CONCERNING "LARVAL" COLONIES OF PECTINATELLA.

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During several summer sessions of the Lake Laboratory of the Ohio State University, as occasion offered, the sexual reproduction of the Bryzoan Pectinatella has been kept under observation.

As is well known, Pectinatella grows in large submerged masses attached to any artificial support. The thickened cuticle which makes the skeleton of Bryozoans is in this case a gelatinous mass with the polyps distributed in irregular patterns over the surface. When the colony reproduces sexually the fertilized egg is retained for a time in the superficial portions of the gelatin. There it develops what Parker and Haswell, Vol. I, p. 325, call "a ciliated hollow cyst from which the colony is derived by gemmation."

The individual polyps connected with this cyst are not especially embryonic and can hardly be distinguished from polyps dissected out from an adult colony. According to the Cambridge Natural History, Vol. II, p. 512, "The peculiarity of the Phylactolaematous larva may be explained by assuming that it becomes a zooecium while it is still free-swimming. Thus the larva of Plumatella develops one or sometimes two polypides which actually reach maturity before fixation takes place. That of Cristatella develops from two to twenty polypides or polypide buds at the corresponding period, and it is in fact a young colony while still free-swimming."

In Pectinatella the so-called larval colony is freed from the adult gelatin after an undetermined stay and may be obtained in small numbers at certain times by sweeping around the adult with a dip-net. Unfavorable conditions hasten the giving off of these forms. Of two adults on the same stick, one partly out of water due to a S. W. wind was giving off many more larval colonies than the other. By bringing the adult into the laboratory, the stimulus of the changed environment results in the freeing of hundreds of these colonies.

The earliest date at which the free colonies have been taken in the open water around the adults is July first in

Terwilliger's Pond, South Bass Island. Towards the last of July almost every Pectinatella is producing both statoblasts and these colonies in large numbers. The non-sexual statoblasts seem to be produced in numbers later in the season than the sexual colonies. I could not decide whether there is a natural aperture for emergence or whether they go through breaks in the envelope, but the latter seem the most likely. (Fig. 1).

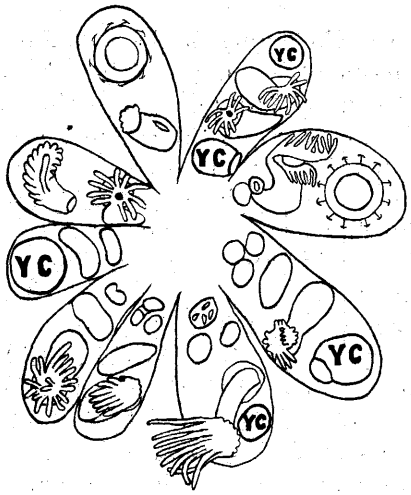

FIG. 1

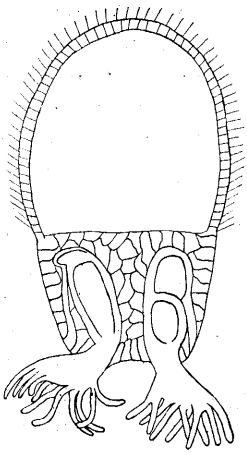

FIG. 2

Figure 1. Pectinatella, adult. One cluster of branches showing larval colonies and two statoblasts. × 25.

Figure 2. Diagrammatic sketch of free swimming colony. × 100.

As the larval colony is freed from the parent it is a ciliated float or bladder with a number of polyps below. There may be from one to five polyps, the usual number being four. As the colonies swim upwards by ciliary action, then sink, swim, sink, they have much the appearance of microscopic balloons.

They are from two to five millimeters long and about half as wide as they move in the water. The range of variation in length is great because the polyps of the cyst may be retracted into the gelatinous mass at the base of the float or may be extended downward with outspread tentacles swinging for food. The cyst also may contract.

The animals are, as one would expect, somewhat negative to light, but it is difficult to get precise records of the moving forms. One can be exact with the colonies as they affix themselves. When attaching to the side of a battery jar covered with pasteboard which had a rectangular hole two inches by one inch cut on the window side of the jar, out of thirty-six larval colonies, thirty attached on the half of the jar away from the window and six on the half of the jar toward the window.

The colonies were distributed vertically in a definite way also, eight only being in the lower three inches of the water and the rest in the upper four inches, more than half of the thirty-six colonies being located between one inch and three inches below the surface of the water.

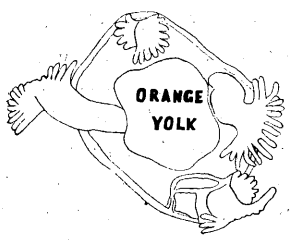

FIG. 3

FIG. 4

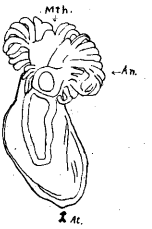

FIG. 5

Figure 3. Pectinatella. Sketch of camera drawing of recently set colony. × 100.
Figure 4. Four-polyp colony starved; fully differentiated; yolk all gone. × 25.
Figure 5. Last polyp of a starved colony, was letting loose from wall. Mth.= mouth. An.=anus. At.=point of attachment. × 100.

When no light at all was admitted to the battery jar, out of thirty-four colonies, twenty-three attached in the lower three inches of water and eleven in the upper two inches.

These colonies are also quite sensitive to foul water. At 11:30 A. M., one day an adult colony, which nearly filled a battery jar, was brought in. At 1:30 the adult was removed. The next morning the water in the jar was foul, one hundred and fifty colonies were in the first inch, eight in each of the next two inches and seven scattered in the lower four inches of water. In spite of the crowding to the top the attachment of the one hundred and fifty colonies was chiefly on the side of the jar away from the window, so the need for oxygen did not inhibit the customary light reaction.

The process of attaching is a very rapid one and has been observed a number of times. A specimen will be swimming and when possible striking the top of its float against some solid body. The side of the jar can be used in default of anything which can be struck more directly from beneath. Those observed were seen to fix the apex of the float to the glass, to shrink to as little as one-fourth of their swimming length and show in the center, between the polyps, a mass of orange-colored yolk. (Fig. 3). The epithelium of the place of attachment is sticky, so if the colony is scraped off at once it will stick to the knife. There are, in my opinion, as many sticky points at the top of the float as there are polyps in the colony, since attachment can be made a little off from the exact center of the float.

The larger portion of the float, in addition to being ciliated on the outside, possesses delicate bands of tissue in its wall which, when the colony attaches must serve to compress the contents of the cyst and to bring the yolk into the central region between the polyps. The liquid material which is contained in the cyst as it swims, shows very little of the orange color which characterizes the yolk of the attached colony. It is possible that this liquid content is a salty solution, in which case vitellin would be dissolved in it. If then, when the colony attached, the salt was taken up by the cells of the organisms, the dissolved yolk material would at once appear, as yolk is insoluble in water. There is, however, in preserved free colonies some solid yolk, as has been demonstrated by sectioning, so that the fact that none is visible may be due to the central position it holds. The rapid contraction of the walls of the cyst may force the yolk into the center between the polyps where it is most conspicuous. (Fig. 2).

The colonies, after attachment to the side of the jar, find no adequate supply of food. Since they starve to death in spite of the fact that the alimentary canals of many of them showed that they were filled with one-celled algae, I assume Pectinatella uses animal food. For the colonies exist and differentiate only as long as there is a yolk supply. (Fig. 4). Some of them, at least, then retrogress in an interesting way. Instead of all the polyps starving at once they are reduced successively from four, or the normal number, to three, to two, to one. The latest persisting polyp appears normal and healthy until

all of the tissue of the other polyps of the colony has disappeared. (Fig. 5). Then the mucus attachment elongates, the animal drops off and dies. This change took place in the specimens under observation in from three to four days after the time of attaching. Here I transfer a few sentences from my notes. Larval colonies of Pectinatella swept from around adults July 3, all set July 4. Three colonies at the surface film, one just at the middle of jar, four near the bottom. July 5, one of the lower colonies gone. Two of the others have but two colonies. Appear filled with algæ. July 6, another gone. Two colonies reduced to one polyp each. One has slipped on the glass diagonally downward half an inch. July 7, out of the eight colonies set on July 4, three are entirely gone, two have one polyp apiece, three appear normal. July 8, one only—near the bottom of jar. Planaria (Stenostomun) have been seen to eat the polyps of Plumatella and I assume they may be responsible for some of this disappearance.*

If we assume that the larval colony develops from a single fertilized egg, there is here a definite reversal of the growth processes as an adaptation to external conditions. A slightly similar type of reversal of growth occurs normally when the tail of the transforming tadpole is absorbed. Possibly the analogy is closer in the case of human disease when the fat and muscle of the body is depleted, while the nervous system still retains the large percentage of its tissue. The case in point, however, is the resorption of an independent individual, practically cut off from the rest of the colony.

In this particular case, if the explanation given is the true one, we find a device for prolonging the life of Pectinatella in the face of starvation, which should be of importance in the distribution of the species.

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*It may even be that this gradual disappearance of the polyps of a colony is due to their being eaten, one at a time, by some carnivorous creature and to this cause only. The regularity of reduction, however, would be in favor of the hypothesis offered above.