Journal of the Arkansas Academy of Science

Volume 32 Article 14

1978

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ABSTRACT

Fifty-five collections of fishes were made with small-mesh seines and electrofishing gear in the Caddo River and four of its tributaries during 1974-75. Eighty-two species representing 17 families were collected; 14 of the species had not previously been reported from the Caddo River.

INTRODUCTION

The Caddo River, flowing through the Ouachita Mountains in west central Arkansas, is a tributary of the Ouachita River (Fig. 1). Studies on the fishes of the river are limited. Meek (1891) reported that the Caddo River contained "few fish and few species," and Hubbs and Ortenburger (1929) collected only 15 species. Fruge (1971), who conducted the first extensive survey of the fishes of the Caddo River, reported a total of 72 species. Collections during the present survey expanded the species list compiled by Fruge.

The Caddo River has a watershed of approximately 1191 km². The drainage area is characterized by forested hills and narrow valleys. The headwaters are in an area which is predominantly Womble shale and Blakely sandstone. The river flows east-southeasterly through areas of sandstone and shale before turning southerly in an alluvial area and merging with the Ouachita River. In August 1969, 5,463 ha DeGray Lake and a 202 ha reregulating pool were impounded on the lower section of the river (Fig. 1).

The physicochemical features of the Caddo River are characteristic of Ouachita Mountain streams (J. Nix, *pers. comm.*). The water of the river contains low concentrations of dissolved solids (25-100 ppm) and is classified as a calcium-bicarbonate type. Alkalinity values range between 23 and 50 mg/1 (as CaCO3). Higher than normal calcium concentrations for the rivers in this area occur in the headwaters because of the presence of limestone in the shale deposits. Dissolved oxygen remains near saturation throughout the year. Water temperatures above DeGray Lake range from 8 - 16 C (annual $\bar{X}$, 14 C). Turbidity values are relatively low, but increase markedly during periods of high runoff. Seasonal flow rates in the middle section of the river range from 3 to 254 m³/s.

METHODS AND MATERIALS

Fifty-five fish collections were made between May 1974 and July 1975. Sixteen locations on the Caddo River and four of its tributaries (Sta. 3, 4, 10, 11, 12) were sampled (Fig. 1). Although a few areas in small tributary streams were sampled only once because of the paucity of fishes, most stations were sampled at least twice and station 15 was sampled seven times.

Collections were made with small-mesh seines and electrofishing gear. Thirty-four collections were made with two 6.4 mm mesh seines, 3.1 X 1.8 m and 6.1 X 1.8 m in size. In six of these collections, a portable 110 V generator and two hand-held electrodes were also used. The electrodes consisted of two 2.1 m fiberglass wrapped aluminum poles with a grid of copper wire soldered to a hoop of copper tubing at one end. Wires 30 m long connected to each electrode allowed the operators to cover 60 m of stream without moving the generator. Twenty-one collections were made with a 4.6 m flat-bottom aluminum boat modified for electrofishing in rivers and streams. Two removable 2.1 m fiberglass wrapped aluminum poles were mounted on each side of the bow. The electrode array on each boom consisted of two 1.5 m electrodes of 12.7 mm flexible conduit suspended 0.4 m apart. A Smith-Root Type VI Electrofisher[1] was used to control the voltage and amperage of the pulsed DC.

The specimens were preserved in 10% formalin and returned to the laboratory for identification. Taxonomic keys used in species identification were those of Buchanan (1973), Miller and Robison (1973) and Douglas (1974). Most specimens are stored at the Multi-Outlet Reservoir Studies Laboratory, Arkadelphia, Arkansas.

FISH COMMUNITY COMPOSITION

Headwater Section: The headwater section of the river (Stations 1-4), is characterized by clear, shallow, fast-flowing water and rock or gravel substrate, and by large populations of *Fundulus catenatus, Campostoma anomalum, Notropis boops, N. chrysocephalus, N. umbratilis,* and *Etheostoma radiosum.* Common centrarchids included *Lepomis megalotis* and *L. cyanellus. Micropterus dolomieui,* although not collected in large numbers, was the most common *Micropterus* species collected. The only madtom collected was *Noturus taylori.*

Middle Section: In this portion of the river (Stations 5-9) the pools are deeper and wider, and riffle habitat diminishes in proportion. This section of the river contained abundant populations of *Fundulus catenatus, Pimephales notatus, Notropis boops, N. whipplei, Lepomis megalotis, L. macrochirus,* and *Etheostoma radiosum. Micropterus salmoides* and *M. punctulatus* occurred in about equal numbers and were more common than *M. dolomieui. M. dolomieui* was the most abundant bass only at Station 5. *Ambloplites rupestris* was common in many of the clear, rocky pools. Common darters collected included *Percina caprodes, Etheostoma radiosum,* and *E. zonale. Labidesthes sicculus* was abundant in the section of

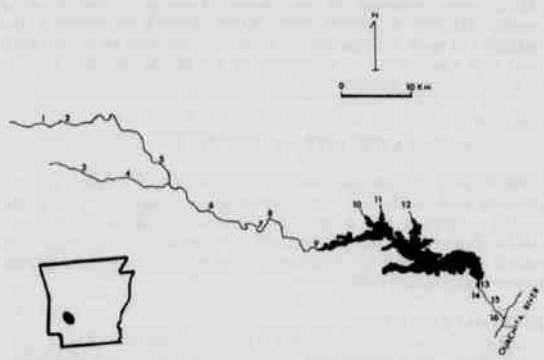

Figure 1. Collecting sites on the Caddo River and tributaries of DeGray Lake.

[1]Reference to trade names does not imply Government endorsement of commercial products.

the river near the upper portion of DeGray Lake. Migrants from the reservoir into the river in this area (Station 9) included *Dorosoma cepedianum*, *D. petenense*, *Morone chrysops*, and *Pomoxis nigromaculatus*. Although the extent of this migration is not known, we do not believe that it is extensive. Samples taken at Station 8 and upstream have showed no seasonal increases in numbers of these species. *Moxostoma erythrurum*, *M. duquesnei*, and *Hypentelium nigricans*, although not abundant, were found throughout the middle section.

Lower Section: The waters are more turbid in the lower section of the river (Stations 13-16), and there is more emergent vegetation (*Dianthera* sp.) in the shallow areas. *Fundulus olivaceus*, *Pimephales notatus*, *Notropis whipplei*, *Lepomis megalotis*, *L. macrochirus* and *Labidesthes sicculus* were common throughout this section. *Moxostoma erythrurum* and *M. duquesnei* occurred throughout the lower portion of the river and were most abundant immediately below the reregulating pool (Station 14). *Cyprinus carpio* was also abundant at this station, the only station where it occurred in large numbers. *Minytrema melanops* was collected throughout the lower portion of the river but not in large numbers. *Micropterus salmoides* and *M. punctulatus* were more abundant in the lower portion of the river, but the relative abundance was similar to that in the middle section. The most common darters collected at these stations were *Etheostoma radiosum* and *E. zonale*. However, more species of percids and cyprinids were collected in the lower portion of the river probably because of the greater diversity of habitat there than in the upstream sections. Percids collected were *Etheostoma blennioides*, *E. chlorosomum*, *E. collettei*, *E. gracile*, *E. histrio*, *E. proeliare*, *E. radiosum*, *E. stigmaeum*, *E. whipplei*, *E. zonale*, *Percina caprodes*, *P. copelandi*, and *Stizostedion vitreum*.

Cyprinids taken in the lower river were *Campostoma anomalum*, *Cyprinus carpio*, *Hybopsis x-punctata*, *Notropis atherinoides*, *N. boops*, *N. chrysocephalus*, *N. emiliae*, *N. fumeus*, *N. perpallidus*, *N. umbratilis*, *N. venustus*, *N. whipplei*, *Pimephales notatus*, *P. tenellus* and *P. vigilax*.

DISCUSSION

Seven species reported by Fruge (1971) were not collected by us: *Notropis amnis*, *N. rubellus*, *Noturus eleutherus*, *Ammocrypta vivax*, *Percina maculata*, *P. nasuta*, and *Etheostoma nigrum*. Of these, only *Notropis rubellus* and *Noturus eleutherus* were collected in sizable numbers by Fruge. We cannot explain why we failed to collect these two species. The darter species, which were not abundant are more apt to be collected with seines and possibly night collections which Fruge used more extensively than we did. Fruge collected a single specimen of *Notropis amnis*.

Fourteen species were collected that were not listed by Fruge (1971) or by earlier collections: *Ichthyomyzon gagei*, *Amia calva*, *Lepisosteus oculatus*, *Alosa chrysochloris*, *Esox niger*, *Cyprinus carpio*, *Fundulus notti*, *Carpiodes cyrpinus*, *Ictiobus cyprinellus*, *Moxostoma carinatum*, *M. poecilurum*, *Anguilla rostrata*, *Ictalurus melas*, and *Noturus gyrinus*. None of these species was common. The addition of most of these species to the list compiled by Fruge (1971) was due mainly to the efficiency of the electroshocking boat in collecting stream species.

ANNOTATED LIST OF SPECIES COLLECTED

More than 10,000 specimens representing 82 species and 17 families were collected. The following annotated list shows the species collected and a brief description of relative abundance. Arabic numerals following the common name indicate the stations at which each species was collected. Common and scientific names follow Bailey et al. (1970).

PETROMYZONTIDAE

Ichthyomyzon castaneus Girard - Chestnut lamprey - 7,8,9,14,15.
Found only in middle and lower portion of river; few specimens collected.

Ichthyomyzon gagei Hubbs and Trautman - Southern brook lamprey - 7,8,9,15,16.
Found only in middle and lower portions of river; few specimens collected.

POLYODONTIDAE

Polyodon spathula (Walbaum) - Paddlefish - 14.
Common in the spring at the base of the reregulating dam below DeGray Lake; no specimens collected elsewhere.

LEPISOSTEIDAE

Lepisosteus oculatus (Winchell) - Spotted gar - 14,15,16.
Common in pools in lower portion of river. Not collected above DeGray Lake.

Lepisosteus osseus (Linnaeus) - Longnose gar - 8,14,15,16.
Uncommon. Two species collected in the middle section of the river and three in the lower.

AMIIDAE

Amia calva Linnaeus - Bowfin - 14.
Rare. Collected in lower portion of river below DeGray Reservoir in pool habitat.

ANGUILLIDAE

Anguilla rostrata (Lesueur) - American eel - 5,9,14,15.
Uncommon. Six specimens collected.

CLUPEIDAE

Alosa chrysochloris (Rafinesque) - Skipjack herring - 14.
Uncommon. Collected only at base of reregulating dam.

Dorosoma cepedianum (Lesueur) - Gizzard shad - 6,7,8,9,13,14,15,16.
Common in middle and lower portions of river, especially near DeGray Lake and confluence with Ouachita River.

Dorosoma petenense (Gunther) - Threadfin shad - 9,13,14,15.
Common in portion of river near reservoir confluence.

ESOCIDAE

Esox americanus vermiculatus Lesueur - Grass pickerel - 3,14,15.
Uncommon. Two specimens collected in middle portion of river and three below DeGray Lake.

Exos niger Lesueur - Chain pickerel - 13,14,15.
Uncommon. Fourteen specimens collected in reregulating pool and below.

CYPRINIDAE

Campostoma anomalum (Rafinesque) - Stoneroller - 1,2,3,4,5,6,7,10,11,12,15.
Found throughout the river but most abundant in the swifter water in the headwater region and in the small tributary streams of DeGray Lake (Stations 10, 11, 12).

Cyprinus carpio Linnaeus - Carp - 14,15,16.
Common in lower portion of river, especially in deep pools below reregulating dam and near confluence with Ouachita River.

Hybopsis x-punctata Hubbs and Crowe - Gravel chub - 6,7,14,15.
Although not collected in large numbers, most common in lower portion of river.

Notemigonus crysoleucas (Mitchill) - Golden shiner - 3.
Rare. Only one specimen collected.

Notropis atherinoides Rafinesque - Emerald shiner - 14,15,16.
Uncommon. Found only in pools in lower portion of river.

Notropis boops Gilbert - Bigeye shiner - 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16.
Abundant throughout the river.

Notropis chrysocephalus (Rafinesque) - Striped shiner - 1,2,3,4,5,7,10.
Abundant in the headwater section of the river.

Notropis emiliae (Hay) - Pugnose minnow - 13,14,15,16.
Uncommon. Fourteen of 22 specimens were taken in reregulating pool (Sta. 13).

Notropis fumeus Evermann - Ribbon shiner - 15.
Rare. Only a few specimens collected in the lower portion of the river.

Notropis perpallidus Hubbs and Black - Colorless shiner - 8,14,15.
Uncommon. Most specimens collected in lower section of river.
Notropis umbratilis (Girard) - Redfin shiner - 2,3,4,5,6,9,10,11,12,13,15.
Although found throughout the river, abundant only in the headwater region.
Notropis venustus (Girard) - Blacktail shiner - 16.
Rare. Only two specimens collected near confluence with Ouachita River.
Notropis whipplei (Girard) - Steelcolor shiner - 3,4,6,7,8,9,12,14,15,16.
Common throughout the river.
Pimephales notatus (Rafinesque) - Bluntnose minnow - 3,4,5,6,7,8,9,11,12,13,14,15.
Common throughout the river, especially abundant in the middle portion.
Pimephales tenellus (Girard) - Slim minnow - 9,13.
Uncommon. Only 6 specimens collected.
Pimephales vigilax (Baird and Girard) - Bullhead minnow - 14.
Rare. One specimen collected.
Semotilus atromaculatus (Mitchill) - Creek chub - 1,2,3.
Uncommon. Found only in the clear, swift headwaters.

CATOSTOMIDAE
Carpiodes cyprinus (Lesueur) - Quillback - 14.
Rare. One specimen collected.
Erimyzon oblongus (Mitchell) - Creek chub sucker - 7,10.
Rare. Only 2 specimens collected.
Hypentelium nigricans (Lesueur) - Northern hog sucker - 1,2,5,6,7,8,9,14,15,16.
Most common in the middle and upper portion of the river in clear, swift waters.
Ictiobus cyrpinellus (Valenciennes) - Bigmouth buffalo - 14.
Rare. Only 1 specimen collected.
Minytrema melanops (Rafinesque) - Spotted sucker - 6,13,14,15,16.
Uncommon. Found mainly below DeGray Lake in the lower section of the river.
Moxostoma duquesnei (Lesueur) - Black redhorse - 5,6,9,14,16.
Common in the middle and lower portion of the river.
Moxostoma erythrurum (Rafinesque) - Golden redhorse - 5,8,9,13,14,15,16.
Common in middle and lower portions of the river, especially below reregulating pool.
Moxostoma carinatum (Cope) - River redhorse - 14,15.
Uncommon. Only 4 specimens collected, all in the lower section of river.
Moxostoma poecilurum (Jordan) - Blacktail redhorse - 14.
Rare. One specimen collected below DeGray Lake.

ICTALURIDAE
Ictalurus melas (Rafinesque) - Black bullhead - 14.
Rare. Only one specimen collected.
Ictalurus natalis (Lesueur) - Yellow bullhead - 4,5,7,9,13,15,16.
Although widely distributed, only one or two specimens were collected at each station.
Ictalurus punctatus (Rafinesque) - Channel catfish - 6,13,14,15.
Uncommon. Seven specimens collected.
Pylodictis oliveris (Rafinesque) - Flathead catfish - 5,9,15.
Uncommon. Although only three specimens were collected in the present survey, subsequent electrofishing at Station 8 revealed a larger population.
Noturus miurus Jordan - Brindled madtom - 7,14,16.
Uncommon. Only four specimens collected. The low number of all madtom species collected was probably due to gear avoidance.
Noturus nocturnus Jordan and Gilbert - Freckled madtom - 15.
Uncommon. Five specimens collected, all in the lower section of the river.
Noturus taylori Douglas - Caddo madtom - 1,3,5,7.
Ten specimens collected. Distribution limited to middle and headwater sections of the river.
Noturus gyrinus (Mitchill) - Tadpole madtom - 15.
One specimen collected in the river. Other specimens collected in DeGray Lake. Distribution probably limited to the lake and river below.

APHREDODERIDAE
Aphredoderus sayanus (Gilliams) - Pirate perch - 13,15.
Rare. Only two specimens collected, both in the lower river. More common in reservoir collections that were not part of this survey.

CYPRINODONTIDAE
Fundulus catenatus (Storer) - Northern studfish - 1,2,3,4,5,6,7,10,12,15.
Found throughout the river but abundant in the headwaters and middle portion of the river above DeGray Lake.
Fundulus notatus (Rafinesque) - Blackstripe topminnow - 15.
Rare. Distribution apparently limited to lower section of river.
Fundulus notti (Agassiz) - Starhead topminnow - 15.
Rare. Only one specimen collected in a small overflow pond near river.
Fundulus olivaceus (Storer) - Blackspotted topminnow - 3,4,5,6,7,8,9,10,12,13,14,15,16.
Common throughout the river.

POECILIIDAE
Gambusia affinis (Baird and Girard) - Mosquitofish - 4,7,15.
Common only in the lower section of the river in two small overflow ponds.

ATHERINIDAE
Labidesthes sicculus (Cope) - Brook silverside - 3,4,5,6,7,8,9,12,13,14,15,16.
Found throughout the river and abundant in the lower section.

PERCICHTHYIDAE
Morone chrysops (Rafinesque) - White Bass - 9,13.
Uncommon. One specimen collected in reregulating pool and several at the upper end of DeGray Lake at river confluence during spring spawning migration.

CENTRARCHIDAE
Ambloplites rupestris (Rafinesque) - Rock bass - 4,6,7,8,9,15.
More common in the clear water above DeGray Lake than in the more turbid water below.
Elassoma zonatum Jordan - Banded pygmy sunfish - 15.
Rare. Two specimens collected in an isolated overflow pond near main river channel.
Lepomis cyanellus Rafinesque - Green sunfish - 3,4,6,7,8,9,10,11,12,13,14,15,16.
Found throughout the river but not abundant.
Lepomis gulosus (Cuvier) Warmouth - 8,9,13,14.
Uncommon. Most collected in reregulating pool and near confluence of river and reservoir.
Lepomis humilis (Girard) - Orangespotted sunfish - 13.
Rare. Only one specimen collected.
Lepomis macrochirus Rafinesque - Bluegill - 1,2,3,4,5,6,7,8,9,13,14,15,16.
Abundant throughout the river, especially in the lower section.
Lepomis megalotis (Rafinesque) - Longear sunfish - 1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16.
The most abundant centrarchid collected.
Lepomis microlophus (Gunther) Redear sunfish - 7,8,9,13,14,15.
Found in the middle and lower section of the river; most common near DeGray Lake.
Lepomis punctatus (Valenciennes) - Spotted sunfish.
Rare. One specimen collected from DeGray Lake. Although we collected this species from the lake, we feel that it is present in the river as reported by Fruge (1971).
Micropterus dolomieui Lacepede - Smallmouth bass - 1,3,5,6,7,8,9.
Collected only in the headwater and middle section of the river. Least abundant of the three *Micropterus* species collected.
Micropterus punctulatus (Rafinesque) - Spotted bass - 6,7,8,9,10,13,14,15,16.
Common through the middle and lower section of the river.
Micropterus salmoides (Lacepede) - Largemouth bass - 3,5,6,7,8,9,10,11,13,14,15,16.
Most abundant of the *Micropterus* species collected.

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Pomoxis annularis Rafinesque - White crappie - 6,8,9,14,16.
Uncommon. Only ten specimens collected.
Pomoxis nigromaculatus (Lesueur) - Black crappie - 6,8,9,14,16.
Found throughout the middle and lower portions of the river but not in large numbers.

PERCIDAE
Etheostoma blennioides Rafinesque - Greenside darter - 1,3,8,15.
Widely distributed. The low numbers collected probably indicate gear selectivity (electroshocker). Fruge (1971) stated that this species was common, especially in swiftly running water with large rocks.
Etheostoma chlorosomum (Hay) - Bluntnose darter - 13,16.
Rare. Two specimens collected in lower section of river.
Etheostoma collettei Birdsong and Knapp - Creole darter - 6,7,14, 15,16.
Common in lower section of river.
Etheostoma gracile (Girard) - Slough darter - 15.
Rare. Only one specimen collected.
Etheostoma histrio Jordan and Gilbert - Harlequin darter - 14,15.
Not common. Four specimens collected in lower section of river.
Etheostoma pallididorsum Distler and Metcalf - Paleback darter - 1.
Only one specimen collected, in the extreme headwater region. Fruge (1971) stated that the paleback darter was common in the sloughs and backwaters of the upper headwaters.
Etheostoma proeliare (Hay) - Cypress darter - 15.
Rare. Only one specimen collected in a backwater area in the lower section of the river.
Etheostoma radiosum (Hubbs and Black) - Orangebelly darter - 1, 2,3,4,5,6,7,8,9,10,11,12,14,15,16.
Most common darter throughout the river.
Etheostoma stigmaeum (Jordan) - Speckled darter - 7,16.
Uncommon. Found mainly in quiet waters.
Etheostoma whipplei (Girard) - Redfin darter - 15.
Uncommon. Found only in the lower section of the river.
Etheostoma zonale (Cope) - Banded darter - 4,5,7,8,14,15.
Common. Found mainly in riffle areas.
Percina caprodes (Rafinesque) - Logperch - 3,4,5,6,7,8,9,10,11,13, 14,15,16.
Common throughout the river.
Percina copelandi (Jordan) - Channel darter - 15,16.
Uncommon. Found only in lower section of river.
Stizostedion vitreum vitreum (Mitchill) - Walleye - 14,16.
Uncommon. Five specimens collected in lower section of river.

ACKNOWLEDGEMENTS

We thank Thomas O. Duncan and Ralph B. Roseberg for assistance in field collections, and Drs. Thomas Buchanan, Westark Junior College, Ft. Smith, Arkansas, and Neil Douglas, Northeast Louisiana University, Monroe, Louisiana, for their verification of the identification of some of the species collected.

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