STATE Texas
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PERIOD June 1,1954 - Oct. 31, 1955

SEGMENT COMPLETION REPORT

BY

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TITLE

Inventory of Species Present in Benbrook Lake, Benbrook, Texas.

OBJECTIVES

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

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 which is 694 feet above sea level. Rainfall has been light during the last few years over the entire drainage area, which permitted the lake to fill to only about one-fourth or one-third of its normal capacity. The lake was stocked with 550,000 fish during 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 there-after.

COLLECTING METHODS

The fish population was sampled each month by gill nets with meshes of 1 to 3 inches square measure. Periodic checks were also made with minnow seines measuring 30 by 6 feet with $\frac{1}{4}$ inch mesh. 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 contents. A checklist of the fishes collected from Benbrook Lake is recorded in Table 2.

RESULTS OF SEINING COLLECTIONS

Seven seine collections were made to catch 621 specimens of fish numbering 19 species. Table 3 records the number of each species collected and the percentage of the total number that it represents. Minnows and other forage fish were scarce during the time that the predaceous species, mainly largemouth bass, were abundant. (The beginning of the present survey coincided with the initial large bass harvest from the lake, but work done immediately preceding the present study corroborates the above statement.)

Only two small shad were caught in the seine samples taken in July 1954, indicating the spawn of that species had been heavily preyed upon and adequately controlled when largemouth bass were abundant in the lake. It was further noticed that fry and fingerling bass were also absent from the seine collections taken during the summer and fall of 1954. If hatching had been successful the spawn evidently had fallen prey to the larger fish. As the forage fish in the lake began to multiply they were naturally taken in larger quantities in the seine collections. Shad became so abundant during the fall of 1954 and in 1955 they accounted for 43.48 percent of all the specimens collected. This was a very high increase over the 1.58 percent that they represented in the seine samples of the previous survey.

RESULTS OF NETTING COLLECTIONS

A total of 79 gill net sets were made from June 1954 through October 1955 to produce 981 specimens representing 19 species. A tabulation of data from the net collections is given in Table 4. The fish population in Benbrook Lake changed from predominately game fish to mostly rough fish during the 17 month period of this study. Table 5 offers a comparison of the present game fish and rough fish populations of the lake with those of the previous survey.

The rapid increase in the rough fish population in Benbrook Lake has been an interesting development and is due, in part, to the unique history of the lake which immediately preceded this survey. A better understanding of the problem may be had by a study of Table 6 which compares the results of the present and last segments net collections by species, showing the percentage of the total catch by both number and weight and the average "K" factor for each period. During the time that the lake was closed to fishing the overcrowded bass were continuously hunting for food. Nearly all types of animal life were heavily preyed upon, including other bass. Although, they could not have existed forever under such starvation conditions the bass were quite effective in devouring the spawn of all fish before it had a chance to grow off. Then when some 250,000 bass, plus many fish of other species, were harvested from the lake during the first part of June 1954 it left the impoundment with insufficient predators to adequately control the spawn of the remaining species. It was during the summer and fall of 1954 that the spawning of carp, shad and spotted sucker was so successful. The writer believes it is worthy of note that three of our better predators are not found in the lake. These are the gars, flathead catfish, and white bass.

Six gill net sets made during June and mid-July, following the heavy fishing pressure in early June, produced only 24 specimens of which one-half were large mature shad. Inspection of last segment's records revealed that each set averaged 75 fish per net during that period of inventory. Large carp and shad accounted for 30 percent or more of the few fish caught from June to October. A great many unmolested schools of small shad were seen on the surface for the first time in October denoting a build up of food and a scarcity of predatory fish at that time. Adequate samples of fish were caught in the nets from October 1954 through October 1955. Shad were the most abundant species captured, followed by bass, carp, and spotted sucker. Many of the bass caught were probably those stocked during the fall of 1954 as little evidence of a successful bass spawn was found for that year. Internal inspection revealed that malnutrition had caused many of the mature bass to reabsorb their eggs.

Carp and spotted suckers have multiplied fast and at various times each has composed a major part of the net catch. White crappie were collected in limited numbers from October until July. Most of them were small. Good catches of crappie that weighed more than 8 ounces each were taken in August and September. There

was no previous indication that this size-group of crappie were in the lake in appreciable numbers. The crappie has increased from almost nothing to better than 8 percent of the total net catch.

The bullhead catfish population is still high and during the last 17 months has more than doubled in representative percentage of the total fish netted. The yellow bullhead was slightly the more abundant of the two species during the previous study but was outnumbered 2 to 1 by the black bullhead in the present survey. It seems possible that the yellow bullhead may disappear from the lake in the future. The channel catfish population has remained relatively stable during the past three years.

One of the more interesting developments of the lake has been a marked change in the largemouth bass population. This species has decreased from a former 85 percent to the present 16 percent of the total net catch. Such a drop would seem natural when one considers the large harvest of bass taken from the lake in 1954. It is apparently better to have a smaller number of healthy bass in an impoundment than to crowd the water with more fish than it can support. An examination of the past records of the lake revealed some interesting changes in the health and general condition of the bass. The extensive parasitism, malnutrition, slow growth, and predation upon like species that was present during the crowded condition was noticeably lacking in the present study. Neither was there any indication of reabsorption of eggs by bass during the last spawning season, and the increase in growth rate was accelerated when forage fish became abundant in the lake. Bass that averaged $10\frac{1}{2}$ ounces when the lake was closed to fishing in September averaged only $11\frac{1}{4}$ ounces when the lake was reopened to fishing the following June. During the next 17 months, while the lake was opened to fishing, the bass more than doubled in weight for an average of 1.58 pounds for all fish netted.

The stomachs of the fishes were examined to note all conspicuous food present. Many of the food items listed as unidentifiable fish remains were quite possibly shad. Table 7 records the food items found and the frequency of their occurrence for each species of fish studied.

By an inspection of the data collected during the past and present surveys on Benbrook Lake it is noted that 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. It is recommended that further study be made of Benbrook Lake in order to follow the development of that impoundment.

SUMMARY

1. Benbrook Lake was sampled with minnow seines and gill nets from June 1, 1954 to October 31, 1955.

2. A total of 621 specimens were collected by seines and 981 fish were taken with nets.

3. Shad accounted for 22 percent of the total net catch as compared with less than 3 percent found in the previous study.

4. Largemouth bass represented 16 percent of the fish netted as compared with 85 percent found in the previous survey.

5. The fish population changed from predominately game fish to mostly rough fish during the 17 month period of this survey.

6. Bass grew much faster after the lake was opened to fishing.

7. Malnutrition, parasitism, and the reabsorption of eggs was not present after the crowded game fish population of the lake was alleviated.

8. 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.

Table 1. Hatchery Stocking of Fish in Benbrook Reservoir, May 1, 1953 - October 31, 1955.

Species	1953	1954	1955	Totals
Channel Catfish (Ictalurus punctatus)	25,875		41,000	66,875
Largemouth Bass (Micropterus salmoides)	370,325	109,000	34,970	514,295
Warmouth Bass (Chaenobryttus coronarius)	40,075		20,000	60,075
Redear Sunfish (Lepomis microlophus)	50,525		12,660	63,185
Bluegill Sunfish (Lepomis macrochirus)	22,325		12,660	34,985
Longear Sunfish (Lepomis megalotis)	4,500			4,500
Yellowbelly Sunfish (Lepomis auritus)			12,660	12,660
White Crappie (Pomoxis annularis)	11,300			11,300
Black Crappie (Pomoxis nigromaculatus)	23,650			23,650
Totals	548,575	109,000	133,950	791,525

Table 2. Checklist of Fish Species from Benbrook Lake, Texas, 1954-55.

Common Name	Scientific Name
1. Gizzard Shad	Dorosoma cepedianum
2. River Carpsucker	Carpiodes carpio
3. Grey Redhorse	Moxostoma congestum
4. Spotted Sucker	Minytrema melanops
5. Carp	Cyprinus carpio
6. Redfin Shiner	Notropis umbratilis
7. Brazos River Shiner	Notropis brazosensis
8. Blacktail Shiner (Spottail)	Notropis venustus
9. Red Shiner (Redhorse)	Notropis lutrensis
10. Parrot Minnow	Pimephales vigilax
11. Fathead Minnow	Pimephales promelas
12. Southern Channel Catfish	Ictalurus punctatus
13. Black Bullhead	Ameiurus melas
14. Yellow Bullhead	Ameiurus natalis
15. Blackstripe Topminnow	Fundulus notatus
16. Gambusia	Gambusia affinis
17. Largemouth Black Bass	Micropterus salmoides
18. Warmouth	Chaenobryttus coronarius
19. Green Sunfish	Lepomis cyanellus
20. Redear Sunfish	Lepomis microlophus
21. Bluegill Sunfish	Lepomis macrochirus
22. Yellowbelly Sunfish	Lepomis auritus
23. White Crappie	Pomoxis annularis
24. Dusky Darty	Hadropterus scierus
25. Logperch	Percina caprodes

Table 3. Results of Seining Collections by Number of Each Species, Benbrook Lake, Texas, 1954-55.

Species	Number Collected	Percent of Total
Gizzard Shad	270	43.48
Grey Redhorse	1	0.16
Spotted Sucker	1	0.16
Redfin Shiner	15	2.42
Brazos River Shiner	8	1.29
Blacktail Shiner (Spottail)	4	0.64
Red Shiner (Redhorse)	107	17.23
Parrot Minnow	23	3.70
Fathead Minnow	2	0.32
Blackstripe Topminnow	66	10.63
Gambusia	1	0.16
Largemouth Black Bass	27	4.35
Green Sunfish	7	1.13
Redear Sunfish	1	0.16
Bluegill Sunfish	36	5.80
Yellowbelly Sunfish	43	6.92
White Crappie	1	0.16
Dusky Darter	1	0.16
Logperch	7	1.13
Total	621	100.00

Table 4. Tabulation of Data From Gill Net Collections From Benbrook Lake, June 1954 Through October 1955.

Species	Number Caught	Percent of Total Number	Pounds Caught	Percent of Total Weight	Avg. Weight in Pounds	No. of Fish Per 100' Net
Gizzard Shad	218	22.22	79.39	9.83	.36	2.73
Carpsucker	21	2.14	66.47	8.23	3.17	.26
Gray Redhorse	1	.10	.75	.09	.75	.01
Spotted Sucker	132	13.46	75.93	9.40	.58	1.66
Carp	145	14.78	157.30	19.48	1.08	1.82
Channel Catfish	25	2.56	48.05	5.95	1.92	.31
Y. Bullhead	53	5.40	25.09	3.11	.47	.66
B. Bullhead	91	9.28	35.94	4.45	.39	1.14
L. M. Bass	156	15.90	249.86	30.95	1.58	1.96
Warmouth	2	.20	1.30	.16	.65	.03
Green Sunfish	1	.10	.37	.05	.37	.01
Y. B. Sunfish	2	.20	.42	.06	.21	.03
Bluegill Sunfish	53	5.40	20.46	2.54	.39	.66
White Crappie	81	8.26	46.01	5.70	.57	1.02
Total	981	100.00	807.34	100.00		

Table 5. A comparison of the Game and Rough Fish Caught by Gill Nets in Benbrook Lake.

Netting Collections	June 1953 through May 1954	June 1954 through October 1955	Percentage Change Increase	Percentage Change Decrease
Total No. of Specimens Caught	2,187	918		58.02
* Total Wt. of Specimens Caught	1,652	807		51.13
Average Wt. Per Specimen	0.75	0.88	17.20	
**Total Weight of Game Fish	1,460	366		74.90
Total Wt. of Rough Fish	192	441	129.68	
Total No. of Game Fish	1,948	320		83.57
Total No. of Rough Fish	239	661	176.57	
Avg. Wt. Per Game Fish	0.75	1.15	52.67	
Avg. Wt. Per Rough Fish	0.80	0.67		16.63
Percent Game Fish By Number	89.07	32.62		63.38
Percent Rough Fish By Number	10.93	67.38	516.47	
Percent Game Fish By Weight	88.32	45.39		48.61
Percent Rough Fish By Weight	11.69	54.61	367.15	

* Weight in pounds
** Catfishes, included in game fish

Table 6. Results of the Current Netting Collections from Benbrook Lake as Compared with Collections of the Preceding Study.

	June 1953 - May 1954			June 1954 - October 1955		
	Percentage of Total Catch			Percentage of Total Catch		
Species	By Number	By Weight	Avg. "K" Factor	By Number	By Weight	Avg."K" Factor
Gizzard Shad	2.79	2.60	1.78	22.22	9.83	1.78
River Carpsucker	0.32	0.78	2.44	2.14	8.23	2.86
Gray Redhorse	0.05	0.05	2.04	0.10	0.09	2.70
Spotted Sucker	1.05	1.65	2.07	13.46	9.40	2.11
Carp	0.32	0.56	2.62	14.78	19.48	2.60
Southern Channel Catfish	1.46	5.27	1.77	2.56	5.95	1.74
Yellow Bullhead	3.34	2.72	2.31	5.40	3.11	2.32
Black Bullhead	3.06	3.31	2.27	9.28	4.45	2.36
Largemouth Black Bass	84.77	81.94	2.56	15.90	30.95	2.65
Warmouth	0.10	0.02	3.34	0.20	0.16	3.97
Green Sunfish	0.27	0.13	3.34	0.10	0.05	3.75
Yellowbelly Sunfish	0.59	0.17	4.30	0.20	0.06	3.74
Bluegill Sunfish	1.51	0.52	4.18	5.40	2.54	4.07
White Crappie	0.27	0.20	3.07	8.26	5.70	2.86

Table 7. Frequency of Occurrence of Food Items from Fish Collected By Gill Nets, Benbrook Lake, June 1954 Through October 1955.

Species	Shad	Unidentifiable Fish Remains	Insects	Algae and Vegetation	Mussels	No. of Fish Examined
Largemouth Black Bass	18	47		1		128
White Crappie	3	36	1	3		78
Southern Channel Catfish		8	2	3	7	25
Black Bullhead		9	2	15		38
Yellow Bullhead	1	6		1		20
Bluegill Sunfish		1		6		12
Warmouth		1				2