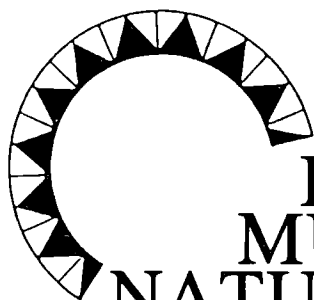


# BULLETIN

of the



FLORIDA  
MUSEUM OF  
NATURAL HISTORY

**A NEW SPECIES OF BASS, *Micropterus cataractae*  
(TELEOSTEI: CENTRARCHIDAE),  
FROM THE APALACHICOLA RIVER BASIN  
IN ALABAMA, FLORIDA, AND GEORGIA**

**James D. Williams and George H. Burgess**

Volume 42 No. 2, pp. 80-114

1999

UNIVERSITY OF FLORIDA      GAINESVILLE

Numbers of the **BULLETIN OF THE FLORIDA MUSEUM OF NATURAL HISTORY** are published at irregular intervals. Volumes contain about 300 pages and are not necessarily completed in any one calendar year.

JOHN F. EISENBERG, *EDITOR*  
RICHARD FRANZ, *Co-EDITOR*  
RHODA J. BRYANT, *MANAGING EDITOR*

Communications concerning purchase or exchange of the publications and all manuscripts should be addressed to: Managing Editor, Bulletin; Florida Museum of Natural History; University of Florida; P. O. Box 117800, Gainesville FL 32611-7800; U.S.A.

*This journal is printed on recycled paper.*

ISSN: 0071-6154

CODEN: BF 5BA5

Publication date: October 8, 1999

Price: \$ 6.50

**A NEW SPECIES OF BASS, *Micropterus cataractae*  
(TELEOSTEI: CENTRARCHIDAE),  
FROM THE APALACHICOLA RIVER BASIN  
IN ALABAMA, FLORIDA, AND GEORGIA**

**James D. Williams<sup>1</sup> and George H. Burgess<sup>2</sup>**

**ABSTRACT**

The shoal bass, *Micropterus cataractae* (Centrarchidae), is described from the Apalachicola, Chattahoochee, and Flint river drainages of Alabama, Florida, and Georgia. It has been introduced and is now established in the Altamaha River drainage in central Georgia. A moderate sized bass, it attains a total length of about 64 cm (25 in) and weight of 3.99 kg (8 lb 12 oz). The new species differs from other species of *Micropterus* in details of morphology and pigmentation. Morphologically it is most similar to the spotted bass, *M. punctulatus*, but usually has been aligned with the redeye bass, *M. coosae*. It inhabits shoal areas of rivers and large creeks throughout its range. Most of its riverine habitat has been destroyed by impoundments and dredging, but it persists in the unimpounded portion of the Flint River. Populations also persist in some of the larger, less disturbed, tributaries of the Apalachicola, Chattahoochee, and Flint rivers.

**RESUMEN**

Se describe el bass de raudal, *Micropterus cataractae* (Centrarchidae) en las cuencas de los ríos Apalachicola, Chattahoochee y Flint, en Alabama, Florida y Georgia. Además, ha sido introducido y está ahora establecido en el Río Altamaha en Georgia central. Este bass es de tamaño moderado y alcanza un largo total de cerca de 64 cm (25 pulgadas) y un peso de 3.99 kg (8 libras, 12 onzas). Esta nueva especie difiere de otros *Micropterus* en detalles de morfología y pigmentación. Morfológicamente es más parecido al bass moteado, *M. punctulatus*, pero usualmente ha sido asignado al bass de ojo rojo, *M. coosae*. Esta nueva especie habita áreas de banco y arroyos grandes a través de su rango de distribución. La mayor parte de su hábitat a sido destruido por embalses y operaciones de dragar, aunque persiste en áreas del Río Flint. También persisten poblaciones en algunos de los más grandes tributarios de los ríos Apalachicola, Chattahoochee y Flint.

---

<sup>1</sup>U.S. Geological Survey, Biological Resources Division, Florida Caribbean Science Center, 7920 NW 71st Street, Gainesville, Florida 32653.

<sup>2</sup>Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611.

## INTRODUCTION

During the past 40 years, the shoal bass, described herein as *Micropterus cataractae*, alternatively has been referred to as the redeye bass, *M. coosae*, as an undescribed subspecies or variety of the redeye bass, or as an undescribed species. In their monograph on the black basses, Hubbs and Bailey (1940) included a brief discussion of a single large specimen of *Micropterus* from the Chipola River in western Florida. They noted that insufficient material prevented a clear understanding of the status and relationships of the specimen, which possibly represented a new species. Bailey and Hubbs (1949) further discussed the single Chipola specimen in their original description of the Suwannee bass, *M. notius*, and noted differences between it, the redeye bass, *M. coosae*, and Alabama spotted bass, *M. punctulatus henshalli*. They concluded that it likely represented an undescribed species of the spotted bass group. The first notice of this undescribed bass in the popular sport fishing literature was by Dequine (1949). In a later popular article on *Micropterus*, McClane (1972) provided a color illustration of the shoal bass (referred to as redeye bass Apalachicola form) and gave characters distinguishing it from other basses. Ramsey (1973) reviewed the *M. coosae* complex and concluded that the shoal bass was an endemic species of the Apalachicola River basin. While most recent popular and technical references to shoal bass have recognized it as a distinct species (Bass 1996), the International Game Fish Association (IGFA) has continued to treat it under the heading of redeye bass, *Micropterus coosae* but discusses the confusion surrounding the common name and the lack of a scientific name (IGFA 1997).

The shoal bass has been the subject of a number of biological and management investigations, including studies of life history (Wright 1967; Hurst 1969), spawning and growth in ponds (Smitherman and Ramsey 1972), and growth in the Chipola River population (Parsons and Crittenden 1959). Fishery management investigations include creel surveys (Ober 1977; Scott 1981), a culture study (Johnson 1977), an evaluation of supplemental stocking (Scott 1978), and a compilation of the taxonomy and biology (Gilbert 1992).

The restricted distribution and habitat preference of the shoal bass has limited its importance as a sport fish. However, in areas where it does occur it generally supports a unique fishery. The confusion surrounding the identity of the shoal bass has likely contributed to its relative anonymity. The current world record redeye bass, *Micropterus coosae*, is based on a 3.99 kg (8 lb 12 oz) shoal bass taken in the Apalachicola River, Florida (IGFA 1997). The redeye bass, *M. coosae*, does not occur in the Flint River drainage. We recommend the world record for the "redeye bass" be transferred to the shoal bass, *M. cataractae*, and new records be established for the smaller redeye bass, *M. coosae*, which rarely exceeds 25.5 cm (10 in) in length and 0.5 kg (1 lb).

In this contribution we describe and name this distinctive bass. A brief review of life history data from published and unpublished sources is also included. Distributional data for *Micropterus cataractae* and other native and introduced *Micropterus* in the Apalachicola River basin are summarized. We did not undertake a phylogenetic analysis

of *Micropterus* to determine the relationship of *M. cataractae* to other *Micropterus* species. However, its coloration and morphology are most similar to that of the spotted bass, *M. punctulatus*.

### ACKNOWLEDGMENTS

We are indebted to the following individuals and institutions for the loan and exchange of material: William G. Saul (ANSP); Jonathan W. Armbruster and Craig Guyer (AU); Charles M. Dardia and J. M. Humphries (CU); Larry Page (INHS); Wayne C. Starnes (NCSM); Henry L. Bart, Jr. (TU); Richard L. Mayden, Herbert T. Boschung, and Bernard R. Kuhajda (UAIC); Bud Freeman, Tracie Jones, and Mary Freeman (UGAMNH); Reeve M. Bailey and Douglas W. Nelson (UMMZ); Susan Jewett and Jeffrey T. Williams (USNM); and David A. Etnier (UT). Field support was provided by the following individuals: Noel M. Burkhead, D. Gray Bass, John Chick, Carter R. Gilbert, Russell Ober, William Smith-Vaniz, Steven J. Walsh, and Douglas Weaver. D. Gray Bass, Dave Etnier, and William Smith-Vaniz reviewed and commented on the final draft of the manuscript.

We thank Sherry Bostick for her assistance in producing several drafts of this manuscript. We express our gratitude to Amy Benson for the preparation of the distribution maps, Lori Walz for the line drawings, and Joseph Tomelleri for permission to use four of his excellent bass color illustrations.

### MATERIALS AND METHODS

Type material of *Micropterus cataractae* is deposited in the following institutions: Academy of Natural Sciences of Philadelphia (ANSP); Auburn University (AU); Cornell University (CU); North Carolina State Museum of Natural Sciences (NCSM); Florida Museum of Natural History, University of Florida (UF); National Museum of Natural History (USNM); Museum of Natural History, University of Georgia (UGAMNH); Tulane University (TU); University of Alabama Ichthyological Collection (UAIC); University of Michigan Museum of Zoology (UMMZ); and University of Tennessee (UT). Meristic data were taken from 162 *Micropterus cataractae*, 55 *M. coosae*, and 36 *M. punctulatus punctulatus*, all from the Apalachicola River basin in Alabama, Florida, and Georgia. Material of *Micropterus* from several southeastern river systems outside the Apalachicola River basin was examined for comparative purposes, but those specimens are not cited in the material examined section.

Scale and fin ray counts and proportional measurements are based on the methodology of Hubbs and Lagler (1958). Gill rakers on the upper and lower limb of the first arch were combined for a total count. Rudiments were excluded and only those rakers whose height exceeded their basal diameter were counted.

### *Micropterus cataractae* new species

Shoal Bass

Plates 1, 2, and 5

*Micropterus* sp.—Hubbs and Bailey 1940:16, 28, Map 1 (Chipola R., FL); Bailey and Hubbs 1949:2, 8-9, 11-13 (description of single large specimen from Chipola R.); Dequene 1949:10-13, 18-19 (undescribed bass

from Chipola R.); Carr and Goin 1959:87-88 (characteristics, biology, distribution); Ramsey and Smitherman 1972:354 (coloration of young of Apalachicola River stock); Hurst et al. 1975:47-52 (distribution, biology); Ramsey 1975:71-72 (systematic relationships among basses); Ramsey 1976:54, 63 (conservation status); Carlander 1977 (summary of length-weight data); Yarger 1977:27 (distribution in Apalachicola River basin); Gilbert 1978:27-28 (conservation status, distribution in Florida); Scott 1978:1-29 (supplemental stocking in Flint R., GA); Deacon et al. 1979:41 (assigned conservation status of special concern in Alabama, Florida, and Georgia); Timmons et al. 1979:313, 315 (present in West Point Reservoir, Chattahoochee R., GA, before and two years after impoundment); Ogilvie 1980 (life history in Chipola R., FL); Hess and Ober 1981:16, 20 (present in Flint and Chattahoochee rivers, relative abundance in Flint R. during 1974-1975); Scott 1981:1-23 (creel survey in Flint R., GA); Williams 1981:333 (assigned conservation status of special concern); Ramsey 1984:10 (distribution); Williams et al. 1989:11 (assigned conservation status of special concern in Alabama, Florida, and Georgia); Page and Burr 1991:265, Plate 35 (characteristics, range); Gilbert 1992:98-104 (conservation status, biology, distribution in Florida); Bass 1996:6-7 (shoal bass fishery in Florida); Couch et al. 1996:35, 38 (distribution in Apalachicola, Chattahoochee, and Flint rivers; federal and state conservation status); Mettee et al. 1996:556-557 (characteristics, distribution in Alabama); Dunaway 1998:203 (illustration; sport fishing information); Hoehn 1998:32 (photograph of juvenile; distribution in Florida).

*Micropterus coosae*.—Dendy 1954:12 (misidentification: Little Uchee Cr., Russell Co., AL); Kilby et al. 1959:77 (present in Chipola R., Jackson Co., FL); Parsons and Crittenden 1959:191-192 (growth in Chipola R., Jackson Co., FL); Wright 1967:1-51 (life history, taxonomy in Flint R., GA); Gilbert 1969:45-46, Map 76 (distribution in central Chattahoochee R. drainage); Dahlberg and Scott 1971:39-40 (distribution, characteristics of "Flint River smallmouth"); Ramsey et al. 1972:66, 80 (conservation status, distribution); Smitherman and Ramsey 1972:357-365 (spawning, growth in ponds); Ramsey 1973:76 (characteristics, distribution); Robbins and MacCrimmon 1974:109-113 (biology, range in Flint and Chipola rivers); McClane 1974:132 (color illustration, characteristics); MacCrimmon and Robbins 1975:64-65 (misidentification, in part; present in Flint R., GA, and Apalachicola and Chipola rivers, FL).

**HOLOTYPE**.—UF 92070, 387 mm standard length (SL), adult male, Florida, Jackson County, Chipola River, ca. 1.5 miles downstream of bridge on State Route 278, 0.7 miles W of intersection with State Route 71, 8 May 1989. Collected by J. D. Williams, G. H. Burgess, C. R. Gilbert, S. J. Walsh, and D. G. Bass.

**PARATOPOTYPES**.—UF 79980, 17:65-305 mm SL, taken with the holotype.

**OTHER PARATYPES**.—**Apalachicola River**. Florida, Gadsden County: TU 22843, 1:383 mm SL, Apalachicola River from Jim Woodruff Dam down to gravel bar at Mosquito Creek, 15 December 1959; TU 22875, 2:322-385 mm SL, Apalachicola River below Jim Woodruff Dam at Chattahoochee, 28-29 March 1960; UF 37726, 1:235 mm SL, Apalachicola River (RM 106), Jim Woodruff Dam, 21 March 1983; UF 38743, 1:325 mm SL, Apalachicola River at tailwater of Jim Woodruff Dam, 10 May 1957; UF 38744, 1:314 mm SL, Apalachicola River at tailwater of Jim Woodruff Dam, 28 December 1957; UF 57447, 2:190-405 mm SL, Apalachicola River at Chattahoochee, Jim Woodruff Dam, and downstream for 1.0 mile, 4-5 August 1960.

**Chipola River drainage**. Florida, Jackson County: AU 15128, 2:138-178 mm SL, Chipola River (and Dry Creek at mouth), 2.7 air miles WNW of Altha and 8.3 air miles SSE of Marianna, 14 August 1977; AU 15635, 2:112-405 mm SL, Chipola River, 2 air miles SSW of Sink Creek, from just above Bell Pond (T2N, R9W, Sec. 6), 16 June 1977; AU 15637, 2:61-159 mm SL, Chipola River just below Ring Jaw Island, 4.6 air miles SSW of Sink Creek Village (T2N, R9W, Sec. 18), 29 July 1977; UF 1624, 12:230-345 mm SL, Chipola River, 1.0 mile below mouth of Dry Creek, 24 June 1957; UF 1950, 7:170-273 mm SL, Chipola River, shoal waters from near mouth of Dry Creek to a point about 3 miles below Peacock Bridge, 6 October 1956; UF 6928, 1:262 mm SL, Dry

Creek (T3N, R10W, Sec. 1), 17 September 1956; UF 24661, 5:163-325 mm SL, Chipola River, about 2 miles S of Peacock Bridge, 20 September 1956; UF 110754, 4:266-304 mm SL, Chipola River, about 10 mi. SSE of Marianna, 3 March 1970; UMMZ 110997, 1:310 mm SL, Chipola River, Marianna, 27 January 1933; UMMZ 201859, 5:155-302 mm SL, Chipola River, about 2 miles S of Peacock Bridge, 20 September 1956.

**Chattahoochee River drainage.** Alabama, Lee County: UAIC 11132.01, 1:229 mm SL, Halawakee Creek, ca. 10 miles NE of Opelika, 24 September 1968; UAIC 11135.01, 2:268-315 mm SL, Wacoochee Creek, ca. 1.0 mile from Chattahoochee River, 17 April 1970; UAIC 11137.01, 1:310 mm SL, Wacoochee Creek, ca. 1.0 mile from junction with Chattahoochee River, 2 May 1969. Russell County: CU 16198, 1:175 mm SL, Uchee Creek, tributary of Chattahoochee River, 9.2 miles S of Phoenix City, 12 June 1949. Georgia, Fulton County: UAIC 11133.01, 1:195 mm SL, Chattahoochee River, 0.8 miles E of Vinings at US Highway 41, 13 February 1979; UAIC 11134.01, 4:53-116 mm SL, Big Creek, 0.9 air miles SE of Roswell at county road, 30 October 1978. Heard County: UAIC 11136.01, 1:313 mm SL, Chattahoochee River at mouth of Centralhatchee Creek, 1.0 mile N of Franklin, 4 November 1972.

**Flint River drainage.** Georgia, Baker County: UGAMNH 2378, 1:265 mm SL, Ichawaynochaway Creek, between old power dam and State Route 200 crossing, 8 April 1992. Dougherty County: UMMZ 163920, 1:82 mm SL, Flint River, 0.25 miles below the entrance to Radium Springs, 3 miles S of Albany, 19 September 1952; UMMZ 164094, 1:86 mm SL, Flint River between Radium Springs and Rivers Bend, 21 September 1952. Lee and Worth counties: AU 6604, 4:72-133 mm SL, Flint River, at tailwaters of Lake Blackshear Dam, 31 December 1970. Meriwether County: NCSM 27361, 1:235 mm SL, Big Red Oak Creek on GA 85, about 3.5 air miles S of Gay, 13 December 1997; TU 187504, 2:220-280 mm SL, Big Red Oak Creek on GA 85, about 3.5 air miles S of Gay, 13 December 1997. Mitchell and Baker counties: UMMZ 174541, 1:390 mm SL, Flint River, probably near Newton, 6 October 1958. Talbot and Upson counties: ANSP 152214, 2:56-76 mm SL, Flint River at Pobiddy Road, S of Thomaston, 22 April 1983; ANSP 152222, 3:51-62 mm SL, Flint River at Pobiddy Road, S of Thomaston, 22 April 1983; ANSP 152382, 7:42-218 mm SL, Flint River at Pobiddy Road, S of Thomaston, August 1983; UGAMNH 611A, 10:73-223 mm SL, Flint River, 1.0 mile above Highway 36 crossing, 29 October 1958; USNM 341876, 5:93-236 mm SL, Flint River at Pasley Shoal, 9 air miles W of Thomaston, 16 June 1971. Upson County: UF 101804, 5:62-137 mm SL, Flint River, 7.3 air miles WSW of Thomaston, above Highway 36 bridge (RM 260), Station 3, 12 June 1984; UF 101805, 2:81-192, Flint River, 8 air miles SSW of Thomaston, 1.0 mile below Pobiddy Bridge (RM 251), 20 June 1984; TU 27521, 3:55-70 mm SL, Potato Creek, tributary to Flint River, 5 miles SW of Thomaston, Highway 36, 23 April 1962; UT 90.165, 2:95-107 mm SL, Potato Creek, 2 miles NW of Thomaston on GA 74, 28 May 1976.

**DIAGNOSIS.**—*Micropterus cataractae* (Plates 1, 2, and 5) can be distinguished from the morphologically similar *M. punctulatus punctulatus* (Plates 3, 4, and 7) and *M. coosae* (Plate 6) by one or a combination of the following characters: *Micropterus cataractae* typically (92% of 136 specimens examined) lacks teeth on the tongue (*M. coosae* and *M. punctulatus* have an oval to elongate patch); in adults, anterior half to two-

thirds of body has dark, vertically elongated, midlateral blotches which are separated by a distance approximately equal to the width of a blotch (*M. coosae* and *M. punctulatus* have irregular to more quadrate blotches; blotches usually confluent to form a stripe in *M. punctulatus*); caudal fin margin of *M. cataractae* darkly pigmented (in *M. coosae* posterior half to two-thirds dull reddish to copper colored except dorsal and ventral tips white to cream colored); *M. cataractae* has weakly developed lines on the ventrolateral portion of the body (*M. coosae* typically has 5-7 well developed parallel lines ventrolaterally, including the caudal peduncle).

Pored lateral line scales 67-81, usually 72-77; scales below the lateral line 15-21, usually 18-20; total caudal peduncle scales 27-35, usually 30-33; unbranched pyloric caeca 8-14, usually 11-12.

*Micropterus cataractae* and other species of *Micropterus* can be distinguished from the largemouth bass, *M. salmoides*, by the presence of scales on the basal portions of the interradi al membranes of the soft dorsal and anal fins (lacking in *M. salmoides*). The outline of the spinous dorsal fin is curved and the spinous and soft dorsal fins are connected (in *M. salmoides* the spinous dorsal fin outline is angular and the spinous and soft dorsal fins are almost separated). Pyloric caeca are usually simple (typically bifid near their base in *M. salmoides*). Juveniles (20-30 mm SL) of *M. cataractae* have a narrow and lightly pigmented lateral stripe which ends in an oval to wedge shaped basicaudal spot (*M. salmoides* juveniles have a well developed black lateral stripe which terminates in a rectangular caudal spot).

**DESCRIPTION.**—*Micropterus cataractae* is a moderate sized species that attains a total length of 64 cm (25 in) and a weight of 3.99 kg (8 lb 12 oz). The general body shape of *M. cataractae* is illustrated in Plates 1, 2, and 5. Proportional measurements of the holotype and 31 paratypes are given in Table 1.

Frequency distributions of scale and fin-ray counts are presented in Tables 2 and 3. Lateral line scales 67-81 (mean = 74.2); scales above the lateral line 8-10 (mean = 8.9); scales below the lateral line 15-21 (mean = 18.5). Total caudal peduncle scales rows 27-35 (mean = 31.4). Peduncle scales above the lateral line 12-16 (mean = 14.4); below the lateral line 13-17 (mean = 15.1). Cheek scale rows 12-16 (mean = 15.0). Dorsal spines 9-11 (mean = 10.0); dorsal soft rays 10-13 (mean = 12.1); the anal fin typically has three spines and 9-12 (mean = 10.1) soft rays. Pectoral rays 14-17 (mean = 16.1). Total gill rakers 6-9 (mean = 7.6), typically with 2 rakers on the upper limb and 5 on the lower limb of the first arch. We did not make vertebral counts, but Wright (1967) reported a modal total count of 32 (including the hypural plate) with means of 13.98 precaudal vertebrae and 18.00 caudal vertebrae (n = 50) for the Flint River population. Wright (1967) also made pyloric caeca counts on 73 shoal bass from the Flint River, reporting a range of 8-14, a mode of 12, and a mean of 11.61; he noted that the caeca are typically unbranched.

In adults, the ground coloration of the dorsal and lateral surfaces of the head and body ranges from olive green to dark olive to almost black. A dusky to black blotch, about half to two-thirds the diameter of the eye, is present on the posterior portion of the opercle. Three diagonal dark lines are present laterally on the head. Two of these extend from the posterior margin of the orbit posteriorly and ventrally across the cheek and opercle. The



Table 1. Proportional measurements of the holotype and 31 paratypes of *Micropterus cataractae* expressed as thousandths of standard length.

	Holotype	Minimum	Maximum	N	Mean
Greatest body depth	299	218	302	32	268
Body width	155	133	208	32	162
Least depth caudal peduncle	112	94	118	32	109
Caudal peduncle length	209	186	251	32	227
Pectoral length	155	131	165	32	148
Pelvic length	126	118	149	32	134
Highest dorsal spine	72	63	101	32	76
Lowest dorsal spine	44	31	72	31	41
Highest dorsal ray	136	113	163	32	139
Highest anal spine	45	26	73	32	45
Highest anal ray	125	87	192	32	141
Head length	337	322	375	32	337
Head width	159	130	205	32	165
Orbit length	49	34	87	32	59
Interorbital width	82	53	91	32	77
Snout length	96	82	133	32	94
Upper jaw length	149	86	149	32	134
Lower jaw length	147	75	159	32	139

third originates between the eye and the upper jaw and extends posteriorly and ventrally across the dorsal margin of the supramaxilla, terminating on the cheek. The iris is typically bright red.

Body with 10 to 15 midlateral and 6 to 8 supralateral dark, vertically elongate blotches. Anterior blotches vertically elongate but becoming gradually more quadrate posteriorly. Blotches on the anterior half to two-thirds of the body often have a light center. Interspaces between blotches approximately equal to width of individual blotches. Dark vertically elongate dorsolateral blotches typically extend into the interspaces between the lateral blotches, but may be obscured by the dark color of the dorsum. These dark vertically elongate blotches ("tiger-stripes") are the most distinctive feature of coloration. A large quadrate to rectangular basicaudal blotch is typically present. Dusky to dark spots on scales of the ventrolateral portion of the body frequently coalesce to form wavy lines. Venter white to cream colored.

Median fins dark olivaceous to grey black. Dark spots present on the basal half of the soft dorsal and anal fins. These spots, which may be obscured by darker pigment, are usually more prominent basally and posteriorly on the fins. Pectoral fins dusky to greenish grey. Leading edge of the pelvic fins (spine and first 1 to 2 rays) dusky, the inner rays cream colored with scattered melanophores.



	<u>Scale rows around caudal peduncle</u>															
	23	24	25	26	27	28	29	30	31	32	33	34	35	N	Mean	
<i>M. cataractae</i>	-	-	-	-	2	4	1	18	62	53	20	1	1	162	31.37	
<i>M. coosae</i>	-	-	2	3	8	29	7	5	1	-	-	-	-	55	28.00	
<i>M. p. punctulatus</i>	3	11	9	6	7	-	-	-	-	-	-	-	-	36	25.08	
	<u>Scale rows above lateral line on caudal peduncle</u>															
	10		11		12		13		14		15		16		N	Mean
<i>M. cataractae</i>	-		-		3		10		78		70		1		162	14.35
<i>M. coosae</i>	-		2		7		38		8		-		-		55	12.95
<i>M. p. punctulatus</i>	3		20		12		1		-		-		-		36	11.30
	<u>Scale rows below lateral line on caudal peduncle</u>															
	11		12		13		14		15		16		17		N	Mean
<i>M. cataractae</i>	-		-		5		17		108		29		3		162	15.05
<i>M. coosae</i>	-		11		33		8		3		-		-		55	13.06
<i>M. p. punctulatus</i>	15		44		7		-		-		-		-		36	11.78
	<u>Scale rows on cheek</u>															
	11		12		13		14		15		16		17		N	Mean
<i>M. cataractae</i>	-		6		43		74		29		10		-		162	14.98
<i>M. coosae</i>	4		26		19		3		3		-		-		55	12.44
<i>M. p. punctulatus</i>	1		10		16		5		2		1		1		36	14.63

Table 3. Frequency distribution of fin ray counts in species of *Micropterus* from the Apalachicola River basin.

	<u>Dorsal spines</u>				N	Mean
	9	10	11			
<i>M. cataractae</i>	7	152	3		162	9.98
<i>M. coosae</i>	-	55	-		55	10.00
<i>M. p. punctulatus</i>	4	32	-		36	9.89

	<u>Dorsal rays</u>				N	Mean
	10	11	12	13		
<i>M. cataractae</i>	1	4	135	22	162	12.10
<i>M. coosae</i>	-	1	47	7	55	12.11
<i>M. p. punctulatus</i>	-	1	28	7	36	12.17

	<u>Anal rays</u>				N	Mean
	9	10	11	12		
<i>M. cataractae</i>	4	135	22	1	162	10.13
<i>M. coosae</i>	3	50	2	-	55	9.98
<i>M. p. punctulatus</i>	3	28	5	-	213	10.06

	<u>Pectoral rays</u>				N	Mean
	14	15	16	17		
<i>M. cataractae</i>	1	6	131	24	162	16.10
<i>M. coosae</i>	-	12	40	3	55	15.84
<i>M. p. punctulatus</i>	-	11	20	5	36	15.83

**COMPARISONS.**—Three species of basses, *Micropterus cataractae*, *M. coosae*, and *M. salmoides*, are native to the Apalachicola River basin. The spotted bass, *M. punctulatus punctulatus*, has been introduced into the Apalachicola River basin and is established. Two additional basses, the Alabama spotted bass, *M. punctulatus henshalli*, and smallmouth bass, *M. dolomieu*, were introduced into the Chattahoochee River drainage, but are not known to have established reproducing populations. Differences in color pattern are illustrated in Plate 5 (*M. cataractae*), Plate 6 (*M. coosae*), Plate 7 (*M. punctulatus punctulatus*), and Plate 8 (*M. punctulatus henshalli*). A comparison of pigment pattern and morphology of *M. cataractae*, *M. coosae*, *M. punctulatus punctulatus*, and *M. salmoides* is presented in Table 4.

Of the four basses in the Apalachicola River basin, the largemouth and redeye basses are the most distinctive and usually the easiest to identify. The following characters

Table 4. Comparison of pigment pattern and morphology of four species of *Micropterus* from the Apalachicola River basin. Data for *M. salmoides* based on our data and Bailey and Hubbs (1949).

CHARACTERISTICS	<i>cataractae</i>	<i>coosae</i>	<i>p. punctulatus</i>	<i>salmoides</i>
Parallel rows of spots on ventrolateral portion of body	5-7 weakly developed rows of dark spots	5-8 well developed rows of dark spots extending posteriorly onto the caudal peduncle	4-6 weakly developed rows of dark spots	scattered dark spots may be present, rows of spots absent
Midlateral pigment in adults	dark vertical bars	dark confluent irregular blotches or stripe	dark confluent irregular blotches or stripe	dark confluent irregular blotches
Teeth on tongue	typically none	oval to rectangular patch	oval to rectangular patch	typically none
Dorsal fins connected or separate	connected	connected	connected	separate
Scales on base of anal and second dorsal fins	present	present	present	absent
Lateral line scales	67-81, usually 72-77	62-73, usually 64-69	59-70, usually 61-64	64-72, usually 65-70
Cheek scales	12-16, usually 13-15	11-15, usually 12-13	11-17, usually 12-13	10-13, usually 11-12
Scales above LL	8-10, usually 9	7-9, usually 7-8	6-9, usually 7-8	7-9, usually 8-9
Scales below LL	15-21, usually 18-20	13-16, usually 14-15	12-15, usually 13	14-18, usually 15-16
Total caudal peduncle scales	27-35, usually 30-33	25-31, usually 27-29	23-27, usually 24-25	26-30, usually 26-28
Peduncle scales above LL	12-16, usually 14-15	11-14, usually 13	10-13, usually 11-12	11-13, usually 13
Peduncle scales below LL	13-17, usually 15	12-15, usually 12-13	11-13, usually 11-12	12-13, usually 13
Approximate maximum size	3.99 kg (8 lb 12 oz)	1.0 kg (2 lb 4 oz)	4.1 kg (8 lb 15 oz)	7.6 kg (16 lb 12 oz)

distinguish the largemouth from the other basses in the Apalachicola River basin: posterior end of spinous and anterior end of soft dorsal fins deeply incised, almost separated; base of interradiar membranes of anal and soft dorsal fins without scales; no patch of teeth on the tongue; in adults the maxilla extends well beyond eye; pyloric caeca typically branched near base; a midlateral row of confluent dark blotches; no ventrolateral rows of spots on the body; and body generally more robust than in other species of *Micropterus*.

The color pattern in young (to ca. 60 mm SL) *Micropterus salmoides* is characterized by a dark midlateral stripe, 2-4 scale rows wide, which terminates in a quadrate blotch which may be continuous or separated from the midlateral stripe. The caudal fin is yellowish orange with a grey to black submarginal band.

The redeye bass, *Micropterus coosae*, is the smallest member of the genus in the Apalachicola River basin, rarely exceeding 30 cm SL. It is distinguished from *M. cataractae* by the presence of an oval to rectangular patch of teeth on the tongue, fewer lateral line scales, and fewer scale rows above and below the lateral line. The juveniles of *M. coosae* can be distinguished from those of *M. punctulatus* (Plate 4) by the presence of vertical bars along the sides which become less pronounced in the adults. The caudal fin of juvenile *M. coosae* is characterized by a dark submarginal band and a pronounced oval caudal spot.

Although the shoal bass, *Micropterus cataractae*, has, in the past, been most often confused with *M. coosae*, it is morphologically most similar to the spotted bass, *M. punctulatus*. It differs from the spotted bass by the absence of teeth on its tongue. *Micropterus cataractae* also has more lateral line scales, more rows of scales above and below the lateral line, and more caudal peduncle scales than *M. punctulatus*. The color pattern of adult *M. cataractae* is characterized by the presence of dark vertical bars along the sides (Plates 1 and 5). These bars, which are also present in juveniles (Plate 2), easily distinguish the shoal bass from spotted bass.

**ETYMOLOGY.**—The specific name *cataractae* is from the Latin *cataracta*, which means waterfall, in reference to waterfalls and shoals, the preferred habitat of this bass. We follow tradition and suggest the common name "shoal bass" for this species, which almost exclusively inhabits shoal areas of rivers and large creeks, and has been known as the shoal bass since the early 1970s (Ramsey 1973).

**DISTRIBUTION.**—The shoal bass is native to the Apalachicola and Chipola rivers in west Florida, the Chattahoochee River in eastern Alabama and western and northern Georgia, and the Flint River in southwestern Georgia (Fig. 1). In the Apalachicola River, Florida, it is known from the main channel of the river from Jim Woodruff Dam downstream for a distance of about 6 miles. The shoal bass likely ranged farther downstream prior to dredging of shoal areas in the main channel of the river for navigation. In the Chipola River, a tributary of the Apalachicola River, the shoal bass is confined to the main channel from near the Alabama-Florida state line downstream to near Clarksville, Calhoun County, Florida.

The shoal bass is known from the main channel of the Chattahoochee River and its larger tributaries in eastern Alabama and northern and western Georgia, but has

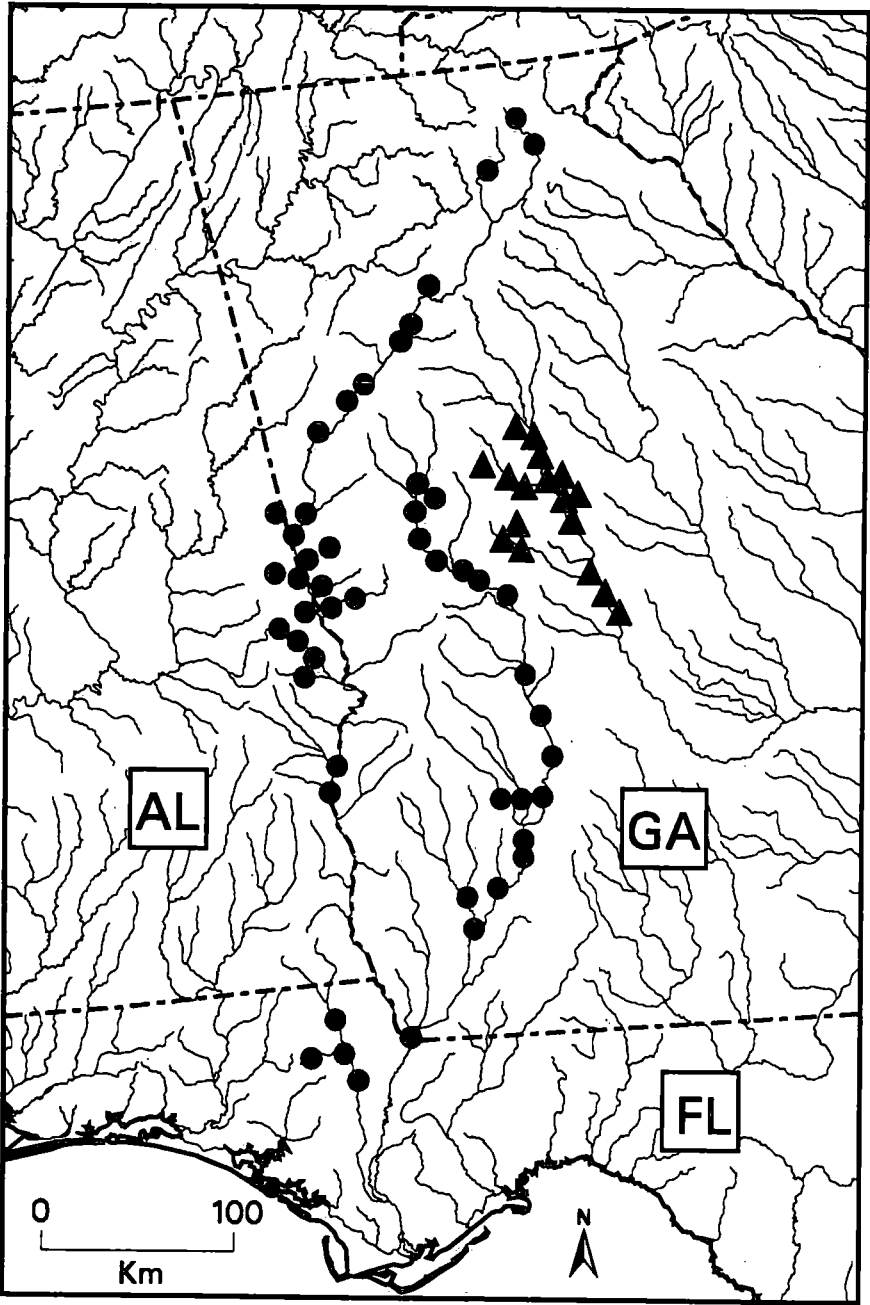


Figure 1. Distribution of the shoal bass, *Micropterus cataractae*. Native distribution in the Apalachicola drainage (closed circles) and the introduced population in the Altamaha drainage (triangles).

disappeared from most of the mainstem Chattahoochee River after creation of large impoundments on the main channel of the river. It is known to persist in some of the larger tributaries that continue to support some shoal or swift water habitat above and below the Fall Line. In the Flint River, the shoal bass occurs throughout the main channel and larger tributaries above and below the Fall Line, but has been eliminated from the lowermost reaches of the river by the impounded waters behind Jim Woodruff Dam. It also no longer occurs in two Flint River impoundments, Blackshear and Worth, located upstream of Albany.

The shoal bass occurs sympatrically with two native basses, the redeye bass, *Micropterus coosae*, and largemouth bass, *M. salmoides*, and two introduced subspecies of the spotted bass, the northern spotted bass, *M. punctulatus punctulatus*, and Alabama spotted bass, *M. punctulatus henshalli*. Within the native range of the shoal bass, the redeye bass is restricted to the Chattahoochee River drainage above the Fall Line (Fig. 2). The largemouth bass is the most widespread species of *Micropterus* in the Apalachicola River basin where it occurs throughout the system.

The northern spotted bass, *Micropterus punctulatus punctulatus*, appears to have been introduced in the Apalachicola River basin below the Fall Line prior to 1941 (Fig. 3). Bailey and Hubbs (1949) first recorded the species from this basin and speculated that it was probably the result of stocking. Their record was based on two specimens (UMMZ 164613) taken from the mouth of the Flint River on 13 October 1941 by Archie F. Carr and students. The northern spotted bass is currently found in the Apalachicola River below Jim Woodruff Dam downstream for a distance of about 50 river miles (Gilbert 1973). *Micropterus p. punctulatus* is also known from several localities in the Chattahoochee River drainage above the Fall Line. Based on dates of collection (none before 1968), it appears that the introductions above the Fall Line occurred after those from below the Fall Line (Fig. 3). Additional evidence in support of a second introduction above the Fall Line is the presence of hydropower dams on the Chattahoochee River in the vicinity of Columbus, Georgia which would limit the upstream dispersal of the population from below the Fall Line. These dams were built between 1834 and 1926 (Couch et al. 1996). We have examined one specimen (UGAMNH 697) from the Flint River taken below Lake Worth Dam on 7 October 1959. We are not aware of any records of the northern spotted bass from the Flint River above the Lake Worth impoundment, which was built in 1920 (Couch et al. 1996), just north of Albany, Georgia. The absence of *M. punctulatus punctulatus* from most of the Flint River drainage is evidence in support of our opinion that the northern spotted bass is introduced in the Apalachicola River basin.

The source of the stock of *Micropterus punctulatus punctulatus* in the Flint River is not known. The first fish hatchery in the Apalachicola River basin was located at Cold Spring (near Bullockville), Meriwether County, Georgia (Flint River drainage), and began fish production in 1901 (Bowers 1902). Black bass (*Micropterus* species) production and distribution from the Cold Spring hatchery was begun in 1901 (Ravenel 1902). During the early 1900s, other hatcheries located in Georgia supplied bass to the state for distribution.



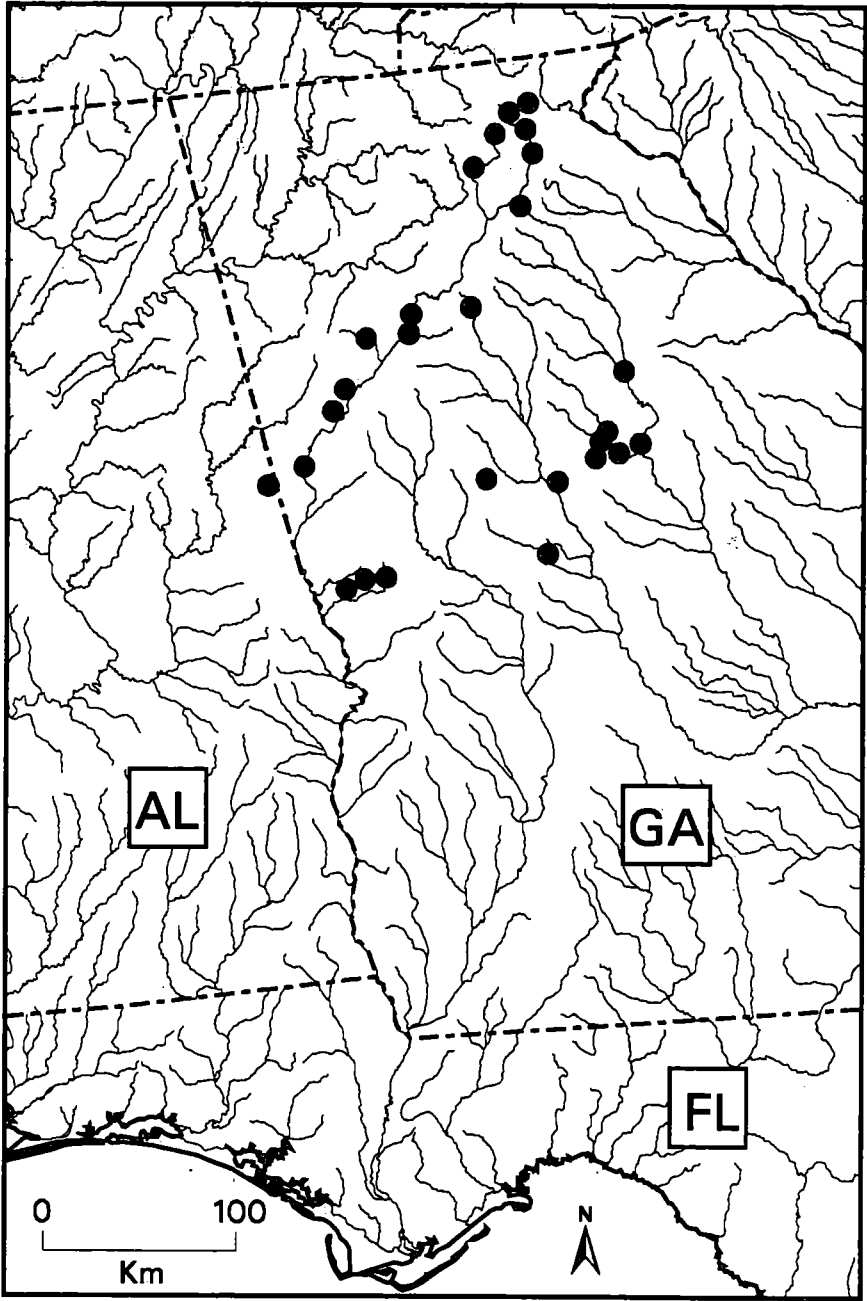


Figure 2. Distribution of the redeye bass, *Micropterus coosae* (closed circles), in the Apalachicola and Altamaha drainages.

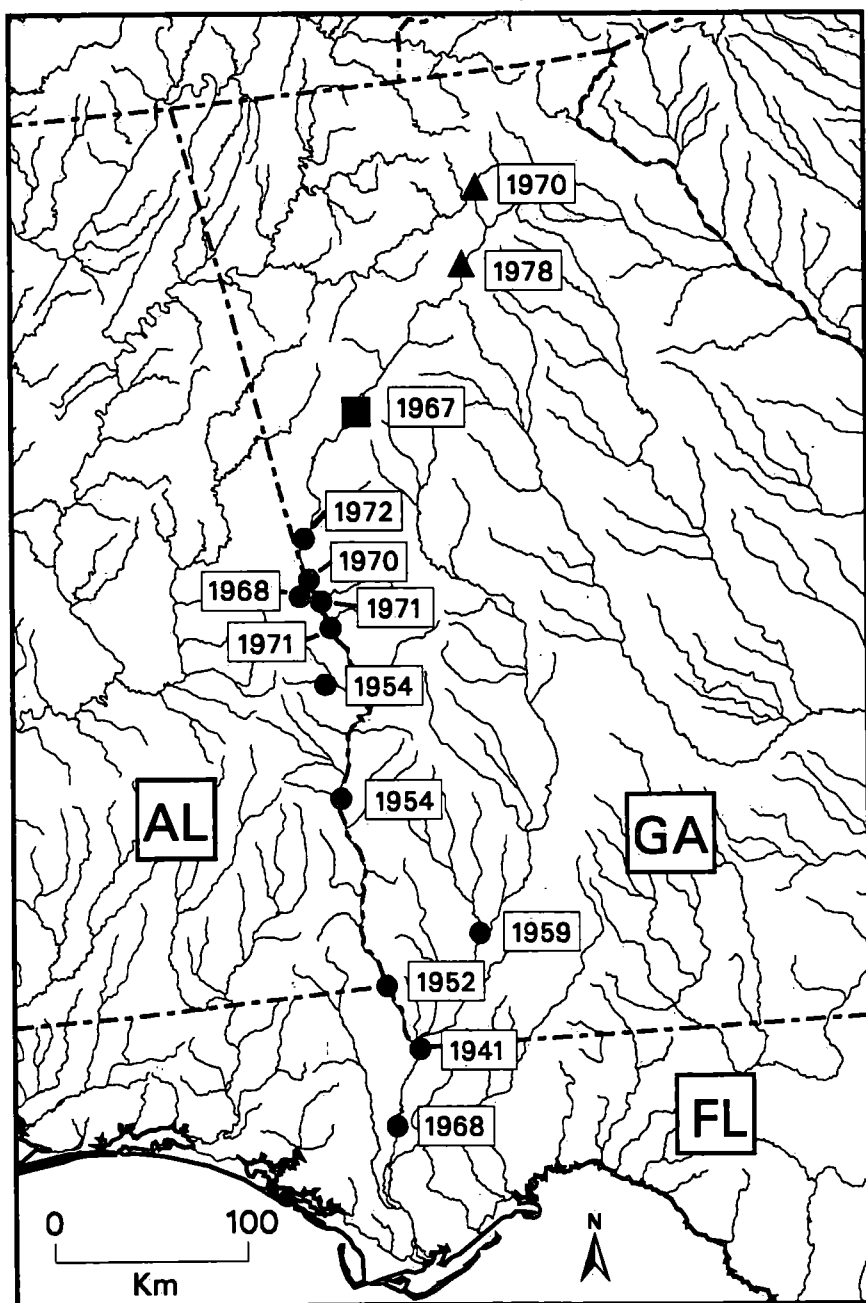


Figure 3. Distribution of three species of basses introduced in the Apalachicola drainage: smallmouth bass, *Micropterus dolomieu* (closed square), Alabama spotted bass, *M. punctulatus henshalli* (closed triangles), and northern spotted bass, *M. punctulatus punctulatus* (closed circles). The date (year) enclosed in the box indicates the earliest date of collection for that species at that locality.

There are two collections of Alabama spotted bass, *Micropterus punctulatus henshalli*, from the Chattahoochee River drainage in Georgia. The first was collected in 1970 (Chestatee River, Lumpkin County, AU 3482) and the second in 1978 (below Buford Dam, Gwinett County, AU 21997), both from the upper portion of the river, northeast of Atlanta, Georgia. The origin of the stock of these bass is unknown as there are no records of official stocking of Alabama spotted bass by the Georgia Department of Natural Resources in the upper portion of the Chattahoochee River. It is not known if the Alabama spotted bass has established a reproducing population in the Chattahoochee River drainage.

One additional species, the smallmouth bass, *Micropterus dolomieu*, was introduced in the upper Chattahoochee River in Habersham County, Georgia, by the Georgia Department of Game and Fish on 11 December 1967 (Gilbert 1969). A single specimen of smallmouth bass (68 mm SL) was collected by J. S. Ramsey and R. J. Gilbert from the Dog River, a tributary of the Chattahoochee River, Douglas County, Georgia, on 1 July 1967 (AU 219). This specimen, taken prior to stocking by the state, apparently represents an unauthorized introduction. These two introductions were apparently unsuccessful, as the species is not currently known to be established in the Chattahoochee River drainage (B. Freeman pers. comm.).

There is one known introduction of *Micropterus cataractae* outside its native range. The Georgia Department of Game and Fish stocked the shoal bass in the Ocmulgee River, a tributary of the Altamaha River, in northcentral Georgia, in the mid-1970s. It is now well established in the main channel of the Ocmulgee River for a distance of approximately 35 miles above and 25 miles below the Fall Line and in several large tributaries near the vicinity of the Fall Line (Bart et al. 1994).

There have been several introductions of the redeye bass, *Micropterus coosae*, in the United States and one in Puerto Rico. The introduction into Puerto Rico occurred in 1958 and 1959 when stock from the Chattahoochee River near Helen, White County, Georgia was transferred to Maricao Hatchery (Erdman 1967). Robbins and MacCrimmon (1974) erred in reporting that the stock introduced into Puerto Rico was from the *Flint River* (should be Chattahoochee River) near Helen, Georgia. This could be misinterpreted as an introduction of *M. cataractae*, since *M. coosae* does not occur in the Flint River. Based on the description and an excellent photograph provided by Erdman (1967), there is no doubt that the introduced Puerto Rican *Micropterus* was *M. coosae*.

*Micropterus cataractae* has been held twice in hatcheries, once for the purpose of development of propagation techniques and once for experimental purposes. As early as 1974, stock from the Flint River was held intermittently in the state of Georgia hatchery in Cordele, Crisp County, Georgia. Progeny from this stock has been used for supplemental stocking in the Flint River and for introduction into the Ocmulgee River. Stock from the Chattahoochee River drainage also was held in ponds at Auburn University, Lee County, Alabama (Tallapoosa River drainage) for research purposes. None of this stock was intentionally released into the wild.

**LIFE HISTORY.**—The shoal bass life history has never been thoroughly investigated, but various aspects of the biology have been reported. Biology of the shoal bass was included in masters theses by Wright (1967) and Hurst (1969) and in a summary

by Gilbert (1992). Hatchery populations were discussed by Smitherman and Ramsey (1972) and Johnson (1977). Other studies included an examination of the shoal bass fishery (including a creel survey) in the upper Flint River (Ober 1977), supplemental stockings (Scott 1978), and a creel survey on the Flint River to evaluate previous stocking (Scott 1981). Smitherman (1975) examined the adaptability of several basses, including the shoal bass, to a pond environment. Some publications on bass biology contain information on both the shoal bass, *Micropterus cataractae*, and the redeye bass, *M. coosae* (Hurst et al. 1975; MacCrimmon and Robbins 1975). Growth and habits of the redeye bass (Parsons 1953) are based on an introduced population of *M. coosae* in southeastern Tennessee. The reports of shoal bass, *M. cataractae*, under the name redeye bass can be confusing and care should be taken to be certain which species is being discussed. For example, some reports of record size for redeye bass, *M. coosae*, are actually based on shoal bass, *M. cataractae* (Dendy 1954; Anonymous 1967).

Age and growth of the shoal bass has been reported from the Chipola, Flint, and Chattahoochee rivers (Dendy 1954; Parsons and Crittenden 1959; Wright 1967; Hurst 1969; Hurst et al. 1975). In the Chipola River, Parsons and Crittenden (1959) found that shoal bass have a relatively fast growth rate, attaining average total lengths (TL) of about 10 cm in the first year and 29 cm TL in the third year. They documented a five year old, 38.4 cm TL fish weighing 0.8 kg. Two other specimens, 41.9 cm TL/1.14 kg and 48.3 cm TL/2.1 kg, were reported but no ages were given. Greatest growth (about 11 cm) in the Chipola River was during the second year and the least (3.8 cm) during the fifth year. In the Flint River, greatest growth occurred during the second and third year and least in the sixth year (Wright 1967). In Halawakee Creek, an Alabama tributary of the Chattahoochee River, the greatest growth occurred during the first and third year and least during the sixth and seventh year (Hurst 1969). Maximum age reported was 8 years (Wright 1967). One of the largest recorded shoal basses (reported as a redeye bass) weighed 2.7 kg, was 52 cm TL, and had a girth of 40.1 cm (Anonymous 1967). The International Game Fish Association angling record for *Micropterus coosae*, as discussed in the introduction, is based on a shoal bass weighing 3.99 kg (8 lb 12 oz), taken in the Apalachicola River, Florida, 28 January 1995.

Food of the shoal bass consists primarily of crayfishes, fishes, and insects (Wright 1967; Hurst 1969). Insects were the most important food item for the smaller individuals, 4-12 cm SL. The transition from insects to crayfishes and fishes occurred in the third year of life. Food, listed in the order of importance, for larger fish is crayfishes, fishes, and insects (Wright 1967; Hurst 1969).

Shoal bass attain sexual maturity at age 3 (Hurst et al. 1975). The smallest sexually mature female, 2+ years of age, was 152 mm SL and weighed 70 g (Hurst 1969). Wright (1967) reported fecundity ranging from 5,396 (31.4 cm SL; 844 g in weight) to 21,779 (44.2 cm SL; 2,314 g in weight) ova in Flint River fishes. Hurst (1969) reported an average of 22,000 ova for 5-year-old fish weighing about 1 kg. Ripe female shoal bass have been reported in streams during early April at temperatures of 14.4-18.3°C (Hurst 1969).

Spawning occurs during April and May and occasionally early June when water temperatures are 18-23°C (Wright 1967; Hurst 1969). In ponds, spawning has been

reported at temperatures of 25-26.1°C (Smitherman and Ramsey 1972) and 21.6-22.2°C (Johnson 1977). Wright (1967) reported spawning in the Flint River in 1966-1967 after a rapid rise in water level and suggested that both water temperature and water level were important factors in initiating spawning. Hurst (1969) reported a shoal bass nest, at a depth of 20 cm, at the end of a long pool. The nest was a shallow depression about 46 cm in diameter. Eggs were found adhering to small rocks and pebbles in the depression. In hatchery ponds, nests were observed in soft clay rubble and plant roots at a depth of 76 cm to 1.3 m (Johnson 1977). Nests were saucer shaped depressions 5-10 cm deep and 30-92 cm in diameter. Smitherman and Ramsey (1972) found nests constructed on hard clay even when gravel or limestone chip substrate was present in hatchery ponds. Male shoal bass vigorously guard the nest (Johnson 1977).

Spawning behavior of two shoal bass was observed from the bank of a hatchery pond (Johnson 1977). The pair assumed a side by side position, facing the same direction, over the nest. While on the nest, their coloration was blotched, the vertical bars on the sides dark green on a background color of bronze. During a 45 minute period on the nest, the pair was observed to roll over on their sides several times, presumably in the act of spawning. Underwater examination of the nest after the female had left revealed approximately 1,000 large amber colored ova. Another nest contained 500-3,000 ova (Johnson 1977). Shoal bass eggs were approximately 2 mm in diameter and hatching occurred in about 48 hours at 21.1°C. Sac fry measured 6 mm TL (Smitherman and Ramsey 1972). Fry were observed in tight aggregations at the bottom of the nest seven days after hatching and had left the nest and dispersed 12-14 days after hatching (Johnson 1977). Smitherman and Ramsey (1972) reported that fry approximately 25 days old were 21-28 mm TL.

**CONSERVATION STATUS.**—During the past two decades, the conservation status of the shoal bass has been reviewed by biologists in Alabama, Florida, and Georgia. The first review was conducted by Ramsey et al. (1972) for the shoal bass population in the Chattahoochee River and its tributaries in Alabama. They noted that the species had been eliminated from most of the Chattahoochee River proper in Alabama, but survived in a few of the larger tributaries. Ramsey et al. (1972) assigned the shoal bass in Alabama a conservation status of Rare-2 (a species that could be abundant but restricted to a few localities or very limited habitat). In a subsequent review Ramsey (1976) reported the shoal bass as an Alabama species of Special Concern (a species that must be continually monitored because eminent degrading factors or limited distribution and restricted habitat may cause it to become endangered or threatened in the foreseeable future). Without explanation, the species was omitted from a more recent review of vertebrate animals of Alabama in need of special attention (Ramsey 1986). That omission is surprising because no recovery or habitat protection activities were initiated and no new populations of shoal bass have been discovered in Alabama during the past 20 years.

An examination of the conservation status of shoal bass in Florida (Gilbert 1978) concluded with a recommendation of threatened status (likely to become endangered in the state in the foreseeable future if current trends continue). Threatened status also was recommended in the most recent review (Gilbert 1992). The basis of the threatened status in Florida was the limited habitat within a very restricted range. Pollution and siltation

continue to degrade shoal bass habitat in the Chipola River (Ogilvie 1980), and there has been little effort to control or reduce the impact of these contaminants. The only other known Florida locality, below Jim Woodruff Dam on the Apalachicola River, is subject to considerable alteration associated with dredging of the river channel for navigation, and irregular flows associated with power generation, flood control, and lock operation.

In Georgia, shoal bass have disappeared from most of the main channel of the Chattahoochee River as that river has been impounded from just below its junction with the Flint River upstream to near Newnan, ca. 70 km southwest of Atlanta, Georgia. The headwaters of the Chattahoochee River are also impounded by Buford Dam, forming Sidney Lanier Reservoir northeast of Atlanta, Georgia. Much of the reach of the Chattahoochee River between Buford Dam (northeast of Atlanta) and West Point Reservoir (southwest of Atlanta) has been turned into a cold water stream by deep water releases from Buford Dam.

The U.S. Fish and Wildlife Service has never included the shoal bass in its list of candidate species for consideration for listing as endangered or threatened status. The American Fisheries Society Endangered Species Committee (Deacon et al. 1979) considered the conservation status of shoal bass throughout its range and assigned the species the status of Special Concern (a species that could become endangered or threatened by relative minor disturbances in their habitat). Subsequent evaluation of the conservation status of shoal bass (Williams et al. 1989) resulted in retention of the previous classification.

The current distribution of shoal bass, based on museum records and information from fishery biologists, and the continued loss of habitat indicate a continued decline of this species. We strongly recommend a thorough survey for this species throughout its range. Research should also be undertaken to determine microhabitat requirements which would provide direction for the renovation of former habitat.

## LITERATURE CITED

- Anonymous. 1967. Shawmut fisherman catches world's record Coosa bass. *Alabama Conservation* (November-December):5-6.
- Bailey, R. M., and C. L. Hubbs. 1949. The black basses (*Micropterus*) of Florida with description of a new species. *Occ. Pap. Mus. Zool., Univ. Michigan* 516:1-43.
- Bart, H. L., M. S. Taylor, J. T. Harbaugh, J. W. Evans, S. L. Schleiger, and W. Clark. 1994. New distribution records of Gulf Slope drainage fishes in the Ocmulgee River system, Georgia. *Proc. Southeastern Fishes Council* 30:4-10.
- Bass, D. G. 1996. Running the river for shoal bass. *Florida Wildlife* (January-February):6-7.
- Bowers, G. M. 1902. Report of the Commissioner. U.S. Commission of Fish and Fisheries Report for the year ending June 30, 1901. 20 pp.
- Carlander, K. D. 1977. *Handbook of Freshwater Fishery Biology*. Volume 2. Ames: Iowa State University Press. 431 pp.
- Carr, A., and C. J. Goin. 1959. *Guide to the Reptiles, Amphibians and Fresh-Water Fishes of Florida*. Gainesville: University of Florida Press. 341 pp.
- Couch, C. A., E. H. Hopkins, and P. S. Hardy. 1996. Influences of environmental settings on aquatic ecosystems in the Apalachicola-Chattahoochee-Flint river basin. U.S. Geological Survey, National Water-Quality Assessment Program, Water-Resources Investigations Report 95-4278. 58 pp.
- Dahlberg, M. D., and D. C. Scott. 1971. The freshwater fishes of Georgia. *Bull. Georgia Acad. Sci.* 29:1-64.

- Deacon, J. E., G. Kobetich, J. D. Williams, and S. Contreras. 1979. Fishes of North America endangered, threatened, or of special concern: 1979. *Fisheries* 4(2):29-44.
- Dendy, J. S. 1954. How large do redeye bass grow? *Alabama Conservation* 26(3):12.
- Dequene, J. F. 1949. Is the Florida smallmouth a fable? *Florida Wildlife* 3(4):10-13, 18-19.
- Dunaway, V. 1998. *Sport Fish of Florida*. Wickstrom Publishers, Inc. 253 pp.
- Erdman, D. S. 1967. Inland game fishes of Puerto Rico. Federal Aid Project F-1-R, Job No. 7. Department of Agriculture, Commonwealth of Puerto Rico, San Juan. 82 unnumbered pp.
- Gilbert, C. R. (ed.). 1978. *Rare and Endangered Biota of Florida. Volume 4: Fishes*. Gainesville: University Presses of Florida. 58 pp.
- \_\_\_\_\_. (ed.). 1992. Shoal bass, *Micropterus n. sp. cf coosae*. Pp. 98-104 in *Rare and Endangered Biota of Florida. Volume II: Fishes*, ed. C. R. Gilbert. Gainesville: University Press of Florida. xl + 247 pp.
- Gilbert, R. J. 1969. The distribution of fishes in the central Chattahoochee River drainage. M.S. thesis, Auburn University, Auburn, Alabama. 128 pp.
- \_\_\_\_\_. 1973. Systematics of *Micropterus p. punctulatus* and *M. p. henshalli* and life history of *M. p. henshalli*. Ph.D. dissertation, Department of Fisheries and Allied Aquaculture, Auburn University, Auburn, Alabama. 136 pp.
- Hess, T. B., and R. D. Ober. 1981. Recreational use surveys on two Georgia rivers. Pp. 14-20 in *The Warmwater Streams Symposium*, ed. L. A. Krumholz. Southern Division American Fisheries Society.
- Hoehn, T. S. 1998. Rare and imperiled fish species of Florida: A watershed perspective. Office of Environmental Services, Florida Game and Fresh Water Fish Commission, Tallahassee. 60 pp.
- Hubbs, C. L., and R. M. Bailey. 1940. A revision of the black basses (*Micropterus* and *Huro*) with descriptions of four new forms. Misc. Publ. Mus. Zool., Univ. Michigan 48:1-61 + pl.
- Hubbs, C. L., and K. Lagler. 1958. Fishes of the Great Lakes Region. *Cranbrook Inst. Sci. Bull.* 26:1-186.
- Hurst, H. N. 1969. Comparative life history of the redeye bass, *Micropterus coosae* Hubbs and Bailey, and the spotted bass, *Micropterus p. punctulatus* (Rafinesque), in Halawakee Creek, Alabama. M.S. thesis, Department of Zoology, Auburn University, Auburn, Alabama. 56 pp.
- Hurst, H. N., G. Bass, and C. Hubbs. 1975. The biology of the Guadalupe, Suwannee, and redeye basses. Pp. 47-53 in *Black Bass Biology and Management*, ed. R. H. Stroud and H. Clepper. Washington DC: Sport Fishing Institute. 534 pp.
- IGFA. 1997. *World Record Game Fishes*. International Game Fish Association, Pompano Beach, Florida. 352 pp.
- Johnson, T. L. 1977. Culture of the shoal bass. Final report to the Georgia Department of Natural Resources, Game and Fish Division, Atlanta. Project Number F-28-3, Southwest Region Fisheries Investigations. 15 pp.
- Kilby, J. D., E. Crittenden, and L. Williams. 1959. Several fishes new to Florida freshwaters. *Copeia* 1959(1):77-78.
- MacCrimmon, H. R., and W. H. Robbins. 1975. Distribution of the black basses in North America. Pp. 56-66 in *Black Bass Biology and Management*, ed. R. H. Stroud and H. Clepper. Washington DC: Sport Fishing Institute. 534 pp.
- McClane, A. J. (ed.). 1974. *McClane's New Standard Fishing Encyclopedia and International Angling Guide*. (Second edition). New York: Holt, Rinehart and Winston. 1156 pp.
- McClane, J. W. 1972. I.D. guide to all the American bass. *Field and Stream* 76(10):52-57.
- Mettee, M. F., P. E. O'Neil, and J. M. Pierson. 1996. *Fishes of Alabama and the Mobile Basin*. Birmingham, Alabama: Oxmoor House, Inc. 820 pp.
- Ober, R. D. 1977. Upper Flint River creel and recreational use survey. Final report to the Georgia Department of Natural Resources, Game and Fish Division, Atlanta. Project Number F-28-3, Southwest Region Fisheries Investigations. 43 pp.
- Ogilvie, V. E. 1980. Shoal bass investigation. Completion report, Endangered Wildlife Project E-1, Study I-L, Florida Game and Fresh Water Fish Commission. 12 pp.
- Page, L. M., and B. M. Burr. 1991. *A Field Guide to Freshwater Fishes*. Boston, Massachusetts: Houghton Mifflin Co. 432 pp.
- Parsons, J. W. 1953. Growth and habits of the redeye bass. *Trans. Amer. Fish. Soc.* 83:202-211.
- \_\_\_\_\_, and E. Crittenden. 1959. Growth of the redeye bass in Chipola River, Florida. *Trans. Amer. Fish. Soc.* 88:191-192.
- Ramsey, J. S. 1973. The *Micropterus coosae* complex in southeastern U.S. (Osteichthyes, Centrarchidae). *Assoc. Southeastern Biologist Bull.* 20:76.

- \_\_\_\_\_. 1975. Taxonomic history and systematic relationships among species of *Micropterus*. Pp. 67-75 in *Black Bass Biology and Management*, ed. R. H. Stroud and H. Clepper. Washington DC: Sport Fishing Institute. 534 pp.
- \_\_\_\_\_. 1976. Freshwater fishes. Pp. 53-65 in *Endangered and Threatened Plants and Animals of Alabama*, ed. H. T. Boschung. Bull. Alabama Mus. Nat. Hist. 2.
- \_\_\_\_\_. 1984. Freshwater fishes. Pp. 1-14 in *Vertebrate Wildlife of Alabama*, ed. R. H. Mount. Auburn University Agricultural Experiment Station, Auburn, Alabama.
- \_\_\_\_\_. 1986. Freshwater fishes. Pp. 1-21 in *Vertebrate Wildlife of Alabama*, ed. R. H. Mount. Auburn University Agricultural Experiment Station, Auburn, Alabama.
- \_\_\_\_\_, W. M. Howell, and H. T. Boschung, Jr. 1972. Rare and endangered fishes of Alabama. Pp. 57-86 in *Rare and Endangered Vertebrates of Alabama*, ed. J. E. Keeler. Alabama Department Conservation Natural Resources, Division Game and Fish, Montgomery.
- Ramsey, J. S., and B. O. Smitherman. 1972. Development of color pattern in pond-reared young of five *Micropterus* species of southeastern U.S. Proc. Ann. Conf. Southeastern Assoc. Game Fish Commissioners 25:348-356.
- Ravenel, W. de C. 1902. Report on the propagation and distribution of food-fishes. U.S. Commission of Fish and Fisheries Report for the year ending June 30, 1901, pp. 21-110.
- Robbins, W. H., and H. R. MacCrimmon. 1974. The black bass in America and overseas. Biomangement and Research Enterprises, Sault Ste. Marie, Ontario, Canada. 196 pp.
- Scott, T. M., Jr. 1978. An evaluation of supplemental stocking of the shoal bass as a management technique. Final report to the Georgia Department of Natural Resources, Game and Fish Division, Atlanta. Project Number F-28-5, Southwest Region Fisheries Investigation. 29 pp.
- \_\_\_\_\_. 1981. Creel survey on the Flint River between Lakes Blackshear and Worth. Final report to the Georgia Department of Natural Resources, Game and Fish Division, Atlanta. Project Number F-28-8, Southwest Region Fisheries Investigation. 23 pp.
- Smitherman, R. O. 1975. Experimental species associations of basses in Alabama ponds. Pp. 76-84 in *Black Bass Biology and Management*, ed. R. H. Stroud and H. Clepper. Washington DC: Sport Fishing Institute. 534 pp.
- \_\_\_\_\_, and J. S. Ramsey. 1972. Observations on spawning and growth of four species of basses (*Micropterus*) in ponds. Proc. 25th Ann. Conf. Southeastern Assoc. Game Fish Commissioners 1971:357-365.
- Timmons, T. J., W. L. Shelton, and W. D. Davies. 1979. Initial fish population changes following impoundment of West Point Reservoir, Alabama-Georgia. Proc. Ann. Conf. Southeastern Assoc. Game Fish Commissioners for 1977, 31:312-317.
- Williams, J. D. 1981. Threatened warmwater stream fishes and the endangered species act: a review. Pp. 328-337 in *The Warmwater Streams Symposium*, ed. L. A. Krumholz. Southern Div. Amer. Fish. Soc.
- Williams, J. E., J. E. Johnson, D. A. Hendrickson, S. Contreras-Balderas, J. D. Williams, M. Navarro-Mendoza, D. E. McAllister, and J. E. Deacon. 1989. Fishes of North America endangered, threatened, or of special concern: 1989. Fisheries 14(6):2-20.
- Wright, S. E., IV. 1967. Life history and taxonomy of the Flint River redeye bass (*Micropterus coosae*, Hubbs and Bailey). M.S. thesis, University of Georgia, Athens. 51 pp.
- Yerger, R. W. 1977. Fishes of the Apalachicola River. Pp. 22-33 in *Proceedings of the Conference on the Apalachicola Drainage System*, 23-24 April 1976, Gainesville, Florida, ed. R. J. Livingston and E. A. Joyce, Jr. Florida Mar. Res. Publ. 26, 177 pp.



## OTHER MATERIAL EXAMINED

*Micropterus cataractae*

## Apalachicola River Basin

**Alabama: Barbour County:** UMMZ 168752 (3) Chattahoochee R. at US 28 bridge, just E of Eufala, 11 Sept. 1954. **Lee County:** AU 2108 (3) Wacoochee Cr., 3.4 air mi. above mouth, 0.7 mi S of Powledge, 27 Oct. 1969. AU 2229 (1) Wacoochee Cr., 1.9 air mi. ENE of Salem (T19N, R28E, S25N), 18 Nov. 1969. AU 3573 (3) Wacoochee Cr., 5.3 air mi. ENE of Salem (R29E, T19N, S29NE), 13 Oct. 1970. AU 3664 (1) Wacoochee Cr., 8.2 air mi. ENE of Salem (R29E, T19N, S23NW), 27 Oct. 1970. AU 3751 (2) Trib. to Wacoochee Cr. just above mouth, 3.8 mi NE of Salem (R29E, T19N, S19NW), 19 Nov. 1970. AU 5020 (1) Wacoochee Cr., ca. 1 mi. above Chattahoochee R., 03 May 1968. AU 10789 (1) Sturkie Cr., Trib. to Little Uchee Cr., 8.7 air mi. SSE of Salem, co. rd., (R28E, T18N, S15SW), 17 Oct. 1971. AU 10801 (1) Little Uchee Cr., 4.9 air mi. SSW of Salem, co. rd. (R28E, T18N, S29N), 17 Oct. 1971. AU 11918 (1) Halawakee Cr., 2.4 air mi. SW of Beulah, co. rd., 08 May 1969. AU 15173 (1) Wacoochee Cr., ca. 1 mi. from mouth (in aquarium 1 day), 14 July 1977. AU 17234 (1) Cove of L. Harding, W of Bartlett's Ferry Dam, 29 Aug. 1979. AU 21383 (1) Halawakee Cr. just below beans mill dam, 5.2 air mi. W of Beulah, Hwy. 29, 14 Nov. 1980. AU 21629 (24) Auburn University experimental pond (R-31: broad), P1 stock from Halawakee Cr., 21 days after hatching, 9 June 1969. AU 21630 (10) Auburn University experimental pond R-17 (rearing), P1 stock from Halawakee Cr., 32 days after hatching, 20 June 1969. AU 21631 (10) Auburn University experimental pond R-17 (rearing), P1 stock from Halawakee Cr., 43 days after hatching, 1 July 1969. AU 21632 (10) Auburn University experimental pond R-17 (rearing), P1 stock from Halawakee Cr., 58 days after hatching, 16 July 1969. AU 21633 (10) Auburn University experimental pond R-17 (rearing), P1 stock from Halawakee Cr., 74 days after hatching, 1 Aug. 1969. AU 21635 (10) Auburn University experimental pond R-17 (rearing), P1 stock from Halawakee Cr., 102 days after hatching, 29 Aug. 1969. AU 21637 (10) Auburn University experimental pond R-17 (rearing), P1 stock from Halawakee Cr., 161 days after hatching, 27 Oct. 1969. AU 21638 (12) Auburn University experimental pond R-17 (rearing), P1 stock from Halawakee Cr., 183 days after hatching, 18 Dec. 1969. AU 21639 (36) Auburn University experimental ponds R-17 & R-18 (rearing), P1 stock from Halawakee Cr., 233 days after hatching, 6 Feb. 1970. AU 23995 (1) Halawakee Cr., 2.1 air mi. SSW of Beulah, at covered bridge, 26 Oct. 1971. UMMZ 175873 (1) Chattahoochee R., Goat Dam tailwaters, 14 Apr. 1958. **Randolph County:** AU 6523 (1) Wehadkee Creek, trib. to Chattahoochee R., 4.6 air mi. SE of Rock Mills, co. rd., 30 June 1972. **Russell County:** AU 2897 (1) Uchee Cr., 6.3 air mi. S of Crawford, Seale Rd., 1 Oct. 1955. AU 5022 (1) Little Uchee Cr., 3 mi. E of Crawford, S of Hwy. 80, Sta. 5, 10 Oct. 1953. USNM 167961 (2) Uchee Cr., below bridge on Crawford to Seale (Chattahoochee Dr.), 5 Oct. 1954. USNM 245518 (2) Chattahoochee R. at Eufala, 6 Oct. 1966 (actually Barbour County).

**Georgia: Baker County:** UGAMNH 2378 (1) Ichawaynochaway Cr. between Old Power Dam and SR 200 Crossing, 8 Apr. 1992. UGAMNH 2399 (10) Ichawaynochaway Cr. at plantation site, 26 Sept. 1985. **Carroll County:** AU 13666 (1) Whooching Cr., 2.8 mi. E of Lowell, Hwy. 5, 29 July 1976. **Dougherty County:** ANSP 84528 (1) Flint R., 1/4 mi. below entrance of Radium Springs & just below lower end of golf course, 29 Sept. 1952. ANSP 84538 (1) Flint R., 1/4 mi. below Merck Co. outlet, ca. 1 mi. S of Radium Springs outlet, 20 Sept. 1952. AU 6984 (1) Flint R., 5.0 air mi. S of Radium Springs outlet, 1.5 mi. S of Putney, 16 Sept. 1971. **Douglas County:** AU 9677 (1) Dog R., 4.0 air mi. E of Fairplay, Hwy. 166, station #2, Aug. 1974. AU 15798 (1) Anneewakee Cr., 7.1 air mi. E of Bill Arp, Hwy 166, 20 Oct. 1977. UT 90.649 (1) Unnamed trib. to Chattahoochee R. at St. Rt. 166 xing, ca. 7.2 air mi. SSE of Douglasville, 3.0 air mi. W of Campbellton, 2 May 1982. **Fulton County:** AU 15597 (1) Chattahoochee R., 2.5 mi. above mouth of Peachtree Cr., 2 Aug. 1977. **Habersham/White counties:** UGAMNH 838 (1) Chattahoochee R., 1 mi. S of GA 115, 24 Oct. 1963. **Harris County:** AU 3967 (1) Flat Shoal Cr., ca. 4 mi. SE of West Point, Hwy. 103, 21 Apr. 1970. AU 5021 (2) Mountain Oak Cr., 2.7 air mi. WNW of Mountain Hill, Hwy. 103, 25 Oct. 1971. AU 5023 (2) Flat Shoal Cr., ca. 4 mi. SE of West Point, Hwy. 103, 12 Sept. 1971. AU 23085 (3) Mulberry Cr., ca. 3 mi. S of Mountain Hill, 1 July 1981. **Lee County:** AU 7036 (3) Kinchafoonce Cr. at mouth of Middle Cr., 4.8 mi. WNW of Leesburg, 30 Sept. 1971. AU 12346 (1) Muckalee Cr., 3.8 air mi. SE of Leesburg Beverly Acres, 1 Oct. 1973. AU 18343 (1) Kinchafoonce Cr., 4.8 air mi. WNW of Leesburg at junction with Middle Cr., 19 Sept. 1975. **Lee/Worth counties:** AU 6524 (37) Flint R., 8.5 air mi. E of Leesburg, 0.5 mi. downstream from Hwy. 32

bridge, 14 Sept. 1972. **Lumpkin County:** AU 3480 (2) Chestatee R., ca. 3 mi. SSE of Dahlonga, Hwy. 60, 20 May 1970. AU 4941 (1) Chestatee R., 2.7 air mi. E of Dahlonga, Hwy. 52, 4 Sept. 1971. AU 5911 (1) Chestatee R., 0.2 air mi. S of Dahlonga, Hwy. 60, 13 July 1972. **UGAMNH 542 (5)** Chestatee R. (Sta. 2), new bridge, 22 May 1958. **Macon County:** ANSP 152396 (1) Flint R. below Ogelthorpe, above Buckeye cellulose discharge & below mouth of Spring Cr., 27 Aug. 1983. ANSP 152390 (1) Flint R. below Ogelthorpe, above Buckeye cellulose discharge, above island above mouth Camp Cr., 27 Aug. 1983. AU 24648 (1) Flint R., 2.6 air mi. SSE of Ogelthorpe, RM 177, 29-30 Sept. 1981. **Meriwether County:** AU 7412 (6) Flint R. at bridge, 3.4 air mi. SE of Gay co. rd., 23 Oct. 1991. AU 24789 (2) Flint R., mile 280, between Plat Shoals and Hwy. 18, W of Molena, GA, Sta. 1, 21 June 1984. **Mitchell County:** AU 6602 (3) Flint R., 17.5 air mi. WSW of Camilla near Harmon's Landing, 1 Dec. 1970. **Putnam County:** AU 6374 (5) Murder Cr., 2.6 air mi. NNE of Stanfordville, 23 Aug. 1972. **Taylor County:** AU 24813 (8) Flint R., 11.5 air mi. SSE of Thomaston, 1.5 & 6.5 mi. above Hwy. 80 (RM 240), Sta. 5, 26 June 1984. AU 24814 (8) Flint R., 11.5 air mi. SSE of Thomaston, 1.5 and 6.5 mi. above Hwy. 80 (RM 240), 26 June 1984. AU 24827 (9) Flint R., 13.2 air mi. NNW of Reynolds, 2 mi. above Hwy. 128 (RM 230), Sta. 6, 19 June 1984. **Terrell County:** AU 15977 (4) Sao-fry from nest at stove cake fish hatchery pond #2, brood-stock from Flint R., GA, 12 Apr. 1972. AU 15978 (1) Steve Cocke Hatchery, Dawson, pond #2; brood-stock from Flint R., GA, 14 Apr. 1972. AU 15979 (5) Fry (ca. 14 days post-hatching), Stone Cocke Hatchery, Dawson, pond #2, brood-stock from Flint R., GA, 24 Apr. 1972. **Troup County:** AU 5218 (2) Chattahoochee R., 2.6 air mi. S of Abbottsford - preimpoundment, 21 Apr. 1972. AU 8785 (1) Chattahoochee R., 5.5 air mi. WNW of Lagrange, within 1 mi. N of Yellow Jacket Cr., 14 Oct. 1972. AU 11422 (1) West Point Reservoir (Chattahoochee R.), Wehadkee Arm, 5.1 air mi. ENE of Fredonia, 6 Oct. 1975. **Upson County:** AU 6901 (6) Flint R. at Adam's ls., 2.1 air mi. W of mouth of Potato Cr., 8.5 air mi. SSW of Thomaston, 17 June 1971. AU 6958 (9) Potato Cr., 2.4 air mi. WNW of Thomaston on Hwy. 36, 11 Sept. 1971. AU 24798 (10) Flint R., 10.6 air mi. WNW of Thomaston, at Pleasant Valley (RM 270), 13 June 1984. **Upson/Talbot counties:** ANSP 152221 (1) Flint R. at Pobiddy Road, S of Thomaston, 22 Apr. 1983. ANSP 153219 (2) Flint R., Pobiddy Road, 8 mi. S of Thomaston, 26 Oct. 1983. **UGAMNH 611 (5)** Flint R., 0.5 mi. upstream from Hwy. 36 (station #2), 17 Oct. 1958. **UGAMNH 611A (10)** Flint R., 1 mi. above Hwy. 36, 29 Oct. 1958. **UGAMNH 611B (1)** Flint R., 1 mi. upstream from Hwy. 36 (station #2), 10 Nov. 1958.

## Altamaha River Basin

**Georgia: Butts County:** AU 19256 (1) Ocmulgee R., ca. 3.5 mi. below Jackson Lake Dam, June 1979.

## *Micropterus coosae*

## Apalachicola River Basin

**Alabama: Randolph County:** AU 5190 (1) Wehadkee Cr. below McLosh Mill, 4.6 air mi. SE of Rock Mills, 23 Apr. 1972.

**Georgia: Carroll County:** AU 27501 (3) Snake Cr. at USGS Gauging Station, N of Banning, 18 Sept. 1991. **UGAMNH 2349 (4)** Snake Cr. at CR 809 crossing, 2.75 air mi. NNW of Whitesburg, 26 July 1991. **Cobb County:** AU 15812 (1) Powder Springs Cr., trib. to Sweetwater Cr., 1.4 air mi. WNW of Clarkdale, Oglesby Road, 24 Oct. 1977. **Douglas County:** AU 218 (1) Dog R., trib. to Chattahoochee R., 3.3 mi. NE of McWhorter, Hwy. 5, 1 July 1967. **Fulton County:** AU 15597 (1) Chattahoochee R., 2.5 mi. above mouth of Peachtree Cr., 2 Aug. 1977. **UMMZ 88290 (1)** Nancy Cr., about 10 mi. N of Atlanta, trib. of Chattahoochee R., 2 Sept. 1929. **Habersham County:** **UGAMNH 598 (1)** Raper Cr. at the Mines, 13 Oct. 1958. **Harris County:** AU 18905 (1) Trib. [Dowdell Cr.] to Mulberry Cr., 2 km SW of Hamilton, 15 Mar. 1979. AU 18906 (1) Dowdell Cr., trib. to Mulberry Cr., 3.6 air mi. NW of Waverly Hall, 3 July 1979. **CU 17534 (7)** Trib. to Mulberry Cr., 0.5 mi. W of Hamilton on Rt. 116, 29 Mar. 1950. **UF 56693 (2)** Trib. of Mulberry Cr., 7.9 mi. E of Hamilton on Rt. 116, 17 Aug. 1960. **Heard County:** AU 8787 (1) Central Hatchee Cr., ca. 3/4 mi. N of Franklin, 200 yds. from confluence w/Chattahoochee R., 17 May 1974. **Lumpkin County:** AU 3370 (1) Dicks Cr., trib. of Chestatee R., ca. 1.5 air mi. above mouth, 15 Nov. 1968. AU 3481 (1) Chestatee R., ca. 3 mi. SSE of Dahlonga, Hwy. 60, 20 May 1970. AU 5912 (1) Chestatee R., 0.2 air mi. S of Dahlonga, Hwy.

60, 13 July 1972. CU 21455 (1) Yahoola Cr., 1 mi. E of Dahlonega on GA 52, 10 June 1952. UF UNCART (1) Yahoooca Cr. at St. Hwy. 9, ca. 2.2 air mi. N of Dahlonega, 15 July 1992. UGAMNH 414 (1) Boggs Cr., 27 Aug. 1954. UGAMNH 541 (10) Chestatee R. at Grinnel Bridge, 15 May 1958 through 27 May 1958. UGAMNH 581 (1) Ward Cr. (where soldiers wash their cars), 23 July 1958. UGAMNH 604 (4) Cane Cr. at first bridge N of Dahlonega, 20 Oct. 1958. UMMZ 157963 (2) Cane Cr., trib. to Chestatee R., 1.25 mi. WSW of Dahlonega, 25 Aug. 1939. UMMZ 175585 (1) Cane Cr. at jct. of SR 9E & US Rt. 19, ca. 2 mi. SSW of Dahlonega, 9 Sept. 1958. USNM 168075 (2) Trib. of Chattahoochee R., 0.3 mi. W of Dahlonega on US 19, 11 Sept. 1954. USNM 162406 (1) Trib. of Chestatee R., 1.3 mi. WSW of Dahlonega on US Rt. 19, 11 Sept. 1947. Macon County: AU 24648 (1) Flint R., 2.6 air mi. SSE of Oglethorpe, RM 177, 29-30 Sept. 1981. Meriwether County: AU 24789 (2) Flint R., mile 280 between flat shoals and highway, W of Molena, 21 June 1984. Mitchell County: AU 6602 (3) Flint R., 17.5 air mi. WSW of Camilla near Harmon's landing, 1 Dec. 1970. Taylor County: AU 24827 (9) Flint R., 13.2 air mi. NNW of Reynolds, 2 mi. above Hwy. 128 (RM 230), 19 June 1984. Troup County: AU 11422 (1) West Point Reservoir (Chattahoochee R.) Wehadkee Arm, 5.1 air mi. ENE of Fredonia, 6 Oct. 1975. Upson County: AU 24788 (5) Flint R., 7.3 air mi. WSW of Thomaston, above Hwy. 36 bridge (RM 260), 12 June 1984. AU 24801 (2) Flint R., 8.0 air mi. SSW of Thomaston, 1 mi. below Pobiddy bridge (RM 251), 20 June 1984. AU 24798 (10) Flint R., 10.6 air mi. WNW of Thomaston at Pleasant Valley (RM 270), 13 June 1984. Upson/Falbot counties: UGAMNH 611A (10) Flint R., 1 mi. above Hwy. 36, 29 Oct. 1958. White County: TU 30434 (1) Trib. to Tesnatee Cr., 2 mi. NW of Cleveland, Hwy. 129, 14 Apr. 1963. TU 38330 (4) Trib. to Tesnatee Cr., 1.8 mi. NW of Cleveland, Hwy. 129, 21 June 1965. UGAMNH 324A (1) Chattahoochee R. near Nora Mills, below Helen, 23 Apr. 1958. UGAMNH 620 (2) Cane Cr., 0.25 mi. above jct. with Sautee Cr., 22 Oct. 1958. UGAMNH 2075 (2) Chattahoochee R., 1 mi. S of Helen, 26 June 1950. White/Habersham counties: UGAMNH 838 (15) Chattahoochee R., 24 Oct. 1963.

## Altamaha River Basin

Georgia: Crawford County: UGAMNH 664 (2) Echeconnee Cr., 7 June 1959. Greene County: AU 18196 (1) Apalachee R., 6.5 air mi. WSW of Greensboro, 12 Sept. 1978. Gwinnett County: AU 5047 (2) Yellow R., 2.9 air mi. E of Lilburn, 11 Sept. 1970. AU 14130 (1) Garner Cr., trib. of Yellow R., 2.7 air mi. SE of Lilburn, Hwy. S2345, 4 Oct. 1976. Hall County: AU 26462 (5) Candler Cr., W of Gillsville, 5 May 1990. CU 11200 (1) Oconee R., 2 mi. NW of Gillsville, 9 Apr. 1947. CU 43555 (1) East fork of Oconee R., W of Gillsville, 11 Sept. 1962. UMMZ 201118 (3) Chandler Cr., N of Gillsville at jct. of Rts. 323 & 52, 26 June 1977. Jasper County: AU 4967 (1) Cedar Cr., about 5.5 mi. ENE of Hillsborough, 18 Aug. 1970. Jones County: AU 5949 (2) Cedar Cr., trib. to Big Cedar Cr., 5.5 air mi. E of Round Oak, on Union Hill Rd., 27 Aug. 1972. AU 26147 (2) Filling Cr. at Juliette Rd., 5.1 mi. E of Juliette, 24 Aug. 1989. Lamar County: AU 27550 (2) Buck Cr., @ Chappel Mill Rd. at Chappel, 21 Sept. 1991. Putnam County: AU 3455 (4) Hitchcock Br., southern trib. to Murder Cr., 6.4 air mi. due NE of Jasper/Putnam/Jones co. line, 1969. AU 4956 (2) Little R., at mouth of Gladly Cr., 2.9 air mi. W of Eaton, 18 Aug. 1970. AU 6374 (5) Murder Cr., 2.6 air mi. NNE of Stanfordsville, 23 Aug. 1972. UGAMNH 433 (1) Sinclair Reservoir, GA Hwy. 24 at Little R., May 1955.

## *Micropterus punctulatus henshalli*

## Apalachicola River Basin

Georgia: Gwinnett County: AU 21997 (3) Chattahoochee R., 3.1 km S of Buford Dam, 5 mi. W of Buford, 15 Mar. 1978. Lumpkin County: AU 3482 (1) Chestatee R., ca. 3 mi. SSE of Dahlonega, Hwy. 60, 20 May 1970.

*Micropterus punctulatus punctulatus***Apalachicola River Basin**

**Alabama: Barbour County:** UMMZ 168752 (3) Just E of Eufala, Chattahoochee R. at US 28 Bridge, 11 Sept. 1954. **Chambers County:** AU 24599 (1) Chattahoochee R. at Riverview, in rapids, ca. 1978. UF 95836 (1) Chattahoochee R., near Langdale, Aug. 1992. UF 95837 (1) Chattahoochee R., near Langdale, Aug. 1992. **Lee County:** AU 1483 (4) Halawakee Cr., ca. 10 mi. NE of Opelika (T20N, R28E, Sec. 27), 12 Oct. 1968. AU 1581 (2) Halawakee Cr., trib. to Chattahoochee R., ca. 10 mi. NE of Opelika, 8 Jan. 1969. AU 1611 (1) Halawakee Cr., trib. to Chattahoochee R., ca. 10 air mi. NE of Opelika (T20N, R28E, S27), 23 Oct. 1968. AU 5335 (1) Lake Harding at mouth of Halawakee Cr. arm, 8 Feb. 1972. AU 11918 (1) Halawakee Cr., 2.4 air mi. SW of Beulah, co. rd., 8 May 1969. AU 17234 (1) Cove of Lake Harding, W of Bartlett's Ferry Dam, 29 Aug. 1977. AU 23995 (1) Halawakee Cr., 2.1 air mi. SSW of Beulah, at covered bridge, 26 Oct. 1971. AU 27604 (2) Halawakee Cr. at CR 390, NE of Opelika, AL, 11 Oct. 1991. **Russell County:** USNM 167961 (2) Uchee Cr. below bridge on Crawford to Seale (Chattahoochee Dr.), 5 Oct. 1954.

**Florida: Calhoun County:** UF 65711 (1) Apalachicola R., west bank off sand bar behind deflector, 0.6 mi. N of Blounts Landing (approx. 1 mi. S of SR 20 bridge), 9 Sept. 1968. **Gadsden County:** TU 24405 (1) Apalachicola R. from boat ramp to Jim Woodruff Dam, Nov. 1960. UMMZ 134613 (2) Mouth of Flint R., 13 Oct. 1941. **Jackson County:** UMMZ 166286 (1) Chattahoochee R. at mouth of Mill Cr., 0.5 mi. N of bridge, on FL Hwy. 2 (T7N, R8W, S23, 26), 2 May 1952.

**Georgia: Dougherty County:** UGAMNH 697 (1) Flint R., Sta. #6, below Lake Worth dam, 7 Oct. 1959. **Harris County:** AU 5193 (1) Mulberry Cr., 0.1 mi. above Chattahoochee R., 22 Oct. 1971. UNCAT (1) Chattahoochee R. near Langdale, Aug. 1992. UNCAT (1) Chattahoochee R. near Langdale, Aug. 1992. **Quitman County:** AU 4320 (1) Cove of Walter F. George Reservoir, 2.3 air mi. SSW of Georgetown, 7 June 1971. **Troup County:** AU 5219 (2) Chattahoochee R., 2.6 air mi. S of Abbottsford-preimpoundment, 21 Apr. 1972. AU 5834 (5) Chattahoochee R. at islands, ca. 1.0 air mi. N of West Point dam site, 3.5 air mi. N of West Point, 18 Aug. 1970. AU 10376 (4) West Point Reservoir, Chattahoochee R., Wehadkee arm, 4.0 air mi. SSE of Evansville, 2.8 air mi. SSW of Gabbettville, 15 July 1975. UT 90.313 (2) West Point Reservoir at Hwy. 219 xing, 25 Aug. 1977. UT 90.553 (1) West Point Reservoir, 5 July 1977.

*Micropterus dolomieu***Apalachicola River Basin**

**Georgia: Douglas County:** AU 219 (1) Dog R., trib. to Chattahoochee R., 3.3 mi. NE of McWhorter, Hwy. 5, 1 July 1967.

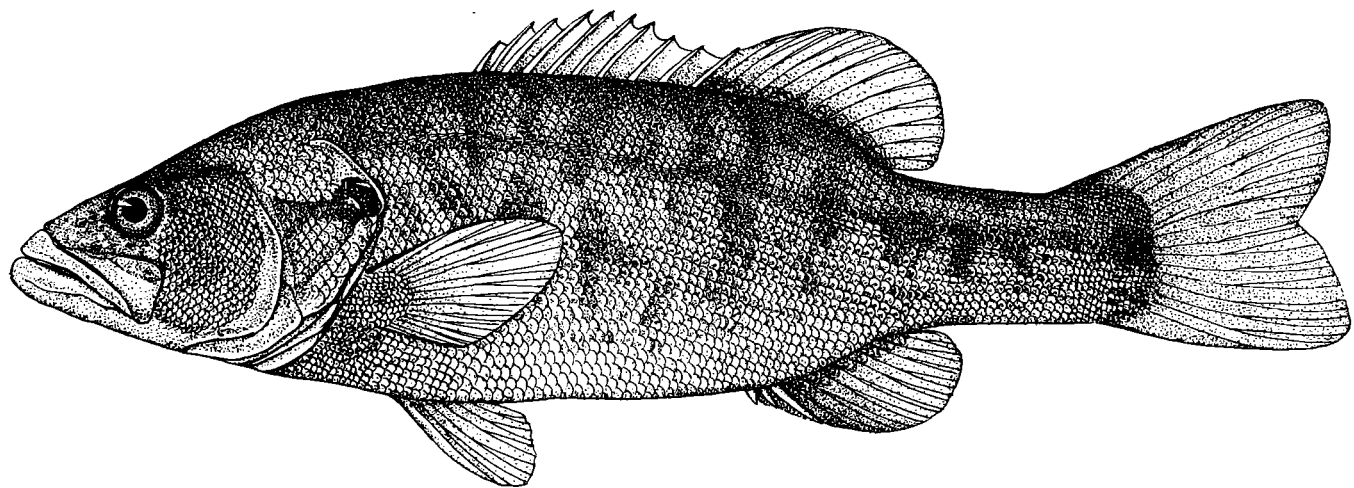


Plate 1. *Micropterus cataractae*, Paratype, UF 110754, 304 mm SL, Florida, Jackson County, Chipola River, about 10 mi. SSE Marianna, 3 March 1970.

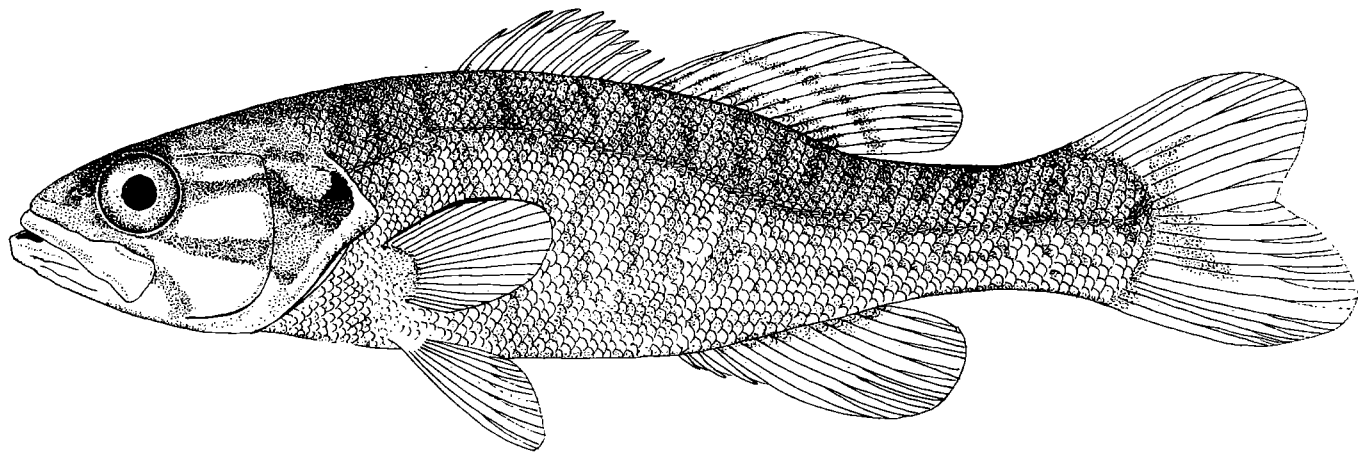


Plate 2. *Micropterus cataractae*, juvenile (nontype), AU 15798 (1), 62 mm SL, Georgia, Douglas County, Anneewakee Creek, 7.1 air mi. E of Bill Arp, Hwy 166, 20 October 1977.

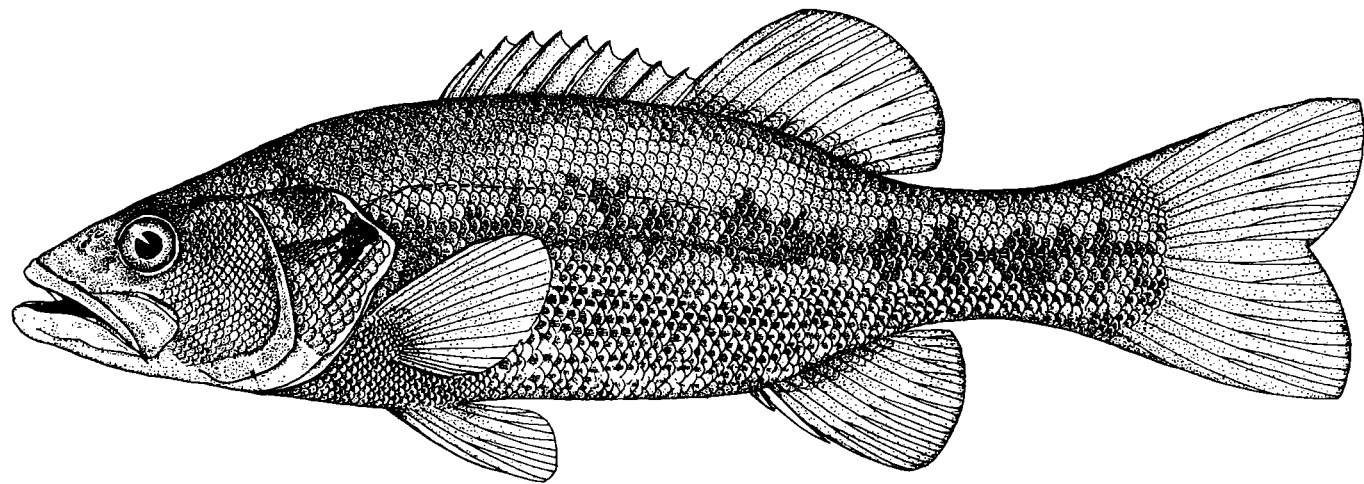


Plate 3. *Micropterus punctulatus punctulatus*. AU 1611, 215 mm SL, Alabama, Lee County, Halawakee Creek, tributary to Chattahoochee River, about 10 air mi. NE of Opelika (T20N, R28E, S27), 23 October 1968.

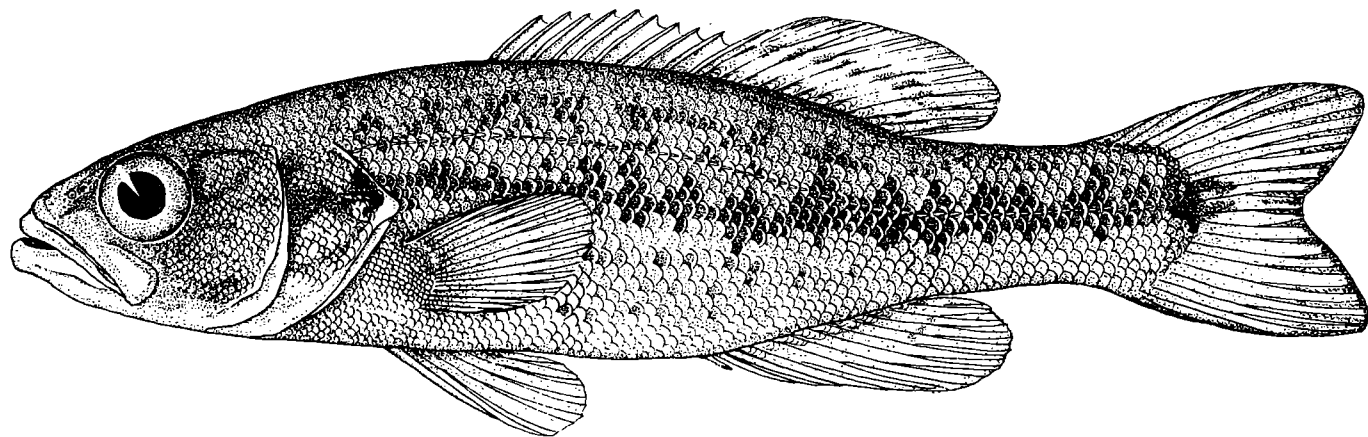
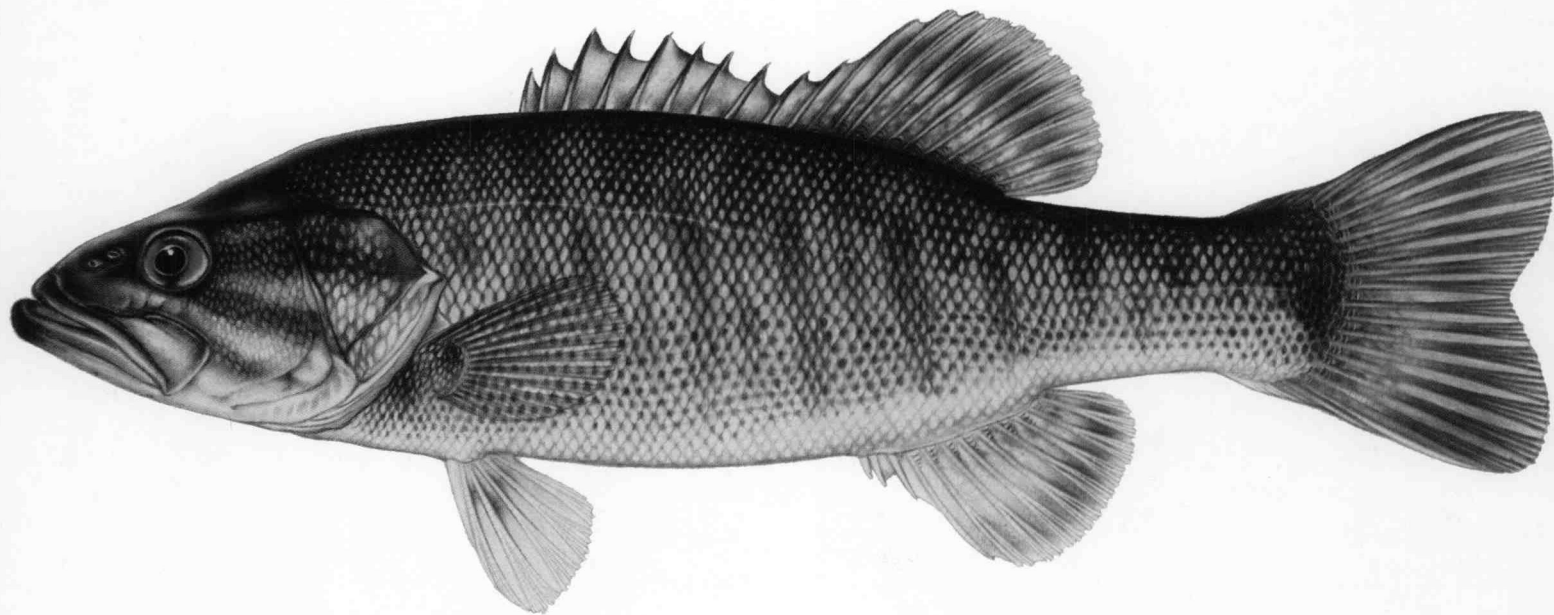


Plate 4. *Micropterus punctulatus punctulatus*. AU 5834, 59 mm SL, Georgia, Troup County, Chattahoochee River at islands, about 1.0 air mi. N of West Point dam site, 3.5 air mi. N of West Point, 18 August 1970.





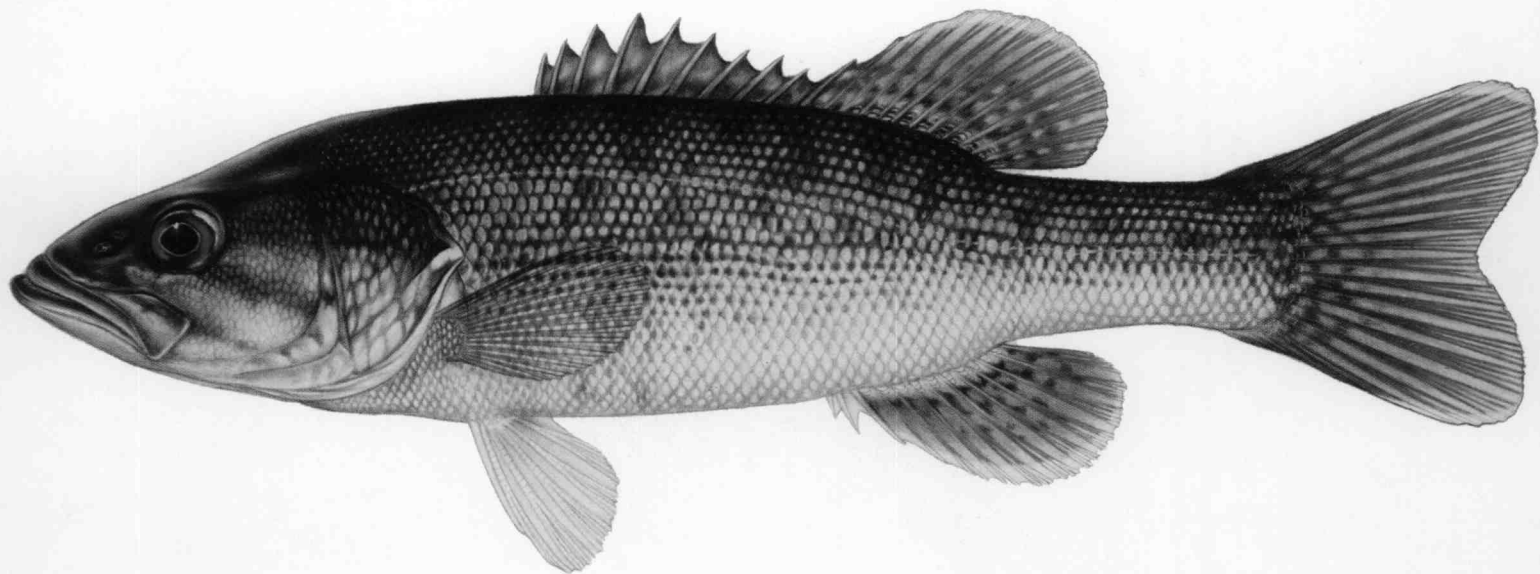
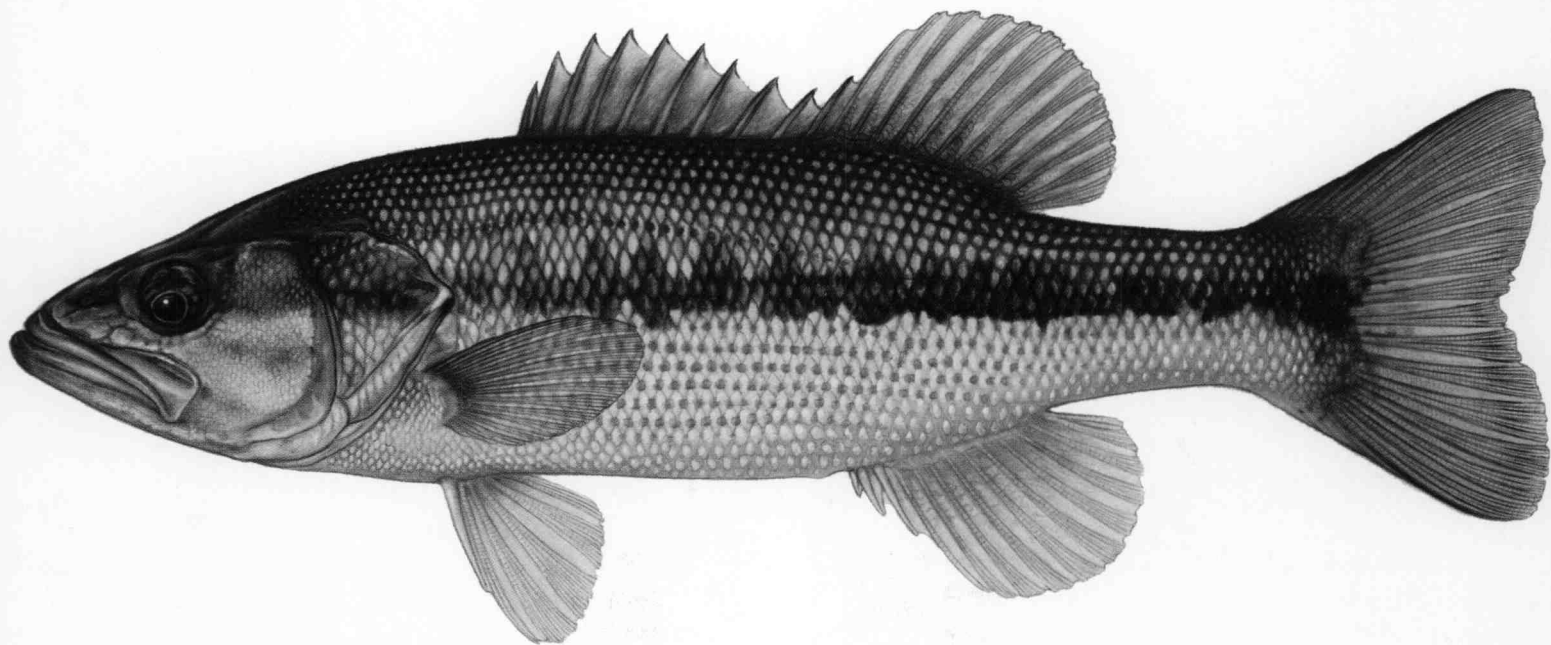


Plate 6. *Micropterus coosae*. Georgia, Walker County, West Fork Armuchee Creek, 21 April 1989. © Joseph R. Tomelleri.



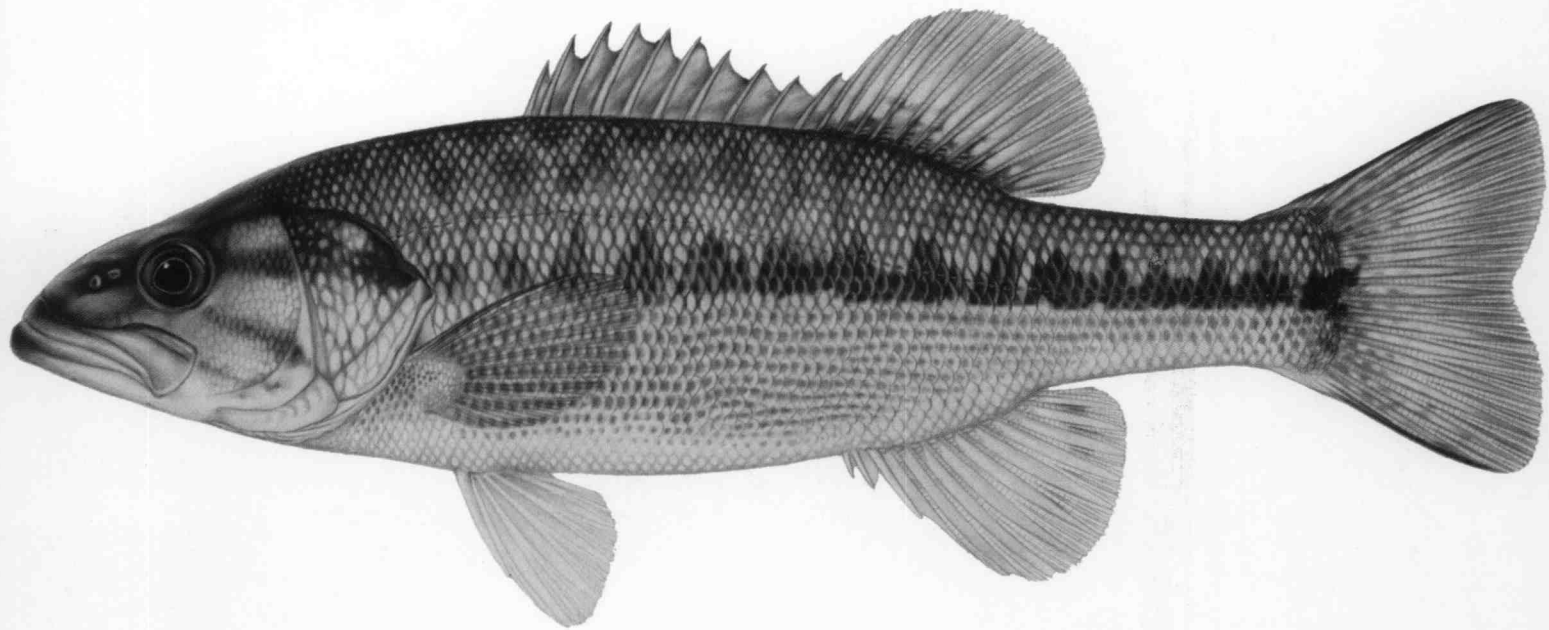


Plate 8. *Micropterus punctulatus henshalli*. Georgia, Gilmer County, Carters Reservoir, April 1989. © Joseph R. Tomelleri.

Contributions to the BULLETIN OF THE FLORIDA MUSEUM OF NATURAL HISTORY may be in any field of biology. Manuscripts dealing with natural history or systematic problems involving the southeastern United States or the New World tropics are solicited especially. Manuscripts should be of medium length—circa 35-200 pages (10,500-60,000 words). Examination for suitability is made by an Editorial Board.

The BULLETIN is distributed worldwide through institutional exchanges and standing orders. It is considered the responsibility of the author to distribute his paper to all interested individuals. To aid in this, the author(s) receive(s) 50 copies free, and he/she(they) may purchase additional separates at cost if ordered when page proof is returned. The author is also responsible for any charges incurred for alterations made by him on galley or page proofs. The Museum will send an invoice to the author for this amount upon completion of publication.

### PREPARATION OF MANUSCRIPT

Contributors should consult recent numbers of the BULLETIN for preferred style and format. Highly recommended as a guide is the Scientific Style and Format, CBE Style Manual for Authors, Editors, and Publishers, 6th Edition, 1994 (published by the Council of Biology Editors).

Manuscripts must be submitted in duplicate and satisfy the following minimal requirements. They must be double-spaced throughout, including tables, figure captions, and literature citations. Figure legends and tables should be typed on separate sheets. Also, please submit a copy of the complete text, tables, figure captions, and literature cited on a floppy disk (we use Word for Windows, yours has to be compatible with it).

All illustrations are referred to as figures. They must comply with the following standards: Photographs should be sharp, with good contrast, and printed on glossy paper, or the originals submitted. If the background of photographs (especially those of specimens) is not desired, amberlith should be cut out and used to cover the background. Drawings should be made with dense black waterproof ink on quality paper or illustration board. All figures should have a cover sheet. All lettering will be medium weight, sans-serif type (e.g. Futura Medium, News Gothic) in cutout, dry transfer, or lettering guide letters. Make allowance so that after reduction no lower case letter will be less than 1 mm high (2 mm is preferred) nor any capital letter greater than 5 mm high. The maximum size for figures is 9" x 14" (twice BULLETIN page size); figures should not be less than typepage width (4¼"). With soft lead pencil, on the back of each illustration, designate the top and identify each by author's name, manuscript title, and figure number.

All manuscripts not submitted in BULLETIN format will be returned to the author for retyping and/or formatting.

*Manuscripts, all editorial matters, and requests for more detailed preparation instructions should be addressed to:*

Managing Editor of the BULLETIN  
Florida Museum of Natural History  
University of Florida  
P. O. Box 117800  
Gainesville FL 32611-7800, U.S.A.  
Phone: 352-392-6724  
FAX: 352-846-0287  
email: [rjbryant@flmnh.ufl.edu](mailto:rjbryant@flmnh.ufl.edu)