

CONTRIBUTIONS TO THE BIOLOGY OF THE GREAT LAKES.

A REPORT OF WORK ON THE PROTOZOA OF LAKE ERIE, WITH ESPECIAL
REFERENCE TO THE LAWS OF THEIR MOVEMENTS.*

By H. S. JENNINGS,
Instructor in Zoology in Michigan University.

The general plan of work outlined in the preceding paper for a study of the Rotatoria in their relations to the life conditions of the lake would apply equally, with some changes, to the Protozoa or to almost any other group of animals. In the study of the Protozoa it was decided to strike at once for the heart of the matter by beginning an investigation of the laws of their activities. A typical and very abundant Infusorian, *Paramecium caudatum*, was selected for special examination, and a study was made of the nature of its activities and the laws which govern them, in the hope that a full knowledge of such laws in the case of one Protozoan might furnish a key to an understanding of the activities of other members of the group, as well as, in time, to those of higher animals. The results of this work have already been published in detail elsewhere, so that a brief résumé is all that will be presented here.

The work was successful in determining the general mechanism of the reactions of *Paramecium* to changes in the external conditions, and in showing that the reactions are of the same essential nature in many other Protozoa. It was shown that the reactions of *Paramecium* are of extraordinary simplicity. As will be recalled by most biologists, *Paramecium* is a somewhat cigar-shaped animal, with one end narrow and blunt, the other broad but pointed. From the blunt end a groove passes obliquely along one side of the body to the middle, ending there in the mouth. The side on which the mouth and groove lie may be distinguished as the oral side; the opposite side (on which the contractile vacuoles lie) as the aboral side. The entire surface of the animal is covered with cilia, by means of which it moves. As it more usually moves in the direction of the narrower, blunter end, that may be called the anterior end, the other the posterior end.

In what might be called the 'normal condition of affairs all of the cilia strike backward, so that the animal moves forward; at the same time it revolves on its long axis. Now, when a change is produced in the environment of the *Paramecium*, such as by it striking against an obstruction or passing into water of different chemical content or different temperature, the normal activity is modified in one of two ways:

1. If the *Paramecium* comes in contact with a solid body of a loose fibrous texture, its activity is decreased; the cilia on the surface of the body cease their

* The papers in this series are based on investigations of the U. S. Fish Commission under direction of Prof. Jacob Reighard, of the University of Michigan. The following have already appeared: The Mechanism of the Motor Reactions of *Paramecium*. <Am. Jour. Physiology, vol. II, pp. 311-341.

Laws of Chemotaxis in *Paramecium*. <Am. Jour. Physiology, vol. II, pp. 355-379.