

ART. XLIV.—*Brief Contributions to Zoölogy from the Museum of Yale College.* No. XIII.—*Descriptions of new and imperfectly known Ascidians from New England*; by A. E. VERRILL.

[Continued from page 212.]

Family, POLYCLINIDÆ.

*Amouroucium glabrum* Verrill, sp. nov. Figures 20 to 22.

When young (fig. 20) this species forms small, clavate, or turbinate, translucent masses, attached by a narrow base, and containing only a few animals arranged somewhat irregularly around a single cloacal opening. The surface is smooth and glabrous, without adhering sand; the texture is rather firm, but so transparent as to distinctly show the animals, which are elongated and comparatively

large, standing nearly vertically, with the ovaries extending nearly to the base of the mass. The intestines, filled with pellets of fecal matter, appear as conspicuous, dark, oblique spots.

Larger specimens (fig. 21) become .5 to 1 inch or more broad and have a large attachment and expanding sides, with a more or less irregular, smooth upper surface, which is usually slightly convex. Several cloacal openings are irregularly placed on the upper surface, and numerous individuals are irregularly scattered throughout the mass, though often forming rather indistinct circular groups around the apertures. The surface is glabrous and the tissues translucent, as in the younger specimens.

The animals, when mature, are mostly about .20 of an inch long, and about .05 in diameter; but many are .25 of an inch long and .06 to .07 in diameter. The thorax is longer and broader than the abdomen, and in specimens taken about the middle of August the cloacal chamber was distended by three to five large eggs, with the tadpole-shaped embryos nearly developed, while the post-abdomen was quite slender and the ovaries shrunken. Specimens obtained earlier (fig. 22) had the post-abdomen much thicker and filled with the large ovaries, in the upper part of which were eggs in various stages of growth, while the cloacal chamber

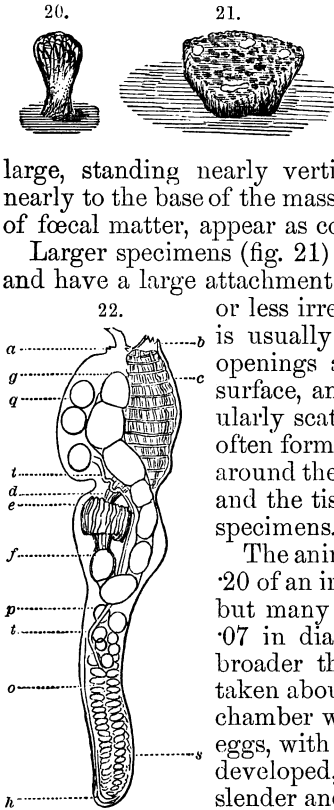


Figure 22.—*Amouroucium glabrum* Verrill, enlarged 10 diameters: *a*, anal orifice; *b*, branchial orifice; *c*, branchial sac; *d*, oesophagus; *e*, stomach; *f*, intestine containing fecal pellets; *g*, anus; *h*, heart; *o*, ovary; *p*, eggs; *q*, eggs containing embryos in process of development; *s*, testes; *t*, spermatic duct,—Original, by A. E. V.

contained but few eggs, in which the development was but little advanced. The post-abdomen is usually but little smaller at base than the abdomen, and tapers gradually to the obtuse end; its length is generally less than that of the thorax and abdomen taken together, but often exceeds it. The stomach (e, fig. 22) is short and broad, with numerous longitudinal, glandular ridges. The intestine is large, and usually contains from 7 to 10, large, blackish fecal pellets.

The branchial orifice (b, fig. 22) is surrounded by six, small, tapering papillæ. The anal orifice is somewhat bilabiate, the lower lobe being stout and broad, the upper longer and tapering.

The color of the masses during life, is pale, translucent, bluish white; the branchiæ are light yellow; the stomach dark orange; ovaries yellowish white; the eggs containing embryos bright orange-yellow.

Eastport Harbor and Grand Menan, low-water under stones, to 60 fathoms, stony and shelly bottoms, attached to stones, shells, ascidians, etc., common,—Exp. of 1861, '63, '64, '68, '70.

*Amouroucium pallidum* Verrill, sp. nov.

Masses sessile, hemispherical or subglobular, usually attached by a large base. Surface generally evenly rounded, sometimes irregular in large specimens, smoothish, but thinly covered with minute, firmly adherent particles of fine sand, which are imbedded in the surface of the common tissue and scattered throughout its substance. The texture is softer and more gelatinous than in the preceding species. The cloacal openings are few in number and irregularly placed, except in small specimens, which usually have but one large central opening. The animals are much smaller and more numerous than in the preceding species, often forming somewhat circular groups of six or eight individuals around the cloacal openings; outside of the circular groups they are usually irregularly scattered, but sometimes form linear series of eight or ten, and in young specimens with but one central opening they often form a larger outer circle, which is near the margin, more or less irregular, and composed of numerous individuals. Except in their much smaller size, the animals resemble those of the preceding species, though they are perhaps a little shorter and thicker in proportion. The post-abdomen, in all the numerous examples examined, was small, thick, obtuse, and decidedly shorter than the abdomen and thorax taken together; it contains few ovules in two series, and often terminates in two slender papillæ.

The larger specimens of this species are .50 to .75 of an inch in diameter; the largest animals are .08 to .11 long, by .03 to .04 of an inch in diameter, but many are much smaller than this; the largest one examined was .15 long by .05 of an inch in diameter.

The color of the masses, in life, is pale, translucent, grayish or bluish white, with yellowish white animals.

Eastport and Grand Menan, with the last,—Expeditions of 1868 and '70.

*Amouroucium pellucidum* Verrill.

*Alcyonidium?* *pellucidum* Leidy, Journal Phil. Acad. Nat. Sciences, 2nd ser., vol. iii, p. 142, Pl. x, fig. 25, 1855.

"Polypidom translucent white, attached by narrow fasciculated bases, which are extended in a procumbent manner and then expand into wedge-shaped masses, upon the free, flat surfaces of which the polyps are clustered. Polyps with bright orange colored tentaculæ.

Attached to rocks, mytili, sponges, etc., at Point Judith (R. I.); abundant.

The masses of *A. pellucidum* from the white, fasciculated points of attachment to the broad free surfaces are up to an inch in thickness. Although I preserved a number of specimens in fresh sea-water for some days, I could not induce the polyps, if they were such, to protrude from their cells, and I only had the opportunity of examining them in their retracted condition as represented in figure 24, plate x."

The figure referred to very well represents the thorax and abdomen of a species of *Amouroucium*, allied to *A. glabrum* V., except that the longitudinal ribs of the stomach were mistaken for the retracted tentacles of a Bryozoan, and figured as such. The post-abdomen is not shown, and was undoubtedly accidentally broken off in dissecting it out.

The cloacal cavity, or atrium, is represented as distended by four large eggs, containing well advanced embryos; the branchial sac has a broad dorsal and 12 transverse ducts; the intestine is like that of *A. glabrum*, and contained dark fœcal pellets; the branchial opening has six rounded papillæ; the anal has an elongated lobe above it.

Two specimens, dredged at Wood's Hole, Mass. by Prof. H. E. Webster, appear to be identical with this species. These form low, soft, broadly expanded and flat topped masses, up to 2 inches in diameter, and .50 to .75 thick, attached by the middle of the lower surface and proliferous around the edge of the base, which is surrounded by young colonies, composed of but few individuals arranged around a central orifice and covered externally with adhering sand. These young colonies are elongated, expanding to the truncate upper end, and ascend very obliquely, the outer ones remaining free, except at base, the inner ones coalescing more or less completely with the central mass. The common tissue of the upper side is very soft, gelatinous, translucent, with but little adhering sand; the sand increases toward the margin, and on the outer and lower sides

nearly covers the surface. The individual zoöids are very numerous on the upper side, mostly arranged in rather irregular, elongated, elliptical or oblong systems, composed of many individuals of various sizes. The adult individuals are rather slender and elongated; the slender post-abdomen equalling or exceeding in length the rest of the body, but not more than half the diameter of the thorax and slightly constricted at base. In young individuals, not half grown, the post-abdomen forms nearly half the whole length, and is very slender. The branchial aperture has six, short, round papillæ; the anal is situated a short distance from the end of the body, and has short inconspicuous lower lobes, with an elongated, pointed lobe above. The branchial sac is oblong, with numerous longitudinal and transverse vessels and a broad ventral duct. The stomach is about as broad as long, subglobular, with the ends truncated and the surface covered with numerous, interrupted, longitudinal, glandular ridges. The post-abdomen is nearly filled by the large, elongated ovary, which extends nearly to the posterior end on the dorsal or atrial side, and contains numerous closely packed ovules of comparatively large size, and the conspicuous male organs, extending through the whole length on the ventral or branchial side, in the form of a slightly convoluted, dark colored duct. The posterior end terminates in a small, obtuse papilla. The atrium, or cloacal cavity, contains eggs in which the embryos are well developed, and in some cases the free, tadpole-shaped larvæ. The tunic is speckled with numerous, minute, purplish-brown pigment cells.

One of the larger adult individuals measured .30 of an inch in length; thorax .08; abdomen .06; post-abdomen .16; diameter of thorax .031 to .035; of abdomen about the same; of post-abdomen .015 to .020.

*Amouroucium stellatum* Verrill, sp. nov.

This species forms large, erect, crest-like plates or fronds, attached at the lower edge to stones and pebbles by short root-like extensions; the outer and upper edges are subacute or rounded, divided into two broad, rounded lobes above. The frond is 2.5 inches high, and about the same in breadth, the thickness varying from .20 to .35 of an inch. The tissue is firm and cartilage-like externally, softer within; surface smooth and glabrous, without adhering sand. The zoöids are arranged in nearly circular and pretty regular stellate groups, usually containing from six to fifteen individuals, arranged around a central sub-circular orifice; in contraction the position of each individual is indicated by an oval spot, more transparent than the common tissue, with a small flake-white spot around the branchial orifice.

The individual zooids are elongated and slender; the post-abdomen more slender, usually considerably exceeding in length the rest of the body, and but slightly constricted at base; the thorax and abdomen are shorter and stouter than in the preceding species; branchial sac with about 12 transverse vessels; stomach oblong-oval, with numerous longitudinal glandular folds; intestine large. Branchial orifice with six short lobes; anal orifice terminal or nearly so, close to the branchial, with an acute upper lobe.

Color, in alcohol, milky white, subtranslucent; zooids yellowish. One of the larger zooids measured .31 of an inch in length; the thorax .085; the abdomen .062; the post-abdomen .165; diameter of thorax .045; of post-abdomen .025.

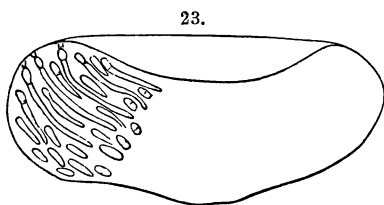
Wood's Hole, Mass.,—Prof. H. E. Webster.

This species is easily distinguished from all the preceding by its large, upright fronds, circular systems, and the regular stellate arrangement of the zooids, and by its firmer texture and smooth surface.

*Macroclinum*, gen. nov.

Allied to *Aplidium*, forming thick, fleshy masses, of various forms; without cloacal openings or common ducts, each individual having its own branchial and anal orifices, side by side. Systems scattered, usually rather indistinct. Animals elongated, slender; post-abdomen narrow, much longer than the abdomen and thorax taken together, filled with voluminous ovaries, placed on each side of the median duct; eggs small and very numerous; stomach deeply lobed; intestine long, often convoluted; anal orifice terminal or subterminal, near the branchial, subcircular or somewhat bilabiate, the upper side with a rather prominent lobe; branchial with six rounded lobes or short papillæ. Type, *M. crater*.

Savigny included in his genus *Aplidium* two "tribes," each containing several species, but differing considerably in structure. In the first tribe, to which the name, *Aplidium*, should be



restricted, the post-abdomen is short and rounded and the ovaries are clustered and contain few large ovules; the anal orifice is on the side of the thorax and distant from the branchial. The second tribe appears to correspond nearly

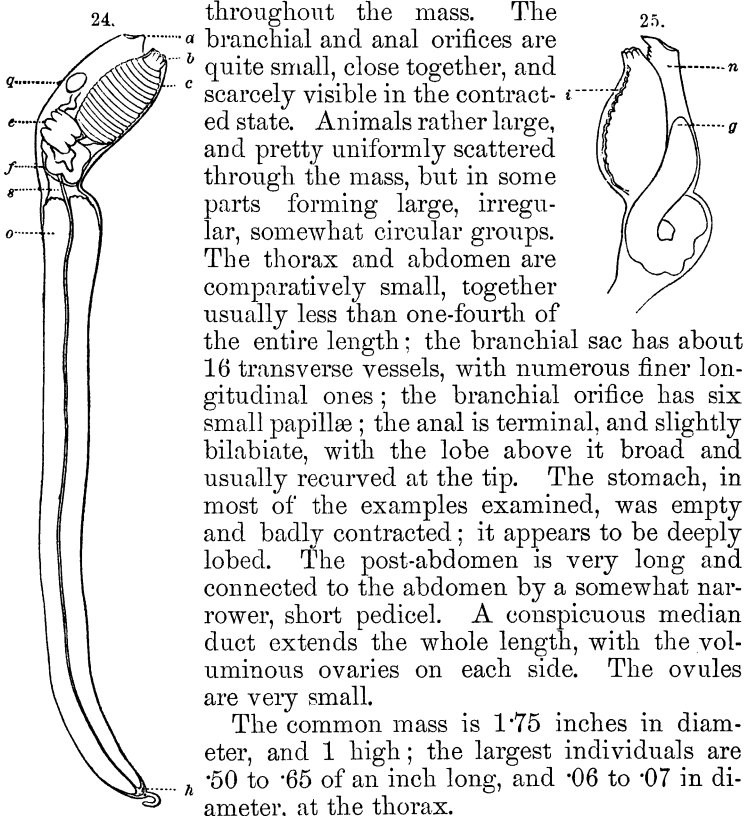
with our genus, *Macroclinum*, the post-abdomen being very long, with the ovaries arranged along each side; but there is considerable diversity in the arrangement of the anal orifices, if

Figure 23.—*Macroclinum crater*, showing in outline a section through the middle, natural size. The animals are omitted on one side.—Original, by A. E. V.

correctly figured. The species are *M. effusum* from the Gulf of Suez, *M. gibbulosum* and *M. caliculatum* from Europe. *M. nutans* (Johns., sp.) from England, appears to be another species.

*Macroclinum crater* Verrill, sp. nov. Figures 23 to 25.

This species forms large, thick, gelatinous, but firm masses, which have a circular outline, with the upper surface deeply concave or cup-shaped. The surface is covered with a thin layer of closely adhering grains of fine sand, which are also diffused



throughout the mass. The branchial and anal orifices are quite small, close together, and scarcely visible in the contracted state. Animals rather large, and pretty uniformly scattered through the mass, but in some parts forming large, irregular, somewhat circular groups. The thorax and abdomen are comparatively small, together usually less than one-fourth of the entire length; the branchial sac has about 16 transverse vessels, with numerous finer longitudinal ones; the branchial orifice has six small papillæ; the anal is terminal, and slightly bilabiate, with the lobe above it broad and usually recurved at the tip. The stomach, in most of the examples examined, was empty and badly contracted; it appears to be deeply lobed. The post-abdomen is very long and connected to the abdomen by a somewhat narrower, short pedicel. A conspicuous median duct extends the whole length, with the voluminous ovaries on each side. The ovules are very small.

The common mass is 1.75 inches in diameter, and 1 high; the largest individuals are .50 to .65 of an inch long, and .06 to .07 in diameter, at the thorax.

Color in alcohol translucent yellowish white; the animals light yellow.

Banks of Newfoundland,—T. M. Coffin.

Figure 24.—One of the individual animals, extracted and enlarged 7 diameters; *a*, anal orifice; *b*, branchial; *c*, branchial sac; *e*, stomach; *f*, intestine; *h*, heart; *o*, ovary; *g*, egg in process of development in the cloacal chamber or atrium; *s*, spermatid duct.—Original, by A. E. V.

Figure 25.—View from the opposite side, showing the thorax and abdomen of another individual, enlarged 10 diameters; *g*, termination of the intestine, which is filled with fecal matter; *i*, ventral duct of the branchial sac; *n*, cloacal chamber.

With the last species Mr. Coffin obtained another, which is not well enough preserved to admit of accurate determination. It may be a species of *Amouroucium*, or another *Macroclinum*. It forms broad incrustations, 2 or 3 inches across and about .25 thick in the center. The marginal portion is thin and covered with adherent grains of sand; the central part is smooth and glabrous, slightly convex. The zoöids are about .30 long, with a long post-abdomen, which is not pedicellate, resembling that of *A. glabrum*.