

Survey of Fishes in the Oklahoma Panhandle and Harper County, Northwestern Oklahoma

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A survey of the fishes of the Panhandle and Harper County in Northwestern Oklahoma produced 33 species representing 12 families. Sixteen additional species have been reported by others or have been stocked in lakes, for a total of 48 known species. Only seven were new records for the region. A description of the Cimarron and North Canadian River Systems, a brief history of ichthyological collections within the region, and an annotated checklist with remarks on probable status and abundance of each species are included.

INTRODUCTION

This study concerns a review of the status of the fishes in this region. The objective of this study was to evaluate populations of fish species characteristic of the western plains segment of the upper North Canadian and Cimarron River Basins in northwestern Oklahoma and to assess the extent of changes in these fishes during the past sixty years. The records of fishes collected in this report extend from 1926 to the present. Collection records from Oklahoma State University, the University of Oklahoma, and University of Kansas were examined during this study. All collections in the period 1976-1985 were by the author and personnel from the Oklahoma State Department of Health (OSDH), Environmental Service Laboratory.

DESCRIPTION OF THE CIMARRON AND NORTH CANADIAN (BEAVER) RIVER BASINS

This study includes Beaver, Texas, Cimarron, and Harper counties of northwestern Oklahoma. This region is drained by two major streams, the North Canadian (Beaver) River and the Cimarron River.

The Cimarron River originates in the Johnson Mesa area near Capulin Mountains in northeastern New Mexico near Raton. It begins with a small tributary called Cimarron Creek near the Colorado state line and becomes the Dry Cimarron just northeast of Capulin Mountain. Moving easterly, the river first enters Oklahoma as the Cimarron River from the west at river mile 597.4 near the town of Kenton in Cimarron County. It flows parallel to the state line for a distance of about 67 km, then proceeds northeasterly and crosses the extreme southeastern corner of Colorado and southwestern corner of Kansas. It returns to Oklahoma at a point north of Mocane in the northwest corner of Beaver County, then flows eastward to where it exits the state again from the northwest corner of Harper County. The river then reenters, the state for the third and final time at the Harper-Woods county line.

The North Fork of the Canadian River, also known as Beaver River, heads in northern Union County, New Mexico. It enters Oklahoma about six km south of Mexhoma from New Mexico, then loops south and crosses into Texas for a distance of about 19 km, reenters Oklahoma, then flows eastnortheast and leaves the region about Gate.

The study region is in the High Plains, which has a regional eastward slope. The highest point in the region is Black Mesa (elevation 2,984 m), and the lowest point is on the Cimarron River in Harper County (elevation 570 m) with a total relief of 892 m. As the Cimarron and North Canadian Rivers drain eastward the North Canadian is 90 m higher than the Cimarron at the New Mexico State line and 45 m higher in eastern Beaver County. Relief is generally very low, with about 60 to 90 m along the main rivers and a maximum of 196 m near Black Mesa in Cimarron County.

The region is poorly drained, with many playa lakes having no drainage outlets. The topography of the region consists of 90%

uplands, 5% slopes, and 5% lowlands.

The Cimarron River has a gradient of 3 to 5 m per mile, and the North Canadian River has a gradient of 3 to 5 m per mile to the east and 6 m per mile westward. The topography in the Black Mesa in Cimarron County is well defined by several small tributaries which have dissected the plateau and produced deep canyons. Many of the smaller streams have gradients of 6 to 12 m per 1.6 km. These tributaries slope sharply toward the main stem forming steep banks and fairly deep channels. The stream density is about one large stream entering the main river every 2 km, and the flood plains are 0.8 to 1.6 km wide for the main rivers.

The North Canadian Basin is a wide, rolling alluvial plain with a minimum number of tributaries west of Guymon. From Guymon east, more numerous intermittent small creeks and branches enter the river from the south. The topography of the drainage basin consists of high plains and rolling prairies, and the land is used primarily for farming and ranching.

The Cimarron River has a broad, mostly flat, and uniform channel with dense growths of salt cedar and cottonwood trees along its immediate banks. Along most of its course in the Oklahoma Panhandle it is a "losing stream," unshaded, with a high rate of evaporation, infiltration, and high dissolved ion content (specific conductivity greater than $2000 \mu\text{mho/cm}$)(1).

Habitats for fishes consist mostly of long shallow riffles, over shifting sand, interrupted by relatively small, shallow pools and backwaters along banks and exposed sandbars. During most visits to the region over a five-year period both rivers were less than 5 m in width, with an average depth of less than 15 cm and a flow of clear water of less than 0.5 m/s. Both main rivers had silt/sand substrate usually covered by filamentous green algae with emergent vegetation (water buttercups, water cress, rushes, cattails) along the stream margins.

The climate of the region is classified as semi-arid. The normal precipitation across the region ranges from 43 to 51 cm, decreasing in the west. All streams have a sandy channel with low base flow, and long periods of no flow are common. Most of the tributaries of the North Canadian River have fairly large drainage areas, but they are generally intermittent and characterized by flow that is irregular, varying from periods of low flow to long periods of no flow.

Eighty-eight percent of the time the daily discharge is greater than 2.8 cfs with an eighteen-year mean of 48 cfs in the Cimarron River north of Kenton in Cimarron County. The Cimarron River near Forgan, Oklahoma, had daily flows that exceeded 877 cfs 90% of the time.

The North Canadian River near Guymon had a daily discharge greater than 2.8 cfs 97% of the time with a thirty-one year average of 1.976 cfs, while the North Canadian River near Beaver had a daily discharge greater than 2.8 cfs 75% of the time with a thirty-one-year average of 2.002 cfs.

Table 1 includes the maximum, minimum and mean values for water-quality parameters in Cimarron and North Canadian Rivers for the past seven years (1).

Cimarron River water is moderately mineralized. Runoff from the Triassic, Jurassic, and Cretaceous rocks in this region contain relatively large amounts of sulfates (2). The mineral content of Cimarron River water as it enters the state near Kenton frequently exceeds 1,500 mg/L. As it reenters the state near Mocane, the chemical character of the water changes to a sodium chloride type but the dissolved mineral concentration occasionally exceeds 1,500 mg/L. As it reenters the state for the third time from Kansas, the Cimarron River water is highly degraded by salt sources in Kansas that often increase the river's salt level to 15×10^3 mg/L. Cimarron River water is very hard, with moderate to high turbidity, fairly high pH, and some elevated levels of toxic metals, but dissolved oxygen remains near saturation levels throughout the year.

The water of the North Canadian River above Hardesty in Texas County contains low amounts of dissolved minerals, generally less than 400 mg/L. As the North Canadian cuts into the Cloud Chief Formation just above Palo Duro Creek, dissolved mineral concentrations increase rapidly, frequently exceeding 2,000 mg/L at Beaver City. Water quality in the region is related to the flow regime of the river. During periods of low flow, or between rainfalls, the rivers

TABLE 1. Maximum, mean, and minimum water quality values for the Cimarron River at Englewood, Kansas and North Canadian River at Beaver for 1980–1983. (1)

Water Quality Parameters		Cimarron River			North Canadian River		
		Min.	Mean	Max	Min.	Mean	Max
Dissolved Oxygen	mg/L	3.9	7.5	13.8	1.5	8.7	13.9
Water Temperature	°C	0.0	16.6	33.5	0.0	16.9	32.0
pH	Std. Unit	6.9	8.0	8.8	7.3	8.1	9.0
Specific Conductance	μmho/cm	2 × 10 ³	10879	26.5 × 10 ³	630	1619	6.9 × 10 ³
Nitrogen, Total	mg/L	0.10	1.11	6.97	0.10	1.70	6.31
Phosphorus, Total	mg/L	5 × 10 ⁻⁴	0.225	2.180	5 × 10 ⁻³	0.341	2.350
Chloride	mg/L	171	3859	13 × 10 ³	45	223	451
Sulfate	mg/L	138	704	7838	20	405	2311
Iron, Total	mg/L	100	1863	9.8 × 10 ³	100	1133	5.2 × 10 ³
Turbidity	NTU	1	41	300	1	73	1000
Solids, Suspended	mg/L	2	153	2276	1	174	3208
Hardness, Total	mg/L	472	1047	3963	205	543	876
Sodium	mg/L	184	2737	7550	63	164	249

may contain relatively large amounts of dissolved solids.

The only major reservoir on the North Canadian is Lake Optima. This dam and reservoir is located at river mile 623.3 just below the confluence of the main stem and Coldwater Creek. Authorized for construction in 1936, construction began in 1966 with final impoundment in 1978. The water of this lake is relatively hard with low chloride content.

There are three Department of Wildlife Conservation (ODWC) lakes in the region. Lake Carl Etling, located in Section 5 4N 2E CM in Cimarron County. It is situated on South Carrizzo Creek, a tributary of the Cimarron River. Lake Shultz is located in Texas County about 12.8 km southeast of Hardesty on Huckberry Creek, a tributary of the Beaver River. Lake Chamber, in Beaver County (Section 13 3N 18E CM), is located in Mexico Creek Basin. In addition to the ODWC lakes, there are 13 lakes of 4 ha or more and 3,113 smaller ponds in the region.

ICHTHYOLOGICAL COLLECTIONS

The 67 collections that provide data for this paper on Texas, Cimarron, Beaver and Harper Counties fishes were made by the author between 1976 and 1985 from 13 sampling stations (Table 2) and include 130,186 specimens (Table 3).

A 10.0 x 1.3-m minnow seine with 4-mm mesh was used for all sampling. At each station a 200-m section of the stream was sampled. The sampling consisted of 20 seine hauls of 10-m lengths and required usually about 1-h effort at each site. Gill nets and seining were used during an overnight sampling of Lake Optima. A total of 900 m of 2.5-, and 5.0-, and 10-cm mesh gill nets were used.

All specimens were placed in 10% formalin in the field, washed in water, and then transferred to alcohol back at the laboratory in Oklahoma City. All fish were identified by species, measured for total length, weighed, and then transferred to the Oklahoma State University Museum of Zoology in Stillwater. Quantitative records are available from OSDH for all collections from 1976 to date (counts and biomass of each species).

Seven permanent sites were established starting in summer 1976. Each site was visited twice a year. Table 2 gives locations and additional information on these sites. Five additional ones were visited just once because these contain the vary rare darter *Etheostoma cragini*. Additional sampling from these five sites would have resulted in damage to both the population of this darter as well as the very fragile habitats. No other collections were taken from this area. Also one site from Lake Optima was included. At nine other sites no fishes were found because of the lack of water.

PREVIOUS STUDIES IN THE AREA

The first known collections in the region were in 1926 by an Oklahoma Biological Survey team led by C.L. Hubbs and A.I. Ortenburger (3). This survey yielded 15

TABLE 2. List of the permanent stations used in this survey.

Site No.	River System	County	Legal Description	Location	Starting Date	Number of Collections	Times Water Absent
1	Cimarron River	Cimarron	S4 T5N R1E CM	N of Kenton	1980	12	0
2	Cimarron River	Cimarron	S11 T5N R2E CM	E of Kenton	1980	9	0
3	Cimarron River	Harper	S24 T29N R26W IM	S of Englewood	1981	7	3
4	Cimarron River	Harper	S7 T28N R20W IM	E of Buffalo	1976	27	0
5	North Canadian	Beaver	S6 T3N R21E CM	S of Turpin	1981	8	1
6	North Canadian	Beaver	S7 T4N R24E CM	N of Beaver	1981	8	1
7	North Canadian	Harper	S23 T25N R24W IM	N of May	1981	8	1
8	Lake Optima	Texas	S30 T3N R17E CM	Prairie Point	1984	1	0
9	Crooked Creek	Beaver	S24 T29N R26W	W of Englewood	1984	2	0
10	Crooked Creek	Beaver	S9 TSN R27E	W of Englewood	1984	1	0
11	Horse Creek	Beaver	S2 TSN R28E	N of Gage	1984	1	0
12	Horse Creek	Beaver	S3 TSN R28E	N of Gage	1984	1	0
13	Horse Creek	Beaver	S9 TSN R28E	N of Gage	1984	1	0

species from six sampling sites. These were from Cimarron River near Kenton (four sites), Coldwater Creek southwest of Guymon in Texas County, and Sleeping Bear Creek southeast of Buffalo in Harper County.

The next known collections were by A. Pool and C. Cenling in 1947. They collected from two sites in Harper Co., North Canadian River north of May and in a small cattle pond. This visit produced 11 species from the two sites.

In 1949, G.A. Moore and F.B. Cross of Oklahoma A&M College collaborated on a trip to the region. Eight sites were visited and 15 species were collected (unpublished records). In 1957, C.C. Carpenter, I.Y. Mahmaud, and M. Diener from the University of Oklahoma made nine collections in the region and found 11 species (unpublished field notes). Sites visited were Cimarron River Drainage near Kenton in Cimarron County, Fulton and Coldwater Creeks in Beaver County, Palo Duro Creek in Texas County, and Sand Creek in Harper County.

Cross et al. (4) reviewed a number of surveys of the Cimarron River and Crooked Creek in Kansas from 1955 to 1983. Crooked Creek is a large tributary of the Cimarron that flows into Beaver County, Oklahoma. These surveys included Morton, Grant, Seward, Meade, and Clark Counties. A total of 17 collections produced 16 species from the Cimarron River over a thirty-one-year study period. Only five species could be classed as common: *Notropis girardi*, Arkansas River shiner; *Notropis lutrensis*, red shiner; and *Hybognathus placitus*, plains minnow. Six species could be classed as rare: *Hybopsis gracilis*, flathead chub; *Carpiodes cyprinus*, river carpsucker; *Etheostoma cragini*, Arkansas darter; *Ictalurus punctatus*, channel catfish; *Lepomis humilis*, orangespotted sunfish; and *Micropterus salmoides*, largemouth bass. Nineteen species have been reported from Crooked Creek, including five species that were not found in the Cimarron River: *Phenacobius mirabilis*, suckermouth minnow; *Cyprinus carpio*, common carp; *Carassius auratus*, goldfish; *Campostoma anomalum*, stoneroller; and *Pomoxis annularis*, white crappie.

In 1983, Cross et al. (4) collected 12 species from four sites on the Cimarron River in Kansas. Four of these species may not be indigenous to the Cimarron. Cross has indicated that *Notropis bairdi* and *Gambusia affinis* are introduced, and that *Micropterus salmoides* and *Ictalurus punctatus* are indigenous to the area.

Additional unpublished records from the Museum of Natural History at the University of Kansas show the following collections from Oklahoma: A.B. Leonard, 1951; Anderson and Packard, 1956; Welch and Timkle, 1957; R.R. Patterson, 1960; A.L. Metcalf, 1962; F.B. Cross and J.T. Collins, 1972.

In 1963 an extensive survey of the region was conducted by the Oklahoma Biological

TABLE 3. Species list and fish collected from each sampling site (numbers of samplings and fish shown).

Species	Sites									
	1	2	3	4	5	6	7	8	9,10	11,12,13
	Cimarron River				North Canadian River			Lake	Crooked	West Horse
N of Kenton	E of Kenton	S of Englewood, KS	E of Buffalo	S of Turpin	N of Beaver	N of May	Optima	Creek	Creek	
F. Lepisosteidae										
<i>Lepisosteus platostomus</i>	0-0	0-0	0-0	0-0	0-0	0-0	0-0	1-1	0-0	0-0
F. Clupeidae										
<i>Dorosoma cepedianum</i>	0-0	1-1	1-1	1-1	0-0	1-1	1-1	1-153	0-0	0-0
F. Cyprinidae										
<i>Campostoma anomalum</i>	12-465	8-703	1-1	0-0	0-0	0-0	0-0	0-0	0-0	0-0
<i>Cyprinus carpio</i>	0-0	0-0	2-5	4-14	0-0	3-5	2-8	1-60	0-0	0-0
<i>Hybognathus placitus</i>	1-7	1-1	6-383	21-2546	3-161	5-160	5-802	0-0	2-9	0-0
<i>Hybopsis gracilis</i>	8-127	1-260	0-0	0-0	0-0	0-0	0-0	0-0	0-0	0-0
<i>Notropis atherinoides</i>	0-0	0-0	0-0	1-2	0-0	0-0	0-0	0-0	0-0	0-0
<i>Notropis bairdi</i>	0-0	0-0	3-112	6-1,606	1-28	0-0	0-0	0-0	0-0	0-0
<i>Notropis blennioides</i>	0-0	0-0	1-4	0-0	0-0	0-0	0-0	0-0	0-0	0-0
<i>Notropis buchmanii</i>	0-0	0-0	1-12	0-0	0-0	0-0	0-0	0-0	0-0	0-0
<i>Notropis girardi</i>	0-0	0-0	1-2	5-75	3-178	1-17	1-1	0-0	0-0	0-0
<i>Notropis lutrensis</i>	12-7,435	9-3,476	6-317	14-157	7-700	6-1,550	7-4,584	1-13	3-212	2-5
<i>Notropis stramineus</i>	12-8,423	9-4,571	5-2,036	19-5,569	6-1,595	6-2,212	7-1,615	1-75	3-865	1-1
<i>Phenacobius mirabilis</i>	9-199	4-57	0-0	0-0	3-3	4-121	6-102	0-0	0-0	0-0
<i>Pimephales promelas</i>	12-11,167	9-1,964	4-281	2-2	7-480	4-296	7-2,515	0-0	2-9	2-116
<i>Pimephales vigilax</i>	1-1	1-2	0-0	0-0	0-0	1-1	3-31	0-0	0-0	0-0
F. Catostomidae										
<i>Carpionotus carpio</i>	0-0	0-0	0-0	2-6	0-0	1-9	3-11	1-15	0-0	0-0
<i>Carpionotus cyprinoides</i>	0-0	0-0	0-0	1-1	0-0	0-0	0-0	0-0	0-0	0-0
<i>Ictiobus bubalus</i>	0-0	0-0	0-0	2-8	2-2	0-0	0-0	0-0	0-0	0-0
F. Ictaluridae										
<i>Ictalurus melas</i>	1-2	2-15	0-0	0-0	0-0	0-0	0-0	1-3	1-1	1-899
<i>Ictalurus natalis</i>	9-81	0-0	1-1	1-1	0-0	0-0	1-1	0-0	1-1	0-0
<i>Ictalurus punctatus</i>	0-0	0-0	1-1	1-6	0-0	0-0	0-0	1-5	0-0	0-0
F. Cyprinodontidae										
<i>Fundulus zebrinus</i>	12-7,346	9-15,810	6-3,418	27-34,746	7-8,911	7-4,210	7-5,348	0-0	3-1,052	2-176
F. Poeciliidae										
<i>Gambusia affinis</i>	0-0	0-0	6-242	16-1,902	7-3,661	6-1,582	7-974	0-0	2-2	3-777
F. Atherinidae										
<i>Menidia beryllina</i>	0-0	0-0	0-0	0-0	0-0	0-0	0-0	1-24	0-0	0-0
F. Percichthyidae										
<i>Morone chrysops</i>	0-0	0-0	0-0	0-0	0-0	0-0	0-0	1-5	0-0	0-0
F. Centrarchidae										
<i>Lepomis cyanellus</i>	2-21	4-7	0-0	5-51	2-2	1-3	4-6	0-0	0-0	3-1-2
<i>Lepomis humilis</i>	0-0	0-0	1-1	0-0	0-0	0-0	1-1	0-0	0-0	0-0
<i>Lepomis macrochirus</i>	0-0	0-0	0-0	2-16	0-0	0-0	0-0	0-0	0-0	0-0
<i>Lepomis megalotis</i>	0-0	0-0	0-0	2-4	1-1	1-2	1-1	0-0	0-0	0-0
<i>Micropterus salmoides</i>	0-0	0-0	0-0	2-4	0-0	2-5	2-4	0-0	0-0	0-0
<i>Pomoxis annularis</i>	0-0	0-0	0-0	0-0	0-0	0-0	0-0	1-1	0-0	0-0
F. Percidae										
<i>Etheostoma cragini</i>	0-0	0-0	0-0	4-51	0-0	0-0	0-0	0-0	2-5	3-156
<i>Stizostedion vitreum</i>	0-0	0-0	0-0	0-0	0-0	0-0	0-0	1-7	0-0	0-0

Survey under the leadership of H. Lindsay and C. Bates (unpublished data). This survey included 43 collections from the four counties in the region and yielded 29 species. Other unpublished collections in the University of Oklahoma Zoological Museum were by V.D. Dowell, 1954 and 1955; C.D. Riggs, 1957; G. Grubita, 1958; Atkins, Jackson, and Tilber, 1963, and Felley and Cothran, 1979.

In 1950 B.R. Glass and R.H. Miller collected four species from Doby Springs in Harper County (O.S.U. Museum).

Between 1959 and 1985, a number of lake stockings and lake surveys were conducted by ODWC in the region. Most of these were carried out in Lake Etling (5) and Lake Optima (6). Other unpublished data indicate stocking in the following lakes: Lake Chambers, Beaver Lake, Guymon Elks

Club Lake, Guymon School Pond, and Guymon City Lake.

In the following list of species of the region, the number of sites at which the species was found, the number of samples, and the number of specimens collected by the author are indicated in italics (in parentheses). Dates in italics indicate time of known collections not reported in the literature.

ANNOTATED CHECKLIST

Lepisosteidae. Gars

1. *Lepisosteus platostomus* (Rafinesque). Shortnose gar (1-1-1)

This is the only known record of a gar in the region. A single specimen was captured with a gill net from Lake Optima in 1984 by the author. This gar was 59.7 cm in length and weighed 801.0 g. This species appears to be very rare in the region.

Clupeidae. Shads and herrings

2. *Dorosoma cepedianum* (Lesueur). Gizzard shad (3-3-155).

A single gizzard shad was taken from the main stream of the North Canadian River at Beaver and another from the North Canadian at May. Prior to this record, three specimens were taken from three stations in the North Canadian River in 1963 by Lindsay and Bates. There is no known record of this species from the Cimarron River in the region.

This species comprised 53% of all fish taken in Lake Optima during the 1984 survey by the author. Surveys by ODWC between 1982 and 1984 in Lake Etling (5) and Lake Optima (6) produced 8,140 shad in 1983 from Etling and 3,931 from Lake Optima. The shad population in the region probably exceeds the densities present before construction of Lake Etling and Lake Optima.

Salmonidae. Trout

3. *Salmo gairdneri* (Richardson). Rainbow trout (0-0-0).

From 1959 to 1964 the ODWC periodically stocked rainbow trout in Lake Etling (5). ODWC surveys in 1964 and 1965 found that this species comprised 1.3% of all fish collected. However, all surveys since 1965 failed to find this species in the lake. It appears that high summer temperature and low dissolved oxygen have prevented the establishment of this species (ODWC unpub. report).

Esocidae. Pikes

4. *Esox lucius* (Linnaeus). Northern pike (0-0-0).

From 1966 to 1976 the ODWC periodically stocked northern pike in Lake Etling (5). Surveys by ODWC of the lake produced a few specimens as recently as 1982, but none were found in the 1984 survey.

5. *Esox masquinongy* (Mitchell). Muskellunge (0-0-0).

In 1957, 22 kg of 15-cm fish were stocked in Lake Chambers by ODWC. There is no information on the results of this stocking (ODWC unpub. report).

Cyprinidae. Minnows

6. *Compostoma anomalum* (Rafinesque). Stoneroller (3-21-1169).

This "headwater" species appears to be restricted to the two westernmost sites on the Cimarron River near Kenton in Cimarron County. These stations on the Cimarron River are very similar to typical headwater streams, with long, shallow, rocky riffles and pools during the spring of the year. However, during the late summer the habitat for the stoneroller changes to very small standing pools that are used by cattle and become filled with large amounts of organic waste. The stoneroller comprised 1.0% of all fish collected at these two sites during 13 visits.

The first reported records for the stoneroller was by Hubbs and Ortenburger (3) from four sites in the 1926 survey near Kenton, Cimarron County. The Cimarron River sites produced 500 specimens and West Carrizzo Creek 675 specimens. Stonerollers were also found in Sleeping Bear Creek in Harper County, 32 km southeast of Buffalo.

During the 1950s and 1960s several other collections were made of this species in the region. Lindsay and Bates in the 1963 survey found this species at only four sites. All these sites were in the vicinity of Kenton in Cimarron County. ODWC lake surveys of Lake Etling in 1964-65 found this species to be very abundant (5). In the 1984 ODWC survey stonerollers comprised 10.5% of the fish taken.

There are only two records of the stoneroller east of Cimarron County in my

study area. One is a record by Hubbs and Ortenburger (3) in Sleeping Bear Creek and one is by the author in Cimarron River south of Englewood, Kansas in Harper County, just downstream from the mouth of Crooked Creek. Cross et al. (4) did not find this species in the Cimarron River in Kansas, but did indicate that it occurred in the Crooked Creek drainage, a tributary of the Cimarron River that flows into Oklahoma. Large numbers (109) were found in 1972, but were absent during the 1983 survey, after dropping off to one specimen in 1979.

The stoneroller appears to be on the decline in the region. It has shown a steady decline since 1926.

7. *Carassius auratus* (Linnaeus). Goldfish (0-0-0).

Five goldfish were taken by G.A. Moore and F. Cross in 1949 from South Carrizzo Creek in Cimarron County and were deposited in the University of Kansas Natural History Museum Collections. Cross et al. (4) reported this species from the Crooked Creek drainage in Kansas in 1958 and again in 1964, but it has since disappeared. ODWC surveys (5) in Lake Etling in 1964 captured a number of goldfish. In 1979, 107 were taken from the lake. This was 8.8% of the fish collected that year. However, recent surveys indicate a decline of goldfish in the lake.

8. *Cyprinus carpio* (Linnaeus). Carp (5-12-92).

The carp were found in eastern sections of Cimarron and North Canadian Rivers, and are uncommon in the region except in lakes. I collected a total of 60 specimens in gill nets in one night from Lake Optima in the summer of 1984. This comprised 21% of fish collected. The total weight for these carp was 12.1 kg, which was 32% of the total biomass.

Lindsay and Bater in 1963 collected seven specimens from Coon Creek, in Beaver County. This was the first and only reported record for this species in the region until this study.

In 1977, ODWC stocked two carp in Lake Etling. Surveys of Lakes Etling and Optima by ODWC in 1979 produced numerous carp while surveys in 1982-84 were less productive.

9. *Ctenopharyngodon idella* (Valenciennes). Grass carp (0-0-0).

This species has been stocked by ODWC for weed control four times in Beaver Lake (1981-84-85) and Guymon Lake (1983). There are no other records for the species in the region.

10. *Hybognathus placitus* (Girard). Plains minnow (8-44-4069).

The author found the plains minnow abundant in eastern sections of the North Canadian and Cimarron Rivers in Harper County but did not find any in ten collections in 1980-85 at the two westernmost stations (Sites 1 and 2).

It appears that the distribution and abundance of *H. placitus* have declined since the first collections in 1926 by Hubbs and Ortenburger (3). They reported that the species was very abundant throughout the region and captured 560 specimens from the westernmost station (Site 1) on the Cimarron River near Kenton in Cimarron County.

The 1957 survey by Carpenter et al. found only two members of this species at twenty-eight stations in the region.

Cross et al. (4) indicated that the abundance of this species has declined in the Cimarron River in western Kansas and it appears that the species is now absent from that river in Cimarron County in Oklahoma and Grant County in Kansas.

This fairly common herbivorous minnow appears to be on the decline in the Cimarron River. This author, on five visits to the easternmost Cimarron station east of Buffalo (Site 4) at the Woods-Harper County line, has observed large numbers of stressed plains minnow leaping up out of the water. Also, there were large numbers of dead or dying fish throughout the stream. This behavior may be related to the high levels of dissolved solids, which sometimes exceeds a specific conductance of 26,500 $\mu\text{mho}/\text{cm}$. The chlorides and sulfates may exceed $20 \times 10^3 \text{ mg/L}$ at low flow periods.

11. *Hybopsis aestivalis* (Girard). Speckled chub (0-0-0).

Hubbs and Ortenburger (3) found nine specimens of this species in Coldwater Creek, a tributary of the North Canadian River, 13 km southeast of Guymon in Texas County, in 1926. It was reported as

Extrattius tetranemus. Cross and Moore collected it in 1949 from two North Canadian River stations near Guymon and in Palo Duro, Creek in Texas County. The last known record for this chub was in 1963 by Lindsay and Bates from the mainstream of the Cimarron River in Harper County. Cross et al. (4) did not list the species from the Cimarron River in Kansas. The species is very rare or possibly extinct in the region.

This species was not found in 79 collections by the author between 1980 and 1985 and only four specimens from the Cimarron River were taken by Lindsay and Bates (1963), which indicates serious depletion of the speckled chub in the past 23 years.

12. *Hybopsis gracilis* (Richardson). Flathead chub (2-9-387).

All of my records for this species were from the westernmost parts of the Cimarron River (Sites 1 and 2) in both Oklahoma and Kansas. The only other known previous record of this species was by Carpenter, et al. (1957) when eight specimens were collected from the Cimarron River near Kenton at the same two stations where I collected the species. Many of the Cimarron stations east of this point are now dry most of the year.

The species persists in the Cimarron River in New Mexico (4). Future occurrences may be expected in the Cimarron due to migrants from headwaters during high flows. Resident populations in Oklahoma have been extirpated and can be reestablished only by restoration of flow in the Cimarron.

13. *Notemigonus crysoleucas* (Mitchell). Golden shiner (0-0-0).

This is a rare species that has been collected from the North Canadian River drainage only twice. Hubbs and Ortenburger (3) 1926 reported one specimen from Coldwater Creek SE of Guymon in Texas County. Eight golden shiners were taken in 1963 by Lindsay and Bates from Coon Creek in Beaver County.

In the 1981 and 1983 surveys of Lake Etling, several large specimens were taken by ODWC gill nets and electrofishing methods. Two additional specimens were found in the 1983 survey of the lake (5). The golden shiner will continue to occur in the impoundments where it will be introduced as a bait minnow.

14. *Notropis atherinoides* (Rafinesque). Emerald shiner (1-1-2).

The emerald shiner is very rare in the region. The two specimens found during this survey were at the easternmost site (Site 4) in the Cimarron River. There is no other record of this species from the Cimarron River in the region. One additional record was a single specimen from Lake Etling during the ODWC 1981 survey (5). This species has never been reported from the Cimarron River in Kansas (4). Absence of this species from 79 collections from the region reflects a significant change in status of this shiner since 1963, where Lindsay and Bates collected 207 specimens from 13 stations on the North Canadian River in three counties.

Hubbs and Ortenburger (3) reported one specimen as *N. fumeus* but later indicated that it was a member of the *atherinoides* group. This specimen was from Coldwater Creek SE of Guymon. In 1951 A.B. Leonard collected 43 specimens from the North Canadian River S of Gate, Beaver County.

The largest number of specimens of emerald shiner was taken by Lindsay and Bates during the 1963 survey when they collected 207 specimens from the Beaver River drainage at 13 stations in three counties.

The absence of emerald shiners from all North Canadian River stations in my survey reflects a significant decline of this species in the region. Since this species inhabits the midwater zones of rivers, where there is noticeable current and fairly deep channels, it appears that the decline in flow in the North Canadian River has resulted in the decline of the shiner.

15. *Notropis bairdi* (Hubbs and Ortenburger). Red River shiner (3-10-1746).

The Red River shiner is a recent invader of the Arkansas River basin from the Red River system. Cross et al. (4) found this species in the Cimarron River in Kansas as early as 1972. It was the dominant species at two of the 1983 survey sites in Kansas and represented 32% and 35% of all fish taken at these sites. It was also found in Crooked Creek but it was scarce there, comprising only 1.3% of the total sample.

During this survey the Red River shiner

was found only at the two easternmost stations (Sites 3 and 4) of the Cimarron River during 1982-83. At the Buffalo site (Site 4) it increased from 1.0% in July to 15.0% in August and 20.0% in September 1982. By June 1983 it had increased to 32.0% of all fish captured. Then, as flow declined in late 1983 and 1984, the population dropped to zero. At the Cimarron Station south of Englewood, Kansas (site 3) in 1983 this minnow comprised 6.0% and 17% in June and July samples. Then, in late 1983 and 1984, it had disappeared at this station also.

J.D. Felley and E.G. Gothran (7) reported nine specimens from the Buffalo station on the Cimarron River at the Woods-Harper County line in 1979.

The first known collection from outside of the Cimarron River in the Arkansas drainage was made by the author from North Canadian River S of Turpin, Beaver County (Site 5). In June of 1983 28 specimens were taken.

16. *Notropis blennioides* (Girardi). River shiner (1-1-4).

This is the first known record of this species in the Cimarron River in this region of the state. *N. blennioides* is very rare and may have been washed into the Cimarron River (Site 3) from Crooked Creek during flooding.

Cross (4) reported the absence of the species in the Cimarron River in Kansas.

17. *Notropis burchanani* (Meek). Ghost shiner (1-1-12).

This is the first known record for this species in the region. Twelve specimens were found in the Cimarron River south of Englewood, Kansas in Harper County, Oklahoma. This species was not found in Kansas during the 1983 survey (4).

18. *Notropis girardi* (Hubbs and Ortenburger). Arkansas River shiner (5-11-273).

Arkansas River shiners were found in 10 collections from two stations on the North Canadian and Cimarron Rivers. Data from past collections suggest that this species has declined recently in both rivers. Cross, Gorman, and Haslouer (7) also indicated that it has declined in the Cimarron River and the larger sandy tributaries in Kansas.

Hubbs and Ortenburger (3) in 1926 found this species at two of their sites. A series of 90 and 11 specimens were taken from the two westernmost sites on the Cimarron River near Kenton (Sites 1 and 2). I found only two specimens from 10 collections between 1980 and 1985 from these two sites. Lindsay and Bates (1963) found this shiner only in the Cimarron and North Canadian Rivers in Harper County. Decline in the western portions of the Cimarron may have been before 1963.

Many other collectors found this species in fairly large numbers between 1951 and 1980 in the Beaver River drainage. Cross and Collins (1972) captured a series of 235 specimens from the Beaver River south of Turpin in Texas County. This is the same site where, in this study, I collected 128 specimens during three visits. Lindsay and Bates (1963) collected 1,291 specimens from 20 stations, primarily in the North Canadian River drainage.

Cross et al. (4) indicated that *N. girardi* was common before 1964 in Crooked Creek and the Cimarron River in Kansas but in 1983 there were only two collections (one and eight specimens) from the Cimarron River and none from Crooked Creek. Cross et al. (4) suggested that the decline of this species was due to a combination of factors, of unshaded streams with high water temperature, discharges that fluctuate widely, and high total dissolved solids (conductivity often greater than $20 \times 10^3 \mu\text{mho/cm}$). Change in the flow regime resulting from the dropping water table may be the major factor. The introduction of the Red River shiner, *N. bairdi* has had an adverse effect on *N. girardi*. These two species are very similar morphologically and seem similar in ecological requirements.

19. *Notropis lutrensis* (Baird and Girard). Red shiner (12-61-18,450).

The red shiner is ubiquitous in the region, and comprise more than a third of the fishes taken at 12 stations. The red shiner has always been among the most abundant plains fishes. This species was the third most abundant fish in this study.

Hubbs and Ortenburger (3) reported 286 specimens from five stations in 1926. It has been observed many times by others over the past 60 years. Lindsay and Bates (1963) found this species at 38 sites and collected 3263 specimens. Cross et al. (4) collected 180 specimens from four sites during the

1983 survey of Crooked Creek and Cimarron River in Kansas.

The status of the red shiner has not been affected so adversely by altered flows in the Cimarron and North Canadian drainages as have other species found in northwestern Oklahoma. However, in the Cimarron River east of Buffalo in Harper County (Site 4), population of this species have been drastically reduced by dissolved solids levels that exceeds 20×10^3 . It has been collected only 12 times in 27 visits to this site since 1976.

This species was very common in both Lake Etling (5) and Lake Optima (6) during ODWC surveys.

The red shiner seems to be sustaining itself better than most other cyprinids, perhaps because of its tolerance of intermittent flow and its opportunistic reproductive behavior.

20. *Notropis stramineus* (Cope). Sand shiner (11-74-26,978).

The sand shiner was the most abundant minnow collected and was found at more localities than any other fish. It represented between 8.0% to 30.0% of all fishes taken at the seven permanent sampling stations. At only one site was the red shiner more abundant than this species.

Hubbs and Ortenburger (3) found this species at four sites in 1926 in large numbers (2,233 specimens) but it was absent in the Cimarron River near Kenton. Many others have collected this species in large numbers throughout the region. Lindsay and Bates (1963) found this shiner at 24 sites but in smaller numbers than in the present survey.

Sand shiner made up 10.0% of the fish from Lake Etling (5) and Lake Optima (6) during the 1979 and 1983 ODWC surveys. It was also taken by the author in 1983 from Lake Optima.

The red shiner appears to regain dominance over the sand shiner from Woodward downstream in the North Canadian River and from Cleo Springs downstream in the Cimarron River. The sand shiner is very common and appears to be fairly stable in the study area.

21. *Phenacobius mirabilis* (Girard). Suckermouth minnow (5-26-482).

The suckermouth minnow was found in small numbers at the two westernmost sites of the Cimarron River (Sites 1 and 2), was absent in the Cimarron River in Kansas (4), and was less common in the two eastern-most Cimarron sites (Sites 3 and 4) in Oklahoma. The species was less common at all North Canadian River stations.

Cross et al. (4) did not find this species in the Cimarron River in Kansas, but did find it in Crooked Creek. Hubbs and Ortenburger in 1926 (3), Carpenter, et al. (1957), Atkins et al. (1963), and Lindsay and Bates (5 fish from 4 sites) (1963) all reported small numbers of this species. ODWC reported it in Lake Optima during the 1979-82-83 lake surveys (6).

21. *Pimephales notatus* (Rafinesque). Bluntnose minnow (0-0-0).

The only known record for this species is 15 specimens collected from Dugout Creek in Beaver County (Section 24 4N 22W) by Atkins, Jackson, and Tilber in May (1963).

22. *Pimephales promelas* (Rafinesque). Fathead minnow (10-50-16,983).

The fathead minnow occurs throughout the region and was fairly abundant at most sites. In the Cimarron River the population showed a sharp decline from west to east (5752-1331-107-1) at the four permanent stations. The reverse occurred in the North Canadian River with an increase in numbers (143-173-1040) from west to east at the three permanent stations.

Historical records indicate the fathead minnow has always existed throughout the region. Hubbs and Ortenburger (3) found the fathead minnow to be abundant at all six stations. It was collected many times by others from 1926 to the present survey. Lindsay and Bates (1963) found it at 39 sites in fairly large numbers. In Kansas, Cross et al. (4) found this species to be very abundant in both Cimarron River and Crooked Creek.

ODWC surveys of Lake Etling in 1981 reported large numbers (6489 specimens) of this minnow. This species made up 92.3% of the seining sample that year (5). Earlier surveys in 1964-65 indicated that it was very abundant in the lake. However, during the 1982 survey this minnow comprised only 4.3% of the fish population. It was also collected from Lake Optima by ODWC in 1979, when it comprised 1.1%, and in 1983,

when it comprised 2.0% of the fish population (6).

This species is present in fairly large numbers except in the highly mineralized sections of the Cimarron River. It is an indicator of low diversity and unstable stream conditions and is always found in areas with high organic pollution from cattle during periods of low flow. However, it is not very tolerant of high dissolved-solids levels.

23. *Pimephales vigilax* (Baird and Girard). Bullhead minnow (4-6-35).

Bullhead minnow is very rare in the region. My records are the only known ones for the region. There were no known occurrences of the species in the Cimarron River in Kansas (4).

F. Catostomidae. Suckers

24. *Carpiodes carpio* (Rafinesque). River carpsuckers (4-7-41).

The river carpsucker was the most common and widespread catostomid in the region. In the Cimarron River, this species was found only in the lower reaches (Site 4) near Buffalo (six specimens). It was much more abundant in the North Canadian River and Lake Optima. I captured fifteen specimens in 1984 from Lake Optima.

The first reported record for this species was in 1951 by Leonard, when ten specimens were collected from the North Canadian River S of Gate. Lindsay and Bates found seven specimens from Coon Creek in Beaver County in 1962 and the 1983 survey of Lake Optima ODWC reported one (6).

25. *Carpiodes cyprinus* (Lesueur). Quillback (1-1-1).

This very rare sucker was taken once from the Cimarron River east of Buffalo (Site 4). This is the first known record of this species in this region.

26. *Ictiobus bubalus* (Rafinesque). Smallmouth buffalo (2-4-10).

This finding is the only known record for this species. All were young of the year taken from the uppermost site (Site 5) in the North Canadian River S of Turpin, Beaver County, and at site 4 east of Buffalo.

Ictaluridae. Catfishes

27. *Ictalurus melas* (Rafinesque). Black bullhead (5-10-920).

Black bullheads were taken in the two westernmost stations in the Cimarron River (Sites 1 and 2) and the westernmost site in the Beaver River (Site 5). This species was abundant in Horse Creek (899 fish in one collection), a tributary of the Cimarron River in Beaver County. It was collected from both Crooked Creek and Lake Optima during this survey.

Hubbs and Ortenburger (3) collected 12 specimens at four sites during the 1926 survey. The black bullhead was also collected by Carpenter et al. (1957), Riggs (1957), and Lindsay and Bates (1963) (eight sites produced twenty-four fish).

ODWC surveys of Lake Etling in 1964 reported that this species comprised 77% of all fish taken. In 1965 this catfish comprised 81% of all fish collected (5). The 1979 survey yielded sixty from the gill net sample and a total of 174 fish which comprised 14.2% of the sample. The 1981-82 surveys indicate that this species comprised 49.6% of all fish. The 1979 survey of Lake Optima by ODWC reported that this catfish comprised 20.6% of the gill net sample but only 0.4% of the seine sample (6).

This pollution-tolerant, "pioneer" species, most characteristic of intermittent streams, appears to be uncommon in the streams but more abundant in lakes of the region. It is rare in the Cimarron River and Crooked Creek in Kansas (4).

28. *Ictalurus natalis* (Lesueur). Yellow bullhead (5-13-85).

The yellow bullhead was found in Crooked Creek and the westernmost site in the Cimarron River (Site 1). Two specimens were taken from Lake Optima in 1984 by the author. The only other known record for this species was by Riggs in 1957 from Sand Creek in Harper County.

29. *Ictalurus punctatus* (Rafinesque). Channel catfish (3-3-12).

A single specimen was taken in 1983 from the Cimarron River S of Englewood, Kansas (Site 3) in Harper County.

From 1976 to 1983 ODWC stocked this species nine times in Lake Etling. Additional stocking has taken place in Lake Optima (four times), Lake Chambers (six times), Beaver Lake, Guymon City Lake, and Guymon School Pond (unpub. records).

Surveys by ODWC in Lake Etling in 1979 indicated that this species made up 10% of all fish in the lake (5). According to

the Lake Optima 1979 survey, this catfish comprised 1.0% of all fish (6).

The channel catfish is very rare in the mainstreams, and tributaries of the region but is fairly common in the lakes. The lack of pools during the summer months has prevented establishment of large numbers of this species. It appears that this species will increase in numbers because of the stocking of the lakes.

30. *Ictalurus furcatus* (Lesueur). Blue catfish (0-0-0).

There is no known record of this species from the region. It was stocked in Lake Optima (6) in 1979-82-83 by ODWC.

31. *Pyladictis olivaris* (Rafinesque). Flathead catfish (0-0-0).

The only records for this species in the region are stocking records in Lake Etling in 1981-82 by ODWC (5). ODWC placed 383 in Lake Chambers in the period 1979-85 (unpub. records).

CYPRINODONTIDAE. Topminnows

32. *Fundulus zebrinus* (Jordan and Girard). Plains killifish (12-85--81,017).

The plains killifish was abundant in 1926 (3) and Lindsay and Bates (1963) found large numbers at 40 sites. It was reported in 84 of the 85 collections between 1976 and 85 and remains widely distributed in the region.

In the Cimarron River mainstream east of Buffalo (Site 4) in Harper County, I found plains killifish the only species present when the water was low and the dissolved solids were greater than 20×10^3 mg/L. This occurred on September 10, 1980, and again on September 30, 1984, and October 6, 1985. This species comprised over 80% of all fishes in nine collections during my study. This high percentage was usually during the fall collection period. The distribution of *F. zebrinus* correlates strongly with salinity (or dissolved solids), being the greatest in the reaches of the Cimarron River. The station in Harper County has yielded 34,746 specimens during twenty-seven trips.

This species was abundant in 1926 (3) and has shown up in many other collections from the region. Lindsay and Bates (1963) found large numbers from forty sites. It was fairly abundant in Lakes Etling (5) and Optima (6), comprising 5.5-5.6% of the fish collected by ODWC seining sample.

Cross et al. (4) indicates that it was abundant in the Cimarron River and Crooked Creek in Kansas, where it comprised between 15% and 65% of the 1983 collections.

This species has withstood changes in flow patterns better than most other High Plains stream fishes and remains abundant throughout the region.

POECILIIDAE. Livebearers

33. *Gambusia affinis* (Baird and Girard). Mosquitofish (9-47-9,141).

The mosquitofish now occurs in small numbers throughout the region. Cross et al. (4) indicated that it is not a native to this region and was probably introduced in Kansas as a forage fish in the 1930s. The species was not taken by Hubbs and Ortenburger (3) in 1926, Carpenter et al. in 1957, and many other earlier collectors. It was first taken in 1962 by Metcalf from the North Canadian River near Optima. Lindsay and Bates (1963) found that it was more abundant and widespread. The author took 525 specimens from one small pool in Horse Creek, a very weedy tributary of the Cimarron River in Beaver County.

Cross et al. (4) noted that this species and the plains killifish were complementary in abundance at sites in Kansas. Where either one represented more than 25% of the population, the other was absent or rare except in two sites on the North Canadian River where they both occurred in large numbers. Where both occurred in equal numbers, they were usually scarce relative to other species.

The mosquitofish is found in Lakes Etling (5) and Optima (6) in small numbers.

This species appears to be common and more abundant now than in the past; it appears to be increasing in numbers and distribution throughout the region.

ATHERINIDAE. Silversides

34. *Menidia beryllina* (Cope). Inland silverside (1 -1 -24).

This silverside was stocked in Lake Optima in 1981 by ODWC as a forage fish (6). An ODWC lake survey yielded 328 specimens in 1983. The author also collected twenty-four specimens from the lake in 1984. This species is unknown from either river in the region but may become

established in both because it is common in some downstream sites and has been stocked in most of the lakes in the state by ODWC.

PERCICHTHYIDAE. Temperate basses

35. *Morone chrysops* (Rafinesque). White bass(1 -1 -5).

This species was taken only in Lake Optima. There were five stockings of the hybrid *M. chrysops* X. *M. saxatilis* in Lake Optima in 1979-84 by ODWC (6). A lake survey by ODWC in 1979 and 1984 produced small numbers of these hybrid bass.

The species is very rare and is not expected to occur in the mainstream rivers of the region because of the low-flow regime.

CENTRARCHIDAE. Sunfishes

36. *Lepomis cyanellus* (Rafinesque). Green sunfish (7-21-192).

Green sunfish were found in small numbers throughout the region, usually in small tributaries or the headwater portions of the of the Cimarron River.

First taken by Hubbs and Ortenburger (3) from two sites in 1926, this sunfish has been reported by many other collectors, but always in small numbers. Lindsay and Bates (1963) found the species in all four counties in the region (17 sites and 65 specimens).

In the 1964-65 ODWC surveys of Lake Etling the green sunfish comprised 8.0% and 16.0% of fish taken, and it has been found in all subsequent surveys of the lake (5). Surveys of Lake Optima in 1979 by ODWC yielded 29 specimens, 19.2% of the fish taken by electrofishing (6).

37. *Lepomis humilis* (Girard). Orangespotted sunfish (2-2-2).

Orangespotted sunfish were less common than the green sunfish in most collections from the region. The first known specimen was taken in 1946 from Doby Springs in Harper County, by Braggs. One specimen was collected by Carpenter et al., from Palo Duro Creek, in 1957. One additional specimen was taken in 1962 by Metcalf from the North Canadian River south of Turpin. The Lindsay and Bates (1963) survey collected the largest numbers, twenty-one specimens from five sites. Cross et al. found the species in the Cimarron River in Seward County, Kansas since 1965 (4).

In the 1979 ODWC survey of Lake Optima this sunfish comprised 6.6% of the electrofishing sample. Three specimens were taken by seine sampling (6) in 1983 by ODWC.

38. *Lepomis macrochirus* (Rafinesque). Bluegill (2-2-16).

Bluegill were found only in the Cimarron River E of Buffalo (Site 4) at the Harper-Woods County line.

In the summer of 1985 several hundred bluegill were found dead along the edge of the water and lying on the bottom. This fish kill was the result of a recent flooding of a fairly freshwater tributary forcing the bluegill into the Cimarron River, where the high dissolved salt level (17.5×10^3 mg/L) was lethal.

This species was first reported in 1926 from Kansas in farm ponds along the Cimarron River as far west as Morton County, Kansas (4). The first Oklahoma record was by Riggs (1957) from Sand Creek in Harper County. Six bluegill were taken by Lindsay and Bates in 1963 from Clear Creek in Harper County.

The only known records for this species in the three Panhandle counties are from ODWC stocking records. This sunfish has been stocked many times in all major lakes in the region. It was found to be very abundant in Lake Etling (5). Each lake survey usually yielded over one hundred specimens. *L. cyanellus* x *L. macrochirus* hybrids have been stocked throughout the area by ODWC.

The bluegill is very rare in the tributaries and mainstreams of the region. However, it is common in most lakes and farm ponds in the area. It appears to be increasing in lakes because of introductions there. This species is probably not a native to the region.

39. *Lepomis megalotis* (Rafinesque). Longear sunfish (4-5-8).

The longear sunfish was taken from the lower Cimarron and North Canadian Rivers. This species has been found only one other time, in 1963 by Lindsay and Bates, when 25 specimens were taken from Redoubt Creek in Harper County. Cross et al. (4) did not find this species in the Cimarron River, in Kansas.

40. *Lepomis microlophus* (Guenther). Red-

ear sunfish (0-0-0).

The only known record for this species is from the stocking records in Lake Etling (5) in 1979, when ODWC introduced this species.

41. *Micropterus dolomieu* (Lacepede). Smallmouth bass (0-0-0).

In 1979 ODWC introduced 1,400 smallmouth bass into Lake Etling (5). During the 1979 survey this species comprised 1.1% (three specimens), and in 1980 comprised 0.6% (seven specimens) of fish taken. There has not been a record of this species since 1980.

42. *Micropterus salmoides* (Lacepede). Largemouth bass (3-6-13).

Largemouth bass was found in small numbers in both major drainages in the region. The only other reported collections from mainstreams was in 1926 by Hubbs and Ortenburger (3) when eight bass were taken from Coldwater Creek, a tributary of the North Canadian River in Beaver County, southeast of Guymon.

This species has been stocked many times in large numbers by ODWC throughout the lakes and ponds in the area. The ODWC introduced the Florida Largemouth bass subspecies *Micropterus salmoides floridanus* (Lesueur) into Lake Etling (5) and Lake Optima (6) in 1981-82. Lake surveys in 1983-84 indicate that this species is abundant in these lakes.

This species appears to be on the increase in the region because of its introduction into the lakes. However, it is rare in streams probably because of the lack of deep pool habitats.

44. *Pomoxis annularis* (Rafinesque). White crappie (1-1-1).

White crappie remains very scarce in streams of this region. There are only two known records for this species from Lake Optima, the one I collected and one taken in 1983 by ODWC (6).

PERCIDAE. Perches

45. *Etheostoma cragini* (Gilbert). Arkansas darter (5-11-212).

The first record from the study area was a collection that I made of 1983 from the mainstream of the Cimarron River S of Englewood, Kansas, Harper County (8). Since then I found the species in large numbers in Horse Creek, a tributary of the Cimarron River N of Gage, Beaver County, and in Crooked Creek in both Oklahoma and Kansas.

In 1983 Cross et al. (4) found this species at three sites in the Cimarron River of Kansas (62 specimens) and at one site in Crooked Creek (33 specimens).

Cross reported that the darter has declined in both numbers and distribution. Owing to a dropping water table, the springs in the region are drying up and forcing the darter into the unfavorable habitats in the Cimarron River. There is no known record of this species in the mainstream of the Cimarron River before 1980.

This species faces extinction in the area if drying of the marshy springs continues from west to east across the region. Since 1982 this species was collected each time during the June sampling periods but by the July sampling the area was dry and the darter was gone.

46. *Etheostoma spectabile* (Agassiz). Orangethroat darter (0-0-0).

There is only one known record of this species from the study area. It was by Metcalf in September, 1962, from the North Canadian River, 2 km southwest of Optima on Highway 54 in Texas County. One specimen was taken and deposited in the University of Kansas Natural History Museum. Cross et al. (4) indicates that the species does not occur in the Cimarron River in Kansas.

This species appears to have disappeared from most of the tributaries and mainstreams in the region. There appears to be no record of this species during the past 25 years.

47. *Percina caprodes* (Rafinesque). Logperch (0-0-0).

The only known collection of this species in the region was a single specimen taken by ODWC in the 1983 survey of Lake Optima (6). The logperch is very rare in the area and its status is unknown.

48. *Stizostedion vitreum* (Mitchell). Walleye (1-1-7).

Seven walleye were taken from gill nets in Lake Optima during this study. Since 1979, 10×10^4 walleye have been stocked by ODWC into Lake Etling (5) and Lake Optima (6). Lake surveys by ODWC indicated that these stockings were successful,

with large numbers being collected.

There is only one known record for this species from a nonlake habitat. Three specimens were taken by Atkins, Jackson, and Tilber in 1963 from Dugout Creek in Beaver County (Sec. 24 4N 22W), and were placed in the University of Oklahoma Zoological Museum.

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