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FISHES OF THE HIWASSEE RIVER SYSTEM—ECOLOGICAL AND TAXONOMIC CONSIDERATIONS

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ABSTRACT

Seventy-two collections of fishes were made in the Hiwassee River and its tributaries between August, 1970, and July, 1971. Greatest emphasis was placed on studies of the ecological relationships, distribution, and taxonomy of smaller species. Seventy-two species of fishes are known to occur in the Hiwassee system, with species of special significance including Ichthyomyzon hubbsi, Notropis spectrunculus, an undescribed dace of the genus Phoxinus, Hypentelium etowanum, Micropterus coosae, Perca flavescens, Etheostoma camurum, Percina aurantiaca, P. burtoni, and P. squamata. Mining wastes were found to have greatly reduced the diversity of fishes in the Ocoee River and some of its tributaries.

INTRODUCTION

The Hiwassee River system is a complex of five rivers which together drain portions of southeastern Tennessee, northcentral Georgia, and southwestern North Carolina. These five rivers—the Hiwassee, Ocoee, Toccoa, Nottely, and Valley rivers—lie within a watershed area of 2,800 square miles, as indicated in Figure 1.

The Ocoee River is the largest single contributor of water to the Hiwassee system. It joins the Toccoa River in extreme southeastern Tennessee. These two rivers form a stream very nearly as long as the main Hiwassee with its northern tributary, the Nottely.

The largest tributaries of the Toccoa and Nottely rivers in Georgia are very similar, having clear, cold water and rocky substrates. Steep gradients and fast waters are common in the headwaters of Rock, Copper, and Fightingtown creeks, but the Ocoee-Toccoa tributaries have only moderately fast currents.

Below the Tennessee-Georgia line the Ocoee River undergoes a marked change. A load of silt is carried from Ducktown to the Ocoee by North Potato and Brush Creeks. Rough Creek and Big Creek, flowing from the southwest off Big Frog Mountain, bring fast, clear, cold water to a silty, scouring Ocoee which falls 600 feet in less than 10 miles until it reaches Parksville Reservoir. The reddish-brown silt has settled from the water which leaves the lake, but the dissolved mineral wastes persist and seem to form a chemical barrier that inhibits dispersal of aquatic life between the Ocoee-Toccoa system and the main Hiwassee downstream.

The Nottely River is similar to the Ocoee-Toccoa headwaters in Georgia. The Nottely, like the Ocoee-Toccoa system, has a rocky bottom ranging from gravel to boulders and is also an excellent trout stream. The Nottely keeps its fine qualities until it is interrupted just south of the Georgia-North Carolina line by Nottely Dam. The river below the dam was found by Messer (1965) to be a habitat suitable mainly for rough fish until it mixes with the waters of the main Hiwassee and Valley rivers in Hiwassee Reservoir.

Seventy-two collections were made from August, 1970, until July, 1971. Emphasis was placed on collecting the smaller fishes of the Hiwassee system in Tennessee. The Tennessee Valley Authority (1971) has considerable data concerning the larger lowland fishes of this area. The fishes of northern Georgia have been recently surveyed (Satterfield, 1961), as have the fishes of the North Carolina portion of the drainage (Messer, 1965).

Toward the end of the survey, some collecting was done in the main channels of the Ocoee and Hiwassee Rivers. This was done with the hope of finding some of the normal small lowland fishes of the Tennessee River tributaries, such as Percina sciera (Swain) and Pimephales vigilax (Baird and Girard).

Some streams were sampled more than one time either at a single site or at several sites along their courses. Baker and Indian creeks on the south side of Parksville Reservoir received two collections each in the hope that useful data could be gathered concerning an undescribed species of the genus Phoxinus. Similarly, many collections were made in Big Lost Creek to obtain
FIG. 1: Map of the Hiwassee River Drainage

(* Indicates a Tennessee Fish and Game Commission Collection)

Where traditional methods were found to be ineffective, sodium cyanide, acting as a terminal oxidase inhibitor, was used to stun the fishes. All collections were preserved in ten percent formaldehyde and housed in the University of Tennessee at Knoxville Fish Collection.

Calculations of meristics and morphometrics used in this research were made in accordance with the standard procedures described by Hubbs and Lagler (1958). All identifications were made by the authors. The following abbreviations were used in this paper: U.T. denotes the University of Tennessee at Knoxville Fish Collection, and T.G.F. denotes the Tennessee Game and Fish Hiwassee River Collection. The locations of these collections are shown in Figure 1 and the numbers denoting these collections are given in the text.

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SPECIES COLLECTED

Mountain brook lamprey—Ichthyomyzon hubbi Rostcy. This small non-parasitic lamprey was found in the cool, fast waters of two Toccoa River tributaries in Fannin County, Georgia. Collections of this fish in the Little Tennessee River in North Carolina (Raney, 1952), suggest that moderate to large-size streams are its normal habitat. Our specimens included two larvae from U.T. 37 and two adults from U.T. 62. The lengths of the larval specimens were 19.0 centimeters and 10.5 centimeters, and the lengths of the adults were 13.4 centimeters and 12.2 centimeters. The adults were collected on May 15, 1971.

An additional non-parasitic lamprey, Lampetra lentisata (Lenhart) and two species of parasitic lampreys—Ichthyomyzon baileyi (Jordan) and Ichthyomyzon censatus (Girard)—were collected in the Tennessee portion of the main Hiwassee River. The authors feel that these fishes occur in the Hiwassee headwaters only rarely.

Gizzard shad—Dorasoma cepedianum (Lessau). The gizzard shad was found in the Hiwassee River in Tennessee and the Nolichucky River in Georgia. This species exists in many of the larger channels of the Hiwassee system.

Records for Alosa chrysocloris (Rafinesque) and Dorosoma petenense (Gunther) come from the main channel of the Hiwassee in Tennessee. Their presence in the North Carolina and Georgia portions of the system is also probable.

Brook trout—Salvelinus fontinalis (Mitchill). The "brookie" is a native of the upper Tennessee drainages and is present only in the highest quality trout streams. Dahlberg and Scott (1971) recorded this species from the Hiwassee and Toccoa systems in Georgia, and Meuser (1965) listed collections from three locations in North Carolina.

Rainbow and brown trout—Salmo gairdneri Richardson and Salmo irina Linnæus—were observed to be present in the headwaters of all the major drainage areas collected. Both species have been introduced and very few specimens were taken. Rough and Big Creeks of the Oconee system, and Wolf Creek of the Hiwassee system appear to have naturally reproducing populations of rainbow trout.

Stoneroller—Campostoma anomalum (Rafinesque). The stone- roller was the most widely distributed cyprinid in the Hiwassee system. Although found to be most abundant in the higher elevations, it was also collected in the lowland stream tributary to the main river in Tennessee.

Bluntnose minnow—Pimephales notatus (Rafinesque). This minnow was collected in the slow waters of the lowland tributaries to the Hiwassee, and in the main channel of the lower Hiwassee River.

Bullhead minnow—Pimephales vigilis (Butid and Girard). This species’ cyprinid was found only in the warm, slow waters of the lower Hiwassee.

Blacknose dace—Rhinichthys atratulus (Heerman). The blacknose dace was collected in many small to moderate size streams which drain the Tennessee foothills. Some specimens, however, were collected in very large streams and very little gradient, and some were collected in the main channel of the Hiwassee River.

Longnose dace—Rhinichthys cataractae (Valenciennes). The longnose dace was found at higher elevations than the blacknose dace. Separation of the two species in the river is distinct. Rhinichthys atratulus found only in the Hiwassee and Oconee systems, and R. cataractae in the Nolichucky, Toccoa, and Valley Rivers.

Emerald shiner—Notropis atherinellus Rafinesque. The emerald shiner was represented by a single large specimen collected from the main Hiwassee near Lake Chickamauga.

Warpaint shiner—Notropis eociocephalus (Cope). Individuals or small groups of the warpaint shiner were commonly collected in the large, swift tributaries of the Toccoa and Oconee Rivers by the authors, and in the Valley River system by Meuser (1965). All collections of N. eociocephalus were made in streams with sand, gravel, and cobbles. Ramsey (1965) reported this species in the Nolichucky River.

Striped shiner—Notropis corninus chrysoceplalus (Rafinesque). The authors collected the striped shiner in fairly large, slow-moving streams of the foothills. Gilbert (1964), however, reported that the fish has been collected from the Tennessee-Georgia border area.

Whitetail shiner—Notropis palustris (Cope). This species is widely distributed, but rarely abundant, in the Hiwassee system. Though found primarily in clear streams of moderate size and current, specimens were also collected in the main river. Gibbs (1963) collected the whitetail shiner in the Nolichucky and Toccoa systems and Meuser (1965) in the Valley River.

Mountain shiner—Notropis lutescens (Jordan). This cyprinid was common in the southern tributaries of the lowland Hiwassee. The mountain shiner was usually collected in streams of moderate size and current. Many of these streams flowed through agricultural land.

Mirror shiner—Notropis spectabilis (Cope). The mirror shiner was generally found in the fast-moving, clear waters of the higher elevations. This cyprinid is not normally found below an altitude of 1,500 feet above sea level (Raney, 1965). The mirror shiner was collected from the main Hiwassee and T. G. F. 2, however, was taken at an altitude of about 800 feet above sea level.

Splotched shiner—Notropis splotulosus (Cope). The splotched shiner was found in the relatively warm portions of the lower Hiwassee and its lowland tributaries. All collections of this species came from slow, turbid water.

Telecope shiner—Notropis telopicus (Cope). Although T. G. F. 2 from the main Hiwassee River yielded two specimens of the telescope shiner, small creeks or streams were the preferred habitat. This fish was not found to be abundant in the lowlands or headwaters of the Hiwassee River. The scarcity of this species is notable when its well-documented abundance in the waters of the very similar river, the French Broad, is known (Gilbert, 1968).

Steelhead shiner—Notropis nygma (Cope). The authors know of no collection of N. nygma from the Hiwassee system which does not also contain specimens of the closely-related jointed shiner. N. nygma appears to be less common than the species. No records from the Hiwassee system outside Tennessee are known to the authors.

Carps—Cyprinus carpio Linnaeus. Carp were observed to be abundant in the warmer waters of the lower Hiwassee during the summer months. The few numbers recorded in collections are probably due to the unwillingness of collectors to recover the carp and to the difficulty encountered in catching this species.

Bigeye chub—Hybopsis amblops (Rafinesque). The authors found H. amblops in the moderate to large-sized tributaries of the Oconee and upper Hiwassee River and Dahlberg and Scott (1971) extended the recorded range of this species in the Hiwassee system to the Nolichucky River in Georgia.

Blotched chub—Hybopsis inopinatus Hubbs and Crowe. Four specimens of this species were collected from the riffles of a moderate-sized tributary of the Nolichucky River in Union County, Georgia. Dahlberg and Scott (1971) also recorded specimens of H. inopinatus from the Nolichucky. A single specimen of Hybopsis drumsellii (Kirtland) reported from the Valley River by Meuser (1965) is regarded as a misidentification of H. inscriptus.

River chub—Nocomis microlepops (Cope). The river chub
in the deep waters of the HWISE. The "stream-like" waters of the HWISE were described as a "bridge" of the river, with a small amount of fish occurring in the water. The channel catfish (Ictalurus punctatus) is a large species that can be found in the shallow waters of the HWISE. The channel catfish is the most important species in the HWISE, as it is the most abundant and commonly caught species in the system.

Riverine fish—Oncorhynchus mykiss (Rainbow trout). This species is commonly found in the HWISE and is the most abundant species in the system. Rainbow trout are known to be voracious predators and can be found in the shallow waters of the HWISE. The species is also known to be a good indicator of water quality, as it is sensitive to changes in pH and water temperature.

Black bullhead—Ictalurus melas (Black bullhead). This species is commonly found in the HWISE and is a good indicator of water quality. The black bullhead is a bottom-dwelling fish that is known to feed on vegetation and detritus. The species is also known to be a good indicator of water quality, as it is sensitive to changes in pH and water temperature.

Green sunfish—Lepomis cyanellus (Green sunfish). The green sunfish is a small species that is commonly found in the HWISE. The species is known to feed on insects and small invertebrates. The green sunfish is also known to be a good indicator of water quality, as it is sensitive to changes in pH and water temperature.

Discussion

On the basis of the distributional records available, it can be seen that the HWISE is a complex system with many different species and habitats. The HWISE is a complex system with many different species and habitats. The HWISE is a complex system with many different species and habitats. The HWISE is a complex system with many different species and habitats. The HWISE is a complex system with many different species and habitats.

The riverine fish—Oncorhynchus mykiss (Rainbow trout) is the most abundant species in the HWISE. The species is known to be a good indicator of water quality, as it is sensitive to changes in pH and water temperature. The black bullhead—Ictalurus melas (Black bullhead) is a bottom-dwelling fish that is known to feed on vegetation and detritus. The species is also known to be a good indicator of water quality, as it is sensitive to changes in pH and water temperature.
The authors' inclusion of Nereopsis spectrancus into the group of fishes which might indicate the degree of isolation within the Ocoee-Toccoa system stems from previous studies only. In 1965, N. spectrancus from the Hiwassee were thought to be the same as the populations from the North Carolina streams; all have fully scaled napes (Ramsay, 1965). Consideration was, in fact, being given to assigning the populations a subspecies status so as to differentiate them from the N. spectrancus population in the more northerly system, the Tennessee River which have naked or partially naked nape. A tentative decision to call the Hiwassee River type a fully-scaled, separate subspecies have not been examined of the specimens from the Ocoee-Toccoa River system. All of the Toccoa N. spectrancus collected by the authors had the naked nape conditions to a greater or lesser degree. If one assumes that the naked nape characteristic is inherited, as has been suggested for Esox lucius nigrofasciatus (Lac., and Bailey, 1947), then one would also be led to assume that the Toccoa populations of N. spectrancus have been unable to negotiate the poisons and hydroelectric dams of the Ocoee River so as to enter the Hiwassee and mate with the fully-scaled types there. The system of Hypentelium etowahum lies in the existence of this sucker in the Ocoee system in Baker Creek. Hypentelium etowahum has, like the Toccoa N. spectrancus, had difficulty reaching the Hiwassee River by traveling down the Ocoee River. Hypentelium etowahum is, in fact, found nowhere else in the Tennessee River system. In 1969, Jenkins (1970) lists another extremely useful character involving the number of scale rows above the lateral-line. The count, made obliquely forward from the lateral-line in the scale row in front of the dorsal fin and then obliquely backward to the anterior margin of the lateral-line, on either side, is usually 15 or more in H. nigricane and 14 or less in H. etowahum. All of the 15 hog suckers from Baker Creek are clearly above the latter counting the lateral-line scale on either side, is usually 15 or more in H. nigricane and 14 or less in H. etowahum. Stock of these fish, before they count the lateral-line scale on either side, is usually 15 or more in H. nigricane and 14 or less in H. etowahum. The authors had hoped that Esoxostoma conerare Storer would be found in habitats afforded by the main channel of the lower Hiwassee, but it was never found. The authors' collection of E. conerare in Toccoa streams which partially explained this phenomenon. The main channel of the Hiwassee is probably too cold for these fishes as it flows through the exposed sulphate salts. Indeed, this is the case, a remedy may lie in the planting of water weeds downstream from the copper mining works. Moreover, Baker Creek is an important tributary, though highly soluble under normal conditions, are precipitated out in waters with high organic content such as sediments and neutralization of copper mining wastes (Tennessee Stream Pollution Control Board, 1954), the authors believe that the Hiwassee River fishes, and, as previously mentioned, the fishes of the Ocoee headwaters, are even today prevented from traveling downstream to the main Hiwassee. The consequences of this almost 100 years of isolation are in a small way shown by the distribution of Nereopsis spectrancus (Cope) and Hypentelium etowahum (Jordan).