

DESCRIPTIONS OF TEN SPECIES AND ONE NEW GENUS OF AN-
NELIDS FROM THE DREDGINGS OF THE U. S. FISH COMMISSION
STEAMER ALBATROSS.

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(With six plates.)

SERPULIDÆ.

The ten species described in this paper were collected on the Albatross expeditions during the years 1883-'85. Five are well known, and five are believed to be new. Other species of the family in the collection remain to be described in another paper.

The Serpulidæ are not among the easiest annelids to collect. The tubes are nearly always attached to dead shells and stones, which from their nature are likely to be left to the last for preservation, and then, if the tubes are not broken with much care, the inhabitants are likely to be badly mutilated, while as a rule those left in the tubes are not well preserved. Altogether there is no family of animals more likely to be neglected in dredging, when more showy, and apparently more delicate, forms are abundant.

PROTULA Risso.

Protula diomedææ, n. sp.

(Plate xx, figs. 1-6.)

The branchial filaments are inserted on a spiral of about $1\frac{1}{4}$ turns, and are about 40 in number. Eye-like spots are exposed to view when the branchiæ are detached.

The thoracic lamellæ are broad and thin, with entire edges.

The thoracic setæ are long and slender, outer third limbate (fig. 3). The uncini of this region are shorter and broader than those of the abdomen (figs. 1 and 2). The anterior abdominal setæ are short, with broad, flat, and slightly falcate blades. The inner edges of the blades are serrate (fig. 4). The extreme posterior abdominal setæ, as is common in species of this genus, are very long and hair-like, with curved points.

The tubes (fig. 6) are from 4 to 5 inches in length, and are attached by the base to objects on the bottom. The lines of growth are not conspicuous. The surface is very rough to the touch, reminding one of shark skin.

The average length of specimens in alcohol is 40^{mm}; breadth, 3^{mm}. Length of thorax, 11^{mm}; from collar to end of branchiæ, 10^{mm}.

Dredged in great numbers at station 2307, in 43 fathoms, off Cape Hatteras; and one or two at a time at other stations.

RECORD OF SPECIMENS.

Off the eastern coast of the United States:

- Latitude 36° 38' 30" N., longitude 74° 40' 10" W., 81 fathoms; station 2011, one specimen (981).
- Latitude 36° 41' 05" N., longitude 74° 35' 55" W., 373 fathoms; station 2014, two specimens (982).
- Latitude 39° 29' 00" N., longitude 72° 19' 55" W., 74 fathoms; station 2031, two specimens (983).
- Latitude 39° 29' 00" N., longitude 72° 19' 40" W., 74 fathoms; station 2032, one specimen (984).
- Latitude 42° 32' 00" N., longitude 68° 17' 00" W., 99½ fathoms; station 2055, one specimen (985).
- Latitude 40° 16' 50" N., longitude 67° 05' 15" W., 1,290 fathoms; station 2084, one specimen (986).
- Latitude 40° 05' 00" N., longitude 70° 34' 45" W., 70 fathoms; station 2085, one specimen (987).
- Latitude 40° 05' 05" N., longitude 70° 35' 00" W., 69 fathoms; station 2086, one specimen (988).
- Latitude 40° 06' 50" N., longitude 70° 34' 15" W., 65 fathoms; station 2087, two specimens (989).
- Latitude 40° 01' 50" N., longitude 70° 59' 00" W., 117 fathoms; station 2091, one specimen (990).
- Latitude 39° 57' 30" N., longitude 69° 41' 10" W., 78 fathoms; station 2199, one specimen (991).
- Latitude 35° 42' 00" N., longitude 74° 54' 30" W., 43 fathoms; station 2307, very numerous (992).
- Latitude 37° 08' 30" N., longitude 74° 33' 30" W., 85 fathoms; station 2422, two specimens (994).
- Latitude 44° 27' 30" N., longitude 57° 10' 45" W., 137 fathoms; station 2472, two specimens (995).
- Latitude 44° 07' 30" N., longitude 57° 16' 45" W., 116 fathoms; station 2481, one specimen (996).

Gulf of Mexico:

- Latitude 28° 36' 00" N., longitude 85° 33' 30" W., 111 fathoms; station 2402, two specimens (993).

Two species of *Protula* have already been described from practically the same region, *P. media* Stimpson,* and *P. americana* McIntosh.†

From these *P. diomedæ* is readily distinguished, living as it does in a comparatively straight tube attached only at the base, while they both construct coil tubes attached more or less throughout their entire length. A much more important difference in the case of *P. media* is its deeply scalloped lamellæ described by Stimpson and figured in Smith and Harger's Saint George's Banks Dredgings, pl. vi, as compared with the entire margin of the thoracic lamellæ of *P. diomedæ*. In the case of *Protula americana* the uncini are very different. Compare fig. 2 with fig. 7 of McIntosh.

* Marine Invert., Grand Manan, p. 30, 1853.

† Challenger Reports, vol. 12, p. 512, pl. liv, fig. 3; pl. xxxia, figs. 19 and 20; 1885.

Protula alba, n. sp.

(Plate xx, figs. 8, 9.)

Branchiæ spiral of about one turn; filaments, twenty-five. When the branchiæ are removed at the base two dark spots are exposed to view, as described by Stimpson as a character of *P. media*.

The thoracic lamellæ are broad and very thin, continuous with the collar, which is entire.

The setæ of the thorax are long and slender, outer third limbate. The uncini of the thorax and abdomen are alike in form; their teeth are exceedingly minute (fig. 8). The falcate setæ of the abdomen have also very minute teeth on their inner edges (fig. 9). The extreme posterior abdominal setæ are of the usual form, long, hair-like, and curved at the ends. Color white.

Length of large specimens 25^{mm}; breadth of thorax, including lamellæ, 6^{mm}; breadth of abdomen 2.5^{mm}.

Saint Thomas, West Indies; shallow water. Ten specimens (979).

HYDROIDES Gunner.**Hydroides dianthus** Verrill.

(Plate xx, fig. 10.)

Serpula dianthus Verrill, Invert. Animals of Vineyard Sound, p. 620, 1874.

Hydroides dianthus Verrill, Proc. Acad. Nat. Sci., Phila., for 1873, p. 300.

Hydroides dianthus Webster, Annel. Chæt. of the Virginian Coast, p. 66, 1879; and Annel. Chæt. of New Jersey, p. 23, 1879.

The branchiæ are composed of about eighteen filaments. There are three concentric circles of spines on the operculum, the outer one being formed by the denticles on the edge. These denticles are from 21 to 27 in number, short and pointed, curving outward from the center. The next circle is composed of ten long spines (ten on four specimens and nine on one), curving either outward from the center or towards it; in none of the specimens examined did more than five point outward. The third and inner circle is composed of short conical projections arising from the base of the long spines of the second circle (fig. 10); these conical projections or spines are close down to the floor of the operculum, and are usually concealed by dirt.

The only color remaining is a wide band of dark green a little below the edge of the operculum.

Tubes convoluted, calcareous, on living oysters, shells, and stones.

Five small specimens from the oyster beds of Chesapeake Bay (997).

Hydroides spongicola, n. sp.

(Plate xx, figs. 11, 12. Plate xxi, figs. 13-16.)

Branchiæ large, composed of about thirty slender filaments.

Operculum armed with three concentric circles of spines, the outer one on the edge of the operculum comprising sixty-five slender-pointed denticles curving outward from the center. The next and most prominent circle arises from inside the cup of the operculum and extends upward perpendicularly to the floor; it is composed of from fourteen to

eighteen spines, their points curving invariably inward (fig. 12). The inner circle of spines arises from the base of the long spines, near the bottom of the cup, and are slightly curved towards the center (fig. 11).

The collar-setæ have two conical points at the head of the main shaft (13). The uncini of the thorax have from six to eight teeth; those of the abdomen are smaller, with the same number of teeth (figs. 14 and 15).

The setæ and uncini of this and the preceding species are so nearly alike that they fail to be characteristic.

Very thin and frail calcareous tubes in living sponges.

Length of large specimen, 40^{mm}; breadth, 2.5^{mm}.

Gulf of Mexico, latitude 27° 04' N., longitude 83° 21' 15" W., 26 fathoms; station 2409, ten specimens (975).

Hydroides protulicola, n. sp.

(Plate xx, fig. 17. Plate xxi, figs. 18-23.)

The branchiæ are small, having from ten to twelve filaments with long, naked ends; the pinnæ are large.

The opercula have about twenty-six conical points forming the edge. Twelve stout spines, with their points invariably bent outward from the center, form the inner and prominent armature (fig. 18). These spines have stout, decurved processes on their inner bases, corresponding to the spines forming the inner circle in the preceding species (fig. 17).

As compared with *H. dianthus*, the points at the head of the main shaft are a little longer and not quite so stout, and have prominent markings below them (fig. 19).

The thoracic uncini, having from six to eight teeth, are much narrower than the abdominal, which have five or six teeth (figs. 20 and 21).

Found living in coiled tubes fastened to the tubes of *Protula diomedea*.

Length of large specimens, 16^{mm}; width, 2^{mm}.

Off Cape Hatteras, latitude 35° 42' N., longitude 74° 54' 30" W., 43 fathoms; station 2307, 20 specimens (972).

CRUCIGERA, new gen.

Serpulidæ with the operculum infundibuliform and calcareo-cartilaginous, bearing radii more or less branched, with rounded apices crenulating the periphery; inner surfaces beset with conical teeth. Peduncle with four digital processes just below the operculum, forming a cross.

Crucigera Websteri, n. sp.

(Plate xxi, figs. 24, 25. Plate xxii, figs. 26-30.)

The branchiæ are composed of about eighteen filaments.

The operculum is bell-shaped, with a strong peduncle; four digital processes arise on the peduncle just below the cup and form a cross. The disk is composed of a number of radii, branching so as to form fifty well rounded apices (figs. 24 and 25). The radii, on their inner surfaces, are armed with short, conical, horny teeth.

The collar-setæ are long and very stout (figs. 26 and 27).

The thoracic uncini are like the abdominal, but much larger (figs. 29 and 30).

The tubes, on their upper surfaces, have two or three very irregular, thin ridges; their under surfaces, usually attached for the greater part of their length to dead shells and stones, are, when free, round and smooth.

Length of large specimen, 16^{mm}.

Gulf of Mexico, latitude 29° 16' 30" N., longitude 85° 32' W., 26 fathoms; station 2369, eight specimens (974).

POMATOSTEGUS Schmarida.

Pomatostegus stellatus Schmarida.

(Plate xxii, figs. 32-35. Plate xxiii, figs. 36, 37.)

Terebella stellata Abildg., *Schriften Naturf., Freunde*, ix, p. 142.

Serpula stellata Savigny, *Syst. des Ann.*, p. 75.

Pomatostegus stellatus Schmarida, *Neue wirbellose Thiere*, p. 32, 1859.

The opercula have from two to five disks, the upper ones often much worn and broken, those nearest the peduncle usually quite perfect. The upper disks are readily detached, leaving the projecting stem of the one below surmounted by the usual crown of radial points. The specimens show, in some cases, a partial cleavage of the soft head of the peduncle from the lowest disk (figs. 32-34). It would appear from this that the disks were successively secreted, and that they grow out, keeping the operculum in good repair.

The collar-setæ are long and slender, slightly constricted, and then enlarged just below the head of the main shaft (fig. 35).

The thoracic setæ are limbate; the uncini are large and have twelve or thirteen teeth (fig. 36). The abdominal uncini are the same in shape, but have only nine or ten teeth (fig. 37).

The branchiæ are spiral, of little more than one turn. They retain their color in alcohol, varying from a dark blue, with only a trace of white, to a blue with white bands. One specimen has white branchiæ with only very narrow bands of blue.

Length of large specimens, 45^{mm}; width, 4^{mm}.

Ten specimens (969 and 998).

Jamaica and Curaçao; shallow water.

SPIROBRANCHUS Blainville.

Spirobranchus giganteus (Pall.) Mörch.

(Plate xxiii, figs. 38-42. Plate xxiv, figs. 43-47.)

Serpula gigantea Pallas, *Misc. Zool.*, p. 139, pl. 10, figs. 2-10.

Serpula gigantea Savigny, *Syst. des Ann.*, p. 74.

Serpula gigantea Grube, *Fam. der Ann.*, p. 90.

Cymospira gigantea Blainville, *Diet. des Sci. Nat., Art. Vers.*

Cymospira gigantea Schmarida, *Neue wirbellose Thiere*, p. 31.

Cymospira gigantea Quatrefages, *Hist. Nat. des Ann.*, tome ii, p. 543.

Spirobranchus giganteus Mörch, *Rev. Crit. Serp.*, p. 56, pl. ii, figs. 18-20.

There are eight specimens of this species in the collection, four from St. Thomas and four from Curaçao. The St. Thomas specimens are somewhat darker and smaller than those from Curaçao. The operculum of a small specimen from St. Thomas is nearly circular (fig. 38). A slightly larger specimen shows a ridge running back from the horns to the center of the disk, as is the case with specimens of the same size from Curaçao.

Figs. 41 and 42 show an operculum of a large specimen from Curaçao, in which the ridge runs back to the posterior edge of the disk and is elevated, having four short horns projecting at the end.

The branchiæ of the large specimens are eight-spiral; those of the small, five-spiral.

The collar-setæ are of two varieties (figs. 43 and 44). The points of setæ represented by fig. 43 were invariably broken. The figure shows the point restored by producing the outlines to an intersection beyond the break.

The thoracic uncini (fig. 45) have from sixteen to eighteen teeth; the abdominal (fig. 46), from ten to thirteen.

The collars of all the specimens are of a deep blue; the branchiæ are rose-red, variegated with flesh-color.

As is well known, this species lives in tubes formed in coral. The mouths of the tubes are made smooth by a secretion of carbonate of lime of a light-purple tinge. A single curved spine of the same substance projects over the entrance of the tube (fig. 40). This is undoubtedly secreted by the worm.

The largest specimen is about 75^{mm} in length and 9^{mm} in breadth; the smallest about 40^{mm} in length, and 5^{mm} in breadth.

Colors and sizes taken from specimens in strong alcohol.

Coral reefs; shallow water (961-964).

Spirobranchus incrassatus (Krøyer) Mörch.

(Plate xxiii, fig. 48. Plate xxiv, fig. 49.)

Cymospira incrassata Krøyer, Mus. Reg.

Cymospira incrassata Quatrefages, Hist. Nat. des Ann., t. ii, p. 545.

Spirobranchus incrassatus Mörch, Rev. Crit. Serp., p. 59, pl. xi, figs. 21-23.

A single specimen of this species was placed in the collection by a member of the Mexican Geographical Commission. It agrees quite well with Mörch's description and figures, except that the unpaired horn arises from the operculum (fig. 49) at the same angle as the large pair, and all are much nearer the center. The true outline of the operculum is shown in fig. 48. The branchiæ are eight-spiral.

It is probable that a large series of specimens would show this to be a variety of *S. giganteus*, or even a form due to age. The species was described originally from the Pacific Ocean.

The long collar-setæ are the same in size and shape as those figured from *S. giganteus*. It was impossible to compare the small collar-setæ,

The thoracic uncini have from eighteen to twenty teeth; the abdominal, eleven to thirteen. The capillary setæ from the abdomen are a little more enlarged at the end.

Length, 90^{mm}; breadth, 9^{mm}, in alcoholic specimens. No color remains.

Collected at Vera Cruz. Teste Señor J. G. Aguilera (999).

Spirobranchus dendropoma Mörch.

(Plate xxiv, figs. 57, 58. Plate xxv, figs. 50-56.)

Spirobranchus dendropoma Mörch, Rev. Crit. Serp., p. 60, 1863.

Cymospira litigera Quatrefages, Hist. Nat. des Ann., tome ii, p. 545, 1865.

Many specimens of this species were collected at St. Thomas, Jamaica, and Curaçao. They agree quite well with Mörch's description except that the horns, five or six in number, are situated nearer the center than he describes them.

The branchiæ differ from the two preceding species of the genus in having but one turn on a circular rather than on a spiral base, and in the structure of the branchial filaments, which have a cirrus at the base of the free portion (fig. 50).

While in these respects it differs from the leading species of the genus, the structure of the opercula and the form of the setæ and uncini show it to be closely related to it. The opercula vary in shape, and range in color from dark blue to white. The horns of some of the larger specimens (fig. 53) are short and stumpy, while others are long and have numerous branches (figs. 51 and 52). Specimens with large horns have, as a rule, more slender peduncles. The digital processes on the inner margin of the wings of the peduncles are often well marked.

No unbroken specimens of the collar-setæ were found. The markings on the head of the main shaft are more distinct than those on similar setæ of *S. giganteus* (fig. 54.)

The uncini of the thorax are similar to those of the abdomen but larger, and average one or two teeth more, the former having from twelve to fifteen, and the latter from ten to thirteen, according to their position in the row (figs. 55 and 56). The abdominal setæ are scarcely distinguishable from those of the preceding species (fig. 57).

The specimens when first collected were placed in strong alcohol, and still retain some color, as is often the case under these circumstances.

The branchiæ vary from a light to a dark blue banded with white. The lamellæ of the thorax are in most cases a dark violet-blue. The thorax and anterior part of the abdomen are dark.

Length of large specimens, 40^{mm}; breadth, 2.5^{mm}.

In tubes; coral reefs; shallow water (967, 968, and 977).

EXPLANATION OF PLATE XX.

Protula diomedæ Benedict, sp. nov.

- FIG. 1. Thoracic uncinus, enlarged 650 diameters.
FIG. 2. Abdominal uncinus, enlarged 650 diameters.
FIG. 3. Long thoracic setæ, enlarged 433 diameters.
FIG. 4. Anterior abdominal setæ, enlarged 433 diameters.
FIG. 5. Posterior abdominal setæ, enlarged 433 diameters.
FIG. 6. Tube, natural size.

Protula americana McIntosh.

- FIG. 7. Anterior uncinus, after McIntosh, enlarged 700 diameters.

Protula alba Benedict, sp. nov.

- FIG. 8. Abdominal uncinus, enlarged 650 diameters.
FIG. 9. Anterior abdominal setæ, enlarged 433 diameters.

Hydroïdes dianthus Verrill.

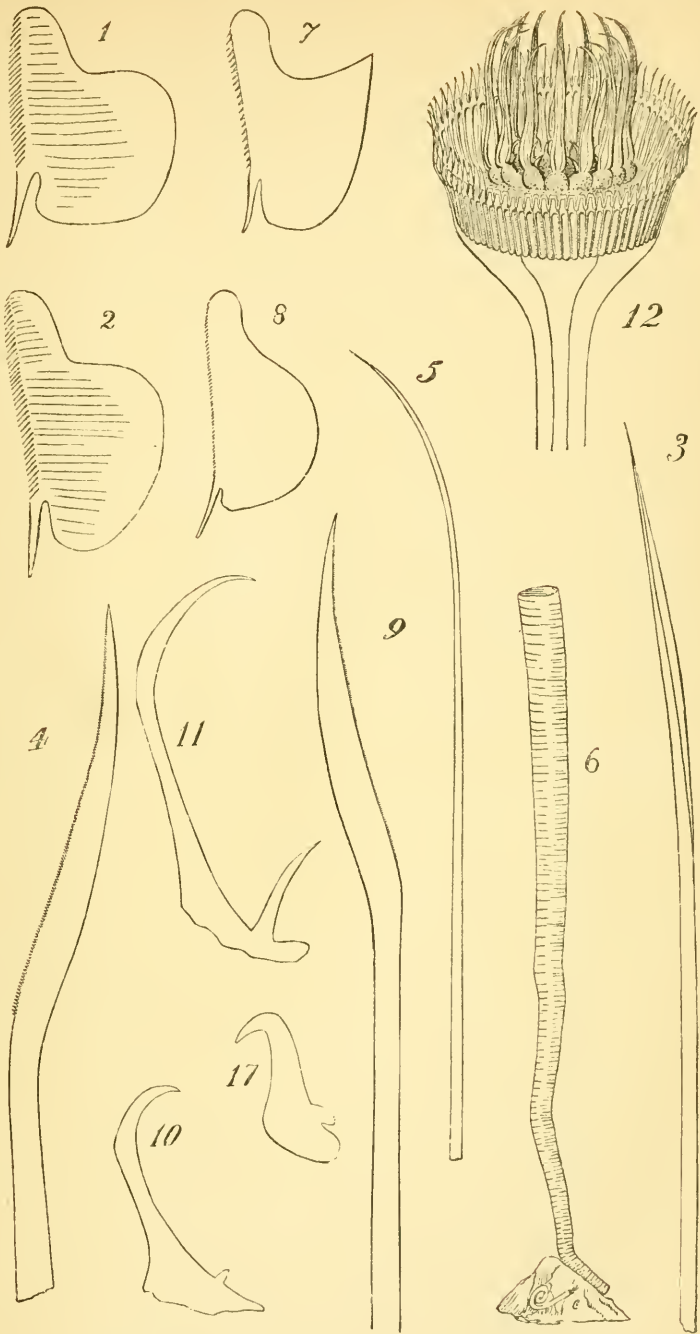
- FIG. 10. Spine of operculum, showing conical process at base, enlarged 43 diameters.

Hydroïdes spongicola Benedict, sp. nov.

- FIG. 11. Spine of operculum, enlarged 43 diameters.
FIG. 12. Operculum, enlarged.

Hydroïdes protulicola Benedict, sp. nov.

- FIG. 17. Large spine of operculum, showing protuberance on inner base, enlarged 43 diameters.



EXPLANATION OF PLATE XXI.

Hydroides spongicola Benedict, sp. nov.

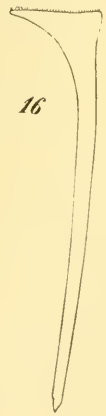
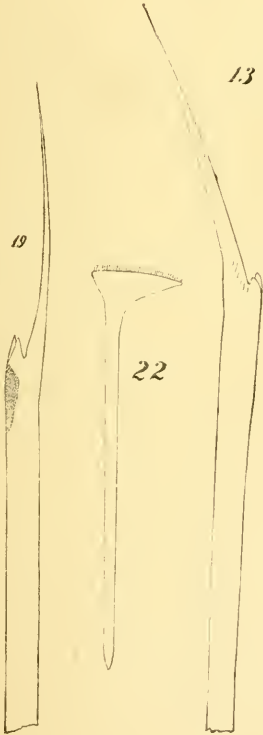
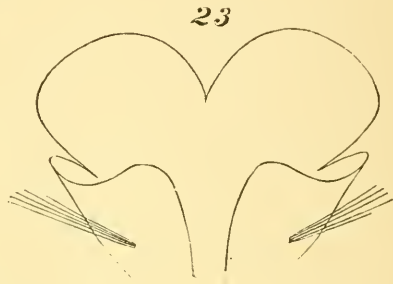
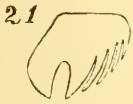
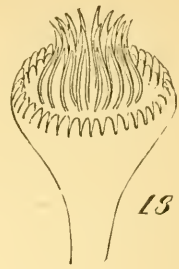
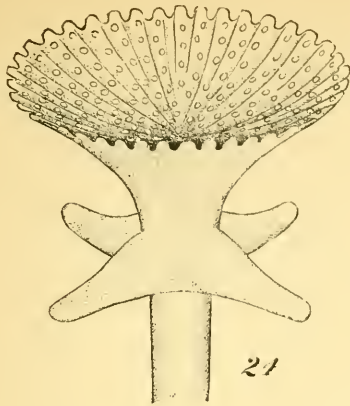
- FIG. 13. Collar setæ, enlarged 325 diameters.
FIG. 14. Abdominal uncinus, enlarged 650 diameters.
FIG. 15. Thoracic uncinus, enlarged 650 diameters.
FIG. 16. Spatulate setæ of abdomen, enlarged 325 diameters.

Hydroides protulicola Benedict, sp. nov.

- FIG. 18. Operculum, enlarged.
FIG. 19. Collar setæ, enlarged 210 diameters.
FIG. 20. Thoracic uncinus, enlarged 650 diameters.
FIG. 21. Abdominal uncinus, enlarged 650 diameters.
FIG. 22. Spatulate setæ, enlarged 325 diameters.
FIG. 23. Outline of collar, enlarged 37 diameters.

Crucifera Websteri, Benedict sp. nov.

- FIG. 24. Disk of operculum, enlarged. .
FIG. 25. Radii, enlarged.



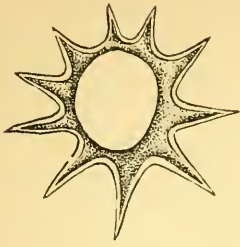
EXPLANATION OF PLATE XXII.

Crucifera Websteri Benedict, sp. nov.

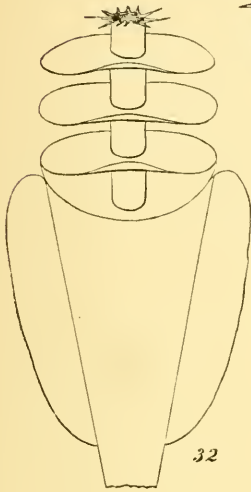
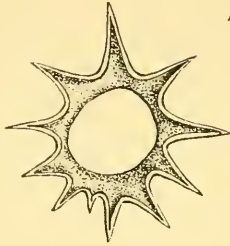
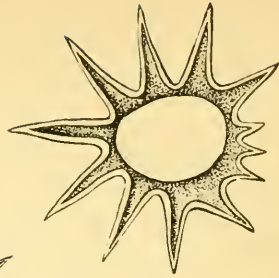
- FIG. 26. Collar setæ, front view, enlarged 210 diameters.
FIG. 27. Collar setæ, side view, enlarged 210 diameters.
FIG. 28. Spatulate setæ, enlarged 325 diameters.
FIG. 29. Thoracic uncinus, enlarged 650 diameters.
FIG. 30. Abdominal uncinus, enlarged 650 diameters.

Pomatostegus stellatus Schmarda.

- FIG. 32. Operculum and peduncle, enlarged.
FIG. 33. Stellate ends of opercula, enlarged.
FIG. 34. Lower disk of operculum, enlarged.
FIG. 35. Collar setæ, enlarged 210 diameters.



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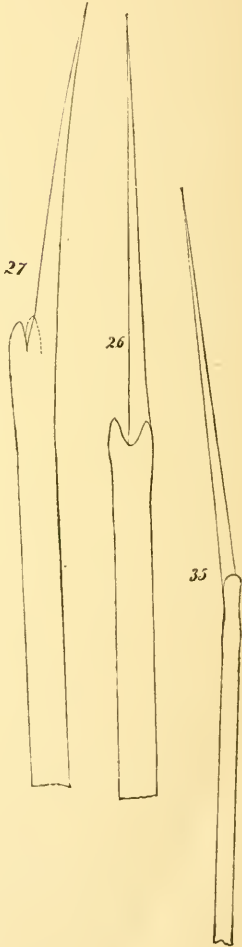
32

29



27

26



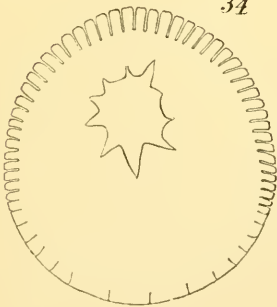
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28



34



35

EXPLANATION OF PLATE XXIII.

Pomatostegus stellatus Schmarda.

FIG. 36. Thoracic uncinus, enlarged 650 diameters.

FIG. 37. Abdominal uncinus, enlarged 650 diameters.

Spirobranchus giganteus (Pall.) Morch.

FIG. 38. True outline of disk of operculum, small specimen, enlarged 5 diameters.

FIG. 39. True outline of disk of operculum, large specimen, enlarged 5 diameters.

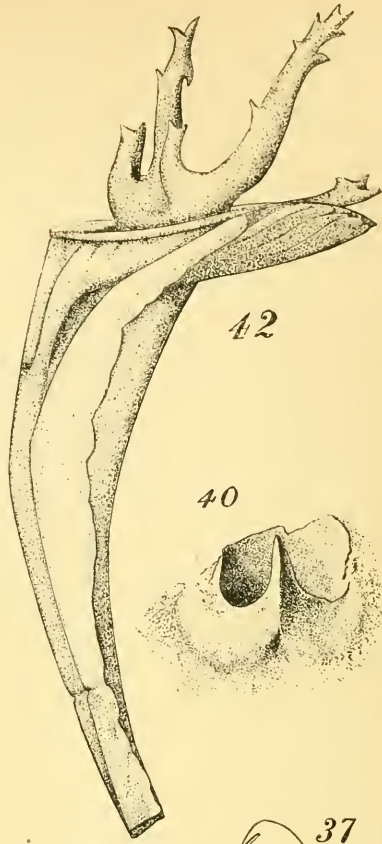
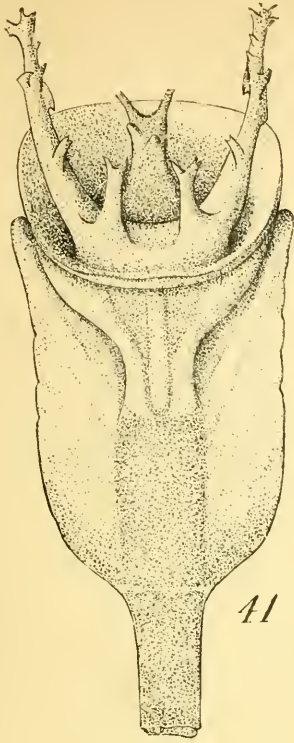
FIG. 40. Mouth of tube, enlarged 3 diameters.

FIG. 41. Operculum, front view, enlarged.

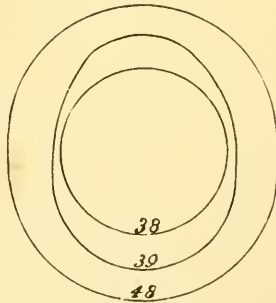
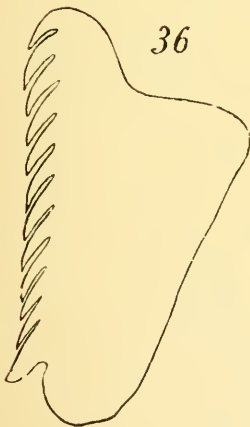
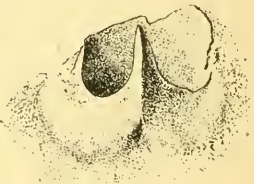
FIG. 42. Operculum, side view, enlarged.

Spirobranchus incrassatus (Kroyer) Morch.

FIG. 48. True outline of operculum, enlarged 5 diameters.



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EXPLANATION OF PLATE XXIV.

Spirobranchus giganteus (Pall.) Morch.

FIG. 43. Straight collar setæ, enlarged 210 diameters.

FIG. 44. Bent collar setæ, enlarged 210 diameters.

FIG. 45. Thoracic uncinus, enlarged 650 diameters.

FIG. 46. Abdominal uncinus, enlarged 650 diameters.

FIG. 47. Abdominal setæ, enlarged 325 diameters.

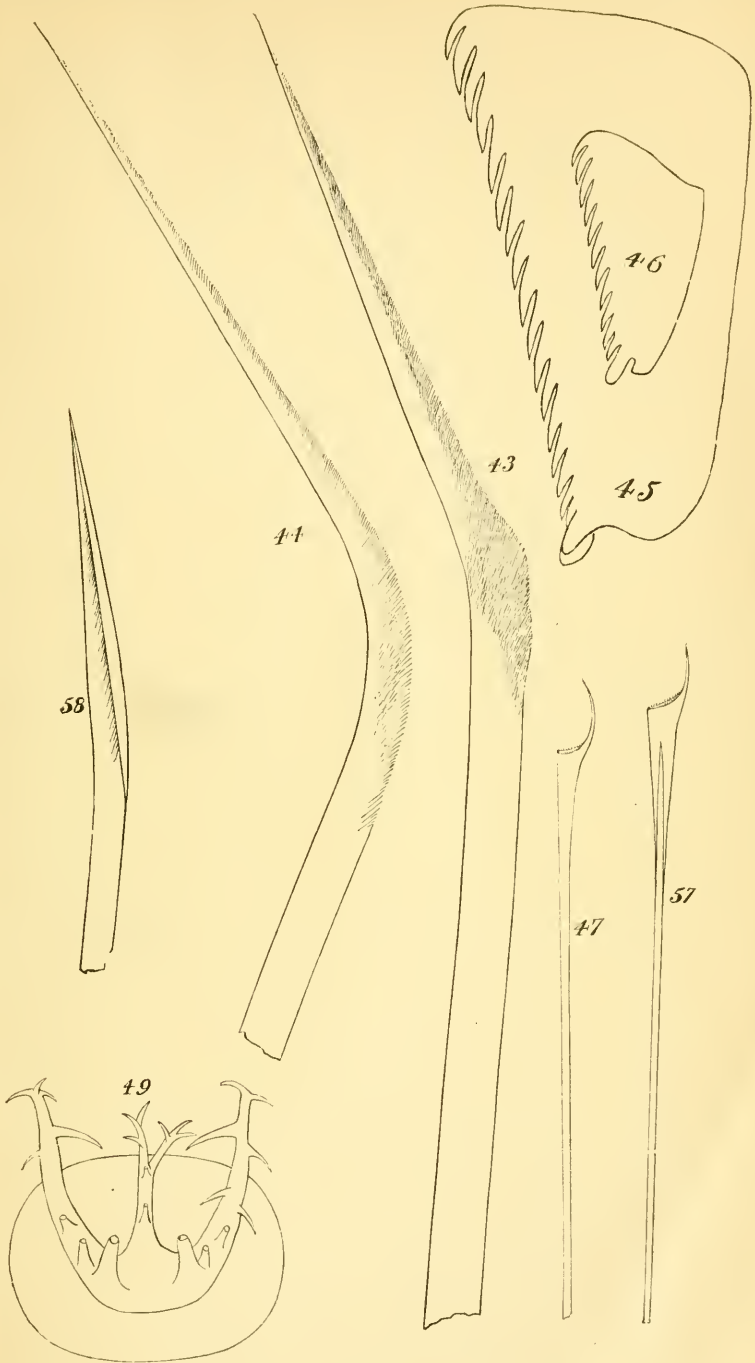
Spirobranchus incrassatus (Kroyer) Morch.

FIG. 49. Operculum, enlarged.

Spirobranchus dendropoma Morch.

FIG. 57. Abdominal setæ, enlarged 325 diameters

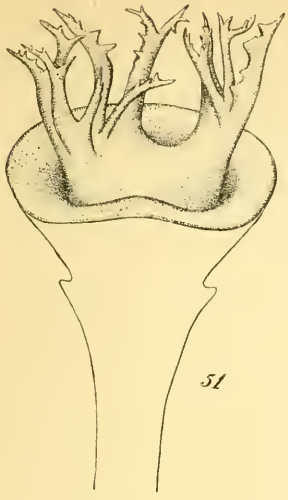
FIG. 58. Thoracic setæ, enlarged 325 diameters.



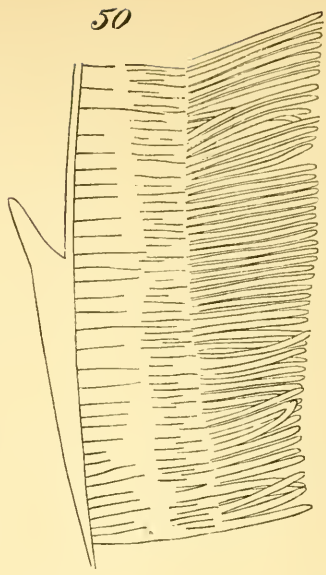
EXPLANATION OF PLATE XXV.

Spirobranchus dendropoma Morch.

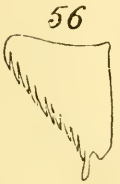
- FIG. 50. Portion of branchial filament, enlarged.
- FIG. 51. Operculum, front view, enlarged.
- FIG. 52. Operculum, side view, enlarged.
- FIG. 53. Operculum of a large specimen, enlarged.
- FIG. 54. Collar setæ, enlarged 650 diameters.
- FIG. 55. Thoracic uncinus, enlarged 650 diameters.
- FIG. 56. Abdominal uncinus, enlarged 650 diameters.



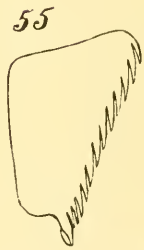
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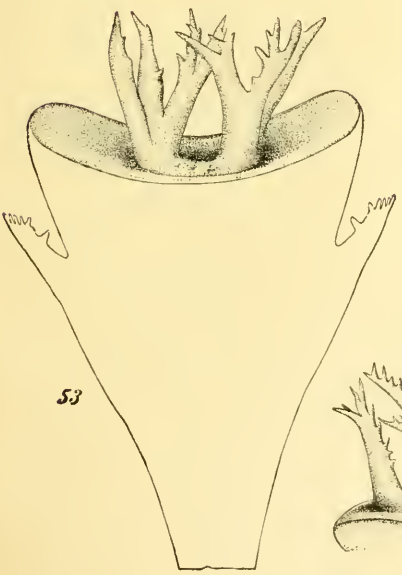
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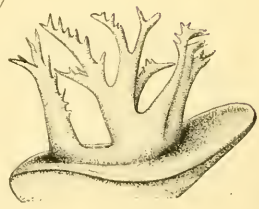
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