

OBSERVATIONS ON THE FOOD OF CLADOCERA.

BY THE LATE

HOMER G. FISHER.

During the winter of 1913-1914 I became interested in the feeding of two species of cladocera (*Daphnia pulex* and *Simocephalus vetulus*) which were being reared in the laboratory of Dr. A. M. Manta at the Station for Experimental Evolution of the Carnegie Institution of Washington. It was a part of my duty to collect food for them and hence the food was often examined microscopically, but by this method I was unable to determine just what elements of the mixture were being used as food by the daphnids.

At the suggestion of Dr. Banta, I then tried to examine the contents of the alimentary tracts of some of the daphnids, but I was still unable at that time to arrive at any definite conclusion as to what constituted their food. The only organized material that I was able to make out was a very minute organism that I supposed to be a bacterium. These observations were extended during the following year at the Zoological Laboratory of Indiana University and during the following summer at the Indiana University Biological Station. At the Biological Station a third form, *Daphnia hyalina*, was studied.

The method has been to examine the alimentary tracts as soon after feeding as possible to determine what had been ingested. At the University Laboratory the daphnid was always rinsed in tap water, placed on a clean slide, and crushed with a clean cover slip. In this manner most of the material of the alimentary canal was expelled and made available for observation. At the Biological Station the same method was used except that the animal was allowed to swim in distilled water a few minutes before it was put on the slide. Additional studies were made by making smears of the alimentary tract and staining. The stain used was in every case Flemming's triple stain. The following species and numbers were examined; at the Station for Experimental Evolution about 15 individuals, at the University Laboratory 18 *Daphnia pulex* and 14 *Simocephalus vetulus*, and at the Biological Station 64 *Daphnia pulex*, 17 *Simocephalus vetulus*, and 3 *Daphnia hyalina*. They were all parthenogenetic females.

At the Station for Experimental Evolution the daphnids were all obtained from laboratory jars. At the University they were obtained from Hill Pond, and at the Biological Station they were collected from Eagle (Winona) lake and from Cherry creek near its mouth. At the lake all of the *Daphnia* were obtained with a plankton pump from near the center of the lake at a depth of 4-8 meters. The *Simocephalus* were collected with a silk sampling net from the creek and from the edge of the lake among the aquatic plants. The material was examined as soon after collection as was practicable.

The only organized material found in the intestine of any of the species was a minute pear shaped flagellate, the systematic position of which has not been determined. There may be two or more species of the flagellates but they are so minute that it is not possible at present for me to determine

this. That they are flagellates can only be made out with an oil immersion lens. In many of the specimens the intestine was gorged with the flagellates and in no case have I ever found them absent. In living material the typical flagellate movement can be discerned.

The possibility has been suggested that the observed phenomena was only a Brownian movement, but upon staining enough organization can be made out to show clearly that the animal is a flagellate. Some individuals can be seen dividing. The uniformity of the shape of the individuals also shows them to be living organisms, as it is not likely that powdered particles in suspension would be of a uniform pear shape. As a further evidence that the bodies were alive I ran some Flemming's fixing solution under the cover glass and as soon as it reached the animal they immediately ceased all movement.

It was also suggested that these might only be parasitic in the intestine of the daphnid, but it was observed that they were found almost exclusively in the anterior end of the intestine. However, the material from the anal end of the intestine showed a few, but it seems that even these might have been forced to their position by the movement of the water around the body of the daphnid at the time it was crushed.

I also strained a large quantity of lake water through a silk net and then filtered it through filter paper. Upon examination this filtrate was found to contain the same flagellates. This demonstrated that they were living in the same water with the daphnids.

Since no other organized material was found in the intestine of the three species of cladocera and since their occurrence is constant, it seems reasonable to conclude that they form the food of the animal. While the number of individuals is not large, I believe that the times and conditions of collection of material are diverse enough to mean more than a much larger number of individuals collected at the same place during a single season.

¹Mr. Homer Glenn Fisher died in Oct., 1917. He had hoped to be able to extend these studies before publishing. He had submitted this preliminary summary which is published with no substantial change.—Will Scott.