

JOB COMPLETION REPORT

FILE

State of TEXAS

Project No. F-5-R-3 Name: Fisheries Investigations and Surveys of the Waters of Region 3-B.

Job No. B-3 Title: Inventory of Species in San Angelo Reservoir (O.C. Fisher Lake)

Period Covered: May 1, 1955 - May 1, 1956

ABSTRACT

1. To obtain data on the fishery populations and some of the influencing ecological conditions seventy-nine gill net collections and thirty-six seining collections were taken from San Angelo Reservoir. Water analyses for dissolved carbon dioxide and oxygen content were taken periodically and more detailed chemical analysis data was obtained from the State Board of Water Engineers. Other recorded data included water temperature (surface and at established depths) pH, and climatic conditions at the time of each sampling of the fishery populations. A sample number of fish for each principal species were examined and condition (K) was computed. Food habits were determined from stomach contents. Other data relevant to the study included observation for a spawning activity and a study of the lake's productivity.

2. San Angelo Reservoir impounded most of its storage during the first year of inventory. The lake level fluctuated slightly until September 1954. From that time a continued decline of about .5 feet per month has occurred.

3. About 8,811 individuals of thirty species and ten families were captured by seining or in gill net collections. Two species were believed to be introduced by bait dealers or fishermen.

4. White bass indicated a trend toward domination over similar game species. Largemouth bass declined significantly, and channel catfish and white crappie had advanced to a position of being the most important game species at the end of inventory.

5. Gizzard shad were the most important forage species.

6. River carpsucker were apparently well established as the dominant species in the reservoir and that tendency may be increasing. Since there is no know utilization of this species it is concluded that these fish constitute the primary management problem for the reservoir.

7. During inventory the most severe drought ever recorded for this area occurred. At no time during the first four years following the closing of the flood control conduits has the reservoir reached the average annual minimum pool. Maximum storage during the period was about the area allocated for siltation.

8. It is believed that the anticipated annual fluctuations of the water level as expected under the adopted plan for reservoir management will prove sufficiently detrimental to prohibit the successful propagation of largemouth bass.

OBJECTIVES

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

PROCEDURE

During inventory seventy-nine gill net collections were made at 23 netting stations in San Angelo Reservoir. Experimental nylon gill nets measuring 125 feet long by 8 feet in depth and made up in five, 25 foot sections, were used. Mesh size for these nets increased progressively in each following section at one-half inch intervals beginning with one-inch mesh and terminating with a three-inch mesh section.

Thirty-six seining collections were made at fourteen localities along the lake shore. In nearly all collections both 26 foot $\frac{1}{4}$ " mesh bag seines and 15 foot $\frac{1}{4}$ " mesh common sense seines were used. To estimate relative abundance a count was made of all individuals taken in two hauls with a 26 foot $\frac{1}{4}$ " mesh bag seine for each collection. In additional seining where relative abundance data was not taken, a four foot common sense seine with a $1/16$ " mesh was used. To collect fry after the spring spawning by fishes, a 4 foot by 8 foot straight nylon seine with $1/32$ " mesh was used.

Water analysis for dissolved carbon dioxide and oxygen content was taken periodically and surface temperature, pH and the climatic conditions were recorded for each netting and seining collection. Significant turbidity was recorded on five occasions.

To make a detailed study of the largemouth black bass population, 2,237 individuals of that species were tagged and released at eight localities in the reservoir.

In net collections, most fish were identified, counted, weighed, measured and sexed in the field. A sample number of each species were examined for stomach content and a scale sample taken. On occasions it was necessary to preserve an individual, its stomach or some other organ for more detailed examination in the laboratory. When this was required, the specimen was preserved in 10% formalin.

COOPERATING AGENCIES

United States Corp of Engineers
 United States Geological Survey
 State Board of Water Engineers
 Fish and Wildlife Service, River Basin Studies

FINDINGS

Description - San Angelo Reservoir is adjacent to much of the north and western residential additions of the city of San Angelo in Tom Green County, Texas.

The impoundment, 40,855 feet long, of compacted impervious earth fill and reinforced concrete construction, was completed in 1951-52 by the U. S. Corps of Engineers for flood control and storage of water for municipal, industrial, and irrigation uses. The dam bisects the North Concho River 6.6 miles above the confluence with the South Concho River and at that point is 128 feet above the river bed. Two concrete conduits are located at this point to provide the regulation of flood releases and in making reservoir withdrawals. These conduits are 18 feet in diameter, 489 feet long, pass through the base of the dam and have a maximum discharge potential of 25,100 second-feet.

The reservoir is primarily for flood control and has a maximum design of 691,400 acre feet capacity; however the top of the flood control pool would contain about 391,500 acre feet and would have a maximum area of 12,696 surface acres. Conservation pool is designated at 1908 feet above mean sea level, and at that level the reservoir would contain 114,300 acre feet and will have 5,441 surface acres. "Dead Storage", that portion of the reservoir allocated for siltation, is below elevation 1886.0 and has 33,900 acre feet capacity and an area of about 2,468 surface acres. The average annual minimum pool is estimated to be 65,613 acre feet volume and will extend to 3,437 surface acres. Average annual maximum pool is estimated to be 97,949 acre feet and 4,790 surface acres. Under the adopted management plan of operation the reservoir would be at conservation pool 3.5 percent of the time and no water would be retained above that elevation. All storage above "Dead Storage" and below conservation pool level, a total capacity of 80,000 acre feet, was purchased by the city of San Angelo for municipal and industrial consumption. Water levels are estimated to be above the average annual maximum pool elevation about 29 percent of the time and above the average annual minimum pool elevation about 74 percent of the time. Average annual fluctuation would be 8.0 feet, and maximum annual range in pool fluctuation would be about 28 feet. Maximum rate of recession will be about 5.5 feet per day, and would be the result of flood releases. Probable month of maximum stage will be September and probable month of low stage will be January.

The 1,511 square miles of contributing watershed above the dam are within the southern portion of the Osage Plains, and are characterized by strata of Choza, San Angelo, and Blaine formations of the Permian Age. Sedimentary beds of the Trinity and Fredericksburg groups of the Cretaceous Age outcrop adjacent to the reservoir area. Soils are predominately Abilene clay loams and the flood plain is composed of alluvial sandy loams, clay silts, and deposits of gravel. The most important soils in the contributing area are characterized as dark chocolate-brown silty clay loams, calcareous, and high in organic matter. Native vegetation of the area is mixed short prairie grasses; however with abuse of the ranges a disclimax savannah of grasses and brush, primarily of mesquite, has resulted. Complete climatic records for fifty-two years indicate that average annual temperature is 64.9 degrees F., average minimum temperature in January is 32.1 degrees and average maximum temperature in August is 96.6 degrees. Average frost free period is 233 days (March 22 - November 10). Average precipitation for fifty-five years is 21.69 inches with a maximum of 42.12 in 1882; and with minimums of 8.29 inches in 1917 and 7.41 inches in 1956.

The North Concho River and its tributaries originate primarily in southern Howard county, and in central and northern Glasscock county. The stream flows southeasterly to its confluence. The upper watershed is intermittent except for

two spring areas, and where low water impoundments provide for small storages of run-off. Maximum recorded discharges for the river was 62,900 second-feet, and average discharge over a 26.5 year period was 50.6 second-feet. Extreme low flow has been recorded for the past 19 years. Zero flow occurred about nine percent of the time, and the longest recorded continuous period of no flow, prior to inventory, was 86 days in 1931. Longest period of an apparent and significant continuous flow noted during this survey was six days. Additional information pertaining to this stream is available in completion reports for Jobs A-1, A-2, B-1 and B-2.

Capacities and Fluctuations - The following data pertaining to capacities and fluctuatuions in lake level during inventory are taken from records of the U. S. Corp of Engineers and air temperatures as recorded in the table are taken from that source. Fluctuation data and air temperatures were taken at the control tower in the dam, and were usually taken between 8 A.M. and 9 A.M. Water temperatures were taken by commission personnel and were recorded in part at Parr's Boat Docks on the south shore of the lake, and on other occasions at Green's Concession on the north shore. Water temperatures were usually recorded between 8 A.M. and 10 A.M.

Capacities and Fluctuations of San Angelo Reservoir

Year		Jan.	Feb	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1953													
	EL. 1800	46.46	46.70	46.48	51.57	51.0	70.7	69.09	71.58	83.46	83.30	84.82	84.31
	AF	51	137	104	871	734	12391	10824	13346	32956	32509	35992	34801
1954													
	EL. 1800	84.31	83.85	83.65	83.24	82.75	87.0	91.00	92.95	91.98	90.39	89.71	89.
	AF	33860	33181	32287	31409	41350	52279	57074	54155	52656	50527	48607	47384
1955													
	EL. 1800	88.84	88.61	84.40	87.84	86.96	86.85	85.92	85.86	85.60	85.09	84.51	84.00
	AF	46206	45582	35010	43529	41247	40967	38639	38492	37857	36631	35265	34088
1956													
	EL. 1800	83.65	83.48	83.20	82.70								
	AF	33181	32966	32287	31192								

Symbols: EL. - feet above mean sea level

AF - acre feet

As shown above significant increases in the capacity of the reservoir occurred six times during the thirty-six month inventory period. However, there was a general recession in reservoir level of about one-half foot per month from July 1954 to April 1956, and a corresponding decrease in capacity of about 1000 acre feet per month. Surface area reduced about 600 surface acres or about 16 percent. The most severe drought in the recorded history of this area has occurred since 1950 and this condition had not changed at the time this report was prepared. At no time since January 1953 when dam construction was complete and the flood gates closed, has the reservoir reached the average annual minimum pool; nor has the expected minimum annual average discharge of the North Concho River occurred. The significance of these findings and their influence on the existing fish populations are discussed later in this report.

Temperatures at San Angelo Reservoir

Year	Month	Temperature of Surface Water (F)			Air Temperature (F)		
		Min.	Max.	Avg.	Min.	Max.	Avg.
1953	January	43	51	52	17	83	50
1953	February				16	78	47
1953	March			62	28	84	56
1953	April			69	38	90	64
1953	May			74	41	106	73.5
1953	June				66	106	70.70
1953	July			82	58	103	80.5
1953	August	78	83	80	61	105	83
1953	September	76	80	77	53	106	79.5
1953	October	70	78	73	44	91	57.5
1953	November	66	70	68	31	78	54.5
1953	December	54	68	62	11	73	42
1954	January	49	61	58	19	79	49
1954	February	45	52	49	27	86	56.5
1954	March	50	60	56	26	90	58
1954	April	53	66	60	33	95	64
1954	May	64	72	68	40	96	68
1954	June	81	84	82	55	99	77
1954	July	83	86	84	65	106	85.5
1954	August	84	88	86	67	102	84.5
1954	September	78	86	82	54	102	78
1954	October	74	80	76	38	96	67
1954	November	70	76	72	29	58	43.5
1954	December				19	91	55
1955	January	46	60	55	24	75	49.5
1955	February	48	68	57	18	76	47
1955	March	55	69	64	23	92	67.5
1955	April			72	41	100	70.5
1955	May	68	74	72	51	100	75.5
1955	June	76	81	78	52	104	78
1955	July	74	83	78	65	101	83
1955	August	76	84	77	61	103	82
1955	September	72	78	76	52	95	73.5
1955	October	59	79	64	34	94	64
1955	November	59	68	62	19	87	53
1955	December	64	68	66	20	87	53.5
1956	January			58	10	80	45
1956	February	58	60	59	14	90	52
1956	March	60	64	62	22	91	56.5
1956	April	64	78	70	36	94	65

Water Analysis - San Angelo Reservoir

Year	Month	Turbidity	Air Temp. (F)	Water Temp. (F)	pH	Diss. O ₂	Diss. CO ₂
1953	November	23	80	70	8.4	11.00	0.0
1953	December	-	67	60	8.2	13.50	0.0
1954	January	-	58	54	8.2	13.50	0.0
1954	February	-	40	49	8.2	14.00	0.0
1954	March	-	58	54	8.4	8.00	0.0
1954	April	-	60	62	8.4	8.00	0.0
1954	May	-	64	70	8.4	10.00	0.0
1954	June	12	76	60	8.6	7.00	5.0
1954	July	18	84	83	8.4	7.00	2.0
1954	August	-	87	85	8.4	7.00	2.0
1954	September	-	80	74	8.4	10.00	0.0
1954	October	-	75	68	8.2	13.00	0.0
1954	November	-	69	58	8.2	14.00	0.0
1954	December	-	-	-	8.2	11.00	0.0
1955	January	-	55	49	8.2	15.00	0.0
1955	February	-	60	42	8.3	10.00	0.0
1955	March	-	63	62	8.2	11.00	0.0
1955	April	16	72	70	8.4	9.50	5.0
1955	May	18	72	69	8.4	10.00	3.0
1955	June	-	86	79	8.4	12.00	0.0
1955	July	-	84	83	8.2	11.00	4.0
1955	August	-	84	79	8.3	13.00	2.0
1955	September	-	79	77	8.2	13.00	2.0
1955	October	-	67	74	8.3	10.00	0.0
1955	November	-	80	64	8.2	16.00	0.0
1956	January	-	80	58	8.3	14.00	0.0
1956	March	-	69	63	8.4	11.00	0.0

Detailed data on several other important aspects of water quality is not available for the reservoir; however records of the State Board of Water Engineers and the United States Geological Survey provide some information pertaining to water quality of the North Concho River. It is considered probable that reservoir water is less alkaline and may also have less chloride content. Total chlorides obtained in water analysis were from 180 to 300 p.p.m., and hardness was from 333 to 353. As shown, no dissolved oxygen deficiencies were recorded and carbon dioxide content was not excessive.

Bottom Characteristics - Prior to inundation 2,940 acres below elevation 1908 and located between the dam and the limits of the recreational areas were cleared of most of the woody vegetation. Most of this clearing was done on the right bank of the river. On the north shore, above elevation 1886.0, most of the inundatable

area was covered with mesquite and other brush species. Bottom types vary from alluvium beach sand and terrace deposits near the inundated river bank to loams of the previously described types. An area of about 300 acres adjacent to and paralleling the dam (where excavations were made for building materials during construction) is exposed caliche, and within that area a number of alkali deposits are located on the north shore near Jones Point.

Aquatic Vegetation - Excepting algae and minute pelagic forms; there is no important emergent or floating aquatic vegetation in San Angelo Reservoir. Bulrushes occur in the river bed above the lake where gravel or silt deposits permit. Willows and pecan are the only important woody types on the shores. On the following map twenty-one fish attractors that were constructed prior to inventory are designated. These structures are of second growth mesquite and are secured to the bottom with cables and stones.

FISH POPULATIONS

Species Distribution - Seining and netting collections resulted in the capture of thirty species of ten families during the thirty-six month inventory period. Species and families recorded are:

Checklist of Species

<u>Common Name</u>	<u>Family Name</u>	<u>Scientific Name</u>
Longnose gar	<u>Lepisosteidae</u>	<u>Lepisosteus osseus</u>
Gizzard shad	<u>Clupeidae</u>	<u>Dorosoma cepedianum</u>
Smallmouth buffalo	<u>Catostomidae</u>	<u>Ictiobus bubalus</u>
River carpsucker	"	<u>Carpionodes carpio</u>
Gray redhorse sucker	"	<u>Moxostoma congestum</u>
Carp	<u>Cyprinidae</u>	<u>Cyprinus carpio</u>
Golden shiner	"	<u>Notemigonus crysoleucas</u>
Goldfish*	"	<u>Carassius auratus</u>
Banded Tetra*	"	<u>Astyanax fasciatus</u>
Redhorse shiner	"	<u>Notropis lutrensis</u>
Proserpine shiner	"	<u>Notropis proserpinus</u>
Spottail shiner	"	<u>Notropis venustus</u>
Plains minnow	"	<u>Hybognathus placita</u>
Parrot minnow	"	<u>Pimephales vigilax</u>
Stoneroller	"	<u>Campostoma anomalum</u>
Channel catfish	<u>Ameiuridae</u>	<u>Ictalurus punctatus</u>
Yellow bullhead	"	<u>Ictalurus natalis</u>
Flathead catfish	"	<u>Pylodictus olivaris</u>
Mosquitofish	<u>Poeciliidae</u>	<u>Gambusia affinis</u>
White bass	<u>Serranidae</u>	<u>Roccus chrysops</u>
Largemouth bass	<u>Centrarchidae</u>	<u>Micropterus salmoides</u>
Warmouth bass	"	<u>Chaenobryttus gulosus</u>
Green sunfish	"	<u>Lepomis cyanellus</u>
Spotted sunfish	"	<u>Lepomis punctatus</u>
Redear sunfish	"	<u>Lepomis microlophus</u>
Yellowbelly sunfish	"	<u>Lepomis auritus</u>
Longear sunfish	"	<u>Lepomis megalotis</u>
White crappie	"	<u>Pomoxis annularis</u>
Logperch	<u>Percidae</u>	<u>Percina caprodes</u>
Freshwater drum	<u>Sciaenidae</u>	<u>Aplodinotus grunniens</u>

* - Species introduced as bait during inventory period.

Of the above species logperch, warmouth bass, banded tetra, and proserpine minnows were taken in the river near the mouth only, and were not taken in seining collections from the unprotected areas of the reservoir. Seining stations were difficult to locate and maintain, particularly on the north shore of the lake.

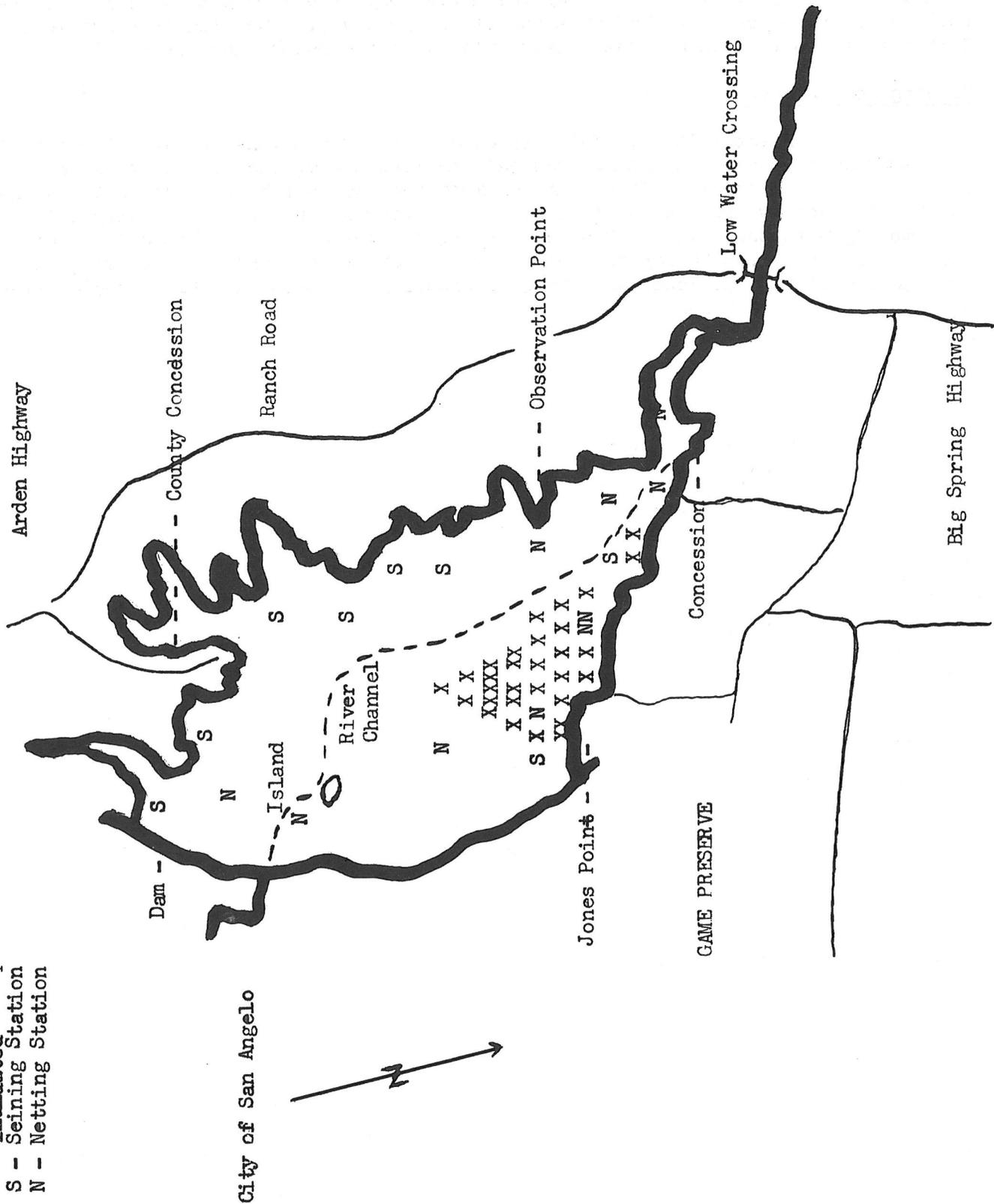
Seining Collections:

It was impossible to maintain exact seining stations because of reservoir fluctuations; however an attempt was made to repeat sampling as near to a designated locality as was possible. Technique was modified somewhat by improved nylon seines during the last two year's work; however the following charts include only data obtained by sampling with bag seines. Most distribution information was obtained in seining collections where population estimates were not attempted, and the following should be regarded as of importance only when considering the most important species present and their interrelationship.

SAN ANGELO RESERVOIR

Symbols

- X - Inundated Mesquite
- S - Seining Station
- N - Netting Station



Seining Collections from San Angelo Reservoir, 1953 - 1954.

Species	June	July	August	September	October	March	April	May	June	Total	Percent
Mosquitofish	101	37	41	112	14	21	32	180	116	654	25.8
Redhorse shiner	64	16	121	38	111	0	140	117	0	607	23.8
Spottail shiner	31	0	10	0	0	0	12	0	4	57	2.1
Golden shiner	0	0	0	0	0	0	0	8	14	22	.8
Parrot minnow	0	0	0	0	0	0	0	25	2	27	1.0
Largemouth bass	41	8	0	0	12	6	13	8	2	90	3.4
River carpsucker	0	0	0	0	0	0	0	7	3	10	.3
Gizzard shad	100	121	0	12	121	116	4	21	0	495	19.0
White crappie	6	6	2	0	0	25	2	0	0	41	1.5
Green sunfish	14	21	4	24	5	28	13	12	12	133	5.2
Western Longear	8	8	4	11	5	5	10	8	0	59	2.3
Bluegill	21	11	6	61	28	16	61	31	12	247	9.9
Redear sunfish	0	2	0	2	0	2	4	9	4	23	.9
Yellowbelly sunfish	0	0	0	1	0	1	0	4	0	6	.2
Spotted sunfish	0	4	0	0	0	0	7	21	31	63	2.4
Orangespotted sunfish	0	0	0	0	5	0	3	7	6	21	.8
Total	386	234	188	261	301	220	301	458	206	2555	99.5

Seining Collections from San Angelo Reservoir, 1954 - 1955.

Species	July	August	September	October	November	December	January	March	April	Total	% by Number
Mosquitofish	36	100	48	12	8	0	0	36	25	265	15.22
Redhorse shiner	140	90	45	147	12	21	25	12	40	532	30.53
Spottail shiner	12	0	20	12	0	10	9	0	0	63	3.62
Parrot minnow	8	10	9	21	13	0	0	25	9	95	5.45
Gizzard shad	20	10	30	8	8	14	8	0	17	115	6.60
River carpsucker	4	0	4	0	2	0	9	0	0	19	1.09
Largemouth bass	8	4	10	21	0	2	3	2	12	62	3.56
White bass	0	0	0	12	3	2	0	12	4	33	1.89
White crappie	8	3	14	20	4	2	4	0	2	57	3.27
Channel catfish	1	0	0	1	0	0	0	0	0	4	.23
Green sunfish	27	12	20	30	12	0	12	21	11	145	8.32
Bluegill	35	14	31	30	18	14	11	38	28	219	12.57
Redear sunfish	2	2	4	10	0	0	5	5	6	34	1.95
Western longear sunfish	12	6	4	4	0	0	3	21	2	52	2.98
Orangespotted sunfish	0	0	2	0	0	0	3	0	2	7	.40
Yellowbelly sunfish	0	0	1	6	0	0	2	20	11	40	2.30
Total	313	251	242	334	80	65	94	192	171	1742	100.00

Seining Collections from San Angelo Reservoir, 1955 - 1956.

Species	June	August	October	February	Total	Percent	(1953-1956 Total)	(1953-1956 Percent)
Mosquitofish	8	21	20	14	63	8.86	982	19.59
Redhorse shiner	24	36	36	60	156	21.94	1295	25.87
Spottail shiner	0	0	0	0	0	0.00	120	2.37
Golden shiner	21	14	21	23	79	11.11	101	2.07
Parrot minnow	20	16	16	25	77	10.82	199	3.96
Largemouth bass	6	6	10	10	32	4.51	184	3.67
River carpsucker	4	8	6	4	22	3.09	51	1.01
Gizzard shad	6	0	0	0	6	.85	616	12.30
White crappie	11	11	6	12	40	5.62	138	2.78
Green sunfish	13	5	10	1	29	4.09	307	6.18
Western longear sunfish	0	0	0	0	0	0.00	111	2.28
Bluegill sunfish	14	11	21	28	74	10.40	540	10.77
Redear sunfish	10	14	31	8	63	8.87	120	2.37
Yellowbelly sunfish	0	6	1	2	9	1.24	55	1.09
Spotted sunfish	1	0	2	0	3	.43	66	1.28
Orangespotted sunfish	1	5	5	6	17	2.39	45	.88
White bass	13	5	5	7	30	4.25	63	1.25
Channel catfish	3	5	0	3	11	1.55	15	.28
Total	155	163	190	203	711	100.00	5,008	100.00

Netting Collections:

As in seining work exact duplication of netting was impossible except in a few instances. Only the netting stations pertinent in other discussion are shown on the included map. As the charts are regarded as the best available expression of a total interrelationship; populations for the most important species and the apparent ecological influences upon each species are discussed separately where evidence of such influence was obtained.

Netting Collections from San Angelo Reservoir, 1953 - 1954.

Species	June	July	August	September	October	November	December	January	February	March	May	June	Total	Percentage
Gizzard shad	0	5	17	21	0	21	17	67	43	11	14	31	247	14.30
River carpsucker	0	0	39	5	1	11	111	212	43	17	8	58	505	29.00
Carp	0	2	0	0	0	0	0	0	8	9	2	9	30	.17
Smallmouth buffalo	0	0	0	0	0	0	0	0	1	0	0	0	1	.07
Longnose gar	0	0	0	0	0	0	0	0	1	2	1	0	4	.26
Gray redborse sucker	0	0	0	0	0	0	7	5	1	1	0	2	16	.94
Freshwater drum	0	0	0	0	0	0	0	0	0	0	0	7	7	.42
White bass	0	0	0	0	0	0	0	1	0	0	1	0	2	.15
Yellow bullhead	0	0	0	0	0	0	4	0	0	0	3	0	7	.42
Flathead catfish	0	0	0	0	0	1	0	0	0	1	1	1	4	.26
Channel catfish	0	2	63	2	2	31	7	97	20	28	28	33	313	17.90
Largemouth bass	31	12	14	11	61	28	42	72	17	14	14	4	321	18.50
White crappie	4	1	11	2	9	28	38	64	41	14	21	19	252	14.60
Sunfishes	0	0	2	0	0	7	0	4	10	2	9	5	39	.30
Total	35	22	146	41	73	127	227	522	185	99	102	169	1748	100.00

Netting Collections from San Angelo Reservoir, 1954 - 1955.

Species	July	August	September	October	November	December	January	February	March	April	Total	Percentage
Gizzard shad	14	0	21	40	24	37	35	49	99	33	352	25.99
River carpsuckers	31	13	14	34	70	87	119	68	17	56	499	36.89
Carp	0	0	0	0	0	0	3	0	1	0	4	.30
Gray redbhorse suckers	0	0	0	0	0	0	3	1	0	0	4	.30
Freshwater drum	0	0	8	0	6	4	5	3	8	2	36	2.66
Yellow bullhead	0	0	0	0	0	0	1	0	0	0	1	.07
Largemouth bass	21	5	6	4	0	2	2	12	0	2	54	3.69
White bass	0	0	9	0	0	2	0	4	3	0	18	1.33
White Crappie	30	21	0	21	15	12	6	20	1	0	126	9.30
Longnose gar	0	0	0	0	0	0	0	1	1	0	2	.147
Channel catfish	4	12	18	13	0	11	2	36	15	19	130	6.90
Sunfishes	0	60	19	12	1	0	2	21	1	1	128	9.50
Total	100	111	95	124	106	167	176	196	166	113	1354	100.00

Netting Collections from San Angelo Reservoir.

Species	May	June	October	February	March	Total	Total	Total	Total	Percentage
	1953-54	1954-55	1955-56	1953-56	1954-56	1953-56				
Gizzard shad	33	22	49	99	66	247	352	269	826	21.71
River carpsucker	56	119	68	17	56	505	499	316	1324	34.81
Carp	0	3	0	1	6	30	4	10	44	1.15
Smallmouth buffalo	0	0	0	0	1	1	0	1	2	.05
Longnose gar	0	0	1	2	0	4	2	3	9	.24
Gray redborse sucker	0	3	1	0	0	16	4	4	24	.63
Freshwater drum	2	5	3	8	3	7	36	21	62	1.64
White bass	0	6	4	3	8	2	18	21	41	1.08
Yellow bullhead	0	1	0	0	0	7	1	1	9	.23
Flathead catfish	0	0	0	0	0	4	1	0	4	.10
Channel catfish	19	2	36	15	4	313	130	76	500	13.14
Largemouth bass	2	2	12	0	0	321	54	16	389	10.22
White crappie	0	6	20	2	1	252	126	29	407	10.71
Sunfishes	1	0	2	2	2	39	128	7	162	4.29
Total	113	169	196	149	146	1748	1354	773	3803	100.00

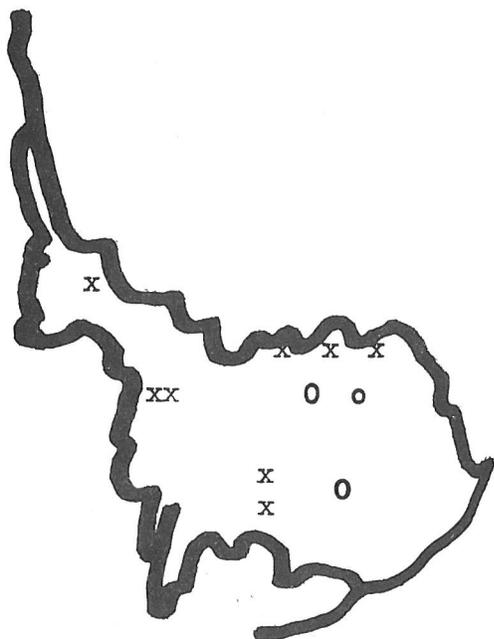
Comparative Data on Principal Fish Populations for San Angelo Reservoir.

Species	No. Individuals	Weight Comparisons (% by Weight)			Numerical Comparisons (% by Number)				
		1953-54	1954-55	1955-56 Average	1953-54	1954-55	1955-56 Average		
Gizzard shad	826	12.85	6.89	27.25	15.66	14.29	25.99	21.71	20.66
River carpsucker	1324	72.00	67.32	46.50	62.24	29.07	36.89	34.81	33.57
Gray redhorse sucker	24	.27	.43	.75	.48	.94	.30	.63	.62
Carp	44	.38	.93	5.75	2.35	.17	.30	1.15	.54
Smallmouth buffalo	2	.01	0.00	0.00	0.00	.07	0.00	.05	.04
Longnose gar	9	.07	4.23	.75	1.68	.26	1.47	.24	.66
Freshwater drum	62	.02	2.54	3.00	1.83	.42	2.66	1.64	1.57
Yellow bullhead	9	.03	.77	0.00	.36	.42	.07	.23	.24
Channel catfish	500	.67	6.60	8.75	5.34	17.92	6.90	13.14	12.56
Flathead catfish	4	.09	0.00	0.00	.03	.26	0.00	.10	.12
White bass	41	.01	6.93	3.00	3.31	.15	1.33	1.08	.85
Largemouth bass	389	2.64	6.58	3.00	2.82	18.50	3.69	10.22	4.64
White crappie	407	11.10	6.87	2.50	7.16	14.57	9.30	10.71	11.53
Sunfishes	162	.06	.69	.50	.42	.25	9.50	4.29	4.68

Comparative Physical Condition of Principal Species of Fish in San Angelo Reservoir.

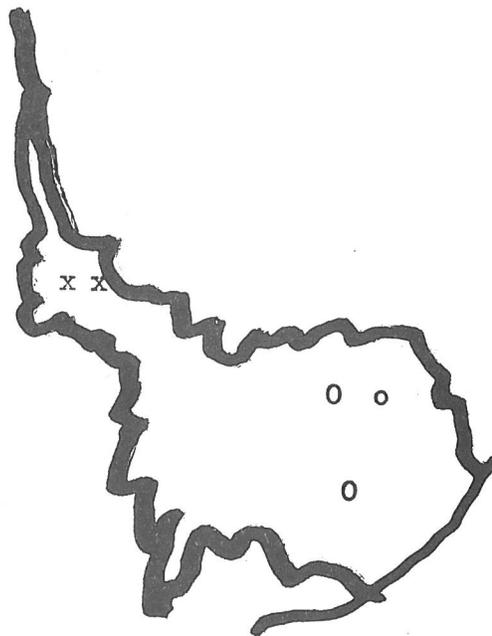
Species	1953-54			1954-55			1955-56			Total		
	No.	"K" Range	Avg. "K"	No.	"K" Range	Avg. "K"	No.	"K" Range	Avg. "K"	No.	%	Avg. "K"
Gizzard shad	60	1.51-3.12	1.69	80	1.60-2.10	1.85	34	1.62-2.08	1.84	174	4.58	1.79
River carpsucker	98	2.03-2.78	2.47	105	2.32-2.64	2.64	40	2.28-2.60	2.54	243	6.39	2.49
Carp	30	2.32-2.71	2.54	4	2.46-2.64	2.60	4	2.64-2.69	2.66	38	.99	2.60
Smallmouth buffalo	1	2.56	2.59	0	0	0	1	3.64	3.64	2	.06	2.08
Longnose gar	4	0	2.08	2	.351-	.351	2	.332	.332	8	.24	2.94
Gray redbhorse sucker	16	2.13-2.85	2.31	4	2.22-2.32	2.27	4	2.24-2.30	2.26	24	.72	2.28
Freshwater drum	7	2.08-2.50	2.21	6	2.38-2.42	2.40	6	2.31-2.32	2.28	19	.49	2.29
Yellow bullheads	7	2.24-2.69	2.47	1	2.10	2.10	1	2.30	2.30	9	.25	2.29
White bass	2	0	2.04	18	2.10-2.28	2.23	21	2.30-2.54	2.40	41	1.01	2.22
Flathead catfish	4	2.18-2.49	2.22	0	0	0	0	0	0	4	.12	2.22
Channel catfish	110	1.86-2.42	2.18	16	1.88-2.08	1.97	24	2.08-2.19	2.09	150	3.94	2.07
Largemouth bass	312	2.72-3.84	2.84	7	2.82-3.10	2.92	8	2.74-2.90	2.82	327	8.59	2.86
White crappie	192	2.13-3.69	2.73	40	2.22-3.64	3.37	7	2.88-3.10	2.90	239	6.34	3.00
Sunfishes (<u>Lepomis</u>)	34	3.00-3.70	3.25	21	3.24-4.18	4.08	4	3.52-3.68	3.62	59	1.55	3.65

LOCALITIES HAVING HIGH PERCENTAGES OF GAME
FISH IN SAN ANGELO RESERVOIR



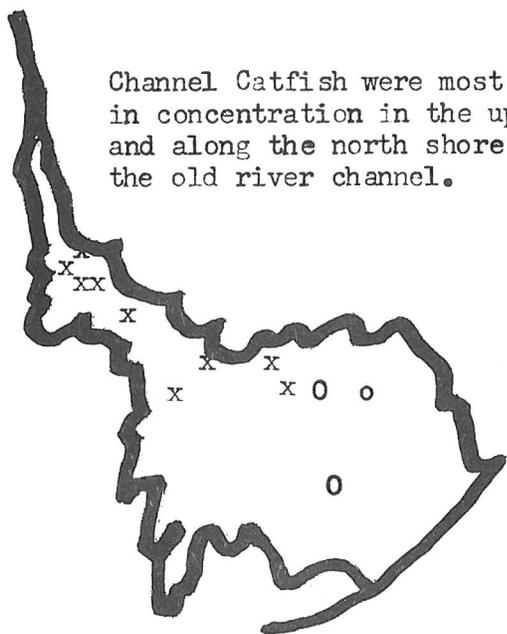
Largemouth Bass

Largemouth Bass were concentrated along the cleared sections of the north shore, near and in Pot's creek, and where the excavation for dam construction created a submerged bank.



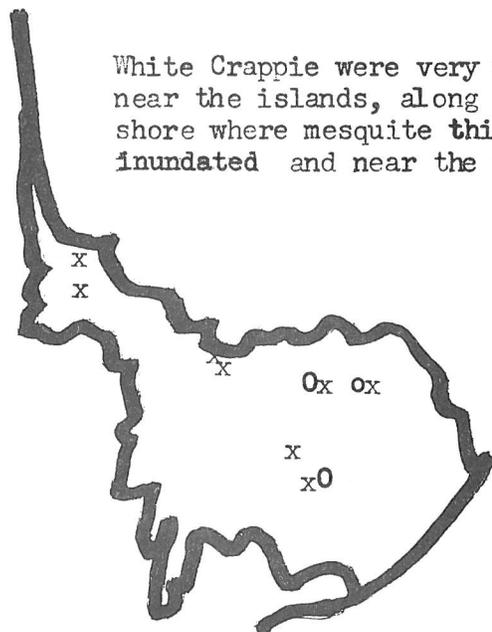
White Bass

White Bass were taken almost exclusively near the river mouth in the old Pullham Crossing Area.



Channel Catfish

Channel Catfish were most dense in concentration in the upper lake and along the north shore near the old river channel.



White Crappie

White Crappie were very numerous near the islands, along the north shore where mesquite thickets were inundated and near the river mouth

STOMACH ANALYSIS

The following data are included as resulting from the analysis of stomachs containing food; however its reliability may be questioned because of the tendency of several species notably largemouth bass and longnose gar to regurgitate their stomach contents when captured in gill nets, or when held in live boxes pending examination. It is considered probable that for some species the small number of stomachs containing food are inadequate to express the importance of the various food types. The following is on a volumetric displacement basis.

Stomach Contents for Principal Species

White Bass

No. Stomachs	Fish Examined	Shad %	Fish Remains %	Insects %	Crustaceans %	Others %
38	41	87	12	1	trace	silt

Largemouth Black Bass

63	80	36	38	16	4	6
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White Crappie

84	204	52	11	29	1	7
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Southern Channel Catfish

No. Stomachs	Fish Examined	Shad	Fish Remains	Insects	Sunfish	Algae	Others
52	118	26	13	13	11	29	Grain 4% Silt and debris 4%

As shown in the preceding data 443 individual fish were opened for examination of stomach content, gonadal development, and for the existence of internal parasites. Of this sample 247 stomachs were found to contain food. Shad were the most common food for most species and insects were apparently more important than observed in other reservoirs.

POPULATION TRENDS AND INFLUENCES

White Bass. All evidence obtained during inventory indicated an increasing trend toward dominance by white bass. Apparently the continuous decline in the reservoir level did not prevent that species from reproducing successfully as juvenile fish were taken in both netting and seining collections during the last eighteen months prior to completion of field activities. These fish were observed spawning or congregating when run-off occurred in the early spring, and were more common in sportsmen catches after the first year's work.

Largemouth Bass. It is believed that the annual fluctuation of the lake level as anticipated by hydrologists with the U. S. Corp of Engineers and as resulting from the adapted plan for reservoir operation will be sufficiently detrimental to prevent a continuous and successful propagation by this species. As shown in netting and seining collections largemouth bass were reduced during inventory from the most numerous game species to a position of relative unimportance. Seining collections indicated meager spawning activity by this species in the last two years of inventory and sexual development and condition of individuals taken indicated that a relatively low percentage of sexually mature individuals actually spawned during that period. Of 2,237 largemouth bass tagged with mandible tags and released during inventory only six individuals have been recaptured or otherwise recovered. No pertinent data has been obtained from these recovered fish. With the exception of two individuals that were found dead and washed ashore by wave action within thirty-six hours after their release, all fish recovered were taken by sportsmen and had been cleaned before they were examined by Commission personnel. Since caution and reasonable precautions were taken to prevent damage to tagged individuals, it is believed that this type tag is unsatisfactory for this particular study.

White Crappie. It is believed that seining and netting collection data do not provide for a proper evaluation of the importance of this species, and this contention is supported by creel data. As previously explained under those sub-headings exact duplication of seining and netting collection work was prevented by fluctuation of the reservoir level. Apparently white crappie congregated along the north shore of the reservoir where dense inundated concentrations of mesquite prevented adequate sampling by the methods employed. In the few areas where sampling was possible, a significantly greater number of these fish were obtained. Spawning apparently occurred from late February to April, and as shown in stomach analysis data, fall insects may have a highly significant influence on the rate of growth and sexual development for individuals of this species.

Sunfishes (all Lepomis). Of the seven species of sunfish and possible two common hybrids taken during inventory, no species had established what could be termed a permanent dominance, although seining data indicated a trend toward dominance by bluegill sunfish. As discussed in the completion report for the creel census conducted on this reservoir, only during the first eighteen months of inventory were sunfish taken of sufficient size to provide sport and food. Since that time data available indicated that from a utilization standpoint sunfishes in the lake should be regarded in a forage capacity rather than as game fish. Spawning by this group was believed to be from late spring until frost, however fish were observed on or near nests throughout the year.

Southern Channel Catfish. As shown in netting and seining collection data channel catfish are statistically the most important game species in San Angelo Reservoir following inventory. Condition of this population is regarded as favorable when reservoir conditions are taken into consideration, and apparently reproduction was successful during the spawning periods. Creel data supports this result in sampling.

Gizzard Shad. Shad were the most important forage species for all the principal game species in the reservoir, and as such are of basic importance. There is not sufficient data at present to correlate successful reproduction of this species and condition of the principal game species, nor is there adequate data to illustrate the importance of spring run-off and spawning by shad. However all data and evidence obtained during inventory indicated the possibility of such interrelationships and their potential importance on any proposed management effort.

River Carpsuckers. Apparently these fish were the most unaffected of any species by reservoir conditions during the inventory period. Condition of this population remained greater than "K" values for populations of the same species in other reservoirs and streams. There was an obvious trend toward dominance of this reservoir by these fish. Individuals in advanced stages of sexual development were taken in almost every netting collection, and spawning activity was believed to have occurred immediately following every significant increase in the reservoir capacity. The utility of this species as forage is believed to be insignificant as none of these fish or identifiable portions of any individual were recovered from the stomachs of the game fish examined, nor is there any known reliable market for these fish when taken commercially.

Other Species. Of the remaining species taken during inventory only members of the genus Notropis are of significance in the data obtained. Apparently these shiners were of increasing importance as forage, as the number of individuals encountered in stomach analysis increased toward the end of field work. Since the reservoir and much of the contributing watershed were treated with rotenone to remove the existing fish populations prior to impoundment of significant run-off, it is believed that these species were introduced from the extreme upper watershed and/or possibly by bait dealers. None were used by hatchery personnel in the restocking program. Gray redhorse suckers decreased during inventory and carp increased numerically. Other species, as longnose gar, freshwater drum, and smallmouth buffalo were too infrequent to be of any apparent importance in considering the reservoir populations.

RECOMMENDATIONS

1. No recommendations for constructive action are made at this time because fishing results remain favorable, as indicated by creel census, and because no effective methods are known that might be employed to correct the detrimental conditions that exist.
2. Should an effective control be found for river carpsuckers, it is recommended that such a device and/or procedure be employed to curb, control, or eradicate the population of that species.
3. It is recommended that the reservoir be re-surveyed in a period of three to five years, or as may prove practical or expedient.

Prepared by Lawrence S. Campbell
Project Leader

Approved by

Marion Toole
Chief Aquatic Biologist

Date July 22, 1957

