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MISCELLANEOUS PAPERS  
ON THE  
ZOOLOGY OF MICHIGAN.

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OBSERVATIONS ON THE FISHES OF HOUGHTON COUNTY,  
MICHIGAN.

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STATE NORMAL SCHOOL, CHARLESTON, ILLINOIS.

OBSERVATIONS ON THE FISHES OF HOUGHTON COUNTY,  
MICHIGAN.

THOMAS L. HANNINSON.

During the latter half of August, 1906, the writer made a study of the fish in a number of small lakes in Houghton County, Michigan, for the Michigan Geological and Biological Survey. Most of the work was done on lakes lying along the Copper Range Railroad between Stonington and Winona, two small stations nearly ten miles apart and in general between seventeen and one-half and twenty-seven and one-half miles southwest of Houghton by rail. Only two lakes at any distance from this ten-mile stretch of railroad were examined—Krahl Lake, about two miles southeast of Winona, and Bear Lake, about seven, and one-half miles north of Houghton in the sand dune region of Lake Superior.

As it was impossible in the time devoted to the work to make a detailed study of all of the fish environments in each lake, attention was principally confined to one kind of habitat—the shallow water, three feet or less in depth, about the shores and islands. Each habitat was seined with a six foot "common seine," seine, and in addition to observations on abundance, notes were made on the ecological distribution. A complete series of the fish taken in each place has been deposited in the Museum of Zoology, University of Michigan.

The writer is indebted to A. C. Lane, former State Geologist, for helpful suggestions in the course of the work, to A. G. Ruthven for assistance in the preparation of this paper for publication, and to the following persons for aid in identifying material: C. A. Davis, seed planter; A. G. Ruthven, reptiles and amphibians; S. E. Meek, three species of minnows; Edwin Jinton and H. B. Ward, fish perennials; F. S. Collins, algae; J. P. Moore, leeches; N. A. Harvey, sponges.

LOCAL DISTRIBUTION OF FISH.

*Stonington Lakes.* Three small lakes close to the station of Stonington, on the Copper Range Railroad are called the Stonington Lakes in this paper. Each of these lakes is surrounded by thick forest except where they come close to the railroad embankment. They are in general oblong in shape, and the largest is perhaps a quarter of a mile

in length. As in all of the lakes of this densely forested region south of Houghton, the water has an amber color, and the bottom material of the shoals is similar to that found in the shallow water of the other lakes—a firm sand tinged with the color of the water.

The lakes were examined and a number of collections made on August 25. No detailed study of the vegetation was attempted, but the following plants of special interest were noted:

*Hydrocharis polymorpha* L.—Growing in abundance on beaches.  
*Prosera rotundifolia* L.—Abundant on the shore and extending out on partly floating logs.

*Hydrissium frutescens* L.—Growing in patches, and in places forming distinct zones along the water's edge.

*Briza media* (Huds.)—Forming patches on the bottom in shallow water.

*Myriophyllum Farwellii* Morong.—On submerged portions of logs.  
*Potamogeton* sp.?—In patches in deeper water.

*Bryopsis* Sirodoti Grunl.—In patches.  
*Chaetochytrium* Pilsen (Ag.) Thuret.—An alga forming gelatinous colonies in shallow water.

Conspicuous aquatic invertebrates noted were:

*Spongilia lacustris* (Linn.)—On brush and other submerged objects near shore.

*Macrodactyla decaeva* (Say).—Apparently the common leech of the northern lakes about Houghton.

Caddis worms.—Common on the bottom of shoals. Their cases were made of sticks.

Two amphipods occurred in some numbers around the shores, *Rana sylvatica* Baird and *Rana pipiens* Schreber.

The fish observed were:

*Chrosomus erythrogaster*.—Abundant in schools in both lakes.

*Pimephales promelas*.—Abundant in large schools in both lakes.

*Coregonus phoxincheus*.—One taken in the south lake.

*Catostomus commersoni*.—One caught in the south lake.

*Pygosticus purgatus*.—Eight taken in the middle lake.

*Huichia inconstans*.—Two found in the middle lake.

**South Twin Lake.** This lake is located about three miles northeast of Winona, on the Copper Range Railroad. It is somewhat over a mile long and a half mile wide, and receives several small streams. The outlet (Plate VIII) is Misery Creek, which flows to the west into Lake Superior (Fig. 1). The lake is completely surrounded by the forest except for a small clearing about the single building on its shore (Plate II). A well-marked beach, continuous with a broad shoal of compact

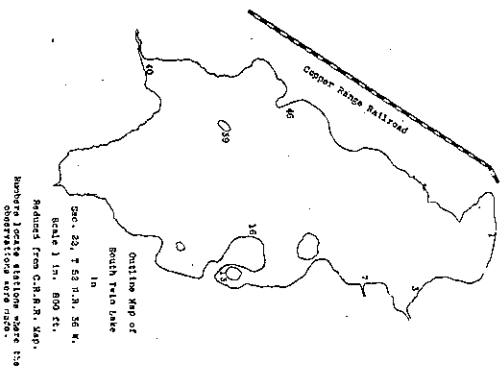


Figure 1.

sand or gravel, is present in most places. The water and bottom are tinged with amber.

South Twin lake received the most attention of the two. Stations were located in typical habitats and rather detailed studies were made at these places. Here again, the work was principally confined to the shallow water. Upon the beaches were sedges, rushes, and many other plants, forming in most places a thin growth of vegetation. A distinct zone of low shrubs, chiefly *Myrica Gale* (L.) and *Chamaedaphne calyculata* (L.) Moench, almost completely surrounds the lake just outside the beach region. Outside this is a zone of high bushes, and then comes the timber region, which is mainly composed of hardwoods but also includes many conifers, conspicuous among which are some large white pines.

The plants noted on the shoal were:

Buttricks.—Formed a scant growth over many shoals. Thick patches were unusual.

*Spergonium* sp?—Often formed a thick growth in shallow water.  
*Pyrantion arcticatum* (Huds).—A rather conspicuous growth in places where there were but a few inches of water.  
*Lebetia Dortmannia* L.—Found growing with the *Pyrantion*.  
*Pedonogon*.—Several species grew on the shoal, principally on the outer part.  
*Bryozoa purpurea* Cusp.—Patches were often present on deeper shoals.

#### Habitat Distribution of Fish in South Twin Lake.

*Station 1.* This is the shoal and adjacent shore at the extreme north end of the lake. The shallow water area is comparatively extensive with a bottom of hard sand. Over this is a scant growth of rushes, which form the only conspicuous vegetation. The shore zones of plants are distinct, but the low bush or heath zone practically covers the beach (Plate II).

Fishing with the hand seine was done on the morning of August 28 in water that was mostly between one and two feet in depth. The water temperature was 70° F. Fish were few and were not moving on the shoal: those taken were found resting beneath objects such as overhanging bushes, an old row boat and pieces of water-logged bark. The following species were collected:

*Rhinichthys atronotus lundae*.—Several taken.

*Semotilus atromaculatus*.—Several small specimens taken.

*Micropeternus schmidtsi*.—One small specimen 4.2 cm. long was caught. *Station 3.* This is a shoal which differs from that of Station 1 in being much narrower, a depth of three feet being reached about thirty or forty feet out from the shore. The shore features are similar to those of Station 1, and this is also true of the bottom which is composed of a similar hard, reddish sand with little vegetation (a few rushes and other plants). Many logs (Plate III) were floating near the shore. Collecting was done with the six-foot minnow seine in water three feet or more in depth and there was no difficulty in getting a representative collection of fishes for they showed little fear of the net.

The invertebrates found were:

*Macrobathra decora*.—This large leech was common.

Dragonfly nymphs and eggs of *Tetragoneuria* sp.—The latter were in long strings of jelly-like substance.

Caddis worms.

The fish taken were:

*Semotilus atromaculatus*.—Small specimens found in water less than a foot deep.

*Chasmodon sphyrapetor*.—Many in shallow water near shore. A large, compact school was seen in three feet of water.  
*Rhinichthys atronotus lundae*.—Chiefly in the shallow water near shore.

*Corestis plumbeus*.—Three small specimens.

*Leuciscus neogus*.—One taken.

*Catostomus commersoni*.—About a dozen small ones were taken and one comparatively large specimen, nearly a foot long, was found sticking on the submerged part of a floating log on the wood freshly hauled by the strapping off of a portion of the bark.

*Eucalia inconstans*.—One taken.

*Micropeternus schmidtsi*.—Small specimens under four inches in length were common in a few inches of water near shore.

*Percis flavescens*.—Small specimens under three inches in length were common. They were confined to the deeper part of the shoal in two or three feet of water and were found in compact schools.

The first three species of fish mentioned in this list were closely associated and tended to school together.

*Station 16.* A stretch of shore different from that of any other part of the lake is found at this station (Plate IV). The beach is unusually broad with low bushes scattered over it, and the shoal is also peculiar in that the bottom is covered with large pebbles over which no fish were found. The only place where fish were seen was in a shallow beach pool which was connected with the lake by a short, narrow channel. This little bay is scarcely more than a square yard in area and only an inch or so in depth. Many small fish were observed, and as the writer approached, they began to hasten through the little channel to the lake. A collection of these fish contained representatives of *Semotilus atromaculatus*, *Rhinichthys atronotus lundae*, *Corestis plumbeus*, *Breutelia inconstans* and *Leptomis cyaneus*. All were small individuals of their species, and the *Semotilus* was most abundant, only one of each of the last four species being taken.

*Station 13.* As shown on the map, this station is at the end of a little bay. There is a diversity of conditions, but the whole region is a shoal with more aquatic vegetation than any of the stations yet described. In places the water reaches a depth of about four feet. The bottom is mostly hard and sandy, but close to the south end of the bay there is a thin layer of humus over the sand. Plate V shows a part of the eastern portion of the bay.

Rushes were abundant, and there was a good sized patch of *Brasericia Shreber*.

The following invertebrates were found in this habitat:  
*Spongilla lacustris* (Linn.) and *Spongilla fragilis*, Leidy.—These two

formed a conspicuous green growth on the submerged branches of a tree that had fallen into the water. This tree can be seen in Plate V.

*Macrobethia decora*.—A few were seen and collected.

Two species of fish were found, *Catostomus commersoni* (one small specimen) and *Micropterus salmoides* (small specimens, less than two inches long), the latter being common.

Station 7. *Spartanium* (Plate VI), growing in patches in one to two feet of water, covered much of the bottom of the shoal called Station 7. Except for many long slender leaves floating on the surface, the plants were submerged at the time studied. Beyond this growth, toward deep water, was a zone of pond weeds (*Potamogeton Nuttallii* and perhaps other species of the genus), followed by a zone of water lilies, which occupied the deepest part of the shoal and extended out to the beginning of deep water. A small, sandy delta at the mouth of a little creek entering the lake at this point broke the *Spartanium* zone.

The following fish were caught on the shoal, but a representative collection could not be made on account of the denseness of the vegetation: *Semotilus atromaculatus*, *Rhinichthys atronatus lanatus*, *Lepomis gibbosus*, *Micropterus salmoides*. Only a few small specimens of each of the listed species were taken. Ten of the small *Semotilus* caught were infested with a protozoan parasite, *Mycobolus*. Many small fishes were seen.

Station 46. The shoal with the greatest amount of plant life of any visited is on the west side of the lake and just north of a small point of land. This is called Station 46. No attempt will be made to describe the complex association of plants found in this habitat, but an idea of its general character may be had from Plate VII. The water is mostly three or four feet deep and the sand is covered by several inches of humus.

As at Station 7, the abundance of vegetation did not permit careful fishing. Many fish, including some large *Semotilus atromaculatus* 100-120 mm. long, were seen, showing that this was a favorite fish habitat, and even from the small amount of data obtained it was evidently the type most favored by shoal fish. A noteworthy feature was the great abundance of red-bellied leeches, *Macrochela decora*, which, while found at other stations in some numbers, were nowhere so abundant as on this shoal.

The following fish were found at this station:

*Semotilus atromaculatus*.—Many seen, none taken.

*Leuciscus neogaeus*.—Three small specimens collected.

*Micropterus salmoides*.—Many small bass were seen but none were

captured. The habitat undoubtedly represented an important feeding ground for them.

*Percis flavescens*.—One small specimen taken.

Deep Water Region.—As previously stated, the deep water region, by which is meant all of that extensive portion of the lake surrounded by the relatively narrow shoals, was scarcely examined in any of the lakes, but in this lake, a little hook and line fishing, done just off the shoal called Station 1, yielded seven *Percis flavescens* (130-160 mm. long); and just off the lily zone of Station 7, in deep water, two rather large *Lepomis cyprinellus* (150-180 mm. long) and a *Micropterus salmoides* (265 mm. long) were taken.

Stream at Station 7. The stream already referred to as entering the lake at this station is a very small one, and fish were found only close to its mouth, in a deep pool (as deep as four feet in places). Satisfactory collecting could not be done with a net, but a number of good sized *Semotilus atromaculatus* (10-15 cm. long) were caught there with a hook and line baited with worms.

Station 40. This is the area about the head of Misery Creek, the principal and perhaps the only outlet of the lake. The general character of the region is shown in Plate VIII. The water is very deep at the source of the creek, but about a bridge and for a considerable distance below it, the stream is shallow enough to permit fishing with the small seine. In the center of the stream the depth averages perhaps three feet. The bottom is of hard sand covered in places with considerable brush and other forest debris. Fish tended to keep under the bridge, where they were abundant; few were found in the other part of the creek visited. The following species were noted and collected:

*Chrosomus erythrogaster*.—Abundant; many large specimens, 60-70 mm. long were taken.

*Semotilus atromaculatus*.—Abundant; many large specimens, 120 or more mm. long, were taken. As many as two dozen of these large clubs were caught at a haul with the six-foot seine.

*Rhinichthys atronatus lanatus*.—Abundant; many large specimens, some 100 mm. long, were collected.

*Leuciscus neogaeus*.—Two were taken, each about 70 mm. long.

*Catostomus plumbens*.—Common. They were mostly about 50 mm. long.

*Percis flavescens*.—Five were taken, 50-70 mm. in length.

*Micropterus salmoides*.—One taken, about 40 mm. long.

North Twin Lake. This lake lies to the north and east of South Twin Lake and is considerably the larger of the two. Very little work was

done there, only about an hour being spent in collecting along the south end. It appeared to be surrounded by unbroken forest except at the south end where lumbering was going on. The bottom and vegetation seemed to be like those of South Lake. Many fish were observed in the shallow water area, and the following five species were taken: *Chrosomus erythrogaster*, *Semotilus atromaculatus*, *Rhinichthys atronatus*, *Catostomus commersoni*, *Lepomis cyanellus*. With the exception of *Rhinichthys atronatus* and *Lepomis cyanellus*, which were very common, only a few specimens of each species were caught.

**Krait Lake.** Krait Lake is located about two miles southeast of Winona, mostly south of Sections 33 and 34, Township 52. It is surrounded by dense forest except for the clearing about an inhabited house. It is smaller but similar to South Twin Lake in the character of the bottom and vegetation; and the shoal, as far as observed, is narrower. The same brown-stained water and bottom sand was found as in the other forest lakes visited. The sand beach is more or less obscured by the zone of low bushes, outside of which is a zone of high bushes and beyond this the timber region. The small shrubs bordering the beach, and in places covering it, seemed to be entirely of two species—*Myrica Gale* and *Chamaedaphne catgutata*.

The following strictly aquatic plants were found: *Syringium* sp? (forming large, dense, submerged patches in places), *Potamogeton nodosus* L., *Koeleria cristata* L., *Myriophyllum Farwellii*, *Utricularia vulgaris* L., *Talipottia tenuis* Kütz., *Batrachospermum* sp? Sponges were abundant but none were collected.

Only the following two species of fish were found:

*Lepomis cyanellus*.—This species was very abundant, and took a baited hook greedily. In fact, the great abundance and voracity of this sunfish was a prominent characteristic of this lake. In a short time, seventy individuals around 15 cm. in length were caught. They seemed to be most abundant in the deep water just off the shoal. In the shallow water a few small specimens (20-30 mm. in length) were taken, but no other species were found in this shoal region.

*Percia flavescens*.—One small specimen, about 100 mm. long, was taken by hook.

All of the fish taken in Krait Lake were very dark in color with a decided amber tinge like that of the water.

**Bear Lake.** Bear Lake is out of the region of the other lakes studied and already considered. It is in the brush-covered sand dune area

about a half mile from Lake Superior and about seven and a half miles directly north of Houghton. The lake is nearly a mile long with an average width of perhaps a quarter of a mile and presents conditions very different from those in the lakes in the forest south of Houghton. The water is clear and the sand unstained. The shoal is variable in extent; in some places it is narrow and in others one can wade out a hundred feet or so from shore.

Birchuses were more or less abundant in different parts of the shallow water region, and formed dense and extensive patches. There was also a growth of stone-works on the bottom, associated with some gelatinous and filamentous green algae which appeared to be chiefly *Zygnema* and *Sphingium*.

Two small crayfish, *Cambarus* sp?, were taken here, the only place in the county where they were found.

Only the shoal was fished, on August 23, but an attempt was made to get a representative collection. The following species were obtained: *Pemphledes nodosus*.—Rather common.

*Atrionis chrysalentis*.—One small specimen (30 mm. long) taken.

*Notoptis coryna*.—This species was common and occurred in large schools. The specimens were mostly from 60-70 mm. long.

*Percia flavescens*.—Small specimens about 40 mm. long were common in shallow water.

*Etheostoma zoster*.—A number were found on the sandy bottom.

The fish found in Bear Lake were of normal coloration and not amber-tinged as were all of those found in the amber-colored water of the forest lakes.

#### CONCLUSION.

As has already been stated, the work upon which this paper is based was only a reconnaissance made for the purpose of obtaining a general knowledge of the fishes and fish environments in the lakes of the region. Study was centered on the shoals since in that habitat more species, and thus a better representation of the fauna, could be obtained in the time that could be given to the work. The main value of the report must then be the additional data on the distribution of the species in the state and the general information on the fish faunas of the lakes of this region which it contains.

Five general conclusions may be drawn from the ecological data given above and that contained in the list of species which follows.

(1). The forest lakes examined, which have apparently very similar conditions, have quite different fish faunas.

(2). All of the fishes from the stained waters of the forest lakes are very dark in color, their bodies being tinged with the same color as the water.

- (3). In August the shoal fishes are generally most abundant where there is most aquatic vegetation.
- (4). Fish enemies in the form of parasites appear to be very frequent in the lakes examined.
- (5). South Twin Lake is one of the northern lakes that may be advantageously studied to determine its suitability as an environment for the black bass. The young evidently thrive there, and one of size was caught which was in very good condition. The many minnows in the lake might furnish a large quantity of available food for the bass.

## LIST OF SPECIES.

- The following list comprises only the species actually secured or observed by the writer, and, as has been said, is principally confined to the shoal species. It is of course incomplete, but it contains additional data on the distribution of the species. The nomenclature and the order of consideration are, with a few modifications, those used in Jordan and Evermann's Fishes of North and Middle America. The millimeter numbers given refer to the length of the fish, which was taken from the tip of the snout to the posterior end of the caudal fin.
1. *Catostomus colanemus* (Forster). Long-nosed Sucker.—Found only in Twin Lakes, where it appeared to be common.
  2. *Catostomus commersoni* (Acquiedo). Common Sucker.—A single small specimen (36 mm.) taken from South Stoughton Lake.
  3. *Cyprinus erythrogaster* Rafinesque. Red-bellied Dace.—Common in both Twin Lakes and in each of the two Stoughton Lakes examined. In the latter, it was found schooling with *Prinophilates promelas*. The specimens collected measured 21-63 mm. One fish with bright red under-parts was found.
  4. *Prinophilates promelas* Rafinesque. Fathead Minnow.—Taken only at Stoughton, where it was abundant in both of the lakes studied. Two hundred and four specimens (22-60 mm.) were collected. Three were found with cestodes (probably *Ligula*) filling their body-cavities and greatly distending their abdomens.
  5. *Pimephales notatus* (Rafinesque). Blunt-nosed Minnow.—Found only at Bear Lake, where thirteen were taken (24-35 mm.).
  6. *Semotilus atromaculatus* (Mitchell). Horned Dace.—The horned small specimens, 60-70 mm. long, were found on shoals, but large ones (100-155 mm.) were in streams close to the lake. The fish were much infested with a protozoan parasite, *Myxobolus*, which produced whitish swellings of the skin and often made the fish conspicuous. Of the two hundred and thirteen specimens preserved, thirty-five were diseased

- with this parasite. They are parasitized internally as well as externally, for fourteen parasite worms, Echinorhynchus, were found in their alimentary canals. A superficial examination was made of the digestive tracts of ten large dace (103-143 mm.) and the contents observed were as follows: chrysa and other parts of beetles, pieces of dragon-fly and May-fly nymphs, small spiders, winged ants, a small amphipod, some pieces of wood, and the vertebral columns of two frogs. The two hundred and thirteen specimens preserved measured 27-155 mm.
7. *Lactisus neogaeus* (Cope).—Eight (44-70 mm.) were taken from South Twin Lake.
  8. *Abramis chrysolaucus* (Mitchell). Golden Shiner.—Only one very small specimen (31 mm.) was observed. This was found in Bear Lake.
  9. *Nematopis cyclops*, Meek.—Common at Bear Lake but none were found elsewhere in the region. Twenty-four specimens (41-66 mm.) were taken.
  10. *Rhinichthys atronatus hantus* (Cope). Black-nosed Dace.—Noted only in Twin Lakes, where it was present in considerable numbers. The fifty-five specimens preserved measured 25-98 mm.
  11. *Caecatus pilinellus* (Agassiz).—Found in some numbers in South Twin Lake. Forty-two were taken, the measurements of which were 40-50 mm.
  12. *Salvelinus fontinalis* (Mitchell). Brook Trout.—A common fish in the streams. None were found in lakes, but the writer was told that they frequent the shoals in the spring, retiring into the deep water in summer, when they rarely take a hook.
  13. A few small specimens were taken by hook in a small branch of Sleepy Creek, at Winona. On three small specimens (46-84 mm.) four large copepod parasites (probably *Lernaeopoda*) were found.
  14. *Esoc laevis* L. Common Pike.—The writer saw fish of this species that had been taken in a small lake located some seven miles southeast of Winona. This lake is said to contain so many of these fish that it is called "Pike Lake."
  15. *Bucania neostans* (Kirland). Brook Stickleback.—Six specimens of this stickleback were collected at Stoughton and South Twin Lake. They measured from 32-53 mm.
  16. *Pygostius puncticus* (Jamaeus). Nine-spined Stickleback.—Found only at Middle Stoughton Lake where eight were taken from single school. They measured 42-49 mm.
  17. *Lepomis cyanellus* Rafinesque. Blue-spotted Sunfish.—From in small numbers at Twin Lakes and very abundant at Kirt's. Last of those collected measured 20-166 mm. An examination of the digestive tracts of ten specimens, averaging about 120 mm. in length, show



the fish in Krait Lake to be feeding on animal and plant material. The stomach contents were as follows: insect fragments (heads of hemipterous insects and parts of beetles), pieces of wood, alga fragments, leaves of *Spartanum* or *Fritoutia*, and water lily seeds.

17. *Atheistius schmidts* (Jacquiné). Large-mouth Black Bass.—Small specimens were very abundant on shoals of South Twin Lake, but none were noticed elsewhere. Those caught measured 34-78 mm. in length. In the stomachs examined were fish bones, teeth of a minnow, entomostreans, and Chironomid larvae. One comparatively large specimen (285 mm.) was caught with hook and line in South Twin Lake.
18. *Percus jesseni* (Mitchill). Yellow Perch.—Found at South Twin Lake, Bear Lake and Krait Lake. Small specimens were generally distributed on shoals in South Twin Lake. Some of these taken were 43-70 mm. long. None were found on the shoals of Krait Lake or Stonington Lakes. Larger perch (133-155 mm.) were taken from deep water off the shoals in South Twin Lake, Bear Lake and Krait Lake.
19. *Etheostoma flavescens* Jordan and Meek.—Found only in Bear Lake, where four were taken in shallow water on a sandy bottom. These were 37-45 mm. in length.