JOB COMPLETION REPORT

STATE OF TEXAS

Project No. F4R3 Name Fisheries Investigations and Surveys of the Waters of Region 4-B.

Job No. B-4 Title Inventory of Species Present in Possum Kingdom Lake.

Period Covered November 1, 1955 to October 31, 1956

ABSTRACT

1. Possum Kingdom Lake is a multipurpose reservoir constructed, by the Brazos River Conservation and Reclamation District, on the Brazos River near, Graford, Texas. This lake covers 19,991 surface acres at spillway level and extends into Stephens, Young, and Jack counties with the major portion in Palo Pinto County.

2. The inventory of species present together with relative abundance estimates of the fish population were made from data collected between June 1, 1953 and October 31, 1956.

3. Rough fish made up 76 percent of the total population by number and 80 percent by weight.

4. The most abundant species in the catch was gizzard shad. This species made up 62 percent of the total net catch.

5. Bluegill sunfish were the most numerous game fish but channel catfish provided the greatest poundage of the game species.

6. Redear sunfish introduced into Possum Kingdom in 1951 have become well established and are increasingly prominent in the catch of the still and fly fishermen.

OBJECTIVES

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

HISTORY AND DESCRIPTION

Possum Kingdom was completed in 1941 as a multipurpose reservoir. The primary purposes of this impoundment are to provide water for hydroelectric, irrigation and municipal uses. The secondary purposes are fishing, hunting and recreation. It is owned and operated by the Brazos River Conservation and Reclamation District.

This lake is located on the Brazos River near Graford, Texas and impounds 19,991 surface acres at spillway level. The lake is long and narrow with a shoreline of 310 miles that winds among the foothill type mountains comprising the terrain of these portions of Palo Pinto, Stephens, Young, and Jack Counties. The major portion of the lake lies in Palo Pinto County. The shoreline is irregular and consists of a mixture of gently sloping valleys and high limstone bluffs. These bluffs often extend as far below the water as they do above with many submerged ledges.

Early rains that filled the lake soon after completion of the dam made removal of the original vegetation impossible. This vegetation consisted of large pecan and other hardwood trees along the banks of the river together with large and small mesquites and cedars. These trees are still to be seen during periods of low water and have been augmented with thick stands of willow and salt cedar. The encroachment of terrestrial vegetation follows each period of low water and tends to add to the fertility of the lake. Aquatic vegetation is generally limited to the shoal areas and consists of heavy growths of bushy pondweed (Najas guadalupensis). This plant occurs in the shallow water in such quantities that many of the better fishing areas are choked and motor boats are unable to penetrate water less than six feet in depth. Water having a depth greater than six feet offers no vegetation problem and although this species of vegetation grows at that depth there is clear water above the vegetation and fishing is generally good.

TECHNIQUES USED

Collections and observations were made monthly during the period from November 1, 1955 to October 31, 1956.

Seine collections were made at established seine stations when the water level permitted. The heavy growth of terrestrial vegetation in the areas that were exposed during the periods of low water made the findings of suitable seine sites difficult as the water rose. The problem was much the same when the lack of rainfall together with an excessive demand for water lowered the lake below the usual low level. The vegetation that had originally covered the lake bed was not cleared, therefore many obstructions were present and as the level descended these were to be contended with when seining was attempted.

Net collections were made with gill nets. These nets were usually $1\frac{1}{2}$ inch square mesh nets 100 feet long and 8 feet deep. Some 2 inch and 3 inch square mesh nets were used but the majority of the nets were of the smaller size. These nets were set at stations established during the previous segments but the changes in water level forces the net stations to be shifted. The middle one-half of the lake was netted as this area was the most accessible and provided habitats similar to those found at either extremity. This area is also the most heavily fished. The specimens taken were weighed and measured to provide comparative data and field analysis of the stomachs were made to determine food habits. These specimens were examined to detect the presence of parasites or disease. The data taken was recorded on forms devised for that purpose and taken to the laboratory for further processing.

DISCUSSION

The checklist of species from Possum Kingdom Lake, (Table 1), includes thirty-six species. Two of these species are generally confined to marine habitats. The Rio Grande tetra and striped mullet were introduced by bait dealers and have not become established as yet. There is some evidence that the striped mullet have been able to survive since the first record was made in 1954 when two specimens were taken by contract fishermen. These fish weighed over ten pounds as did the last record which was taken by contract fisherman, H. L. Moon in February 1956. This specimen weighed twelve pounds. The Rio Grnade tetra has not appeared in collections since 1954 and are presumed to be unable to adapt to the lower temperatures of this region.

The fluctuations of the water level made seining at the eleven seining beaches (Map 1) rather difficult. Stations 6, 10, and 11 were usable and collections at these totaled 251 specimens (Table 2). The smaller sunfishes made up the bulk of these collections. Except for Station 10 they were the most predominant group in the catch.

The sunfish group provided 170 specimens or 68 percent while the two species of Notropis made up 19 percent along with largemouth bass which were the fifth most numerous species with 10 percent of the total.

The net collections provided some rather interesting comparisons. Table 3 presents the comparative data on the catch as far as rough fish and game fish are concerned. A total of 2,086 specimens were taken, weighing 1,316.69 pounds. Rough fish made up 84.65 percent of this number and 84.51 percent of the total weight. The average weight of the rough fish was .63 pounds and of the game fish was .64 pounds. These fish were taken in overnight sets of gill nets at the twelve net stations established in the central portion of the lake (Map 2). All of these stations could not be used on each netting trips as the fluctuations of the water level left some of them in water too shallow for netting at times and made others unprofitable when the water became to deep. There were some stations that could be used by moving in or out as the water level changed.

The data presented in Table 4 shows the results of the netting in terms of fish taken per 100 feet of gill net set overnight in Possum Kingdom Lake. The variations in the catch for the different months of the netting period is shown. The 87 net sets totaled 8,750 feet of net and took 2,086 fish weighing 1,316.69 pounds. The best catches from the standpoint of numbers taken per 100 feet of net were made in November, March, and July when 55.25, 44.88, and 32.33 fish were taken respectively. The weights varied from month to month and February with only 24.13 fish per 100 feet of net provided 21.41 pounds to follow the January total of 36.86 pounds. March and July produced 21.14 and 21.25 pounds respectively. The June catch was lowest in both number and weight with 6.38 fish weighing 5.16 pounds per 100 feet of net.

The catch is further broken down in Table 10 to show the number of each species taken per month per 100 feet of gill net. Gizzard shad dominated the catch each month with November and March providing the greatest average catch with 48.25 and 36.75 specimens per 100 feet of gill net. The average for the entire period was 18.81 shad while the bluegill sunfish made a rather poor second with 1.1 specimens per 100 feet of net. The highest bluegill catch was in May when 3.62 were taken per 100 feet of net and November and March with 2.13 and 2.5 respectively.

The length, weight, and coefficient of condition for each species taken in the gill nets are presented in Table 5 and show some change from the previous two segments. The average lengths and weights of the various species are compared in Table 16. The average length and weight of these fish generally rose in the 1954 - 1955 period when the lake filled after a prolonged period of low water. This condition was reversed in the 1955 - 1956 period when a declining lake level tended to reduce the growth rate appreciably. There were notable exceptions to this, however, for gizzard shad, largemouth bass, and white crappie showed an increase in average length and weight each period while yellowbelly sunfish increased in average length but had a loss of average weight. The gain experienced by the gizzard shad was very pronounced since the 1,646 specimens taken in the 1955 - 1956 segment exceeded the total of the other two segments by 122 fish. The average gain in length was 13 millimeters and in weight was 84 grams. The gain was less pronounced in the largemouth bass and white crappie.

The 1,646 gizzard shad made up 78.9 percent of the total catch (Tables 6 - 7) while 96 bluegills and 76 channel catfish comprised 4.6 and 3.64 percent, respectively. In Tables 8 and 9 the dominance of gizzard shad, in the population of Possum Kingdom Lake, is quite apparent. Although this is a comparatively small species, 812.2 pounds or 62.2 percent of the total weight were shad. The larger species such as longnose gar, river carpsucker and channel catfish provided 10.9, 7.2 and 5.7 percent respectively. Largemouth bass were rather low in number but constituted 4.1 percent of the total weight.

The stomachs of the majority of fish taken in the gill nets were empty but of the 138 that contained food, 72.6 percent contained algae (Table 11).

The 50 sunfish that had fed on algae represented 89.2 percent of the total and of the 53 channel catfish, 45 or 84.9 percent had consumed algae. White bass proved to be primarily feeding upon fish since 50 percent had eaten unidentifiable fish and 37.5 percent had eaten shad. Largemouth bass also preferred fish since 50 percent contained shad and 30 percent had eaten fish that were unidentifiable. White crappie fed largely on fish as 63.6 percent contained unidentifiable fish remains while 27.3 percent had consumed algae.

Stocking records are available for Possum Kingdom since 1945 (Table 12). The original stocking was made in 1941 but the fish were planted by more than one hatchery and exact figures have not been available to the writer. The bulk of the stocking has been bass fry. A total of 15,179,002 bass have been planted since 1945 along with 339,000 sunfish, 142,050 channel catfish, 35,000 white crappie, and 10,000 warmouth bass. The 1956 stocking was limited to 44,000 sunfish and 5,400 channel catfish since the 1955 spawn of bass and crappie appeared to be more than ample.

The presence of natural salt deposits together with saltwater from oil production above Possum Kingdom Lake are of some concern to those using or planning to use the water from this lake. Table 13 presents monthly data as reported by the U. S. Geological Survey from their analysis of the water released from Possum Kingdom Dam. Considerable fluctuation in the concentration of various elements is noted but as yet the only mortality has occurred on the river above the lake when excessive salinity in a pool above a small retention dam was observed. Chemical data is available from the publications of the U. S. Geological Survey for 1952, 1953, 1954, and 1956 but data on 1955 was not available to the writer. Table 18 presents such comparative data as is at hand and it will be noted that 1953 and 1956 were periods of highest concentration of the chemicals present. These periods of concentration are also the periods of low rainfall on the watershed. This lack of rainfall reduces the dilution of salinity and other mineral content of the effluent from the natural salt deposits and salt pits in the oil fields along the Clear Fork and Salt Fork of the Brazos above the lake.

The three segments covered by this project reflect the complete cycle of lake levels. The 1953 - 1954 segment was a period of low water while the lake filled and remained at a high level during the 1954 - 1955 segment and dropped to a low level during the 1955 - 1956 segment. Table 14 presents a comparison of the results of seine collections made during each of the three segments covered by the project. The 1953 - 1954 segment was highly productive of forage species with 85.1 percent of the total being species that provide considerable food for the bass, sunfish and catfish as well as other predacious species. The 1954 - 1955 seine collections were composed of 36 percent forage species and 64 percent game fish. Largemouth bass made up 18.7 percent of the game fish with the remaining 45.3 percent sunfish, largely bluegill and yellowbelly. The 1955 - 1956 collection was composed of an even smaller percentage of forage species since 78.1 percent were game fish. Only 10.4 percent were largemouth bass and the majority of the remaining game fish was divided between three species of sunfish. The bluegill, yellowbelly, and redear sunfish provided 37.4, 18.7 and 10.8 percent of the total catch respectively. The increase in the catch of redear sunfish is of importance because this species was introduced into Possum Kingdom in the fall of 1951 and is beginning to show in increasing numbers in the catch of the fishermen.

A comparison of the catch of rough fish and game fish for the three segments is presented in Table 15. The 1954 - 1955 segment provided the smaller number of specimens but the greater weight. The 1955 - 1956 segment provided the greatest number of

specimens but the predominance of gizzard shad in the catch reduced the total weight to the lower of the three segments. The percentage of rough fish both by weight and number showed a rather regular increase from segment to segment.

Table 17 offers comparative data on species distribution by weight and percentage for the three segments covered by this study. Gizzard shad made up 21.86 percent of the total net catch in the 1953 - 1954 segment but increased to 30.99 percent in 1954 - 1955 and to 62.2 percent in the 1955 - 1956 segment. A similar increase was noted for the redear sunfish, but the longnose gar, smallmouth buffalo, white bass, and drum suffered a decrease in percentage. The decrease of the smallmouth buffalo was quite significant since an examination of data collected drom the contract netters reports reveals that the catch of this species declined from 1.33 pounds per surface acre-per month in 1954 to 1.18 pounds in 1955 and 1.08 pounds in 1956.

The other species did not show a consistent loss or gain from segment to segment.

RECOMMENDATIONS

1. The increase of rough fish in the catch both by number and weight indicates a need for better rough fish control methods.

2. The dominance of gizzard shad is more pronounced in each succeeding segment. This species is controlled very little by the contract netting operation since there is no market for them. A selective kill of shad could serve a useful purpose, but would be quite expensive.

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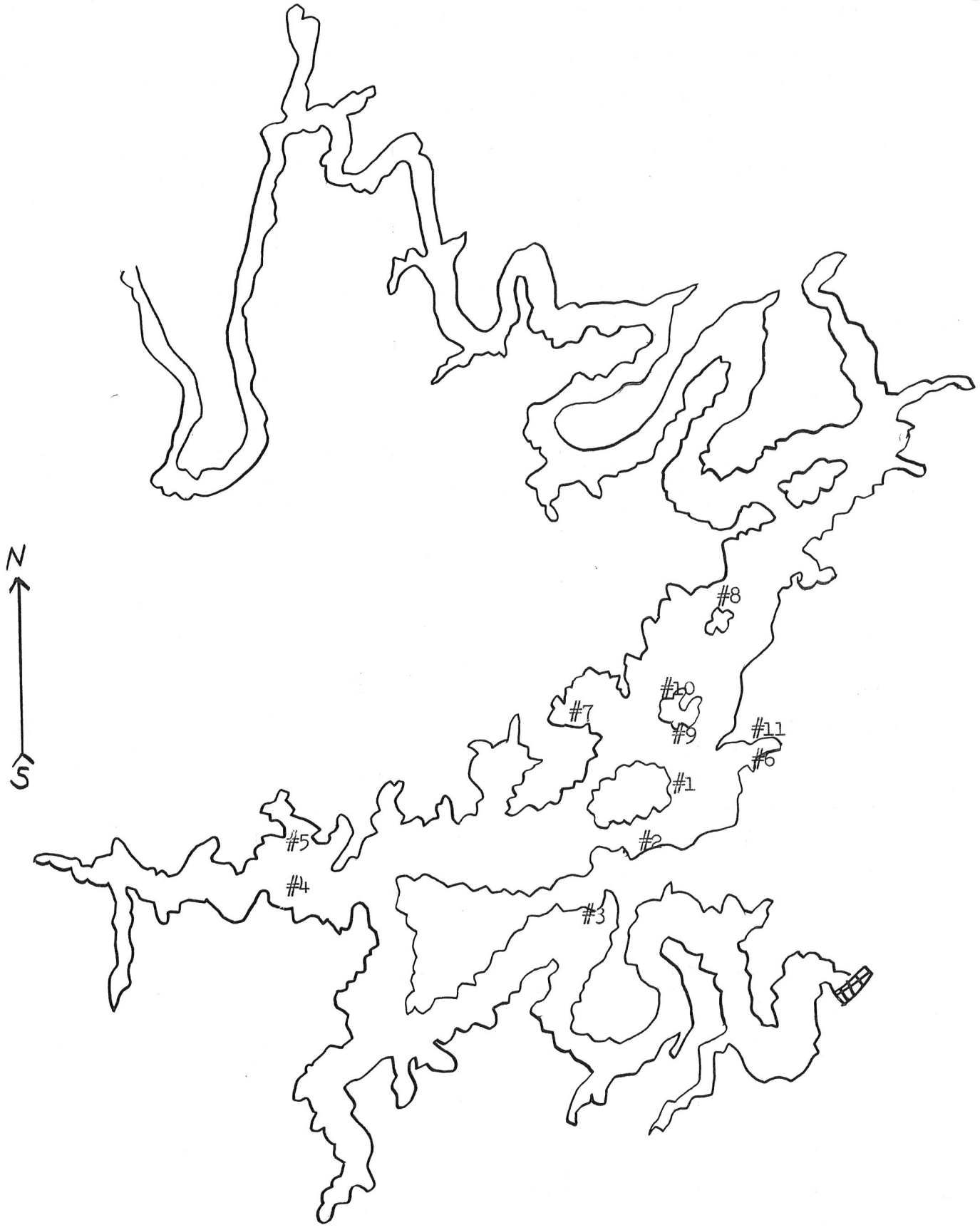
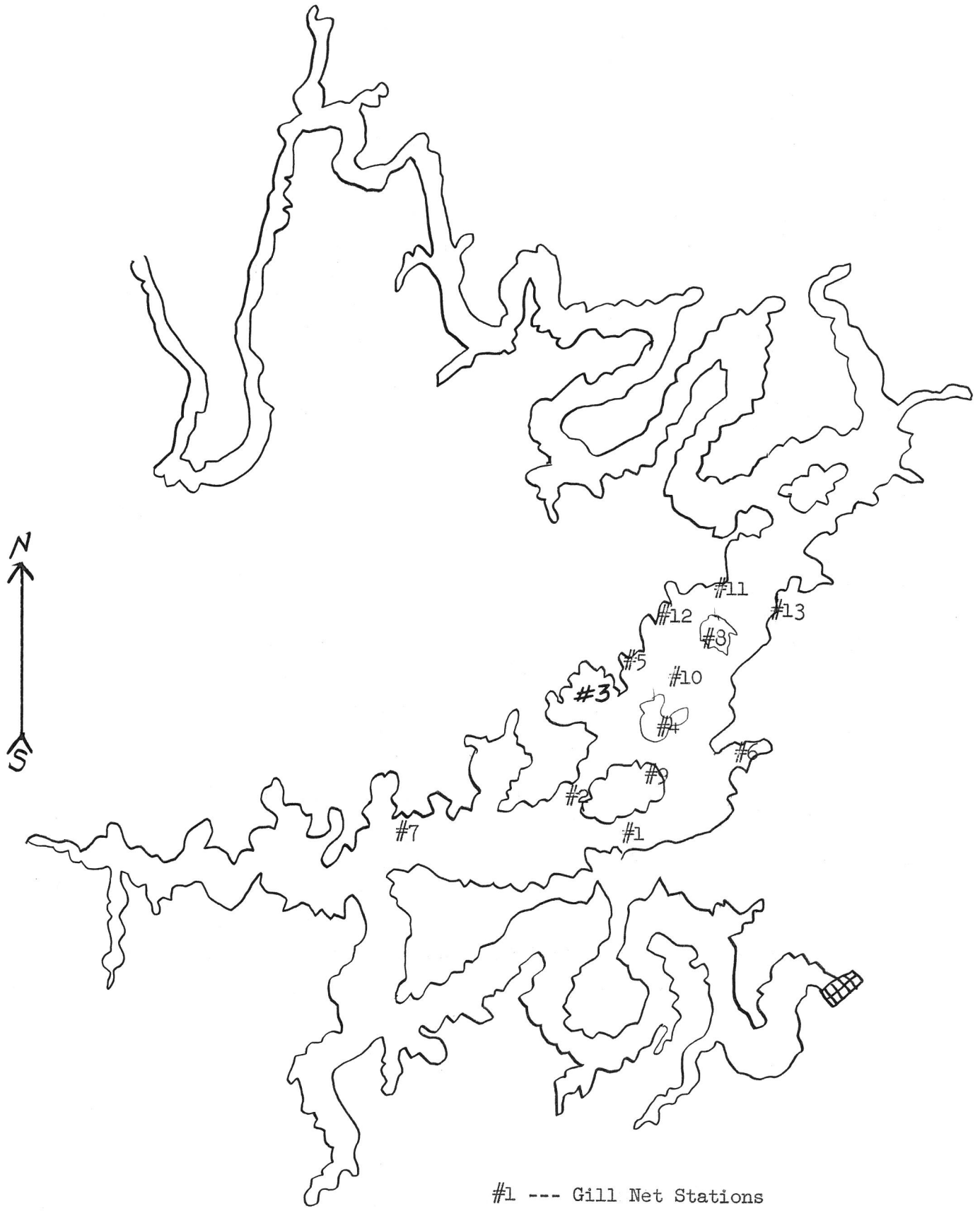
Date March 27, 1957

Map. 1. Seine Collection Stations on Possum Kingdom Lake.



#1 --- Seine Station

Map 2. Netting Stations on Possum Kingdom Lake.



#1 --- Gill Net Stations

Table 1. Checklist of Fishes from Possum Kingdom Lake, June 1, 1953 through October 31, 1956.

Scientific Name	Common Name
Lepisosteus platostomus	shortnose gar
Lepisosteus productus	spotted gar
Lepisosteus osseus	longnose gar
Dorosoma cepedianum	gizzard shad
Carpiodes carpio	river carpsucker
Ictiobus bubalus	smallmouth buffalo
Moxostoma congestum	gray redhorse
Cyprinus carpio	European carp
Notropis oxyrhynchus	sharpnose shiner
Notropis fumeus	ribbon shiner
Notropis umbratilis	redfin shiner
Notropis venustus	blacktail shiner
Notropis lutrensis	Plains red shiner
Notropis deliciosus	Southern sand shiner
Notropis atrocaudalis	spottail shiner
Pimephales vigilax	parrot minnow
Ictalurus punctatus	channel catfish
Ictalurus natalis	yellow bullhead
Pylodictus olivaris	flathead catfish
Fundulus notatus	blackstripe topminnow
Gambusia affinis	mosquitofish
Roccus chrysops	white bass
Micropterus punctulatus	spotted bass
Micropterus salmoides	largemouth black bass
Chaenobryttus gulosus	warmouth
Lepomis cyanellus	green sunfish
Lepomis punctatus	spotted sunfish
Lepomis microlophus	redear sunfish
Lepomis macrochirus	bluegill sunfish
Lepomis auritus	yellowbelly sunfish
Pomoxis annularis	white crappie
Pomoxis nigromaculatus	black crappie
Percina caprodes	logperch
Aplodinotus grunniens	freshwater drum
Astyanax fasciatus	Rio Grande tetra
* Mugil cephalus	striped mullet

* Note - This species is a marine form that has probably been introduced by bait dealers.

Table 2. Species of Fishes Collected by Seining, from Possum Kingdom, by Number of each Species taken at each Seining Station, November 1, 1955 - October 31, 1956.

Fish Species	Station 6	Station 10	Station 11	Total
Dorosoma cepedianum	0	0	1	1
Ictiobus bubalus	0	0	1	1
Notropis venustus	24	12	0	36
Notropis lutrensis	0	12	0	12
Pimephales vigilax	2	0	0	2
Fundulus notatus	0	0	1	1
Gambusia affinis	0	0	2	2
Micropterus salmoides	2	0	24	26
Lepomis punctatus	1	0	0	1
Lepomis cyanellus	0	1	0	1
Lepomis microlophus	2	0	25	27
Lepomis macrochirus	54	0	40	94
Lepomis auritus	0	0	47	47
Total	85	25	141	251

Table 3. A Comparison of Game and Rough Species Caught in Gill Nets from Possum Kingdom Lake, Texas, November 1, 1955 - October 31, 1956. *

Total Number Specimens Caught	2,086
Total Weight Specimens Caught (Pounds)	1,316.69
Average Weight Per Specimen (Pounds)	.6312
Total Weight of Rough Fish (Pounds)	1,112.75
Total Weight of Game Fish (Pounds)	203.94
Total Number of Rough Fish	1,766
Total Number of Game Fish	320
Average Weight Per Rough Fish (Pounds)	.63
Average Weight Per Game Fish (Pounds)	.64
Percent Rough Fish (by Weight)	84.51
Percent Game Fish (by Weight)	15.48
Percent Rough Fish (by Number)	84.65
Percent Game Fish (by Number)	15.34

* All catfish included in game fish.

Table 4. Success of Gill Netting at Possum Kingdom Lake in Terms of Number and Pounds of Fish Caught, November 1, 1955 - October 31, 1956.

Month	No. of Net Sets	No. Ft. Net Sets	No. Fish Caught	No. Lbs. Fish Caught	Avg. No. Fish Per Net	Avg. No. Fish Per 100' Net	Avg. No. Lbs. Fish Per Net	Avg. No. Pounds Fish Per 100'
November	8	800	442	294.90	55.25	55.25	36.86	36.86
December	6	600	72	52.87	12.00	12.00	8.81	8.81
January	8	800	109	66.75	13.63	13.63	8.34	8.34
February	8	800	193	171.26	24.13	24.13	21.41	21.41
March	8	800	359	169.12	44.88	44.88	21.14	21.14
April	8	800	191	125.23	23.88	23.88	15.65	15.65
May	10	1050	157	131.71	15.70	14.95	13.17	12.54
June	8	800	51	41.28	6.38	6.38	5.16	5.16
July	3	300	97	63.75	32.33	32.33	21.25	21.25
August	6	600	91	55.75	15.17	15.17	9.29	9.29
September	8	800	163	97.81	20.38	20.38	12.23	12.23
October	6	600	161	100.26	26.83	26.83	16.71	16.71
Totals	87	8,750	2,086	1,316.69				
Monthly Avg.					23.98	23.84	15.14	15.05

Table 5. Length, Weight, and Coefficient of Condition of Fish Collected by Gill Nets from Possum Kingdom Lake November 1, 1955 - October 31, 1956.

Species	Total No.	Std. (mm) Length Range	(mm) Length Av.	(gm) Weight Range	(gm) Weight Av.	K Range	K Average.
L. productus	19	445 - 640	518	624 -1531	680	.56-.64	.60
L. osseus	36	470 -1100	769	652 -6265	1918	.47-.63	.55
D. cepedianum	1,646	180 - 290	235	160 - 482	321	1.9 -2.7	2.3
I. bubalus	6	220 - 402	300	280 -2240	1030	2.6 -3.4	3.2
C. carpio	54	200 - 350	275	205 -1106	655	2.5 -2.6	2.5
Cy. carpio	3	220 - 255	242	265 - 380	338	2.4 -2.5	2.4
I. punctatus	76	225 - 460	293	115 -1843	443	1.3 -2.13	1.7
P. olivaris	1	320 - 320	320	510 - 510	510	1.57-1.57	1.57
R. chrysops	30	180 - 300	240	200 - 709	451	2.6 -3.5	3.0
M. salmoides	38	180 - 480	284	102 -3289	678	1.55-3.4	2.37
C. doronarius	3	170 - 175	173	159 - 177	171	3.23-3.40	3.29
L. microlophus	14	125 - 180	152	65 - 180	118	2.9 -3.9	3.3
L. macrochirus	96	100 - 160	130	20 - 140	80	3.0 -3.45	3.23
L. auritus	12	130 - 156	139	82 - 126	101	3.23-4.60	3.92
P. annularis	47	130 - 253	192	55 - 415	235	2.5 -2.83	2.67
P. nigromaculatus	3	170 - 180	175	128 - 139	134	2.2 -2.9	2.52
A. grunniens	2	230 - 230	230	235 - 240	238	1.95-1.95	1.95
Total	2,086						

Table 6. Species Distribution in Net Catch by Number in Possum Kingdom Lake, November 1, 1955 - October 31, 1956.

Species	November	December	January	February	March	April	May	June	July	Aug.	Sept.	Oct.	Total
L. productus	1	1	0	0	4	5	6	1	0	0	0	1	19
L. osseus	1	0	0	0	1	3	13	4	5	3	2	4	36
D. cepedianum	386	61	68	177	294	132	66	33	84	77	132	136	1646
I. bubalus	1	0	0	0	2	2	0	0	0	0	0	1	6
C. carpio	9	0	4	3	5	13	17	2	0	0	0	1	54
Cy. carpio	0	0	0	0	0	2	1	0	0	0	0	0	3
I. punctatus	3	1	26	9	5	0	0	4	4	6	12	6	76
P. olivaris	0	0	0	0	0	0	0	0	0	0	0	1	1
R. chrysops	2	1	4	1	4	0	1	0	2	3	10	2	30
M. salmoides	11	7	2	2	6	2	5	0	0	1	0	2	38
C. gulosus	0	0	0	0	0	3	0	0	0	0	0	0	3
L. microlophus	2	0	0	1	4	0	6	1	0	0	0	0	14
L. macrochirus	17	1	5	0	20	6	38	6	2	1	0	0	96
L. auritus	0	0	0	0	0	11	1	0	0	0	0	0	12
P. annularis	9	0	0	0	10	12	3	0	0	0	7	6	47
P. nigromaculatus	0	0	0	0	3	0	0	0	0	0	0	0	3
A. grunniens	0	0	0	0	1	0	0	0	0	0	0	1	2
Total	442	72	109	193	359	191	157	51	97	91	163	161	2,086

Table 7. Species Distribution in Net Catch by Percentage of Number in Possum Kingdom Lake, November 1, 1955 - October 31, 1956.

Species	November %	December %	January %	February %	March %	April %
L. productus	0.2	1.4	0.0	0.0	1.1	2.6
L. osseus	0.2	0.0	0.0	0.0	0.3	1.6
D. cepedianum	87.3	84.7	62.4	91.7	81.9	69.1
I. bubalus	0.2	0.0	0.0	0.0	0.6	1.0
C. carpio	2.0	0.0	3.7	1.6	1.4	6.8
Cy. carpio	0.0	0.0	0.0	0.0	0.0	1.0
I. punctatus	0.7	1.4	23.8	4.7	1.4	0.0
P. olivaris	0.0	0.0	0.0	0.0	0.0	0.0
R. chrysops	0.5	1.4	3.7	0.5	1.1	0.0
M. salmoides	2.6	9.7	1.8	1.0	1.7	1.0
C. gulosus	0.0	0.0	0.0	0.0	0.0	1.6
L. microlophus	1.4	0.0	0.0	0.5	1.1	0.0
L. macrochirus	3.8	1.4	4.6	0.0	5.5	3.2
L. auritus	0.0	0.0	0.0	0.0	0.0	5.8
P. annularis	2.0	0.0	0.0	0.0	2.8	6.3
P. nigromaculatus	0.0	0.0	0.0	0.0	0.8	0.0
A. grunniens	0.0	0.0	0.0	0.0	0.3	0.0
Total	100.00	100.00	100.00	100.00	100.00	100.00

Table 7. (Continued).

Species	May %	June %	July %	August %	September %	October %	Total %
L. productus	3.8	2.0	0.0	0.0	0.0	0.6	0.91
L. osseus	8.3	7.8	5.0	3.0	1.2	2.5	1.72
D. cepedianum	42.1	64.7	87.0	85.0	81.0	84.5	78.90
I. bubalus	0.0	0.0	0.0	0.0	0.0	0.6	0.30
C. carpio	10.8	3.9	0.0	0.0	0.0	0.6	2.60
Cy. carpio	0.6	0.0	0.0	0.0	0.0	0.0	0.14
I. punctatus	0.0	7.8	4.0	7.0	7.4	3.7	3.64
P. olivaris	0.0	0.0	0.0	0.0	0.0	0.6	0.05
R. chrysops	0.6	0.0	2.0	3.0	6.1	1.3	1.44
M. salmoides	3.2	0.0	0.0	1.0	0.0	1.3	1.82
C. gulosus	0.0	0.0	0.0	0.0	0.0	0.0	0.14
L. microlophus	3.8	2.0	0.0	0.0	0.0	0.0	0.67
L. macrochirus	24.3	11.8	2.0	1.0	0.0	0.0	4.60
L. auritus	0.6	0.0	0.0	0.0	0.0	0.0	0.58
P. annularis	1.9	0.0	0.0	0.0	4.3	3.7	2.25
P. nigromaculatus	0.0	0.0	0.0	0.0	0.0	0.0	0.14
A. grunniens	0.0	0.0	0.0	0.0	0.0	0.6	0.10
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table 8. Species Distribution in Net Catch by Weight in Possum Kingdom Lake, November 1, 1955 - October 31, 1956.

Species	November Weight	December Weight	January Weight	February Weight	March Weight	April Weight	May Weight
L. productus	1.50	1.00	0.00	0.00	9.12	9.37	11.88
L. osseus	4.13	0.00	0.00	0.00	2.19	8.81	44.94
D. cepedianum	245.88	28.13	32.25	98.33	118.81	64.94	28.88
I. bubalus	6.19	0.00	0.00	0.00	3.13	6.12	0.00
C. carpio	16.19	0.00	6.63	6.56	9.13	23.81	28.50
Cy. carpio	0.00	0.00	0.00	0.00	0.00	1.40	0.84
I. punctatus	3.25	0.37	21.06	10.06	3.48	0.00	0.00
P. olivaris	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R. chrysops	1.20	0.57	3.72	0.44	2.52	0.00	0.67
M. salmoides	6.72	22.50	1.94	1.63	8.10	1.44	6.06
C. gulosus	0.00	0.00	0.00	0.00	0.00	1.13	0.00
L. microlophus	0.63	0.00	0.00	0.24	1.13	0.00	1.57
L. macrochirus	5.28	0.30	1.15	0.00	6.29	1.01	7.49
L. auritus	0.00	0.00	0.00	0.00	0.00	2.45	0.12
P. annularis	3.93	0.00	0.00	0.00	3.81	4.75	0.76
P. nigromaculatus	0.00	0.00	0.00	0.00	0.88	0.00	0.00
A. grunniens	0.00	0.00	0.00	0.00	0.53	0.00	0.00
Total	294.90	52.87	66.75	117.26	169.12	125.23	131.71

Table 8. (Continued).

Species	June Weight	July Weight	August Weight	September Weight	October Weight	Total Weight
L. productus	1.81	0.00	0.00	0.00	1.44	36.12
L. osseus	18.23	15.99	11.80	19.98	17.88	143.96
D. cepedianum	13.00	40.86	31.81	54.75	60.56	812.20
I. bubalus	0.00	0.00	0.00	0.00	0.62	16.06
C. carpio	2.30	0.00	0.00	0.00	2.00	95.12
Cy. carpio	0.00	0.00	0.00	0.00	0.00	2.24
I. punctatus	4.23	4.54	5.09	13.32	11.08	75.48
P. olivaris	0.00	0.00	0.00	0.00	1.13	1.13
R. chrysops	0.00	2.06	2.35	8.41	1.08	23.02
M. salmoides	0.00	0.00	4.50	0.00	1.08	53.97
C. gulosus	0.00	0.00	0.00	0.00	0.00	1.13
L. microlophus	0.26	0.00	0.00	0.00	0.00	3.83
L. macrochirus	1.44	0.30	0.20	0.00	0.00	23.46
L. auritus	0.00	0.00	0.00	0.00	0.00	2.57
P. annularis	0.00	0.00	0.00	2.35	2.87	18.47
P. nigromaculatus	0.00	0.00	0.00	0.00	0.00	0.88
A. grunniens	0.00	0.00	0.00	0.00	0.52	1.05
Total	41.28	63.75	55.75	97.81	100.26	1,316.69

Table 9. Species Distribution in Net Catch by Percentage of Weight in Possum Kingdom Lake, November 1, 1955 - October 31, 1956.

Species Percentage (Wt.)	November %	December %	January %	February %	March %	April %
L. productus	0.5	1.9	0.0	0.0	5.4	7.5
L. osseus	1.4	0.0	0.0	0.0	1.3	7.0
D. cepedianum	83.4	53.2	48.3	83.8	70.3	51.8
I. bubalus	2.1	0.0	0.0	0.0	1.9	4.9
C. carpio	5.5	0.0	9.9	5.6	5.3	19.0
Cy. carpio	0.0	0.0	0.0	0.0	0.0	1.1
I. punctatus	1.1	0.7	31.6	8.6	2.1	0.0
P. olivaris	0.0	0.0	0.0	0.0	0.0	0.0
R. chrysops	0.4	1.1	5.6	0.4	1.5	0.0
M. salmoides	2.3	42.5	2.9	1.4	4.7	1.1
C. gulosus	0.0	0.0	0.0	0.0	0.0	0.9
L. microlophus	0.2	0.0	0.0	0.2	0.7	0.0
L. macrochirus	1.8	0.6	1.7	0.0	3.7	1.8
L. auritus	0.0	0.0	0.0	0.0	0.0	2.0
P. annularis	1.3	0.0	0.0	0.0	2.3	3.8
P. nigromaculatus	0.0	0.0	0.0	0.0	0.5	0.0
A. grunniens	0.0	0.0	0.0	0.0	0.3	0.0
Total	100%	100%	100%	100%	100%	100%

Table 9. (Continued).

Species Percentage (Wt.)	May %	June %	July %	August %	September %	October %	Total %
L. productus	9.0	4.4	0.0	0.0	0.0	1.4	2.7
L. osseus	34.1	44.2	25.1	21.2	20.3	17.8	10.9
D. cepedianum	21.9	31.5	64.1	57.0	56.0	60.4	62.2
I. bubalus	0.0	0.0	0.0	0.0	0.0	0.6	1.2
C. carpio	21.6	5.6	0.0	0.0	0.0	2.0	7.2
Cy. carpio	0.6	0.0	0.0	0.0	0.0	0.0	0.2
I. punctatus	0.0	10.2	7.1	9.1	12.6	11.1	5.7
P. olivaris	0.0	0.0	0.0	0.0	0.0	1.1	0.1
R. chrysops	0.5	0.0	3.2	4.2	8.6	1.1	1.7
M. salmoides	4.6	0.0	0.0	8.1	0.0	1.1	4.1
C. gulosus	0.0	0.0	0.0	0.0	0.0	0.0	0.1
L. microlophus	1.2	0.6	0.0	0.0	0.0	0.0	0.3
L. macrochirus	5.7	3.5	0.5	0.4	0.0	0.0	1.8
L. auritus	0.1	0.0	0.0	0.0	0.0	0.0	0.2
P. annularis	0.6	0.0	0.0	0.0	2.4	2.9	1.4
P. nigromaculatus	0.0	0.0	0.0	0.0	0.0	0.0	0.1
A. grunniens	0.0	0.0	0.0	0.0	0.0	0.5	0.1
Total	100%	100%	100%	100%	99.9%	100%	100%

Table 10. Number of Each Species Caught per Month per 100 Feet of Gill Net (set overnight) in Possum Kingdom Lake, November 1, 1955 - October 31, 1956.

No. 100' Net Species	8 November	6 December	8 January	8 February	8 March	8 April
L. productus	0.13	0.17	0.00	0.0	0.50	0.63
L. osseus	0.13	0.00	0.00	0.00	0.13	0.37
D. cepedianum	48.25	10.17	8.50	22.13	36.75	16.50
I. bubalus	0.13	0.00	0.00	0.00	0.25	0.25
C. carpio	1.13	0.00	0.50	0.37	0.63	1.63
Cy. carpio	0.00	0.00	0.00	0.00	0.00	0.25
I. punctatus	0.37	0.17	3.25	1.13	0.63	0.00
P. olivaris	0.00	0.00	0.00	0.00	0.00	0.00
R. chrysops	0.30	0.17	0.50	0.13	0.50	0.00
M. salmoides	1.37	1.17	0.25	0.25	0.75	0.25
C. gulosus	0.00	0.00	0.00	0.00	0.00	0.37
L. microlophus	0.30	0.00	0.00	0.13	0.50	0.00
L. macrochirus	2.13	0.17	0.63	0.00	2.50	0.75
L. auritus	0.00	0.00	0.00	0.00	0.00	1.37
P. annularis	1.13	0.00	0.00	0.00	1.25	1.50
P. nigromaculatus	0.00	0.00	0.00	0.00	0.37	0.00
A. grunniens	0.00	0.00	0.00	0.00	0.13	0.00
Total	55.37	12.02	13.63	24.14	44.89	23.87

Table 10. (Continued).

No. 100' Nets Species	10.5 May	8 June	3 July	6 August	8 September	6 October	87.5 Total
L. productus	0.57	0.13	0.00	0.00	0.00	0.17	0.22
L. osseus	1.24	0.50	1.67	0.50	0.25	0.67	0.41
D. cepedianum	6.28	4.13	28.00	12.83	16.50	22.67	18.81
I. bubalus	0.00	0.00	0.00	0.00	0.00	0.17	0.07
C. carpio	1.62	0.25	0.00	0.00	0.00	0.17	0.62
Cy. carpio	0.10	0.00	0.00	0.00	0.00	0.00	0.03
I. punctatus	0.00	0.50	1.33	1.00	1.50	1.00	0.87
P. olivaris	0.00	0.00	0.00	0.00	0.00	0.17	0.01
R. chrysops	0.10	0.00	0.67	0.50	1.25	0.33	0.34
M. salmoides	0.48	0.00	0.00	0.17	0.00	0.33	0.43
C. gulosus	0.00	0.00	0.00	0.00	0.00	0.00	0.03
L. microlophus	0.57	0.13	0.00	0.00	0.00	0.00	0.16
L. macrochirus	3.62	0.75	0.67	0.17	0.00	0.00	1.10
L. auritus	0.10	0.00	0.00	0.00	0.00	0.00	0.14
P. annularis	0.28	0.00	0.00	0.00	0.88	1.00	0.54
P. nigromaculatus	0.00	0.00	0.00	0.00	0.00	0.00	0.03
A. grunniens	0.00	0.00	0.00	0.00	0.00	0.17	0.02
Total	14.96	6.39	32.34	15.17	20.38	26.85	23.84

Table 11. Frequency of Occurrence of Food Organisms from Stomachs of Fish taken in Gill Nets, from Possum Kingdom Lake, November 1, 1955 - October 31, 1956.

Food Items / Species	Algae		Maize		Grasshopper		Beetles		Bugs		Shad		Sunfish		Fish Remains		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Channel Cat	45	84.9	1	1.9	2	3.8	0	0.0	0	0.0	3	5.6	1	1.9	1	1.9	53	100.0
White Bass	1	12.5	0	0.0	0	0.0	0	0.0	0	0.0	3	37.5	0	0.0	4	50.0	8	100.0
L. M. Bass	1	10.0	0	0.0	0	0.0	0	0.0	0	0.0	1	10.0	5	50.0	3	30.0	10	100.0
Sunfish	50	89.2	0	0.0	0	0.0	4	7.2	2	3.6	0	0.0	0	0.0	0	0.0	56	100.0
White Crappie	3	27.3	0	0.0	0	0.0	0	0.0	0	0.0	1	9.1	0	0.0	7	63.6	11	100.0
Totals	100		1		2		4		2		8		6		15		138	
Averages		72.6		0.7		1.4		2.9		1.4		5.8		4.4		10.9		100.0

Table 12. Stocking of Fish In Possum Kingdom Lake, Texas, Since 1945.

	SPECIES PLANTED						
Year	Bass	White Crappie	Black Crappie	Channel Catfish	Warmouth	Sunfish	Total
1945	2,190,000						2,190,000
1946	1,934,000						1,934,000
1947	3,665,000	35,000		51,500	10,000	265,000	4,026,500
1948	2,023,000			7,000			2,030,000
1949	200,000						200,000
1950	2,200,000						2,200,000
1951	205,950			38,150		30,000	274,000
1952	235,497						235,497
1953	970,555						970,555
1954	754,000						754,000
1955	701,000			40,000			741,000
1956				5,400		44,000	49,400
Totals	15,079,002	35,000		142,050	10,000	339,000	15,605,052

Table 13. Monthly Variations in Chemical Content of Brazos River Water at Possum Kingdom Dam From January 1, 1956 - October 31, 1956. *

Month Parts per million	January ppm	February ppm	March ppm	April ppm	May ppm	June ppm	July ppm	Aug. ppm	Sept. ppm.	Oct. ppm.	Average ppm
Silica (SiO_2)	13	9.6	12	10	10	11	9.6	10	11	12	11
Calcium (Ca)	266	234	212	189	184	183	185	203	214	219	209
Magnesium (Mg)	40	30	32	28	26	23	27	30	32	30	30
Sodium+Potassium (Na+K) (Calculated)	620	511	458	374	340	359	379	434	515	501	449
Bicarbonate (HCO_3)	128	120	117	109	112	116	118	122	129	128	120
Sulfate (SO_4)	660	581	550	484	452	449	465	466	530	518	516
Chloride (Cl)	980	790	700	572	525	545	578	700	800	790	698
Nitrate (NO_3)	1.3	0.8	0.9	0.8	3.2	1.2	0.8	0.7	1.2	0.8	1.2
Dissolved solids	2640	2220	2050	1710	1750	1630	1700	1900	2170	2130	1999
Specific conductance (Micromhos at 25° C.)	4230	3570	3220	2770	2640	2650	2780	3110	3440	3430	3184
Total hardness as $CaCO_3$	828	708	660	586	566	551	572	630	666	670	644
Non-Carbonate hardness	723	609	564	497	474	456	476	530	560	565	545
pH	7.8	7.8	7.6	7.8	7.5	7.6	7.7	7.5	7.5	7.6	7.6
Percent sodium	62	61	60	58	57	59	59	60	63	62	60

* Analyzed by U. S. Geological Survey.

Table 14. Results of Seining Collections by Number and Percent of each Species taken from Possum Kingdom Lake, by Seining During the Period June 1, 1953 - October 31, 1956.

Species	1953-54 No.	%	1954-55 No.	%	1955-56 No.	%	Total No.	%
Dorosoma cepedianum	0	0.0	12	1.0	1	0.4	13	0.56
Astyanax fasciatus	2	0.2	0	0.0	0	0.0	2	0.08
Ictiobus bubalus	0	0.0	1	0.1	1	0.4	2	0.08
Carpiodes carpio	1	0.1	0	0.0	0	0.0	1	0.04
Cyprinus carpio	0	0.0	1	0.1	0	0.0	1	0.04
Notropis oxyrhynchus	0	0.0	3	0.3	0	0.0	3	0.13
Notropis fumeus	16	1.7	25	2.2	0	0.0	41	1.76
Notropis umbratilis	1	0.1	0	0.0	0	0.0	1	0.04
Notropis venustus	201	21.3	55	4.8	36	14.3	292	12.51
Notropis lutrensis	501	53.2	157	13.7	12	4.8	670	28.69
Notropis deliciosus	0	0.0	12	1.0	0	0.0	12	0.52
Notropis atrocaudalis	0	0.0	63	5.5	0	0.0	63	2.70
Pimephales vigilax	62	6.6	37	3.2	2	0.8	101	4.33
Fundulus notatus	0	0.0	3	0.3	1	0.4	4	0.17
Gambusia affinis	18	1.9	41	3.6	2	0.8	61	2.61
Micropterus salmoides	108	11.5	213	18.7	26	10.4	347	14.86
Lepomis cyanellus	1	0.1	2	0.2	1	0.4	4	0.17
Lepomis punctatus	0	0.0	36	3.2	1	0.4	37	1.59
Lepomis microlophus	1	0.1	70	6.1	27	10.8	98	4.20
Lepomis macrochirus	30	3.2	280	24.5	94	37.4	404	17.30
Lepomis auritus	0	0.0	129	11.3	47	18.7	176	7.54
Percina caprodes	0	0.0	2	0.2	0	0.0	2	0.08
Totals	942	100.0	1,142	100.0	251	100.00	2,335	100.0

Table 15. A Comparison of Game and Rough Species Caught in Gill Nets from Possum Kingdom Lake, June 1, 1953 to October 31, 1956.*

	1953-54	1954-55	1955-56	Total
Total No. of Species Caught	1,516	1,467	2,086	5,069
Total Wt. of Specimens Caught	1,497.45	1,518.52	1,316.69	4,332.66
Average Wt. per Specimen (lbs.)	0.99	1.04	0.63	0.85
Total Wt. of Rough Fish	1,143.81	1,205.54	1,112.75	3,462.10
Total Wt. of Game Fish	354.64	312.98	203.94	870.56
Total No. of Game Fish	471	422	320	1,213
Total No. of Rough Fish	1,045	1,043	1,766	3,854
Average Wt. Per Rough Fish	1.09	1.06	0.63	0.90
Average Wt. Per Game Fish	0.75	0.74	0.64	0.72
Percent Rough Fish (by wt.)	76.38	79.39	84.51	80.00
Percent Game Fish (by wt.)	23.62	20.61	15.48	20.00
Percent Rough Fish (by No.)	68.94	71.17	84.65	76.00
Percent Game Fish (by No.)	31.06	28.83	15.34	24.00

* - Drum and catfish included in game fish.

Table 16. Comparison of Average Lengths and Weights of the Species Taken from Possum Kingdom Lake from June 1, 1953 to October 31, 1956.

	Total Number Taken			Average Length (MM)			Average Weight (GM)		
	1953-1954	1954-1955	1955-1956	1953-1954	1954-1955	1955-1956	1953-1954	1954-1955	1955-1956
Lepisosteus productus	10	9	19		530	518	522	976	680
Lepisosteus osseus	90	52	36		786	769	1348	2059	1918
Dorosoma cepedianum	729	795	1646	220	222	235	207	237	321
Ictiobus bubalus	160	96	6	349	348	300	1238	1503	1030
Carpiodes carpio	36	80	54	289	293	275	645	724	655
Cyprinus carpio	19	23	3	250	316	242	487	882	338
Ictalurus punctatus	77	56	76	325	352	293	624	913	443
Pylodictus olivaris	1	1	1	406	410	320	1063	1021	510
Roccus chrysops	126	31	30	243	266	240	388	488	451
Micropterus punctulatus	0	1	0		300			680	
Micropterus salmoides	59	75	38	261	280	284	456	627	678
Chaenobryttus gulosus	0	2	3		166	173		158	171
Lepomis microlophus	4	16	14	149	133	152	95	98	118
Lepomis macrochirus	32	149	96	114	148	130	70	112	80
Lepomis auritus	9	14	12	134	138	139	108	111	101
Pomoxis annularis	75	42	47	187	187	192	175	185	235
Pomoxis nigromaculatus	0	3	3		173	175		189	134
Aplodinotus grunniens	87	17	2	197	196	230	179	170	238

Table 17. Comparison of Species Distribution, by Weight and Percentage of the Species taken from Possum Kingdom Lake from June 1, 1953 to October 31, 1956.

Species	Weight in Pounds			Percentage of Catch		
	1953-54	1954-55	1955-56	1953-54	1954-55	1955-56
Lepisosteus productus	11.50	14.31	36.12	0.77	0.95	2.7
Lepisosteus osseus	267.61	229.93	143.96	17.89	15.19	10.9
Dorosoma cepedianum	327.40	468.91	812.20	21.86	30.99	62.2
Ictiobus bubalus	447.62	315.14	16.06	29.90	20.82	1.2
Carpiodes carpio	65.13	116.97	95.12	4.35	7.73	7.2
Cyprinus carpio	24.55	48.59	2.24	1.63	3.21	0.2
Ictalurus punctatus	99.86	109.05	75.48	6.66	7.21	5.7
Pylodictus olivaris	2.34	2.25	1.13	0.15	0.15	0.1
Roccus chrysops	114.16	33.45	23.02	7.62	2.21	1.7
Micropterus punctulatus	0.00	1.50	0.00	0.00	0.10	0.0
Micropterus salmoides	62.44	103.47	53.97	4.17	6.84	4.1
Chaenobryttus gulosus	0.00	0.68	1.13	0.00	0.04	0.1
Lepomis microlophus	2.05	4.34	3.83	0.14	0.29	0.3
Lepomis macrochirus	3.72	37.10	23.46	0.28	2.45	1.8
Lepomis auritus	3.11	3.06	2.57	0.20	0.20	0.2
Pomoxis annularis	27.66	16.82	18.47	1.85	1.11	1.4
Pomoxis nigromaculatus	0.00	1.26	0.88	0.00	0.08	0.1
Aplodinotus grunniens	38.30	6.50	1.05	2.55	0.43	0.1
Total	1497.45	1513.33	1316.69	100.00	100.00	100.00

Table 18. Comparison of Average Annual Variations in the Chemical Content of Brazos River Water at Possum Kingdom Dam for 1952, 1953, 1954 and 1956. *

Year Parts per million	1952 ppm	1953 ppm	1954 ppm	1956 ppm
Silica (SiO_2)	13	13	14	11
Calcium (Ca)	135	152	118	209
Magnesium (Mg)	23	29	18	30
Sodium and Potassium (Na*k) (Calculated)	331	388	289	449
Bicarbonate (HCO_3)	124	130	113	120
Sulfate (SO_4)	295	322	245	516
Chloride (Cl)	527	636	460	698
Nitrate (NO_3)	1.5	1.0	1.3	1.2
Dissolved Solids	1390	1610	1200	1999
Specific Conductance (Micromhos at 25°C.)	2410	2770	2100	3184
Total Hardness as $CaCO_3$	432	498	368	644
Non-Carbonate Hardness	330	392	276	545
pH	7.6	7.6	7.7	7.6
Percent Sodium	63	63	63	60

* - Data for 1955 has not been published and was not available to this writer.