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DESCRIPTION OF NEW SERPULIDS FROM BERMUDA WITH NOTES ON
KNOWN FORMS FROM ADJACENT REGIONS.

BY KATHARINE J. BUSH, PH.D.

The following descriptions of species of Serpulids are of forms (six of which are considered as new to science) collected at Bermuda by Professor A. E. Verrill and party, in 1898 and 1901; also at the Island of Dominica, W. I., by A. H. Verrill, in 1906.

A full description is given of the rediscovered species *Pomatostegus brachysoma* of Schmarda who failed to mention characters which, at the present time, are considered of great importance in determining genera and species. Notes are also given of some of McIntosh's species in which the genera is questionable; but the specimens are not sufficiently well preserved to reveal any additional facts, so that the exact genera must still remain undetermined.

Mention is made of most, if not all, of the species belonging to the group found in the southern waters, and figures are introduced of important features of known Mediterranean forms collected at Beirut, Syria, and thought to have been incorrectly determined.

SALMACINOPSIS gen. nov.

This genus resembles Claparede's genus *Salmacina*, 1869 and 1870, (type *S. incrustana* Clap.), in having few branchiæ, no operculum and 9 thoracic segments, but differs in having simple tapered setæ without fin-like basal expansion, in the collar fascicle and different shaped uncini, which are similar to those in the genus *Protula*, from which the 9 thoracic segments, absence of thoracic membrane and the peculiar branchiæ readily distinguish it. Type, the following species:

Salmacinopsis setosa sp. nov.

Numerous slender, rounded, rather fragile tubes attached their entire length were taken from a piece of dark green glass. They are of uniform diameter, more or less irregularly curved, without sculpture, roughened by irregular lines of growth.

Body rounded, of uniform size, with broadly rounded blunt posterior end. Anteriorly without distinct segmentation but posteriorly divided into well-rounded segments on one side. Thoracic region defined only by setæ and tori, there being 9 fascicles of setæ alternating with

8 tori in a straight series. No thoracic membrane along sides or posteriorly but an indistinctly four-lobed collar of moderate uniform depth, lapping along the median line, reaching but a short distance posteriorly with broadly rounded ends; lateral incisions or clefts the depth of collar forming three definite unequal parts, the middle one emarginate in the center appearing as an indistinct double lobe. Branchial lobes in the form of a rather deep collar-like membrane attached in a semicircle to the comparatively small stem-like cephalic lobe. The branchiæ, 4 on each side in the largest example, arise from this border and are peculiar in being but two sided, *i.e.*, broad, flattened, thin with a single row of rather stout long pinnæ in the middle of the inner surface, leaving a wide somewhat puckered margin or border on each side. They are equal in length, twisted about each other in retraction, and have elongated tapered naked tips. No operculum. Tori and uncini of uniform size throughout entire body. Small fascicles of setæ on abdomen. Setæ on thorax long, slender, tapered, simple blades with long capillary ends, a few without blades, and in the last three fascicles (7-9) a few with short blades and long, broadened, deeply serrate ends. Setæ on abdomen strongly bent at base of moderately wide, somewhat abruptly tapered, conspicuously serrate blades; additional long stiff hair-like ones along caudal region. Uncini resembling those of *Protula*, with numerous exceedingly fine appressed teeth and one very long fang-like end or terminal one.

Protula sp.

Two imperfect unattached tubes of good size, over 40 mm. long and 4 mm. in diameter, are slightly tapered and somewhat tortuous, the surface roughened by fine lines of growth. Only the branchial lobes of the animal were found and are of interest in being elongated into a spiral of about one and a half turns bearing numerous, between thirty and forty (30-40), long slender branchiæ having elongated tapered naked tips; they undoubtedly belong to a species of typical *Protula*.

Protula diomedæ Benedict, 1886, has similar branchial lobes but is a very much larger species, building tubes 4 or 5 inches long. The type was found off Cape Hatteras, N. C., in 43 fathoms. Other specimens are cited from the Gulf of Mexico in 111 fathoms, and further rather remarkable range is given as extending north from Chesapeake Bay to the Grand Banks in 65 to 1,290 fathoms. *Protula alba* Benedict, 1886, from shallow water at St. Thomas, W. I., has but twenty-five branchiæ.

Protula submedia Augener, 1906, from off the Windward Islands in

127 to 248 fathoms, has uncini very like those of *P. diomedæ*. *Protula antennata* Ehlers, 1887, found off Cuba in 292 fathoms, does not belong in the genus *Protula*. The uncini have the long terminal tooth, truncated and notched.

The *Protis simplex* Ehlers, 1887, has no operculum, but the collar setæ bring it into close relation to the genus *Salmacina*. The following species from Bermuda also has some affinity to the genus *Protis*.

From a mass of very much coiled and twisted eroded tubes partially covered with sponges, ascidians, and bryozoans, an exceedingly interesting deep crimson colored annelid with darker spots and markings was taken. The most perfect specimen is about 20 mm. long, with between 60 and 70 segments, with 7 on the thorax, the fascicles of setæ in very oblique series. Branchial lobes wanting. Collar apparently 4-lobed, reaching only to the 2d fascicle of setæ; no later or posterior free border on thorax. Collar setæ with stout shaft or manubrium with long, narrow, serrate, abruptly tapered end, bent and somewhat enlarged at the base and coarsely serrate, spreading out, resembling a fin. Other setæ very long, very slender, with very delicate deeply fringed blade with long lash-like end. Uncini small, very numerous; on the abdomen the tori reaching nearly around the body. They are somewhat triangular with few (5 or 6) curved pointed teeth above an unusually large base, somewhat protruding beneath the very large terminal tooth. Abdominal setæ flaring, asymmetrical, with serrate edge. The *Filigrana Huxleyi* Ehlers, 1887, from Tortugas, in 19 fathoms belongs to this group.

MEMBRANOPSIS gen. nov.

Membranopsis inconspicua sp. nov.

A small animal 6 mm. long is of special interest in the development of the thoracic membrane. As the branchial lobes are wanting its exact generic relation is indeterminable. The 9 thoracic segments bring it in close relation to *Salmacina*, while the form of the uncini and abdominal setæ show affinity to *Apomatus*; the development of the thoracic membrane separates it from *Salmacinopsis*.

It is of a brownish color in preservation, rounded, with but little taper to the blunt posterior end. There are 9 thoracic and about 25 abdominal segments. The collar is of moderate depth, apparently of four (4) lobes, two rolling rounded median ones and two small lateral ones, which extend backward around the 3d fascicle of setæ; from the 4th to the 8th fascicle, the free border is deeply incised on the side of each forming separate deep narrow scollops; that of the

9th fascicle continues as a wide, free, unbroken border across the body to the opposite fascicle; the fascicles forming a straight series. The setæ on the collar are badly injured; a few show simple tapered rather stiff blades similar to those on the following segments; in the 7th to 9th fascicles, there are a few curved setæ with short blades and broad, deeply serrate ends. On the abdomen the setæ are curved somewhat in crescent shape rather narrow and abruptly tapered toward the tip. Uncini similar to those of *Protula* and *Apomatus*.

SUBPROTULA gen. nov.

Branchial lobes small, not spiral, the branchiæ in a semicircle. No operculum. Collar three-lobed (3). Thoracic membrane a free margin to the fifth (5) segment, no posterior border. Thoracic segments seven (7). Setæ similar. Uncini irregularly trapesiform with a number of teeth, the last large and square cut. Type, the following species:

Subprotula longiseta sp. nov.

Nine good sized specimens (about 20 mm. long) taken from dead coral from Castle Harbor, have short rachis-like branchial lobes, not spiral, with the moderately long, rather stout branchiæ extending their entire length forming a kind of semicircle; the end of each abruptly contracted above the long pinnæ then expanding into a conspicuous club-shaped tip, the inner surface covered with minute papillæ; on one or two these appear to have become greatly enlarged, forming a closely crowded mass. On the sides of each rachis, which number fifteen (15) in each lobe, there are similar rounded or pear-shaped papillæ resembling uncolored ocelli, close together at the base, becoming well separated distally. No operculum. Thoracic membrane very much developed, forming a deep rolling three (3)-lobed collar extending backward along the sides, gradually diminishing in width from the very large angular lateral flaps to the fifth (5th) fascicle of setæ. There is no free posterior border. In front of the large median lobe a triangular or tongue-shaped process protects the mouth. There are seven (7) fascicles of setæ on the thorax and six (6) tori; each of the latter situated on the posterior edge of a rectangular membrane successively increasing in size, often overlapping each other. Setæ numerous, all similar, very long, slender, with long capillary ends, the inferior ones the broader and more curved; on the collar a few capillary ones. Uncini with about sixteen (16) teeth on the largest, the terminal one very large and truncated, not at all like that of *Protula*. There are between fifty (50) and sixty (60) abdominal

segments; the setæ three or four (3 or 4) in a fascicle rather stiff, very long, regularly tapered from an angular base with conspicuously serrate edge; along the caudal region replaced by long hair-like ones.

As far as Schmarda's description and figures of *Protula longiseta* from the coral reefs of Jamaica shows, this species agrees fairly well. The Bermuda form, however, cannot be placed in the genus *P. sygmobranchus*, in which Schmarda's species has been placed, as the type (*P. protensus* Gm.) as given by Claparede, 1870, has small branchial lobes with numerous branchiæ in a circle, seven (7) thoracic segments, but with the collar entire and the uncini very distinctive, somewhat resembling those of *Protula*. No genus is known that can include this Bermuda form, therefore the new name *Subprotula* is proposed with the specific name *longiseta*, avoiding multiplicity of names if it prove to be the same as Schmarda's species.

A fragment of a tube about 2.5 mm. in diameter is of especial interest in having a tough, horn-colored, semitransparent, chitinous lining; the calcareous covering is thick, its surface nearly smooth, without markings of any kind, even lines of growth. The animal, about 20 mm. in length, is destitute of an operculum, a very small protuberance on outside of the base of one of the branchial lobes showing point of attachment. The branchial lobes small, stem-like; the branchiæ (16 on each side) much curled and twisted in preservation are arranged in a semicircle. Thoracic membrane well developed, forms a deep rolling collar, apparently 3-lobed (mutilated), extends backward as a free lateral border to the 5th fascicle of setæ; no posterior border. Seven (7) fascicle of setæ and six (6) tori on thorax; the latter in separate rectangular membranous areas successively increasing in size. Setæ numerous, very long and slender, none showing broadened conspicuously serrate ends. Uncini much striated, approaching *Protula* in form, but with coarser teeth (about 16 in largest), the last moderately long and square-cut.

The conspicuously developed chitinous lining of this tube is remarkable. The character of the animal agree closely with *S. longiseta*, with the exception of the small protuberance noted on the base of one of the branchial lobes. This may possibly be an abnormality and not the point of attachment of a lost operculum.

—————? *assimilis* (McIntosh, as *Placostegus*).

This species is recorded by McIntosh from off Bermuda, in 435 fathoms.

The tube is glassy, ornamented with a dorsal, or median, and two lateral ridges, which terminate at the aperture in tooth-like projections.

The characteristic operculum ought to be readily recognized. It is described, in the type, as concave, of a dull yellowish color with brown rim; a second specimen has an additional upper part, like an inverted cone.

The peculiarities of the collar described as made up of a number of unequal ribbon-like processes or lobes, are possibly due to injury. The rectangular form of the thoracic uncini, with numerous teeth above one long, sharp, terminal one, seems the only character showing any affinity to the genus *Placostegus* (type, *P. tridentatus*). The thoracic setæ are very slender and simple. The *Placostegus incomptus* Ehlers, 1887, from off Cuba, in 101 to 129 fathoms, has strong affinity to the genus *Plagostegopsis* Saint-Joseph, 1894.

***Eucarphus serratus* sp. nov.**

Branchial lobes not free, the branchiæ arranged in a semicircle; there are twelve about equal ones in each, with long delicate ends and long pinnæ; a rudimentary operculum opposite the fully developed one, which has two chitinous cups one above the other, the lower with numerous radii and deeply pointed margin, very unlike the shallow broadly scalloped margin found in that of *Eucarphus lunulifera* Claparede, 1870, the upper one edged with thirteen stout, rather long, erect spines broadly rounded on the end, curved beneath on either side, forming a small angular lateral point; no outer, inner, nor basal processes or spinelets. Collar very deep and full. Setæ similar to those found in *Hydroides* and *Eupomatus*, with stout manubrium having two large tooth-like spines on exposed end at the base of the very delicate, abruptly tapered terminal portion, not broadened into a blade. Six fascicles of setæ and six tori on thorax. The setæ with long gracefully tapered ends; the uncini somewhat triangular in outline, the base much prolonged and tapered beneath the teeth, which number about seven, are of about equal size, rather long, pointed and appressed, in front view appearing broad and delicately serrate in a single series; on the abdomen becoming smaller and thicker with more numerous sharper teeth, eight or nine in the largest, the last broader than the others. Abdominal setæ flaring, with coarsely serrate edge, elongated on one side with a delicate (scarcely discernible) filamentose end; needle-like along caudal region.

Only one specimen in an irregular good sized tube roughened only by unequal irregular lines of growth.

This may prove to be the *Eucarphus dirampha* Mörch, 1863, from St. Thomas, W. I.

That is described as having from 13-16 spines on the operculum, which are figured as having bulbous bases not at all like the simple taper of the Bermuda species. The tube is given as slightly tortuous, loosely agglomerate, with unequal lines of growth; 3 mm. in diameter. Another related species (*E. benzoni* Mörch, 1863) is recorded from Bahia, Brazil. This builds left-handed, solitary, very solid, obsoletely nodulose spirorbiform tubes attached to *Purpura* and *Dolium*.

Hydroides bispinosa sp. nov.

Two specimens differ from typical *Hydroides* in having the edge of the lower cup of the operculum, with broad, shallow scallops, not deep narrow points; the upper cup has about 9 strongly curved, tapered spines, somewhat angular on the outer side with a single small pointed process or spinelet on each side just below the angle and a long spike-like spinule on inner base. Rudimentary operculum in opposite lobe. Branchiæ eight on each side; long, rather stout, with very long terminal filament. Thoracic membrane but little (comparatively) developed, with moderately deep collar. Setæ in collar fascicle with two very prominent striated spines at base of abruptly tapered ends; in the following six fascicles long tapered blades. Uncini noticeable in being triangular, broad at base, with few, about equal, very sharply pointed, much curved, well separated, teeth, 5 or 6 on those of thorax and 3 or 4 on abdomen. Abdominal setæ in fascicles of seven, flaring without elongation, the edge coarsely dentate, one end tooth larger than the others and curved in hook-shape; similar to the setæ figured by Marenzeller as *Hydroides multispinosa*; additional long stiff hair-like ones along caudal region.

Tubes much roughened by irregular growth lines crossing two large dorsal carinæ, the shallow central area extending forward at the aperture in a broadly rounded projection; attached in irregular flat coils in masses or groups, often much eroded.

Hydroides parvus (Treadwell 1901, as *Eupomatus*).

Numerous rough tubes of good size, variously curved and often twisted over each other, are attached their entire length to the exposed surface of valves of *Placuanimia rudis*, the interior of the aperture of *Livona pica* and other hosts found at Bermuda.

They are rounded, of nearly uniform diameter, with two more or less clearly defined dorsal carinæ, with here and there a faintly indicated median thread; no transverse markings other than irregular ones of growth which roughen the entire surface.

The species was recorded by Treadwell from the shores of Porto Rico

attached to Bryozoans. The Bermuda specimens are of larger size, agreeing well with Treadwell's description, with the exception of the form of the abdominal setæ. The long acicular ones described by him occur only on the caudal region; those of the characteristic *Hydroides* form with striated, flaring, conspicuously serrate ends are present on the other abdominal segments. The characteristic basket-like operculum readily distinguishes the species, in some instances two fully developed ones occur. It is formed of two chitinous light yellow cups, fitted one above the other, on a long, slender, rather stiff peduncle. The lower is edged with 25 or 30 deep points and the upper has nine strongly curved fang-like spines with three conspicuous outer processes (two pointed lateral and one blunt, more or less elongated, median) situated at the point of greatest curvature; a little above the middle; at the inner base of each fang is a short, erect, blunt process or spinule; in every instance these fangs have their points in contact forming a very pretty basket-like end to the operculum. There is great variability in the size of the blunt median process, which is sometimes low and broadly rounded and sometimes much elongated and truncated.

The animals are long (50 mm.) slender rounded, the branchiæ about 4 mm. The collar setæ, characteristic of the group, are horn-colored with stout shaft or manubrium with two, sometimes three, conspicuous tooth-like spines at the base of long tapered ends; other thoracic setæ long and narrow regularly tapered. Uncini much striated with a few (7) strongly curved pointed teeth in profile but showing irregular series when the rather broad exposed surface is in view. Abdominal setæ with flaring striated coarsely serrate ends; hair-like along caudal region.

***Eupomatus elegantulus* sp. nov.**

The species is readily identified by its large operculum ($2\frac{1}{2}$ mm. in diameter). The lower cup edged with 30 or 40 deep narrow points, the upper with 13 very long, very slender, tapered, regularly curved, spreading, simple spines without outer, lateral, or inner spinelets except a long slender much curved spinule at the inner base of each, their points in contact forming a basket-like center. Entire length of body about 20 mm. Branchial lobes simple, short, the branchiæ in a semicircle (16 or 18 on each). Thoracic membrane badly mutilated but showing a well-developed collar and free lateral and posterior border. Seven (7) fascicles of setæ and six (6) tori in oblique series on thorax. The collar setæ with two (2) conspicuous spines at base of moderately long tapered end; other setæ long, very slender with capillary tips. Uncini triangular in outline, the base protruding

forming a narrow end beneath the six (6) coarse teeth, which successively increase in size.

Tubes unattached, yellowish, of good size, gradually tapered, rounded, and somewhat contorted, the surface roughed by numerous conspicuous irregular growth lines crossed on one side by three well-separated rather delicate longitudinal often lamellar-like lines.

Three similar species have been recorded from the West Indian fauna. *Eupomatus sanctæ-crucis* Mörch, 1863 (as *Eucarphus*), from the Island of St. Croix is described and figured as having a minute spinelet on the outer (?) surface of each spine of the upper cup of the operculum at about the middle, thus if correct (they usually occur on the inner surface) representing a connecting link between typical *Hydroides* with two or more spinelets and typical *Eupomatus* destitute of them. *Eupomatus spongicolus* Benedict, 1886 (as *Hydroides*), from Gulf of Mexico in sponges from 26 fathoms, has numerous (14-18) simple long slender curved spines with long basal inner spinules on upper cup of the operculum and about 65 narrow deep points on edge of lower one. *Eupomatus Floridanus* nom. nov. for *E. uncinatus* Ehlers, 1887 (non Philippi, 1844), from 7 fathoms off Cape Dear Rio, Florida, has 11 very long, much curved spines with inner basal spinule on upper cup and about 30 deep points on edge of lower one. This does not agree with the operculum of *E. uncinatus* from the Mediterranean (a fact mentioned by Ehlers). From mass of 2 or 300 tubes in Yale Museum, a number of dried animals were taken showing the opercula and collar setæ in good condition. There are 9 or 10 spines on the upper cup which are stiff nearly straight, being curved only near the tip and so abruptly as to appear angulated on the outer surface, the inner basal spinule inconspicuous wart-like; they are very like the figure given by St.-Joseph, 1906. On the American coast the *Eupomatus dianthus* (Verrill) Bush as figured by Benedict, 1886 (as *Hydroides*), is a closely related species.

***Pomatostegus brachysoma* Schmarda.**

One beautifully preserved animal has been received from the Island of Dominica, W. I., from Mr. A. H. Verrill. Entire length 45 mm.; operculum 15 mm. of which 5 mm. belongs to its horny end; thorax, about 5 mm.

The very large operculum arises abruptly without a peduncle from the base of one of the branchial lobes. It is cornucopia shaped with very oblique end and very conspicuous thin membranous side appendages, gradually increasing in width from the base to the free rounded end lobe. There are three semitransparent horn-colored somewhat

saucer-shaped plates conspicuously serrate on edge and about equal in size, the lowest closely affixed to the end of the operculum. From this, a little to one side of center, a large rounded hollow column arises, made up of four parts or sections successively decreasing slightly in size, with concave sides and flaring top and bottom, each of which is encircled by a series of elongated spines, longest above; at the base of the lowest one no spines are developed. At the joining of the sections there are therefore two series of spines between which a large saucer-shaped plate rests; in this specimen, the third joint is destitute of a plate and some of the spines at the apex have been torn away. Branchial lobes elongated, free, slightly spiral, plume-like, the slender tapered rachis, with a thick, broad or deep, striated, web-like membrane on each side, is strongly curved at the end causing the sides to be unequal. The moderately long, much curled, stout branchiæ (about 50) arise on the outer side only. Collar conspicuous, entire, varying in depth, a broad, shallow emargination on each side forming a comparatively narrow, deep, angular median marginal lobe having a noticeable seam-like median depression; the large lateral flaps end on a line with the first torus without forming any lateral nor posterior free border. The thorax, however, conspicuously defined, the seven fascicles of setæ in very oblique series; the tori reaching across body nearly in contact along the median line; each is situated in the posterior edge of a separate overlapping membrane which forms a free, broadly rounded, outer end with pointed fluke-like side lobes; only on the first do both of them show, and on the sixth or last the posterior one is elongated, extending across the body to the opposite side in a scarcely discernible free border. Collar fascicle small, the superior setæ very slender, geniculate and roughened by minute hair-like spines at base of narrow regularly tapered blade approaching the form characteristic of the genus *Spirobranchus*; inferior setæ capillary. Other thoracic fascicles large with numerous rather stiff setæ; the shortest, capillary; median with darker rounded elongated blades and short tips; the longest with short tapered ends. Uncini like *Spirobranchus* with curved pointed teeth (8 in largest abdominal one) above a more prominent truncated terminal tooth (not twisted). Abdominal setæ comparatively small, slender, tapered, often scarcely discernible, just pricking through the integument.

Pomatostegus stellata (Abildgaard, 1789) was carefully described by Ehlers, 1887, from a specimen from off Florida in 13 fathoms. It has a similar one-lobed collar but smaller operculum and a more elongated body of 140 segments. Benedict, 1886, also described and figured

the same species from several specimens from Jamaica and Curaçao and Treadwell recorded it from Porto Rico. The *P. macrasoma* Schmarda, 1861, is distinguished by its 2-lobed collar (which possibly may have been mutilated) and more elongated form with comparatively small operculum. The *P. brachysoma* is relatively short of 100 segments with a very large operculum plashed with chocolate brown, the branchiæ and pinnæ banded with the same color.

Benedict, 1886, and Ehlers, 1887, record *Spirobranchus giganteus* (Pallas) Mörch, *S. tricornis* (Mörch) Ehlers, *S. pseudoincrassatus* Bush, 1905 (for *incrassatus* Benedict, 1886, *non* Kröyer), and *S. dendropoma* Mörch, 1863, from off Florida and the West Indies. Other serpulids recorded from this region and Bermuda are *Crucigera Websteri* Benedict, 1886, *Hyalopomatus Langerhansi* Ehlers, 1887 (which is not a true *Hyalopomatus*), *Cymospira* (?) *polycera* Schmarda, 1861, *Paravermilia annulata* (Schmarda, 1861) Bush, 1907, not *Vermilia annulata* Ehlers, 1887 = *Paravermilia Ehlersiana* n. n., *Paravermilia Bermudensis* Bush, 1905 and 1907, *P. ambliæ* Bush, 1907, *P. intermedia* Bush, 1907, *Pseudovermilia occidentalis* (McIntosh, 1885) Bush, 1907, *P. pileum* Bush, 1907, *Spirorbis formosus* Bush, 1905, *Spirorbis mutabilis* Bush, 1905, and *Rhodopsis pusillus* Bush, 1905.

BIBLIOGRAPHY.

- AUGENER, H.—Bulletin, Museum Comparative Zoölogy, Vol. XLIII, 1906.
 BENEDICT, J. E.—Proceedings, United States National Museum, Vol. IX, 1886.
 BUSH, K. J.—Harriman Alaska Expedition, Vol. XII, 1905. American Journal Science, Vol. XXIII, January and February, 1907.
 CAULERY, M. and MESNIL, F.—Bulletin scientif. de la France et de la Belgique, Vol. XXX, 1897.
 EHLERS, E.—Memoirs, Museum Comparative Zoölogy, Vol. XV, 1887.
 MARION F., and BOBRETZKY, N.—Annales des Science Naturelle, Vol. 6, 1875.
 MCINTOSH, W. C.—Challenger Voyage, Vol. XII, 1885.
 MÖRCH, A. L.—Naturhist. Tidsskrift, Vol. I, 1863.
 SCHMARDA, L. K.—Neue Wirbellose Thiere, Vol. II, 1861.
 TREADWELL, A. L.—Bulletin, U. S. Fish Commission, Vol. II (for 1900) 1901.

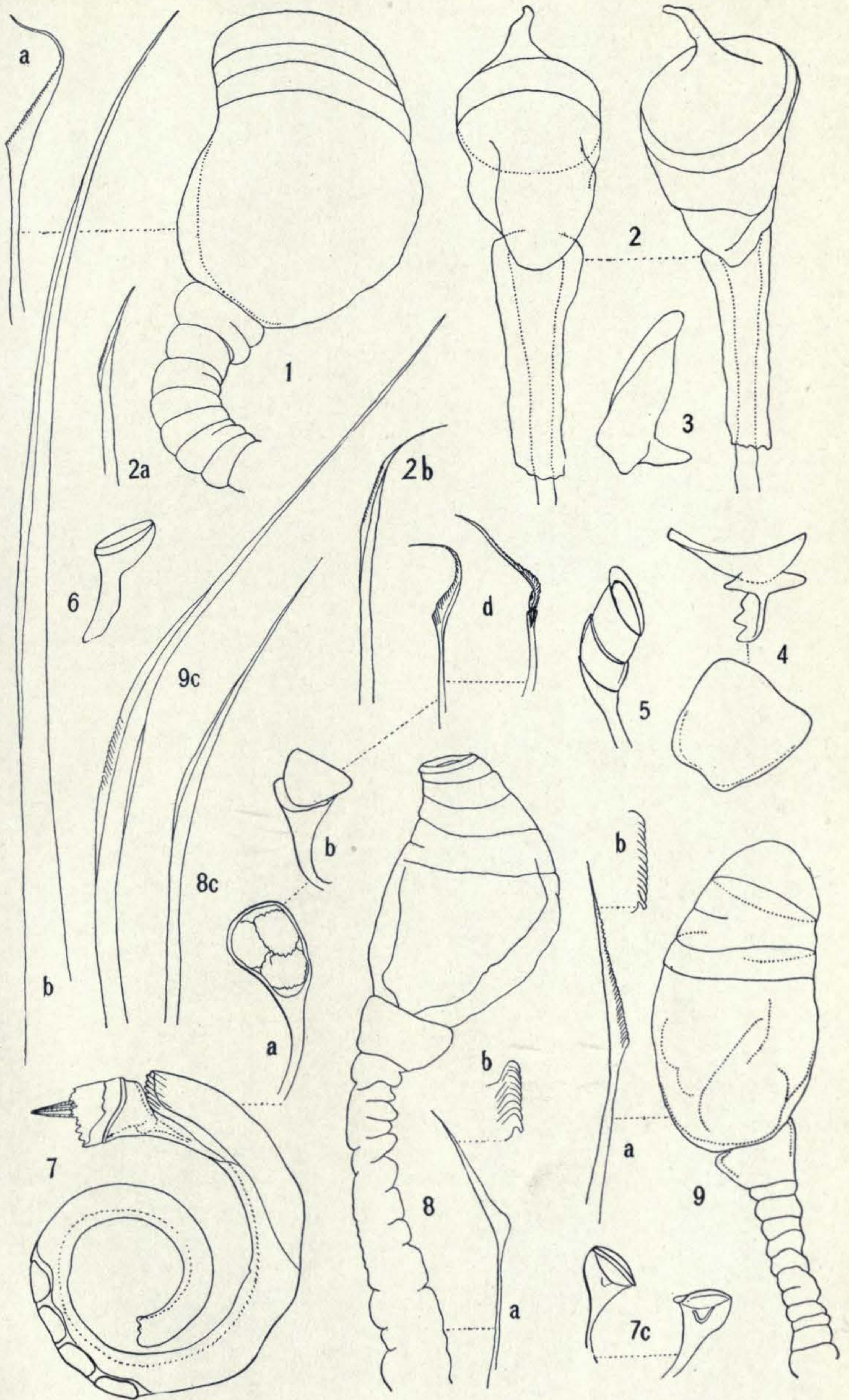
EXPLANATION OF PLATE XXXVI.

- Fig. 1.—*Paravermilia ambliæ* Bush. Side view of operculum; *a*, abdominal seta; *b*, thoracic seta.
 Fig. 2.—*Pseudovermilia occidentalis* (McIntosh) Bush. Front and back views of operculum; *a*, collar seta; *b*, seta from 2d segment.
 Fig. 3.—*Spirorbis mendosus* n. n. for *S. cornu-arietis* Marion and Bobretzki, 1875, *non* Philippi, 1844 + Caullery and Mesnil, 1897. Side view of calcareous plate of operculum.¹

¹ Figures 3, 4, and 6 are from specimens described by the author in 1905, from Beirut, Syria, page 288.

- Fig. 4.—*Spirorbis serratus* sp. nov. Two calcareous plates of operculum; upper one tilted to show posterior basal serrations; lower separate shield-shaped frontal plate.
- Fig. 5.—*Spirorbis formosus* Bush. Side view of operculum with two complete calcareous cylinders.
- Fig. 6.—*Spirorbis nudus* sp. nov. Side view of operculum.
- Fig. 7.—*Spirorbis mutabilis* Bush. Side view of animal taken from tube and stained to show position of eggs (*e*), protozoans, etc., cover the operculum; *a*, back view of an operculum filled with eggs; *b*, front view of another operculum, the calcareous plate is dislodged; *c*, views of another operculum; *d*, back and side views of collar seta.
- Fig. 8.—*Paravermilia bermudensis* Bush. Side view of operculum of type, the tip broken off; *a*, abdominal seta; *b*, edge of thoracic uncinus; *c*, collar seta.
- Fig. 9.—*Paravermilia intermedia* Bush. Side view of operculum; *a*, abdominal seta; *b*, edge of thoracic uncinus; *c*, back view of seta from 2d segment.

All the figures are camera-lucida drawings by the author. A No. 3 objective was used for the opercula, with the exception of fig. 1, where an inch objective was used. No. 7 objective was used for the setæ.



BUSH: BERMUDA ANNELIDS.