

Segment Completion Report

State of TEXAS

Project No. F-7-R-8

Name: Fisheries Investigations and Surveys
of the Waters of Region 1-B.

Job No. B-16

Title: Experimental Management of the Rita
Blanca Lake Fishery

Period Covered:

January 1, 1960 - December 31, 1960

OBJECTIVES

To initiate and conduct experimental management practices at Rita Blanca Lake to restore balance through the control of excessive populations of golden shiners and black bullhead catfishes.

TECHNIQUES

Predation on golden shiners and bullheads, as well as the threatening populations of carp and goldfish, was increased by stocking flathead catfish and predator-sized black bass and crappie in Rita Blanca Lake near Dalhart, Texas.

Extensive seining was conducted in an effort to reduce populations of all problematical species. This was accomplished partly by commercial bait seining under the supervision of game wardens and their appointed deputies.

Attempts were made with specialized hoop nets and small-meshed gill nets to capture and remove bullhead catfish and large golden shiners.

Water levels were controlled by the addition of sub-surface water containing a higher mineral content than that in the lake. This also decreased turbidity and improved habitat for game fishes, as well as fishing conditions for sportsmen.

Artificial spawning facilities were installed to enhance reproduction of flathead catfish. Suitable spawning sites were located for all other game fishes so that additional spawning devices can be provided if, or when, they are necessary. These facilities will be placed between the extreme levels at which the water may fluctuate during the spawning season.

Periodic surveys were conducted so that possible changes in any aspect of the Rita Blanca fishery resulting from these experimental procedures can be detected and recorded.

BACKGROUND INFORMATION

Experimental Introduction

Largemouth Bass - Results of the original basic survey and inventory of species at Rita Blanca Lake in 1957 indicated that largemouth bass comprised only 0.9 percent of the total population. Details of these investigations are given in the Report F-7-R-5, Job B-13. Scarcity of this species in Rita Blanca is a significant factor because several sizeable stockings of bass fry and fingerlings have been made during the previous years. It was quite obvious that very few, if any, of these fish survived, and those that did survive failed to reproduce.

The survey also disclosed that the golden shiner was the most abundant species present, comprising approximately 21 percent of gill net collections and 50 percent of seine collections. Since this species reputedly feeds on fry of other fish, their overabundance may have been responsible for the lack of successful reproduction of bass, crappie and other bottom-nesting game fishes. An attempt is being made to reverse the order of predation by stocking yearling or adult-sized black bass, as well as other predator-type game fishes which are too large at the time of stocking to be eaten by golden shiners.

In April 1959, an undisclosed number of adult bass were transferred from the state-owned lake near Canadian by State fish hatchery personnel. Then on July 23, 1959, an additional 10,000 cannibal-size bass were stocked by the U.S. Fish and Wildlife Service Fish Cultural Station at Tishomingo, Oklahoma. These fish, which ranged from 4 to 7 inches in length, were too large to be eaten by the larger golden shiners, and large enough to begin feeding upon the smaller shiners.

Flathead Catfish - In November, 1959, 288 flatheads were captured from Lake Stamford and transferred to Rita Blanca Lake, near Dalhart. This was a very successful operation, having lost only three out of the 288 fish that were transported during sub-freezing temperatures. These fish ranged from three to twenty-eight pounds. The average weight was 11.1 pounds and comprised a total weight of 3,171 pounds.

The primary purpose of the introduction of these fish, which were stocked at the rate of one per acre, was to increase predation on golden shiners and bullhead catfish. No restrictions were placed on their capture by sports fishermen, however, which makes them an additional sports fish for the upper Panhandle Region.

Of the 285 flatheads originally stocked in November, 1959, 40 have been found dead during the past 13 months by the local game warden and lake management personnel. Causes of this mortality are not known for certain. There are several possibilities, including insecticides and organic pollution from watershed feed lots, winter freeze-kills, foul-hooking and hook-swallowing. In addition to those found dead, 14 have been reported caught by sports fishermen. This leaves a total of approximately 230 flatheads in the lake.

White Crappie - In July 1960, approximately 6,850 white crappie were seined from Lake McClellan and transferred to Rita Blanca to increase predation on golden shiners. Also a small number of white bass were taken during the seining operations and stocked incidentally with the crappie.

Manual Controls

An attempt to reduce populations of all undesirable species was made by experimental seining operations. Numerous drags were made with a 200-foot, one-half inch mesh seine at various locations around the lake. Seining was also done at night in the shallow cove areas. Although large numbers of fish were removed by this method, it is slow, restricted, laborious, and too expensive to constitute an effective control measure.

In order to reduce labor costs, commercial bait dealers were permitted to seine golden shiners on an experimental scale under supervision of game wardens and their appointed deputies. More than 200 gallons of shiners, averaging 100 shiners per gallon, or a total in excess of 20,000, were removed on one occasion using this method. An estimated total of 50,000 shiners has been removed by seining operations.

Specialized "bullhead nets" were used on one occasion. These nets consisted of small, double-throated hoop nets connected in a series by lead nets. Since these nets caught more crappie than either bullhead catfish or shiners, they were discontinued.

Small-meshed gill nets were also tried on two occasions. Although these nets caught numerous bullheads and large shiners, they were too destructive to small channel catfish and crappie. Therefore, their use was discontinued.

All undesirable species, including bullheads, shiners, carp, and goldfish, that were caught during these seinings, trapping and netting operations were removed.

Habitat Improvements

In an effort to decrease turbidity and improve habitat for game fishes, as well as fishing conditions for sportsmen, water levels were controlled by the addition of sub-surface water containing a higher mineral content. This was accomplished by using electrically driven pumps with six-inch discharges from two separate wells located on the northeast end of the lake. All pumping costs were provided by the courts of Dallam and Hartley Counties. Table 1 gives a chemical analysis of water, showing the difference in water quality resulting from the addition of sub-surface water.

In order to enhance reproduction of flathead catfish, thirty artificial spawning devices were installed in various locations around the lake in June 1960. Concrete culverts (12-inches in diameter and 36-inches long) were plugged at one end and placed in depths of 4- to 10-feet deep. Suitable spawning sites for all game fishes were located and mapped so that artificial facilities can be provided if, or when, they are necessary. These spawning devices will be placed between the extreme levels at which water levels may fluctuate during the spawning seasons.

FINDINGS AND DISCUSSION

Rita Blanca Lake was check-seined in April and June, and completely resurveyed in May and October in efforts to determine the effects of these experimental management procedures.

Percentage composition of species collected by gill nets on May 18 and October 12

is given in Tables 2 and 3 respectively. Approximately 1200 feet of experimental ty gill nets (1- to 3-inch mesh) were used on both occasions.

The survey conducted in May provided positive proof that flatheads are surviving and thriving in Rita Blanca, at which time 33 of the transplanted flatheads were captured. They were released immediately after capture in order to prevent mortality. All were in excellent condition, and on several occasions, males and females were taken very close together in the same net, indicating that they may be pairing-off or mating. However, no indications of flathead reproduction were shown in any of the surveys or seining operations during this period of study. After sufficient time and opportunity to reproduce has been permitted, some of the flathead stomachs will be collected and examined to determine the extent of their depredation on golden shiners and bullhead catfish.

Although gill net collections showed a decrease in golden shiners from 70.2 percent in May to 39.1 percent in October, they were extremely abundant in October seine collections. Approximately 35 gallons were taken in three drags with a 100-foot, $\frac{1}{2}$ -inch mesh seine.

Seine collections during June, July and October indicated very successful reproduction of golden shiners. In contrast, there was no evidence of reproduction of largemouth bass, white crappie, or sunfish, even though all crappie and bass taken during the survey in May were ripe and in excellent spawning condition. If these species spawned, most of their fry were probably consumed by golden shiners. However, a few young-of-the-year channel catfish were taken in October.

Examination of channel catfish stomachs collected in May showed no indication of predation on shiners. They were feeding principally on insect larvae, huge Daphnia, snails and filamentous algae, probably taken incidentally to feeding on insect larvae. Crappie were also feeding mostly on insect larvae. Only one out of the 13 taken contained fish, and it was too well digested to be identifiable. One of the three bass taken contained a bullhead catfish measuring 140-mm long.

Only one of the 66 channel catfish examined in the October collection contained a golden shiner. The others were feeding principally on the same items as they were in May except for considerable quantities of sewage organisms, mostly psychoda larvae. Only two of the 57 crappie collected contained golden shiner remains.

Coefficient of condition factors were computed for representative samples of specimens collected by gill nets. These fish were weighed, measured and the stage of gonadal development recorded, in order to detect any progressive changes in condition resulting from experimental management procedures. In order to maintain comparative data, this work will be done during the same months each year, both before and after the spawning season. Table 4 presents a comparison of "K" factors of fishes collected in May and October, 1960, with the average of those taken between June and December, 1957.

Obviously, all species except male golden shiners and both sexes of carp-goldfish cross are in better condition than in 1957. This could be caused by several factors, the most probable largest contributing factors being less competition for space resulting from the increased water supply, and increase in food production resulting from increased water clarity and coverage of more fertile lake bottoms.

Occasional fish kills continued to occur in Rita Blanca Lake during this segment. Fish of all species, but mostly golden shiners and bullhead catfish, were usually killed following rains on the immediate watershed. Fish mortality was confined primarily to a large bay near the dam which receives run-off from the feed lot on the hill overlooking the lake.

The cause of the fish-kill was assumed to be Cooper-Tox, an insecticide containing toxaphene, which is used to control flies and grubs in the watershed feed lots. Since large quantities of barnyard manure is also washed into the lake, oxygen depletion caused by organic decomposition in that immediate area could also have been partially responsible for the kills. Surface bubbling of decomposition gasses was quite noticeable in the upper one-half of the receiving cove. It was also interesting to note that most of the channel catfish that were collected in the lower end of the lake were feeding (and thriving) on sewage effluent organisms.

Although no extensive damage was done to the fishery of Rita Blanca Lake, accounts of the investigations were recorded and presented to the State Health Department and officials in charge of the lake so that corrective measures could be considered to prevent repetition of the incidents.

In June 1960, a natural, selective fish kill on goldfish, black bullhead catfish and golden shiners occurred at the upper end of Rita Blanca. Although only undesirable species were affected by this die-off, city officials and many of the local sportsmen were quite concerned about eating the other unaffected game species and with water skiing in the water.

An investigation disclosed that all of the moribund and dead fish collected were afflicted by abnormal gill conditions probably caused by a bacteria of the myxobacteria group, and commonly referred to as "gill rot". The fish-kill lasted for only a short duration, and the fishery suffered no noticeable damage. For additional information concerning details of this fish-kill and findings of the investigation, the reader is referred to the report, F-7-R-8, Job C-1.

RECOMMENDATIONS

Although insufficient time has lapsed since the beginning of this project to determine any over-all effects, the benefits derived from raising the water level with harder, sub-surface water are obvious. This is a very expensive measure, however, and the cost for continuing may prove to be prohibitive in the future. Therefore, consideration should be given to other methods of providing the necessary water at a lower cost. In this regard, the following recommendations are offered:

1. If pumping from the existing wells is continued, the water should be piped directly from the wells to the lake instead of being allowed to fall from the hillside and flow through open ditches with sandy, pervious bottoms. Since the average evaporation rate in Dalhart area is 72 inches per year, there is little doubt that considerable amounts of money are being wasted by allowing water to evaporate and seep back into the soil before it arrives at the lake.
2. Recent investigations at the Dalhart City sewage plant disclosed that the effluent is not sufficiently treated. Also, discussions with city officials revealed

plans to improve sewage treatment facilities. If this is accomplished, the treated sewage effluent could be run through a series of oxidation ponds stepped-down from the hillside plant, and utilized as make-up water for Rita Blanca Lake. Since Dalhart uses a sub-surface water supply, this would practically eliminate the necessity of pumping water from the wells at Rita Blanca. Also the lower ponds in the series could be utilized for propagating bait minnows. These minnows could be used to supply the demand for bait at Rita Blanca, and the surplus could be sold elsewhere to help defray other operational costs. The ponds could also be utilized as rearing ponds for hatchery-produced fry to offset the lack of natural reproduction of game species in the lake.

Oxidation ponds should definitely be constructed between the watershed feed lots and the lake to absorb shock-loads of organic matter being washed from the feed lots and to retain lethal insecticides until they oxidize sufficiently to be harmless to fishes.

Efforts should be made as soon as possible to determine the extent to which flat-head catfish are feeding on golden shiners and bullhead catfishes. If they are providing satisfactory predation, then every effort should be made to achieve natural reproduction of flatheads in the lake. Otherwise, additional stockings should be made from lakes containing abundant populations of flatheads. Also, stocking of yearling or adult black bass, white bass, and crappie should continue until the golden shiner population is conquered and a desirable balance is established.

Manual methods of shiner removal should be exercised whenever possible, either by Game and Fish Commission personnel or by supervised commercial bait dealers. This work should be done in the spring prior to spawning, if possible, but removal of shiners at any time except when bottom-nesting game species are spawning is desirable.

Periodic surveys and studies should continue at Rita Blanca Lake so that changes in any aspect of the fishery, resulting from these experimental management procedures, can be detected and recorded.

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Date April 25, 1961

Table 1. Chemical analysis of water, showing difference in water quality resulting from addition of sub-surface water.

	Lake water September 18, 1957 (before addition)	Sub-surface water June 15, 1960	Lake water June 15, 1960 (after addition)
Calcium	46	30	30
Magnesium	-	40	49
Sodium	5	20	23
Chloride	14	0	7
Sulfate	24	100	115
Carbonate	0	0	0
Bicarbonate	96	220	244
Total soluble salts	185	410	468
pH (reaction)	7.2	8.3	7.4

Table 2. Percentage composition of species collected by gill nets from Rita Blanca Lake, May 18, 1960.

Species	Number of fish collected	Percent of total
Channel catfish	108	9.69
Crappie	13	1.17
Bullhead	150	13.46
Golden shiner	782	70.20
Goldfish cross	12	1.08
Largemouth bass	3	.27
Goldfish	13	1.16
Flathead catfish	33	2.97
Totals	1,114	100.00

Table 3. Percentage composition of species collected by gill nets from Rita Blanca Lake, October 12, 1960.

Species	Number of fish collected	Percent of total
Channel catfish	211	30.66
Creppie	57	8.29
Bullhead	135	19.62
Golden shiner	269	39.10
Sunfish	12	1.74
Goldfish	4	.59
Totals	688	100.00

Table 4. Comparison of distribution of "K" factors for Rita Blanca Lake, June through December 1957, and collections on May 18 and October 12, 1960.

Channel catfish, Ictalurus punctatus

"K" factor frequencies	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	Average "K"
1957 Average															
males	0	1	1	3	3	1	2	1	0	0	0				1.90
females	8	8	14	6	9	9	1	0	0	1	1				1.78
May 18, 1960															
males				9	7	15	15	10	5	1	0	0	0	0	2.1
females				1	12	15	13	2	6	2	2	1	0	1	2.1
October 12, 1960															
males			2	7	6	12	3	2	1						1.85
females			1	5	13	5	9	5	2						1.90

White crappie, Pomoxis annularis

"K" factor frequencies	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4	5.1	Av
1957 Average																								
males	1	3	3	2	1	1	1	1	0	1	0	0	1	1										
females	2	4	1	4	2	3	2	1	1	1	1	0	0	1										
May 18, 1960																								
males									1	0	1	0	0	0	1	0	1	0	0	0	1			
females									1	-	3	1	2	0	0	0	1	0	0	0	0			
October 12, 1960																								
males							0	1	0	0	0	2	0	2	1	3								0
females							1	1	1	4	2	3	1	2	0	1								1

Carp, Cyprinus carpio

"K" factor frequencies	3.1	Average "K"
1957 Average		
males	0	.00
females	1	3.10
May 18, 1960	No fish taken on last collection	

Table 4. (continued)

Black bullhead, Ictalurus melas

"K" Factor frequencies	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	4.2	4.3	4.4
1957 Average																								
males	0	1	0	0	0	0	0	1	1	0	0													
females	1	3	3	6	5	5	1	3	3	1	1													
May 18, 1960																								
males					1	0	0	0	0	3	0	2	0	2	4	2	0	0	0	0	0	0	0	0
females					0	0	0	0	0	0	3	1	0	3	1	0	0	0	0	1	0	2	0	0

Golden shiner, Notemigonus chrysoleucas

"K" Factor frequencies	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	Average "K"	
1957 Average														
males		0	0	0	0	1	0	0	0	0			2.40	
females		0	2	1	1	0	0	0	0	0			2.08	
May 18, 1960														
males					1	0	0	0	0	0	0	0	2.2	
females					0	1	1	1	5	1	1	0	1	2.6

Carp-Goldfish, Cyprinus X Carassius

"K" factor frequencies	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1	Average "K"
1957 Average														
males		0	0	0	0	0	0	0	2	0	0	0	0	3.70
females		1	0	0	0	1	0	0	1	1	0	1	0	3.58
May 18, 1960														
males	1	1	1	1	0	1	0	1	0	0	0	0	0	3.2
females	0	2	1	0	0	0	0	2	0	0	0	0	1	3.4

Table 4. (continued)

Largemouth bass, Micropterus salmoides

"K" Factor frequencies	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	Average "K"
1957 Average															
males	0	0	0	0	0	0	0	0	0	0					.00
females	0	0	1	0	0	1	0	0	0	0					2.85
May 18, 1960															
males						1	0	0	1	0	0	0	0	0	3.2
females						0	0	0	0	0	0	0	0	1	3.8

Goldfish, Carassius

"K" Factor frequencies	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0	6.1...	6.5	...	7.6	
1957 Average																								
males	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0							
females	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1							
May 18, 1960																								
males						1	2			1			0				1	1	1		1		1	
females						0	0			1			1				0	0	0		1		1	