

STATE Texas

PROJECT NO. F-7-R-2, Job B-4

PERIOD June 1, 1954 to May 31, 1955

JOB COMPLETION REPORT

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FILE

TITLE

Laboratory and statistical results of analysis of materials and data collected in the field.

OBJECTIVES

1. To determine the following data from laboratory examination of field collected specimens and data:
 - a. Growth rate of the species present.
 - b. Food habits.
 - c. Sexual development and spawning success.
 - d. Comparative physical condition (coefficient of condition).
2. To determine population estimates and trends from field data.

TECHNIQUES

1. Field and laboratory techniques for objective 1, above, were as follows:
 - a. This objective was abandoned on the basis of last year's findings.
 - b. Stomachs of all predacious fishes that obviously contained food were preserved in a formalin solution and later examined in the laboratory. Stomachs of a number of non-predacious fishes were also opened and examined.
 - c. Sexual development, spawning seasons and spawning successes were determined by field observations. Reproductive potential was determined by making counts of the eggs in the ovaries of female fishes that were almost ready to spawn.
 - d. Coefficients of condition were computed in the laboratory from measurements of length and weight, made in the field, after the formula presented by Carlander (Fresh-water Fisheries Biology).
2. Population estimates of the fishes of Lake Wichita and the Big Wichita River were determined by gill net and seining collections. The data is presented elsewhere (Completion Reports F-7-R-2, job B-5 and jobs A-2 and B-6, combined).

BACKGROUND

The report on the laboratory and statistical analysis of materials and data collected in the field during the 1953-1954 project year, covering Lake Kickapoo, Lake Kemp and Lake Diversion (Completion Report F-7-R-1, Job B-4) is used as the outline for the present report, which is organized in a similar fashion so that the statistical results of the three lakes studied last year may be readily compared with the one lake and one river studied this year.

The Canadian River, in the Texas Panhandle, was also studied in detail in the past year but no large fishes yielding data of the type summarized here were taken.

AGE DETERMINATION

Our detailed studies of the "annuli" on the scales of fishes from this part of Texas, in the 1953-1954 project year, led to no useful findings that could be applied to the fisheries biology of this area. Our summary of our last-year's work is repeated here. We have found no reason to change it.

"We are forced to conclude that annuli on the scales of fishes from this region, if valid for age determination at all, will require far more time and detailed study than we can spare for them. In this region, winters are mild and the lakes rarely freeze. Insect and plant life is available throughout the year. It is possible that scale marks reflect violent ecological conditions such as drouth, excessive salinity or sudden floods rather than regular yearly growth stages.

"We do feel, however, that scale markings may show, or at least indicate in a general way, age of the specimens. If the 'ridiculous' specimens are discarded and the doubtful specimens read as best they can be determined, the results are in fair agreement with what we would judge from size and weight. Nevertheless we have no confidence in the results and would rather depend on length and weight as age indicators."

We have noted several recent publications that also cast some doubt on the complete validity of annuli, even from areas where annuli have been much used in the past.

FOOD HABITS

The stomachs of all predacious fishes were examined in the field. Those stomachs that contained food were removed, labeled and preserved in 10% formalin. In the laboratory these stomachs were opened, under a microscope when necessary. Parasitic worms were discarded and only those food items that could be identified with reasonable certainty were recorded. Of the non-predacious fishes, a reasonable number of stomachs, gullets and the anterior portions of intestinal tracts, were tied off and removed from specimens for laboratory examination. Because of the nature of the food items, no quantitative method of presenting this data could be devised. Food-habits data is here presented by species, in phylogenetic order.

Lepisosteus osseus (Long-nosed Gar).-- A specimen from Diversion Dam Station on the Big Wichita River, taken August 3, 1954, contained two small bluegill sunfishes (Lepomis macrochirus), each about 85 mm. in length.

Lepisosteus productus (Spotted Gar).-- A specimen from Lake Wichita, female weighing 525 grams, contained a small gizzard shad (Dorosoma cepedianum), too digested to measure, on October 29, 1954.

Ictiobus cyprinellus (Bigmouth Buffalo).-- Two small specimens, taken May 14, 1955, contained only planktonic organisms. The food habits of this buffalo seem to be identical to those of the next species.

Ictiobus bubalus (Smallmouth Buffalo).-- A number of smallmouth buffalos were studied. This fish has no distinct stomach, and the pharynx constricts to a tube of almost uniform diameter in which esophagus, stomach and intestines are scarcely differentiated, externally. In the field we tied off the throats and anterior portions of the gut and saved these parts in formalin. In the laboratory we found great numbers of zooplankton in the gullets and anterior parts of the gut, digested zooplankton and reddish oil in the parts immediately posterior, and only fecal material farther back.

On December 15, 1954, the digestive tracts of three large specimens were carefully examined. Only zooplankton, almost entirely large forms of Cladocera and Copepoda, was present. Great numbers of these were found in perfect condition. A plankton haul in the lake showed the dominant planktonic animals to be rotifers and protozoa. These small forms outnumbered the entomostracans at least 10 to 1, but only the larger arthropods had been eaten by the buffalos. Apparently the smallmouth buffalo, and probably the largemouth buffalo also, is extremely selective in its feeding habits.

Carpiodes carpio (River Carpsucker).-- Small quantities of plankton were found in the anterior parts of the digestive tracts of several river carpsuckers, along with a small amount of unidentifiable material that seemed to be vegetable in nature. Farther back the long digestive tract contained only large quantities of fecal matter. We are not sure the material in the anterior part of the gut was food. Certainly it was present in amounts too small to support fishes as large as carpsuckers.

Hiodon alosoides (Goldeye).-- A female weighing 275 grams, taken at the Diversion Dam Station on the Big Wichita River, July 6, 1954, contained a large Carabid beetle and a small Acrid grasshopper.

Ictalurus punctatus (Spotted Channel Catfish).-- Only two channel catfishes with food in their stomachs were taken, both from Lake Wichita. A 525 gram fish taken September 23, 1954, contained one small gizzard shad. A catfish taken February 25, 1955, held a large gizzard shad and several Acanthocephalan parasites.

Ameiurus melas (Black Bullhead).-- All of the specimens containing food were taken from Lake Wichita. On October 29, 1954, a 600 gram female held one crayfish; an 800 gram fish held 21 sunfishes, 3/4 to 2 inches in length, and 11 tiny crayfishes; a 750 gram female held 1 gizzard shad, 3 inches long, 1 small crayfish, and 14 grass shrimp (Palaemonetes).

Two bullheads were taken November 23, 1954. One held 11 small sunfishes. The other held two small gizzard shad.

A specimen taken December 21, 1954, held two small gizzard shad.

A large bullhead taken February 1, 1955, held eight small sunfishes, apparently all Lepomis cyanellus, and two small gizzard shad.

Three large specimens taken May 25, 1955, had their stomachs bulging with decayed, brown vegetation that seemed to be cattail (Typha). One stomach held

nothing but this vegetation. The other two held large numbers of large fish eggs that compared most favorably with the eggs of the drum (Aplodinotus grunniens).

Morone chrysops (White Bass).-- There seemed to be little seasonal variation in the food of the white bass from Lake Wichita. Gizzard shad and grass shrimp formed the bulk of the food, with other small fishes making up the difference. In the Big Wichita River, only gizzard shad were found in the stomachs of specimens taken. The data from Lake Wichita is presented in the following table.

food item	frequency of occurrence	total number identified
<u>Paleomanotes</u> sp.	15	27
<u>Dorosoma cepedianum</u>	36	55
<u>Notropis</u> sp.	7	7
<u>Notemigoneus crysoleucas</u>	4	4
<u>Lepomis megalotis</u>	1	1
<u>Lepomis macrochirus</u>	1	2
<u>Pomoxis annularis</u>	1	1
<u>Aplodinotus grunniens</u>	1	1

Micropterus salmoides (Black Bass).-- All of our specimens of black bass from the Big Wichita River that contained food in their stomachs came from Kemp Dam Station. On December 13, 1954, one bass held a small gizzard shad; one held a small drum; another held a large parrot mimmow (Pimephales vigilax). On February 21, 1955, a bass 290 mm. long held a channel catfish (Ictalurus punctatus) 76 mm. long. On March 1, 1955, a specimen 193 mm. long held a small drum and another, 355 mm. long, contained three small gizzard shad.

Several specimens from Lake Wichita also contained food. One taken on December 15, 1954, contained a gizzard shad two inches long. One taken December 21, 1954, contained two small gizzard shad and a grass shrimp. Five taken on March 4, 1955, held food as follows: one grass shrimp; one small golden shiner (Notemigoneus crysoleucas); three each contained a single gizzard shad. The following summary shows the materials identified in tabular form.

food item	frequency of occurrence	total number identified
<u>Paleomanotes</u> sp.	2	2
<u>Dorosoma cepedianum</u>	8	11
<u>Pimephales vigilax</u>	1	1
<u>Notemigoneus crysoleucas</u>	1	1
<u>Ictalurus punctatus</u>	1	1
<u>Aplodinotus grunniens</u>	1	1

Pomoxis annularis (White Crappie).-- Only one crappie with food in its stomach was taken from the Wichita River, at Kemp Dam Station on December 13, 1954. It contained a small green sunfish and a large parrot minnow.

A number of specimens from Lake Wichita contained food, as follows:

food item	frequency of occurrence	total number identified
<u>Palaemonetes</u> sp.	4	15
<u>Dorosoma cepedianum</u>	19	22
<u>Notropis</u> sp.	1	1
<u>Notemigoneus crysoleucas</u>	1	1
<u>Lepomis</u> sp.	1	1
<u>Aplodinotus grunniens</u>	1	1

Aplodinotus grunniens (Freshwater Drum).-- a male drum, 298 grams in weight, taken July 7, 1954 at Diversion Dam Station on the Big Wichita River, contained a large short-horned grasshopper. This is our first record of an insect from the stomach of a fish of this species.

Two specimens were taken at Lake Wichita on October 5, 1954, with food in their stomachs. One female of 675 grams contained two small gizzard shad. A male of 700 grams held another drum, about three inches in length. We found this species to be cannibalistic last year also. A drum taken in Lake Wichita on February 1, 1955, contained two small gizzard shad.

REPRODUCTION

Records were kept of all observations in the field of spawning fish and schools of fry. All young of large fishes that were taken in seine hauls were counted and measured. All fishes taken in gill nets were examined for stages of sexual development and recorded as: (1) immature, with small, thin testes or small ovaries containing eggs of medium-size or smaller; (2) ripe, with large, thick testes or large ovaries containing large eggs; (3) spent, with flabby testes or ovaries, ovaries usually with a small number of unlaidd eggs and often with traces of blood. The judgment of "immature" and "ripe" is purely arbitrary but, in the field, few borderline cases occur. The observer simply asks himself, "Is this fish ready or nearly ready to breed." In general, eggs of a ripe female fish can easily be separated from one-another and easily be counted. The "spent" condition is more difficult to judge, especially in male fishes. It is also a condition of short duration. Some errors are doubtless included in this classification but, when many fish of a species are recorded as "spent" in a single catch, it is thought that the actual spawning date was but a few days past.

The ovaries of a number of females recorded as "ripe" were saved in a formalin solution. In the laboratory the ovaries were weighed to the nearest 1/10 gram. A small portion, less than one gram, was then snipped from the large mass, as representative a sample as possible, and weighed on a chemical balance to the nearest milligram. The eggs in this small sample were then counted and the total number of eggs in the ripe ovary thus estimated. Since the number of eggs is an obvious function of the weight of the fish, we list the number of

eggs per fish and eggs per kilogram as well.

In general it seems that the past project year was a much more normal year than the 1953-1954 project year, principally because this year the lakes were nearly full and rainfall was abundant. In the 1953-54 year, lakes were extremely low and it was a "drought" year. All species for which we have adequate data did breed in the spring or summer of 1954. Some forms apparently did not do so in 1953. Breeding times also seemed somewhat more regular and limited this past season.

Spawning data is here listed for each species, with data from the Big Wichita River given first. We suppose that the reproductive potential of a species of fish is genetically fixed in any given area and therefore we have not listed separately egg counts from the Wichita River and Lake Wichita.

Lepisosteus osseus.-- The largest spawn of this gar took place in both the Big Wichita River and Lake Wichita in May, 1955. A similar spawn must have occurred in May or early June, 1954, for gar fry were taken in late June, 1954, in the lake. A few fish with gonads large enough to be in spawning condition were taken in the fall and early spring.

Lepisosteus platostomus.-- The spawning season of the shortnosed gar seems to occur earlier than that of the above species. We found most large females to be "ripe" in April, 1954 and 1955. Several spawning fish were taken in August and September, suggesting that this form may spawn twice a year.

Lepisosteus productus.-- A "ripe" female taken in Lake Wichita on July 15, 1954, is our only breeding record for this past year.

Dorosoma cepedianum.-- The principal breeding season of this species in the Wichita Valley occurs in May, when most specimens taken have "ripe" gonads. A few, scattered individuals have "ripe" gonads at other months of the year. In seine hauls we took tiny gizzard shad, obviously not more than a few days old, in almost every month of the year, including the winter months. We judge that all or nearly all of the adult fish of this kind breed in May, but a fraction of one percent breed twice, at any time of the year. Survival of the offspring of these off-season breeders seems to be surprisingly high.

Ictiobus cyprinellus.-- The bigmouth buffalo spawned successfully in Lake Wichita in May, 1954, and specimens one to two inches long were taken in seine hauls in late May and in June. No more small specimens were taken until May, 1955, when several fish 10 to 12 inches long were caught in a seine haul. On this basis, the species grows about a foot in the first year.

Ictiobus bubalus.-- The smallmouth buffalo spawned successfully in May, 1954, in Lake Wichita. Fish slightly more than an inch in length were abundant, along with an occasional bigmouth buffalo of slightly larger size, in June, 1954. For a week or so, these small fishes were common. By July, no more were taken in seine hauls in the shallows.

On February 2, 1955, a seine haul in deeper water took 201 young buffalo of this species. They ranged from 102 to 130 mm. in standard length (mean 114.8) and from 33 to 76 grams in weight (mean 48.7).

Gonad development of the smallmouth buffalo is gradual. Noticeable enlargement of eggs and ovaries occurs in February and March. By April, eggs are listed as "ripe" although a few off-season spawners are recorded as "ripe" at other times of the year.

Carpionodes carpio.-- The carpsucker spawns at irregular times. In Lake Wichita, most of the females taken in February and March were "ripe." A few ripe individuals were taken at other months of the year. In the past project year, relatively few carpsucker fry and young fish were noted. In the previous year, the carpsucker was one of the most successful spawners. Perhaps this species reproduces most successfully when the only bottom available is mud or silt, as is true in drought years when the lakes are reduced in volume.

Cyprinus carpio.-- We took a ripe female in February, 1955, and recorded a "spent" female in May. Otherwise all the European carp we captured in gill nets were not in or approaching breeding condition. We took only a few small carp in seine hauls.

Ictalurus punctatus.-- Two females in breeding condition were taken, one in late March and one in early April. Distinct enlargement of ovaries was seen in fish taken March 4, 1955. The catfish spawned successfully in Lake Wichita in April, but not in numbers comparable to other nearby lakes where 3-inch fish were a nuisance to fishermen in June and July.

Ameiurus melas.-- Two females taken on April 29, 1955, contained ripe ovaries. All others taken, both males and females, were immature. This indicates a quite regular spawning season, in early May. No fry of this species were taken in Lake Wichita.

Morone chrysops.-- White bass in both the Big Wichita River and Lake Wichita spawned successfully in the spring of 1954 and again in the spring of 1955. The breeding season of the species is rather extensive, reaching from April to July. In July, fish from a few inches to nearly 1/4 pound in weight occur together in the rapids and in deeper pools. We found no off-season breeders in this species.

Micropterus salmoides.-- Black Bass spawned successfully in Lake Wichita in early May, 1955. We found no spawn of this species in the Wichita River.

Pomoxis annularis.-- The spawning season of the white crappie in Lake Wichita apparently started in early May, because ripe females were taken on April 29, 1955. The spawning season was short. All adult females taken in May were ripe. All taken after that month were immature. Few fry and no fingerlings were taken in seine hauls, and it is possible that the spawn might not have been successful.

Aplodinotus grunniens.-- Our only ripe female drum was taken in Lake Wichita on April 29, 1955. Small drum were found in the stomachs of predacious fishes in May and June.

 REPRODUCTIVE POTENTIAL (EGG COUNTS)

species	weight of fish	number of eggs	eggs per kilogram
<u>Lepisosteus osseus</u>	735	13,712	1,866
	8,619	89,541	1,039
	4,000	14,125	3,521
<u>Lepisosteus platostomus</u>	800	6,370	7,963
	1,300	15,908	12,236
	1,300	27,765	21,258
<u>Dorosoma cepedianum</u>	625	354,450	567,120
	550	174,378	317,051
	515	125,810	244,291
	725	136,000	187,586
	545	213,803	401,473
	428	124,384	290,607
	510	108,460	112,667
	1,125	445,653	396,133
<u>Carpionodes carpio</u>	600	184,428	307,377
	800	263,874	329,843
	850	458,307	539,185
<u>Cyprinus carpio</u>	3,500	386,746	110,498
<u>Ictalurus punctatus</u>	2,100	26,870	12,795
	710	11,476	16,163
<u>Ameiurus melas</u>	760	97,500	128,207
	925	75,888	82,041
<u>Morone chrysops</u>	454	270,600	596,035
	434	160,000	268,364
	382	241,875	633,181
	405	301,815	745,222
	472	173,788	368,195
	490	389,000	793,878
<u>Micropterus salmoides</u>	388	25,606	59,000
	256	21,962	86,415
<u>Aplodinotus grunniens</u>	775	23,839	30,760

The egg counts reveal some rather interesting facts. For example, the longnosed gar is far more numerous and successful in north-central Texas than is the shorinosed gar. Nevertheless, the latter lays more eggs per kilogram of body weight. In general, the channel catfish is far more numerous and successful in north-central Texas than is the black bullhead. Yet the latter lays far more eggs, both per fish and per kilogram of body weight, than does the channel catfish.

COEFFICIENT OF CONDITION

The "K" factors were determined for each specimen of large fish taken in our gill nets. Obvious errors in recording resulted in some impossible ratios of length to weight, and these were discarded. All others are included in the following paragraphs. We have preferred to state all of our actual data rather than give averages or other statistical conclusions, so that our figures can be readily compared with those of other workers by any preferred methods.

It is obvious that the fishes taken in Lake Wichita were in much better physical condition than those from the Big Wichita River. This is true of both rough fishes and game fishes, plankton-eaters and predacious species. This bears out what we had concluded from our field observations of the fishes from the two waters.

As compared with Lake Kickapoo, Lake Kemp and Lake Diversion, as determined during the previous project year, the fishes from Lake Wichita are in superior physical condition and have higher "K" factors, though the differences are not so great as between the lake and the Wichita River. This also agrees with our field observations. Lake Wichita seems to be the most productive body of water in this area.

DISTRIBUTION OF "K" FACTORS FOR LAKE WICHITALepisosteus osseus

factors	.2	.3	.4	.5	.6
males	1	4	28	44	2
females	-	2	13	10	-

Lepisosteus platostomus

factors	.4	.5	.6	.7	.8
males	2	2	9	5	1
females	-	4	4	5	4

Lepisosteus productus

factors	.5	.6	.7	.8	.9	1.0
males	-	1	2	1	-	-
females	2	-	-	2	-	1

Dorosoma cepedianum

factors	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9
males	-	1	1	5	3	11	12	6	5	3	8	2	-	-	-
females	2	2	-	6	8	10	9	23	19	10	12	3	5	6	5

Ictiobus cyprinellus

factors	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7
males	1	1	-	-	2	1	1	-	-	-	-	1

* Ictiobus bubalus

factors	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
males	3	-	-	7	13	16	33	23	20	22	22	10	11	6	2
females	-	-	-	2	1	1	7	6	2	6	3	2	3	2	-

Carpionodes carpio

factors	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4
males	3	5	7	12	17	11	14	10	6	3	1	-
females	2	2	4	5	9	4	9	6	4	7	7	8

Cyprinus carpio

factors	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3
males	1	1	1	6	2	2	4	2	4	-
females	-	-	1	2	5	3	4	-	-	1

Ictalurus punctatus

males -- 2 fish with "K" of 1.5; 1 fish with "K" of 1.6.

females -- 1 fish with "K" of 2.3

* We took 201 small buffalo in a seine haul on February 2, 1955. These ranged from 102 mm. to 130 mm. in standard length, and from 33 to 76 grams in weight. They were weighed in a mass, not determined as to sex, but individually measured as to length. The average (mean) "K" for these young fish was 3.3.

Ameiurus melas

factors	2.6	2.7	2.8	2.9	3.0
males	1	1	1	2	1
females	1	1	-	2	-

Morone chrysops

factors	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6
males	1	-	-	2	7	6	7	9	12	6	3	-
females	-	3	1	7	9	13	10	8	5	4	-	-

Micropterus salmoides

factors	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6
males	-	-	-	-	-	3	1	1	1	3	1	-
females	-	1	-	1	-	5	1	3	4	4	1	-

Pomoxis annularis

factors	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0	4.1
males	3	-	2	4	-	4	4	5	2	2	2	2	4	2	-
females	6	-	8	2	1	3	5	5	3	6	3	4	3	1	1

Aplodinotus grunniens

factors	2.4	2.5	2.6	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4
males	-	1	2	1	1	6	1	1	1	-	-
females	1	-	6	8	1	4	4	1	1	1	1

DISTRIBUTION OF "K" FACTORS FOR THE BIG WICHITA RIVER

Lepisosteus osseus

factors	.3	.4	.5	.6
males	20	73	17	-
females	3	50	22	3

Lepisosteus productus

factors	.5	.6
males	2	-
females	1	1

Dorosoma cepedianum

factors	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4
males	4	4	2	3	11	16	20	24	28	11	8	4	1
females	2	5	4	4	7	3	13	17	17	11	12	7	1

Hiodon alosoides

males -- none taken.

females -- 1 fish with "K" of 1.4; 2 fish with "K" of 1.5

Ictiobus bubalus

factors	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	3.7	3.8
males	5	2	-	-	2	-	6	1	5	1	2	2	-	-	-
females	-	1	-	-	1	-	5	1	2	1	4	2	1	1	3

Carpionodes carpio

factors	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
males	2	2	4	5	5	6	4	6	1	3	4	2	2	-	1
females	3	4	4	5	1	3	13	2	3	3	3	-	1	-	-

Cyprinus carpio

factors	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
males	1	-	-	-	1	1	-	1	-	-	1	-	-	-	-
females	-	-	-	-	1	-	-	1	-	-	1	-	-	-	1

Ictalurus punctatus

factors	1.3	1.4	1.5	1.6	1.7	1.8	1.9
males	4	10	2	4	3	2	2
females	1	4	6	3	-	3	1

Morone chrysops

factors	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	3.5
males	1	5	1	2	3	2	2	4	2	-	-	1	-	-	-
females	4	3	3	5	5	5	1	2	1	1	-	-	3	-	2

Micropterus salmoides

factors	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7
males	1	-	2	-	-	1	-	1	2	1	-	1
females	-	-	2	1	1	-	2	4	1	3	3	4

Pomoxis annularis

factors	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	3.5
males	-	-	1	5	3	2	3	-	-	-	1	1	1	-	-
females	2	-	1	2	2	2	-	2	-	2	-	1	-	1	1

Aplodinotus grunniens

factors	1.7	1.8	1.9	2.0	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9
males	-	3	5	6	-	3	-	-	2	-	-	-	-
females	1	4	3	4	4	4	2	7	5	2	-	1	1

PATHOLOGICAL CONDITIONS

During the past project year we kept a close watch for diseased and abnormal fishes. However, fewer were found than during the preceding year. We suppose that the better ecological conditions, more water in lakes and streams, is at least partially responsible for this.

Saprolegnia parasitica.-- Several dead fish that were covered with one of the several species of Saprolegnia were found in the Wichita River below the Lake Kemp Dam. We suspect that most, perhaps all, of these represent secondary infections of the fungus on injured or dead fish. No living, fungus-infected fish were noted.

Crappie Tail Fungus.-- This disease was fairly common last year. Not one case was seen or reported this year.

Parasitic worms.-- Nematodes, acanthocephalans and cestods were common in the intestines and occasionally in the stomachs of larger fishes, but the only coelomic parasites noted were a few Contracaecum spiculigerum found in two black bullhead catfishes. No intramuscular parasitic worms were found.

Gizzard Shad Eye Disease.-- Less than five large gizzard shad from Lake Wichita and none from the Big Wichita River had their eyes sealed over by an opaque layer of ossified mucous.

Abnormalities Of Development.-- One smallmouth buffalo, taken February 1, 1955, in Lake Wichita, had a large hump just above and to one side of the caudal fin but was fat and otherwise healthy.

On October 29, 1954, we took a gizzard shad, along with 13 other, normal, gizzard shad, that was so deformed that it resembled a carp or sucker. The body was shortened and greatly humped, with a deep notch or cleft just back from the dorsal fin. It seemed fat and healthy.

Accidental Abnormalities.-- Several smallmouth buffalos and river carpsuckers were taken that were blind in one eye, and one carpsucker was blind in both eyes.

In Lake Wichita we took two gars, one longnosed and one shortnosed, that had lost their upper jaws. There remained only the elongated lower "beak" and a healed stump of the upper jaw. In both cases the wounds had completely healed and the fish were apparently managing to find food enough to sustain life, though both were in poor condition. We suppose the upper jaws were broken off by angry fishermen who thought this would cause the death of the fish.

SUMMARY

The determination of the age of fishes from north-central Texas by the annuli markings on their scales appears unreliable. Food habits of several species of fishes were determined by examination of stomach contents. Gars had fed mostly on sunfishes and gizzard shad. Buffalos (Ictiobus) had fed entirely on entomostracan crustaceans. One goldeye had eaten insects only. Grass shrimp and gizzard shad constituted most of the food items found in the stomachs of game fishes. Spawning, reproductive success and the number of eggs produced by the larger species of fishes is discussed. The comparative physical condition ("K" factors) are given for all larger fishes taken. The fishes from Lake Wichita were in much better physical condition than those from the Big Wichita River. Pathological conditions were rarely encountered in the past year.