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## The Distribution of Zooplankton in Lake Okoboji

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THE DISTRIBUTION OF ZOOPLANKTON IN  
LAKE OKOBOJI

MALCOLM McDONALD

During the past several summers a series of chemical and physical measurements have been made on Lake Okoboji by staff members of the Lakeside Laboratory. This is a continuation of work begun many years ago. In the summer of 1938 an attempt was made to study the relationship between the distribution of zooplankton and chemical and physical changes.

During the period June 30 to August 24 collections were made every two or three days from two stations in West Okoboji and one in East Okoboji Lake. Each collection consisted of a series of ten-liter samples pumped from various depths, concentrated by passage through a plankton net, and preserved in formalin. Temperature, dissolved oxygen and other data were recorded at the same time. A complete count by species and age groups was made of each sample for all organisms except protozoa, which were ignored.

The regular collecting station for the main lake was the "deep hole," which is about thirty-eight meters deep and is approximately in the center of the open lake. Another collecting station in West Okoboji Lake was in Emerson's Bay, nine meters in depth, which is separated from the open lake by a reef, consequently developing its own thermocline and stratification. The third regular station was in East Lake, which is too shallow (six meters) to develop a thermocline and is filled with a thick growth of blue-green algae.

Collections were started before the thermocline in the lake was established; and its formation, existence, and partial destruction in late summer by storms was followed. In addition, two series of collections were made at two-hour intervals during twenty-four hour periods to show vertical migrations in response to light changes. The most noticeable change during the summer was the elimination of life below the thermocline. Some organisms showed a very narrow range of vertical distribution and others showed a wide range. There is both a vertical and a horizontal stratification of forms, and the vertical stratification changes with light intensity.

In connection with this survey the taxonomy of the genus *Cyclops*, Order Copepoda, was studied in detail. A key has been constructed which requires a minimum of dissection and which the

author hopes is simpler than that in "Fresh Water Biology" by Ward and Whipple.

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## EFFECTS OF X-RAYS ON THE EARLY DEVELOPMENT OF THE GRASSHOPPER

TITUS C. EVANS

Eggs of *Melanoplus differentialis* were irradiated with different dosages of X-rays on the first day of development. Effects were noted on the subsequent increase in number and kinds of cells, weight and rate of oxygen consumption.

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## THE TIME OF EMBRYONIC DETERMINATION OF SENSORIA AND ANTENNAL COLOR, AND THEIR RELATION TO THE DETERMINATION OF WINGS, OCELLI, AND WING MUSCLE IN APHIDS

KARL A. STILES

Intermediate-winged aphids of the species *Macrosiphum solani-folii* were studied in an effort to determine the time of embryonic segregation of the sensoria and antennal color, and their relation to the determination of wings, ocelli, and wing muscle.

Dark antennal color and increased sensoria of winged aphids are considered to be characters closely correlated in development; for, in general, when there was a darkening of antennae, there was a corresponding increase in the number of sensoria. In practically all cases increased sensoria were correlated with a relatively large amount of nondegenerate wing muscle. It is concluded that embryonic determination of dark antennal color and increased sensoria takes place in a comparatively short period of time as compared with that of wings, ocelli, and wing muscle. The data make