

Report of Fisheries Investigations
Notes on the Natural History of Problematical Fish Species

by

Leo D. Lewis
Project Leader

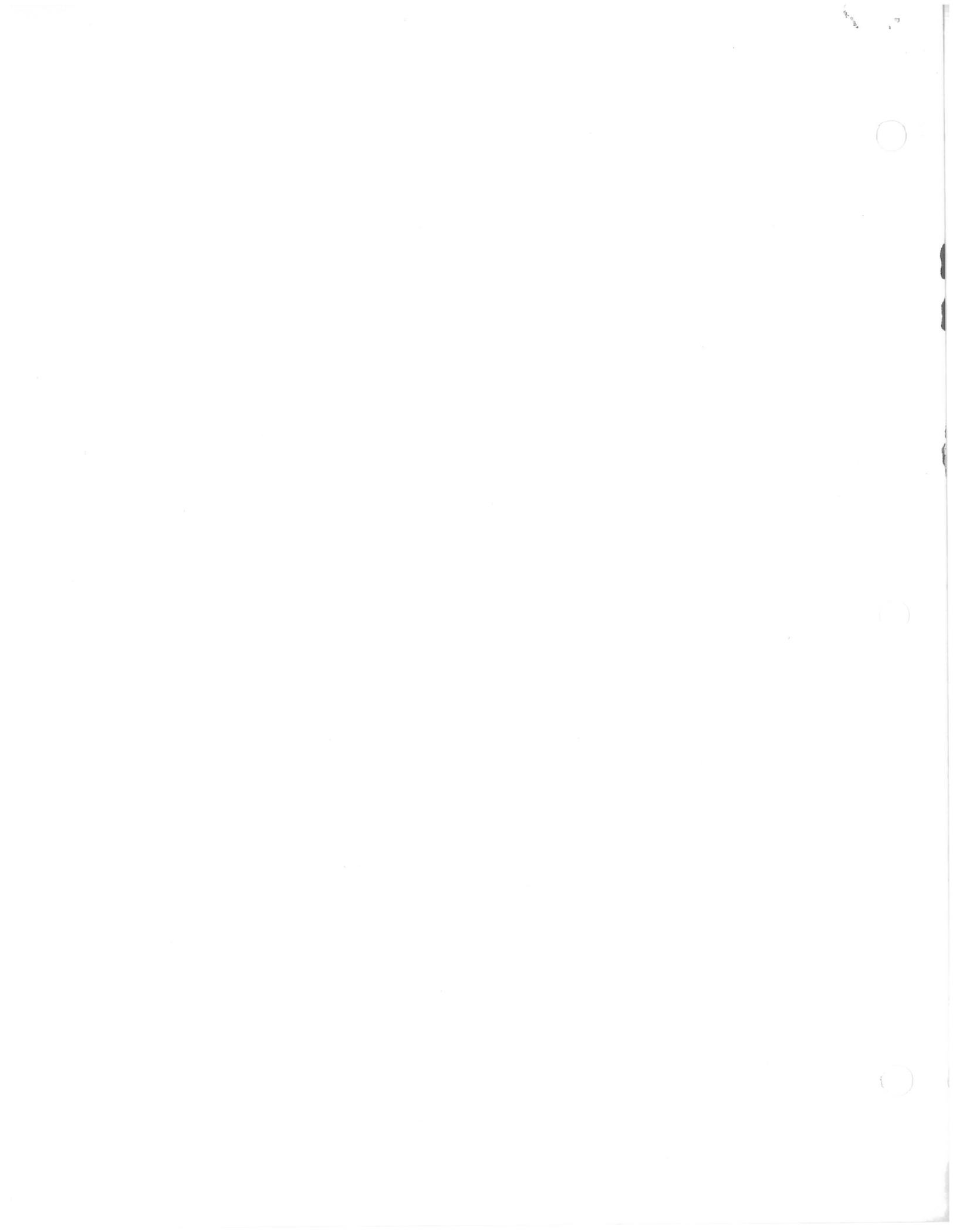
Dingell-Johnson Project F-7-R-6, Job B-15
June 1, 1958 - May 31, 1959

H. D. Dodgen - Executive Secretary

Texas Game and Fish Commission
Austin, Texas

Marion Toole
Coordinator

Kenneth C. Jurgens & William H. Brown
Assistant Coordinators



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. B-15

Title: Notes on the Natural History of
Problematical Fish Species.

Period Covered:

June 1, 1958 through May 31, 1959

Abstract:

Laboratory and field work was begun at Lake Diversion to study food and feeding habits, distribution, movements, and reproductive habits of gizzard shad, carp, carp-sucker and the buffalofishes. General field notes were taken and netting and seining collections were made at least twice monthly. All data was compiled and tabulated in such a manner as to obtain as much information as possible. This information will be utilized to organize and plan detailed natural history studies in the future, at which time special emphasis will be placed on features of natural histories that may aid in population controls.

Objectives:

To conduct laboratory and field studies of the anatomy, food and feeding habits, distribution, movements, and reproductive habits of problematical species. This work is to be preparatory to more detailed studies of each species at a future time, with special emphasis on such features of natural histories that may aid in population controls.

Techniques:

Netting and seining collections were made at least twice each month from Lake Diversion in an effort to determine distribution, movements and general living habits of river carpsucker, carp, shad, and the buffalo fishes. These data were compiled and tabulated in such a manner as to obtain as much information as possible.

Data for the study of distribution and movements was collected mostly from twenty regular netting stations. These stations were chosen according to habitat types and were located between the Lake Diversion Dam and the confluence of Cottonwood Creek and the Big Wichita River, the headwater tributary of Lake Diversion. In addition to the regular netting stations, periodic random sets were made to obtain supplementary data. Collections were made with experimental type nylon gill nets ranging in mesh size from one inch to three inch square mesh in 25 foot sections. During each collection, physical data and weather conditions were recorded in an effort to determine their possible effects upon movements and distribution of fishes. If there was evidence of increased activity of any fish species in a particular area, that area was either check-seined or "boogered" with gill nets.

It was planned to make detailed field observations on the location, time, extent and general requirements for spawning of rough fish species. Unfortunately, however, other official obligations and segment report writing prevented concentrated field work during the spawning season of 1959. This problem will be alleviated during the next period of study by reducing the number of jobs to be performed and by changing the segment termination date to December 31, instead of May 31.

Stages of gonadal development were recorded each month for the species under study in order to determine major spawning periods. Likely spawning areas were check-seined with small-meshed minnow seines to determine spawning success and distribution of fry. Spawning areas are to be recorded on maps for future study.

Field notes were taken regarding associations, enemies, preferred habitats, and any other features of life histories which might make undesirable species vulnerable to chemical or biological control.

Laboratory studies were conducted on food habits and fecundity of the river carp-sucker, carp, gizzard shad and the buffalofishes. This work was done by the Midwestern University during this period of study through an inter-agency contract agreement. Stomachs and digestive tracts were collected, preserved and delivered to the college laboratory at least once each month. In addition to preserved materials, live specimens, plankton and other materials were delivered upon request. Results of this study will be presented in a report to be submitted by the Midwestern University in accordance with the inter-agency contract agreement.

Information obtained in the laboratory and in the field during this segment period will be utilized to organize and plan detailed natural history studies in the future.

Findings:

Distribution and Movements

Field work on this job began in June 1959. Initial efforts were made to determine most suitable locations to establish regular netting stations, and to locate useable beaches for check-seining. After several months of intensive netting and seining, the decision was made to establish 14 regular netting stations to be worked during the later part of each month with 125 foot sections of experimental type gill nets. In addition to these stations, it was decided to include data collected from the six regular netting stations used during the first part of the month on the E-2 job. At each of these stations, 250 feet of experimental type gill nets are set over the lake from the dam to the river. Both floating and sinking sets were made in order to show vertical as well as horizontal distributions. Periodic random sets were made to obtain supplemental data.

After several months of gill netting, data began to appear voluminous and confusing. Therefore, considerable time was devoted to compiling and tabulating as much data as possible in a simplified and understandable manner. Figure 1 is an example of how distribution data is now being recorded. The following information is given:

- (1) Total number and number of each species taken from all stations combined during one particular collection.

- (2) Percent of the total number of each species taken from all stations combined.
- (3) Total number and number of each species taken from each station during one particular collection.
- (4) Percent of the total number of all species and percent of the total of each species taken at each station.
- (5) Percent males of each species under study taken at each station.

For example, distribution of gizzard shad (or any other particular species) during the later part of June may be determined by referring to Figure 1. A total of 194 fish of all species was taken during this particular collection. Eighty-three shad were taken which comprised 42.78 percent of the total number of all fish taken from the 14 netting stations. Twenty-one of the 83 shad taken were collected from the Sandy Beach floating net, comprising 25.3 percent of the total number of shad taken from all stations combined. Considering only the fish taken from the Sandy Beach floating net, a total of 25 fish was taken, 84 percent of which were shad. Of the twenty-one shad taken at this station, 38.09 percent were males. Of the 28 shad taken from the Sandy Beach area, 21 (75 percent) were taken near the surface and only 7 (25 percent) were taken near the bottom in the sinking net.

At the Rocky Bend station, approximately one mile up the lake from Sandy Beach, 19 shad were taken which comprised 22.89 percent of the total number of shad taken over the entire lake. Of the 19 shad taken at Rocky Bend, 61.29 percent were males. No shad were taken during this time from the Mid-lake, Crappie Creek and Rock Island stations, and a total of only 6 (7.2 percent) shad was taken towards the dam from these stations. Seventy-four of the 83 shad taken (89.2 percent) were collected from the river or upper one-fourth of the lake.

Data recorded in this manner from collections at least twice monthly over a period of several years is expected to indicate distribution and activity patterns from which experimental selective control measures may be attempted.

Food and Feeding Habits

Food habits of the four species under study will not be discussed in this report. This information will be presented in a separate report by the Department of Biology of Midwestern University. After termination of the inter-agency contract agreement with the university on August 31, 1959, however, the study of food habits will probably be continued by F-7-R personnel and results will be included in future reports under this job.

In addition to collecting, preserving and delivering field-collected materials to the university for analysis, attempts were made to determine time and locations of feeding. Since only stomachs and digestive tracts containing food were saved, specimens were processed as soon as possible after capture to prevent digestion of food beyond recognition. Nets were set in suspected areas of feeding and were run every one to two hours for a period of 24 hours. According to these limited collections, the majority of fish under study, with the exception of carp, fed mostly after mid-night. The most food was found in digestive tracts of fish collected from 4:00 A. M. to 8:00 A. M.

Specimens for food analysis were also collected with a nylon seine measuring 300 feet long and 12 feet deep. Although excellent laboratory materials were obtained in this manner, it was very time consuming and required more labor than collections made with gill nets.

Reproductive Habits

Unfortunately, spawning activities could not be observed in the field during this period of study due to other untimely obligations during the spawning season. However, an attempt was made to locate general spawning areas by check-seining for freshly spawned fish, fry and fingerlings.

Spawning locations and requirements of carpsucker in Lake Diversion are unknown at this time. Although carpsucker are quite numerous, no one has been contacted that has actually observed spawning of this species. The lake was seined as often as possible, especially in the upper part of the lake and in the river above, in an effort to locate freshly spawned carpsucker. Due to insufficient time, seining did not extend above confluence of Spring Creek and the Big Wichita River. Very few carpsucker under two inches long were taken anywhere.

In contrast to the absence of carpsucker fry, shad fry were found in abundance at almost any location after spawning began. Short drags with a 15-foot fry seine often produced hundreds of shad fry. They were most numerous in Boggy Bay and in the river near Rocky Bend. They seemed to prefer slightly turbid water and were seldom found in water less than four inches deep, even though they were constantly pursued by predacious fishes elsewhere. One shad fry less than one inch was taken in a plankton net being towed in deep, open water, far from cover or shore.

Buffalo and black bass fry shared a preference for shallow, warm, vegetated areas. In the river, buffalo fry were found only in shallow water from one to eight inches deep, and never over six to eight feet from shore. Seining in water other than warm and shallow never produced buffalo fry.

Major spawning periods of the various species were determined by gonadal inspection of all fishes taken in gill nets on the E-2 job. Only one female carpsucker was found to be spent in April. In the early part of May, females of one smallmouth buffalo and one carpsucker 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, twenty-nine percent of all carpsuckers and twenty-two percent of the smallmouth buffalo were spent. All other spawning-size individuals of the above mentioned species were ripe and ready.

Discussion:

This very brief and limited study so far has made it quite evident that considerable time and study of all aspects of environment will be required to discover the many unknown factors concerning the living habits of shad, carp, carpsucker and the buffalo-fishes. A study of movements and distribution of fishes alone, without learning causes or reasons for same, would contribute very little towards management and control of populations. It is hoped that time will be available in the future to consider and correlate all aspects of environmental data, including food and feeding habits, spawning, changes in barometric pressure and temperature, turbidity, light, current, vegetation

and cover, bottom types, competition and presence of other species, and perhaps other factors, with data pertaining to movements and distribution.

It is most important that we locate preferred spawning areas and determine necessary requirements for spawning of the species under study. If this is done, and it is found that reproduction of a particular species is dependent on certain factors, perhaps alteration of the spawning areas to eliminate one or two of the factors would result in an effective control. It may be possible to greatly reduce rough fish populations by concentrating on fry immediately after spawning.

In the past, rough fish control has been practically dependent on the use of chemicals and commercial fishing. Neither of these methods has been proven to be sufficiently effective, at least for a very long period of time. The primary objectives of this study are to discover biological controls that are naturally present and constantly working for a specific purpose. This can only be attained by conducting an all-inclusive life history study of the problematical species. Somewhere, there must be a factor-weakness through which each individual species can be controlled.

Prepared by Leo D. Lewis
Project Leader

Approved by Marion Toole
Director Inland Fisheries Division

Date October 2, 1959

Natural History
June 26, 1959
Distribution

			Dam Floating	Dam Sinking	Gravel Beach	Midlake	Crappie Creek	Rock Island	Rocky Point	Little Brusy	Rattlesnake	Sandy Beach Floating	Sandy Beach Sinking	Rocky Bend	Hackberry	Cottonwood
Long Nose Gar (1)	No.	9						2		1					5	1
	%	4.63						22.22		11.11					55.55	11.11
Short Nose Gar (2)	No.	2												1		1
	%	1.04												50.00		50.00
Shad	No.	83	2	2	2				1	1	1	21	7	19	9	18
	%	42.78	2.40	2.41	2.41				1.21	1.20	1.21	25.30	8.43	22.89	10.85	21.69
Smallmouth Buffalo	No.	36			4		3	6	2	2	2			3	6	8
	%	18.56			11.11		8.33	16.67	5.55	5.56	5.55			8.34	16.66	22.23
Big Mouth Buffalo	No.	0														
	%															
Carpsucker	No.	9									2		1	1	2	3
	%	4.63									22.22		11.11	11.11	22.22	33.33
Carp	No.	20		1	1		3	3	1	2	3	1	1		1	3
	%	10.31		5.00	5.00		15.00	15.00	5.00	10.00	15.00	5.00	5.00		5.00	15.00
Channel Cat	No.	10														
	%	5.16														
Bullhead	No.															
	%															
Flathead	No.															
	%															
White Bass	No.	1								1						
	%	.51								100.00						
Black Bass	No.	1						1								
	%	.52						100.00								
Crappie	No.	12		2		1	1				1	3	1	3		
	%	6.18		16.66		8.34	8.33				8.33	25.00	8.34	25.00		
Drum	No.	11									1		3	1	3	3
	%	5.68									9.09		27.27	9.09	27.27	27.28
(1)	No.	194	2	5	7	1	7	12	5	9	10	25	14	31	26	40
	%	100.00	1.03	2.57	3.61	.52	3.61	6.18	2.58	4.64	5.15	12.89	7.22	15.97	13.41	20.62

(3)
(4)
(5)
(6)

Figure 1
Method of Recording Monthly Distribution Data from Lake Diversion
(See explanation under Distribution and Movements)