

NUMBER 89

JULY 15, 1920

OCCASIONAL PAPERS OF THE MUSEUM OF
ZOOLOGY

UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN

PUBLISHED BY THE UNIVERSITY

REPORT ON INVESTIGATIONS OF THE FISH OF THE
GALIEN RIVER, BERRIEN COUNTY, MICHIGAN

BY T. L. HANKINSON

Ichthyologist, the Roosevelt Wild Life Forest Experiment Station,
Syracuse, New York

During the progress of the ichthyological survey of the waters of Michigan being made by the writer for the Michigan Geological and Biological Survey under the direction of Dr. A. G. Ruthven, Chief Naturalist of the Survey, attention has been given to the fish of the Galien River because the stream flows through the Warren Forest Preserve, in Berrien County, Michigan, a region being especially studied by the Survey and the Museum of Zoology, University of Michigan, in co-operation with the Chamberlain Memorial Museum at Three Oaks.

The field work on fish giving data for this paper was done by the writer from June 1-8, from August 27-29, 1919, and on June 7, 1915. In the work done in 1919, the writer was given much useful assistance by George M. Fox, Director of the Chamberlain Memorial Museum, principally through providing transportation and giving suggestions valuable in the work. Mrs. Hankinson

aided considerably by making field records while the collecting was going on. Information useful to the writer in these investigations was given by N. A. Wood and Dr. Lee R. Dice, both of the Museum of Zoology, University of Michigan, and by J. C. Kraemer, Frank Sawyer, and A. Whitmayer, all three of whom are residents of the region and familiar with the fish there. Small examples of a few species of fish could not be identified by the writer, and these were named for him by Henry W. Fowler, of the Academy of Natural Sciences of Philadelphia. Miss Ada Weckel, of Oak Park, Illinois, identified the amphipods collected.

Very little attention has apparently been given heretofore to the fish of the Galien River, for the only references to literature on the fish of the stream that can be found are those that pertain to plantings of brook trout, wall-eyed pike, and small-mouth black bass (*Reports of the State Board of Fish Commissioners of Michigan* for 1905, p. 28; 1913, p. 22; 111; and 1915, p. 81).

The Galien River is a small river arising from many streams and lakes in the southern third of Berrien County, chiefly south of Lighton, east of New Buffalo, and west of Buchanan, and entering Lake Michigan at New Buffalo (map, Fig. 1). The south branch, which is its most important tributary, joins the main stream near Union Pier. The Warren Woods are about seven miles up the stream from the mouth; and the river here was given especial attention, but collections were made in a number of its other parts. Each of the places fished was given a number and called a station. The stations outside the woods are located as accurately as possible on the accompanying map. The numbers used are not consecutive so that others may be added for future work, using the same notation. The stations are listed below with a brief description of each.

Station 1.—Mouth of the Galien River at New Buffalo, where the river cuts through the broad, low, sandy beach of Lake Michigan. Here the stream expanded from a usual width of about a

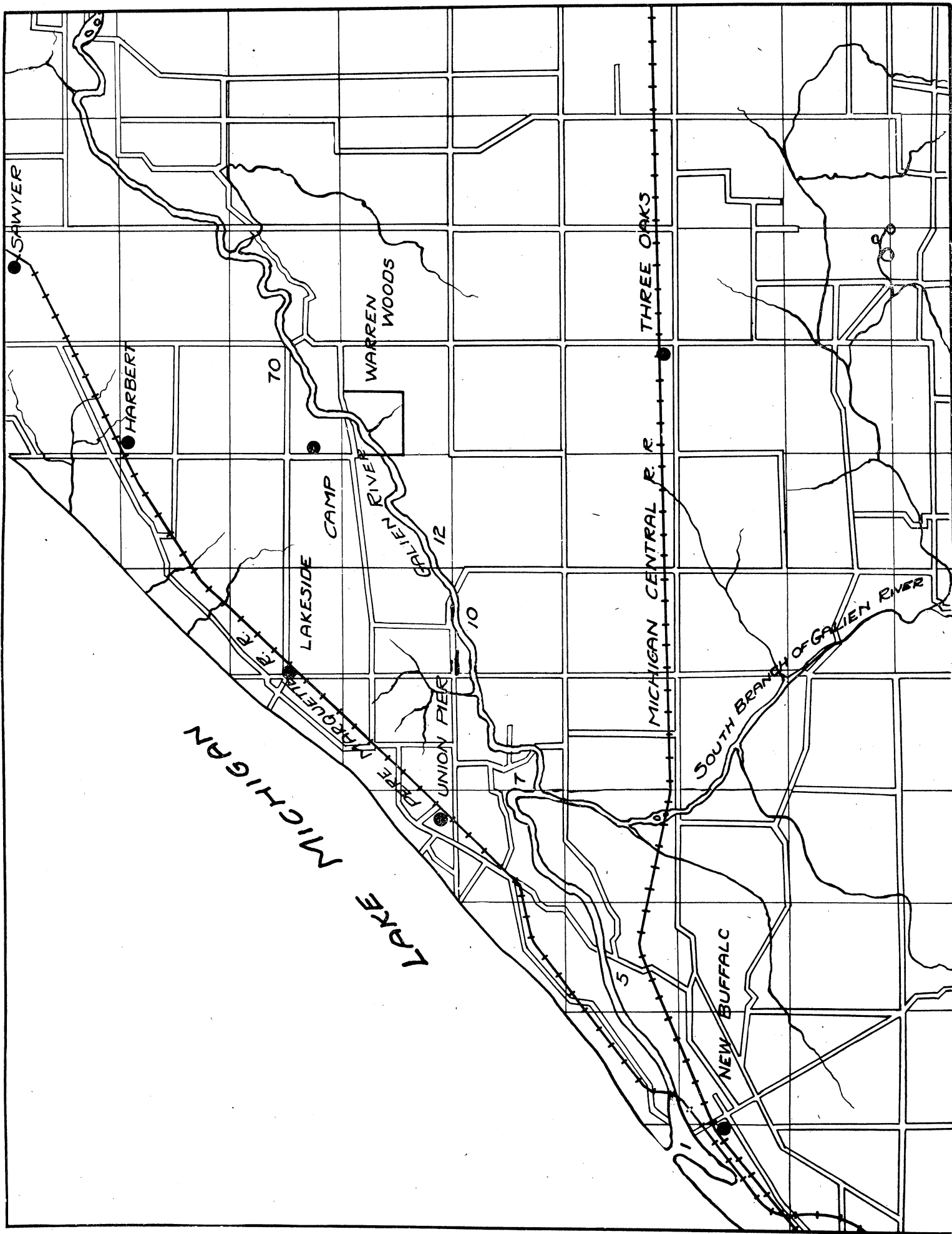


FIG. 1.—Map of southwest portion of Berrien County, Michigan, showing lower course (about twelve miles) of the Galien River. Numbers locate stations outside of the Warren Woods. Modified from the U.S. Postal Map.

hundred feet to nearly two hundred feet; and this expansion had a broad, shallow area where wading and fish collecting could be easily done, and here all the fish collections were made. The region was visited but once, on June 7, 1915.

Station 5.—Plate I, Fig. 1. Part of the river near the rock road bridge, a mile and a half southwest of Union Pier. The stream was about a hundred feet wide here and was sluggish and running through a broad strip of uncultivated flood plain. It was shallow with firm clay bottom and had little evident water vegetation, except patches of a fine-leaved pondweed, *Potamogeton* and some water lilies. In places along the bank were rows of large willows overhanging the stream. The station was visited on August 27, 1919.

Station 7.—Plate I, Fig. 2. Junction of the north and south branches of the Galien River about a mile south of Union Pier. The stream was broad and so shallow that it could be waded everywhere. There were some broad gravel beaches due to low water bordering a broad stream area with muck bottom and a thick growth of a broad-leaf pondweed, making a place more favorable for small fish than any other place of its size that we found in the river. The station was visited on August 27, 1919.

Station 10.—Galien River near the bridge about two miles east of Union Pier. The water was deep, sluggish, turbid, and much shaded by high banks and large trees and by the bridge. The station was visited on August 27, 1919.

Station 12.—Plate II, Fig. 1. Galien River about a quarter of a mile above Station 10. The stream was narrow and shallow with firm sand bottom; the water was clear and with a marked current. Large tufts of a narrow-leaf pondweed were present. The station was visited on August 27, 1919.

Station 25.—Plate III. River at the bend at the mouth of the creek in the south part of Warren Woods. The stream was from thirty to forty feet wide and was more than half-crossed by

the gravelly creek delta. An old sand dune was cut through by the river, making a portion of each shore high and sandy; elsewhere it was of clay. There was no noticeable aquatic vegetation here or elsewhere in the river through the woods. The station was visited a number of times, but collecting was done only on August 28, 1919.

Station 26.—Plate II, Fig. 2. Mouth region of a small creek in the south part of the Warren Woods, called Sycamore Creek and entering the Galien River at Station 25. This lower part of the creek winds through a broad, grassy glade. It contained little water at any time that it was visited, which was in June and August, 1919. At the latter time, when the collections were made, it was composed of pools that were practically stagnant and were connected by narrow, trickling streamlets. The water was turbid. The bottom was of gravel and firm clay. High overhanging, commonly grassy, banks were present.

Station 30.—Plate IV, Fig. 1. Galien River in Warren Woods in the vicinity of two large trees fallen across the river about fifty feet apart. The place was called Two Bridges by our investigating party. The stream cuts through a large sand bank here leaving a high, sandy cliff on the west side and a piece of sloping sandy shore on the east side; the other banks are of clay. At the upper part of the station was a broad pool, about four feet deep, lying just above the upper tree bridge. The water was shallow between the two bridges, with a marked current and with a sand and gravel bottom; some boulders and sunken logs were present. The place was visited frequently and a number of collections made in both June and August.

Station 46.—Plate V, Fig. 1. A small, winding stream in a narrow, rather deep ravine in the north part of the Warren Woods, just north of the main road. The stream joins the river near the bridge on the main road. In August this stream was dried up except for a few deep, stagnant pools. The bottoms of these were

of hard clay and gravel. Collections were made here on August 27, 1919.

Station 50.—Plate V, Fig. 2. Galien River above bridge of main road at the Warren Woods and upstream about a quarter of a mile as far as the east bank was cleared. The east bank was sandy. The stream at this station was about thirty feet wide on the average and its depth mostly under four feet. The bottom was mostly of firm, slippery clay and usually sloped abruptly toward the middle of the stream. Collections were made here on June 1, 1919.

Station 70.—Galien River near the rock road bridge about a half-mile northeast of the Warren Woods. The stream flows through low, shrubby pasture land and was bordered with many willows and much herbage along its margin. It was rather narrow, averaging about twenty feet. The water was high, rapid, and turbid on June 5, the time the station was visited. The bottom was mostly of hard clay. Some pools and small sloughs were close to the stream, none of which were found connected with the river, but must have been at times of very high water.

LIST OF SPECIES

The most important facts concerning each species of fish found in the Galien River and some of its tributaries are here given. A number of species other than those found by the writer certainly occur in the river. Small-mouthed black bass and wall-eyed pike are reported from the stream, and both have been planted in it near New Buffalo. None of the Siluridae were taken, but bullheads are said to be occasionally caught. Eels, dogfish, and buffalo fish are reported to be found in the river at times. A small lamprey, *Ichthyomyzon sp.*, four and a half inches long, was found clinging to a rock in shallow, swift water at Station 30. The small size and immature condition of the specimen makes its determination at present impossible.

The list is undoubtedly more complete for species represented in the streams by small individuals than for those with large ones, since methods primarily for collecting large fish were little used, most of the collecting being done with minnow seines.

1. *Hypentelium nigricans* (LeSueur), Hog Sucker.—Apparently scarce in the river. A small one taken at Station 7.

2. *Catostomus commersonii* (Lacépède), Common Sucker.—Two small ones under five inches long taken in Sycamore Creek, Station 26. None of mature size were taken or noted, but Frank Sawyer says that suckers (very probably this species) are abundant in the river in early spring at their spawning time.

3. *Minytrema melanops* (Rafinesque), Spotted Sucker.—One small one, two inches long, taken in August, at Station 26.

4. *Moxostoma aureolum* (LeSueur), Common Red Horse.—One young one, two inches long, taken at Station 7.

5. *Moxostoma duquesnei* (LeSueur), Fine-scaled Red Horse.—A young one two inches long caught at Station 26.

6. *Cyprinus carpio* Linnaeus, Carp.—A small one nearly four inches long of the scaled variety was taken in Sycamore Creek, Station 26. Frank Sawyer says carp are abundant in the river in the spring and follow the suckers at their spawning time and probably eat the spawn.

7. *Campostoma anomalum* (Rafinesque), Stone Roller.—One taken in Sycamore Creek in August, 1919.

8. *Pimephales notatus* (Rafinesque), Blunt-nosed Minnow.—Abundant and generally distributed in the river but most common in the shallower water and where the bottom is stony (Station 30) or sandy (Station 12) or where there is much aquatic vegetation (Station 7). Not many places with these especially favorable conditions for the species were found in the part of the river examined.

The minnow breeds in the Galien River. Egg patches were found in June on the flat undersides of objects on the bottom;

one patch was under a board and one under an old shovel blade and one under a cook-stove top. Each patch of eggs was oblong with the longest diameter nearly six inches; each was attended by a large male of the species about three and a half inches long with body highly charged with black pigment, especially intense on the head. Two of them captured had each sixteen tubercles or pearl organs arranged in three horizontal rows on the snout. The attending fish were as usual very bold in defense of their eggs and hence were easily caught.

The eggs on the shovel blade were left as they were found after the male fish watching them had been taken, and the next day they were all gone, very probably eaten by crayfish or minnows.

9. *Semotilus atromaculatus* (Mitchill), Creek Chub.—Many were found in the river but these were all small ones, none much over two inches in length. Larger ones, four to five inches long, were caught in August in the pools of the ravine stream in the woods, Station 46.

10. *Notemigonus crysoleucas* (Mitchill), Golden Shiner.—Apparently scarce in the region. A few taken in the river at Station 30 and a few from the small stream, Station 26. One caught in a slough, at Station 70, in June. All taken were small fish under three inches in length.

11. *Notropis blennioides* (Girard), Straw-colored Minnow.—Taken only at Station 1, at the mouth of the river.

12. *Notropis hudsonius* (Clinton), Spot-tail Minnow.—Taken in the river at Station 1 and not elsewhere in the stream.

13. *Notropis whipplei* (Girard), Silver-fin Minnow.—Found at the mouth of the river, Station 1, and not elsewhere in the stream.

14. *Notropis cornutus* (Mitchill), Common Shiner.—The most abundant and most generally distributed minnow in the part of the Galien River fished. Large examples were uncommon, and these were confined to rather definite and rather unusual conditions in the stream where the water was clear and rapid and where the

bottom was gravelly or sandy; these conditions were found only at Stations 12 and 30.

At Station 30 on June 3, 1919, the spawning act in this species was witnessed by the writer many times. Here a large male common shiner about five inches in length and in high coloration was maintaining a position over a growing pile of stones that was being built up by a busy river chub, in a manner to be described. The males of these two species were apparently not disturbed in the least by each other's activities, but the shiner gave much attention to a gathering of smaller members of his species that were undoubtedly all or nearly all females. He would swim out among them and attempt to drive them over the pile; and when successful, he would forcibly apply a side of his body to a side of one of the females. The contact would be maintained for but an instant when the two fish would separate. The female when released would float for a few seconds as the female horned dace does (Reighard, 1910, p. 1131) apparently exhausted by the spawning act. In this embrace the positions of the two sexes were very similar to those described by Reighard for the horned dace (*op. cit.*); the female is applied obliquely to the male with the head up while he keeps about the usual horizontal position. Sometimes the female was brought against the right side and sometimes the left side of the male shiner. Once another large male in breeding garb came near, but the one constantly occupying the pile drove him away by darting quickly to his side and then turning and striking him or at him with a head-on thrust. An attempt was made to collect some of these breeding shiners, but only one of them was taken and that a female distended with eggs, which were running from her body.

15. *Notropis atherinoides* Rafinesque, Emerald Minnow.—Scarce; one taken at the mouth of the river and one at Station 70.

16. *Notropis rubrifrons* (Cope), Rosy-face Minnow.—Uncommon in the river; a few taken at each of four stations (7, 12, 25, 30).

A male in breeding attire was caught on the gravelly shoal at Station 30 on June 3, 1919. This fish was about three inches long and flushed with red dorsally, the red being especially brilliant on the head. Every scale on the body except those immediately along the ventral line had several small, granular pearl organs at its exposed margin.

17. *Hybopsis kentuckiensis* (Rafinesque), River Chub.—Abundant and quite generally distributed in the river, but large individuals appeared scarce, and these were found at but one place, Station 30, where there were breeding activities by males on a gravelly shoal. A deep hole under a log near the upper log bridge was being used by them for a retreat. Three nests in the form of low, roundish, dome-shaped piles of small stones, were in the shallow water here. The piles were about a foot across and a few inches high, and the stones in them were quite uniform in size, being nearly an inch in thickness on the average and ranging from about a half-inch to two inches in greatest diameter (Pl. IV, Fig. 2). These nests were from two to ten feet out from shore and in water ranging from six inches to a foot in depth.

On June 3, I watched the building of one of these nests by a large male fish, probably seven inches long, adorned with red ventrally and with prominent pearl organs on the snout. My presence on the log bridge over the stream about eight feet from the nest was disregarded by the working fish a few minutes after I had taken my seat, and he worked incessantly for the hour or more in the early afternoon that he was under observation. During the time he built about a third of the nest, and this was evidently completed before sundown, for the next morning it had the size and form of other completed nests of the species, and a hard rain following the afternoon of the observations so raised the water and increased the current at the nesting spot that it is not at all likely that the fish could have worked under the changed conditions. The completed pile was about twenty inches in diameter and three

or four inches high. When last seen at mid-afternoon on June 3, it was about a foot in diameter and not nearly so high.

During the period of my observations the fish carried stones to the pile holding them in his mouth, laboring in an active and tireless way, making dozens of excursions usually up stream and obtaining the stones chiefly from points two or three feet away. Stones as large as two inches in diameter were brought at times, but with such loads the fish would enter the strongest part of the current and allow this to assist him. Only once was he seen to drop a stone short of the pile. At one time he worked at the center of the pile as if trying to make a little pit in it. Spawning was not observed; in fact no other creek chubs were at the place except a few very small ones associated with the little common shiners, and perhaps other minnows, that were schooling near the nest.

About eight feet away from this nest, however, another large male river chub was building a stone pile. At one time the two males met and a little combat ensued, ending in one applying its side to the back of the other and holding the position for a second or two. Possibly this was the spawning position of the species assumed through the mistaking of sex.

18. *Umbra limi* (Kirtland), Mud Minnow.—None were found in the river but some were taken in both of the tributary creeks in the Warren Woods, Stations 26 and 46.

19. *Esox lucius* Linnaeus, Common Pike.—Three taken, two rather large, thirteen to fifteen inches long, at Stations 25 and 30 and one small one three inches long from Station 50. The one from Station 25 was taken by hook in August with a minnow as bait. They are said to reside in deep holes in the river where anglers obtain considerable sport in fishing for them and where they occasionally catch large ones, as large as seven and a half pounds according to Mr. Sawyer. The pike are quite generally blamed for the scarcity of large minnows, suckers, and some other fish in the river.

20. *Esox vermiculatus* Valenciennes, Little Pickerel.—Many were present in the river, and a few were found in Sycamore Creek near its mouth (Station 26). They rest, apparently in ambush for prey, commonly under bushes or other shore vegetation overhanging the water.

21. *Aphredoderus sayanus* (Gilliams), Pirate Perch.—One taken at Station 7, the junction of the two branches of the Galien River, from the muddy bottom area with pondweed patches (Plate I, Fig. 2).

22. *Pomoxis sparoides* (Lacépède), Calico Bass.—One taken from among floating brush in about four feet of turbid water at Station 50.

23. *Ambloplites rupestris* (Rafinesque), Rock Bass.—A few taken in each of five different stations, and these fish were all very small, under two inches in length, except one rather large example eight and a half inches long, which was caught at Station 12 by drawing the net through a thick pondweed tuft in rapid, clear water.

24. *Eupomotis gibbosus* (Linnæus), Common Sunfish.—Three caught along the shore of the river at Station 5.

25. *Micropterus salmoides* (Lacépède), Large-mouthed Black Bass.—Three small ones, three to three and a half inches long, taken at three different stations, 7, 10, and 12. All were dissected to determine the nature of the food, and each fish was found to have been feeding extensively on small water bugs, Corixidae. This appeared to be the only food in two of the fish, while one had remains of three small amphipod crustaceans in addition to many corixids in its alimentary canal.

26. *Percina caprodes* (Rafinesque), Log Perch.—One taken from under a log on gravel bottom of shallow water at Station 30.

27. *Hadropterus aspro* (Cope and Jordan), Black-sided Darter.—A few taken at each of four stations, 5, 7, 12, and 30, but common only at Station 12, where the bottom was sandy and the water comparatively rapid and clear.

28. *Boleosoma nigrum* (Rafinesque), Johnny Darter.—Abundant at nearly all parts of the river fished; probably the most abundant species of fish in the stream. It seems to prefer sloping clay banks near the shore. In June a number of males in breeding dress were found. These were undersized compared with breeding males taken in other localities. They were about two inches long. No large examples of the species were found in the stream; the many caught measured from one and a quarter to two and a half inches in length. Few of the last length were taken, and the species was markedly dwarfed in the river.

29. *Poecilichthys caeruleus* (Kirtland), Rainbow Darter.—Only three taken, and these in June from the gravel bottom at Station 3. One was a male in high breeding coloration.

CONCLUSIONS

The Galien River in the Warren Woods and vicinity has a small fish fauna. Twenty-nine species were found in the stream, and twenty-one of them at the Warren Woods. There are probably but few other fish permanently inhabiting the river and its branches here, and there appear to be few food and game fish at least in summer, the common pike being the only one of these of sufficient size and numbers to attract anglers, and good strings of these are said to be obtained occasionally. In June the writer tried some line fishing and saw much of it, but no fish was seen caught in this way. In August a common pike was taken by a hook on a set line while it was being placed in the water.

Probably the paucity of good fish in the Galien River with conditions similar to those of the Warren Woods is principally due to the following causes:

a) Absence of much algae and other aquatic vegetation in the river or waters connected with it resulting in a scarcity of entomostracans or other small animals that furnish food for young fish and a limitation of breeding areas for fish needing

plant-covered shallows for spawning or for protecting their eggs or young.

b) Small extent of gravelly shallows in the stream, apparently needed by many species for breeding areas.

c) Presence of numbers of large crawfish, *Cambarus virilis* and *Cambarus propinquus* in the river, which very probably destroy the eggs of fish, especially the ones that deposit them on the bottom or on plants or other places accessible to the crawfish. Fish like bullheads, sunfish, and black bass that actively protect their eggs would undoubtedly fail to keep them from the depredations of so many and so large crawfish. The species of fish that were well-established residents of river conditions like those in the Warren Woods were blunt-nosed minnow, creek chub, common shiner, river chub, and the common pike. These all place their eggs apparently quite safe from crawfish, under or among stones in case of the first four or in case of the common pike out in the shallow marshes early in the season before the period of much crawfish activity.

d) The presence of large common pike, which are well-known destroyers of other fish; and there were few shallows or stream mouths where small fish could escape the pike in the part of the Galien River examined.

e) Intensive fishing of the river by fishermen and anglers especially near its mouth, where many nets are said to be used.

The Galien River could undoubtedly be made artificially much more productive of large and desirable fish, which would be appreciated by the large number of people to whom the stream is readily accessible. It passes through a rather wild and very attractive region; and with more fish in it the recreative value of the little river would be increased. Large-mouthed black bass should thrive there with the abundance of crawfish food, and through reducing the numbers of these animals they would probably improve breeding conditions for themselves and other fish. There

may, however, be an insufficiency of food for young bass, so there should be a better knowledge of their food in the stream preliminary to the planting of these fish as small as fingerlings. In the writer's brief survey, it was found that large-mouthed black bass about three inches long were eating water bugs, Corixidae, and large amphipods, *Hyalolella knickerbockeri*. The latter were found to be very abundant in the river in June, when they were breeding, and there can be no doubt but that these crustaceans and the water bugs are an important fish food in the stream. Welch (1912) notes that corixids are often eaten by sunfish and minnows. A thorough study of the invertebrate life of the river at the Warren Woods, including a quantitative study of forms important as fish food, would probably give interesting and valuable results.

LITERATURE

- Reighard, Jacob. "Methods of Studying the Habits of Fishes with an Account of the Breeding Habits of the Horned Dace." *Bulletin of the Bureau of Fisheries*, XXVIII (1910), 1111-35; 7 plates.
- State Board of Fish Commissioners of Michigan.
 1905, *Sixteenth Biennial Report*, pp. 1-96. Lansing.
 1913, *Twentieth Biennial Report*, pp. 1-200. Lansing.
 1915, *Twenty-first Biennial Report*, pp. 1-215. Lansing.
- Welch, Paul, "Insect Life of Pond and Stream," Part II, *Nature Study Review*, VIII (1912), 181-93.

PLATE I

FIG. 1.—Station 5. Galien River on flats near Union Pier, Michigan.

FIG. 2.—Station 7. Galien River at junction with South Fork near Union Pier, Michigan.

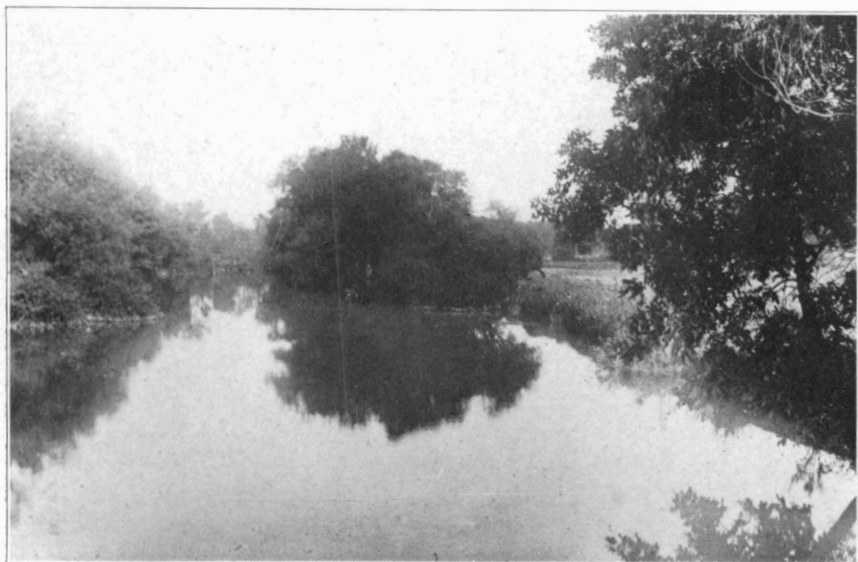


FIGURE 1

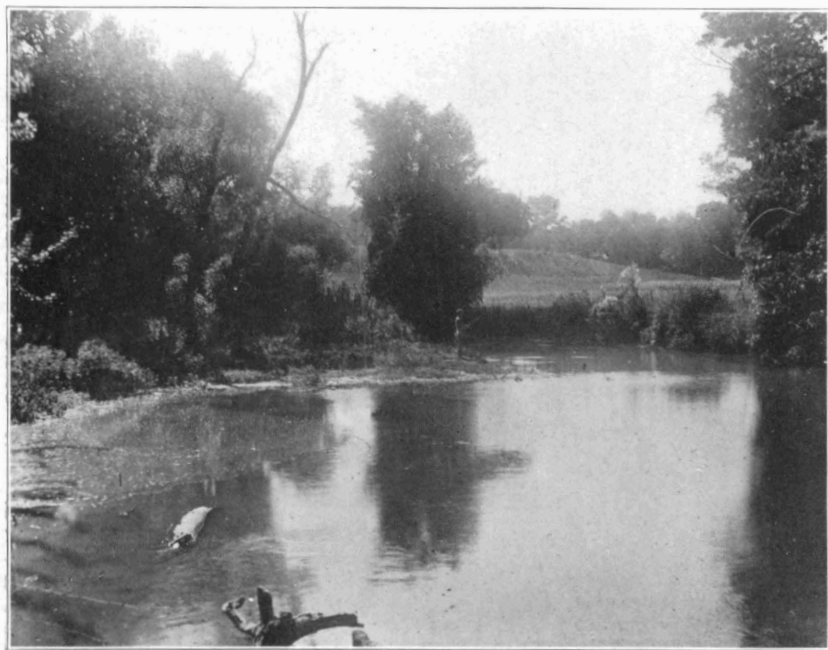


FIGURE 2

PLATE II

FIG. 1.—Station 12. Galien River about a mile southwest of the Warren Woods.

FIG. 2.—Station 26. Sycamore Creek, near its mouth, in Warren Woods.



FIGURE 1



FIGURE 2

PLATE III

Station 25. Galien River in Warren Woods, with mouth of Sycamore
Creek.



PLATE IV

FIG. 1.—Station 30. Galien River in Warren Woods, with log bridges.

FIG. 2.—Nest of *Hybopsis kentuckiensis* at Station 30, at low water.

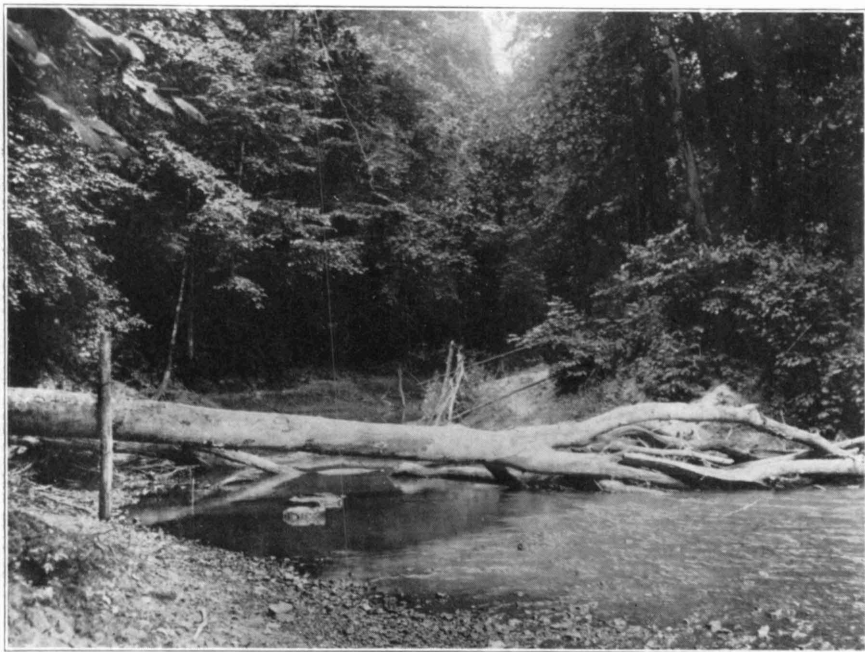


FIGURE 1



FIGURE 2

PLATE V

FIG. 1.—Station 46. A small, winding stream in a narrow, rather deep ravine in the north part of the Warren Woods.

FIG. 2.—Station 50. Galien River above bridge on main road through Warren Woods.



FIGURE 1



FIGURE 2

