THE ZOOPLANKTON OF CRAB ORCHARD LAKE DURING THE FIRST YEAR, 1941-1942

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Introduction

The dam at Crab Orchard Lake, east of Carbondale, Illinois, was first closed May 10, 1940, and completely filled February 1, 1942. W. B. Welch, of Southern Illinois University made periodic collections of the plankton from April 5, 1941 until April 3, 1942. He reported on the phytoplankton (Welch, 1942). Through his kindness, his collections were made available for the present study of the zooplankton. Thanks are due him for this and other favors and help, and to W. M. Gersbacher, of Southern Illinois University, for his advice and help.

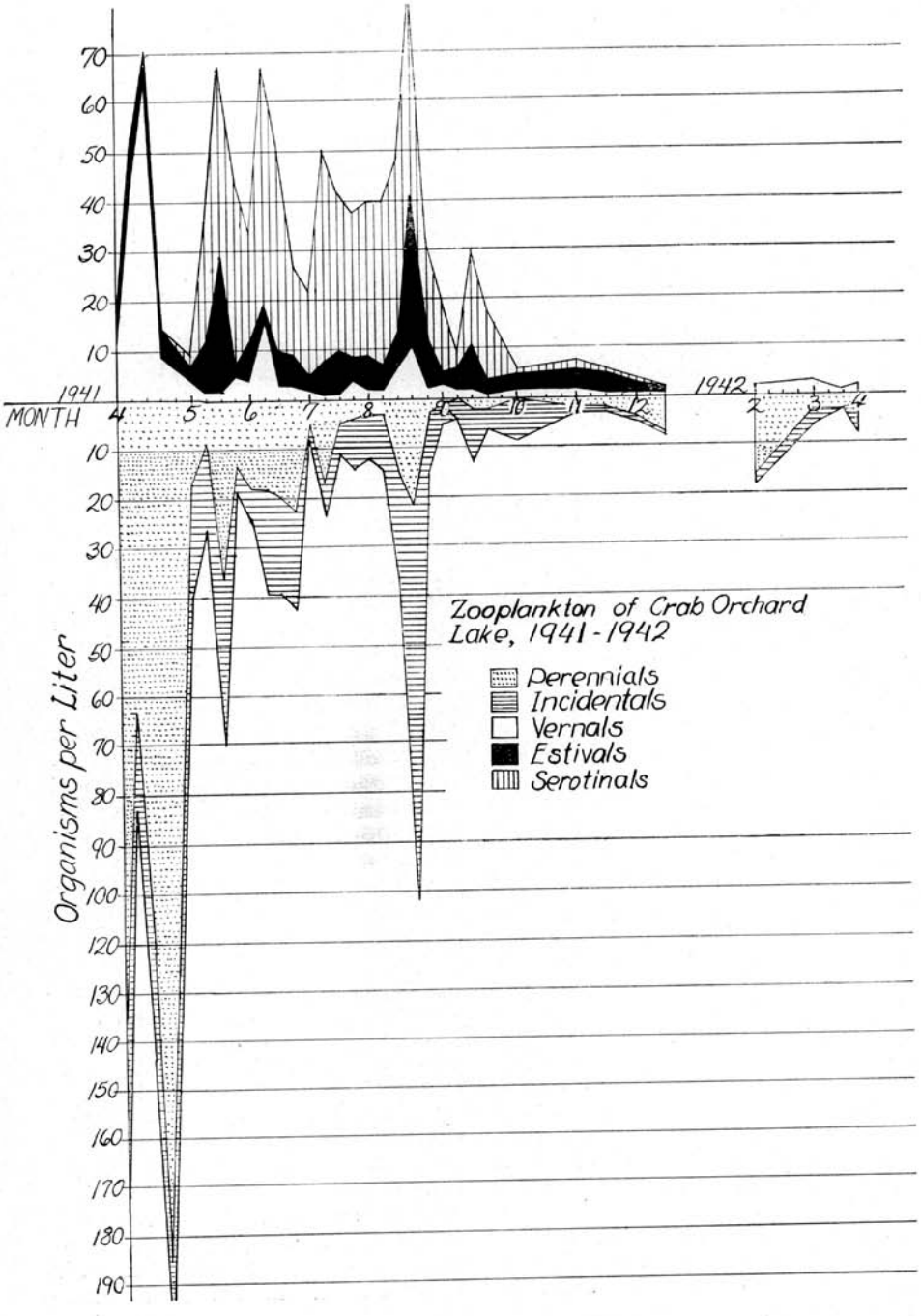
Fluctuations in Abundance

The great value of making frequent (weekly) collections during the spring, summer, and autumn is clearly shown in the accompanying graph. Several important fluctuations appear, which from their short duration could probably not have been discovered by collections at longer intervals. Notable fluctuations in abundance which occurred are described below.

(1) There was a great increase in numbers after the spring rains of 1941 had caused the surrounding lowlands to be flooded, and the subsequent aging of this new water. Large amounts of food materials were made available in the form of dead and decayed plants on the flooded lands. If the increase in numbers was actually caused by an increase of food supply, this organic debris must have been the source, since the plankton algae, which might have been a food source, showed no corresponding increase (Welch, 1942). Indeed, the only species of algae present in any quantity was a species of Asterionella. The other forms did not become abundant until later.

(2) A very sudden decline in population occurred after the early spring peak. This may have occurred as a result of the stagnation of the new water, and a decline in the amount of oxygen, or an increase in the amount of hydrogen sulfide, or a change in the pH. The decay of the organic debris in the water might have been the indirect cause of this decline through its effect on the factors mentioned. An examination of the data shows a very marked decrease in the numbers of individuals of most species in deep water after the first of June, when the general decline appears. It is probably in the deeper waters that a serious change in the factors mentioned would have had the most effect.

The increase and decrease described here are probably phenomena to be observed only in new lakes at the time of the first flooding, or other situations where a large amount of organic debris accumulates, as in lake bottoms which are exposed during long droughts. Eddy (1934) studied Lake Decatur in 1926, the second year after formation, and his graphs show no such increase or decrease, nor did it appear in the third or fourth years. There is no indication of


70
60
50
40
30
20
10
1941
MONTH
4
5
6
7
8
9
10
11
12
1942
2
3
4
10
20
30
40
50
60
70
80
90
100
120
130
140
150
160
170
180
190
Organisms per Liter
Zooplankton of Crab Orchard Lake, 1941 - 1942
Perennials
Incidentals
Vernals
Estivals
Serotinals

this change in the few data available for the second year at Crab Orchard Lake.

(3) There were two sharp increases in abundance in mid-spring and late spring. Both increases were immediately followed by sharp decline.

(4) Beginning about the first of July, the population increased and was held at a generally high level until about the middle of August.

(5) A midsummer increase in abundance occurred about the middle of August. This increase was more pronounced than either of those of the mid or late spring, but was shorter in duration. It is notable that this increase occurred in nearly all species on August 22.

(6) The increase of August 22 was followed by a very sharp decline, which continued into the winter with late fall and early winter populations at a low level.

Seasonal Development

The present study is of value in that it shows the trend of invasion and development from the first formation of the lake. Even in this early stage, seasonal and perennial predominants appear. In general, the data presented in this paper seem to correspond closely to the perennial and seasonal groups reported by Eddy. In some cases, however, there are differences. Where these differences occur, it is assumed for the present that such differences are a result of the immaturity of the successional development, and are not real. In Eddy's collections, some forms appeared earlier than others, and frequently had a different seasonal development in the early than in the later stages. Eddy's listing of perennial and seasonal predominants is adopted here, even though there are some apparent discrepancies.

Perennials

Difflugia spp. Eddy lists *D. lobostoma*, and *D. globulosa*, both of which are probably present here, but it was not possible to make a consistent separation. A species is present which appears to be *D. urceolata*—Protozoan
Polyarthra trigla Ehr.—Rotifer
Keratella cochlearis var *macracantha* (Gosse)—Rotifer
Synchaeta spp.—Rotifer
Bosmina longirostris (O. F. M.)—Cladoceran

Vernals

Notholca sp. (*longispina* Kellicott?)—Rotifer
Cyclops bicuspidatus Claus—Copepod
Cyclops spp.—Copepod

Estivals

Filinia sp.—Rotifer
Conochiloides sp.—Rotifer
Daphnia longispina (O. F. M.)—Cladoceran
Diaptomus spp.—Copepod

Serotinals

Pedalia mira (Hudson)—Rotifer
Diaphanosoma leuchtenbergianum Fischer—Cladoceran
Ceriodaphnia lacustris Birge—Cladoceran
Ceriodaphnia sp. May be *Moina* listed by Eddy—Cladoceran
Ceratium hirundinella O.F.M.—Protozoan

Incidentals

Cathypna sp.—Rotifer
Monostyla sp.—Rotifer
Ratulus spp.—Rotifer
Noteus quadricornis Ehr.—Rotifer
Chydorus sphaericus (O.F.M.)—Cladoceran
Nauplius—Copepod

Plankton Community Development

Eddy (1934) considers the only permanent freshwater communities to be found in streams. These communities reach the highest development in physiographically mature streams. Impounded waters, as in

the lake at Crab Orchard, duplicate the conditions of a mature stream to an extent that causes the plankton development to resemble that of a mature stream. This appears to be true at least in the earlier stages, but in later stages, the impounded lake resembles an abandoned stream channel. As such, it forms a developmental stage in a land community.

The newly formed lake probably represents a secondary bare area, since many of the later predominant organisms probably are present in the original stream. Upon the sudden increase of space, at flooding, with the attendant increase of available food materials in the submerged land vegetation, the zooplankton experiences a sudden rapid increase, as suggested by the data here presented. Later, conditions become stable at a lower level of productivity, and new forms invade until the typical stream community is developed.

Eddy suggested that fresh water communities may show an associational difference. He found species of Brachionus to be prevalent in the waters he studied in southern Wisconsin and northern and central Illinois, but lacking in southern waters. The data studied here seem to corroborate his suggestion, since species of Brachionus were very poorly represented for a short time in the summer only. However, the data are not extensive enough to warrant any further discussion here on that subject.

Summary

This study of the net zooplankton of Crab Orchard Lake during the first year of filling before overflowing the spillway found a list of 21 genera with at least as many or more species of zooplankters. Seasonal aspect is developed, with a hiemal society absent or poorly developed, a poorly defined estival society, and well developed vernal and serotinal societies. A possible indication of the associational nature of stream communities is shown in the absence or scarcity of species of Brachionus, which is a predominant organism in more northern waters.

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