

STATE OF TEXAS

*Ready File*Project No. F4R3 Name Fisheries Investigations and Surveys of the Waters of Region 4-B.Job No. B-5 Title Inventory of Species Present in Benbrook Lake, Texas.Period Covered: June 1953 - October 1956ABSTRACT

1. Benbrook Lake is located about 15 miles southwest of Fort Worth, Texas in Tarrant County. The dam was completed in September 1952.
2. The lake will impound 3,769 surface acres of water at top of conservation pool level, but has filled to only one-third of that capacity to date.
3. The fish population was sampled with gill nets each month during the three and one-third year period.
4. The population of fish has changed from predominately game fish to predominately rough fish during the past three and one-third years of study.
5. Largemouth bass have decreased from a former 84.77 percent to the present 3.80 percent of the total fish population.
6. The white crappie has increased from a former 0.27 percent of the present 21.29 percent of the total fish population.
7. Benbrook Lake was closed to fishing from September 1953 to June 1954.
8. Largemouth bass suffered from overcrowding during the period that the lake was closed to fishing resulting in extensive parasitism, loss of weight, predation upon like species, and reabsorption of eggs.
9. Largemouth bass grew much faster after the lake was opened to fishing.
10. Malnutrition, parasitism, and the reabsorption of eggs was not present after the crowded game fish condition was alleviated.
11. A rapid change in fish population, either in types or numbers, may upset the lake balance causing it to fluctuate from one extreme to another.
12. Benbrook Lake was offering fairly productive bass and crappie fishing at the close of the present study.
13. Fishing should be more productive when the lake catches enough water to inundate the remaining two-thirds of the proposed lake area.

OBJECTIVES

To determine the species present and their relative abundance as well as the ecological factors influencing their distribution.

## INTRODUCTION

This paper reports on the work done during the third segment of a three-segment survey and summarizes the results of data collected during the entire three and one-third years of study. The project had as its primary aim the accumulation of data which would show the progression of a new lake during the first few years of its existence. Emphasis was given to the study of changes in the fish population and the problems associated with such changes.

## HISTORY OF LAKE

Benbrook Lake is located in Tarrant County about 15 miles southwest of Fort Worth, Texas. Closure of the dam was made September 29, 1952. The lake will impound 3,769 surface acres of water at top of conservation pool level. A severe drought allowed the impoundment to catch only enough water to fill to about one-third of its normal capacity. The lake is usually clear but sometimes stirred by winds until it is slightly dingy. The lake was stocked with 550,000 fish in 1953 of which 370,000 were largemouth bass. Table 1 lists all fish that have been stocked in Benbrook Lake by State and Federal Hatcheries. The impoundment was closed to fishing in September 1953 and remained closed until June 1, 1954. Fishing pressure was extremely heavy the first few days of the open season but not so intensive thereafter.

## COLLECTING METHODS

The fish population was sampled each month with gill nets during the three and one-third years of study which began in June 1953 and ended in October 1956. The nets were 100 or 125 feet long, eight feet deep, and had meshes of 1 to 3 inches square measure. The bulk of the sampling was done with nets having meshes  $1\frac{1}{2}$  inches in size. Periodic checks were also made with minnow seines of various types and sizes. The seined samples were preserved in 6 percent formalin and taken to the laboratory for identification. The fish collected by gill nets were worked to obtain their length, weight, gonadal development, and stomach content. A checklist of fish collected from Benbrook Lake is recorded in Table 2.

## DISCUSSION

Consideration will be given to each major species of fish and the changes that took place in the population of those species throughout the period of study. The effect of the changes in the composition of the fish population on the lake as a whole will be discussed. Table 3 shows the results of the seine collections made during the third segment of the survey. Heavy stocking of the lake with fry prevented the data taken at the seine stations from being too indicative of the success of the local spawns. Table 4 is a tabulation of data taken from the gill net collections during the third segment of the survey. Table 5 records the frequency of occurrence of food items observed in the stomachs of the netted specimens.

## LARGEMOUTH BASS

Largemouth bass were caught in large numbers in each net that was set in the lake from August 1953 through May 1954. The lake had been heavily stocked with bass in 1953 and was closed to fishing in September of that year. The bass averaged  $9\frac{1}{2}$  ounces in weight when the netting was begun in August. The fish gained nearly  $1\frac{1}{2}$  ounces per month for the next two months. Then their growth slowed down and they even lost some weight until they averaged only  $11\frac{1}{3}$  ounces in May 1954 just before the lake was reopened to fishing. The effect of severely crowded conditions, accompanied by heavy infestations of parasites and a shortage of food, resulted in poor health of the bass.

Once a hundred foot gill net with  $1\frac{1}{2}$ -inch mesh was checked after being set out for only 45 minutes. The net contained 45 bass. The incident points out how crowded the fish were and shows the vast amount of movement that took place as the starving fish fought among themselves for the small amount of natural food available in the lake. Bass ate bass and anything else in the lake that they could swallow. An artificial lure moved through the water attracted dozens of small bass and they would fight over the lure until the hooked fish was removed from the lake. Effects of the overcrowded condition were many. All bass were heavily parasitized. Some died from one cause or another, perhaps many of them starved to death. The mature fish reabsorbed their eggs and if there were any successful spawns there was no indication that any of them escaped the hungry and emaciated adults.

Many thousands of bass were caught June 1, 1954 when the lake was opened to fishing. A fair harvest, but in rapidly decreasing numbers, was made during the next few days. Then bass fishing was very poor for a long time. Our gill nets caught only 18 bass from June through September after the lake was opened to fishing, as compared to dozens and sometimes hundreds of bass that were taken in each net that was set in the lake when the bass population was so highly overcrowded. Larger catches of bass were made in the nets during the lake fall months but never in numbers that would compare with the previous large catches. However, the bass were growing and were showing the effects of an available food supply. By December 1954 fat bass weighing 2 and 3 pounds were caught. The bass population had begun to revive. Although not present in numbers as great as in the previous year, the health and general condition of the bass was excellent. The bass population remained fairly good throughout the rest of the study. It apparently dropped some in numbers during the last segments survey but gained in average weight and coefficient of condition of individual fish.

Table 6 shows the average catch per net set and average weight and "K" factor of bass captured during each segment of the survey.

#### WHITE CRAPPIE

White crappie are the only species of crappie that have been taken from Benbrook Lake, although it was stocked with about two to one in favor of the black crappie in 1953. In August and September of 1953 five crappie were caught in gill nets. They were thought to be specimens that were in the river system prior to formation of the lake. There were no more caught for one year then a few, mostly small ones, were captured each month from October 1954 to August 1955. In September of that year the first good catch of crappie was taken with gill nets. A large harvest of 6 to 8 ounce size crappie was made in November and good catches were netted rather consistently each month thereafter.

Reports from fishermen of their hook and line harvest indicated that their first good catches of crappie coincided very closely with our first favorable net catches. It will be noted that it took the crappie from  $2\frac{1}{2}$  to 3 years to build up a population that showed up favorably in either our net catches or the fishermen's harvest. We do not know what effect the stocking of crappie had on the lake with the exception that the black crappie did not survive. It is possible that the present population of crappie were spawned from the few specimens that were in the drainage system when the lake was impounded. One reason for the rather slow increase in the number of crappie may be attributed to the small amount of water and the very few specimens of crappie that were present when the dam was constructed. The progression of the crappie population is shown in the lower part of Figure 1. It may be of interest to note that the average "K" factor of white crappie increased as the number of fish in the lake increased. The converse is true of the largemouth bass which showed an increase in the average "K" factor as the population of that species decreased. The crappie population was good at the end of the survey (October 1956) and will probably offer productive fishing for the next several years.

### CHANNEL CATFISH

The channel cat population has not fluctuated too severely in the lake. It is true that the best net catches of channel cat were made during the first segment of the survey when 32 channel cat were captured with an average weight of 2.73 pounds per fish. Evidently many or all of them were fish that were in the pot holes of the river when water was impounded in the lake. Evidently, their growth was quite rapid due to the expansion of the lake which offered very fertile feeding grounds and new food supplies.

The bulk of the catches of channel cat during the last two periods of the survey consisted of smaller fish. Reference is again given to Table 6 which shows that the number of fish per hundred feet of net dropped considerably during the second segment but began to increase during the last survey period. The increase in numbers and decrease in average size indicates that spawning has been successful. Spawning facilities are good and as forage fish are abundant the channel cat population should continue to be pretty good in the lake. There are no yellow cats (flatheads) in the lake.

### BLACK AND YELLOW BULLHEAD CATFISH

The bullhead population has been relatively high during the entire period of study. The impoundment has a number of creeks entering it from the drainage area and a considerable amount of shallow brushy areas that are conducive to good bullhead production. Both black and yellow bullheads are present but the yellow bullhead is rapidly disappearing from the lake and should soon become extinct. The black bullhead may also be decreasing in numbers but evidence of such is much less conclusive than the decrease indicated for the yellow species. It is uncommon for the bullhead species to remain in large numbers very long after a lake has been formed in this area. It is possible that the absence of a yellow cat population, which is normally found in most of our lakes and is often given credit for preying on bullheads, is the reason that the bullhead population has been able to sustain itself in Benbrook Lake. Bullheads are found quite often in the fishermen's creel, especially those of young children and colored people.

### SPOTTED SUCKER

The rapid expansion of the population of spotted suckers in Benbrook Lake has been an interesting development. The species has not been found in any of the other local lakes, although none are on the same drainage as Benbrook, therefore it should probably be considered as endemic to the Clear Fork of the Trinity River.

The first spotted sucker netted was an adult specimen caught October 13, 1953. Several additional fish were captured during the following January, March, and April. Each weighed about one pound and those taken during March and April were ready to spawn. Young suckers averaging 5 to 6 ounces in weight were caught during October and November of 1954. Other mature fish were collected during the spring of 1955 and many that weighed almost a pound each were taken in late fall of 1955. The catch of spotted suckers was high during the remainder of the netting study. Gonadal development indicates that the fish spawn in April and May and netting catches show that the young weigh 5 to 7 ounces by the end of that year. These fish seem to be capable of spawning when they are two years old and have attained a weight of about a pound. The largest sucker captured from the lake weighed 1 pound and 12 ounces. The expansion of the sucker population has been very rapid. The few specimens that originally populated the Clear Fork of the Trinity three years ago developed into one of the major species of Benbrook Lake. Figure 2 shows the increase in the spotted sucker population as indicated by the percentage of the total net catch that the species represented.

### COMPARISON OF THE GAME FISH AND ROUGH FISH POPULATION

Table 7 records the data regarding the game fish and rough fish populations and shows the changes in the composition of the population during the three segment survey. Figure 3 shows the percentage, by number and weight, of the total net catch represented by game species.

### STOCKING

Benbrook Lake has been heavily stocked with game fish. There were 1,654,295 largemouth black bass fingerlings or fry stocked in the lake between 1953 and 1956, both years inclusive. This averages more than 1500 bass per surface acre. Bass fishing has been fairly good at times and very poor at other times on the lake. There were also 23,650 black crappie reportedly stocked in the lake during 1953. A 17 month creel census and a 3 1/3 year netting survey failed to produce any specimens of that species. Evidently the lake is not suitable for the production of black crappie and additional stocking of that species would be futile.

### POLLUTION AND FISH KILLS

There are no known sources of serious pollution affecting Benbrook Lake. No doubt there has been some siltation but so far it has not been serious. There are no cities or factories emptying their effluent into the drainage system. But there have been a few fish kills on the lake. Several small kills occurred during the summer in isolated water holes far up the Clear Fork of the Trinity River. Chemical analysis of such areas, taken early in the morning, revealed a very low oxygen content. Lack of oxygen during the latter part of the night probably caused the fish to suffocate.

Almost every year, during early spring, fish die on the main body of the lake from apparently unknown causes. Usually the kill is not serious but during the spring of 1956 a large number of mature bass died. A few specimens of other species were affected but the bulk of the fish that died were two to four pound bass. The cause is not known but there seems to be certain conditions that can be correlated between Benbrook kills and similar incidents that have happened on other lakes. These conditions will be watched closely during the coming spring.

### FUTURE OF LAKE

Benbrook Lake has two major factors in its favor for good fisheries production during the next few years. The first and probably most important item is the large area of land that has not yet been inundated. There still remains about two-thirds of the normal lake that will be flooded for the first time when the impoundment fills. A great deal of the new area is composed of fertile flatlands that should add considerable to the productivity of the lake. The second factor in favor of good fishing in the near future is the large numbers of local anglers available for fishing the lake. It seems that a fairly heavy fishing pressure is preferred for most lakes.

On the other hand, there are a few factors present that could be detrimental to the success of the future fishing on the lake. Number one is the rapidly increasing rough fish population, composed primarily of spotted sucker, that may affect the game fish production. Number two is the insistence of various local citizenry on heavy stocking, restricting of harvest or in other ways interfering with the normal development and harvest of the game species.

### RECOMMENDATIONS

It is recommended that the monthly netting of Benbrook Lake be discontinued but that some provision be provided for an occasional check on the lake in order to obtain data regarding any future major changes in the fish population.

It is further recommended that some consideration be given to methods of control or harvest of the rapidly expanding spotted sucker population.

Prepared by Robert N. Hambric  
Assistant Project Leader

Approved by Marion Toole  
Chief Aquatic Biologist

Date April 10, 1957

Table 1. Hatchery Stocking of Fish in Benbrook Lake, Texas, May 1953 through October 1956.

Species	1953	1954	1955	1956	Total
Largemouth black bass	370,325	109,000	34,970	1,140,000	1,654,295
Redear sunfish	50,525		12,660	53,333	116,518
Bluegill sunfish	22,325		12,660	53,333	88,318
Yellowbelly sunfish			12,660	53,333	65,993
Total	443,175	109,000	72,950	1,299,999	1,925,124

Table 2. Checklist of Fish Species from Benbrook Lake, Texas, 1953 - 56.

Common Name	Scientific Name
Gizzard shad	<u>Dorosoma cepedianum</u>
River carpsucker	<u>Carpionodes carpio</u>
Grey redhorse	<u>Moxostoma congestum</u>
Spotted sucker	<u>Minytrema melanops</u>
Carp	<u>Cyprinus carpio</u>
Suckermouth minnow	<u>Phenacobius mirabilis</u>
Redfin shiner	<u>Notropis umbratilis</u>
Brazos river shiner	<u>Notropis brazosensis</u>
Blacktail shiner (Spottail)	<u>Notropis venustus</u>
Red shiner (Redhorse)	<u>Notropis lutrensis</u>
Silvery minnow	<u>Hybognathus nuchalis</u>
Plains minnow	<u>Hybognathus placita</u>
Parrot minnow	<u>Pimephales vigilax</u>
Fathead minnow	<u>Pimephales promelas</u>
Stoneroller	<u>Campostoma anomalum</u>
Southern channel catfish	<u>Ictalurus punctatus</u>
Black bullhead	<u>Ictalurus melas</u>
Yellow bullhead	<u>Ictalurus natalis</u>
Tadpole madtom	<u>Schilbeodes mollis</u>
Blackstripe topminnow	<u>Fundulus notatus</u>
Gambusia	<u>Gambusia affinis</u>
Kentucky spotted bass	<u>Micropterus punctulatus</u>
Largemouth black bass	<u>Micropterus salmoides</u>
Warmouth	<u>Chaenobryttus gulosus</u>
Green sunfish	<u>Lepomis cyanellus</u>
Small sunfish	<u>Lepomis symmetricus</u>
Redear sunfish	<u>Lepomis microlophus</u>
Bluegill sunfish	<u>Lepomis macrochirus</u>
Orangespotted sunfish	<u>Lepomis humilis</u>
Yellowbelly sunfish	<u>Lepomis auritus</u>
White crappie	<u>Pomoxis annularis</u>
Dusky darter	<u>Hadropterus scierus</u>
Logperch	<u>Percina caprodes</u>

Table 3. Results of Seining Collections by Number of Each Species, Benbrook Lake, Texas, 1955 - 56.

Species	Number Collected	Percent of Total
Gizzard shad	174	18.41
Redfin shiner	53	5.61
Brazos river shiner	26	2.75
Blacktail shiner (spottail)	42	4.44
Red shiner (Redhorse)	390	41.27
Plains minnow	3	0.32
Parrot minnow	63	6.67
Yellow bullhead	1	0.11
Blackstripe topminnow	3	0.32
Gambusia	83	8.78
Largemouth black bass	20	2.12
Green sunfish	13	1.37
Bluegill sunfish	66	6.98
Orangespotted sunfish	5	0.53
Yellowbelly sunfish	1	0.11
Logperch	2	0.21
Total	945	100.00

Table 4. Tabulation of Data from Net Collections from Benbrook Lake, November 1955 through October 1956.

Species	Number Caught	Percent of Total No.	Pounds Caught	Percent of Total Weight	Average Wt. in Pounds	No. of Fish Per 100' Net	Ibs. Fish Per 100' Net
Shad	153	11.75	27.66	3.35	0.20	3.31	0.66
Carp	3	0.25	8.81	1.07	2.94	0.07	0.21
Spotted sucker	609	51.48	555.92	67.30	0.91	14.50	13.24
Carp	15	1.27	7.43	0.90	0.50	0.36	0.18
Channel cat	29	2.45	27.44	3.32	0.95	0.69	0.65
Black bullhead	59	4.99	17.28	2.09	0.29	1.40	0.41
Yellow bullhead	9	0.76	3.80	0.46	0.42	0.21	0.09
Largemouth bass	45	3.80	74.42	9.01	1.65	1.07	1.77
Bluegill sunfish	22	1.86	3.46	0.42	0.15	0.52	0.08
White crappie	253	21.39	99.79	12.08	0.39	6.02	2.38
Total	1183	100.00	826.01	100.00		28.15	19.67

Table 5. Frequency of Occurrence of Food Items from Fish Collected by Gill Nets, Benbrook Lake, Texas, November 1955 through October 1956.

Species	Shad	Unidentifiable Fish Remains	Insects	Algae and Vegetation	Number of Fish Examined
Largemouth black bass	3	6	0	0	45
White crappie	8	126	2	1	251
Southern channel catfish	3	5	2	9	29
Black bullhead	0	2	1	14	59
Yellow bullhead	0	0	0	1	9
Bluegill sunfish	0	0	0	3	21

Table 6. Comparison of Fish Caught Per 100 Feet of Gill Net and Their Average Weight and "K" Factor, Benbrook Lake, Texas, 1954-1956.

Species		No. of Fish Per 100' Net	Avg. Weight (Pounds)	Average "K" Factor
Bass	1954	63.03	0.73	2.56
	1955	1.96	1.58	2.65
	1956	1.07	1.68	2.72
White Crappie	1954	0.02	0.55	3.07
	1955	1.02	0.57	2.86
	1956	6.02	0.39	2.76
Channel Catfish	1954	1.10	2.73	1.77
	1955	0.31	1.92	1.74
	1956	0.69	0.95	1.74
Yellow Bullhead	1954	2.52	0.88	2.21
	1955	0.66	0.47	2.32
	1956	0.21	0.42	2.32
Black Bullhead	1954	2.31	0.80	2.27
	1955	1.14	0.39	2.36
	1956	1.40	0.29	2.49

Table 7. A Comparison of the Changes in the Game Fish and Rough Fish Populations of Benbrook Lake, Texas, 1953-1956.

	Aug. 1953 through May 1954	June 1954 through Oct. 1955	% Change from First Segment	June 1955 through October 1956	% Change from Previous Segment	Percentage Chg. between First and Last Segment
Avg. Wt. Per Specimen for all Fish Netted	0.75	0.88	17.33	0.70	-20.45	-6.67
Avg. Wt. Per Game Fish	0.75	1.15	53.33	0.59	-48.70	-21.33
Avg. Wt. Per Rough Fish	0.80	0.67	-16.25	0.74	10.45	-7.50
Percent Game Fish by No.	89.07	32.62	-63.38	29.50	9.56	-66.88
Percent Rough Fish by No.	10.93	67.38	516.47	70.50	4.63	545.01
Percent Game Fish by Wt.	88.32	45.39	-48.61	24.82	-45.32	-71.90
Percent Rough Fish by Wt.	11.69	54.61	367.15	75.18	37.67	543.11

FIGURE 1

YEARLY POPULATION TREND AND CC RESPONDING AVERAGE "K" FACTORS OF TWO SPECIES, BENBROOK LAKE 1954 - 1956

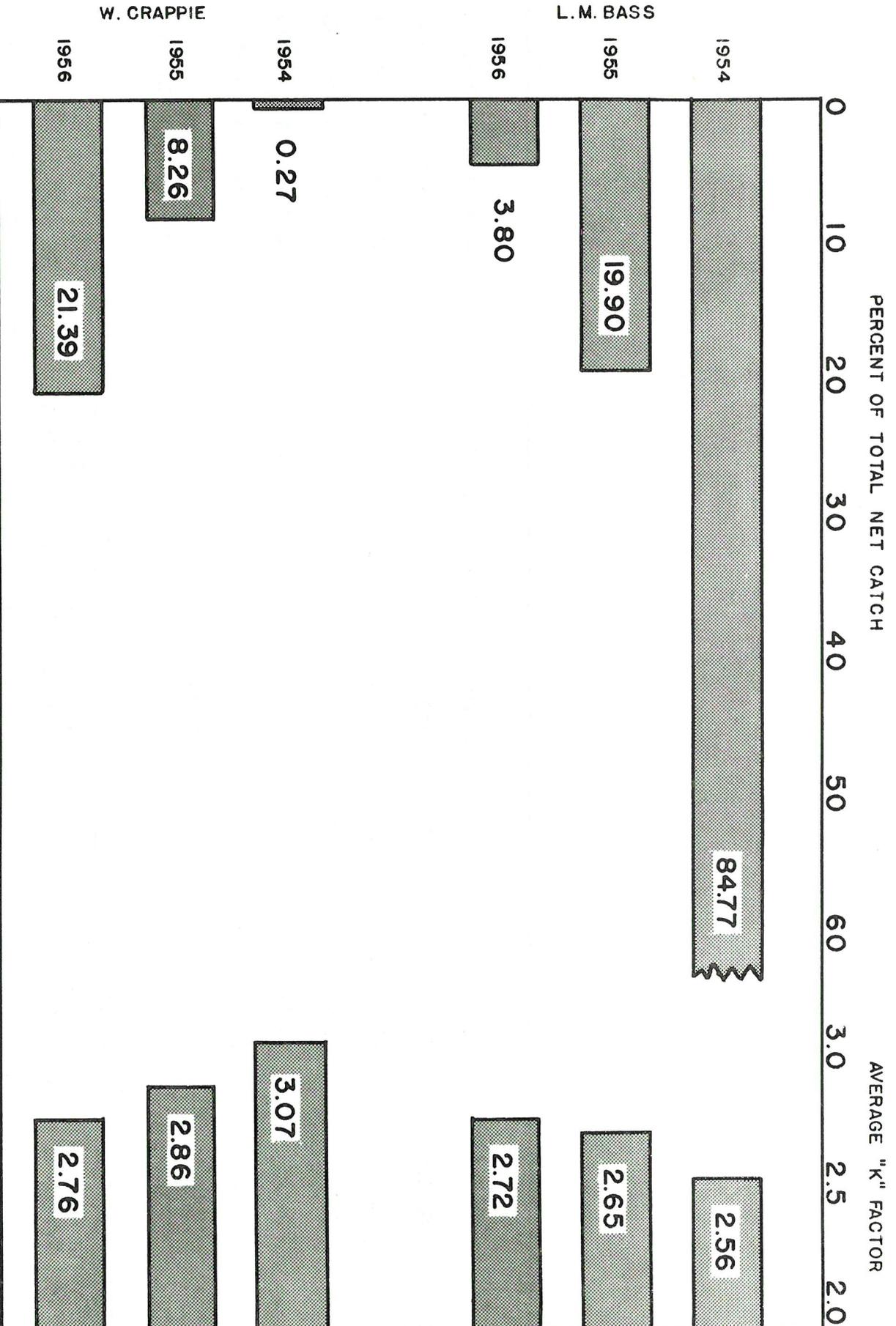


FIGURE 2

INCREASE IN THE SPOTTED SUCKER POPULATION, BENBROOK LAKE 1954-1956

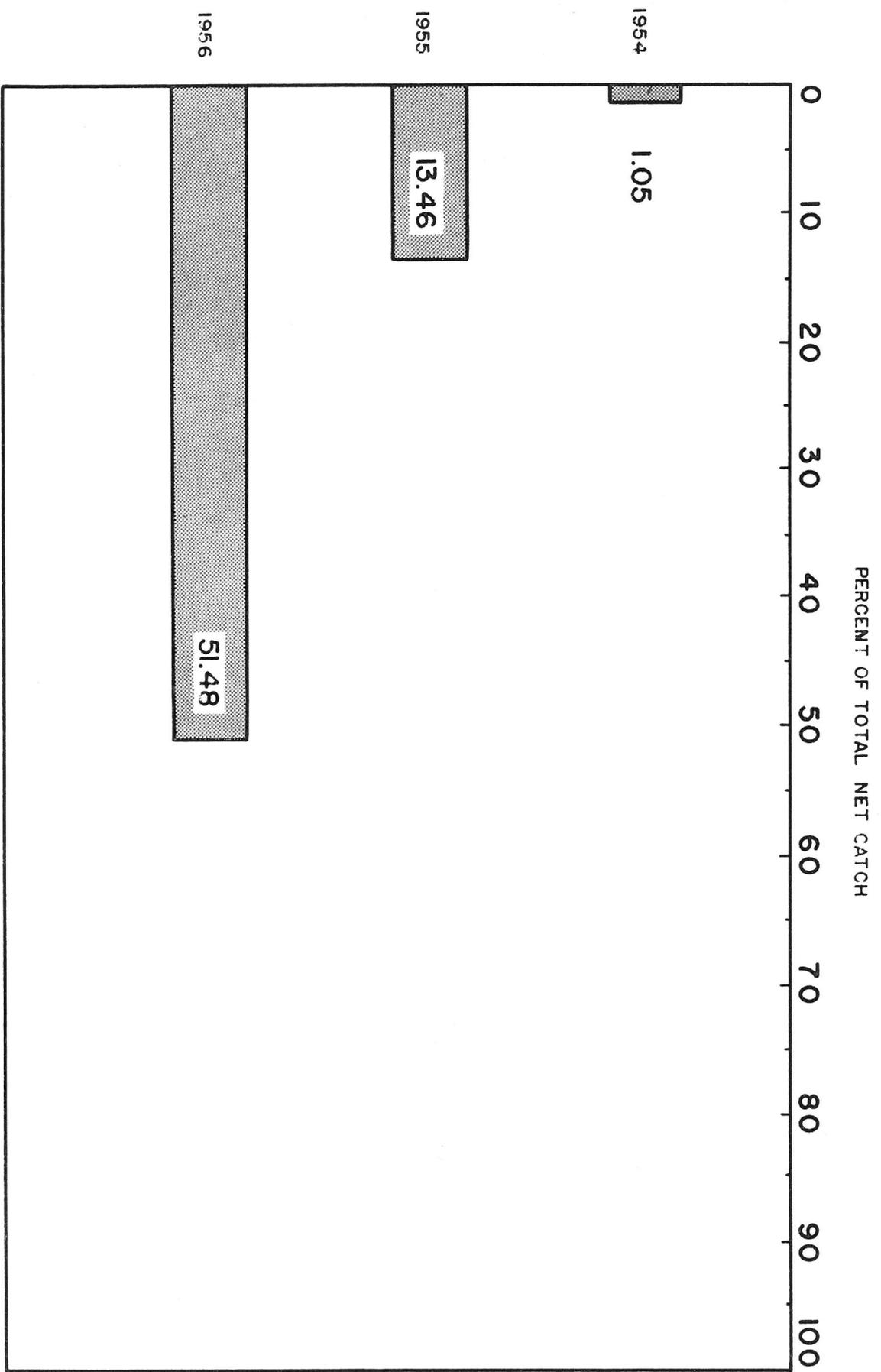


FIGURE 3

DECREASE IN THE GAME FISH POPULATION, BENBROOK LAKE

