

INSTITUTE FOR FISHERIES RESEARCH

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FISH DIVISION

ELK LAKE

In many respects this lake resembles Torch Lake. Evidently the two are similar in origin. In general shape, drop-off, color of water, kind of bottom, oxygen content, and in other ways the two lakes are very much alike. Both are known for their beauty. Elk Lake is about half as long, about three-fourths as wide on the average, and has a maximum depth about two-thirds as great as that of Torch Lake. The two lakes vary to a considerable extent in productivity. Elk Lake, though not extremely productive, is relatively rich compared to Torch Lake.

Previous Elk Lake was investigated by the old lake survey on July 16-22, 1891, and by ^{Walter Koch and} John Van Oosten July 27 to August 3, 1923. Their report is here repeated:

"Elk Lake

The period of July 27 to August 3 was spent on Elk Lake, a body of water of approximately thirteen square miles area, located in Antrim County.* Except for a 15-20 ft. flat of about one-half mile wide at the south end and a narrow shelf at the north end, the bottom slopes abruptly, particularly on the east and west shores, to form a central basin of considerable width, which is overlain by depths of one hundred and fifty to one hundred and ninety feet and extends the length of the lake. The bottom along shore to a depth of five to twelve feet is rocky, except along a part of the north shore, where there is sand only, and along part of the south shore where sand and clay are predominant. Elsewhere the bottom is almost uniformly yellowish clay, mixed with marl, often in the deepest water covered with ooze. The elevation of the water level on account of the Elk River dam has submerged logs and stumps all along shore but has not contributed much to the production of shore-shoals, so favorable to the life of inland lake. Marl is commonest as a constituent on the southern flat. The debris is so widely distributed that it is impossible to pull a seine

* Such details of the physiography of this and other lakes as are given in Scott's Inland Lakes of Michigan, 1922 are not repeated here.

except in a very few areas, and it appears to have served as a protection from wave action, so that accumulations of silt have smothered the bottom over vast stretches. Vegetation is very sparse in any part of the lake except for small beds of Potamogeton in Spencer Bay and in the cove at Elk Lake Inn, and occasional patches of chara in deeper water along the north shore. These Potamogeton beds are said to be the only good bass fishing areas.

Gill nets of 1 1/2, 2 1/2, and 2 3/4 inch mesh were set at nine stations (See Roman numerals on accompanying map) from depths of twelve to one hundred and sixty feet and the shores were searched over most of their extent for small fish. Inside the fifty foot contour were taken the usual inland lakes species and in the deeper waters the Salmonidae. Only the latter ever occurred at all commonly in the nets and frequently few fish of any kind were caught.

Small fish were seldom seen in the shallow waters and were common only on the clean sand at the north end. No more than a dozen schools of shiners were recorded on the entire lake, and except for a few stray small-mouthed bass of the year no young food fishes were observed."

Acknowledgements We are indebted to Mr. Zable of Zable Lodge for providing a boat for our work, to Elk Lake Inn, Rex Terrace, Meguzee Point Hotel, and to numerous residents of Elk Rapids and Kewadin for their information and help, to Mr. Felix Jaundrews, commercial fisherman, for helping us determine the relative abundance of obnoxious fish, to Conservation officers Craw and Fike, and to Robert Breed of Ann Arbor.

Location and size Elk Lake is located in Antrim and Grand Traverse Counties just east of the East Arm of Grand Traverse Bay. A good paved road runs along part of the west shore. This and other roads provide easy access to most parts of the lake. The lake has a length of almost 9 miles, an average width of 1.3 miles, and an area of 7732 acres (12.1 square miles).

Inlets and outlets Elk Lake has two small inlets, both trout streams, Williamsburg and Bottle creeks, at the south end. Its chief source of water is through Round Lake, with which it is directly connected by a narrows about a thousand feet wide. The entire Intermediate chain of lakes with their inlets, and Bellaire Lake, Clam Lake, and Torch Lake, drain through Torch River into Round Lake, and thence into Elk Lake. This main inlet brings in a considerable amount of water, which after having passed through these other lakes, especially the shallow

and weedy Round Lake, must carry a considerable amount of fertilizing substance in solution and in suspension. Boats can pass through this inlet to Bellaire where a power dam prevents their passing into the Intermediate chain of lakes.

Elk River flows from Elk Lake into Grand Traverse Bay. This stream is quite short, and since a power dam has been built near its mouth, it appears to be little more than an arm of the lake. It also carries a considerable volume of water. Below the dam the old stream bed, about one-half mile long, carries little water, as the chief outflow is through a short straight cut into the lake.

Pollution The lake appears to be very clear and clean and oxygen is high. Evidently very little pollution is present. The lakes in the chain above Elk Lake appear to be clean and very little if any injurious material can reach Elk Lake through its inlet.

Dam in The dam at Elk Rapids has raised the level of Elk, Round and
outlet possibly Torch Lakes to some extent. In doing so it has done little, if any, noticeable harm and may have been beneficial in flooding some areas, particularly at the lower end of Round Lake. The dam, which is used for generating electricity, produces little if any fluctuation in the level of the water.

The fish ladder at this dam is not properly located and does not operate. It leads up from the old channel, which carries very little water. From time to time fish have been taken below the dam and placed above it. This is especially true of small mouth bass. For several years a live box was kept below the dam to collect undersized bass caught by the fishermen, for planting above the dam.

Use of This lake has a rather extensive resort development. Many desirable
water cottage sites are still available and resort development will undoubtedly continue to increase. The lake has a number of well known resort hotels on its shore as well as a golf course, and has numerous summer

homes along the northwest shore and at the connection with Round Lake. Boats, bait, and tackle are available here, as well as modern accomodations. Conditions are excellent for swimming, and fishing is good. Camping sites for tourists are available.

Elk Rapids and Kewadin are on the lake and Williamsburg is only a short distance removed. This lake, like Torch Lake, is ideal for resorters.

Temperature

Surface and bottom temperatures in Elk Lake are slightly higher

than in Torch Lake. When examined (August 18, 1931; air temperature 88°)

the surface temperature was 74° and the bottom temperature was 45°. At 12 meters (= 39 feet) the reading was 70°.

Temperature at all depths between 100 feet and the bottom was found to be 45°.

The water is very definitely stratified, the warm layer extending down to 40 or 45 feet. Water below this depth is fitted, so far as temperature is concerned, for trout, white fish, herring and the other cold water fishes. The relatively warm temperature of the surface water is well suited to the warm water species.

Oxygen

Oxygen was found to be high even at the bottom. This is expected

since relatively little decay takes place in the lake. Since this fortunate condition happens to prevail, fish can live at any depth in the water, and the entire body of water can be productive instead of only the upper parts as is the case in many lakes which reach a fairly great depth.

Other chemical conditions

The lake is fairly clear but not nearly so free of sediment as is true in some lakes. The Secchi disc could be seen to a depth of 3.2 meters. In a few Michigan lakes which have been worked previously,

the disc could be seen up to almost 10 meters.

The water has a decided blue appearance. Probably both the color and turbidity are due to the marl suspension.

Carbon-dioxide was found only below a depth of 100 feet and was present in only

very small amounts even at the bottom.

The lake is alkaline at all depths. pH ranges from 8.0 at the top to 7.6 at the bottom (7.0 is neutral).

The water is fairly soft. It is just slightly harder than that of Torch Lake. Both are below the average hardness of the lakes examined by this institution to date.

Chemically (to the extent to which we have made chemical determinations) the lake appears very well fitted for fish life.

Depth Maximum depth found by us was 60 meters or about 198 feet. The 1891 survey recorded 170 feet, and the 1923 survey, 190 feet. The shelf is generally fairly narrow, having an average width of about 500 to 600 feet. This shelf is almost flat, reaching a depth of 6 to 8 feet at the drop-off. The bottom slopes fairly abruptly on the east and west sides. The south end is rather shallow for about 0.6 of a mile out. The northern end, above the outlet bay, also has a relatively wide area which is less than 30 feet deep. The outlet bay is relatively shallow.

The slope at the drop-off is generally quite steep. The map indicates the depth at various points and the drop-off, 10, 25, and 50 meter contours.

This lake is fairly similar to Torch Lake in the shape of its basin, but the basin is not so deep as that of Torch.

Bottom The bottom of the shall is chiefly sand with stones and gravel along the east and west sides. The two ends were of almost pure sand. Bottom below the shelf is almost entirely clay. On the slope the sand gradually intergrades into clay. Considerable marl is also present on the slope. Several "patches" of almost pure marl were found.

Marl generally is in the form of concretions. A small amount of marl is generally mixed with the sand and clay.

A margin of peat borders the outlet bay and some peat is present at the north end and at Elk Lake Inn.

Vegetation Weed beds are not large or plentiful but considerable vegetation is present on the shoal and in some places also below the drop-off. Near Kewadin, at the north end of the lake, weeds are fairly abundant. Algae is present along much of the shore line both on and below the drop-off. Muskgrass and pondweeds are present on the shelf and slope in the outlet bay, near Elk Lake Inn, near the Round Lake connection and at various other points along the lake. Although more vegetation appears to be desirable, the lake is not nearly so much in need of weed beds as is Torch Lake.

Natural Natural food for warm water species appears to be fairly abundant.
food Forage fishes are found to be numerous, clams are quite common, and, especially in the weed beds, aquatic insects are fairly abundant. The fact that fish in this lake are fairly numerous, reach a large size, and appear to be in good condition, indicates that food is present in considerable quantities.

Plankton was not studied because of the large amount of time which would be required to make a careful analysis of the microscopic life in the lake.

Fertility Generally, the lake appears to be fairly fertile, but it cannot be considered a "rich lake". Several factors which evidently contribute to the fertility are:

1. The rich swampy area near Kewadin at the north end of the lake. Here the bottom is of peat, dead and decaying vegetation, as well as living aquatic vegetation is fairly abundant.
2. Inlet from Round Lake. Round Lake is rather productive. It has, at its south east end, a large swamp which evidently contributes extensively to its

productiveness. Water entering Round Lake through Torch River has passed through a number of lakes, both rich and poor, and Torch River itself is connected with swampy areas. This water evidently carries an a considerable amount of fertility.

3. Williamsburg Creek passes through the village of Williamsburg and flows into the southern end of Elk Lake. It probably carries in some nutrition.

4. A large tamarack swamp exists just south of Elk Lake. Bottle Creek drains a part of this swamp and flows into Elk Lake at the extreme south end of the lake.

5. Some land is flooded at Elk River Bay and in Elk River. Although the current here is toward Grand Traverse Bay and away from Elk Lake, the peat bottom along the bay and along Elk River evidently tends to increase productiveness in the outlet bay. Increased weed beds will evidently also tend to increase the productivity of the lake.

Spawning grounds Sufficient gravel is present among the stones along the east and west shores to provide for spawning grounds for the nest building fishes. Temperature of the water is fairly high and conditions should be satisfactory for spawning.

Our knowledge of the spawning of cold water fishes in inland lakes is very limited and we cannot state to what extent conditions are favorable for the lake trout, white fish, and cisco.

Since perch generally spawn on weed beds, conditions seem fairly favorable for them.

Species of fish present Game fish. Small-mouth bass, perch and rock bass were found to be fairly abundant. Some northern pike, large-mouth bass, muskellunge, herring, white fish were also taken. Lake trout are reported. Trout, herring, rock bass, grass pike, perch and white fish were taken here in the investigations in 1891. Lake trout, perch, small-mouth bass and rock bass were taken by

Koelz and Van Oosten in their investigation of the lake in 1923.

Report No. 97 on the setting of commercial nets in Elk Lake, August 12th to 23rd, 1931, shows that in the four nets set on several locations for periods ranging from two to five days (equivalent to one net set for 34 days) shows the following game fish taken: Black bass (small-mouth bass) 121, Rock bass 135, Northern pike 7, Perch 1.

Some of the bass caught were of a large size: a number of them weighed about five or six pounds. Resorters say that it is not uncommon to take a good mess of bass, especially at the south end of the lake.

The commercial nets were set in the warmer layer of water and gave no indication of the relative abundance of cold water fishes.

Muskellunge are rare. One small specimen was taken by our party in seining. Generally very few are caught. Large-mouth bass also appear to be few in number. Some lake trout are taken but fishing for this species in Elk Lake often results in no catch.

Small-mouth bass and perch are the most commonly taken game fishes, and are fished for much more than the other species.

Course Fish. Common Suckers were taken by all three parties. 65 were taken in the commercial nets. Brown bullheads were taken by our party and also in 1923. One large catfish was taken in the commercial nets.

Suckers appear to be relatively abundant. Bullheads are present but evidently are not numerous. No catfish, except the above mentioned one, were taken by any of the parties and none were reported by local residents.

Suckers reach a large size and appear to be in good condition.

Obnoxious Fish. It was reported by local residents that obnoxious fish were very numerous. Our net sets and those of the commercial fishermen failed to produce a single obnoxious fish. Lawyers were taken on the two previous investigations (1891

and 1923). Gar are present in the adjoining lake (Round). Undoubtedly some obnoxious fish are present but they appear to be much less numerous than local residents had supposed. Report No. 97 deals with this subject.

Forage Fish. Straw-colored minnows, blunt-nosed minnows, common shiners, black-nosed shiners, mud minnows, Menona killifish, log perch, Johnny darters, Iowa darters, rosy-fronted minnows, and long-nosed dace were taken by our party. No additional species were taken by the 1923 party.

Of the forage fishes, blunt-nosed minnows and straw-colored minnows appear to be by far the most abundant. Common shiners and rosy-fronted minnows are common.

Only one mud minnow and one black-nosed shiner were taken. Except in a few locations the lake does not contain the peat bottom which is usually present where mud minnows are common.

Forage fishes are more abundant here than they are in Torch Lake.

Predators It is difficult to make a statement regarding the status of predators in Elk Lake. Fish-eating birds are very few. Lawyers were taken by the two previous survey parties and lawyers and gar are reported as being quite abundant by some local residents. This opinion, however, has not been expressed by hotel owners, generally, along the lake. We were unable to take any predatory fish with our own nets or with those of the commercial fishermen. We conclude that predators appear to be relatively few in number.

Cover Cover is good in several locations, such as outlet bay, the north end of the lake, and the cove at Elk Lake Inn, but generally it is not satisfactory. Along the greater part of both the east and west shores and along much of the south end very little protection for the young fish exists. The vegetation generally is short and does not provide cover for a large number of fish. Except in certain local areas, increased cover is desirable.

It will be noticed that conditions now are quite different from what they were in 1923 when this lake was investigated by Koelz and Van Oosten (see quotation from their report above). Evidently the logs and stumps were carried away naturally or were removed by the riparian owners. Most of the shallow water, even at the edges, is now devoid of stumps and logs.

Water level Water level fluctuates very little. Torch River maintains a fairly even flow into Round Lake and the dam has no marked effect on raising and lowering the water, because of the large storage capacity of the lake. A constant level is desirable. The dam has raised the water to a head of about 11 feet.

Laws and Regulations One of the operators of Meguzee Point Hotel states that the proportion of bass to pike in the northern part of the lake is about 3 to 1. Proprietors of Elk Lake Inn state that the proportion is about 19 to 1. In the commercial net sets the number of bass taken was 121, the number of pike 7 (17 to 1). Undoubtedly bass are far more numerous than pike in this lake, especially in the southern half of the lake.

Elk Lake is designated as a pike lake. According to the provision that "A pike lake under the terms of this Act shall be deemed to be a lake in which pike or pike-perch are the dominating species of game fish found therein, and commonly known as pike lakes" (see Laws Relating to Conservation, Revision of 1931, p. 38) this lake is rather illogically so designated.

By change of provision of Act 165, P.A. 1929, as amended by Act 326, P.A. 1931, Chapt. 3, Sec. 1 - Taking permitted of lake or mackinaw trout by hook and line at any time of year, to number of 2 per day per person, or to 5 per day or in possession by party in boat.

In a pike lake, pike-perch, muskellunge, perch, calico bass, rock bass, strawberry bass, crappies, catfish, bullheads, cisco, whitefish, smelt, suckers, mullet, redhorse, carp, gar fish, dog-fish and sheepshead can be taken from May 1st to March 31st. In other lakes these species can be taken from June 25th to March 31st. In a pike lake, brook, brown and rainbow trout as well as the above mentioned fishes can be taken one month and 24 days sooner than in undesignated lakes (May 1st to June 24th incl.).

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Since lake trout fishing is now permitted in this lake at all times of year, since bass are abundant here, and since fishing for pike and perch usually also results in catching some bass, it is here recommended that the special designation be taken from this lake.

RECOMMENDATIONS

Although the picture we are able to give of this lake is much more colorful than that represented by Koelz and Van Oosten in 1923 (conditions have improved since then), we feel that a number of changes must be made to keep up the present supply of warm water fishes and to increase their numbers, also to improve fishing for the cold water species.

The following recommendations are given:

Stocking. We feel that an annual stocking of 25,000 fall fingerling small-mouth bass and an equal number of fingerling perch is desirable.

We also feel that the annual stocking of 25,000 fingerling lake trout, or 250,000 fry should be made for several years to build up the trout fishing.

Bluegills and large-mouth bass were not found in the lake by our party, but we believe that these species would do well in certain of the shallower areas of Elk Lake. A planting of 5000 fingerlings of each in the more protected areas of the lake is here recommended. The portions of the lake referred to are: the south end,

the cove by Elk Lake Inn, the outlet bay and the north bay by Keewadin.

The planting of other species is not recommended.

Rearing ponds. The large number of bass and lake trout fingerlings which are needed annually for this and other lakes of the region would appear to render a local rearing pond for lake fish very desirable. (See general recommendations for lakes of Antrim County.)

Predator control. In a lake of this type the fish-eating birds are seldom if ever a serious menace to fish life. At present comparatively few fish-eating birds are present. A few kingfishers were seen. These birds are not in need of control now and possibly will not reach a point in the near future where they will very seriously deplete the fish population.

Although we did not take any lawyers they are very likely still present in the lake. This fish is very destructive, especially to the cold water species, and if it becomes very abundant every effort should be made to reduce its numbers. We cannot now, however, recommend definite means of taking the lawyer from the lake without also taking a number of lake trout or other desirable cold water species.

Gar are present in the adjoining lake but few seem to pass into Elk Lake. None were taken by any of the investigating parties.

At present predators do not appear to be seriously in need of control. Efforts to remove some of them by using commercial nets proved fruitless. See Report No. 97.

Gravel spawning beds. Gravel is present on the east and west shores in considerable quantities. An increase in the amount of gravel appears unnecessary.

Food increase. This lake contains quite a few blunt-nosed minnows. These spawn under the bottoms of slabs or other relatively flat objects. Better spawning conditions

for these minnows appear desirable but unless old boards or slabs are easily available the increase of spawning sites for these minnows is not recommended because other food is fairly abundant and this species seems to be doing fairly well now. An increase in brush shelters will undoubtedly also increase the supply of insects and minnows. An increase in food is not nearly so necessary here as in Torch Lake.

Vegetation increase. Although a number of weed beds are present, an increase in vegetation would help improve fishing conditions. The method of increase as recommended for Torch Lake should be used here. This will be discussed under cover increase.

Fertility increase. The lake is rich now in certain local areas and is fairly productive generally. Because of the size of the lake and because of its rather large outlet, a program of increasing the general fertility of the lake by use of commercial fertilizer or some similar substances cannot be resorted to. Certain local areas can be made more productive as discussed under the next item.

Cover increase. More protection for young fish is desirable. Brush shelters provide protection and at the same time tend to increase the food. They also stimulate the development of weed beds. Placing one hundred shelters such as described in the Torch Lake report on the shelf along the east shore and fifty along the opposite shore would in our opinion prove of great benefit to the lake. These should be placed where most needed and should be some distance apart. In at least one-fourth of these we recommend that about two cubic yards of rich soil should be placed, to start the building-up of weed beds. Planting muskgrass within these shelters is recommended to accelerate the establishment of the weed beds. The weeds for the planting may be taken safely and advantageously along the southwestern shore of Round Lake. None

should be taken from High or Bass lakes or Lake of the Woods, for fear of transferring the parasites which seriously affect the perch in those lakes.

More detailed discussion of the recommendations for cover increase are given in the report for Torch Lake. A careful reading of those recommendations is advised in connection with the reading of this report.

INSTITUTE FOR FISHERIES RESEARCH

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