

ELK LAKE

1975 Survey Report

INTRODUCTION

A gill net survey was conducted on Elk Lake, Antrim County, from October 1 -9, 1975. This survey was done to determine the status of the fisheries resource. An attempt was made to standardize gear and set up index stations so year to year comparisons of abundance of major species can be made.

The sport fishery in Elk Lake is supported by various species. Yellow perch and rock bass are the main panfish species taken. Small-mouth bass are taken especially in the spring. There is a trophy spear fishery for muskellunge, through the ice. This fishery is concentrated near the narrows between Elk and Round Lakes. Some lake trout are taken but the fishery is marginal. In some years, fair numbers of rainbow trout were creeled. There is a winter fishery for whitefish. Some spearing for whitefish is done in the fall, during spawning, but this activity has declined.

Fisheries management has been limited to setting special regulations, stocking fish and placing fish shelters. The only special regulation on Elk Lake provides for the use of spears and artificial lights for taking whitefish, ciscoes, suckers and carp between November 1 and December 31. Fish stocking dates back to 1894 when Lake trout fry were planted. Various species have been stocked, including yellow perch, large and small mouth bass, walleyes and various salmonids. Recently, stocking has been entirely salmonids (See Table 1).

Elk Lake has problems. Fishermen feel it offers poorer fishing than Torch Lake or other areas. A survey in 1971 noted that splake and lake trout were in poor condition. Infestations of tapeworms and bladderworms were noted in splake. Sanderson found that cisco were scarce in Elk Lake in 1969 (Sanderson 1970). He felt this condition resulted in a poor forage base for lake trout. Survival of fish plants have been poorer than expected.

METHODS

Thirteen overnight sets were made with standard great lakes gill net gangs. These nets are a 1000 foot braided nylon net with 100 foot each of mesh sizes $1\frac{1}{2}$ " through 6" stretch measure. The nets are 6 feet deep. In addition, two 125' inland experimental gill nets were

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set in the old Elk River channel to gather information for a proposed boating channel. Net locations were recorded on a hydrographic map.

All fish were measured to the nearest tenth of an inch. Most lake trout, cisco and whitefish were sexed. Lake trout were stomach sampled and checked for disease. All fish were weighed to the nearest ounce. Ten fish per inch group for each species were scale sampled for age and growth analysis. Not all fish were aged, so an estimated age structure was generated by taking the % per inch group for each age and expanding this to the total catch. The original data was kept separate for each net and is filed in the Atlanta Field Office.

RESULTS AND DISCUSSION

Eight species of fish totaling 567 individuals were captured (Table 3). Major species by weight were whitefish, lake trout, common white suckers, rock bass and cisco. Only 509.3 lbs. of fish were taken. This is less than half that taken in a similar survey from Torch Lake. Elk Lake has fewer whitefish, cisco and lake trout than Torch Lake (Table 2). Suckers, rock bass and yellow perch were more abundant in Elk Lake.

A discussion by species follows.

LAKE TROUT

Thirty (30) lake trout for a total weight of 94.1 lbs. were taken. This was 18.5% of the catch by weight. The catch per 1000 foot of gill net was only 2.23 (Table 2). This indicates lake trout have a low population in Elk Lake. No lake trout have been stocked since 1965. It is not known if these fish are from natural reproduction or migrated from Torch Lake.

Growth of lake trout in Elk Lake (Table 4) is similar to Torch Lake (Alward 1976). The length-weight relationship is also similar in these lakes (Fig. 5)

Figure 1 shows the number of fish per age group. The most abundant age group was age IV fish. This is unlike Torch Lake, where age VI and V were most abundant. The difference in age structure indicates there may not be free interchange in these populations. There is apparently steady recruitment.

All lake trout were sexed. There were 10 males, 16 females, and 4 were immature. All lake trout stomachs were examined; 27% were empty; 60% contained fish; of these 44% contained yellow perch, 22% sculpin, and 6% had sticklebacks. Thirteen per cent of all stomachs contained

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mayflies, 3% spiders, and 6% had plankton including Mysis.

Roundworms were common in the body cavity by the air bladder. Of 23 fish checked 21 had roundworms and 2 had none.

WHITEFISH

Ninety-three (93) whitefish weighing 192.3 pounds were taken during the survey. This was the 37.8% of the catch by weight and is the dominant fish in the lake. The catch per effort was 7.15, less than half than from Torch Lake (Table 2).

The age distribution (Figure 2) indicates a year class void and wide fluctuations in abundance by age. This population is less stable than the Torch Lake whitefish. There are good numbers of large whitefish and this population does support a fishery. It is not a heavily exploited population.

Growth of whitefish in 1975 was similar to the 1971 survey (Table 5). Elk Lake fish are growing faster than those in Torch Lake. Ninety-one (91) of the 93 whitefish were sexed. Of these, 38% were mature males, 29% mature females and 33% immature.

Twenty-four whitefish stomachs were sampled; 9 were empty, one had minnows, 8 ostracods, and 7 had Mysis.

CISCO

Fifty-nine (59) cisco weighing 45.6 pounds were taken. Figure 3 shows the age distribution of the cisco. There is a year class void and pronounced variations in abundance by age indicating unsteady recruitment. The catch per 1000 foot of gill net was 4.54 in 1975. This is less than one fourth the abundance in Torch Lake.

In 1965 Sanderson found that Elk Lake cisco were few in number and were dominated by old fish (Sanderson, 1970).

Growth in 1975 is similar to past surveys (Table 6) and similar to cisco from Torch Lake.

Elk Lake cisco are characterized by wide fluctuations of the population. They are not abundant. This species is the main forage species for lake trout in Torch Lake, but not in Elk Lake.

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YELLOW PERCH

Seventy-five (75) yellow perch weighing 14.9 pounds were taken; this was only 2.9% of the catch by weight. These fish are not abundant in Elk Lake. Growth is near state average and stable (Table 7). The age distribution (Figure 4) shows a normal drop in abundance with age and steady recruitment.

ROCK BASS

Two hundred forty-eight (248) rock bass weighing 66.9 pounds were taken; this was 13.1% of the catch by weight. One hundred ninety-four (194) of these were taken in one net set off the old Elk River outlet. Growth is just above state average (Table 8).

OTHER SPECIES

Common white suckers were 14.5% of the catch by weight. These fish were more abundant in Elk Lake than Torch Lake (Table 2). Only a few burbot and small mouth bass were captured.

MANAGEMENT RECOMMENDATIONS

Survey techniques can be improved. See the Torch Lake 1975 netting survey report for details.

Elk Lake is well suited for salmonids. There is a large, cold, well oxygenated zone of water suitable for these fish. Elk Lake is the lowest lake on a long chain and should be relatively productive. Why plants of salmonids have not been more successful is open to speculation. I theorize that the reason lake trout or splake have not been more successful is that the forage base of cisco and whitefish fluctuates widely. This is supported by Sanderson's work on food webs (Sanderson (1970) and our stomach content analysis of lake trout.

Rainbow trout plants have been successful occasionally. I suspect that survival of rainbow is higher when cisco and whitefish populations are down and low when these fish are abundant. These fish are all largely dependant on plankton and probably compete directly for food.

Lake trout have continued to provide a small fishery for many years. Some are still being taken even though no plants have been made since 1965. These fish grow to a relatively large size and seem to be desired most by fishermen. Our objective should be to provide better lake trout fishing in Elk Lake.

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This objective can best be met by improving the forage base, and stocking lake trout. Smelt may provide a stable forage base. These fish would likely reproduce naturally in Battle or Williamsburg Creeks. Smelt are abundant in nearby Lake Bellaire and the splake population is good. Smelt can compete with other fish for food. If smelt are abundant, rainbow trout survival would probably be less and this species should not be stocked. Cisco and whitefish abundance may also be reduced.

A stocking of 25,000 lake trout per year in Elk would be similar to the rate of 3.2 lake trout per acre that produces a good population in Torch Lake.

If smelt become abundant, a winter fishery will develop. Lake Bellaire presently has a popular fishery for this species. Lake Charlevoix at one time had a good smelt fishery that drew fishermen from long distances away. This fishery alone would probably generate more angler days than any other fisheries management.

Elk Lake would benefit from effective fish shelters. Elk Lake is large and relatively difficult to fish. Marked shelters that concentrate yellow perch or rockbass would be popular and increase the harvest. There is a study being done in Torch Lake to test the effectiveness of various shelters. This should give us accurate information on what type of structures to install and where to place them. I recommend we install fish shelters when we get the results of this study.

Elk Lake has more warm water fish than Torch Lake. I recommend we survey Elk Lake with trap nets to gather better information on the bass, yellow perch and other warm water fish. This may improve our management of Elk Lake.

Great lakes muskellunge are native to this system. A management plan should be developed for this species. This fish uses Torch River for spawning and is found in Elk and Skegemog Lakes the rest of the year. Creel census information is imperative for correct fisheries management. We need "base line" information now and a comparable study after management changes to ~~gauge~~ gauge our success. Creel census data would tell us which sport fishing techniques are most successful and the best areas to fish. Elk Lake is difficult to fish and anglers would benefit from this information: Whitefish in particular could withstand heavier exploitation.

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LITERATURE CITED

1. Alward, Warren D. 1976. Torch Lake 1975 netting survey report. Michigan Dept. of Natural Resources mimeo.
2. Sanderson, David W. 1970. Food of Lake Trout in Torch and Elk Lakes, Antrim County, Michigan, with special reference to the Torch Lake cisco as a major forage organism. M.S. Thesis, Central Michigan University.

SUBMITTED BY:

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July 8, 1976

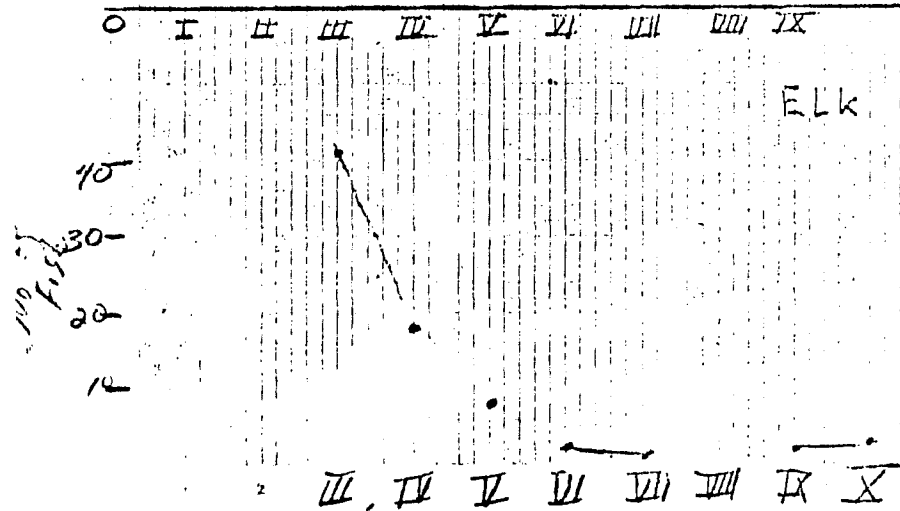
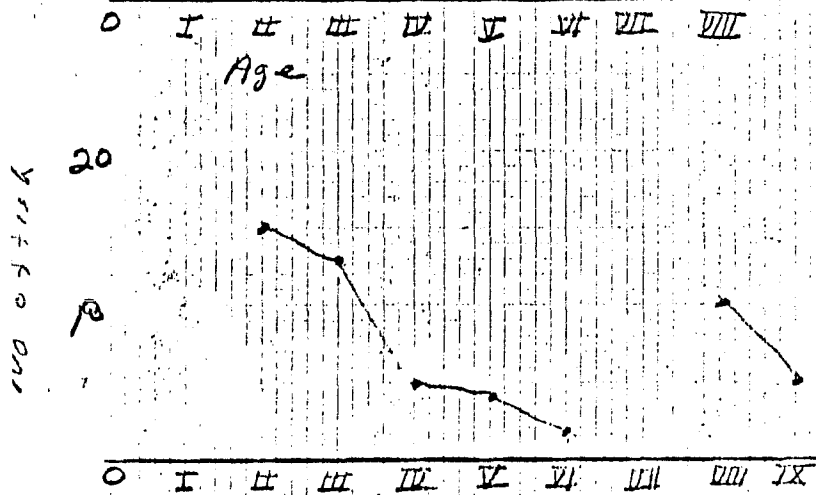
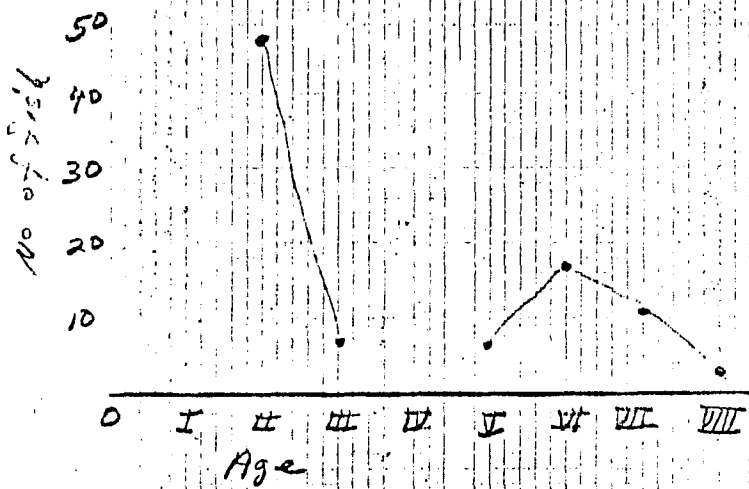
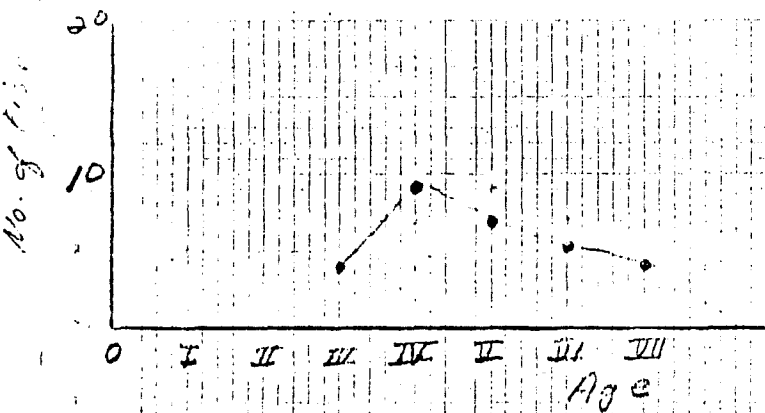


Figure 2

Length - Weight Relationship Lake Trout

● = Torch lake

○ = Elk Lake

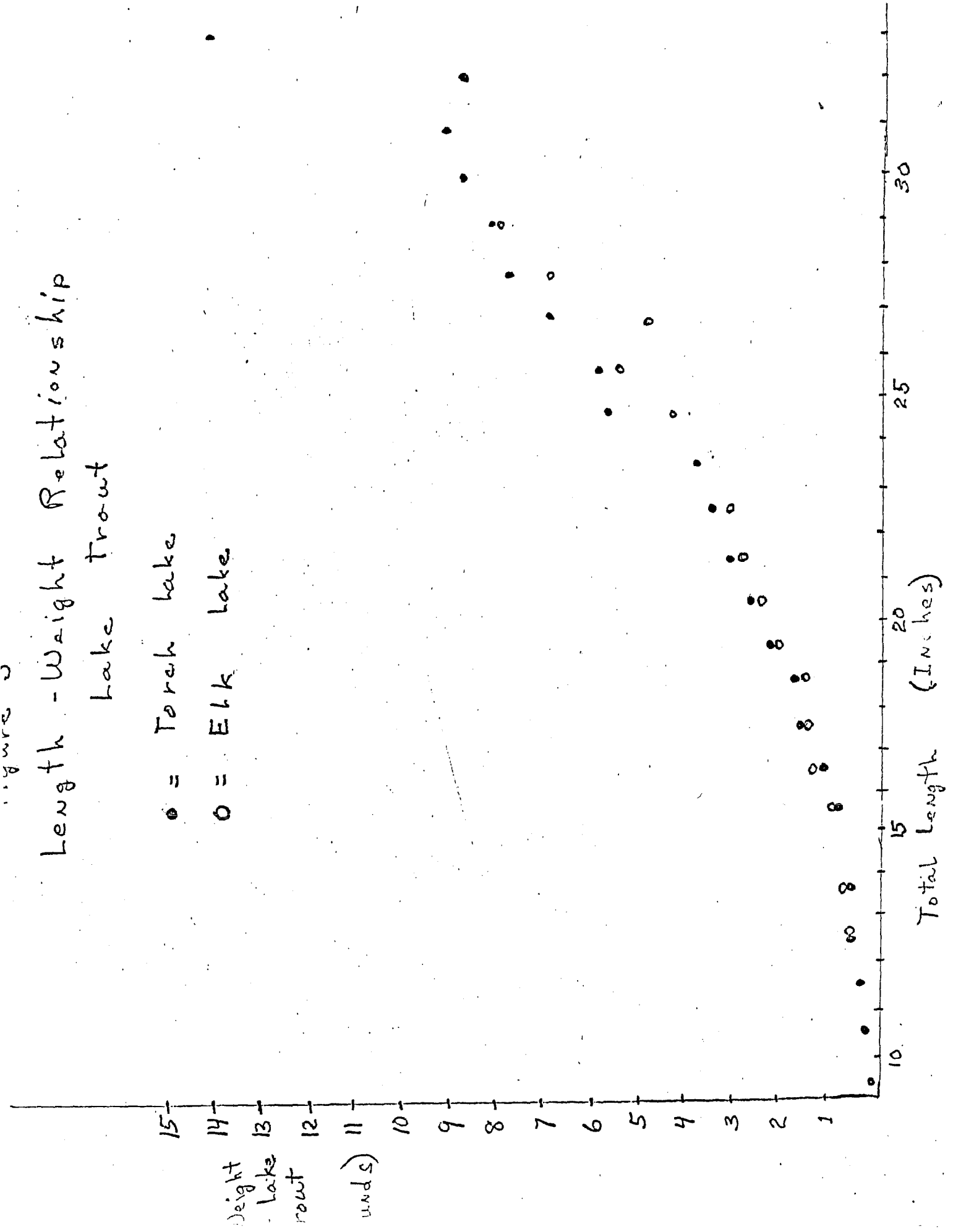


TABLE 1

RECENT ELK LAKE FISH PLANTS

YEAR	SPECIES	NUMBER	SIZE	AGE
1968	Rainbow	8,550	6.9	17 mo.
1968	Splake	25,000	4.1	17 mo.
1969	Rainbow	25,000	5.1	17 mo.
1969	Splake	20,000	4.3	19 mo.
1970	Splake	30,000	6.0	16 mo.
1971	Rainbow	27,120	6.2	
1971	Splake	80,897	5.2 - 5.5	16 mo. - 18 mo.
1972	Rainbow	30,024	7.7	17 mo.
1972	Steelhead	10,012	4.4	15 mo.
1973	Rainbow	90,084	5.6 - 6.4	11 mo. - 15 mo.
1974	No Plants			
1975	No Plants			

TABLE 2

CATCH PER EFFORT

(CPE = No. /1000 ft. gill net)

<u>SPECIES</u>	<u>TORCH LAKE</u>		<u>ELK LAKE</u>	
	<u>No.</u> <u>Caught</u>	<u>10 Nets</u> <u>C.P.E.</u>	<u>No.</u> <u>Caught</u>	<u>13 Nets</u> <u>C.P.E.</u>
Lake Trout	203	20.30	29	2.23
Brown Trout	1	0.10	-	-
Yellow Perch	32	3.20	71	5.46
Rock Bass	10	1.00	243	19.08
Cisco	187	18.70	59	4.54
Whitefish	164	16.40	93	7.15
Burbot	7	0.70	10	0.77
White Sucker	7	0.70	35	2.69
Smallmouth Bass	1	0.10	3	0.23

* does not include inland experimental gill nets

TABLE 3

LENGTH DISTRIBUTION AND WEIGHT BY SPECIES
ELK LAKE SURVEY - 1975

Inch Group	Lake Trout	Yellow Perch	Smallmouth Bass	Rock Bass	Cisco	Whitefish	Common White Suckers	Burbot	
3	-	-	-	6	-	-	-	-	
4	-	-	-	29	-	-	-	-	
5	-	1	-	48	-	-	-	-	
6	-	36	-	39	1	-	-	-	
7	-	14	-	59	10	-	1	-	
8	-	10	-	53	-	-	1	-	
9	-	7	-	7	18	-	2	-	
10	-	2	3	2	7	1	6	1	
11	-	3	-	1	-	-	3	-	
12	1	2	-	-	3	5	5	-	
13	1	-	-	-	2	29	3	-	
14	-	-	-	-	1	14	5	1	
15	3	-	-	-	3	2	4	1	
16	2	-	-	-	9	3	8	-	
17	3	-	-	-	4	1	9	1	
18	1	-	-	-	1	-	7	1	
19	3	-	-	-	-	2	-	-	
20	4	-	-	-	-	4	-	1	
21	1	-	-	-	-	14	-	2	
22	2	-	-	-	-	10	-	1	
23	-	-	-	-	-	5	-	1	
24	4	-	-	-	-	3	-	-	
25	1	-	-	-	-	-	-	-	
26	1	-	-	-	-	-	-	-	
27	1	-	-	-	-	-	-	-	
28	1	-	-	-	-	-	-	-	
29	-	-	-	-	-	-	-	-	
30	-	-	-	-	-	-	-	-	
31	-	-	-	-	-	-	-	-	
32	-	-	-	-	-	-	-	-	
33	1	-	-	-	-	-	-	-	
Total	30	75	3	248	59	93	54	10	567
Total Weight	94.1	14.9	2.0	66.9	45.6	192.3	74.0	19.5	509
% By Weight	18.5	2.9	0.4	13.1	9.0	37.8	14.5	3.8	

TABLE 4

AGE & GROWTH OF LAKE TROUT

Date of Collection; Mean Length in inches;
Number of fish in parenthesis.

AGE GROUP	SEPT-OCT 1971	OCT 1975
III		14.3 (4)
IV	22.7 (1)	17.6 (8)
V	23.9 (1)	20.4 (6)
VI		24.1 (5)
VII	31.9 (1)	29.3 (4)

TABLE 5

AGE & GROWTH OF WHITEFISH

Date of Collection; Mean Length in inches;
Number of fish in parenthesis.

AGE GROUP	SEPT-OCT 1971	OCT 1975
II	13.1 (17)	13.5 (35)
III	15.5 (16)	15.1 (4)
IV	17.0 (5)	
V	18.7 (16)	21.2 (7)
VI	19.6 (4)	21.6 (17)
VII	21.7 (1)	22.8 (11)
VIII		22.5

TABLE 6
AGE & GROWTH OF CISCO

Date of collection; mean length in inches;
Number of fish in parenthesis.

AGE GROUP	Aug. 1956	Sept-Oct. 1971	Oct. 1975
I	8.1 (17)	8.8 (3)	
II	9.6 (2)	9.1 (2)	8.2 (11)
III	9.3 (5)		9.8 (8)
IV	11.1 (1)		11.8 (4)
V	14.3 (1)	13.6 (6)	13.1 (5)
VI	14.1 (2)	14.7 (8)	15.6 (1)
VII		15.6 (20)	
VIII		16.2 (19)	16.8 (4)
IX		16.7 (5)	15.7 (1)
X		17.4 (1)	17.4 (1)
XI		18.9 (2)	

TABLE 7

AGE AND GROWTH OF YELLOW PERCH

Date of collection; mean length in inches;
number of fish in parenthesis.

AGE GROUP	Aug. 1956	Sept-Oct. 1971	Oct. 1975
III	5.8 (4)	6.5 (13)	6.5 (19)
IV	6.8 (53)		8.1 (15)
V	7.6 (28)	8.2 (2)	9.3 (8)
VI	9.4 (29)	8.6 (4)	10.1 (3)
VII	10.2 (16)	9.8 (2)	10.1 (1)
VIII	10.4 (1)	10.4 (2)	
IX	11.3 (10)		11.6 (2)
X	11.2 (1)		12.1 (3)

TABLE 8

AGE AND GROWTH OF ROCK BASS

Date of collection; mean length in inches;
number of fish in parenthesis.

AGE GROUP	Aug. 1956	Sept-Oct. 1971	Oct. 1975
I			3.9 (1)
II		4.9 (1)	4.3 (18)
III	5.0 (6)	5.3 (6)	5.7 (14)
IV	6.2 (25)	5.3 (1)	7.3 (17)
V	7.0 (6)	8.4 (3)	8.9 (11)
VI	7.9 (5)	8.6 (4)	9.5 (4)
VII	8.2 (3)	9.3 (7)	
VIII		9.5 (1)	
IX		9.8 (2)	
X			11.4 (1)