

CRUSTACEA OF WINONA LAKE.<sup>1</sup>

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Two hydrographic maps of Winona Lake with descriptions have been published; one by Large (Proc. Ind. Acad. Sci., 1901) and another by Norris (Proc. Ind. Acad. Sci., 1901). The lake is situated in Kosciusko County, Indiana, about one mile southeast of the city of Warsaw. It is irregular in outline and has an average length of about one and one-eighth miles north and south and an average width of nearly three-fourths of a mile east and west with a large bay extending westward from the north end. There is comparatively only a small amount of shallow water in the lake as the bottom slopes off rapidly from the shores and reaches a maximum depth of eighty-one feet.

The fresh water crustacea are well represented in this lake both in variety of forms and in number of individuals. It is not probable that this list enumerates all the species to be found here.

The material for this report was collected during the months of July and August of 1908 and 1909 in connection with the work of the Indiana University Biological Station. Many thanks are due to Dr. C. H. Eigenmann, Director of the Station, for the many courtesies and suggestions received.

The Entomostraca were taken at about all hours of the day and night by means of the tow net, dip net and by pumping. The day catches showed very few forms near the surface even on cloudy days, but they were abundant near the surface from one to two hours after sunset until about sunrise. The nauplius forms were not numerous at the first of July, but became more abundant as the season advanced.

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<sup>1</sup> Contributions from the Zoölogical Laboratory of Indiana University, No. 118.

The following list includes the species that have been identified:

CRUSTACEA.

Sub-Class Phyllopora.

Order Cladocera.

Sididae.

- Sida crystallina* Mueller.
- Pseudo-sida tridentata* Herrick
- Daphnella excisa* Sars.

Daphnidae.

- Ceriodaphnia reticulata* Herrick.
- Ceriodaphnia scitula* Herrick.
- Ceriodaphnia lacustris* Birge.
- Scapholeberis mucronata* Mueller.
- Simocephalus vetulus* Mueller.
- Simocephalus serrulatus* Koch.
- Daphnia minnehaha* Forbes.
- Daphnia retrocurva* Forbes.
- Daphnia pulex* DeGreer.
- Daphnia hyalina* Leydig.

Bosminidae.

- Bosmina cornuta* Jurine.
- Bosmina longirostris* O. F. Müller
- Bosmina striata* Herrick.

Lyncodaphnidae.

Sub-family Eurycerinae.

- Eurycerus lammellatus* O. F. Müller

Sub-family Luceinae.

- Acroperus harpæ* Baird.
- Alona quadrangularis* Müller.
- Alona costata* Sars.
- Pleuroxus procurvus* Birge
- Procurvus denticulatus*.

Sub-Class Copepoda.

Order Eucepoda.

Calanidæ.

- Osphranticum labronectum Forbes
- Diaptomus birgei Marsh.
- Diaptomus oregonensis Lilljeborg
- Diaptomus pallidus Herrick.
- Episcura lacustris Forbes.

Cyclopida.

- Cyclops brevispinosus Herrick.
- Cyclops lenckarti Koch.
- Cyclops pulchellus Koch.
- Cyclops signatus Koch.
- Cyclops modestus Herrick.
- Cyclops capilliferus Forbes.
- Cyclops insignis Claus.
- Cyclops serrulatus Fischer.
- Cyclops fluviatilis Herrick.
- Cyclops fimbriatus Fischer.
- Cyclops prasinus Fischer.

Order Siphonostomata.

Lernaepida.

- Specimen found on gills of the Black Bass (*Micropterus salmoides*), species undetermined.

Sub-Class Ostracoda.

Cyprididæ.

- Cypridopsis vidua O. F. Müller.

Sub-Class Malacostraca.

Order, Decapoda.

Astacinae.

- Cambarus diogenes Girard.
- Cambarus propinquus Girard.
- Cambarus immunis Hagen.

Order, Amphipoda.

Orchestridæ.

- Hyalella knickerbockeri Bate.

## Order, Isopoda.

## Oniscidæ.

*Porcellio rafnkei* Brandt.

## Asellidæ.

*Asellus tomalensis* Harford.

The economic importance of the smaller crustacea is well known. They form one of the most important food supply links between the lower plants and animals on the one side and the higher animals on the other. A small minnow about one inch long was kept for some time and fed on Amphipoda (*Hyaella knickerbockeri*). A small darter hatched from the egg and cared for by Mr. W. I. Lower was fed on Entomostraca, principally Ostracoda, until it was eighty-seven days old and was about three-eighths of an inch long.

As parasites the small crustacea frequently cause great mortality among fishes, but so far only one parasitic form has been found in Winona Lake and that in extremely small numbers on the gills of the Black Bass (*Micropterus salmoides*). Examination of other fish and of the clams in the lake failed to reveal other parasitic crustacea.

Three species of crayfish were found. *Cambarus propinquus* was abundant in the streams flowing into the lake and also in the outlet, but was extremely scarce in the lake. *Cambarus diogenes* and *Cambarus immunis* were found only in burrows along the shore and along the edge of the streams and in the adjacent low ground. The burrows are from two to three feet deep and contain six to eight inches of water at the bottom. Where the soil is homogeneous they extend obliquely downward in almost a direct course, but in the presence of stones and other obstructions they wind about sometimes to a considerable extent. In digging the holes the crayfish work head downward and bring the earth up between the chela and the first pair of walking feet and deposit it by the aid of the second pair of walking feet. Attempts were made to get the burrowers out of their holes by pouring strong salt solution and also formalin into them. But the crayfish would die before they would come to the surface. Traps at the surface were also resorted to without success and the only practical method of obtaining them was by means of a ditching spade which required no small amount of labor.

While the crayfish were always found in shallow water, under and among stones and sticks or in burrows, it was found that they could live

in deeper water. One pair each of *C. propinquus* and *C. diogenes* were placed in a wire cage in six feet of water at the mouth of Cherry creek July 21, 1908, and were fed from time to time. They were alive and in good condition when taken out August 24, 1908. It was found, however, that they would not live in extreme depths. One pair each of *C. propinquus* and *C. diogenes* were placed in a wire cage in forty-five feet of water and were in good condition two days later. But when placed in sixty-five feet of water they perished in less than twenty-four hours.

