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OBSERVATIONS ON THE EFFECT OF OPERATING AN OUTBOARD MOTOR OVER BLUEGILL SPAWNING BEDS

The subject of the effects of operating motor boats in inland lakes, especially over the beds of spawning and nest-guarding fishes, has again been brought to our attention by letters from sportsmen who are quite emphatic in censuring the actions of many motor-boat operators. One such complaint, this spring, came from Mr. Norbert J. Bierlein (12105 Wilshire Avenue, Detroit), a cottager on Zukey Lake (one of the lakes in the Huron River chain) in Livingston County. Mr. Bierlein was contacted, and the date of June 8, 1936 was agreed upon as suitable to him and the writer for making observations bearing on this motor-boat - fish-spawning problem.

The scope of this problem has been outlined in detail in numerous inter-departmental memoranda and letters (these are available in the Institute files). The comparatively small amount of experimental data previously obtained on this problem consists of: (1) observations by Mr. Loutit to the effect that an outboard motor, with the wheel at a depth of about 17 inches, "greatly disturbed" a sandy bottom in water about 27 inches deep; and (2) observations by J. Metzelaar to the effect that (summarizing his report briefly) operating an outboard motor at 20 to 25 m.p.h. in depths of 2 to 2½ ft. and 4 to 4 1/6 ft. had no effect on the bottom.

Although the present study (on Zukey Lake on June 8 by Mr. Bierlein and the writer) was limited by equipment, time and conditions encountered in the lake, it is believed that the observations which were made have a very important bearing on the problem.

Mr. Bierlein was well acquainted with the Bluegill spawning beds in Zukey Lake and he spent the first hour (10 to 11 a.m.) pointing out several of these beds, including approximately 50 nests. All of the nests which we saw were at depths of 3 ft. 2 in. to 4 ft. 6 in., and were located between 100 and 300 ft. from shore. All nests had been made over a marl bottom; for each nest, approximately 2 inches of the marl had been fanned away in order to expose a sufficient number of shells of dead snails and clams (mostly snails) on which to spawn. All of the nests were located within or near zones of bulrushes of sparse to moderate density. The nests varied approximately from 12 to 18 inches in diameter. The water temperature at 12 noon was 71 degrees F.

For our experiment we selected a group of ten Bluegill nests all located within an area approximately 20 ft. x 30 ft., in water 3 ft. 2 in. to 4 ft. deep, in a region where the rushes were sparse and along the south shore of the lake. The adult fish left their nests as we approached and did not return while we were in that vicinity.

Each of the ten nests was examined by means of a water-glass to determine that it was a new nest and had been occupied this spring. To determine the status of the eggs or fry on these nests, we attempted to collect fry from each nest by using a $2\frac{1}{2}$ ft. glass tube fitted at the end with 2 ft. of rubber hose. In making these collections the thumb was held over the upper end of the glass tube; the end of the hose was let down on the nest, and the thumb was released. The result was that an equal amount of water was drawn up from the surface of the nest at each sampling. Thirteen such samples were drawn up from the ten nests; the entire content of these samples was preserved, and the number of fry in the lot was counted. Bluegill fry were found on 9 of the 10 nests. The location of each nest was marked by making a knot in the top of a nearby bulrush.

Our next step was to operate an outboard motor over these nests to see what effect it would have on the fry in the nests. A small boat, about 12 ft. long, was used. The outboard motor was a 2 cylinder Johnson Sea Horse 4. This motor, when set in its normal position on this boat, drew 25 inches of water; while being used during this experiment we estimated that the propeller was operating at 29 inches below the lake

level (the 4 additional inches resulting from the dip of the motor while in operation). The motor had a 3-blade propeller, and each blade or bucket was 3 inches long. This combination of boat and motor was operated over this series of ten Bluegill nests at a maximum speed of 10 m.p.h. (estimated by Mr. Bierlein) with the motor turning over at the rate of 3,600 revolutions per minute. The boat was run in a straight course over the bed 3 times at top speed. Further, by turning the motor at right angles to the boat, the boat was run in a circle over the nests at least 8 times. Thus this motor was operated in water 3 ft. 2 in. to 4 ft. deep and with the propeller operating at a depth of 2 ft. 5 in., and was run directly over most of the 10 nests 11 times or directly over all of the 10 nests many times. Considering the loose nature of the marl bottom, the effect of the agitation of the water by the motor was not very great; it was, however, sufficient to roil the water to the extent that one could not see the nests immediately after the motor was stopped. After about 15 minutes the water had returned close to normal transparency, most of the sediment having settled to the bottom.

After operating the motor over the bed, the nests were again examined to determine how the fry had been affected. The amount of silt deposited on each nest was not sufficient (in my opinion) to do great damage to the fry. Fry were again collected from the nests by means of the same glass tube fitted with the rubber hose; thirteen samples were again taken from the 10 nests. Assuming that some fry might have been washed from the nest by the action of the motor, 2 samples (using the same tube) were taken from the bottom around the periphery of each nest (from 2 to 12 inches from each nest).

Summary and Conclusions

Nine of the ten Bluegill nests in the bed under observation contained newly-hatched fry. These fry had large yolk sacs and were extremely feeble; when placed in a jar of clear water they readily settled to the bottom and remained quite inactive. The 13 samples from the 10 nests, taken before the operation of the motor, contained 825 Bluegill fry.

After the motor-boat was run over the bed, the same 9 of the 10 nests were found to contain fry. Thirteen samples taken at this time yielded 2,501 young Bluegills. The greater number in the second series of samples resulted from one very large sample of over 1,000 fry (probably purely a matter of chance that the end of the tube was let down directly in a great concentration of the young fish). These data indicate that there was no great decrease in the number of fry in any of the nests during the experiment. Further the many samples taken from the surface of the bottom around the periphery of each nest contained no fry, indicating that the fry had not been moved as much as two inches from their nests. It is a certainty, therefore, that this motor, operated under the conditions already described, was not at all effective in washing the Bluegill fry from their nests; and the experiment also demonstrated that an agitation of the water sufficient to stir up a marl bottom is not necessarily sufficient to wash Bluegill fry from their nests. (This difficulty in washing Bluegill fry from their nests may be attributed, at least in part, to the comparatively great density of the eggs (Breeder, 1936) hence of the newly hatched fry with large yolk sacs.)

It is believed that this experiment has considerable bearing on the motor-boat versus Bluegill-spawning problem as a whole for a majority of the nests of this species are to be found in water 3 to 5 ft. deep, or little less, and the majority of motors operated on our inland lakes are small outboards. The results suggest that, in so far as the washing of eggs and newly hatched fry from the nests is concerned, the problem is not as serious as believed by most fishermen.

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