

STATE Texas
PROJECT NO. F-4-R-1, Job B-4
PERIOD June 4, 1953 - May 31,
1954

Segment Completion Report

by

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TITLE

Inventory of Species Present in Possum Kingdom Lake, Palo Pinto County, Texas.

OBJECTIVES

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

HISTORY OF LAKE

Possum Kingdom Reservoir, completed in 1941, is located on the Brazos River a few miles west of Graford, Texas, and approximately 245 miles upstream from Whitney Dam. Portions of the reservoir lie in Palo Pinto, Stephens and Young Counties and one small arm enters Jack County when the lake is full. The reservoir is owned and operated by the Brazos River Conservation and Reclamation District for the purpose of hydroelectric power, irrigation and municipal uses. Large rains filled the entire basin in six days following the closure of the dam in 1941. The lake was closed to fishing during the first year of its life.

PHYSICAL CHARACTERISTICS

Possum Kingdom is a clear-water lake impounding 19,991 surface acres when the water is at spillway level, (elev. 1,000 ft. above sea level). It has a total storage capacity of 733,800 acre feet. The lake is approximately 67 miles long and has a 310 mile shoreline. It is a narrow winding lake with an irregular shoreline, characterized by gently sloping valleys in some areas and limestone bluffs in others.

The lake bottom is composed of partly sandy farm land as well as grazing land containing some trees. There was little if any timber removed from the reservoir as it was flooded before clearing operations could begin. Possum Kingdom Dam controls a drainage area of 23,048 square miles drained by the Brazos River and its tributaries. The soils are of the West Cross Timbers primarily of the Windthropt - Nimrod group. The above area is characterized by sandy soil with some outcrops of heavy dark soil of the Denton - San Saba Sands. Vegetation is composed chiefly of post oak, black jack, mesquite, cedar, pecan and bunch grasses. Seventeen and one-half percent of the drainage area is farming land and the remainder is used for grazing.

Possum Kingdom Lake is subject to rather rapid fluctuation in the water level due to periodic draw downs for irrigation and manufacturing of electricity. The exact effect that the fluctuating water level has had upon the fish life of the lake is not certain at this date.

CHEMICAL CHARACTERISTICS

There were no chemical analyses made of the lake by the State Game and Fish Commission during the past year.

AQUATIC VEGETATION

Aquatic vegetation does not create a problem in the lake. However, the low level of water during the past three years has allowed much salt cedar and blood weeds to grow on the exposed lake shore. When the lake refilled during the summer and fall of 1953 most of the vegetation was covered with water. It is probable that the fish life of the lake benefited by the inundation of the vast amount of vegetation growing around the lake at that time.

COLLECTING METHODS

The fish population of the lake was random sampled by the use of gill nets and minnow seines. Part of the sets were made with gill nets 8 feet deep by 100 feet long with square mesh sizes of 1 inch to 3 inches. Other sets were made with gill nets 8 feet deep and 125 feet long which contained a series of 25 foot sections in which the square mesh sizes were graduated in one-half inch intervals from one to three inches. Seining collections were made with 30 x 6 feet straight seines and 30 x 6 ft. bag seines each with $\frac{1}{4}$ inch mesh.

Data taken from fish caught in gill nets included the length, weight, sex, stomach content and degree of parasitism, if any, of each fish. Scales from the game fish were collected for future age and growth studies. Table 1 records the checklist of fishes collected from Possum Kingdom Lake.

RESULT OF SEINING COLLECTIONS

Two seining collections were made on the lake. One collection made July 19, 1953 netted 62 specimens representing seven species. Another collection taken May 28, 1954 found 880 specimens representing 10 species. The Rio Grande tetras found May 28, 1954 were probably introduced by bait fishermen. Their ability to survive in the lake during the winter months is questionable. Tabulations of the seining collections are found in Table 2.

RESULTS OF NETTING COLLECTIONS

Ninety gill net sets were made on the Lake from July 1953 until May 1954, yielding 1516 specimens. Game fish composed 31% of the catch and white bass were the most abundant game fish taken. Gizzard shad were the most abundant species netted and accounted for almost one-half of the entire catch. A comparison of the data representing game fish and rough fish species is recorded in Table 3.

The length, weight and coefficient of condition of all fish collected by gill nets are given in Table 4. The results of monthly catches of each species showing the number caught and the percent of the total monthly catch they represent, is recorded in Table 5. Corresponding information is listed in Table 6 except the catch is represented by weight and the percent column shows the percent of the total weight of that month's catch for each species.

The number of gill nets set each month varied from month to month. Table 7 shows the frequency of capture of each species as well as the number caught per 100 ft. of net set and the seasonal variation in catches.

DISCUSSION

Possum Kingdom Lake is one of the more popular fishing lakes in Texas and draws a considerable portion of the fishermen from West Texas and the Plains Region where good fishing water is scarce. It is common knowledge that the lake afforded excellent fishing during the first few years of its life. For three or four years preceding the start of this program, fishing (especially bass fishing) became progressively less productive. The water level dropped lower and lower until July of 1953 when the water level was approximately 35 ft. below the spillway outlet. There was apparently no direct adverse effect upon fish during that period due to an abundance of water left in the lake. However, a large concentration of forage fish, including shad and blacktail minnows, was developed in the lake during the years of low water level which also coincided with the poor fishing period. Observations of the local fishermen indicate there may have been some preying upon the nest of game fish by the large schools of shad and spottail minnows ever present in their spawning areas. It is expected that such an abundance of forage fish might curtail the movements of the game species resulting in a poor harvest by the fishermen.

Large rains resulted in a rise of the water level in July 1953 and additional rains filled the lake in a few months. Much land area that had been exposed for a long time, as well as the vegetation growing on it was covered with water. An excellent bass catch the following spring may have been the result of the extensive rise in water level and expansion of the lake area.

In an effort to reduce the surplus of forage fish in the lake, a proclamation allowing commercial exploitation of minnows was enacted in February 1954. It is hoped that the removal of surplus minnows from the lake, together with the expanded lake area and the natural run of minnows up the flowing streams will be sufficient to alleviate the problem of surplus forage fish in the lake.

An accidental stocking of white bass in the lake occurred in about 1949. They have multiplied and grown rapidly and have furnished excellent fishing the past two years. The abundance of white bass now found in the lake may also help control the over supply of shad and minnows thus helping to produce better catches of black bass.

An extensive rough fish removal program has been active for the past three or four years. Hundreds of tons of carp, buffalo, carpsucker, shad and gar have been removed from the water by state contract fishermen using gill nets, barrel nets and drag seines.

Several striped mullet have been caught in the commercial fishermen's nets. One specimen weighed nine pounds after it had been dressed and frozen. The mullet were probably introduced as young fish by bait fishermen several years ago. The success of reproduction by the species in the lake has not yet been established.

Information on the success of the fish spawns during the past years is not available, but the present study indicates a very successful bass spawn for the spring of 1954. An abundance of food in the lake and an adequate growth of protective vegetation should encourage survival and growth of fry. Table 8 records the fish stocked in the lake since 1945.

Lack of biological information and reports of a decline in fish harvest from the lake resulted in the instigation of this project. Data resulting from the work indicates that additional information can be obtained by prolonging the study. Data collected from representative seine and net stations is included in the following data sheets and is typical of the data collected from all such stations.

SUMMARY

Possum Kingdom is a clear water lake located on the Brazos River a few miles west of Graford, Texas. The reservoir impounds almost 20,000 surface acres, backs up the river for 67 miles and has a 310 mile shoreline. It is subject to fairly rapid water fluctuations.

Ninety gill net sets on the lake caught 1516 fish which weighed a total of 1497 pounds. Nineteen species were represented. Rough fish constituted 76% by weight and 69% by number of the fish taken. Shad were the most abundant fish netted and accounted for 48% of the total fish caught. White bass were the most abundant game fish taken, representing 8% of the total catch.

Two seine collections yielded 942 fish representing 12 species. The plains red shiner represented 53% of the total specimens collected. Largemouth bass fry accounted for 11 $\frac{1}{2}$ % of the collection.

The Rio Grande tetra and striped mullet were probably introduced by bait fishermen. Data resulting from the project indicate that additional information can be obtained by prolonging the study.

Data collected from representative net and seine stations and typical of data collected from all stations are included.

Table 1. Checklist of Fish Species from Possum Kingdom Lake, Texas,
1953-1954.

Common Name	Scientific Name
1. Spotted Gar	<u>Lepisosteus productus</u>
2. Longnose Gar	<u>Lepisosteus osseus</u>
3. Gizzard Shad	<u>Dorosoma cepedianum</u>
4. Rio Grande Tetra	<u>Astyanax fasciatus</u>
5. Smallmouth Buffalo	<u>Ictiobus bubalus</u>
6. River Carpsucker	<u>Carpionodes carpio</u>
7. German Carp	<u>Cyprinus carpio</u>
8. Ribbon Shiner	<u>Notropis fumeus</u>
9. Red Shiner (redhorse)	<u>Notropis lutrensis</u>
10. Blacktail Shiner (spottail)	<u>Notropis venustus</u>
11. Parrot Minnow	<u>Pimephales vigilax</u>
12. Channel Catfish	<u>Ictalurus punctatus</u>
13. Yellow Cat (flathead cat)	<u>Pilodictus olivaris</u>
14. Mosquitofish	<u>Gambusia affinis</u>
15. Striped Mullet	<u>Mugil cephalus</u>
16. White bass (sand bass)	<u>Morone chrysops</u>
17. Largemouth black bass	<u>Micropterus salmoides</u>
18. Warmouth bass	<u>Chaenobryttus coronarius</u>
19. Bluegill (bream)	<u>Lepomis macrochirus</u>
20. Redear Sunfish	<u>Lepomis microlophus</u>
21. Green sunfish	<u>Lepomis cyanellus</u>
22. Yellowbelly Sunfish	<u>Lepomis auritus</u>
23. White crappie	<u>Pomoxis annularis</u>
24. Logperch	<u>Percina caprodes</u>
25. Drum	<u>Aplodinotus grunniens</u>

Table 2. Results of Seining Collections by Number of Each Species, Possum Kingdom Lake, Texas, 1953 - 1954.

Species	July 19, 1953	May 28, 1954	Total	% of Total
<i>Micropterus salmoides</i>	9	99	108	11.45
<i>Lepomis macrochirus</i>	21	9	30	3.17
<i>Lepomis microlophus</i>		1	1	0.10
<i>Lepomis cyanellus</i>		1	1	0.10
<i>Notropis venustus</i>	1	200	201	21.33
<i>Notropis lutrensis</i>	6	495	501	53.17
<i>Notropis umbratilis</i>	1		1	0.10
<i>Notropis fumeus</i>		16	16	1.69
<i>Pimephales vigilax</i>	23	39	62	6.78
<i>Gambusia affinis</i>		18	18	1.81
<i>Astyanax fasciatus</i>		2	2	0.20
<i>Carploides carpio</i>	1		1	0.10
Total	62	880	942	100.00

Table 3. A Comparison of the Game and Rough Species Caught in Gill Nets from Possum Kingdom Lake, Texas, 1953 - 1954.*

Total Number of Specimens Caught	1,516
Total Weight of Specimens Caught	1,497.45
Average Weight Per Specimen	0.99
Total Weight of Rough Fish	1,143.81
Total Weight of Game Fish	353.64
Total Number of Rough Fish	1,045
Total Number of Game Fish	471
Average Weight Per Rough Fish	1.09
Average Weight Per Game Fish	0.75
Percent Rough Fish (by weight)	76.38
Percent Game Fish (by weight)	23.62
Percent Rough Fish (by number)	68.94
Percent Game Fish (by number)	31.06

* - Drum and Catfish included in game fish.

Table 4. Length, Weight and Coefficient of Condition of Fish Collected from Gill Nets from Possum Kingdom Lake, Texas, 1953-1954

Species	Total Number	Std. L. Range (MM)	St. L. Aver. (MM)	Weight Range (Gm)	Weight Average	"K" Range	"K" Average
Spotted Gar	59	159-495	261	113-2155	456	1.04-3.50	2.22
Longnose Gar	90						
Gizzard Shad	729	187-249	220	142-265	207	1.40-2.89	1.91
Smallmouth Buffalo	160	127-406	349	57-2070	1238	2.50-3.81	3.07
River Carpsucker	36	152-356	289	93-1247	645	2.24-2.73	2.51
European carp	19	191-362	250	198-1134	487	2.70-2.89	2.52
Channel Catfish	77	210-483	325	160-2013	624	1.32-2.30	1.63
Yellow (flathead catfish)	1	406-406	406	1063-1063	1063	2.78-2.78	2.78
White Bass	126	191-305	243	170-851	388	0.89-3.79	2.61
Largemouth Bass	59	159-495	261	113-2155	456	1.04-3.50	2.22
Redear Sunfish	4	102-171	149	42-113	95	2.25-3.21	3.57
Bluegill Sunfish	32	102-133	214	42-113	70	4.25-5.62	4.93
Yellowbelly Sunfish	9	121-146	134	95-142	108	4.10-5.04	4.36
White Crappie	75	114-254	187	57-410	175	1.08-4.42	2.65
Drum	87	184-216	197	142-230	179	2.25-2.29	2.28

Table 5. Results of Netting Collections by Number and Percent of Total Number For Each Species. Possum Kingdom Lake, Texas, 1953 - 1954.

Species	July		Aug.		Sept.		Oct.		Nov.	
	No.	%	No.	%	No.	%	No.	%	No.	%
Spotted Gar	1	0.33	1	0.64			3	1.17	2	1.97
Longnose Gar	16	5.45	21	13.38	11	8.14	12	4.67	5	4.85
Shad	121	40.87	87	55.41	28	20.74	153	59.53	50	48.53
S. M. Buffalo	10	3.37	27	17.20	51	37.77	21	8.17	5	4.85
Carp sucker	12	4.05			2	1.48			2	1.95
Carp	5	1.69	3	1.91	7	5.18	1	0.39		
Channel Catfish	34	11.48	1	0.64	9	6.66	19	7.39	1	0.97
Yellow Catfish										
White Bass	9	3.04	5	3.18	2	1.48	11	4.28	11	10.68
Largemouth Bass	3	1.01			10	7.45	13	5.06	4	3.88
Redear Sunfish							3	1.17		
Bluegill	1	0.33			7	5.18	1	0.39	11	10.67
Y. B. Sunfish					2	1.48	2	0.78		
W. Crappie	3	1.01	9	5.73	5	3.70	18	7.00	12	11.65
Drum	81	27.36	3	1.91	1	0.74				
Total	296	100.0	157	100.00	135	100.00	257	100.00	103	100.00

Table 5. (Cont.) Results of Netting Collections by Number and Percent of Total Number For Each Species, Possum Kingdom Lake, Texas, 1953 - 1954.

Species	Dec.		Jan.		Feb.		Mar.		Apr.		May		Total	
	No.	%	No.	%	No.	%								
Spot. Gar	1	1.37					1	1.64	1	1.28	10	0.65		
L. N. Gar					3	1.09	16	26.23	6	7.70	90	5.93		
Shad	55	75.34	4	14.82	6	11.11	164	59.64	30	49.18	27	34.62	726	47.94
S. M. Buffalo	1	1.37	1	3.70	1	1.85	29	10.55	3	4.92	11	14.10	160	10.55
Carp sucker	2	2.74	1	3.70	1	1.85	7	2.55	3	4.92	6	7.70	36	2.37
Carp							1	0.36			2	2.56	19	1.24
Channel Catfish	1	1.37	1	3.70	4	7.41	3	1.09			4	5.13	77	5.07
Y. Catfish											1	1.28	1	0.06
W. Bass	9	12.33	18	66.67	32	59.26	29	10.55			1	1.28	127	8.43
L. M. Bass	3	4.11	2	7.41	5	9.26	16	5.82	2	3.28	2	2.56	60	3.95
R. E. Sunfish							1	0.36					4	0.26
Bluegill													12	15.38
Y. B. Sunfish	1	1.37					3	1.09	5	8.19	13	0.85		
W. Crappie													3	3.85
Drum													2	2.56
Total	73	100.00	27	100.00	54	100.00	275	100.00	61	100.00	78	100.00	1516	100.00

Table 6. (Cont.) Results of Netting Collections by Weight and Per Cent of Total Weight for each Species, Possum Kingdom Lake, Texas 1953 - 1954

Species	Dec.		Jan.		Feb.		March		April		May		Total	
	Wt.	%	Wt.	%	Wt.	%	Wt.	%	Wt.	%	Wt.	%	Wt.	%
Spot. Gar	2.00	8.76												
L.N. Gar									2.00	1.93			11.50	0.77
Shad	3.25	14.34	1.25	5.58	2.12	4.78	6.30	3.22	68.00	65.74	18.50	22.55	267.61	17.89
Buffalo	2.56	11.30	2.37	10.58	0.12	0.27	80.55	41.09	17.04	16.47	14.16	17.26	327.40	21.86
Carp	3.06	13.50	2.37	10.58	1.31	2.95	45.37	23.14	10.43	10.08	28.54	34.79	447.62	29.90
Ch. Cat.	0.94	4.15	1.12	5.00	3.84	8.66	9.27	4.73	3.43	3.31	11.05	13.47	65.13	4.35
Y. Cat							1.50	0.76			3.74	4.56	24.55	1.63
W. Bass	7.62	33.61	13.66	60.98	26.17	59.00	17.87	9.11			2.34	2.85	2.34	0.15
L.M. Bass	3.00	13.24	1.63	7.28	8.34	18.93	22.14	11.29	0.99	0.95	1.56	1.90	62.44	4.17
R. Sunfish							0.28	0.14					2.05	0.14
Bluegill														
Y. Sunfish	0.25	1.10					0.71	0.35	1.13	1.17	2.15	2.62	3.72	0.28
W. Crappie					2.40	5.41	7.65	3.95	0.37	0.34	3.11	3.11	27.66	1.85
Drum														
Total	22.68	100.00	22.40	100.00	44.30	100.00	196.00	100.00	103.39	100.00	84.04	100.00	1497.45	100.00

* Weight in pounds.

Table 7. Number of Fish Caught per One Hundred Feet of Gill Net (set overnight).

Species	No. of Nets												Average For Yr.
	10	12	8	Aug. Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	
Spotted Gar	0.10	0.08	0.00	0.18	0.33	0.17	0.00	0.00	0.00	0.00	0.33	0.18	0.11
Longnose Gar	1.60	1.75	1.38	0.71	0.83	0.00	0.00	0.00	0.00	0.43	5.33	10.80	1.00
Gizzard Shad	12.10	7.25	3.75	9.25	8.33	9.17	0.37	1.00	23.44	10.00	49.09	8.11	
S. M. Buffalo	1.00	2.25	6.38	1.25	0.83	0.17	0.09	0.17	0.00	1.00	2.00	1.78	
Carp sucker	1.20	0.00	0.25	0.00	0.33	0.34	0.09	0.17	1.00	1.00	10.80	0.40	
Carp	0.50	0.25	0.88	0.06	0.00	0.00	0.00	0.00	0.14	0.00	0.36	0.21	
Channel Catfish	3.40	0.08	1.12	1.14	0.17	0.17	0.09	0.66	0.43	0.00	0.72	0.85	
Yellow Catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.01	
White Bass	0.90	0.42	0.25	0.65	1.83	1.50	1.67	5.66	0.00	0.00	0.18	1.41	
Largemouth Bass	0.30	0.00	1.25	0.77	0.66	0.50	0.18	0.83	2.28	0.66	0.36	0.66	
Bluegill	0.10	0.00	0.88	0.06	1.83	0.00	0.00	0.00	0.00	0.00	21.60	0.36	
R. E. Sunfish	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.05	
White Crappie	0.30	0.75	0.62	1.07	2.00	0.00	0.00	0.83	2.71	0.33	0.54	0.85	
Drum	8.10	0.25	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.96	
Y. B. Sunfish	0.00	0.00	0.00	0.00	0.00	0.17	0.00	0.00	0.43	1.66	0.00	0.10	

Table 8. Stocking of Fish in Possum Kingdom Lake, Texas
1945 - 1954

Year	Bass	W. Crappie	Channel Cat	Warmouth	Bream
1945	2,190,000				
1946	1,934,000				
1947	3,665,000	35,000	51,500	10,000	265,000
1948	2,023,000		7,000		315,000
1949	200,000				
1950	2,200,000				
1951	205,950		38,150		30,000
1952	235,497				
1953	970,555				
1954*	600,000				
1954**	77,000				
Totals	14,301,002	35,000	96,650	10,000	610,000

* - Records up to May 1954.

** - This planting was done by the U. S. Fish Cultural Station.

IMPOUNDMENT SURVEY FORM

Name of Water: Possum Kingdom Lake Investigator: Hambric

Location: Palo Pinto County Date: May 1954

Surface acres: 19,991 Average depth: ? Acre Ft. 733,800 Max. depth: ?

Tributaries: Brazos and Clear Fork Drainage Area: 17,656 sq. mi.

Dam: Length: ? Height: ? Construction: Concrete Year built: 1941

Bottom type: Mud, rock, gravel

Aquatic vegetation: Amount: Abundant Locations: Sand & Bloodweed Islands

Kinds: Nejas, Bloodweeds, Salt Cedar Profile: Rough

Surrounding area: Land use: Farming and grazing Profile: Rough

Water level fluctuation: Severe at times.

Water uses: Hydroelectric, irrigation.

Types of Fishing: Still fishing, casting, trot lines.

No. fishermen seen: ? Catch: Fair

Approx No. Cottages: ? Boats: ? Boat liveries: 15 Free beaches: some

Accessibility: Fair

Fishing Reputation: Good

Previous Five Year Stocking: Largemouth bass, channel catfish, bream.

Pollution: Salt water from Clear Fork of Brazos.

Remarks: None.

Fish Card

Coll. No.: Locality: Possum Kingdom Date: May 28 Collector: Hambric
Time: 12:30 PM.

Description

Shoreline: Shallow, gradual slope

Bottom: Mud

Cover: Sparse

Weather: Present: Hot, scattered clouds Preceding: Hot, clear

Water Temperature: Hot Color: Clear

Surface: Turbidity: 25 ppm

Bottom:

Vegetation:

Submerged: None

Floating: None

Emerged: Short grass

Predators: Longnose gar

Parasites and Disease: None

Tackle Used: Minnow Seine Length: 30' Mesh: 1/4" Depth: 6'

No. of Hauls: 4 Length of hauls: 50'

Species	No.	Species	No.
Notropis venustus	148		
Largemouth bass fry	86		
Gambusia affinis	16		
Notropis lutrensis	98		
Lepomis cyanellus	1		
Lepomis macrochirus	9		
Lepomis microlophus	1		
Pimephales vigilax	3		
Notropis fumeus	1		
Total	363		