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Abstract

A survey of the fishes of Crooked Creek, White River Drainage, in northcentral Arkansas was conducted using personal collections, historical records, literature records, and the Arkansas Fishes Database. The study revealed a total of 65 species of fishes distributed among 14 families. Earlier records of only 36 species in 10 families were documented. This study documents a total of 29 species and four families as new to the Crooked Creek stream system. In addition, no endangered or threatened species were collected.

Key Words: Crooked Creek; White River; northcentral Arkansas; fishes; Arkansas Fishes Database; ichthyofauna; Smallmouth Bass.

Introduction

Crooked Creek is hailed state and region-wide as a premier Smallmouth Bass (*Micropterus dolomieu*) stream in Arkansas by area fishermen, local and state media, Arkansas Department of Parks and Tourism, and the Arkansas Game and Fish Commission (AG&F). Ironically, the fishes of this well-known stream are poorly documented and no study, to date, has been attempted specifically aimed at elucidating the ichthyofauna of Crooked Creek. In this study, we assembled a list of the fishes of Crooked Creek from our personal collections of this system over the past 30 years, collections of several state ichthyologists and fishery biologists, previous literature citations, museum collection records, and historical collections contained in the Arkansas Fishes Database (AFD), the files of which are maintained by the AG&F. In addition, we recently collected fishes from Crooked Creek to further document the ichthyofauna of this Ozarkian system.

Materials and Methods

Survey Methods

Documentation of the fishes of Crooked Creek was accomplished by a combination of previous collections of fishes from the system by the authors and several state ichthyologists and fishery biologists, museum specimens, literature records based on previous collections from Crooked Creek, and fish records housed in the AFD. Collecting gear included the use of seines, hook and line, and a boat electrofisher and backpack electroshocker in an effort to use various methods of capture. Collections in riffles and runs were primarily made using a 3.1 × 1.8 m seine with 3.2 mm mesh, whereas in wider pool regions, a 6.1 × 1.8 m seine with 3.2 mm mesh was utilized extensively. In addition, boat and backpack electrofishing was accomplished under the auspices of the AG&F. Power settings using an ETS boat electrofisher was DC current 504 volts, 14 amps peak, and 60 cycles/sec, and those with an LR24 Smith-Root model backpack electroshocker was 60 hz, 25% duty, and 300 volts.

Voucher specimens were preserved in the field with 10% formalin and later placed in 45% isopropyl alcohol for permanent storage in the fish collections at Southern Arkansas University (SAU) and the University of Arkansas at Fort Smith (UA-FS). Scientific and common names follow those of Robison and Buchanan (1988) or Nelson et al. (2004).

Study Area

The Ozark region of northern Arkansas is one of the most faunistically rich sections of the United States (Robison and Beadles 1974). Within this area, the White River drainage supports a tremendous diversity of fish species (see Robison and Buchanan 1988). Crooked Creek is a nationally known spring-fed, upland White River tributary stream located on the Ozark Plateau of northcentral Arkansas (Daly et al. 2002). It originates near Marble Falls in Newton County and flows north and east for nearly 130 km

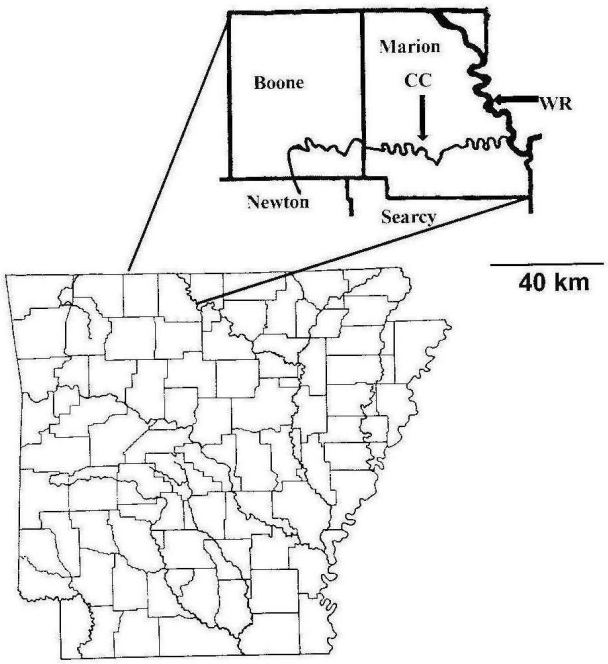

Figure 1. Location of Crooked Creek in northcentral Arkansas. Abbreviations: CC = Crooked Creek; WR = White River.

through Boone County, and continues east across Marion County to join the White River just below the city of Cotter (Fig. 1). The clear upper section of the stream flows through oak-hickory forests and cedar glades and is characterized by shallow rocky pools separated by swift, gravelly riffles. The lower portion consists of larger pool regions (up to 25 m wide), some with emerged, large boulders in the pool regions as it winds through oak-hickory forests and pastureland. This lower portion, at times, becomes almost intermittent under extreme drought. However, it is rated a Class I to II rapids for canoe/floating rides of about 84 km with public access.

Historical Review

Fishes have been collected from Crooked Creek by various collectors; however, Cashner (1967) was the first to collect fishes systematically. He sampled one station in the lower portion of the creek using a boat electrofisher as part of a larger thesis project on a survey of the fishes of the cold tailwaters of the White River system. Cashner (1967) reported 15 species in seven families. Neither Keith (1964) nor Brown (1967) collected specifically in Crooked Creek, although they did inventories of fishes of portions of the White River system. Robison and Buchanan (1988) reported 36 fish species in 10 families inhabiting the Crooked Creek stream system. Although he did not collect fishes, Drope (1997) conducted a physicochemical survey of Crooked Creek in which he reported pollution from the towns of Harrison and Yellville.

Crooked Creek has received national acclaim as having some of the best Smallmouth Bass fishing of any stream and is considered the "blue-ribbon smallmouth stream in the state" by regional and state planning organizations (http://www.arkansas.com) as well as the AG&F. Thus, Crooked Creek is a state and national treasure as a Smallmouth Bass stream. Numerous studies involving the collection of sport fishes by the AG&F tend to support these statements. In addition, Crooked Creek was considered by Daly et al. (2002) to provide excellent habitat for Smallmouth Bass due to its continuing series of riffles and pools. Indeed, Daly and coauthors captured 433 *M. dolomieu* from 10 sites on Crooked Creek during the summers of 1988-1990. Smallmouth Bass populations have been previously studied in Crooked Creek for yellow grub (*Clinostomum marginatum*) trematode parasites (Daly et al. 1987, 1991, 2002) and more recently, CTM, R. Bonett (University of Tulsa), and HWR (unpublished) have collected *M. dolomieu* to assess the present health of the Smallmouth Bass fishery in this stream.

Crooked Creek is a very productive source for sand and gravel and has historically been involved in litigation between the state of Arkansas and local gravel mine owners. Because of rapid population growth and new construction in northern Arkansas, demand for sand and gravel has increased. Large-scale gravel mining has become a serious threat to the water quality and biota (not the least of which is sportfishing) of Crooked Creek and the impairment is not avoidable or reparable (Brown et al. 1998). In addition, Crooked Creek drains a primarily rural area, although the cities of Harrison and Yellville apparently affect the stream physicochemically (Drope 1997).

Results and Discussion

A total of 54 collections and 13,145 specimens of fishes collected from 1984 to 2011 were used in our analysis of the fishes of Crooked Creek. We were able to document the current presence of 65 species of fishes from Crooked Creek, which were distributed among 14 families (Appendix). Previously, Robison and Buchanan (1988) provided distribution records for only 36 species contained within 10 families. Our present study adds 29 species as new drainage records for the Crooked Creek stream system. The diversity of fishes in Crooked Creek is primarily characteristic of the Ozark uplands. Most commonly collected in the

system were the Central Stoneroller (*Campostoma pullum*), Duskystripe Shiner (*Luxilus pilsbryi*), Ozark Minnow (*Dionda nubila*), Black Redhorse (*Moxostoma duquesnei*), Yellow Bullhead (*Ameiurus natalis*), Ozark Bass (*Ambloplites constellatus*), Smallmouth Bass (*Micropterus dolomieu*), Longear Sunfish (*Lepomis megalotis*), and Rainbow Darter (*Etheostoma caeruleum*) (Appendix).

Several species more rarely encountered in Arkansas were collected during our study including the Chestnut Lamprey (*Ichthyomyzon castaneus*), American Eel (*Anguilla rostrata*), River Redhorse (*Moxostoma carinatum*), Pealip Redhorse (*Moxostoma pisolabrum*) and Yellow Perch (*Perca flavescens*). No state, federally threatened, endangered species and/or species of special concern or of greatest conservation need (Anonymous 2004; Anderson 2006, Jelks et al. 2008; NatureServe 2010) were found to occur in Crooked Creek during our study.

The 3 most often collected species found in the system were Smallmouth Bass, Longear Sunfish, and Duskystripe Shiner. A total of 4,352 (33.1%) individual *M. dolomieu* of the 13,145 specimens in the 54 collections we enumerated reflects its great abundance in Crooked Creek and substantiates its reputation as a premier Ozark Zone Blue Ribbon Smallmouth Bass stream in Arkansas. However, this figure may be a bit misleading as fish collections by the AG&F were used in this analysis and often they were primarily collecting game fishes to assess the sportfishery of the stream.

With 65 species of fishes, Crooked Creek compares favorably with other well-documented streams of the Ozark Mountains such as the nearby Buffalo River, which has 67 species (Cashner and Brown 1977), Piney Creek, which supports 47 species (Matthews and Harp 1974; Matthews, 1978), and the Strawberry River, which has 109 species (Robison and Beadles 1974, Robison 1979, McAllister et al. 2009). Undoubtedly, additional new records of fish from Crooked Creek will be reported with further collecting efforts.

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Appendix. Fishes documented from Crooked Creek, White River Drainage, Arkansas.

Family/Species/Authority	Common Name
Petromyzontidae	
Ichthyomyzon castaneus Girard[1]	Chestnut Lamprey
Lepisosteidae	
Lepisosteus osseus (Linnaeus)	Longnose Gar
Anguillidae	
Anguilla rostrata (Lesueur)	American Eel
Clupeidae	
Dorosoma cepedianum (Lesueur)	Gizzard Shad
Cyprinidae	
Campostoma oligolepis Hubbs & Greene	Largescale Stoneroller
Campostoma pullum (Rafinesque)[1]	Central Stoneroller
Cyprinella galactura (Cope)	Whitetail Shiner
Cyprinella whipplei Girard	Steelcolor Shiner
Cyprinus carpio Linnaeus	Common Carp
Erimystax harryi (Hubbs & Crow)	Ozark Chub
Hybopsis amblops (Rafinesque)	Bigeye Chub
Luxilus chrysocephalus Rafinesque[1]	Striped Shiner
Luxilus pilsbryi (Fowler)[1]	Duskystripe Shiner
Nocomis biguttatus (Kirtland)	Hornyhead Chub
Notropis boops Gilbert	Bigeye Shiner

Notropis greenei Hubbs & Ortenburger.....Wedgespot Shiner
Notropis nubilus (Forbes).....Ozark Minnow
Notropis percobromus (Cope).....Carmine Shiner
Notropis telescopus (Cope).....Telescope Shiner
Phoxinus erythrogaster (Rafinesque).....Southern Redbelly Dace
Pimephales notatus (Rafinesque)[1].....Bluntnose Minnow
Semotilus atromaculatus (Mitchill).....Creek Chub

Catostomidae
Carpiodes carpio (Rafinesque).....River Carpsucker
Carpiodes cyprinus (Lesueur).....Quillback
Carpiodes velifer (Rafinesque).....Highfin Carpsucker
Ctenopharyngodon idella (Valenciennes)[2].....Grass Carp
Hypentelium nigricans (Lesueur)[1].....Northern Hog Sucker
Moxostoma carinatum (Cope).....River Redhorse
Moxostoma duquesnei (Lesueur).....Black Redhorse
Moxostoma erythrurum (Rafinesque).....Golden Redhorse
Moxostoma pisolabrum (Trautman & Martin).....Pealip Redhorse

Ictaluridae
Ameiurus melas (Rafinesque).....Black Bullhead
Ameiurus natalis (Lesueur).....Yellow Bullhead
Ictalurus punctatus (Rafinesque).....Channel Catfish
Noturus albater Taylor.....Ozark Madtom
Noturus exilis Nelson.....Slender Madtom
Noturus flavater Taylor.....Checkered Madtom
Pylodictis olivaris (Rafinesque).....Flathead Catfish

Salmonidae
Oncorhynchus mykiss (Walbaum)[1,2].....Rainbow Trout

Atherinopsidae
Labidesthes sicculus (Cope)[1].....Brook Silverside

Fundulidae
Fundulus catenatus (Storer).....Northern Studfish
Fundulus olivaceus (Storer).....Blackspotted Topminnow

Poeciliidae
Gambusia affinis (Baird & Girard).....Western Mosquitofish

Cottidae
Cottus carolinae (Gill).....Banded Sculpin
Cottus immaculatus Kinziger & Wood[1,3].....Immaculate Sculpin

Centrarchidae
Ambloplites constellatus Cashner & Suttkus[1].....Ozark Bass
Lepomis cyanellus Rafinesque[1].....Green Sunfish
Lepomis macrochirus Rafinesque[1].....Bluegill
Lepomis megalotis (Rafinesque)[1].....Longear Sunfish
Lepomis microlophus (Gunther).....Redear Sunfish
Micropterus dolomieu Lacépède[1].....Smallmouth Bass
Micropterus punctulatus (Rafinesque).....Spotted Bass

Micropterus salmoides (Lacépède)[1] ..... Largemouth Bass
Pomoxis nigromaculatus (Lesueur) ..... Black Crappie

Percidae
Etheostoma blennioides Rafinesque ..... Greenside Darter
Etheostoma caeruleum Storer ..... Rainbow Darter
Etheostoma euzonum (Hubbs & Black) ..... Arkansas Saddled Darter
Etheostoma flabellare Rafinesque ..... Fantail Darter
Etheostoma juliae Meek ..... Yoke Darter
Etheostoma spectabile (Agassiz)[4] ..... Orangethroat Darter
Etheostoma zonale (Cope) ..... Banded Darter
Perca flavescens (Mitchill) ..... Yellow Perch
Percina caprodes (Rafinesque) ..... Logperch
Percina maculata (Girard) ..... Blackside Darter
Percina sciera (Swain) ..... Dusky Darter

[1]Previous records from Cashner (1967).
[2]Introduced species.
[3]Formerly Arkansas populations of Ozark Sculpin, *Cottus hypselurus* Robins & Robison; *C. hypselurus* is now restricted to Missouri.
[4]This may actually represent an undescribed species according to Page and Burr (2011).