

STATE Texas
PROJECT F6R3 - Job B-5
PERIOD July 1, 1954 - March 30, 1956

Job Completion Report

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TITLE

Inventory of Fish Species Present in Some of the Small Lakes in the Rio Grande Valley.

OBJECTIVES

To determine the species present and their relative numbers in Lake Bentsen, Delta Orchards Lake, and Olmito Lake.

PROCEDURE

The investigation of the small lakes in the Rio Grande Valley was divided into two jobs: Job A-5, Basic Survey of Small Lakes in the Rio Grande Valley, to gather fundamental data on the chemical and physical characteristics of the lakes, and the present job. Refer to Job Completion Report on the Basic Survey for applications to this job.

The present job consisted of making monthly experimental net sets at two designated stations in each of the lakes as shown in Maps 1, 2, and 3. Seining collections were made when receding water levels exposed beaches that could be seined. The information collected included kind and relative numbers of fish from the various lake, size, coefficient of condition, sex and sexual condition, parasites and diseases, and the seasonal changes and fluctuations in the whole population.

NETTING COLLECTIONS

1. Six netting stations were selected in the three small lakes in the Rio Grande Valley. These are shown in Maps 1, 2, and 3. The two netting stations in each lake were selected for their ecological significance and exposure to prevailing winds.

The two stations selected on Lake Bentsen represent two ecological "niches". Station No. 1, was located at the southmost end of the lake in relatively silt free water of very little current velocity when the lake is impounding water. This section of the lake is perpendicular to the prevailing southeast winds. The yearly average depth in this location was 14 feet. Station No. 2, was located in the middle of the lake where some of the deeper water occurred, the bottom for the most part was sandy silt as this area is in the outer edge of the de-siltation zone when water is being impounded. The edges of the lakes at this location are abundant in growth of trees and some willows at the waters edge, and consequently wind action in this section is very mild. The yearly average depth for this location was seventeen feet.

The two netting stations selected on Delta Orchards Lake were also of different ecological significance. Station No. 1, was located in open water near an island of willows, (*Salix nigra*), and bulrush beds, (*Scirpus sp.*). Station No. 2, was located in open water with no nearby cover. For the most part the stations were exposed to strong southeast winds that prevail almost the year round on this lake. Station No. 1, had an average depth of 8 feet and Station 2, 10 feet. The lake bottom is entirely silt.

Netting stations on Olmito Lake were selected to show the two ecological conditions present in the lake. Station No. 1, was located in the upper part of the lake, near the bridge over the lake. This location has a fine sand bottom with some sandy loam spots, which produce abundant growths of mosses and some small willows. The yearly average depth for this location was ten feet. Station No. 2, was located in the bend of the lake near abundant willows growing in water about six feet deep. The yearly average depth for the location was eight feet.

2. Experimental gill nets composed of five sections of varying mesh (1", 1½", 2", 2½" and 3") each twenty five feet long, and eight feet deep were set at each station monthly, except in December 1954 on Delta Orchards Lake when only one net was set. Several times during the project nets were not set in Delta Orchards Lake because of high winds and very rough waters. A total of 112 experimental gill nets were set in all three lakes in the period covered by this project. All nets were "floaters" resting on the surface and reaching the bottom only where the water was less than nine feet deep. Galvanized steel rings on the bottom line served to weigh the net down, while plastic or cork floats helped to keep the net tight vertically. Concrete weights of approximately one quart of concrete were used to anchor the nets down at each end, and two quart plastic floats were used to keep the ends high. Normally the nets were set around 1:00 P.M. and picked up the following morning between the hours of 5:00 and 8:00 A.M.

Two 100 by 8 foot gill nets with two-inch square mesh and three 100 by 8 foot gill nets with three-inch mesh were set once in Lake Bentsen after spawning buffalo had been located by means of experimental nets. A total of 241 fish of nine species were taken, and because of the nets' selectivity for the larger fish, the results are not included in this report.

3. The fish taken in all experimental gill nets were processed on the shore as soon as the nets were brought in. All fish were laid on a measuring board, and the standard and total lengths in millimeters were recorded, except in certain instances when large numbers of buffalo or fresh water drum were taken they were only counted and weighed after a representative collection had been worked. Each fish up to 500 grams was weighed on a Hanson platform scale, larger fish were weighed on a Perfecto hanging scale. Pounds and ounces were converted into grams and recorded. When food was found in the stomach of a game or predatory fish, the stomach was removed, tagged and preserved in ten percent formalin for later laboratory study. Special notes concerning the fish such as worms, parasites, stunted growth, mutilation, and other features were noted and are discussed under the individual species.

Scale samples were not taken because of their apparent lack of distinct circuli. All fish handling was done by the two field assistants, while the Assistant Project Leader made all the notes, records, and observations.

SEINING COLLECTIONS

1. Two seining stations were selected in each of the three lakes. The beaches were not exposed except during low water stages and seining collections were made irregularly.

Seining Station No. 1, in Lake Bentsen was located at the southmost end of the lake. The bottom had a gradual slope of fine sandy silt and loam devoid of vegetation with the exception of a few stands of Coastal Bermuda grass along the south shore. Seining Station No. 2, was located about 200 hundred yards east of Station 1. The bottom was fine sandy silt and loam. Vegetation in the form of Desert Willows (Baccharis sp.) was very abundant. Both stations had good protection from the mild southeast winds by virtue of the high cliff-like banks of the lake. Beaches of different ecology were not usable because of the steep banks and deep water.

Seining Station No. 1 in Delta Orchards Lake was located on the northwest shore of the lake close to State Highway 88. The bottom was fine sandy silt with a gradual slope for about twenty-five feet and then a sudden drop off. Vegetation was present in small amounts along shore, mostly, willows and dry willows. Station No. 2, located on the northeast shore of the lake had a bottom of fine sandy silt with a gradual slope. Vegetation present was the same as in Station No. 1, but here we found some old willow stumps. Both seining stations were located in the northern section of the lake because of their shallowness during low water periods and parallel location to strong southeast winds the water was usually roiled and murky.

Two seining beaches of Olmito Lake were selected and sampled twice when the low water made seining possible. Station No. 1 was located on the west side of the lake and had a sandy silt and loam bottom with a gradual slope towards the center of the lake. Some submerged vegetation was present and there were a few stands of emerged Desert Willows. Station No. 2 was located on the opposite side of the lake in front of the St. Clair home. Collections were made by swimming the seine out or dropping off the pier. The bottom of sandy silt had a rather steep slope and was covered by submerged aquatics and a few stands of dry willows.

Seining was done whenever possible with a thirty by six foot bag seine with one-fourth inch mesh. When brush prevented the use of a bag seine, a sixteen by four foot seine with one-quarter inch mesh was used. A representative collection of fish seined was preserved in two quart fruit jars containing ten percent formalin and sorted, identified and counted later in the laboratory. Excessive numbers of a single species or fish too large for the jars were counted, recorded on fish cards, and discarded at time of collection.

2. Data concerning weather, water conditions, and other observations were kept on Fish Cards and Fish Collection Sheets. A description of the lakes and their chemical and physical characteristics is given in the Job Completion Report for Job A-5.

3. Although adult largemouth bass were recovered from all three Valley Lakes, Seining collections failed to show any signs of spawning bass, as no bass fry or fingerlings were recovered. This may be accounted for by excessive rough fish populations, fluctuating water levels, murky water, and lack of adequate spawning beds. Rough fish and muddy waters were probably the most important factors controlling bass spawning.

FINDINGS

The seasonal variation of fish activity, as reflected by comparison of monthly

netting catches, may be seen in Tables 3, 4, and 5 for Lake Bentsen, in Tables 11, 12, and 13 for Delta Orchards Lake, and in Tables 19, 20, 21, and 22 for Olmito Lake.

LAKE BENTSEN

On the basis of increased net catch as a criterion of fish activity, it can be seen from Tables 4 and 5 that there was a very slight peak of fish activity in May 1954, June, August, and September 1955, when the water level was somewhat constant. The largest percent (10.46) of fish for the project period was caught in August 1955, while the least amount (2.92) percent was caught in July 1954. On the basis of maximum and minimum catches for the project period no definite strong peak of fish activity can be noted. The relative absence of fish activity is in all probability due to a receding water level of the lake in the spring months of the year when an activity peak could be expected, but this is the time when water is drawn from Lake Bentsen for crop irrigation purposes.

Table 6 shows the smallmouth buffalo to be well established in Lake Bentsen as it leads by number and weight. Tables 7 and 8 show the sexual condition of the fish in Lake Bentsen. Condition 1 indicates that eggs or milt were flowing; 2, gonads were well developed; 3, sexes are discernable; 4, sexes are not discernable; 5, indicates that the fish had just spawned. Seasonal trends of sexual condition are not distinct or clear cut. Receding water levels during spring probably accounts for this, as many specimens showed signs of egg re-absorption.

The seining collections made on Lake Bentsen show the absence of bass spawn, even though the water level was maintained rather constant for two months during late February to the middle of May.

DELTA ORCHARDS LAKE

Table 11, for Delta Orchards Lake shows two peaks of fish activity, a strong peak during April, May, and June receding and then rising in September with a slightly higher peak in October. Table 14 shows the rank by weight and number. It is interesting to note that blue catfish leads by number and was second by weight. The sexual condition of the six most common fish species can be seen in Tables 15 and 16. Largemouth bass (*Micropterus salmoides*) have never been too successful in this lake as the numbers that showed up in netting results are not proportional to the stocking records over the years. The sport fishing catch of bass is small compared to that of fresh water drum, catfish and white crappie.

OLMITO LAKE

Tables 19 and 20 for Olmito Lake show the numbers of fish taken in experimental nets during the period of study. High fish activity occurred in June 1954, and a slightly higher one in April 1955. Periods of least activity were January and February 1955.

Table 20 shows that five species of rough fish make up 77 percent of the fish population of the lake. This is correlated with the interconnection of this lake with the resaca system in the Lower Rio Grande Valley which is predominately rough fish in content. The pounds of each fish species taken in experimental nets are shown in Tables 21 and 22. Stockings of Goggeye (*Chaenobryttus coronarius*) largemouth bass and blue catfish (*Ictalurus furcatus*) prior to project study have shown up in netting results. Game fish populations in this lake are hampered by excessive rough fish populations, receding water levels, sudden inflows of rain run-off water, and the absence of spawning beds. Ranks, lengths, weights, and "K" factors of the fish caught are shown on Table 23. Sexual condition of six common fish species is shown on Tables 24 and 25.

DISCUSSION OF INDIVIDUAL SPECIES

The different fish species of all three Valley lakes are discussed under each species, together with notes on parasites, worms, and mutilation. Table 26 shows stomach analyses for fish caught in the three valley lakes. A total of 48 stomachs were analysed. Low number of stomachs containing food may be accounted for by the warm waters in the Valley lakes and effect of wind and wave action on the captured fish causing them to regurgitate stomach contents.

Lepisosteus spatula -- alligator gar. Alligator gar are rather common in all three Valley lakes and by far the largest in size of the fish netted. The adults were often infected with tape worms in the stomach and intestine. Ecto-parasites in the form of fish lice (Argulus sp.) and small leeches were found on many specimens from Delta Orchards Lake, a few from Lake Bentsen and occasionally on those from Olmito Lake. Fish lice seemed to prefer areas around the gill covers for attachment. Several large alligator gars weighing over twenty pounds were taken from Delta Orchards Lake.

Lepisosteus productus -- spotted gar. They were the most common gar in Lake Bentsen and Olmito Lake, where many were found to have ripe gonadal development during the spring months. None were found in seining collections. Many were found to contain fish lice and small leeches around the gills. This species, because of large numbers present in Olmito Lake, is a serious threat for the food supply available to the game fish of the lake.

Lepisosteus osseus -- longnose gar. Longnose gar were present in Lake Bentsen and Delta Orchards Lake, but were not recorded from Olmito Lake, although they are present in the "resaca system". Usually, they are found in the open waters of the lake and around brush piles. In both lakes gonadal development was noted during the spring months. Parasites in the form of fish lice and small brown leeches were found present around the gills.

Dorosoma petenensis -- threadfin shad. This forage species was found in all three Valley lakes but not in great numbers from Delta Orchards Lake. Sexual development took place during the spring and early fall and apparently spawning occurred twice during the year. This forage fish was found in great numbers in some of the lakes of the "resaca system" of the Lower Rio Grande Valley.

Dorosoma cepedianum -- gizzard shad. They are common in all of the Valley lakes in great numbers. Sexual development was noted during the spring months and early fall. This forage fish constitutes an important item of diet for the game fish in the lakes. The heavier populations of this species were netted in Olmito Lake where apparently the rough fish are not cropping them, or it is not one of the preferred items of their diet. Black fungus growths around the pectoral fins were noted on some specimens.

Astyanax fasciatus mexicanus -- Rio Grande tetra. Of common occurrence in all of the lakes, it is more prolific in Delta Orchards Lake. This species was usually found on rather shallow gradual sloping beaches.

ictiobus bubalus -- smallmouth buffalo. Smallmouth buffalo are very common in all three lakes in large numbers throughout the year. They are usually found in deep open water during the summer and around the shore lines during the winter. This species constitutes a serious fisheries problem in all of the lakes, which is further aggravated by the lake supervisors who refuse to allow commercial fishermen to net them. Some specimens, weighing up to twenty pounds, were netted. Eradication of this species seem impossible, as the valley lakes take in water from the Rio Grande when available and pump it into the lakes without benefit of screening or filtration. Gonadal development was apparent during the spring months. Young of this species were seined from

Delta Orchards Lake. Several specimens caught in nets showed signs of mutilation apparently due to gar bites while netted.

Carpiodes carpio -- river carpsucker. They were uncommon, only ten specimens having been taken, and all of these from Delta Orchards Lake. It is possible that because of their similarity to smallmouth buffalo some of them could have been missed. This species is present in the Rio Grande and could be expected to occur in the other lakes.

Cyprinus carpio -- carp. Carp were found in all of the lakes but they are least common in Lake Bentsen. This is probably due to the lack of sufficient underwater plants and overpopulations of smallmouth buffalo, directly competing with them for the available food and cover. Carp were found at all netting stations but seemed to have a preference for the shallower parts of the lake. Gonadal development was noted to occur in the spring months. No parasites were noted although mutilation was common, especially in the tail region. None were found in the seining collections.

Notropis braytoni -- Tamaulipas shiner. This shiner was very common in all three lakes, especially on shallow beaches and around the shoreline. Spawning apparently took place in May as gonadal development began in March and April. This species is an important forage fish to the game fish of the Valley lakes.

Notropis lutrensis -- redhorse shiner. This species was taken only in Lake Bentsen during seining collections. Gonadal development apparently took place in March and April. No endo-parasites were noted but a few specimens showed signs of "fin rot".

Mugil cephalus -- striped mullet. This apparently brackish and salt water species has become established in Delta Orchards Lake and Olmito Lake. A six-pound and twelve-ounce specimen was taken in a net at Delta Orchards Lake. No young were taken and the adults were netted in the middle of the lakes. No parasites were observed and no young species were taken by seines.

Cyprinodon varigatus -- sea pupfish. This species was found in small numbers in Lake Bentsen and Delta Orchards Lake. This little forage fish was usually found around the shore lines in the quiet water.

Ictalurus punctatus -- southern channel catfish. This catfish occurs in Delta Orchards Lake and Olmito Lake, though more common in the former. Their occurrence was occasional in both lakes and they were netted in open water on cool days and especially on cool nights. Gonadal development occurred in May. Round worms in the stomach and stomach mesenteries were noted on the specimens from Delta Orchards Lake.

Ictalurus furcatus -- blue catfish. The most important game fish in all of the three Valley lakes and was found in all parts of the lakes at all times of the year. This species is well established in Lake Bentsen and Delta Orchards Lake, but predation has apparently kept the populations down in Olmito Lake. Ecological conditions apparently are very adequate for this species in both Lake Bentsen and Delta Orchards Lake as a sixteen pound specimen was caught in Lake Bentsen and a sportfisherman caught a thirty-three pound specimen in Delta Orchards Lake. Parasites were observed on specimens from all three lakes in the form of small brown leeches, attached around the gills and fins and round worms in the visceral and mesentery regions.

Ameiurus melas -- black bullhead. This species was found in Lake Bentsen and Olmito Lake. Their occurrence is not very common, but neither is it rare. One specimen was recorded from Lake Bentsen and twenty-three from Olmito Lake. This species did not begin to appear in Olmito Lake until after rain run-off water came into the lake, apparently washed down from some other part of the "resaca system". Shore fishermen usually caught them in weed beds and shallow areas.

Strongylura marinus -- needlefish. Two specimens were netted in Delta Orchards Lake. This species and the striped mullet are the only two salt water fish recorded from these lakes. They apparently ascend the Rio Grande and are taken into the pumps.

Gambusia affinis a -- gambusia. Very common in all three Valley lakes. Gonadal development occurred in the early spring and continued throughout the summer. They are very numerous in seining collections and are usually found in shoreline areas and around mats of grass.

Menidia beryllina -- tidewaters silversides. These species are very common in all three lakes, apparently one of the forage fish for some of the game fish, but definitely not one of the preferred items of diet. This species was usually found around very shallow water and under docks and piers.

Micropterus salmoides -- largemouth bass. This species occurred in all three Valley lakes but is more prevalent in Lake Bentsen. This can probably be attributed to the clearer water and more available food supply. Gonadal development occurred in the spring months. No fry or fingerlings were recovered, as spawning grounds are few and receding water levels may have stranded them in very low and warm water, or on land. Predation is apparently also very high. One specimen weighing four pounds was caught in Lake Bentsen. Rod and reel catches were made on all three lakes. Visceral worms were found in fish netted in Delta Orchards Lake.

Chaenobryttus coronarius -- warmouth bass. warmouth bass occurred in both stations of all of the lakes. They were very common in Olmito Lake probably due to big stocking during the early part of the project period. Gonadal development occurred in April and May.

Lepomis cyanellus -- green sunfish. Green sunfish were found in small numbers in all three Valley lakes. Gonadal development was not apparent at time of capture and parasites were not noted.

Lepomis macrochirus -- bluegill. Bluegill sunfish occurred in all of the three valley lakes. Some were caught by shore fishermen. Seined specimens were small and usually caught around underwater shelves near the shoreline. Greatest numbers of bluegills were found in Olmito Lake, although their size and weight were not enough to attract the "perch fishermen".

Lepomis auritus -- yellowbelly sunfish. Few specimens were caught in Delta Orchards Lake and Olmito Lake. None were caught in Lake Bentsen. They were usually found on all netting stations.

Lepomis megalotis -- longear sunfish. This species occurred only in Olmito Lake where only three specimens were taken.

Pomoxis annularis -- white crappie. White crappie were absent in Lake Bentsen but present in fair numbers in Olmito Lake and in large numbers in Delta Orchards Lake. This species has shown a great comeback in Delta Orchards Lake. Some specimens weighed up to two and a half pounds. They usually netted in open water but occasionally were found around vegetation patches. Parasites in the form of visceral and mesentery round worms were found on almost all specimens. Gonadal development began in February and March.

Aplodinotus grunniens -- fresh water drum. Fresh water drum were common in all three Valley lakes but more numerous in Lake Bentsen. This species was found in all stations but no definite habitat preference could be determined. In this region this

fish could be considered a game fish as it is preferred next to catfish. Gonadal development occurred in the spring months of the year and sometimes lasting until July. Many were infected with visceral and mesentery worms. Many showed up in periodic seining collections.

Cichalsoma cyanoguttata -- Rio Grande Perch. This species was of common occurrence in the seining collections from the three Valley lakes. In netting collections they were most prominent from Olmito Lake. Gonadal development was noted in the early spring months of the year. Parasites were relatively few, except on one specimen that has caudal mutilation and white fungus growths. Stomachs failed to reveal any signs of predation on game fish spawn, fry, or young.

AQUATIC VERTEBRATES OTHER THAN FISH

Large flocks of tame and wild geese and ducks winter on Lake Bentsen and Delta Orchards Lake. Other common water birds that were more prominent in the winter were the Mexican cormorant, coots, anhingas, sea gulls, and terns. Turtles were common and occasionally caught in nets. Both the soft shell turtle (Amyda sp.) and the slider (Pseudemys sp.) were found. Few frogs were found on the lake; most common being the leopard frog (Rana pipiens) and the cricket frog (Acris crepitans).

RECOMMENDATIONS

Lake Bentsen, near Mission, and Delta Orchards Lake, near Raymondville, are both major irrigation reservoirs, while there is a limited amount of irrigation from Olmito Lake. As all of these lakes are filled from the Rio Grande as water is available, the rough fish populations predominate. So far, no traps, weirs, screens or filters preventing the entry of rough fish fry and fingerlings has been successful, and until such time that means are taken to control the entry of rough fish from the Rio Grande no fisheries improvement program can be very successful. There has been an earnest effort on the part of some of the lake managers and owners to have something done about this condition of rough fish entry into the lakes, but when it comes to the actual expense, interest fades as some of them expect the state to do the work, maintenance, and pay all the expenses.

It is recommended that the annual or bi-annual stocking with game fish fry for these lakes be discontinued for the following reasons: Lake Bentsen has a sufficient game fish population, but fluctuating water levels prevent the spawning from being successful and the water that is brought into the lake is high in rough fish fry content. In Delta Orchards Lake, because of its heavy populations of smallmouth buffalo, shallow and murky water, and constant wind action causing siltation of any bass nets, further stocking of largemouth bass would not be advisable until drastic changes take place in the lake ecology. Under present conditions, crappie and catfish populations have been very successful.

Olmito Lake, because of its interconnection with the "resaca system", is also heavily populated with rough fish and until some time when measures are taken to insure the exclusion of rough fish from the lake, stockings of the lake are of doubtful value.

SUMMARY

The fish populations of Lake Bentsen, Delta Orchards Lake, and Olmito Lake were investigated by monthly netting and irregular seining collections for the period from July 1, 1954 to March 1956. A description of the netting stations is given and the kind and numbers of fish taken are discussed. The seasonal and monthly changes in numbers and percentages of the various fish are given and the other common vertebrates and parasites are considered. Stomach analysis, coefficient of condition, sizes and numbers are shown in table form. Twenty-six tables, six photographs, and three maps are included in this report.

Table 1. A List of Fish Species Recorded from Lake Bentsen.

Scientific Name	Common Name	Symbols Used in Following Tables.
<u>Lepisosteus spatula</u>	alligator gar	<u>L. spatula</u>
<u>Lepisosteus productus</u>	spotted gar	<u>L. productus</u>
<u>Lepisosteus osseus</u>	longnose gar	<u>L. osseus</u>
<u>Dorosoma petenensis</u>	threadfin shad	<u>D. petenensis</u>
<u>Dorosoma cepedianum</u>	gizzard shad	<u>D. cepedianum</u>
<u>Astyanax fasciatus m.</u>	Rio Grande Tetra	<u>A. fasciatus m.</u>
<u>Hybopsis aestivalis</u>	speckled dace	<u>H. aestivalis</u>
<u>Ictiobus bubalus</u>	smallmouth buffalo	<u>I. bubalus</u>
<u>Carploides carpio</u>	river carpsucker	*
<u>Cyprinus carpio</u>	carp	<u>C. carpio</u>
<u>Notropis braytoni</u>	Tamaulipas shiner	<u>N. braytoni</u>
<u>Notropis lutrensis</u>	redhorse shiner	<u>N. lutrensis</u>
<u>Notropis volucellus</u>	mimic shiner	*
<u>Hybognathus placitus</u>	plains shiner	*
<u>Pimephales vigilax v.</u>	parrot minnow	*
<u>Cyprinodon varigatus v.</u>	sea pupfish	<u>c. varigatus v.</u>
<u>Molliensia latipinna</u>	sailfin molly	*
<u>Ictalurus furcatus</u>	blue catfish	<u>I. furcatus</u>
<u>Ameiurus melas</u>	black bullhead	<u>A. melas</u>
<u>Gambusia affinis a.</u>	Gambusia	<u>G. affinis a.</u>
<u>Menidia beryllina</u>	tidewaters silversides	<u>M. beryllina</u>
<u>Micropterus salmoides</u>	largemouth black bass	<u>M. salmoides</u>
<u>Chaenobryttus coronarius</u>	goggleeye	<u>C. coronarius</u>
<u>Lepomis cyanellus</u>	green sunfish	<u>L. cyanellus</u>
<u>Lepomis macrochirus</u>	bluegill	<u>L. macrochirus</u>
<u>Aplodinotus grunniens</u>	fresh water drum	<u>A. grunniens</u>
<u>Cichlasoma cyanoguttata</u>	Rio Grande Perch	<u>C. cyanoguttata</u>
<u>Gobionellus boleosoma</u>	darting goby	*

*Rotenone Collection July 22, 1952.

Table 2. Seining Collections Lake Bentsen July 1, 1954 to June 30, 1955.

Species	Total Number	Percent of Total
<u>Dorosoma petenensis</u>	66	3.33
<u>Dorosoma cepedianum</u>	1011	51.08
<u>Astyanax fasciatus m.</u>	97	4.90
<u>Hybopsis aestivalis</u>	9	.46
<u>Notropis braytoni</u>	62	3.13
<u>Notropis lutrensis</u>	262	13.23
<u>Cyprinodon varigatus v.</u>	83	4.19
<u>Gambusia affinis a.</u>	279	14.10
<u>Menidia beryllina</u>	85	4.29
<u>Chaenobryttus coronarius</u>	1	.05
<u>Lepomis macrochirus</u>	2	.10
<u>Lepomis cyanellus</u>	3	.15
<u>Aplodinotus grunniens</u>	1	.05
<u>Cichlasoma cyanoguttata</u>	18	.91
	<u>1979</u>	<u>99.97</u>

Table 3. Numbers of Fish Taken in Experimental Nets from Lake Bentsen, March 1954 through October 1955.

Species	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Percent
<i>L. spatula</i>	0	0	1	3	7	2	1	3	0	1	0	0	18	1.39
<i>L. productus</i>	0	5	2	4	12	6	0	0	0	0	4	1	34	2.62
<i>L. osseus</i>	1	0	7	0	0	0	1	3	3	1	0	0	16	1.23
<i>D. cepedianum</i>	4	9	24	9	2	0	4	0	0	1	4	14	71	5.48
<i>I. bubalus</i>	39	23	87	49	85	30	35	85	82	58	20	42	635	49.03
<i>C. carpio</i>	0	3	2	1	2	2	5	2	5	1	0	2	25	1.93
<i>I. furcatus</i>	2	7	17	23	18	23	13	21	10	17	4	9	164	12.66
<i>A. melas</i>	0	0	0	0	1	0	0	0	0	0	0	0	1	0.07
<i>M. salmoides</i>	0	2	2	1	0	2	2	3	0	1	1	2	16	1.23
<i>L. macrochirus</i>	0	0	2	4	2	0	1	0	0	1	0	0	10	0.77
<i>L. cyanellus</i>	0	0	0	0	1	0	1	0	0	0	0	0	2	0.15
<i>A. grunniens</i>	1	41	29	95	59	21	26	8	4	0	0	3	300	23.16
<i>C. cyonguttata</i>	0	2	0	0	0	0	0	0	1	0	0	0	3	0.23
Total	47	92	173	189	188	86	89	125	105	81	46	73	1295	99.87
Percent	3.62	7.10	13.36	14.60	14.50	6.64	6.87	9.65	8.10	6.25	3.55	5.63	99.87	
No of Nets Set	2	2	4	4	4	4	4	4	4	4	2	2	40	
Avg. No. Fish Per Net	23.	46.	42.	47.	47.	21.	22	31	26	20	23	34		

Table 4. Pounds of Fish Taken in Experimental Nets from Lake Bentsen, March through December 1954.

Species	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
<u>L. spatula</u>	0.69	0	5.51	1.72	1.27	4.92	0	5.95	0	0
<u>L. productus</u>	2.88	0	0	0	0	0	0	0.84	3.78	0
<u>L. osseus</u>	5.14	0	0	0	0	1.63	3.07	0	0	1.06
<u>D. cepedianum</u>	0	0	0.25	0	0.56	0	0	0	0.69	2.59
<u>I. bubalus</u>	22.81	0	36.63	3.79	13.36	14.39	18.90	25.26	19.66	0
<u>C. carpio</u>	0	0	0	0	0	.73	3.51	3.51	0	1.88
<u>I. furcatus</u>	15.42	0	31.49	22.23	11.53	11.33	12.14	9.99	6.32	18.95
<u>A. melas</u>	0	0	0	0	0	0	0	0	0	0
<u>M. salmoides</u>	0	0	0.25	0.90	0.52	1.21	0	1.57	0.97	0
<u>L. macrochirus</u>	0	0	0	0	0.14	0.55	0	0	0	0
<u>L. cyanellus</u>	0	0	0	0	0	0	0	0	0	0
<u>A. grunniens</u>	4.26	0	5.83	0	0.04	0	2.84	1.50	4.65	0
<u>C. cyanoguttata</u>	0	0	0	0	0	0	0.10	0	0	0
Total	51.20	0	79.96	28.64	27.42	34.76	40.46	48.62	36.07	24.48
Percent	5.45	0	8.51	3.04	2.92	3.70	4.30	5.17	3.84	2.60

Table 5. Pounds of Fish Taken in Experimental Nets from Lake Bentsen, January through October 1955.

Species	January	February	March	April	May	June	July	August	September	October	Total	Percent
<u>L. spatula</u>	0	0	0	11.04	5.52	0	0	0	0	0	36.62	3.89
<u>L. productus</u>	0	6.86	0.75	3.51	11.28	7.72	0	0	0	0	37.63	4.00
<u>L. osseus</u>	0.97	0	0.63	0	0	0	1.31	0	0	0	13.81	1.48
<u>D. cepedianum</u>	0.63	1.13	5.04	1.75	0.13	0	0	0	0.09	0	12.86	1.37
<u>I. bubalus</u>	26.22	13.30	20.60	14.82	6.73	16.79	13.46	69.60	45.15	50.96	432.43	46.05
<u>C. carpio</u>	0	4.84	4.89	2.00	2.00	5.51	9.21	1.75	8.21	0	48.04	5.11
<u>I. furcatus</u>	3.07	12.82	10.22	0.79	8.67	23.10	11.60	24.77	8.03	3.44	245.91	26.19
<u>A. melas</u>	0	0	0	0	0.36	0	0	0	0	0	0.36	0.04
<u>M. salmoides</u>	0	2.44	2.06	0.88	0	0	0	0	0	1.75	12.55	1.33
<u>L. macrochirus</u>	0	0	0.33	0.08	0	0	0	0	0	0.01	1.11	0.11
<u>L. cyanellus</u>	0	0	0	0	0	0	0.12	0	0	0	0.12	0.01
<u>A. grunniens</u>	1.75	7.83	8.92	22.58	15.65	8.07	8.90	2.12	2.32	0	97.26	10.35
<u>C. cyanoguttata</u>	0	0.24	0	0	0	0	0	0	0	0	.24	0.03
Total	32.64	49.46	53.44	57.45	50.34	61.19	44.61	98.24	63.80	56.16	938.94	99.96
Percent	3.48	5.27	5.69	6.12	5.37	6.51	4.75	10.46	6.79	5.98		99.96

Table 6. Ranks, Lengths, Weights, and "K" Factors of Fish Caught in Gill Nets in Lake Bentsen, March 1954 through October 1955.

Species	Rank No.	By Wt.	Standard Length			Weight in Grams			"K" Factor		
			Min.	Max.	Average	Min.	Max.	Average	Min.	Max.	Average
<u>L. spatula</u>	7	6	340	660	556.10	539	2269	1160.30	.53	1.00	.73
<u>L. productus</u>	5	5	370	704	449.50	240	1588	570.60	.53	.73	.61
<u>L. osseus</u>	9	7	330	635	417.30	262	482	392.12	.50	.81	.62
<u>D. cepedianum</u>	4	8	130	230	118.00	42	227	121.63	.70	3.45	1.83
<u>I. bubalus</u>	1	1	135	640	341.60	52	10880	2593.30	2.40	3.65	2.97
<u>C. carpio</u>	6	4	260	460	335.44	200	2132	1115.44	1.15	2.50	2.10
<u>I. furcatus</u>	3	2	235	465	372.62	150	1474	919.00	1.13	1.63	1.34
<u>A. melas</u>	13	11	168	240	202.00	126	172	148.75	1.15	1.60	1.46
<u>M. salmoides</u>	8	9	168	360	249.87	113	794	353.00	1.07	2.55	2.00
<u>L. macrochirus</u>	10	10	58	130	104.60	5	85	51.80	1.93	4.85	3.47
<u>L. cyanellus</u>	12	13	105	115	110.00	54	57	55.50	3.50	3.70	3.60
<u>A. grunniens</u>	2	3	105	390	276.00	22	1503	493.75	.09	3.40	2.17
<u>C. cyanoguttata</u>	11	12	103	130	116.50	48	110	76.00	4.20	5.00	4.60

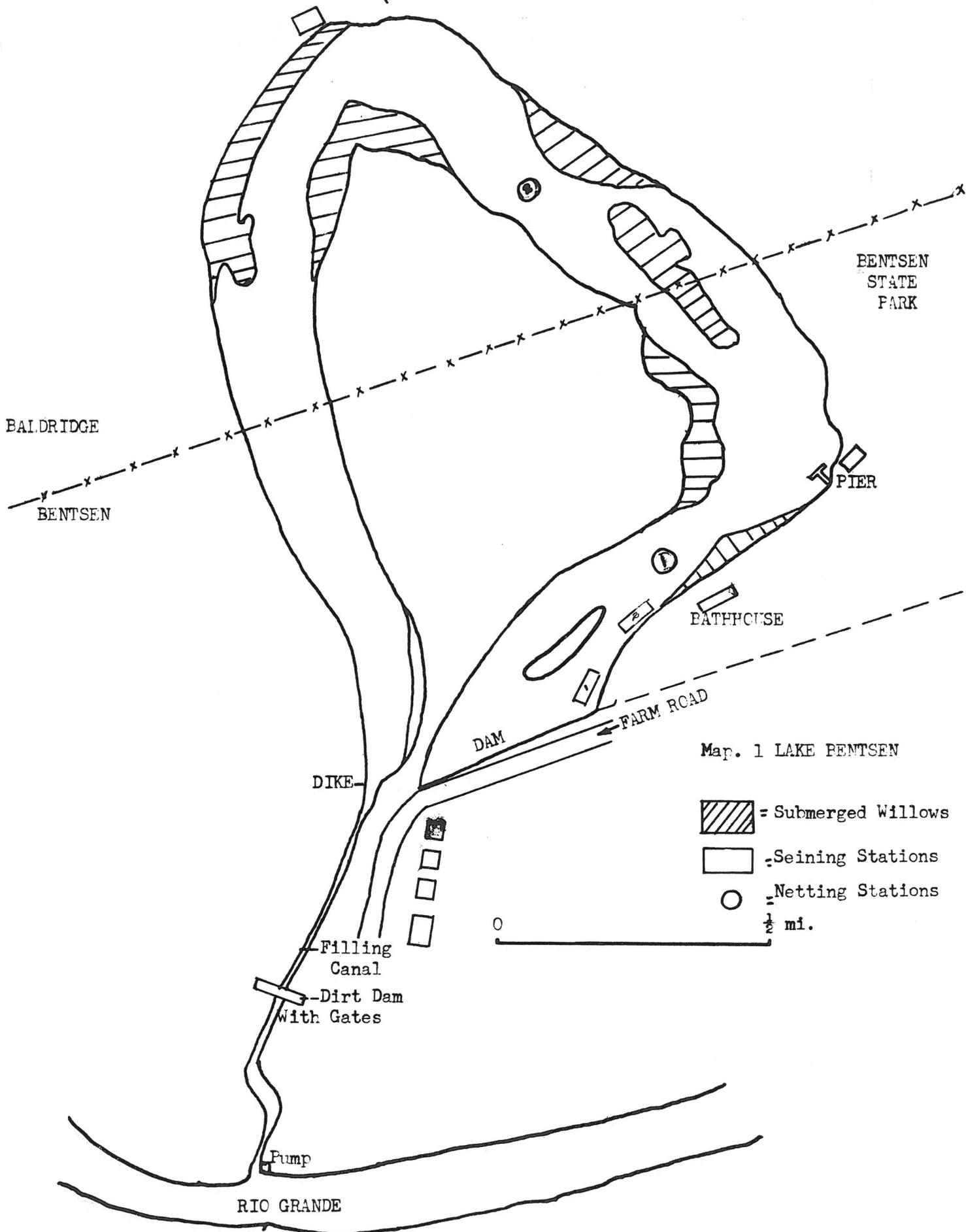
Table 7. Sexual Condition of Seven Common Species of Fish Taken in Experimental Nets from Lake Bentsen, March through December 1954.

Species	March					April					May					June					July				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
<u>L. spatula</u>	M			1										1					2					2	
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Table 8. Sexual Condition of Seven Common Species of Fish Taken in Experimental Nets from Lake Bentsen January through October 1955.

Species	January					February					March					April					May					September					October														
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5					
<u>L. spatula</u>						1	2									2	1									1																			
<u>L. productus</u>						1	2				3					1										1																			
<u>D. cepedianum</u>						1	1	3			1	1	18			1										1																			
<u>L. bubalus</u>						1	3	6			2	3	26			2	4	5								1																			
<u>C. carpio</u>						1	12				1	1				1	1									1																			
<u>L. furcatus</u>						1	3	23			3	2	20			2	2									1																			
<u>A. grunniens</u>						1	4				1	5				1	5									2	3																		
<u>L. spatula</u>						1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5					
<u>L. productus</u>						3					3					2	2									2	9	62																	
<u>D. cepedianum</u>						1	2	14			1	5	3			3	7	24								2	31																		
<u>I. bubalus</u>						1	5				6	1	10			1	10									1	13																		
<u>C. carpio</u>						1	1	3			1	1				1	1									1	1																		
<u>L. furcatus</u>						1	3	9			2	1	4			2	1									1	2																		
<u>A. grunniens</u>						1	3	8			1	3	11			1	5	6								1	6																		

N



Map. 1 LAKE BENTSEN

-  = Submerged Willows
 -  = Seining Stations
 -  = Netting Stations
- 0 1/2 mi.

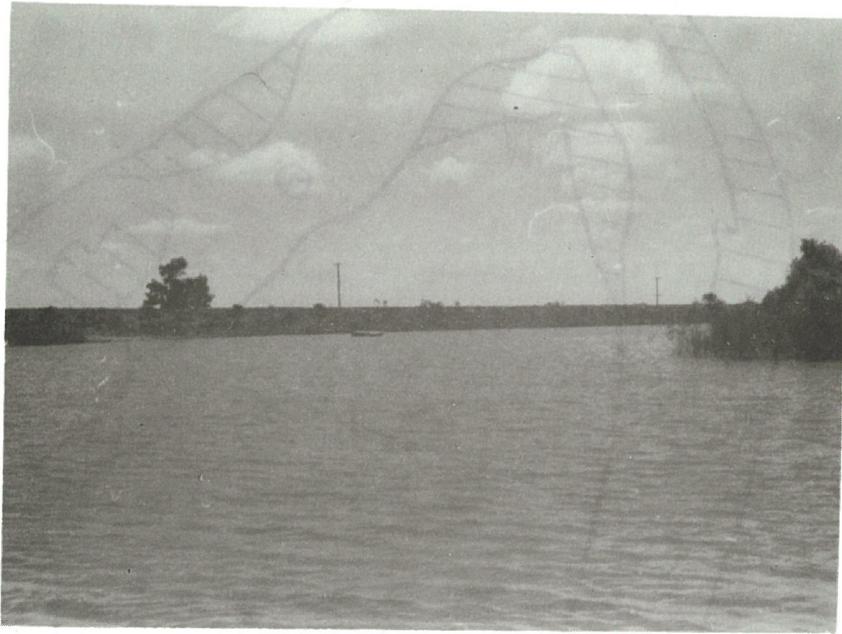


Fig. 1. Netting Station No. 1. Lake Bentsen

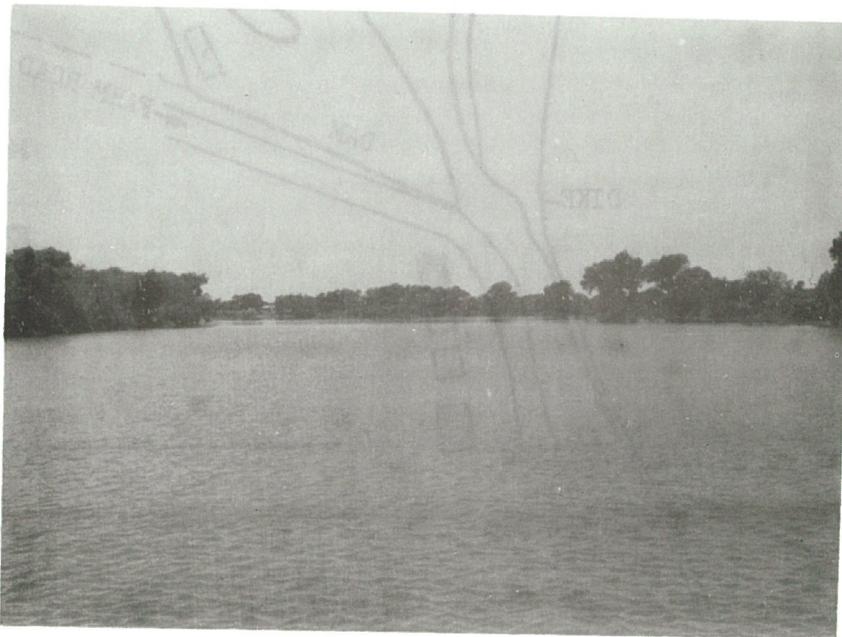


Fig. 2. Netting Station No. 2. Lake Bentsen

le 9. A List of Fish Species Recorded from Delta Orchards Lake

Scientific Name	Common Name	Symbols Used in Following Tables
<u>Lepisosteus spatula</u>	alligator gar	<u>L. spatula</u>
<u>Lepisosteus productus</u>	spotted gar	<u>L. productus</u>
<u>Lepisosteus osseus</u>	longnose gar	<u>L. osseus</u>
<u>Dorosoma petenensis</u>	threadfin shad	<u>D. petenensis</u>
<u>Dorosoma cepedianum</u>	gizzard shad	<u>D. cepedianum</u>
<u>Astyanax fasciatus m.</u>	Rio Grande Tetra	<u>A. fasciatus m.</u>
<u>Ictiobus bubalus</u>	smallmouth buffalo	<u>I. bubalus</u>
<u>Carpiodes carpio</u>	river carpsucker	<u>Carp. carpio</u>
<u>Cyprinus carpio</u>	carp	<u>C. carpio</u>
<u>Notropis braytoni</u>	Tamaulipas shiner	<u>N. braytoni</u>
<u>Ictalurus punctatus</u>	southern channel catfish	<u>I. punctatus</u>
<u>Ictalurus furcatus</u>	blue catfish	<u>I. furcatus</u>
<u>Ameiurus melas</u>	black bullhead	<u>A. melas</u>
<u>Strongylura marinus</u>	needlefish	<u>St. marinus</u>
<u>Cyprinodon variegatus v.</u>	sea pupfish	<u>C. variegatus v.</u>
<u>Gambusia affinis a.</u>	Gambusia	<u>G. affinis a.</u>
<u>Mugil cephalus</u>	striped mullet	<u>M. cephalus</u>
<u>Menidia beryllina</u>	tidewater silversides	<u>M. beryllina</u>
<u>Micropterus salmoides</u>	largemouth black bass	<u>M. salmoides</u>
<u>Caenobryttus coronarius</u>	goggleeye	<u>C. coronarius</u>
<u>Lepomis cyanellus</u>	green sunfish	<u>L. cyanellus</u>
<u>Lepomis macrochirus</u>	bluegill	<u>L. macrochirus</u>
<u>Lepomis auritus</u>	yellowbelly sunfish	<u>L. auritus</u>
<u>Pomoxis annularis</u>	white crappie	<u>P. annularis</u>
<u>Aplodinotus grunniens</u>	fresh water drum	<u>A. grunniens</u>
<u>Cichlasoma cyanoguttata</u>	Rio Grande Perch	<u>C. cyanoguttata</u>

Table 10. Seining Collections Delta Orchards Lake July 1, 1954 to March 30, 1956.

Species	Total Number	Percent of Total
<u>Dorosoma petenensis</u>	2	.09
<u>Dorosoma cepedianum</u>	1419	62.92
<u>Astyanax fasciatus m.</u>	416	18.44
<u>Ictiobus bubalus</u>	33	1.46
<u>Notropis braytoni</u>	74	3.28
<u>Cyprinodon varigatus v.</u>	9	.40
<u>Gambusia affinis a.</u>	52	2.30
<u>Menidia beryllina</u>	232	10.29
<u>Lepomis macrochirus</u>	3	.13
<u>Aplodinotus grunniens</u>	12	.53
<u>Cichlasoma cyanoguttata</u>	3	.13
	<hr/> 2255	<hr/> 99.97

Table 11. Numbers of Fish Taken from Experimental Nets from Delta Orchards Lake, March 1954 through October 1955.

Species	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Total	Percent
<i>L. spatula</i>	0	17	7	6	4	5	5	5	4	1	3	5	61	3.05
<i>L. productus</i>	1	1	5	3	1	1	0	2	1	0	0	0	15	0.75
<i>L. osseus</i>	1	1	8	1	0	1	1	0	4	0	0	0	17	0.85
<i>D. Cepedianum</i>	5	19	7	2	8	1	2	4	5	2	6	9	70	3.50
<i>D. petenensis</i>	2	9	2	0	1	0	0	1	0	0	0	3	18	0.93
<i>I. bubalus</i>	40	46	67	90	39	52	63	97	16	13	13	20	556	27.80
<i>Carp. carpio</i>	0	2	6	1	0	0	0	1	0	0	0	0	10	0.50
<i>C. carpio</i>	11	47	26	4	10	0	0	3	0	0	4	10	123	6.15
<i>I. furcatus</i>	28	30	73	110	24	16	90	127	14	4	4	21	605	30.25
<i>I. punctatus</i>	0	0	9	0	3	0	2	0	0	0	0	0	14	0.70
<i>M. cephalus</i>	10	1	18	16	0	9	0	2	0	0	0	3	59	2.95
<i>St. marinus</i>	0	0	0	0	0	1	0	1	0	0	0	0	2	0.10
<i>M. salmoides</i>	0	1	0	0	1	1	0	1	0	0	0	2	5	0.25
<i>C. coronarius</i>	0	1	1	0	0	0	0	0	0	0	0	0	2	0.10
<i>L. macrochirus</i>	0	0	3	0	1	0	0	0	0	0	0	0	4	0.20
<i>L. cyanellus</i>	0	0	0	0	0	0	0	0	0	0	0	2	2	0.10
<i>L. auritus</i>	0	1	0	0	0	0	0	0	0	0	0	1	2	0.10
<i>P. annularis</i>	36	16	9	11	23	12	17	28	13	12	14	31	222	11.10
<i>A. grummiens</i>	9	41	29	16	39	14	4	7	3	0	16	28	207	10.35
<i>C. cyanoguttata</i>	0	0	0	0	0	0	1	1	0	0	0	0	2	0.10
Total	144	230	270	260	154	119	186	278	62	32	77	182	2006	99.80
Percent	7.20	11.60	13.50	13.00	7.70	5.95	9.30	13.95	3.10	1.60	3.85	9.10		99.85

Table 12. Pounds of Fish Taken in Experimental Nets from Delta Orchards Lake, March through December 1954.

Species	March	April	May	June **	July	August	September	October	November	December **
<u>L. spatula</u>	0	56.86	10.41	0	10.03	52.31	37.67	90.17	69.91	0
<u>L. productus</u>	0	0	5.45	0	2.13	0	4.26	0	5.89	0
<u>L. osseus</u>	2.50	2.13	4.70	0	3.51	0	3.13	0	17.43	0
<u>D. cepedianum</u>	2.92	4.88	3.44	0	1.05	0	0.39	0.30	0.89	0
<u>D. petenensis</u>	0.36	1.17	0.35	0	0.11	0	0	0.08	0	0
<u>I. bubalus</u>	9.52	9.27	30.79	0	5.44	1.82	17.66	24.99	14.57	0
<u>Carp. carpio</u>	0	1.03	7.66	0	0	0	0	0	0	0
<u>C. carpio</u>	3.70	31.09	15.67	0	7.46	6.68	0	2.98	3.32	0
<u>I. furcatus</u>	9.09	18.40	0	0	3.82	0	38.43	30.91	25.11	0
<u>I. punctatus</u>	0	0	60.71	0	9.72	0	0	0	0	0
<u>M. cephalus</u>	0.94	0	12.17	0	0	6.27	6.21	0	8.10	0
<u>S. marinus</u>	0	0	0	0	0	0	0	0.28	0	0
<u>M. salmoides</u>	0	0	0	0	0	0.39	0	0	0	0
<u>C. coronarius</u>	0	0	0	0	0	0	0	0	0	0
<u>L. macrochirus</u>	0	0	0.25	0	0.09	0	0	0	0	0
<u>L. cyanellus</u>	0	0	0	0	0	0	0	0	0	0
<u>L. auritus</u>	0	0	0.12	0	0	0	0	0	0	0
<u>P. annularis</u>	0	0.18	0	0	0.94	1.19	5.60	10.39	10.15	0
<u>A. grunniens</u>	2.76	33.25	9.09	0	11.36	0.81	8.54	5.44	10.81	0
<u>C. cyanoguttata</u>	0	0	0	0	0	0	0	0	0	0
Total	31.79	157.42	160.81	0	55.66	69.47	121.89	165.54	166.18	0
Percent	1.56	7.76	7.92	0	2.74	3.42	6.00	8.16	8.19	0

** Net set impossible.

Table 13. Pounds of Fish Taken in Experimental Nets from Delta Orchards Lake January through October 1955.

Species	January	February	March	April	May	June	July	August	September	October	Total	Percent
<i>L. spatula</i>	0	105.46	14.57	66.42	13.75	78.81	20.07	0	0	0	626.44	30.88
<i>L. productus</i>	0	5.01	2.57	3.70	5.89	7.25	2.25	0	0	2.69	47.09	2.32
<i>L. osseus</i>	0	0	0	0	17.68	3.51	0	0	0	0	54.59	2.69
<i>D. cepedianum</i>	0	2.30	1.06	0.46	0.17	0.54	0.13	0	0	0	18.53	0.91
<i>D. petenensis</i>	0	0.41	0	0	0	0	0	0	0	0	2.48	0.01
<i>I. bubalus</i>	0	17.30	29.48	33.35	23.07	38.82	13.58	20.63	15.84	26.50	332.26	16.32
<i>Carp. carpio</i>	0	0	0	0	0	2.04	0	0	0	0.37	11.11	0.60
<i>C. carpio</i>	0	15.65	2.00	2.98	7.52	4.21	0	0	0	0.42	103.68	5.11
<i>I. furcatus</i>	0	59.56	28.93	51.66	28.98	62.54	13.95	8.11	49.37	20.88	449.74	22.17
<i>I. punctatus</i>	0	0	0	0	0	0	0	0	0	0	70.43	3.47
<i>M. cephalus</i>	0	0.84	6.98	0.35	1.15	4.37	2.43	4.47	0.69	5.01	59.89	2.95
<i>St. marinus</i>	0	0	0	0	0	0	0	0.26	0	0	0.54	0.00
<i>M. salmoides</i>	0	2.24	0	1.50	0	0	1.25	0	0	0	5.38	0.26
<i>C. coronarius</i>	0	0	0	0.48	0.17	0	0	0	0	0	0.65	0.00
<i>I. macrochirus</i>	0	0	0	0.07	0.26	0	0	0	0	0	0.67	0.00
<i>I. cyanellus</i>	0	0.19	0	0	0	0	0	0	0	0	0.19	0.00
<i>I. auritus</i>	0	0.08	0	0	0	0	0	0	0	0	0.20	0.00
<i>P. annularis</i>	0	23.05	16.16	8.21	3.57	4.46	1.11	0.69	3.36	2.14	91.18	4.49
<i>A. grunniens</i>	0	18.48	5.94	16.39	14.14	9.07	4.10	0.30	2.47	0.24	153.19	7.55
<i>C. cyanoguttata</i>	0	0	0	0	0	0	0	0	0.07	0.08	0.16	0.00
Total	0	250.57	107.58	185.57	116.35	215.62	58.87	34.36	71.80	57.96	2028.39	99.87
Percent	0	12.35	5.30	9.14	5.73	10.63	2.90	1.69	3.53	2.85		99.87

* Decimal in thousands.

** Net set impossible.

Table 1. Ranks, Lengths, Weights, and "K" Factors of Fish Caught in Gill Nets in Delta Orchards Lake, March 1954 through October 1955.

Species	Rank No.	By Wt.	Standard Length			Weight in Grams		"K" Factor			
			Min.	Max.	Average	Min.	Max.	Average	Min.	Max.	Average
<u>L. spatula</u>	8	1	422	980	730.66	652	15890	3286.00	.89	1.68	1.00
<u>L. productus</u>	11	10	420	670	551.00	567	2268	1463.00	.57	.72	.65
<u>L. osseus</u>	10	9	510	610	588.33	680	1558	1072.33	.40	.62	.52
<u>D. cepedianum</u>	6	11	115	340	208.33	32	397	123.80	.65	2.12	1.25
<u>D. petenensis</u>	9	14	140	160	148.30	50	57	52.33	.71	.85	.76
<u>I. bubalus</u>	2	3	120	400	342.75	56	3288	1908.25	3.20	3.50	3.47
<u>Carp. carpio</u>	13	12	205	290	256.66	242	507	438.66	1.07	1.30	1.23
<u>C. carpio</u>	5	5	144	288	219.75	85	482	283.00	2.90	4.17	3.13
<u>I. furcatus</u>	1	2	175	580	442.60	80	3969	1010.25	.80	1.74	1.33
<u>I. punctatus</u>	12	7	282	500	406.40	369	2495	1304.20	1.28	2.57	1.79
<u>M. cephalus</u>	7	8	190	360	306.66	130	2155	801.33	1.07	2.40	2.02
<u>St. marinus</u>	19	17	380	436	407.00	120	130	125.00	1.05	1.07	1.06
<u>M. salmoides</u>	14	13	185	310	258.75	178	680	468.00	1.45	1.80	1.61
<u>C. coronarius</u>	16	16	130	175	151.60	80	220	152.50	2.10	2.56	2.32
<u>L. macrochirus</u>	15	15	95	110	102.00	32	57	47.80	.57	2.20	1.71
<u>L. caynellus</u>	17	19	100	105	103.50	40	51	45.70	2.25	2.35	2.29
<u>L. auritus</u>	18	18	95	100	97.50	53	57	55.00	5.50	5.70	5.60
<u>L. auritus</u>	3	6	55	230	141.80	5	410	147.30	1.38	3.97	2.58
<u>P. grunniens</u>	4	4	120	350	224.00	57	1162	504.80	1.40	3.25	2.73
<u>A. cyanoguttata</u>	20	20	80	100	91.66	33	40	36.33	.62	2.10	1.60

Table 16. Sexual Condition of Six Common Species of Fish Taken in Experimental Nets from Delta Orchards Lake January through October 1955.

Species	January					February					March					April					May				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
<u>L. spatula</u>	M						1	2	2			2	2				3	2						1	
	F																							6	
	M						1	6	7			2	6	23			1	9	16					15	
<u>I. bubalus</u>	F						1	5				1	6					9						6	
	F						1	3	3			2	2	2				1	2					2	
<u>C. carpio</u>	M						1	3	3			1	1					1						3	
	F											6	8	12				8	4					18	
<u>I. furcatus</u>	M						1	2	1			1	6	18				3	1					4	
	F											2	8	18				5						3	
<u>P. annularis</u>	M						2	3	3			2	6	2				3	2					4	
	F						1	1	7			3	3	2				3						3	
<u>A. grunniens</u>	M						1	1	10			2	3					4						7	
	F											3	2					3						3	
Species	June					July					August					September					October				
<u>L. spatula</u>	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
<u>I. bubalus</u>	1	2	14	64		1	1	2	8		1	3	31			1	3	25			1	6	31		
<u>C. carpio</u>	1	1	2			1	1	6			1	3				1	5				1	6			
<u>I. furcatus</u>	1	1	15	80		1	1	4	9		2	4	6			2	6	65			1	16	59		
<u>P. annularis</u>	1	1	13	1		1	1	7	9		1	4	6			1	7	2			2	14			
<u>A. grunniens</u>	1	1	4	5		1	1	3	7		1	1	1			1	2				1	1			

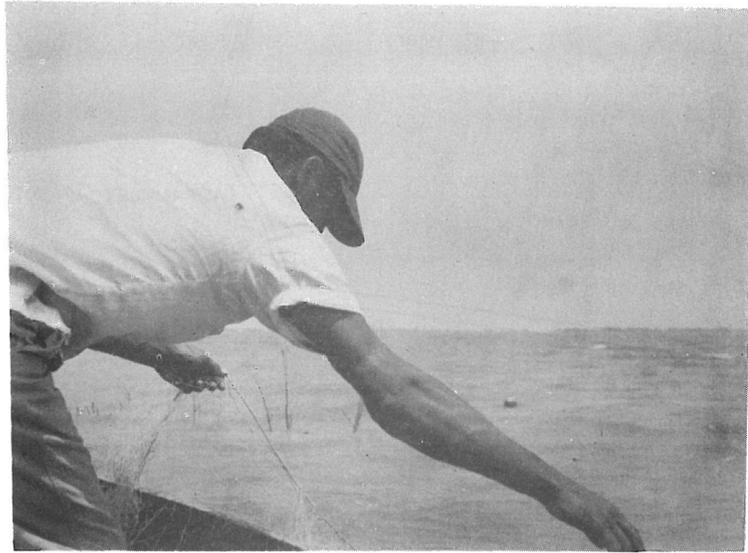


Fig.5. Netting Station No.1,Delta Orchards Lake.

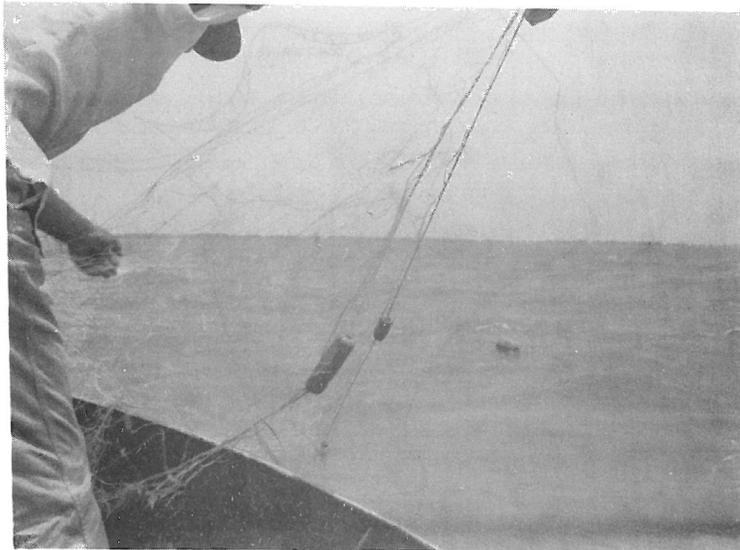
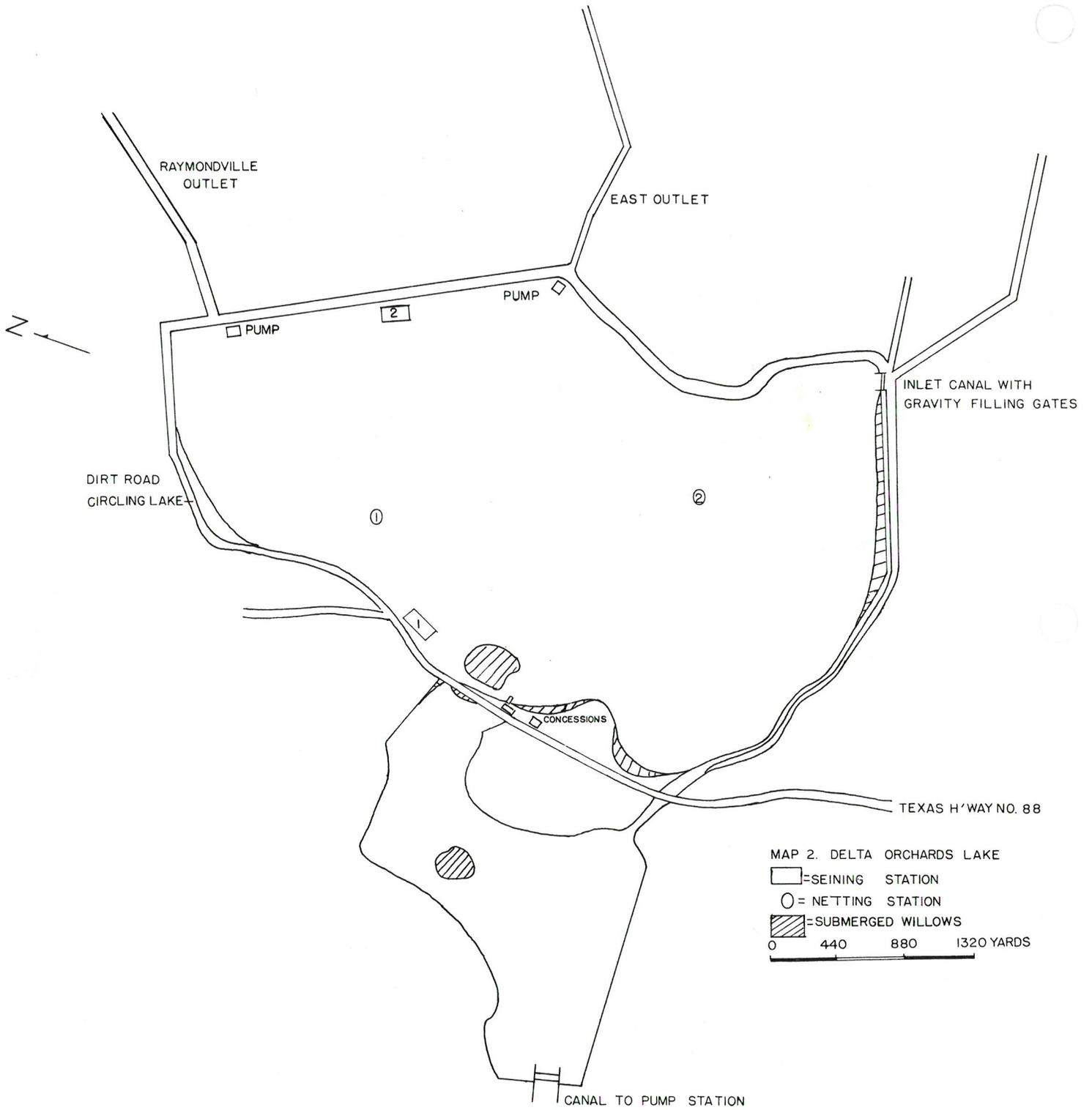


Fig.6. Netting Station No. 2. Delta Orchards Lake.



MAP 2. DELTA ORCHARDS LAKE
 □ = SEINING STATION
 ○ = NETTING STATION
 ▨ = SUBMERGED WILLOWS
 0 440 880 1320 YARDS

Table 17. A List of Fish Species from Olmito Lake.

Scientific Name	Common Name	Symbols Used in Following Tables
<u>Lepisosteus spatula</u>	alligator gar	<u>L. spatula</u>
<u>Lepisosteus productus</u>	spotted gar	<u>L. productus</u>
<u>Dorosoma petenensis</u>	threadfin shad	<u>D. petenensis</u>
<u>Dorosoma cepedianum</u>	gizzard shad	<u>D. cepedianum</u>
<u>Astyanax fasciatus m.</u>	Rio Grande Tetra	<u>A. fasciatus</u>
<u>Ictiobus bubalus</u>	smallmouth buffalo	<u>I. bubalus</u>
<u>Cyprinus carpio</u>	carp	<u>C. carpio</u>
<u>Notropis braytoni</u>	Tamaulipas shiner	<u>N. braytoni</u>
<u>Ictalurus punctatus</u>	southern channel catfish	<u>I. punctatus</u>
<u>Ictalurus furcatus</u>	blue catfish	<u>I. furcatus</u>
<u>Ameiurus melas</u>	black bullhead	<u>A. melas</u>
<u>Gambusia affinis a.</u>	Gambusia	<u>A. affinis a.</u>
<u>Mugil cephalus</u>	striped mullet	<u>M. cephalus</u>
<u>Menidia beryllina</u>	tidewater silversides	<u>M. beryllina</u>
<u>Micropterus salmoides</u>	largemouth black bass	<u>M. salmoides</u>
<u>Chaenobryttus coronarius</u>	goggleye	<u>C. coronarius</u>
<u>Lepomis cyanellus</u>	green sunfish	<u>L. cyanellus</u>
<u>Lepomis macrochirus</u>	bluegill	<u>L. macrochirus</u>
<u>Lepomis auritus</u>	yellowbelly sunfish	<u>L. auritus</u>
<u>Lepomis megalotis</u>	longear sunfish	<u>L. megalotis</u>
<u>Pomoxis annularis</u>	white crappie	<u>P. annularis</u>
<u>Aplodinotus grunniens</u>	fresh water drum	<u>A. grunniens</u>
<u>Cichlasoma cyanoguttata</u>	Rio Grande Perch	<u>C. cyanoguttata</u>

Table 18. Seining Collections Olmito Lake July 1, 1954 to June 30, 1955.

Species	Total Number	Percent of Total
<u>Dorosoma cepedianum</u>	38	8.87
<u>Dorosoma petenensis</u>	125	29.20
<u>Astyanax fasciatus m.</u>	34	7.94
<u>Notropis braytoni</u>	6	1.40
<u>Gambusia affinis a.</u>	104	24.29
<u>Menidia beryllina</u>	71	16.59
<u>Lepomis macrochirus</u>	8	1.87
<u>Lepomis cyanellus</u>	22	5.14
<u>Aplodinotus grunniens</u>	8	1.86
<u>Cichlasoma cyanoguttata</u>	12	2.80
Total	428	99.96

Table 19. Numbers of Fish Taken in Experimental Nets from Olmito Lake, March through December 1954.

Species	March	April	May	June	July	August	September	October	November	December
<i>L. spatula</i>	0	5	13	5	3	0	1	3	0	0
<i>L. productus</i>	8	11	0	35	20	9	15	22	23	11
<i>D. cepedianum</i>	12	0	24	21	13	7	0	1	4	7
<i>I. bubalus</i>	30	24	13	20	9	5	14	11	57	87
<i>C. carpio</i>	1	5	14	33	20	7	10	4	1	1
<i>I. furcatus</i>	0	0	0	0	0	0	0	2	2	0
<i>I. punctatus</i>	0	0	0	0	0	0	0	0	0	0
<i>A. melas</i>	0	0	0	0	0	0	0	7	3	1
<i>M. cephalus</i>	0	0	0	0	0	0	0	0	0	1
<i>M. salmoides</i>	0	0	0	0	0	0	0	0	0	1
<i>W. coronarius</i>	0	0	0	0	0	0	0	1	2	0
<i>C. coronarius</i>	0	0	0	0	0	1	0	0	2	0
<i>L. macrochirus</i>	0	0	0	1	3	6	3	0	5	2
<i>L. aurtus</i>	0	6	-2	1	0	3	0	0	0	0
<i>L. megalotis</i>	0	0	1	0	0	0	0	0	0	0
<i>L. cyanellus</i>	0	0	0	0	0	0	1	1	0	0
<i>P. annularis</i>	7	0	0	2	16	0	0	0	2	0
<i>A. grunniens</i>	3	0	0	0	1	0	3	0	1	0
<i>C. cyanoguttata</i>	1	3	0	0	2	2	1	3	11	1
Total	66	54	67	118	87	40	48	71	101	111
Percent	4.93	4.03	5.01	8.82	6.50	2.99	3.59	5.31	7.55	8.30
No. of Nets Set	1	2	2	2	2	2	2	2	2	2
Avg. N. Fish Per Net	33.0	27.0	24.5	59.0	43.5	20.0	24.0	35.5	50.5	55.5

Table 20. Numbers of Fish Taken in Experimental Nets from Olmito Lake January through October 1955.

Species	January	February	March	April	May	June	July	August	September	October	Total	Percent
<u>L. spatula</u>	0	0	0	0	0	0	0	0	0	0	30	2.24
<u>L. productus</u>	8	0	7	27	26	14	4	2	16	11	269	20.11
<u>D. cepedianum</u>	8	10	17	9	8	9	2	0	6	0	158	11.81
<u>I. bubalus</u>	16	20	13	40	37	23	9	13	2	0	443	33.13
<u>C. carpio</u>	0	0	1	2	4	3	0	6	2	0	114	8.52
<u>I. furcatus</u>	0	0	0	0	0	1	1	1	0	8	15	1.12
<u>I. punctatus</u>	0	0	0	0	0	2	0	1	2	0	3	.22
<u>A. melas</u>	0	0	1	4	4	4	0	0	1	0	23	1.72
<u>M. cephalus</u>	0	1	0	0	0	4	0	13	3	0	22	1.64
<u>M. salmoides</u>	0	0	0	0	1	0	0	0	0	0	5	.37
<u>C. coronarius</u>	0	0	1	16	8	7	5	0	0	0	46	3.34
<u>I. macrochirus</u>	0	0	0	5	4	6	1	2	0	0	39	2.91
<u>I. aurtus</u>	0	0	0	0	0	0	0	0	0	0	12	.89
<u>I. megalotis</u>	0	0	0	0	0	0	0	0	1	1	3	.22
<u>I. cyanellus</u>	0	0	0	0	0	1	0	0	1	0	5	.37
<u>P. annularis</u>	0	1	3	12	1	2	0	4	6	21	87	6.50
<u>A. grunniens</u>	0	2	2	3	5	5	0	1	4	1	46	3.44
<u>C. cyanoguttata</u>	0	0	3	0	1	0	0	2	0	2	17	1.27
Total	32	34	48	119	98	77	33	45	44	44	1337	99.92
Percent	2.39	2.54	3.59	8.90	7.32	5.75	2.46	3.36	3.29	3.29	1337	99.92
No. of Nets Set	2	2	2	2	2	2	2	2	2	2	39	
Avg. No. Fish Per Net	16.0	17.0	24.0	59.5	46.0	38.5	16.5	22.5	22.0	22.0		

Table 21. Pounds of Fish Taken in Experimental Nets from Olmito Lake March through December 1954.

Species	March	April	May	June	July	August	September	October	November	December	Total
<i>L. spatula</i>	0	50.68	12.74	29.36	7.31	0	4.51	23.70	0	0	128.30
<i>L. productus</i>	6.64	22.83	0	39.87	28.90	15.11	24.35	33.59	18.02	22.78	212.09
<i>D. cepedianum</i>	1.33	0	3.27	2.25	2.17	0.89	0	0.11	0.54	0.88	11.44
<i>I. bubalus</i>	19.06	12.82	13.11	23.67	7.79	7.82	17.80	5.36	3.77	58.40	169.60
<i>C. carpio</i>	0.74	8.97	3.98	32.09	25.06	8.30	15.48	8.90	1.25	0	104.77
<i>I. furcatus</i>	0	0	0	0	1.50	0	0	0.57	0.52	0	2.59
<i>I. punctatus</i>	0	0	0	0	0	0	0	0	0	0	0
<i>A. melas</i>	0	0	0	0	0	0	0	1.73	0.91	0.19	2.83
<i>M. cephalus</i>	0	0	0	0	0	0	0	0	0	6.27	6.27
<i>M. salmoides</i>	0	0	0	0	0	0	0	0.76	2.70	0.34	3.80
<i>C. coronarius</i>	0	0	0	0	0	0	0	0.61	0.53	0	2.81
<i>L. macrochirus</i>	1.09	0	0.43	0	0	0.15	0	0.57	0.42	0.08	2.85
<i>L. auriatus</i>	0	0.25	0	0.08	0.36	0.87	0.22	0	0	0	2.85
<i>L. megalotus</i>	0	0.69	0.25	0.09	0	0.26	0	0	0	0	1.29
<i>L. cyanellus</i>	0	0	0.12	0	0	0	0	0	0	0	0.12
<i>L. annularis</i>	0.30	0.56	0	0	0	0	0.08	0.09	0	0	1.03
<i>P. grunniens</i>	2.97	0	0	0.97	3.71	0	0	0	0.88	2.51	11.04
<i>A. cyanoguttata</i>	1.66	0	0	0	0.53	0.54	1.30	6.52	1.39	1.39	13.33
<i>C. cyanoguttata</i>	0.07	0	0	0	0.20	0.25	0.11	0	0	0	.63
Total	33.86	96.80	33.90	128.38	77.53	34.19	63.85	82.51	30.93	92.84	674.79
Percent	3.13	8.97	3.14	11.90	7.18	3.16	5.91	7.64	2.85	8.60	

Table 22. Pounds of Fish Taken in Experimental Nets from Olmito Lake, January through October 1955.

Species	January	February	March	April	May	June	July	August	September	October	Total	Proj. Total	Percent
L. spatula	0	0	0	17.29	0	0	0	0	0	0	17.29	145.59	13.49
L. productus	2.95	0	6.93	0	30.00	13.74	4.82	2.69	21.53	5.29	87.95	300.04	27.14
D. cepedianum	1.14	2.38	2.22	0.96	0.96	1.04	0.20	0.29	0.75	0	9.94	21.38	1.98
I. bubalus	22.28	24.85	6.55	31.08	37.00	22.43	11.76	11.71	2.51	0	170.17	339.77	31.49
I. carpio	0	0	0.62	3.26	4.51	1.93	0	7.07	2.51	0	19.90	124.67	11.55
C. carpio	0	0	0	0	0	2.25	0.31	0.77	0	6.20	9.53	12.12	1.23
I. furcatus	0	0	0	0	0	0	0	0.92	1.52	0	2.44	2.44	0.22
I. punctatus	0	0	0	0	0	0	0	0	0.59	0	4.86	7.69	0.71
A. melas	0	0	0.49	0.84	1.95	0.99	0	0	10.46	0	31.18	37.45	3.47
M. cephalus	0	0.56	0	0	0	5.04	0	15.12	0	0	21.72	37.45	3.47
M. salmoides	0	0	0	0	0	0	0	0	0	0	0	3.80	0.35
C. coronarius	0	0	0.16	2.43	1.88	1.49	0.98	0.17	0	0	7.11	9.92	0.92
L. macrochirus	0	0	0	0.17	0.18	0.52	0.13	0.15	0	0	1.15	4.00	0.37
L. aurtus	0	0	0	0	0	0	0	0	0	0	0	1.29	0.12
L. megalotus	0	0	0	0	0	0	0	0	0	0.15	0.15	0.27	0.02
L. cyanelus	0	0	0.45	0	0	0	0.13	0.34	0.10	0	1.02	2.05	0.19
P. annularis	0	0.80	1.28	0	0.68	0.86	6.93	3.38	5.77	5.24	24.94	35.98	3.33
A. grumdens	0	0.61	0.79	3.09	2.15	3.46	0	0.74	7.01	0.97	15.82	29.15	2.70
C. cyanoguttata	0	0	0	0	0.09	0	0	0	0.08	0.37	0.54	1.17	0.12
Total	26.37	29.20	19.49	59.12	79.40	53.75	25.26	43.35	49.83	18.22	403.99	1078.78	99.40
Percent	2.44	2.70	1.80	5.48	7.36	4.98	2.34	4.01	4.61	1.68			99.88

Table 23. Ranks, Lengths, Weights and "K" Factors of Fish Caught in Gill Nets in Olmito Lake, March 1954 through March 1956.

Species	Rank No.	By Wt.	Standard Length		Average	Weight in Grams		"K" Factor		Average	
			Min.	Max.		Min.	Max.	Min.	Max.		
L. spatula	9	3	385	810	655.33	340	8168	2009.35	.60	.99	.76
L. productus	2	2	330	590	440.00	217	1729	692.00	.69	.85	.75
D. cepedianum	3	8	130	165	148.50	60	113	75.00	1.85	2.58	2.22
I. bubalus	1	1	105	420	471.75	85	2722	1042.00	1.67	7.32	3.89
C. carpio	4	4	200	450	330.60	227	2466	1258.80	2.15	2.88	2.79
I. furcatus	13	9	190	400	282.60	82	1021	208.00	1.17	1.59	1.36
I. punctatus	17	14	280	300	288.33	369	482	422.33	1.53	2.20	1.77
A. melas	10	11	158	230	185.16	74	290	177.16	1.98	3.40	2.38
M. cephalus	11	5	230	530	366.66	255	2835	1027.75	1.88	2.56	2.18
M. salmoides	15	13	240	330	283.33	347	1134	682.66	2.51	3.15	2.73
C. coronarius	6	10	110	170	137.50	62	197	113.25	3.90	4.50	4.15
L. macrochirus	8	12	60	142	101.25	6	125	52.88	2.75	4.29	3.96
L. aurtus	14	16	90	115	102.83	37	57	51.16	3.70	6.70	4.70
L. megalotis	18	18	105	110	107.40	41	57	48.50	3.60	4.25	3.93
L. cyanellus	16	15	100	145	112.50	38	137	85.00	3.70	4.00	3.85
P. annularis	5	6	170	230	197.50	188	356	281.66	2.71	4.28	3.47
A. grunniens	7	7	120	310	217.00	40	851	348.60	1.46	2.85	2.74
C. cyanoguttata	12	17	97	235	106.00	44	337	118.25	.90	4.50	2.95

Table 25. Sexual Condition of Six Common Species of Fish Taken in Experimental Nets from Olmito Lake, January through October 1955.

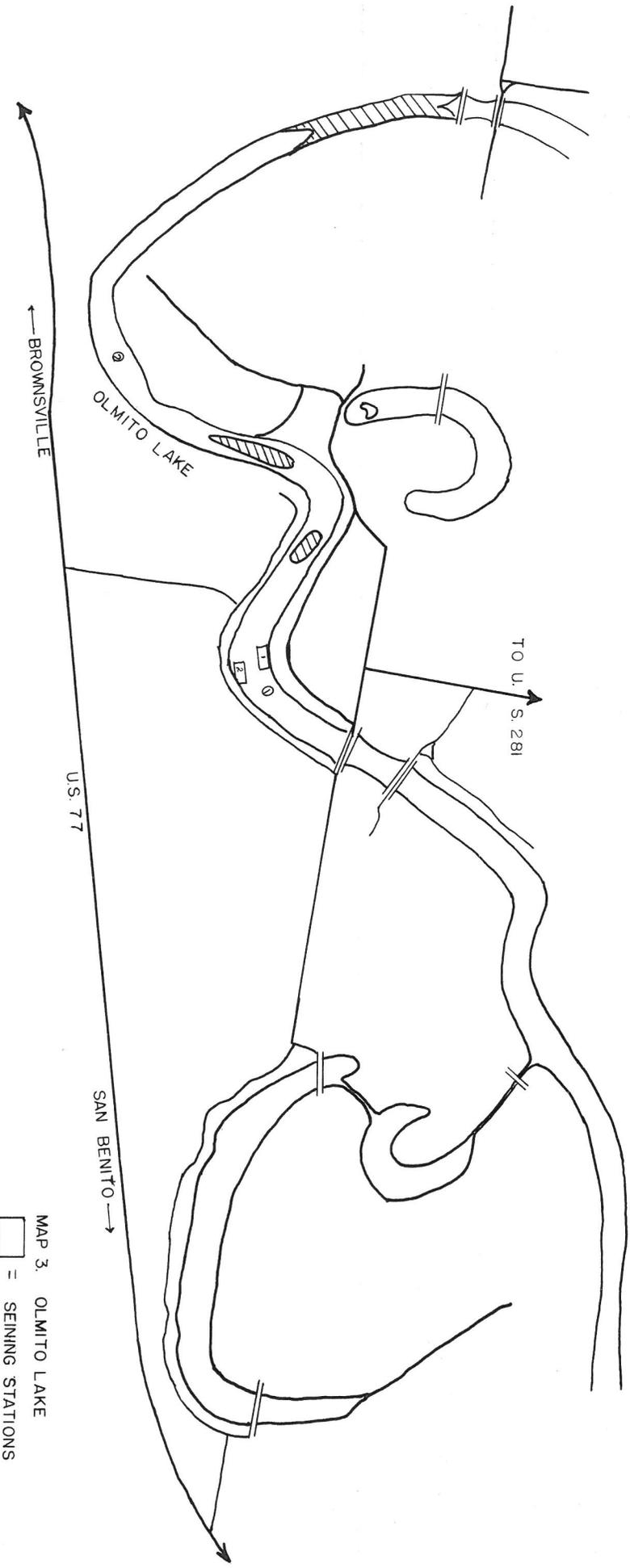
Species	January					February					March					April					May									
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5					
<u>L. productus</u>			1	4																										
	M		F																											
			3	1				1	3	2			1	1	1			3	3	20										
	F		4					1	3	2			1	2	1			1	2	1										
<u>D. cepedianum</u>			3	7				1	3	6			1	2	3			5	12	18										
	M		F					F	M	F			F	M	F			F	M	F										
			3					2	6				6	3				3	18											
<u>I. bubalus</u>			2					1																						
	M		F					M																						
			6					5					4					1	1	1										
<u>C. carpio</u>																														
	M		F					F																						
<u>P. annularis</u>								1																						
	M		F					M																						
								2																						
<u>A. grunniens</u>																														
	M		F					F																						
<u>L. productus</u>			3	8				1	2	2			1	1	1			1	4	6										
	M		F					M					F					F	M	F										
			4	4				1	2	2			1	4	3			1	4	3										
<u>D. cepedianum</u>			1	4																										
	M		F																											
			3	12																										
<u>I. bubalus</u>			6	1				1	1	7			1	3	3			1	1	1										
	M		F					M					F					F	M	F										
			1					1	7	2			1	3	3			1	1	1										
<u>C. carpio</u>			2										3																	
	M		F																											
			1										2																	
<u>P. annularis</u>			1	1																										
	M		F																											
			2	1																										
<u>A. grunniens</u>			1	1																										
	M		F																											
			1	1																										



Fig. 3. Netting Station No. 1. Olmito Lake



Fig.4. Netting Station No. 2. Olmito Lake



MAP 3. OLMITO LAKE

□ = SEINING STATIONS

○ = NETTING STATIONS

▨ = SUBMERGED WILLOWS

0 220 440 50 YARDS

Table 26. Stomach Analysis Showing Number of Stomachs Containing Various Food Items.

Species	Number of Stomachs	Volume in cc.	Dragonfly Larvae	Crayfish	Orthoptera	Lepidoptera	Game Fish	Forage Fish	Unidentified Fish
<u>L. spatula</u>	3	129						2 a	1 b
<u>L. productus</u>	4	164		1 a				1 c	2 a
<u>L. osseus</u>	2	83		1 a				1 a	2 a
<u>I. furcatus</u>	8	180		2 a	2 a			3 b	1 b
<u>M. salmoides</u>	6	42	1 a		2 a			2 b	1 c
<u>C. coronarius</u>	3	2	1 c		1 c	1 a			
<u>L. macrochirus</u>	4	3	1 a		1 c	2 a			
<u>P. annularis</u>	10	17					1 b	6 b	3 b
<u>A. grunniens</u>	8	54			1 a		2 b	4 c	1 b
Total	48	674	3	4	7	3	3	19	9

a - Lake Bentsen
 b - Delta Orchards Lake
 c - Olmito Lake