

CONTRIBUTIONS FROM THE LABORATORY
OF THE
MARINE BIOLOGICAL ASSOCIATION OF SAN DIEGO.

I.

THE HYDROIDS OF THE SAN DIEGO
REGION.

BY
HARRY BEAL TORREY.

The San Diego Region, as here defined, extends along the coast from LaJolla, ten miles north of Pt. Loma, to the Coronado Is., fifteen miles south of the same point. In climate, topography and faunal characters, it is in many respects similar to the region about San Pedro, Cal., which lies some ninety miles to the northwest. The hydroids about San Pedro have been considered in a former paper (1902). The present work is concerned only with the local hydroids,¹ of which there are 42 known species, 8 being new; and all are represented in the collections of the University of California or the Marine Biological Association of San Diego. The accompanying table will show their recognized distribution.

No attempt has been made to give complete specific synonymies. The plan adopted gives (1) the original name of the species, (2) the permanent name if some change has been necessitated, and (3) all synonyms in papers dealing with Pacific Coast species.

¹With the single exception of *S. pedrensis*.

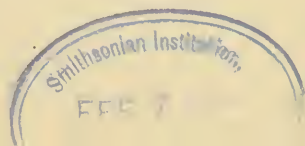


TABLE OF DISTRIBUTION.		Alaska	Puget Sound.	California N. of San Diego.	San Diego.	East America.	Iceland, Gr., Spitzb. and J. M.	Europe.	Asia.	South Africa.	New Zealand.
Gymnoblastera											
Bougainvilliidae											
1.	<i>Bimeria gracilis</i> Clark				+						
2.	<i>Bougainvillia gloriotta</i>				+						
Eudendriidae											
3.	<i>Eudendrium rameum</i> (Pallas)			+	+		JG	+	N		
4.	<i>ramosum</i> (Linn.)			+	+	+	JG	+			
5.	sp.				+						
Hydractiniidae											
6.	<i>Hydractinia californica</i>				+						
Pennariidae											
7.	<i>Corymorpha palma</i> T.			+	+						
8.	<i>Tubularia crocea</i> (Ag.)			+	+	+					
Calyptoblastera											
Haleciidae											
9.	<i>Halecium annulatum</i> T.										
10.	<i>kofoidi</i> T.				+	+					
11.	<i>washingtoni</i> Nutting			+		+					
Campanulariidae											
12.	<i>Campanularia edwardsi</i> Nutting										
13.	<i>everta</i> Clark			+	+						
14.	<i>hesperia</i>										
15.	<i>hineksi</i> Alder					+	+	+			
16.	<i>volubilis</i> (Linn.)		+	+	+	+	+	1		NE	
17.	<i>Obelia corona</i>										
18.	<i>dichotoma</i> (Linn.)		+	+	+	+			+	N	
19.	<i>geniculata</i> (Linn.)			+	+	+	G	+		NE	+
20.	<i>Clytia bakeri</i>										
21.	<i>compressa</i> (Clark)		+		+						
22.	<i>hendersoni</i>					+					
23.	<i>universitatis</i>					+					
24.	<i>Calycella syringa</i> (Linn.)		+	+	+	+	+	IG	+	N+E	
Lafoeidae											
25.	<i>Lafoea dnmosa</i> (Flem.)		+	+	+	+		SG	+	NE	
Sertulariidae											
Sertularella group											
26.	<i>Sertularella halecina</i> T.					+					
27.	<i>pedrensis</i>					+					
28.	<i>tenella</i> (Alder)			+			+				+
29.	<i>tricuspidata</i> (Alder)		+	+		+	+	+	+	NE	
30.	<i>turgida</i> (Trask)			+	+						
Dynamena group											
31.	<i>Dynamena cornicina</i> McC.					+	+				
32.	<i>Sertularia desmoidis</i> T.					+					
33.	<i>furcata</i> Trask					+	+				
Thniaria group											
34.	<i>Sertularia filicula</i> E. & S.		+	+	+	+	+	G	+	NE	
Plumulariidae											
35.	<i>Aglaophenia diegensis</i> T.					+					
36.	<i>inconspicua</i> T.					+					
37.	<i>pluma</i> (Linn.)					+			+		+
38.	<i>struthionides</i> (M.)		+	+		+					
39.	<i>Diplocheilus allmani</i>					+					
40.	<i>Plumularia alicia</i> T.					+	+				
41.	<i>megalcephala</i> A.					+	+				
42.	<i>plumularioides</i> (C.)		+			+					
43.	<i>setacea</i> (Ellis)		+	+		+	+		+		
Totals		7	11	20	42	14	8	13	8	1	2

KEY TO FAMILIES, GENERA AND SPECIES.

1. No true hydrothecae or gonangia	Gymnoblastea	2
1. True hydrothecae and gonangia present.....	Calyptoblastea	13
2. Tentacles in proximal and distal sets; hydranth abruptly set off from stem	Pennariidae	3
2. Tentacles in one circlet, filiform		6
3. Solitary nutritive polyp, rooted in sand; perisarc rudimentary	Corymorpha	4
3. Several nutritive polyps from common stolon; perisarc well developed; gonophores fixed.....	Tubularia	5
4. Not more than 30 proximal tentacles; gonophores without tentacles	C. palma (p. 9)	
5. About 25 proximal tentacles; gonophores with 6-10 flattened pro- cesses	T. crocea (p. 10)	
6. Colony encrusting; hydranths clavate; spiral zooids; spines on hydrorhiza	Hydractiniidae, Hydractinia	7
6. Colony branching		8
7. Sterile hydranths with 6-10 tentacles; blastostyles with knoblike tentacles	H. californica (p. 19)	
8. Proboscis trumpet shaped; hydranth not fusiform	Eudendriidae, Eudendrium	9
8. Proboscis conical; hydranth fusiform	Bougainvilliidae	10
9. Stem and principle branches polysiphonic.....	E. rameum (p. 8)	
9. Stem polysiphonic at base only; branches simple.....	E. ramosum (p. 8)	
10. Gonophores fixed sporosacs.....	Bimeria	11
10. Gonophores liberated as medusae, with four pairs of tentacles	Bougainvillia	12
11. Stems simple, only partially annulated; hydranth with 10-12 tentacles.....	B. gracilis (p. 6)	
12. Stem and branches without annulae, often twined about each other.	B. gloriotta (p. 7)	
13. Nematophores absent		14
13. Nematophores present; hydrothecae sessile, on one side of stem or branches only	Plumulariidae	38
14. Hydrothecae with definite basal septa; gonangia not aggregated ...		15
14. Hydrothecae without definite basal septa, tubular; smooth margined; gonangia aggregated	Lafoeidae	28
15. Hydrothecae much wider than deep	Haleciidae	16
15. Hydrothecae campanulate, usually deeper than wide, never adnate nor immersed	Campanulariidae	19
15. Hydrothecae sessile, adnate or immersed, in 2 to 6 rows..	Sertulariidae	30
16. Gonangia with sporosacs	Halecium	17
17. Stem not fasciated.....		18
17. Stem fasciated; ultimate branches geniculate..	H. washingtoni (p. 11)	
18. Annulated; hydrothecae about half as deep as broad, margin everted	H. annulatum (p. 10)	

18. Not annulated; hydrothecae shallow, margin not everted.....		
.....	<i>H. kofoidi</i> (p. 11)	
19. Operculum of numerous small triangular pieces; unbranched; hydrothecae tubular.....	<i>Calycella</i> , <i>C. syringa</i> (p. 20)	
19. No operculum.....		20
20. Gonophores sessile, sporosaes.....	<i>Campanularia</i>	21
20. Gonophores free medusae.....		23
21. Stems branched, non-fascieled; hydrothecae with 12-14 marginal teeth.....	<i>C. edwardsi</i> (p. 11)	
21. Stems unbranched.....		22
22. Hydrothecal margin with 12-15 ereuations; gonangium compressed, small aperture.....	<i>C. everta</i> (p. 12)	
22. Hydrothecae with 10-12 square-topped teeth.....	<i>C. hincksi</i> (p. 13)	
22. Hydrothecae deep, with 11-12 short, sharp teeth.....	<i>C. hesperia</i> (p. 12)	
22. Hydrothecae small, tubular, with 9 low blunt teeth.....	<i>C. volubilis</i> (p. 13)	
23. Medusae liberated with at least 16 tentacles.....	<i>Obelia</i>	24
23. Medusae liberated with 4 tentacles.....	<i>Clytia</i>	26
24. Hydrothecal margin smooth.....		25
24. Hydrothecal margin bidentate.....	<i>O. corona</i> (p. 14)	
25. Branching irregular; stem non-geniculate.....	<i>O. dichotoma</i> (p. 15)	
25. Usually unbranched, except for pedicels; latter on shoulder pro- cesses of geniculate stem.....	<i>O. geniculata</i> (p. 15)	
26. Stems simple.....		27
26. Stems and branches polysiphonic; colonies large and bushy, hydrothecal margin with 12-15 teeth.....	<i>C. universitatis</i> (p. 19)	
27. Branched; hydrothecae delicate, with about 14 carinate teeth.....	<i>C. hendersoni</i> (p. 18)	
27. Unbranched; hydrothecae usually with thick wall, erenate margin; gonangium compressed, wide aperture.....	<i>C. compressa</i> (p. 17)	
27. No branches except hydranth pedicels; latter usually with but single annulus; hydrothecal margin smooth.....	<i>C. bakeri</i> (p. 16)	
28. Hydrothecae straight.....	<i>Lafoea</i>	29
29. Hydrothecae sessile; stem creeping or erect and polysiphonic.....	<i>L. dumosa</i> (p. 20)	
30. Hydrothecae in two rows.....		31
31. Hydrothecae alternate, one to an internode.....	<i>Sertularella</i> group	32
31. Hydrothecae opposite, one pair to an internode.....	<i>Dynamena</i> group	35
31. Hydrothecae subopposite to alternate, more than two to an internode	<i>Thuiaria</i> group	37
32. Hydrothecal margin dentate.....		33
32. Hydrothecal margin entire, everted, hydrothecae tubular; branches and gonangia rising within hydrothecae.....	<i>S. halecina</i> (p. 26)	
33. Three marginal teeth.....		34
33. Four marginal teeth; hydrothecae and stems annulated.....	<i>S. tenella</i> (p. 28)	
34. Hydrothecae corrugated; internodes long, slender; gonangia spinulose.....	<i>S. pedrensis</i> (p. 27)	

34. Hydrothecae smooth; internodes moderate; gonangia with high narrow transverse corrugations	<i>S. tricuspidata</i> (p. 28)	
34. Hydrothecae smooth or roughened; internodes stout, geniculate: gonangia with distal spines or annulae or both..	<i>S. turgida</i> (p. 29)	
35. Margin of hydrotheca without teeth.....	<i>S. desmoides</i> (p. 30)	
35. Margin of hydrotheca with two teeth		36
36. Teeth prominent; mouth of hydrotheca large.....	<i>S. furcata</i> (p. 31)	
36. Teeth moderate, mouth of hydrotheca small	<i>D. cornicina</i> (p. 30)	
37. Aperture of hydrotheca round; hydrotheca abruptly narrowed distally.....	<i>S. filicula</i> (p. 32)	
38. Nematophores fixed by a broad base		39
38. Nematophores fixed by a narrow base		44
39. Stem simple; hydrotheca with dentate margin, no anterior intrathecal ridge; corbulae without hydrothecae at bases of leaflets.....	<i>Aglaophenia</i>	40
39. Stem simple; hydrotheca with anterior intrathecal ridge; single sapracalyceine sareostyle; no corbulae.....	<i>Diplocheilus</i>	43
40. Hydrotheca with 11 irregular teeth	<i>A. struthionides</i> (p. 35)	
40. Hydrotheca with 9 teeth		41
41. Median tooth recurved		42
41. Median tooth not recurved	<i>A. pluma</i> (p. 34)	
42. Hydrocladial nodes well marked; mesial nematophore reaches mouth of hydrotheca	<i>A. inconspicua</i> (p. 34)	
42. Hydrocladial nodes weak; mesial nematophore does not reach mouth of hydrotheca	<i>A. diegensis</i> (p. 33)	
43. Margin of hydrotheca smooth; mesial nematophore very short and broad.....	<i>D. allmani</i> (p. 36)	
44. Hydrocladia pinnately disposed on erect stem without thorny processes or nematophorous branchlets; no corbulae.....	<i>Plumularia</i>	45
45. Hydrocladial internodes thecate and non-thecate		46
45. Hydrocladial internodes thecate only	<i>P. plumularioides</i> (p. 38)	
46. Nodal septa transverse		47
46. Nodal septa alternately transverse and oblique; thecate internodes twice as long as non-thecate	<i>P. alicia</i> (p. 37)	
47. Hydrocladia borne on short processes of stem, always alternate	<i>P. setacea</i> (p. 39)	
47. Hydrocladia borne on long processes of stem, very slender, opposite distally	<i>P. megaloccephala</i> (p. 37)	

GYMNOBLASTEAE.

Fam. BOUGAINVILLIIDAE.

Gen. **Bimeria**, Wright, 1859.1. **Bimeria gracilis** Clark.

Bimeria gracilis, Clark, 1876a, p. 252, pl. 38, fig. 3.

Thyphosome. Stems rising from creeping hydrorhiza to height of 20 to 30 mm., with numerous short branches. Hydranths borne alternately on latter, on moderate pedicels; 9-11 rather stout tentacles. Stem usually smooth, occasionally wrinkled. Pedicels with 2 to 5 more or less indistinct annulae at the base. Perisarc opaque, extending to bases of tentacles.

Gonosome. Sporosacs ovate, borne on branches singly or in pairs. Pedicel short and smooth; spadix branched.



Fig. 1.—*Bimeria gracilis*. Gonophores.

Distribution. Dredged near the mouth of San Diego Bay, in 3 fathoms, July, 1903; La Jolla, at low water, July, 1903. San Diego (Clark).

There can be little doubt that this is Clark's species. The perisarc was covered with minute adhering particles. Male sporosacs are slightly smaller than female.

Gen. **Bougainvillia**, Lesson, 1836.2. **Bougainvillia glorietta**, n. sp.

Trophosome. Stems branched, rising from a creeping hydrorhiza in clusters to the height of 20 to 30 cm. Stems, or stem and branches frequently twine about each other. Perisarc smooth, without annulae, occasionally wavy, unusually adhesive, covered with particles of dirt and diatoms, reaching bases of tentacles. Terminal hydranths largest, with 20 to 25 tentacles carried in two or three irregular whorls, the outermost shortest. Tentacles highly contractile, held stiffly when at rest.

Gonosome. Gonophores each on a short pedicel, in groups of two or three on branches or hydranth stalks.

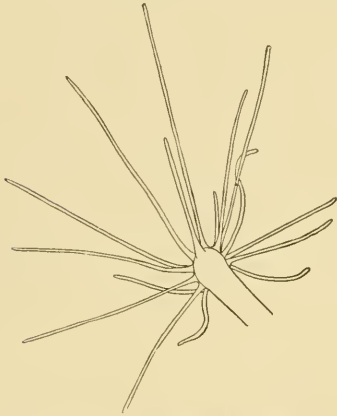


Fig. 2.—*Bougainvillia glorietta*.
Hydranth from below.

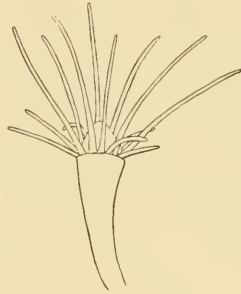


Fig. 3.—*B. glorietta*.
Hydranth with tentacles
partly retracted; edge of
perisarc visible.

Distribution. San Diego Bay, Cal.

This is the second species of the genus to be found on this coast. The first was collected in San Francisco Bay by A. Agassiz ('65) and referred to *B. mertensi*. It was taken again by myself in Oakland Harbor, Cal., and is mentioned in a footnote on p. 1 of my former paper (:02). The present species resembles *B. superciliaris*, yet differs in lacking annulae in the perisarc and in the twining habit of stem and branches. Medusae with 4 pairs of tentacles, 4 simple mouth processes and 8 ocelli were still within the perisarc, July 5, 1903.

EUDENDRIIDAE.

Gen. **Eudendrium**, Ehrenberg, 1834.3. **Eudendrium rameum** (Pallas).

Tubularia ramea, Pallas, 1766, p. 83.

Eudendrium rameum, Johnston, 1847, p. 45, pl. 5, figs. 1, 2.

Eudendrium rameum, Torrey, 1902, p. 33.

Trophosome. "Hydrocaulus profusely branched, attaining a height of from three to six inches, fascieled in the main stem and principal branches; main stem attaining a thickness of more than a quarter of an inch, and as well as the principal branches, very irregularly ramified; branches alternately losing their fasciculation and then consisting of single capillary tubes, which may continue to branch before the emission of the ultimates or hydranth-bearing ramuli, which are regularly alternate in their disposition; perisarc rigid, occasionally marked with nearly obsolete annulations on the smaller branches. Hydranths with about twenty tentacles, frequently atrophied in the male after the production of gonophores."

Gonosome. Male sporosacs two-chambered, borne upon the body of the hydranth in a vertical immediately below the tentacles; female sporosacs oval, scattered on the hydrocaulus for some distance below the hydranth." (Allman, '71.)

Distribution. Mouth of San Diego Bay, between tides (June 26, 1903; no gonosome); San Pedro, Cal., on float at surface (Dec., 1901; no gonosome). Mediterranean, Norway, Gt. Britain (Allman). Jan Mayen (Markt.) Helgoland (Hartlaub). Greenland (Levinsen). Northern Asia (Thompson).

4. **Eudendrium ramosum** (Linn.).

Tubularia ramosa, Linnaeus, 1767, p. 1302.

Eudendrium ramosum, Ehrenberg, 1834, p. 296.

Eudendrium ramosum, Torrey, 1902, p. 34.

Trophosome. Hydrocaulus much branched, fascieled at the base and attaining a height of four inches or more; primary ramifications irregular, after which the branches become regularly alternate and mostly distichous in their arrangement, giving off all along their length, from their upper or distal sides, short, usually simple ramuli, which support the hydranths on their summits; perisarc firm, annulated at the origin of the branches, or even along the entire length of the smaller branches. Hydranths usually with about twenty tentacles.

Gonosome. Male sporosacs two-chambered, borne on body of hydranth below tentacles which often atrophy. Female sporosacs pyriform, scattered on body of hydranth and stalk immediately below it.

Distribution. Mouth of San Diego Bay, in 3 fathoms; Pacific Grove, Cal. Gt. Britain (Allman). Jan Mayen, Adria, Rovigno (Markt.). Helgoland (Hartlaub). Greenland (Bétencourt).

The San Diego material consists of three stem fragments which are provisionally placed in this species. The definition is Allman's ('71), with a few slight verbal changes.

5. **Eudendrium** sp.

A fragment of a colony, consisting of hydrorhiza and a few very short stems, was taken at Point Loma, June 27, 1903. The perisarc is sparsely and wavyly annulated. Female blastostyles with tentacles.

FAM. HYDRACTINIIDAE.

Gen. **Hydractinia**, Van Beneden, 1844.

6. **Hydractinia californica**, n.sp.

Trophosome. Sterile hydranths 2 to 2.5 mm. long in extension, with 6 to 10 tentacles, usually in 2 recognizable whorls; proboscis domed to conical. Spines .5 to .9 mm. long, conical, often with truncated tops and irregular protuberances; with about 10 longitudinal dentate ridges.

Gonosome. Sporosacs, with 1 or 2 eggs in female, borne in clusters of 2 to 10 or more about half way from the base of the blastostyle. Latter with 5 to 10 knob-like clusters of nematocysts representing tentacles; 1 to 1.3 mm. long.

Colors. Perisarc deep brown, fleshy parts white.

Distribution. Off San Diego, in 50 fathoms. Covering the shells of *Dentalium polygonum* inhabited by hermit crab.

This species is very closely allied with *H. echinata* (Flem.) of Europe and *H. polyclina* Ag. of the eastern United States, which are themselves almost indistinguishable. It appears to differ from them in its much smaller number of tentacles. The latter arise in threes, fours, or fives, or irregularly; there is no single typical method.

FAM. PENNARIIDAE.

Gen. **Corymorpha**, Sars, 1835.

7. **Corymorpha palma**.

Corymorpha palma, Torrey, 1902, p. 37; 1902a, p. 987.

Trophosome. Stems each 6 to 14 cm. long, rooted in sand by a dense tangle of filamentous processes, and covered by perisarc proximally

for one third or one fourth of its length; thickest near proximal end, tapering gradually into a narrow neck which supports the hydranth. Latter with 18 to 30 proximal tentacles in one whorl, with a span of about 2.5 cm.; distal tentacles more than twice as numerous, more or less irregularly placed around the mouth in several whorls.

Gonosome. Gonophores medusoid, permanently fixed to peduncles springing from the base of the proboscis just within the whorl of proximal tentacles, each with a ring and 4 radial canals, and a manubrium at least twice as long as the bell, without a mouth; tentacles wanting; velum may be present or absent.

Distribution. San Diego and San Pedro, Cal., throughout the year, between tides, on sand flats. Eggs laid in May, June, July.

Gen. **Tubularia**, Linnaeus, 1767.

8. **Tubularia crocea** (Ag.).

Parypha crocea, L. Agassiz, 1862, 111, p. 249, pls. 23, 23a, figs. 1-7.

Parypha microcephala, A. Agassiz, 1865, p. 195.

Tubularia crocea (Ag.), Allman, 1871, p. 416.

Tubularia elegans, Clark, 1876a, p. 253, pl. 38, fig. 2.

Tubularia crocea, Torrey, 1902, p. 43, pl. 2, Figs. 22, 23.

Trophosome. Colony usually a bushy mass of stems, tangled below, which may be 10 cm. long and may occasionally branch. Hydranths with not more than 25 proximal tentacles.

Gonosome. Gonophores borne in pendulous clusters on peduncles arising between proximal and distal tentacles; with 6 to 10 flattened processes, varying in size, more prominent in female, sometimes hardly visible in male.

Distribution. San Diego Bay, San Pedro Harbor, and San Francisco Bay, Cal. Eastern United States (Agassiz).

CALYPTOBLASTEAE.

Fam. HALECHIDAE.

Gen. **Halecium**, Oken, 1816.

9. **Halecium annulatum**.

Halecium annulatum, Torrey, 1902, p. 49, pl. 3, figs. 30, 31.

Trophosome. Stems rising from a creeping hydrorhiza to a height of 7 mm.; the longer have 2 regularly alternating branches. Stem and branches more or less regularly annulated throughout. Hydrothecae may be half as deep as broad; margin everted. Sessile hydrothecae alternately on either side of stem or branch; peduncles arising within these carry other hydrothecae which may also give rise to other peduncles.

Gonosome. Female gonangia broadly ovate, excessively compressed, with terminal aperture. Single gonophore with numerous ova, surrounded by blastostylar processes reaching to gonangial wall.

Distribution. Coronado Is., Mexico (July, 1903), and Coronado, Cal. (July, 1901). Growing on seaweed.

10. *Halecium kofoidi*.

Halecium kofoidi, Torrey, 1902, p. 49, pl. 3, figs. 32, 33.

Trophosome. Stems rising from creeping hydrorhiza, branching irregularly; largest colonies with thick trunk may reach 5 mm. in height. Branches arise just below hydrothecae; divided obliquely into internodes of approximately equal length. Each internode usually bears on a distal shoulder process a sessile hydrotheca which does not reach beyond the distal node. Within this hydrotheca another may arise, and another within the latter, both on short stalks somewhat constricted at the base and bent slightly away from the stem. Hydrothecal wall especially thick.

Gonosome. Male gonangia long, oval, smooth, 3 or 4 times as long as broad; may be waved proximally; small terminal aperture.

Distribution. Coronado Is., Mexico (July 25, 1903, on kelp at surface); Pt. Loma; mouth of San Diego Bay, 5 fathoms; Catalina Is., 42 fathoms.

11. *Halecium washingtoni* Nutting.

Halecium geniculatum, Nutting, 1899, p. 744, pl. 63, fig. 1.

Halecium washingtoni, Nutting, 1901, p. 789.

Halecium nuttingi, Torrey, 1902, p. 50.

Trophosome. Colony fasciated, branching in much the same plane, branches approximately alternate; non-fasciated branches more or less regularly annulated at their bases, with long internodes which are arranged in zigzags distally. Hydrothecae at the distal end of each internode, singly or in pairs, margins everted. Hydranths with 16 to 24 tentacles.

Gonosome. "Gonangia borne singly in the axils of the branches and branchlets, regularly ovoid in one view, barnacle-shaped in the other; aperture large, terminal" (Nutting, '99).

Distribution. Pt. Loma, July, 1901. Puget Sound (Nutting).

Fam. CAMPANULARIIDAE.

Gen. *Campanularia*, Lamarek, 1816.

12. *Campanularia edwardsi* Nutting.

Campanularia edwardsi, Nutting, 1901, p. 346, fig. 28.

Trophosome. "Colony attaining a height of over an inch, branching somewhat irregularly, but with a distinct tendency to send off pedicels from the main stem in sub-opposite pairs. Stems, branches and pedicels exceedingly long and slender, with the annulation confined to the proximal portions, except the few just below the hydrothecae. Hydrothecae very large, deeply campanulate, with 12 to 14 exceedingly sharp, slender teeth. Hydranth with about 28 tentacles.

Gonosome. "Unknown" (Nutting).

Distribution. Mouth of San Diego Bay, in 3 fathoms. Woods Hole, Mass., between tides (Nutting).

There is much variation in the size and proportions of the hydrothecae, correlated apparently with mode of growth. The stems are usually densely clustered. Some of the larger stems, however, grow more freely above the rest. These longer stems bear the longest hydrothecae, which may be .92 mm. long. On the crowded stems, the hydrothecae may be no longer than .60 mm. Short scattered stems produce the largest hydrothecae of all. The diameter does not vary with the length, as the following measurements in mm. show: .625 x .26; .67 x .31; .68 x .45; .70 x .45; .72 x .39; .92 x .45. As a rule, however, the diameter is less than half the length. The thecae growing in the clusters are relatively broader.

The gonosome was not present, July 15, 1903.

13. *Campanularia everta* Clark.

Campanularia everta, Clark, 1876a, p. 253, pl. 39, fig. 4.

Campanularia everta, Torrey, 1902, p. 51, pl. 4, figs. 35-37.

Trophosome. Pedicels of variable length, smooth, wavy or irregularly annulated, arising directly from a creeping hydrorhiza; spherical annula immediately below each hydrotheca. Wall of latter varies greatly, from excessive thickness to thin; straight or convex in profile; margin usually crenate.

Gonosome. Gonangia somewhat compressed, ovate, with small round terminal aperture. Acrocyts may be present in female, which are somewhat larger than male.

Distribution. San Diego, low water to 24 fathoms; Catalina I., 42 fathoms; Pacific Grove, Cal. San Diego (Clark).

Gonosome present, June 26, 1903.

Transitions between all the forms of hydrothecae have been traced in the same colony. *C. everta* can be distinguished from *Clytia compressa* by the gonosome; the gonangia have a much narrower aperture and the gonophores are fixed sporosaes.

14. *Campanularia hesperia*, n. sp.

Trophosome. Stems simple, unbranched, from a creeping hydrorhiza, terminating in hydranths; with about 10 rings at base, 2 to 4 just below hydrothecae, and usually 3 or 4 others in the distal half of the stem. Hydro-

thecae less than half as broad as long (.5 x .22 mm.; .6 x .25 mm.), with 11 or 12 short, sharp marginal teeth. Hydranth with 22 to 24 tentacles.

Gonosome absent, July 13, 1903.



Fig. 4.—*Campanularia hesperia*. Hydrotheca and pedicel.

Distribution. La Jolla, Cal., between tides, on the tests of ascidians.

This species closely resembles *Clytia cylindrica* Ag. in habit and skeletal features, but the latter species has but 16 tentacles, and the absence of the gonosome makes it desirable to distinguish between the two for the present.

15. *Campanularia hincksi* Alder.

Campanularia Hincksi, Alder, 1857, p. 127.

Campanularia Hincksi, Hincks, 1868, p. 162, pl. 24, fig. 3.

Campanularia hincksi, Torrey, 1902, p. 53.

Trophosome. Pedicels arise directly from hydrorhiza. Hydrothecae large and deep, with 11 to 14 flat-topped teeth which may have rounded corners or be slightly hollowed out above. Wall very thin, with delicate longitudinal lines from the margin between the teeth.

Gonosome. Gonangia much elongated, slightly tapering distalward, to truncate end; 10 to 18 wavy annulations.

Distribution. Mouth of San Diego Bay, in 3 fathoms; off San Diego in 40 to 75 fathoms. Newport, R. I. (Nutting). British coasts, from 10 to 20 fathoms to deep water (Hincks).

Gonosome present, June 29, 1903.

16. *Campanularia volubilis* (Linn.).

Sertularia volubilis, Linnaeus, 1767, p. 1311.

Campanularia volubilis, Alder, 1856, p. 358, pl. 13, fig. 7.

Campanularia volubilis, Hartlaub, 1901, p. 357.

Campanularia volubilis, Torrey, 1902, p. 54, pl. 5, fig. 48.

Trophosome. Pedicels long, annulated, springing from hydrorhiza. Hydrothecae small, broadly tubular; margin with 9 to 10 short blunt teeth, frequently reduplicated.

Gonosome. Gonangia smooth, flask-shaped, somewhat compressed, with a long narrow neck and small circular aperture.

Distribution. San Diego, shore rocks; San Pedro, Cal., 9 fathoms; Tomales Bay, Cal., shore rocks. Near Vancouver, B. C. (Hartlaub). Gulf of St. Lawrence (Packard). Massachusetts

(Agassiz). Iceland, British coasts (Hineks). Norway (Sars). Helgoland (Hartlaub). White Sea (Mereschkowsky).

No gonosome in the San Diego specimens, June 26, 1903.

Gen. **Obelia**, P. et L., 1809.

17. **Obelia corona**, n. sp.

Trophosome. Colonies very low; stems simple, short, slightly flexuous, from a creeping stolon, with 3-6 annulae distal to each pedicel. Hydranths long, narrow, tapering, margin with 8-10 teeth, each with two sharp cusps, pedicel short, completely annulated, with 2-4 annulae. Hydranth with about 24 tentacles.

Gonosome. Gonangia about 3 times as long as broad, with wide aperture; pedicel slender, with 2-4 annulae. Numerous medusae, largest with 24 tentacles.

Dimensions. Hydrotheca: .44 x .20; .43 x .18 mm.

Gonangium: .76 x .20 mm. (including pedicel).



Fig. 5.—*Obelia corona*.
Hydrothecae.

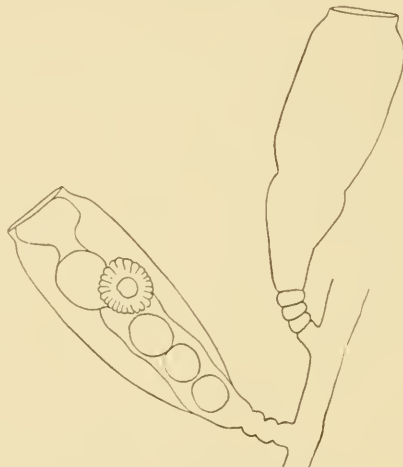


Fig. 6.—*O. corona*. Gonangia.

Distribution. San Diego Bay, on piles under wharves at low tide, July 15, 1904. Creeping over sponges.

Hydranths and gonangia are frequently borne on pedicels springing directly from the stolon. Stems and stolons transform with readiness into each other in the colonies at hand, owing doubtless to the many opportunities offered by life on a growing sponge for variations in the contact stimulus.

18. *Obelia dichotoma* (Linn.).

Sertularia dichotoma, Linnaeus, 1767, p. 1312.

Obelia dichotoma, Hincks, 1868, p. 156, pl. 28, fig. 1.

Obelia dichotoma, Calkins, 1899, p. 356, pl. 3, fig. 16.

Obelia dichotoma, Torrey, 1902, p. 57.

Trophosome. "Stem filiform, slender, nearly straight, irregularly branched, ringed above the origin of the branches, of a deep horn color: branches suberect, often very long, and more or less ramified, ringed at intervals, a single calycele in the axils; hydrothecae alternate, broadly campanulate and deep, polyhedral above, each side corresponding with a very slight sinuation of the margin, borne on ringed pedicels, which vary in length from 4 or 5 to as many as 16 rings."

Gonosome. "Gonothecae axillary, slender, smooth, widening from the base upwards, and terminating above in a raised, somewhat conical aperture." (Hincks). Medusae liberated with 16 tentacles (Hincks), 20 to 24 (Southern California specimens).

Distribution. San Diego; San Pedro, Cal. Puget Sound (Calkins). Alaska (Nutting). Eastern United States (Nutting). Helgoland (Schulze). N. Asia (Thompson).

It is possible that the California species is the stock which produces an undescribed medusa of the genus *Obelia* that is very abundant in the neighborhood of San Diego. If this prove to be the case, the hydroid, though identical with *O. dichotoma* as regards the trophosome, will become a new species.

19. *Obelia geniculata* (Linn.).

Sertularia geniculata, Linnaeus, 1767, p. 1312.

Obelia geniculata, Allman, 1864, p. 372.

Obelia geniculata, Torrey, 1902, p. 58.

Trophosome. "Stem zigzag, sometimes sparingly branched, jointed at each of the flexures, and thickened immediately below them, so as to form a series of projections or rests, from which the pedicels arise, hydrothecae somewhat oboconical, rather short, the length slightly exceeding the width, with a plain margin, borne on short, annulated stalks (rings (4-6), which are suberect and taper slightly upwards."

Gonosome. "Gonothecae axillary, unshaped, attached by a short ringed stalk (3-4 rings)." (Hincks.) Medusae at time of liberation with 24 tentacles.

Distribution. Coronado, Cal., at surface; Catalina I., 42 fathoms; San Francisco, between tides. Eastern United States (Agassiz, Nutting). Europe (Hincks). White sea (Mereschkowsky). New Zealand (Hartlaub).

Gonosome present, July 1, 1903.

The geniculation varies in different parts of the colony and may be absent in some regions. The colonies from Coronado are unusually low, and branched. Otherwise they are not distinguishable from the typical forms.

Gen. *Clytia*, Lamouroux, 1816.

20. *Clytia bakeri*, n. sp.

Trophosome. Stems clustered, about 20 mm. long, without branches. Each stem free, for 2 to 5 mm., from pedicels of hydrothecae, which then follow each other alternately in quick succession; closely annulated at base, annulae increasing gradually in length, ultimately becoming internodes of stem. Stem internodes usually 3 to 4 times as long as broad, each bearing a pedicel on a shoulder process from distal end. Hydrothecae small, conical, without marginal teeth; pedicel consisting usually of but one annula almost as long as broad.

Gonosome. Gonangia long, narrow, with bottlenose apertures, tapering gradually to short peduncles; borne usually in pairs at the bases of hydrothecal pedicels. Sporosae abundant, 12 to 20.

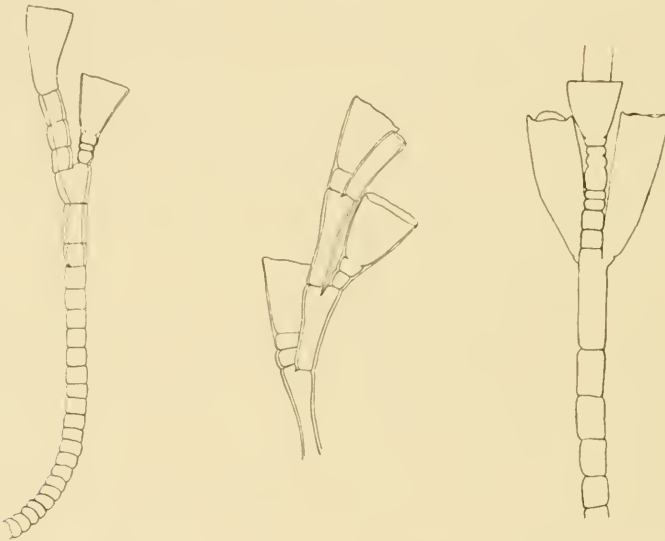


Fig. 7.—*Clytia bakeri*. Proximal portion of stem, showing characteristic annulation.

Fig. 8.—*C. bakeri*. Portion of stem in distal half, with three typical hydrothecae, one of which is sessile.

Fig. 9.—*C. bakeri*. Proximal region of stem with gonangia and hydrotheca with exceptionally long pedicel.

Distribution. Pacific Beach, in the surf, attached in tufts to the posterior region of both valves of the beach clam *Donax*, a most unusual situation for a hydroid, which may account for the irregular, damaged margins of the hydrothecae. The beach was literally covered with the colonies, Jan. 2, 1904. Mouth of San Diego Bay, under similar circumstances, July, 1904.

There is considerable variation in the length of the annulae or internodes on the stem and the annulation of the pedicels. Occasionally a pedicel has several annulae (fig. 9), but this is the case only in the lower portion of the stem—*e.g.*, the pedicel referred to is the lowest in the colony. More often the hydrothecae are sessile; this condition is found in the distal portion of the colony. As a general rule, the annulation disappears from base to tip.

The dimensions of the hydrothecae in four average specimens, are as follows, length first, in mm.: .69 x .45; .68 x .50; .50 x .52; .48 x .37.

Dimensions of gonangia: .98 x .33; 1.14 x .28.

This species is named in honor of that tireless friend of education and public spirited citizen of San Diego, Dr. Fred Baker.

21. *Clytia compressa* (Clark).

Campanularia compressa, Clark, 1876a, p. 214, pl. 8, figs. 5, 6.

Clytia compressa, Nutting, 1901, p. 170, pl. 17, figs. 3, 4.

Cytia compressa, Torrey, 1902, p. 58, pl. 6, fig. 49.

Trophosome. As in *C. everta*.

Gonosome. Gonangia compressed, broadly ovate, with truncated top and large aperture.

Distribution. San Diego, 5 fathoms; San Pedro, Cal., 3 fathoms. Orea, Al. (Nutting). Shumagin Is., Al., 6-20 fathoms, on *Laminaria* (Clark).

Gonosome present. May 23 and July 13, 1901.

22. *Clytia hendersoni*, n. sp.

Trophosome. Colonies branching, 3 to 5 cm. high. Internodes of the stem flexuous, with a pronounced knee at the base of each, and running parallel with hydranth pedicels for nearly half their length; above each knee, 3 to 8 annulae. Pedicels completely annulated, with 6-14 annulae. Hydrothecae large, deep, 1.00-1.2 mm. long by .40-.60 mm. in diameter, tapering gradually, with very thin and easily collapsible walls, bordered by about 14 very sharp, keeled teeth.

Gonosome. Gonangia with wide mouths, widest in distal half, tapering, 3 times as long as broad, with wavy contours but not annulated. Pedicels short, with 3 or 4 annulae. Usually 3 or 4 medusae in each gonangium, each with 4 tentacles and without gonads.

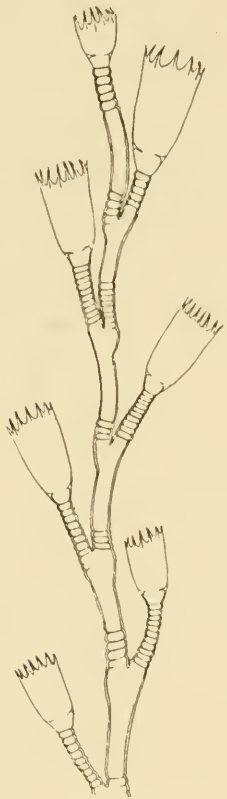


Fig. 10.—*Clytia hendersoni*. Stem with hydrothecae.

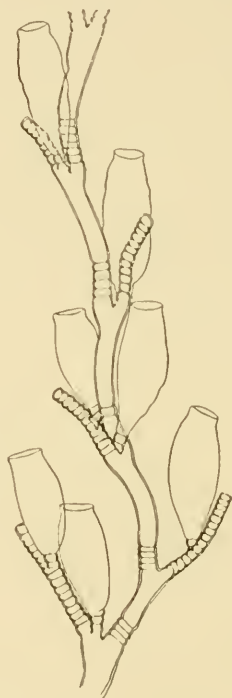


Fig. 11.—*C. hendersoni*. Stem with gonangia.

Distribution. San Diego Bay, 3 fathoms, July 15, 1903. Growing rather thickly on sponges. The flexuous character of the stem is more pronounced distally.

This species is named for Miss Margaret Henderson as a slight mark of appreciation of her efficient assistance in the preparation of this paper.

23. *Clytia universitatis*, n. sp.

Campanularia denticulata, Torrey, 1902, p. 51, pl. 4, fig. 34.

Trophosome. Stem long, branching irregularly, forming bushy tufts often exceeding 200 mm. in length. Stem and branches polysiphonic. Hydranth pedicels long, almost completely annulated; hydrothecae deep, tapering, with 12-15 marginal teeth; hydranths with about 28 tentacles.

Gonosome. Gonangia borne on stem, branches or hydranth pedicels, less than 3 times as long as broad, with short pedicel which may or may not contain a single annulus; with wide aperture. Contour somewhat irregular, occasionally 1 or 2 annulations distally. Medusae numerous, oldest with 4 tentacles.

Dimensions. Hydrothecae, in mm.: .70 x .37; .78 x .40; .81 x .39; .83 x .42. Gonangium: .95 x .39; 1.00 x .41.

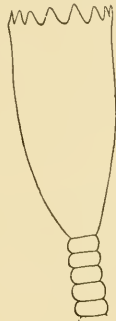


Fig. 12.—*Clytia universitatis*. Hydrotheca.



Fig. 13.—*C. universitatis*. Gonangium.

Distribution. San Diego Bay, on piles of wharves at low tide, July 15, 1904; San Pedro Bay, Cal., Dec., 1901.

The species bears a general resemblance to *Campanularia verticillata*. The pedicels of the hydranths, however, are not arranged in verticils, and the gonophores are not sporosacs. Young colonies taken in San Pedro Harbor, December, 1901, were previously identified with *C. denticulata* Clark, though certain differences were noted and the immaturity of the colonies prevented an accurate determination.

Gen. **Calycella**, Hincks, 1861.

24. **Calycella syringa** (Linn.).

Sertularia syringa, Linnaeus, 1767, p. 1311.

Calycella syringa, Hincks, 1861, p. 294.

Calycella syringa, Hincks, 1868, p. 206, pl. 39, fig. 2.

Calycella syringa, Calkins, 1899, p. 358, pl. 4, fig. 20.

Calycella syringa, Clark, 1876, p. 217, pl. 12, fig. 25.

Calycella syringa, Hartlaub, 1901, p. 358.

Calycella syringa, Nutting, 1899, p. 741; 1901, p. 176.

Calycella syringa, Torrey, 1902, p. 59, pl. 6, fig. 50.

Trophosome. Pedicels borne on stolon, shorter than hydrothecae. Margins of hydrothecae frequently reduplicated.

Gonosome. Gonangia on stolon, with arocoysts at maturity; ovate, smooth.

Distribution. San Diego Bay, 1 to 5 fathoms. Puget Sound: Berg Inlet and Kadiak, Al. (Nutting). Coal Harbor and Shumagin Is., Al. (Clark). White Sea (Mereschkowsky). Northern Asia (Thompson). Kara Sea (Berg). British Coasts, Iceland in 100 fathoms (Hincks). Greenland (Leivinsen). Helgoland (Hartlaub).

No gonosome in San Diego colonies, July 15, 1903.

FAM. LAFOEIDAE.

Gen. **Lafoea**, Lamouroux, 1821.

25. **Lafoea dumosa** (Flem.).

Sertularia dumosa, Fleming, 1828, p. 83.

Lafoea dumosa, Sars, 1862.

Lafoea dumosa, Hincks, 1868, p. 200, pl. 41, fig. 1.

Lafoea dumosa, Clark, 1876, p. 216, pl. 12, fig. 23.

Lafoea dumosa, Nutting, 1899, p. 747, pl. 64.

Lafoea dumosa, Torrey, 1902, p. 59.

Trophosome. Stem simple and creeping or fasciated and erect. Hydrothecae strong, narrowed toward the base, with little or no pedicels.

Gonosome. Gonangia columnar, with bottle necks, crowded together in encrusting masses.

Distribution. San Diego Bay, in 6 fathoms; Port Orchard, Puget Sound. California Coast (Clark). Alaska (Clark, Nutting). White Sea (Mereschkowsky). New England Coast (Verrill, Nutting). West Indies, 450 fathoms (Allman). British Coasts (Hincks). Spitzbergen (Marktanner-T.). North Cape, Norway (Sars). Helgoland (Hartlaub).

Both the erect and creeping forms were found at San Diego. Overgrown with *C. hincksi*. No gonosome, June 29, July 15, 1903.

FAM. SERTULARIIDAE.

Anyone who has had occasion to work among the *Sertulariidae* will admire the masterly way in which Nutting (:04) has dealt with the perplexing questions of classification in that family. I am not yet prepared, however, to abandon Schneider's plan of segregating the species into typical groups which shall take the places of genera. These groups do not necessarily give their names to the species which they include. Thus they discourage the growth of synonyms, offer no awkward bars to the free passage of any species from one group to nearer relatives, and at the same time lessen the confusion which the present unsettled state of opinion regarding the relationships of existing species tends to produce.

When it is not easy to define groups clearly, owing either to the uncertain values of diagnostic characters or to baffling transitional forms, it is plainly desirable to have as few groups as convenience will permit. Marktanner-Turnerestcher ('90) distinguished 18 genera. Nutting has reduced this unusual total to 12; but that number, I am convinced, is still too large. The distinction between *Thuiaria* and *Abietinaria* hardly seems of enough service to outweigh the practical difficulties which it invites; and although Nutting has put forth every effort to make it useful, he has only succeeded in distinguishing the genera by relying now on one, now on another combination of characters, not an attractive makeshift. But however desirable or undesirable this procedure may be, I make no reservations in condemning Allman's genera *Thecocladium* and *Syntheccium* as Nutting has defined them. According to Allman, *Thecocladium* is distinguishable by the intrathecal origin of its branches, *Syntheccium* by the intrathecal origin of its gonangia. The justice of my objections (:02, pp. 61, 62) to genera founded on single characters of such a sort is admitted by Nutting, who then attempts to strengthen both genera, but particularly *Syntheccium*, which alone occurs in American waters, by supporting them on combinations of characters. *Syntheccium* is accordingly based upon a

combination of strictly opposite branches, smooth margined hydrothecae, absence of opercula, as well as the intrathecal origin of the gonangia.

Analysis, however, does not reveal the strength which is claimed for this structure. In the first place, combinations are of little value unless the characters selected for combination vary independently of each other, which is obviously not true of margin and operculum, as Nutting is aware. In the second place, it is well known that at some stage in the development of all hydroids, a perisarcial membrane blocks the exit of the hydranth from the hydrotheca, and that this membrane becomes the one-, two-, three-, or four-parted adult operculum, according to the character of the margin, or may be wanting altogether. Among sertularians with smooth round margins, it is often delicate, and is commonly lost. In *Sertularella formosa*, according to Nutting, it is usually wanting, but occasionally appears as a "thin membrane stretched like a drumhead across the aperture." In *Sertularella hartlaubi*, according to the same authority, the operculum is "in some cases an adaurine flap, in others apparently an irregularly ruptured membrane stretched straight across the aperture like a drumhead." *Sertularella halccina* (a *Synthecium* according to Nutting) possesses a thin drumhead operculum before the hydranth emerges for the first time, but is non-operculate in the adult. Such facts only lead inevitably to the conclusion of Hartlaub (1900, p. 8) that the absence of an operculum is of no taxonomic consequence. In the third place, Nutting does not appear to insist that *Synthecium* shall exhibit the opposite branching which his definition demands, when he places *S. halccina* in that genus. It is possible to assume that he was heedless of the mode of branching in this species, but this assumption is hardly applicable to the alternately branching *Synthecium alternans* Allman. It is more probable that Nutting included *S. halccina* in spite of its branching. Yet in thus escaping the responsibility of removing it from *Synthecium* to *Sertularella* or to an entirely new genus, he abandons opposite branching as a distinguishing mark of *Synthecium*. It would appear, then, that there are but two instead of four characters on whose association the genus is really based: the smooth round

margin of the hydrothecae and the intrathecal origin of the gonangia.

Are these characters of equal rank? Evidently Nutting prefers the latter, since he does not hesitate to align such a smooth round margined species as *S. formosa* with the typical dentate opereculate species of *Sertularella*. Here I can by no means agree with his judgment, but must take the ground which I previously occupied (:02, p. 62). The mere *location* of gonangia, whether arising within or outside of hydrothecae, cannot to my mind be of such taxonomic importance as the striking differences of the trophosomes in species like *S. halccina* and *S. tubitheca*; though I am far from refusing its aid as a means of distinguishing *species*.

The general grounds which I formerly urged against *Syntheccium* need not be repeated here. I am still in hearty accord with the position then taken, but a review of actual conditions in *S. halccina* may prove more convincing. In the majority of cases, the gonophores of this species arise within hydrothecae. Occasionally, however, they are borne directly on the stolon (fig. 14), as in *Dynamena cornicina*. When such a difference in the position of the gonangia exists in different species, it has been held by Allman and Nutting to indicate generic distinction. For instance, *Sertularella integritheca*, with smooth round margined hydrothecae and extrathecal gonangia, is said to be generically distinct from such a form as *Syntheccium alternans* Allman, with intrathecal gonangia but otherwise similar to *S. integritheca*. Occasional conditions such as the intrathecal origin of gonangia in species in which the gonangia are usually extrathecal, are held by the same authors to be abnormalities which may be disregarded in classification. The extrathecal origin of the gonangia of *S. halccina*¹ being but occasional, would naturally find a place in the same category. These views do not appear to me to be justifiable, for the occasional presence of extrathecal gonangia must lessen the importance of the usual condition, and should *not* be disregarded for this very reason.

¹ If it be objected that the extrathecal gonangia in *S. halccina* arise on the stolon instead of the stem, it may be remembered that stem and stolon are fundamentally the same structure, and transform into each other with the utmost readiness.

According to Nutting (:04, p. 42), "it occurs not infrequently in several widely different forms among the Sertularidae that a gonangium will occasionally have its origin within the lumen of the hydrotheca, although these species normally produce gonangia in the ordinary position." The very fact that what is typical of *S. halecina* is atypical of most other sertularians, though not infrequent, and what is occasional in *S. halecina* is usually typical of the others, only leads to a rejection of the view which lays more than specific importance on the difference in the typical position of gonangia in different species.



Fig. 14.—*Sertularella halecina*. Portion of stolon with gonangium (s); base of one stem, with intrathecal gonangium (i).



Fig. 15.—*S. halecina*. Portion of stem showing origin of branch just below hydrotheca (x).



Fig. 16.—*S. halecina*. Portion of colony. Showing an extrathecal branch (x).

If the branches of *S. halecina* be now considered, it will be seen that they, as well as the gonangia, emerge typically from hydrothecae. In this respect, then, *S. halecina* is a *Thecocladium*. Yet this character is not invariable. Occasionally branches arise independently of hydrothecae. Four such cases are shown in figs. 15, 16, 17, 18. In figs. 15, 17, 18, the branches arise on the bulging stem just beneath hydrothecae, a familiar origin of branches in the *Sertulariidae*. In fig. 16, the branch is not associated with a hydrotheca in any way. All these cases (except fig. 17) were found on the same colony; and it is inter-

esting that of three successive branches from a short section of the same stem (fig. 18), the origin of the first is typical of *Thecocladium*, the origin of the second and third is typical of *Sertularella*. Without denying the usefulness of the usual manner



Fig. 17.—*S. halecina*. A younger stem than is shown in fig. 18 with two extrathecal branches.



Fig. 18.—*S. halecina*.—Stem with three branches two of which are extrathecal, the third intrathecal, in origin. The stem is old, with damaged hydrothecae.

of branching, or any other typical character, in defining species, the facts which have just been enumerated hardly supply the idea of stability which is commonly associated with the conception of a genus.

Sertularella halecina is at once a typical *Synthecium* in the character of the hydrothecal margin and the intrathecal origin of the gonangia, a typical *Thecocladium* in the intrathecal origin of the branches, a typical *Sertularella* in the manner of the origin of both branches and gonangia. Allman refers to the intrathecal origin of two branches in *Synthecium campylocarpum* as an abnormality, and Nutting speaks similarly of the intrathecal origin of the only two branches which were present in the material from which I described *Sertularella dentifera*. Both cases may be abnormal, in the sense of unusual; but in the light of conditions in *S. halecina*, is it wise to dismiss them forthwith as taxonomically insignificant? Which are the abnormal, the insignificant characters in *S. halecina*? I must confess my inability to decide. Until such a decision be reached, I do not think better can be done than to consider the species a member of the *Sertularella* group, in which it was originally placed.

Sertularella group.

26. *Sertularella halecina*.

Sertularella halecina, Torrey, 1902, p. 61, p. 6, fig. 55.

Trophosome. Stems from a creeping stolon rise to height of 30 mm., with few branches which originate either within hydrothecae or just below them. Nodal divisions faint, often wanting. Hydrothecae adnate at base only, cylindrical, with slight swelling on lower side of base, wide aperture with smooth, everted rim.

Gonosome. Gonangia arise within hydrothecae or from stolon, long, tubular; single tubular gonophore.

Distribution. San Diego Bay, 3 to 12 fathoms: growing on kelp and among bryozoa. Gonosome present, July, 1901; June, July, 1903.

My reasons for withdrawing this species from *Synthecium*, where Nutting placed it, have been given above. I am not yet prepared to consider it identical with *S. cylindrica* Bale (Nutting, :04), because there is no record of the method of origin of branches and gonangia in the latter, and the margins of the hydrothecae are not so distinctly or characteristically everted.

27. *Sertularella pedrensis*, n. sp.

Sertularella conica, Torrey, 1902, p. 60.

Trophosome. Stems from creeping stolon, longest 35 mm., with occasional branches; stems and branches divided into slender internodes of variable length. Hydrothecae distant, borne at distal ends of internodes, free for two thirds their length, narrowing to tridentate apertures, which are often reduplicated, with tripartite opercula; each hydrotheca with 3 to 6 transverse rugae which are stronger on adaxial side.

Gonosome. Gonangia ovate, covered thickly and completely with slender spines.



Figs. 19, 20.—*Sertularia pedrensis*. Hydrothecae.

Fig. 21.—*S. pedrensis*. Gonangium.

Distribution. San Pedro, Cal.

The trophosome of this species so closely resembles Allman's descriptions and figures of *S. conica*, that I formerly identified it with the latter. Nutting (1904) has since pointed out that the hydrothecae of *S. conica* have four marginal teeth, a fact which at once distinguishes the two species. The recent discovery of two gonangia on the San Pedro colonies affords an unmistakable diagnostic character.

28. *Sertularella tenella* Alder.

Sertularia tenella, Alder, 1856, p. 357, pl. 13, figs. 3-6.

Sertularella tenella, Alder, 1857, p. 113.

Sertularella tenella, Hincks, 1868, p. 242, pl. 47, fig. 3.

Sertularella tenella, Hartlaub, 1901, p. 360, pl. 21, figs. 12, 20, 21.

Sertularella tenella, Torrey, 1902, p. 64.

Trophosome. "Zoophyte minute; stems short, slender, simple or slightly branched, zigzagged and jointed and twisted above each calycle; hydrothecae rather distant, elongate, barrel shaped, finely ribbed across, the aperture erect, patent, squared, 4-toothed, and closed by a four sided operculum."

Gonosome. "Gonothecae ovate, slender, ringed transversely, produced above into a short, tubular orifice" (Hincks).

Distribution. La Jolla, Cal., between tides: San Diego, 9 fathoms. Bare I. (Hartlaub). Gt. Britain, between tides to deep water (Hincks). New Zealand (Hartlaub).

Growing on rocks and *Fucus*. No gonosome, July 16, 1901, July 13, 1903. Longest stem, 4 mm.; length of hydrotheca, .4 to .5 mm., breadth, .25 mm.

29. *Sertularella tricuspidata* (Alder).

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

Sertularella tricuspidata, Hincks, 1868, p. 239, pl. 47, fig. 1.

Sertularella tricuspidata, Clark, 1876, p. 224, pl. 12, figs. 26, 27.

Sertularella tricuspidata, Nutting, 1899, p. 741.

Sertularella tricuspidata, Hartlaub, 1901, p. 359.

Sertularella tricuspidata, Nutting, 1901, p. 183.

Sertularella hesperia, Torrey, 1902, p. 63, pl. 7, figs. 57, 58.

Trophosome. "Colony a matted mass of shoots and twigs sometimes attaining a height of 5 or 6 inches. Stem not fascicled, slender, divided into internodes, each of which bears a hydrotheca or a branch with its axillary hydrotheca. Branches irregularly alternate, often branching profusely either alternately or dichotomously, divided into regular internodes each of which bears a hydrotheca, some of the nodes being double and oblique, which gives a twisted appearance to the branch. Hydrothecae distant, small, cylindrical, without corrugations, the distal half or more being free; margin with three strong, equal and equidistant teeth."

Gonosome. "Gonangia borne profusely on the main stem and branches, large, oblong-ovate, marked throughout with very prominent compressed annular ridges, the uppermost of which forms a bowl-shaped structure from the center of which arises the tubular neck which ends in a slightly everted margin and round aperture."

Distribution. San Diego Bay, 1 to 9 fathoms. "Abundant throughout the north polar and north temperate regions of the world" (Nutting, :04).

30. *Sertularella turgida* (Trask).

Sertularia turgida, Trask, 1854, p. 113, pl. 4, fig. 1.

Sertularella turgida, Clark, 1876a, p. 259, pl. 38, figs. 4, 5.

Sertularella conica, Calkins, 1899, p. 359, pl. 4, fig. 22.

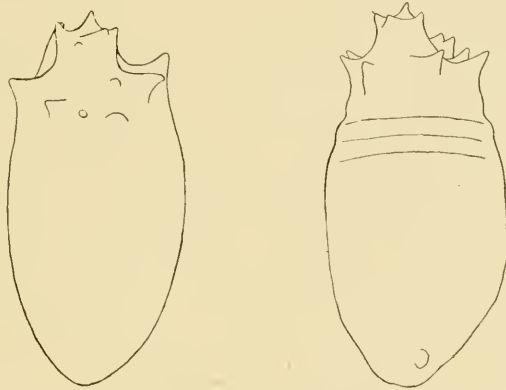
Sertularella nodulosa, Calkins, 1899, p. 360, pl. 5, fig. 29.

Sertularella turgida, Hartlaub, 1901, p. 360, pl. 21, figs. 5, 6.

Sertularella turgida, Torrey, 1902, p. 64, pl. 7, figs. 59-62; pl. 8, figs. 63-69.

Trophosome. Stems stout, from creeping stolon, about 30 mm. long, seldom branching; divided into short geniculate internodes. Hydrothecae large, stout, free for about half their length: aperture large, with 3 strong teeth.

Gonosome. Gonangia large, ovate, distally spinose or annulated or both; aperture small.



Figs. 22, 23.—*Sertularella turgida*. Gonangia.

Distribution. Pacific Coast, from Coronado Is. to 54° N. lat. Off Japan (Albatross hydrographic station 3775). Between tides to 204 fathoms.

This is by far the most variable species on the coast, a characteristic to which reference was made in my former paper (:02, p. 65). Figs. 22 and 23 make more complete the transitions between forms of gonangia there figured. From a spiny type an annulated type is reached through a spiny-annulated condition. The hydrothecae are extremely variable, as regards shape, wrinkling and immersion. The internodes vary much in length and thickness.

Dynamena group.**31. *Dynamena cornicina* McCrady.**

Dynamena cornicina, McCrady, 1858, p. 204.

Sertularia complexa, Clark, 1879, p. 245, pl. 4, figs. 26-8.

Sertularia complexa, Bale, 1888, p. 769, pl. 18, figs. 1-4.

Sertularia cornicina, Nutting, 1901, p. 359, fig. 56.

Sertularia complexa, Nutting, 1901, p. 360, fig. 57.

Sertularia cornicina, Nutting, 1904, p. 58, pl. 4, figs. 1-5.

Trophosome. Stems short, slender, unbranched, rising from a creeping stolon to height of 10 to 20 mm.; divided into regular internodes each with a pair of opposite hydrothecae distally. Hydrothecae tubular, adnate in front for two thirds their length; margin with two teeth.

Gonosome. Gonangia borne at base of stems, broadly ovate, annulated throughout, with broad aperture.

Distribution. Coronado Is., Cal., on seaweed at the surface. Charleston, S. C. (McCrady). Woods Hole, Mass. (Nutting). Pourtales Plateau (Nutting). Yucatan Coast (Clark). Australia (Bale).

The colonies from the Coronado Islands were identical with *S. complexa*, though there were easy transitions to the typical trophosome of *D. cornicina*. I have followed Nutting in considering the two species synonymous.

D. cornicina is very close to *S. desmoides*, from which it appears to differ in the absence of branches, the sharply toothed aperture, and the position of the nodal constrictions immediately above rather than immediately below the hydrothecae.

32. *Sertularia desmoides*.

Sertularia desmoidis, Torrey, 1902, p. 65, pl. 8, figs. 70-72.

Sertularia desmoides, Nutting, 1904, p. 56, pl. 3, figs. 1-3.

Trophosome. Stems from creeping stolon, rising to height of 30-50 mm., branching sparsely and irregularly. Internodes vary in length, but the portion distal to the hydrothecae is never longer than the rest of the internode. Two hydrothecae on the proximal portion of each internode, opposite and contiguous on one side of the stem for one half their length, bending sharply outward in distal half and narrowing to a smooth or somewhat bilabiate operculate aperture.

Gonosome. Gonangia sessile, ovate, half as broad as long, with a wavy outline and broad round aperture.

Distribution. San Diego, 1-25 fathoms; San Clemente I., 42 fathoms; San Pedro, Cal., 13 fathoms. Albatross station 2939, lat. N. 33° 36', long. W. 118° 09' 30'', 27 fathoms (Nutting).

Gonosome present. July, 1901. June 27, 1903. Both robust and attenuated varieties were obtained.

33. *Sertularia furcata* Trask.

Sertularia furcata, Trask, 1854, p. 112, pl. 5, fig. 2.

Sertularia furcata, Agassiz, 1865, p. 145.

Sertularia furcata, Clark, 1876a, p. 258, pl. 39, fig. 3.

Sertularia furcata, Torrey, 1902, p. 66, pl. 8, figs. 73-5.

Trophosome. Stems short, unbranched, rising from a creeping stolon to height of 10-15 mm.; divided into short internodes, each with a pair of hydrothecae opposite and in contact on one side of the stem for half their length. Two strong marginal teeth and a large aperture.

Gonosome. Gonangia broadly ovate, compressed, with moderate terminal aperture.

Distribution. San Diego Bay, 5 fathoms; Coronado Is., Mex., 18-24 fathoms; San Pedro, Cal., 9 fathoms; San Francisco, shore rocks. Farallone Is., Cal. (Trask). Santa Barbara and Santa Cruz, Cal. (Clark).

Nutting (:04) has identified this species with the *Dynamena pulchella* of d'Orbigny from Patagonia, quoting Clark's description of *S. furcata*, however. I am unable to follow him because his reproduction of d'Orbigny's figures does not show the contact of the members of each pair of hydrothecae, which is a marked character of the species, the internodes are longer and more slender than the constantly short internodes of *S. furcata*, and the two species are widely separated geographically as well. It is true that Clark's figure does not show the contact of the hydrothecae, but that is because he has probably drawn the reverse rather than the face of the stem. This view is supported by the position of the gonangia, which ordinarily occur on the face of the stem, and by the similarity of Clark's figure to fig. 73 of my former paper, representing the reverse of one internode of the stem.

Gonangia were present in colonies collected in November, 1897, and July, 1901. By a strange confusion which I came upon in the preparation of the present paper, I laid claim in my former paper to the discovery of the gonosome of the species, though it was well known to me that Trask, as well as Clark,¹ had described and figured both trophosome and gonosome.

¹ Nutting (:04), who calls attention to this blunder, has himself erred in ascribing the first complete description, including gonosome, to Clark. I do not see Trask's paper in Nutting's bibliography, and infer that he was not acquainted with it at first hand.

Thuiaria group.34. **Sertularia filicula** E. & S.

Sertularia filicula, Ellis and Solander, 1786, p. 57, pl. 6.

Sertularia anguina, Trask, 1854, p. 112, pl. 5, fig. 1.

Sertularia labrata, Murray, 1860, p. 250, pl. 11, fig. 2.

Sertularia filicula, Hincks, 1868, p. 264, pl. 53, fig. 3.

Sertularia anguina, Clark, 1876a, p. 255, pl. 40, figs. 1, 2.

Sertularia anguina var. *robusta*, Clark, 1876a, p. 256, pl. 40, figs. 3, 4, 5.

Sertularia filicula, Torrey, 1902, p. 68, pl. 9, fig. 80.

Sertularia filicula, Nutting, 1904, p. 117, pl. 34, fig. 1.

Trophosome. Stems with alternating branches, pinnately disposed; divided into internodes each of which usually bears a branch and three hydrothecae, two sub-opposite, the third axillar. Branches may themselves branch; divided into unequal internodes, each bearing several hydrothecae, sub-opposite, in pairs. Hydrothecae flaskshaped, adnate for more than half their length, apertures small, round, opening upward.

Gonosome. Gonangia pearshaped, produced somewhat distally, ending with small round aperture.

Distribution. San Diego, 15-25 fathoms; San Pedro, San Francisco, Cal., shore rocks. Monterey to Point Reyes, Cal. (Trask). Vancouver I. (Dawson). Alaska, 10 fathoms; San Miguel I., Cal. (Clark). White Sea (Mereschkowsky). New England coast (Verrill). Grand Manan, 20 fathoms (Stimpson). Labrador (Packard). Greenland (Levinson). North Atlantic (Bonnievie). Norway (Marktanner-Turneretscher). British shores (Hincks).

Nutting's treatment of *Sertularia anguina* Trask is unfortunate. To begin with, the figures of his *Abietinaria anguina* (Trask) are so far from typical of *S. anguina* Trask, judging either from Trask's figures, Clark's figures or all of my own material, some of which was collected at the entrance of San Francisco Bay, where Trask also obtained the species, that I suspect they really represent a distinct species. He says the specimens he has seen "are from Santa Barbara, Cal., and Bering Sea, and they all agree well with Dr. Clark's description of *Sertularia anguina* var. *robusta*." His figures, however, resemble Clark's variety less than the typical *S. anguina* as shown by Clark's own figures. Yet in his synonymy there appear *S. anguina* Trask, *S. labrata* Murray (a correct synonym) and *S. anguina* var. *robusta* Clark, but *not* the *S. anguina* Trask of

Clark, the figures of which the without the slightest shadow of doubt typical of Trask's species. There is as little question that my *S. filicula* E. & S. (:04, p. 68, pl. 9, fig. 80) belongs with Trask's and Clark's *S. anguina*; so I fail to see why Nutting placed it instead, though dubiously, with his *Abietinaria filicula* (Ellis and Solander).

After expressing his inability to agree with me "in considering this species identical with *A. filicula*," Nutting at once adds in a footnote: "It is possible that the name *anguina* should be retained for the var. *robusta* of Clark, which is apparently distinct." I take these statements to mean that if *S. anguina* and *S. filicula* prove to be identical, the var. *robusta* should remain under Trask's old name. Why Nutting is unable to see the identity of the two species he does not say and I am at a loss to discover. My reasons for uniting them lie in the fact that Trask's figure of *S. anguina*, though crude and containing an error in showing 4 rather than 3 hydrothecae on the stem between the bases of successive branches, Murray's figure of *S. labrata*, Clark's figures of *S. anguina*, Hincks' figures of *S. filicula* and my own observations of both trophosome and gonosome refer unmistakably to the same species; and they agree with Nutting's figure (Pl. 34, fig. 1) of *Abietinaria filicula* (Ellis and Solander) and *not*, curiously enough, with his figures of *Abietinaria anguina* (Trask) on the same plate, figs. 5-7. They agree also with the var. *robusta* of Clark in all details save stoutness of the stem, a difference which is probably referable to differences of environment, not heredity.

Fam. PLUMULARIIDAE.

Gen. **Aglaophenia**, Lamouroux, 1812.

35. **Aglaophenia diegensis.**

Aglaophenia diegensis, Torrey, 1902, p. 71, pl. 9, figs. 84-86.

Trophosome. Stem 150 mm. long, with short internodes. Hydrocladia alternating, one to an internode; divided into equal internodes by faint nodes which may be wanting. Hydrothecae each longer than diameter of aperture; 9 irregular marginal teeth, median tooth sharp and recurved, adjacent teeth longest, smallest teeth next the hydrocladium. Mesial nematophore reaches level of hydrothecal aperture. Septal ridge

just below supracalyceine nematophores and one just above floor of hydrotheca.

Gonosome. Corbulae 3 to 4 times as long as broad, formed of 8-10 pairs of alternating leaflets, 8 nematophores on anterior edge of all but first and last. One, rarely two hydrothecae on anterior edge of all but first and last. One, rarely two hydrothecae between corbula and stem. Gonophores in two rows, about 12 in number.

Distribution. San Diego Bay, 1-7 fathoms; False Bay. The corbulae on the False Bay colonies, collected in January, 1904, are longer than that figured in my previous paper, collected in July, 1901; usually with ten leaflets.

36 *Aglaophenia inconspicua.*

Aglaophenia inconspicua, Torrey, 1902, p. 73, pl. 9, figs. 87-89.

Trophosome. Stems stout, in clusters, 35-40 mm. high; divided by antero-posteriorly oblique nodes into internodes as broad as long. Hydrocladia borne on same side of stem, alternate, one from each internode, 3-4 mm. long; divided transversely into equal internodes. A nematophore in the axil of each hydrocladium and two at its base in a line parallel with its axis. Hydrothecae deep, slightly compressed, free for not more than one quarter their length; 9 marginal teeth, median tooth recurved, the next on each side longest. Intrathecal ridge extending obliquely upward from near base of theca. Two ridges on each internode. Mesial nematophore reaching nearly or quite to the mouth of the theca. Supracalyceine nematophores divergent, not reaching level of mouth of theca.

Gonosome. Corbulae not more than twice as long as deep, arched, slightly compressed; formed of 4 to 6 leaflets, the longest with 10 nematophores on distal edge and occasionally one or two on proximal edge near tip. One thecate internode between corbula and stem. Sporosacs 6-12.

Distribution. San Diego, 5 fathoms; gonosome present. July, 1901.

37. *Aglaophenia pluma* (Linn.).

Sertularia pluma, Linnaeus, 1767, p. 1309.

Aglaophenia pluma, Lamouroux, 1816, p. 170.

Aglaophenia pluma, Hincks, 1868, p. 286, pl. 63, fig. 1.

Aglaophenia pluma, Torrey, 1902, p. 73, pl. 10, figs. 90-91.

Trophosome. Stems attaining height of 100 mm. or more, gracefully rising from creeping stolon. Hydrocladia alternate, one to an internode. Hydrothecae each with 9 teeth, median tooth not recurved. Mesial nematophore not reaching level of aperture.

Gonosome. Corbulae of about 9 leaflets, arched; a single hydrotheca at base of each.

Distribution. Off Coronado, Cal., on kelp. South Africa, Belgium, Mediterranean, Gt. Britain (Hincks).

38. *Aglaophenia struthionides* (Murray).

Plumularia struthionides, Murray, 1860, p. 251, pl. 12, fig. 2.

Aglaophenia franciscana, A. Agassiz, 1865, p. 140.

Aglaophenia struthionides, Clark, 1876a, p. 262, pl. 41, fig. 3.

Aglaophenia struthionides, Torrey, 1902, p. 73.

Trophosome. Stems long, strong, often attaining height of 150 mm., occasionally bearing stem-like branches; divided obliquely into short equal internodes each bearing a hydrocladium. Hydrothecae with flaring margin armed with 11 irregular teeth: median tooth long, sharp, recurved; next on each side long and directed forward, next bent outward. Mesial nematophore usually reaches level of aperture.

Gonosome. Corbulae each formed of 8-13 pairs of leaflets; with 3, occasionally 2, hydrothecae at base.

Distribution. Puget Sound to San Diego. This is the commonest hydroid on the coast, frequently cast up on California beaches. Corbulae present, January, June, July.

Gen. *Diplocheilus*, Allman, 1883.

Trophosome. All internodes thecate, each internode with an infracalycine mesial nematophore not in contact with the hydrotheca, and a supra-calycine median sarcostyle without definite nematophore; each hydrotheca with anterior intrathecal ridge.

Gonosome. Gonangia unprotected.

Allman founded this genus on the following characters: a duplicature of the walls of the hydrothecae "forming an external calycine envelope," a shield-like mesial nematophore not adnate to the hydrotheca, and the absence of lateral nematophores. Bale ('93) has demonstrated that the hydrothecae of the single species (*D. mirabilis* Allman) for which the genus was created do not possess the double walls described by Allman, but are constructed after the fashion of the hydrothecae of *Kirchenpaueria producta* Bale, with anterior intrathecal ridges which, from certain viewpoints, suggest a duplicature of the walls. Bale has also demonstrated the opening of a median sarcostyle above each hydrotheca, flanked by webs of perisarc between theca and internode which form a broad, non-typical nematophore. Allman's definition has been modified to accord with these facts.

All the trophosomal characters of *D. mirabilis* which have been mentioned are found also in *K. producta* Bale. The striking similarity of the trophosomes of the two species leaves no doubt of their generic unity, in spite of the absence of the gono-

some in *D. mirabilis*. Bale, however, is certainly in error in finding in Jickeli's *Kirchenpaueria* the bond of union. According to Jickeli's figure ('83, pl. 28, fig. 27), the hydroid for which he erects the genus is an eleutheroplean plumularian—probably a *Plumularia*—with nematophores broken away. The frequent absence of nematophores in species which characteristically possess them and the absence of any other distinguishing characters remove the slender claims to priority over *Diplocheilus* which have been made for this inadequate genus.

***Diplocheilus allmani*, n. sp.**

Halicornaria producta, Torrey, 1902, p. 75, pl. 10, fig. 95.

Trophosome. Colony with simple stem, divided obliquely into internodes which vary in length according to age. Hydrocladia alternate, each from a shoulder process projecting from the middle region of each internode. Each hydrocladium divided more or less obliquely into equal thecate internodes. Each hydrotheca somewhat compressed below, somewhat flaring distally, with a broadly oval, smooth orifice; about as deep as long; free for one third of its length. Strong anterior intrathecal septum about two thirds the length of the hydrotheca from the bottom, reaching about one third across it at widest point. Cauline nematophores absent with the exception of single axillary nematophores. Mesial nematophore short, not reaching the base of hydrotheca, expanding into the form of a sickle shaped segment of a saucer with a diameter two thirds that of hydrotheca and embracing the internode for half its circumference. Single median supracalyceine sarcostyle, flanked by two webs of perisare stretched between theca and internode, forming a non-typical median nematophore.

Gonosome absent.

Distribution. Pt. Loma, Cal., on seaweed and sponges.

The differences which separate *D. mirabilis* Allman, *D. producta* (Bale) and *D. allmani* are slight. *D. allmani*, originally thought to be identical with *D. producta*, possesses hydrothecae with flaring rims and broadly ovate apertures instead of the compressed form and narrowed apertures of *D. producta*. It differs from *D. mirabilis* in the absence of all cauline nematophores save those in the axils of the hydrocladia, and the cauline internodes never bear more than one hydrocladium each. The immaturity and paucity of my material make it impossible to determine the real value of these differences. For the present, then, it seems desirable to distinguish the species.

Gen. **Plumularia**, Lamarck, 1816.40. **Plumularia alicia.**

Plumularia alicia, Torrey, 1902, p. 75, pl. 10, figs. 96, 97.

Trophosome. Stems in clusters, slender, loosely branching, 7 to 13 cm. high: divided transversely by faint nodes into short equal internodes. Hydrocladia alternate, one from distal end of each internode, and with 4 to 7 hydrothecae; thecate and non-thecate internodes alternate, separated by nodal septa which are alternately transverse and oblique; thecate internodes twice as long as non-thecate. Proximal and distal septal ridge in each internode. Hydrothecae free for at least half their length, adauline contours, in profile, somewhat recurved. A single nematophore on each internode of stem on side opposite origin of hydrocladium; 2 nematophores in each axil; each hydrocladial non-thecate internode with 1 nematophore; thecate internodes with 1 mesial and 2 supracalycine nematophores. Perisarc of stem thick and brown, of hydrocladia delicate and colorless.

Gonosome. Male gonangia small, ovate, attached by very short peduncles between the nematophores in the axils of the stem or branches.

Distribution. San Diego, 15 to 25 fathoms; Long Beach, Cal., 5 to 13 fathoms. Gonosome present, June and July, 1901.

41. **Plumularia megalcephala** Allman.

Plumularia megalcephala, Allman, 1877, p. 31, pl. 19, figs. 1, 2.

Plumularia megalcephala, Nutting, 1900, p. 57, pl. 1, fig. 5.

Trophosome. "Hydrocaulus irregularly branched, not fasciated; pinnae alternate, each borne close to the distal end of an internode of the stem, where it is supported on a long stout process of the internode; proximal internode of pinna short and destitute of hydrothecae; following internodes longer, every alternate one carrying a hydrotheca, and slightly longer than the others. Hydrothecae small and shallow, each borne near the middle of its internode, and supporting a very large hydranth. Beside the supracalycine pair of nematophores, each hydrotheca-bearing internode carrying a single mesial nematophore at the proximal side of the hydrotheca; intervening internode carrying two mesial nematophores, and short basal internode carrying one.

"Gonosome not known" (Allman).

Distribution. Off San Diego, in 40-75 fathoms. Off Alligator Reef, 14 fathoms (Allman). Albatross Station 2669, lat. N. 31° 9', long. W. 79° 33', 352 fathoms (Nutting).

"The internode intercalated between the hydrotheca-bearing internodes was sometimes present, sometimes absent, and was of variable length. The internodes of the stem carry two nematophores placed laterally and alternately, and one or two pairs on it a lateral process" (Allman).

Nutting adds the fact in his description that the hydrocladia "alternate as a rule, but not regularly so in some specimens, where they are occasionally opposite toward the distal end of the stem.

The San Diego material consists of two stems, the longest measuring 100 mm., both unbranched. The stem internodes vary in length, due to the obliteration of one or two nodes, and bear one, two or three hydrocladia respectively. The number of their lateral nematophores varies with their length, from two to four. There is a pair of nematophores on each basal process, also an unpaired conical open process from which coenosare projected in one case, and is probably to be reckoned as a nematophore. The hydrocladia are slender. In the first formed regions of the colony they alternate; in the younger, distal regions they are usually opposite, as Nutting has said. A further variation in the distal region consists in an alternation of successive pairs of hydrocladia, so that the members of every other pair lie in a plane making an angle somewhat less than 90° with the original plane of the colony. The basal internode of each hydrocladium is short toward the base of the stem, with a single mesial nematophore. In the younger distal part of the colony it is usually wanting. Occasionally a non-thecate internode fuses with a thecate internode. The thecate internodes frequently bear two mesial nematophores.

One stem had produced a heteromorphic shoot with several hydrocladia alternately placed, as is the rule with the basal part of the stem.

This species appears to be closely allied with *P. filicula* Allman, but its hydrothecae are not so deep and its habit is less regular.

42. *Plumularia plumularioides* (Clark).

Halccium(?) *plumularioides*, Clark, 1876, p. 217, pl. 10, figs. 16, 17.

Plumularia plumularioides, Nutting, 1901, p. 62, pl. 4, fig. 3.

Plumularia plumularoides, Torrey, 1902, p. 78, pl. 11, figs. 103, 104.

Trophosome. "Hydrocaulus erect, simple, straight, divided by transverse joints into internodes of considerable length, regularly branched and with a few annulations at the base; branches arranged alternately on

opposite sides of the stem, one to each internode, having their origin in a small shoulder-like process just below each joint, divided usually into regular internodes, though in some cases, short internodes occur between the longer ones. Hydrothecae arranged uniserially, usually one to each internode, partly adherent to the stem, or entirely free, shallow, tapering slightly to the base, with an entire rim." (Clark).

Gonosome. Gonangia borne on the shoulder processes supporting the hydrocladia. Immature ones alone known; widest distally, tapering abruptly to base.

Distribution. San Diego, 15 to 25 fathoms. Cape Etolin, Al., 8 to 10 fathoms (Clark).

43. *Plumularia setacea* (Ellis).

Corallina setacea, Ellis, 1755, p. 19.

Plumularia setacea, Lamarek, 1816, p. 129.

Plumularia setacea, Hincks, 1868, p. 296, pl. 66, fig. 1.

Plumularia setacea, Clark, 1876a, p. 261, pl. 41, figs. 1, 2.

Plumularia setacea, Nutting, 1900, p. 56, pl. 1, figs. 1-4.

Plumularia palmeri, Nutting, 1900, p. 65, pl. 6, figs. 4, 5; 1901, p. 188.

Plumularia setacea, Torrey, 1902, p. 79, pl. 11, fig. 105.

Trophosome. Stems 5 to 100 mm. long, non-fascieled, divided into internodes, each bearing a hydrocladium from a distal process. Hydrocladia alternate; basal internode short, non-thecate; thecate and non-thecate internodes alternate; there may or may not be septal ridges at either end of each internode and associated with the hydrothecae. Latter not deeper than broad, broadest at margin. Nematophores polythalamie, 2 supra and 1 infra-calycine, 1 on each non-thecate internode except the basal internode of each hydrocladium, 2 on each cauline internode, 1 on the side opposite the hydrocladium, the other axillary.

Gonosomc. Gonangia borne on the stem near the axils of the hydrocladia, much elongated, female somewhat longer and stouter than the male, with a long, narrow neck; small terminal aperture.

Distribution. Pt. Loma, La Jolla, Catalina I., San Pedro, and Monterey, Cal. Victoria, B. C., Santa Barbara and San Diego (Nutting). Eastern U. S. (Nutting). Coasts of Europe and Gt. Britain (Hincks). Helgoland (Hartlaub).

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