The Crawfishes.

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Crawfishes are quite common in Lake Maxinkuckee and in Lost Lake; on the land about the lakes they are less frequent. The truly aquatic species are found chiefly in the shallower depths, hiding under rocks, sticks, and among Chara and other aquatic vegetation. But even at their best, not as many will be taken in the seine as will be secured in similar collecting in sluggish streams. The greatest number taken in one haul of the seine in Lake Maxinkuckee was twenty-two.

In the collections turned over to me for identification and study, four species are represented, namely: *Cambarus blandingi acutus*, *C. diogenes*, *C. propinquus*, and *C. immunis spinirostris*; or, using English names instead of Latin combinations, we may designate these four species as the Pond Crawfish, the Solitary Crawfish, the Gray Rock Crawfish, and the Rock Crawfish. Of these, the first three have long been known to occur in northern Indiana, but *C. immunis spinirostris* has not heretofore been known north of Terre Haute. One or two other species probably occur in the Maxinkuckee region. *C. argillicola* Faxon has been reported from several localities north, east and south of Lake Maxinkuckee, and *C. rusticus* Hagen has been taken near Mount Etna, Huntington County, Indiana.

Beyond doubt, the crawfish fauna of this lake, or of any other, will repay careful study. The habits and economic importance of these animals are only poorly known; but it must be that, as a source of food supply for other animals, or as scavengers, they fill a field of usefulness.

As the species of crawfishes are rather difficult to distinguish, and as the present account is for the general public rather than for the zoologist, it will be impracticable to give more concerning the structural characters of these than is absolutely indispensable for their recognition. Before beginning this, however, it must be stated that the male crawfish may be distinguished from the female by the presence of two pairs of rigid appendages which are attached to the first two joints of the abdomen or tail, and which, projecting nearly straight forward, lie in a sort of groove between the bases of the walking legs. In the female the abdomen is broader than in the male, and the appendages of the first two joints are slender and flexible like those which follow. The rostrum is the beak-like projection of the shell (or carapace) above the eyes.

1. *Cambarus blandingi acutus* (Girard). Pond Crawfish.

This species may be at once distinguished by the fact that in the males the third and fourth pairs of walking legs bear a hook on the third joint from the base. The rostrum is long and approximately triangular, with a pair of small teeth quite close to the tip. The large pincers and the legs which bear them are long, slender, and roughly granular.

This crawfish is represented in the collection by two males and seven females from Aubeenaubee Creek, one male and one female from Culver Inlet, eight males and two females from Spangler Creek, and by two males and one young female from Bruce Lake.

This is the pond crawfish of the region, its home being in woodland ponds. Individuals were seen from time to time, but they usually escaped under the leaves. Several dead ones were found in ponds. Generally speaking, it is not a very abundant species anywhere. It is occasionally met with in the sloughs of the Mississippi.

2. *Cambarus diogenes* Girard. The Solitary Crawfish.

This crawfish is an inhabitant of the lake at certain times only. It visits the water early in the spring for the purpose of producing its young, but during the remainder of the year each individual lives alone in a burrow over which it constructs a chimney of mud pellets. This habit is so peculiar, being shared by only one other Indiana species, that it alone should be almost enough to distinguish the solitary crawfish; but as some of our readers may wish to know what the animal is like, the following description is given: The body is high and compressed; the rostrum is short, thick-edged, and without teeth near the tip; the two longitudinal, curved lines on the back run together throughout the whole part of their length, so that only small triangular spaces are left between them in front and behind. The color is usually quite brilliant for a crawfish, the claws, rostrum, and the elevations on the shell being more or less marked with crimson and yellow.

Represented in our collections by one large female and seven young from Aubeenaubee Creek. Other examples were noted in 1901 as follows:

March 31, a good-sized female caught in a pool at the birch swamp; April 1, one dead, in ditch east of railroad, in Green's marsh; April 2, remains of several seen in the Outlet; April 3, remains of one found in Green's marsh; April 4, two caught, copulating east of the railroad, in Green's marsh, and one caught in the marsh north of Lost Lake; April 9, three living ones seen, two caught, and remains of great numbers at the drained lake; April 11, one big one caught at mouth of Farrar's Creek, and one at mouth of Aubeenaubee Creek; April 15, several seen in creek at south end of the lake, two caught; April 17, a female with eggs caught on west side of lake; April 19, a large one dead at water's

edge just east of the depot; May 3, chimneys abundant east of Lost Lake outlet; May 17, one caught at edge of Lake Maxinkuckee at Long Point, with small young attached to it. This is a large, "meaty" species with heavy pincers, and, except where its natural habitat gives it a muddy flavor, makes an excellent food.

3. *Cambarus propinquus* Girard. The Gray Rock Crawfish.

This species may be recognized at once by the fact that the upper surface of the rostrum has a low median longitudinal ridge. This is too low to be visible, but may be detected by passing the tip of one's finger across from side to side, when the elevated portion may easily be felt. The species is usually an inhabitant of running water and will probably be found to occur most abundantly about the inlets and outlets of the lake. It is represented in our collections by fifteen males and twenty-nine females from Aubeenaubee Creek, nine males and five females from Lake Maxinkuckee, seven males and ten females from Culver Inlet, one male and one female from outlet of lake, and four males and seven females from East Inlet.

This is the common crawfish of the lake. It is found in considerable abundance everywhere among rocks and in the Chara. The lake form is brownish gray in color. It is too small to be of much use as human food. This species is also found in Yellow River, near Plymouth, and appears to be the most common species of the region. They do not burrow, but hide under rocks or bits of boards or sticks, under which they may make small excavations. Of many notes taken the following may be given here:

April 27, 1901, several seen in the bottom, one bluish in color; two copulating. June 3, a large shed carapace in Outlet Bay. June 7, several caught; they hide under boards; one very small one with its mother. June 12, many caught, more seen; almost every blunt-nosed minnow's nest is watched by one or two. June 13, a good many at minnows' nests. June 16, some caught at minnows' nests. June 22, still at minnows' nests. In 1904, October 19, a common content of fish stomachs; fishermen report that they are the best bait now; one angler caught six black bass with crawfish and one with a minnow. October 3, many at the head of the Outlet, about eight seen in a small space; one was eating at a dead grass pike; it stayed there a good while. October 31, one still eating in the morning at the pike; very little of the pike eaten. November 2, still eating at the pike. November 14, one near shore east of Long Point eating a minnow. November 22, two caught while copulating. November 25, two caught copulating east of Long Point. January 1, 1905, three seen together, two smallish, copulating, and a big one nearby.

From numerous observations of the crawfishes of the lake the following conclusion may be drawn:

There appears to be no special time for mating, and no special breeding period was observed; nor again, any special time for moulting. It is probable that in the fairly uniform temperature of the lake the lives of the crawfishes are not so markedly divided into seasons as they are in the river crawfishes. Generally, in rivers heavily populated with crawfishes, one can find immense numbers of moulted shells at certain periods—usually about the beginning of July—but in Lake Maxinkuckee only occasional and scattered cast-off skins can be found.

The nature of the food was not easily discovered by examination of stomach contents, as the material was too finely comminuted. A few were seen eating dead fishes as mentioned above. They are usually found in the vicinity of minnow nests, and probably devour fish eggs to some extent. Various fishes, especially walleye and bass, eat them at times, and they are one of the principal foods of the soft-shelled turtle. The lake species are rarely used for bait, perhaps because of the difficulty of obtaining soft-shells or "peelers" in the lake; river crawfishes are sometimes used.

The crawfishes of the lake often have protozoa attached to the gills, but this probably does not seriously inconvenience them.

4. *Cambarus immunis spinirostris* Faxon. The Rock Crawfish.

In general form and appearance this species is somewhat like the last, but it lacks the longitudinal ridge on the rostrum. The teeth of the rostrum are apt to be very small and, in the males, the tips of the first abdominal appendages are slender, blade-like, and recurved.

Represented in the collections by nine males and eight females from Aubeenaubee Creek, one male from Culver Inlet, and twelve young females from Norris Inlet.