

## Segment Completion Report

State of TEXAS

Project No. F-7-R-6

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

Job No. E-2

Title: Experimental Control of Undesirable  
Fish Species in Lake Diversion.

Period Covered:

June 1, 1958 - May 31, 1959

### Abstract:

An estimated minimum of 185 tons of fish, mostly shad and drum, was removed from Lake Diversion by an experimental selective-kill treatment in March 1957. Inventory was made by nets and seines from ten months before to 26 months after the treatment in order to compile comparative data which may indicate possible effects of the treatment.

A total of 4,385 fishes have been collected by gill nets from which data concerning food habits, sexual development, spawning success, coefficient of condition, and pathological conditions were recorded, and as far as possible, reduced to tabular form. A total of 1,381 of the 4,385 fishes taken for study has been collected during the period covered by this report.

The most significant changes in the fish population immediately following the treatment were: (1) increase in "K" factors for all species; (2) reduction of the shad population; (3) increase in the relative abundance of carpsucker and buffalo, and (4) increase in average weight of all species except shortnose gar and carp.

Two years after treatment, condition factors of rough fish species either increased or remained the same as they were during the preceding year; whereas game fish species and shad showed a decrease in "K". Although some species have a lower condition factor during the segment, as compared to the previous segment, all species are equal to or higher than during the period preceding the selective-kill treatment.

Although having been reduced from 36.6 percent to 6.8 percent by the treatment, shad have replenished themselves to 22.5 percent of the fish population within two years. Game fish species increased from 14.9 percent during the 1956-1957 segment to 20.2 percent during the 1957-1958 segment, but dropped to 19.6 percent during the period covered by this report. White bass, black bass and channel catfish have made substantial gains, but crappie decreased.

Apparently, the rotenone treatment killed the mayfly nymphs in March 1957, removing them from the diet of fishes during 1957-1958. They began to re-appear in stomachs of game fishes, as well as the buffalo fishes, in August 1958.

This work will continue until sufficient data is obtained to determine overall effects of the reduction of shad and drum, selectively, with rotenone.

### Objectives:

To determine the practical application and effectiveness of methods developed under Job E-1 (Experimental Control of Undesirable Fish Species). Specifically, objectives of the work covered by this report were to determine effects of the selective-kill treatment during March 1957.

### Techniques:

Field work on this job began in June 1957. Collections have been spaced one month apart since that time so that data collected during each segment would be comparable to that of the previous segment. Approximately 1,200 feet of gill net, ranging in size from one inch to three inches square mesh, were set on each visit. Each fish taken in these nets was measured, weighed, and the stage of gonadal development recorded. Filled stomachs of predacious species were saved in formalin, along with ripe ovaries and pathological tissues. Samples of forage fishes were obtained with small-mesh minnow seines and preserved in formalin. Game fish which were taken while seining were identified, counted, and then released. Formalin-preserved materials were identified and counted in the laboratory and the data recorded.

Physical data, including air temperature, water-surface temperature and turbidity were recorded at the lake.

### Background Information:

An estimated minimum of 185 tons of fish, mostly gizzard shad and drum, was removed from Lake Diversion by an experimental selective-kill treatment in March 1957. Inventory had been taken by gill nets and seines for ten months prior to the treatment, in order to compile data which would be comparative to that compiled following treatment. Details of the treatment and work done during that period are discussed in the report F-7-R-4, Job E-1. Collection of data continued during the following 12 month period (June 1, 1957 through May 31, 1958) and is presented in the report F-7-R-5, Job E-2. This report presents data collected during 12 consecutive months from June 1, 1958, through May 31, 1959, which is the second 12 month period after the selective-kill treatment. The primary purpose of this work is to compile information which may indicate resulting effects of reducing shad and drum populations by killing selectively with rotenone.

### Findings:

#### Fish Collections

A total of 2,663 fishes was collected from Lake Diversion for study during the segment covered by this report. Gill nets collected 1,381 specimens, and the remaining 1,282 were taken in seine samples.

Comparison of the number and percentage of fish taken in gill nets during the 1956-1957, 1957-1958, and 1958-1959 segments is given in Table 1. A total of 271, or 19.6 percent, of the fish collected by gill nets during the present segment, was game fish. This is 0.57 percent less than in the previous segment, at which time game fish constituted 20.2 percent of the total. Prior to the treatment, game fish comprised 14.9 percent of the total. Shad, smallmouth buffalo and carpsucker made up almost 70 percent of the gill net collection during the segment covered by this report. The carpsucker was the most abundant species present, comprising 25.8 percent of the total. Percentage composition, sex ratios, and average weights by sex of fishes collected by gill nets during the 1956-

1957 segment as compared to the 1957-1958 and 1958-1959 segments is given in Tables 2, 3 and 4 respectively.

The total weight of all species collected by gill nets during the present segment is 2,533.5 pounds. Percentage composition by weight and mean weights of fishes collected by gill nets during the 1956-1957 segment as compared to the 1957-1958 and 1958-1959 segments is given in Tables 5, 6 and 7 respectively.

A total of 1,282 forage fishes was collected with small mesh minnow seines. The major forage fishes continue to be Notropis lutrensis, Pimephales vigilax and Dorosoma cepedianum. This information, with a break-down of species, is given in Table 8. The total number of fishes taken by both gill nets and seines is given in Table 9. Table 10 presents monthly totals of species collected by gill nets during the segment covered by this report.

#### Food Habits

Approximately 20 percent of all game fish collected contained food in their stomachs. Food remains were found in stomachs of 59 specimens; 31 white bass, 13 channel catfish, 8 crappie, 4 black bass and 3 flathead catfish. Tables 11 through 15 present results of analyses made on food remains found in stomachs of all predacious species that contained food.

White bass fed largely upon sunfish, shad, mayfly nymphs and minnows. During the month of March 1959, every white bass that contained food had eaten large numbers of mayfly nymphs. Contents of one white bass taken in February included 17 small bluegills, 2 small orange spotted sunfish and 1 shad.

Cotton rats, insects, algae and other plant materials made up the bulk of food items contained in channel catfish stomachs. During July, August and September 1958, cotton rats (Sigmodon hispidus) became very numerous in the Wichita Valley, and especially so in the area surrounding Lake Diversion. Whether this animal is semi-aquatic in habit or was searching for food or new habitat is not known; however, many were observed swimming aimlessly in the middle of the lake, floating with the current of the headwater river, and dead along the shoreline. At any rate, they were proven to be a very popular food item of channel catfish. It was interesting to note that, apparently, only live cotton rats were utilized for food. Rats that were trapped alive and placed on trotlines were not taken by catfish.

Crappie fed mostly on mayfly nymphs, shad and sunfish.

The four black bass examined contained only fish and fish remains. One cannibal contained a black bass 73 mm in length.

Sunfish, other unidentifiable fish remains, and mayfly nymphs were found in the stomachs of flathead catfish.

#### Sexual Development and Spawning Success

The gonads of all fishes captured in gill nets were examined, and the sex and stage of gonadal development were recorded. If the gonads were large and well-developed, obviously approaching spawning condition, they were recorded as "ripe". Fish taken shortly

after spawning were recorded as "spent". All others were recorded as "immature". As spawning activities progressed, seining effort was increased in order to determine spawning success of the various species. Immature individuals of the larger fishes taken in seine drags were measured and counted. In addition, notes were made of schools of fry seen, young fishes found in the stomachs of predacious fishes, etc.

Females of only two flathead catfish, one channel catfish, and one carpsucker were found to be spent in April. In the early part of May, females of one channel catfish, one smallmouth buffalo, one carpsucker and two longnose gar were spent. Apparently, the major spawning period was in progress when the lake was checked on June 6, 1959. Almost all shad of spawning size were spent. Fifteen percent of the carp were spent. Twenty-nine percent of all carpsuckers taken were spent. Twenty-two percent of the smallmouth buffalo were spent, and sixty percent of the longnose gar were spent. All other spawning-size individuals of the above mentioned species were ripe and ready.

Also in June, large numbers of shad fry were seined, mostly from shallow mud-bottomed areas in the upper end of the lake. Fry of carp, carpsucker and buffalo were found only in shallow areas along the shore where water temperatures were in excess of 90 degrees. Black bass fry were found at almost every seining location, indicating a very successful spawning season for this species. Except in the river above Lake Diversion, white bass fry, although plentiful, were not as numerous as black bass fry.

Unfortunately, the present segment termination date for this work occurs during the major spawning period and causes confusion in compilation of data and report writing. Therefore, for this and other reasons, the termination date for this work is being changed to December 31 of each year.

#### Coefficient of Condition

"K" factors were worked out for all of the larger fishes collected in gill nets as they were during previous segments. Comparison of "K" factors of all species collected in gill nets for the three consecutive years is given in Table 16. Distribution of "K" factors for the 1958-1959 segment is shown in Table 17.

With the exception of smallmouth buffalo, carpsucker, carp and drum, average "K" factors were about the same or lower as compared to the previous segment. Male carp increased from 2.6 to 2.8, and females increased from 2.7 to 2.8. Female carpsucker increased from 2.7 to 2.8, whereas the males remained at 2.7. Smallmouth buffalo of both sexes remained at 3.2. Female drum increased from 2.9 to 3.0 and males from 2.8 to 2.9. Longnose gar remained at .4. All other species displayed a decrease in "K".

In general, the "K" factors of rough fish species either increased or remained the same as they were during the preceding segment; whereas game fish species and shad showed a decrease in "K". Although some species show a lower "K" factor reading during this segment as compared to the previous segment, they are still equal to or higher than during the segment preceding the selective-kill treatment. Information contained in Table 16, correlated with relative abundance data, indicates that decreasing the numbers of shad and drum improves condition of all game fish species (as well as the remaining rough fish species), and as the numbers of shad (and other rough fish species) increase during the second year following the kill, the condition of game fish species decreases.

#### Physical Characteristics

The highest recorded temperature at one foot under the surface of open water was

80 degrees F. on September 12, 1958. During December and January, ice formed in protected shallows and in the river thick enough to impede boat traffic and prevented net setting. Turbidity readings were not taken, but the water was generally clear, as usual. Water and air temperatures are given in Table 18.

#### Discussion:

The primary purpose of this work is to accumulate comparative data and record pertinent observations over a period of years from which possible effects of shad and drum reduction with rotenone can be determined. Although certain facts appear to be significant from the data that has been collected, no attempt will be made at this time to make any definite conclusions concerning the overall effects of the selective-kill treatment. All data will be grouped and carefully perused after sufficient data has been collected in an effort to conclude as many facts as possible.

Noteworthy are changes in the relative abundance of shad. According to gill netting results, shad were decreased from 36.6 percent before the treatment to 6.8 percent during the segment following the treatment. During the second year after treatment, they increased to 22.5 percent of the fish population, proving their reputed reproductive capabilities. The average weight of shad increased from .7 pound to 1.43 pounds after the treatment, but dropped to .97 during the period covered by this report. Increase in average weight is possibly due to the great reduction of smaller shad, which are more susceptible to the effects of rotenone, and the decrease in average weight may be due to the additional capture of progeny of the surviving larger shad two years after treatment.

The gill net method of sampling fish populations failed again to show significant changes in the drum population, although they were greatly reduced by the treatment. The use of rotenone will probably be required to determine the status of drum.

Game fish increased from 14.9 percent during the 1956-1957 segment to 20.2 percent during the 1957-1958 segment, but dropped to 19.6 percent during the period covered by this report. White bass, black bass and channel catfish have made substantial gains, but crappie decreased from 5.3 percent to 4 percent. Condition of all game fishes except female black bass, as determined by "K" factors, has decreased since the 1957-1958 period, but they are still in better condition than before the treatment.

Mayfly (Hexagenia) and mayfly nymphs have been proven to be very important food items of game fishes in Lake Diversion. They were represented in stomachs of most predacious type fishes before the treatment, but were practically absent during the segment following the treatment.

Mayflies began to reoccur in the latter part of 1958 being found in the stomach of a flathead catfish in August 1958, and were found to be an important food item again, especially of white bass and crappie, by March 1959. It appears that rotenone killed the mayfly nymphs in March 1957, removing them from the diet of fishes during 1957-1958. They were probably restocked into Lake Diversion from irrigation canals, Lake Kemp and other nearby waters and were again present in abundance after the summer of 1958.

More than two years have passed since the selective-kill treatment at Lake Diversion. Progeny of surviving individuals of all species are now over two years old and will be represented in gill net samples in increasing numbers during the remainder of this study.

Collections will continue until sufficient data is obtained to determine overall effects of the reduction of shad and drum, selectively, with rotenone.

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Table 1. Comparison of the Number and Percent of Total Fish Taken in Gill Nets in Lake Diversion During the 1956-1957, 1957-1958 and 1958-1959 Segments.

Species	Number Taken			% of Total		
	1956-1957	1957-1958	1958-1959	1956-1957	1957-1958	1958-1959
<u>Lepisosteus osseus</u>	37	113	68	2.9	6.6	4.92
<u>Lepisosteus platostomus</u>	4	6	11	0.3	0.3	0.80
<u>Dorosoma cepedianum</u>	472	116	311	36.6	6.8	22.52
<u>Ictiobus cyprinellus</u>	0	0	2	0.0	0.0	0.15
<u>Ictiobus bubalus</u>	175	456	291	13.6	26.6	21.07
<u>Carpiodes carpio</u>	369	620	356	28.6	36.1	25.78
<u>Cyprinus carpio</u>	31	44	64	2.4	2.6	4.63
<u>Ictalurus punctatus</u>	38	95	71	3.0	5.5	5.14
<u>Ictalurus melas</u>	0	3	0	0.0	0.2	0.0
<u>Pylodictus olivaris</u>	2	3	7	0.2	0.2	0.51
<u>Roccus chrysops</u>	76	121	121	5.9	7.1	8.76
<u>Micropterus salmoides</u>	7	18	17	0.5	1.0	1.23
<u>Pomoxis annularis</u>	68	110	55	5.3	6.4	3.99
<u>Aplodinotus</u>	9	11	7	0.7	0.6	0.50
Total	1,288	1,716	1,381	100.00	100.00	100.00

Table 2. Percentage Composition, Sex Ratios and Average Weights by Sex of Fishes Collected by Gill Nets from Lake Diversion, 1956 - 1957.

Species	Number Taken	% of Total	% Males	Avg. Male Weight	% Females	Avg. Female Weight
<u>Lepisosteus osseus</u>	37	2.9	54.0	2.9	46.0	6.4
<u>Lepisosteus platostomus</u>	4	.3	25.0	2.8	75.0	3.7
<u>Lepisosteus productus</u>	0	.00	0.0	0.0	0.0	0.0
<u>Dorosoma cepedianum</u>	472	36.6	42.6	.65	57.4	.75
<u>Ictiobus bubalus</u>	175	13.6	64.0	2.22	36.0	3.54
<u>Carpionodes carpio</u>	369	28.6	54.2	1.27	45.8	1.33
<u>Cyprinus carpio</u>	31	2.40	48.4	3.82	51.6	4.47
<u>Ictalurus punctatus</u>	38	3.0	55.3	1.58	44.7	1.68
<u>Roccus chrysops</u>	76	5.90	47.4	.72	52.6	.72
<u>Micropterus salmoides</u>	7	.5	28.6	.74	71.4	1.80
<u>Pomoxis annularis</u>	68	5.3	47.0	.34	53.0	.53
<u>Aplodinotus grunniens</u>	9	.7	55.5	.80	44.5	.92
<u>Pylodictus olivaris</u>	2	.2	0.0		100.0	1.40
Total	1,288	100.0				

Table 3. Percentage Composition, Sex Ratios, and Average Weights of Sex of Fishes Collected by Gill Nets from Lake Diversion, 1957 - 1958.

Species	Number Taken	% of Total	% Males	Avg. Male Weight	% Female	Avg. Female Weight
<u>Lepisosteus osseus</u>	133	6.6	51.4	4.19	48.6	7.97
<u>Lepisosteus platostomus</u>	6	0.3	0.0	-	100.0	1.54
<u>Dorosoma cepedianum</u>	116	6.8	40.0	1.16	60.0	1.63
<u>Ictiobus bubalus</u>	456	26.6	54.8	2.86	45.2	3.38
<u>Carpiodes carpio</u>	620	36.1	45.3	1.35	54.7	1.39
<u>Cyprinus carpio</u>	44	2.6	43.9	3.12	56.1	4.30
<u>Ictalurus punctatus</u>	95	5.5	26.3	1.86	73.7	2.11
<u>Ictalurus melas</u>	3	0.2	0.0		100.0	1.19
<u>Roccus chrysops</u>	121	7.1	34.7	1.07	65.3	1.36
<u>Micropterus salmoides</u>	18	1.0	33.3	1.88	66.7	2.29
<u>Pomoxis annularis</u>	110	6.4	43.6	0.56	56.4	0.73
<u>Aplodinotus grunniens</u>	11	0.6	63.6	0.74	36.4	1.35
<u>Pylodictus olivaris</u>	3	0.2	0.0	-	100.0	4.10
Total	1,716	100.0				

Table 4. Percentage Composition, Sex Ratios, and Average Weights by Sex of Fishes Collected by Gill Nets from Lake Diversion, 1958 - 1959.

Species	No. Taken	% of Total	Males				Females			
			No.	%	Total Wt.	Ave. Wt.	No.	%	Total Wt.	Ave. Wt.
<u>Lepisosteus osseus</u>	68	4.92	36	52.94	82.66	2.30	32	47.06	233.59	7.30
<u>Lepisosteus platostomus</u>	11	0.80	5	45.45	3.42	.68	6	54.55	7.37	1.23
<u>Dorosoma cepedianum</u>	311	22.52	92	29.58	54.80	.60	219	70.42	248.05	1.13
<u>Ictiobus cyprinellus</u>	2	0.15	1	50.00	3.18	3.18	1	50.00	1.50	1.50
<u>Ictiobus bubalus</u>	291	21.07	173	59.45	529.80	3.06	118	40.55	361.20	3.06
<u>Carpiodes carpio</u>	356	25.78	182	51.12	242.63	1.33	174	48.88	244.78	1.41
<u>Cyprinus carpio</u>	64	4.63	32	50.00	54.83	1.71	32	50.00	74.47	2.33
<u>Ictalurus punctatus</u>	71	5.14	27	38.03	57.87	2.14	44	61.97	123.31	2.80
<u>Ictalurus melas</u>	0	0.00	0	0.00	0.00	0.00	0	0.00	0.00	0.00
<u>Pylodictus olivaris</u>	7	0.51	0	0.00	0.00	0.00	7	100.00	34.74	4.96
<u>Roccus chrysops</u>	121	8.76	41	33.88	22.57	.55	80	66.12	76.77	.96
<u>Micropterus salmoides</u>	17	1.23	5	29.41	6.82	1.36	12	70.59	26.03	2.17
<u>Pomoxis annularis</u>	55	3.99	14	25.45	12.10	.86	41	74.55	22.43	.55
<u>Aplodinotus grunniens</u>	7	0.50	4	57.14	4.45	1.11	3	42.86	4.15	1.38
Total	1,381	100.00	612		1,075.13		769		1,458.39	

Table 5. Percentage Composition by Weight and Mean Weights of Fishes  
Collected by Gill Nets from Lake Diversion, 1956 - 1957

Species	Weight (lbs)	% of Total Weight	Mean Weight
<u>Lepisosteus osseus</u>	166.1	9.4	4.5
<u>Lepisosteus platostomus</u>	13.8	.8	3.45
<u>Lepisosteus productus</u>	0	0	0
<u>Dorosoma cepedianum</u>	335.4	19.0	.71
<u>Ictiobus bubalus</u>	472.0	26.8	2.7
<u>Carpionodes carpio</u>	479.5	27.2	1.3
<u>Cyprinus carpio</u>	128.7	7.3	4.15
<u>Ictalurus punctatus</u>	61.7	3.5	1.6
<u>Roccus chrysops</u>	54.5	3.1	.72
<u>Micropterus salmoides</u>	10.5	.6	1.50
<u>Pomoxis annularis</u>	30.0	1.7	.44
<u>Aplodinotus grunniens</u>	7.7	.4	.85
<u>Pylodictus olivaris</u>	2.8	.2	1.4
Total	1,763.2	100.0	-

Table 6. Percentage Composition by Weight and Mean Weights of Fishes  
Collected by Gill Nets from Lake Diversion, 1957 - 1958

Species	Weight (lbs)	% of Total Weight	Mean Weight
<u>Lepisosteus osseus</u>	645.4	18.0	6.03
<u>Lepisosteus platostomus</u>	7.7	0.2	1.54
<u>Dorosoma cepedianum</u>	149.8	4.2	1.43
<u>Ictiobus bubalus</u>	1,406.1	39.3	3.10
<u>Carpionodes carpio</u>	728.1	20.3	1.37
<u>Cyprinus carpio</u>	159.4	4.5	3.80
<u>Ictalurus punctatus</u>	194.2	5.4	2.04
<u>Ictalurus melas</u>	3.6	0.1	1.19
<u>Roccus chrysops</u>	152.1	4.2	1.26
<u>Micropterus salmoides</u>	38.8	1.1	2.16
<u>Pomoxis annularis</u>	72.4	2.0	0.66
<u>Aplodinotus grunniens</u>	10.6	0.3	0.96
<u>Pylodictus olivaris</u>	12.3	0.3	4.10
Totals	3,580.5	99.9	-

Table 7. Percentage Composition by Weight and Mean Weights of Fishes  
Collected by Gill Nets from Lake Diversion, 1958 - 1959

Species	Weight (lbs.)	% of Total Weight	Mean Weight
<u>Lepisosteus osseus</u>	316.25	12.48	4.65
<u>Lepisosteus platostomus</u>	10.79	.42	.98
<u>Dorosoma cepedianum</u>	302.85	11.96	.97
<u>Ictiobus cyprinellus</u>	4.68	.19	2.34
<u>Ictiobus bubalus</u>	891.00	35.17	3.06
<u>Carpionodes carpio</u>	487.41	19.23	1.37
<u>Cyprinus carpio</u>	129.30	5.11	2.02
<u>Ictalurus punctatus</u>	181.18	7.15	2.55
<u>Ictalurus melas</u>	0.00	0.00	0.00
<u>Pylodictus olivaris</u>	34.74	1.37	4.96
<u>Roccus chrysops</u>	99.34	3.92	.82
<u>Micropterus salmoides</u>	32.85	1.30	1.93
<u>Pomoxis annularis</u>	34.53	1.36	.63
<u>Aplodinotus grunniens</u>	8.60	.34	.25
Total	2,533.52	100.00	

Table 8. Total Numbers of Forage Fish Taken From Lake Diversion  
1958 - 1959

Species	No.	% of Total
<u>Dorosoma cepedianum</u>	88	6.86
<u>Phenacobius mirabilis</u>	35	2.73
<u>Notropis percobromus</u>	34	2.65
<u>Notropis oxyrhynchus</u>	16	1.25
<u>Notropis girardi</u>	105	8.19
<u>Notropis lutrensis</u>	429	33.46
<u>Notropis deliciosus</u>	10	.78
<u>Hybognathus placita</u>	3	.24
<u>Pimephales vigilax</u>	422	32.91
<u>Gambusia affinis</u>	21	1.64
<u>Micropterus salmoides</u>	43	3.36
<u>Lepomis microlophus</u>	7	.54
<u>Lepomis macrochirus</u>	40	3.12
<u>Lepomis humilis</u>	20	1.56
<u>Percina caprodes</u>	8	.63
<u>Aplodinotus grunniens</u>	1	.08
Total	1,282	100.00

Table 9. Total Number of Fishes Taken From Lake Diversion, 1958-1959.

Species (Scientific Name)	Common Name	Number Taken
<u>Lepisosteus platostomus</u>	shortnose gar	11
<u>Lepisosteus osseus</u>	longnose gar	68
<u>Dorosoma cepedianum</u>	gizzard shad	399
<u>Ictiobus cyprinellus</u>	bigmouth buffalo	2
<u>Ictiobus bubalus</u>	smallmouth buffalo	291
<u>Carpiodes carpio</u>	carpsucker	356
<u>Cyprinus carpio</u>	carp	64
<u>Phenacobius mirabilis</u>	suckermouth minnow	35
<u>Notropis percobromus</u>	plains shiner	34
<u>Notropis oxyrhynchus</u>	sharpnose shiner	16
<u>Notropis girardi</u>	Arkansas River shiner	105
<u>Notropis lutrensis</u>	redhorse shiner	429
<u>Notropis deliciosus</u> (N. <u>stramineus</u> - new name)	sand shiner	10
<u>Hybognathus placita</u>	plains minnow	3
<u>Pimephales vigilax</u>	parrot minnow	422
<u>Ictalurus punctatus</u>	channel catfish	71
<u>Ictalurus melas</u>	black bullhead	0
<u>Pylodictus olivaris</u>	flathead catfish	7
<u>Gambusia affinis</u>	mosquitofish	21
<u>Roccus chrysops</u>	white bass	121
<u>Micropterus salmoides</u>	black bass	60
<u>Lepomis microlophus</u>	redeer sunfish	7
<u>Lepomis macrochirus</u>	bluegill	40
<u>Lepomis humilis</u>	orangespotted sunfish	20
<u>Pomoxis annularis</u>	white crappie	55
<u>Percina caprodes</u>	logperch	8
<u>Aplodinotus grunniens</u>	freshwater drum	8
Total		2,663

Table 10. Monthly Totals of Species Collected by Gill Nets From Lake Diversion, 1958 - 1959.

Species	June		July		August		September		October		November		December	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Longnose gar	8	14.09	8	10.67	7	6.38	6	4.83	10	6.41	1	.81	1	.95
Shortnose gar	2	.67	0	0.00	4	4.25	4	3.23	1	.64	0	0.00	0	0.00
Gizzard shad	30	14.77	20	26.67	13	11.71	25	20.16	27	17.30	22	18.04	8	7.62
Smallmouth buffalo	52	26.17	10	13.33	20	21.27	23	17.74	52	33.34	39	31.96	26	24.76
River carpsucker	32	21.48	10	13.33	14	14.90	37	29.84	35	22.43	34	27.87	35	33.33
Carp	9	6.71	11	14.67	7	7.44	5	4.03	10	6.41	2	1.64	2	1.91
Channel cat	2	7.38	10	13.33	8	8.51	11	7.26	8	5.13	3	2.46	10	9.52
Black bullhead	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
White bass	12	8.05	5	6.67	19	20.22	9	7.26	3	1.92	7	5.74	12	11.43
Black bass	0	0.00	0	0.00	0	0.00	1	.81	2	1.29	2	1.64	2	1.90
White crappie	0	0.00	1	1.33	4	4.25	5	3.22	7	4.48	9	7.38	8	7.62
Drum	0	0.00	0	0.00	0	0.00	2	1.62	1	.65	0	0.00	0	0.00
Flathead catfish	1	.68	0	0.00	1	1.07	0	0.00	0	0.00	2	1.64	0	0.00
Bigmouth buffalo	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	.82	1	.96
Totals	148	100.00	75	100.00	97	100.00	128	100.00	156	100.00	122	100.00	105	100.00

Table 10. Monthly Totals of Species Collected by Gill Nets From Lake Diversion, 1958 - 1959.  
(Continued)

Species	Lake Diversion Monthly Check												Total Number	% of Total
	January		February		March		April		May					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Longnose gar	1	5.88	0	0.00	1	.85	19	10.27	6	4.19	68	4.92		
Shortnose gar	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	0.80		
Gizzard shad	4	23.53	17	19.31	43	36.75	63	34.05	39	27.27	311	22.52		
Smallmouth buffalo	0	0.00	12	13.64	6	5.13	23	12.43	28	19.58	291	21.07		
River carpsucker	5	29.41	19	21.59	45	38.46	48	25.95	42	29.37	356	25.78		
Carp	0	0.00	0	0.00	0	0.00	4	2.16	14	9.79	64	4.63		
Channel cat	0	0.00	10	11.36	4	3.42	3	1.62	2	1.40	71	5.14		
Black bullhead	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00		
White bass	6	35.29	27	30.69	8	6.84	11	5.95	2	1.40	121	8.76		
Black bass	1	5.89	2	2.27	5	4.27	0	0.00	2	1.40	17	1.23		
White crappie	0	0.00	1	1.14	5	4.28	10	5.40	5	3.50	55	3.99		
Drum	0	0.00	0	0.00	0	0.00	1	.54	3	2.10	7	0.50		
Flathead catfish	0	0.00	0	0.00	0	0.00	3	1.63	0	0.00	7	0.51		
Bigmouth buffalo	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.15		
Totals	17	100.00	88	100.00	117	100.00	185	100.00	143	100.00	1,381	100.00		

Table 11. Stomach Analysis of White Bass Taken From Lake Diversion,  
1958 - 1959

Food Item	Frequency of Occurrence	Total Number Identified
Mayfly nymphs	9	292 /
Sunfish ( <u>Lepomis</u> )	9	39
Shad ( <u>Dorosoma</u> )	10	16
Black bass ( <u>Micropterus</u> )	1	1
Fish remains (unidentifiable)	6	8
Minnows (unidentifiable)	4	4
Freshwater shrimp	1	1
Grasshopper (shorthorned)	1	1

\* \* \* \*

Table 12. Stomach Analysis of Channel Cat Taken From Lake Diversion,  
1958 - 1959

Food Item	Frequency of Occurrence	Total Number Identified
Cotton rat ( <u>Sigmodon hispidus</u> )	9	10
Hair (probably rat)	2	-
Filamentous algae	3	-
Leaf hopper	1	1
Wasp	1	1
Grass seeds	1	20 /
Amphipods	1	65
Chironomid larvae	2	6
Water beetle ( <u>Haliplidae</u> )	1	1
Fish vertebra	1	1
Plant fiber	1	-

Table 13. Stomach Analysis of White Crappie Taken From Lake Diversion, 1958 - 1959.

Food Item	Frequency of Occurrence	Total Number Identified
Mayfly nymphs	4	70 /
Sunfish ( <u>Lepomis</u> )	1	1
Fish remains	2	3
Shad ( <u>Dorosoma</u> )	3	5

\* \* \* \*

Table 14. Stomach Analysis of Black Bass Taken From Lake Diversion, 1958 - 1959.

Food Item	Frequency of Occurrence	Total Number Identified
Sunfish ( <u>Lepomis</u> )	1	1
Fish remains	2	3
Black bass ( <u>Micropterus</u> )	1	1

\* \* \* \*

Table 15. Stomach Analysis of Flathead Catfish Taken From Lake Diversion, 1958 - 1959.

Food Item	Frequency of Occurrence	Total Number Identified
Mayfly nymphs	1	5
Sunfish ( <u>Lepomis</u> )	2	6
Fish remains	1	1

Table 16. Comparison of Average "K" Factors of Fish Taken From Lake Diversion, 1958 - 1959.

	1956 to 1957	1957 to 1958	1958 to 1959
Longnose gar			
Male	.4	.4	.4
Female	.4	.4	.4
Shortnose gar			
Male	.5	-	.5
Female	.6	.6	.5
Gizzard shad			
Male	1.9	2.2	2.1
Female	1.9	2.3	2.2
Bigmouth buffalo			
Male	-	-	3.5
Female	-	-	3.4
Smallmouth buffalo			
Male	3.1	3.2	3.2
Female	3.1	3.2	3.2
Carp sucker			
Male	2.6	2.7	2.7
Female	2.7	2.7	2.8
Carp			
Male	2.5	2.6	2.8
Female	2.6	2.7	2.8
Channel cat			
Male	1.7	1.8	1.7
Female	1.6	1.8	1.7
Flathead cat			
Male	-	-	-
Female	1.5	1.8	1.7
White bass			
Male	2.4	3.0	2.8
Female	2.6	3.0	2.7
Black bass			
Male	2.4	2.7	2.5
Female	2.4	2.7	2.7
Crappie			
Male	2.5	3.0	2.9
Female	2.5	2.9	2.8
Drum			
Male	2.2	2.8	2.9
Female	2.2	2.9	3.0





Table 17. Distribution of "K" Factors for Fish Taken From Lake Diversion, 1958 - 1959.  
(Continued)

		<u>Roccus chrysops</u>											Average "K"			
Factor	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.4
Males	1	-	-	1	3	4	8	8	5	5	8	1	5	1	1	2.8
Females	-	-	2	3	6	11	10	10	11	3	7	2	2	2	1	2.7

  

		<u>Micropterus salmoides</u>											Average "K"			
Factor	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0						3.0
Males	-	2	-	-	-	1	1	1	-	-						2.5
Females	-	1	1	-	1	3	2	-	2	2						2.7

  

		<u>Pomoxis annularis</u>											Average "K"			
Factor	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	4.0
Males	-	-	1	2	-	3	3	3	1	1	-	1	-	-	-	1
Females	2	3	-	4	6	5	6	3	-	2	4	2	-	-	2	1

  

		<u>Aplodinotus grunniens</u>											Average "K"				
Factor	2.6	2.7	2.8	2.9	3.0	3.1	3.2										3.2
Males	1	-	-	2	-	-	1										2.9
Females	-	-	-	1	1	1	1										3.0

Table 18. Temperatures of Air and Water at Lake Diversion  
on Collection Dates.

Date	Air	Water
6/12/58	82	-
7/3/58	82	-
8/12/58	82	-
9/12/58	97	80
10/8/58	72	-
11/13/58	69	59
12/3/58	59	51
1/7/59	49	37
2/10/59	49	44
3/4/59	65	51
4/8/59	53	63
5/8/59	74	71

