hydroid of B. niobe has not been described. On the other hand, the hydroids listed by Cary and Spaulding (1909) were identified by Nutting, and can be relied upon. Table 2 is a summary of the thirty-three papers reporting hydroids from the northern Gulf of Mexico, and lists the hydroids now reported from that region.

Table 2. Tabular summary of the hydroids reported from the northern Gulf of Mexico. Those species preceded by an asterisk were recorded in the present study. Author numbers refer to papers listed in Table 1.

Family and Species	Region and Author	
	NW Gulf	NE Gulf
CLAVIDAE		
Clava sp.		31
Cordylophora lacustris	12, 15, 18	20
Turritopsis fascicularis		31
Turritopsis nutricula		31
CORYNIDAE		
Syncoryne eximia	15, 18	
Syncoryne mirabilis		31
*Zanclea costata	15, 16, 18	22
Zanclea gemmosa		31(?)
ATRACTYLIDAE		
*Bimeria franciscana	11, 14, 18, 19	20
Bimeria gracilis		30, 31
Bimeria humilis	15, 18, 27	
Bougainvillia sp.	7, 8, 21, 23, 24, 26	
Bougainvillia carolinensis	4, 12, 14, 15, 18	30, 31
*Bougainvillia inaequalis	12, 13, 14, 15, 18	31
Bougainvillia longicirra		31
Bougainvillia rugosa	12, 15, 18	
Bougainvillia superciliaris	4	
*Perigonimus jonesi	4, 29	
*Perigonimus repens		

Table 2. Tabular summary of the hydroids reported from the northern Gulf of Mexico. (Cont'd.)

Family and Species	Region and Author	
	NW Gulf	NE Gulf
EUDENDRIDAE		
Eudendrium sp.	25	
Eudendrium carneum		22
*Eudendrium exiguum		
*Eudendrium eximium		9, 31
Eudendrium rameum		31
Eudendrium ramosum	4	
Eudendrium speciosum		14
Eudendrium tenue	15, 18	
HYDRACTINIDAE		
*Hydractinia echinata	2, 4, 8, 10, 14, 15, 16, 18, 26	20, 22, 32
*Podocoryne carnea	4, 15, 18	33
*Stylactis n. sp.		
PENNARIDAE		
Pennaria tiarella		22, 30, 31
TUBULARIDAE		
*Ectopleura grandis	15, 18, 27	31
Tubularia sp.	8	
Tubularia crassa		31
*Tubularia crocea	10, 15, 16, 18	31
Tubularia larynx		31
Tubularia tenella		30, 31
CAMPANULARIDAE		
Campanularia sp.	21	20, 31
Campanularia amphora		31
Campanularia angulata		31(?)
Campanularia gelatinosa	4	
Campanularia marginata		6, 9, 31(?)
Campanularia verticillata	14	
Clytia sp.	10	22
Clytia sp. (near edwardsi)		31
*Clytia coronata	12, 14, 15, 18 27	20, 30, 31
*Clytia cylindrica	4, 6, 12, 15, 16, 18, 27	30
Clytia fragilis	15, 18	31
*Clytia johnstoni		30, 31
Clytia kincaidi		30, 31(?)

Table 2. Tabular summary of the hydroids reported from the northern Gulf of Mexico. (Cont'd.)

Family and Species	Region and Author	
	NW Gulf	NE Gulf
CAMPANULARIDAE (Cont'd.)		
Clytia longicyatha	12, 15, 18	30, 31
*Clytia longitheca (?)		
*Clytia noliformis	4, 6, 12, 14, 15, 18	31
Gonothyraea sp. ("giant")		31
*Gonothyraea gracilis	12, 14, 15, 16, 18	30, 31
Obelia sp.	10, 17	22
*Obelia bicuspidata	12, 14, 15, 18	18, 20, 28, 31
*Obelia dichotoma	4, 8, 15, 16, 18	18, 31
Obelia equilateralis	12, 15, 18	
Obelia flabellata		30, 31
*Obelia geniculata	15, 18	
Obelia gracilis		20
Obelia hyalina	10, 14	30, 31
Obelia obtusidens	12, 14, 15, 18	
CAMPANULINIDAE		
Cuspidella sp.		31
Cuspidella costata		31
Cuspidella humilis	15, 18	30, 31
Lafoeina tenuis		18
Lovenella sp.		22
*Lovenella n. sp.		
*Lovenella gracilis		20, 31
*Lovenella grandis		20, 31
HALECIDAE		
*Campalecium n. sp.		
Halecium sp.	21	
Halecium sp. (near beani)		31
*Halecium bermudense		18, 31
Halecium nanum	15, 18	
Halecium sessile		31
Halecium tenellum		9, 12, 18
HEBELLIDAE		
Hebella calcarata		9, 18
LAFOEIDAE		
Filellum serpens	15, 18	

Table 2. Tabular summary of the hydroids reported from the northern Gulf of Mexico. (Cont'd.)

Family and Species	Region and Author	
	NW Gulf	NE Gulf
SERTULARIDAE		
Pasya quadridentata	4, 11, 12, 14, 15, 18	
Sertularella conica	18	6, 9, 18
Sertularella gayi	15, 18	
Sertularia sp.	17	22
Sertularia cornicina	15	
Sertularia dalmasi	18	3, 18
Sertularia inflata	4, 12, 15, 16 18	12, 18
*Sertularia mayeri		
Sertularia pourtalesi		
Sertularia turbinata	5	
Thuiaria cupressina	8	
PLUMULARIDAE		
Monostaechas quadridens	15, 18	9, 17
Plumularia sp.	2	
Plumularia clarkei		31
Plumularia diaphana	5, 12, 14, 15 18	20, 31
*Plumularia floridana	12, 14, 15, 18	
Plumularia setacea	5, 15, 18	18
Schizotricha tenella	12(?), 15, 18(?)	
Aglaophenia aperta		13, 18
Aglaophenia cristifrons	15, 18	
Aglaophenia dichotoma		9, 18
Aglaophenia elongata		9, 18
*Aglaophenia late-carinata	4, 5, 12, 13, 14, 15, 18, 25	20
Aglaophenia longiramosa		13, 18
Aglaophenia lophocarpa		1, 18
Aglaophenia mercatoris		9, 18
Aglaophenia perpusilla	15, 18	
Aglaophenia rigida	12, 15, 18	
Cladocarpus flexilis		12, 18
Cladocarpus flexuosus		1, 18
Cladocarpus longipinna		13, 18
Halicornaria sinuosa		9, 18
Lytocarpus phillipinus		

The major taxonomic works most useful in identification are Fraser's (1937, 1944) monographs of the hydroids of the Pacific and Atlantic coasts of North America; Allman's (1871, 1872) monograph of the Gymnoblastea; Nutting's (1900, 1904, 1915) monograph of four calyptoblast families; and volumes 1 and 2 of Mayer's (1910, 1910a 1910b) three volume monograph of the medusae of the world. These last two references (Mayer, 1910, 1910a) contain many drawings, descriptions, and tables comparing species of hydroids and their medusae. Other useful, shorter papers include Fraser's (1911, 1912) keys to the hydroids of the West Coast and of Beaufort, North Carolina; Nutting's (1901) key to the hydroids of the Wood's Hole region; and Van Gemeden-Hoogeven's (1965) paper on Caribbean calyptoblasts of three families. Unfortunately, this last paper does not contain a key.

METHODS AND MATERIALS

Specimens were acquired from several sources. Mr. Donald E. Harper, Jr., a graduate student at Texas A&M, provided material from more than fifty offshore dredge sites. Dr. Sammy M. Ray allowed the removal of about forty samples from the Texas A&M Marine Laboratory Museum, Galveston. Additional specimens were supplied by Mr. Robert P. Hofstetter, Texas Parks and Wildlife Department, Seabrook; and by Dr. Sewell H. Hopkins, Dr. Harold W. Harry, and Mr. Roger D. Anderson, all of the Biology Department, Texas A&M University.

In addition to the material supplied by others, a series of over one hundred and ten collections were made in Galveston Bay and along the seaside beach of Galveston Island from July, 1968 to September, 1969. These collections were made throughout the summer of 1968 and at approximately monthly intervals from September 1968 to September 1969. A number of sites were visited on each collecting trip. Table 3 shows the occurrence of hydroids collected at each location. As can be seen, many samples were taken which did not contain hydroids. Many of these were purposely taken to insure against overlooking minute forms not readily noticeable.

Samples collected by the writer were preserved according to a method outlined by Russell (1963), and adapted for field situations. The living organisms were placed in clean glass jars and covered with fresh seawater from the collecting site. A generous quantity of magnesium sulfate (Epsom salts) was added, and the jar left undisturbed for ten to sixty minutes, or until the organisms became

Table 3. Occurrence of hydroids at frequently visited collecting sites. Code: H—hydroids collected; +—sample collected, but hydroids not present; =—station visited, but unable to collect due to rough water or absence of caretaker of BCF East Lagoon Lab; o—station not visited.

Collecting Sites	Dates of Collecting Trips											
	Summer 1968	26-27 Oct '68	23-24 Nov '68	14 Dec '68	1-2 Feb '69	1-2 Mar '69	20 Mar '69	18-20 Apr '69	20 May '69	13-15 Jun '69	1-2 Aug '69	5-6 Sept '69
Seaside Beach	H	H	+	H	+	+	+	H	o	H	H	H
San Luis Pass	+	+	+	H	=	+	+	H	o	+	+	+
Wooden Groins (Front Beach)	o	H	H	=	H	H	=	H	o	H	+	H
South Jetty	+	+	+	+	H	+	+	+	o	H	H	H
Settling Tank (East Lagoon Lab)	H	=	+	+	+	=	=	+	o	H	H	H
Offat's Bayou	+	+	+	+	+	+	+	+	o	H	+	+
First Island (West Bay)	H	o	o	o	o	o	o	o	o	o	o	o
Eight Mile Road (West Bay)	+	+	+	+	+	+	+	+	o	+	+	+
Carancahua Reef (West Bay)	o	o	o	o	o	o	o	o	+	o	o	o
Pelican Island Causeway	o	o	o	o	o	o	+	+	o	+	+	+
Hanna Reef (East Bay)	H	o	o	o	o	o	o	o	o	o	o	o
Kona Kai (East Bay)	o	o	+	+	+	+	+	+	o	+	+	+
Bolivar Pen. Ferry Landing	o	o	o	o	o	o	o	+	o	o	o	o
Texas City Dike	o	+	+	+	+	o	+	+	o	+	+	o
Dickinson Bayou at Highway 146	o	+	+	+	+	o	+	+	o	+	+	o
Eagle Point (Galveston Bay)	o	o	+	+	o	o	+	+	o	+	+	o
Switchover Reef (Galveston Bay)	H	o	o	o	o	o	o	o	o	o	o	o

insensitive and ceased to respond when agitated. The samples collected between June and December, 1968, were then killed by the addition of a saturated solution of mercuric chloride (corrosive sublimate), and preserved by the addition of sufficient full strength formalin to make the entire solution 4% formalin in seawater. The use of the mercuric chloride killing solution was later discontinued since the use of formalin alone seemed to kill and preserve in one step as well as did the mercuric chloride-formalin two-step procedure.

As each sample was taken, pertinent collecting data were recorded. Water temperatures were measured with a -20 C to 100 C laboratory thermometer attached to a long nylon cord. Salinities were determined by the use of an American Optical Company TS (Total Solids) meter. Depths, which were usually shallow, were measured with a yardstick or estimated and recorded to the nearest foot. In addition, notes were taken concerning the nature of the substrate, water quality, water movement, and pertinent observations.

The dredge samples collected by Don Harper were preserved in essentially the same manner as mine. He also used a TS meter for determination of salinities. Depths, however, were determined by a recording fathometer on board the collecting vessel.

A total of approximately two hundred and ten samples was amassed from the various sources mentioned previously, including my own collections. For convenience, each sample was assigned a collection number based on the collection date and the sequence in which the samples collected on that date were obtained. For example, sample

number 680729-1 was the first sample acquired which had been collected on 29 July 1968 (year 68, month 07, day 29).

Prior to examination, all specimens were placed in 70% ethanol. Examinations of preserved material were made with a 13.3x American Optical Company dissecting microscope and a Swift compound microscope, using magnifications of 40x, 100x, and 400x. Measurements shorter than two millimeters were made with an optical micrometer under the compound microscope at either 40x or 100x. Wet mounts were used for most examinations, although a few semi-permanent microscope slides were made using Turtox CMC-S mountant for both staining and mounting. To avoid damaging the specimens, wet mounts were made using standard depression slides or using flat slides with an elevated coverslip. Unusually large specimens, or those attached to small mollusk shells or other substrates, were examined in a micro-culture slide having a concavity of 4 x 13 x 43 millimeters. Upon completion of the identifications, permanent, unstained glycerin-jelly mounts were made of all species, and stained balsam-mounts were made of most species.

The samples were originally examined and identifications made in order of collection dates. The references commonly used in identification are listed at the end of the Historical Review section of this thesis. When the preliminary identifications were completed, the specimens were re-examined in groups of like genera and species. As this second series of identifications was done, pertinent data were recorded for each sample. In addition to identity and collecting information, the following data were recorded: actual substrate,

height of largest colonies or individuals, presence or absence of gonosome, degree of branching (when taxonomically important), dimensions of hydrotheca and gonotheca (when present), and number of teeth of opercular segments (when present). Most of these data are presented in Appendix B. Finally, specimens were sent to Miss Joann H. Allwein, Department of Zoology, North Carolina State University at Raleigh, for verification and identification of uncertain species.

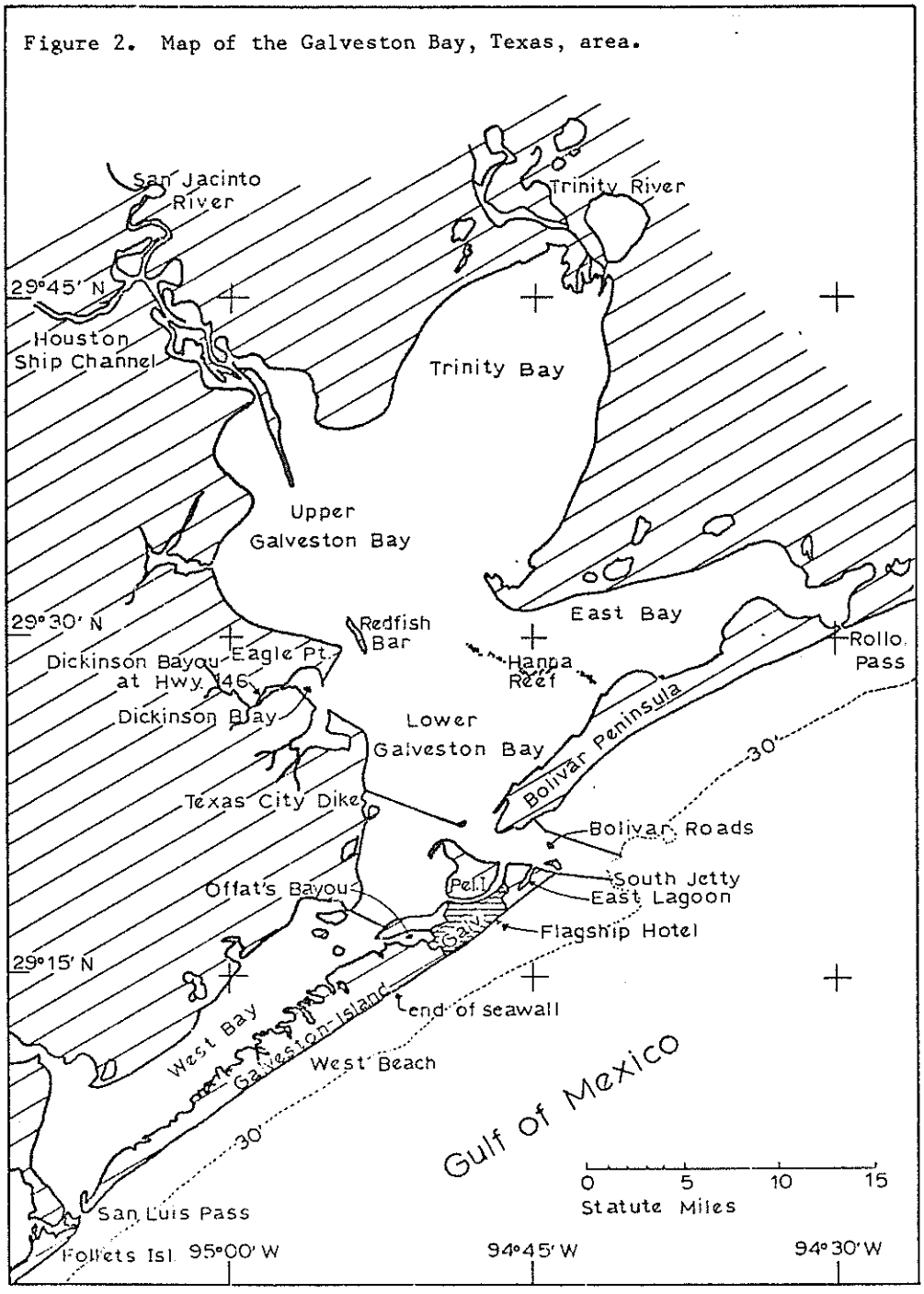
A complete sub-collection of all species is retained in my collection, and a similar, though less voluminous collection has been forwarded to Miss Allwein. Representatives of all species dredged by Don Harper have been returned to him, along with several other common species. The remaining material, constituting most of the bulk, and representing most of the species found, has been placed in the museum of the Texas A&M Marine Laboratory, Galveston.

DESCRIPTION OF THE AREA AND COLLECTING SITES

Galveston Bay is a large, shallow bay system separated from the Gulf of Mexico by three sand barriers: Bolivar Peninsula, Galveston Island, and Follets Island (Figure 2). The bay system is commonly subdivided into five regions: Trinity Bay, Upper and Lower Galveston Bays, East Bay, and West Bay. Trinity and Galveston Bays comprise a large estuarine bay, while East and West Bays form a coastwise lagoon fifty-five miles in length (Lankford and Rehkemper, 1969). The average depth (excluding navigational channels) ranges from 6.5 feet in Galveston and Trinity Bays to 4 feet in West Bay and only 3 feet in East Bay (U.S. Coast and Geodetic Survey Chart 1282).

The bay system is supplied with salt water by three tidal passes. In order of importance, they are: Bolivar Roads, between Bolivar Peninsula and Galveston Island; San Luis Pass, between Galveston and Follets Islands; and Rollover Pass, a small, man-made cut across Bolivar Peninsula. The two major influences on salinity patterns are the freshwater runoff from the Trinity River and tidal influx through Bolivar Roads (Hofstetter, 1959). In general, the salinity of the bay system varies inversely with the amount of Trinity River discharge. Other important salinity influences include the other two tidal passes, the San Jacinto River, the Intracoastal Waterway, Clear Creek, and Dickinson and Cedar Bayous. The average annual salinities for the various areas are: Trinity Bay, 0-16 ppt; Upper Galveston Bay, 6-22 ppt; Lower Galveston Bay, 10-26 ppt; East Bay, 8-20 ppt;

Figure 2. Map of the Galveston Bay, Texas, area.



and West Bay, 11-34 ppt (Hofstetter, 1959; Stevens, 1963). A horizontal salinity gradient exists along the axis of the Trinity and Galveston Bays (Lankford and Rehkemper, 1969).

Because of the large surface area (approximately 610 square miles, Lankford and Rehkemper, 1969) and shallow depth, winds and tides keep the waters of the bay system well mixed and temperature and salinity stratification in the open bay is minimal. Stratification in the navigational channels is common, however, and may comprise a twofold difference between surface and bottom salinities (Pullen, 1961). Winds are also important in flushing the bay system and forcing high salinity waters back into the bay (Pullen, 1961).

Tidal fluctuations are influenced by both meteorologic and astronomic conditions. Tides along the Texas coast are generally weak, with a range of fluctuation at Galveston of only about one-half to two feet, depending on the stage of the tidal cycle (Marmer, 1954). Tides in the Galveston area are of the "mixed diurnal" type, exhibiting harmonic constants of about 1.6 to 1.9 (Marmer, 1954).

Wind speed, direction, and duration are important factors affecting water level and turbulence in the bay. It has been widely reported (e.g., Pullen, 1961; Lankford and Rehkemper, 1969) that strong prevailing winds may raise the water level in the bay as much as two to three feet. This figure seems exaggerated, since an increase of this magnitude above normal high tide levels would inundate much of the surrounding low-lying land. Mackin and Hopkins (1962) reported a tidal increase of only about three feet during

hurricane Flossie (September, 1956) as it passed over Bayou Rigaud, Louisiana, and Mackin (personal communication, 1970) believes the contribution by even strong winds to be less than one foot.

Tidal conditions are such that sea level at Galveston Bay varies throughout the year, from a low of about -0.4 foot (deviation from mean sea level) in January to +0.2 foot in May, back down to about -0.2 foot in July, and up to +0.5 foot during September and October (Marmer, 1954).

The average annual temperature cycle is fairly constant from year to year, with close correlation between air and water temperatures. Pullen (1961) reported ranges from approximately 9 C in January to 34 C in July for air temperatures, and 10 C to 31 C for water temperatures for the same months (monthly average temperatures).

Other ecologically important parameters include turbidity (83 to 97 per cent transmittance), hydrogen ion concentration (7.1 to 8.0 pH units), and dissolved oxygen (6.4 to 10.5 parts per million). These values are monthly averages reported by Pullen, 1961. Bottom substrate varies throughout the bay system, including soft mud, sand, shell gravel, and oyster reef. The geology of the area is well described by Lankford and Rogers, 1969.

The seaside barrier islands face the open Gulf of Mexico. The area is fairly shallow, having an average horizontal gradient of only 8.14 feet per nautical mile, to the eight fathom isobath (U.S. Coast and Geodetic Survey Chart 1282). The bottom type is fine sand and shell gravel extending from the beach to about three or four fathoms,

with soft mud beyond that depth. The average near shore salinities recorded during this study ranged from 15.12 to 35.56 parts per thousand. The nearshore waters are commonly turbid, but clear rapidly at about the four or five fathom isobath.

Collections were made at the following sites:

Seaside Beach

This collecting "site" refers to the entire twenty-nine mile seaside beach of Galveston Island. The major part of the beach, from the west end of the seawall to San Luis Pass, was traveled each collecting trip. Hydroid-bearing material collected here included flotsam, sargassum weed, and invertebrates (mostly blue crabs and hermit crabs). In addition to the part of the beach beyond the seawall, those areas near the South Jetty and near wooden and rock groins were also visited regularly.

For convenience, the beach is subdivided into three regions in the collection records (Appendix B). Front Beach refers to that portion adjacent to Galveston (city), including Stewart Beach, west to the end of the seawall. East Beach extends from the South Jetty to the concrete posts which mark the eastern boundary of Stewart Beach. West Beach extends from the end of the seawall to San Luis Pass.

In addition to the Galveston Beach, an area of beach approximately two miles long on Bolivar Peninsula was also visited regularly. This beach was reached via a dirt road off Highway 87, approximately

4.5 miles east of the Bolivar ferry landing. In general, material seen or collected at this site was the same as that found on Galveston Island.

San Luis Pass

The major collecting areas at this site were the bases of the concrete pilings supporting the causeway which extends across the tidal pass. Because of the strong tidal flow at all times through the pass, it was possible to visit only those pilings in fairly shallow water near Galveston Island. Hydroids were collected here only twice. Other common biota included algae (Chlorophyta), balanoid barnacles, oyster drills, blue crabs, and hermit crabs.

Groins

A series of approximately twenty wooden or rock groins have been constructed by Galveston County, off Front Beach, for control of beach erosion. The wooden groins were the only sites where hydroids could be regularly collected at all times of the year (Table 3). These groins consist of a double row of wooden pilings, about three feet apart, with a heavy sheet of corrugated steel placed vertically between the pilings. Because of the vertical nature of the pilings, it is possible to walk near the groin seaward to a depth of about four or five feet. Strong currents and deep holes near the groins make it unsafe to go farther than this. At low tide, hydroids commonly may be found just below the water level.

The county is currently replacing most or all of the wooden

groins with new rock ones by placing large granite boulders on and around the existing wooden groins. A number of such rock groins have been present for some time. Because of the irregular placement of the boulders, causing strong currents and holes, it is unsafe to walk or swim near the groin. The first of the new rock groins was completed in November, 1968, and replaced the wooden groin at 57th Street. It was examined several times, and even by September, 1969, supported very little biota. Some algae and a few barnacles were all that could be found. None of the older rock groins supported readily apparent hydroids.

South Jetty

This is the southern member of a pair of large jetties protecting Bolivar Roads. The jetty originates at Fort Point, borders the northern edge of Galveston Island, and extends seaward approximately 13,650 feet from the tip of East Beach. A wide concrete cap overlays the first 2,000 feet. The remainder is uncapped, consisting of large granite boulders. Whitten, Rosene, and Hedgpeth (1950) discuss the construction of these jetties.

Collections were made along both sides of the cap, and at three places where the cap has been broken, leaving gaps through which water may flow during periods of high water. Water movement around the jetty is usually turbulent, and may become extremely rough during high seas.

The dominant biota of the jetty includes algae (Chlorophyta and

Rhodophyta), sea anemones, gastropods (Thais and Siphonaria, especially), blue crabs, hermit crabs, and isopods. Hydroids were found very infrequently on the jetty itself, although several samples were collected on both the protected (north) and unprotected (south) sides. This paucity of hydroids may be due to turbulence near the surface. Hydroids may, and probably do, occur on the submerged slope of the jetty, but were not accessible, due to turbulent waters and an abundance of fishermen.

In addition to the jetty itself, hydroid-bearing flotsam, sargassum weed, and invertebrates (mainly blue crabs and the tubes of Diopatra cuprea) were occasionally collected from the jetty or on the adjacent beach.

Offshore Stations

Ten offshore stations were sampled by Don Harper during the months of August and September, 1967; August, September, October, and December, 1968; and February and May, 1969. His stations were selected along two transects, as nearly as possible directly offshore from the Flagship Hotel and from the western end of the seawall at the two, three, four, five, and six fathom isobaths. Measurements with an improvised pelorus show the stations to be imperfectly located, but for the purposes of this thesis the deviance is not significant, so the locations will be referred to as "off the Flagship" or "off the end of the seawall."

Several collections obtained from the Texas A&M Marine Labora-

tory Museum were dredged at various times by the Bureau of Commercial Fisheries in the Galveston Bay area. The approximate location of these stations will be given as "off Bolivar Peninsula", "off West Beach", etc.

East Lagoon Laboratory Settling Tank

The Bureau of Commercial Fisheries maintains a field laboratory at East Lagoon, near the northern end of Galveston Island. A settling tank of fiberglass-lined concrete has been constructed on the roof of the laboratory as part of a running seawater system. Water from the lagoon is pumped into this tank, where dense material, including organisms, settles out. The clarified water then overflows to holding tanks below. Marine life uncommon elsewhere on the island may often be found in this tank, apparently due to the constant circulation of fresh seawater and the constant introduction of organisms.

Hydroids were abundant here during the summer months. Other common inhabitants included algae (Chlorophyta and Rhodophyta), small anemones, sponges, bryozoa, bivalves, isopods, amphipods, tanaids, hermit crabs, small blue crabs, and occasionally tunicates. Because of the geographic proximity and the similarities in flora and fauna, I believe that some of the hydroids probably present, but inaccessible at the South jetty were represented here.

West Bay

This is the southwestern arm of the Galveston Bay system. Four

locations were visited:

1.) Offat's Bayou

This is a fairly small, secondary embayment near the eastern end of the bay. A small causeway extends across the bayou near its eastern end, facilitating collecting. The habitat appears to be favorable for hydroids. The water is commonly clear, there is much hard substrate, and the bayou is never excessively rough. Even though this site was visited on every collecting trip, including three explorations with diving gear, hydroids were collected only once, and then in very small quantity. Other common inhabitants include algae (Chlorophyta), balanoid barnacles, oysters, and hermit crabs. Ctenophores were observed on several occasions.

2.) First Island

This is a small island not named on maps lying just west of the large causeway connecting Galveston Island and the mainland. It is the first of a string of nine or ten similar islands, apparently formed by spoil from the nearby Intracoastal Waterway channel. The bottom is soft mud, overlaid with a little sand and shell gravel. The island was visited only once, during August, 1968. Hydroids were collected on floating sargassum and on a submerged, embedded timber.

3.) Eight Mile Road

This site is located on West Bay, near Andy's Fish Camp, at the northern end of Eight Mile Road. The water is shallow and the bottom has a slight gradient. Bottom type ranges from soft mud to sand to oyster reef. This site was visited on every collecting trip, but

hydroids were never found. This is in agreement with the findings of Gillard (1969), who reported no hydroids after a year-long study of the ecology of an oyster reef at this site.

4.) Carancahua Reef Area

Collections were made here through the assistance of Dr. W. Lee Trent of the Bureau of Commercial Fisheries on 20 May 1969. Dredge samples were taken in Carancahua Cove and in West Bay, near Carancahua Reef. Oyster shells and shell gravel were collected from oyster reefs in the area, and some interesting samples containing foliaceous bryozoa were scraped off channel buoys in West Bay and the Jamaica Beach canals. No hydroids were found in any of the collections made.

Pelican Island Causeway

A small causeway connects Galveston and Pelican Islands across the Galveston Ship Channel. Collections were made from the Pelican Island side of the span. The concrete pilings were examined, as were a series of wooden pilings extending at an oblique angle into the channel. Hydroids were never found. The only biota common were algae (Chlorophyta) and hermit crabs, which were abundant.

East Bay

This is the northeastern arm of the bay system. Three locations were visited:

1.) Hanna Reef

This is a large, elongate, natural oyster shell reef extending

across most of the mouth of East Bay. Samples of Bimeria franciscana were collected at this site by Mr. Robert Hofstetter and Mr. Roger Anderson from oyster trays maintained by the Texas Parks and Wildlife Service.

2.) Kona Kai Housing Development

This is a beach-house development about eight miles east of the Bolivar Peninsula ferry landing on Highway 87. A concrete bulkhead, large concrete slabs, and boulders provided abundant hard substrate, but hydroids were never found here. This site borders the Intracoastal Waterway, so may be polluted. Common biota included algae (Chlorophyta), balanoid barnacles, and oysters.

3.) Bolivar Peninsula Ferry Landing

The pilings near the ferry landing at Bolivar Peninsula were examined once. The water was extremely turbid and covered with an oil film. Hermit crabs were the only organisms observed.

Texas City Dike

This is a man-made dike extending approximately five miles into the bay. Large boulders and the pilings of a fishing pier were examined regularly, but hydroids were not found. Acorn barnacles were the only common organisms noted.

Dickinson Bayou at Highway 146

Pilings of this bridge, scattered bricks and concrete blocks, large rocks, and mollusk shells were examined regularly, without finding any hydroids. The substrate is a very soft, gooey mud that

restricted collecting efforts to water about two feet deep or less. Oysters were common.

Dickinson Bay

Abundant specimens of Bimeria franciscana were collected here by Dr. Sewell H. Hopkins, from the cooling system intake port of the Houston Power and Light Company's power plant.

Eagle Point

Samples were collected from numerous pilings, broken concrete slabs, and oyster shells at Eagle Point, near San Leon. Hydroids were not found, although suitable substrate was abundant. Common biota included barnacles, mussels, oysters, and isopods.

Switchover Reef

This is a small, artificial oyster reef situated near Redfish Bar in mid-Galveston Bay. Collections were made here by Mr. Robert Hofstetter and Mr. Roger Anderson, and consisted of only Bimeria franciscana.

RESULTS

The results section of this thesis is presented in the form of a key, species descriptions, and pertinent comments. As shown in Table 2, only sixty-two species of hydroids have now (including the present study) been reported from the northwestern Gulf coast (the coasts of Texas and Louisiana). Of these, twenty-nine are represented in the present study.

The following key and descriptions are presented as an aid to other collectors. The taxonomic system and verbal descriptions used are based on those of Fraser (1937, 1944). The North American synonymies and distribution records for each species are extensively covered in Fraser's monographs, so are not repeated here, except for those covering the northern Gulf coast (the previously delimited "Carolinian Gulf Coast"). Also, many synonymies not given by Fraser are presented, as well as citations for Fraser's monographs. New distribution records and pertinent observations are presented, as well as original camera-lucida drawings (Appendix C) for those species actually seen. It should be noted that the descriptions given for species I have seen are my own, based on my specimens, and may not agree in all respects with Fraser's descriptions. Whenever possible, my descriptions have been written so as to describe my specimens and parallel Fraser's description. The Remarks section of each description should be consulted in this regard. Some terms are defined in Appendix A, and a compilation of most of the raw data is presented in Appendix B.

Artificial Key To The Hydroids Reported From The Northwestern Gulf Of Mexico, Based On The Characters Of The Trophosome

1. Hydranths and gonophores lacking hydrothecae (or hydrophores) and gonothecae.....Suborder Gymnoblastea....2

   Hydranths and gonophores with hydrothecae (or hydrophores) and gonothecae.....Suborder Calyptoblastea....21

2. Hydranths with capitate tentacles only.....Family Corynidae....3

   Hydranths with filiform tentacles only.....4

3. Stem short, unbranched, about the length of the hydranth, annulated throughout.....Zanclea costata

   Stem large, much branched, irregularly annulated..... .....Syncoryne eximia

4. Filiform tentacles arranged in one or two definite whorls.....5

   Filiform tentacles scattered over the hydranth..... .....Family Clavidae...Cordylophora lacustris

5. Filiform tentacles arranged in a single whorl.....6

   Filiform tentacles arranged in two whorls, one proximal and one distal.....Family Tubularidae....20

6. Colonies with unbranched zooids lacking perisarc..... .....Family Hydractinidae....7

   Colonies branched or unbranched, zooids with perisarc.....9

7. Spines present.....8

   Spines absent.....Stylactis n. sp.

8. Spines jagged.....Hydractinia echinata

Spines smooth.....*Podocoryne carnea*

9. Hypostome of hydranth conical or dome-shaped.....
.....Family Atractylidae....10

Hypostome of hydranth trumpet shaped....Family Eudendridae....17

10. Stem simple.....11

Stem fascicled.....15

11. Colony small (10 mm or less), completely lacking annulations..12

Colony larger, with at least some annulations.....14

12. Hydranth large, pedicel enlarging from its orgin to hydranth....
.....*Bimeria humilis*

Hydranth small, pedicel enlarging or not.....13

13. Colony freely branching; perisarc gelatinous, thick, wrinkled...
.....*Perigonimus jonesi*

Colony unbranched or only slightly branched; perisarc smooth....
.....*Perigonimus repens*

14. Hydranths with 10 to 16 filiform tentacles...*Bimeria franciscana*

Hydranths with 15 to 20 filiform tentacles.....
.....*Bougainvillia superciliaris*

15. Perisarc of stem and branches smooth.....16

Perisarc of stem and branches quite wrinkled throughout.....
.....*Bougainvillia inaequalis*

16. Pedicels not annulated, but rugose at base of hydranth.....
.....*Bougainvillia rugosa*

Pedicels annulated proximally, smooth at base of hydranth.....
.....*Bougainvillia carolinensis*

17. Stem small (about 15 mm), simple.....Eudendrium tenue

    Stem larger, fascicled.....18

18. Stem only fascicled.....19

    Stem and main branches fascicled.....Eudendrium eximium

19. Pedicels all on same side of branch, more or less vertically placed.....Eudendrium ramosum

    Pedicels alternate.....Eudendrium exiguum

20. Proximal and distal tentacles both about 14 to 16.....Ectopleura grandis

    Proximal and distal tentacles both about 20 to 24.....Tubularia crocea

21. Hydrothecae usually free, supported by pedicels.....22

    Hydrothecae more or less sessile or adnate to stem or branch..47

22. Hydrothecae with operculum of converging segments.....Family Campanulinidae....23

    Hydrothecae without operculum of converging segments.....26

23. Hydrothecae sessile.....Cuspidella humilis

    Hydrothecae pedicellate.....24

24. Hydrothecae with distinct margin or hinge-line at base of opercular segments.....25

    Hydrothecae without distinct margin or hinge-line at base of opercular segments.....Lovenella n. sp.

25. Hydrothecae greater than 1.0 mm long.....Lovenella grandis

    Hydrothecae less than 1.0 mm long.....Lovenella gracilis

26. Hydrotheca reduced to a saucer-shaped hydrophore.....
.....Family Halecidae.....27

Hydrotheca not so reduced.....29

27. Stem simple.....28

Stem fascicled.....*Halecium bermudense*

28. Branching irregularly.....*Halecium nanum*

Branching regularly.....*Campalecium* n. sp.

29. Hydrothecae tubular, lacking diaphragm.....
.....Family Lafoeidae...*Filellum serpens*

Hydrothecae campanulate, with diaphragm..Family Campanularidae.30

30. Hydrothecal margin entire (lacking teeth).....31

Hydrothecal margin with distinct teeth.....34

31. Stem branched.....32

Stem unbranched, but bearing many hydrothecae.....33

32. Hydrotheca depth to width ratio about 1.0.....*Obelia hyalina*

Hydrotheca depth to width ratio about 1.5.....*Obelia dichotoma*

33. Hydrothecae triangular in cross section.....*Obelia equilateralis*

Hydrothecae circular in cross section.....*Obelia geniculata*

34. Teeth bicuspid (each bearing two cusps).....35

Teeth simple.....37

35. Hydrotheca depth to width ratio about 4.0 to 4.5.....
.....*Clytia longitheca*

Hydrotheca depth to width ratio less than 4.0.....36

36. Colony small (to 15 mm); hydrothecae often with indistinct
longitudinal striations.....*Obelia bicuspidata*

Colony large (to 250 mm); hydrothecae lacking longitudinal striations.....*Campanularia gelatinosa*

37. Stem fascicled.....38

Stem simple.....39

38. Margin with 12 to 14 low, blunt teeth..*Campanularia verticillata*

Margin with 18 to 20 deeply cut acute or slightly rounded teeth. .....*Clytia longicyatha*

39. Stem branched, bearing hydrothecae or branches.....40

Stem unbranched, serving as a pedicel.....44

40. Margin with 12 low, rounded teeth.....*Obelia obtusidens*

Margin with 8 to 14 deeply cut acute or nearly acute teeth....41

41. Margin with 8 or 9 teeth.....*Clytia coronata*

Margin with 10 to 14 teeth.....42

42. Pedicels long and slender, stem not geniculate.....43

Pedicels shorter, stem geniculate.....*Clytia fragilis*

43. Colony of several long and slender pedicels and branches..... .....*Gonothyraea gracilis*

Colony usually unbranched; if branched, only sparingly so, with about 3 or 4 hydrothecae per colony.....*Clytia cylindrica*

44. Margin with 10 to 12 low, rounded teeth.....*Clytia noliformis*

Margin with acute or nearly acute teeth.....45

45. Margin with 8 or 9 teeth.....*Clytia coronata*

Margin with 10 to 14 teeth.....46

46. Hydrotheca about twice as deep as wide.....*Clytia cylindrica*

Hydrotheca depth to width ratio 1.0 to 1.5.....*Clytia johnstoni*

47. Nematophores present.....Family Plumularidae....48

Nematophores not present.....Family Sertularidae....56

48. Nematophores monothalmic, fixed (non-moveable).....49

Nematophores bithalmic, moveable.....52

49. Hydrothecal margin with 8 teeth.....Aglaophenia rigida

Hydrothecal margin with 9 teeth.....50

50. Intrathecal ridge extending entirely across hydrotheca.....51

Intrathecal ridge extending less than halfway across hydrotheca.

.....Aglaophenia cristifrons

51. Intrathecal ridge straight.....Aglaophenia late-carinata

Intrathecal ridge concave towards margin..Aglaophenia perpusilla

52. Colony with all hydrocladia arising from upper side of branches.

.....Monostaechas quadridens

Colony with hydrocladia arranged otherwise.....53

53. Stem pronouncedly geniculate; hydrocladia bifurcating.....

.....Schizotricha tenella

Stem not geniculate, or only slightly so; hydrocladia not

bifurcating.....54

54. All nodes transverse.....55

Transverse and oblique nodes alternating.....Plumularia diaphana

55. Hydrocladial internodes with septal ridges....Plumularia setacea

Hydrocladial internodes without septal ridges.....

.....Plumularia floridana

56. Hydrothecae opposite.....57

Hydrothecae alternate.....62

57. One pair of hydrothecae per internode.....58

Hydrothecae arranged in groups of pairs.....*Pasya quadridentata*

58. Mature colony branched.....59

Mature colony unbranched.....60

59. Branches alternate, hydrothecal margin with 2 teeth.....*Sertularia inflata*

Branches irregularly placed, hydrothecal margin with 3 teeth.....*Sertularia dalmasi*

60. Hydrothecal margin with 2 teeth.....*Sertularia cornicina*

Hydrothecal margin with 3 teeth.....61

61. Hydrothecae about as long as the internode.....*Sertularia mayeri*

Hydrothecae about one-half as long as the internode.....*Sertularia turbinata*

62. Margin with 2 teeth.....*Thuiaria cupressina*

Margin with 4 teeth.....63

63. Stem simple, to about 25 mm tall.....*Sertularella conica*

Stem fascicled proximally, to about 150 mm tall.....*Sertularella gayi*

Descriptions Of The Families, Genera, And Species Of Hydroids Now Reported From The Northwestern Gulf Of Mexico

Family CLAVIDAE

"Hydranths with scattered filiform tentacles. Gonophores give rise to sporosacs or to free medusae" (Fraser, 1944).

Genus Cordylophora Allman

"Colony branched; main stem well developed; hydranths with scattered filiform tentacles. Gonophores borne on the stems or branches; producing fixed sporosacs" (Fraser, 1944).

Cordylophora lacustris Allman

Plate I, Figure 3

Cordylophora lacustris Allman, 1844, p. 330.
Fraser, 1944, p. 34.
Deevey, 1950, p. 349.
Deevey, 1954, p. 269.
Fincher, 1955, p. 91.

Diagnosis: Colony regularly branched, main branches also branched, six centimeters in height; branches and pedicels annulated at the base; hydranth with 16 to 20 scattered, filiform tentacles. Gonophores oval, on very short, annulated pedicels, borne on the stem or branches, invested with a thin perisarcal covering (Fraser, 1944).

Gulf Distribution: Frenier Beach, La. (Fraser, 1944); Louisiana (Deevey, 1950); NW Gulf (Deevey, 1954); Mississippi Sound, Miss. (Fincher, 1955).

Remarks: Although I expected to find this species, it was not collected during the present study. It is a brackish to freshwater form, found on rocks, sticks, eelgrass, etc., according to Fraser.

Family CORYNIDAE

"Hydranths clavate with scattered capitate tentacles. Gonophores arising from the body of the hydranth produce sporosacs or free medusae" (Fraser, 1944).

Genus Syncoryne Ehrenberg (in part)

"Colony unbranched or irregularly branched; perisarc well developed; tentacles scattered over the body of the hydranth, strongly capitate. Gonophores usually few in number, producing free medusae that, when liberated, have four rudimentary tentacles" (Fraser, 1944).

Syncoryne eximia (Allman)

Plate I, Figure 4

Coryne eximia Allman, 1859, p. 141.
Syncoryne eximia Fraser, 1944, p. 40.
Deevey, 1950, p. 335.
Deevey, 1954, p. 269.

Diagnosis: Colonies in tangled masses, each much branched, but with the branches almost entirely on the one side of the stem, or, when the large branches are branched, on the one side of each branch; annulations irregular, often represented by a wrinkling only, seldom present to the same extent on the ultimate branches; hydranths rather elongated, with 20-30 tentacles. Medusa buds, each on a short pedicel, scattered among the tentacles, from the body of the hydranth. (Fraser, 1944)

Gulf Distribution: Port Aransas, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Genus Zanclea Gegenbaur

Hydranths sessile or with pedicel or stem shorter than the hydranth, growing from a stolon; short, capitate tentacles are scattered over the whole of the body of the hydranth. Gonophores producing medusae, the tentacles of which are supplied with stalked bodies, especially well provided with nematocysts (Fraser, 1944).

Zanclea costata Gegenbaur

Plate I, Figure 5

Zanclea costata Gegenbaur, 1857, p. 229.
Fraser, 1944, p. 43.
Deevey, 1950, p. 349.
Whitten, Rosene, and Hedgpeth, 1950, p. 73.
Deevey, 1954, p. 269.
Menzel, 1956, p. 2.

Diagnosis: Zooid 1 to 2 mm high; hydranth elongate, clavate, bearing 20 to 30 or more capitate tentacles evenly distributed over its surface; hydranth supported by a short pedicel annulated throughout, or annulated proximally but not distally; the pedicel is about the same length as the hydranth or shorter; stolon not annulated. Medusa buds develop proximally on the hydranth body, between the tentacles.

Gulf Distribution: Port Aransas, Tex. (Deevey, 1950); Texas coast jetties, definite site not given (Whitten, Rosene, and Hedgpeth, 1950); NW Gulf (Deevey, 1954); Apalachee Bay, Fla. (Menzel, 1956); epizooic on sargassum, Galveston, Tex. (present study).

Remarks: My specimens agree well with those figured by Fraser (1944) and Mayer (1910), except that in mine, the tentacles are not so perfectly arranged in verticils. Also, several of my specimens

have the pedicel annulated only about half its length, the remainder being irregularly wrinkled, but not annulated. Fraser's figure is reproduced for comparison with my drawing.

Family ATRACTYLIDAE

"Perisarc well developed; hydranths with a basal whorl of filiform tentacles. Gonophores producing sporosacs or free medusae" (Fraser, 1944).

Genus Bimeria Wright

"Colony usually branched, invested with a conspicuous perisarc that extends to cover the base of the tentacles of the hydranth; filiform tentacles in a single basal whorl. Gonophores producing sporosacs that are covered with perisarc throughout the whole development period" (Fraser, 1944).

Bimeria franciscana Torrey

Plate II, Figure 6

Bimeria franciscana Torrey, 1902, p. 28.
Bimeria tunicata Fraser, 1943, pp. 76, 86.
Fraser, 1944, p. 50.
Bimeria franciscana Deevey, 1950, p. 335.
Deevey, 1954, p. 269.
Crowell and Darnell, 1955, p. 516.
Bimeria tunicata Fincher, 1955, p. 91.

Diagnosis: Colonies large (to 13 cm), commonly occurring in clusters; main stem simple, lacking nodes or annulations; primary branches arise irregularly from the stem, annulated proximally, but lack nodes; secondary branches uncommon, small when present. Perisarc

heavy, dark brown throughout. Hydranths regularly alternate on short pedicels which are annulated proximally; the distal portion of the pedicel is quite rugose at the base of the hydranth; occasionally the pedicel bifurcates and bears two hydranths; hydranths with about 10 to 16 filiform tentacles arranged in a single whorl about the conical proboscis. Sporosacs globular, arising from the base of the hydranth on very short pedicels; as many as ten sporosacs may be found on a single hydranth.

Gulf Distribution: Louisiana coast (Fraser, 1943); off Freeport, Houston ship channel in Galveston Bay, Sabine Pass, Corpus Christi, Tex. and Bay Chene Fleuri, La. (Deevey, 1950); NW Gulf (Deevey, 1954); Lake Pontchartrain, La. (Crowell and Darnell, 1955); Mississippi Sound, Miss. (Fincher, 1955); Galveston Bay, Tex. (present study).

Remarks: This species was originally described from San Francisco Bay by Torrey (1902), and later redescribed by Fraser (1943). Deevey (1950) placed Fraser's name into synonymy, and was followed by Crowell and Darnell (1955). This last paper is short, but very good. It discusses the distribution and ecology of the hydroid in Lake Pontchartrain, reports temperature and salinity tolerance experiments, and discusses the growth of young colonies in vitro. The species was collected five times in Galveston Bay, during the summer months. Dried colonies were also found on a cable spool washed up on West Beach.

Bimeria humilis Allman

Plate II, Figure 7

Bimeria humilis Allman, 1877, p. 8.
Fraser, 1944, p. 49.
Deevey, 1950, p. 335.
Deevey, 1954, p. 269.
Lyon, 1962, p. 3.

Diagnosis: Colonies arising from a stolon that grows to form a loose network over other hydroids, etc.; the colony may consist of a single zooid with a long pedicel which may be wavy towards the base but is not annulated, or of a longer stem, up to 3 mm., that gives off other zooids laterally, in which case, the lateral zooids have shorter pedicels, with 2 or 3 annulations in the proximal portion. In all cases the pedicel increases in diameter until it merges into the pyriform hydranth; the perisarc thins out so gradually that it is difficult to determine just where it ceases; hydranths large with 12-15 tentacles. Sporosacs appear on the hydranth pedicels in both the types of colonies; they are oval, or orbicular, with short, annulated pedicels (Fraser, 1944).

Gulf Distribution: Palacios, Tex. and Grand Isle, La. (Deevey, 1950); NW Gulf (Deevey, 1954); Matagorda Bay, Tex. (Lyon, 1962).

Remarks: Not recorded in the present study.

Genus Bougainvillia Lesson

"Colonies much branched; perisarc well developed on stem and branches; hydranths fusiform; proboscis dome-shaped or conical. Gonophores pedicellate; medusae with 4 radial canals and 4 clusters of tentacles; tentacle bulbs ocellate" (Fraser, 1944).

Bougainvillia carolinensis (McCrady)

Plate II, Figure 8

Hippurene carolinensis McCrady, 1858, p. 164.
Bougainvillia carolinensis Cary and Spaulding, 1909, p. 5.
Fraser, 1944, p. 50.

Bougainvillia carolinensis Behre, 1950, p. 7.
Deevey, 1950, p. 347.
Deevey, 1954, p. 269.
Gaille, 1967, pp. 12, 33.
Pequegnat and Pequegnat, 1968, pp. 22, 31, 32.

Diagnosis: Colony reaching a height of 30 cm., irregularly branched; stem and sometimes some of the branches fascicled in the proximal portion; branches annulated at the base; hydranth with large, flexible proboscis; tentacles 10-12. Gonophores scattered over the stem, branches, and pedicels, often singly but sometimes in clusters; mature medusae with 7-9 long, slender tentacles in each marginal cluster (Fraser, 1944).

Gulf Distribution: Louisiana coast (Cary and Spaulding, 1909); Bayou des Gette and East Bay, La. (Fraser, 1944); Grand Isle, La. Behre, 1950); to Louisiana (Deevey, 1950); NW Gulf (Deevey, 1954); off Panama City, Fla. (Gaille, 1967; Pequegnat and Pequegnat, 1968).

Remarks: Not recorded in the present study.

Bougainvillia inaequalis Fraser

Plate III, Figure 9

Bougainvillia inaequalis Fraser, 1944, p. 51.
Fraser, 1945, p. 22.
Behre, 1950, p. 7.
Deevey, 1950, pp. 337, 349.
Deevey, 1954, p. 269.
Pequegnat and Pequegnat, 1968, pp. 22, 32.

Diagnosis: Colony large, to 10 cm in height; stem coarse; primary branches, and even some secondary branches, heavily fascicled; both the main branches and smaller branches are given off very irregularly; the ultimate branches are small, at times consisting of single pedicels; perisarc heavy, much wrinkled throughout; at times the wrinkles are regularly arranged and approach being annulations,

but are never quite as regular as are annulations; distally the perisarc becomes more delicate at the base of the hydranth, terminating just below the tentacles; hydranths elongate, proboscis rounded, with 8 to 12 long, filiform tentacles arranged in a single whorl. Medusa buds occur singly or in clusters on short pedicels originating from the hydranth pedicels.

Gulf Distribution: Off Pass á Loutre, 5 miles NNE, 15 fathoms, and East Bay, La. (Fraser, 1944); front beach, Grand Isle, La. (Behre, 1950); buoys off Sabine Pass and Freeport, and on pilings, Aransas Bay, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954); off Panama City, Fla. (Pequegnat and Pequegnat, 1968); off Galveston, Tex. (present study).

Remarks: My specimens agree well with Fraser's description, except that the branching is much more irregular, and the perisarc at the base of the hydranths does not form a wrinkled cup-like structure as indicated by his figures. This species was collected twenty-two times, during essentially all months of the year, from depths of 1 to 36 feet, all off the Galveston front beach. A variety of substrates were represented: worm tubes, Thais, blue crabs, barnacles, shell fragments, jetty rocks, flotsam, and mud bottom.

Bougainvillia rugosa Clarke

Plate III, Figure 10

Bougainvillia rugosa Clarke, 1881, p. 140.
Fraser, 1944, p. 53.
Deevey, 1950, p. 347.
Deevey, 1954, p. 269.

Diagnosis: Fascicled stem growing from a stolon, 75 mm.; branching irregular, none of the branches nearly as large as the main stem; the branches are seldom branched, but each gives rise to 3 or 4 hydranths; the perisarc is thick, smooth throughout except at the base of the hydranths, i.e., near the terminus of the perisarc; here it becomes roughly corrugated, with ridges that pass around the base of the hydranths, parallel to one another, forming a definite protection for the base of the hydranth. The perisarc of the remainder of the pedicel may be slightly wrinkled but not annulated. The proboscis is of medium size, the tentacles few, 8-10. Gonophores on the hydranth pedicels, just below the hydranth; in the medusa there are but 3 tentacles in each cluster (Fraser, 1944).

Gulf Distribution: Bayou Mussell and Pass Sortie, La. (Fraser, 1944); to Louisiana (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Bougainvillia superciliaris Agassiz

Plate III, Figure 11

Bougainvillia superciliaris Agassiz, 1862, pp. 289, 344.
Cary and Spaulding, 1909, p. 5.
Fraser, 1944, p. 53.

Diagnosis: Colony, 50 mm., with simple stem and irregularly arranged branches; branches and pedicels more or less definitely annulated at the base; hydranth with small, rather insignificant proboscis, and 15-20 tentacles. Gonophores borne almost entirely in clusters on the pedicels, just below the hydranths; mature medusae with a large number of marginal tentacles in each cluster, 10-15, or even more, but there are but 2 tentacles to each bulb at the time of liberation (Fraser, 1944).

Gulf Distribution: On piles and oyster shells, Louisiana coast (Cary and Spaulding, 1909).

Remarks: Not recorded in the present study. The identification of the above material from Louisiana was made by C. C. Nutting.

Genus Perigonimus Sars

"Colony unbranched or branched; perisarc well developed; hydranths clavate with conical or dome-shaped proboscis. Gonophores producing free medusae that when liberated have 2 or 4 tentacles, arranged singly; no ocelli" (Fraser, 1944).

Perigonimus jonesi Osborn and Hargitt

Plate III, Figure 12

Perigonimus jonesii Osborn and Hargitt, 1894, pp. 27-34.
Perigonimus jonesi Cary and Spaulding, 1909, p. 5.
Fraser, 1944, p. 57.
Dawson, 1966, p. 176.

Diagnosis: Colonies small, stems to about 1.5 mm; zooids solitary or stem sparsely branched in an irregular manner, there is no distinction between the stem and pedicel, the perisarc continuing unaltered to the base of the tentacles; perisarc thick, gelatinous in appearance, wrinkled throughout and especially rugose at the base of the tentacles; hydranths with 8 to 18 filiform tentacles arranged in a single whorl about a sub-conical hypostome. The gonosome was not observed in the material collected. "Gonophores borne on the hydranth body or on the branches; medusae ovoid, with 2 tentacles, 4 radial canals, and 4 eye-spots; manubrium short, with a four-lobed mouth" (Nutting, 1901, in Fraser, 1944).

Gulf Distribution: Epizoic on Mulinia lateralis var. corbuloides, off Calcasieu Pass, La. (Cary and Spaulding, 1909); fouling, Grand Isle, La. (Dawson, 1966); epizoic on sargassum, Galveston, Tex. (present study).

Remarks: My specimens agree well with Fraser's description in all but two respects, size and degree of branching. Fraser found the species to grow to one-quarter inch and branch freely. His figure is reproduced for comparison with my drawing. This species was collected only once, on sargassum at West Beach during September, 1969.

Perigonimus repens (Wright)

Plate IV, Figure 13

Eudendrium pusillum Wright, 1857, p. 231.
Atractylis repens Wright, 1858.
Perigonimus repens Fraser, 1944, p. 58.

Diagnosis: Stems small (0.6 to 1.6 mm), bearing solitary hydranths or sparsely branched; arising from a (apparently) reticular stolon; perisarc well developed, fitting relatively loosely over the coenosarc, ending below the base of the hydranth, of approximately the same diameter throughout, not expanded distally; tentacles about 6 to 8 in number. The gonosome was not observed in the material examined. "Gonophores borne on pedicels growing from the stolon, or the stem; in the latter case there may be one or more. Medusae with 2 developed and 2 rudimentary tentacles at the time of liberation" (Fraser, 1944).

Gulf Distribution: Off Galveston, Tex. (present study).

Remarks: Although my specimens do not fit Fraser's description perfectly, this is apparently the species to which they belong. According to Fraser, the distal perisarc is large enough for the

hydranth to retract into, and the hydranth bears about 10 tentacles. After examining my material, Miss Allwein stated that she was not sure that this was the correct species, but that the material looked as much like P. repens as anything she could think of. At least two of the zooids collected bear two hydranths each. This species was collected twice, both on 23 October 1968, on the tubes of Spiochaetopterus oculatus (Polychaeta: Chaetopteridae) dredged at 3 and 4 fathoms from off the end of the seawall. If this is the correct identification for the material examined, it constitutes a significant range extension. Fraser lists only four records for the species, all in the New England region.

Family EUDENDRIDAE

> Colony usually branching; perisarc well developed, but not passing over the base of the tentacles on the hydranth; proboscis trumpet-shaped, but with much freedom of movement; tentacles all filiform, in a single basal whorl. Gonophores producing fixed sporosacs; male and female gonophores dissimilar; male gonophores in whorls, female gonophores in clusters (Fraser, 1944).

Genus Eudendrium Ehrenberg (in part)

> Colony branching, often profusely; perisarc evident, often regularly annulated. Hydranths with a single verticil of filiform tentacles, and a proboscis that is at times trumpet-shaped and at times hemispherical, the distal end being the larger. Gonophores (male) forming verticils just beneath the tentacles of the hydranth, each verticil being composed of a number of gonophores radiating like the spokes of a wheel, each gonophore having 2 to 4 chambers in linear series; female gonophores not in regular verticils and usually clustered around the hydranth bodies. No medusae (Nutting, 1901).

Eudendrium exiguum Allman

Plate IV, Figure 14

Eudendrium exiguum Allman, 1877, p. 6.
Fraser, 1944, p. 68.

Diagnosis: Colony of moderate size (to 60 mm), slender, main stem fascicled proximally; branches few and irregularly placed; abruptly arising upwards so as to run parallel to the main stem; branches seldom branch again, but give rise to alternate hydranth pedicels, which extend from the branches at near right angles; branches and pedicels slender, with a few well-defined annulations proximally; hydranths with about 20 tentacles. The gonosome was not observed in the material examined, and is unknown.

Gulf Distribution: Off Bolivar Peninsula, Tex. (present study).

Remarks: The four collections examined were dredged by the Bureau of Commercial Fisheries during January and February, 1966, apparently from mud or shell bottom off Bolivar Peninsula. The hydranths are not well preserved, but the characteristics of the stem and branches distinguish the species. This record is a range extension, as the species has been previously reported only from southern Florida and Puerto Rico (cf. Fraser, 1944).

Eudendrium eximium Allman

Plate IV, Figure 15

Eudendrium eximium Allman, 1877, p. 5.
Leloup, 1937, p. 93.
Fraser, 1944, p. 68.
Deevey, 1954. p. 269.
Pequegnat and Pequegnat, 1968, pp. 22, 32.

Diagnosis: Stem large (to 200 mm), much branched, stem and main branches much fascicled. Both main branches and secondary branches are alternate; the smaller branches have a few annulations proximally; pedicels indistinctly and irregularly annulated; hydranth with about 20 tentacles surrounding a trumpet-shaped hypostome. The gonosome was not observed in the material examined. "Female sporosacs springing irregularly from the body of the hydranth and from its supporting ramulus" (Fraser, 1944).

Gulf Distribution: Tampa Bay, Fla. (Leloup, 1937); NE Gulf (Deevey, 1954); off Panama City, Fla. (Pequegnat and Pequegnat, 1968); West Bay and off Front Beach, Galveston, Tex. (present study).

Remarks: This species was collected only five times, and all specimens examined were dead and lacked hydranths. The large (200 mm) specimen recorded was alive when collected by Don Harper, and was bearing sporosacs which released planulae in aquaria. Unfortunately, by the time I became interested in this problem and subsampled Harper's material, the specimen was dead. Since no hydranth-bearing specimens have been seen by me, Fraser's figure is reproduced in lieu of an original drawing.

Eudendrium ramosum Linnaeus

Plate IV, Figure 16

Eudendrium ramosum Linnaeus, 1758, p. 804.
Cary and Spaulding, 1909, p. 5.
Fraser, 1944, p. 72.

Diagnosis: Stem slightly fascicled, much and irregularly branched, 15 cm.; hydranth pedicels usually vertically

placed on the pinnately arranged branches; annulations at the base of the branches and pedicels; hydranth with 24 tentacles. Both male and female gonophores borne at the base of the hydranths, or some distance down the pedicels; hydranths normal or somewhat reduced in size; male gonophores 2- to 3-chambered, usually few in the whorl; female gonophores of the usual type (Fraser, 1944).

Gulf Distribution: Louisiana coast (Cary and Spaulding, 1909).

Remarks: Not recorded in the present study.

Eudendrium tenue A. Agassiz

Plate V, Figure 17

Eudendrium tenue Agassiz, 1865, p. 160.
Fraser, 1944, p. 75.
(?) Deevey, 1950, p. 337.
(?) Deevey, 1954, p. 269.

Diagnosis: Stem simple, 15 mm., branching irregularly, the branches and pedicels long and very slender, scarcely annulated; hydranth with about 20 tentacles. Gonophores borne on aborted hydranths on pedicels shorter than those supporting normal hydranths; male gonophores 2-4 chambered, in a dense whorl; "Female gonophores globular, scattered over hydranth body and pedicels" (Nutting) (Fraser, 1944).

Gulf Distribution: ?Port Aransas, Tex. (Deevey, 1950); ?NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study. Deevey (1950) states that the single specimen examined was identified with strong reservations. However, he states that the fragment of a male Eudendrium examined had aborted hydranths above the gonophores, indicating that this may well be the correct identification.

Family HYDRACTINIDAE

Zooids growing from a stoloniferous network of anastomosing and adnate tubes, covered with perisarc and giving rise to spines, unless the colony is otherwise protected. This may be covered with a layer or crust of free coenosarc; the colonies are dimorphic or polymorphic; hydranths devoid of perisarc, with a single basal whorl of filiform tentacles. Colonies dioecious; the generative zooids are smaller than the nutritive zooids and may be aborted (Fraser, 1944).

Genus Hydractinia Van Beneden

Colony formed of distinct nutritive and generative zooids, growing from a stoloniferous network of tubes; this covered with a crust of coenosarc; spines usually well developed, commonly jagged; there may be other types of zooids present in the colony; hydranths with a single basal whorl of filiform tentacles. Generative zooids smaller than the nutritive zooids; sometimes the hydranths are reduced in size, or aborted; in general, the colonies are dioecious; gonophores producing sporosacs (Fraser, 1944).

Hydractinia echinata (Fleming)

Plate V, Figure 18

Alcyonium echinatum Fleming, 1828, p. 517.
Hydractinia echinata Glaser, 1904, p. 41.
Hydractinia polyclina Cary and Spaulding, 1909, p. 5.
Hydractinia sp. Cross and Parks, 1937, p. 9.
Hydractinia echinata Reed, 1941, p. 29.
Fraser, 1944, p. 78.
Hydractinia sp. Behre, 1950, p. 7.
Hydractinia echinata Deevey, 1950, p. 337.
Whitten, Rosene, and Hedgpeth, 1950, p. 73.
Deevey, 1954, p. 269.
Hydractinia sp. Fincher, 1955, p. 91.
Hydractinia echinata Menzel, 1956, p. 2.
Pullen, 1961a, p. 2.
Richmond, 1968, p. 225.
Wells, 1969, p. 95.
Matthews and Wright, 1970, p. 5.

Diagnosis: Colonies densely covering mollusk shells inhabited by the living mollusk or hermit crabs; nutritive zooids to 3 mm or more when extended, but very contractile; tentacles vary in number up to about 30; spiral zooids near edges of colony, especially near operculum of shell, of about same size as nutritive zooids, but with tentacles much reduced, represented by a few (about 8 or less in my specimens) globular buds heavily armed with nematocysts. Older spines are pronouncedly ridged and jagged; younger spines near the edge of the colony may be smaller and smoother. Generative zooids smaller than nutritive, with tentacles much reduced as in spiral zooids, but with about 30 tentacle-buds present; many sporosacs in varying stages of development are borne distally, each with 4 to 10 ova when mature.

Gulf Distribution: Cameron, La. (Glaser, 1904); Louisiana coast (Cary and Spaulding, 1909); Corpus Christi, Tex. area (Cross and Parks, 1937); Texas coast (Reed, 1941); common on shells, especially Polinices sp., Grand Isle, La. (Behre, 1950); Corpus Christi, Tex. (Deevey, 1950); Port Aransas, Tex. (Whitten, Rosene, and Hedgpeth, 1950); NW Gulf (Deevey, 1954); Mississippi Sound, Miss. (Fincher, 1955); Alligator Harbor, Fla. (Menzel, 1956; Wells, 1969); Galveston Bay (Pullen, 1961); Horn Island, Miss. (Richmond, 1968); Galveston Bay, Tex. area (Matthews and Wright, 1970; present study).

Remarks: Thirty-five colonies of Hydractinia echinata were collected on the shells of Cantharus cancellarus, Polinices duplicata, and Thais haemastoma inhabited by the living mollusk or hermit crabs

(Pagurus longicarpus and P. pollicaris). The hydroid-bearing shells were collected at various times throughout the year, mainly from the seaside of Galveston Island and Bolivar Peninsula, at depths up to thirty feet.

Crowell (1945) discussed an apparent selection by H. echinata and Podocoryne carnea for specific shells in the Woods Hole area. Although both species of hydroids were found on a variety of mollusk shells, Littorina littorea almost always bore H. echinata, while Nassa trivittata always bore P. carnea. Crowell suggested that P. carnea might have a disadvantage in the competition for "standing room" on the smoother shells. In an attempt to duplicate Crowell's observations for the Galveston area, the two species of hydroids and the various shells utilized as substrates were tabulated (Table 4). As can be seen, in the specimens available for examination, H. echinata predominates on Polinices duplicata shells while P. carnea is most common on live Cantharus cancellarus shells. It is interesting that the hydroids are found on shells inhabited by only two species of hermit crabs, since at least five species of hermit crabs are found in the Galveston area. Matthews and Wright (1970), working in the Galveston area, reported that Hydractinia usually lives on the shells inhabited by P. longicarpus and P. pollicaris, as corroborated by my findings. They (Matthews and Wright) noted that Hydractinia colonies on shells inhabited by Clibanarius vittatus were usually moribund, and that when experimentally deprived of a shell, 80% of the Clibanarius observed

refused to accept a shell covered with Hydractinia, while those that did accept the shell carefully picked off all the polyps before entering the shell. Apparently the Clibanarius are sensitive to stinging by the hydroid, while the Pagurus spp. are not.

Table 4. Occurrence of Hydractinia echinata and Podocoryne carnea on various hosts in the Galveston area.

		H. echinata		P. carnea	
Busycon pyrum/ Pagurus pollicaris				1	2%
Cantharus cancellarus/	living			22	50%
	P. longicarpus	1	3%	5	12%
	P. pollicaris	1	3%	4	9%
	empty			1	2%
Polinices duplicata/	P. longicarpus	19	54%	1	2%
	P. pollicaris	12	34%	6	15%
	empty	1	3%	2	4%
Thais haemastoma/	living			1	2%
	P. pollicaris			1	2%
	empty	1	3%		
Total		35	100%	44	100%

Genus Podocoryne Sars (in part)

Colony formed of distinct nutritive and generative zooids growing from a stoloniferous network of anastomosing tubes supplied with perisarc, this covered with a crust of coenosarc; spines well developed; other types of zooids may be present; hydranths with a single basal whorl of filiform tentacles. Generative zooids, not necessarily smaller than the nutritive zooids, give rise to gonophores that produce free medusae (Fraser, 1944).

Podocoryne carnea Sars

Plate V, Figure 19

Podocoryne carnea Sars, 1846, p. 4.
Cary and Spaulding, 1909, p. 5.
Fraser, 1944, p. 82.
Deevey, 1950, p. 337.
Deevey, 1954, p. 269.
Wells, 1969, p. 93.

Diagnosis: Colonies densely covering mollusk shells inhabited by the living mollusks or hermit crabs; nutritive zooids to about 3 or 4 mm when extended, but very contractile; tentacles varying in number, about 8 to 16; spiral zooids near edges of colony, commonly near the operculum of the shell serving as substrate; spiral zooids of about the same size as nutritive zooids, but lacking tentacles or any vestige of tentacles; narrowing to a rounded point distally. Spines smooth, tapering to a rounded point. Generative zooids about the same size as nutritive zooids, or smaller; tentacles reduced in number, about 4 to 6; medusa buds develop a short distance below the tentacles.

Gulf Distribution: On Cancellaria reticulata off Calcasieu Pass, La. (Cary and Spaulding, 1909); Corpus Christi, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954); on Cantharus cancellarus, Alligator Harbor, Fla. (Wells, 1969); Galveston, Tex., area (present study).

Remarks: Forty-four colonies of P. carnea were collected on the shells of Busycon pyrum, Cantharus cancellarus, Polinices duplicata, and Thais haemastoma inhabited by the living mollusks or hermit crabs. Colonies were collected at various locations on the seaside of Galveston Island, at various times throughout the year. The hydroids were most commonly found on the shells of living Cantharus

cancellarus (Table 4), in agreement with Wells (1969) who found all the shells of living mollusks of this species collected in the Alligator Harbor, Florida, area covered with P. carnea. His collections were made several times in 1965. All of my specimens are badly contracted, so Fraser's figure is included in addition to my drawings.

Genus Stylactis Allman

> Colony formed of distinct nutritive and generative zooids growing from a stoloniferous network of anastomosing tubes, provided with perisarc from which spines may arise, but there is no coenosarcal encrustation covering the network; hydranths with a basal whorl of filiform tentacles. Generative zooids smaller than the nutritive, bearing, below the hydranth, gonophores that produce free, but somewhat degenerate medusae (Fraser, 1944).

Stylactis new species

Plate V, Figure 20

Diagnosis: Nutritive zooids of moderate size, to about 3 mm when extended; arising from a series of anastomosing stolons; tentacles long and slender, about 6 to 12 in number, well supplied with nematocysts, arranged in a single whorl about the large, rounded hypostome. Spiral zooids and spines both lacking. Generative zooids of same size and appearance as nutritive zooids; tentacles well developed, about 6 to 10 in number; sporosacs (degenerate medusa buds?) arise well below the tentacles, ovate, with about 20 or more ova when fully developed.

Gulf Distribution: Galveston, Tex. (present study).

Remarks: This species was collected only once (but in quantity then), in September, 1969, growing among the bases of Obelia in the BCF East Lagoon Lab settling tank. The species is distinguished from the two former species (H. echinata and P. carnea) by the absence both of spines and of a covering of free coenosarc over the hydrorhiza. I originally thought this species to be a Hydractinia, but further study showed it to belong to the genus Stylactis. Only two species of Stylactis have previously been reported from North America: S. arge from Chesapeake Bay (40 mm tall, 6 to 8 tentacles in two whorls), and S. hooperi (25 mm tall, about 20 tentacles in a single whorl). The descriptions of neither of these species fit my specimens. The species most resembling my material is the type species, S. fuciola (Sars), as described by Allman, 1872. Unfortunately, I have not seen a drawing of this species. It was described from the Mediterranean Sea, is about 3 mm tall, and has 8 to 12 tentacles. However, it also has spines, which my material lacks. This genus is unusual in that the American species have degenerate medusae which are liberated, while the European species have sporosacs (degenerate medusae?) which remain attached (cf., Mayer, 1910). My specimens bear gonophores most resembling sporosacs, so I have described them as such. If living specimens were observed, however, it might be found that the gonophores actually are degenerate medusae.

Since this thesis does not constitute publication, no specific epithet is specified for this new species. This is done to prevent

a nomen nudum from being introduced into the literature.

Family TUBULARIDAE

Colony branched irregularly or unbranched, growing from a stolon that usually forms an irregular network; hydranths with a proximal and a distal set of filiform tentacles. Gonophores borne on the hydranth between the two whorls of tentacles (Fraser, 1944).

Genus Ectopleura Agassiz

Colonies or separate zooids growing from a stolon that is but little reticular, if at all; stems or pedicels with a noticeable perisarc that thins out and disappears a short distance below the base of the hydranth; hydranths vasiform, with 2 whorls of filiform tentacles, the basal or proximal being much longer than the oral or distal. Gonophores develop from the body of the hydranth between the 2 whorls of tentacles, producing free medusae (Fraser, 1944).

Ectopleura grandis Fraser

Plate VI, Figure 21

Ectopleura grandis Fraser, 1944, p. 92.
Deevey, 1950, pp. 337, 349.
Deevey, 1954, p. 270.
Lyon, 1962, p. 3.
Pequegnat and Pequegnat, 1968, pp. 22, 32.

Diagnosis: Zooids solitary or sparsely branched, rising to a height of 50 mm; perisarc irregularly annulated, some of the annulations merely superficial while others are true nodes; annulated more extensively proximally than distally, the distal annulations occurring in series of about 5 to 8, with smooth areas between; just below the base of the hydranth the perisarc thins to form a flexible pellicle; tentacles (both distal and proximal) about 14 to

16 in number. Medusae buds develop in branched clusters around the base of the hydranth body, just inside the proximal tentacles.

Gulf Distribution: Barataria Bay, Imbale Bay, and East Bay, La. (Fraser, 1944); Palacios and Port Aransas, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954); Matagorda Bay, Tex. (Lyon, 1962); off Panama City, Fla. (Pequegnat and Pequegnat, 1968); off Galveston, Tex. (present study).

Remarks: This species was collected once (February, 1969, collection 690226-2) growing on small bivalve shells at 18 feet, off the end of the seawall. Several other collections of immature Tubularids are tentatively placed in this species as a result of a tentacle count, but may actually be young Tubularia. The above mentioned collection is identified with some certainty due to the presence of only 14 tentacles on a hydranth bearing fairly well developed gonophores. The specimens are assumed to be E. grandis since Fraser (1937, 1944) describes no other Tubularids with so few tentacles. The gonophores are assumed to be medusa buds since they lack apical processes (as in Tubularia crocea, the other species collected) and lack any internal differentiation at a size where comparable T. crocea gonophores show some differentiation and have definite apical processes. However, none of the gonophores is sufficiently well developed to resemble young medusae, even in stained preparations.

The largest specimen in the above mentioned collection is about 50 mm tall and is branched, bearing four hydranths. The most mature

hydranth is too distorted to draw, but the drawings of the gonophores come from that polyp. The polyp drawn bears very young medusa buds, so is fairly mature.

The specimens examined vary most significantly from Fraser's description in size. Although the pedicel is well developed, the hydranths themselves are much smaller than would be expected. Fraser described them as being about 1.5 mm from base to mouth, with tentacles as long as 2.5 mm. My specimens are only about three-quarters of that size.

Genus Tubularia Linnaeus (in part)

> Colony unbranched or irregularly branched from a stolon that is not regularly reticulate; hydranths large; tentacles in the proximal whorl longer than those in the distal. Gonophores in clusters, attached by means of peduncles to the body of the hydranth just distal to the proximal tentacles; female gonophores give rise to actinulae (Fraser, 1944).

Tubularia crocea (Agassiz)

Plate VI, Figure 22

Parypha crocea Agassiz, 1862, pp. 249-265, 342.
Tubularia crocea Reed, 1941, p. 29.
Fraser, 1944, p. 97.
Deevey, 1950, p. 339.
Whitten, Rosene, and Hedgpeth, 1950, p. 73.
Deevey, 1954, p. 270.
Pequegnat and Pequegnat, 1968, pp. 22, 31, 32.

Diagnosis: Colonies to about 70 mm tall, zooids solitary or branching regularly; perisarc smooth or with occasional annulations, thinning distally to form a short, flexible pellicle just below the body of the hydranth; proximal and distal tentacles approximately

equal in number, about 20 to 24. Medusoid gonophores developing actinulae while remaining attached to the hydranth; growing in racemes which seldom hang below the tentacles; the gonophores may have 4 to 10 crest-like laterally compressed, hollow, apical processes, although these may be reduced or lacking; no radial canals.

Gulf Distribution: Texas coast (Reed, 1941); buoy and jetty, Port Aransas, Tex. (Deevey, 1950); Port Aransas and Freeport jetties, Tex. (Whitten, Rosene, and Hedgpeth, 1950); NW Gulf (Deevey, 1954); off Panama City, Fla. (Pequegnat and Pequegnat, 1968); off Galveston, Tex. (present study).

Remarks: This species was collected seven times, during the months of December, March, April, and May, from depths of 3 to 30 feet, all from off the seaside of Galveston Island. All the material identified as this species is mature and bears gonophores. The specimens examined differ most significantly from Fraser's description in the presence of annulations on the pedicel. Fraser does not mention these features as being either present or absent. However, Nutting (1901) figures T. crocea with prominent annulations, so apparently the species does have annulations. The degree of annulation in the material examined varies considerably, and some of the specimens would probably have been placed in T. larynx if not for the distinctive apical processes.

Representatives of all the collections on hand were stained and mounted and compared with very nicely preserved material from Tuxpan,

Mexico. It is noteworthy that the gonophores of the Galveston specimens are considerably smaller than those of the Tuxpan species. However, none of the Galveston material is as mature as are the Tuxpan samples, so it is assumed that the disparity in size is due to immaturity. A drawing of a mature gonophore and its enclosed actinula from the Tuxpan collection is included in the figures. The spherical object is a mass of plasma cells considered by Allman (1872) to be an ovum. This actinula-bearing gonophore has eight compressed apical processes, although Fraser (1944) describes the species as having only four. Allman (1872) allows six to ten such processes in his description, however.

Family CAMPANULARIDAE

> Hydrotheca campanulate, without operculum, never sessile, never adnate to, or immersed in, the stem or branches; diaphragm always present; hydranth with trumpet-shaped proboscis, proboscis with a single whorl of filiform tentacles. Gonophores producing sporosacs or free medusae; when the medusae are produced, they usually have lithocysts on the margin and have the gonads along the course of the radial canals (Fraser, 1944).

Genus Campanularia Lamarck (in part)

"Stem unbranched, regularly or irregularly branched; arising from a stolon. Gonophores producing sporosacs that remain within the gonangium while the planulae develop" (Fraser, 1944).

Campanularia gelatinosa (Pallas)

Plate VII, Figure 23

Sertularia gelatinosa Pallas, 1766, p. 116.
Obelia gelatinosa Cary and Spaulding, 1909, p. 6.
Campanularia gelatinosa Fraser, 1944, p. 118.

Diagnosis: Stems fascicled, growing in clusters, 20-25 cm.; larger branches are also fascicled; in the fascicled portions, the perisarc is thickened and dark in colour, but in the smaller branches and their ramifications, it is whitish transparent; as the small branches divide somewhat dichotomously, a large number of hydranth pedicels appear close together and these in their whiteness give the gelatinous appearance when in the water, to which evidently the specific name is due. The branches have usually 3-5 annulations at the base and the larger branches from which they spring have a similar number above their point of origin. The hydranth pedicels are slender, varying much in length; the shorter ones are annulated throughout, but the longer ones may have a smooth portion towards the centre. The hydrothecae are deeply campanulate, tapering quite gradually from margin to base; margin with about 10 teeth, each provided with 2 cusps. Gonangia elongated-oval, with distinct neck and tapering base; pedicel short, annulated (Fraser, 1944).

Gulf Distribution: On driftwood, Cameron, La. (Cary and Spaulding, 1909).

Remarks: Not recorded in the present study. Identification of the above material from Louisiana was made by C. C. Nutting.

Campanularia verticillata (Linnaeus)

Plate VII, Figure 24

Sertularia verticillata Linnaeus, 1758, p. 811.
Campanularia verticillata Fraser, 1944, p. 129.
Behre, 1950, p. 6.

Diagnosis: Main stem fascicled throughout, ending like a stump; main branches also fascicled; hydranths arranged in regular whorls, with rather long pedicels, annulated or wavy throughout. Hydrothecae large, broad for their length, slightly more expanded towards the margin; margin

with 12-14 low, blunt teeth. Gonangium somewhat fusiform except that the distal end is prolonged into a neck; sessile on the stem; often occurring in groups around the stem, although not forming a whorl; ova large (Fraser, 1944).

Gulf Distribution: Grand Isle, La. (Behre, 1950).

Remarks: Not recorded in the present study. This record should be considered as dubious, since it greatly extends the range of this species which is common, according to Fraser (1944), only as far south as Long Island Sound. Behre says: "This identification has never been verified nor the record repeated."

Genus Clytia Lamouroux (modified)

"Stem irregularly branched, unbranched, or indefinite. Gonophores producing free medusae, somewhat spherical or bell-shaped, with 4 tentacles at the time of liberation" (Fraser, 1944).

Clytia coronata (Clarke)

Plate VII, Figure 25

Campanularia coronata Clarke, 1879, p. 242.
Clytia coronata Fraser, 1944, p. 134.
Behre, 1950, p. 7.
Deevey, 1950, p. 339.
Deevey, 1954, p. 270.
Fincher, 1955, p. 92.
Lyon, 1962, p. 3.
Gaille, 1967, p. 12.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colony of moderate size, to 10 mm, although usually only about half that size; unbranched or with a few irregularly placed branches; branches turn upwards abruptly near the origin, to run parallel to the stem; pedicels and branches annulated proximally

and below the hydrothecae; solitary zooids (unbranched stems) with pedicel annulated distally and proximally, or throughout. Hydrothecae large, about twice as long as broad, usually about 0.5 to 0.7 mm long, but occasionally to 0.9 mm; tapering gradually from margin to base; margin with 8 to 9 deeply cut teeth which are acute or slightly rounded at the tip. Gonangia on short, annulated pedicels arising from stolon or stem; oblong ovate, distally truncate, sometimes with a narrowing just below the margin; usually bearing about 4 to 7 medusa buds.

Gulf Distribution: On floating sargassum, Grand Isle and Pass Christian, Miss. (Fraser, 1944); on drifting log, Grand Isle, La. (Behre, 1950); on buoy off Sabine Pass, on driftwood , Port Aransas, on sargassum and tar, Port Aransas and Palacios, Tex, Grand Isle, La. (Deevey, 1950); NW Gulf (Deevey, 1954); Mississippi Sound, Miss. (Fincher, 1955); Matagorda Bay, Tex. (Lyon, 1962); fouling, off Panama City, Fla. (Gaille, 1967; Pequegnat and Pequegnat, 1968); Galveston, (present study).

Remarks: Collected 21 times during the months of February through September at various locations along the seaside beach. Most frequently found on floating sargassum, the species was also collected on worm tubes, blue crabs, and other hydroids (Eudendrium).

Clytia cylindrica Agassiz

Plate VIII, Figure 26

Clytia (Platypyxis) cylindrica Agassiz, 1862, p. 306.
Clytia cylindrica Cary and Spaulding, 1909, p. 5.
Nutting, 1915, p. 58.

Clytia cylindrica Fraser, 1944, p. 134.
Clytia elsae-oswaldae Fraser, 1944, p. 136.
Clytia cylindrica Deevey, 1950, p. 341.
Whitten, Rosene, and Hedgpeth, 1950, p. 73.
Deevey, 1954, p. 270.
Lyon, 1962, p. 3.
Gaille, 1967, pp. 12, 33.

Diagnosis: Colonies small, to about 3 or 4 mm tall; stem usually unbranched, serving as a pedicel, but sometimes sparingly branched, bearing a total of 2, 3, or 4 hydrothecae; pedicels and stem slender, annulated proximally and distally, occasionally (see Remarks section) annulated throughout, or annulated proximally and distally with the middle wavy; hydrotheca long, about 2 to 2.5 times as long as broad, cylindrical for most of its length, tapering to the base somewhat abruptly near the diaphragm; margin with 10 to 12 acute teeth. Gonangia borne on short, annulated pedicels from stolon or stem; smooth, oblong, distally truncate, narrowing slightly just below the rim; usually bearing about 4 to 6 medusa buds.

Gulf Distribution: On gulfweed, Louisiana coast (Cary and Spaulding, 1909); on plumularian hydroid, Cameron, La. (Nutting, 1915); East Bay, La. and Texas Gulf coast (Fraser, 1944); on sargassum and tar, Port Aransas and Palacios, Tex., on female blue crab, Grand Isle, La. (Deevey, 1950); on sargassum and jetty rocks, Port Aransas and Port Isabel, Tex. (Whitten, Rosene, and Hedgpeth, 1950); NW Gulf (Deevey, 1954); Matagorda Bay, Tex. (Lyon, 1962); off Panama City, Fla. (Gaille, 1967); Galveston, Tex. (present study).

Remarks: Collected eleven times, during the months of February, May, and July through December at various locations on the seaside

beach on a variety of substrates: sargassum, worm tubes, mollusk shells, and the stems of Tubularid hydroids.

This species is apparently quite variable, if I have correctly delimited it. Fraser (1944) describes it as being unbranched, consisting of only solitary zooids, but Nutting (1915) notes that it may be irregularly branched. Also, Fraser's description of Clytia elsae-oswaldae Stechow (which was placed into synonymy with Clytia cylindrica by Deevey, 1950) includes sparsely branched forms. The forms with pedicel annulated throughout or with non-annulated region wavy have not previously been described, and are included with considerable hesitation since both Fraser and Nutting were definite in stating that the pedicel was annulated at both ends but smooth in the middle. I originally believed these forms to represent Clytia hesperia (Torrey, 1904), but specimens examined bear gonangia not like those of Torrey's species; rather, they seem to be identical to those of C. cylindrica. The possibility of this being a new species was considered, but rejected due to the rather minor differences between the annulated form and C. cylindrica: namely, stem annulated throughout versus stem medially smooth. The two forms have identical hydrothecae and gonangia. Fraser mentions that C. coronata may be annulated throughout, but allows only 8 to 9 teeth for that species. Nutting (1915) allows 7 to 12 teeth for C. coronata, but does not mention specimens with pedicels completely annulated.

Clytia cylindrica as above described very closely resembles Gonothyraea gracilis. The two species may be differentiated by the

presence of medusae buds in the gonangia of C. cylindrica, versus medusoid sporosacs in G. gracilis. Also, G. gracilis apparently occurs only as a branched form, while C. cylindrica is most commonly unbranched.

Clytia fragilis Congdon

Plate VII, Figure 27

Clytia fragilis Congdon, 1907, p. 470.
Fraser, 1944, p. 137.
Deevey, 1950, p. 341.
Deevey, 1954, p. 270.
Pequegnat and Pequegnat, 1968, pp. 21, 31, 32.

Diagnosis: Colonies 12-18 mm. long, the small diameter of the stem and the hyalinity of the perisarc giving the appearance of fragility, short, strongly-marked nodes (internodes?), ending below with an abrupt curve and attached to the side of the next lower node (internode?), ending above, apparently, in the pedicel of the hydranth. Stem geniculate, somewhat curved at each node. Hydranths alternate. The branches which arise from the growth of a pedicel, given off irregularly, duplicating the structure of the stem. Annulation at lower end of node (internode?) sometimes extending well up or occurring midway in its length. Hydrothecae campanulate, elongated, with nearly straight sides, tapering most abruptly close to pedicels. Rim with 10-14 pointed teeth, separated by rounded edges. In old individuals, the walls often folding and cracking longitudinally, causing the hydrotheca to collapse, the teeth in part breaking off, producing an irregular edge. Diaphragm with a small opening, sometimes quite far from the base of the hydranth. Pedicels often as long as a node (internode?). If entirely annulated, there are from 10 to 20 rings. Gonothecae attached closely to base of a hydranth pedicel, or carried away from the stem by its elongation, nearly twice as long as the hydrothecae, flattened, ovoid, truncate above, with a flaring ring and tapering to the short, annulated pedicel. There may be some suggestion of annulation on the wavy surface. About six medusa buds can be found on the blastostyle. Their bells are deep and their manubria large (Congdon, in Fraser, 1944).

Gulf Distribution: Buoy, Sabine Pass and Port Aransas, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954); off Panama City, Fla. (Pequegnat and Pequegnat, 1968).

Remarks: Not recorded in the present study.

Clytia johnstoni (Alder)

Plate VII, Figure 29

Campanularia johnstoni Alder, 1856, p. 359.
Clytia johnstoni Fraser, 1944, p. 138.
Gaille, 1967, p. 12.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colony small, about 3 to 5 mm tall; stem usually unbranched, serving as a pedicel; annulated proximally and distally with a smooth interval between the annulations; hydrotheca broadly campanulate, about 1.2 to 1.5 times as long as broad; margin with about 12 to 14 teeth that are either acute or rounded. Gonangia develop from stolons or stems, with a short, annulated pedicel; oblong or cylindrical in shape, corrugated, distally truncate; aperture large, occupying most of the distal end.

Gulf Distribution: Off Panama City, Fla. (Gaille, 1967, Pequegnat and Pequegnat, 1968); on floating sargassum, San Luis Pass, Tex. (present study).

Remarks: Collected only once (14 April 1967), abundant, with Clytia noliformis on sargassum floating near San Luis Pass. This is a new record for Texas waters.

Clytia longicyatha (Allman)

Plate IX, Figure 30

Obelia longicyatha Allman, 1877, p. 10.
Clytia longicyatha Fraser, 1944, p. 142.
Deevey, 1950, p. 347.
Deevey, 1954, p. 270.
Gaille, 1967, p. 12.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colony with stem fascicled towards the base, reaching a height of 25 mm., alternately but not very regularly branched; main stem annulated above the origin of each branch or pedicel; the branch similarly; pedicels long and slender, annulated at each end. Hydrothecae large, nearly 1 mm. in length, the distal half nearly cylindrical, the proximal tapers to the base; diaphragm and basal chamber very distinct; margin with 18-20 deeply cut teeth, acute or slightly rounded at the tip. Gonangia with smooth walls, borne on the stolon or the stem, enclosing the deep, bell-shaped medusa buds, arranged on the blasto-style in pairs, the one opposite the other. Length of gonangium 1.0 to 1.1 mm., diameter 0.4 mm. (Fraser, 1944).

Gulf Distribution: On sargassum, off the Louisiana coast (Fraser, 1944); Louisiana (Deevey, 1950); NW Gulf (Deevey, 1954); off Panama City, Fla. (Gaille, 1967; Pequegnat and Pequegnat, 1968).

Remarks: Not recorded in the present study.

Clytia longitheca (Fraser)

Plate VII, Figure 28

Campanularia longitheca Fraser, 1914, p. 137.
Clytia longitheca Fraser, 1914, footnote, p. 137.
Fraser, 1937, p. 75.

Diagnosis: Colony small, to about 4 mm; stem simple, slender, neither flexuous nor geniculate; sometimes, but not always, annulated above the pedicels; pedicels short, annulated throughout; hydrothecae

long and slender, about 4.5 times as long as wide; margin with seven deeply cut teeth, each with two distinct, rounded cusps; indentations between teeth rounded. The gonosome was not observed in the present study.

> Gonangium attached to the stolon by a short pedicel with three annulations; long and slender, 1.25 mm. long and 0.3 mm. in greatest width; the base is narrow and from this the gonangium gradually increases in size for the proximal third of the length, after which it is practically uniform; distal end sharply truncate, with the opening occupying less than one-third of the surface; walls smooth; five medusae in each gonangium (Fraser, 1937).

Gulf Distribution: Off Galveston, Tex. (present study).

Remarks: A single specimen was collected in a dredge sample off the end of the seawall, 4 August 1968, at 4 fathoms. Substrate unknown. The material examined does not fit Fraser's (1937) description exactly, but this is the closest description I can find. Fraser's material differed in being unbranched (solitary zooids), and having 9 to 10 (rather than 7) bicuspid teeth. This species has been previously reported only from the Pacific coasts of Canada and California. The entire colony collected is figured in the plates, and some of Fraser's drawings are reproduced for comparison.

Clytia noliformis (McCrady)

Plate IX, Figure 31

Campanularia noliformis McCrady, 1858, p. 92.
Clytia nolliformis Cary and Spaulding, 1909, p. 6.
Clytia simplex Stechow, 1912, p. 352.
Clytia noliformis Fraser, 1944, p. 144.
Behre, 1950, p. 7.
Deevey, 1950, p. 341.
Deevey, 1954, p. 270.
Pequegnat and Pequegnat, 1968, pp. 21, 31, 32.

Diagnosis: Colonies small; stems to about 2 mm or less, unbranched, serving as a pedicel; stem annulated extensively, often annulated or wavy throughout; hydrothecae stout, broadly campanulate, about as wide as deep, with 10 to 12 low, rounded teeth. Gonangia develop from the stolon, almost sessile on short, non-annulated pedicels; broadly oval with a distinct neck.

Gulf Distribution: On gulfweed and driftwood, Louisiana coast (Cary and Spaulding, 1909); on sargassum off Louisiana coast (Stechow, 1912); Grand Isle, La. (Fraser, 1944); on sargassum, Grand Isle, La. (Behre, 1950); on sargassum, St. Joseph Island, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954); off Panama City, Fla. (Pequegnat and Pequegnat, 1968); on floating sargassum, off Galveston, Tex. (present study).

Remarks: Collected six times in the months of February, April, March, and August, all on sargassum from the seaside beach, Galveston Island.

Genus Gonothyraea Allman

"Stem branched; hydrotheca campanulate, with thin walls. Reproduction by fixed medusiform sporosacs, furnished with tentacles, that, at maturity, become extra-capsular, remaining attached until their contents are discharged" (Fraser, 1944).

Gonothyraea gracilis (Sars)

Plate IX, Figure 32

Laomedea gracilis Sars, 1851, p. 18.
Gonothyraea gracilis Fraser, 1944, p. 148.
Behre, 1950, p. 6.
Deevey, 1950, pp. 341, 349.
Whitten, Rosene, and Hedgpeth, 1950, p. 73.
Deevey, 1954, p. 270.
Gaille, 1967, pp. 12, 33.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colonies of moderate size, to about 10 mm tall; stem sparsely and irregularly branched; stem, branches, and pedicels long and slender; branches and pedicels turn abruptly upward near the origin to lie parallel to the stem; stem, branches, and pedicels annulated proximally and below the hydrothecae; stem annulated above the origin of each branch; hydrothecae long and slender, about 2 to 2.5 times as long as broad, variable in size, about 0.5 to 1.0 mm long, cylindrical or near cylindrical for the distal half or two-thirds, proximally tapering gradually to the base; margin with 10 to 14 deeply cut acute teeth. Gonangia borne on short, annulated pedicels arising from the stolon or stem; oblong-ovate, distally truncate, often with a flaring rim; bearing about 4 or 5 sporosacs at maturity.

Gulf Distribution: From mangrove swamps at Bayou Pass, Grand Isle, and East Bay, La. (Fraser, 1944); on sargassum, Grand Isle, La. (Behre, 1950); buoy, Sabine Pass, and cast on beach, Port Aransas, Tex. (Deevey, 1950); rocks and shells, Port Aransas, Tex. (Whitten, Rosene, and Hedgpeth, 1950); NW Gulf (Deevey, 1954); off

Panama City, Fla. (Gaille, 1967; Pequegnat and Pequegnat, 1968); Galveston, Tex. (present study).

Remarks: Collected twenty-one times, during the months of February through October. This species was most common on sargassum, but also occurred on Tubularia stems, blue crabs, mollusk shells, and driftwood. Most frequently collected at the seaside beach, it was found once on sargassum that had drifted into West Bay.

Genus Obelia Peron et Le Suer (modified)

"Stem branched, simple or fascicled; hydrothecae campanulate, with thin walls. Reproduction by free medusae, that when liberated, possess more than 8 marginal tentacles but no oral tentacles. Eight interradial lithocysts are present" (Fraser, 1944).

Obelia bicuspidata Clarke

Plate IX, Figure 33

Obelia bicuspidata Clarke, 1876, p. 58.
Fraser, 1944, p. 153.
Obelia oxydentata Fraser, 1944, p. 164.
Obelia bicuspidata Behre, 1950, p. 7.
Deevey, 1950, p. 343.
Deevey, 1954, p. 270.
Obelia oxydentata Fincher, 1955, p. 92.
Richmond, 1962, p. 69.
Obelia bicuspidata Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colony of moderate size, stem to about 15 mm, geniculate, sparingly branched; stem and branches annulated at base and at proximal ends of each internode; pedicels annulated throughout, consisting of 10 to 15 annulations each; hydrothecae alternate; hydrothecae long and slender, distally cylindrical, tapering near

the base; about 3 times as long as wide, to about 0.5 mm long; margin with usually 9 to 10 (but occasionally as few as 7) deeply cut teeth, each of which bears two slender cusps; faint longitudinal striations extend from the base of the teeth most of the length of the hydrotheca. Gonangia axillary, supported by short, annulated pedicels; each pedicel consists of about 4 annulations; slightly longer than the hydrothecae, ovate, distally truncate, sometimes with a slight collar; each gonangium bears about 10 to 15 developing medusa buds.

Gulf Distribution: Tampa Bay, Fla., shore and on sargassum, Grand Isle, in mangrove swamp, Bayou Pass, Bayou de Gettes, Hog Island, and Barataria Bay, La. (Fraser, 1944); on sargassum, Grand Isle, La. (Behre, 1950); buoy, Sabine Pass, Port Aransas, Tex., and Grand Isle, La. (Deevey, 1950); NW and NE Gulf (Deevey, 1954); Mississippi Sound, Miss. (Fincher, 1955); Horn Island, Miss. (Richmond, 1962); off Panama City, Fla. (Pequegnat and Pequegnat, 1968); Galveston, Tex. (present study).

Remarks: Collected five times, during the months of July through September, at various locations in West Bay and along the seaside beach, on submerged debris (a wooden 2" x 2" timber and a brick), on a blue crab, on Thais, and on floating sargassum. Obelia oxydentata was placed into synonymy with O. bicuspidata by Deevey (1950), who considered the former species to be merely the immature form of the latter. Fraser (1944) reports that this species may have a fascicled stem, but none of my specimens exhibit this feature, so it is not included in the above description.

Obelia dichotoma (Linnaeus)

Plate X, Figure 34

Sertularia dichotoma Linnaeus, 1758, p. 812.
Obelia dichotoma Cary and Spaulding, 1909, p. 6.
Cross and Parks, 1937, p. 9.
Fraser, 1944, p. 155.
Deevey, 1950, p. 343.
Whitten, Rosene, and Hedgpeth, 1950, p. 73.
Deevey, 1954, p. 270.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colonies slender, of moderate to large size, commonly about 10 to 15 mm, but to as large as 80 mm; main stem amber to dark brown color, apparently depending on size and age of colony; smaller colonies unbranched or sparsely branched, the larger colonies profusely branched; branches given off irregularly, usually long, often as long as the main stem; stem and branches vary from non-sinuous (straight internodes) to distinctly sinuous or geniculate; stem and branches divided regularly into internodes by well-marked nodes; each internode has about 2 to 4 annulations proximally and a hydrothecal process distally; pedicels variable, short and annulated throughout (about 3 to 12 annulations), or longer (equal in length to about 8 to 20 annulations) and with non-annulated regions. Hydrothecae deeply campanulate or funnel-shaped, about 1.5 times as long as broad; margin sometimes slightly flared, sometimes not; margin lacking regular teeth, but often irregular and sometimes resembling low teeth. Gonangia axillary, on short, annulated (about 2 to 6 annulations) pedicels; oblong-ovate, distally rounded (immature?), or with a distinct collar; about 2 to 4 times as long as the

hydrothecae; each gonangium bears about 4 to 12 developing medusa-buds.

Gulf Distribution: On gulfweed and driftwood, Louisiana coast (Cary and Spaulding, 1909); Corpus Christi Bay, Tex. (Cross and Parks, 1937); buoys, off Sabine Pass, Galveston Bay, Sabine Bank, off Freeport, off Matagorda Island, on driftwood, oysters, south jetty, sargassum, tar, and female blue crab, Port Aransas (Deevey, 1950); on jetties at Sabine Pass, Galveston, Port Aransas, and Freeport (Whitten, Rosene, and Hedgpeth, 1950); NW and NE Gulf (Deevey, 1954); off Panama City, Fla. (Pequegnat and Pequegnat, 1968); Galveston, Tex. (present study).

Remarks: Collected thirty-five times, during virtually all months of the year, at various seaside-beach locations. Recorded substrates include wooden pilings and posts, submerged debris, sargassum, blue crabs, Thais, and Tubularia.

This species is apparently morphologically quite variable. In my collections, I can discern two more or less distinct extreme types, with a complete intergradation between them. One type has a somewhat zig-zag (but not sinuous, the internodes being straight, not curved) stem or branch, with long internodes and very short pedicels. The other type has an extremely sinuous stem or branch with short internodes and longer pedicels, the pedicels often being as long as the internodes. The second type is more common and was drawn. I originally believed the former type to be O. dichotoma and the latter type to be O. hyalina. However, for several reasons, I now believe

all my collections to represent a single, variable species. The reasons are: (1) the two types of stems and pedicels and stem-pedicel combinations seem to intergrade completely; (2) it is not uncommon to find both types represented in the same collection, or even in the same large colony; and (3) after an extensive study of the descriptions and figures of O. dichotoma and O. hyalina by Mayer (1910a), Nutting (1915), and Fraser (1944), the only characteristic I can find of any value in differentiating the two species is the length to width ratio of the hydrotheca. In O. dichotoma this ratio is about 1.5, while in O. hyalina it is about 1.0. All my specimens have ratios of about 1.2 to 1.6. Although I believe the collections to represent a single, variable species, two or more species may actually be represented. If this is the case, at least some of the collection records listed in Appendix A are invalid for O. dichotoma.

Obelia equilateralis Fraser

Plate X, Figure 35

Obelia equilateralis Fraser, 1938, p. 35.
Fraser, 1944, p. 157.
Deevey, 1950, p. 347.
Deevey, 1954, p. 270.

Diagnosis: Colony small, simple, unbranched, reaching a height of 6 or 7 mm.; stem irregularly geniculate, annulated at the proximal end of the internodes; hydrothecae irregularly arranged on long pedicels that are annulated below the base of the hydrotheca, and sometimes at the proximal end as well; hydrothecae, in face view, almost equilaterally triangular; margin entire, without flare. Gonangium large, 1.4 mm. long, growing directly from the stem between the nodes, smooth, elliptical or slightly obovate; opening small, terminal; no collar (Fraser, 1944).

Gulf Distribution: Louisiana coast, detailed location undecipherable (Fraser, 1944); Louisiana or Texas (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Obelia geniculata (Linnaeus)

Plate X, Figure 36

Sertularia geniculata Linnaeus, 1758, p. 812.
Obelia geniculata Fraser, 1944, p. 158.
Deevey, 1950, p. 345.
Deevey, 1954, p. 270.

Diagnosis: Colonies of moderate size, to about 10 mm tall; stem usually unbranched although it may occasionally have a single branch; stem strongly geniculate, bearing alternate hydrothecae on distinct processes near the distal end of each internode; hydrothecae short, as wide as long, pedicels annulated at each end or throughout; usually curved away from the stem. Gonangia supported on short pedicels with one or two annulations, usually axillary, but sometimes on the stolon; oval or oblong-ovate in shape, with a distinct collar; bearing many developing medusa buds on the blastostyle.

Gulf Distribution: On buoy, Sabine Pass, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954); Galveston, Tex. (present study).

Remarks: This cosmopolitan species was collected only once (August, 1967) on a detached sargassum thallus off the Flagship Hotel. The specimens collected are not well preserved, and lack gonangia, so material from Tuxpan, Mexico, is figured and described. The specimens differ from Fraser's description in size (to 25 mm

according to Fraser) and in having occasional stems branched. Fraser describes the species as being unbranched, but Nutting (1915) implies that the colonies may be branched.

Obelia hyalina Clarke

Plate X, Figure 37

Obelia hyalina Clarke, 1879, p. 241.
Reed, 1941, p. 29.
Fraser, 1944, p. 160.
Behre, 1950, p. 7.
Gaille, 1967, pp. 12, 33.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colony small, usually from 15 to 20 mm. in height; some colonies are scarcely branched; others of about the same height, with several branches; stem distinctly geniculate, with several annulations above the origin of each branch and pedicel; branches sometimes coming from the axil of a pedicel, and sometimes taking the place of pedicels; pedicels either short and annulated throughout, or longer and annulated at each extremity; hydrotheca campanulate, depth to width nearly equal; sometimes there is a tendency to a flaring in the margin; margin entire. Gonophores borne in the axils of the pedicels; gonangium oval, but slightly tapering to the base; distal end either rounded or provided with a distinct collar; length of the gonangium 2-4 times the length of the hydrotheca (Fraser, 1944).

Gulf Distribution: Texas coast (Reed, 1941); on sargassum, Grand Isle, La. (Behre, 1950); off Panama City, Fla. (Gaille, 1967; Pequegnat and Pequegnat, 1968).

Remarks: Not recorded in the present study. See also the Remarks section of the description of Obelia dichotoma.

Obelia obtusidens (Jaderholm)

Plate X, Figure 38

Campanularia obtusidens Jaderholm, 1904, p. 2.
Obelia obtusidens Fraser, 1944, p. 163.
Behre, 1950, p. 7.
Deevey, 1950, p. 347.
Deevey, 1954, p. 270.

Diagnosis: Colony simple, reaching a height of 3 cm.; stem slightly geniculate, in large colonies there are regularly alternating branches, in smaller colonies there may be none; stem quite extensively annulated in the proximal portion of each internode; short pedicels annulated throughout, longer ones, in proximal and distal portions; hydrotheca broadly campanulate, almost as broad as long; margin with 12 low, rounded teeth; lines passing downward along the hydrothecal wall from the indentations. Gonangium arising directly from the stolon, with a short pedicel, not annulated; smooth, broad at the distal end and tapering rather rapidly to the proximal end; there is a distinct collar (Fraser, 1944).

Gulf Distribution: Grand Isle, La., shore (Fraser, 1944); on floating log, Grand Isle, La. (Behre, 1950); Louisiana or Texas (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Family CAMPANULINIDAE

"Colonies branched or unbranched; hydrothecae pedicellate or sessile, tubular or turbinate, always operculate, the operculum formed of converging segments; hydranths with conical proboscis. Gonophores producing sporosacs or free medusae" (Fraser, 1944).

Genus Cuspidella Hincks

"Hydrotheca tubular, sessile on a creeping stolon; arising singly; the bases of the opercular segments definite; no diaphragm

present. Gonophores producing free medusae" (Fraser, 1944).

Cuspidella humilis (Alder)

Plate XI, Figure 39

Campanularia humilis Alder, 1862, p. 239.
Cuspidella humilis Fraser, 1944, p. 169.
Deevey, 1950, p. 345.
Deevey, 1954, p. 270.
Gaille, 1967, p. 12.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Stolon slender; hydrotheca stout in proportion with its length (1 to 3), but quite minute; tubular, sessile, operculum of 10-12 segments. 'The gonothecae are set on the stolons, and are of the same shape and appearance as the hydrothecae, but much larger. The gonophores develop free medusae'(Broch) (Fraser, 1944).

Gulf Distribution: Buoy, off Freeport, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954); off Panama City, Fla. (Gaille, 1967; Pequegnat and Pequegnat, 1968).

Remarks: Not recorded in the present study.

Genus Lovenella Hincks

"Colony branched or unbranched; hydrotheca pedicellate, turbinate; diaphragm present; operculum sharply defined by a sinuous margin on the tube of the hydrotheca; no nematophores present. Gonangia borne on the stems, producing free, bell-shaped medusae, with 8 tentacles in 2 sets, and 4 lithocysts" (Fraser, 1944).

Lovenella new species

Plate XI, Figure 40

Diagnosis: Stem unbranched, serving as a long pedicel, reaching a height of about 4 mm, or slightly branched, reaching a height of 25 to 30 mm; stem and pedicels slender, divided into many short internodes by well defined nodes; when branching, pedicels short and annulated throughout or at both ends with a short, smooth internode between; hydrothecae turbinate to sub-turbinate, 0.5 to 0.8 mm long, about 2.5 times as long as broad; with an operculum of 6 to 8 converging, triangular segments, the bases of which are not defined; diaphragm distinct. Gonangia supported on short, annulated pedicels which arise just proximal to the hydrothecae, or taking the place of hydrothecae; elongate, about twice the length of the hydrothecae, about 3 to 5 times as long as broad, tapering gradually to the base; distally truncate, surface smooth; producing free medusae.

Gulf Distribution: Off Galveston, Tex., 3 to 6 fathoms (present study).

Remarks: Collected thirty-four times, these hydroids were common in all the offshore dredge samples taken by Don Harper at depths of 3 to 6 fathoms. They were most common on the shells of Nassarius acuta and Pyramidella crenulata inhabited by Phascolion strombi, a sipunculid. The hydroids were also found on the shells of Terebra dislocata, Pandora trilineata, Corbula sp., and on small shell fragments.

This species was originally thought to be an Operculariella

because of the absence of a distinct margin, or hinge-line, for the opercular segments. Further examination indicates that it must be a Lovenella: free medusae are produced by the gonangium; the hydrothecae are turbinate; and the stem is divided into short internodes rather than annulations. Furthermore, the overall appearance of the specimens agrees well with figures of Lovenella gracilis Clarke. This species differs from L. gracilis in the following respects: lack of distinct opercular-segment margin; hydrothecae slightly smaller (0.5 to 0.8 mm in Lovenella n.sp., 0.7 to 1.5 in L. gracilis collected in the present study); and fewer opercular segments (8 to 12 in L. gracilis). These distinctions were observed in virtually hundreds of specimens examined. If this species proves to be valid, the characters of the genus will have to be amended, since the genus is described as having a "sharply defined sinuous margin." The genus differs from Operculariella (which has sporosacs that are extended into acrocysts) in the production of free medusae.

Lovenella gracilis Clarke

Plate XI, Figure 41

Lovenella gracilis Clarke, 1881, p. 139.
Fraser, 1944, p. 174.
Fincher, 1955, p. 92.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colony unbranched or slightly branched, to about 25 mm tall; zooids arising singly (unbranched stem) with long pedicels, or arising from a branched stem on pedicels of a single annulation; stem and pedicels divided into many internodes by very

distinct nodes; hydrothecae turbinate, to about 1 mm long, about twice as long as broad; operculum of 6 to 12 (usually 8 to 10) triangular segments with distinct bases forming a scalloped margin; diaphragm distinct. Gonangia axillary; slender and elongate (about 5 times as long as broad, about twice as long as the hydrothecae); distally truncate; each gonangium bears about 15 to 30 developing medusa buds on the blastostyle.

Gulf Distribution: On clam shells off Horn Island, Miss. (Fincher, 1955); off Panama City, Fla. (Pequegnat and Pequegnat, 1968); off Galveston, Tex. (present study).

Remarks: Collected 22 times in various months throughout the year, from depths of 12 to 30 feet from off the Front Beach on the shells of Nassarius acuta, Pyramidella crenulata, Corbula sp., and on small bivalve shells and shell fragments. My specimens vary from Fraser's description only in the variation of number of opercular segments present. The specimens examined had 6 to 12 segments, while Fraser describes the species as having only 8 segments. While counting segments, it is least confusing to count the tips of the scallops on the margin formed at the base of the opercular segments, rather than the segments themselves.

Lovenella grandis Nutting

Plate XI, Figure 42

Lovenella grandis Nutting, 1909, p. 354.
Fraser, 1944, p. 174.
Gaille, 1967, p. 12.
Pequegnat and Pequegnat, 1968, pp. 21, 31, 32.

Diagnosis: Colonies moderately large, to 50 mm tall, sparsely branched; stem divided regularly into internodes by well-defined nodes; hydrothecae alternate, arising from processes near the distal end of the internode; pedicels consisting of a single annulation separate the hydrothecae from the hydrothecal processes on the stem; hydrothecae large (1.3 to 1.5 mm), turbinate, with an operculum of 10 to 12 triangular segments, the bases of which form a distinct, scalloped margin; diaphragm prominent. Gonangia long, slender, the proximal half tapering gradually to the base, while the distal half is approximately tubular; distally truncate, there may be a slight tapering to form an indistinct collar; axillary; pedicels consisting of a single annulation; each gonangium bears about 15 to 20 developing medusa buds.

Gulf Distribution: Off Panama City, Fla. (Gaille, 1967; Pequegnat and Pequegnat, 1968); off Galveston, Tex. (present study).

Remarks: A single colony of this species was collected off West Beach at 30 feet on 2 March 1967. The specimen examined was not attached to any substrate, and may have been detached by the dredge, or may have been anchored in the mud bottom. My material differs from Fraser's description in the following respects: hydrothecae smaller (1.28 mm versus 1.75 mm); gonangia larger (2.0 mm versus 1.6 mm), colony branching; and hydrothecal pedicel of a single annulation rather than a double annulation. This last point is probably insignificant, since Fraser's figure shows only single annulations.

Family HALECIDAE

Hydrothecae reduced to saucer-shaped hydrophores, which usually pass without constriction into the broad, tubular pedicels; they are too small to lodge the contracted hydranths; margin entire, often flaring; reduplication common; hydrophores with a circle of bright dots just below the rim, more or less evident; hydranth with conical proboscis. Gonophores producing fixed sporosacs or medusoid structures; there is often a decided difference between the male and female gonangia (Fraser, 1944).

Genus Campalecium Torrey

"As in the family; no nematophores or tentacular organs. Gonangia bearing medusoid gonophores" (Fraser, 1937).

Campalecium new species

Plate XII, Figure 43

Diagnosis: Stem short (to about 5 mm), simple, arising from a creeping stolon, with about 10 to 12 annulations proximally, branching in a geniculate manner; each internode straight, arising from the previous internode just proximal to a distal hydrophore pedicel at an angle; a pedicel commonly arises from the axil formed between two successive internodes; internodes and pedicels annulated proximally, with 3 to 6 annulations; occasionally the pedicel is annulated throughout, or proximally and with irregularly placed annulations distal to the proximal annulations; hydrophore margin very slightly everted, if at all; no dots below the rim of the hydranth discernible in the preserved material; hydranth large, with 20 to 22 filiform tentacles in a single whorl about the conical proboscis; nematocysts strongly evident. Many of the hydranths have

a membranous "hydrotheca" enveloping the proximal half of the hydrosoma. Gonangia axillary, on short, annulated pedicels; obconical or oblong-ovate, distally truncate or rounded; with very delicate perisarc, so that the theca almost seems to be lacking; gonophores medusoid, globular, 2 or 3 per gonangium; details of medusa not discernible.

Gulf Distribution: Epizoic on Callinectes sapidus, Galveston, Tex. (present study).

Remarks: Collected only once (1 August 1969), on a blue crab at South Jetty. To the best of my knowledge, the only other species in this genus is Campalecium medusiferum Torrey (1902), apparently reported only once (when described), by Torrey, from Long Beach, California, at a depth of 6 fathoms. Campalecium n. sp. differs from C. medusiferum in the following respects: stem regularly branched (C. medusiferum is sparingly and irregularly branched); hydrophore with rim not everted or only slightly so (C. medusiferum with strongly everted rim); hydranth with fewer tentacles (20 to 22 in Campalecium n. sp., 24 to 28 in C. medusiferum); and gonangium with annulated pedicel (C. medusiferum with non-annulated pedicel).

As previously mentioned, no specific epithet is designated for this new species since this thesis does not constitute publication. This is done to prevent a nomen nudum from being introduced into the literature.

Genus Halecium Oken

"As in the family; no tentacular organs present. Gonangia usually different in the two sexes" (Fraser, 1944).

Halecium bermudense Congdon

Plate XII, Figure 44

Halecium bermudense Congdon, 1907, p. 473.
Fraser, 1944, p. 187.

Diagnosis: Stem fascicled, irregularly branching, reaching a height of about 35 mm; nodes transverse, internodes moderately long, tubular, curved proximally to join the distal end of the previous internode, giving the stem or branch a geniculate appearance; perisarc heavy throughout, amber colored near the base of the stem; hydrophores alternate, shallow, with flaring margin; almost sessile; reduplication common. Gonosome not observed in the present study.

> Gonangia arising from the base of the hydrophores or from the axils, with short pedicels; female obovate, somewhat larger than wide; aperture lateral, large, with wavy margin. "Male gonothecae cylindrical and usually slender, truncate and tapering towards the base; often marked by an irregular, encircling groove somewhat wavy in outline one-third of the way from the base" (Congdon) (Fraser, 1944).

Gulf Distribution: Tampa Bay, Fla., 7-10 fathoms (Fraser, 1944); off Bolivar Peninsula, Tex. (present study).

Remarks: Collected 4 times on the same day off Bolivar Peninsula, growing on shell fragments at a depth of 30 feet. Fraser (1944) cites himself (1912) for the Tampa Bay record, but I could not locate that record in the 1912 paper.

Halecium nanum Alder

Plate XII, Figure 45

Halecium nanum Alder, 1859, p. 355.
Fraser, 1944, p. 198.
Deevey, 1950, p. 345.
Deevey, 1954, p. 270.

Diagnosis: Colony minute, 1.5 to 2 mm. high (Congdon reports as high as 3 mm.), arising from a much branched stolon, which seems to have more free ends than usual. On one small piece of sargassum may be found colonies in several stages of growth, from those with a single hydrophore, supported on a tubular pedicel, to those that have attained adult growth. The mode of branching is irregular and characteristic; usually the main stem consists of the original hydrophore and its pedicel, although that may be extended by duplication; just below the hydrophore, another pedicel may be given off, which may reduplicate, or give off 1 or 2 pedicels or branches, and this may be repeated; branches or pedicels may be given off at both sides, or they may be almost all on the one side; frequently they are not all given off in the same plane, although they can scarcely be said to be given off on all sides. Hydrophore pedicels rather long; margin scarcely flaring. Gonangia given off similar in position to the lateral hydrophores or branches; male ovate or obovate, with a narrow attachment, but broadly rounded at the distal end; female larger with a straight, annulated support passing up the one side, and the other side forming a segment of a circle; the two unite distally to form a hydrophore for the 2 small hydranths that are given off; in each gonangium there are usually 2 large ova, the one above the other (Fraser, 1944).

Gulf Distribution: On sargassum and tar, Port Aransas, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Family LAFOEIDAE

Hydrotheca tubular; margin entire; operculum absent; no diaphragm except in Lictorella where there is a delicate diaphragm present; hydranth with conical proboscis. Gonangia appear in masses, usually protected by modified hydrothecae, thus making a "coppinia" (Fraser, 1944).

Genus Filellum Hincks

"Stem a slender stolon, growing over other hydroids, worm tubes, etc.; hydrothecae partly adherent, the free portion curved upward; no diaphragm in the hydrothecal cavity. Gonangia aggregated in a coppinia" (Fraser, 1944).

Filellum serpens (Hassall)

Plate XII, Figure 46

Campanularia serpens Hassall, 1852, p. 163.
Filellum serpens Fraser, 1944, p. 215.
Deevey, 1950, p. 345.
Deevey, 1954, p. 270.

> Diagnosis: Stolon reticular, creeping over other hydroids, worm tubes, etc.; hydrothecae adherent to the stolon from one-half to two-thirds of the length; nearly the same size throughout, not annulated, but there may be some horizontal striae near the margin; margin not flaring; no nematophores. Coppinia mass rather compact, the gonangia not placed so close together as in some other species; hydrothecal tubes long and slender (Fraser, 1944).

Gulf Distribution: On buoys off Freeport, Houston Ship Channel in Galveston Bay, and Sabine Pass, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Although previously reported from Galveston Bay, this species was not recorded in the present study.

Family SERTULARIDAE

"Hydrothecae sessile, usually arranged on both sides of the stem and branches, and more or less adnate to them; operculum present; diaphragm present in the hydrothecal cavity. Gonophores producing fixed sporosacs" (Fraser, 1944).

Genus Pasya Stechow

"Hydrothecae opposite, arranged in groups of 2 or more pairs, the different pairs of each group being unequal in size; margin with 2 or 3 teeth; operculum usually with 2 flaps. Gonangium oval, with large aperture" (Fraser, 1944).

Pasya quadridentata (Ellis and Solander)

Plate XIII, Figure 47

Sertularia quadridentata Ellis and Solander, 1786, p. 57.
Pasythea quadridentata Cary and Spaulding, 1909, p. 6.
Pasya quadridentata Fraser, 1943, p. 92.
Fraser, 1944, p. 252.
Pasythea quadridentata Behre, 1950, p. 7.
Pasya quadridentata Deevey, 1950, p. 347.
Deevey, 1954, p. 270.

Diagnosis: Colony usually from 3 to 8 mm. in height, but sometimes reaching 29 mm.; stem unbranched, or slightly branched, arising from a creeping stolon; divided into quite regular internodes, bearing from 1 to 6 pairs of hydrothecae; nodes running obliquely from front to back; commonly the proximal internode has one pair of hydrothecae and all of the others have more than one pair. The hydrothecae of the lowest pair are bent out nearly at right angles, the next pair less so, and the distal pair adhere for the greater portion of their length; the members of each pair are united in front, but are some distance apart, behind; the margin of the hydrotheca has 2 or 3 teeth. A single gonangium appears on the face of the stem just at the base, large, nearly oval, but broader at the distal end than at the proximal, provided with 5 or 6 broad corrugations; aperture large, circular, occupying all, or nearly all, of the distal end; an operculum is stretched tightly across the aperture (Fraser, 1944).

Gulf Distribution: On floating gulfweed, Louisiana coast (Cary and Spaulding, 1909); Grand Isle, La. (Fraser, 1943; Behre, 1950); Louisiana (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Although apparently common on sargassum, this species was not recorded in the present study.

Genus Sertularella Gray (modified)

"Hydrothecae in 2 rows, alternate, usually with 3-4 teeth on the margin of the hydrotheca, and an operculum of 3 or 4 flaps. Gonangia commonly supplied with ridges or corrugations" (Fraser, 1944).

Sertularella conica Allman

Plate XIII, Figure 49

Sertularella conica Allman, 1877, p. 21.
Nutting, 1904, p. 79.
Leloup, 1937, p. 104.
Fraser, 1944, p. 258.
Deevey, 1954, p. 270.

Diagnosis: Colony small, either unbranched or with a few small branches, which are like the main stem; hydrothecae alternate, rather distant, free for about two-thirds of their length, nearly tubular, but with the proximal end slightly swollen, and the distal end narrowing slightly; there is some appearance of annulations but these only on the adcauline side of the hydrotheca; margin with 4 teeth; operculum with 4 flaps. Gonangia on the stem or on the stolon; oval, without distinct pedicel or neck; margin provided with 3 or 4 stout teeth, that may be straight or curved inward, almost to meet above the centre of the aperture; surface rugose, with distinct crests on the rugosities (Fraser, 1944).

Gulf Distribution: Off Mobile, Ala,, west of Apalachee Bay, Fla. (Nutting, 1904); Tampa Bay, Fla. (Leloup, 1937); NW and NE Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Sertularella gayi (Lamouroux)

Plate XIII, Figure 48

Sertularia gayi Lamouroux, 1821, p. 12.
Sertularella gayi Fraser, 1944, p. 262.
Deevey, 1950, p. 346.
Deevey, 1954, p. 270.

Diagnosis: Colony attaining a height of 6 inches (Nutting); stem rather rigid, but often not erect; basal portion fascicled; branches given off irregularly, with a tendency to a pinnate arrangement; branches are not fascicled even at the base, and unlike the basal portion of the main stem, they are divided into regular internodes by oblique nodes, each internode giving off a hydrotheca. Hydrothecae broad at the base and tapering slightly to the margin, one third or less adherent; adcauline side corrugated, the ridges rounded; margin with 4 shallow teeth; operculum with 4 flaps. Gonangia borne on the upper side of the branches, inserted near the base of the hydrothecae, long, slender, terete, narrowing to a short, broad pedicel at the proximal end, and to a 2-toothed margin at the other; the upper one-third to one-half is marked by narrow, annular ridges or crests (Fraser, 1944).

Gulf Distribution: Port Isabel Channel, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Genus Sertularia Linnaeus (modified)

"Hydrothecae in 2 rows, occurring in pairs which are strictly opposite throughout, or at least on the distal portion of the stem and branches. Gonangia oval or ovate, usually smooth" (Fraser, 1944).

Sertularia cornicina (McCrady)

Plate XIII, Figure 50

Dynamena cornicina McCrady, 1858, p. 204.
Sertularia cornicina Fraser, 1944, p. 279
Deevey, 1950, p. 346.

Diagnosis: Colony commonly 10-15 mm. high, consists of an unbranched, simple, erect stem, growing from a filiform stolon, divided into rather long, regular internodes by well marked nodes, at which the stem is definitely narrowed. Hydrothecae, an opposite pair to each internode, are frontolaterally placed so that the adjacent sides are adnate for about half their length on the face, but are well apart, though parallel, at the back; the remainder of the hydrotheca curves abruptly outward to a margin, with 2 distinct teeth; operculum with 2 flaps; there are 3 or 4 chitinous points extending downward into the cavity of the internode from the base of the hydrotheca.... Gonangia grow from the stolon close to the origin of the stem; broadly oval, with a short collar and large terminal aperture; regularly rugose, the rugosities rounded (Fraser, 1944).

Gulf Distribution: Port Isabel and on sargassum, Port Aransas, Tex. (Deevey, 1950).

Remarks: Not recorded in the present study. Deevey (1954) did not indicate that this species had been reported from either the NW or NE Gulf in his checklist of hydroids of the Gulf of Mexico.

Sertularia dalmasi (Versluys)

Plate XIV, Figure 51

Desmoscyphus dalmasi Versluys, 1899, p. 38.
Sertularia rathbuni Nutting, 1904, p. 57.
Sertularia dalmasi Fraser, 1944, p. 280.

Diagnosis: Colony reaching a height of 3 inches (Allman), consisting of a main stem, and sometimes this alone, but usually with 1-4 branches, that may be on the one side of the stem, looking as though other stem fragments had been stuck on in a haphazard manner, at right angles to the stem. The arrangement of the nodes seems to be just as

haphazard, as there is no regularity observable. There may be nodes of the "pinched" variety quite close together, or there may be none for some considerable distance on the stem or branch. What corresponds to a regular internode is long and slender. The pairs of hydrothecae are placed fronto-laterally, contiguous on the face for about half their length, and the adjacent sides, parallel but well apart for the same distance on the back; the diameter is greatest just at the curve outward, decreasing slightly towards the base and towards the margin; there are 3 teeth on the margin, an adcauline tooth, smaller than either of the lateral teeth, but more sharply pointed; operculum of 3 flaps (Fraser, 1944). The gonosome is unknown.

Gulf Distribution: South of Mobile, Ala., 27 fms (Nutting, 1904); NW and NE Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Sertularia inflata (Versluys)

Plate XIV, Figure 52

Desmoscyphus inflatus Versluys, 1899, p. 42.
Sertularia versluysi Cary and Spaulding, 1909, p. 6.
Sertularia inflata Fraser, 1944, p. 283.
Deevey, 1950, p. 347.
Whitten, Rosene, and Hedgpeth, 1950, p. 73.
Deevey, 1954, p. 270.

Diagnosis: Colony varying much in height, but not reaching more than 5 cm.; sometimes the stem, which is simple, is divided into regular internodes by oblique nodes, with a branch and 2 hydrothecae on one side and 1 hydrotheca on the other, but at other times the nodes are indistinct or absent. Branches are given off regularly and alternately. The main stem may be straight, in which case the branching gives it a regular appearance, or it may be more or less geniculate, with the branches given off at the bends, so that it seems almost dichotomous. Each branch has a transverse node followed by an oblique or pinched node before the proximal hydrothecae are given off. As in the case of the stem, the nodes may be distinct and regular, or indistinct and absent. The hydrothecae are arranged alternately on the stem but are strictly opposite on the branches, the pairs being rather distant. The hydrothecae are short and stout, the proximal portion being turgid,

those of the pair adnate; the distal portions are bent abruptly to produce a wrinkle on the concave side; the margin has 2 teeth and the operculum has 2 flaps (Fraser, 1944).

The gonosome is unknown.

Gulf Distribution: Gulfweed, Louisiana coast (Cary and Spaulding, 1909); Tampa Bay and Texas Gulf coast (Fraser, 1944); sargassum and jetties, Texas coast (Whitten, Rosene, and Hedgpeth, 1950); reported from Louisiana or Texas (Deevey, 1950); NW and NE Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Sertularia mayeri Nutting

Plate XIV, Figure 53

Sertularia mayeri Nutting, 1904, p. 58.
Fraser, 1944, p. 285.

Diagnosis: Colonies small, to about 3 mm; stem simple, unbranched; proximally the stem lacks nodes, but (in my material) has a characteristic twist just below the proximal hydrotheca; just distal to the proximal hydrotheca is a node, and the stem is regularly divided into internodes therafter; hydrothecae in pairs on the fronto-lateral surface of each internode; hydrothecae adnate anteriorly, but posteriorly separated by the stem internode; margin with 3 teeth, one superior and two lateral; operculum of 2 flaps; conspicuous perisarcal processes occur just inside the margin on the dorsal and ventral surfaces. The gonosome was not observed in the material examined. "The gonangia appear on short pedicels growing from the stolon; orbicular or broadly oval, with length and

about one and a half times the height of a hydrotheca. Aperture large, circular; the wall is definitely and distinctly corrugated" (Fraser, 1944).

Gulf Distribution: On floating sargassum, Galveston, Tex. (present study).

Remarks: My specimens agree well with Fraser's description, except that they are smaller (to 12 mm according to Fraser). Fraser does not mention the intra-marginal processes or the twisted stem.

Collected 6 times, all on floating sargassum at various front beach localities, during the months of April, June, August, and September. This identification constitutes a range extension, since this species has not previously been reported from the "Carolinian" Gulf coast, although it has been reported from waters off southern Florida.

Sertularia turbinata (Lamouroux)

Plate XIV, Figure 54

Dynamena turbinata Lamouroux, 1816, p. 180.
Sertularia brevicyanthus Cary and Spaulding, 1909, p. 6.
Sertularia turbinata Fraser, 1944, p. 290.

> Diagnosis: Colony 6 or 7 mm. high, consisting of a single, simple, unbranched stem (Congdon states that there are infrequent branches), a small portion at the base of which is free of hydrothecae; the stem is provided with one pinched joint, the remainder is divided into long, slender internodes, 8 or 9 of them, slender at the nodes and expanding somewhat to the base of the hydrothecae distant to the middle of the internode; there is a pair of opposite hydrothecae to each internode, appearing on the face of the internode, some distance apart in the proximal pairs but the distance between grows less and less until in the distal pairs the inner walls may be adnate for a part of their

length; hydrotheca short, rather abruptly turned outward about the middle, with the adcauline wall forming a semi-circle, and the abcauline somewhat indented, often with a distinct ridge passing up a short way into the cavity; there is a downward projection of the perisarc from the inner angle of the base of the hydrotheca; margin with 3 teeth, one towards the anterior face larger than either of the others; operculum of 2 flaps. Gonangium arising from the stem on a short pedicel, just below the proximal pair of hydrothecae, flattened at the back, in cross section not round or oval, but plano-convex, 1.1 mm. long, 0.95 mm. broad, with 8 sharp rings or corrugations, whole border is bent upward, with broad slit-like opening, without teeth or hooks (After Stechow) (Fraser, 1944).

Gulf Distribution: Gulfweed, Louisiana coast (Cary and Spaulding, 1909).

Remarks: Not recorded in the present study.

Genus Thuiaria Fleming (modified)

"Hydrothecae in 2 rows on the stem and branches; not in opposite pairs; hydrothecae with not more than 2 teeth; operculum of 1 abcauline flap or 2 flaps. Gonangia smooth or with 2 spines on the shoulders" (Fraser, 1944).

Thuiaria cupressina (Linnaeus)

Plate XV, Figure 55

Sertularia cupressina Linnaeus, 1758, p. 808.
Cross and Parks, 1937, p. 9.
Thuiaria cupressina Fraser, 1944, p. 298.

Diagnosis: Colony up to 30 or 35 cm., consists of a simple, slender, but very definite stem, that is slightly sinuous, not definitely divided into internodes; branching is regularly alternate, with a hydrotheca in the axil of each branch; the primary branches, that are not of great length, are much branched, sometimes dichotomously, giving a graceful appearance to the whole colony; in the branches the nodes are irregularly placed, so that there is no definite number of

hydrothecae to an internode. The hydrothecae appear in regular alternation with the base of one on one side opposite the middle of the one on the other side; the space between two in succession on the one side is not great, but varies considerably, usually closer on the ultimate branches than on the proximal portion of the primary branches or on the main stem; the hydrotheca is tubular, largely immersed and not strongly turned outward; margin with 2 low, rounded teeth; operculum of 2 flaps. Gonangia appear in rows on the face of the branches and the branchlets, inserted just below the hydrothecae; they are obovate or triangular, short and stout, with 2 prominent, shoulder spines, a short neck or collar, and a circular aperture (Fraser, 1944).

Gulf Distribution: Corpus Christi Bay, Tex. (Cross and Parks, 1937).

Remarks: Not recorded in the present study.

Family PLUMULARIDAE

"Hydrothecae growing only on one side of the branch (hydrocladium), sessile, more or less adnate; nematophores always present. Gonophores producing fixed sporosacs, often protected by modified branches or portions of branches" (Fraser, 1944).

Genus Monostaechas Allman

"Colony dichotomously branched; hydrocladia all springing from the upper side of the branches; cauline nematophores absent. Gonangia oval or ovate, without special protective structures" (Fraser, 1944).

Monostaechas quadridens (McCrady)

Plate XV, Figure 56

Plumularia quadridens McCrady, 1858, p. 199.
Monostaechas quadridens Leloup, 1937, p. 108.
Fraser, 1944, p. 334.
Deevey, 1950, p. 347.
Deevey, 1954, p. 271.

Diagnosis: Colony attaining a height of 15 cm., dichotomously branched; branches coming off from the main stem at irregular intervals; branches divided into long internodes, each internode giving rise to a hydrocladium from its upper side and distal end; several long, slender nematophores are present on the upper side of each internode; the hydrocladia are given off at such an angle that they all pass up in the same general direction as the main stem and hence run parallel to one another; each hydrocladium is divided into alternate thecate and non-thecate internodes, the proximal one being thecate; each thecate internode is bounded by a proximal oblique, and a distal transverse node, each non-thecate internode, with the transverse node proximal, and the oblique node distal. Hydrotheca large, campanulate, with entire margin; supracalycine nematophores borne on distinct, internodal processes, reach to, or above, the margin of the hydrotheca; one or more mesial nematophores to each non-thecate internode. Gonangia oval to spherical, borne on the processes immediately below the hydrothecae, often occurring in series, one for each hydrotheca, for some distance along the hydrocladium; each gonangium is provided with 2 nematophores at the base (Fraser, 1944).

Gulf Distribution: Tampa Bay, 8-10 fathoms (Leloup, 1937); epizoic on Podochela sidneyi, Port Isabel, Tex. (Deevey, 1950); NE and NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Genus Plumularia Lamarck (in part)

"Hydrocladia usually unbranched, pinnately arranged, each ordinarily having more than one hydrotheca; hydrotheca with entire margin; all nematophores movable and of the same type. Gonangia

without extra protective structures" (Fraser, 1944).

Plumularia diaphana (Heller)

Plate XV, Figure 57

Anisocalyx diaphana Heller, 1868, p. 42.
Plumularia alternata Stechow, 1912, p. 363.
Plumularia diaphana Fraser, 1944, p. 342.
Plumularia alternata Behre, 1950, p. 7.
Plumularia diaphana Deevey, 1950, p. 347.
Deevey, 1954, p. 271.
Fincher, 1955, p. 92.
Pequegnat and Pequegnat, 1968, pp. 21, 32.

Diagnosis: Colony simple, unbranched, 12 mm.; stem geniculate, divided into internodes of which every alternate one bears a hydrotheca and a hydrocladium; there may be a pair of hydrothecae proximally. Hydrocladia divided into regularly alternating, non-thecate and thecate internodes; the proximal one being non-thecate; thecate internodes are bounded by oblique nodes proximally and transverse nodes distally. Hydrotheca deeply campanulate, with approximately the distal third free; supracalycine nematophores and mesial nematophores of similar size, usually one mesial to each internode; there is one nematophore on each internode of the stem and one in the axil of each hydrocladium. Gonangia arise in pairs or in verticils of 4, just below the base of the cauline hydrothecae, each gonangium with a short pedicel, with 2 or 3 annulations; the gonangium has the shape of a curved cornucopia, enlarged gradually to the distal end, which is almost truncate; each gonangium bears 1 or 2 pairs of nematophores in the basal portion; the blastostyle follows the curve of the gonangium, and has a definite enlargement near its distal end (Fraser, 1944).

Gulf Distribution: $27^{\circ}10'N \times 91^{\circ}50'W$, Gulf of Mexico (Stechow, 1912); floating sargassum, Grand Isle, La. (Fraser, 1944; Behre, 1950); Louisiana (Deevey, 1950); NW Gulf (Deevey, 1954); off Panama City, Fla. (Pequegnat and Pequegnat, 1968).

Remarks: Not recorded in the present study.

Plumularia floridana Nutting

Plate XV, Figure 58

Plumularia floridana Nutting, 1900, p. 59.
Fraser, 1944, p. 345.
Behre, 1950, p. 7.
Deevey, 1950, p. 347.
Deevey, 1954, p. 271.

Diagnosis: Colony small, to about 5 mm; stem unbranched, regularly divided into internodes which bear alternating hydrocladia from distally placed shoulder-like processes, hydrocladia composed of alternating thecate and non-thecate internodes, the proximal being short and non-thecate; hydrothecae cup-shaped, with at least a portion of the distal region free; nematophores bithalmic, small; two supracalycine nematophores above and one mesial nematophore below each hydrotheca; also, one nematophore on each non-thecate and cauline internode and in the axil of the hydrocladium. The gonosome was not observed in the present study, and is unknown.

Gulf Distribution: On sargassum, Grand Isle, La. (Fraser, 1944; Behre, 1950); Louisiana or Texas (Deevey, 1950); NW Gulf (Deevey, 1954); on sargassum, Galveston, Tex. (present study).

Remarks: Collected 6 times, all on floating sargassum, at various locations on the front beach, during the months of August and September. The following inconsistencies occur between my material and Fraser's description: smaller (to 12 mm, according to Fraser); without annulations (2 or 3 at each cauline node, according to Fraser); all non-thecate internodes single (sometimes two short ones occur instead of the single, longer one, according to Fraser);

and hydrothecae cup shaped (hydrothecae cylindrical, according to Fraser). I can see no glaring discrepancies between the two, assuming that my specimens are younger than the material described by Fraser. Some cauline internodes in my material have structures resembling faint or shallow annulations, but these are not well developed. Fraser's figures show the hydrothecae to be similar in shape to mine, so the difference in hydrothecal shape may be merely the choice of adjectives used in the descriptions.

Plumularia setacea (Ellis)

Plate XVI, Figure 59

Corallina setacea Ellis, 1755, p. 19.
Plumularia setacea Stechow, 1912, p. 362.
Fraser, 1944, p. 352.
Deevey, 1950, p. 347.
Deevey, 1954, p. 271.

Diagnosis: Colony not large, sometimes reaching a height of 5 cm. but often much less; stem simple, divided into regular internodes, each bearing a hydrocladium, which is seldom branched; the hydrocladia are regularly alternate, and are in the same plane; after the proximal internode, which is short, and without a hydrotheca, thecate, and non-thecate internodes alternate; the distinctness of the internodal septa varies much, sometimes so faint that the septa can scarcely be seen, and at other times, they are very definitely marked. The hydrotheca is small, placed near the distal end of the internode. There are 2 supracalycine nematophores, 1 mesial nematophore to each hydrocladial internode, with the exception of the proximal, 1 on each cauline internode on the side opposite the hydrocladial process, and 1 in the axil of that process. Gonangia borne on the hydrocladial processes of the cauline internodes, much elongated, usually with a long neck and a circular aperture (Fraser, 1944).

Gulf Distribution: 27°10'N x 91°50'W, Gulf of Mexico (Stechow, 1912); on sargassum, St. Joseph Island, and on sargassum and tar,

Port Aransas, Tex. (Deevey, 1950); NW and NE Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Genus Schizotricha Allman (modified)

"Colony simple, branched, with hydrocladia pinnately arranged, bifurcating. Gonangia springing from the stem, branch, or hydrocladium, not especially protected..." (Fraser, 1944).

Schizotricha tenella (Verrill)

Plate XVI, Figure 60

Plumularia tenella Verrill, 1874, p. 731.
Schizotricha tenella Fraser, 1944, p. 358.
Deevey, 1950, p. 347.
Deevey, 1954, p. 271.

Diagnosis: Colonies usually growing in clusters, reaching a height of 5 cm., but often much less than that; stem dichotomously branched, divided into internodes, each alternate one bearing a hydrocladium and a hydrotheca. Hydrocladia slender, often branched, divided into 3 kinds of internodes, the one following the other in regular succession; the first, a short internode without any nematophore, and with a transverse node at each end; the second, somewhat longer, with 1 or 2 nematophores, the proximal node transverse, the distal oblique; the third is about the same length as the second or longer, with the proximal node oblique, and the distal transverse; it is the thecate internode; the hydrotheca is placed near the distal end of the interior side, it is small, cup-shaped to cylindrical, with about a half of it free from the internode. There are 2 supracalycine nematophores present, and a mesial nematophore below the hydrotheca; there are 2 or more nematophores on each of the cauline internodes. Gonangia appear at the base of the hydrothecae; curved, cornucopia-shaped, with 1 or 2 pairs of nematophores near the base (Fraser, 1944).

Gulf Distribution: ?Louisiana (Fraser, 1944); Louisiana or Texas (Deevey, 1950); ?NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Genus Aglaophenia Lamouroux (modified)

"Hydrothecal margin provided with distinct, sharp teeth; posterior intrathecal ridge present; 1 mesial and 2 supracalycine nematophores for each hydrotheca always present. Gonangia enclosed in true corbulae, formed of modified hydrocladia; there are no hydrothecae at the base of the leaves of the corbulae" (Fraser, 1944).

Aglaophenia cristifrons Nutting

Plate XVII, Figure 62

Aglaophenia cristifrons Nutting, 1900, p. 95.
Fraser, 1944, p. 369.
Deevey, 1950, p. 346.
Deevey, 1954, p. 271.

Diagnosis: Colony, 6 cm., consisting of a simple, rigid, unbranched stem, with little or no indication of nodes, but the hydrocladia are given off in regular alternation from the antero-lateral surface; the hydrocladia are somewhat rigid, also, although they are slender and slightly sinuous; the internodes are long and curved, and even although the hydrothecae are relatively larger or longer than usual, they are still somewhat distant; fitting to the internode, both walls of the hydrotheca are curved, more than twice as long as broad; margin with 9 teeth, the median one sharp-pointed, very slightly recurved, all the lateral teeth rounded, and of much the same size. The intrathecal ridge is not conspicuous, extending only for a short distance from the wall of the internode; the supracalycine nematophores are tubular, reaching to, or slightly above, the margin of the hydrotheca; the mesial nematophore projects directly outward from the lower convex curve of the hydrotheca; the cauline nematophores are all tubular, none of them large, but the one actually on the hydrocladial process is smaller than either of the others. Corbula small, consisting of 5 or 6 pairs of broad leaves, the distal edges of which stand out prominently; they are provided with strong nematophores. There is a single hydrotheca between the corbula and the stem (Fraser, 1944).

Gulf Distribution: Epizoic on Podochela sidneyi, Port Isabel, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Aglaophenia late-carinata Allman

Plate XVI, Figure 61

Aglaophenia late-carinata Allman, 1877, p. 56.
Aglaophenia minuta Cary and Spaulding, 1909, p. 6.
Aglaophenia late-carinata Stechow, 1912, p. 370.
Fraser, 1944, p. 378.
Fraser, 1945, p. 22.
Behre, 1950, p. 7.
Aglaophenia minuta Behre, 1950, p. 7.
Aglaophenia late-carinata Deevey, 1950, p. 347.
Deevey, 1954, p. 271.
Fincher, 1955, p. 92.
Breuer, 1961, p. 166.

Diagnosis: Colony small, to about 20 mm; stem unbranched, with faintly marked transverse nodes; each internode with three nematophores, one proximal, and one each above and below the hydrocladial process; hydrocladia alternate, arising near the distal end of each internode; regularly divided into internodes, each bearing a single hydrotheca and with two septa, one opposite the intrathecal ridge and one opposite the supracalycine nematophore; hydrotheca with 9 teeth, 4 lateral on each side and one median beneath the keel; intrathecal ridge straight, very prominent, extending entirely across the hydrotheca; keel extending from mesial nematophore to margin; supracalycine nematophores short, extending just to margin of hydrotheca or less; mesial nematophore small, free, with a prominent constriction separating the free and adnate portions. The gonosome

was not observed in the present study.

> Commonly but one corbula in a colony, formed from the proximal hydrocladium; the corbula is short, stout, rounded, composed of 7 or 8 pairs of leaves; these are not wholly in contact, but a perforation is present between each two in succession; each leaf has a row of nematophores and a spur at the base; there is one hydrotheca between the corbula and the stem (Fraser, 1944).

Gulf Distribution: On gulfweed, Louisiana coast (Cary and Spaulding, 1909); 27°10'N x 91°50' W, Gulf of Mexico (Stechow, 1912); on floating sargassum, front beach, Grand Isle, La. and Texas Gulf coast (Fraser, 1944); Grand Isle, La. (Fraser, 1945); sargassum, Grand Isle, La. (Behre, 1950); Louisiana (Deevey, 1950); NW Gulf (Deevey, 1954); sargassum, Mississippi Sound, Miss. (Fincher, 1955); sargassum, lower Laguna Madre, Tex. (Breuer, 1961); on floating sargassum, Galveston, Tex. (present study).

Remarks: Collected 11 times, all on floating sargassum, at various locations on the front beach, during the months of July, August, and September.

Aglaophenia perpusilla Allman

Plate XVII, Figure 63

Aglaophenia perpusilla Allman, 1877, p. 48.
Fraser, 1944, p. 385.
Deevey, 1950, p. 346.
Deevey, 1954, p. 271.

> Diagnosis: Colony minute, 7 mm.; the simple, erect stem arises from a filiform stolon, divided into regular internodes by transverse nodes; each internode gives rise to a hydrocladium, antero-laterally placed; the hydrocladia are regularly curved outward and to some extent backward; divided into regular internodes, each with a septum below the supracalycine nematophore and one opposite the hydrothecal ridge, each bearing a hydrotheca which is relatively broad for its length; with 9 teeth on the margin, the median

one straight, sharp-pointed, but the other 4 on each side are rounded and similar in size; there is a keel on the face of the hydrotheca, distinct but not very prominent; the intrathecal ridge, less than half way up, runs all the way across. The supracalycine nematophores are well developed, extending well above the margin of the hydrotheca; the mesial nematophore projects distinctly outward but is not of great length; it has a constriction not far from the end; the cauline nematophores are quite prominent, showing up conspicuously in a lateral view (Fraser, 1944).

The gonosome is unknown.

Gulf Distribution: St. Joseph Island and Port Aransas, Tex. (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

Aglaophenia rigida Allman

Plate XVII, Figure 64

Aglaophenia rigida Allman, 1877, p. 43.
Fraser, 1944, p. 389.
Deevey, 1950, p. 347.
Deevey, 1954, p. 271.

Diagnosis: Colony up to 24 inches (according to Nutting); stem simple, slender, and wiry, divided into regular internodes each of which gives rise to a hydrocladium from a process not far from the distal end; branches few in number, or absent, given off from the stem, sometimes in pairs, much like the main stem. Hydrocladia up to 10 mm. in length, divided into regular internodes, each with 2 internal septa. The hydrotheca occupies almost all of the internode, so that the hydrothecae are somewhat crowded on the hydrocladium; the hydrotheca is relatively stout, with the face slightly concave; margin with 8 similar, deeply cut, but not very sharp teeth; the supracalycine nematophores reach the margin of the hydrotheca; the intrathecal ridge is short; the mesial nematophore is about half the length of the hydrotheca; it passes out obliquely with about one-fourth free; the 3 cauline nematophores on each internode are quite large. "Corbulae long, cylindrical, with 12-14 pairs of leaves, when mature; leaves closed, each with a row of nematophores along its distal edge, and a short, stout spur at the base" (Nutting) (Fraser, 1944).

Gulf Distribution: 5 miles NNE of Pass á Loutre, La., 15 fathoms (Fraser, 1944); Louisiana or Texas (Deevey, 1950); NW Gulf (Deevey, 1954).

Remarks: Not recorded in the present study.

DISCUSSION

An abbreviated tabulation of the data available on the hydroids collected is presented in Table 5. An examination of this table and of the more complete raw data (Appendix B) allows a division of the material collected into three more or less distinct hydroid faunas (Table 6):

(1) The "sargassum fauna." This category includes those species found commonly or exclusively on pelagic sargassum. In most cases, the records of these species are more dependent on the occurrence of sargassum than on individual species tolerances. Furthermore, many species of sargassum epizooans are more or less specific for certain varities of Sargassum, and the occurrence of these forms is dependent upon the appearance of their variety of sargassum. Burkenroad (1939) discusses these epizooans and their specificity in some detail.

(2) The "invertebrate epifauna." This category includes those species found exclusively or commonly on other invertebrates: bivalves, gastropods, hermit crabs, blue crabs, and other hydroids. In many cases, these epifaunal associations are probably due to facultative use of any available hard substrate by the hydroid, but in some instances (e.g., the Hydractinidae), true symbioses occur.

(3) The "typical hydroid fauna." This category includes those species collected on a variety of hard substrates, including groin pilings, jetty rocks, oyster reefs, shell fragments, submerged

Table 5a. Tabular summary of data recorded for hydroids collected in the Galveston Bay area. "F" in depth column represents "floating".

Species	Times Coll.	Months Collected J F M A M J J A S O N D	Depth Ft.	Temp. °C	Sal. Ppt.
Zanclea costata	5	A S	F	35	23-26
Bimeria franciscana	5	J J A S	1	---	3-8
Bougainvillia inaequalis	22	F A J A S O D	1-36	13-33	20-35
Perigonimus jonesi	1	S	F	35	26
Perigonimus repens	1	O	12-18	24	25
Eudendrium exiguum	3	J F	20-30	13-15	---
Eudendrium eximium	5	F M O	6-18	13-26	24
Hydractinia echinata	35	F M A S D	1-30	13-18	28
Podocoryne carnea	44	F M M A D	12-42	13-35	26-32
Stylactis n. sp.	1	S	2	35	26
Ectopleura grandis	9	F O D	18-42	12-24	24-32
Tubularia crocea	7	M A M D	3-36	14-26	24-29
Clytia coronata	21	F A M J J A S	F-18	13-35	21-35
Clytia cylindrica	11	F M J A S O D	F-48	12-35	24-31
Clytia johnstoni	1	A	F	---	---
Clytia longitheca	1	A	24	27	31
Clytia noliformis	6	F M A A	F-18	13	---
Gonothyraea gracilis	21	F A M J A S O	F-24	13-35	21-31
Obelia bicuspidata	5	J J A S O	F-3	30-35	17-26
Obelia dichotoma	35	F M A M J J A S O N D	F-27	14-35	20-34
Obelia geniculata	1	A	12	---	---
Lovenella n. sp.	34	F M A S O D	12-36	14-31	23-32
Lovenella gracilis	22	F A S O D	12-30	15-31	23-32
Lovenella grandis	1	M	30	14	29
Campalecium n. sp.	1	A	1	33	14
Halecium bermudense	4	F	30	9	---
Sertularia mayeri	6	A J A S	F	35	23-26
Plumularia floridana	6	A S	F-12	35	23-26
Aglaophenia late-carinata	11	J A S	F-18	28-35	23-29

Table 5b. Tabular summary of data recorded for hydroids collected in the Galveston Bay area. (Cont'd.)

Species	Areas Collected	Typical Substrates
Zanclea costata	Off Seaside Beach	Sargassum
Bimeria franciscana	West Bay, Lower Galv. Bay	Oyster reef
Bougainvillia inaequalis	Off Seaside Beach	Mud(?), shells, blue crab, etc.
Perigonimus jonesi	West Beach	Sargassum
Perigonimus repens	West Beach	Spiochaetopterus oculatus tubes
Eudendrium exiguum	Off Seaside Beach	Mud(?), bivalve shell
Eudendrium eximium	Off Seaside Beach, West Bay	Mud(?)
Hydractinia echinata	Off Seaside Beach, Pier 22	Gastropods, hermit crabs
Podocoryne carnea	Off Seaside Beach	Gastropods, hermit crabs
Stylactis n. sp.	East Lagoon Lab Settling Tank	On and among bases of Obelia dichotoma
Ectopleura grandis	Off Seaside Beach	Shells, shell fragments
Tubularia crocea	Off Seaside Beach	Pilings, Diopatra tubes, large pipe
Clytia coronata	Off Seaside Beach	Sargassum, blue crabs, worm tubes
Clytia cylindrica	Off Seaside Beach	Sargassum, Tubularids, worm tubes
Clytia johnstoni	San Luis Pass	Sargassum
Clytia longitheca	Off Seaside Beach	Unknown
Clytia noliformis	Off Seaside Beach	Sargassum
Gonothyraea gracilis	Off Seaside Beach, West Bay	Sargassum, Tubularids, shells, blue crab
Obelia bicuspidata	Off Seaside Beach, West Bay	Sargassum, blue crab, Thais, debris
Obelia dichotoma	Seaside Beach	Pilings, blue crabs, rocks, etc.
Obelia geniculata	Off Seaside Beach	Sargassum
Lovenella n. sp.	Off Seaside Beach	Gastropod shells
Lovenella gracilis	Off Seaside Beach	Gastropod shells
Lovenella grandis	Off Seaside Beach	Mud(?)
Campalecium n. sp.	Seaside Beach	Blue crab
Halecium bermudense	Off Seaside Beach	Shell fragments
Sertularia mayeri	Off Seaside Beach	Sargassum
Plumularia floridana	Off Seaside Beach	Sargassum
Aglaophenia late-carinata	Off Seaside Beach	Sargassum

Table 6. Species composition of the three hydroid "faunas." Those species preceded by an asterisk are restricted to a single "fauna."

"Sargassum Fauna"	"Invertebrate Epifauna"	"Typical Hydroid Fauna"
*Zanclea costata	Bougainvillia inaequalis	*Bimeria franciscana
*Perigonimus jonesi	*Perigonimus repens	Bougainvillia inaequalis
Clytia coronata	*Hydractinia echinata	*Eudendrium exiguum
Clytia cylindrica	*Podocoryne carnea	*Eudendrium eximium
*Clytia johnstoni	Clytia coronata	*Stylactis n. sp.
*Clytia noliformis	Clytia cylindrica	*Ectopleura grandis
Gonothyraea gracilis	Gonothyraea gracilis	*Tubularia crocea
Obelia bicuspidata	Obelia bicuspidata	Clytia coronata
Obelia dichotoma	Obelia dichotoma	Clytia cylindrica
*Obelia geniculata	*Lovenella n. sp.	Gonothyraea gracilis
*Sertularia mayeri	*Lovenella gracilis	Obelia bicuspidata
*Plumularia floridana	*Campalecium n. sp.	Obelia dichotoma
*Aglaophenia late-carinata		*Lovenella grandis
		*Halecium bermudense

Substrate unknown: Clytia longitheca

debris, etc. This listing includes most of the frequently collected species, and includes several species also listed in the other two hydroid "faunas."

Three species were collected only rarely, and then without attached substrate. Mud probably serves as a substrate for Eudendrium eximium, and possibly for Lovenella grandis, so these two species have been included in the "general hydroid fauna" category. The single fragment of Clytia longitheca was detached from its substrate.

In the descriptions of the hydroid species, little or no discussion of temperature or salinity tolerances was made for two reasons: (1) in many cases these data are not available for all the collections, and (2) in only a few cases are enough collections available for meaningful conclusions to be drawn. A single species (Bimeria franciscana) was restricted to the low salinities of the bay areas, and only three species (Eudendrium eximium, Gonothyraea gracilis, and Obelia bicuspidata) were collected from both bay and seaside areas. The remainder of the species collected were restricted to the seaside beach and offshore areas, which exhibited neither extremely high nor low salinities. Furthermore, in my opinion, temperature and salinity tolerance limits should be based on laboratory studies, not on a miscellaneous assemblage of collecting data which do not necessarily reflect the actual tolerances or even the optimal conditions for the organism studied. In any event, the complete data available are listed by collection in Appendix B,

and the extreme values recorded (rounded off) for each species have been included in Table 5.

In place of temperature and salinity tolerances, some reflection of the seasonality of the organisms has been attempted; the months during which each species was collected are listed in the remarks section of the descriptions, in Table 5, and in Appendix B. It is felt that this information is of more value to the field collector than tolerance limits, and may reflect the occurrence of the species more truly than simple temperature ranges.

Also, no discussion is made of bathymetric distribution since, in most cases, the depths are shallow (30 feet or less). Table 5 should be consulted for recorded extreme depths. Interpretation of these data is difficult for several reasons. Those forms exclusively restricted to sargassum are normally found only at the uppermost region of the water column. Occasionally, however, portions of the plant break off and sink, and records of hydroids from these deep fragments give abnormal (though not unnatural) distributions. For example, Fraser (1944) records Plumularia floridana on sunken sargassum from as deep as 1525 fathoms. Also, the bathymetric location of the invertebrate epifaunal forms is complicated by the habits of the host, which may depend on season or reproductive state of the host. And finally, but of major consideration, recorded tolerances to depth (as well as to all other parameters) are as much dependent on collecting effort as on actual occurrence. No samples were available for depths greater than 50 feet. It would be very

interesting to know what species occur at various depths on the supports of the offshore drilling platforms, but collections from those structures were not available. Similarly, no hydroids were reported for all of Upper Galveston or Trinity Bays, since no samples were available for those areas.

The list of species collected seems small when compared with those reported for other areas. Nutting (1901) reported 83 species from the Woods Hole region, Fraser (1912) reported 51 species from the Beaufort area, and Fraser (1914) reported 136 species from the Vancouver Island region.

Several explanations for this paucity in hydroid fauna are evident. The most obvious is a lack of suitable hard substrate. The northern Gulf coast has a sand and mud shoreline, with man-made pilings and jetties serving as the prominent hard surfaces. The most productive substrates noted in this study were seaside pilings, such as wooden groins or piers. The few natural hard substrates include other invertebrates (e.g., crabs and oyster reefs) and shell gravel. A second explanation for lack of diversity among many phyla is the occurrence of large-scale temperature and/or salinity changes common in Texas bays, and a wide seasonal range of temperatures (Hopkins, personal communication, 1970). These environmental changes occur when cold fronts pass through the area, rapidly changing the temperature of shallow bay waters, or when drought or excess precipitation and subsequent run-off cause high salinity or freshet conditions, respectively. Also important is the

large seasonal temperature range common in Gulf waters. As noted previously, Pullen (1961) reported a range of 14 C to 31 C for Galveston Bay, and I recorded temperatures varying from 14 C to 35 C for my collections.

The zoogeographic distributions of many of the species collected during the present study are comprehensively discussed by Deevey (1950), and will not be detailed here. Instead, an attempt will be made to discuss briefly the zoogeographic affinities of groups of species. The species collected and their reported North American distributions are listed in Table 7.

Table 7. Previously recorded North American distributions and zoogeographic categories (as referred to in the text) of the hydroids collected in the Galveston Bay area.

	Canada Atlantic Coast	Cape Hatteras to Maine	C. Canaveral to C. Hatteras	So. Florida & Caribbean	NE Gulf of Mexico	NW Gulf of Mexico	North America Pacific Coast	Widespread	Gulf Coast Disjunct	Warm water	New species	Other	New for Texas waters	New for Gulf waters
Zanclea costata	X	X	X	X	X			X						
Bimeria franciscana				X	X	X				X				
Bougainvillia inaequalis				X	X					X				
Perigonimus jonesi	X				X				X				X	
Perigonimus repens	X					X					X			X
Eudendrium exiguum			X							X			X	
Eudendrium eximium			X	X						X			X	

Table 7. Previously recorded North American distributions and zoogeographic categories (as referred to in the text) of the hydroids collected in the Galveston Bay area. (Cont'd.)

	Canada Atlantic Coast	Cape Hatteras to Maine	C. Canaveral to C. Hatteras	So. Florida & Caribbean	NE Gulf of Mexico	NW Gulf of Mexico	North America Pacific Coast	Widespread	Gulf Coast Disjunct	Warm water	New species	Other	New for Texas waters	New for Gulf waters
Hydractinia echinata	X	X	X		X	X			X					
Podocoryne carnea		X	X		X	X			X					
Stylactis n. sp.											X			
Ectopleura grandis		X		X	X	X		X						
Tubularia crocea	X	X	X		X	X	X		X					
Clytia coronata			X	X	X	X		X						
Clytia cylindrica		X	X	X	X	X	X	X						
Clytia johnstoni	X	X	X	X		X	X	X					X	
Clytia longitheca							X							X
Clytia noliformis	X	X	X	X	X	X		X						
Gonothyraea gracilis	X	X	X	X	X	X	X	X						
Obelia bicuspidata		X	X	X	X	X	X	X						
Obelia dichotoma	X	X	X	X	X	X	X	X						
Obelia geniculata	X	X	X	X		X	X	X						
Lovenella n. sp.											X			
Lovenella gracilis		X	X		X				X				X	
Lovenella grandis		X			X				X				X	
Campalecium n. sp.											X			
Halecium bermudense			X	X	X					X			X	
Sertularia mayeri				X						X			X	
Plumularia floridana		X	X	X		X		X					X	
Aglaophenia late-carinata		X	X	X	X	X		X						

Many of the species (e.g., Zanclea costata, Ectopleura grandis, Clytia coronata, Clytia cylindrica, Clytia johnstoni, Clytia noliformis, Gonothyraea gracilis, Obelia bicuspidata, Obelia

dichotoma, Obelia geniculata, Plumularia floridana, and Aglaophenia late-carinata) are widely distributed forms, ranging from Canada or the northeastern U.S. coast to the Caribbean, and many are also known from Europe and the U.S. Pacific coast. Species with a wide geographic distribution such as these species exhibit would be expected anywhere along the U.S. coast, and their occurrence at Galveston is not unusual.

Several additional species (e.g., Perigonimus jonesi, Hydractinia echinata, Podocoryne carnea, Tubularia crocea, Lovenella gracilis, and Lovenella grandis) have similar distributional records, but are absent from the Caribbean region. These species tend to be restricted to cooler waters, and their occurrence at Galveston helps demonstrate the affinity of the northern Gulf coast to the southern U.S. Atlantic coast (Carolinian Province). This type of distribution is called "Gulf coast disjunct" by Deevey (1950), and is discussed in detail by him.

On the other hand, several species (e.g., Bimeria franciscana, Bougainvillia inaequalis, Eudendrium exiguum, Eudendrium eximium, Halecium bermudense, and Sertularia mayeri) are apparently warm water forms, and are found only along the southern Atlantic coast and in the Caribbean region. The presence of these forms in Texas implies an affinity to the fauna of the Caribbean region, although there seems to be less affinity with that region than with the Atlantic coast, if the number of shared species is taken as a measure of affinity.

This leaves only five species unaccounted for. Of these, three are described as new (Stylactis n. sp., Lovenella n. sp., and Campalecium n. sp.), and the other two (Perigonimus repens and Clytia longitheca) are identified without certainty. If correctly identified, these last two species show unusual distributional patterns. Both are known from the U.S. Pacific coast and one is also known from the New England area.

In summary, these data would seem to indicate that the hydroid fauna of the northwestern Gulf has affinities closer to the Atlantic coast than to the Caribbean. Many species are shared with the Caribbean, but most of these species are widespread, and occur also in more northern waters, as well as elsewhere in the world. Furthermore, many of the shared species are transients restricted to sargassum, and are not typical members of the resident hydroid fauna of the Galveston area. The apparent zoogeographic affinity with the hydroid fauna of the southern U.S. Atlantic coast would seem to justify considering the northern Gulf coast as part of the Carolinian zoogeographic province, as has been done throughout this thesis.

SUMMARY

1. The literature pertaining to hydroids from the Gulf of Mexico, Caribbean, and southern U.S. Atlantic coast is discussed and tabulated. It is pointed out that only ten papers report six or more species of hydroids from the coasts of Texas and Louisiana. Of these ten, only two (Deevey, 1950; Fincher, 1955) are primarily concerned with hydroids, and the latter is little more than a checklist. The remaining eight papers are ecological studies or checklists. Therefore, the bulk of our reliable knowledge of the hydroids of the region is based upon a single paper.

2. Methods and materials used are described. Specimens were preserved with formalin following narcotization with magnesium sulfate.

3. The Galveston Bay area is described and several ecologically important parameters are discussed. Each commonly visited collecting site is described.

4. A total of 90 species has now been reported from the northern Gulf of Mexico. Of these, 62 have been reported from the coasts of Texas and Louisiana, and 29 were collected in the present study. A key, verbal descriptions, figures, and northern Gulf coast synonymies and distribution records are given for each of the species reported from Texas and Louisiana. The results of the study of collections examined are summarized and tabulated, and a discussion is presented of three more or less distinct hydroid "faunas." It

is suggested that the paucity of reported hydroids in the area is due to scarcity of suitable substrate, highly variable environmental conditions, and lack of collecting effort. The previously reported distribution records of the species collected are tabulated and briefly discussed. It is concluded that the Galveston Bay area shows zoogeographic affinities to both the Caribbean Sea and the Atlantic coast of the United States, but that a stronger affinity exists for the latter region than for the former, based upon a count of number of shared species.

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APPENDIX A: GLOSSARY OF TERMS

APPENDIX A: GLOSSARY OF TERMS

Those entries preceded by an asterisk are quoted or paraphrased from Fraser, 1944.

*Acrocyst: an extra-capsular sac surrounded by a gelatinous covering in which development of the ova takes place.

Abcauline: away from the stem.

Adcauline: towards the stem.

Adnate: grown fast to; fused together.

Anastomosis: a union; intercommunication; interconnection.

Axillary: branches or pedicels which arise from the axil of the stem and another branch or pedicel.

*Bithalmic: two-chambered, as in the nematophores of certain Plumularidae.

*Blastostyle: a modified zooid that serves as an axis or support for developing sporosacs or medusa-buds.

Campanulate: bell-shaped.

Capitate: terminating in a knob or cap.

Clavate: club-shaped; elongate obconical.

*Coenosarc: the cellular and intercellular substance of a zooid or whole colony.

*Coppinia: a mass formed of a close aggregation of gonangia, among which are scattered modified hydrothecae, which serve as a protection for the mass. Found in the Lafoeidae.

*Corbula: a specially modified hydrocladium which forms a protective

structure for the gonangia or sporosacs in certain of the Plumularidae.

*Diaphragm: a partial, transverse, perisarcal partition near the base of the hydrotheca, which forms a support for the base of the hydranth.

Fascicled: referring to a stem or branch of two or more adnate tubes. See Figure 24a, Campanularia verticillata.

Filiform: thread-like; slender and slightly tapering throughout.

*Generative zooid: a zooid that gives rise to sporosacs or medusa-buds.

Geniculate: having knee-like joints or bends.

*Gonangium: a perisarcal protection for the gonophore.

*Gonophore: a zooid that gives rise to sporosacs or medusa buds.

*Gonosome: a collective term for all the generative zooids of a colony, and structures that are directly associated with them.

Hyaline: glassy or transparent.

*Hydranth: a nutritive zooid.

*Hydrocladium: an ultimate branch that bears sessile hydrothecae but only on one side; found in the Plumularidae.

*Hydrocaulus: the axis for support in colonial forms or the single pedicel in solitary species.

*Hydrophore: a saucer-shaped hydrotheca, not deep enough to contain the contracted hydranth; found in the Halecidae.

*Hydrorhiza: a creeping stem that gives rise to single zooids or to colonies; it may be filiform, or may have cross communications

with other stolons to form a network (a reticular stolon).

*Hydrotheca: a perisarcal protection for the hydranth in calyptoblastic species.

*Hypostome: the hollow elevation from the body of the hydranth which supports the mouth.

*Internode: the portion of a stem or branch between successive joints.

Intrathecal ridge: a ridge extending more or less across the interior surface of the hydrotheca in certain Plumularidae.

*Medusa-bud: an outgrowth from the blastostyle, or sometimes directly from the stem or branch, that develops into a medusa.

*Medusoid: a structure similar to a medusa-bud, but usually lacking one or more of the regular characters of the medusa, e.g., the digestive tract, mouth, radial canals, or tentacles.

Mesial: median; pertaining to or situated in a median plane or line.

Monothalmic: one-chambered.

*Nematophore: the perisarcal protection for a sarcodal or coenosarcal process containing nematocysts, including both the sarcostyle and sarcotheca.

*Node: a joint in the stem or branch.

Nutritive zooid: a feeding or non-generative zooid.

Ob-: prefix meaning "inverted".

*Operculum: a chitinous structure of one or more segments that closes the hydrothecal aperture when the hydranth is contracted.

Ovate: egg-shaped.

*Pedicel: the stalk supporting a hydranth or gonophore.

*Pellicle: a thin, flexible perisarcal covering.

*Perisarc: a non-cellular, chitinous protective covering secreted by the ectodermal cells of the coenosarc.

Proboscis: the hypostome.

Reticular: netlike; entangled.

Rugose: wrinkled; ridged; folded.

*Simple: not fascicled.

Solitary: zooids which arise singly and unbranched from the stolon.

*Sporosac: a sac that buds from a blastostyle, or directly from a stem or branch to form a chamber in which the sex cells are matured. The female sporosacs may retain the developing ova until they become planulae.

Stem: the hydrocaulus.

Stolon: the hydrorhiza.

Supracalycine: above the hydrotheca; in the Plumularidae, the paired nematophores located just distal to the hydrotheca.

*Trophosome: a collective term for all the nutritive zooids of a colony and structures that are directly connected with them.

Truncate: square or broad at the end, as if cut off transversely.

Turbinate: shaped like a spinning top; obconical.

Verticil: a whorl or circle; arranged around a point on an axis.

*Zooid: one of the individuals, more or less independent, that go to make up a colony; they may be nutritive, generative, defensive, or sensory.

APPENDIX B: TABLE OF RAW DATA

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This table of raw data includes most of the data available to me. In some instances, however, some or all of the collecting data are not available. In these cases, dashes are entered in the table, in lieu of the data. Categories not applicable (e.g., hydrotheca measurements for gymnoblasts, or number of teeth for even-margined calyptoblasts) are left blank. The species are listed in the same sequence as in Tables 5 and 7. The entries which consist mainly of dashed lines are Bureau of Commercial Fisheries dredge samples collected in the Galveston area. A letter requesting the collecting information for these samples has been mailed, but no reply has been recieved at the time of writing.

In order to conserve space in the table headings, the following abbreviated column headings are used:

Coll. #	Collection number;
Mm	Height of largest colony, in millimeters;
Htca LxW	Hydrotheca length and width, in microns;
#T or #O	Number of teeth or opercular segments present, where applicable;
G	Presence (+) or absence (-) of gonosome;
Date	Date collected;
Site	Collecting site;
C	Temperature, in degrees Celsius;
Ppt	Salinity, in parts per thousand;
Z	Depth, in feet (F = floating);
Substrate	Actual substrate upon which the colony was found.

In order to conserve space in the table itself, the following code for the collecing sites has been used:

ArcRf	Arcadia Reef
BolFB	Front Beach, Bolivar Peninsula
BolRd	Bolivar Roads, off jetties
DknBy	Dickinson Bay
ELLST	East Lagoon Laboratory Settling Tank
EstBc	East Beach, Galveston Island
FntBc	Front Beach, Galveston Island
FstIs	First Island, West Bay
GalvA	Galveston area (specific site not known)
HanRf	Hanna Reef
OBolP	Off Bolivar Peninsula
OEsBc	Off East Beach, Galveston Island
OEOSW	Off end of sea wall, Galveston Island
OffBy	Offat's Bayou
OFlgH	Off Flagship Hotel, Galveston
OFtBc	Off Front Beach, Galveston Island
OWsBc	Off West Beach, Galveston Island
Pr.22	Pier 22, Galveston harbor
PtArs	Port Aransas
SnLsP	San Luis Pass
SoJet	South Jetty, and vicinity
SwoRf	Switchover Reef
WstBc	West Beach, Galveston Island
WstBy	West Bay

Table 8a. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca	LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Zanclea costata Gegenbaur											
680802-1	1.0				+	2 Aug 68	FntBc	----	-----	F	Sargassum
690906-1	1.5				+	6 Sep 69	SoJet	35.0	23.22	F	Sargassum
690906-4	2.0				+	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
690906-5	1.0				+	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
690906-6	1.5				+	6 Sep 69	FntBc	35.0	25.92	F	Sargassum
Bimeria franciscana Torrey											
680701-1	130				+	1 Jul 68	HanRf	----	-----	1	Oyster reef
680801-1	50				+	1 Aug 68	HanRf	----	2.8	1	Oyster reef
680801-2	80				+	1 Aug 68	SwoRf	----	7.8	1	Oyster reef
690906-3	80				+	6 Sep 69	WstBc	----	-----	--	On large cable spool, on beach
690909-1	100				+	18 Jun 69	DknBy	----	-----	1	Caught on intake screen, Houston Power & Light cooling facility
Bougainvillia inaequalis Fraser											
660220-1	90				-	20 Feb 66	OWsBc	13.1	-----	18	Unknown
670509-2	5				-	9 May 67	OFtBc	23.5	24.04	6	*Tubularia crocea*
670924-6	40				+	24 Sep 67	OEOSW	28.0	27.54	30	Unknown
680716-1	25				+	16 Jul 68	EstBc	----	-----	3	*Callinectes sapidus*
680729-1	60				+	29 Jul 68	FntBc	----	-----	1	Shell fragment
680804-8	60				+	4 Aug 68	OEOSW	32.0	30.78	30	Unknown
680804-9	80				+	4 Aug 68	OEOSW	27.0	31.32	24	Unknown
680804-11	120				+	4 Aug 68	OEOSW	27.0	31.32	24	Unknown
680827-6	3				-	27 Aug 68	OEOSW	31.0	23.76	18	Calcareous worm tube
681017-3	100				-	17 Oct 68	OFlgH	25.8	25.92	24	Unknown
681017-4	50				-	17 Oct 68	OFlgH	25.7	25.92	30	Unknown
681017-5	50				-	17 Oct 68	OFlgH	25.8	26.46	36	Unknown
681204-2	10				+	4 Dec 68	OFlgH	15.7	30.78	24	*Thais haemastoma*

Table 8b. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Bougainvillia inaequalis Fraser (Cont'd.)										
681204-5	4			+	4 Dec 68	OEOSW	15.5	31.86	24	*Mulinia lateralis*
681204-5	20			-	4 Dec 68	OEOSW	15.5	31.86	24	Unknown
681204-9	5			-	4 Dec 68	OEOSW	14.5	28.62	12	*Mulinia lateralis*
690202-1	25			-	2 Feb 69	SoJet	18.0	25.92	1	Jetty rocks
690202-4	15			+	2 Feb 69	BolFb	19.0	23.76	F	Tangled flotsam
690226-2	10			-	26 Feb 69	OFlgH	14.8	24.30	18	Unknown
690418-3	15			-	18 Apr 69	SnLsP	20.0	19.98	1	*Balanus* sp. on concrete pilings
690419-5	30			-	19 Apr 69	FntBc	20.0	23.76	F	Unknown, detached
690801-2	20			+	1 Aug 69	SoJet	33.0	34.56	F	Black polyethylene sheet
Perigonimus jonesi Osborn and Hargitt										
690906-4	1			-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
Perigonimus repens (Wright)										
681023-2	2			-	23 Oct 68	OEOSW	24.0	24.84	12	*Spiochaetopterus oculatus* tube
681023-5	3			-	23 Oct 68	OEOSW	24.0	25.38	18	*Spiochaetopterus oculatus* tube
Eudendrium exiguum Allman										
660120-1	20			-	6 Jan 66	OBolP	13.0	-----	20	Unknown
660120-2	60			-	7 Jan 66	BolRd	14.8	-----	30	Bivalve shell
660205-2	30			-	---------	-----	----	-----	--	Unknown
660205-4	50			-	---------	-----	----	-----	--	Unknown
Eudendrium eximium Allman										
660204-3	150			-	---------	-----	----	-----	--	Unknown
660220-7	50			-	29 Feb 66	OWsBc	13.1	-----	18	Unknown
660222-4	150			-	---------	-----	----	-----	--	Unknown

Table 8c. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Eudendrium eximium Allman (Cont'd.)										
670504-1	70			-	4 May 67	OFtBc	25.5	24.04	6	Unknown
671014-1	200			+	14 Oct 67	WstBy	----	-----	--	Unknown
Hydractinia echinata Fleming										
651217-1	2			+	17 Dec 67	-----	----	-----	--	1-*Polinices duplicata*/*Pagurus pollicaris*
660222-1	2			+	22 Feb 66	GalvA	12.9	-----	30	3-*P. duplicata*/*P. pollicaris*
660222-3	2			+	22 Feb 66	-----	----	-----	--	1-*P. duplicata*/*P. pollicaris*
670301-3	2			+	1 Mar 67	-----	----	-----	--	1-*P. duplicata*/*P. longicarpus*
670320-1	2			+	20 Mar 67	OEsBc	18.0	27.16	18	1-*P. duplicata*/*P. longicarpus* 1-*P. duplicata*/*P. pollicaris*
670320-6	2			+	20 Mar 67	-----	----	-----	--	1-*P. duplicata*/*P. pollicaris*
670320-7	2			+	20 Mar 67	-----	----	-----	--	2-*P. duplicata*/*P. longicarpus*
670802-1	2			+	2 Aug 67	OF1gH	----	-----	12	1-*P. duplicata*/*P. pollicaris*
670802-2	2			+	2 Aug 67	OEOSW	----	-----	12	1-*Thais haemastoma*/empty
680924-1	2			+	24 Sep 68	Pr.22	----	-----	1	1-*P. duplicata*/*P. pollicaris*
690614-1	2			+	Unknown	GalvA	----	-----	--	2-*P. duplicata*/*P. pollicaris* 1-*P. duplicata*/*P. longicarpus* 1-*P. duplicata*/empty 1-*Cantharus cancellarus*/*P. pollicaris*
700328-2	2			+	Unknown	GalvA	----	-----	--	14-*P. duplicata*/*P. longicarpus* 1-*P. duplicata*/*P. pollicaris* 1-*C. cancellarus*/*P. longicarpus*
Podocoryne carnea Sars										
651217-1	3			+	17 Dec 65	-----	----	-----	--	1-*Busycon pyrum*/*P. pollicaris* 1-*T. haemastoma*/*P. pollicaris* 2-*P. duplicata*/*P. pollicaris*

Table 8d. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca	LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Podocoryne carnea Sars (Cont'd.)											
651217-1	3				+	17 Dec 65	-----	----	-----	--	2-C. cancellarus/living
660205-2	3				+	5 Feb 66	-----	----	-----	--	4-C. cancellarus/living
660220-2	3				+	29 Feb 66	OWsBc	13.1	-----	18	10-C. cancellarus/living
660222-1	3				+	22 Feb 66	GalvA	12.9	-----	30	2-P. duplicata/P. pollicaris
											1-C. cancellarus/P. pollicaris
660222-3	3				+	22 Feb 66	-----	----	-----	--	2-C. cancellarus/living
670301-1	3				+	1 Mar 67	-----	----	-----	--	1-C. cancellarus/P. pollicaris
670302-2	3				+	2 Mar 67	OWsBc	13.5	28.59	30	1-C. cancellarus/P. pollicaris
											1-P. duplicata/P. pollicaris
670320-1	3				+	20 Mar 67	OEsBc	18.0	27.16	18	1-P. duplicata/P. longicarpus
											1-C. cancellarus/P. longicarpus
670320-6	3				+	20 Mar 67	-----	----	-----	18	1-C. cancellarus/P. pollicaris
670320-10	3				+	20 Mar 67	-----	----	-----	42	1-C. cancellarus/empty
670509-4	3				+	9 May 67	-----	----	-----	6	1-P. duplicata/empty
670802-1	3				+	2 Aug 67	OF1gH	----	-----	12	1-P. duplicata/empty
											1-P. duplicata/P. pollicaris
680804-2	3				+	4 Aug 68	OF1gH	30.0	28.62	18	1-T. haemastoma/living
680827-7	3				+	27 Aug 68	OEOSW	30.9	23.22	12	1-C. cancellarus/P. longicarpus
681204-2	3				+	4 Dec 68	OF1gH	15.7	30.78	24	2-C. cancellarus/living
681204-4	3				+	4 Dec 68	OEOSW	15.6	31.86	30	2-C. cancellarus/living
700328-2	3				+	Unknown	GalvA	----	-----	--	3-C. cancellarus/P. longicarpus
Stylactis new species											
690905-1	3				+	5 Sep 69	ELLST	35.0	25.92	2	On and among bases of *Obelia*

Table 8e. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Ectopleura grandis Fraser										
?660203-1	15			-	3 Feb 66	OFtBc	12.1	-----	48	Shell fragments
?660207-1	8			-	7 Feb 66	OFtBc	----	-----	24	*Bugula* sp.
?660222-4	25			-	22 Feb 66	-----	----	-----	--	Unknown
?681023-1	5			-	23 Oct 68	OEOSW	24.2	25.92	24	*Ectopleura grandis* stem
?681204-4	50			-	4 Dec 68	OEOSW	15.6	31.86	30	Bivalve shell
?681204-5	20			-	4 Dec 68	OEOSW	15.5	31.86	24	Unknown
690226-2	50			+	26 Feb 69	OEOSW	14.8	24.30	18	Bivalve shells
?690226-3	40			-	26 Feb 69	OEOSW	14.9	24.76	24	*Nassarius acuta*
?690802-4	50			-	Unknown	OWsBc	----	-----	42	Unknown
Tubularia crocea (Agassiz)										
670302-1	70			+	2 Mar 67	OEsBc	13.5	28.59	30	Unknown
670504-1	35			+	4 May 67	OFtBc	25.5	24.04	6	*Diopatra cuprea* tubes
670509-1	45			+	9 May 67	OEsBc	25.0	24.04	6	Unknown
670509-2	105			+	9 May 67	OFtBc	23.5	24.04	6	Unknown
681204-3	--			+	4 Dec 68	OF1gH	15.6	28.62	36	Unknown, detached hydranth only
?690400-1	50			+	Apr 69	PtArs	----	-----	--	Pilings
690418-1	50			+	18 Apr 69	WstBc	20.0	25.38	3	Large pipe in surf zone
Unidentifiable Tubularidae (hydranths detached)										
670301-5	40				1 Mar 67	-----	----	-----	--	Unknown
670302-2	20				2 Mar 67	OWsBc	13.5	28.59	30	Unknown
670802-6	20				2 Aug 67	OFtBc	----	-----	18	Unknown
670924-6	20				24 Sep 67	OEOSW	28.0	27.54	30	Unknown
680804-9	25				4 Aug 68	OEOSW	27.0	31.32	24	Shell fragment
680804-10	20				4 Aug 68	OEOSW	27.0	31.32	24	Bivalve shell
680924-5	10				24 Sep 68	OEOSW	31.0	24.84	30	Unknown
681023-4	8				23 Oct 68	OEOSW	24.5	25.92	30	Bivalve shell

Table 8f. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Clytia coronata (Clarke)										
620701-1	3	-------	9	+	1 Jul 62	WstBc	----	-----	--	*Callinectes sapidus*, female
660220-1	4	650x278	9	+	20 Feb 66	OWsBc	13.1	-----	18	Sargassum
660706-1	2	371x186	9	-	6 Jul 66	FntBc	----	-----	1	*Diopatra cuprea* tube
670414-2	2	603x232	9	-	14 Apr 67	ArcRf	----	-----	F	Sargassum
670504-1	2	464x209	9	-	4 May 67	OFtBc	25.5	24.04	6	Sargassum, *Eudendrium eximium*
670605-1	3	557x232	9	+	5 Jun 67	FntBc	----	-----	F	Sargassum
670605-3	10	650x302	9	+	5 Jun 67	OFtBc	25.5	24.04	6	Unknown
670802-2	3	650x325	8	-	2 Aug 67	OEOSW	----	-----	12	Sargassum leaf
670802-6	2	964x186	9	-	2 Aug 67	OFtBc	----	-----	18	*Diopatra cuprea* tube
680716-2	2	557x232	9	-	16 Jul 68	EstBc	----	-----	F	Sargassum
680729-1	2	650x232	9	+	29 Jul 68	FntBc	----	-----	F	Sargassum
680804-2	4	557x233	9	+	4 Aug 68	OFlgH	30.0	28.62	18	Unknown
680924-8	2	626x232	9	-	24 Sep 68	OEOSW	----	-----	12	*Spiochaetopterus oculatus* tube
690608-1	5	580x278	9	+	8 Jun 69	WstBc	----	-----	F	Sargassum
690613-2	2	487x186	8	-	13 Jun 69	WstBc	30.0	21.60	1	*Obelia dichotoma*
690613-5	3	603x232	9	+	13 Jun 69	SnLsP	30.0	20.52	F	Wooden grid
690613-5	3	510x278	9	+	13 Jun 69	SnLsP	30.0	20.52	F	Sargassum
690614-5	3	510x163	9	+	14 Jun 69	SoJet	30.0	21.60	F	Sargassum
690615-1	3	650x186	9	+	15 Jun 69	BolFB	30.0	21.60	F	Sargassum
690801-2	4	557x278	9	+	1 Aug 69	SoJet	33.0	34.56	1	*Callinectes sapidus*
690906-4	3	394x232	8	-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
Clytia cylindrica (Agassiz)										
660106-1	2	-------	12	-	16 Dec 65	-----	----	-----	F	Sargassum
660203-1	4	975x348	12	-	3 Feb 66	OFtBc	12.1	-----	48	*Ectopleura grandis* stems
670509-1	3	650x255	12	+	9 May 67	OEsBc	25.0	24.04	6	*Tubularia crocea* stems
670509-2	1	603x242	12	-	9 May 67	OFtBc	23.5	24.04	6	*Tubularia crocea* stems
670509-3	2	-------	10	+	9 May 67	-----	----	-----	6	Sargassum

Table 8g. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Clytia cylindrica (Agassiz) (Cont'd.)										
670802-5	2	557x255	11	-	2 Aug 67	OFtBc	----	-----	24	Shell fragments
680729-1	3	696x255	11	-	29 Jul 68	FntBc	----	-----	F	Sargassum
680924-8	2	650x255	11	-	24 Sep 68	OEOSW	----	-----	12	Bivalve shell
681023-5	2	696x255	10	-	23 Oct 68	OEOSW	24.0	25.38	18	*Spiochaetopterus oculatus* tube
681204-2	3	975x348	12	+	4 Dec 68	OF1gH	15.7	30.78	24	*Diopatra cuprea* tubes
690906-4	2	650x255	10	-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
Clytia johnstoni (Alder)										
670414-1	3	487x278	11	+	14 Apr 67	SnLsP	----	-----	F	Sargassum
Clytia longitheca (Fraser)										
680804-10	4	696x139	14	-	4 Aug 68	OEOSW	27.0	31.32	24	Sargassum
Clytia noliformis (McCrady)										
660220-1	2	418x302	10	-	20 Feb 66	OWsBc	13.1	-----	18	Sargassum
670320-4	3	-------	10	+	20 Mar 67	-----	----	-----	18	Sargassum
670320-5	2	-------	10	+	20 Mar 67	-----	----	-----	18	Sargassum
670320-8	3	-------	10	-	20 Mar 67	-----	----	-----	30	Sargassum
670414-1	2	418x348	10	+	14 Apr 67	SnLsP	----	-----	F	Sargassum
680802-1	2	394x278	10	-	2 Aug 68	FntBc	----	-----	F	Sargassum
Gonothyraea gracilis (Sars)										
660204-2	5	1090x418	13	+	4 Feb 66	OFtBc	13.3	-----	18	Unknown
660205-3	5	--------	12	+	5 Feb 66	-----	----	-----	--	Tubularid stem
660207-1	8	1045x394	10	-	7 Feb 66	OFtBc	----	-----	18	*Bugula* sp.
670414-1	5	882x348	12	+	14 Apr 67	SnLsP	----	-----	F	Sargassum
670504-1	4	580x302	12	+	4 May 67	OFtBc	25.5	24.04	6	*Tubularia crocea* stem
670509-1	3	557x255	12	+	9 May 67	OEsBc	25.0	24.04	6	*Tubularia crocea* stem

Table 8h. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Gonothyraea gracilis (Sars) (Cont'd.)										
670509-2	5	812x278	11	+	9 May 67	OFtBc	23.5	24.04	6	Tubularia crocea stems
670605-2	8	765x325	10	+	5 Jun 67	FntBc	----	-----	F	Sargassum
680802-1	5	557x278	11	+	2 Aug 68	FntBc	----	-----	F	Sargassum
680804-1	4	580x255	12	+	4 Aug 68	OF1gH	30.0	28.62	F	Sargassum
680804-2	7	905x325	11	+	4 Aug 68	OF1gH	30.0	28.62	18	Thais haemastoma
680804-9	8	882x325	12	+	4 Aug 68	OEOSW	27.0	31.32	24	Tubularid stems, shell fragments
680807-2	11	765x302	12	+	7 Aug 68	FstIs	----	-----	F	Sargassum
680827-1	4	789x255	10	+	27 Aug 68	OF1gH	30.2	23.76	12	Unknown
681017-2	6	882x302	12	+	17 Oct 68	OF1gH	25.9	26.46	18	Small bivalve shell
690613-1	10	743x325	12	+	13 Jun 69	WstBc	30.0	21.60	1	Callinectes sapidus
690613-2	4	673x255	12	+	13 Jun 69	WstBc	30.0	21.60	1	Wooden stump in surf zone
690613-3	8	812x371	12	+	13 Jun 69	WstBc	30.0	21.60	F	Sargassum
690613-5	4	905x302	12	+	13 Jun 69	SnLsP	30.0	20.52	F	Sargassum
690906-5	6	510x255	12	+	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
690906-6	4	580x232	11	+	6 Sep 69	FntBc	35.0	25.92	F	Sargassum
Obelia bicuspidata Clarke										
680716-1	5	408x165	9	-	16 Jul 68	EstBc	----	-----	3	Callinectes sapidus
680807-1	15	485x174	10	+	7 Aug 68	FstIs	----	-----	3	Wooden 2" x 2" timber
681023-3	2	464x186	7	-	23 Oct 68	Pr.22	----	-----	--	Thais haemastoma, above water
690614-3	8	485x165	10	-	14 Jun 69	OffBy	30.0	16.74	3	Brick
690906-4	3	456x155	9	-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
Obelia dichotoma (Linnaeus)										
620701-1	5	-------		-	1 Jul 62	WstBc	----	-----	--	Callinectes sapidus, female
640624-1	11	310x214		+	24 Jun 64	BolRd	----	-----	27	Callinectes sapidus
670414-1	5	252x175		-	14 Apr 67	SnLsP	----	-----	F	Sargassum
670509-2	4	330x242		-	9 May 67	OFtBc	23.5	24.04	6	Tubularia crocea stems

Table 8i. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Obelia dichotoma (Linnaeus) (Cont'd.)										
680716-1	11	350x252		+	16 Jul 68	EstBc	----	-----	3	*Callinectes sapidus*
680729-1	20	310x214		+	29 Jul 68	FntBc	----	-----	1	*Callinectes sapidus*
680729-2	6	427x330		-	29 Jul 68	FntBc	----	-----	1	*Callinectes sapidus*, empty shell
680819-1	85	340x242		+	19 Aug 68	ELLST	----	-----	2	Settling tank walls
681026-1	8	446x252		-	26 Oct 68	FntBc	23.0	27.00	1	Wooden groin pilings
681026-2	8	417x272		-	26 Oct 68	FntBc	23.0	27.00	1	Wooden groin pilings
681123-1	7	398x262		-	23 Nov 68	FntBc	20.0	29.16	1	Wooden groin pilings
681204-1	7	485x291		+	4 Dec 68	OF1gH	14.7	29.16	12	Unknown
690202-1	10	485x340		+	2 Feb 69	SoJet	18.0	25.92	1	Jetty rocks
690202-2	10	466x310		+	2 Feb 69	FntBc	15.0	25.92	1	Wooden groin pilings
690226-1	10	388x330		-	26 Feb 69	FntBc	14.8	23.22	12	Unknown
690226-2	9	350x223		-	26 Feb 69	FntBc	14.8	24.30	18	Unknown
690302-1	14	485x350		+	2 Mar 69	FntBc	14.0	24.84	1	Wooden groin pilings
690418-1	10	350x272		+	18 Apr 69	WstBc	20.0	25.38	3	Large pipe in surf zone
690418-3	10	427x310		+	18 Apr 69	SnLsP	20.0	19.98	1	*Thais haemastoma*
690418-3	12	340x252		+	18 Apr 69	SnLsP	20.0	19.98	1	Concrete pilings of causeway
690419-4	26	350x310		+	19 Apr 69	WstBc	20.0	23.76	1	Large log in surf zone
690420-1	15	291x204		-	20 Apr 69	FntBc	20.0	25.92	1	Wooden groin pilings
690613-1	6	369x262		+	13 Jun 69	WstBc	30.0	21.60	1	*Callinectes sapidus*
690613-2	4	350x214		-	13 Jun 69	WstBc	30.0	21.60	1	Wooden stump in surf zone
690613-4	15	350x291		+	13 Jun 69	WstBc	30.0	21.60	1	Wooden posts
690613-5	5	301x233		-	13 Jun 69	WstBc	30.0	20.52	1	Wooden grid
690614-2	19	340x242		-	14 Jun 69	ELLST	30.0	19.44	2	Plastic bucket in settling tank
690614-4	5	388x272		+	14 Jun 69	FntBc	30.0	21.60	1	Wooden groin pilings
690801-1	65	291x242		+	1 Aug 69	ELLST	33.5	26.46	2	Tank walls
690802-1	12	398x291		-	2 Aug 69	WstBc	34.0	34.02	1	*Callinectes sapidus*
690802-2	5	388x272		-	2 Aug 69	WstBc	34.0	34.02	1	Wooden posts

Table 8j. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#O	G	Date	Site	C	Ppt	Z	Substrate
Obelia dichotoma (Linnaeus) (Cont'd.)										
690905-1	50	340x242		+	5 Sep 69	ELLST	35.0	25.92	1	Settling tank walls
690906-2	25	320x233		+	6 Sep 69	WstBc	35.0	25.92	1	Wooden 4" x 6" timber
690906-6	6	359x214		+	6 Sep 69	FntBc	35.0	25.92	2	Wooden groin pilings
700328-3	15	-------		+	Unknown	GalvA	----	-----	--	*Balanus* sp.
Obelia geniculata (Linnaeus)										
670802-1	4	281x223		-	2 Aug 67	OF1gH	----	-----	12	Sargassum
Lovenella new species										
670302-2	6	742x302	8	+	2 Mar 67	OWsBc	13.5	28.59	30	*Pandora trilineata*
670802-3	8	650x255	6	+	2 Aug 67	OFtBc	----	-----	24	*Nassarius acuta*
670924-2	2	510x186	6	-	24 Sep 67	OF1gH	28.0	28.08	18	*Nassarius acuta*
670924-3	2	603x232	6	-	24 Sep 67	OF1gH	28.0	28.08	24	*N. acuta*, *Pyramidella crenulata*
670924-4	2	580x255	6	-	24 Sep 67	OF1gH	28.0	28.62	24	*Nassarius acuta*
670924-5	2	510x209	6	-	24 Sep 67	OEOSW	28.0	28.62	36	*Nassarius acuta*
670924-7	6	580x278	6	-	24 Sep 67	OEOSW	28.0	27.54	24	*N. acuta*, *P. crenulata*
680804-2	3	510x186	6	-	4 Aug 68	OF1gH	30.0	28.62	18	*Pyramidella crenulata*
680804-3	20	765x278	6-7	-	4 Aug 68	OF1gH	30.0	29.16	24	*N. acuta*, *P. crenulata*, *P. trilineata*, *Corbula* sp.
680804-4	12	603x255	6	+	4 Aug 68	OF1gH	30.0	29.16	24	*N. acuta*, *P. crenulata*
680804-5	3	487x186	6	-	4 Aug 68	OF1gH	30.0	27.54	30	*Nassarius acuta*
680804-7	3	510x209	6	-	4 Aug 68	OEOSW	28.0	29.16	36	*Nassarius acuta*
680804-8	12	650x232	6	+	4 Aug 68	OEOSW	32.0	30.78	30	*P. crenulata*, *P. trilineata*
680804-10	14	580x232	6	+	4 Aug 68	OEOSW	27.0	31.32	24	*N. acuta*, *P. crenulata*
680827-2	10	696x278	6-7	-	27 Aug 68	OF1gH	30.2	23.76	18	*Pyramidella crenulata*
680827-3	5	719x232	6	-	27 Aug 68	OF1gH	30.0	23.22	30	*Nassarius acuta*
680827-4	28	791x278	6	+	27 Aug 68	OEOSW	31.0	24.84	30	*Corbula* sp., *N. acuta*, *P. crenulata*

Table 8k. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#O	G	Date	Site	C	Ppt	Z	Substrate
Lovenella new species (Cont'd.)										
680827-5	23	556x278	6	+	27 Aug 68	OEOSW	31.0	23.76	24	*N. acuta*, *P. crenulata*
680827-6	10	743x255	6	-	27 Aug 68	OEOSW	31.0	23.76	18	*N. acuta*, *P. crenulata*
680924-3	8	604x255	6-8	-	24 Sep 68	OF1gH	27.5	23.76	18	*N. acuta*, *P. crenulata*, *Terebra dislocata*
680924-4	19	697x255	6	+	24 Sep 68	OF1gH	27.7	23.76	24	*Nassarius acuta*
680924-5	3	626x209	6	-	24 Sep 68	OEOSW	31.0	24.84	30	*Nassarius acuta*
680924-6	2	510x209	6	-	24 Sep 68	OEOSW	29.0	23.76	24	*N. acuta*, *T. dislocata*
681017-3	3	603x242	6	+	17 Oct 68	OF1gH	25.8	25.92	24	*N. acuta*, *P. crenulata*, *Corbula* sp.
681017-4	4	556x232	6	-	17 Oct 68	OF1gH	25.7	25.92	30	*Nassarius acuta*
681017-6	6	466x204	6	-	17 Oct 68	OEOSW	25.8	26.46	12	Unknown
681023-1	4	626x255	6	-	23 Oct 68	OEOSW	24.2	25.92	24	*N. acuta*, *P. crenulata*
681023-4	3	580x209	6	-	23 Oct 68	OEOSW	24.2	25.92	30	*Nassarius acuta*
681023-5	2	557x209	6	-	23 Oct 68	OEOSW	24.0	25.83	18	*N. acuta*, *P. crenulata*
681204-2	12	812x375	6	+	4 Dec 68	OF1gH	15.7	30.78	24	*N. acuta*, *P. crenulata*, *T. dislocata*
681204-4	2	812x255	6	-	4 Dec 68	OEOSW	15.6	31.86	30	*T. dislocata*
681204-7	3	510x186	6	-	4 Dec 68	OF1gH	14.7	29.16	18	Bivalve shell
681204-8	3	765x232	6	-	4 Dec 68	OF1gH	15.6	30.24	30	*N. acuta*, *P. crenulata*
690226-2	2	510x186	6	-	26 Feb 69	OF1gH	14.8	24.30	18	*Nassarius acuta*
690226-3	2	743x278	6	-	26 Feb 69	OF1gH	14.9	23.76	24	*Nassarius acuta*
Lovenella gracilis (Clarke)										
670802-3	8	1045x302	8	-	2 Aug 67	OFtBc	----	-----	24	Unknown
680804-2	18	1160x534	6-12	+	4 Aug 68	OF1gH	30.0	28.62	18	*Pyramidella crenulata*
680804-4	10	928x348	9	-	4 Aug 68	OF1gH	30.0	29.16	24	*Pyramidella crenulata*
680804-7	6	882x278	8	-	4 Aug 68	OEOSW	28.0	29.16	30	*Corbula* sp.
680804-10	14	928x394	8	+	4 Aug 68	OEOSW	27.0	31.32	24	*Nassarius acuta*

Table 81. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#O	G	Date	Site	C	Ppt	Z	Substrate
Lovenella gracilis (Clarke) (Cont'd.)										
680827-5	14	744x239	8	+	27 Aug 67	OEOSW	31.0	23.76	24	*N. acuta*, *P. crenulata*, shell fragments
680827-6	18	1045x464	8-12	+	27 Aug 67	OEOSW	31.0	23.76	18	Shell fragments
680924-2	12	1045x440	11	+	24 Sep 68	OF1gH	27.1	22.68	12	Unknown
680924-6	10	928x464	9	+	24 Sep 68	OEOSW	29.0	23.76	24	*Pyramidella crenulata*
680924-7	12	998x371	10	+	24 Sep 68	OEOSW	28.9	23.76	18	Shell fragments
680924-8	22	928x348	10	+	24 Sep 68	OEOSW	----	-----	12	Shell fragments
681017-1	10	950x394	10	+	17 Oct 68	OF1gH	25.8	25.92	12	Shell fragments
681017-2	5	719x232	7	-	17 Oct 68	OF1gH	25.9	26.46	18	Shell fragments
681017-6	16	1045x464	10	+	17 Oct 68	OEOSW	25.8	16.46	12	Unknown
681023-1	12	1045x464	10	+	23 Oct 68	OEOSW	24.2	25.92	24	Shell fragments
681023-2	20	1045x371	10	+	23 Oct 68	OEOSW	24.0	24.84	12	Shell fragments
681023-5	8	812x302	10	-	23 Oct 68	OEOSW	24.0	25.38	18	Shell fragments
681204-2	22	1045x464	9-12	+	4 Dec 68	OF1gH	15.7	30.78	24	*Nassarius acuta*
681204-5	12	1045x394	8-10	+	4 Dec 68	OEOSW	15.5	31.86	24	*Nassarius acuta*
681204-6	8	1045x302	8	-	4 Dec 68	OEOSW	15.3	31.32	18	Unknown
690226-2	13	928x394	6-12	-	26 Feb 69	OF1gH	14.8	24.30	18	Unknown
690226-3	5	1045x464	10	-	26 Feb 69	OF1gH	14.9	23.76	24	*Nassarius acuta*
Lovenella grandis Nutting										
670302-1	72	1276x534	10	+	2 Mar 67	OWsBc	13.5	28.59	30	Unknown
Campalecium new species										
690801-2	3			+	1 Aug 69	SoJet	33.0	34.56	1	*Callinectes sapidus*

Table 8m. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca	LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Halecium bermudense Congdon											
660205-1	30				-	5 Feb 66	OBolP	8.5	-----	30	Shell fragments
660205-2	30				-	5 Feb 66	-----	----	-----	--	Shell fragments
660205-4	35				-	5 Feb 66	-----	----	-----	--	Shell fragments
660205-5	35				-	5 Feb 66	-----	----	-----	--	Unknown
Sertularia mayeri Nutting											
670414-2	2				-	14 Apr 67	ArcRf	----	-----	F	Sargassum
680802-1	3				-	2 Aug 68	FntBc	----	-----	F	Sargassum
690613-5	4				-	13 Jun 69	WstBc	30.0	20.52	F	Sargassum
690906-1	3				-	6 Sep 69	SoJet	35.0	23.22	F	Sargassum
690906-4	2				-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
690906-5	3				-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
Plumularia floridana Nutting											
670802-2	2				-	2 Aug 67	OEOSW	----	-----	12	Sargassum
680802-1	5				-	2 Aug 68	FntBc	----	-----	F	Sargassum
690906-1	2				-	6 Sep 69	SoJet	35.0	23.22	F	Sargassum
690906-4	3				-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
690906-5	2				-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
690906-6	3				-	6 Sep 69	FntBc	35.0	25.92	F	Sargassum
Aglaophenia late-carinata Allman											
670802-1	6				-	2 Aug 67	OF1gH	----	-----	12	Sargassum
670802-2	4				-	2 Aug 67	OEOSW	----	-----	12	Sargassum
670924-1	5				-	24 Sep 67	OF1gH	27.9	27.54	12	Sargassum
680716-2	8				-	16 Jul 68	EstBc	----	-----	F	Sargassum
680729-1	6				-	29 Jul 68	FntBc	----	-----	F	Sargassum

Table 8n. Table of raw data. For explanation of column headings and collecting site code, see introductory section at beginning of Appendix B.

Coll. #	Mm	Htca LxW	#T	G	Date	Site	C	Ppt	Z	Substrate
Aglaophenia late-carinata Allman (Cont'd.)										
680802-1	20			-	2 Aug 68	FntBc	----	-----	F	Sargassum
680804-1	15			-	4 Aug 68	OFlgH	30.0	28.62	F	Sargassum
680804-2	15			-	4 Aug 68	OFlgH	30.0	28.62	F	Sargassum
690906-1	5			-	6 Sep 69	SoJet	35.0	23.22	F	Sargassum
690906-5	4			-	6 Sep 69	WstBc	35.0	25.92	F	Sargassum
690906-6	6			-	6 Sep 69	FntBc	35.0	25.92	F	Sargassum

APPENDIX C: PLATES

PLATE I

Figure 3. Cordylophora lacustris Allman.
- a. Hydranths with sporosacs. Bar equals 1 mm.
- b. Natural size.

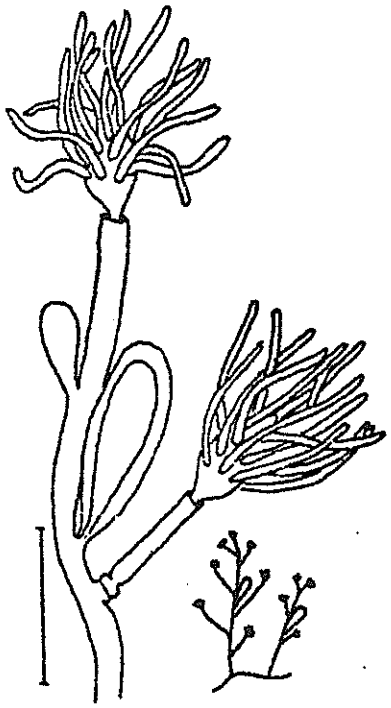
(Both after Fraser, 1944).

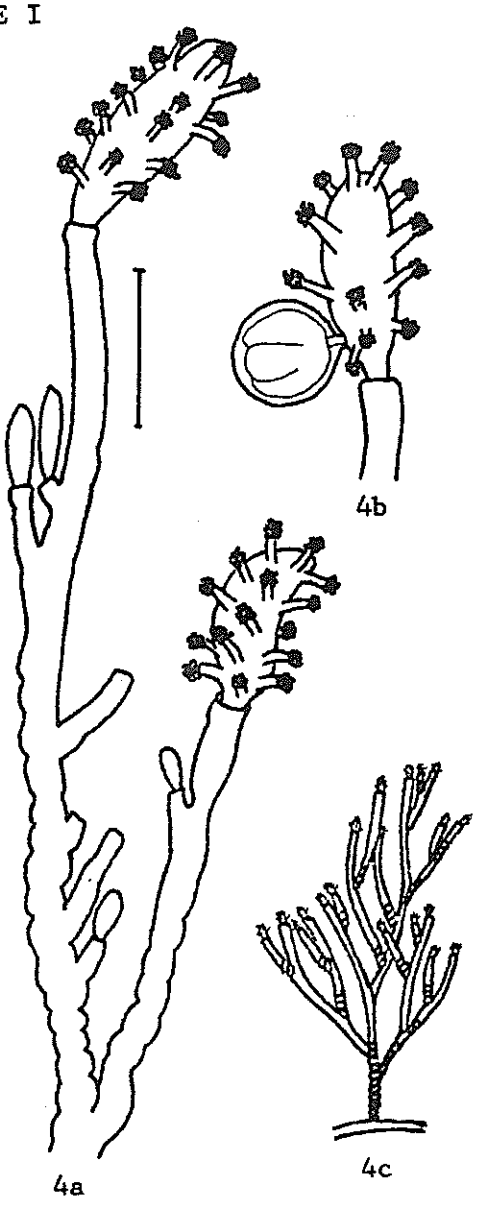
Figure 4. Syncoryne eximia (Allman).
- a. Hydranths and detail of branching. Bar equals 1 mm.
- b. Hydranth with medusa bud.
- c. Natural size.

(All after Fraser, 1944).

Figure 5. Zanclea costata Gegenbaur.
- a. Zooid with medusa buds; collection 690906-1. Bar equals 1 mm.
- b. Zooid with medusa buds; after Fraser, 1944. Bar equals 1 mm.
- c. Natural size; collection 690906-1.

PLATE I





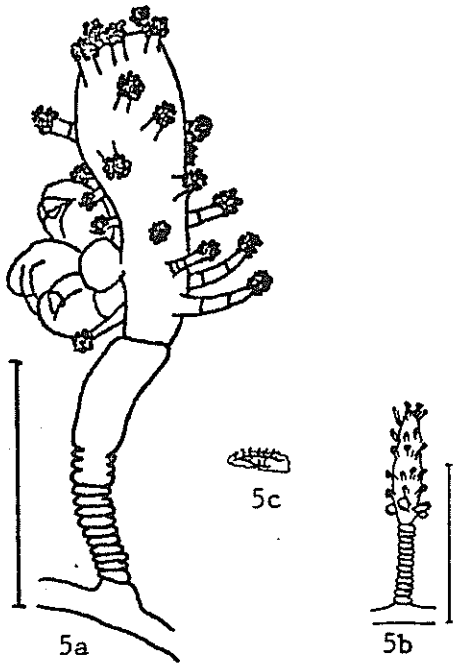


PLATE II

Figure 6. *Bimeria franciscana* Torrey.
- a. Portion of branch with hydranths bearing sporosacs. Bar equals 1 mm.
- b. Detail of hydranth. Bar equals 0.5 mm.
- c. Natural size.

(All collection 680701-1).

Figure 7. *Bimeria humilis* Allman.
- a. Colony with zooids and sporosacs. Bar equals 1 mm.
- b. Natural size.

(Both after Fraser, 1944).

Figure 8. *Bougainvillia carolinensis* (McCrady).
- a. Portion of branch with hydranths and gonophores. Bar equals 1 mm.
- b. Natural size.

(Both after Fraser, 1944).

PLATE II

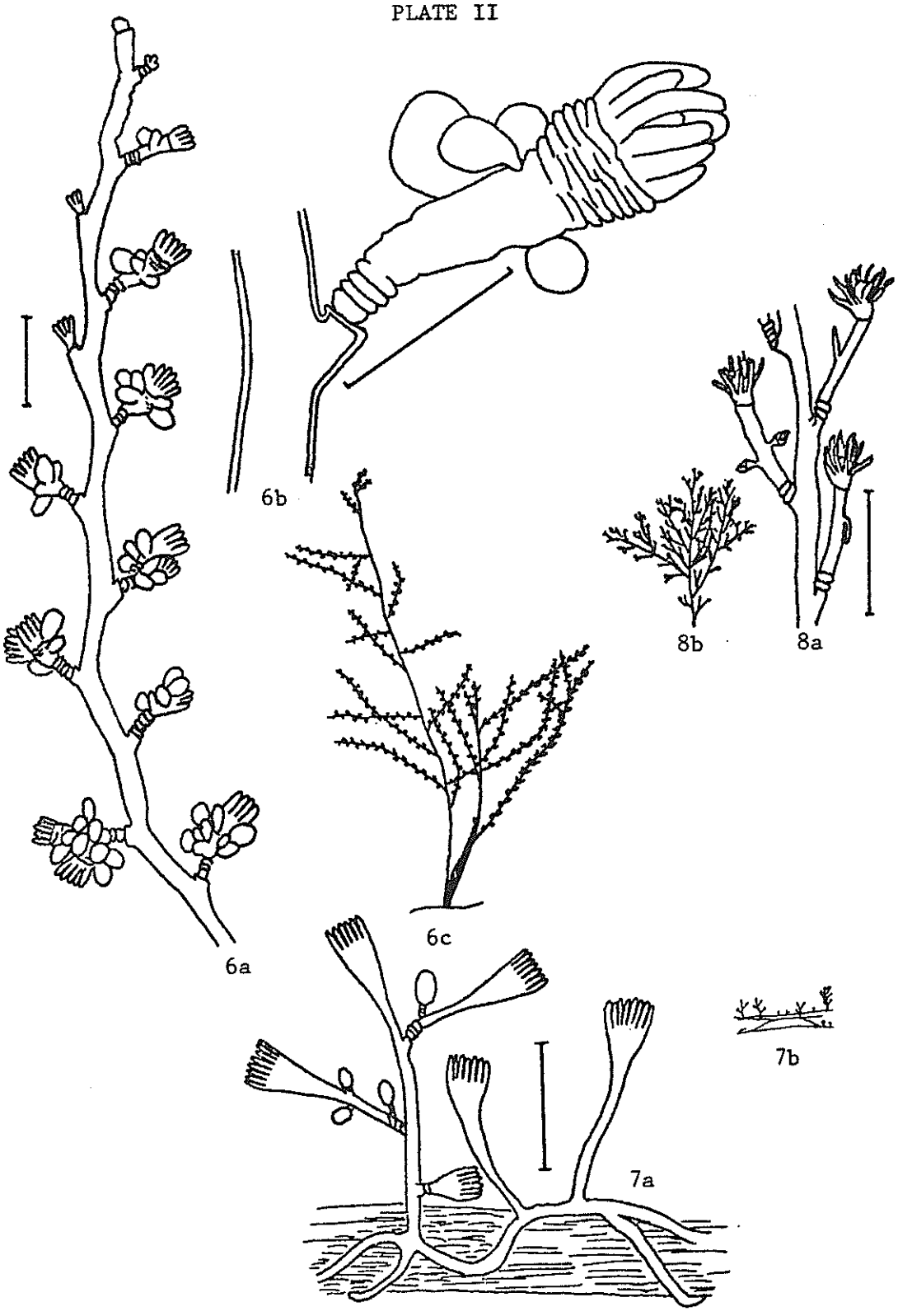


PLATE III

Figure 9. Bougainvillia inaequalis Fraser.
- a. Portion of branch with hydranths and medusa buds. Bar equals 1 mm.
- b. Natural size, heavily fascicled colony.

(Both collection 690202-4).

Figure 10. Bougainvillia rugosa Clarke.
- a. Portion of branch. Bar equals 1 mm.
- b. Portion of fascicled stem.
- c. Natural size.

(All after Fraser, 1944).

Figure 11. Bougainvillia superciliaris Agassiz.
- a. Portion of colony with hydranths and medusa buds. Bar equals 1 mm.
- b. Natural size.

(Both after Fraser, 1944).

Figure 12. Perigonimus jonesi Osborn and Hargitt.
- a. Small colony, entire; collection 690906-4. Bar equals 1 mm.
- b. Portion of colony with hydranths and gonophores; after Nutting in Fraser, 1944. Bar equals 1 mm.
- c. Natural size; collection 690906-4.

PLATE III

PLATE IV

Figure 13. Perigonimus repens (Wright).
- a. Portion of colony on Spiochaetopterus oculatus tube. Bar equals 1 mm.
- b. Detail of hydranth. Bar equals 0.25 mm.
- c. Natural size.

(All collection 681023-2).

Figure 14. Eudendrium exiguum Allman.
- a. Portion of colony with hydranth. Bar equals 1 mm.
- b. Natural size.

(Both collection 660120-2).

Figure 15. Eudendrium eximium Allman.
Portion of female colony; after Allman in Fraser, 1944. Bar equals 1 mm.

Figure 16. Eudendrium ramosum Linnaeus.
- a. Portion of male colony. Bar equals 1 mm.
- b. Portion of female colony.
- c. Natural size.

(All after Fraser, 1944).

PLATE IV

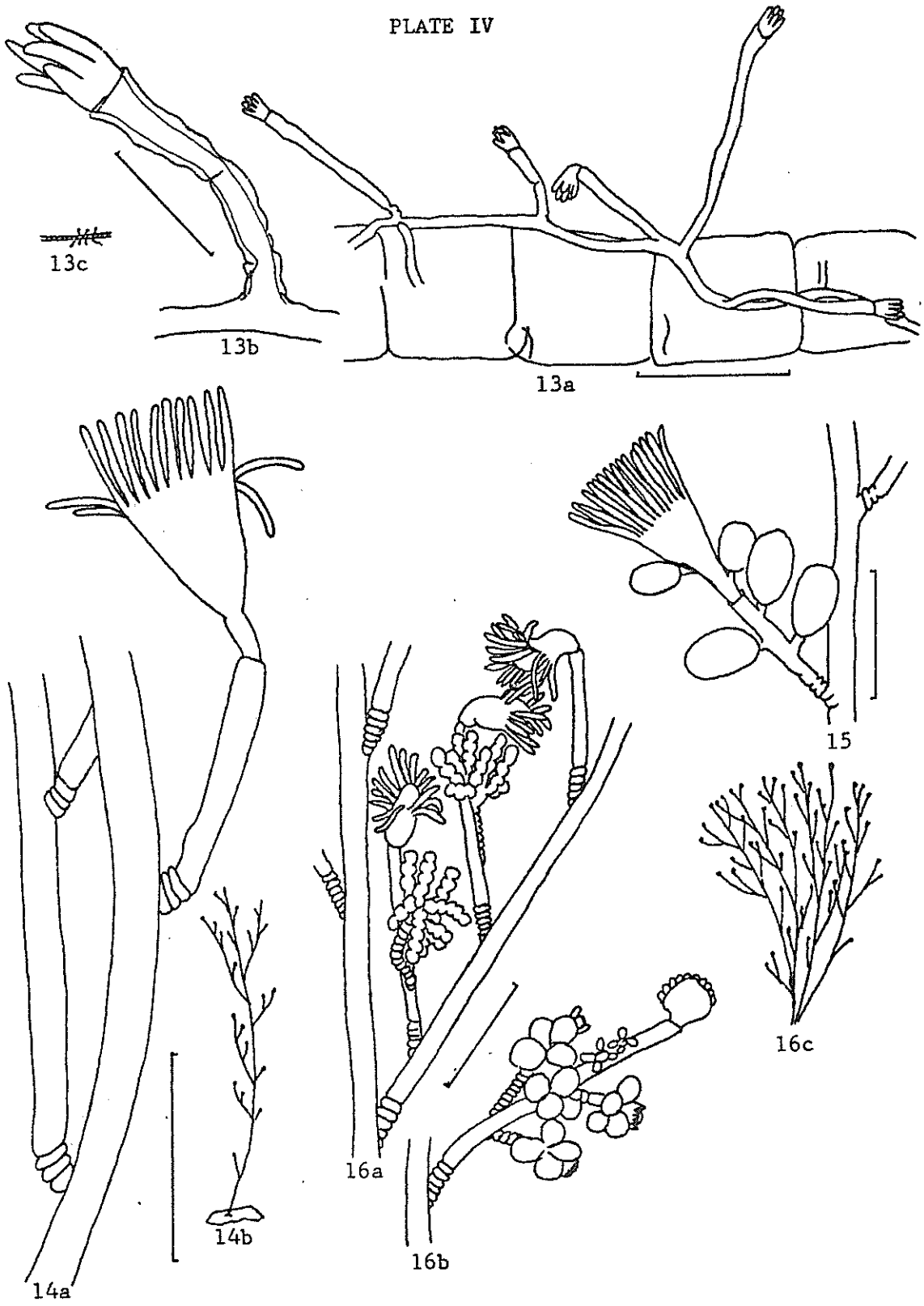


PLATE V

Figure 17. Eudendrium tenue A. Agassiz.
- a. Portion of male colony. Bar equals 1 mm.
- b. Natural size.

(Both after Fraser, 1944).

Figure 18. Hydractinia echinata (Fleming).
- a. Generative, nutritive, and spiral zooids and spine. Bar equals 1 mm.
- b. Natural size.

(Both collection 650700-1, from the Woods Hole, Mass., area).

Figure 19. Podocoryne carnea Sars.
- a. Nutritive, generative, and spiral zooids and spine; collection 670320-6. Bar equals 1 mm.
- b. Nutritive and generative zooid; after Fraser, 1944. Bar equals 1 mm.
- c. Natural size; collection 670320-6.

Figure 20. Stylactis new species.
- a. Nutritive and generative zooids and stolon. Bar equals 1 mm.
- b. Natural size.

(Both collection 690905-1).

PLATE V

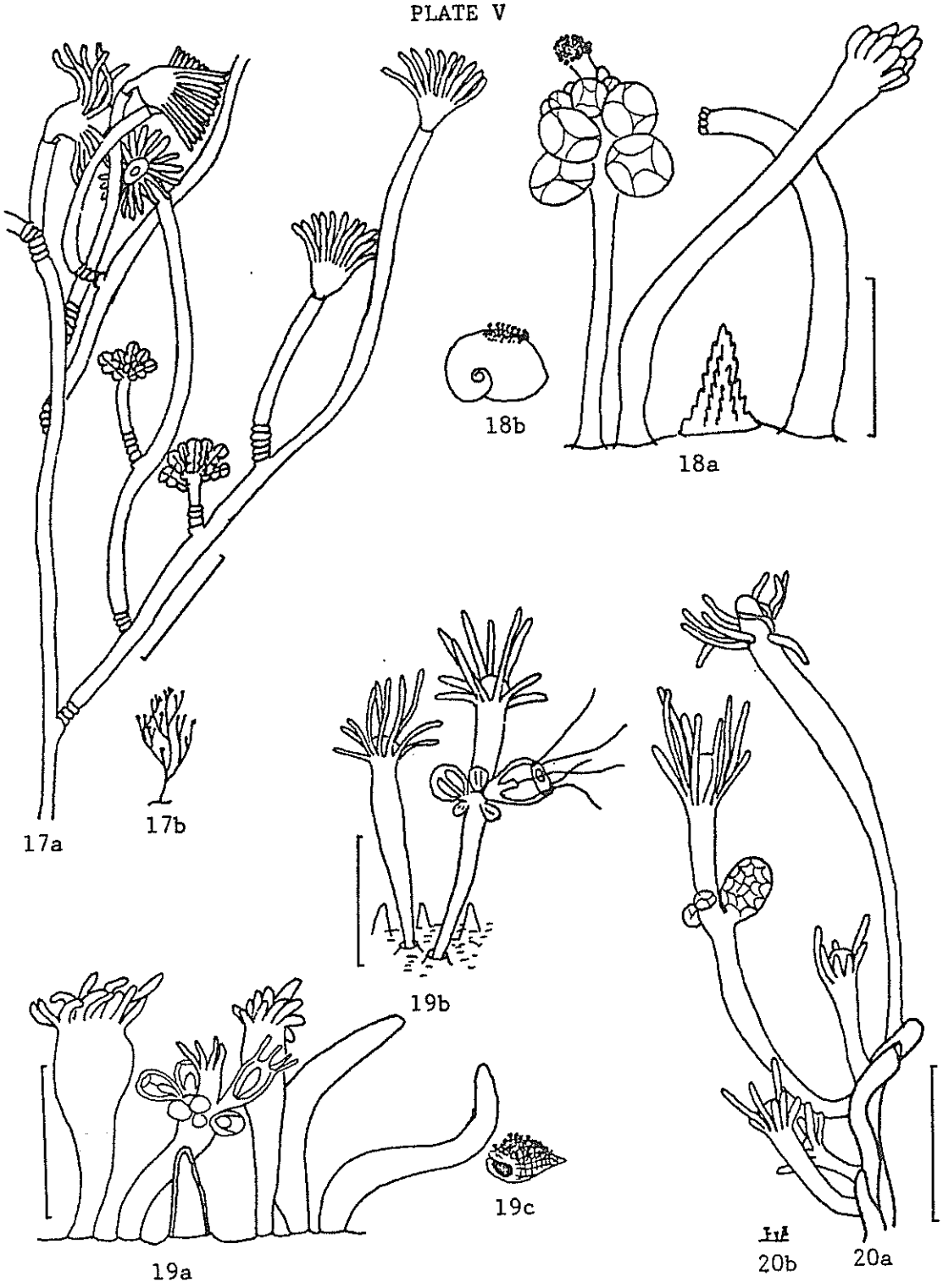


PLATE VI

Figure 21. Ectopleura grandis Fraser.

a. Immature hydranth, bearing only about 6 or 8 very young medusa buds; collection 690226-2. Bar equals 1 mm.
b. Mature hydranth; after Fraser, 1944. Bar equals 1 mm.
c. Cluster of very immature medusa buds; collection 690226-2. Bar equals 0.25 mm.
d. Natural size; collection 690226-2.

Figure 22. Tubularia crocea (Agassiz).

a. Hydranth with young gonophores; collection 670509-2. Bar equals 1 mm.
b. Hydranth with mature gonophores; after Fraser, 1944. Bar equals 1 mm.
c. Mature gonophore containing an almost fully developed actinula; collection 670130-1 (from Tuxpan, Mexico). Bar equals 0.25 mm.
d. Small, immature raceme of gonophores; collection 670509-2. Bar equals 0.25 mm.
e. Natural size; collection 670509-2.

PLATE VI

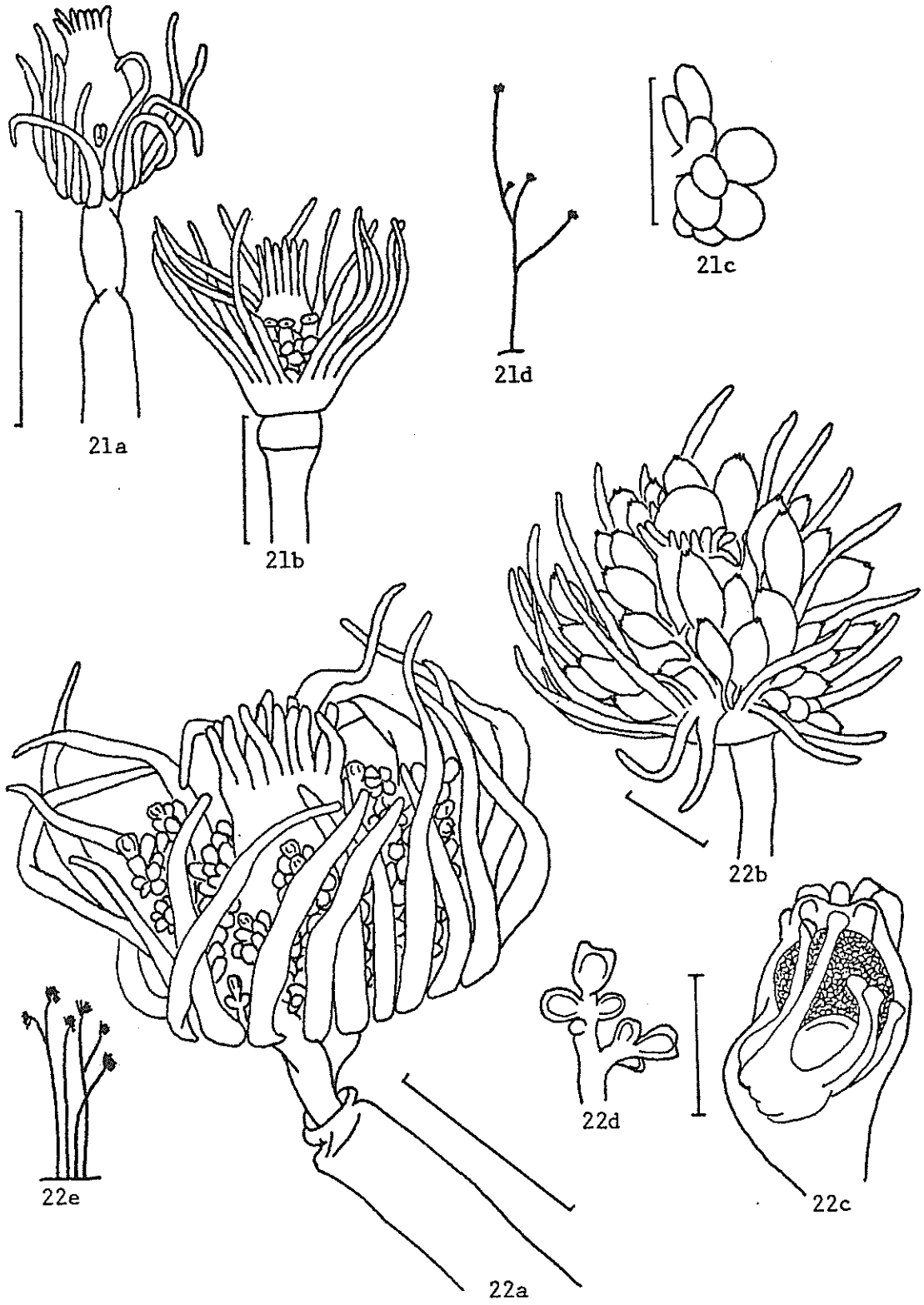


PLATE VII

Figure 23. Campanularia gelatinosa (Pallas).
- a. Portion of colony showing branching and hydrothecae. Bar equals 1 mm.
- b. Gonangium, same scale as 23a.
- c. Terminal portion of colony, natural size.

(All after Fraser, 1944).

Figure 24. Campanularia verticillata (Linnaeus).
- a. Portion of fascicled stem with hydrothecae. Bar equals 1 mm.
- b. Gonangium, same scale as 24a.
- c. Natural size.

(All after Fraser, 1944).

Figure 25. Clytia coronata (Clarke).
- a. Portion of colony showing branching, hydrothecae, and gonangia. Bar equals 1 mm.
- b. Natural size.

(Both collection 670605-3).

PLATE VII

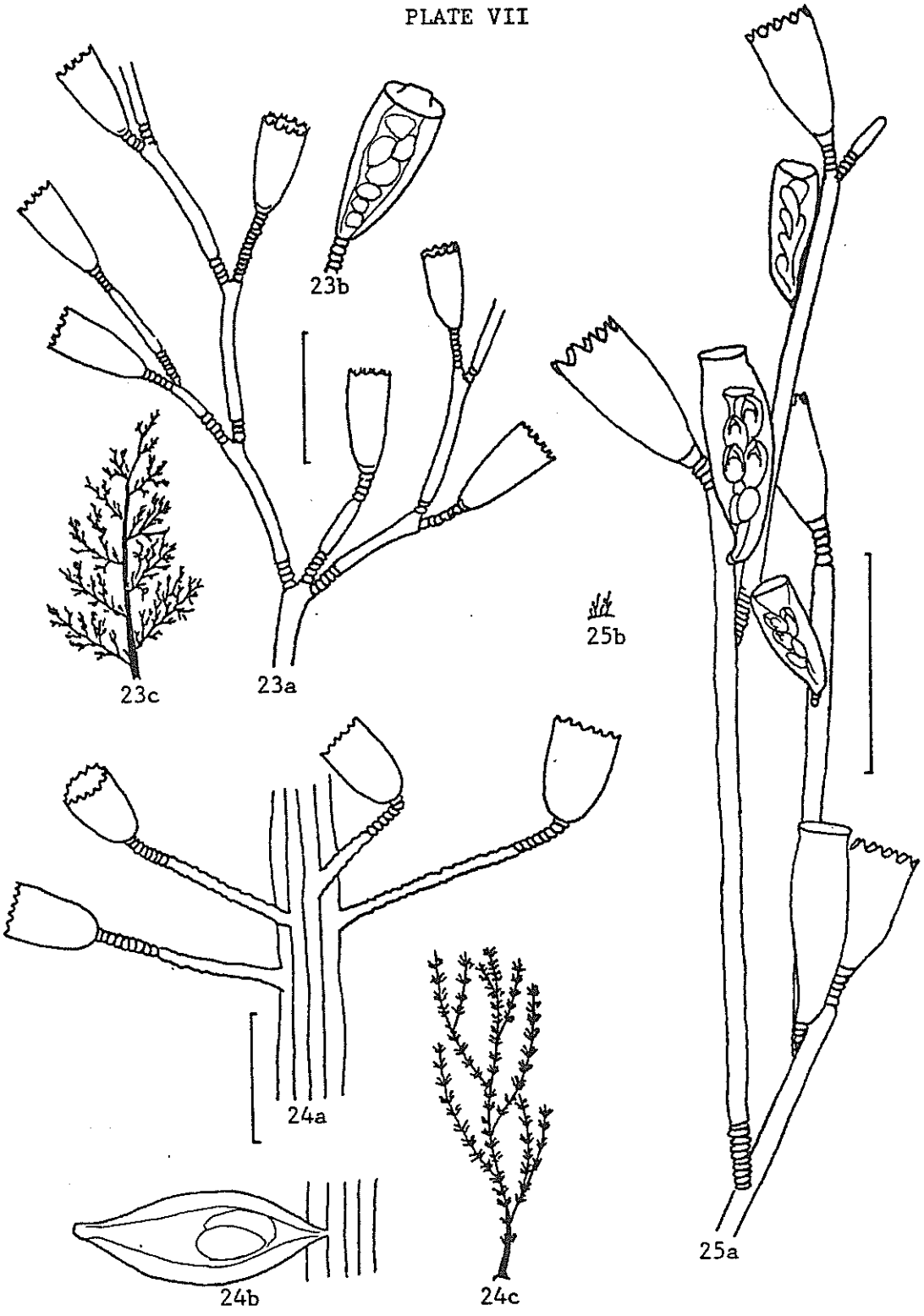


PLATE VIII

Figure 26. Clytia cylindrica Agassiz.
- a. Colony showing hydrothecae, gonangia, and branched stem; collection 670509-1. Bar equals 1 mm.
- b. Solitary zooids with much annulated stems; collection 670509-2.
- c. Natural size; collection 670509-1.

Figure 27. Clytia fragilis Congdon.
Portion of colony with hydrothecae and gonangium; after Fraser, 1944. Bar equals 1 mm.

Figure 28. Clytia longitheca (Fraser).
- a. Entire colony collected, with two hydrothecae and two young hydrothecae; collection 680804-10. Bar equals 1 mm.
- b. Detail of hydrotheca; collection 680804-10. Bar equals 0.25 mm.
- c. Zooid and gonangium; after Fraser, 1937. Bar equals 1 mm.
- d. Natural size; collection 680804-10.

Figure 29. Clytia johnstoni (Alder).
- a. Zooid and gonangium. Bar equals 1 mm.
- b. Natural size.

(Both collection 670414-1).

PLATE VIII

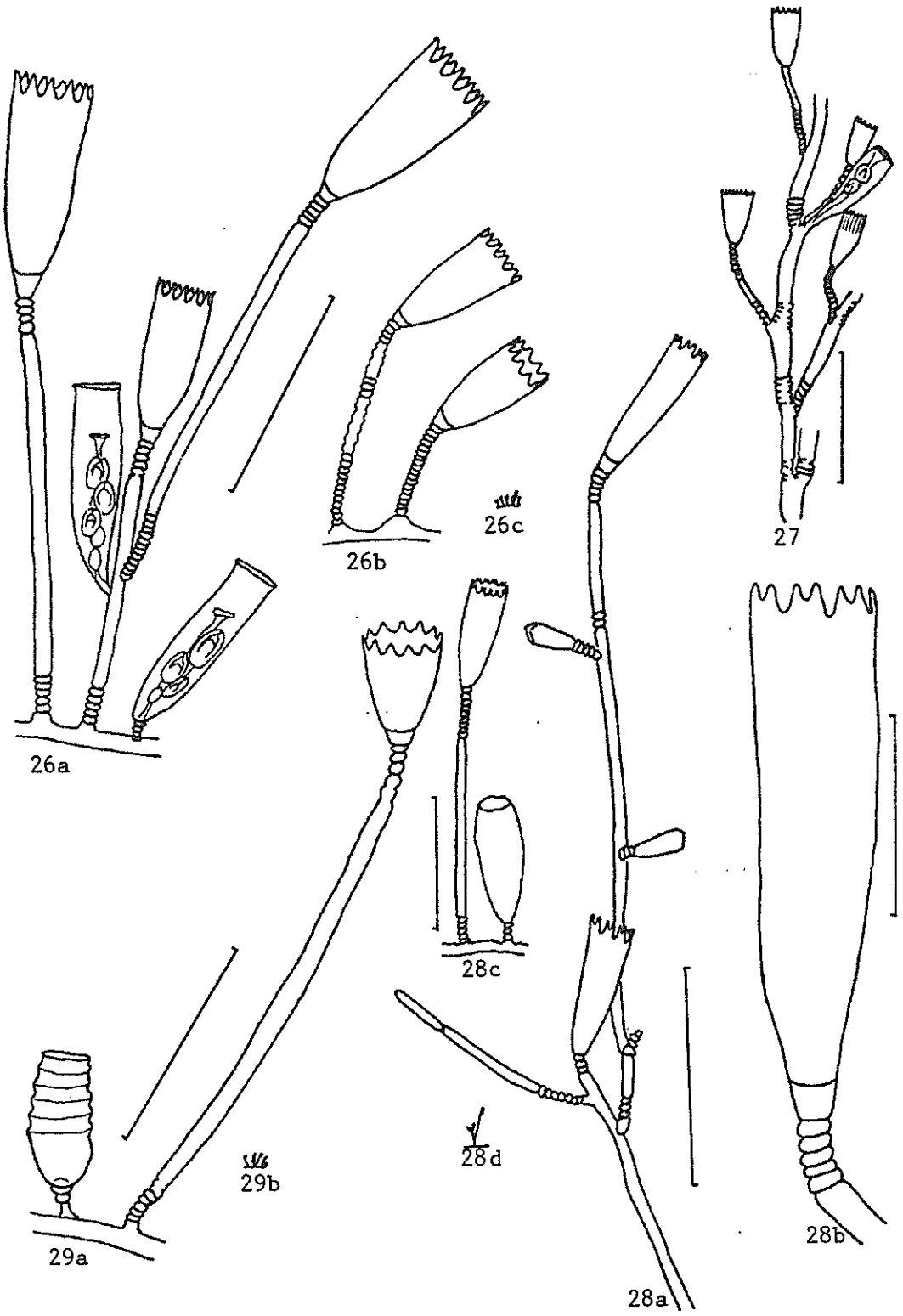


PLATE IX

Figure 30. Clytia longicyatha (Allman).
- a. Portion of colony showing hydrothecae and gonangia. Bar equals 1 mm.
- b. Natural size.

(Both after Fraser, 1944).

Figure 31. Clytia noliformis (McCrady).
- a. Zooids and gonangium. Bar equals 1 mm.
- b. Natural size.

(Both collection 670414-1).

Figure 32. Gonothyraea gracilis (Sars).
- a. Colony with hydrothecae and gonangia. Bar equals 1 mm.
- b. Natural size.

(Both collection 670509-2).

Figure 33. Obelia bicuspidata Clarke.
- a. Portion of colony showing branching, hydrothecae, and gonangia. Bar equals 1 mm.
- b. Detail of hydrotheca. Bar equals 0.25 mm.
- c. Natural size.

(All collection 680807-1).

PLATE IX

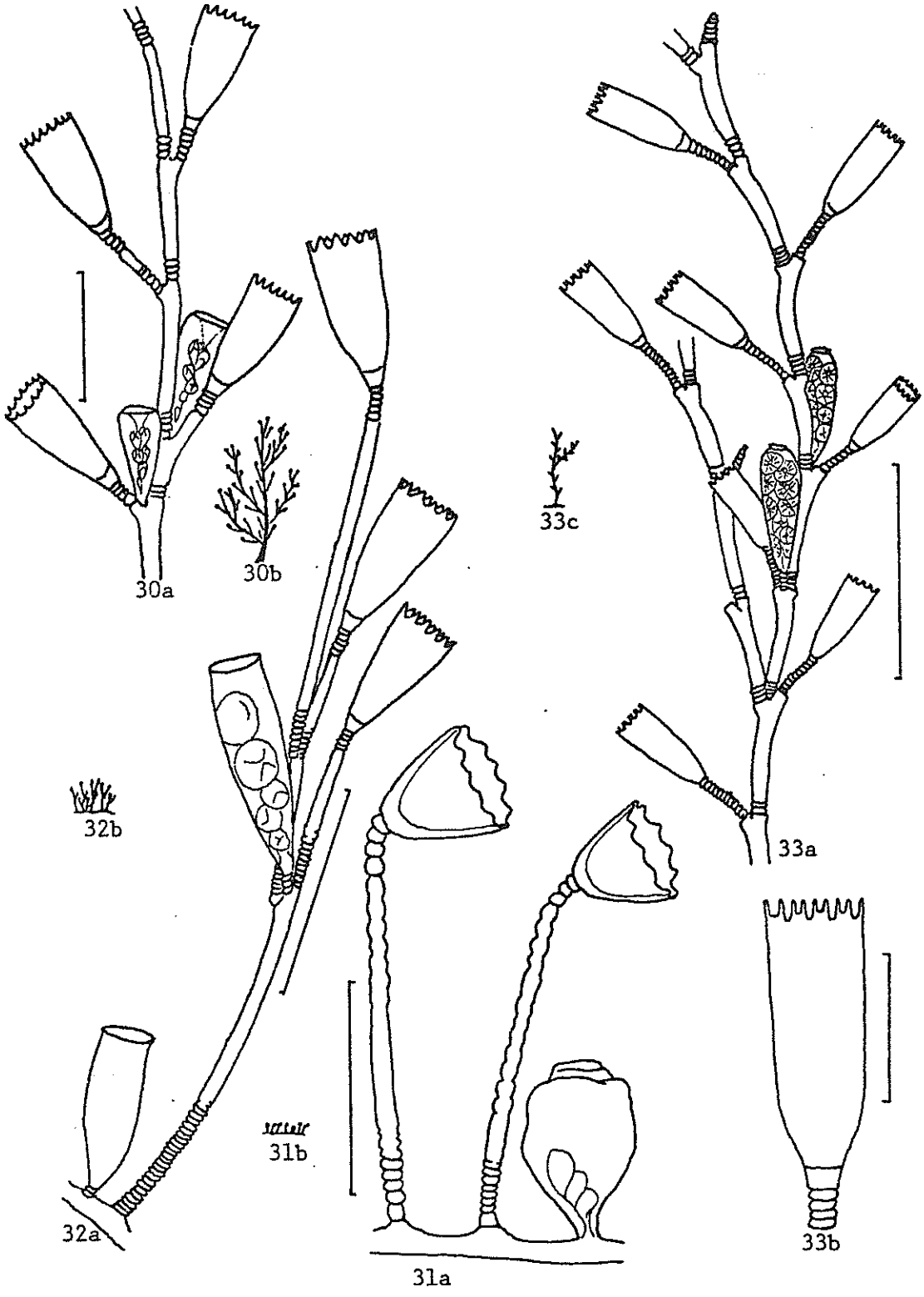


PLATE X

Figure 34. Obelia dichotoma (Linnaeus).
a. Portion of stem with hydrothecae and gonangia. Bar equals 1 mm.
b. Natural size.
(Both collection 680819-1).

Figure 35. Obelia equilateralis Fraser.
a. Portion of colony showing branching and hydrothecae. Bar equals 1 mm.
b. Gonangium.
c. Natural size.
(All after Fraser, 1944).

Figure 36. Obelia geniculata (Linnaeus).
a. Portion of colony showing hydrothecae and gonangia. Bar equals 1 mm.
b. Natural size.
(Both collection 670131-7, from Tuxpan, Mexico).

Figure 37. Obelia hyalina Clarke.
a. Portion of colony with hydrothecae. Bar equals 1 mm.
b. Portion of colony with hydrothecae and gonangia.
c. Natural size.
(All after Fraser, 1944).

Figure 38. Obelia obtusidens (Jaderholm).
a. Colony with hydrothecae. Bar equals 1 mm.
b. Gonangium.
c. Natural size.
(All after Fraser, 1944).

PLATE X

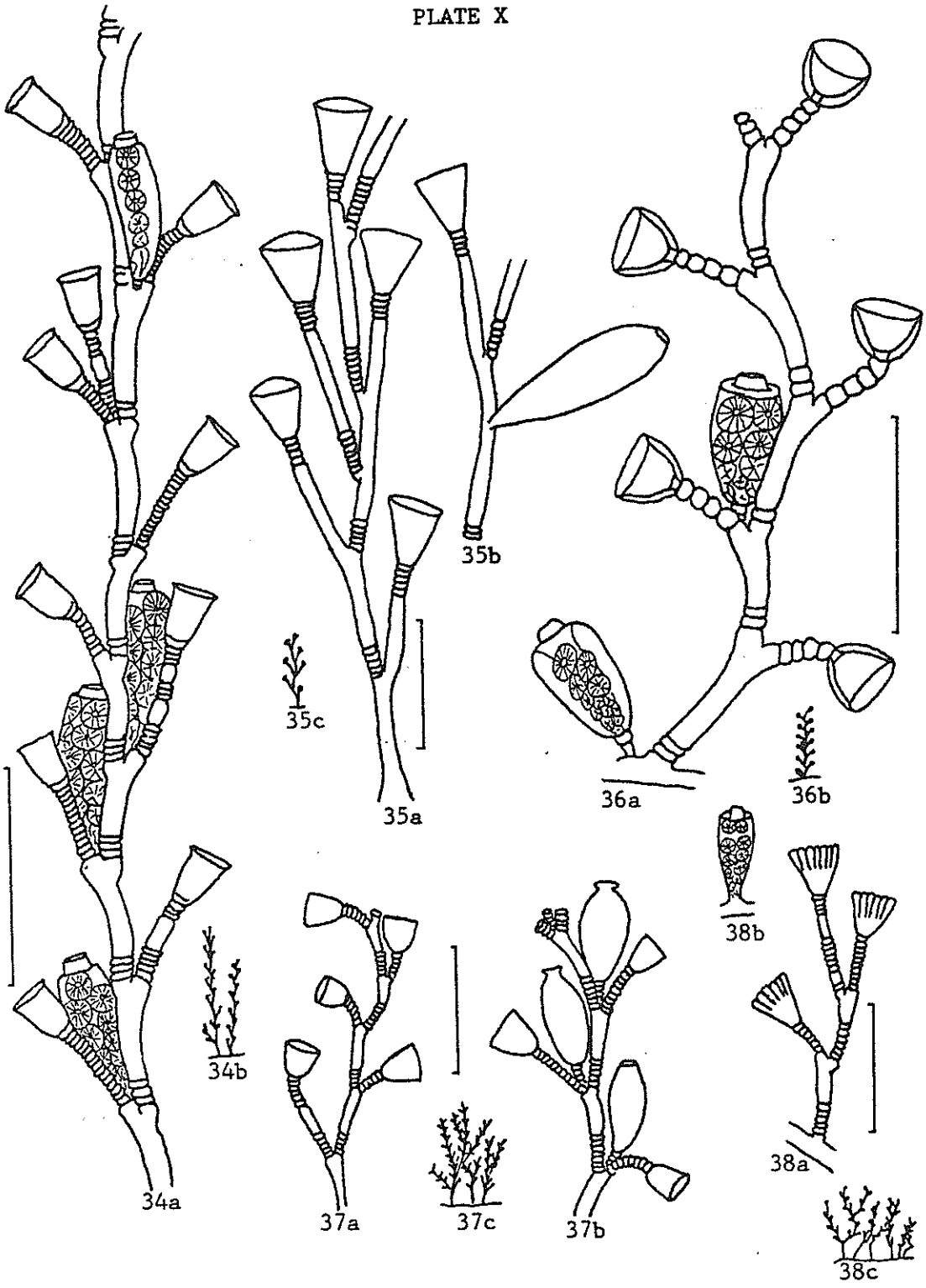


PLATE XI

Figure 39. Cuspidella humilis (Alder).
- a. Hydrothecae and hydranth. Bar equals 1 mm.
- b. Natural size.

(Both after Fraser, 1944).

Figure 40. Lovenella new species.
- a. Portion of branched colony showing hydrothecae and gonangia; collection 680924-4. Bar equals 1 mm.
- b. Unbranched colony; collection 681017-3.
- c. Detail of hydrotheca and hydranth; collection 680924-4. Bar equals 0.25 mm.
- d. Natural size, branched and unbranched; collections 680924-4 and 681017-3.

Figure 41. Lovenella gracilis Clarke.
- a. Portion of colony showing hydrothecae and gonangia. Bar equals 1 mm.
- b. Natural size.

(Both collection 680924-8).

Figure 42. Lovenella grandis Nutting.
- a. Portion of colony showing hydrothecae and gonangia. Bar equals 1 mm.
- b. Natural size.

(Both collection 670302-1).

PLATE XI

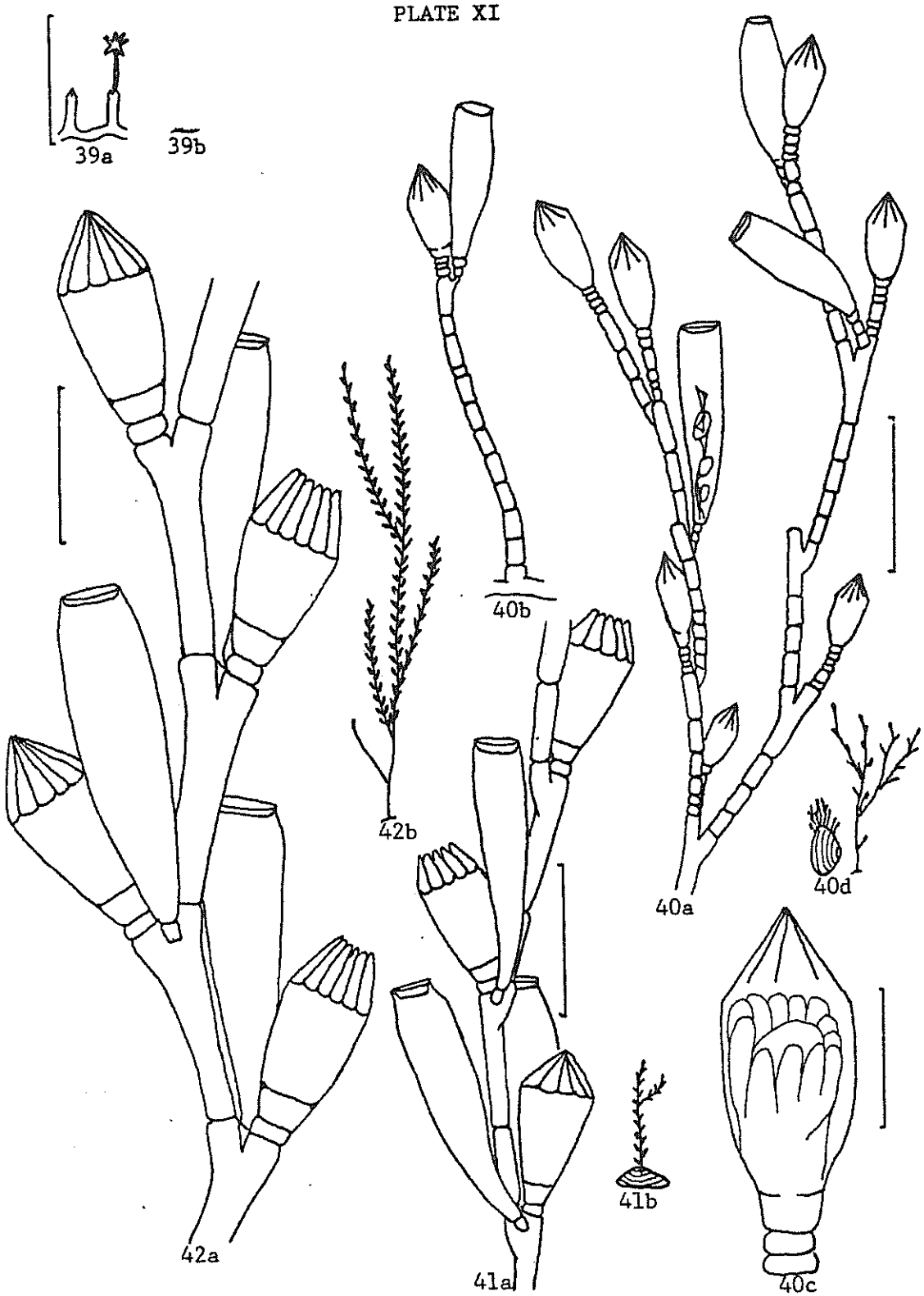


PLATE XII

Figure 43. Campalecium new species.
- a. Colony showing hydranths, gonangium, and branching. Bar equals 1 mm.
- b. Detail of hydranth. Bar equals 0.25 mm.
- c. Detail of gonangium.
- d. Natural size.

(All collection 690801-2).

Figure 44. Halecium bermudense Congdon.
- a. Colony showing fascicled stem and hydrophores; collection 660205-1. Bar equals 1 mm.
- b. Detail of reduplicated hydrophore; collection 660205-1. Bar equals 0.5 mm.
- c. Male gonophore; after Fraser, 1944. Bar equals 1 mm.
- d. Female gonophore; after Fraser, 1944. Bar equals 1 mm.
- e. Natural size; collection 660205-1.

Figure 45. Halecium nanum Alder.
- a. Colony showing hydrophores. Bar equals 1 mm.
- b. Colony showing hydrophores and male gonophores.
- c. Female gonophore.
- d. Natural size.

(All after Fraser, 1944).

Figure 46. Filellum serpens (Hassall).
- a. Hydrothecae growing from stolon. Bar equals 1 mm.
- b. Coppinia. Bar equals 1 mm.
- c. Coppinia, natural size.
- d. Natural size.

(All after Fraser, 1944).

PLATE XII

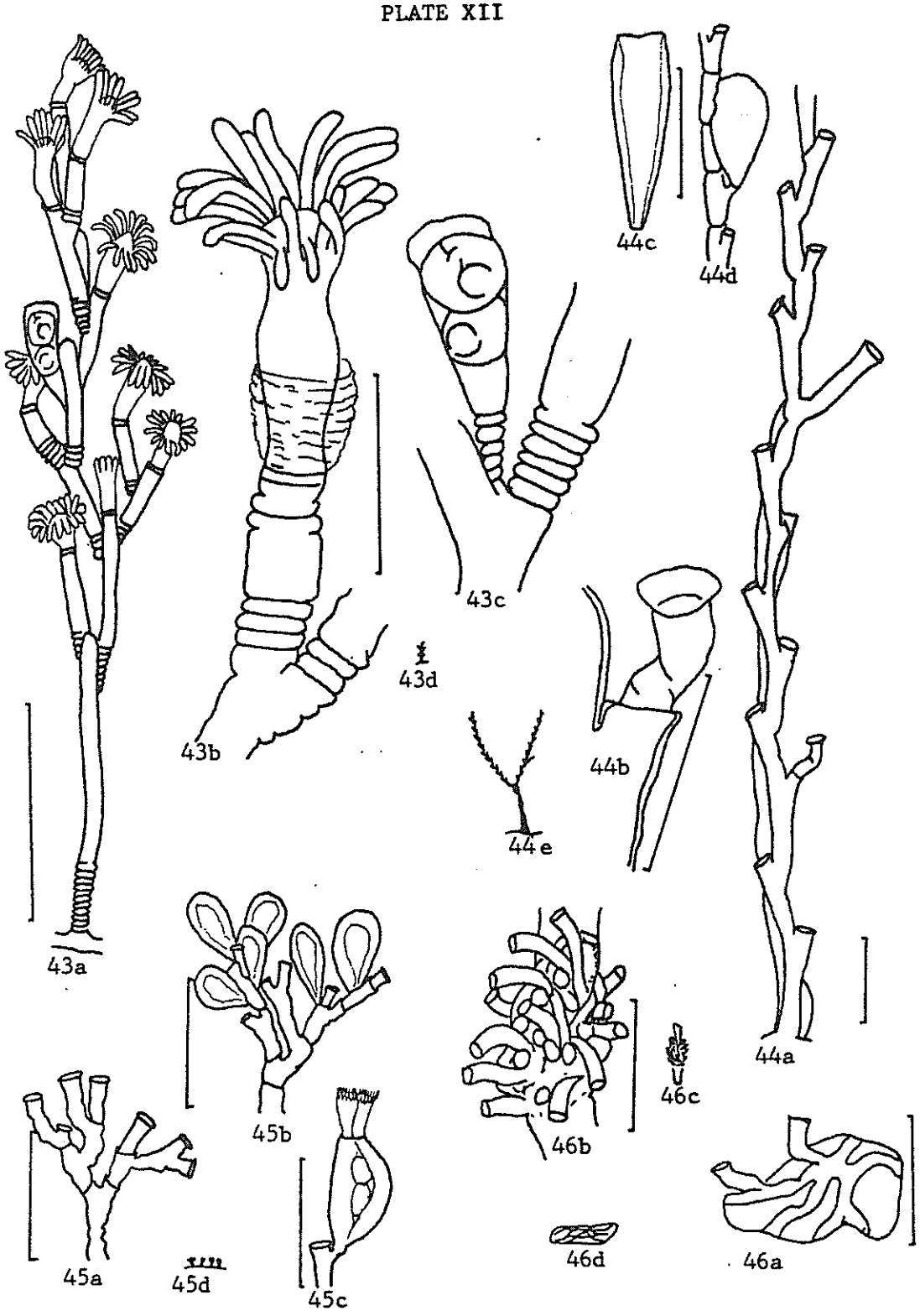

43a
43b
43c
43d
44a
44b
44c
44d
44e
45a
45b
45c
45d
46a
46b
46c
46d

PLATE XIII

Figure 47. Pasya quadridentata (Ellis and Solander).
- a. Portion of colony showing arrangement of hydrothecae. Bar equals 1 mm.
- b. Gonangium.
- c. Gonangium, side view.
- d. Natural size.

(All after Fraser, 1944).

Figure 48. Sertularella conica Allman.
- a. Portion of branch with hydrothecae. Bar equals 1 mm.
- b. Gonangia.
- c. Natural size.

(All after Fraser, 1944).

Figure 49. Sertularella gayi (Lamouroux).
- a. Portion of stem and branch with hydrothecae. Bar equals 1 mm.
- b. Gonangium.
- c. Natural size.

(All after Fraser, 1944).

Figure 50. Sertularia cornicina (McCrady).
- a. Portion of stem with hydrothecae, front view. Bar equals 1 mm.
- b. Portion of stem with hydrothecae, back view.
- c. Gonangium.
- d. Natural size.

(All after Fraser, 1944).

PLATE XIII

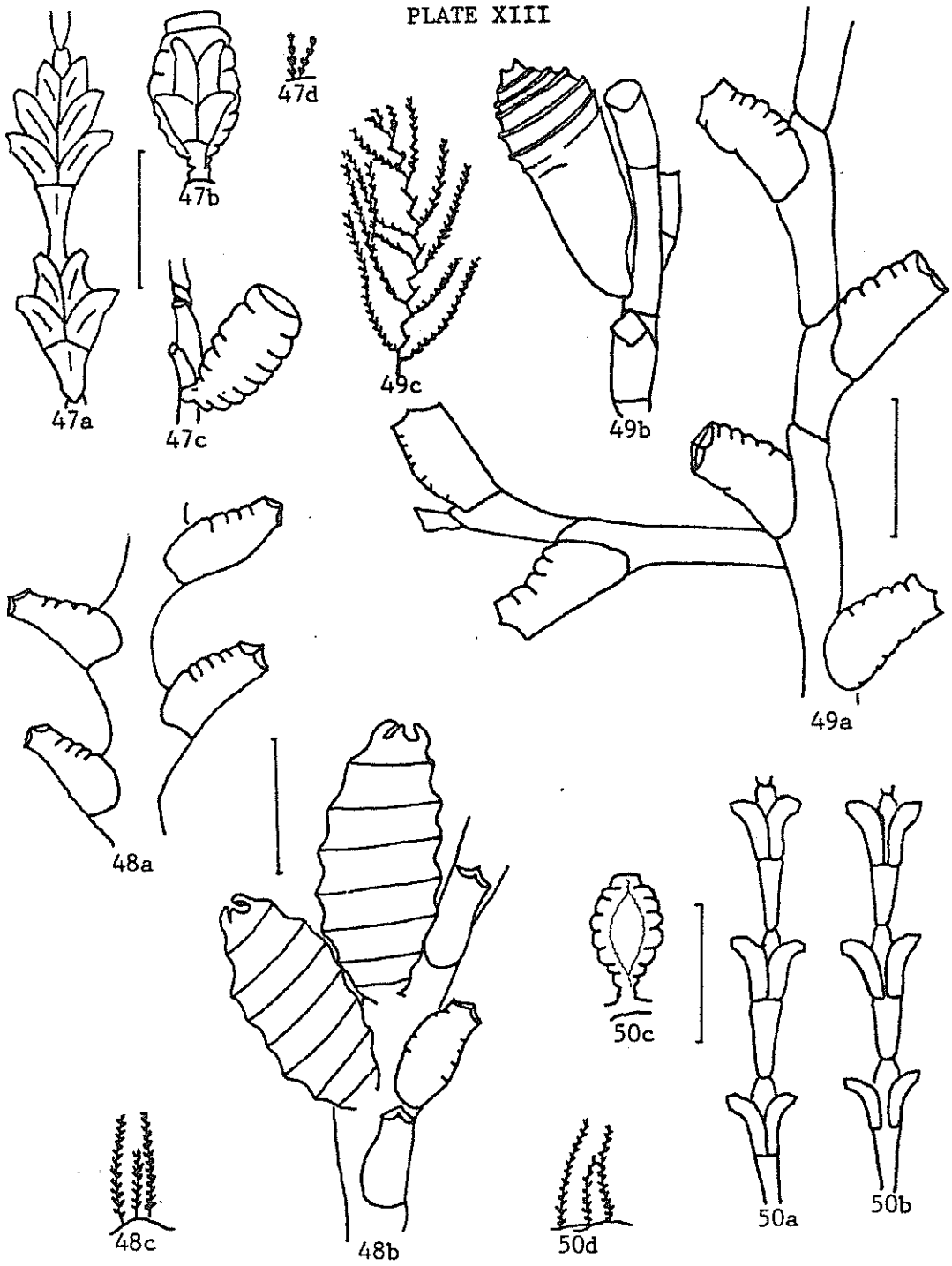


PLATE XIV

Figure 51. Sertularia dalmasi (Versluys).
- a. Portion of stem with hydrothecae, front view. Bar equals 1 mm.
- b. Portion of stem with hydrothecae, back view.
- c. Portion of stem with branch connection.
- d. Detail of hydrotheca. Bar equals 0.25 mm.
- e. Natural size.

(All after Fraser, 1944).

Figure 52. Sertularia inflata (Versluys).
- a. Portion of colony with hydrothecae. Bar equals 1 mm.
- b. Natural size.

(Both after Fraser, 1944).

Figure 53. Sertularia mayeri Nutting.
- a. Portion of stem with hydrothecae; collection 690906-5. Bar equals 1 mm.
- b. Gonangia; after Fraser, 1944. Bar equals 1 mm.
- c. Natural size; collection 690906-5.

Figure 54. Sertularia turbinata (Lamouroux).
- a. Portion of stem with hydrothecae. Bar equals 1 mm.
- b. Portion of stem with gonangium.
- c. Natural size.

(All after Fraser, 1944).

PLATE XIV

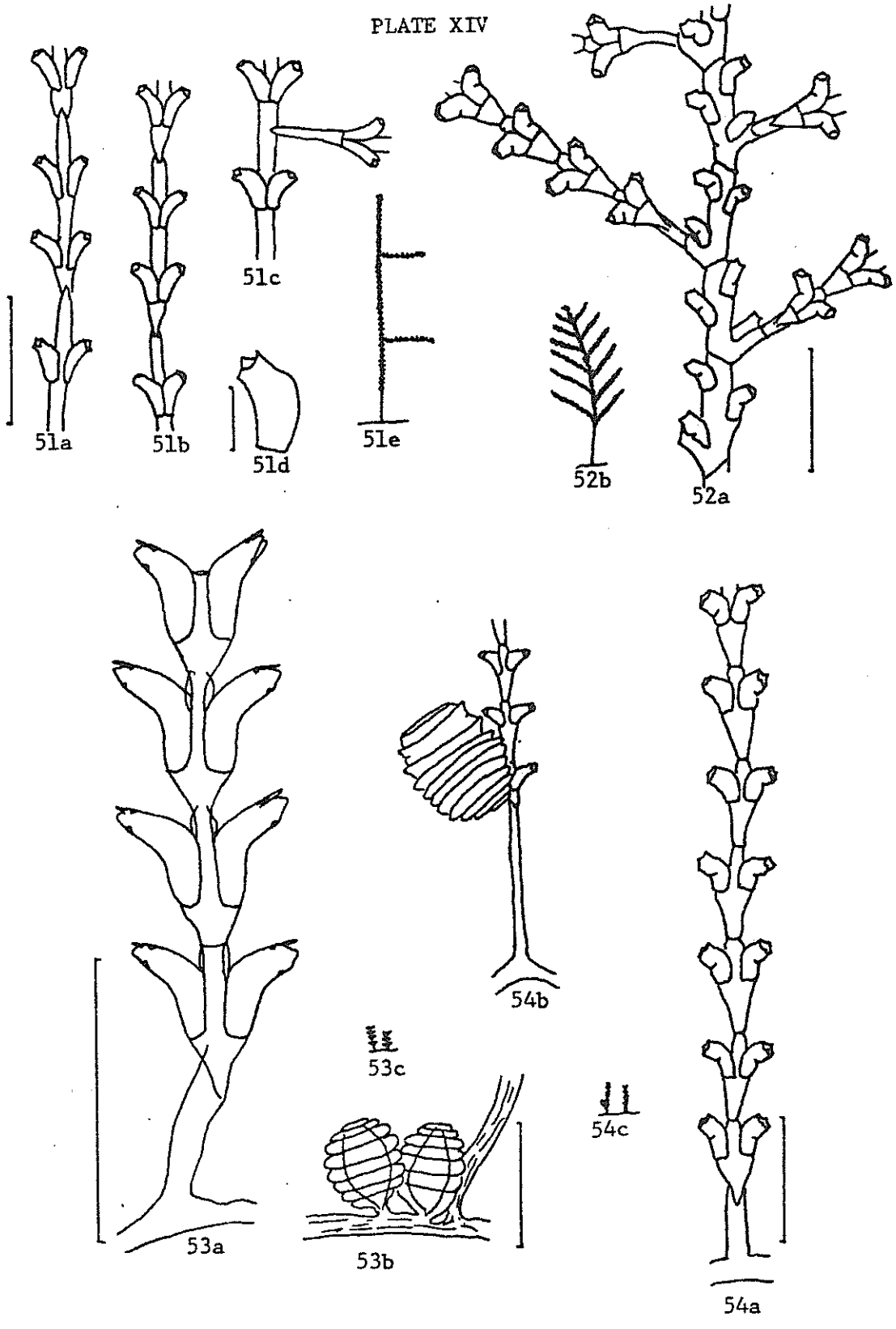


PLATE XV

Figure 55. Thuiaria cupressina (Linnaeus).
- a. Portion of stem and branch with hydrothecae. Bar equals 1 mm.
- b. Gonangia.
- c. Natural size.

(All after Fraser, 1944).

Figure 56. Monostaechas quadridens (McCrady).
- a. Portion of colony with hydrothecae and gonangium. Bar equals 1 mm.
- b. Natural size.

(Both after Fraser, 1944).

Figure 57. Plumularia diaphana (Heller).
- a. Portion of stem and hydrocladia with hydrothecae. Bar equals 1 mm.
- b. Portion of hydrocladia with gonophores.
- c. Gonophore. Bar equals 0.25 mm.
- d. Natural size.

(All after Fraser, 1944).

Figure 58. Plumularia floridana Nutting.
- a. Portion of colony showing hydrocladia and hydrothecae. Bar equals 0.5 mm.
- b. Detail of colony showing hydrocladia. Bar equals 1 mm.
- c. Natural size.

(All collection 690906-4).

PLATE XV

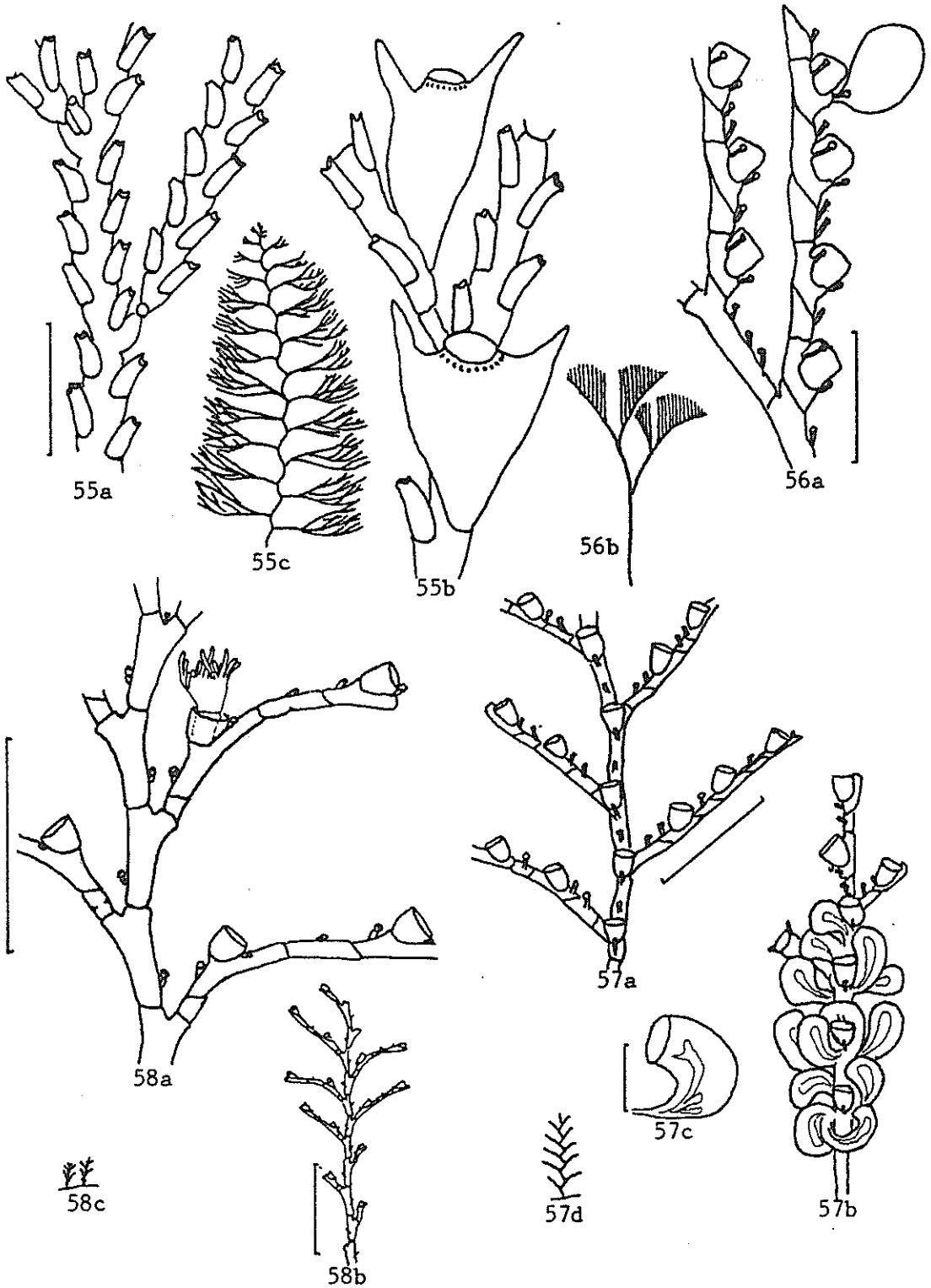


PLATE XVI

Figure 59. Plumularia setacea (Ellis).
- a. Portion of colony showing hydrocladia and hydrothecae. Bar equals 1 mm.
- b. Portion of colony with gonophores.
- c. Natural size.

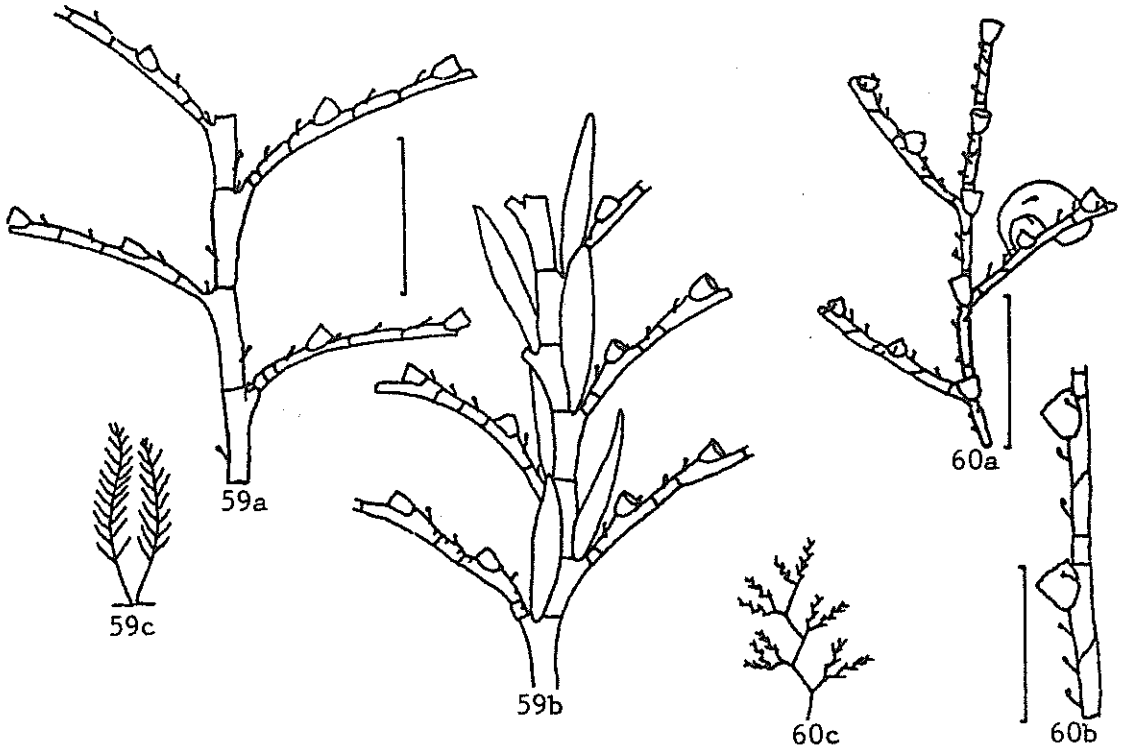
(All after Fraser, 1944).

Figure 60. Schizotricha tenella (Verrill).
- a. Portion of colony showing hydrocladia, hydrothecae, and gonangium. Bar equals 1 mm.
- b. Detail of hydrocladium. Bar equals 0.5 mm.
- c. Natural size.

(All after Fraser, 1944).

Figure 61. Aglaophenia late-carinata Allman.
- a. Portion of hydrocladium showing hydrothecae and hydranth; collection 690906-5. Bar equals 0.5 mm.
- b. Gonophore; after Fraser, 1944. Bar equals 1 mm.
- c. Detail of colony, showing arrangement of hydrocladia; collection 690906-5. Bar equals 1 mm.
- d. Natural size; collection 690906-5.

PLATE XVI



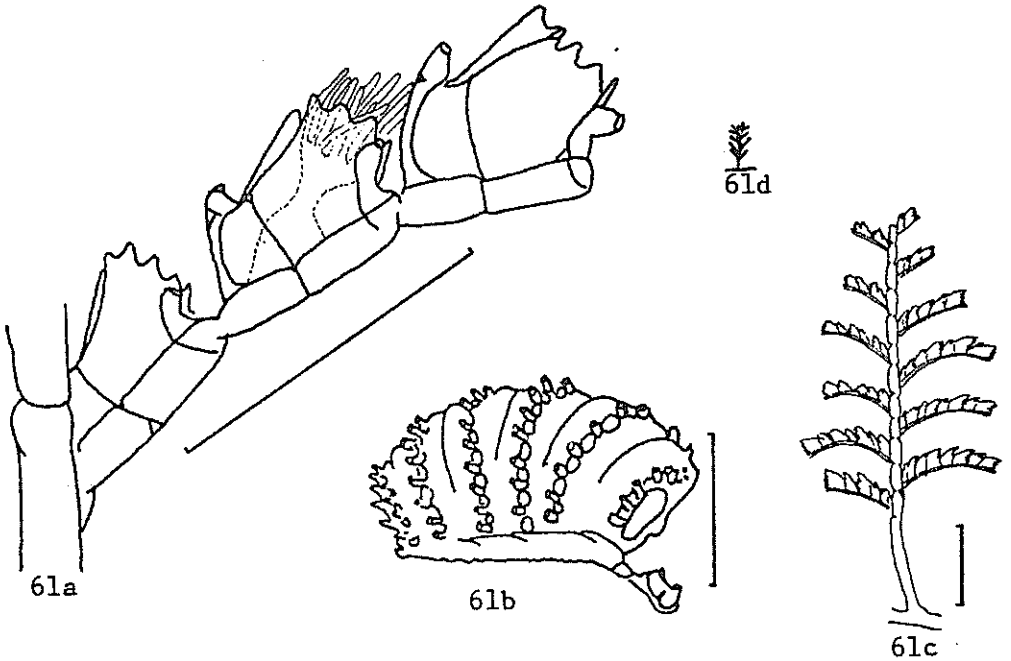


PLATE XVII

Figure 62. Aglaophenia cristifrons Nutting.
- a. Portion of hydrocladium. Bar equals 0.5 mm.
- b. Portion of hydrocladium. Bar equals 1 mm.
- c. Natural size.

(All after Fraser, 1944).

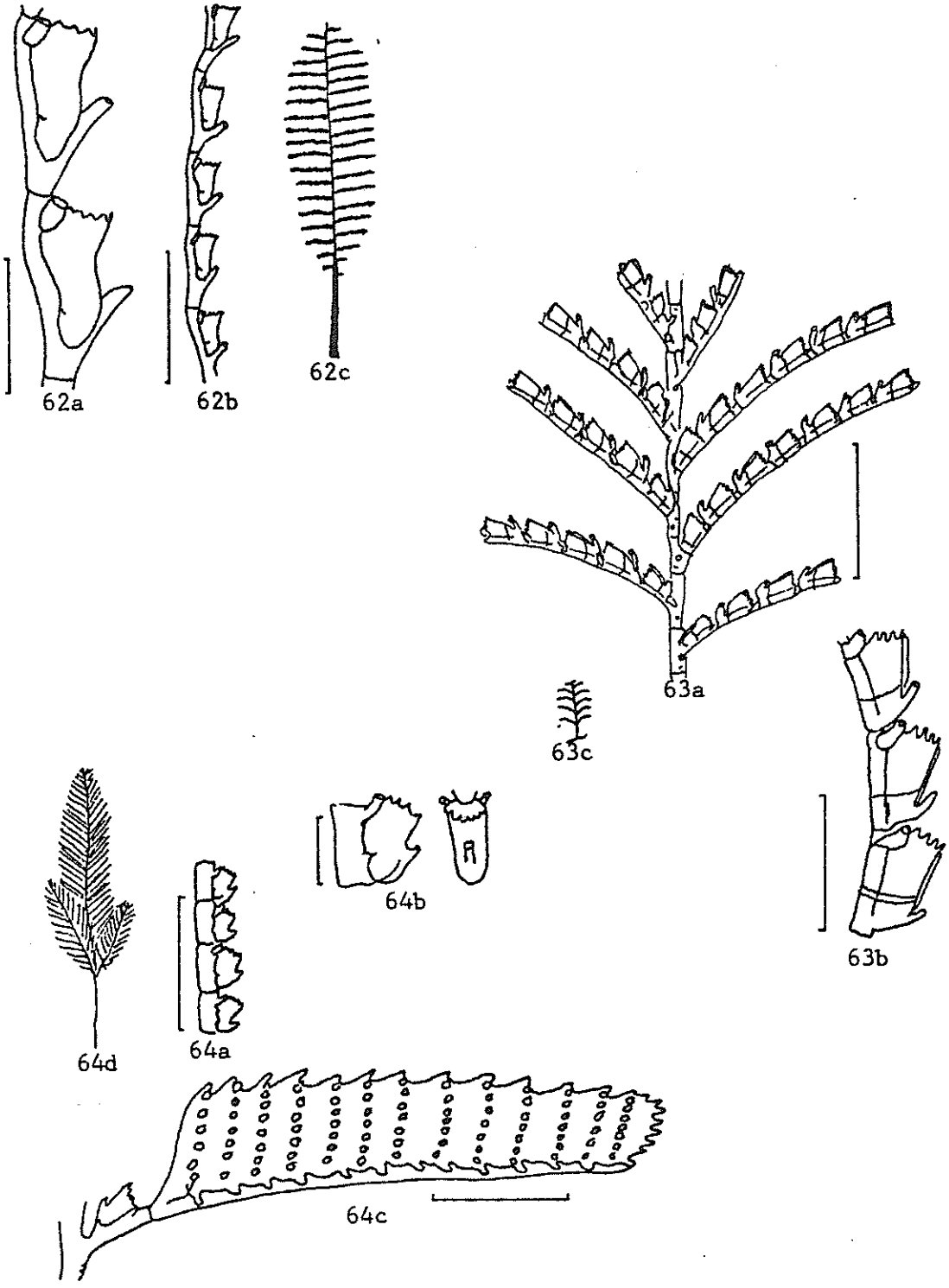
Figure 63. Aglaophenia perpusilla Allman.
- a. Portion of colony showing hydrocladia. Bar equals 1 mm.
- b. Portion of hydrocladium. Bar equals 0.5 mm.
- c. Natural size.

(All after Fraser, 1944).

Figure 64. Aglaophenia rigida Allman.
- a. Portion of hydrocladium. Bar equals 1 mm.
- b. Detail of hydrotheca, side and front views. Bar equals 0.25 mm.
- c. Corbula. Bar equals 1 mm.
- d. Natural size.

(All after Fraser, 1944).

PLATE XVII



ADDENDUM

Since completion of this manuscript, two unpublished theses have been brought to my attention. They are:

Joyce, Edwin A., Jr. 1961. The Hydroida of the Seahorse Key area. M.S. Thesis, Univ. Florida, Gainesville. vi + 116 p.

The following species are reported from Seahorse Key, Florida: Rhizogeton fusiformis, Ectopleura dumortieri, Hydractinia echinata, Podocoryne carnea, Podocoryne hooperi, Eudendrium carneum, Eudendrium laxum, Bimeria franscicana, Bougainvillia inaequalis, Bougainvillia tenella, Bougainvillia sp. A., Pennaria tiarella, Pennaria sp. A., Campanularia flexuosa, Clytia edwardsi, Clytia noliformis, Clytia cylindrica, Clytia johnstoni, Clytia sp. A., Clytia sp. B., Obelia oxydentata, Obelia geniculata, Hebella calcarata, Lovenella gracilis, Lovenella grandis, Halecium dyssymetrum, Halecium sessile, Halecium sp. A., Sertularia stookeyi, Sertularia erasmoi, Antenella secundaria, Plumularia margaretta, and Plumularia diaphana.

Shier, Clare Frances. 1965. A taxonomic and ecological study of shallow water hydroids of the northeastern Gulf of Mexico. M.S. Thesis Florida State Univ., Tallahassee. vi + 128 p., + 35 pls.

The following species are reported from the Alligator Harbor, Florida area: Rhizogeton fusiformis, Turritopsis fascicularis, Zanclea costata, Bimeria sp., Bougainvillia carolinensis, Bougainvillia tenella, Eudendrium carneum, Eudendrium insigne, Eudendrium tenellum, Hydractinia echinata, Podocoryne carnea, Stylactis sp., Pennaria tiarella, Pennaria sp., Clytia cylindrica, Clytia johnstoni, Clytia longicyatha, Clytia sp., Obelia hyalina, Lovenella gracilis, Lovenella grandis, Halecium dyssymetrum, Halecium nanum, Halecium calcarata, Sertularia mayeri, Sertularia stookeyi, Sertularia sp., Antennella secundaria, Plumularia diaphana, Plumularia floridana, Plumularia inermis, and Plumularia margaretta.