TUBICOLOUS ANNELIDS OF THE TRIBES SABELLIDES AND SERPULIDIES FROM THE PACIFIC OCEAN

BY

KATHARINE JEANNETTE BUSH, PH.D.
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INTRODUCTION

Practically nothing was known of the annelids of the North Pacific coast before Johnson's valuable reports of 1897 and 1901—the first entitled 'A Preliminary Account of the Marine Annelids of the Pacific Coast,' the other 'The Polychaeta of the Puget Sound Region.' This is especially true of Alaska, a few species only having been recorded north of Vancouver Island, British Columbia; therefore the collections made by Dr. William E. Ritter, of the University of California, and Dr. Wesley R. Coe, of Yale University, as members of the Harriman Alaska Expedition of 1899, are of great interest.
Of the 35 species from Alaska described as new to the North Pacific fauna (p. 179), only 4—*Spiroorbis spirillum* (Linné) and variety *lucidus* Montagu, *Spiroorbis mörchi* Levinsen, *Spiroorbis quadrangularis* Stimpson, and *Spiroorbis violaceus* Levinsen—appear to be circumpolar; of these but one—*Spiroorbis spirillum* (Linné), with its variety *lucidus* Montagu—extends southward along the California coast. *Schizobranchia insignis* sp. nov. appears at Vancouver Island, where also *Eudistyliia tenella* sp. nov. is found.

Of the remaining species, 9, as far as known, occur only on the coast of California (at Pacific Grove), 1 on the coast of Mexico, and 1 on the coast of Honolulu.

The 148 species given in the list (p. 172) as previously recorded from the Pacific were about equally distributed north and south of the equator, there being but 9 more above than below it before Moore (1904) added 13 from the coast of Japan; but in the North Pacific those forming the more or less flexible tubes are numerous, while in the South Pacific those building firm calcareous ones predominate. Only 8, however, have thus far been found from Puget Sound northward along the coast of Alaska.

As will be seen by the following list, most of the forms, the larger number of which are of unusual size, are representatives of well-known genera.

Among the Polynoidae and closely related families, as well as among the Sabellidæ and Serpulidæ, are to be found most of the unique forms, although there are two very interesting sexual individuals, one similar to that figured by Örsted (1843) as *Polybostrichus*, now placed with the Syllidæ, and another, of unknown relationship, which has the ventral surface covered by large clusters of eggs attached to each segment in pairs.

**LIST OF FAMILIES AND KNOWN GENERA REPRESENTED IN THE COLLECTION.**

- *Aphroditacæ*  
  *Iphione?*  
  *Lepidonotus*, 3 sp.

- *Harmothoe*, 8 sp.  
  *Lanilla?*  
  *Polynoe*, 2 sp.  
  *Lepidametria?*
Sigalionidae
Phyllopecidae
Phyllodoce, 4 sp.
Eulalia, 2 sp.
Eteone, 4 sp.
Nephthyidae
Nephthys, 9 sp.
Glyceridae
Glyceria, 4 sp.
Staurocephalidae
Staurocephalus
Lumbrineridae
Lumbrineris, etc., 4 sp.
Eunicidae
Leodice
Nereis, 7 sp.
Syllidae
Autolytus (Polybostrichus)
Syllis
Gnathosyllis, etc.
Spionidae
Scolecolepis
Polydora
Spiro, etc.
Cheiactopteridae
Cheiactopterus
Cirratulidae
Cirratulus
Aricidae
Aricia
Opheliidae
Ammotrypane
Ophelia
Chloroemidae
Trophonia, 3 sp.
Flabelligera, 5 sp.
Brada, 4 sp.
Euphrosynidae
Spinther?
Amphinomidae
Notopygus?
Scalibregmidae
Eumenia
Scalibregma
Telethusa
Arenicola, 2 sp.
Capitellidae
Notomastus
Maldanidae
Nicomache
Axiothella
Ammocharidae
Ammochares, 2 sp.
Amphectenidae
Pectinaria, 3 sp.
Hermellidae
Sabella
Terebellidae
Amphitrite, 2 sp.
Terebella
Nicolea
Polycirrus
Sabella
Sabella, 4 sp.
Parasabella, 2 sp.
Aspeira
Schizobranchia, 5 sp.
Endistyla, 4 sp.
Chone
Eriographididae
Myxicola, 2 sp.
Serpulidae
Serpula
Crucigera, 3 sp.
Hyalopomatopsis
Spirocris, 10 sp.

As an aid to students interested in the many much misunderstood forms found among the Sabellides and Serpulides, and also because so little is known of those from the Pacific, descriptions and figures of a few species collected in 1901 at Pacific
Grove, California, by Dr. Coe, are added, and also some facts regarding the few known species obtained farther south.

The *Spiorobis* group, recently found of so much interest (p. 252), has been thoroughly studied as a whole; the results are here given in as condensed a form as seems possible without interfering with a clear understanding of the many species.

The three following lists, although not properly a part of the introduction, are placed here for convenience.

**SPECIES PREVIOUSLY recorded FROM THE PACIFIC**
**ARRANGED WITH REFERENCE TO THEIR**
**GEOGRAPHICAL DISTRIBUTION.**

**North Pacific.**

**Bering Sea:**

1. *Pseudopotamilla reniformis* (Leuckart, 1849, as *Sabella*), figures, + Malmgren 1867, as *Potamilla*, figures, + Marenzeller 1890. Also North Atlantic.


**Puget Sound Region:**

3. *vancouveri* (Kinberg 1866, as *Sabella*). See p. 197.

4. *Eudistylia polymorpha* (Johnson 1901, as *Bispira*, figures). South to Pacific Grove, California.


8. *Crucigera zygophora* (Johnson 1901, as *Serpula*, figures).

**Central America to United States of Colombia:**


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1 When the generic name has been changed by subsequent writers, the original one is also given after the name of the author.

2 An interrogation mark in the place of the generic name indicates that the description of the species is not sufficiently clear to determine its position.
12. *Spirorbis marioni* Caullery and Mesnil 1897, figures. Panama.
13. *Spirorbis langerhansi* Caullery and Mesnil 1897, figures. Panama.

Honolulu:

14. *Dasychone havaica* (Kinberg 1866, as *Sabella*).

Japan:

22. *Aspera* sp. ? (Marenzeller 1884, as *Potamilla torelli* Malmgren, figures).
23. *Pseudopotamilla suavis* (Grube 1877, as *Potamilla*).
24. *Pseudopotamilla myriops* (Marenzeller 1884, as *Potamilla*, figures).
25. *Paralaonome japonica* (Marenzeller 1884, as *Laonome*, figures).
27. *Dasychone japonica* McIntosh 1885, figures, + Moore 1904. 50 fms.
28. *Demonax picta* (McIntosh 1885, as *Dasychone*, figures). 50 fms.
29. *Hypsicomus pheotania* (Schmarda 1861, as *Sabella*, figures) Marenzeller 1884, figures. Also Ceylon.
32. *Mycicola platycheta* Marenzeller 1884, figures.
34. *Aptomatus enosima* Marenzeller 1884, figures.
35. ?— *ctenophora* (Moore 1904, as *Vermilia*, figures).
36. ?— *pluriannulata* (Moore 1904, as *Vermilia*, figures). 45 fms.
37. *Hydroides multispinosa* Marenzeller 1884, figures, + McIntosh 1885, figures, *non* Fischli 1900, figures. 8–50 fms.
40. ? — *diplochone* (Grube 1877, as *Hydroides*).\(^1\)
41. *Serpula jukesii* Baird 1865 (?), figures, + Grube\(^2\) 1877.
42. *Serpula granulosa* Marenzeller 1884, figures.
43. *Omphalopomopsis langerhansii* (Marenzeller 1884, as *Omphalopoma*, figures) Saint-Joseph 1894, as type.
44. *Pomatostegus laticapitus* Marenzeller 1884, figures, + Moore 1904.
45. *Pomatoceros helicoides* Marenzeller 1884, figures.
47. *Spirorbis argutus* Bush 1904, figures. 34 fms.
50. *Spirorbis foraminosus* Bush\(^3\) 1904, figures. 34 fms.

Hong Kong:
51. *Dasychone orientalis* McIntosh 1885, figures. 10 fms.

Philippine Islands:
52. *Sabella acrophthalmos* Grube 1878.
53. *Dasychone cingulata* Grube 1878, figures.
54. *Dasychone boholensis* Grube 1878.
55. *Dasychone serratibranchis* Grube 1878, figures.
56. *Eurato pyrrhogaster* (Grube 1878, as *Sabella*, figures) Saint-Joseph 1894, first species as type.
57. *Eurato porifera* (Grube 1878, as *Sabella*, figures) Saint-Joseph 1894.
59. *Eurato notata* (Grube 1878, as *Sabella*) Saint-Joseph 1894.
60. ? — *spectabilis* (Grube 1878, as *Sabella*, figures, + Marenzeller 1884, as *Laonome*, figures, + Saint-Joseph 1894, as *Sabellastarte*).
61. ? — *zebuensis* (McIntosh 1885, as *Sabella*, figures). 95 fms.
62. ? — *tenuiitorquus* (Grube 1878, as *Potamilla*, figures).

\(^1\)The operculum is described as two complete funnels bordered with deep serrations, one above the other and may prove to be a *Eupomatus*.

\(^2\)Grube's description of this species does not appear to agree very closely with that of Baird.

\(^3\)The description and figures of these four species (47–50) of *Spirorbis* were prepared for insertion in Mr. J. Percy Moore's report on the *Sabellas* and *Serpulas* collected off the coast of Japan by the U. S. steamer *Albatross* in 1900. This is now passing through the press, with every probability of early publication. Mr. Moore has very kindly furnished a list of species included in this paper.
63. *Pseudopotamilla* polyophthalmos (Grube 1878, as *Potamilla*, figures).
64. *Pseudopotamilla* oligophthalmos (Grube 1878, as *Potamilla*, figures).
69. ? — *philippensis* (McIntosh 1885, as *Serpula*, figures).
70. *Dasynema chrysogyrus* (Grube 1878, as *Serpula*, figures) Saint-Joseph 1894, as type.
71. *Pomatostegus actinocerus* Mörch 1863, figures, + Grube 1878, as *Serpula*.
73. *Spirobranchus tricornigerus* (Grube 1878, as *Serpula*, figures).
74. *Spirobranchus quadricornis* (Grube 1878, as *Serpula*, figures).
76. *Placostegus porosus* (Daudin 1800, as *Vermetus*, figure) Mörch 1863.
77. *Placostegus ornatus* (Sowerby, as *Serpula*, figure) Mörch 1863.
78. *Omphalopoma umbilicata* (Mörch 1863, as *Placostegus*).
80. *Galeolaria tetracera* (Schmarda 1861, as *Pomatoceros*, figure).
81. *Ditrypa gracillima* Grube 1878.

**Ternate Island:**

82. *Dasychonopsis maculata* (Fischli 1900, as *Dasychone*, figures).
83. *Protululopsis nigra-nucha* Fischli 1900, figures.
84. *Eucarphus ternatensis* (Fischli 1900, as *Hydroides multispinosa* Marenzeller, variety, figures).

**South Pacific.**

**Peru and Chili:**

85. ? — *tilosaulus* (Schmarda 1861, as *Sabella*, figures, + Kinberg 1866, as *Demonax*, + Ehlers 1901, as *Sabella*).
86. ? — *leucaspis* (Kinberg 1866, as *Demonax*, + Ehlers 1901).
87. ? — incertus (Kinberg 1866, as Demonax, + Ehlers 1901).
88. Zephyrus? sp. (McIntosh 1885, as Vermilia, figures).
89. Placostegus sp. ? Ehlers 1900, + 1901.
90. Spirorbis chilensis Gray 1849, + Ehlers 1901.

Staats of Magellan and vicinity:
91. Sabella sp. Ehlers 1901. 8-50 fms.
92. Sabella magellanensis Kinberg 1866, + Ehlers 1901.
93. Paralaonome ? antarctica (Kinberg 1866, as Laonome, + Ehlers 1897, 1900, 1901). 2-12 fms.
94. Dasychonopsis curta (Ehlers 1901, as Dasychone, figures). 20 fms.
95. Fabricia alata Ehlers 1897, figures, + 1901. 1-2 fms.
96. Oria limbata Ehlers 1897, figures, + 1901. 5 fms.
97. Serpula narconensis Baird 1864, figures, variety magellanica McIntosh 1885, figures. 15-175 fms.
98. Zephyrus loveni Kinberg 1866, + Ehlers 1901.
99. Metavermilia nigropileata (Ehlers 1900, + 1901, as Vermilia, figures).
100. Spirorbis nordenskjöldi Ehlers 1900, +1901.
101. Spirorbis perrieri Caullery and Mesnil 1897, + Ehlers 1900, + 1901. 20 fms.
103. Spirorbis levinseni Caullery and Mesnil 1897, + Ehlers 1901.
104. Spirorbis patagonicus Caullery and Mesnil 1897, + Ehlers 1901.
105. Spirorbis claparedei Caullery and Mesnil 1897, + Ehlers 1901.
106. Spirorbis aggregatus Caullery and Mesnil 1897, + Ehlers 1901.

Figi Islands and vicinity:
107. Sabella samoensis Grube 1870.
108. Dasychone cingulata Grube 1870.

Mid Ocean:
109. ? — ornatus? (McIntosh 1885, as Placostegus, figures). 2375 to 3125 fms.

1 Ehlers 1901 refers this species to Serpula vermicularis Linne 1767.
2 This species is not a Placostegus as the uncini have but few coarse teeth similar to Serpula. The operculum is protected by a calcareous plate. It is not probable that this is identical with P. ornatus Sowerby from the Philippine Islands.
110. ? — benthalianus (McIntosh 1885, as Placostegus, figures). 3125 fms.
111. Protoplacostegus mörchii (McIntosh 1885, as Placostegus, figures). 2375 fms. See p. 226

New Zealand:
112. ? — ceratodaula (Schmarda 1861, as Sabella, figures).
113. ? — armata (Quatrefages 1865, as Sabella, figures).
114. ? — grandis (Baird 1865, as Sabella).
115. Apomatus elisabethæ McIntosh 1885, figures.
117. Galeolaria boltoni (Baird 1865, as Eupomatus, figures).
118. Eucarphus cumingii Mörch 1863, variety navalis Mörch 1863.
119. Sclerostyla zelandica (Baird 1865, as Serpula, figures).
120. Placostegus cariniferus (Gray 1843) Baird 1865.
121. Placostegus caruleus Schmarda 1861, figures, + Mörch 1863.
122. Spiorbis zelandicus Gray 1843, + Mörch 1863.

Australia:
123. Spirographis australiensis Haswell 1884.
124. ? — velata (Haswell 1884, as Sabella, figures).
125. ? — punctulata (Haswell 1884, as Sabella, figures).
126. ? — sulcata (Ehlers 1897, as Sabella) (Sabella fusca McIntosh 1885, figures, non Grube). 2–10 fms.
127. Filograna divaricata Mörch 1863 (Serpula filigrana Lamarck 1818).
128. Salmacina australis Haswell 1884, figures.
129. Galeolaria cospitosa Lamarck 1818, + Mörch 1863, figures, + Haswell 1884, as Vermilia.
130. Galeolaria elongata Lamarck 1818, + Mörch 1863.
131. Galeolaria decumbens Sowerby, figures, + Mörch 1863.
132. Galeolaria rosea (Quatrefages 1865, as Vermilia, figures, + Haswell 1884, figures).
133. Galeolaria ? tetracera (Schmarda 1861, as Pomatoceros, figures) Mörch 1863.
134. Hydroides elegans (Haswell 1884, as Eupomatus, figures).
135. Serpula juakesii Baird 1865, figures, + Haswell 1884.
136. Serpula vasifera Haswell 1884, figures.
137. Zopyrus kompfferi Kinberg 1866.
138. Pomatostegus strigiceps (Mörch 1863, as Pomatoceros, + McIntosh 1885, figures, + Haswell 1884, as Vermilia). 150 fms. Also New Zealand.
139. *Pomatostegus bowerbanki* Baird 1865, figures, + Haswell 1884.
140. *Spirobranchus rostratus* (Lamarck 1818, as *Vermilia*) Mörch 1863.
141. *Spirobranchus mörchi* (Quatrefages 1865, as *Cynospira*, + Haswell 1884).
142. *Spirobranchus brachycera* (Baird 1865, as *Cynospira*, figures, + Haswell 1884).
143. *Pomatoceros elephus* Schmarda 1861, figures, + Haswell 1884, figures.
144. *Placostegus taniatus* (Lamarck 1818, as *Vermilia*) Mörch 1863.
145. *Ditrypa strangulata* Deshayes, figure, + Mörch 1863.
146. *Spirobois tricostalis* Lamarck 1818, + Mörch 1863.

**NEW GENERA.**

The following genera, fifteen in number, are here proposed:

**Paralaonome.**
Type, *P. japonica* (Marenzeller 1884, as *Laonome*, figures).

**Metalaonome.**
Type, *M. mariae* (Lo Bianco 1893, as *Bispira*, figures).

**Dasychonopsis.**
Type, *D. pallidus* sp. nov.

**Parasabella.**
Type, *P. media* sp. nov.

**Aspeira.**
Type, *A. modesta* sp. nov.

**Pseudopotamilla.**
Type, *P. reniformis* (Leuckart 1849, Malmgren 1867, as *Potamilla*, figures).

**Schizobranchia.**
Type, *S. insignis* sp. nov.

**Eudistylia.**
Type, *E. gigantea* sp. nov.
Metachone.
  Type, *M. mollis* sp. nov.

Protoplacostegus.
  Type, *P. mörchii* (McIntosh 1885, as *Placostegus*, figures).

Rhodopsis.
  Type, *R. pusillus* sp. nov. (See Addendum.)

Metavermilia.
  Type, *M. multicristata* (Philippi 1844, + Marenzeller 1893, as *Vermilia*, figures).

Paravermilia.
  Type, *P. bermudensis* sp. nov.

Schizocraspedon.
  Type, *S. furcifera* (Grube 1878, as *Hydroides*, figures).

Glossopsis.
  Type, *G. minax* (Grube 1878, as *Hydroides*, figures).

**SPECIES NEW TO THE REGION.**

**North Pacific.**

**Bering Sea:**
  1. *Spirobranchus spirillum* Linné, variety *lucidus* Montagu. South to Pacific Grove, California; also Atlantic.

**Alaska:**
  2. *Sabella elegans* sp. nov. Kadiak.
  3. *Sabella humilis* sp. nov. Popof Island.
  5. *Sabella formosa* sp. nov. Berg or Glacier Bay.
  8. *Aspeira modesta* sp. nov. Kadiak.
  9. *Schizobranchia insignis* sp. nov. Yakutat south to Victoria, Vancouver Island, British Columbia.
 10. *Schizobranchia nobilis* sp. nov. Unalaska Island to Prince William Sound.
 13. *Schizobranchia affinis* sp. nov. Popof Island.
 15. *Eudistylia plumosa* sp. nov. Sitka.
16. Eudistylia abbreviata sp. nov. Yakutat to Sitka.
17. Chone teres sp. nov. Unalaska Island.
19. Myxicola glacialis sp. nov. Unalaska Island.
21. Crucigera formosa sp. nov. Unalaska Island to Wrangel.
22. Crucigera irregularis sp. nov. Juneau.
24. Spirorbis semidentatus sp. nov. Unalaska Island to Sitka.
25. Spirorbis variabilis sp. nov. Sitka.
27. Spirorbis incongruus sp. nov. Prince William Sound.
29. Spirorbis lineatus sp. nov. Prince William Sound.
30. Spirorbis similis sp. nov. Prince William Sound.
32. Spirorbis spirillum Linne. Loc. ? to Santa Barbara, California; also North Atlantic.
33. Spirorbis rugatus sp. nov. Sitka.
34. Spirorbis asperatus sp. nov. Prince William Sound to Pacific Grove, California.
35. Spirorbis abnormis sp. nov. Sitka.

Puget Sound Region:
36. Eudistylia tenella sp. nov. Vancouver Island, British Columbia.

California, Pacific Grove:
37. Parasabella sp.
38. Pseudopotamilla debilis sp. nov.
39. Eudistylia intermedia sp. nov.
40. Metachone mollis sp. nov.
41. Myxicola affinis sp. nov.
42. Protula atypha sp. nov.
43. Eupomatus gracilis sp. nov.
44. Spirorbis eximius sp. nov.
45. Spirorbis comptus sp. nov.

Mexico:
46. Eupomatus humilis sp. nov.
Honolulu:
47. Dasychonopsis pallidus sp. nov.

South Pacific.

Australia:
48. Spirorbis inversus sp. nov.
49. Spirorbis tridentatus sp. nov.

The accompanying heliotype plates are from photographs of the annelids lying under water, that they might appear as life-like as possible, a process developed by Mr. A. H. Verrill, who has also prepared for reproduction most of the camera-lucida drawings of the setæ and opercula.

I am especially indebted to Professor A. E. Verrill and Dr. W. R. Coe, of Yale University, for valuable advice and criticism, and to Mr. J. Percy Moore, of the University of Pennsylvania, for many courtesies, especially the great privilege of studying some of his North Greenland and Japanese forms.

Yale University Museum,
New Haven, Connecticut,
January, 1904.
ANNELIDS OF THE TRIBES SABELLIDES AND SERPULIDES.

SYSTEMATIC DISCUSSION.

Tribe SABELLIDES.

Family SABELLIDÆ.

Attempts have been made by several authors to arrange the many and varied forms belonging to this group in analytical tables convenient for interpretation.

Grube (1851) placed them all in Sabella, dividing and subdividing the genus according to the form of the branchial lobes. Kröyer (1856) separated the northern forms into various known genera, proposing the name Bispira for those having the branchial lobes equal and coiled spirally: "Foruden disse fæm Grupper mener jeg, at de Sabeller, hos hvilke begge Gjællebuskene danne Spiraler, må udgjøre en sjætte Slaegt, hvilken man måske kunde Kalde Bispira." He also described many new species which he referred to the genus Sabella. As no definite species was mentioned as type, and also as many of the species referred by him and others to the genus Sabella have been found to have their branchial lobes spiral or involute in retraction, it is

1This name Bispira, suggested by Kröyer (1856—nomen nudum), without adequate description or reference to any species, as cited above, was first used by Claparède (1870) for Bispira volutacornis (Rathke, 1843), supposing this to be the same as Amphitrite volutacornis Montagu (1804) given by Quatrefages (1865) as the first species under his genus Distylia, ignoring the fact that Kröyer had called attention to their being distinct. Saint-Joseph (1894), notwithstanding he mentions these facts, combines the two genera, making volutacornis Montagu the type of the genus Bispira, eliminating the volutacornis Rathke as it is synonymous with the rubropunctata Grube and referable to the genus Jasmineira Langerhans (1880), type J. caudata Langerhans. Other authors—Langerhans (1880), Lo Bianco (1893), and Johnson (1901)—have added to the confusion by applying Bispira to still other forms, which should be referred to as many distinct genera. It is therefore deemed desirable to restore Distylia for the volutacornis Montagu, and if Bispira is to be considered, it apparently should be studied in connection with its relation to Jasmineira.
not surprising that this name (Bispira) has been applied by subsequent writers to various distinct forms. Quatrefages (1865) made a careful study of all the then known genera and species, giving descriptions and some figures, also a good analytical table. He, however, ignored the name Bispira of Krøyer, and proposed the new genus Distylia for forms having the branchial lobes equal and coiled spirally, describing and figuring the (Amphitrite) Sabella volutacornis Montagu (1804) as the first species. Malmgren (1865-7) made the greatest advance toward a possible correct interpretation of the northern forms by introducing many new genera, giving excellent figures of the species, especially of the setæ, and referring most of Krøyer's new species to those already described by Sars and others. Langerhans (1884) was the first to attempt an analytical table based on the arrangement and form of the setæ. His knowledge of the genera, however, being derived largely from published descriptions and figures, which often proved inadequate, he cannot be followed with certainty. He makes no mention of Distylia, and places Bispira in his second grand division, far removed from the related genus Spirographis, which differs in having the branchial lobes unequal and but one spirally coiled. His conception of Bispira was probably suggested by Claparède, and is evidently not that of Saint-Joseph (1894). The latter author has, by studying the animals themselves, been able to correct many of the errors hitherto overlooked. He follows Langerhans in making the arrangement and form of the setæ of great importance, but finds it necessary to introduce several new genera for the reception of the various species. In his analytical table there are some misconceptions which it seems desirable to note. Under his second division the presence and position of the eyes are made a distinguishing character, whereas it often happens that species referable to the same genus may or may not possess them. The genus Fabricia Blainville (1828), being said to have no collar, is separated from Oria Quatrefages (1865), although Bourne (1883) gives a good figure showing it to possess one. The two genera Demonax and Parachonia of Kinberg are not mentioned.

A special division was necessary for the genus Protulides, as it was described by Webster (1884) as having avicular uncini and pennoned setæ in all the tori of the body. Numerous specimens from Bermuda, recently studied, agree perfectly with Webster's description and figures of the type species (P. elegans) with the exception that they have avicular uncini only in the abdominal tori. Webster states that his description is based largely on notes made on specimens from Beaufort, North Carolina. Andrews in 1891, however, in studying specimens from
Beaufort, found that they differed from Webster’s description in this same character (avicular uncini only in the abdominal tori). As it is hardly possible that two species would be found in the same two localities, which differ only in the same character, it is safe to assume that the author’s notes were at fault. It is therefore necessary to change this character in the descriptions of both the genus and the species. This change reveals the strong similarity between this genus and *Hypsicomus* Grube (1870) and Marenzeller (1884), *non* Ehlers (1887), the two differing but little in form and arrangement of the setæ, but the collars are distinctly unlike. In *Protulides* it is of uniform depth, like that of *Chone* and *Euchone*, and complete save the dorsal opening, while in *Hypsicomus* it has a somewhat undulating edge and ends in a ventral lobe on each side of the ventral fissure or cleft. McIntosh in his Challenger Report (1885) figures a seta and uncinus from a specimen (*Laonome haeckelii*) from St. Vincent, Cape Verde Islands, of which only the tail was found. The uncinus is given in a three-quarter view, so that it is foreshortened. The same result was noticed in mountings of the Bermuda species (*Protulides elegans*), but pressure turned the uncini, showing them in profile to have a posteriorly elongated base. Ehlers (1887) and Saint-Joseph (1894) referred McIntosh’s species to *Hypsicomus*; it is, however, identical with *Protulides elegans* Webster. Notwithstanding the extended study given by Saint-Joseph and the excellent results obtained, it has been found impossible to place some of the new forms within the prescribed limits of his analytical table. This is also true of several previously described species. The genus *Eudistylia*, having equal spirally coiled branchial lobes and two kinds of dorsal thoracic setæ, should combine with *Distylia* (*Bispira*) in his division I-A-b, but there no eyes are mentioned, and the dorsal setæ in the type (*D. volutacornis*) are superior ‘limbate,’ inferior ‘cimeter’ shaped, the latter commencing on the fifth segment, while in the present form the inferior ones are spatulate back of the collar fascicle, similar to those found in *Pseudopotamilla reniformis*, as figured by Malmgren (1867). This species has, however, simple branchial lobes, and is placed in his second division under *Potamilla*.

In my studies it has appeared impractical to place too much importance on the kinds of setæ alone, as the same forms are repeated in so many different genera. It has seemed desirable to give more consideration to the form of the branchial lobes and the branchiae themselves. In all the typical *Sabellas* studied the rachises of the branchiae are distinctly four-sided, connected along their posterior portions by a deli-
cate membrane or web; in the *Parasabellae* these change to less distinguishable four-sided ones, and the web is but slightly developed or disappears, while in the *Eudistyliae* they become distinctly three-sided, rounded outwardly. They may also be simple, or many times divided or split, as in the *Schizobranchiae*.

It has also been found that, although so many valuable facts have been so comprehensively presented by Saint-Joseph, there are still some genera of which little is known, owing principally to the too broad application by their authors, as evinced by the variety of forms referred to them. This confusion has been greatly increased by subsequent writers, none having restricted the genera to any one of the species as a type, nor published figures as an aid toward a possible correct interpretation. This is especially true of the genera *Sabellastarte* and *Demonax*.

*Sabellastarte* was proposed by Savigny (1809) as a group or divisional name for Sabella-like forms having the branchiae arranged in a double series. It was adopted as such by Grube and Quatrefages, but Saint-Joseph, following Kröyer, used it as a generic name, without presenting any additional facts in regard to the branchial lobes, form of the collar, or form and arrangement of the setae. The two species — *Sabella indica* Savigny and *Sabella magnifica* Shaw — apparently agree only in having very long and numerous branchiae arranged in a double series. The numerous figures given by Shaw show an interesting and easily noted character, i.e., the absence of pinnae on the slender banded rachises. Neither Quatrefages (1865) nor Marenzeller (1884) mentions such a peculiarity as belonging to *S. indica*, thus giving emphasis to the small importance of the arrangement of the branchiae as the only generic character.

Marenzeller describes *S. indica* as having from 60 to 84 (in different individuals) very long branchiae arranged in a double series, and equal to about half the entire length of the body, which consists of from 196 to 227 segments and measures from 80 to 135 mm. in length. Quatrefages gives the setae as lanceolate in form, avicular uncini only in the tori and the collar as four-lobed. It is proposed to restrict the genus to this species as type. The genus *Eurato* Saint-Joseph (1894) differs in not having the branchiae arranged in a double series. Seven species are included in this without mentioning any special one for a type.

Kinberg (1866) placed five species in his genus *Demonax*, the first (*D. krusensterni*) and the last (*D. cooki*) being the only two that from the descriptions appear to be at all alike. Therefore the
genus is restricted to these two species, with the first taken as type. But, as no figures have been given, we can form no definite conception of the form and arrangement of the setæ or of other important features, showing the great need of a more careful study of these species.

In constructing the following analytical table for the genera which are related to the genus *Sabella*, an attempt has been made to base it on characters which can be readily seen with the aid of a good pocket lens, the tables hitherto published being so complicated as to require much careful microscopic work before one can arrive at the generic relation of any species.

In studying the various forms representing the numerous genera, certain details in structure are found to be repeated a certain number of times, forming a definite sequence or continuous evolution, as in the development of the collar.

Taking the form without a collar as the primitive type, the anterior edge of the first segment becomes more or less elongated in front, forming one or two more or less conspicuous lobes. When a collar begins to develop, the entire anterior edge may be produced into a free margin without any openings; or one incision or cleft may occur, forming an opening on the back, the ends being in contact or meeting; or only a portion along the sides and in front may be produced, forming a collar open on the back with widely separated ends. The same process of development taking place in the anterior margin of the first segment of the two-lobed type will produce a two-lobed collar, either with ends in contact or separated on the back. When additional incisions or clefts develop on the sides of either of these two-lobed forms, two corresponding four-lobed collars are formed, those with separated ends usually having the lateral incisions toward the front (ventro-lateral), while in those where the ends are in contact the incisions are toward the back (dorso-lateral). It therefore seems desirable to use the collar as an important character in grouping the genera. Other characters also of these primitive forms are found to be repeated; the setæ and uncini especially, or variations of them, being repeated many times in various combinations which can be arranged in definite groups.

It will be found that the concise facts in regard to many of the 36 genera cited are much too meager to render it possible for one to place each genus in its exact or correct relative position. There is still much work to be accomplished before a perfect analytical table can be formulated.
### ANALYTICAL TABLE FOR SABELLA AND RELATED GENERA.

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Collar absent.</td>
</tr>
<tr>
<td>1'</td>
<td>Collar present.</td>
</tr>
<tr>
<td>2.</td>
<td>Anterior edge of first segment produced in front, forming a small angular ventral lobe.</td>
</tr>
<tr>
<td></td>
<td>Uncini in tori on abdomen; beaked setae in tori on thorax.</td>
</tr>
</tbody>
</table>

1. Myxicola (Koch 1846) Grube 1855 + Malmgren 1865, including Leptochone Claparède 1870, teste Marenzeller 1893.
   - Type, M. infundibulum (Montagu 1808, figures) Koch 1846 + Saint-Joseph 1898, figures. Greenland.
   - Branchiæ joined by membranous web. Inferior setæ on thorax, below collar fascicle, lanceolate in form, i.e., tapered, more or less elongated, widest near lower end of blade. Uncini similar in form to those of Leu- cariste Malmgren 1865 (Terebellacea). Ventral setæ on thorax with broadened curved (beaked) end, more or less serrate on top, in a long, nearly straight shaft or manubrium, similar to those of Terebellides.

2'. Anterior edge of first segment produced in front, forming two long, pointed, ventral lobes.
   - Uncini in tori on abdomen; uncini and pennoned setæ in tori on thorax.

3. Collar entire, without incisions or clefts.
   - Pectinate setæ in tori on abdomen; beaked setæ in tori on thorax.

   - Type, H. aestuarius Bourne 1883, figures. Coast of Isle of Sheppey, England, and mouth of Liffey, Ireland.
   - Branchial lobes small, bearing few ciliated (without pinnae) branchiæ; one eye on ventral surface of each lobe, beneath collar. Inferior setæ on thorax, below collar fascicle, lanceolate in form. Setæ in thoracic tori approaching the form found in Trichobranchus Malmgren 1865 (Terebellacea); setæ in abdominal tori with laterally serrate broadened end, on long shaft or manubrium, approaching that in Lagis Malmgren 1867 (Amphiciotes) with the elongated base of that form turned downward as a shaft or manubrium.

5. Manayunkia Leidy 1858 and 1884.
   - Branchial lobes laterally elongated, bearing numerous ciliated (without pinnae) branchiæ; 7 eye-spots on each lobe. Young resembling Haplobranchus. Setæ somewhat resembling those of Haplobranchus.

3'. Collar open on back, either with or without incisions or clefts. |
4. Collar open on back, without incisions or clefts (one-lobed).
4'. Collar open on back, with one or more incisions or clefts. 6. Collar with ends separated on back.

Pectinate setae in tori on abdomen; beaked setae in tori on thorax.

(5) Fabricia Blainville 1828.

Type, *F. fabricii* (Müller) Fabricius 1780, figure. Greenland.

Branchial lobes small, bearing few branchiae with unequal, more or less alternating, pinnae. Setae similar to those of *Manayunkia*.

Uncini in tori on abdomen; beaked setae in tori on thorax.

(6) Oria Quatrefages 1865 + Claparède 1870.

Type, *O. armandi* (Claparède 1874, figures) Quatrefages 1865 + Claparède 1870 + Langerhans 1880, figures, + Saint-Joseph 1894, figures. Gulf of Naples.

Branchial lobes with branchiae similar to those of *Fabricia*. Setae also similar to those of *Fabricia*. Uncini somewhat similar in form to those of *Ampharetus* or *Amphiectes* Malmgren 1865 (Ampharetidae).

(7) Oriopsis Caullery and Mesnil 1896.


Branchial lobes small, bearing few branchiae. Inferior setae on thorax, below collar fascicle, lanceolate in form. Beaked setae somewhat similar in form to those in *Jasmineira*. Uncini somewhat similar in form to those of *Articulata* Malmgren 1865 (Terebellacea), with more numerous teeth.

Uncini only in tori on both abdomen and thorax.


Type, *E. pyrrhogaster* (Grube 1878, figures) Saint-Joseph 1894, as first species. Philippine Islands.

Branchiae joined by membranous web. Inferior setae on thorax, below collar fascicle, 'suboval' in form. Uncini avicular in form.

5'. Collar with ends meeting, or in contact on back.

Uncini in tori on abdomen; beaked setae in tori on thorax.

(9) Chone Kröyer 1856.

Type, *C. infundibuliformis* Kröyer 1856 + Malmgren 1865, figures, and 1867, figure. Spitzbergen.

Branchiae joined by membranous web. Inferior setae on thorax, below collar fascicle, spatulate in form, *i.e.*, short, rounded, widest in middle or near upper end.

(10) Megachone Johnson 1901.

Type, *M. aurantiaca* Johnson 1901, figures. Puget Sound.

Branchiae joined by membranous web. Inferior setae on thorax, below collar fascicle, lanceolate in form. Uncini similar to, or approaching

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1 Good figures are given by Bourne 1883 and Leidy 1884.

2 Although the collar is described as rudimentary or wanting, and no figures are given, this genus is placed here conditionally, as it is said to possess some characters similar to those in *Oria*.

3 The collar is neither described nor figured with sufficient exactness for one to determine its true character.
the form of those in *Chone*. Intermediate between those of *Chone* and *Euchone*.

(11) **Euchone** Malmgren 1865.

Type, *E. analis* (Krøyer 1856) Malmgren 1865, figures, as first species. Spitzbergen.

Branchiae joined by membranous web. Inferior setæ on thorax, below collar fascicle, subspatulate in form, *i. e.*, short, tapered, widest in middle. With caudal sucker.

(12) **Metachone** gen. nov. (See p. 216.)

Type, *M. mollis* sp. nov., figures. Pacific Grove, California.

Branchiae joined by membranous web. Inferior setae on thorax, below collar fascicle, clavate in form, *i. e.*, long, rounded, widest near upper end. Uncini similar in form to those of *Euchone*. Without caudal sucker.

(13) **Parachonia** Kinberg 1866.¹

Type, *P. letterstedti* Kinberg 1866. Cape of Good Hope.

Branchiae joined by membranous web. Inferior setae on thorax, below collar fascicle, clavate in form. Uncini unknown.

(14) **Jasmineira** Langerhans 1880.

Type, *J. caudata* Langerhans 1880, figures. Madeira.

Branchiae free. Inferior setae on thorax, below collar fascicle, subspatulate in form. Uncini avicular in form.

(15) **Dialychone** Claparède 1870.

Type, *D. acustica* Claparède 1870, figures. Gulf of Naples.

Branchiae free. Inferior setae on thorax, below collar fascicle, clavate in form. Uncini somewhat similar in form to those of *Sabellides* Malmgren 1865 (Ampharetæ), with smaller and more numerous teeth, the lowest one larger than the others.

Avicular uncini in tori on abdomen; avicular uncini and pennoned setæ in tori on thorax.

(16) **Protulides** Webster 1884.¹


Branchiae joined by membranous web. Setæ on collar in a dorsal, oblique, linear series on each side. Inferior setae on thorax, below collar fascicle, suborbicular in form.

6. Collar with only one incision or cleft (two-lobed) ........................................... 7.

6'. Collar with three incisions or clefts (four-lobed) .............................................. 8.

7. Collar with ends separated on back.

Uncini only in tori on both thorax and abdomen.

(17) **Laonome** Malmgren 1865, *non* Kinberg 1866 *nec* Marenzeller 1884.

Type, *L. krøyeri* Malmgren 1865, figures. Spitzbergen.

Branchiae free. Inferior setae on thorax, below collar fascicle, orbicular in form. Uncini similar in form to those of *Euchone*.

¹ A thorough knowledge of this genus may render it necessary to combine it with the preceding (*Metachone*).
(18) Demonax Kinberg 1866 (restricted). (See p. 186.)
Type, D. krusensterni Kinberg 1866. Honolulu.
Branchia free, without outer appendages. Inferior setae on thorax, below collar fascicle, lanceolate in form.

(19) Dasychonopsis gen. nov. (See p. 198.)
Type, D. pallidus sp. nov., figures. Honolulu.
Branchial lobes small, not spiral; branchia free, with outer appendages. Inferior setae on thorax, below collar fascicle, lanceolate in form.

Avicular uncini in tori on abdomen; avicular uncini and pennoned setae in tori on thorax.

(20) Branchiomma (Kölliker 1858) Claparède 1870.
Branchia free; eyes subterminal. Inferior setae on thorax, below collar fascicle, ob lanceolate in form, i.e., tapered, widest in middle, differing in length.

(21) Parasabella gen. nov. (Potamilla Malmgren 1865, in part, + Marenzeller 1884, in part). (See p. 199.)
Type, P. media sp. nov., figures. Alaska.
Branchia joined by a small membranous web; eyes, when present, on outer surface of the rachises. Inferior setae on thorax, below collar fascicle, ob lanceolate in form.

7'. Collar with ends meeting or in contact on back.
Avicular uncini only in tori on both thorax and abdomen.

(22) Paralaonome gen. nov. (Laonome Kinberg 1866 and Marenzeller 1884.) (See p. 197.)
Type, P. japonica (Marenzeller 1884, figures). Japan.
Branchial lobes forming equal spirals. Inferior setae on thorax, below collar fascicle, lanceolate in form.

(23) Notaulax Tauber 1879 + Levinsen 1883 (revised).
Type, Notaulax sp. Tauber 1879 = N. rectangulatus Levinsen 1883, figures.
Branchia free. Setae on collar in dorsal, angular, linear series on each side. Inferior setae on thorax, below collar fascicle, spatulate in form.
Avicular uncini in tori on abdomen; avicular uncini and pennoned setae in tori on thorax.

(24) Hypsicomus Grube 1870 + Marenzeller 1884, non Ehlers 1887.
Type, H. stichophthalmos Grube 1863, figure, as first species. Adriatic Sea.
Branchia joined by membranous web. Setae on collar in dorsal, oblique, linear series on each side. Inferior setae on thorax, below collar fascicle, 'broad oval' in form.

1 At the present time very little is definitely known of this genus.
(25) **Potamilla** Malmgren 1865 (restricted).

Type, *P. neglecta* (Sars 1861) Malmgren 1865, figures, as first species. Off Finmark, in 20–40 fms.

Branchiae free. Inferior setae on thorax, below collar fascicle, subspatulate in form, *i. e.*, short, tapered, widest in middle.

(26) **Aspeira** gen. nov. (**Potamilla** Malmgren 1865, in part). (See p. 202.)

Type, *A. modesta* sp. nov., figures. Alaska.

Branchiae free. Inferior setae on thorax, below collar fascicle, subspatulate to oblaceolate in form, *i. e.*, tapered, widest in middle, varying in length.

8. **Collar with ends separated on back.**

Incisions or clefts ventro-lateral and ventral.

Avicular uncini only in tori on both abdomen and thorax.

(27) **Sabellastarte** Savigny 1809 + Saint-Joseph 1894. (See p. 186.)

Type, *S. indica* Savigny 1809, as first species, + Quatrefages 1865.

Indian Ocean.

Branchial lobes comparatively small, spiral only in retraction. Inferior setae on thorax, below collar fascicle, lanceolate in form. Uncini similar to those of *Pseudopotamilla*.

(28) **Metalaonome** gen. nov.

Type, *M. mariae* (Lo Bianco 1893, as *Bispira*, figures). Gulf of Naples. Branchial lobes spiral only in retraction. Inferior setae on thorax, below collar fascicle, oblaceolate in form.

(29) **Dasychone** Sars 1861 + Malmgren 1865 (restricted).

Type, *D. decora* Sars 1861, as first species, = ? *D. infarcta* (Krøyer 1856) Malmgren 1865, figures. Coast of Norway.

Branchial lobes forming equal spirals; branchiae with outer appendages. Inferior setae on thorax, below collar fascicle, lanceolate in form.

Avicular uncini in tori on abdomen; avicular uncini and pennoned setae in tori on thorax.

(30) **Sabellla** (Linne) Malmgren 1865.

Type, *S. pavonina* Savigny 1809 + Malmgren 1865, figures, as first species. Coast of Norway, in 30–100 fms.

Branchial lobes spiral only in retraction; branchiae joined by membranous web. Inferior setae on thorax, below collar fascicle, lanceolate in form.

(31) **Distyila** Quatrefages 1865 (*Bispira* Saint-Joseph 1894). (See p. 183.)


Branchial lobes forming equal spirals. Inferior setae on thorax, below collar fascicle, lanceolate in form.

(32) **Spirographis** Viviani 1805.


Branchial lobes forming unequal spirals; branchiae joined by membranous web. Inferior setae on thorax, below collar fascicle, lanceolate in form.
8'. Collar with ends meeting or in contact on back.
Inclinations or clefts dorso-lateral and ventral.
Avicular uncini in tori on abdomen; avicular uncini and pennoned setae in tori on thorax.

(33) Potamis Ehlers 1887.
Type, *P. spathiferus* Ehlers 1887, figures. Off the coast of Florida, In 275 fms.
Branchial lobes small; branchiae free, unequal. Inferior setae on thorax, below collar fascicle, orbicular in form. Avicular uncini on thorax in form intermediate between those of *Jasminieira* (as in *J. oculata* Langerhans 1884) and those of *Pseudopotamilla* (as in *P. oculifera* Leidy 1855).

(34) Pseudopotamilla gen. nov. (*Potamilla* Malmgren 1865, in part).
(See p. 203.)
Type, *P. reniformis* (Leuckart 1849, figures, + Malmgren 1867, figures). Iceland.
Branchial lobes small; branchiae simple, free, equal. Inferior setae on thorax, below collar fascicle, spatulate in form.

(35) Schizobranchia gen. nov. (See p. 205.)
Type, *S. insignis* sp. nov., figures. Alaska.
Branchial lobes small; branchiae free, divided. Setae similar in form to those of *Pseudopotamilla*.

(36) Eudistyelia gen. nov. (See p. 209.)
Type, *E. gigantea* sp. nov., figures. Alaska.
Branchial lobes produced ventrally, forming equal spirals; branchiae in nearly equal double series. Setae similar to those of *Pseudopotamilla*, i.e., inferior setae on thorax, below collar fascicle, spatulate in form.

Genus Sabella Malmgren 1865.
Type, *Sabella pavonina* Savigny.

In this genus the branchial lobes are small at base, free and more or less prolonged ventrally, spirally coiled or involute in retraction, more or less flaring when fully expanded.

The branchiae are nearly equal in length, arranged in a single series, their rachises four-sided, being flattened on the back, the two outer angles furnished with thin membranous edges, most developed and sometimes ruffled along their anterior or distal portions, where they frequently fold outward, toward each other, forming a conspicuous groove. The two inner edges bear slender, more or less crowded pinæ which do not extend to the end, leaving a thin, flattened, more or less bluntly rounded tip. They are connected along their posterior or proximal portions by a more or less developed, thin, interbranchial membrane or web. Eyes usually present, arranged in pairs on the back, often concealed by color spots.
Collar four-lobed, circular, with a slightly undulating rolling edge, the lateral slits in front of the fascicles of setae, or ventro-lateral, often marked by a spot of color; ventral lobes small; dorsal lobes wanting, the ends widely separated on the back, showing the cephalic region with a deep median furrow defined by a conspicuous ridge on each side. Inside the collar, opposite the ventral fissure, is a small, triangular, median, somewhat bilobed cephalic swelling, often with two conspicuous spots of color, bordered by a thin, often ruffled membrane. Extending inward from this, along the base of each branchial lobe, is a thin, moderately developed, often much ruffled membrane, which, folding on itself, terminates at the ventral end of the lobe. Mouth protected on each side by a moderately developed membranous lobe supporting a very long, conspicuous, regularly tapered dorsal tentacle.

Fascicles of setae forming oblique series on the thorax, of two forms, the superior ones linear, the inferior round and protected by an auriform membrane; those on the abdomen comma-shaped.

All the setae limbate, of one form, long; regularly tapered, lanceolate, the two equal sides, seen only in a direct front or back view, appearing as a single border, as given by Malmgren in a direct profile view; varying in width, the superior ones much narrower than the inferior and fewer in number; on the abdomen they are less regularly tapered. Along the tori on the thorax are two forms, avicular hooks and pennant-bearing or pennoned setae; on the abdomen avicular hooks only.

A typical example of the type (Sabella pavonina Savigny 1809) has not been seen. The above description refers to forms like Sabella crassicornis Sars (1851).

Sabella melanostigma Schmarda (1861), given by Ehlers (1887) as a typical example of his interpretation of this genus, Saint-Joseph (1894) placed in his new genus Eurato, under the second group in his analytical table, for genera having avicular hooks only in the thoracic tori. Treadwell (1901) recorded this species from Porto Rico.

SABELLA ELEGANS sp. nov.
pl. xxvi, fig. 2; pl. xxvii, fig. 6c; pl. xxxiii, figs. 20, 21; pl. xxxiv, figs. 1, 4, 5, 10; pl. xxxvii, figs. 12, 33.

Type locality. — Kadiak.

These setae of the tori have the exposed end of the long shaft or manubrium expanded into a short, more or less cordate-shaped, usually striated portion, bearing a long transparent, flexible, pennant-like terminal portion. 'Cucullate,' 'mucronate,' 'en pioche,' and other terms have been used as descriptive of them.
Color white, with the branchiae tinged with pink and conspicuously spotted with dark purple, forming bands.

Number of segments about 80, of which 8 belong to the thorax.

The branchiae number about 22 in each lobe, not counting the 3 or 4 small ones at the lower or ventral end. They are about 16 mm. long, broad and flat on the back, with the membranous edges ruffled and very conspicuously developed along their distal portions.

Eyes in pairs, situated in the color spots, so that they are not readily found.

Length of figured specimen 2.25 inches; breadth at base of collar about 7.5 mm.; length of thorax along setae 7 mm.

Kadiak, July 3, four specimens.

This species closely resembles Sabella crassicornis Sars, as figured by Malmgren (1865), but has more numerous branchiae and color spots. It is easily distinguished from the other species of this region by the regular arrangement of the color spots on the rachises and the extending of the color onto the pinnae, which is unusual.

SABELLA HUMILIS sp. nov.

pl. xxvii, fig. 2; pl. xxxvi, figs. 4-11.

Type locality. — Popof Island.

Compared with the smallest specimen of S. elegans, which has about 50 segments (7 on the thorax) in a length of 15 mm. and a breadth of about 2.5 mm., this species is shorter, having 55 segments (8 on the thorax) in a length of 11 mm. and breadth of 2 mm.

The branchiae, though of similar form, length, and number (12 pairs), have the basal membrane more developed and but three series of unequal-sized spots of color, on most of which a pair of eyes is situated, while the former has six series of color spots of about equal size, and regular in arrangement. There is also a noticeable contrast between the prevailing colors — deep crimson in the present species, and pale yellowish white in S. elegans.

The tube is thin, horn-color, with a coating of very fine grey sand. Popof Island, July 8, one specimen, dredged.

SABELLA LEPTALEA sp. nov.

pl. xxvii, fig. 6a; pl. xxxiii, figs. 5, 14, 27, 29; pl. xxxiv, figs. 6-9, 22.

Type locality. — Kadiak.

In form and coloring this species closely resembles S. formosa and S. elegans, but differs in having the pinnae of the branchiae fewer, shorter, and exceedingly delicate.
There are about 90 segments in the largest specimen, of which 8 belong to the thoracic region.

Branchial lobes small, considerably developed ventrally, each bearing about 22 rather long branchiae, which are connected by a basal membrane; the rachises taper gradually toward the extremity, which often bears a short, very delicate terminal filament; their two thin outer edges are considerably developed and turn outward, especially near the tip; their pinnae are moderately long, exceedingly slender, and gradually decrease in length.

Eyes single or in pairs on nearly all of the brown color spots, which number from 5 to 8 on different branchiae.

Length 75 mm.; breadth at base of thorax 10 mm.; length of thorax along setae about 11 mm.; length of branchiae about 19 mm.

Kadiak, July 3; three ♀ specimens.

One specimen was taken from its tube, which is very thin and flexible, of a dark purplish brown color, with a coating of very fine gray sand.

SABELLA FORMOSA sp. nov.
pl. xxvii, fig 66; pl. xxxiii, fig. 32; pl. xxxiv, figs. 14, 21; pl. xxxv, figs. 7, 25, 30; pl. xxxvi, figs. 25, 32.

_Type locality._—Berg or Glacier Bay.

A large species, similar in size and form to _S. leptalea_, of a beautiful pink color, the branchiae of a deeper shade, with large brown spots varying in number from 3 to 7 and not evenly spaced, as in _S. elegans_.

In the largest specimen, which is distended with eggs and not very well preserved, there are about 70 segments, of which 8 belong to the thorax.

The branchial lobes arch well forward ventrally, the free portion forming noticeable spirals when unexpanded. The branchiae, about 29 in each lobe, not counting 4 or 5 undeveloped ventral ones, are comparatively long and slender, with closely crowded, very long and slender pinnae, which decrease abruptly, leaving relatively short thin ends. Eyes of good size, arranged in pairs on some but not all of the brown spots.

Collar simply rounded at the ventral fissure, without angular lobes, often with spots of brown at the bases of the noticeable lateral clefts.

Length of largest specimen about 100 mm.; branchiae 23 mm.; breadth at base of thorax about 10 mm. Length of smallest specimen about 47 mm.; breadth about 7 mm.

_Berg or Glacier Bay, June 10, four specimens, dredged._
Tubes thin and flexible; brown, with a tinge of pink; joined to each other, covered with exceedingly fine gray sand, to which delicate hydroids are attached.

This is readily distinguished from the other allied forms by the more numerous branchiae, with their very long crowded pinnae and irregularly arranged brown spots.

**SABELLA (?) VANCOUVERI** Kinberg.

*Sabella vancouveri* Kinberg, Annulata nova, p. 353, 1866.

*Type locality.* — Vancouver Island, British Columbia.

Nothing corresponding to this species occurs in the present collection.

It was described by Kinberg (1866) as having a stout body; 8 or 9? thoracic segments; 182 branchiae on both sides, 18–23 mm. long, with 5 purple bands; setae limbate, hastate; uncini; length of the 36 anterior segments, 60 mm.

No mention is made of the form of the branchial lobes, yet the large number of branchiae make it improbable that the species can be a typical *Sabella*. No species of *Eudistylia*, however, has more than 3 bands of color on the branchiae, and those of *Schizobranchia* are not banded.

**Genus Paralaonome** nov.

*Type, Laonome japonica* Marenzeller.

The above species was erroneously referred by Marenzeller to the genus *Laonome* of Malmgren (1865), agreeing with *L. kröyeri* Malmgren, the type, only in having a single series of avicular uncini in all the tori; these differ greatly in form, however, being distinctly prolonged posteriorly, not truncated as in Malmgren's species.

The branchial lobes are large, prolonged ventrally, spirally coiled in retraction, as in *Sabella*, and bear numerous branchiae arranged in a double series.

The narrow four-lobed collar differs, also, from the much more conspicuous two-lobed one on *L. kröyeri*.

*Paralaonome* is therefore proposed for the reception of the Japanese species, notwithstanding the fact that Saint-Joseph (1894) suggested that it should be referred to the genus *Sabellastarte* Savigny (1809), type *S. indica* Savigny (1809), although it does not appear to agree very closely with the other species placed there.

*Laonome antarctica* Kinberg (1866) from the Straits of Magellan may prove to be a related species.
PARALAONOME JAPONICA (Marenzeller).

*Laonome japonica* Marenzeller, SüdJapanische Anneliden, p. 212, pl. III, figs. 4 (A–C), 1884.

*Sabellastarte japonica* Saint-Joseph, Annélides de Dinard, p. 249, 1894.

*Type locality.* — Japan.

Branchial lobes much prolonged ventrally, and spirally coiled in retraction, possibly unrolled in expansion, bearing 100 to 110 or more moderately long branchiae arranged in two series, their wine-colored rachises slender, four-sided, the two inner edges with closely crowded yellowish pinnæ. Eyes, if present, not discernible.

Collar inconspicuous, four-lobed, the dorso-lateral incisions forming small dorsal lobes separated by a deep furrow; at the ventral fissure simply rounded without angular ends.

Number of segments about 200, of which 8 belong to the thorax, on which the fascicles of setæ, which are circular in form as in *Sabella*, form very oblique series.

Setæ on all of the segments long, regularly tapered, of two forms, narrow and broad. Avicular uncini only in all the tori.

Length, without the branchiae, of a much contracted specimen 70 mm.; breadth 10 mm.

The above characters are taken from a specimen in the Yale University Museum, and agree well with those given by Marenzeller, differing only in size and number of branchiae, stated by him to be 144.

Genus *Dasychone* Sars 1861.

*Type, Dasychone decora* Sars = *Dasychone infarcta* (Kröyer 1856) Malmgren 1865.

The various species which have been referred to this genus vary so greatly in the size and form of the branchial lobes, the size and arrangement of the outer branchial processes, also the form of the collar, that they need much careful study and separation, probably resulting in the further division of the genus (see p. 192).

Genus *Dasychonopsis* nov.

*Dasychone* Malmgren 1865, in part.

*Type, Dasychonopsis pallidus* sp. nov.

The type (*D. pallidus*), in its small (not spiral) branchial lobes and bilobed collar, agrees with *Dasychone argus* Sars, as figured by Malmgren (1865). Both are unlike *D. infarcta* (Kröyer), supposed to be identical with *D. decora*, given by Sars in 1861 as his first species and therefore taken as the type of the genus *Dasychone*. This has the
branchial lobes much prolonged ventrally, and spirally coiled, and the collar distinctly four-lobed, with conspicuous ventro-lateral and ventral incisions. The name Dasychonopsis is therefore proposed for D. pallidus sp. nov., as type. D. compressa Ehlers (1887) and D. curta Ehlers (1901) are related species.

DASYCHONOPSIS PALLIDUS sp. nov.

Type locality.—Honolulu.

A small nearly colorless species, with long slender branchiæ about one half as long as body, a little rust color on the branchial lobes and minute darker dots at the outer end of each torus.

Branchial lobes small, not prolonged ventrally, neither spiral nor involute, bearing 9 pairs (18) of branchiæ having slender four-sided rachises, with moderately long, delicate, tapered tips, often curled inward, connected posteriorly by a shallow inconspicuous membrane; slender, well-separated pinnae along their two inner edges, and comparatively stout tapered processes, forming 5 to 8 pairs, situated at regular intervals along the two outer ones; between the processes a pair of yellowish brown eyes often occur; at the edge of the interbranchial membrane a single long, slender process, turning outward, arises from the dorsal outer edge of each rachis.

Collar two-lobed, without lateral incisions, of nearly uniform depth, arising abruptly just above the dorsal setæ, widely separated, ending in angular ventral flaps.

Number of segments 18, of which 5 belong to the thorax, on which the small circular fascicles of setæ form oblique series.

Collar setæ long, regularly tapered, of two forms, narrow and broad; on the other thoracic segments broad ones only; on the abdomen they are of two forms, similar to those on the collar but much longer; uncini only in all the tori, those on the abdomen with more numerous apical teeth.

Entire length 7.5 mm.; branchiæ about 4 mm.

Kinberg (1866) described Sabella havaica from Honolulu as having the outer processes on the branchiæ, characteristic of Dasychone. Although similar in size (8 mm.) to the present species, it has 13 branchiæ and 44 segments.

Genus Parasabella nov.

Type, Parasabella media sp. nov.

This generic name is proposed for species which, though resembling typical Sabellas in form, have the branchial lobes small, but slightly
prolonged ventrally, with the branchiae not so distinctly four-sided, and connected by a very slightly developed, posterior, interbranchial, membranous web. The collar bilobed, without lateral incisions, widely separated on the back, ending in more or less angular ventral ends.

All the fascicles of setæ laterally elongated.

Setæ on the thorax of two forms; superior ones long, regularly tapered; inferior ones shorter, broader, and oblanceolate. Tori with avicular uncini and pennoned setæ.

*Parasabella microphthalmia* Verrill (1874) from the southern coast of New England is a *Parasabella*.

**PARASABELLA MEDIA sp. nov.**

Pl. xxvii, figs. 3-5; pl. xxxiii, figs. 34-36; pl. xxxiv, fig. 3; pl. xxxvi, figs. 15, 14; pl. xxxvii, fig. 30.

*Type locality.* — Kadiak.

This small species is short and stout, abruptly tapered near the broad posterior end, light brown in color, tinged with crimson, with the branchiae variously spotted with dark brown.

Segments about 100 in the largest example, of which 8 belong to the thorax, on which the fascicles of setæ form oblique series.

Branchial lobes but slightly prolonged ventrally, bearing about 18 pairs of long, rather slender, much curled and twisted branchiae; their rachises not so distinctly four-sided as in *Sabella*, and not connected by a noticeable basal membrane or web; pinnae short, but little developed, leaving long tapered ends. The irregular development of the pinnae and the curling of the branchiae are largely, if not entirely, due to the presence of a curious parasite which attaches itself to, and develops in masses along, the thin inner membranous edges of the rachises. These masses are protected by a thin transparent wall. Eyes none; not discernible in preserved specimens.

Collar well developed, without lateral incisions, open on the back, arising abruptly midway between the broad dorsal furrow and the first fascicle of setæ, ending in small, angular, ventral lobes.

Setæ characteristic of the genus, with the exception of the pennoned ones of the thoracic tori, which have one side larger than the other, and developed into a long, slender, terminal filament, which is separated or split at its base, from the pointed end of the shaft or manubrium.

Length of largest specimen about 35 mm.; breadth at base of thorax about 5 mm.; at base of collar 4 mm.; length of thorax along setæ about 5.5 mm. Length of smallest specimens 19 mm.; breadth at base of thorax about 4 mm.
Kadiak, July 3, several specimens. Their tubes, which are semi-transparent, horn color, with more or less foreign matter adhering in patches, are attached in clusters or colonies.

**PARASABELLA MACULATA** sp. nov.

*Pl. xxviii*, figs. 8, 9; *pl. xxxiii*, figs. 8, 12, 33; *pl. xxxiv*, fig. 2; *pl. xxxvi*, figs. 12, 15, 16, 21, 22.

*Type locality.* — Kadiak.

A rather long, slender species, yellowish white, with the branchiae irregularly spotted with brown, each rachis having its two outer edges marked by dashes and spots of dark chocolate brown, and the pinnæ banded with a lighter shade.

Segments rather long and well defined, about 70 in number, of which 8 belong to the thorax, where the fascicles of setæ are in nearly straight series.

Branchiae about 14 pairs; not joined by a basal web, narrow, without noticeably thinner edges; the pinnæ of moderate length, gradually decreasing toward the end, leaving a comparatively long, rounded, tapered, naked terminal portion.

Eyes not discernible.

Collar well developed, round, of nearly uniform depth, arising abruptly a little above the dorsal fascicles of setæ, and ending in two small ventral lobes.

Oral membrane conspicuous, tentacles long, broad at base, with an opaque, rib-like median portion tapering into the long slender end.

Dorsal furrow conspicuous on the first three segments.

Length about 35 mm.; branchiae about 10 mm.; breadth at base of thorax 3.5 mm.

Kadiak, July 3, one specimen.

Although so very dissimilar in general appearance, this species is very much like the preceding in the coloring of the branchiae and form of most of the setæ, but those of the tori do not appear to have the conspicuous split seen in that species (pl. xxxvii, fig. 30).

**PARASABELLA** sp.

*Type locality.* — Pacific Grove, California.

A very small colorless specimen, destitute of branchial lobes, has the round bilobed collar and form of setæ characteristic of this genus. It has 8 thoracic and 50 abdominal segments.

Length 12 mm.; of thorax 3 mm.; breadth 2 mm.
Genus Aspeira nov.

Type, Aspeira modesta sp. nov.

Branchial lobes with small basal attachment, not spiral, without ventral prolongation, and united dorsally, bearing a single series of moderately long, simple plumose branchiae of about equal length, their rachises rounded on the back and, along the two inner edges, having a conspicuous ruffled membrane, most developed posteriorly, outside of which the long, rather coarse, well-separated (especially posteriorly) pinnae arise; these extend nearly to the end of the rachis, leaving but a very small tapered tip. Eyes none.

Collar bilobed, as in Potamilla, arising from the dorsal furrow and continuing in an unbroken curve to the ventral fissure, where it abruptly expands into long, narrow, triangular processes, twisted strongly backward. Inside the collar are two well-marked dorsal cephalic swellings.

A conspicuous ruffled membrane extends inward from the ventral fissure of the collar, inside each branchial lobe, folds on itself, and terminates at the ventral end. On each side of the mouth is a very large, irregular, leaf-like membranous lobe supporting a long, slender, dorsal tentacle, which is attached near its base to the inside of the branchial lobe.

Fascicles of setae laterally elongated as in Pseudopotamilla and Eudistylia.

Setae of the collar fascicle and superior ones of the other thoracic fascicles, with regularly tapered, lanceolate blades; inferior setae, back of the collar, vary from oblanceolate (the longer) to subspatulate (the shorter) forms; abdominal setae bent at the base of the long, abruptly tapered blade. Thoracic tori with avicular hooks and penoned setae; abdominal tori with avicular hooks only.

This genus forms a connecting link between the genera Parasabella and Potamilla.

ASPEIRA MODESTA sp. nov.

pl. xxv, fig. 3; pl. xxxvi, figs. 27-31, 33-35.

Type locality. — Kadiak.

Color in formalin yellowish, with the branchiae broadly and irregularly banded with light chestnut.

Number of segments about 90, with 6 on one side of the thorax and 7 on the other; the fascicles of setae in slightly oblique series.

Branchiae about 11 mm. in length, arranged in a single series of 13 equal pairs, besides 2 small undeveloped ventral ones.
Length about 46 mm., or 1.6 inches; breadth 5 mm.; length of thorax along setae about 5 mm.

Kadiak, July 3, one specimen.

Genus Potamilla Malmgren 1865.

Type, Potamilla neglecta (Sars).

The genus Potamilla of Malmgren appears to have been rather vaguely used by subsequent writers. It was proposed in 1865 for the species Sabella neglecta Sars (1851), redescribed and figured as the first species, and Potamilla torelli Malmgren, which are readily distinguished, especially from species of Sabella, by the bilobed collar meeting at the dorsal furrow and by shorter, broader, subspatulate, inferior thoracic setae; their borders, however, being equal, not unequal as given by Malmgren.

It was also suggested that Sabella reniformis (Müller) Leuckart might be referable to the same genus, but the excellent figures given in 1867 show a marked difference in the four-lobed collar with deep dorso-lateral incisions or notches, as well as in the shorter, spatulate inferior thoracic setae. The new name Pseudopotamilla is therefore proposed for such forms.

All species hitherto referred to Potamilla need much careful study before their correct relationship can be determined. Potamilla malmgreni Hansen (1882) from N. L. 63–65° +, W. L. 5–7° +, in 1163–1215 fathoms, should be referred to the genus Potamis Ehlers (1887). The avicular thoracic hooks are somewhat analogous in form to those in Euchone.

Genus Pseudopotamilla nov.

Type, Potamilla reniformis (Müller + Leuckart) Malmgren.

This generic name is proposed for species similar to P. reniformis which have hitherto been referred to the genus Potamilla.

The branchial lobes are simple, and not prolonged ventrally, but differ from those in Potamilla in having the dorsal ends protected by a stiff, sharp or thin edge, often turning outward. Malmgren’s figure 77A, pl. xiii, 1867, is not sufficiently clear to show this.

The collar is four-lobed, meeting on the back, with small, angular, dorsal lobes formed by conspicuous dorso-lateral incisions or notches, and more or less developed, usually pointed, ventral ends.

1 Type, Potamis spathiferus Ehlers, from off the coast of Florida, in 275 fathoms.
Oral membranes as in *Potamilla* and related genera; one extending inward from each side of the ventral fissure, along the base of each branchial lobe, folding on itself to the ventral end of the lobe; the other, inside this, more or less irregular, leaf-like in form, supporting long, slender, tapered, dorsal ends.

Fascicles of the setae small, laterally elongated, in straight series; thoracic tori comparatively short, of about uniform length. Inferior thoracic setae, back of the collar fascicle, spatulate in form. Müller 1771, as *Amphitrite*, Leuckart 1849, as *Sabella*, Quatrefages 1865 and McIntosh 1868, as *Sabella saxicava*, Malmgren 1867 + Marion and Bobretzky 1875 + Marion 1878 + Langerhans 1884 + Andrews 1891 and Saint-Joseph 1894, as *Potamilla*, have published figures of this species, but as there appears to be considerable variation in the form of the setae, especially the uncini, it is probable that the name has been sometimes erroneously applied.

In this genus can be placed *Potamilla oculifera* Leidy (1855), which has long been considered synonymous with *P. reniformis*. Figures of the characteristic setae of specimens (no. 885 Yale Museum), collected at Watch Hill, Rhode Island, are given on pl. xxxiii, figs. 6, 30; pl. xxxiv, fig. 11; pl. xxxvii, figs. 11, 13, 14, 29. *Potamilla tortuosa* Webster (1878), from the Virginia coast, has similar inferior thoracic setae, and may possibly belong here. McIntosh (1885) thought this identical with the species from Torquay identified by him as *Sabella saxicava*. *Pseudopotamilla reniformis* (Müller) was recorded from Bering Sea by Marenzeller (1890).

**PSEUDOPOTAMILLA DEBILIS** sp. nov.

*Type locality.* — Pacific Grove, California.

A long, slender, delicate, nearly colorless specimen, has only faint indications of brown along the distal portion of the branchiae, which number about 16 in each lobe and are very long (about 7.5 mm.) and very slender, with long, delicate, well-separated pinnae and a few scattered eyes.

The collar has very wide dorso-lateral notches and long, narrow, pointed, ventral ends.

There are 8 thoracic and over 50 abdominal segments (extremity mutilated).

Length of thorax along setae about 4 mm.; breadth about 2.5 mm.
SABELLIDES AND SERPULIDES

Genus Schizobranchia nov.

Type, Schizobranchia insignis sp. nov.

The three most typical species (insignis, nobilis, and concinna) of this genus are remarkable for their large size and beautiful deep wine-colored, much-divided branchiae.

The small, nearly semicircular branchial lobes are simple, not spiral, and bear long branchiae, stout at base, often irregularly arranged in two series and usually regularly dichotomously divided from 1 to 6 times, so that the tips number several hundred. The ends of the lobes are stiffened and protected by conspicuous, usually white, cartilaginous edges.

The two much smaller species (dubia and affinis), however, and the young of these large forms, do not have all the branchiae forked, but some are simple, thus showing a connecting link with species of typical Pseudopotamilla, in which all the branchiae are simple.

Eyes numerous, varying in size and arrangement along the back of most of the rachises of the branchiae.

Mouth protected on each side by three deep membranous frills or folds. The two outer ones form a single membrane, which is attached at one end to the inner surface of the ventral edge of the branchial lobe, extends inward along the base of the lobe to about the middle, then, folding on itself, terminates at the collar fastened to the side of the ventral fissure. The inner one, next the mouth, is large, irregular, somewhat leaf-like in form, deepest ventrally and abruptly tapered into a long narrow end; dorsally bearing a delicate filamentose tentacle, which arises from the inner surface of the dorsal edge of the branchial lobe.

Collar four-lobed, as in Eudistylia and Pseudopotamilla; deepest along the sides beyond the small, angular, dorsal lobes, curving more or less broadly and abruptly forward from the dorso-lateral notches, ending in small angular processes on each side of the shallow ventral fissure.

Body long and usually slender, more or less compressed dorso-ventrally, very gradually tapered to the pointed posterior end. Dorsal groove most conspicuous on the first segments. Fascicles of setae similar in form to those of Eudistylia and Pseudopotamilla, usually in a nearly straight series on the sides of the thorax, often oblique in much contracted specimens.

Setae similar in form to those of Pseudopotamilla.

Chitinous tubes usually solitary when fully developed, twisted about one another in colonies or groups when immature; thick along their
lower embedded portions, of a rusty brown color, much thinner above, of a light horn color, sometimes tinged with wine color, covered with a thin layer of fine gray sand, to which small hydroids, ascidians, and seaweeds adhere; within, sometimes beautifully iridescent or silvery.

SCHIZOBRANCHIA INSIGNIS sp. nov.

pl. xxiv, figs. 1, 2; pl. xxvii, fig. 1; pl. xxviii, fig. 5; pl. xxxv,
figs. 2, 12, 13, 15, 16, 26, 27.

Type locality. — Yakutat.

This large species is light brown in color, more or less tinged with pink, with the branchiae sometimes of the same tone but usually of a deep wine color.

Segments short, flattened, numbering about 180 in the largest specimens, of which 8 belong to the thorax; in those of medium size the number varies from 6 to 8.

Branchiae stout at base, comparatively short, the larger portion of them of nearly uniform length, measuring 17 mm. They are often arranged somewhat biseriately, and number about 16 in the outer or regular series; in immature specimens the number often differs in the two lobes. Each rachis is usually regularly dichotomously divided from one to four times, so that there may be between 200 and 300 terminal branches (occasionally one occurs which has three primary divisions); the pinnæ are long and slender, crowded distally, forming very blunt, broadly rounded ends, which are often much twisted.

Eyes large, numerous, irregularly placed on the back of most of the rachises, principally along the posterior portion.

Collar very deep at the sides, at the end of the slightly developed dorsal lobes.

Fascicles of setæ in slightly oblique series on the thorax.

Many of the specimens have eggs showing along the abdominal tori.

Length of a perfect specimen about 158 mm., or 6.25 inches; breadth at base of collar about 7 mm.; length of thorax along setæ about 14 mm. A young, much contracted specimen has 18 pairs of branchiae, all forked, the longest twice. It is about 5 mm. in breadth, and has 8 thoracic and 80 abdominal segments in a length of 37 mm. Another, less contracted one, about 4 mm. broad, has 16 pairs of branchiae, 8 thoracic and 100 abdominal segments in a length of 75 mm. A smaller one, about 3.5 mm. broad, has 18 pairs of simple branchiae, 8 thoracic and 50 abdominal segments in a length of about 20 mm.
Victoria, Vancouver Island, British Columbia, June 1, one poorly preserved specimen; New Metlakatla, Annette Island, June 4, three very young specimens; Yakutat, June 19, numerous specimens.

SCHIZOBRANCHIA NOBILIS sp. nov.

珽 xxiv, fig. 3; pl. xxvii, fig. 7; pl. xxxiii, fig. 22; pl. xxxv, figs. 1, 3-6, 8, 10, 11, 23.

Type locality. — Orca, Prince William Sound.

This species often has the whole body pervaded with pink or light wine color, and is larger than the preceding (S. insignis), with longer (about 23 mm.), more flexible, and more numerous branchiae, there being about 26 in the outer series in each lobe, but similarly divided, the longest 4 times; the pinnae are less crowded, forming more tapered ends.

Eyes numerous, varying in size and arrangement, sometimes with a diagonal line of pigment.

Many of the specimens are without posterior portions. The largest has 72 segments in a length of about 165 mm., or 6.5 inches. It is about 8 mm. broad at base of collar, and the 8 thoracic segments measure about 15 mm. along setæ. Two specimens "killed in formalin" are much contracted, and vary in breadth at base of thorax from 10 to 12 mm. The anterior fascicles of setæ form very oblique series, and on one specimen number 9 in a length of 15 mm.; on the other there are 8 in a length of 12.5 mm. Both have lost posterior portions, one having 60 segments in a length of 72 mm., the other 80 segments in 98 mm. In one the branchiae, which number about 22 in each lobe, are beautifully expanded, the longest measuring about 30 mm. They are stout, unequal at base, and not regularly dichotomously divided, some having 4 and 5 divisions, so that some of the tips are double and some single, and may number 26 on a single branchia. Young specimens common at Dutch Harbor, Unalaska Island, about 3 mm. broad and from 25 to 75 mm. long, have from 6 to 8 thoracic segments, 12 to 16 pairs of branchiae, the longest divided 2 or 3 times; occasionally one has 3 primary or basal divisions. A single specimen from Virgin Bay, Prince William Sound, differs from these in having 10 thoracic segments; on one side two of them have two fascicles of setæ and two tori. A few specimens contain eggs.

Orca, Prince William Sound, June 25-26, several specimens; Virgin Bay, Prince William Sound, June 27, one immature specimen; Dutch Harbor, Unalaska Island, July 8 and 17, many young.
SCHIZOBANCHIA CONCINNA sp. nov.
pl. xxiii, figs. 2, 3; pl. xxviii, fig. 2; pl. xxxiv, figs. 15, 17, 18; pl. xxxv, figs. 17, 24.

Type locality. — Orca, Prince William Sound.
At Orca, with the preceding species (S. nobilis), the anterior portion of a single specimen was found, which is remarkable for its slender rounded form and long, unequal, very slender branchiae with their numerous terminal branches, about 22 in each lobe, the long ones about 30 mm. in length, often regularly forked 6 times, so that one might have as many as 64 tips. The pinnae are long and very slender. The eyes are numerous and very conspicuous, though varying in size, often with a diagonal line of pigment.
There are about 16 segments in a length of about 33 mm., 8 of which belong to the thorax, which is about 7.5 mm. in breadth at base of collar and 13 mm. in length along setae.
Young, varying in size from 11 to over 50 mm. in length and .5 to 3 mm. in breadth, have 5 to 14 pairs of branchiae, 6 to 8 thoracic and from 40 to over 60 abdominal segments. They differ from S. dubia in having both body and branchiae tinged with delicate pink or wine color and the setae and avicular uncini larger and more numerous.

SCHIZOBANCHIA DUBIA sp. nov.
pl. xxviii, fig. 1; pl. xxix, fig. 1; pl. xxxiii, fig. 7; pl. xxxvi, figs. 1, 2, 3, 17, 18, 19, 20; pl. xxxvii, fig. 28.

Type locality. — Orca, Prince William Sound.
This species bears a superficial resemblance to Pseudopotamilla reniformis (Müller) and P. oculifera Leidy, but differs in having some of the branchiae forked.
The slender tubes are found in closely crowded masses.
The animals in preservation show but a slight tinge of brown on the base of the branchiae, which are relatively long and slender, with long graceful pinnae forming broadly rounded ends. Eyes very conspicuous.
There is great irregularity in the development of the 40 or 50 specimens examined. Among those of the same size, the larger number have 6 and 7 thoracic segments on opposite sides, a few have 8, and one has 9; in those differing in size this inconstancy is still more marked. The smallest specimen, about 6 mm. long and 1 mm. broad, has 8 thoracic and 25 abdominal segments, 5 pairs of branchiae, the dorsal ones forked; another, about 7 mm. long, has 8 thoracic and about 50 abdominal segments, 7 pairs of branchiae; another, 15 mm.
long, has 6 and 7 thoracic and 50 abdominal segments and 8 pairs of branchia; among the largest specimens, 67 mm. long and 2.5 mm. broad, one has 7 thoracic and 115 abdominal segments and 14 pairs of branchia, and another has 8 thoracic segments and 15 pairs of branchia. There is also great diversity in the number of branchia which become forked.

The short tori and small fascicles of setae forming straight series along the sides of the body, and the inferior spatulate setae usually arranged in two parallel rows, appear to be constant in character.

Numerous specimens of a similar slender form collected at Dutch Harbor, Unalaska Island, differ in their relatively shorter, stouter, more divided branchiae and in the greater number and size of their setae and avicular uncini, which agree in form with those of *S. nobilis*.

**SCHIZOBANCHIA AFFINIS** sp. nov.

*Type locality.* — Popof Island.

Two small crimson or wine-colored specimens appear to have little affinity with those of similar size belonging to other species. They are immature, as only one has the longest dorsal branchiae forked; and as they are said to have been dredged, they are probably the young of some shallow-water form.

They are about 3 mm. in breadth, and have from 13 to 16 pairs of branchia about 7 mm. in length, which have long, rather stout, regularly developed pinnæ and a few conspicuous eyes. In both specimens posterior segments are wanting. One has 9 thoracic and 35 abdominal segments in a length of 27 mm., and the other has 8 thoracic and 20 abdominal segments, with well-developed eggs showing along their tori, in a length of 28 mm.

**Genus Eudistyla** nov.

*Type,* *Eudistyla gigantea* sp. nov.

Like *Distyla* of Quatrefages (1865), this genus has the branchial lobes equal and spirally coiled, forming more or less elongated, permanent spires, differing in this character from typical *Sabella* and other genera which have the branchial lobes attached but a portion of their length, the more or less prolonged ventral portion being free and spirally twisted or involute in retraction, flaring in expansion (*pl. xxvi, fig. 2*). Dorsal ends protected or stiffened by a conspicuous, usually white, thin edge.
Branchiae numerous, usually simple, rarely divided, generally arranged in a single series, sometimes irregularly biserial, plumose, with a stout, gradually tapered, three-sided stem or rachis, rounded on the back, without appendages, flattened and slightly grooved along the inner surface, with thin membranous edges along the two angles, especially posteriorly, outside of which the long slender pinnae arise. These decrease in length, more or less abruptly, near the end, leaving a short tapered tip. Groups of from 2 to 6 long delicate cilia, arranged in alternating longitudinal rows, are found on the surface of the pinnae, under a high power.

Eyes usually present, irregularly arranged on one or both sides of the back of some of the rachises.

Collar four-lobed, meeting on the back, but little developed dorsally, arching more or less abruptly from dorso-lateral notches and continuing obliquely in a more or less undulating curve to small ventral ends.

A thin, wide, ruffled membrane extends inward from the ventral fissure along the base of the branchial lobes to the summit of each spire. Next the mouth are two large, irregular, leaf-like tentacles.

Body more or less compressed dorso-ventrally, gradually tapered to the pointed posterior end. Dorsal furrow very conspicuous anteriorly.

Fascicles of setae, forming more or less oblique series on the thorax, of two forms: superior ones crescent-shaped, inferior ones laterally elongated, protected by a conspicuous auriform membrane. On the abdomen they are laterally elliptical.

Superior setae comparatively few, with narrow lanceolate ends. Inferior setae more numerous, of two forms, those of the first fascicle at the base of the collar with broader ends, those of the other fascicles, in 6 to 8 parallel rows, with spatulate ends. Setae on the abdomen somewhat similar to the inferior ones of the collar fascicle, but longer and bent at the base of the blade. Two forms in the thoracic tori—avicular hooks (uncini) and pennoned setae; avicular hooks only in the abdominal tori.

This genus is readily distinguished from Distylia by the spatulate inferior thoracic setae.

**EUDISTYLIA GIGANTEA** sp. nov.

pl. xxii, figs. 1, 2; pl. xxii, figs. 4, a, c, d; pl. xxii, fig. 1; pl. xxv, fig. 4; pl. xxxi, figs. 1-8, 10-14, 16, 17, 21, 23-26; pl. xxxiv, fig. 23.

*Type locality.*—Orca, Prince William Sound.

Color in formalin, yellow, tinged with brown, the branchiae with three conspicuous bands of dark maroon or wine color. Small speci-
mens are much paler. Number of segments about 340, of which 8 belong to the thoracic region. They are very short on the abdomen, so that the tori are closely crowded. Branchial lobes forming well-separated spires of about 2½ turns, measuring about 16 mm. in height, without branchiae.

Branchiae long and flexible, the longest from 33.5 to 36.5 mm. in length in different specimens, numbering 125 to 135 in each lobe, and usually arranged in a single series; occasionally one occurs which has an additional one in front of it; one is also sometimes divided.

Eyes of good size, varying in number on different specimens and also in number and relative position on the same specimen.

Collar increasing abruptly in height from the wide angular lateral notches, slanting obliquely forward at a considerable angle, with slightly undulating margin and ending in two prominent angular processes on either side of the median ventral fissure.

Dorsal furrow very deep on the first few segments, turns to the right at the seventh segment, passes diagonally across the eighth segment to the ventral region, then diagonally across the first abdominal segment, turning downward into the ventral groove at the second segment.

Length of largest specimen 12 inches, breadth at end of thorax about 17 mm.; length of thorax along setae about 13 mm., varying in different specimens from 11 to 15 mm. Another perfect specimen is 9.75 inches long and about 15 mm. wide.

Tube solitary, more or less bent, of a tough brownish chitinous substance, the rough surface usually covered along the exposed portion with sponges, ascidians, hydroids, seaweeds, etc.

Yakutat, June 22, two small specimens; Orca, Prince William Sound, June 25, ten large specimens; Virgin Bay, Prince William Sound, June 26, two small specimens.

Some of the specimens are abnormally developed. In the one figured, where an injury has been repaired, the symmetry in the arrangement and form of the thoracic setæ is interrupted, on one side between the sixth and seventh segments and on the other between the seventh and eighth. The additional one has no slender lanceolate superior setæ, but a somewhat elliptical fascicle of spatulate setæ, like the inferior ones; no torus, but an elliptical fascicle of setæ similar to those on the abdomen. Another, which also shows repairs of injuries, has 10 thoracic segments and smaller branchial lobes forming spires of about 1½ turns, with but 70 to 80 shorter (about 27 mm.) branchiae arranged mostly in a double series, sometimes branched, rarely more than once. The avicular hooks also vary somewhat in form.
In some, eggs are seen through the integument along the abdominal tori.
A number of parasitic nematode worms were taken from the entire length of one specimen which was dissected. They were twisted about the spirally coiled intestine, filling the cavity on the sides of the segments.

**EUDISTYLIA PLUMOSA** sp. nov.

_pl_. XXI, figs. 3, 4; _pl_. xxii, fig. 4, b; _pl_. xxxii, figs. 9, 15, 18, 19, 20, 22.

_Type locality._—Sitka.
Color in formalin, light brown, the branchiae banded with delicate pink. The specimen is imperfect, there being but about 60 segments, of which 8 belong to the thoracic region. On the abdomen they are about twice as long as in the other related species, and well rounded.
Branchial lobes forming spires of 3 full turns measuring in height about 13 mm. without the branchiae, which are beautifully plumose, long (about 22 mm.), very graceful, rarely divided, numbering about 135 in each lobe, arranged in a single series.
Eyes small, few, scattered, being present on but a few of the rachises.
Collar with very small dorsal lobes, increasing abruptly in height from small lateral notches, arching upward and forward in a regular curve to the conspicuous ventral ends.
Dorsal furrow very deep on the first three segments, turns to the right, passes diagonally across the eighth segment to the ventral region, curves around the fascicle of setae of the first abdominal segment, and merges into the ventral groove on the second.
Length 4.5 inches; breadth at the end of thorax about 12 mm.; length of thorax along setae about 13.5 mm.
Sitka, one imperfect specimen with a tough, semitransparent, chitinous tube.
This species can be readily identified by its rounded, little-tapered form, long and rounded segments, high collar, and very graceful and plume-like branchiae.

**EUDISTYLIA ABBREVIATA** sp. nov.

_pl_. xxiv, fig. 4; _pl_. xxxiii, figs. 1, 2, 10, 18, 5; _pl_. xxxiv, figs. 13, 16.

_Type locality._—Yakutat.
Although similar in coloring to _E. gigantea_, this species is easily recognized by the comparatively short, stout branchiae. Medium-sized specimens (_pl_. xxiv, fig. 4) show a striking resemblance in form to species of _Schizobranchia_.

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**BUSH**
Branchial lobes forming low spires of about 2 turns, with 70 or 80 short (about 16 mm.), stout, stiff, rarely divided branchiae. Eyes very small and few in number.

Collar deep along the sides, curving abruptly and obliquely from the dorso-lateral notches to the rounded ventral ends.

Thoracic segments 8; abdominal segments in a medium-sized perfect specimen about 240; one very large mutilated one has over 325 segments.

The former is 6.5 inches, or 164 mm. long, 12 mm. along thoracic setae, and 8.5 mm. broad at base of collar. Large ones are 12 mm. broad, and probably attain a length of 10 or 12 inches. One of the smallest specimens, with about 100 segments, is 30 mm. long and about 2.5 mm. broad.

Tubes covered with rather coarse black and variegated sand, which in turn is sometimes overspread by compound ascidians.

Yakutat, June 22, seven specimens; Ocean Cape, Yakutat, five specimens; Sitka, June 17, one specimen.

**EUDISTYLIA TENELLA** sp. nov.

pl. xxii, figs. 2, 3; pl. xxiii, figs. 4, 5; pl. xxxiii, figs. 16, 19, 24; pl. xxxiv, fig. 12; pl. xxxv, fig. 22.

_Type locality._ — Victoria, Vancouver Island, British Columbia.

This species is at once distinguished by its very delicate branchiae, the inner edges of their very slender rachises bordered by opaque yellowish crenulations from which the exceedingly fine cilia-like pinnae arise.

In the largest specimen the segments are irregularly developed on both the thorax and abdomen, especially along the middle portion, where some are divided on one side and others on the opposite side, the total number, however, being about the same (175); of these 10 on the left side and 11 on the right side belong to the thorax, the irregularity occurring on the first three segments. Three smaller specimens are, however, symmetrically developed and have but 8 thoracic segments.

Branchial lobes forming low spires of about 2 turns, bearing from 70 to 75 very slender branchiae in an irregular double series, measuring about 16 mm. in length, usually of a very delicate pink color, sometimes with a broad band of deep wine color near their tips. Eyes none.

Collar with inconspicuous dorsal lobes, and wide shallow lateral notches, from which it slants obliquely forward to the small ventral ends.
Length of largest specimen about 4.5 inches; breadth at base of collar 6.5 mm.; length of thorax along setae 15 mm. A more contracted one is 3.25 inches long, 8 mm. broad in middle of thorax.

Victoria, British Columbia, June 1, four specimens.

EUDISTYLIA POLYMORPHA (Johnson).


One young from Pacific Grove, California, and two well-grown specimens from Victoria, Vancouver Island, British Columbia, are readily identified by their conspicuous black eyes (pl. xxix, fig. 6).

Recorded by Johnson from Pacific Grove, California, to Puget Sound, Washington.

EUDISTYLIA INTERMEDIA sp. nov.

*Type locality.* — Pacific Grove, California.

Animal in formalin, pale cream color, with a brownish tinge on both the dorsal and ventral surfaces of the thorax, and a spot of dark bluish pigment showing through the integument at the side of each fascicle of setae; a similar color showing also along the anterior abdominal tori; a broad band of brown and pinkish purple on the lower portion of the branchiae, and a narrow, scarcely discernible pink one farther out.

Branchial lobes forming spires of about 3 turns, 13 mm. in height, each with 60 or more rather slender branchiae, the longest about 18 mm. Pinnae numerous and closely crowded. The thin dorsal ends of the lobes very noticeable. Eyes very small and scattered.

Collar but slightly developed dorsally, narrow on the sides, arching obliquely forward in an undulating curve, ending in small rounded ventral ends.

There are 8 thoracic and about 175 abdominal segments.

Length without branchiae 144 mm.; breadth of thorax 10 mm.; length along setae 11 mm.

This species is readily distinguished from *E. polymorpha* (Johnson) by its more numerous branchiae, inconspicuous eyes, and form of the avicular uncini, which have much shorter, stouter necks, longer beaks, and are larger and less evenly rounded in front.

1 Johnson's figure 179 on plate 17 is given as the 'ventral aspect'; it should be 'dorsal.' Also in his description on p. 428 'dorsal' should read 'ventral,' and *vice versa.*
CHONE TERES sp. nov.

_pl. xxx, fig. 1; pl. xxxvii, figs. 16-23._

Type locality. — Dutch Harbor, Unalaska Island.

A very slender species of a uniform yellowish tint, with very short branchiae and very gradually tapered posterior end without ventral groove or sucker.

In the single specimen preserved in its tube, the segments, about 80, of which 8 belong to the anterior region, are not very clearly defined.

Branchiae very short, about 12 in each lobe, longer in the right than in the left one, probably due to inequality in contraction, the longer twisted about the shorter, their racihes connected for the greater part of their length by a delicate membrane. They are furnished on their inner surface with numerous very delicate pinnae, which end abruptly, leaving a thin, comparatively short, broad, abruptly tapered, naked, terminal portion. Eyes none.

Collar very deep, about 2½ times that of the first segment. Above there are several very long delicate filaments, either abnormal pinnae or undeveloped branchiae. There are two short, stout, dorsal tentacles.

Both dorsal and ventral grooves or furrows clearly defined; the dorsal one turning abruptly to the right passes between the eighth and ninth (last thoracic and first abdominal) segments diagonally across the latter below, and merges into the ventral one.

Fascicles of setæ in very straight series, as is usual in this genus. Superior fascicle very small, of but a few slender limbate setæ (pl. xxxvii, fig. 16) placed on the first segment at the base of the collar and on the succeeding segments above the elongated inferior fascicle of two rows of spatulate setæ (fig. 20), which is above and in front, or forward of and somewhat oblique to the short torus having a single row of hooked setæ (fig. 21). There are also found in the superior fascicles a few with abruptly bent shafts — bayonet setæ (fig. 18). On the abdomen the setæ are slender, limbate (fig. 17), in an elongated fascicle just in front of and below the very short torus of uncial plates (figs. 22, 23).

Length about 56 mm.; branchiæ about 8 mm.; anterior or thoracic region 9 mm.; breadth 2.5 mm.

Tube rough, thin, flexible, semitransparent, amber color, more or less tinted with brown, with very little adhering sand.

Although no mention of figures of odd 'bayonet' setæ have been noticed in descriptions of any of the known species of this genus, they are not regarded of sufficient importance to warrant any change in the
generic name, especially as they may be easily broken or not mounted in such a way as to show, and are consequently overlooked.

*Chone dumeri* Malmgren (1867), from Spitzbergen, is a slender species, but is only half as long as the present one, with fewer, very long branchiae having long, slender, naked terminal portions. *Chone infundibuliformis* Kröyer (1856), specimens of which from Greenland are before me, is a short stout species, with conspicuously marked segments and grooves, with very long branchiae which number about 22 in each lobe.

**Genus Metachone** nov.

Type, *Metachone mollis* sp. nov.

The setae on the thorax of *M. mollis* are similar to those of *Dialychone acustica* Claparède (1870) from Naples, the type of the genus *Dialychone*, but the abdominal uncini are more nearly like those found in species of *Euchone*; while in *D. acustica* they more nearly resemble those of *Sabellides* Malmgren 1865 (Ampharetea), with the lowest tooth larger than the others.

**METACHONE MOLLIS** sp. nov.

*pl. xxxv, figs. 19, 20, 28.*

**Type locality.** — Pacific Grove, California.

A slender colorless specimen has lost a posterior portion, so that its exact generic position is uncertain. The setae are similar to those of *Megachone aurantiaca* Johnson (1901), but there are additional inferior clavate ones on the thorax, which were not found in that species.

In the one branchial lobe preserved there are 17 branchiae, with slender tapered tips and long delicate pinnae, connected for the greater part of their length by a delicate web.

Collar deep, with dorsal incision only, *i. e.*, open on the back, with ends in contact.

Length of 8 thoracic and 10 abdominal segments 27 mm.; breadth 2.5 mm.; length of branchiae about 8 mm.; length of thorax about 10 mm.

The species described and figured by Verrill (1885) as *Sabella picta* is a *Metachone*.

Marenzeller (1890) recorded *Euchone analis* (Kröyer) Malmgren from Bering Sea. It is possible that on further examination this may prove to be a distinct species, more nearly related to *M. mollis*. 
Family ERIOGRAPHIDÆ.

MYXICOLA CONJUNCTA' sp. nov.

Pl. xxvi, figs. 1, 4, a; pl. xxxviii, figs. 1-11.

*Type locality.* — Virgin Bay, Prince William Sound.

In general appearance this species closely resembles the *Myxicola steenstrupi* Kröyer from the Bay of Fundy.

Like that species its body is a pale yellow color, but the pinnæ of the branchiæ are of a decided brown, which shows through the pale rachises and web, giving a tinge of color to the whole. There is also sometimes a tinge of brown on the thorax.

The body gradually tapers, both forward and backward, from the end of the thorax, and differs considerably in length in full-grown specimens. The segments, which are well marked, biannular, vary in number from 100 to 115, of which 8 belong to the thorax.

As the branchiæ arise directly from the edge of the first segment, there are no smooth basal portions or lobes visible. There are 20 on each side, which are moderately long and tapered, their rachises connected by a membranous web for the greater part of their length, leaving comparatively long, slender, unadorned free ends; pinnæ numerous, very long and slender. Eyes none.

There is no collar, but the edge of the first segment is drawn inward on each side on a line with the fascicle of setæ, and below it is produced forward into a thin median triangular lobe, to protect the ventral branchial opening. A conspicuous membrane arises on each side of the dorsal groove or furrow, passes inward between the dorsal division of the branchiæ and around the mouth, forming two loops; there are no tentacles.

The dorsal furrow is conspicuous the entire length of the thorax, turns to the right, passes diagonally across the eighth and ninth (first abdominal) segments, and merges into the but faintly indicated ventral furrow.

The fascicles of setæ form straight series along the sides of the body, and are at first round and cushion-like in form, but decrease in size and become laterally compressed and somewhat elliptical in form on the succeeding segments.

On the first segment the setæ are of one form, long, with short, rather broad blades terminating in long slender capillary ends, and are arranged like needles around the edge of a cushion. The setæ of the next four segments are similar to these. On the sixth to eighth segments additional, often more slender, spear-shaped or hastate setæ
occur in the middle of the fascicle, which also have long slender capillary tips; these apparently become worn off, as the simple spear is often seen, and they often have more color than the other setae. The hooked setae are difficult to find, probably because easily broken, but have been seen on all but the first segment, never more than two together.

On the abdomen the setae are spear-shaped, with long terminal filamentous ends. The uncial plates have a long slender primary tooth and a shorter closely appressed secondary one. They form a nearly complete circle around the body, passing posterior to the fascicles of setae, interrupted only by a narrow ventral area.

Length of one of the largest specimens 120 mm.; breadth at base of thorax 7 mm., at first segment 5 mm.; length of branchiae about 17 mm. A much more contracted specimen of 85 segments is about 55 mm. in length, 9 mm. in breadth at base of thorax, and 4.5 mm. at first segment, with the branchiae 14 mm. in length. The smallest specimen, of about 50 segments and 10 pairs of branchiae, is 15 mm. long, besides 7 mm., the length of the branchiae.

Virgin Bay, Prince William Sound, June 27, sixteen specimens embedded in thick jelly.

**MYXICOLA AFFINIS** sp. nov.

pl. xxxviii, figs. 17-20.

*Type locality.* — Pacific Grove, California.

A specimen filled with eggs, of a decided yellow color, with a greenish tinge to the branchiae, especially the very long pinnæ, has 8 thoracic and 50 abdominal segments and 20 pairs of branchiae with comparatively long, free, slender tapered tips.

It is very like specimens of *Myxicola steenstruπi* Kröyer (see pl. xxxviii, figs. 13-16, 21, 22, 24) from the Bay of Fundy, but has the limbate setæ much broader, and the hooked thoracic setæ (numbering 14 on the last segment) stouter and much less curved.

Length 4.5 mm.; greatest breadth of thorax 5.5 mm., of first segment 4.5 mm.; length of branchiae 12 mm., of free end 3 mm.

*Myxicola pacifica* Johnson (1901) is a larger species, with 9 thoracic segments and 14 pairs of very long (21 mm.) branchiae.

**MYXICOLA GLACIALIS** sp. nov.

pl. xxi, fig. 1; pl. xxv, figs. 1, 2; pl. xxvi, fig. 4; pl. xxxviii, figs. 12, 23, 25-32.

*Type locality.* — Dutch Harbor, Unalaska Island.

This is a slender species, with the body of the usual cream color, the thoracic region and branchiae colored with deep purple having a tinge
of brown. In life "white or yellowish with brown purple branchiae."

Like all the species, there are the longer and shorter forms, but all taper gradually backward from the first segment, and have long, well-marked, biannular segments, which vary in number from 70 to 100, of which but 3 belong to the thorax.

There are 14 pairs of branchiae, each with a rather short and broad terminal portion reaching beyond the web; the long, well-separated pinnae are sometimes much curled and twisted.

The triangular ventral lobe of the first segment is well developed; the lateral puckerings are not always noticeable, and the distinction between the thoracic and abdominal regions is not clearly defined by a groove or furrow.

The hooked setae, 4 in number, were found on the second and third segments and the uncial plates on the fourth (first abdominal) segment, and form a complete circle around the body commencing at about the twelfth segment, passing posterior to the fascicle of setae.

The largest specimen is about 80 mm. long and 3.5 mm. broad at the first segment; branchiae about 13 mm. long. The smallest specimen, of about 50 segments, with 9 pairs of branchiae, is about 17 mm. long and 2.5 mm. broad, with the branchiae 5 mm. long.

Dutch Harbor, Unalaska Island, July 8 and 17, thirty specimens embedded in much mucus under and between stones on shelly sand.

**Tribe SERPULIDES.**

**Family SERPULIDÆ.**

Comparatively few authors have attempted any systematic work on this difficult group. Philippi in 1844 gave results of his study of the Mediterranean forms; Mörcch in 1863 reviewed all the then known species and gave fine figures of the operculum of many of them; Levinsen in 1883 added to the northern forms, but, as in the case of the Sabellides, Saint-Joseph in 1894 gave an extensive analytical table of the known genera, proposing many new ones, based on the different forms and arrangement of the setae.

In studying many species, however, one soon finds it impossible to adopt all of his changes, especially in the genus *Spirobis* (see p. 252), and that, although so many new names appear, there are still many interesting and peculiar forms which require to be separated under new genera; no attempt, however, has been made to find the correct generic relation of all the species hitherto published.

As similarly stated under the Sabellides, the following analytical table for the genera which are related to the genus *Serpula* is based
primarily on characters readily seen with the aid of a good pocket lens.

In instances, however, where the operculum has been lost other characters become most important, so that owing to the very small size of many of the animals higher powers are required.

Many forms which have simple tapered setæ in the collar fascicle are found to possess uncini and abdominal setæ which differ decidedly in form, so that many of the genera are based on these two characters. This is especially true of species hitherto referred to the genus *Vermilia* Lamarck 1818. As no figures appear to have been published of the setæ and uncini of the type species (*Vermilia triquetra* Lamarck), the only known character by which the genus is distinguished is the operculum with a calcareous plate, which was figured by Philippi in 1844. Langerhans in 1880, however, described and figured a species identified as *Vermilia polytrema* Philippi, which has not only the calcareous plate on the operculum but also two basal horny or chitinous spine-like processes, not unlike the figure given by Philippi 1844. The uncini have rather numerous long sharp teeth, the lowest much larger than the others and notched in the end, giving a bifid appearance; the abdominal setæ are trumpet-shaped, with a long slender end. The *Vermilia nigropileata* Ehlers 1901 has similar uncini, but the operculum is described as having a black horn-colored end without calcareous deposit. The *Spirobranchus occidentalis* McIntosh has a similar black horny cap on the operculum and similar uncini. Several species from Bermuda with a similar operculum are often found with the horny end covered by a thin layer of calcareous deposit which can be readily cleaned off. It is not improbable that the same condition existed in Lamarck's and Philippi's species and has been overlooked.

"Operculum testaceum orbiculatum, simplex," was interpreted by Philippi as 'calcareus operculum.' The Bermuda species, however, as well as those described and figured by Marenzeller 1893 and Moore 1904 have uncini and abdominal setæ very unlike those given by Langerhans, McIntosh, and Ehlers, and also differ from each other. *Vermilia multivaricosa* (Mörch 1863) Marenzeller 1893, having the abdominal setæ strongly geniculate with, broad angular tapered blades, was made the type of the genus *Vermiliopsis* by Saint-Joseph 1894. The figures of *Vermilia infundibulum* Claparède 1870 and those of *Vermilia spirorbis* Langerhans 1883 do not appear to agree very closely with this species, although Marenzeller made them synonymous. *Vermilia multicristata* (Philippi 1844) Marenzeller 1893, having but slightly bent, narrower, regularly tapered abdominal setæ, as well as different uncini, is here referred to the new genus *Metavermilia*, as
type; and one of the Bermuda species (*P. bermudensis* sp. nov.) having nearly straight regularly tapered setae similar to those on the thorax, with deeply serrate edges and still different uncini, is made the type of another new genus, *Paravermilia*. The thoracic setae in all three forms are regularly tapered, differing only in their comparative length and breadth; the opercula are also alike in having a horny or chitinous end which varies greatly in form. In the Bermuda species it forms a high, irregularly bent or curved tapered cone made up of several unequal parts which fit on to each other, resembling a spiral shell.

The uncial plates in the numerous forms belonging to this family show great variability in form, are often very irregular in outline, but the opposite sides stand in definite relation to each other so that 'tetragonal,' 'rectangular,' 'rhomboid' and 'trapeziform' have been adopted for them in the following table.

**ANALYTICAL TABLE FOR SERPULA AND RELATED GENERA.**

1. With an operculum.................................................................................................................. 2.
1'. Without an operculum (see p. 226)..................................................................................... 14.
2. One or more entire branchiae differentiated into or replaced by a peduncle bearing an operculum.................................................................................................................. 3.
2'. Tip only of one or more branchiae differentiated into an operculum-like organ (see p. 226).................................................................................................................. 11.
3. Operculum furnished with a calcareous plate........................................................................... 4.
3'. Operculum furnished with a chitinous or horny plate (see p. 223)................................. 8.
4. Collar setae present.................................................................................................................. 5.
4'. Collar setae absent.

(1) **Placostegus** Philippi 1844.
   Type, *P. tridentatus* (Fabricius 1779, as *Serpula*, + Gunnerus 1768, figure, as *Serpula tripeta*, + Philippi 1844, figure, as *P. crassifera*) Mörch 1863, as first species, also as *P. tricuspidatus*, + Levinson 1883, figures, + Marenzeller 1893, figures. North Atlantic Ocean, in 20–200 fms.
   Uncial plates rectangular in form, with very numerous fine appressed teeth, the lowest large and fang-like. Operculum with calcareous plate.

(2) **Placostegopsis** Saint-Joseph 1894.
   Type, *P. langerhansii* (Marenzeller 1893, as *Placostegus*, + Langerhans 1883, figures, as *Placostegus tricuspidatus*, non Sowerby) Saint-Joseph 1894. Madeira, Atlantic Ocean.
   Uncini similar to those in *Spirobis*. Operculum with a simple calcareous plate.

5. Superior setae not simple tapered blades.............................................................................. 6.
5'. Superior setae simple tapered blades.

(3) **Dasynema** Saint-Joseph 1894.
   Type, *D. chrysogyrus* (Grube 1878, figures, as *Serpula*) Saint-Joseph 1894. Philippine Islands, Pacific Ocean.
Uncini somewhat similar to those in Spirobranchus (?), "pectiniform with numerous teeth." No figure. Operculum with shallow calcareous cap.

(4) Vermilia Lamarck 1818, + Philippi 1844, restricted.
Type, V. triquetra Lamarck 1818 (non Serpula triquetra Linné), + Philippi 1844, figure, + Mörch 1863, as V. cinerea. Mediterranean Sea. Uncial plates not known. Operculum with elongated, somewhat cylindrical calcareous cap, figured as not covering the entire end of the operculum, thus giving the appearance of basal processes.

(5) Pomatoceros Philippi 1844.
Type, P. triquetra (Linné 1767, as Serpula, + Leuckart 1849, as P. tripodis, non Philippi 1844, figure) Mörch 1863, as first species, + Saint-Joseph 1894, figures. North Sea, Atlantic Ocean.
Uncial plates trapeziform, with pointed teeth, the lowest one larger than the others. Operculum with calcareous plate bearing a cluster of yellowish spines (usually three). See pl. xliv, fig. 3.

(6) Galeolaria Lamarck 1818.
Type, G. castipata Lamarck 1818, + Mörch 1863, as first species. Australia, Pacific Ocean.
Uncini unknown. Operculum with tessellated calcareous cup bearing variable movable spines.


(7) Spirobranchus Daudin 1800 (see p. 236).
Type, S. spirobranchus (Linné 1760, + Daudin 1800, as S. borealis) (see p. 262). North Sea on Fucus, Atlantic Ocean.
Uncial plates somewhat rectangular, with rather numerous appressed equal teeth. Operculum with the calcareous plate variable in form.

6’. Superior setæ constant or uniform.

7. Superior setæ with posterior fin-like expansion.

(8) Filograna Langerhans 1883.
Type, F. gracilis Langerhans 1883, figures. Madeira, Atlantic Ocean.
Uncial plates similar to those in Spirobranchus. Operculum with calcareous concave cap.

7’. Superior setæ geniculate, with numerous small spines at base of blade.

(9) Pomatostegus Schmarda 1861.
Type, P. stellata (Abildgaard 1789, figures, as Terebella) Schmarda 1861, as P. macrosoma, figures, + Mörch 1863, + Baird 1865, + Benedict 1866, figures. West Indies, Atlantic Ocean.
Uncial plates tetragonal, with numerous pointed teeth, the lowest one larger, blunt and more conspicuous than the others. Operculum consisting of a number of separate calcareo-chitinous or horny plates joined by a central axis in the form of a pyramid.

(10) Spirobranchus Blainville 1817. (Cymospira Savigny 1809, + Blainville 1828.)
Type, S. giganteus (Pallas 1766, figures, as Serpula, + Blainville 1828, figures, as Cymospira), Mörch 1863, figures, + Ehlers 1887, figures. West Indies, Atlantic Ocean.

1 In the series of specimens from Denmark, in the Yale Museum, some of the opercula have apparently lost the spines, which are replaced by a conspicuous node of calcareous deposit. The collar setæ are small and few in number.
Uncial plates tetragonal, with somewhat irregular, pointed teeth, the lowest one larger than the others, often blunt, twisted. Operculum with a calcareous plate bearing a cluster of branching spines.

8'. Collar setae absent.

(11) Rhodopsis gen. nov. (see p. 179 and Addendum).
Type, R. pusillus sp. nov. Bermuda, Atlantic Ocean.
Uncial plates tetragonal, with appressed teeth, the lowest larger than the others. Operculum with a chitinous or horny disk covered with horny spines in the form of a rosette.

9'. Superior setae on collar simple tapered blades.

Type, V. multiviricosa (Mörch 1863, as Vermilia, + Marenzeller 1893, as Vermilia, figures) Saint-Joseph 1894, restricted. Mediterranean Sea.
Uncial plates tetragonal, with appressed rather blunt teeth, the lowest larger and more conspicuous than the others. Operculum with horny cap.

(13) Paravermilia gen. nov. (see p. 221).
Type, P. bermudensis sp. nov. Bermuda, Atlantic Ocean.
Uncial plates somewhat rectangular, with appressed teeth, the lowest large and blunt. Operculum with horny cap often resembling a little spiral shell.

(14) Metavermilia gen. nov. (see p. 220).
Type, M. multiviricrata (Philippi 1844, figure, as Vermilia, + Langerhans 1883, as Vermilia multicosata and Vermilia clavigera, figures, + Marenzeller 1893, as Vermilia, figures). Mediterranean Sea.
Uncial plates trapeziform, with long slender teeth, the lowest longer than the others. Operculum with a conic horny cap.

(15) Halopomatus Marenzeller 1878.
Type, H. claparedii Marenzeller 1878, figures. Arctic Ocean, off Nova Zembla, in about 125 fms.
Uncial plates tetragonal, with numerous appressed teeth, the lowest very long and fang-like. Opercula membranous? bulb with central air-chamber. (The figure shows distinct cell structure.)

(16) Dittrypa Berkeley 1832-4.
Uncial plates somewhat similar to Spirobranchus. Operculum with flat horny plate ornamented with striae.

Type, J. fimbriata (Della Chiaji 1828, as Serpula, figures, + Philippi 1844, as Placostegus, figure, + Mörch 1863, + Langerhans 1883, as

1Vermilia agglutinata Marenzeller 1893, figures, is a Vermiliopsis.
2Berkeley's species was D. subulata (figures) and Sars' species, D. libera.
3Philippi described the operculum as having a calcareous plate, which is figured as a simple disc, not at all like Langerhans' figure. Future study may prove the two forms to be distinct species.
Omphalopoma spinosa, figures, + Marenzeller 1893, as Omphalopoma, figures) Saint-Joseph 1894. Mediterranean Sea.
Uncini plates rhomboidal, with appressed teeth, the lowest long and blunt. Operculum with concave horny cap.

10. Superior setae with posterior fin-like expansion.

(18) Omphalopoma Mörch 1863.1
   Type, O. umbilicata Mörch 1863. Philippine Islands, Pacific Ocean.
   Uncini unknown. Operculum with a concave horny cap.

   Type, H. marenzelleri (Langerhans 1883, figures, as Hyalopomatatus) Saint-Joseph 1894. Madeira, Atlantic Ocean.
   Uncini somewhat similar to Spirorbis, the teeth longer. Operculum with a chitinous or horny cap.

(20) Chitinopoma Levinsen 1883.2
   Type, C. greenlandica (Malmgren 1867, as Hydroidea) Levinsen 1883, figures, as C. fabricii. Greenland, North Atlantic Ocean.
   Uncini plates trapeziform, with appressed teeth, the lowest larger than the others. Operculum with concave horny plate.

(21) Omphalopomopsis Saint-Joseph 1894.
   Type, O. langerhansi (Marenzeller 1884, as Omphalopoma, figures) Saint-Joseph 1894. Japan, Pacific Ocean.
   Uncini plates trapeziform, with comparatively few pointed teeth, the lowest large and blunt. Operculum with concave horny plate.

10'. Superior setae geniculate, with conspicuous spines at base of blade.

(22) Serpula Linne 1767, + Philippi 1844.
   Type, S. vermicularis (Ellis 1755, figures, as Tubus) Linne 1767, + Saint-Joseph 1894, figures. North Atlantic Ocean.
   Uncini plates tetragonal, with few unequal coarse serrations. Primary operculum funnel-shaped, with numerous radii forming serrations on margin; secondary operculum usually club-shaped, occasionally like primary one.

(23) Sclerostyloa Mörch 1863.
   Type, S. ctenactis Mörch 1863. St. Thomas, West Indies, Atlantic Ocean.
   Uncini like Serpula. Operculum with comparatively few radii forming a scalloped margin; intermediate between Serpula and Crucigera. It is described by Mörch as calcareous.

(24) Zoopyrus Kinberg 1866.
   Type, Z. lovent Kinberg 1866,3 as first species. Straits of Magellan, Island of Bucket, Pacific Ocean.

1 Saint-Joseph (1894) restricted this genus to O. cristata Langerhans (1883), figures, from Madeira, which has a thin concave horny plate in the operculum and uncini somewhat similar to those in Spirorbis.
2 Vermilia serrula Stimpson 1853, + Verrill 1885, figure, from Grand Manan, New Brunswick, appears to be synonymous with this species.
3 As no figures of this species seem to have been published, very little definite knowledge is available by which to determine the correct position of the genus; Ehlers 1901 placed it next to Serpula.
(25) **Crucigera** Benedict 1886.
   Type, *C. websteri* Benedict 1886, figures. Gulf of Mexico, Atlantic Ocean, in 26 fms.
   Uncial plates similar to those in *Serpula*. Operculum with cup similar to that in *Sclerostyla*, but with conspicuous basal processes.

(26) **Hydroides** Gunnerus 1768.
   Uncini similar to those in *Serpula*. Operculum similar in form to *Serpula*, with a central crown of horn-colored spines, each with lateral processes.

(27) **Eupomatus** Philippi 1844.¹
   Uncini similar to those in *Serpula*, with fewer teeth than type. Operculum similar in form to *Serpula*, with a central crown of horn-colored, simple, curved, regularly tapered spines without lateral processes.

(28) **Eucarpus** Möhr 1863.²
   Type, *E. cumingii* Möhr 1863, figures. Philippine Islands, Pacific Ocean.
   Uncini similar to those in *Serpula*. Operculum³ similar to that of *Serpula*, with a central crown of horn-colored spines the ends of which are blunt, with a lateral process on each side.

(29) **Schizocraspedon** gen. nov. (see p. 287).
   Type, *S. furcifera* (Grube 1878, as *Hydroides*, figures). Philippine Islands, Pacific Ocean.
   Uncini somewhat similar to those in *Eupomatus*. Operculum forming two deep funnels, one above the other, without radii, with the edge of each split into long, slender, divided processes; those on the upper one with small, dark spines on their inner proximal portion.

(30) **Glossopsis** gen. nov. (see p. 287).
   Type, *G. minax* (Grube 1878, as *Hydroides*, figures). Philippine Islands, Pacific Ocean.
   Uncini similar to the preceding. Operculum a deep funnel without radii, the edge cut into broad deep points, each with a terminal knob; a long, rounded, tongue-like, curved process with fluke-like tip, bearing a

¹ *Polyphragma* Quatrefages 1865 included *Eupomatus* and *Hydroides*.
² *Phragmatopoma* Möhr 1863, type *P. caudata* (Kröyer) Möhr 1863, figures, has an operculum resembling that of *Sabellaria virgini* Kinberg 1866, + Ehlers 1901, figures (Hermellidae), and is probably closely related to that genus. Kinberg (1866) refers three new species to the genus, which he places in his family Hermellae.
³ The *Eupomatus furcifera* Claparède 1870, figures, has a similar operculum and should be referred to *Eucarpus*. 
lateral palmate form of about 7 long unequal pointed lobes, arises from
the center of the cup.

11. **Operculum with a calcareous plate** (see p. 221).
   Superior setæ on collar simple tapered blades.

   (3) **Josephella** Caullery and Mesnil 1896.
   Type, *J. marenzelleri* Caullery and Mesnil 1896, figures. Cape de la
   Hogue, northern coast of France, English Channel.
   Uncini similar to *Vermilioopsis*. Operculum with long conic calcareous
   plate.

11'. **Operculum membranous or chitinous**................................. 12.

12. **Superior setæ on collar not simple tapered blades**..................... 13.

12'. **Superior setæ on collar simple tapered blades**

(32) **Apomatus** Philippi 1844.
   Type, *A. ampulliferus* Philippi 1844, + Marion and Bobretzki 1875,
   figures. Mediterranean Sea.
   Uncini similar to *Protula*. Operculum a membranous (?) sphere.

(33) **Fiolograna** Saints-Joseph 1894.
   Type, *A. similis* (Marion and Bobretzki 1875, as *Apomatus*, figures, +
   Marion 1879, figures) Saints-Joseph 1894. Mediterranean Sea (Mar-
   seilles).
   Uncini and operculum similar to preceding.

13. **Superior setæ geniculate.**

(34) **Protoplacostegus** gen. nov. (see p. 287).
   Type, *P. mörchii* (McIntosh 1885, as *Placostegus*, figures).
   Uncini somewhat similar to *Serpula*. Operculum with horny cap.

13'. **Superior setæ with posterior fin-like expansion**

(35) **Filograna** Oken 1815, + Berkeley 1832.
   Type, *F. implexa* Berkeley 1827, as *Serpula*, figures, + Saint-Joseph
   1894, figures. (See footnote 2.) North Atlantic Ocean, in 20 to 40 fms.
   Uncini similar to *Vermilioopsis*. A spoon-shaped organ on one or
   more branchiae.

14. **Superior setæ on collar not simple tapered blades, i.e., with posterior
   fin-like expansion** (see p. 221).

(36) **Salmacina** Claparède 1870.
   Type, *S. incrustans* Claparède 1870, figures. Bay of Naples, Medi-
   terranean Sea.
   Uncini somewhat similar to *Serpula*.

1 Saint-Joseph proposed to separate the four species (*A. ampulliferus* Philippi
1844, *A. enosina* Marenzeller 1885, *A. globifera* Theel 1879, and *A. similis*
Marion and Bobretzki 1875) into two genera based on the difference in form of
the abdominal setæ, under the names *Apomatus* and *Apomatoïdes*, but unfortu-
ately places the species for which the genus *Apomatus* was proposed, under the
later name, thus, unless transposed, making the two synonymous.

2 *Salmacina adifacatris* Claparède 1870 (appendix) is figured as having the
tips of the branchiae regularly tapered. The spoon-shaped end figured by Saint-
Joseph (1894) as belonging to *Salmacina dystera* Huxley (as *Protula*, 1855) is
either an error in reference for *Filograna implexa*, or the species is erroneously
referred to *Salmacina*. 
(37) Protis Ehlers 1887.
   Type, *P. simplex* Ehlers 1887, figures. West Indies, Atlantic Ocean, in 86 fms.
   Uncini similar to *Eupomatus*.

14'. Superior setae on collar simple tapered blades.................................................. 15.

15. Branchial lobes not spiral.

(38) Psygmobranchus Philippi 1844.1
   Type, *P. protensus* (Gmelin) Claparède 1870, figures. Mediterranean Sea.
   Uncini similar to *Protula*.

15'. Branchial lobes spiral.

(39) Piratesa Templeton 1835.2
   Type, *P. nigroannulata* Templeton 1835, figures, + Kinberg, 1866.
   Black River, Island of Mauritius, Indian Ocean.
   Uncini unknown.

(40) Protula Risso 1826.
   Type *P. rudolfii* Risso 1826, as first species. Mediterranean Sea at Nice in about 3 feet.
   Uncial plates irregular in outline, with numerous very fine teeth on the face, the lowest one very long and fang-like.

(41) Protulopsis Saint-Joseph 1894.3
   Type, *P. intestinum* (Lamarck 1818, as *Protula*) Saint-Joseph 1894, figure. Seas of Europe (Triest and Naples).
   Uncini unknown.

1 *Psygmobranchus coccus* Claparède 1870 has uncini with few coarse teeth like *Eupomatus*, and is probably referable to *Protis*, although Claparède suggested its resemblance to *Salmacina*. *Psygmobranchus multicostatus* Claparède 1870 has uncini more nearly like *Serpula*, so that it should be referred to *Salmacina*.

2 *Anisomelus lutes* Templeton 1835, from the figures, shows characters placing it with the Terebellacea as designated by Quatrefages (1865), rather than with the Serpulacea as given by Mörch (1863). There are four pairs of branchiae, very long and very short, below which, on the thorax, are 6 filaments similar to those found on *Trichobranchus glacialis* Malmgren 1865, figures.

3 Saint-Joseph (1894) makes *Protula intestinum* Lamarck, an abdominal seta of which he figures, the type of a new subgenus, *Protulopsis*. There is, however, considerable uncertainty in regard to the other characters, as no figures have been found. Excellent figures are given by Fischli (1900) of his species *Protulopsis nigra-nucha*; the uncini are similar to *Hyalopomatopsis*.
PROTULA ATYPHA sp. nov.

pl. xxxvii, figs. 1, 2, 4.

Type locality. — Pacific Grove, California.

An imperfect animal without color, poorly preserved in a portion of a white, calcareous, irregularly bent tube.

There are but 12 segments back of the thorax, which is long, of 7 segments, all of the well-separated fascicles of setae directed obliquely backward in nearly straight series, the wide membrane bordering it forming a rather deep irregular (mutilated) collar.

Branchial lobes of good size, elongated ventrally and involute, bearing numerous (about 30, besides a few rudimentary ventral ones) long, delicate (?), densely pinnate branchiae in each lobe.

No operculum.

Mouth parts not determinable.

Setae on the thorax of one form, slender, unequal (the shorter ones the broader), capillary, those on the collar fascicles not different from the others. Setae on the abdomen in small fascicles and bent at the base of the moderately broad tapered blade (pl. xxxvii, fig. 1).

Both thoracic and abdominal tori small, with the thin uncial plates (pl. xxxvii, figs. 2, 4) of similar size and form, apparently smooth, with only a long pointed terminal tooth, serrations but faintly visible on the exposed surface even under a high objective.

Length of thorax 9 mm.; breadth about 3 mm.; length of longest branchia about 9 mm.

Pacific Grove, California, August, 1901, one specimen.

The thoracic membrane does not form a scalloped border along the sides, so conspicuous in P. media Stimpson from Grand Menan, New Brunswick, figured by Smith and Harger 1874 (see pl. xlv, fig. 7), and the setae are much coarser, those of the latter being very slender; the (much narrower) uncial plates also have more distinct teeth.

On account of its long abdominal setae, Saint-Joseph would doubtless refer this species to his new subgenus Protulopsis, in which the abdominal setae are “oblique bayonets, plicate on the border,” as in P. intestinum Lam. Protula as a subgenus is restricted for species having shorter ‘sickle-shaped’ abdominal setae, as P. tubularia Montagu. The figures given by Benedict (1886) of the abdominal setae of P. diomedae and P. alba show little resemblance to the figure given by Saint-Joseph of that of P. tubularia, but all three and others are mentioned by him as belonging together.
The very small *Protula arctica* Hansen 1882 was referred to the genus *Protis* by Ehlers 1887 (type, *Protis simplex*). The uncial plates have but a few (6) coarse teeth, and the collar setae have a distinct basal expansion or fin. There is no operculum.

**HYALOPOMATOPSIS OCCIDENTALIS** sp. nov.

*Type locality.* — Virgin Bay, Prince William Sound.

Small, thick, white, calcareous, angular, more or less curved tubes, with a prominent median keel, were attached to tubes of *Serpula splendens*. They strongly resemble the figure of the tube of *Chitonopoma greenlandica* (Mørch) given by Levinsen in 1883 as *C. fabricii* (*Serpula triqueta* Fabricius non Linné).

The colorless animal also has a long, slender, rounded form similar to Levinsen’s figure.

The branchial lobes are small, not prolonged ventrally, nor involute, and bear 6 pairs of long branchiae, their rachises broad at base and furnished on their inner surfaces with long, graduated, ciliated pinnae not extending to the end but leaving a long, unadorned, terminal portion; an additional smaller undeveloped branchia is on the end of the lobe opposite the one bearing the operculum. This is a small, elongated, semitransparent bulb on a very long, slender peduncle, often covered on the end with delicate algae (pl. xliv, fig. 8), in the adult specimens usually showing an inner sphere (air bubble?).

No thoracic membrane.

Collar very deep, with deep lateral clefts.

There are about 60 segments, of which 7 belong to the thorax, where the fascicles of setae form straight series and the tori are short.

1 Mørch in 1863 referred the *Serpula triqueta* of Fabricius 1780 to *Hydroides norvegica* as var. *grönlandica*, which Malmgren in 1867 separated as a distinct species, referred to *Hydroides* with doubt, so that Levinsen’s name *fabricii* is superfluous.

Specimens attached to stones from Greenland and to the tubes of *Nathria conchylega* from 32 fathoms off the New England coast are in the Yale University Museum, and may prove to be the same as those on the same host from Greenland identified by Moore (1902) as *Serpula* sp.; these could not be compared. The operculum (pl. xxxvii, figs. 3, 9) is covered by a thin chitinous cup-like plate, and has not the bulb-like form of the western species. When stained and mounted in glycerine, a central chamber with connecting peduncle-canal was distinctly revealed, which differs from that in the opercula of *Spirorbis* in having three distinct parts, those above and below the central chamber or cavity being filled with animal matter. See also pl. xl, fig. 31.
Setæ of the collar fascicle of two forms, long slender limbate and others with broad spinous basal fin (pl. xl, fig 22). Other fascicles with shorter and broader limbate setæ. No capillary ones, as in *Spiorobis*.

Uncini with numerous teeth, the lowest one larger than the others. Abdominal setæ small, trumpet-shaped, with a long tapered end. Total length of largest specimens between 15 and 20 mm.; breadth about .5 mm. Smallest specimen about 5 mm.

Virgin Bay, Prince William Sound, June 27, eight specimens.

**SERPULA SPLENDENS** sp. nov.

_pl. xxvi, fig. 3;_ pl. xxix, fig. 2; _pl. xxx, figs. 2, 3; pl. xxxiii, fig. 31;_  
_pl. xxxv, fig. 18;_ pl. xxxvii, fig. 31; _pl. xxxix, fig. 33._

*Type locality.* — Prince William Sound, at Orca and Virgin Bay.

Color in formalin yellowish, with the branchiae and operculum variously banded and mottled with deep crimson, which in life is a 'brilliant red.'

Thoracic membrane with a very wide margin overlapping on the back and forming a very deep rolling collar with a median ventral and two lateral incisions.

Branchial lobes with comparatively small basal attachment, arching obliquely forward, curving inward ventrally, thickest below and strengthened by a conspicuous tapered median rib, and in front, at the end, by a large rib reaching backward inside the collar. Between these end ribs and attached to them is a broad, gradually widening, muscular band curving inward between the bases of the lobes, forming a trumpet-shaped process over the mouth; above this is a thin, somewhat ruffled membrane, which extends out on each side around and inside the lobes, attached to their bases; extending forward and inward from the dorsal furrow is a tongue-shaped process, free at the end, having a granular surface, which completely covers the end of the trumpet.

Branchiae short, between 45 and 50 pairs, their tapered rachises rounded outwardly, with short filamentose tips, the two inner edges bearing long well-separated pinnae; a few of the extreme ventral branchiae extend around the end of the lobe and backward or inward along its edge.

Opercula two; the primary one thin, large, deep funnel-shaped, with numerous delicate branching radii, forming a finely serrate (between 127 and 150 serrations) margin, the inner surface often with minute scattered tubercles; base globular, without processes, attach
by a stout peduncle to the dorsal end of either branchial lobe; secondary one, when present, somewhat club-shaped, attached to the opposite lobe by a more slender, shorter stem.

Number of segments about 320, of which 7 belong to the thorax, on which the fascicles of setae form very oblique series; abdominal segments short, the lines of uncini closely crowded.

Fascicles of setae on the thorax tubular in form; the first well forward on the collar, smaller than the succeeding ones, and directed forward; the others, directed obliquely backward, vary slightly in size, become flattened and laterally elongated. The setae are of two forms; on the collar slender capillary superior ones and stout bayonet-shaped inferior ones, spinous at the base of the blade (pl. xxxiii, fig. 31), on the other segments capillary only; uncial plates with 6 to 7 long teeth, apparently in two rows (pl. xxxvii, fig. 31). On the abdomen fascicles of the characteristic short flaring-ended setae, and on the caudal region other small fascicles of very long, slender, stiff spines; uncial plates similar to but smaller than those on the thorax, becoming thicker, with more rows of teeth in the caudal tori (pl. xxxix, fig. 33).

In very young animals taken from their tubes, stained, and mounted, the operculum appears club-shaped; the rudimentary branchia resemble flattened strips of membrane with long unequal filamentose ends, and are covered by the collar; no membrane appears along the sides of the thorax; this, however, may be due to the position in mounting. There are about 50 rows of uncini on the abdomen, and 7 fascicles of setae on the thorax; the setae themselves are similar to those in the adult.

A perfect animal taken from its tube is 53 mm. long besides the branchia, which are about 8 mm., 7 mm. broad on the thorax, and 5.5 mm. on the abdomen. A larger imperfect one is 8.5 mm. broad on the thorax and 7 mm. on the abdomen. Diameter of operculum 5 to 7 mm. Another specimen, having about 190 segments, 30 pairs of branchia, and one operculum, is about 35 mm. long and 5 mm. broad on the abdomen.

Their tubes are thick, white, calcareous, variously twisted, more or less free, the surface of attachment flattened, the exposed surface often roughened by the small tubes of their own young, and also by species of Spirobris and Hyalopectopus.

Prince William Sound, at Orca, June 25 and 26, two specimens; at Virgin Bay, June 27, ten specimens.

Serpula jukesii Grube 1877 (non Baird 1865) closely resembles this species.
The *Serpula columbiana* abundant in Puget Sound and extending southward along the California coast to Golden Gate is described by Johnson (1901) as having more numerous branchiae (54 in each lobe), fewer serrations (100) on the margin of the operculum, and but 250 abdominal segments in a length of 55 mm., with a breadth of 7 mm. on the thorax.

Specimens collected by Dr. Coe in August, 1901, on the California coast are supposed to be immature examples of this species. They are without color in formalin, except one, which has two pink spots at the base of the trumpet-shaped process, but when first received one showed both red and orange bands on the branchiae. The larger has 20 pairs of well-developed branchiae, besides a few small ventral ones having very short pinnae, and the operculum has 110 serrations on its margin. An example of the Alaska species of similar size has 35 pairs of branchiae and 127 serrations on the margin of the operculum.

**Genus Crucigera** Benedict 1886.

Type, *Crucigera websteri* Benedict.¹

The very small type species of this genus, a cotype specimen of which, from 26 fathoms in the Gulf of Mexico, has been sent from Washington, has four 'digital processes' at the base of the operculum, the axis of which is continuous with that of its peduncle. The Alaskan species, however, have but 3, 2 of them combining, forming a large, rounded, bilobed process, to which the abruptly contracted distal end of the peduncle is so attached that its axis is not continuous with that of the operculum. Benedict describes the texture as 'calcareo-cartilaginous,' but the operculum of the northern species, after soaking in potash solution, retains its form as a thin, transparent, chitinous shell. The tube is ornamented on one side by three conspicuous lamellar-like longitudinal carinae, and on the opposite side by faintly indicated ridges. The thicker tubes of the northern forms show no indication of such ornamentation.

The operculum of *Serpula zelandica* Baird (1865), as shown in the figure, has similar coarse, blunt serrations on the margin, but no processes at its base, thus representing a transition between typical *Serpula* and *Crucigera*, and therefore referable to *Sclerostyla* Möhrch 1863.

CRUCIGERA ZYGOPHORA (Johnson).


Type locality. — Puget Sound.

Color, salmon or yellow, with the branchiae irregularly banded with deep crimson, the operculum variously mottled with the same color, sometimes flecked on its outer surface with minute white specks.

The branchial lobes are characteristic of the Serpulas, each with about 30 branchiae, having long, slender, tapered rachises, with very long (over 6 mm.) filamentose ends and moderately long delicate pinnae.

Thoracic membrane with a wide free margin extending forward as an exceedingly deep collar, the ventral lobes of which often roll backward, nearly or quite covering the thorax.

Segments numerous, 115 or more; 6 on the thorax below the collar; those on the abdomen often marked only by the lines of uncini.

Often two opercula; the primary one bell-shaped, thick, shallow, sometimes so thick as to become flat on top, with 28 to 30 radii forming a bluntly scalloped margin; at its base are 3 conspicuous unequal processes, attached by a long peduncle to the base of one of the branchial lobes at its outer dorsal end; the secondary one, which is more or less club-shaped, without basal processes is, when present, attached by a shorter peduncle to the opposite lobe.

Length 50 to 80 mm.; breadth about 3 mm.; branchiae about 15 mm.; diameter of operculum 4 mm.

One imperfect specimen is recorded by Johnson from Puget Sound, 1901; Sitka, June 15, common; Orca and Virgin Bay, Prince William Sound, June 25 and 27, very common.

Tube thick, calcareous, attached to fragments of shells in variously twisted masses, the free anterior end with a flaring margin.

CRUCIGERA FORMOSA sp. nov.

*Type locality.* — Dutch Harbor, Unalaska Island.

This species differs from the preceding in having shorter branchiae, their rachises with short terminal filaments, sometimes wanting; yellowish in preservative but a 'brilliant red' in life.
The operculum has the basal processes nearly equal, smaller and somewhat tapered, and the distal end of the peduncle but slightly contracted. A delicate alga, a species of *Ectocarpus*, completely covers the anterior end. There is no secondary operculum on the type; a specimen from Wrangel, however, has two fully developed ones, to only one of which the *Ectocarpus* has become attached.

Length about 60 mm.; branchiae about 6 mm.; breadth of abdomen 3 mm.; of thorax 4 mm.; diameter of operculum 3 mm.

Tube thick, calcareous, but slightly twisted.

Wrangel, June 5, one specimen; Dutch Harbor, July 8, one specimen. Said to be very common.

**CRUCIGERA IRREGULARIS** sp. nov.

*pl. xxv, fig. 5; pl. xxxix, fig. 4; pl. xxxiii, fig. 13; pl. xxxix, figs. 1-5.*

*Type locality.* — Juneau.

Color pinkish, the branchiae and operculum banded and mottled with bright crimson.

This species differs from the two preceding ones in having longer branchiae, their rachises with comparatively short terminal filaments; but especially in its operculum, which is irregular in form, laterally elongated, with about 32 broad radii, which form a thick scalloped edge, which rolls over along the longer and deeper portion. Only one large, broadly rounded, somewhat bilobed process is developed at one side of the base, to which the abruptly contracted distal end of the long stout peduncle is attached; secondary operculum very slender, club-shaped.

Length about 48 mm. from base of branchial lobes; breadth of thorax 4 mm.; longer diameter of operculum 4.5 mm.

Tube thick, calcareous, solitary, attached to a shell.

Juneau, July 6, one specimen.

**EUPOMATUS GRACILIS** sp. nov.

*pl. xxvii, fig. 9; pl. xxxiv, fig. 25; pl. xxxvii, figs. 26, 27.*

*Type locality.* — Pacific Grove, California.

Branchial lobes similar to those of *Serpula*, but not so prolonged ventrally, turning inward but little, the branchiae (18 in each lobe) not extending backward along the end of the lobe, as in *Serpula*.

Operculum deep funnel-shaped, tapering regularly into its peduncle without basal enlargement or processes, with comparatively few regular radii forming deep sharp serrations (about 35) on the margin, and
bearing on its upper surface a central crown of 10 or 11 long, tapered, upward-curving, simple, horn-colored spines characteristic of *Eupomatus uncinatus* Philippi (1844) figured by Ehlers 1887; secondary operculum small, club-shaped, on a very short stem. One specimen has only a central horn-colored ring, the crown of spines having been lost, and the margin has apparently been injured on one side, where the serrations have grown together, forming an angulation.

Thoracic segments 7; abdominal segments over 70 in the largest example, which has lost a posterior portion.

A very wide membrane borders the thorax, forming a very deep collar with lateral incisions or clefts but with no median one, the ventral edge being entire; there is, however, a conspicuous oval opening considerably within the margin.

Setæ similar to those in *Serpula*.

Length of thorax 3.5 mm.; breadth 3 mm.; length of longest branchia 5.5 mm.; diameter of operculum 2.5 mm.

Pacific Grove, California, August, 1901, three specimens.

The tubes are solitary, variously twisted, and attached for the greater part of, if not their entire length. The surface, roughened by growth lines, is often rust colored, covered with bryozoa and other animals.

*Hydroides protulicola* Benedict (1886), specimens of which are in the Yale Museum, is a typical *Eupomatus*, as is undoubtedly *H. spongicola* Benedict, judging from the figures. *Serpula dianthus* Verrill (1874) is also an *Eupomatus*. In *Hydroides* (type, *H. norvegica* Gunnerus) the spines forming the crown on the operculum have conspicuous lateral processes or secondary spines.

EUPOMATUS HUMILIS sp. nov.

pl. xxxix, figs. 39, 40; pl. xliv, fig. 22.

*Type locality.* — Guaymas, Mexico.

A small (probably immature), thin, very slender, round tube, forming one long irregular loop, is attached its entire length to the side of a small coral.

The five branchiae are long, stout, with few pinnae, the very small characteristic operculum on its very slender peduncle reaching above them. The operculum is colorless, with coarsely serrate margin, formed by about 10 long, broad points, crown of 8 long, simple, characteristic spines, each with a basal spinule on its inner surface.

Number of segments unknown, only the anterior portion having been found. Collar setæ few in number, the superior ones with 4
basal spines and slender, delicately serrate blade; setae in the other fascicles slender blades. Uncini very small, with few sharp teeth.

**SPIROBRANCHUS INCRASSATUS** (Kröyer) Mörch.

*pl. xxxiv*, fig. 24; *pl. xxxvii*, figs. 25, 34.


*Type locality.* — West coast of United States of Colombia.

A valve of *Margaritifera* sp., from the Gulf of California, in the Yale Museum is covered with a mass of the tubes of this species. They are of good size, variously twisted over one another, white, often with markings of light yellowish brown and purplish, the high median or dorsal carina often so roughened by the conspicuous growth lines as to be rendered irregularly spinulose. Many of the largest tubes spread along the base, forming a distinct carination on each side, along and above which the surface is often punctured by the erosion of the surface between the irregular growth lines.

The anterior portion of the animal, with the operculum, was found dried in some of the tubes. The plate on the operculum agrees perfectly with Mörch’s figure. Figures of the setae and uncial plate of a specimen from Acapulco, west coast of Central America, were given by Ehlers (1887).

The single example (999) from Vera Cruz, identified and figured by Benedict (1886) as *S. incrassatus* (Kröyer) Mörch, is not this species, and therefore should receive the new name *Spirobranchus pseudoincrassatus*. The thoracic uncini are described as having from 18 to 20 teeth.

Mörch also described and figured two related forms from the Pacific Ocean, near Puntarenas (Costa Rica, Gulf of Dulce), which do not appear to have been subsequently noted: *Hydroides (Eucarpus) crucigera* Mörch, on *Margaritifera barbata* Reeve, from 14 fathoms, and *Pomatostegus kröyeri* Mörch.

**Genus Spiroorbis** Daudin 1800.

Type, *Spiroorbis spirorbis* (Linné 1760) = *Spiroorbis borealis* Daudin 1800. (See *pl. xxxix*, fig. 34; *pl. xl*, figs. 5, 6, 8, 12–15; *pl. xlii*, figs. 15–19.)

Important generic characters for the animal are as follows: — Operculum protected by a calcareous plate, variable in form. Thoracic segments usually 3, rarely 3½ or 4 (Levinsen 1883 + Caul-
SABELLIDES AND SERPULIDES

Iery and Mesnil 1897). Superior thoracic setæ usually differing in form, those of the first or collar fascicle varying from those having simple tapered blades to others having a conspicuous, fin-like basal expansion.

Uncini with rather numerous equal minute teeth in 2 or 3 (?) rows. See also p. 252.

SPIORBIS SEMIDENTATUS sp. nov.

pl. xxvii, figs. 7, 10; pl. xli, figs. 13, 17, 23, 26-30; pl. xliii, figs. 4, 5, 12.

Type locality. — Dutch Harbor, Unalaska Island.

Tube thick and massive, vitreous, rarely showing any transparency, opaque with dull surface, dextral, the few whorls not regularly rounded nor spreading, but piled one above the other, forming a high spire with nearly perpendicular sides and flattened top, without central depression, often with a distinct angular shoulder. Aperture very lustrous within, with a small round opening, the thick shell forming a broad, straight, flattened, inner or columellar margin with a conspicuous projection at its junction with the thinner straight, rounded top edge, from which it arches forward and spreads out in a shining, somewhat iridescent layer on the body of the shell; in some specimens a spiral ridge appears to arise from the outer margin, and is at first ill-defined, but increasing abruptly forms a conspicuous keel, which ends at the aperture in an angular projection; in such instances an added prominence is given to the columellar projection, giving to the aperture a two-toothed appearance. The unkeeled form strongly resembles S. vitreus Fabr., but forms a much higher spire and has never been seen so glassy and transparent as specimens of the latter from the Atlantic; immature examples are semitransparent. The carinated form is similar to S. violaceus, but is not so regularly coiled nor so deeply grooved. Others are like some forms of S. variabilis, but coil in the opposite direction.

Diameter 3 to 4 mm.; height the same.

Animal with 3 thoracic and about 30 posterior segments. Thoracic membrane very conspicuous, partially covering the 7 branchiae and operculum, which expands from the stout peduncle into a cup-shaped organ the size of the rounded aperture, protected by a moderately thick, saucer-shaped, calcareous plate with an irregularly thickened inner basal ridge; it seems to be covered by a very thin membrane, to which minute protozoans are often attached; the edge of the operculum appears as a dark brown rim.
The thoracic setae vary in the three segments. All the inferior ones are of the usual slender capillary form; the superior ones of the collar fascicle have a conspicuous, fin-like, posterior expansion and long, narrower, gradually tapered, coarsely serrate, terminal portion; those of the other fascicles have a broad, smooth, tapered blade, a few in the third fascicle with odd comb-like ends. Uncini rather broad, with two rows of minute teeth.

Posterior segments much swollen, bearing conspicuous bunches of mucous glands nearly concealing the two setae, both of which at first have broad pennant-like blades, but farther back one has the shaft simply pointed and curved.

Strings of undeveloped eggs were in many of the tubes.

Common at Dutch Harbor, on rocks and stones; rare in Prince William Sound, at Orca, on tubes of Serpula splendens; and also at Sitka, on shells and tubes of Crucigera zygophora.

SPIRORBIS VARIABILIS sp. nov.

pl. xxix, fig. 3, a; pl. xxxix, figs. 24, 25; pl. xl, fig. 4; pl. xliii, fig. 16; pl. xlv, fig. 17.

Type locality. — Sitka Harbor.

Tube thick, vitreous, usually semitransparent, sinistral, the few whorls spreading over one another, usually forming a low spire with or without a small central cavity, the top spirally grooved, the grooves in some instances indicated only by the fine sinuous striae of growth and a slightly raised interspace, in others very deep, with three broad, rounded ridges forming conspicuous notches and tooth-like projections in the margin of the aperture, the margin in the other form being uninterrupted. There is great variation in the manner of coiling, some specimens assuming a form that can be distinguished from semidentatus only by its smaller size and opposite coil; others resemble violaceus but turn in the opposite direction.

Diameter 2–2.5 mm.; height 1–1.5 mm.

Animal not differing essentially in number of segments, branchiae, and form of operculum from S. semidentatus. Some opercula have two saucer-shaped calcareous plates, which can be readily separated.

Strings of eggs were found along the back of the posterior segments. Attached to rocks and fragments of shells, either singly or in small colonies.
SPIORBIS EXIMIUS sp. nov.

Pl. xxxix, fig. 9; pl. xli, figs. 7, 18, 20; pl. xliii, figs. 6, 11, 17.

_Type locality._—Pacific Grove, California.

Although but a single specimen, which was destroyed in getting at the animal, was found attached to a _Serpula_ tube, it is noted on account of its very distinctive operculum plate.

Tube tapered, with a conspicuously corrugated surface, forming a small coil, whether dextral or sinistral was not ascertained.

Animal with 3 thoracic and about 18 posterior segments; eggs showing a distinct nucleus were in the posterior part of the body-cavity. Collar membrane very conspicuous; number of branchiae not accurately determined.

Calcareous plate on the operculum unusually large, elongated, with large basal lobe having a distinct hook-like projection on one side, similar to that found on the operculum plate of _S. cornuarietis_, as figured by Marion and Bobretzky in 1875 (pl. 12, f. 27, B).

Superior setae of the first fascicle with conspicuously serrate edge and spiny posterior fin-like expansion; those of the other fascicles narrow smooth-edged blades, three odd ones with comb-like ends in the third fascicle. Posterior brush-like setae very small.

SPIORBIS MARIONI Caullery and Mesnil 1897.

Pl. xxxix, figs. 26, 27; pl. xl, fig. 16.

_Type locality._—Panama.

Small, opaque, more or less regularly coiled, dextral tubes attached to specimens of _Callopoma_ from La Paz, Lower California, and Panama, also to valves of _Barbatia_ from Acajutla and Libertad, Central America, and to a conglomerate mass of worm tubes, coral, bryozoa, etc., from Guaymas, Mexico, resemble the larger sinistral _S. quadrangularis_ Stimpson, in being four-sided. The upper surface has a deep median groove and two conspicuous ridges or carinae, one defining an inner shoulder around the small, deep, central cavity, and the other an outer shoulder, the entire surface often roughened by growth lines.

The calcareous plate on the operculum differs from fig. 6 given by Caullery and Mesnil, only in the smaller central protuberance, a feature which is undoubtedly variable.

The collar setae have coarsely crenulate blades and fin-like bases; the other setae are long, regularly tapered blades, with a few odd-ended ones in the third fascicle.
SPIRORBIS LANGERHANSI Caullery and Mesnil 1897.

_Type locality._ — Panama.

Scattered over the surface of specimens of _Crucibulum imbricatum_ Sby. and _Callopoma_ from Panama, are numerous isolated tubes having a regularly coiled sinistral form spreading at the base, often forming a thin border around it. Four-sided in section, with the outer wall oblique and not perpendicular to the inner one, each shoulder of the comparatively narrow, flattened, dorsal area defined by a carina varying in size in different individuals; occasionally one occurs which is not regularly spiral, forming a small central cavity. The entire surface is often roughened by conspicuous transverse lines. No animals were found. Caullery and Mesnil give the collar setae as similar to those in _S. marioni_ and the plate on the operculum not unlike that found in _S. vitreus_ Fabricius.

SPIRORBIS MÖRCHI Levinsen 1883.

_pl. xxxvii, figs. 15, 24; pl. xli, figs. 15, 16, 21, 24, 25; pl. xliv, figs. 20, 21._

_Type locality._ — Greenland.

Sinistral, dull, opaque unsculptured tubes, forming low coils, with small central cavity, sometimes with upward turned aperture, are not readily identified without their animals, as they are usually more symmetrical than the form figured by Levinsen. They do not, however, differ essentially from eastern specimens on stones from the Grand Banks of Newfoundland and on _Chlamys islandicus_ from Greenland.

The collar setae have a form similar to that given by Levinsen; a long, tapered, coarsely serrate blade with conspicuous, fin-like basal portion. Setae in the second and third fascicles, long, tapered, delicately serrate blades, a few in the third with odd comb-like ends. Uncini with comparatively coarse teeth.

Operculum not unlike that found in the eastern examples, in which it is a brood-pouch protected by a very convex, bilobed, opaque calcareous cap with a long shield-shaped posterior or inner portion, shallow at the back and extending nearly the length of the operculum in front; the eggs visible only in a back view.

Sitka, on tubes of _Crucigera_; Prince William Sound, at Orca, on the tubes of _Serpula_; also on a specimen of _Pachypoma_ from Queen Charlotte Island, British Columbia, collected by the Geological Survey of Canada.
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SPIRORBIS INCONGRUUS sp. nov.

_pl. xl,_ figs. 19, 20, 28.

_Type locality._—Prince William Sound.

Associated with the preceding, _S. mörchi_, are smaller, similarly coiled, but dextral tubes, slightly flattened on top, the surface roughened by growth lines, and an ill-defined spiral line feebly indicating an outer shoulder.

Collar setae also similar to those in _S. mörchi_.

Calcereous plate in the operculum solid and somewhat resembling a plug, thus differing from that of any other species.

Diameter about 1.5 mm.; height about 1 mm.

_S. rugatus_ found on stones at Sitka forms similar dextral tubes, but the collar setae are finely serrate, tapered blades without any indication of a fin-like base.

Prince William Sound, at Orca, on _Serpula_ tubes, and at Virgin Bay, on _Crucigera_ tubes.

SPIRORBIS QUADRANGULARIS Stimpson 1853.

_pl. xxxix,_ fig. 37; _pl. xl,_ figs. 10, 11, 21, 23, 26, 30; _pl. xlii,_ figs. 23-29; _pl. xliii,_ figs. 14, 15.

_Type locality._—Bay of Fundy, in 10 fathoms.

Tubes found on _Crucigera_ tubes from Alaska are not four-sided, but have only a perpendicular inner wall with angular, seldom carinate, shoulder defining a small central cavity. A similar form is very common along the eastern coast, where there is found great variability in the development of the tubes. Young are often without the slightest indication of any angularity, resembling _S. spirorbis_ and maturing into the form figured by Levinsen as _S. affinis_, which often twists irregularly upward like _S. lucidus_; others develop a small ridge on top of the whorls, which sometimes increases into a conspicuous carina forming three-sided whorls. Upon examination of specimens this is found to be the form called _S. granulatus_ by Moore (1902) and is probably the one identified by Levinsen (1883) as the _S. carinatus_ of Montagu (1803). Until the animal of specimens from England can be studied this question must remain undecided, especially as there are in the Yale Museum, on a worn bivalve from England, several sinistral, unicarinate, regularly coiled tubes, which differ from the west Atlantic form in having a large central cavity showing all the whorls, and may prove to be the true _S. carinatus_.

All the animals examined agree in having a similar convex calcereous cap on the operculum and the same form of setae, those of the col-
lar being long, finely serrate, tapered blades with coarser fin-like bases. Prince William Sound, at Orca, on *Crucigera* tubes.

SPIRORBIS LINEATUS sp. nov.

*Type locality.* — Sitka.

Moderately thick yellowish tubes, roughened by growth lines, and 2, rarely 3, spiral threads varying in size and position in different individuals, form more or less regular sinistral coils with small central cavity. Sometimes a thread defines the central cavity, and at other times this apparently disappears and one defines an outer shoulder, the median one being constant, the three rarely occurring together. Associated with these are tubes on which the spiral lines are so feeble as to be scarcely discernible. Immature tubes with 3 spiral lines were at first taken to be worn examples of the small *S. granulatus* Linné, on which the three spirals form conspicuous thin lamellae.

Diameter 1.5 to 2 mm.; height about 1 mm.

The collar setae of both species are similar in form, being long, tapered, finely serrate blades with spiny fin-like bases.

Sitka, on a much-worn bivalve; and Prince William Sound, at Orca, on *Crucigera* tubes.

SPIRORBIS SIMILIS sp. nov.

*Type locality.* — Prince William Sound.

Dull, opaque, unsculptured, usually regularly coiled, somewhat flaring, sinistral tubes with small central cavity, similar to those of *S. mörchi*.

On examination of the animal, however, the operculum plate and setae were found to be very different in form, the collar setae being regularly tapered, finely serrate blades, with fine fin-like bases, similar to those seen in *S. lineatus*, and the operculum, a brood-pouch filled with eggs, protected by a flat calcareous plate with a small spreading base and the usual ventral prolongation or supporting wall.

Prince William Sound, at Virgin Bay and Orca, on *Crucigera* tubes; Sitka, on fragments of rock.

SPIRORBIS VIOLACEUS Levinsen 1883.

*Type locality.* — Greenland.
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Vitreous, strongly grooved and carinated, regularly coiled, dextral tubes agree with eastern specimens from Greenland and the Grand Banks and also with Levinsen's figure.

The plate on the operculum is similar to that figured by Caullery and Mesnil (1897).

The collar setae are like one form figured by them, but none appears to have any indication of the notch-like irregularity in the edge shown in the other form; the serrations are much coarser than in the figure given by Levinsen.

Sitka, on shells; Prince William Sound, at Orca, on Crucigera tubes; also Queen Charlotte Island, British Columbia, on a specimen of Pachypoma collected by the Geological Survey of Canada.

SPIORBIS SPIRILLUM Linné 1760.

pl. xxvii, fig. 8; pl. xxxiii, fig. 15; pl. xxxix, figs. 21, 22, 23, 28; pl. xl, fig. 7; pl. xlii, figs. 1-5; pl. xliii, figs. 9, 10.

Type locality. — ? Ocean, on Sertularia and other zoophytes.

The dextral discoid form at the present time considered to be the true S. spirillum of Linné is very common on algae from Cape Fox, Alaska, south to Santa Barbara, California. On the eastern coast it is very common on kelp (Laminaria) and on the interior of the aperture of univalves (Buccinum, Siphon, etc.) along the New England coast from Cape Cod to Greenland. The slender ascending form, the true S. lucidus of Montagu, also occurs on bryozoa (Bugula marayana and other branching forms) from St. Paul Island, Bering Sea, along the coast of Alaska, south to Pacific Grove, California, where it is also attached to small univalves. On the eastern coast it occurs on bryozoa, hydroids, annelid tubes, and algae; often attaining a large size, the var. greenlandicus of Morch (S. porrecta of Fabricius).

The animals examined from all localities agree in having on the operculum a similar thin, shallow, calcareous plate, with slight inner or basal projection and similarly formed setae; those of the collar geniculate — abruptly tapered serrate blades, broad and angular at base. There is considerable variation in their length and in the size of the serrations, the latter sometimes being scarcely visible, especially on those of the discoid form from Alaska.

SPIORBIS RUGATUS sp. nov.

pl. xxix, fig. 3, b; pl. xxxv, fig. 14; pl. xliv, figs. 18, 19.

Type locality. — Sitka.

On the same fragments of rock with S. variabilis were a few specimens, attached singly and in a small colony, of a small dextral species
forming a regularly coiled low spire with central cavity, fragile in texture in preservation, dull opaque, roughened by conspicuous growth and occasional obscure spiral lines. As noted on page 241, they cannot readily be separated from the tubes of *S. incongruus*. Although the specimens are imperfect, their animals more or less mutilated, the following important characters could be ascertained:

Branchiae 7.

Operculum forming a somewhat cylindrical (imperfect) brood-pouch of simple cell tissue, protected on the end by a thin calcareous cap, but showing no indication of an internal (partition) wall found in this organ in some of the eastern species. One was filled with partially developed eggs; the others had the pouch torn away, leaving the basal expansion in one instance showing the formation of a new calcareous terminal plate (pl. xxxv, fig. 14) and in another a simple covering of tissue.

Large eggs, showing a nucleus and nucleolus when stained, were in the posterior part of the body-cavity, and smaller ones were scattered through the (10?) posterior segments.

In the 3 thoracic segments the setae vary remarkably in form. In the collar fascicle the superior ones have very broad, conspicuously scalloped, tapered blades; in the other fascicles they are so narrow as to be scarcely distinguishable from the inferior capillary ones.

**SPIORBIS COMPTUS** sp. nov.

*Type locality.* — ? California.

On a red alga from California, without definite locality, associated with *S. spirillum*, is a small, dextral, yellowish species, usually forming a low regular coil with small central cavity, often spreading around the base in a thin layer, the surface roughened by conspicuous transverse lines and three prominent spiral ridges, one defining the central cavity, one median, and one around the outer shoulder; in immature examples the median one is usually the most prominent, the others being scarcely noticeable.

Diameter 1.5 mm.; height less than 1 mm.

The animals were all much dried. In a small specimen the operculum had a thin disk-like plate with an elongated, angular basal portion. In an adult the operculum, filled with eggs, was protected by a flat calcareous cap with long basal shield.

The setae were similar to those found in *S. rugatus*; those of the collar fascicle, simple tapered blades with serrate edges.
These tubes are much smaller and more fragile than some on shells from Pacific Grove, California, identified as *S. asperatus*.

**SPIRORBIS ASPERATUS** sp. nov.

pl. xxviii, fig. 10; pl. xxx, fig. 4; pl. xli, figs. 4, 5, 6, 8, 10, 11, 19, 31, 32; pl. xliii, figs. 1, 2, 3, 7, 13, 26.

*Type locality.* — Sitka.

Tubes large, rounded, turning upward in a left-handed spiral, the turns resting one above the other or stretched out, forming variously twisted, crowded masses attached to rocks, shells, and worm tubes; opaque, yellowish, without lustre, roughened by conspicuous growth lines and sometimes with one to three more or less definite spiral threads.

Animal long and slender, with 3 thoracic and 16 to 21 posterior segments. Thoracic membrane conspicuous, nearly covering the branchiae.

Operculum gradually enlarging from the short, stout peduncle, flattened dorso-ventrally and protected on the end by a large, thin, cup-shaped calcareous plate having a large, thin, spreading basal portion.

Superior setæ not differing essentially in form in the three segments; long, narrow, tapered, finely serrate blades; in the third fascicle a few with conspicuously fringed ends were found; as they were not seen in all of the animals examined, it could not be satisfactorily determined whether they simply failed to show in the mounting or actually do not constantly occur.

Strings of undeveloped eggs in some instances were found along the back of the posterior segments, which were much swollen, each with conspicuous bunches of mucous glands partly concealing the two setæ, one of which has the characteristic geniculate form, and the other destitute of a blade, with the end of the shaft or manubrium, pointed and curved.

Sitka, June 16, very common on rocks and shells, usually associated with bryozoa; Prince William Sound, at Orca, on *Crucigera* tubes; Pacific Grove, California, on small shells.

**SPIRORBIS ABNORMIS** sp. nov.

pl. xxxix, fig. 35; pl. xl, figs. 1, 2; pl. xliii, figs. 24, 28, 29.

*Type locality.* — Sitka.

Dull, opaque, usually rounded tubes in irregular sinistral coils, the whorls often piling on one another, somewhat resemble some forms of *S. asperatus*.
The operculum differs from that of all other species in having three distinct parts, each with a similar calcareous plate. In some instances the two upper parts have been torn away, leaving one plate in the operculum which is filled with well-developed embryos, each with a conspicuous patch or mass of white, which under pressure separates into minute rods that are soluble in acid. Similar white masses have been found in the embryos in the operculum of the eastern *S. granulatus* and *S. validus*. Their exact significance has not been satisfactorily determined. They apparently have not before been noted.

Sete finely serrate blades, not very unlike those of *S. asperatus*. On fragments of rocks with *S. variabilis*.

**SPIORBIS INVERSUS** sp. nov.

*Type locality.* — Port Phillip, Australia.

Isolated, minute, opaque, very lustrous, sinistral tubes, closely allied in form to *S. lucidus*, are attached to the tips of the lower or sheltered branches of a bryozoan (*Menipea cirrata* Lam.) in the Yale University Museum.

They are remarkable for the turning downward, like a spout, of the more or less elongated terminal portion, but at first form regular flat coils. No definite characters could be obtained from the much-dried animals. No record of such a species has thus far been found.

**SPIORBIS TRIDENTATUS** sp. nov.

*Type locality.* — Port Phillip, Australia.

Associated with *S. inversus* on the bryozoan *Menipea cirrata* are numerous other isolated white tubes which are carinated and dextrally coiled more or less irregularly upward when mature, the margin of the aperture with two deep angular incisions forming three conspicuous angular teeth.

They differ from all known forms in having the lower surface of the whorls distinctly smaller than the upper surface, the sides inclined outward forming a carinated shoulder, with the usually flattened upper surface, on which is a much larger median carina; a third defines a small, deep, central cavity, but in many full-grown specimens the inner one is inconspicuous or wanting. No animals were found.

This species may prove to be either *S. lamellosus* Lam. or *S. incisus* Mörch (*S. carinatus* Lam. non Montagu) described by Lamarck in 1818, from King Island, which is south of Port Phillip. The descriptions are inadequate for accurate identification, and the figures by Chenu have not been seen.
NOTES ON SOME PREVIOUSLY DESCRIBED SPECIES OF SPIRORBIS, WITH DESCRIPTIONS OF NEW FORMS FROM THE ATLANTIC.

Spirorbis granulatus Linne 1767. pl. xl, fig. 24; pl. xlii, fig. 32.

This small species is well figured by Levinsen (1883, pl. iii, fig. 9; fig. 10 is a different species). It is very common on bryozoans (Celleporaria, Escharopsis, Porella, etc.) from the Grand Banks of Newfoundland, Gulf of St. Lawrence, and Greenland; though often larger and less regularly coiled it is readily distinguished by the three conspicuous thin lamella-like carinae. The name, however, has been erroneously applied to several other forms, as the following: S. granulatus Fabricius 1780 = violaceus Levinsen 1883; granulatus Montagu 1803 = sulcatus Adams 1797; granulatus Langerhans 1880, and probably also that of Saint-Joseph militaris Clarke 1868; granulatus Caullery and Mesnil 1897 = ?; granulatus Moore 1902 = triangular form of quadrangularis Stimpson 1853.

Spirorbis verruca Fabricius 1822, non Levinsen 1883. pl. xli, figs. 3, 12; pl. xliv, figs. 1, 16.

Numerous specimens of a good-sized, thick, opaque, white, sinistral tube with spreading base and small central cavity, attached to a valve of Chlamys islandicus from Greenland, are identified as S. verruca, as they seem to agree more closely with Fabricius’ description than the larger form figured by Levinsen (1883). The surface is ornamented with one, sometimes two, small rounded spiral threads, rarely sufficiently prominent to be termed carinae. In adults, at the upper angle of the inner or columellar margin, the edge of the aperture is tilted upward; sometimes the ends of the threads form obscure projections on the upper edge.

The calcareous plate on the operculum, which becomes a brood-pouch, can scarcely be distinguished from that of S. validus Verrill, but the collar setæ differ in being less numerous and in some having an obscure posterior notch.

Specimens on Notria tubes from Greenland, identified by Moore 1902, on examination prove to be the discoid form of S. validus V.

Spirorbis vitreus Fabricius 1780. pl. xli, fig. 14; pl. xlii, figs. 6, 7.

Some immature forms of this dextral hyaline species have a rounded thread or cingulum on the top of the whorls, ending at the aperture in a tooth-like projection.
Found on stones and shells from the Grand Banks of Newfoundland, and on a fragment of shell from Devonshire, England.

**Spirorbis cancellatus** Fabricius 1780. Pl. xxxix, fig. 36; pl. xl, fig. 27; pl. xlii, figs. 30–34.

A dextral, vitreous, grooved and carinated form, associated with numerous specimens of *S. sulcatus* Adams, is attached to a worn limpet shell from Birterbuy Bay, Ireland. Small notches along the edge of the base indicate the possibility of its proving to be an undeveloped or maturing specimen of *S. cancellatus* Fabr. not before recorded from Great Britain. It may be *S. conicus* Fleming (1825) which Mörch placed as a variety of *S. vitreus* Fabr.

**Spirorbis communis** Bosc 1802.

No satisfactory conclusion can be reached in regard to this species, owing to the very brief description and indefinite locality. The figure given by Bosc represents a regularly coiled sinistral form with smooth surface, similar to *S. spirorbis* Linné.

**Spirorbis corrugatus** Montagu 1803, *non* Caullery and Mesnil 1897.

On a stone from Birterbuy Bay, Ireland, are four species of *Spirorbis*. The most numerous form is of good size, sinistral, the last whorl usually covering all the others, forming a central pit; sometimes irregularly coiled, with the aperture turning upward. Surface in perfect condition, very lustrous and smooth, but as this epidermal layer is easily destroyed many of them have the surface roughened by numerous transverse lines, but no spiral ones. These apparently agree with Montagu's description. The dextral form sometimes having spiral lines, identified and figured by Caullery and Mesnil (1897) as this species, must be distinct, for which the name *pseudocorrugatus* is proposed. The form described and figured by Langerhans (1880) is also dextral.

**Spirorbis heterostrophus** Montagu 1803.

A regularly coiled, small, dextral form has the surface cut by grooves and carinae which increase with age, so that fully developed specimens are distinctly tricarinate, the entire surface often roughened by transverse lines. Another small dextral form, which is considered distinct, has two, three, or more rounded spiral threads and no grooves. This one does not appear to have been mentioned by Montagu or others. A third dextral form has a single dorsal carina and may prove to be *S. carinatus* Montagu or *S. minutus* Montagu.
**SABELLIDES AND SERPULIDES**

**Spirorbis carinatus** Montagu 1803.

As already stated (p. 241), there is considerable doubt in regard to this species. The form described by Fleming (1825) is certainly very similar to *S. quadrangularis* Stimpson, but it is not improbable that both species occur on the English coast. In the Yale University Museum are two unicarinate, regularly coiled forms, one dextral, attached to a valve of *Anomia* from Guernsey, England, and to a stone from Birterbuy Bay, Ireland, and the other sinistral, attached to a worn valve from England; neither is like the carinate, triangular, immature form of *S. quadrangularis* from Eastport, Maine, and from Greenland.

**Spirorbis sulcatus** Adams 1797; *S. granulatus* Montagu 1803, non Linné 1767. pl. xli, fig. 9; pl. xlIII, figs. 8, 19.

Attached to a *Haliotis tuberculata* from Guernsey, England, and to a worn limpet shell from Birterbuy Bay, Ireland, are numerous thick, more or less regularly spirally coiled, sinistral tubes, having a deep groove on top of the whorls, when adult, with a large rounded carina on each side, the inner one defining the small central cavity; in very large specimens another much shallower groove appears on the side of the whorl, with a much smaller carina or thread along its lower edge. The surface, when perfect, has considerable luster. This species is much larger and thicker than the dextral tricarinate form identified as *S. heterostrophus*, and is without question the *S. granulatus* Montagu 1803, non Linné 1767, and therefore must take the name *sulcatus*, used by Adams 1797 (Linnean Transactions, iii, p. 254), non Lamarck 1818.

By the use of potash solution the dried animals were taken from some of the tubes, and the calcareous plate on the operculum and the setæ were found.

**Spirorbis validus** Verrill 1874. pl. xxxvII, figs. 5, 6, 7, 8, 10, 32; pl. xlIV, figs. 11-14.

This, the largest of all species of *Spirorbis*, varies greatly in its manner of coiling, there being a marked contrast between the regular sinistral form figured by Levinsen as *S. verruca* Fabr. and others, where the whorls lie one above the other, forming a high irregular spiral. No difference, however, could be found in the essential characters of their animals. In all the specimens examined, the branchia number 13 (in very large adult forms Verrill counted 15) and all the setæ have long, slender, finely serrate, tapered blades.
Spirorbis stimpsoni Verrill 1879. Pl. xxxix, fig. 38; pl. xl, fig. 29; pl. xliii, figs. 20, 21, 22.

This species forms regularly coiled sinistral tubes with large central cavity, the aperture occasionally turned upward, the surface often roughened by growth lines and a small rounded median thread.

Spirorbis pusilloides nom. nov. for Mera pusilla Saint-Joseph 1894.

As the pusilla of Saint-Joseph is now referred to the genus Spirorbis, and as this specific name was used by Rathke in 1836 for a form from the Black Sea, S. pusilloides is proposed for Saint-Joseph's species.

Spirorbis pseudocorrugatus nom. nov. for S. corrugatus Caullery and Mesnil 1897, non Montagu 1803 (see p. 248).

Spirorbis foraminosus Bush 1904.

Tubes forming a good sized dextral discoid coil, the surface ornamented with 3 carinae, the median one the most prominent, on both sides of which the slightly concave surface is punctured by irregular minute holes or foramina apparently caused by the erosion of the epidermal layer; immature forms probably having the surface crossed by numerous transverse lines. The operculum, which is a brood-pouch, is elongated, cylindrical, filled with eggs, the calcareous plate a simple disk with flaring rim with large shield-shaped basal portion attached posteriorly to a secondary calcareous disk on the end of the operculum proper. Setae with simple tapered blades, those on the collar the broadest and more abruptly tapered than the others.

Spirorbis bellulus Bush 1904.

Tube dextral, regularly coiled, with small central cavity, the surface ornamented with 3, sometimes 4, unequal rounded threads, the one on the summit the most prominent. The calcareous plate on the operculum somewhat angular, with deep upright thickened rim. Setae with long slender tapered blades, those on the collar with comparatively coarse serrations.

Spirorbis dorsatus Bush 1904.

Tube dextral, regularly coiled, with a single high median ridge on the last whorl. No animal found.

Spirorbis argutus Bush 1904.

Tube sinistral, forming a low discoid coil with large central cavity, spreading around the base in a thin layer, the whorl rapidly enlarging and ornamented with one large median keel and numerous distinct
transverse lines. Calcareous plate on the operculum thin, disk-like, slightly thickened in the center. Setae with simple tapered blades.

**Spirorbis tubæformis** sp. nov. pl. xxxix, figs. 30, 32; pl. xlii, figs. 13, 14.

Small, opaque, white sinistral tubes common on Irish moss (*Chondrus*) from Long Island Sound, southern New England, at New Haven, Connecticut, closely resemble the dextral *S. sinistrorsus* common on lobsters from Cornwall, England, in the Yale University Museum. The central cavity is smaller than in *S. spirorbis* Linne, not showing so much of the earlier whorls, the last whorl being more spreading or trumpet-shaped. In the adult form, which is rarely found, the surface sometimes becomes roughened by irregular growth lines, and the whorls appear rounder and turn upward after the manner of *S. lucidus*, but in the opposite direction. Collar setae with fine serrate blades and coarser fin-like bases similar to those of *S. spirorbis*.

**Spirorbis evolutus** sp. nov. pl. xlii, figs. 20, 21, 22.

Smooth, opaque, rather fragile sinistral tubes are attached to the inside of the aperture of a shell (*Sipho*) from the Grand Banks of Newfoundland. The early whorls are coiled in a regular discoid form, from which the tube stretches out and becomes evolute, more or less irregularly curved, sometimes twisted, increasing abruptly in size and forming a long, somewhat trumpet-shaped portion. They are usually separated, but sometimes spread over one another. In the five specimens stained and mounted in glycerine, the number of branchiae is apparently 9, but this is impossible to determine with accuracy, as they have become much matted in preservation. The operculum is of the ordinary form, with the thin calcareous terminal plate having an unusually long, somewhat spreading basal portion. Body-cavity distended with well-developed eggs. Posterior portion very short, number of segments indeterminable; only a few setae and scarcely discernible uncini were visible. Setae of the collar fascicle slender, long, rounded at base, with faintly serrate edges, one or two with a slight posterior notch.

**Spirorbis formosus** sp. nov. pl. xxxix, figs. 18, 19; pl. xli, fig. 22; pl. xliii, figs. 18, 23, 25, 30.

Small, regularly coiled, dextral, yellowish tubes, very common on gulf-weed (*Sargassum*) from the Gulf Stream and Bermuda, where they are also found on shells, are ornamented on top with two or three,
often unequal, spiral threads or carinæ, the interspaces crossed by numerous raised transverse lines which extend over the side, and in fully developed specimens spread around the base. The operculum is furnished with a peculiar calcareous cylinder in which well-developed embryos, some with good sized setæ, have been found. Some specimens collected at Bermuda in February 1904, by Mr. Dwight Blaney, have two complete cylinders, one above the other, on the operculum; others have a single large cylinder filled with well-developed eggs. All the thoracic setæ have narrow tapered blades.

**Spirorbis mutabilis** sp. nov.

Smaller, more or less regularly coiled sinistral tubes are found on various shells at Bermuda, often with the preceding species.

The surface is usually but little roughened, but sometimes very faint spiral lines occur, and in rare instances, when the development has not been impeded, the surface is ornamented with two keels which define the flattened top, giving a four-sided appearance; sometimes the aperture is turned upward. The operculum is furnished with a thin, more or less concave calcareous plate with small base. Some of the opercula were filled with globular masses and others were of the ordinary form. In some instances egg-chains were found in the tubes along the dorsal furrow. The collar setæ have long, tapered, coarsely serrate blades with conspicuous fin-like bases.

**NOTES ON THE GENUS SPIORBIS, WITH A LIST OF DESCRIBED SPECIES.**

The genus *Spirorbis* seems to have been purposely avoided by most authors, little systematic work having been done since Mörch, in 1863, published the descriptions, with added notes, of all of the earlier described species, straightening out much of the confusion in their synonymy.

Levinsen, in 1883, was the first to make a thorough study of the northern species, by dissecting the animals, and has, by his excellent figures of their tubes and important collar setæ, done much toward rendering it possible to correctly identify them.

As little had been published in regard to the importance of the operculum, with its protective calcareous plate, in connection with the writer's study of the Alaska species, the animals of numerous Atlantic forms found along the coast from Greenland to Bermuda have been dissected with special reference to this character. The investigations were
completed before the valuable article on *Spirobranchus*, published by Caullery and Mesnil in 1897, could be consulted. It was found that these authors had made special and careful observations on the operculum, with their calcareous plates, of many species, giving excellent figures, as well as figures of the important collar setae. In connection with their studies of material obtained at the laboratories of St.-Vaast-la-Hougue on the English Channel, and from the French Expedition to Cape Horn, these authors also borrowed specimens from the Museum of Copenhagen (from Levinsen), the Paris Museum, and the Faculty of Science of Lyons, besides special species from Marenzeller and Marion, so that their list includes 27 species, 12 of which are described as new, and their results far exceed in value any hitherto published. Owing to the limited time allowed for the perusal of this paper, only the most important facts could be noted, and it has been found impossible to determine to what degree the following observations may be a repetition of those of Caullery and Mesnil.

In those species in which the embryos are developed in the tube, as in *S. spirorbis* Linné, *S. spirillum* Linné, *S. asperatus* sp. nov. etc., the operculum is used simply as an organ of protection in closing the aperture of the tube; while in others, as *S. granulatus* Linné, *S. validus* Verrill, *S. stimpsoni* Verrill, *S. quadrangularis* Stimpson, etc., it has an added purpose, by being differentiated into a thin-walled, pouch-like cavity in which the embryos are fully developed. It is protected on the end by a calcareous plate or cap, varying in form, having near its inner or ventral edge a more or less developed basal portion. In species where there is but a slight basal thickening, as *S. semidentatus* sp. nov., the plate appears to be more or less embedded in the operculum, and minute protozoans, sponges, etc., are often affixed to its exposed surface; but in others, where there is an elongated, more or less shield-shaped base, special muscles are joined to the free end, apparently governing the movement of the plate, as they appear to extend downward through the peduncle to the muscular layer of the body, such muscle fibers often remaining attached when the plate has been dissected. When the operculum becomes differentiated into a brood-pouch a larger basal portion develops, which is usually shallow behind and long in front, sometimes reaching nearly the depth of the operculum, forming a stiff wall, thus protecting the

1 Considerable difficulty was experienced in obtaining a copy of this article; as lack of time prevented application to the authors themselves, it was borrowed by Mr. Van Name, the Librarian of the University Library, from the Surgeon General's Office in Washington, D. C.
embryos. In some instances this appears to be simply an addition over or in front of the first base, and in others an entirely new plate develops, which pushes the primary one forward until it becomes entirely disconnected and ultimately lost. A series showing this interesting feature was found in *S. validus* V. (pl. xliv, fig. 14). In some instances this second base appears to be formed by a network of calcareous deposit over the surface of that portion of the operculum, and in others it seems to be composed of minute granules. In some instances the primary plate itself is repeated, as in *S. variabilis* sp. nov., where the calcareous disk is composed of two layers easily separable into two complete disks (pl. xliii, fig. 16), and in *S. abnormis* sp. nov., where there were three similar plates, attached one above the other, the operculum itself appearing to be divided into three chambers, the posterior one containing well-developed embryos (pl. xliii, figs. 24, 28, 29). In *S. formosus* sp. nov., where nearly the entire operculum becomes a calcareous cylinder, the primary base was seen inside the cylinder (pl. xliii, fig. 30), when this was severed from its peduncle, and another plate in process of development was found in the expanded end (pl. xliii, fig. 23), which apparently was to become another operculum; two complete cylinders have also been found attached one above the other. This and other instances where the brood-pouch, apparently having split along the back and discharged its embryos, was becoming torn away, revealing a calcareous disk beneath it, points to the fact that in *Spirobis* the animal has the power of renewing its operculum on the same side of the body, instead of forming a secondary one on the opposite side, as in *Serpula, Crucigera*, etc. Caullery and Mesnil found a close relationship between the direction of the coiling of the tube and the development of the animal; that all dextral forms had the operculum on the right side and all sinistral ones on the left side, presumably differentiated from the second branchia. It would therefore seem improbable that any species could turn in both directions, that is, have both a right and left form, an opinion held by some investigators; hence the direction of the coiling of the tube is of first importance in determining species.

The embryological development of a number of species has been studied by several authors — Pagenstecher 1862 (*S. pagenstecheri* Qtr. 1865); Agassiz 1866 + Willemoes-Suhm 1871 + Saint-Joseph 1894 + Schively 1897 (*S. spirorbis* L.); Claparède 1868 (*S. levis* Qtr.); Fewkes 1885 (*S. spirillum* L.); Saint-Joseph 1894 (*S. pusilloides* nom. nov.)—and hermaphroditism has been found to be the rule. Nearly all agree that the spermatozoa are carried in the posterior
SABELLIDES AND SERPULIDES

setigerous segments, some maintain that the ova are found only in the first two or three of these segments, others that they occur only in the middle or body-cavity, which ruptures along its convex side, permitting the eggs to escape into the tube, where they are developed. In preserved specimens of *S. spirorbis* strings or chains of embryos showing well-formed setae have been found lying along the back, apparently coming from an opening in the body-cavity just back of the thorax. In several specimens, when stained and mounted, eggs showing nucleus and nucleolus have been seen in both the body-cavity and (smaller ones) in the first few posterior segments, but no spermatozoa were noticed, the posterior segments being usually filled with minute granules (oil drops?), with the mucous glands on their dorsal surface very conspicuous, especially when eggs were found in the tube. Miss Schively, however, who carried on her investigations during two seasons, examining specimens from eight different localities in Vineyard Sound and Buzzard's Bay, states "that *S. borealis* has two breeding seasons. One of these extends from the middle of June to the middle of July; the other extends through the month of August. During the last two weeks of July no eggs were found either in the body-cavity or in the shell." "The eggs pass out through the operculum; its end bears a movable translucent plate of lime, etc." "The reproductive glands are arranged on either side of the intestinal canal near the stomach. Where the ova and sperm is developed is distinguished merely by the presence of the product. The eggs pass into the body-cavity and from here into the operculum, where they are fertilized and a capsule is secreted; from here they pass out through the opening of the operculum and are placed in the mid-dorsal furrow. The operculum does not serve for a brood-pouch as does that of *S. spirillum." She probably refers to the species studied by Pagenstecher in 1862, which he erroneously identified as *S. spirillum*, to which Quatrefages in 1865 gave the name *S. pagenstecheri*. In the many specimens recently examined, of *S. spirillum* Linné detached from kelp (*Laminaria*), chains of eggs have been found in the tube. This is supposed to be the species studied by Fewkes in 1885, as *S. borealis*; the *S. spirillum* of Agassiz (1866) is *S. borealis* Daudin = *S. spirorbis* Linné.

Saint-Joseph (1894) states that he found in *Mera pusilla* (*Spirorbis pusilloides* nom. nov.) not only well-developed embryos in the operculum, but large ova in the first two abdominal segments and spermatozoa in the following ones. In one instance only were spermatogonia and spermatozoa seen (see Addendum); but the other features were noted
in many of the species studied. In \textit{S. validus} collected the latter part of June, also in \textit{S. granulatus}, the embryos taken from the operculum had the setæ well developed, and each was partially concealed by a conspicuous white patch, which under pressure split into minute short rods, quickly destroyed by acid. The exact significance of this white patch has not been satisfactorily determined, owing to its being now noted, apparently for the first time, in preserved animals. It is a well-known fact that embryos developed in the tube of the parent, on escaping, immediately on reaching a suitable host, begin to build their tubes, so that it might be possible that these embryos, when the specimens were collected, were about escaping from the pouch, and that their growth or movements were not immediately interrupted and the lime was formed which would have constructed their tubes. On the other hand, the mass may cause the embryo to sink rapidly, enabling it more readily to find a host, as it must necessarily escape from the brood-pouch into the open sea, at some distance from a suitable object for attachment. Not until a series of animals has been properly prepared in sections, and a comparative study is made of many species, will it be possible satisfactorily to determine their internal structure. It is found in comparing the published results of the studies of isolated species that there are apparent contradictions, and important points remain unexplained.

Caullery and Mesnil, like Levinsen, found that the number of thoracic segments varied, sometimes increasing to 4 on one side; combining this fact with that of the development of the operculum on the right or left side, they divided the genus \textit{Spirobranchus} into new subgenera — \textit{Paradexiospira}, \textit{Dexiospira}, \textit{Paralceospira}, \textit{Laosphira} and \textit{Romanchella} — discarding all of Saint-Joseph's generic names, excepting \textit{Leodora}, which they thought might prove to be the same as the last, stating that they were unable to follow that author in referring the species to his six widely separated genera.

As it is impossible always accurately to determine the number of thoracic segments, often owing to the very poor condition of the animals in preservation, such a division, although of much interest, does not appear of any more practical value in determining the relationship of species than does the method adopted by Saint-Joseph. The analytical table of species given by these authors includes too many characters to be readily used.

Saint-Joseph (1894), in his analytical table for the Serpulas, makes the number and size of the teeth on the uncial plates of greatest importance. He seems, however, to have erred in describing and figur-
ing the uncial plates of *Spirorbis borealis* Daudin as having the lowest tooth larger than the others, as this does not appear to be the case in any of the species studied. The embedded portion does not extend to the end of the thicker surface plate, on which the teeth seem evenly spaced. He bases his subordinate divisions on the differences in form, not only of the collar setæ, but of all the others, with the result that species of *Spirorbis* are widely separated and referred to other genera, as instanced in the following:

*Spirorbis*, with *S. borealis* Daudin as type, is placed under his second grand division with *Filograna* Oken, *Salmacina* Claparède, and *Filogranula* Langerhans. *Spirorbis granulatus* Linné is referred to *Pileolaria* Claparède, type *P. militaris* Clap.; *S. pagenstecheri* Quatrefages to *Janna* gen. nov. as type; *S. corrugatus* Montagu and *S. lucidus* Montagu to *Circeis* gen. nov., type *C. armoricana* Saint-Joseph; *S. lavis* Quatrefages to *Leodora* gen. nov. as type.

It can be readily seen by this and a further study of the relative positions of these genera that such an arrangement can be adopted only by ignoring the generic importance, not only of the presence of a calcareous plate in the operculum, but also the number of thoracic segments.

The few odd setæ—long blades with deeply serrate (comb-like) ends, similar to those of *Apomatus*¹ Philippi 1844 (type, *A. ampulliferus*), and short setæ like those of *Salmacina* Claparède 1870 (type, *S. incrustans*)—said to be found on the second and third thoracic segments are also given generic value. In the large number of animals examined, however, only the long form has been noticed in the third fascicle, although in a few instances these varied in length in the same bundle, but they were not always found. Whether they simply failed to show in the mounting, or really do not always occur, or occurring only during the breeding season are easily lost, has yet to be determined; therefore it seems undesirable to make them of much importance. Caullery and Mesnil (1897) arrived at the same conclusion, and, finding it impossible to follow Saint-Joseph, discarded five of his generic names, but proposed other subgeneric ones based on different characters (see p. 256).

As the form of the superior collar setæ is of first importance in identifying species, and with care can be invariably determined even in very poorly preserved specimens, an attempt has been made to de-

¹ These are also very like some of the dorsal setæ found in *Amphithrite*, as figured by Saint-Joseph (1894).
vise a simple method of arranging the various species, based on this character. By comparing the different forms, which vary from narrow tapered blades to those having a conspicuous fin-like base, they are found to grade into one another, and fall into the following natural divisions or groups, to which apparently Saint-Joseph's names can be applied:

A. In the forms having the distinct fin-like base, the fin angular or rounded, there are apparent differences in the serrations, which are separable into two groups. In the first the serrations on the edge of the blade are comparatively fine and the spines on the fin usually much coarser (pl. xl, fig. 12). Taking *Spirorbis borealis* Daudin, now considered synonymous with *S. spirotobis* Linné, as the type species, there should be a few (3 to 5) odd setae with elongated fringed ends in the third fascicle of thoracic setae. This is *Spirorbis* in its strictest sense.

B. In the second form the serrations become very coarse on both the blade and fin (pl. xxxvii, fig. 24). As *militaris* Claparede falls into this group, it is equal to the genus *Pileolaria* Claparède + Saint-Joseph, which, according to the latter, has no odd setae.

C. The form with rounded fin gives rise to those in which the fin is defined only by a more or less definite notch, which entirely disappears, forming simple tapered blades (pl. xli, fig. 3). In this group are both *pagensteccheri* Quatrefages, referred to *Janua* by Saint-Joseph as type, and *pusillus* Saint-Joseph, referred to *Mera* as type. The first is described as having the odd setae of *Apomatus* on one or more segments, while the second has them on the third only, so that there seems to be no distinguishable difference between them, except in the form of the operculum. *Mera* therefore becomes synonymous with *Janua*, the name of this third group.

D. The form with angular fin gives rise to a simple blade, broadly angular at base, found in *armoricanus* Saint-Joseph, referred to *Circeis* as type (pl. xli, figs. 1, 2).

E. Instead of being angular, the blade becomes broadly rounded at base, as in *lavis* Quatrefages, referred by Saint-Joseph to *Leodora* as type. Caullery and Mesnil suggested the possibility of this proving synonymous with the following group.

F. The blades become long, narrow, regularly tapered, and similar in all three fascicles, as in *perrieri* Caullery and Mesnil, the type of *Romanchella* Caullery and Mesnil (pl. xxxvii, fig. 8).

None of these groups or divisions are sufficiently disconnected or distinct to give them generic (after Saint-Joseph) or subgeneric (after Caullery and Mesnil) value. But since the names have been proposed,
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they are retained only as sectional ones in the following table (p. 261), especially as setae of similar forms are found in genera which differ from Spirobus in the number of thoracic segments, in the form and substance of the plate in the operculum, and in some instances in lacking an operculum.

As a large number of species are known only by their tubes, the animals of comparatively few having been studied with reference to the form of their collar setae, two simple methods have been adopted in grouping them, as a possible aid to their correct identification; One based on a knowledge of the tube (see p. 260), and the other on the form of the superior collar setae (see p. 261).

Levinsen (1883) used the terms 'sinistral' and 'dextral' in grouping the northern species, but also retained (after Mörch) the substance of the tube as an equally important character. As this, however, is found to change sometimes with growth, and also to be more or less affected in preservation, it cannot always be defined with accuracy, and might prove misleading. Therefore the direction of the coil and the character of the surface of the tube are the only points considered in the first table.

To avoid repetition and confusion of names, a list of all the recognized species, as far as known, is given after the two tables. They are arranged chronologically, and with each is given its principal synonyms and reference to figures, also the principal localities at which it has been found. As the numerals used by Caullery and Mesnil in their recent and very important work (1897) show the arrangement of species in their subgeneric relation as well as to one another, this number is given after the names of these authors. Names with an asterisk show that the species has been studied and is in the Yale University Museum.

Of the 73 species cited, only 59 could be placed in the first table, although the position of some of these may be questioned, and but 41 in the second table. The necessary further study of the others may prove some of them to be but synonyms there being 14 species having the tube inadequately described and 32 about which nothing is apparently known of the animal.

1 Crystalline, vitreous, cretaceous, porcellanous, etc., have been used.
<table>
<thead>
<tr>
<th>Character of Surface of Tube</th>
<th>Spirorbis spirorbitis Linné (18)</th>
<th>Spirorbis claparedi C. &amp; M. (11)</th>
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</thead>
<tbody>
<tr>
<td>Tube sinistral.</td>
<td>communis Bosc.</td>
<td>nordenskjöldi Ehlers (surface?)</td>
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<tr>
<td></td>
<td>corrugatus Montagu non C. &amp; M.</td>
<td>similis sp. nov.</td>
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<td></td>
<td>chilensis Gay (surface?)</td>
<td>abnormis sp. nov.</td>
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<td></td>
<td>lavis Quatrefages.</td>
<td>inversus sp. nov.</td>
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<td>validus Verrill (17).</td>
<td>tubiformis sp. nov.</td>
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<td></td>
<td>mörchi Levinsen (27).</td>
<td>evolutus sp. nov.</td>
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<td></td>
<td>aggregatus C. &amp; M. (10).</td>
<td></td>
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<tr>
<td>Tube dextral.</td>
<td>Spirorbis spirillum Linné (4).</td>
<td>Spirorbis armoricanus Saint-Joseph (5)</td>
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<tr>
<td></td>
<td>sinistrorsus Montagu.</td>
<td>pusilloides nom. nov. (9).</td>
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<td></td>
<td>quadrangularis Stimpson.</td>
<td>asperatus sp. nov.</td>
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<td>malardi C. &amp; M. (12).</td>
<td>mutabilis sp. nov.</td>
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<td>lebruni C. &amp; M. (14).</td>
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<tr>
<td>Tube dextral.</td>
<td>Spirorbis vitreus Fabr. (2).</td>
<td>Spirorbis rugatus sp. nov.</td>
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<td>pseudocorrugatus nom. nov. (7).</td>
<td>incongruus sp. nov.</td>
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<td>semidentatus sp. nov.</td>
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<td></td>
<td>carinatus Montagu.</td>
<td>mediterraneus C. &amp; M. (19).</td>
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<tr>
<td></td>
<td>sulcatus Adams.</td>
<td>kahleri C. &amp; M. (22).</td>
</tr>
<tr>
<td></td>
<td>cornuarietis Philippi (26).²</td>
<td>bernardi C. &amp; M. (23).</td>
</tr>
<tr>
<td></td>
<td>stimpsonii Verrill.</td>
<td>argutus Bush.</td>
</tr>
<tr>
<td></td>
<td>beneti Marion (21).</td>
<td>variabilis sp. nov.</td>
</tr>
<tr>
<td></td>
<td>patagonicus C. &amp; M. (13).</td>
<td>linearis sp. nov.</td>
</tr>
<tr>
<td></td>
<td>heterostrophus Montagu.</td>
<td>dorsatus Bush.</td>
</tr>
<tr>
<td></td>
<td>violaceus Levinsen (3).</td>
<td>eximius sp. nov. (direction?)</td>
</tr>
<tr>
<td></td>
<td>marioni C. &amp; M. (6).</td>
<td>comptus sp. nov.</td>
</tr>
<tr>
<td></td>
<td>pagenstecheri Quatrefages (8).</td>
<td>tridentatus sp. nov.</td>
</tr>
<tr>
<td></td>
<td>foraminosus Bush.</td>
<td>formosus sp. nov.</td>
</tr>
</tbody>
</table>

¹ See pp. 236 and 262.
² See Addendum.
TABLE II.
BASED ON FORM OF SUPERIOR COLLAR SETAE.

A. Setæ having a long tapered blade preceded by a fin-like expansion.

*Spirorbis* Daudin 1800.
a. Serrations on the blade fine, usually much finer than on the fin.

*Spirorbis* Daudin 1800 st. s.

<table>
<thead>
<tr>
<th>Tube sinistral.</th>
<th>Tube dextral.</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirorbis spirorbis</em> Linné (18).&lt;sup&gt;1&lt;/sup&gt;</td>
<td><em>Spirorbis patagonicus</em> C. &amp; M. (13).</td>
</tr>
<tr>
<td><em>quadrangularis</em> Stimpson.</td>
<td><em>bernardi</em> C. &amp; M. (23).</td>
</tr>
<tr>
<td><em>stimpsoni</em> Verrill.</td>
<td><em>lineatus</em> sp. nov.</td>
</tr>
<tr>
<td><em>aggregatus</em> C. &amp; M. (10).</td>
<td><em>similis</em> sp. nov.</td>
</tr>
<tr>
<td><em>claparediei</em> C. &amp; M. (11).</td>
<td><em>tubaformis</em> sp. nov.</td>
</tr>
<tr>
<td><em>malardi</em> C. &amp; M. (12).</td>
<td></td>
</tr>
</tbody>
</table>

b. Serrations on the blade coarse, similar on fin.

*Pileolaria* Claparède 1870.

<table>
<thead>
<tr>
<th>Tube sinistral.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirorbis cornuarietis</em> (Philippi) (20).</td>
<td><em>Spirorbis beneti</em> Marion (21).</td>
</tr>
<tr>
<td><em>militaris</em> Claparède (24).</td>
<td><em>langerhansi</em> Claparède (24).</td>
</tr>
<tr>
<td><em>levinseni</em> C. &amp; M. (15).</td>
<td><em>variabilis</em> sp. nov.</td>
</tr>
<tr>
<td><em>mediterraneus</em> C. &amp; M. (19).</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tube dextral.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirorbis cancellatus</em> Fabr. (1).</td>
<td><em>Spirorbis semidentatus</em> sp. nov.</td>
</tr>
<tr>
<td><em>vilreus</em> Fabr. (2).</td>
<td><em>eximius</em> sp. nov. (direction?).</td>
</tr>
<tr>
<td><em>marioni</em> C. &amp; M. (6).</td>
<td><em>incongruus</em> sp. nov.</td>
</tr>
</tbody>
</table>

B. Setæ having the blade of two forms: with and without a shallow posterior notch.


<table>
<thead>
<tr>
<th>Tube sinistral.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirorbis verruca</em> Fabr. non Levinsen.</td>
<td><em>Spirorbis evolutus</em> sp. nov.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tube dextral.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirorbis pagenstecheri</em> Quatr. (8).</td>
<td><em>Spirorbis pusilloides</em> nom. nov. (9).</td>
</tr>
</tbody>
</table>

C. Setæ having the blade distinctly angulated at base.

*Circeis* Saint-Joseph 1894.

<table>
<thead>
<tr>
<th>Tube dextral.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirorbis spirillum</em> Linné (4).</td>
<td><em>Spirorbis armoricanus</em> Saint-Joseph (5).</td>
</tr>
<tr>
<td><em>violaceus</em> Levinsen (3).</td>
<td></td>
</tr>
</tbody>
</table>

D. Setæ having the blade broadly rounded at base.

*Leodora* Saint-Joseph 1894.

<table>
<thead>
<tr>
<th>Tube sinistral.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirorbis laevis</em> Quatrefages.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tube dextral.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Spirorbis pseudocorrugatus</em> nom. nov. (7).</td>
<td><em>Spirorbis rugatus</em> sp. nov.</td>
</tr>
<tr>
<td></td>
<td><em>comptus</em> sp. nov.</td>
</tr>
</tbody>
</table>

<sup>1</sup> See p. 258.
E. Setae having the blade regularly tapered.

*Romanchella* Caullery and Mesnil 1897.

Tube sinistral.

*Spirorbis validus* Verrill (17).

*Spirorbisasperatus* sp. nov.

*abnormis* sp. nov.

Tube dextral.

*Spirorbis foraminosus* Bush.

*Spirorbis formosus* sp. nov.

**SPECIES OF SPIRORBIS ARRANGED IN ORDER OF DATE OF PUBLICATION.**

An asterisk [*] after the name of a species indicates that specimens are in the Yale University Museum.

1760. *Spirorbis spirorbis* * Linné + Fabricius 1780 + Montagu 1803, in part, + Cuvier (figures). (See pp. 236 and 258.)

*borealis* Daudin 1800 + Mörch 1863 + Malmgren 1867 + Levinsen 1883 (figures) + Saint-Joseph 1894 (figures) + Caullery and Mesnil 1897 (18; figures) + ? Schively 1897 (embryology; figures).

*nautiloides* Lamarck 1818 + Willemoes Suhm 1871 (embryology; figures).

spirillum Agassiz 1866 (embryology; figures) *non* Linné.

Pl. XXXIX, fig. 34; Pl. XL, figs. 5, 6, 8, 12-15; Pl. XLI, figs. 15-19.

Northern waters, on stones and rock-weed (*Fucus*); on other hosts.


*borealis* Fewkes 1885 (embryology; figures) *non* Daudin 1800.

Pl. XXVII, fig. 8; Pl. XXXIII, fig. 15; Pl. XXXIX, figs. 21-23, 28; Pl. XL, fig. 7; Pl. XLI, figs. 1-5; Pl. XLI, figs. 9, 10.

Northern waters, very common, both Atlantic and Pacific; from Cape Cod, Massachusetts, coast of New England to Greenland, and from Bering Sea to California, from shallow water to 90 fathoms, on shells (*Buccinum, Sipho*, etc.), on algae (*Laminaria*, etc.), on bryozoans (*Cellularia, Crisia, Gemellaria, Bugula*, etc.), on hydroids (*Obelia, Salacia, Eudendrium, Sertularia, Thuiaria*, etc.), and on worm tubes (*Nothria, etc.*); England, on bryozoans (*Salicornaria*, etc.).


Pl. XL, fig. 24; Pl. XLI, fig. 32.
Northern waters, from Bay of Fundy, Grand Banks of Newfoundland, Gulf of St. Lawrence, and Greenland, on bryozoans (Celleporaria, Porella, Escharopsis, etc.).

1780. S. VITREUS* Fabricius + Mörch 1863 + Malmgren 1867 + Levinsen 1883 (figures) + Caullery and Mesnil 1897 (2; figures) + Moore 1902. (See p. 247.)
Pl. xli, fig. 14; Pl. xlii, figs. 6, 7.
Northern waters, from Grand Banks of Newfoundland, in 59 to 120 fathoms, on stones and shells (Sipho, Buccinum, etc.); Greenland, on shells (Chlamys islandicus), bryozoans, and worm tubes (Nothria, etc.); Devonshire, England, on shells.

1780. S. CANCELLATUS* Fabricius + Dawson 1860 (figures) + Mörch 1863 + Malmgren 1867 + Levinsen 1883 (figures) + Caullery and Mesnil 1897 (1; figures). (See p. 248.)
Pl. xxxix, fig. 36; Pl. xl, fig. 27; Pl. xlii, figs. 30–34.
Northern waters, Gulf of St. Lawrence, Grand Banks of Newfoundland to Greenland, on stones and shells (Chlamys islandicus); Birterbuy Bay, Ireland, on limpet shells.

1797. S. SULCATUS* Adams + Mörch 1863 (in synonymy). (See p. 249.)
granulatus Montagu 1803 non Linné 1767.
Pl. xli, fig. 9; Pl. xliii, figs. 8, 19.
England, on shells.

Indian Ocean, on marine plants and shells.

1802. S. COMMUNIS Bosc (figures) + Mörch 1863, non Chenu + Fleming 1825. (See p. 248.)
Open ocean, on Fucus.

1803. S. CARINATUS Montagu + Mörch 1863, non Lamarck 1818 + Levinsen 1883. (See p. 249.)
England, on stones and shells (Ostrea, Pinna, Trochus, Arca, etc.).

1803. S. CORRUGATUS* Montagu + Mörch 1863 + Saint-Joseph 1894 non Langerhans 1880 (figures) + Caullery and Mesnil 1897 (7; figures). (See p. 248.)
England and Ireland, very common on stones and shells, with Lepralia.

1803. S. HETEROSTROPHUS* Montagu (figure) + Mörch 1863. (See p. 248.)
England and Ireland, on stones and shells, with Lepralia.

1803. S. SINISTRORSUS* Montagu + Mörch 1863 (in synonymy) + Chenu (figure). (See p. 251.)
England, on lobsters.

1803. S. MINUTUS Montagu + Mörch 1863. (See p. 248.)
England, on calcareous alga (Corallina officinalis).
1808. S. Plicatus Montf. + Mörch 1863.¹

*Serpula rugosa* Chenu (figures) non Turton.

Mediterranean, very common on algae, crustaceans, etc.

1818. S. Tricostalis Lamarck + Mörch 1863 + Chenu (figure).

King George Sound (Port Rio Georges), western Australia.

1818. S. Lamellosus Lamarck + Mörch 1863 + Chenu (figure).

King's Island, Australia.

1822. S. Verruca * Fabricius + Mörch 1863 non Levinsen 1883 (figures) + Caullery and Mesnil 1897 (17) + Moore 1902. (See p. 247.)

Pl. xli, figs. 3, 12; pl. xlv, figs. 1, 16.

Greenland, on shells (*Chlamys islandicus*), and Grand Banks of Newfoundland, on stones.

1825. S. Montagu F. + Mörch 1863.

*Spirorbis* sp. Montagu 1803.

Guernsey, England, on shell (*Haliotis tuberculata*), very common.

1830. S. Antarcticus Lesson (figure) + Mörch 1863 + Chenu (figure).

Isle of Malouines, very common.

1830 and 1841. S. Ponticus Eichwald (figure) + Mörch 1863.

Black Sea, on *Fucus* and other algae.

1836. S. Fusillus Rathke + Mörch 1863 non Saint-Joseph 1894 + Caullery and Mesnil 1897 (9).

Black Sea, near Balaklava, on stones and shells (*Mytilus*).

1843. S. Zelandicus Gray + Mörch 1863.

Great Barrier Island, New Zealand, on shell (*Patella hookeri*).

1844. S. Cornuarietis * Philippi (figure) + Mörch 1863 + Marion and Bobretzki 1875 (figures) + Caullery and Mesnil 1897 (20).

Mediterranean, English Channel (coast of France), on stones and coralline (*Lithothamnion polymorphum*).


Chili.

1853. S. Quadrangularis * Stimpson + Mörch 1863. (See p. 241.)

*Fabricii* Malmgren 1867.

*Carinatus* Levinsen 1883 (figures) non Montagü 1803.

*Affinis* Levinsen 1883 (figure) + 1886.

*Granulatus* Caullery and Mesnil 1897, in part, + Moore 1902.

Pl. xxxix, fig. 37; pl. xl, figs. 10, 11, 21, 23, 26, 30; pl. xlii, figs. 23–29; pl. xliii, figs. 14, 15.

Northern waters, Atlantic and Pacific, on stones, shells (*Chlamys islandicus, Buccinum*, etc.), bryozoans, and worm tubes (*Nothria, Thelepus*,

¹This and other species said to be in the Museum of Paris and figured by Chenu, *Illustrationes de Conchylitoligae,* do not appear to have been mentioned by Caullery and Mesnil 1897.
Crucigera, etc.), from low water to 120 fathoms. Coast of New England, from Cape Cod, Massachusetts, to Bay of Fundy, Gulf of St. Lawrence; Grand Banks of Newfoundland, Greenland, and Alaska.

1860. S. Simplex Grube + Mörch 1863.

Mediterranean.

1863. S. Porosus Mörch + Chenu (figure).

Habitat?

1863. S. Incisus Mörch.

carinalus Lamarck 1818 + Chenu (figure) non Montagu 1803.

King's Island, Australia.

1863. S. Albus Mörch + Chenu (figure).

Sea of India.

1865. S. Pagenstecheri Quatrefages + ? Langerhans 1880 (figures) + ?

Saint-Joseph 1804 + ? Caullery and Mesnil 1897 (8; figures).

spirillum Pagenstecher 1862 non Linné 1760.

Cette, Gulf of Lyons, Madeira, Mediterranean; England?

1865. S. Lævis Quatrefages (figures) + Claparede 1868 (figures) + Saint-Joseph 1894.

Guettary, near Saint-Jean-du-Luz, Bay of Biscay.

1868. S. Militaris Claparede (figures) + Saint-Joseph 1894 + Caullery and Mesnil 1897 (24; figures).

granulatus Langerhans 1880 (figures) (testa Caullery and Mesnil 1897) + ? Saint-Joseph 1894 non Linné 1767.

France (English Channel), Madeira, Naples, on stones and coralline (Lithothamnion).

1874. S. Validus * Verrill. (See p. 249.)

verruca Levinsen 1883 (figures) + Caullery and Mesnil 1897 (17) + Moore 1902.

Pl. xxxvii, figs. 5–8, 10; pl. xliv, figs. 11–14.

Northern waters, on stones, shells (Chlamys islandicus, Sipho, Buccinum, etc.), and worm tubes (Nothria), from 25 to 67 fms.; La Have Bank, Halifax Harbor, Nova Scotia; Grand Banks of Newfoundland, and Greenland.

1879. S. Stimpsoni * Verrill. (See p. 250.)

nautiloides Stimpson 1853 + Verrill 1874 (figure) non Lamarck 1818.

pl. xxxix, fig. 38; pl. xl, fig. 29; pl. xliii, figs. 20–22.

New England coast, from Eastport, Maine, Bay of Fundy, to Massachusetts Bay, on stones and shells, from 10 to 160 fathoms.

1879. S. Beneti Marion (figures) + Caullery and Mesnil 1897 (21).

Marseilles, Gulf of Lyons, on crinoid (Antedon phalangium).

1883. S. Mörchii * Levinsen (figures) + Caullery and Mesnil 1897 (27). (See p. 240.)

Pl. xxxvii, figs. 15, 24; pl. xli, figs. 15, 16, 21, 24, 25; pl. xliv, figs. 20, 21.

Atlantic and Pacific; Grand Banks of Newfoundland and Greenland, on shells (Chlamys islandicus); Alaska, on worm tubes (Crucigera) and shells;
and Queen Charlotte Island, British Columbia, on shells (*Pachypoma gibberosum*).

1883. *S. violaceus* Levinsen (figures) + Caullery and Mesnil 1897 (3; figures). (See p. 242.)

granulatus Fabricius 1780 non Linné 1767.

Pl. xli, figs. 1, 2; pl. xlili, figs. 8–12.
Atlantic and Pacific; Grand Banks of Newfoundland and Greenland, on stones and shells (*Chlamys islandicus*); Alaska, on worm tubes (*Crucigera*) and shells; and Queen Charlotte Island, British Columbia, on shells (*Pachypoma gibberosum*).

1894. *S. armoricanus* Saint-Joseph (figures) + Caullery and Mesnil 1897 (5; figures).

? sinistrorsus Montagu 1803, in part.
France, on lobsters.

1897. *S. Marionii* Caullery and Mesnil (6; figures). (See p. 239.)

Pl. xxxix, figs. 26, 27; pl. xl, fig. 16.

La Paz, Lower California, to Mexico, on sea-urchins (*Cidaris thouarsi*), shells (*Crucibulum, Barbatia, Callopoma*, etc.), and other hosts.

1897. *S. aggregatus* Caullery and Mesnil (10; figures) + Ehlers 1901.
Patagonia, in masses.

1897. *S. claparedei* Caullery and Mesnil (11; figures) + Ehlers 1901.

Patagonia, on algæ and shells (*Modiolarca*).

1897. *S. malardi* Caullery and Mesnil (12; figures).

St. Vaast-la-Hougue, France, on shells.

1897. *S. patagonicus* Caullery and Mesnil (13; figures) + Ehlers 1901.

Patagonia, on nullipore.

1897. *S. lebruni* Caullery and Mesnil (14; figures) + Ehlers 1900 + 1901.

Patagonia, on sea-urchins (*Goniocidaris canaliculata*); Puerto Toro, from 20 to 25 fathoms.

1897. *S. levinseni* Caullery and Mesnil (15; figures) + Ehlers 1901.

Patagonia, Straits of Magellan.

1897. *S. perrieri* Caullery and Mesnil (16; figures) + Ehlers 1900 + 1901.

Patagonia, very abundant on sea-urchins (*Echinus margariticeus, Goniocidaris canaliculata*, etc.), on algæ (*Laminaria*, etc.), on shells (*Modiolarca fuegensis, Pecten flustris*, etc.); Punta Arenas, Puerto Churucca, from 20 fathoms, and Beagle Channel.

1897. *S. mediterraneus* Caullery and Mesnil (19; figures).

Mediterranean, on *Serpula* tubes.

1897. *S. kæhleri* Caullery and Mesnil (22; figures).

Mediterranean, on bryozoans.
1897. S. Bernardi Caullery and Mesnil (23; figures).
Probable origin Indian Ocean, on sea-urchin (*Cidaris metularia*).

1897. S. Langerhansi* Caullery and Mesnil (26; figures). (See p. 240.)
Panama to Central America, on sea-urchins (*Cidaris thouarsi*) and shells
(*Callopoma, Crucibulum, Barbata*, etc.).

1900. S. Nordenskjöldi Ehlers + 1901.
Punta Delgada, Patagonia.

1904. S. Foraminosus* Bush (figures). (See p. 250.)
Japan, on red algæ, in 34 fathoms.

1904. S. Bellulus* Bush (figures). (See p. 250.)
Japan, on pebbles and fragments of shells, in 63 to 75 fathoms.

1904. S. Dorsatus* Bush. (See p. 250.)
Japan, on fragments of shells, in 63 to 75 fathoms.

1904. S. Argutus* Bush (figures). (See p. 251.)
Japan, on red algæ, in 34 fathoms.

1904. S. Pseudocorrugatus nom. nov. (See p. 250.)
corrugatus Caullery and Mesnil 1897 (7; figures) + ? Langerhans
1880 non Montagu 1803.
Madeira and Gulf of Naples.

1904. S. Pusilloides nom. nov. (See p. 250.)
pusillus Saint-Joseph 1894 (figures) + Caullery and Mesnil 1897 (9;
figures) non Rathke 1836.
St.-Vaast-la-Hougue, France.

1904. S. Semidentatus* sp. nov. (See p. 237.)
pl. xxvii, figs. 7, 10; pl. xli, figs. 13, 17, 23, 26–30; pl. xliv, figs. 4, 5, 12.
Alaska (Sitka, Prince William Sound, and Unalaska Island), on rocks,
stones, and worm tubes (*Serpula* and *Crucigera*).

1904. S. Variabilis* sp. nov. (See p. 238.)
pl. xxix, fig. 3, a; pl. xxxix, figs. 24, 25; pl. xl, fig. 4; pl. xlvii, fig. 16; pl. xliv, fig. 17.
Alaska (Sitka), on rocks and shells.

1904. S. Eximius* sp. nov. (See p. 239.)
pl. xxxix, fig. 9; pl. xli, figs. 18, 20; pl. xlvii, figs. 6, 11, 17.
California (Pacific Grove), on worm tube (*Serpula*).

1904. S. Incongruus* sp. nov. (See p. 241.)
pl. xl, figs. 19, 20, 28.
Alaska (Prince William Sound), on worm tubes (*Serpula* and *Crucigera*).

1904. S. Lineatus* sp. nov. (See p. 242.)
pl. xxxix, fig. 29.
Alaska (Sitka and Prince William Sound), on shells and worm tubes.
1904. S. similis * sp. nov. (See p. 242.)
   pl. xxix, fig. 3, c; pl. xxxix, figs. 16, 31; pl. xl, figs. 9, 17, 18; pl. xlIII, figs. 27, 31.
   Alaska (Prince William Sound), on worm tubes (Crucigera).

1904. S. rugatus * sp. nov. (See p. 243.)
   pl. xxix, fig. 3, b; pl. xxxv, fig. 14; pl. xlIV, figs. 18, 19.
   Alaska (Sitka), on rocks.

1904. S. comptus * sp. nov. (See p. 244.)
   California, on algae.

1904. S. asperatus * sp. nov. (See p. 245.)
   pl. xxvIII, fig. 10; pl. xxx, fig. 4; pl. xli, figs. 4, 5, 6, 8, 10, 11, 19, 31, 32; pl. xlIII, figs. 1, 2, 3, 7, 13, 26.
   California (Pacific Grove), Alaska (Sitka and Prince William Sound), on shells and worm tubes (Crucigera).

1904. S. abnormis * sp. nov. (See p. 245.)
   pl. xxxix, fig. 35; pl. xl, figs. 1, 2; pl. xlIII, figs. 24, 28, 29.
   Alaska (Sitka), on rocks.

1904. S. inversus * sp. nov. (See p. 246.)
   Australia (Port Phillip, Victoria), on bryozoa (Menipea cirrata?).

1904. S. tridentatus * sp. nov. (See p. 246.)
   Australia (Port Phillip, Victoria), on bryozoa (Menipea cirrata?).

1904. S. tubiformis * sp. nov. (See p. 251.)
   pl. xxxix, figs. 30, 32; pl. xliI, figs. 13, 14.
   Long Island Sound, on Irish moss (Chondrus).

1904. S. evolutus * sp. nov. (See p. 251.)
   pl. xliI, figs. 20–22.
   Grand Banks of Newfoundland, on shells (Sipho).

1904. S. formosus * sp. nov. (See p. 252.)
   pl. xxxix, figs. 18, 19; pl. xli, fig. 22; pl. xlIII, figs. 18, 23, 25, 30.
   Gulf Stream and Bermuda, on gulf-weed (Sargassum), etc.

1904. S. mutabilis * sp. nov. (See p. 252.)
   Bermuda, on shells.
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ADDENDA.

The following notes, which with a few exceptions relate to forms previously mentioned, were made after the foregoing pages were set up, therefore too late to have them inserted in their proper places.

Genus *Metalaonome* nov. (See pp. 178 and 192.)

Branchial lobes elongated ventrally and spirally coiled only in retraction. Interbranchial membrane inconspicuous or wanting. Collar four-lobed, with ends widely separated on the back. Superior setæ and inferior collar setæ regularly tapered blades; inferior setæ back of collar, short ob lanceolate. Avicular uncini only in all the tori of the body.

Lo Bianco (1893) described the species *Bispira mariae* as having the elongated branchial lobes forming spirals of two or three turns, but in the figure he has represented them as simple, similar to those of *Sabella*, so that probably, like species of that genus, this one has them spiral only in retraction. The branchiae, numbering between 80 and 90, are very long (about one half as long as body) and slender, with seven series of dark color spots forming bands.

The body is short and stout, of about 80 segments, of which 8 belong to the thorax.

The collar is four-lobed, open on back with widely separated ends. Setæ on the collar and superior setæ on the other thoracic segments very narrow, regularly tapered blades; inferior setæ back of collar, short and broad ob lanceolate. Avicular uncini only in all the tori of the body.

Genera *Schizocraspedon* and *Glossopsis* nov. (See pp. 179 and 225.)

Grube (1878) placed his two new species *H. furcifera* and *H. minax* in the genus *Hydroides*, with which they have strong affinities, but the very remarkable development of the opercula, described on p. 225, would at once distinguish them from typical species of that genus; hence they have been respectively referred to the two new genera *Schizocraspedon* and *Glossopsis*.

Genus *Protoplacostegus* nov. (See pp. 179 and 226.)

McIntosh (1885) described and figured his species *Placostegus mörchii* as having a primary, somewhat cup-shaped operculum with horny plate on the end of one branchia and an undeveloped secondary one on the end of another branchia. The setæ short and broad at base with tapered blades (no collar setæ were found). Uncini with few (6
or 7) serrations, the lowest large and fang-like. As all of these characters differ greatly from those of *Placostegus tridentatus*, the type of the genus *Placostegus* (p. 221), the new genus *Proplacostegus* is therefore proposed for McIntosh's species.

**Genus Spirorbis** Daudin. (See p. 247.)

On several specimens of *Margaritifera*, recently received from Beirut, Syria, are numerous tubes of three species of *Spirorbis*. One sinistral form is moderately large, regularly coiled, the surface more or less roughened by irregular concentric growth lines but with no distinct sculpture. The animals examined have a calcareous plate in the operculum, shallow, oblique, cup-shaped with broad, short base, with a conspicuous spine at the back, not differing from that figured by Marion and Bobretzky (1875) for *Spirorbis coronarietis* of Philippi. The collar setae have coarsely serrate blades with coarse fin-like bases. On comparing this with the figure given by Philippi (1844) there was found a decided difference in the size and position of the basal spine, that of Philippi's species being figured as on the front just below the deepest part of the cup, while in the present form and in that figured by Marion and Bobretzky the spine is at the back and rudder-like in form. Philippi also described his species as having the tube concentrically striated, so that there may be some confusion in the identification of the species, and that described and figured by Marion and Bobretzky may be distinct. If, however, upon further study it proves to be the same as Philippi's, this species is erroneously placed in the table on p. 260 and should be transferred to the first group with species whose tubes are unsculptured, the growth lines not being treated as such.

Another animal has the calcareous plate of the operculum composed of two distinct pieces. The end one is a similar, oblique, shallow cup with spreading base, which has an elongated, narrow, median portion thickened along its back, forming three conspicuous serrations; posterior to and in front of the base of this end piece is a large concavo-convex, shield-shaped one which is entirely detached from it and is very unlike the comparatively thin, firm, elongated, shield-shaped protection wall found in the opercula which form brood-pouches. The collar setae are coarsely serrate with basal fin. The tube is sinistral, of good size, with the surface roughened by faint spiral threads and irregular growth lines. Smaller dextral tubes have the surface ornamented with definite spiral threads crossed by distinct concentric lines. The animal has but a simple calcareous disk in the operculum and the
collar setæ have angular tapered blades. As the article on *Spirorbis*, by Caullery and Mesnil, could not be consulted, these two species could not be identified. The first may be *S. beneti* Marion 1875.

In the posterior segments of one animal of *Spirorbis mutabilis* were clusters of spermatogonia and isolated spermatozoa, also good-sized eggs with large nuclei, this being the only instance noted among the many animals studied. (See pp. 252 and 255.)

Genus *Rhodopsis* nov. (See pp. 179 and 223.)

Tube small, calcareous, hair-like, more or less sigmoid, usually attached its entire length to the under surface of the common hat-coral (*Agaricia fragilis*) from Bermuda.

Animal minute, deep yellow, with the operculum protected by a disproportionately large, chitinous disk covered with numerous unequal irregular light horn-colored processes or spines arranged in the form of a rosette—hence the name.

Branchiae not determined, appearing as a mass back of the operculum, in the six specimens examined.

Eyes two, conspicuous red, showing beneath the collar.

Thorax short, the segments defined on each side by the 6, in one instance 5, small fascicles of setæ at the end of the 6 series of uncini, there being no separate fascicle on the collar. Body cavity elongated, showing dark brown intestinal tract. Posterior portion usually mutilated; when perfect, ornamented along the dorsal (?) area by long irregular ribbon-like appendages somewhat resembling the spines on the operculum; the elongated segments (about 5) defined on the opposite (ventral ?) area by transverse lines, a series of uncini on the middle of each; but no setæ were seen.

Thoracic setæ bent at the base of the broad abruptly tapered blade. Uncial plates (seen in profile) similar to those of *Filograna*, with about ten rather blunt appressed teeth, the lowest larger than the others; seen in front the broad tapered face has several alternating rows of minute pointed teeth. On the abdomen the uncini were seen only in a front view; the face is broad, of uniform width, and no serrations could be made out even with the 1⁄10 oil immersion objective.

*Rhodopsis pusillus* sp. nov. (See pp. 179 and 223.)

*Type locality.* — Bermuda.

Numerous small round tubes of uniform diameter, with both ends open, resembling fine wavy white hairs are found scattered over the under surface of the common hat-coral (*Agaricia fragilis*).
They are more or less sigmoid, either isolated or in masses, usually attached their entire length but when too crowded lifting themselves outward, forming a free end. Their surface is roughened by unequal concentric growth lines and they are opaque except for a very small semitransparent portion which in dried specimens is usually about the middle, revealing the position of the minute yellow animal.

Length varying from 5–8 mm.; diameter about $\frac{1}{3}$ mm.

These tubes were supposed to belong to some species of Filograna; the animals, however, after treatment with potash solution, were found to differ from those of that genus in possessing an operculum. This is remarkable for the form, size, and arrangement of the spine-like processes covering the thin chitinous disk which protects its end. They are long, blunt, light horn-color, differ greatly in size and form, and appear to be arranged in three alternating series forming a rosette; those of the outer and middle series being very irregular in outline, differing greatly in number and position of the irregularities; those of the inner series more numerous (about 24), smaller, simple, tapered and obliquely truncated.

No setæ were found on the collar, which is apparently without incisions or clefts, shallow across the back, deep along the sides and in front with angular dorso-lateral corners.

Thoracic segments defined only by the 5 or 6 series of uncini and small fascicles of setæ. Abdomen with uncini only, apparently arranged in a single series, along the median area. The surface on the opposite portion of the body covered with long unequal ribbon-like processes resembling in form the spine-like ones on the opercular plate.

Length of the largest perfect animal $\frac{3}{5}$ mm.

Genus Josephella Caullery and Mesnil (?). (See p. 226.)

Tubes similar to those given above as belonging to Rhodopsis pusillus from Bermuda were found on Margaritifera from Beirut, Syria, but the animal is very dissimilar, being elongated with a simple operculum on which the chitinous plate has a deep erect transparent rim strengthened on its upper surface by long, tapered spine-like processes often with secondary spinules. There are 5 thoracic fascicles of tapered setæ and 4 series of uncini; on the following segments the tori with a few uncini and one very slender tapered seta are well separated along the middle region of the body, but more crowded posteriorly; the caudal portion was not found. The setæ below the collar fascicle are bent at the base of the blade and the uncini have a com-
paratively few unequal serrations the lowest one long and fang-like when seen in profile, but in a front view the broad surface has three or four alternating series of slender teeth. With the exception of the operculum these characters seem to agree with those of *Josephella marenzelleri* Caullery and Mesnil (p. 226); the operculum is described by these authors as being borne on the end of a branchia and as having some calcareous deposit; the Mediterranean species may be immature and a fully developed operculum might have some lime deposit. The tube recalls that of *Filograna*, one species of which (*F. corallifica* Pallas 1766) is given by Mörch, 1863, as from the Mediterranean; since no further mention has been found of any similar form, the species, notwithstanding the fact that the operculum appears also to differ in having a definite peduncle, is referred to *Josephella*, as *J. humilis*, but with considerable doubt.
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PLATE XXI.

Fig. 1. *Eudistyliia gigantea* sp. nov., p. 210. Lateral view, $\times \frac{1}{2}$.

2. Opposite view of same specimen.


4. Lateral view of same specimen, about natural size.
ALASKA ANNELED S
PLATE XXII.

Fig. 1. *Myxicola glacialis* sp. nov., p. 218. Lateral view of long slender form, $\times \frac{3}{4}$.
2. *Eudistylia tenella* sp. nov., p. 213. Ventral view, $\times \frac{4}{3}$.
3. Opposite view of same specimen.

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PLATE XXIII.

2. *Schizobranchia concinna* sp. nov., p. 208. Dorsal view of type, × ½.
3. Ventral view of same specimen.
5. Lateral view of same specimen.

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PLATE XXIV.

Fig. 1. *Schizobranchia insignis* sp. nov., p. 206. Ventral view, \( \times 1 \).
2. Dorsal view of another specimen.
3. *Schizobranchia nobilis* sp. nov., p. 207. Ventral view, \( \times 1 \).
4. *Eudistylia abbreviata* sp. nov., p. 212. Lateral view, \( \times 1 \).
PLATE XXV.

Fig. 1. *Myxicola glacialis* sp. nov., p. 218. Lateral view, $\times 3$.
2. Lateral view of another specimen.
5. *Crucigera irregularis* sp. nov., p. 234. Lateral view, $\times 3$.

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PLATE XXVI.

Fig. 1. _Myxicola conjuncta_ sp. nov., p. 217. Lateral view, slightly enlarged.
2. _Sabella elegans_ sp. nov., p. 194. Lateral view, $\times 3$.
4. Branchiae: _a, Myxicola conjuncta_ sp. nov., p. 217; _b, Myxicola glacialis_ sp. nov., p. 218; both $\times 5$.

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PLATE XXVII.

Fig. 1. *Schizobranchia insignis* sp. nov., p. 206. Lateral view of young specimen in which the branchiae are being repaired from injury, × 2.


4. Dorsal view of same specimen.

5. Portion of two branchiae, × 4.


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PLATE XXVIII.

1. *Schizobranchia dubia* sp. nov., p. 208. Lateral view, $\times 3$.
2. *Schizobranchia concinna* sp. nov., p. 208. Dorsal view of anterior portions of a medium sized specimen, $\times$ about 3.
4. Another branchia with short terminal filament, $\times$ about 2.
7. *Schizobranchia nobilis* sp. nov., p. 207. Branchia, $\times$ about 2.
8. *Parasabella maculata* sp. nov., p. 201. Lateral view, $\times$ about 2.
9. Ventral view of same specimen.

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PLATE XXIX.

Fig. 1. *Schizobranchia dubia* sp. nov., p. 208. Dorso-lateral view, ×5.

2. *Serpula splendens* sp. nov., p. 230. Dorsal view of anterior portion, showing both primary and secondary operculum, ×2.


6. *Eudistylia polymorpha* (Johnson), p. 214. Anterior portion of specimen from Victoria, British Columbia, ×4: a, cut dorso-ventrally, to show the spiral branchial lobe; b, the other half cut laterally, to show height of spiral with branchial membrane.

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PLATE XXX.

Fig. 1. *Chone teres* sp. nov., p. 215. Two views of the type, × 2.

2. *Serpula splendens* sp. nov., p. 230. Lateral view of a specimen, showing a portion of the tube covered with tubes of *Spirobis* and *Hyalopommatopsis*, × 2.

3. Opposite view of another specimen, × 2.


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HELOTYPE CO., BOSTON.
PLATE XXXI.

Fig. 1. *Crucigera formosa* sp. nov., p. 233. Dorso-lateral view of type, ×3.

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HELIOTYPE CO., BOSTON.
PLATE XXXII.

Fig. 1. *Eudistylia gigantea* sp. nov., p. 210. Seta from abdomen, about \( \frac{1}{3} \) view.
2. Pennoned seta, from a thoracic torus of another specimen, back view.
3. Inferior thoracic seta below the collar, from the same specimen as fig. 1, about \( \frac{1}{3} \) view.
4. Inferior seta from the collar fascicle of the same specimen as fig. 1, about \( \frac{1}{3} \) view.
5. Another seta from the same fascicle, more turned.
6. Inferior seta from collar fascicle of type, nearly back view.
7. Superior seta from the same fascicle, side view.
8. Inferior thoracic seta below collar of type, back view.
11. Inferior thoracic seta from the same specimen as fig. 3.
12. Avicular uncinus from a caudal torus of type.
13. Avicular uncinus from a thoracic torus of type.
14. Pennoned seta from same torus, in profile.
17. Pennoned seta from same torus, in profile.
19. Seta from abdomen of type.
20. Superior seta from fourth thoracic segment of type.
22. *Eudistylia plumosa* sp. nov., p. 212. Avicular uncinus near dorsal end of same thoracic torus as fig. 15.
24. Avicular uncinus from abdominal torus of same specimen as fig. 1.
25. Inferior thoracic seta below collar of same specimen as fig. 2.
26. Superior seta from fourth thoracic segment of type.

Figures 1, 4, 5, 6, 7, 9, 10, 19, 20 are by A. H. Verrill, \( \times 196 \); the others, by the author, \( \times 212 \).
PLATE XXXIII.

Fig. 1. *Eudistylia abbreviata* sp. nov., p. 212. Inferior seta from collar fascicle, nearly back view.

2. Superior seta from the same fascicle, in profile.


8. *Parasabella maculata* sp. nov., p. 201. Seta from collar fascicle, in profile.


11. *Schizobranchia affinis* sp. nov., p. 209. Inferior seta from same fascicle as fig. 9, different position.


21. Avicular uncinus from abdominal torus.

22. *Schizobranchia nobilis* sp. nov., p. 207. Avicular uncinus from thoracic torus of a young specimen from Dutch Harbor.


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PLATE XXXIII—Continued.

Fig. 26. *Eudistylia intermedia* sp. nov., p. 214. Avicular uncinus from abdominal torus of specimen from Pacific Grove, California.


28. *Eudistylia intermedia* sp. nov. Pennoned seta from thoracic torus.

29. *Sabella leptalea* sp. nov. Pennoned seta from a thoracic torus, different position from fig. 27.


32. *Sabella formosa* sp. nov., p. 196. Pennoned seta from thoracic torus.

33. *Parasabella maculata* sp. nov., p. 201. Inferior seta from same thoracic segment as fig. 12, different view.

34. *Parasabella media* sp. nov., p. 200. Seta from collar fascicle, about ¾ view.

35. Inferior seta from fourth thoracic segment, back view.

36. Superior seta from same fascicle, in profile.

Figures 1, 2, 21, 23, 25, 34, 35, 36 are by A. H. Verrill, × 222. The others, by the author, × 230, except figure 15, × 37.
Fig. 1. *Sabella elegans* sp. nov., p. 194. Seta from collar fascicle, nearly back view.
2. *Parasabella maculata* sp. nov., p. 201. Superior seta from fourth thoracic fascicle, in profile.
4. *Sabella elegans* sp. nov., p. 194. Inferior seta from fourth thoracic fascicle.
5. Superior seta from same fascicle.
7. Seta from collar fascicle.
8. Superior seta from fourth thoracic fascicle.
9. Inferior seta from same fascicle.
17. *Schizobranchia concinna* sp. nov., p. 208. Avicular uncinus from abdominal torus.
18. Avicular uncinus from thoracic torus, slightly turned.
20. Seta from abdomen.

Figures 1, 3-10, 14, 19, 21 are by A. H. Verrill, × 196. The others, by the author, × 212.

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PLATE XXXV.

Fig. 1. *Schizobranchia nobilis* sp. nov., p. 207. Inferior thoracic seta below collar, of type.
3. *Schizobranchia nobilis* sp. nov., p. 207. Seta from abdomen of type.
4. Pennoned seta from thoracic torus of type.
5. Avicular uncinus from thoracic torus of another specimen.
6. Pennoned seta from same thoracic torus.
8. *Schizobranchia nobilis* sp. nov., p. 207. Inferior seta from thorax of type.
11. Inferior thoracic seta from same specimen as fig. 5.
12. *Schizobranchia insignis* sp. nov., p. 206. Superior thoracic seta below collar, same specimen as fig. 2.
13. Seta from abdomen of same specimen.
15. *Schizobranchia insignis* sp. nov., p. 206. Inferior thoracic seta from same specimen as fig. 2.
16. Another inferior seta from same specimen.
17. *Schizobranchia concinna* sp. nov., p. 208. Avicular uncinus from thoracic torus.
20. Beaked seta from thorax of same specimen.
22. *Eudistylia tenella* sp. nov., p. 213. Avicular uncinus from abdominal torus.
23. *Schizobranchia nobilis* sp. nov., p. 207. Superior seta from collar fascicle.
25. *Sabella formosa* sp. nov., p. 196. Inferior seta from thorax of same specimen as fig. 7.
26. *Schizobranchia insignis* sp. nov., p. 206. Avicular uncinus from thoracic torus of same specimen as fig. 2.
27. Avicular uncinus from abdominal torus of same specimen.
29. *Eudistylia intermedia* sp. nov., p. 214. Pennoned seta from same torus as fig. 21.
30. *Sabella formosa* sp. nov., p. 196. Superior seta from thorax of same fascicle as fig. 25.

Figures 3, 7, 8, 12, 13, 15, 16, 23, 24, 25, 30 by A. H. Verrill, × 196; the others, by the author, × 212, except figure 14, × 35.
PLATE XXXVI.

Fig. 1. \textit{Schizobranchia dubia} sp. nov., p. 208. Pennoned seta from thoracic torus, back view.

2. Avicular uncinus from same torus.
3. Another pennoned seta from thorax, nearly side view.
5. Another seta from collar fascicle.
6. Seta from fourth thoracic fascicle.
7. Pennoned seta from a thoracic torus.
8. Avicular uncinus from an abdominal torus, in profile.
9. Another from same torus, nearly front view.
10. Avicular uncinus from thoracic torus.
11. Pennoned seta from thoracic torus.
12. \textit{Parasabella maculata} sp. nov., p. 201. Avicular uncinus from an abdominal torus.
14. Pennoned seta from a thoracic torus (no potash used).
15. \textit{Parasabella maculata} sp. nov., p. 201. Pennoned seta from a thoracic torus.
16. Avicular uncinus from a thoracic torus.
17. \textit{Schizobranchia dubia} sp. nov., p. 208. One of the shorter or inferior setae from collar fascicle, back view.
18. Seta from the abdomen, back view.
19. One of the longer or superior setae from the collar fascicle, in profile.
20. Side view of one of the superior setae commencing on the second thoracic segment.
22. An abdominal seta, in profile.
23. \textit{Pseudopotamilla debilis} sp. nov., p. 204. Inferior thoracic seta below collar, from specimen from Pacific Grove, California, about \(\frac{3}{4}\) view.
24. Another from the same fascicle, different position.
26. \textit{Pseudopotamilla debilis} sp. nov., p. 204. Avicular thoracic uncinus from specimen from Pacific Grove, California.
28. Seta from abdomen, in profile.
29. One of the longer inferior oblongate setae from the fourth thoracic fascicle.
30. One of the shorter, more nearly spatulate setae from the same fascicle.
31. Pennoned seta from the thoracic torus, different position.
32. \textit{Sabella formosa} sp. nov., p. 196. Pennoned seta from thoracic torus, different position.
33. \textit{Aspeira modesta} sp. nov., p. 202. Superior lanceolate seta from the fourth thoracic fascicle, back view.
34. Avicular uncinus from an abdominal torus.
35. Avicular uncinus from a thoracic torus.

Figures 4-6, 25, 27-30, 32-35 by A. H. Verrill, \(\times 295\); the others, by the author, \(\times 300\).

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PLATE XXXVII.

**Fig. 1.** *Protula atypha* sp. nov., p. 228. Seta from abdomen of specimen from Pacific Grove, California.

2. Front view of thoracic uncinus apparently without serrations.


4. *Protula atypha* sp. nov., p. 228. Side view of another uncinus from sixth thoracic torus.


6. A simple curved seta from same region.

7. Collar seta showing imperfection in margin.

8. Collar seta from another specimen.


14. Another, showing slight variation.


17. Seta from abdomen, partly turned.

18. Bayonet seta from thorax.

19. Superior thoracic seta below collar.

20. Inferior thoracic seta below collar.

21. Hooked thoracic seta from fourth segment.

22. Abdominal uncinus.

23. Another, showing variation.


27. Abdominal uncinus.


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PLATE XXXVII — Continued.

**Fig. 29.** *Pseudopotamilla oculifera* (Leidy), p. 204. Inferior thoracic seta from specimen from Atlantic Ocean, back view.

**30.** *Parasabella media* sp. nov., p. 200. Pennoned seta from thorax, back view.

**31.** *Serpula splendens* sp. nov., p. 230. Front view of thoracic uncinus.

**32.** *Spirobis validus* Verrill, p. 249. Odd seta from third thoracic fascicle of specimen from Grand Banks.

**33.** *Sabella elegans* sp. nov., p. 194. Another pennoned seta from thoracic torus, back view.

**34.** *Spirobranchus incrassatus* (Kröyer), p. 236. Thoracic seta.

Figures by the author: 2, 4, 26, 27, 31, \( \times 330 \); 3, 9, \( \times 50 \); the others, \( \times 295 \).
PLATE XXXVIII.

**Fig. 1.** *Myxicola conjuncta* sp. nov., p. 217. Seta from thorax, side view.
2. Another seta from a thoracic fascicle, side view.
3. Only hooked seta found on sixth thoracic segment.
4. Dark, sharply pointed, spear-shaped seta from eighth thoracic segment.
5. Seta from a thoracic fascicle, back view.
7. Only hooked seta found on seventh thoracic segment.
8. Only hooked seta found on fourth thoracic segment, more turned.
9. Dark spear-shaped seta from eighth thoracic segment, more blunt than fig. 4.
10. Uncial plate from abdomen.
11. Another, showing variation in form.
14. Another, showing variation in form.
15. One of the 4 or 5 hooked setae from sixth thoracic segment.
16. Another from seventh thoracic segment, more turned.
17. *Myxicola affinis* sp. nov., p. 218. Uncial plate from abdomen of specimen from Pacific Grove, California.
18. Another, showing variation in form.
19. Hooked seta from thorax.
20. Another, different view.
22. Another from same segment, different view.
24. *Myxicola steenstrupi* Kröyer. Seta from thorax of same specimen as fig. 13, nearly back view, similar to those on abdomen.
25. *Myxicola glacialis* sp. nov., p. 218. Seta from second thoracic segment of same specimen as fig. 12, back view.
26. Seta from first thoracic segment of same specimen, back view.
27. Seta from abdomen of same specimen as fig. 23, back view.
28. Abdominal seta from same specimen.
29. Seta from thorax of same specimen, back view.
30. Sharp spear-shaped seta from thorax of same specimen.
31. One of 4 hooked setae from third thoracic segment of same specimen as fig. 12.
32. Blunter spear-shaped seta from thorax of same specimen as fig. 30.

All the figures by the author, × 530.
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PLATE XXXIX.

Fig. 1. **Crucigeria irregularis** sp. nov., p. 234. Collar seta from type.
2. Uncial plate from thorax.
3. Uncial plate from abdomen.
4. Seta from abdomen.
5. Another uncial plate from thorax.
6. **Crucigeria formosa** sp. nov., p. 233. Uncial plate from thorax of type, showing abnormal development.
7. Abdominal uncinus, front view.
9. **Spirorbis eximius** sp. nov., p. 239. Caudal seta from specimen from Pacific Grove, California.
10. **Crucigeria formosa** sp. nov., p. 233. Collar seta.
11. Abdominal uncinus.
14. **Crucigeria formosa** sp. nov., p. 233. Another uncinus from thorax, more normally developed than fig. 6.
16. **Spirorbis similis** sp. nov., p. 242. Seta from second thoracic fascicle.
18. **Spirorbis formosus** sp. nov., p. 251. Collar seta.
19. Another, from different specimen.
22. Capillary seta from thorax of a specimen from Pacific coast.
23. Collar seta from another specimen from Atlantic coast.
24. **Spirorbis variabilis** sp. nov., p. 238. Collar seta.
25. Another, showing variations in serrations.
26. **Spirorbis marioni** Caullery and Mesnil, p. 239. Nearly front view of operculum, showing calcareous plate of specimen from Mexico.
27. Side view of same.
30. **Spirorbis tubaformis** sp. nov., p. 251. Seta from second thoracic fascicle of specimen from Long Island Sound.
31. **Spirorbis similis** sp. nov., p. 242. Collar seta from immature specimen.
32. **Spirorbis tubaformis** sp. nov., p. 251. Collar seta from same specimen as fig. 30.
33. **Serpula splendens** sp. nov., p. 230. Caudal uncinus, front view, much enlarged.

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PLATE XXXIX—Continued.


35. *Spirorbis abnormis* sp. nov., p. 245. Collar seta, short one.


40. Collar seta, front view, showing arrangement of four basal spines.

All the figures by the author: 1, 10, 17, 26, 27, 39, × 68; the others, except 33, × 425.
Fig. 1. *Spirorbis abnormis* sp. nov., p. 245. Front view of calcareous plate from operculum of a young specimen.

2. Side view of same.


6. Odd seta from third thoracic fascicle, about ¾ view.


11. Curved abdominal seta.


13. Seta from second or third thoracic fascicle.

14. Side view of odd seta from third thoracic fascicle.

15. Caudal seta.


18. Front view of same.

19. *Spirorbis incongruus* sp. nov., p. 241. Front view of calcareous plate from operculum.


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PLATE XL—Continued.

Fig. 30.  *Spirobranchus quadrangularis* Stimpson, p. 241. Caudal seta of specimen from Greenland.

31.  *Chilitopoma greenlandica* (Mörch) Levinsen, p. 229. One of the shorter collar setae (longest ones broken) of specimen on tubes of *Nothria conchylega* from off the eastern coast of New England, in 32 fathoms.

All figures by the author: 1, 2, 17-20, × 65; others, × 398.

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PLATE XLI.

Fig. 1. *Spirorbis violaceus* Levinsen, p. 242. Collar seta from specimen from the Grand Banks, Atlantic Ocean.

2. Another collar seta.


4. *Spirorbis asperatus* sp. nov., p. 245. Collar seta (serrations too distinctly marked).

5. Abdominal seta, back view.

6. Collar seta of another specimen (serrations invisible).

7. *Spirorbis eximius* sp. nov., p. 239. Seta from second thoracic segment of specimen from Pacific Grove, California.


10. *Spirorbis asperatus* sp. nov., p. 245. Abdominal seta (no serrations), profile view.

11. Apparent arrangement of teeth on uncini, greatly enlarged.


16. Another, in profile.


18. *Spirorbis eximius* sp. nov., p. 239. Collar seta.

19. *Spirorbis asperatus* sp. nov., p. 245. Uncial plate from thorax, about $\frac{1}{4}$ view.

20. *Spirorbis eximius* sp. nov., p. 239. Odd seta from third thoracic fascicle.


22. *Spirorbis formosus* sp. nov., p. 251. Caudal seta from specimen from Bermuda.


25. Collar seta from same specimen.

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PLATE XLI — Continued.

Fig. 27. Collar seta turned, showing upper surface.
28. Uncial plate from thorax, in profile.
29. Collar seta, in profile.
30. Odd seta of third thoracic fascicle, end spread open.
31. *Spiroboris asperatus* sp. nov., p. 245. Uncial plate; apparent aspect.
   of front surface.
32. Uncial plate from thorax, in profile.
   All figures by the author, × 355, except 11 and 31, more enlarged.

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PLATE XLII.

Fig. 1. *Spirorbis spirillum* (Linné) var. *lucidus* (Montagu), p. 243. Back view of a calcareous plate from an operculum of specimen from Greenland.

2. Nearly front view of an operculum showing calcareous plate from another specimen from Greenland.

3. Calcareous plate from operculum of a specimen (typical *lucidus*) from Casco Bay.

4. Operculum of specimen from same locality, showing calcareous plate covered with a minute seaweed.

5. Back view of fig. 3.


7. Top view of same.


10. Bottom view of calcareous plate from another operculum.


12. Front view of same.


14. Front view of same, the plate covered with seaweed.


16. Side view of an operculum of a medium sized specimen, showing calcareous plate.

17. Front view of fig. 15; the plate covered with minute protozoans.

18. Back view of an operculum showing operculum plate, of a young specimen.

19. Front view of same.

20. *Spirorbis evolutus* sp. nov., p. 251. Front view of an operculum showing calcareous plate of specimen from Grand Banks.


22. Side view of same.


24. Front view of calcareous plate, fig. 28.

25. Back view of same.

26. Opposite view of fig. 23.

27. Side view of operculum of a specimen from Greenland collected and identified as *S. granulatus* by Moore, 1902.

28. Front view of another operculum from specimen from same locality.

29. Opposite view of same.

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ALASKA ANNELIDS
PLATE XLII—Continued.

Fig. 30. *Spirorbis cancellatus* (Fabricius), p. 248. Bottom view of a calcareous plate.
31. Nearly front view of same.
32. Operculum showing calcareous plate becoming detached.
33. Back view of fig. 31.
34. Opposite view of fig. 32.
   All figures by the author, $\times 43$.

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PLATE XLIII.

Fig. 1. *Spirorbis asperatus* sp. nov., p. 245. Front view of operculum showing calcareous plate.

2. Front view of a calcareous plate from another operculum.


5. Top view of same.

6. *Spirorbis eximius* sp. nov., p. 239. Calcereous plate from operculum of type, from Pacific Grove, California, bottom view.


11. *Spirorbis eximius* sp. nov., p. 239. Calcereous plate of operculum from type, nearly side view.


13. *Spirorbis asperatus* sp. nov., p. 245. Side view of an operculum showing calcereous plate.


15. Operculum, in profile, from specimen from Alaska.

16. *Spirorbis variabilis* sp. nov., p. 238. Calcereous plate from operculum, to show the separation of two disks.

17. *Spirorbis eximius* sp. nov., p. 239. Front view of operculum showing calcereous plate.


20. *Spirorbis stimpsoni* Verrill, p. 250. Operculum showing primary calcereous plate.

21. Another operculum filled with embryos, with secondary calcereous plate.

22. Back view of fig. 20.

23. *Spirorbis formosus* sp. nov., p. 251. Posterior portion of operculum showing renewal of plate.

24. *Spirorbis abnormis* sp. nov., p. 245. Back view of fig. 28.

25. *Spirorbis formosus* sp. nov., p. 251. Operculum showing calcereous cylinder filled with embryos.


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ALASKA ANNELIDS
PLATE XLIII—Continued.

Fig. 27. *Spirorbis similis* sp. nov., p. 242. Back view of operculum filled with eggs.

28. *Spirorbis abnormis* sp. nov., p. 245. Operculum showing one plate, the other being torn away. Embryos with large white patches which filled the operculum are not represented.

29. Front view of another operculum with 3 calcareous plates.

30. *Spirorbis formosus* sp. nov., p. 251. Detached calcareous cylinder showing interior.

31. *Spirorbis similis* sp. nov., p. 242. Front view of fig. 27, showing calcareous plate.


All figures by the author, × 35.

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PLATE XLIV.

Fig. 1. *Spirorbis verruca* (Fabricius), p. 247. Back view of a double operculum plate showing the primary and secondary ones before separation.

2. *Hyalopomatopsis occidentalis* sp. nov., p. 229. Operculum, in which a delicate yellowish (horny?) cap is partially defined.


4. *Hyalopomatopsis occidentalis* sp. nov., p. 229. Another operculum, less convex on top, showing conspicuous air-bubble.

5. *Spirorbis verruca* (Fabricius), p. 247. Operculum showing a large calcareous plate, from an animal forming a tube which resembles that of *Spirorbis spirorbis* (Linne) from Greenland. As the collar setae could not be found, the species remains undetermined. It may be the very young of one of the larger forms.

6. The same operculum in another position.


8. *Hyalopomatopsis occidentalis* sp. nov., p. 229. Operculum from a full-grown animal, showing distinct central cavity and canal in peduncle, on the end of which algae are growing.


12. The same plate in another position.

13. Opposite view to fig. 11.

14. A double plate showing primary one about splitting away. Both specimens were on *Buccinum* from the Grand Banks, in 36-51 fathoms.

15. *Spirorbis* sp.? Front view of fig. 5.


17. *Spirorbis variabilis* sp. nov., p. 238. Operculum with minute protozoans on end, side view.

18. *Spirorbis rugatus* sp. nov., p. 243. Front view of operculum showing plate.

19. Side view.


21. Back view of another operculum, showing eggs.


All figures by the author, $\times 30$, except 3, $\times 90$; 7, $\times 1$, and 22, $\times 278$. (346)
Savigny, J. C.
Systeme de diverses
Systeme des Annelide
l'Egypte et de la Sy
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p. 76.
p. 77. # 1. Sabella in
Sabel
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Tubul
Amphi
# 3. Sabella pe
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p. 76. Genre XXI. Sabella.

p. 77. # 1. Sabella indica.

Sabella grandis Cuv. Collect. du Mus.

p. 78. # 2. Sabella magnifica.

Tubularia magnifica Shaw, Tr. Linn. Soc., V, p. 223, pl. 9.


# 3. Sabella penicillus.


Sabella penicillus Cuv. Collect. du Mus.

p. 79. # 4. Sabella flabellata.

Tubularia penicillus Oth. Fabr. Faun. Groenl., #442

# 5. Sabella pavonina.

Scolopendra plumosa tubiphora Bast. Opusc. subs. 1, lib. 2, p. 77, pl. 9, fig. 1

Tubularia penicillus Müller Zool. Dan., III, p. 13, pl. 39, fig. 1, 2.

p. 80. # 6. *Sabella unispira*.

*Spirophytis spillanztanii Viviani, Phosph. mar.,* p. 14, pl. 4 & 5.


p. 81. # 7. *Sabella ventilabrum*.

*Corallina tubularia melitensis Ellis, Corallin.,* p. 107, pl. 33.


*Amphitrite ventilabrum Gmel. Syst. nat., vol. 1, pt. 6, p. 3111. no. 3; Lam. Hist. n. an. s. vert., V, p. 356, no. 1.*

# 8. *Sabella volutacornis*.

*Amphitrite volutacornis Montag. Tr. soc. linn., VII, pl. 7, fig. 10, p. 34; Lam. Hist. n. an. s. vert., V, p. 357, no. 6.

*Amphitrite volutacornis Leach Encycl. brit. suppl. I, p. 451, pl. 28, fig. 7*