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### Abstract

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### Keywords

fishes, bull mountain creek, middle fork, kentucky river, coal surface mining, cumberland plateau, tennessee, big south fork, cumberland river system, tennessee, kentucky



# Southeastern Fishes Council PROCEEDINGS

DEDICATED TO THE PRESERVATION OF SOUTHEASTERN FISHES

VOL. 4, NO. 3

AUGUST 1984

## A REPORT ON THE FISHES OF BULL MOUNTAIN CREEK, WITH COMMENTS ON THE STATUS OF RARE SPECIES

Malcolm Pierson<sup>1</sup> and C.A. Schultz

Mississippi Department of Wildlife Conservation  
P.O. Box 137, Aberdeen, MS 39730

<sup>1</sup>Present Address: Department of Environmental Affairs  
Alabama Power Company, G.S.C. #8, 600 North 18th Street  
Birmingham, AL 35291

With the ongoing construction of the Tennessee-Tombigbee Waterway, continuous stress is expected to be put on the ichthyofauna of the Upper Tombigbee River. Major tributaries of the Tombigbee, such as Bull Mountain and Luxapalila creeks and the Buttahatchie, Noxubee, and Sipsey rivers, have become increasingly important as refugia for upper Tombigbee species that require current and stable gravel substrate. In this survey of the fishes of Bull Mountain Creek, representatives of several species usually considered riverine in habitat requirements and listed as endangered, threatened, or rare were collected.

There have been few fish collections reported from the Bull Mountain Creek system. Caldwell (1969) and Boschung (1973), in their preimpoundment surveys of the upper Tombigbee River drainage, made five collections in the Bull Mountain Creek system, with two of these being from the main stem. Schultz (1971) conducted hoop-net sampling in this creek as part of a broad survey of the walleye population in the Tombigbee drainage. The present study consisted of 124 collections made at 15 stations in Bull Mountain Creek proper. Fishes were collected from May 1979 to December 1981 using seines, hoop nets, and rotenone.

Bull Mountain Creek is, at the present time, a free-flowing, virtually unaltered major tributary of the upper Tombigbee River. Its headwaters originate in the Fall Line Hills of Marion and Franklin counties in northwestern Alabama at an elevation of 149 meters. It enters Itawamba County, Mississippi, and flows through the upper Coastal Plain before entering the Tombigbee River at the edge of the Black Belt, at an elevation of 70 meters. The stream channel within the study area meanders through mature bottomland hardwoods, creating a floodplain ranging from 1.8 to 2.7 kilometers in width. The stream's main channel is not well defined at some points because of the braided nature of the creek. Long pools broken by occasional gravel riffles, undercut banks, long blockages, and backwater areas provide a diversity of habitats. Bull Mountain Creek is a fifth-order stream ranging from 10 to 20 meters in width from its mouth to the upper sampling station 50.9 km upstream. U.S. Geological Survey (1980) reports a 40 year average discharge of 16.14 cubic meters per second (570 cfs) at Smithville, Mississippi (5.2 km upstream from the confluence with the Tombigbee River).

At this time no alterations in the form of channelization or impoundment are planned for the upper section of Bull Mountain Creek; however, the completion

and filling of Lock B Pool of the Tennessee-Tombigbee Waterway scheduled for late 1983 will inundate approximately 6.4 km of the lower section. The lower 2.9 km will be cut off by the west-bank levee of the canal section of the Tennessee-Tombigbee Waterway, and will be dependent on a minimum-flow structure for continued flow from Lock B Pool. Because of the west-bank levee, direct movements of fishes from the Tombigbee River into Bull Mountain Creek will be blocked.

Prior to impoundment by Lock B Lake, a survey of the fishes of Bull Mountain Creek was conducted by the Mississippi Department of Wildlife Conservation to determine species composition, and to monitor seasonal movements of fishes vulnerable to hoop net capture (Schultz 1981, Schultz et al 1982).

Three hoop nets were fished at each of four locations (sites 6, 9, 13, and 15 in Fig. 1) for three consecutive days every other week from January to December 1981. An additional 51 net days of sampling occurred from May 1979 to April 1980. Hoop nets were fished unbaited at a variety of depths and flow conditions for a total of 915 net days. These nets were 4.5 m in length and 91 cm in diameter with 2.5 cm nylon mesh. Seines used in 18 collections at eight locations were 3.6 m long and 1.2 m deep with 3.2 mm nylon mesh. Rotenone in liquid form (Noxfish) was used in four samples at four locations, and was put out 60 to 90 m above a 15 x 1.8 m bag seine, which was used as a block net. KMnO<sub>4</sub> was used to oxidize the rotenone below the block net.

Smaller fish specimens were fixed in 15 percent formalin and later identified, measured in total length, counted, and stored in 50 percent isopropanol. Larger fish were identified, measured, and released. Voucher specimens were deposited at the Mississippi Museum of Natural Science, Auburn University fish collection, and Mississippi State University fish collection.

Hoop-net sampling accounted for 32 species, 11 of which were not collected by other methods (Table 1). These nets were generally selective for the larger, mobile game and commercial fishes, and proved effective in taking ictalurids, centrarchids, and catostomids. Channel catfish (*Ictalurus punctatus*) made up 54 percent of the catch, whereas blacktail redhorse (*Moxostoma poecilurum*), shadow bass (*Ambloplites ariommus*), bluegill (*Lepomis macrochirus*), and white crappie (*Pomoxis annularis*) represented 6.8, 6.6, 6.5, and 4.5 percent of the catch respectively. A complete list of species and catch per unit effort is presented in Table 1. A listing of the 1981 hoop net catch by month is presented in Table 2. In most cases, the peak catch of each species occurred during its spawning period. An atypical hoop-net catch of 436 channel catfish during a single sampling period in February occurred after heavy rains and a rapid increase in stream volume and flow. This sample was at the mouth of Bull Mountain Creek, and the high catch probably resulted from the movements of Tombigbee River fish

into the creek. This higher than normal catch inflates the percent relative abundance given for channel catfish in Table 1.

Seines were used for collecting 53 species, seven of which were not collected by other methods (Table 1). Areas suitable for seining occur infrequently in the main stem of Bull Mountain Creek and are widely separated by deep pools. For this reason, stream habitats where collections were made usually consisted of swift gravel riffles and transitional habitat adjacent to riffles. This sampling bias is reflected in the high percent relative abundance of several riffle species. The rock darter (*Etheostoma rupestre*) was the most abundant species in the seine samples, making up 21 percent of the sample, followed by the speckled darter (*Etheostoma stigmaeum*) at 12.1 percent, the striped shiner (*Notropis chrysocephalus isolepis*) at 9.5 percent, the speckled madtom (*Noturus leptacanthus*) at 7.5 percent, and the blacktail shiner (*Notropis venustus*) at 5.9 percent (Table 1). The collection of a single smallmouth bass (*Micropterus dolomieu*) (a non-native species) results from an earlier stocking by the Mississippi Department of Wildlife Conservation.

Rotenone collections accounted for 58 species, five of which were not collected by other methods (Table 1). Sample areas were chosen to represent a wide variety of stream habitats. The black madtom (*Noturus funebris*) was the most abundant species taken in these collections, and comprised 10.8 percent of the total sample. This was followed by the gulf darter (*Etheostoma swaini*), 8.3 percent; the blacktail shiner, 6.5 percent; the rock darter, 5.7 percent; and the striped shiner, 5.2 percent (Table 1). A total of 79 species was collected during the study.

After impoundment of the canal section by Lock B, many Tombigbee River fishes dependent on riverine conditions will probably be eliminated, as predicted by Boschung (1973) and demonstrated in post-impoundment surveys on Gainesville and Aliceville lakes by Timmons (1982). The number of species in Aliceville Lake declined from 82 in pre-impoundment surveys by Caldwell (1969) and Boschung (1973) to 56 in post-impoundment studies 2 years after filling of Aliceville Lake (Timmons, 1982). Similar results can be expected after the closing of locks in the canal section of the waterway. Species present in pre-impoundment surveys by Caldwell (1969) or Boschung (1973) in the upper Tombigbee River, but absent from post-impoundment surveys in Gainesville and Aliceville lakes by Timmons (1982) are: Alabama shad (*Alosa alabamae*), mooneye (*Hiodon tergisus*), stoneroller (*Camptostoma anomalum*), speckled chub (*Hybopsis aestivalis*), rough shiner (*Notropis baileyi*), pretty shiner (*Notropis bellus*), mimic shiner (*Notropis volucellus*), Alabama hog sucker (*Hypentelium etowanum*), frecklebelly madtom (*Noturus munitus*), crystal darter (*Ammocrypta asprella*), harlequin darter (*Etheostoma histrio*), johnny darter (*Etheostoma nigrum*), rock darter (*Etheostoma rupestre*), blackbanded darter (*Percina nigrofasciata*), river darter (*Percina shumardi*), and saddleback darter (*Percina ouachitae*). All of these species except the Alabama shad and speckled chub were collected in the present study in Bull Mountain Creek from 1979 to 1981. Other fishes collected by Schultz (1981) from both the Tombigbee River and Bull Mountain Creek that will be adversely affected by loss of critical habitat due to impoundment are: Alabama shiner (*Notropis callistius*), blue sucker (*Cycleptus elongatus*), river redhorse (*Moxostoma carinatum*), and freckled darter (*Percina lenticula*). The frecklebelly madtom and the freckled darter are currently under status review by the U.S. Fish and Wildlife Service. Alabama lists the frecklebelly madtom as endangered and the blue sucker, crystal darter, and freckled darter as threatened (Ramsey, 1976). Mississippi lists the frecklebelly madtom and crystal darter as endangered and the freckled darter as rare (Clemmer et al 1975). Forty-five specimens of the frecklebelly madtom were taken in eight collections at four locations over gravel and sand-gravel riffles in moderate to strong

current (sites 4, 10, 12, and 15 in Figure 1). The frecklebelly madtom was taken up to 40 km above the confluence of Bull Mountain Creek with the Tombigbee River. A single adult specimen of the blue sucker was collected by hoop net at one location (site 6). Seventeen specimens of the crystal darter were collected at two locations in strong current over stable gravel beds in water to 1 m deep (sites 12 and 14). Two adult specimens of the freckled darter were collected at one location in a swift chute over gravel (site 10).

Beds of stable current-swept gravel occur less frequently in Bull Mountain Creek when compared to the Tombigbee River prior to Tenn-Tom construction. Riverine species occurring in Bull Mountain Creek that have critical habitat requirements exist in reduced numbers over these smaller areas of suitable habitat when compared to populations of the Tombigbee River prior to impoundment.

Many of the Tombigbee tributaries have undergone modifications to the detriment of their fish populations. Stream channelization, clearing of riparian vegetation, and gravel mining and washing activities have altered stream habitat in much of the Tombigbee drainage.

To prevent further habitat alteration, strict enforcement of gravel mining and washing operations is needed. Timber companies and private land owners should be encouraged to leave a buffer zone of vegetation along stream borders during timber cutting or clearing practices. The public should be continually informed about erosion, loss of sport fisheries, and downstream flooding problems associated with stream channelization. A portion of the diverse ichthyofauna of the Tombigbee River may be preserved on a reduced scale if major tributaries such as Bull Mountain Creek are protected as refugia for these sensitive species.

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#### COLLECTING STATIONS ON BULL MOUNTAIN CREEK WITH A LIST OF FISHES COLLECTED AT EACH STATION\*

- 8.0 km NE of Tremont and 0.8 km W of the Alabama State line. Itawamba Co. Ms. T10S, R10E, Sec. 30. Species: 4,8,13,15,16,18,20,21,22,24,26,27,31,33,36,38,39,40,42,44,47,48,64,66,67,68,69,70,74,75.
- 5.4 km NE of Tremont at Co. Road 23. Itawamba Co. Ms. T10S, R10E, Sec. 26. Species: 8,13,15,18,20,27,31,40,44,45,52,64,66,67,68,70.
- 1.6 km NW of Tremont above U.S. Hwy 78. Itawamba Co. Ms. T10S, R10E, Sec. 5. Species: 8,13,16,17,18,19,21,31,40,41,44,52,55,63,64,65,66,67,68,70,74,75,76.
- 1.9 km NW of Tremont above U.S. Hwy 78. Itawamba Co. Ms. T10S, R10E, Sec. 5. Species: 8,13,16,17,18,19,20,21,22,26,27,30,31,36,38,39,40,42,43,46,47,48,49,51,52,56,66,67,68,70,74,75.
- 1.1 km WNW of Tremont below U.S. Hwy 78. Itawamba Co. Ms. T10S, R10E, Sec. 5. Species: 8,13,14,15,16,17,18,19,20,21,22,24,26,31,40,44,45,46,47,52,56,57,62,64,65,66,67,68,70,74,75,76.
- 4.6 km W of Cadamy and 7.5 km SW of Tremont. Itawamba Co. Ms. T10S, R9E, Sec. 25. Species: 2,3,4,5,18,29,30,33,34,35,36,37,38,42,47,49,51,52,58,59,78,79.
- 5.1 km WSW of Cadamy and 8 km SW of Tremont. Itawamba Co. Ms. T10S, R9E, Sec. 25. Species: 15,22,24,31,38,44,45,52,57,62,64,66,67,68,70,74,76.
- 4.8 km WSW of Cadamy and 8.3 km SW of Tremont. Itawamba Co. Ms. T10S, R9E, Sec. 36. Species:

- 8,16,21,22,64,66,67,68,70,74,76.
9. 2.1 km NE of Smithville and 2.1 km upstream from State Hwy 25. Itawamba Co. Ms. T11S, R9E, Sec. 29. Species: 4,5,9,18,33,34,35,36,38,42,47,51,52,53,54,57,58,59,78,79.
10. 1.6 km NE of Smithville and 1.6 km upstream from State Hwy 25. Itawamba Co. Ms. T11S, R9E, Sec. 29. Species: 1,7,8,11,12,13,15,16,17,18,20,21,22,23,24,25,26,27,28,31,32,36,37,39,40,41,43,44,45,46,47,48,49,50,51,52,56,57,60,62,63,66,67,68,71,72,73,74,75,76,79.
11. 1.3 km NE of Smithville and 1.3 km upstream from State Hwy 25. Itawamba Co. Ms. T11S, R9E, Sec. 29. Species: 13,16,17,18,21,22,40,66,67,68,75,76.
12. 1.3 km NNW of Smithville and 1.0 km downstream from State Hwy 25. Itawamba Co. Ms. T11S, R9E, Sec. 30. Species: 5,8,11,12,13,15,16,17,18,20,21,22,23,24,25,26,31,32,35,36,38,39,40,41,42,44,47,49,51,

- 52,56,57,60,61,64,66,67,68,70,71,74,75,76,77,78.
13. 1.8 km NNW of Smithville and 1.3 km downstream from State Hwy 25. Itawamba Co. Ms. T11S, R9E, Sec. 30. Species: 2,4,6,9,17,18,28,32,33,34,35,36,37,38,42,47,51,52,56,58,59,78,79.
14. 3.5 km NW of Smithville and 0.5 km upstream from confluence with Tombigbee River. Itawamba Co. Ms. T11S, R8E, Sec. 25. Species: 5,10,11,13,16,18,20,21,22,24,25,26,35,40,41,45,57,60,62,63,66,67,68,71,75,76.
15. 3.8 km NW of Smithville just upstream from confluence with Tombigbee River. Itawamba Co. Ms. T11S, R8E, Sec. 26. Species: 2,4,5,9,28,30,32,34,35,36,38,42,47,50,51,52,53,56,58,59,78,79.

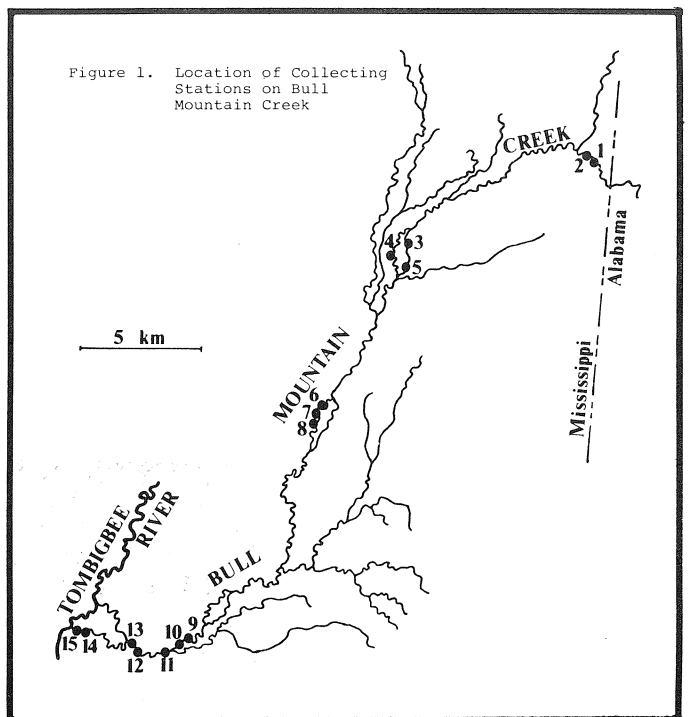
\* Fishes are listed in phylogenetic sequence by number as they appear in Table 1.

Table 1. Number (N), Percentage Relative Abundance (PRA) and Percent Occurrence (PO) of Fishes Collected by Seine and Rotenone and Number, Percentage Relative Abundance and Catch Per Unit of Effort (CPE) by Hoop Net Collecting in Bull Mountain Creek (CPE equals number of fishes per 9 net hours).

	Method of Collection								
	Seine			Rotenone			Hoop Net		
	N	PRA	PO	N	PRA	PO	N	PRA	CPE
1. <i>Lampetra aepyptera</i>	2	0.13	5.6				34	2.13	0.33
2. <i>Lepisosteus osseus</i>							1	0.06	0.01
3. <i>Amia calva</i>				1	0.11	25.0	20	1.26	0.20
4. <i>Anguilla rostrata</i>	1	0.07	5.6	1	0.11	25.0	5	0.31	0.05
5. <i>Dorosoma cepedianum</i>							31	1.95	0.30
6. <i>Hiodon tergisus</i>	1	0.07	5.6						
7. <i>Esox niger</i>	66	4.37	55.5	51	5.73	100.0			
8. <i>Camptostoma oligotepis</i>							6	0.38	0.06
9. <i>Cyprinus carpio</i>	5	0.33	5.6						
10. <i>Hybognathus hayi</i>	14	0.93	5.6	8	0.90	50.0			
11. <i>Hybognathus nuchalis</i>	2	0.13	5.6	3	0.34	25.0			
12. <i>Hybopsis winchellii</i>	18	1.19	50.0	45	5.06	100.0			
13. <i>Moxostoma leptocephalus</i>	1	0.07	5.6						
14. <i>Notemigonus crysoleucas</i>	54	3.58	33.3	34	3.82	25.0			
15. <i>Notropis baileyi</i>	30	3.31	50.0	43	4.83	100.0			
16. <i>Notropis bellus</i>	33	2.19	44.4	37	4.16	75.0	1	0.06	0.01
17. <i>Notropis callistius</i>	143	9.47	44.4	46	5.17	100.0	5	0.31	0.05
18. <i>Notropis chrysoccephalus</i>	5	0.33	16.7	1	0.11	25.0			
19. <i>Notropis emiliae</i>	21	2.72	44.4	32	3.60	100.0			
20. <i>Notropis stilbicus</i>	24	1.59	50.0	17	1.91	100.0			
21. <i>Notropis texanus</i>	89	5.89	72.2	58	6.52	100.0			
22. <i>Notropis venustus</i>	3	0.20	5.6	1	0.11	25.0			
23. <i>Notropis volucellus</i>	23	1.52	27.8	4	0.45	50.0			
24. <i>Notropis sp.</i> (cf. <i>N. longirostris</i> )	5	0.33	5.6	3	0.34	25.0			
25. <i>Pimephales notatus</i>	9	0.60	27.8	9	1.01	100.0			
26. <i>Pimephales vigilax</i>	1	0.07	5.6	2	0.22	50.0			
27. <i>Semotilus atromaculatus</i>				1	0.11	25.0			
28. <i>Carpiodes velifer</i>							3	0.19	0.03
29. <i>Cycleptus elongatus</i>							1	0.06	0.01
30. <i>Erimyzon oblongus</i>				1	0.11	25.0	4	0.25	0.04
31. <i>Hypentelium etowanum</i>	6	0.40	16.7	17	1.91	100.0			
32. <i>Ictiobus bubalus</i>				3	0.34	50.0	23	1.44	0.23
33. <i>Minytrema melanops</i>				2	0.22	25.0	12	0.75	0.12
34. <i>Moxostoma carinatum</i>	2	0.13	5.6	4	0.45	25.0	11	0.69	0.11
35. <i>Moxostoma erythrum</i>				9	1.01	100.0	29	1.82	0.28
36. <i>Moxostoma poecilurum</i>							108	6.78	1.06
37. <i>Ictalurus natalis</i>	1	0.07	5.6	39	4.38	100.0	7	0.44	0.07
38. <i>Ictalurus punctatus</i>				96	10.79	100.0	866	54.36	8.49
39. <i>Noturus funebris</i>	113	7.48	66.7	10	1.12	100.0			
40. <i>Noturus leptacanthus</i>	31	2.05	33.3	14	1.57	50.0			
41. <i>Noturus munitus</i>				4	0.45	75.0	30	1.88	0.29
42. <i>Pygidictis olivaris</i>	1	0.07	5.6	1	0.11	25.0			
43. <i>Aphredoderus sayanus</i>	49	3.25	44.4	4	0.45	75.0			
44. <i>Fundulus olivaceus</i>	7	0.46	22.2				2	0.13	0.02
45. <i>Gambusia affinis</i>	2	0.13	5.6	1	0.11	25.0	1	0.06	0.01
46. <i>Labidesthes sicculus</i>	2	0.13	5.6	18	2.02	100.0	104	6.53	1.02
47. <i>Ambloplites arionum</i>	1	0.07	5.6	2	0.22	50.0	47	2.95	0.46
48. <i>Elassoma zonatum</i>	2	0.13	5.6	7	0.79	75.0	5	0.31	0.05
49. <i>Lepomis cyanellus</i>	2	0.13	5.6	3	0.34	50.0	1	0.06	0.01
50. <i>Lepomis gulosus</i>	16	1.06	33.3	9	1.01	75.0	104	6.53	1.02
51. <i>Lepomis macrochirus</i>							47	2.95	0.46
52. <i>Lepomis megalotis</i>							5	0.31	0.05
53. <i>Lepomis microlophus</i>							1	0.06	0.01
54. <i>Lepomis punctatus</i>									
55. <i>Micropterus dolomieu</i>	1	0.07	5.6	5	0.56	75.0	5	0.31	0.05
56. <i>Micropterus punctulatus</i>	3	0.20	11.1	4	0.45	50.0	1	0.06	0.01
57. <i>Micropterus salmoides</i>	4	0.26	16.7				71	4.46	0.70
58. <i>Pomoxis annularis</i>							14	0.88	0.14
59. <i>Pomoxis nigromaculatus</i>	15	0.99	5.6	2	0.22	25.0			
60. <i>Ammocrypta asprella</i>	20	1.32	27.8	1	0.11	25.0			
61. <i>Ammocrypta beani</i>	2	0.13	11.1	8	0.90	25.0			
62. <i>Etheostoma histrio</i>	7	0.46	27.8	2	0.22	50.0			
63. <i>Etheostoma nigrum</i>	3	0.20	11.1						
64. <i>Etheostoma procellare</i>	318	21.06	77.8	51	5.73	100.0			
65. <i>Etheostoma rupestre</i>	183	12.12	77.8	18	2.02	100.0			
66. <i>Etheostoma stigmaeum</i>	48	3.18	66.7	74	8.31	100.0			
67. <i>Etheostoma swaini</i>	1	0.07	5.6						
68. <i>Etheostoma whipplei</i>	22	1.46	44.4	6	0.67	50.0			
69. <i>Etheostoma (Nanostoma) sp.</i>	1	0.07	5.6	3	0.34	50.0			
70. <i>Percina caprodes</i>				2	0.22	25.0			
71. <i>Percina lenticula</i>				1	0.11	25.0			
72. <i>Percina maculata</i>	16	1.06	50.0	7	0.79	75.0			
73. <i>Percina nigrofasciata</i>	14	0.93	50.0	29	3.26	100.0			
74. <i>Percina ouachitae</i>	27	1.79	50.0	31	3.48	50.0			
75. <i>Percina sciera</i>				1	0.11	25.0			
76. <i>Percina shumardi</i>				1	0.11	25.0			
77. <i>Stizostedion vitreum</i>				3	0.34	25.0	6	0.38	0.06
78. <i>Aplodinotus grunniens</i>							34	2.13	0.33

Table 2. 1981 Monthly Hoop Net Catch in Bull Mountain Creek at 4 Sampling Stations (864 Net Days).

	J	F	M	A	M	J	J	A	S	O	N	D	Total
<i>Lepisosteus osseus</i>	1			1	1	27	1						30
<i>Amia calva</i>													1
<i>Anguilla rostrata</i>				2	5	3	4	1	1	1			17
<i>Dorosoma cepedianum</i>		1					1	2	1				5
<i>Hiodon tergisus</i>			4										4
<i>Cyprinus carpio</i>			1				3		1		1		6
<i>Notropis chrysoccephalus</i>			3										3
<i>Carpiodes velifer</i>							1						1
<i>Cycleptus elongatus</i>												1	1
<i>Erimyzon oblongus</i>												4	4
<i>Ictiobus bubalus</i>				2			1						3
<i>Minytrema melanops</i>			1										1
<i>Moxostoma carinatum</i>	1	5	1			1				1	1	1	6
<i>Moxostoma erythrum</i>	7	9	4	2					1		1	2	27
<i>Moxostoma poecilurum</i>	6	6	20	12	2	2	5	2	3	4	3	9	74
<i>Ictalurus natalis</i>	1	2					1						3
<i>Ictalurus punctatus</i>	20	436	29	18	16	41	58	3	10	7	10	175	823
<i>Pygidictis olivaris</i>						5	6	8	2	1	1	2	27
<i>Ambloplites arionum</i>	2	6	7	21	20	25	3	5	2	1	6	3	101
<i>Lepomis cyanellus</i>				1	1								2
<i>Lepomis gulosus</i>													1
<i>Lepomis macrochirus</i>	9	5	16	16	16	10	3	3	7	9	1		95
<i>Lepomis megalotis</i>			1	6	8	11	10	2	2	2	3	2	47
<i>Lepomis microlophus</i>				1	2		1	1					5
<i>Lepomis punctatus</i>											1		1
<i>Micropterus punctulatus</i>			2										2
<i>Micropterus salmoides</i>							1						1
<i>Pomoxis annularis</i>	1	2	8	13	18	6	4	7	1	1	3		64
<i>Pomoxis nigromaculatus</i>	1	2		3	3	1	1			2			13
<i>Stizostedion vitreum</i>			1							1			3
<i>Aplodinotus grunniens</i>						11	7	2		1	2	6	29



FISHES OF THE MIDDLE FORK OF THE KENTUCKY RIVER, KENTUCKY<sup>1</sup>

Branley A. Branson and Donald L. Batch<sup>2</sup>  
 Department of Biological Sciences  
 Eastern Kentucky University  
 Richmond, Kentucky 40475

## Abstract

Distributional data are provided for 91 fish species from the Middle Fork of the Kentucky River (27 collecting sites).

## Introduction

This contribution is a continuation of the work on Kentucky River drainage fishes (Branson and Batch 1983), and includes the results of fish inventories at 27 sites distributed from first-order streams to the confluence of the Middle Fork with the main Kentucky River. New distributional data for representatives of nine families, 27 genera, 64 species, and one hybrid combination (*Notropis rubellus* x *N. chrysocephalus*) are presented.

The Middle Fork of the Kentucky River is the smallest of the three headwater branches, having a drainage area only slightly in excess of 877 km<sup>2</sup>. There are fewer large tributaries in this drainage than in the other two forks, many of which are very short and of relatively low water volume throughout much of the year. Like the South Fork, however, the Middle Fork has been severely impacted by strip-mine, farm, and urban pollution.

The records listed here for *Phoxinus erythrogaster* and *Etheostoma tippecanoe* are the first from the Middle Fork system.

## Collecting Stations

The 27 numbered collecting stations and dates of sampling are listed below. In the annotated list that follows, species and specimens are referred to appropriate stations according to number. The species are numbered and arranged in the same sequence as they appear in the 1980 AFS checklist (Robins et al 1980). Species numbers followed by "A" either denote species for which published reports of occurrence from the Middle Fork system probably are in error, or (in the case of *Notropis rubellus* x *N. chrysocephalus*) a hybrid combination. The following abbreviations are used for the various collecting sites: SR=state road, US=U.S. highway, CR=county road, and KR=Kentucky state highway.

1. Sturgeon Creek, at CR 1071, Jackson-Owsley Co. line; 20 December 1971. Riffles and pools, 6.1-9.0 m wide, 20 cm-1.5 m deep; bottom of large rocks, gravel, sand. Species: 12,14,25,27,31-32,34-35,39,59,62,65,68,73-74,76,78,87.

2. Little Sturgeon Creek, just off SR 30, Travelers Rest, Owsley Co.; 22 January 1972. Riffles and pools, 7.6 m wide, 31 cm-0.9 m deep; bottom of bedrock, gravel, small rubble. Species: 12,14,20,25,35-36,39,43-44,49,63-64,72,76,78.

3. Sturgeon Creek at SR 587, Lee Co.; 29 April 1972. Riffles and pools, 0.0-12 m wide, 15 cm-1.2 m deep; bottom of gravel and small to medium-sized cobbles. Species: 12,14,25-27,31-32,35,39,44-45,55,64,66,72-74,76,78,81-83,85.

4. Sturgeon Creek, at SR 399, Lee Co.; 29 April 1972. Riffles and pools, 9.2-15 m wide, 15 cm-1.5 m deep; bottom of gravel and rock rubble. Species: 12,26-28,32,35,39,44,60,65,68,72,74,76,78,82-84.

5. Middle Fork of Kentucky River, at SR 708, Lee Co.; 24 June 1972. Riffles and pools, 24-31 m wide, 3

cm-1.3 m deep; bottom of gravel, small rubble, mud. Species: 12,14-15,22,25,27,31-32,35,37,39,44,48,59,62,64,69,74,76,78,82,84,86,89.

6. Twin Branch, 4.4 km W Oakdale, Breathitt-Lee co. line; 24 June 1972. Braided channel and pools, 9.2 m wide, 1.1-1.2 m deep; bottom of gravel, rubble and rocks. Species: 12,39,64.

7. Middle Fork of Kentucky River, at US 30, Breathitt Co.; 1 June 1972. Riffles and pools, 18.0-24 m wide, 25 cm-0.9 m deep. Bottom of gravel and rubble. Species: 1,12,14-15,17,19,22,25-27,31-32,35,37,39,43-44,49,64-65,67-68,71,74-76,78,80-84,86,89.

8. Small unnamed tributary of Middle Fork of Kentucky River, just off SR 315 above mouth of Punccheon Camp Creek, Breathitt Co.; 10 February 1973. Riffles and pools, 0.9-1.5 m wide, 15 cm-1.5 m deep; bottom of gravel, silt, organic debris. Species: 25,32,35,44,74.

9. Punccheon Camp Creek, at SR 315, Breathitt Co.; 10 February 1973. Riffles and pools, 1.8-4.6 m wide, 15 cm-1.5 m deep; bottom of gravel, silt, organic debris. Species: 12,14,25,27,31-32,35,39,44,74,78.

10. Turkey Creek, at CR 1114, Breathitt Co.; 3 March 1973. Riffles and pools, 4.6-7.6 m wide, 15 cm-0.9 m deep; bottom of gravel, rubble, silt. Species: 12,24,26-27,27A,28,31-32,34-35,39,43-44,49,67,74,76,78,81.

11. Burton Creek, at SR 38, Breathitt Co.; 3 March 1973. Riffles and pools, 3.0-6.1 m wide, 15.2 cm-1.0 m deep; bottom of gravel, rubble and large rocks. Species: 12,14,19,22,25-27,31-32,35,39,44,64,73-74,76,78,81.

12. Hell For Certain Creek, at SR 257, Leslie Co.; 14 April 1973. Riffles and pools, 6.1-9.0 m wide, 15 cm-1.2 m deep; bottom of gravel and small rubble. Species: 12,14,21,27,29,35,44,52,64,74,83.

13. Middle Fork of Kentucky River, 1.9 km north of Cowan, SR 931, Letcher Co.; 17 May 1979. Species: 12,14,27,35,39,44,73-74,81,87.

14. Bull Creek, at SR 257, Leslie Co.; 14 April 1973. Riffles and pools, 4.6-7.6 m wide, 15 cm-0.8 m deep; bottom of sand and gravel. Species: 14,27,31-32,35,49,74,83.

15. Cutshin Creek, at SR 699, Leslie Co.; 30 June 1973. Riffles and pools, 31 cm-0.9 m deep; bottom of sand, gravel, silt. Species: 12,14,20,25-29,35,39,43-44,48,72-74,78,81-83.

16. Raccoon Creek, at SR 80, Leslie Co.; 30 June 1973. Riffles and pools, 4.6-7.6 m wide, 15 cm-0.8 m deep; bottom of bedrock, organic litter, rubble, rocks. Species: 12,14,20,25-29,31-32,34-35,39,44,48,56,62,65,67,72-74,76,78-79,82,84,87.

17. Middle Fork of Kentucky River, at SR 80, Leslie Co.; 22 September 1973. Riffles and pools, 0.9 m-30 m wide, 15 cm-2.4 m deep; bottom of rubble and small rocks. Species: 12,16-17,19,25-27,27A,28-29,31-32,35,44,48-49,59-60,62,65,67-68,70,72-74,76,78,81-83,87,89-90.

18. Meadow Creek at Booneville, Owsley Co.; 25 October 1969. Species: 16,25,27,39,72-74,82-83.

19. Greasy Creek, at confluence with Middle Fork of Kentucky River, Leslie Co.; 17 November 1973. Riffles and pools, 6.0-10.7 m wide, 15 cm-1.3 m deep; bottom of gravel, sand, rubble. Species: 12,14,16,19,25,27-29,44,49,62,65,72-76,78,81-83.

20. Greasy Creek, at CR 2009, Leslie Co.; 23 October 1976. Riffles and pools, 15-21 m wide, 15-46 cm deep; bottom of gravel and small rocks. Species: 12,14,19,25,27,31-32,35,39,44,72-74,76,81-83.

21. Greasy Creek, 2.4 km E Chappell on Greasy Creek Road, Leslie Co.; 23 October 1976. Riffles and pools, 3.0-18 m wide, 15 cm-1.5 m deep; bottom of gravel, sand, rubble. Species: 2,12,14,25-30,35,44,47,62,65,67,73-76,78,81-82,87.

22. Laurel Fork of Greasy Creek, at Big Laurel, Harlan Co.; 23 October 1976. Riffles and pools, 3.0-4.6 m wide, 20-41 cm deep; bottom of large rocks, rubble, gravel. Species: 14,17,19,25-27,39,44,74,76,91.

23. Middle Fork of Kentucky River, just south of

<sup>1</sup>Supported by an Eastern Kentucky University faculty grant

<sup>2</sup>Dean, College of Natural and Mathematical Sciences, Eastern Kentucky University

Stinnett via US 421, Leslie Co.; 1 April 1978. Riffles and pools, 11-13.7 m wide, 15-76 cm deep; bottom of sandstone, sand, gravel and large rock slabs. Species: 12,14,16,19,25-29,35,44,48,67,72-74,76,78,81-82,87.

24. Beech Fork of Middle Fork of Kentucky River, S of Mozell via US 421, Leslie Co.; 1 April 1978. Riffles and pools, 3.0-6.1 m wide, 15-77 cm deep; bottom of sandstone rubble. Species: 12,14,19,27,35, 38-39,44,47,67,72,74,76.

25. Beech Fork of Middle Fork of Kentucky River, at junction of US 421 and SR 221, Harlan Co.; 1 April 1978. Riffles and pools, 1.8-3.6 m wide, 15-61 cm deep; bottom of sandstone rubble. Species: 39.

26. Middle Fork of Kentucky River, at CR 1780, Leslie Co.; 2 April 1978. Riffles and pools, 6.1-11.0 m wide, 15 cm-1.1 m deep; bottom of sandstone rubble and gravel. Species: 12,14,19,25,27,31,35,39,44,48,55-56,60,62,65,68,72-74,76,81-82,87.

27. Buck Fork, at confluence with Sturgeon Creek, Lee Co.; 22 Feb. 1972. Riffles and pools, 4.6 m wide, 30-61 cm deep; bottom of rubble and gravel. Species: 12,19,22,25-27,31-32,35,44,48,55-56,59-60,62,65,67-68, 73,76,81-83.

#### Annotated List of Fishes

Collection localities are indicated by numbers, and in some cases these are followed (in parentheses) by numbers of specimens. The common and scientific names and numerical arrangement of species employed herein follow Robins et al (1980). Including the species reported here, 91 species of fishes are known from the Middle Fork of the Kentucky River, a fairly extensive list considering that Jones (1973) only reported 99 species from the entire Kentucky River drainage. Those species that are introduced or which were classified by Branson et al (1981) as endangered, threatened, status undetermined, etc. in Kentucky are so indicated following the species name.

#### Family Petromyzontidae (lampreys)

1. Ichthyomyzon bdellium (Jordan)--Ohio lamprey. Collections: 7(1). Previous records: Rohde and Lanteigne-Courchene in Lee et al (1980) - three localities mapped in Middle Fork system. Rare in Kentucky River drainage.

2. Ichthyomyzon fossor Reighard and Cummins - northern brook lamprey. Threatened.

Collections: 21(5). Previous records: Bauer and Branson (1979) - this collection: Rohde and Lanteigne-Courchene in Lee et al (1980) - one locality mapped in Middle Fork system.

3. Ichthyomyzon greeleyi Hubbs and Trautman - mountain brook lamprey. Status undetermined.

Collections: none. Previous records: Turner (1967) - Greasy Cr., Leslie Co.; Clay (1975) - below Buckhorn Reservoir Dam, Perry Co., and Buckhorn Reservoir, Leslie Co.

4. Lampetra (Okkelbergia) aepyptera (Abbott) - least brook lamprey.

Collections: none. Previous records: Clay (1975), Rohde and Lanteigne-Courchene in Lee et al (1980) (mapped). Rare in Kentucky River drainage (Walsh and Burr 1981).

5. Lampetra appendix (DeKay) - American brook lamprey. Special Concern.

Collections: none. Previous records: Turner (1967), Clay (1975), Rohde in Lee et al (1980) (mapped) - Greasy Cr., Leslie Co. This is the same species to which the specific name lamottei (or lamottenii) was formerly applied.

#### Family Lepisosteidae (Gars)

6. Lepisosteus osseus (Linnaeus) - longnose gar. Collections: none. Previous records: Turner (1959) - Middle Fk. near mouth of Bull Cr. and Cutshin Cr., Leslie Co.; Middle Fk., 3.2 km above Buckhorn Reservoir Dam, Perry Co.; Turner (1967), Charles (1967) - mouth of Greasy Cr., Leslie Co., and Buckhorn

Reservoir, Perry Co.; Jones (1973) - Middle Fk., Perry and Lee cos. The longnose gar is the only lepisosteid known from the Kentucky River drainage, where it is relatively uncommon.

#### Family Clupeidae (Herrings and Shads)

Two clupeids have been stocked in various reservoirs in the Middle Fork system (Charles 1967). Neither species is very common.

7. Dorosoma cepedianum (Lesueur) - gizzard shad. Collections: none. Previous records: Turner (1967) - Buckhorn Reservoir; Jones (1973) - Middle Fk., Perry and Lee cos.

8. Dorosoma petenense (Gunther) - threadfin shad. Collections: none. Previous records: Charles (1967), Turner (1967) - Buckhorn Reservoir. Adversely affected by cold winters.

#### Family Hiodontidae (Mooneyes)

Although mooneyes (Hiodon tergisus) were collected from the South Fork (Branson and Batch 1983), no hiodontids were taken from the Middle Fork.

9. Hiodon alosoides (Rafinesque) - goldeye. Collections: none. Previous records: none. Clay (1975) indicated species as "common in lower portion of Middle Fork."

#### Family Salmonidae (Trouts)

10. Salmo gairdneri Richardson - rainbow trout. Introduced.

Collections: none. Previous records: Jones (1973) - introduced in several Middle Fork tributaries, including Laurel Fk., Harlan and Leslie cos.

#### Family Esocidae (Pikes)

As in the South Fork (Branson and Batch 1983), there is only one esocid known from the Middle Fork system.

11. Esox masquinongy (Mitchill) - muskellunge. Special Concern.

Collections: none. Previous records: Crossman, in Lee et al (1980) - mapped from all three forks of the Kentucky River.

#### Family Cyprinidae (Carps and Minnows)

12. Camptostoma anomalum (Rafinesque) - central stoneroller.

Collections: 1-7, 9-13, 15-17, 19-21, 23-24, 26-27. Previous records: Woolman (1892), Turner (1967), Jones (1973), Harker et al (1979) - numerous localities.

13. Cyprinus carpio Linnaeus - carp. Introduced. Collections: none. Previous records: Harker et al (1979) - mouth of Squabble Cr. (Buckhorn Reservoir).

14. Ericymba buccata Cope - silverjaw minnow. Collections: 1-3, 5, 7, 9, 11-16, 19-24, 26. Previous records: Woolman (1892); Turner (1967); Jones (1973); Harker et al (1979); Burr, Retzer and Mayden (1980); Gilbert in Lee et al (1980) - numerous localities.

15. Hybopsis aestivalis (Girard) - speckled chub. Collections: 5(13), 7(6). Previous records: Wallace in Lee et al (1980) indicated above are only records for Middle Fork system. Not known from South Fork system (Branson and Batch 1983). Not presently included on Kentucky list of endangered or threatened biota, but probably should be listed as threatened, or even endangered, in the state.

16. Hybopsis amblops (Rafinesque) - bigeye chub. Collections 17(1), 18(1), 19(80), 23(1). Previous records: Woolman (1892) - Cutshin Cr. and Middle Fk., near Hyden; Turner (1967) - Greasy Cr. and Middle Fk., Leslie Co.; Jones (1973) - Middle Fk., Leslie Co., Harker et al (1979) - Greasy Cr., Leslie Co. Rare in most of upper Kentucky River drainage.

17. Hybopsis dissimilis (Kirtland) - streamline chub.

Collections: 7(3), 17(1), 22(1). Previous records: Turner (1967) - Greasy Cr., Leslie Co., and Middle Fk., Leslie, Perry and Breathitt cos.; Clay (1975) - Greasy Cr. and Middle Fk.; Harris in Lee et al (1980) (mapped) - Middle Fk. Records for this species are scarce and spotty throughout Kentucky.

18. Hybopsis storeriana (Kirtland) - silver chub.

Collections: none. Although known from the South Fk. (Branson and Batch 1983) and North Fk. (Gilbert in Lee et al 1980), there are no records of this species from the Middle Fk., although it probably occurs in the main stream.

19. Nocomis micropogon (Cope) - river chub.

Collections: 7, 11, 17, 19-20, 22-24, 26-27. Previous records: Woolman (1892), Lachner and Jenkins (1967), Turner (1967), Jones (1973), Harker et al (1979) - numerous records.

20. Notropis ardens Cope - rosefin shiner.

Collections: 2(abundant), 15(1), 16(abundant). Previous records: Jones (1973) - Cutshin Cr., Leslie Co.; Harker et al (1979) - Laurel Fk., Knott Co. Considering its abundance in the South Fork system (Branson and Batch 1983), this species is surprisingly scarce in the Middle Fork.

21. Notropis ariommus (Cope) - popeye shiner.

Collections: 12(1). Previous records: Woolman (1892) - Middle Fk. near Hyden; Turner (1967) - Greasy Cr., Leslie Co. and Middle Fork, Leslie, Perry and Breathitt cos.; Gilbert (1969), Clay (1975), Greasy Cr. and Middle Fk.; Harker et al (1979), Greasy Cr., Leslie Co.; Gilbert in Lee et al (1980) (mapped) - Middle Fork. Status presently undetermined, but probably should be listed as endangered in Kentucky.

22. Notropis atherinoides Rafinesque - emerald shiner.

Collections: 5, 7, 11, 27. Previous records: Charles (1967) - Buckhorn Reservoir; Turner (1967) - Greasy Cr. and Laurel Fk., Leslie Co., and Middle Fk., Leslie, Perry and Breathitt cos.; Jones (1973) - Greasy Cr.; Harker et al (1979) - Sturgeon Cr., Lee Co., and Squabble Cr., Perry Co.; Gilbert and Burgess in Lee et al (1980) (mapped) Middle Fk.

22A. Notropis blennioides (Girard) - river shiner.

Collections: none. The only records for this big-river fish from the upper Kentucky River drainage are those of Woolman (1892) from Bull and Cutshin creeks and the Middle Fork near Hyden. These records are almost certainly based on either Notropis stramineus or N. volucellus (or both), the species to which the name blennioides long was jointly and erroneously applied. The true N. blennioides does not occur in the upper Kentucky River drainage (Gilbert in Lee et al 1980), and almost certainly should be deleted from the present list.

23. Notropis boops Gilbert - bigeye shiner.

Collections: none. Previous records: Gilbert in Lee et al (1980) (mapped) - Middle Fk., but this record needs verification. We (Branson and Batch 1983) reported the bigeye chub as rare in the South Fork, and did not collect it at all from the Middle Fork.

24. Notropis burchanani Meek - ghost shiner.

Collections: none. Previous records: The only basis for inclusion of this species in the Middle Fork fauna is Clay's (1975) distributional statement. Since the ghost shiner is primarily a big-river minnow, its presence in the upper Kentucky River drainage is problematic.

25. Notropis chrysocephalus chrysocephalus (Rafinesque) - striped shiner.

Collections: 1-3, 5, 7-11, 15-23, 26-27. Previous records: Woolman (1892); Turner (1967); Resh, Hoyt and Neff (1971); Jones (1973); Harker et al (1979); Gilbert in Lee et al (1980) (mapped) - numerous localities. Earlier literature references refer to this species either as Notropis megalops or Notropis cornutus.

26. Notropis photogenis (Cope) - silver shiner.

Collections: 3-4, 7, 11, 15-17, 21-23, 27. Previous records: Turner (1967); Jones (1973), Harker et al (1979), Gilbert in Lee et al (1980) - numerous localities.

27. Notropis rubellus (Agassiz) - rosyface shiner.

Collections: 1, 3-5, 7, 9-24, 26-27. Previous records: Turner (1967), Jones (1973), Harker et al (1979), Gilbert and Burgess in Lee et al (1980) - numerous localities.

27A. Notropis rubellus x Notropis chrysocephalus.

Collections: 10(1), 17(2). Previous records: Harker et al (1979) reported this hybrid combination from Squabble Cr., at Buckhorn Reservoir, Perry Co.

28. Notropis spilopterus (Cope) - spotfin shiner.

Collections: 4, 10, 15-17, 19, 21, 23. Previous records: Turner (1967) - Greasy Cr., Leslie Co., and Middle Fk., Leslie, Perry and Breathitt cos.; Jones (1973) - Middle Fk., Perry, Lee and Leslie cos., Cutshin and Greasy creeks, and Laurel Fk., Harlan and Leslie cos.; Harker et al (1979) - Greasy Cr., Leslie Co.; Gilbert and Burgess in Lee et al (1980) (mapped) - Middle Fk. Based on our records, this species is only locally abundant in the Middle Fork.

29. Notropis stramineus (Cope) - sand shiner.

Collections: 12, 15-17, 19, 21, 23. Previous records: Turner (1967) - Greasy Cr., Leslie Co., and Middle Fk., Leslie and Perry cos.; Jones (1973), Middle Fk., Leslie Co., and Cutshin Cr.; Harker et al (1979), Greasy Cr., Leslie Co., and Squabble Cr., Perry Co.

30. Notropis telescopus (Cope) - telescope shiner.

Introduced. Collections: 21(1). Previous records: none. So far as we can discern, this is the only verified record of the telescope shiner from the Middle Fork system. The species is very common in the adjacent Cumberland River drainage.

31. Notropis volucellus (Cope) - mimic shiner.

Collections: 1, 3, 5-7, 9-11, 14, 16-17, 20, 26-27. Previous records: Turner (1967), Harker et al (1979), Gilbert and Burgess in Lee et al (1980) - numerous localities.

32. Notropis whipplei (Girard) - steelcolor shiner.

Collections: 1, 3-4, 7-11, 14, 16-17, 20, 27. Previous records: Woolman (1892), Charles (1967), Turner (1967), Harker et al (1979), Gilbert and Burgess in Lee et al (1980) - numerous localities. Woolman's (1892) records may apply entirely or in part to the closely related N. spilopterus, which at that time was not distinguished from N. whipplei.

33. Phenacobius mirabilis (Girard) - suckermouth minnow.

Collections: none. Previous records: Turner (1967) - Buckhorn Reservoir area (prior to impoundment), Leslie Co.; this record is in need of verification.

34. Phoxinus (Chrosomus) erythrogaster (Rafinesque) - southern redbelly dace.

Collections: 1(1), 10(4), 16(2). The collections reported here are the only ones from the Middle Fork system.

35. Pimephales notatus (Rafinesque) - bluntnose minnow.

Collections: 1-5, 7-17, 20-21, 23-24, 26-27. Previous records: Woolman (1892), Charles (1967), Jones (1973), Harker et al (1979), Lee and Shute in Lee et al (1980) - numerous localities.

36. Pimephales promelas (Rafinesque) - fathead minnow.

Collections: 2(2). Previous records: Charles (1967) - Buckhorn Reservoir; Jones (1973) - Middle Fk., Leslie Co.; Harker et al (1979) - Canoe Cr., Breathitt Co.; Lee and Shute in Lee et al (1980) (mapped) - Middle Fk.

37. Pimephales vigilax Baird and Girard - bullhead minnow.

Collections: 5(17), 7(22). Previous records: Turner (1967) - Greasy Cr., Leslie Co., and Buckhorn Reservoir area (before impoundment). Nowhere abundant in Kentucky River drainage.

38. Rhinichthys atratulus meleagris (Hermann) - blacknose dace.

Collection: 24(1). Previous records: Jones (1973) - Cutshin Cr., Leslie Co. Very rare in upper Kentucky River drainage.

39. Semotilus atromaculatus (Mitchill) - creek chub.

Collections: 1-7, 9-11, 13, 15-16, 18, 20, 22,



24-26. Previous records: Turner (1967), Jones (1973), Harker et al (1979), Lee and Platania in Lee et al (1980) - numerous localities.

#### Family Catostomidae (Suckers)

40. Carpiodes carpio (Rafinesque) - river carpsucker.

Collections: none. Although there are no published records of this species from the Middle Fork of the Kentucky River, the species probably occurs in the lower parts of the system.

41. Carpiodes cyprinus (Lesueur) - quillback.

Collections: none. Previous records: Charles (1967) - Buckhorn Reservoir; Turner (1967) - Greasy Cr., Leslie Co.; Jones (1973) - Middle Fk., Leslie and Perry cos.; Plantania and Jenkins in Lee et al (1980) - mapped in Middle Fork.

42. Carpiodes velifer (Rafinesque) - highfin carpsucker.

Collections: none. Previous records: Woolman (1892) - near Hyden; Turner (1967) - Greasy Cr., Leslie Co., and Middle Fk., Breathitt, Leslie and Perry cos. Because of difficulty of separating young of this species from those of C. carpio, the above records are tentative pending examination of specimens.

43. Catostomus commersoni (Lacepede) - white sucker.

Collections: 2, 7, 10, 15. Previous records: Woolman (1892), Jones (1973), Harker et al (1979), Lee and Kucas in Lee et al (1980) - numerous localities. Although relatively common in large headwater creeks, the white sucker is uncommon in larger streams.

44. Hypentelium nigricans (Lesueur) - northern hog sucker.

Collections: 2-5, 7-13, 15-17, 19-24, 26-27. Previous records: Woolman (1892), Turner (1959), Carter (1966), Charles (1967), Jones (1973), Harker et al (1979) - numerous localities. The most widespread and abundant sucker in the Middle Fork system.

45. Minytrema melanops (Rafinesque) - spotted sucker.

Collections: 3(4 immature). This appears to be the only published record for this species from the Middle Fork system.

46. Moxostoma anisurum (Rafinesque) - silver redbhorse.

Collections: none. Previous records: Charles (1967) - Buckhorn Reservoir; Turner (1967) - Buckhorn Reservoir area (prior to impoundment). These records need verification, particularly since Jenkins in Lee et al (1980) did not show localities from the Middle Fork system.

47. Moxostoma duquesnei (Lesueur) - black redbhorse.

Collections: 21(1), 24(1). Previous records: Turner (1967), Charles (1967) - Greasy Cr., Leslie Co., and Buckhorn Reservoir, Leslie and Perry cos.; Harker et al (1979) - Canoe Cr., Breathitt Co., and Greasy Cr., Leslie Co.; Jenkins in Lee et al (1980) - mapped in Middle Fork.

48. Moxostoma erythrurum (Rafinesque) - golden redbhorse.

Collections: 5, 15-17, 23, 26-27. Previous records: Turner (1967), Charles (1967), Jones (1973), Harker et al (1979), Jenkins in Lee et al (1980) - numerous localities.

49. Moxostoma macrolepidotum breviceps (Cope) - shorthead redbhorse.

Collections: 2, 7, 10, 14, 17, 19. Previous records: Woolman (1892) - Middle Fk. near Hyden; Turner (1967) - Greasy Cr., Leslie Co., and Middle Fk., Leslie and Perry cos.; Jenkins in Lee et al (1980) - mapped in Middle Fork.

#### Family Ictaluridae (bullhead catfishes)

50. Ictalurus furcatus (Lesueur) - blue catfish.

Collections: none. Previous records: The only basis for inclusion of this species is Clay's (1975) general statement regarding presence "from the lower Middle Fork."

51. Ictalurus melas (Rafinesque) - black bullhead.

Collections: none. Previous records: none.

Included here on the basis of scattered records from the uplands of Kentucky, including numerous records from the South Fork system (Branson and Batch 1983).

52. Ictalurus natalis (Lesueur) - yellow bullhead.

Collections: 12(1). Previous records: Turner (1967) - main stream in Leslie and Perry cos.; Charles (1967) - Buckhorn Reservoir; Jones (1973) - Cutshin Cr., Leslie Co.

53. Ictalurus punctatus (Rafinesque) - channel catfish.

Collections: none. Previous records: Turner (1959) - Greasy Cr., Leslie Co., Middle Fk., Perry and Leslie cos.; Charles (1967) - Greasy Cr., Leslie Co., Middle Fk., Breathitt, Leslie and Perry cos.; Jones (1973) - Middle Fk., Lee and Perry cos.

54. Noturus eleutherus Jordan - mountain madtom.

Collections: none. Previous records: Turner (1967) - Middle Fork system in Perry Co.; subsequently cited by Taylor (1969), Clay (1975), and Rohde in Lee et al (1980). This record requires verification.

55. Noturus flavus Rafinesque - stonecat.

Collections: 3(1), 26(1), 27(1). Previous records: Taylor (1969) - Middle Fk.; Harker et al (1979) - Sturgeon Cr., Lee Co.

56. Noturus miurus Jordan - brindled madtom.

Collections: 16, 26-27. Previous records: Woolman (1892) - Middle Fk. near Hyden; Turner (1967), Taylor (1969) - Middle Fk., Breathitt and Leslie cos. The brindled madtom does not appear to be as common in the Middle Fork as in the South Fork (Branson and Batch 1983).

57. Noturus nocturnus Jordan and Gilbert - freckled madtom.

Collections: none. Previous records: Turner (1967) - Middle Fk., in Buckhorn Reservoir area, Breathitt, Leslie and Perry cos.; record subsequently cited by Clay (1975) and Rohde in Lee et al (1980). Records needs verification.

58. Noturus stigmosus Taylor - northern madtom. Threatened.

Collections: none. Previous records: Clay (1975) - Middle Fk., Leslie Co.; mapped by Rhode in Lee et al (1980). Specimens said to be in University of Louisville fish collection (UL-11,868), but could not be located by us. This records needs verification.

59. Pylodictis olivaris (Rafinesque) - flathead catfish.

Collections: 1, 5, 17, 27. Previous records: Charles (1967) - Buckhorn Reservoir; Turner (1967) - Middle Fk., at confluence with Laurel Fork, Leslie Co., and Middle Fk., Leslie and Perry cos.; Jones (1973) - Middle Fk., Leslie and Perry cos.; Harker et al (1979) - Greasy Cr., 2.5 km above Chappell, Leslie Co. Although considered rare in the upper Kentucky River drainage, young are often collected from deep riffles over large rocks in the main stream.

#### Family Cyprinodontidae (Killifishes)

##### Family Poeciliidae (livebearers)

Although both Fundulus notatus (Cyprinodontidae) and Gambusia affinis (Poeciliidae) were collected in the South Fork system (Branson and Batch 1983), neither these nor any other members of the two families were collected during our work in the Middle Fork. No previous records are known for these groups from the system.

##### Family Atherinidae (Siversides)

60. Labidesthes sicculus sicculus (Cope) - brook silverside.

Collections: 4, 17, 26-27. Previous records: Turner (1959, 1967), Charles (1967), Lee in Lee et al (1980) - numerous localities.

##### Family Percichthyidae (Temperate basses)

61. Morone chrysops (Rafinesque) - white bass.

Collections: none. Previous records: Carter (1966), Charles (1967), Turner (1967) - Buckhorn Reservoir.

## Family Centrarchidae (Sunfishes and Black basses)

62. Ambloplites rupestris (Rafinesque) - rockbass

Collections: 1, 5, 16-17, 19, 21, 26-27. Previous records: Woolman (1892), Turner (1959, 1967), Charles (1967), Jones (1973), Harker et al (1979) - numerous localities. Although there are a number of records of this species from the Middle Fork system, the species nevertheless appears to be less common here than for the upper Kentucky River drainage in general.

63. Lepomis cyanellus Rafinesque - green sunfish.

Collections: 2(2). Previous records: Turner (1959, 1967), Charles (1967), Lee in Lee et al (1980) (mapped) - Buckhorn Reservoir and vicinity. Since this is primarily a lowland fish, the paucity of records from upper areas of the Middle Fork system is not particularly surprising.

64. Lepomis macrochirus Rafinesque - bluegill.

Collections: 2-3, 5-7, 11-12. Previous records: Charles (1967), Turner (1967), Jones (1973), Harker et al (1979), Lee in Lee et al (1980) (mapped) - numerous localities. We took relatively few bluegills from small creeks, most of our specimens coming from large, relatively deep pools.

65. Lepomis megalotis (Rafinesque) - longear sunfish.

Collections: 1, 4, 7, 16-17, 19, 21, 26-27. Previous records: Woolman (1892), Turner (1959, 1967), Charles (1967), Jones (1973), Harker et al (1979), Baner in Lee et al (1980) (mapped) - numerous localities.

66. Lepomis microlophus (Günther) - redear sunfish. Introduced.

Collections: 3(1). This is the only published record for the redear sunfish from the Middle Fork system.

67. Micropterus dolomieu (Lacepede) - smallmouth bass.

Collections: 7, 10, 16-17, 21, 23-24, 27. Previous records: Woolman (1892), Turner (1959, 1967), Jones (1973), Harker et al (1979), Lee in Lee et al (1980) (mapped) - numerous localities.

68. Micropterus punctulatus (Rafinesque) - spotted bass.

Collections: 1, 4, 7, 17, 26-27. Previous records: Turner (1959, 1967), Charles (1967), Jones (1973), Harker et al (1979), Gilbert in Lee et al (1980) (mapped) - numerous localities.

69. Micropterus salmoides salmoides (Lacepede) - northern largemouth bass.

Collections: 5. Previous records: Charles (1967) - Buckhorn Reservoir; Jones (1973) - Middle Fk., Perry and Lee cos.; Cutshin Cr., Leslie Co.; Laurel Fk., Harlan and Leslie cos. Although the record from Buckhorn Reservoir likely is valid, specimens on which the other records are based should be reexamined (if available) in order to confirm that they were not based on the superficially similar spotted bass.

70. Pomoxis annularis Rafinesque - white crappie.

Collections: 17. Previous records: Turner (1959, 1967) - Buckhorn Reservoir; Jones (1973) - Middle Fk., Perry and Lee cos.

## Family Percidae (Perches and Darters)

71. Ammocrypta pellucida (Agassiz) - eastern sand darter. Threatened.

Collections: 7(12). Previous records: Turner (1967) - Greasy Cr., Leslie Co.; Middle Fk., Perry and Leslie cos.; Clay (1975) - Little Goose Cr., Clay Co.; Warren (1981) - Greasy Cr. and Middle Fk., Leslie Co. There are few records for this species from the Kentucky River drainage, most of which are old. Although listed in the Threatened category by Branson et al (1981), this and other species of the genus Ammocrypta probably should be reassigned to Endangered status in Kentucky.

72. Etheostoma baileyi Page and Burr - emerald darter.

Collections: 3(4), 4(1), 15(1), 16(6), 17(4), 18(2), 19(4), 20(7), 23(6), 24(1), 26(2) (last two specimens now in University of Tennessee collection

[UT91.1610]). Page and Burr's (1982) recent description of this species did not include records from the Middle Fork of the Kentucky River. Although seasonally abundant and widespread in the Kentucky River drainage, there are few previously published distributional records for the Middle Fork. Previous records: Turner (1967) - Greasy Cr., Leslie Co.; Harker et al (1979) - Sturgeon Cr., Lee Co., Greasy and Cutshin creeks, Leslie Co., and Squabble Cr., Perry Co.

73. Etheostoma blennioides blennioides Rafinesque - greenside darter.

Collections: 1, 3, 11, 13, 15-21, 23, 26-27. Always captured along margins of riffles and chutes with well-developed stands of water willow. Previous records: Woolman (1892), Charles (1967), Turner (1967), Jones (1973), Harker et al (1979), Denoncourt in Lee et al (1980) (mapped) - numerous localities.

74. Etheostoma caeruleum Storer - rainbow darter.

Collections: 1, 3-5, 7-24, 26. As in the South Fork (Branson and Batch 1982), the rainbow and fantail darters are the dominant percids in the Middle Fork. Previous records: Woolman (1892), Jones (1973), Harker et al (1979), Stauffer and Hocutt in Lee et al (1980) (mapped) - numerous localities.

75. Etheostoma camurum (Cope) - bluebreast darter.

Collections: 7(3), 19(2), 21(3). Etheostoma camurum has a very discontinuous distribution in the upper Kentucky River drainage. There are few records from the Middle Fork. Previous records: Turner's (1967) records for E. maculatum from Greasy Creek, Leslie Co., and the Middle Fork, Leslie and Perry cos., are probably the result of misidentified E. camurum; Zorach (1972) - Middle Fk.; Jones (1973) - Cutshin Cr., Leslie Co.; Harker et al (1979) - Greasy Cr., Leslie Co.; Stauffer in Lee et al (1980) (mapped) - Middle Fork system.

76. Etheostoma flabellare flabellare Rafinesque - fantail darter.

Collections: 1-5, 7, 10-11, 16-17, 19-24, 26-27. Previous records: Turner (1967), Jones (1973), Harker et al (1979), Lee in Lee et al (1980) (mapped) - numerous localities.

77. Etheostoma maculatum Kirtland - spotted darter.

Collections: none. The only record of the spotted darter from the upper Kentucky River drainage emanates from Turner (1967) (repeated by Clay [1975]) from Greasy Creek and the Middle Fork, Leslie Co. Since E. camurum is not rare in that vicinity, there is good circumstantial evidence for misidentification.

78. Etheostoma nigrum nigrum Rafinesque - johnny darter.

Collections: 1-5, 7, 9-11, 15-17, 19, 21, 23. This species is widespread and common where clean sand is encountered through the Kentucky River drainage. Previous records: Woolman (1892), Turner (1967), Jones (1973), Harker et al (1979), Bruner in Lee et al (1980) (mapped) - numerous localities.

79. Etheostoma sagitta spilatum (Gilbert) - arrow darter. Threatened.

Collections: 16(1). This species is becoming scarce throughout its range, and population sizes are often small at any given locality. The type locality for this subspecies is Sturgeon Creek, near Travelers Rest, Owsley Co., Kentucky (Gilbert 1887), although we were unable to find specimens at that site. Previous records: Woolman (1892) - Cutshin Cr. and Middle Fk. near Hyden; Kuehne and Bailey (1961), Clay (1975), Harker et al (1979) - Sturgeon Cr., near its confluence, Lee Co.; Gilbert and Burgess in Lee et al (1980) (mapped) - Middle Fork system.

80. Etheostoma tippecanoe Jordan and Evermann - Tippecanoe darter. Threatened.

Collections: 7(10). So far as we can tell, this is the only published record for this attractive little fish from the Middle Fork system. Zorach (1969) did not list any Middle Fork localities. Because of its highly seasonal abundance, a markedly discontinuous distribution, and a habitat at the foot of waist-deep, swift riffles over pea-sized gravel, the biology of the Tippecanoe darter is poorly understood. It is interesting to note that we recently (26 September 1982) collected 11 adult specimens (23.0-36.0 mm SL)

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from the Green River at SR 88, Green Co., Kentucky, in company with 17 other species including Hybopsis dissimilis, Phenacobius uranops, Noturus eleutherus, Etheostoma bellum, Etheostoma rafinesquei, Percina copelandi and Percina evides.

81. Etheostoma variatum Kirtland - variegated darter. Collections: 3, 7, 10-11, 13, 15, 17, 19-21, 23, 26-27. This colorful fish typically lives in deep, swift riffles over a large-rock substrate. Previous records: Woolman (1892), Turner (1967), Jones (1973), Harker et al (1979), Gilbert in Lee et al (1980) (mapped) - numerous localities.

82. Etheostoma zonale (Cope) - banded darter. Collections: 3-5, 15-21, 23, 26-27. Previous records: Woolman (1892), Turner (1967), Jones (1973), Harker et al (1979), Denoncourt in Lee et al (1980) (mapped) - numerous localities.

83. Percina caprodes caprodes (Rafinesque) - central logperch. Collections: 3-4, 7, 12, 14-15, 17, 19-20, 27. Previous records: Charles (1967), Turner (1967), Jones (1973), Thompson in Lee et al (1980) (mapped) - numerous localities.

84. Percina copelandi Jordan - channel darter. Special Concern.

Collections: 4(2), 5(2), 7(11), 16(2), 17(2). There are few records for the channel darter through eastern Kentucky in general and the upper Kentucky River drainage in particular. Previous records: Turner (1967) - Greasy Cr., Leslie Co.; Middle Fk., Leslie-Perry cos. (also see Clay 1975); Gilbert and Burgess in Lee et al (1980) (mapped) - Middle Fork system. Our specimens are currently being studied by Dr. Royal Suttikus, Tulane University.

85. Percina (Odontopholis) n. sp. cf. cymatotaenia (Gilbert and Meek) - bluestripe darter. Special Concern.

Collections: 3(1). The only other record for this species is that of Harker et al (1979) from the mouth of Sturgeon Creek, Lee Co.

86. Percina evides (Jordan and Copeland) - gilt darter. Special Concern.

Collections: 5, 7. The gilt darter is of sporadic occurrence in the upper Kentucky River drainage. The only other published record from the Middle Fork system

is that of Turner (1967), Perry Co. (also see Clay [1975] and Denoncourt in Lee et al [1980]).

87. Percina maculata (Girard) - blackside darter.

Collections: 1, 13, 17, 21, 23, 26. Previous records: Turner (1967), Jones (1973), Harker et al (1979), Beckham in Lee et al (1980) (mapped) - numerous localities.

88. Percina oxyrhyncha (Hubbs and Raney) - sharpnose darter. Status undetermined.

Collections: none. Previous records: Turner (1967) reported Percina phoxocephala from Greasy Cr., Leslie Co., and Middle Fork in Perry and Breathitt cos. However, Bruce Turner, Tulane University, has determined that all material from the upper Kentucky River is the present species. The status listed above probably should be changed to Threatened.

89. Percina sciera (Swain) - dusky darter.

Collections: 5(7), 7(1), 17(2). The only other published records (included by Page in Lee et al [1980]) are those by Turner (1967) from Greasy Creek, Leslie Co., and the Middle Fork, Leslie-Breathitt cos.

#### Family Sciaenidae (Drums)

90. Aplodinotus grunniens (Rafinesque) - freshwater drum.

Collections: 17(1). This large-stream fish was previously reported from Buckhorn Reservoir (Charles 1967, Turner 1967) and the Middle Fork, Perry and Lee cos. (Jones 1973).

#### Family Cottidae (Sculpins)

91. Cottus caroliniae (Gill) - banded sculpin.

Collections: 22(3). Although Lee in Lee et al (1980) listed the banded sculpin from the Middle Fork, we were unable to locate any other published references to the species from that system.

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## A SURVEY OF FISH COMMUNITIES OF STREAMS IN COAL SURFACE MINING AREAS OF THE CUMBERLAND PLATEAU, TENNESSEE

Christopher J. O'Bara and R. Don Estes

Tennessee Cooperative Fishery Research Unit  
Tennessee Technological University  
Cookeville, Tennessee

### Introduction

Coal, the most abundant and economically feasible energy source in the United States, has been labelled the resource to fulfill the energy needs of today's society. Coal production is expected to increase by 65 to 85 percent above the production level of 1975 by the year 1985 (Yancik 1979).

Increased production of coal leads to a greater stress on the aquatic environment due to the influx of acid mine drainage (AMD) and silt. AMD is a product of both surface and underground mining, but is an extremely serious problem in surface mining. It is formed by the oxidation of pyritic material found in the strata surrounding the coal seam and will result in the lowering of the pH, increasing iron concentration and the formation of a sterile ferric hydroxide (FeOH) slime or "yellowboy" on the substrate (Barnes and

Romberger 1969).

Siltation resulting from surface mining also has a serious impact on the lotic environment. Increases in silt have been found to decrease benthic macroinvertebrate communities, thus affecting the ichthyofauna of a stream. Although the influx of AMD and silt are the major degrading factors of coal mining, increased heavy metal concentrations and coal mines also have been found to severely affect the aquatic environment.

Many studies have depicted the detrimental effects of coal mining. Vaughan (1979) found that diatoms and fish species diversities were reduced in streams receiving AMD. Koryak et al (1972) reported that riffle zoobenthos were affected adversely and their community structure was altered radically. Branson and Batch (1972) noted changes in fish communities due to siltation from surface mining, and concluded that fish were eliminated or forced to emigrate because of the loss of a food source or reduction in their reproductive capabilities. Wilson et al (1981) found increased heavy metal concentrations in the livers of rainbow trout (Salmo gairdneri) and brown trout (Salmo trutta) in streams receiving AMD.

The purpose of our study was two-fold: First, to

determine the effects of varying degrees of coal mining activities on the ichthyofauna of selected streams; and second, to attempt to identify streams that should be considered environmentally sensitive by state and federal agencies. The criteria for these streams is the occurrence of endangered, threatened, or specially concerned species as determined by the Tennessee Heritage Program, or a rich ichthyofauna in watersheds in which the majority of streams are heavily impacted.

#### Study Area

The Cumberland Plateau region of Tennessee is part of the Appalachian Plateau physiographic province of eastern United States, which extends from the southern border of New York to central Alabama (Luther 1959). The plateau is a broad, flat-topped tableland capped primarily with sandstone of Pennsylvanian geological age. The surface elevation of the plateau is usually between 1,700 and 2,000 feet above sea level.

A number of the streams sampled are adjacent to the plateau. The Sequatchie River and the Little Sequatchie River flow through a large, broad valley in southeastern Tennessee. This valley is bordered on both sides by the plateau. The Wolf River, West Fork of Obey River, and Elk River originate on the plateau, but cascade onto the Eastern Highland Rim. The rim is of Mississippian geological age and constituted primarily of a limestone conglomerate (Luther 1959).

All streams are in the Tennessee or Cumberland river drainages. Major systems within the Tennessee drainage include the Clinch and Powell rivers, whereas those in the Cumberland drainage include the Big South Fork, Caney Fork, Clear Fork, and Obey River.

#### Materials and Methods

Fish were collected by electrofishing, seining, and ichthyocide application during the fall of 1980. A section of the stream was enclosed and the appropriate sampling technique applied. Fish were preserved in 10% formalin and returned to the laboratory for identification, using the taxonomic keys of Pflieger (1975), Clay (1975), and Etnier (unpublished).

The degree of coal mining impact was determined subjectively, and was based primarily on fish species and benthic macroinvertebrate richness (from qualitative samples), in comparison to drainage area and fauna to be expected at each site. (See subsequent discussion in Results and Discussion section). We determined drainage area and fish species richness, whereas benthic macroinvertebrate data are from Pennington (1980). Using this system, streams were ranked on a scale from 1 to 10, with 1 the most heavily impacted and 10 the least. The most pronounced break in faunal richness appears between those streams in categories 4 and 5.

Selected samples of certain species have been deposited in the fish collections at Tennessee Technological University or at the University of Tennessee, as indicated in Table 1.

#### Collection Sites

Twenty-three collection sites are listed and referenced by site number, river drainage, locality, county, and the drainage area. Species collected at each site are indicated by number and referenced in Table 1. Species richness is also listed.

1. Sequatchie River (Tennessee R.), 24 km E of Whitwell, Marion Co.; 1603.7 km<sup>2</sup>. Species: 3,6,8-9,13,16,22-23,25,35,37,39-40,43,51,53,56,62. Species richness: 18.
2. Clear Fork (Big South Fork of Cumberland R.), 5.3 km NW of Robbins; Scott Co.; 703.5 km<sup>2</sup>. Species: 3,9,14,16,22-24,34,36-37,39,43-44,49,60. Species richness: 15.
3. Little Sequatchie River (Tennessee R.), State Highway 27 bridge, Marion Co.; 300.9 km<sup>2</sup>. Species: 3,6,13-14,18,20,22-23,25,34,36-37,43-44,46,51,61-62. Species richness: 18.

4. Wolf River (Obey R.), 5.1 km E of Byrdstown, Pickett Co.; 275.0 km<sup>2</sup>. Species: 3,14,22-24,28-29,34,36-39,41-42,47,54,57. Species richness: 17.
5. White Oak Creek (Big South Fork of Cumberland R.), State Highway 52 bridge at Rugby, Morgan Co.; 266.5 km<sup>2</sup>. Species: 10-11,13-14,17,19,23,34,36-37,39,43-44,57,58. Species richness: 15.
6. Poplar Creek (Clinch R.), 1.9 km NW of State Highway 95, Anderson Co.; 214.0 km<sup>2</sup>. Species: 2,35,59. Species richness: 3.
7. West Fork of the Obey River (Obey R.), State Highway 52 bridge at Alpine, Overton Co.; 183.7 km<sup>2</sup>. Species: 6,7,14,17-19,23-24,29,33-34,37,39,40,42-44,50-51,54,57. Species richness: 21.
8. Elk River (Tennessee R.), State Highway 41 bridge at Pelham, Grundy Co.; 170.2 km<sup>2</sup>. Species: 2,3,10,13-15,20,23,26,31,34-35,43,46-47,53-54,57,62. Species richness: 19.
9. Piney River (Tennessee R.), 3.2 km NW of Spring City, Rhea Co.; 161.6 km<sup>2</sup>. Species: 12,14,18,34,39,43,49,51,53. Species richness: 9.
10. Richland Creek (Tennessee R.), 1.6 km NW of Dayton, Rhea Co.; 130.2 km<sup>2</sup>. Species: 3,13,23,28,34,36-37-39,41,44,47,51,53,57. Species richness: 15.
11. Soddy Creek (Tennessee R.), 1.3 km N of Soddy, Hamilton Co.; 127.1 km<sup>2</sup>. Species: 22,35. Species richness: 2.
12. Stinking Creek (Clear Fork of Cumberland R.), at Stinking Creek School, Campbell Co.; 99.4 km<sup>2</sup>. Species: 3,20-23,48,52. Species richness: 7.
13. East Fork of Obey River (Obey R.), 1.4 km W of Cliff Springs, Overton Co.; 98.8 km<sup>2</sup>. Species: none. Species richness: 0.
14. Davis Creek (Powell R.), 0.5 km S of Old State Highway 63 near Speedwell, Claiborne Co.; 80.9 km<sup>2</sup>. Species: 3,9,10,12,18,20. Species richness: 6.
15. Jellico Creek (Clear Fork of Cumberland R.), bridge at Gum Fork Road near Newcomb, Campbell Co.; 73.2 km<sup>2</sup>. Species: 3,20,22-23,25,34,36,40,48,52,58. Species richness: 11.
16. Beech Fork (Big South Fork of Cumberland R.), bridge at Shea, Campbell Co.; 72.4 km<sup>2</sup>. Species: 3,10,14,16-17,23,25,36,43-45,58. Species richness: 12.
17. Elk River (Tennessee R.), 7.1 km NW of Pelham, Grundy Co.; 66.7 km<sup>2</sup>. Species: 1,3,5,22-23,25,32,36,41,45-46,62. Species richness: 12.
18. Coal Creek (Clinch R.), U.S. Highway 25 W bridge near Lake City, Anderson Co.; 63.6 km<sup>2</sup>. Species: 3,4,28,30,34,36,38. Species richness: 7.
19. Cove Creek (Clinch R.), 0.8 km N of Caryville, Campbell Co.; 61.7 km<sup>2</sup>. Species: 3,13-14,21,23,25,33,36,39,43,51,53. Species richness: 12.
20. Smoky Creek (Big South Fork of the Cumberland R.), 7.6 km SW of Smoky Junction, Scott Co.; 44.6 km<sup>2</sup>. Species: 3,16-17,22-23,25,37,40,43-44,55,57-58. Species richness: 13.
21. Bee Creek (Caney Fork of Cumberland R.), Lantana Road bridge, 0.6 km W of Winesap, Cumberland Co.; 43.8 km<sup>2</sup>. Species: 3,22,36. Species richness: 3.
22. Crooked Creek (Big South Fork of Cumberland R.), 2.6 km W of Allardt, Fentress Co.; 9.38 km<sup>2</sup>. Species: 13,27,36,39. Species richness: 4.
23. Long Branch (Big South Fork of Cumberland R.), 2.3 km E of Grimsley, Fentress Co.; 2.87 km<sup>2</sup>. Species: 22. Species richness: 1.

#### Results and Discussion

To determine the degree of impact that coal mining activities have on the lotic environment, a number of factors were considered. Although drainage area



cannot always be positively correlated with fish species richness (as in instances of isolation), a general trend does exist. By utilizing this correlation, as well as benthic macroinvertebrate data as previously described, a subjective ranking of streams was acquired (Table 2).

Certain natural factors may also affect fish diversity within an area. For example, streams on the Cumberland Plateau (i.e. those situated on Pennsylvanian limestone strata that have not cut down to Mississippian limestone) naturally tend to be relatively depauperate, even when pristine. Stream order and the complexity and drainage area of a system also are important when considering species composition and richness. Horton (1945) discussed stream order, and classified streams on the basis of dentritic patterns. His classification takes into consideration the complexity of the watershed but not the drainage area, although there is a positive correlation between the two. Keuhne (1962) found a positive correlation between increasing stream order and fish species richness. This principle is generally accepted by aquatic biologists, but in streams receiving AMD runoff the species richness does not follow this correlation.

The East Fork of the Obey River (Site 13) and Soddy Creek (Site 11) are the most severely affected of all the study sites. Most streams were moderately impacted, having benthic macroinvertebrate species richness of between 21 and 36 and fish species richness from 6 to 19. The Little Sequatchie River (Site 3) and Wolf River (Site 4) were the least impacted of the study areas.

A total of 62 species were collected, representing 11 families (Table 1). The most common of these included Campostoma anomalum (central stoneroller), Semotilus atromaculatus (creek chub), Hypentelium nigricans (northern hog sucker), and Lepomis macrochirus (bluegill).

The creek chub is tolerant of AMD conditions, and frequently is the only species found in receiving streams (Branson and Batch 1972). It feeds primarily on terrestrial insects, and therefore is not entirely dependent on the aquatic food web. Matthews and Styron (1981) reported that headwater species such as Semotilus atromaculatus are tolerant of abrupt changes in the physicochemical environment. Parameters such as dissolved oxygen, temperature and pH were studied in their research, but it appears that AMD-induced changes also may be important in eliminating intolerant species and not Semotilus atromaculatus.

The central stoneroller and northern hog sucker are abundant throughout the Tennessee and Cumberland river drainages. Although they were found in streams receiving AMD, they were less tolerant of AMD than the creek chub. Their life histories are closely correlated with abiotic conditions in the streams, and they do not utilize terrestrial food sources.

Fish intolerant of AMD conditions included most of the percid species. The most abundant and widely distributed of these in the study area, Etheostoma blennioides (greenside darter) and Etheostoma caeruleum (rainbow darter) were not found in severely affected streams. These species are helpful when making comparisons, since they are found in both the Tennessee and Cumberland river drainages and utilize a wide range of environmental conditions. It appears that both food sources and spawning requirements are eliminated due to acid mine drainage (Branson and Batch 1972). These factors were the major reason for the elimination of most percids in severely affected streams.

Four species were collected during the survey that, because of the status accorded them by the Tennessee Heritage Program (Eagar and Hatcher 1980) or their general rarity in the state, merit discussion. Hemitremia flammea (flame chub) and Chologaster agassizi (spring cavefish) were both collected at site 17, which was accorded a habitat ranking of 5 (Table 2). The former was listed as a species of Special Concern, whereas the second is noteworthy because of its rather limited distribution in the southern part of the state. Both species are partial to cool, clear

waters, and would be among the first to disappear with increased mining activity in the Elk River system. They are good indicator species that should be carefully monitored. Etheostoma sagitta (arrow darter), which was taken at sites 12 and 15, is regarded as threatened in Tennessee. Stinking Creek (site 12) was considered to be heavily impacted (habitat ranking of 2; Table 2), and the specimens of E. sagitta were collected on the few relatively silt-free riffles of this otherwise heavily silted creek. The future of the species in this creek is precarious. Jellico Creek (site 15) was accorded a habitat ranking of 5. Etheostoma baileyi (emerald darter) was taken in Smoky Creek, which is moderately impacted (ranking of 6). This species has been found to occupy a variety of habitats, and appears to be tolerant of such siltation as was present in Smoky Creek. Nevertheless, the species has a fairly limited distribution in Tennessee, and could be affected by increased coal mining activities.

Five streams are noted in Table 2 as environmentally sensitive, and should be of special concern to state and federal agencies. Of these, the Elk River, Jellico Creek, Stinking Creek, and Smoky Creek were discussed in the preceding paragraph. The fifth stream, Beech Fork, is unique in that it occurs in an otherwise decimated watershed. The New River watershed historically has been the major coal producing area of the state, and its aquatic life has suffered (Vaughan 1979). The relatively rich ichthyofauna in Beech Fork thus may serve as a reservoir if reclamation practices are implemented and conditions improve in adjacent streams.

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Table 1. A list of fish species collected at selected study sites.

Scientific Name	Study Sites*
1. <i>Salmo gairdneri</i>	17
2. <i>Dorosoma cepedianum</i>	6,8
3. <i>Camptostoma anomalum</i>	1,2,3,4,8,10,12,14-21
4. <i>Cyprinus carpio</i>	18
5. <i>Hemistremia flammica</i> <sup>a</sup>	17
6. <i>Hybopsis ambloja</i>	1,3,7
7. <i>Hybopsis dissimilis</i>	7
8. <i>Hybopsis insignis</i>	1
9. <i>Nocomis micropogon</i>	1,2,14
10. <i>Notropis ardens</i>	5,8,14,16
11. <i>Notropis ariommus</i> <sup>a</sup>	5
12. <i>Notropis coccogenia</i> <sup>a</sup>	9,14
13. <i>Notropis c. chryscephalus</i>	1,3,5,8,10,19,22
14. <i>Notropis galacturus</i>	2-5,7-9,16,19
15. <i>Notropis lirus</i>	8
16. <i>Notropis rubellus</i>	1,2,16,20
17. <i>Notropis stramineus</i>	5,7,16,20
18. <i>Notropis telescopus</i>	3,7,9,14
19. <i>Notropis volucellus</i> <sup>a</sup>	5,7
20. <i>Pimephales notatus</i>	3,8,12,14,15
21. <i>Rhinichthys atratulus</i>	12,19
22. <i>Semotilus atromaculatus</i>	1-4,11,12,15,17,20,21,23
23. <i>Hypentelium nigricans</i>	1-5,7,8,10,12,15-17,19,20
24. <i>Moxostoma duquesnei</i>	2,4,7
25. <i>Moxostoma erythrum</i>	1,3,15-17,19,20
26. <i>Moxostoma macrolepidotum</i>	8
27. <i>Ictalurus melas</i>	22

Table 1. (continued)

Scientific Name	Study Sites*
28. <i>Ictalurus natalis</i>	4,10,18
29. <i>Noturus flavus</i>	4,7
30. <i>Fundulus catenatus</i>	18
31. <i>Fundulus notatus</i>	8
32. <i>Chologaster agassizii</i> <sup>a</sup>	17
33. <i>Labidesthes sicculus</i> <sup>a</sup>	7,19
34. <i>Ambloplites rupestris</i>	2-5,7-10,15,18
35. <i>Lepomis cyanellus</i>	1,6,8,11,21
36. <i>Lepomis macrochirus</i>	2-5,10,15-19,22
37. <i>Lepomis megalotis</i>	1-5,7,10,20
38. <i>Lepomis microlophus</i>	4,18
39. <i>Micropterus dolomieu</i>	1,2,4,5,7,9,10,19,22
40. <i>Micropterus punctulatus</i>	1,7,10,15,20
41. <i>Micropterus s. salmoides</i>	4,10,17
42. <i>Etheostoma atripinna</i> <sup>a</sup>	4,7
43. <i>Etheostoma blennioides</i>	1-3,5,7-9,16,19,20
44. <i>Etheostoma caeruleum</i>	2,3,5,7,10,16,20
45. <i>Etheostoma camurum</i>	16,17
46. <i>Etheostoma duryi</i> <sup>a</sup>	3,8,17
47. <i>Etheostoma flabellare</i> <sup>a</sup>	4,8,10
48. <i>Etheostoma kennicotti</i>	12,15
49. <i>Etheostoma maculatum</i> <sup>a</sup>	2,9
50. <i>Etheostoma obervense</i>	7
51. <i>Etheostoma rufilineatum</i>	1,3,7,9,10,19
52. <i>Etheostoma sagitta</i> <sup>a</sup>	12,15
53. <i>Etheostoma simotermum</i> <sup>a</sup>	1,8-10,19
54. <i>Etheostoma stigmaeum</i> <sup>a</sup>	4,7,8
55. <i>Etheostoma baileyi</i>	20
56. <i>Etheostoma zonale</i>	1
57. <i>Percina caprodes</i>	4,5,7,8,10,20
58. <i>Percina maculata</i> <sup>a</sup>	5,15,16,20
59. <i>Percina sciera</i> <sup>a</sup>	6
60. <i>Percina squamata</i> <sup>b</sup>	2
61. <i>Cottus bairdi</i>	3
62. <i>Cottus caroliniae</i>	1,3,8,17

\*reference numbers from collection sites

<sup>a</sup>Tennessee Technological University<sup>b</sup>University of Tennessee

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## RECENT COLLECTIONS OF FISHES FROM THE BIG SOUTH FORK OF THE CUMBERLAND RIVER SYSTEM, TENNESSEE AND KENTUCKY

Christopher J. O'Bara and R. Don Estes

Tennessee Cooperative Fishery Research Unit and  
Biology Department  
Tennessee Technological University  
Cookeville, Tennessee

The Big South Fork of the Cumberland River (BSFCR) system originates with the confluence of the Clear Fork and the New River in Tennessee, and flows in a northerly direction for approximately 40 miles, until it reaches Lake Cumberland, Kentucky. The majority of the tributaries drain the Cumberland Plateau region, which is of Pennsylvanian geologic age. The main river and some larger tributaries have created a gorge, resulting in exposed strata of Mississippian geologic age (Luther 1959).

Comiskey (1970) studied the fishes of this system, and Comiskey and Etnier (1972) later formally published the results of this work, in which they summarized the limited number of earlier publications dealing entirely or in part with the fishes of the system (Cope 1870; Kirsch 1893; Fowler 1907, 1924; Evermann 1918; Shoup and Peyton 1940), and included lists of species recorded by each. They also provided an annotated list

of all species known from the system (although they did not include specific locality data for most species), and discussed the probable method (man-induced) by which two species (*Etheostoma sagitta* and *E. kennicotti*) have reached the Big South Fork system from adjacent parts of the upper Cumberland drainage (i.e. above Cumberland Falls) to the east. The reader is referred to Comiskey and Etnier's 1972 paper for further information.

Recent studies have concentrated on degradation of the aquatic environment due to man's activities. Species distributions have become reduced by acid mine drainage, oil and natural gas field runoff, logging, and domestic and industrial pollution in many streams (Parsons 1959; Winger et al 1979; O'Bara et al 1982). Renewed interest in the BSFCR system has surfaced since establishment of the Big South Fork National River and Recreation area. This area comprises approximately 100,000 acres within the BSFCR system, and provides environmental protection for many tributaries.

The following report lists the results of collections made from 48 stations during the summer and fall of 1981. Only tributaries of the free-flowing section of the BSFCR were sampled, using a combination of 120-volt backpack electroshocker, seines, and ichthyocides. Three sampling sites were selected on

each tributary, primarily on the Cumberland Plateau and in the gorge area. These collections do not represent a complete re-survey of the BSFCR system, but rather are intended to supplement the earlier report by Comiskey and Etnier (1972). This is obvious from the large number of species reported by those authors that were not taken by us, particularly from the Little South Fork (which we did not sample). In general, ecological perturbations (natural gas drilling, logging, domestic and industrial pollution) were much more severe in the eastern than in the western tributaries, a situation that in most cases is reflected in a much lower fish-species diversity (Table 1). In analyzing the number of species at each collecting site, however, it should be remembered that in some cases lower diversity is merely a natural reflection of a more upstream location. Overall we conclude that the fish fauna of the BSFCR system has remained reasonably diverse, despite man-induced environmental degradation.

The Little South Fork is probably the most pristine stream in the BSFCR system, and in addition may have certain ecological characteristics not found in other streams in the area. The following 15 species were recorded by Comiskey and Etnier (1972) only from the Little South Fork, and were not taken during our work: Ichthyomyzon bdellium, Hybopsis dissimilis, Hybopsis insignis, Nocomis effusus, Notropis new species cf. N. procne, Notropis ariommus, Notropis photogenis, Pimephales notatus, Pimephales promelas (possible introduction), Lagochila lacera (now extinct; pre-1900 collection only), Fundulus catenatus, Etheostoma atripinne, Etheostoma flabellare, Percina macrocephala (pre-1900 collection only), and Cottus carolinae. Other species not taken by us that were recorded by Comiskey and Etnier (1972) from other parts of the BSFCR system include Salvelinus fontinalis (introduction), Esox masquinongy, Clinostomus funduloides (possible introduction), Notropis atherinoides, Notropis leuciodus, Moxostoma erythrurum, Moxostoma macrolepidotum breviceps, Noturus exilis, Ictalurus natalis, Labidesthes sicculus, Morone chrysops, Ammocrypta asprella (pre-1900 collection only), Etheostoma kennicotti, Etheostoma new species cf. E. flabellare, Etheostoma baileyi, Etheostoma spectabile, Etheostoma tippecanoe, Etheostoma zonale, Percina burtoni, Percina copelandi, and Percina sciera. The following species were taken by us for the first time from the system: Lepomis gulosus, Micropterus salmoides, Aplodinotus grunniens. Finally, Hybopsis amblops, which was listed by Comiskey and Etnier (1972) only on the basis of old records and a 1953 collection and was thought possibly to be extirpated from the BSFCR system, was rediscovered during our work.

#### Annotated List of Fishes

The common and scientific names and phylogenetic arrangement follow Robins et al (1980). Collection site numbers are included for each species, as is the location of selected voucher specimens (TTU-Tennessee Technological University; UT-University of Tennessee, Knoxville).

#### Family Petromyzontidae-lampreys

1. Ichthyomyzon greeleyi Hubbs and Trautman-mountain brook lamprey. Stas. 2, 16, 22, 24, 28, 29, 31, 37, 40. (TTU). Fourteen ammocoetes were collected from seven streams, with most being found in sandy areas at the mouths of streams.

#### Family Salmonidae-trouts.

2. Salmo gairdneri Richardson-rainbow trout. Stas. 32, 33. This introduced species was undergoing natural reproduction, as evidenced by the presence of several age classes and lack of stocking in recent years.

3. Salmo trutta Linnaeus-brown trout. Stas. 33, 41. This introduced species also showed signs of natural reproduction.

#### Family Cyprinidae-minnows.

4. Campostoma anomalum (Rafinesque)-central stoneroller. Stas. 2, 6, 13, 15, 19, 23-27, 29-32, 38-40, 43, 46, 48. One of the most abundant species in the system. Found in riffle or run areas at all localities except those of extremely small size or those that were heavily impacted.

5. Hybopsis amblops (Rafinesque)-bigeye chub. Sta. 2. (UT). Kirsch (1893) reported the bigeye chub from the Little South Fork, Kennedy Creek, and Rock Creek, but subsequent investigators did not find it at any of these localities. The species was recently reported by Harker et al (1979) from Rock Creek, and was also taken there during our study.

6. Nocomis micropogon (Cope)-river chub. Stas. 14, 28, 31, 33, 34, 37-40, 48. Shows an evident preference for a medium to large cobble substrate in medium to large streams, or at the mouths of small streams.

7. Notropis ardens (Cope)-rosefin shiner. Stas. 2, 14, 22-24, 29, 30, 39, 40, 46-48. A common species in medium to large streams of good water quality. Its absence from the eastern tributaries, Troublesome Creek and Bandy Creek, may be attributed to poor water quality or heavy siltation.

8. Notropis chrysocephalus (Rafinesque)-striped shiner. Sta. 48. Recorded by Comiskey and Etnier (1972) as Notropis cornutus. Found only at one station in association with seven other species of Notropis.

9. Notropis galacturus (Cope)-whitetail shiner. Stas. 2, 37, 38, 47, 48. Found only in western tributaries of fair to good quality habitat, in areas having a medium cobble or gravel substrate.

10. Notropis rubellus (Agassiz)-rosyface shiner. Stas. 14, 22, 37, 40, 47, 48. Common in medium to large streams having a medium-sized cobble substrate; apparently intolerant of siltation.

11. Notropis new species cf. N. spectrunculus-sawfin shiner. Stas. 29, 30, 37, 48. This undescribed species, which was collected in three western tributaries, was found in streams of good to excellent water quality with little siltation.

12. Notropis spilopterus (Cope)-spotfin shiner. Sta. 13. The surprising scarcity of this normally common species confirms Comiskey and Etnier's (1972) observations. The single collection was from a large pool.

13. Notropis stramineus (Cope)-sand shiner. Stas. 6, 14, 22-24, 29, 30, 43, 47, 48. The range of this species in the Cumberland, Tennessee and other drainages south of the Ohio River is surprisingly disjunct and spotty. Only two pockets of abundance are known, one in the upper Tennessee River drainage in eastern Tennessee, and the other in the Big South Fork system (Gilbert 1980). This species is widely distributed in the system, and is widely tolerant of a variety of environmental conditions, being found in streams receiving acid mine, domestic, agricultural, and industrial pollutants.

14. Notropis telescopus (Cope)-telescope shiner. Stas. 2, 13, 14, 19, 22-24, 29, 30, 38, 40, 46, 48. This widely distributed species inhabits both small and large streams throughout the system. Nuptial tubercles found on the snout and chin of all age classes and both sexes provide an easily identifiable field character.

15. Notropis volucellus (Cope)-mimic shiner. Stas. 2, 29, 30, 46, 48. Restricted to three western tributaries, all of which have good to excellent habitat quality.

16. Phoxinus erythrogaster (Rafinesque)-southern redbelly dace. Sta. 42. A headwater species limited to cool waters, where found in association with Rhinichthys atratulus and Semotilus atromaculatus. Recent bridge construction upstream of the collection site has severely altered the habitat, and may have eliminated this species from the Laurel Fork watershed.

17. Rhinichthys atratulus (Hermann)-blacknose dace. Stas. 11, 12, 17, 32-35, 39, 41, 42. Found in most headwater streams draining the Cumberland Plateau. Preference for cool waters and heavy canopy

cover was evident.

18. Semotilus atromaculatus (Mitchill)-creek chub. Stas. 2, 3, 5, 6, 8, 10-12, 15-17, 19-21, 24, 26, 29-35, 40-42, 44-48. The most widely distributed species in the BSFCR system. Found in every watershed, including streams where no other species was found. Tolerant of all but the most severe conditions, and found in streams where flow was reduced to interstitial flow and standing pools. Tolerance to such adverse conditions may partly be explained by its feeding habits, since it consumes mostly terrestrial insects and is not dependent on the aquatic ecosystem for its food supply (Lotrich 1973).

#### Family Catostomidae-suckers.

19. Catostomus commersoni (Lacepede)-white sucker. Sta. 15. Probably more widespread.

20. Hypentelium nigricans (Lesueur)-northern hog sucker. Stas. 2, 3, 10, 13, 14, 16, 19, 23-26, 28-31, 34, 37-40, 43, 46-48. Found in a variety of habitats, and appears to be tolerant to most adverse conditions.

21. Moxostoma duquesnei (Lesueur)-black redhorse. Stas. 2, 14, 24. Occurs only in medium-sized streams, where it was collected in large pools.

#### Family Ictaluridae-catfishes.

22. Ictalurus punctatus (Rafinesque)-channel catfish. Sta. 43. Comiskey and Etnier (1972) reported this species to be common in the main river.

23. Noturus flavus Rafinesque-stonecat. Stas. 2, 13, 14, 16, 19, 22, 25, 31, 40. Inhabits riffle areas of medium-sized streams.

24. Pylodictis olivaris (Rafinesque)-flathead catfish. Sta. 13. Only one juvenile collected during survey. Likely common in the main river.

#### Family Centrarchidae-sunfishes and black basses.

25. Ambloplites rupestris (Rafinesque). Stas. 2, 6, 14, 22-25, 28-32, 37-40, 43, 46-48. Found in a wide variety of habitats and tolerant of most adverse conditions. The most abundant game fish in the system.

26. Lepomis gulosus (Cuvier)-warmouth. Sta. 37. (TTU). The first record of this species from the BSFCR system upstream of Lake Cumberland (O'Bara et al 1983). Most likely represents a recruit from Lake Cumberland.

27. Lepomis macrochirus Rafinesque-bluegill. Stas. 4-6, 10, 13-15, 19, 25, 28, 30, 31, 37-45, 47. Found in a wide variety of habitats. One of the few species seemingly tolerant of severe acid mine drainage.

28. Lepomis megalotis (Rafinesque)-longear sunfish. Stas. 4, 5, 10, 14, 19, 22, 25, 28, 29, 31, 40, 43, 46-48. The most common species of Lepomis in the BSFCR system, and seems to exhibit extreme tolerance to acid mine drainage. Often found in association with the creek chub.

29. Micropterus dolomieu Lacepede-smallmouth bass. Stas. 2, 13, 14, 22, 23, 29, 30, 37-39, 43, 47, 48. Present in a number of medium to large streams, but never in large numbers. Apparently prefers streams of good water quality and little siltation.

30. Micropterus punctulatus (Rafinesque)-spotted bass. Stas. 4-6, 10, 14, 15, 20, 25, 28-31, 37, 40, 43. Found in streams of similar size to those inhabited by smallmouth bass, and the two occurred sympatrically in some places. In general, occupies slightly less pristine waters than M. dolomieu.

31. Micropterus salmoides (Lacepede)-largemouth bass. Stas. 28, 43, 44. Collected only at the mouths of streams where they entered the main river. Not previously reported by Comiskey and Etnier (1972), and individuals collected may represent recruits from Lake Cumberland.

#### Family Percidae-perches and darters.

32. Etheostoma blennioides Rafinesque-greenside darter. Stas. 2, 13, 14, 19, 22, 25, 26, 28-31, 34, 37, 38, 40, 46-48. Occurs primarily in riffles and is

one of the more widely distributed species in the system.

33. Etheostoma caeruleum Storer-rainbow darter. Stas. 2, 10, 13, 14, 16, 19, 22-26, 28-31, 34, 37, 38, 46-48. The most abundant percid in the system, and occurs in all tributaries except those severely affected by pollution.

34. Etheostoma camurum (Cope)-bluebreast darter. Stas. 2, 10, 13, 14, 19, 22, 29, 31, 38, 40, 46-48. Widely distributed, but never present in large numbers. Prefers a substrate of larger cobbles than the greenside or rainbow darters.

35. Etheostoma cinereum Storer-ashy darter. Stas. 14, 19, 28, 29, 31, 37, 38, 40, 46, 48. Listed as threatened in Tennessee. Found in medium-sized streams with good to excellent water quality. Widely distributed in western tributaries, but in eastern tributaries found only in Williams Creek.

36. Etheostoma maculatum Kirtland-spotted darter. Stas. 14, 22, 25, 26, 38, 47, 48. Occurs sporadically in a wide range of habitats, but appears to prefer a medium cobble substrate.

37. Etheostoma obeyense Kirsch-barcheek darter. Stas. 2, 3. (TTU). Found only in Rock Creek, and reported also from Little South Fork system by Comiskey and Etnier (1972).

38. Etheostoma sagitta (Jordan and Swain)-arrow darter. Stas. 5, 6. (TTU). Comiskey and Etnier (1972) discussed possible means by which this species (otherwise restricted to the upper Cumberland River drainage) made its way downstream of Cumberland Falls via a man-made diversion in town of Stearns, Kentucky. Present records constitute further indication of range expansion in lower Cumberland drainage.

39. Etheostoma stigmaeum (Jordan)-speckled darter. Sta. 14. Only capture was in a large pool-run sequence. Comiskey and Etnier (1972) reported species from main river, Station Camp Creek, and the Little South Fork.

40. Percina caprodes (Rafinesque)-logperch. Stas. 4, 13, 14, 19, 28-31, 37, 38. Found in a wide range of habitats, including Roaring Paunch Creek, a severely degraded stream.

41. Percina maculata (Girard)-blackside darter. Stas. 40, 47. These two stations differ widely in character. Station 40 (Laurel Fork) is a cool, medium-sized stream of excellent water quality, whereas station 47 (White Oak Creek) is a large, warm, slightly polluted stream.

42. Percina squamata (Gilbert and Swain)-olive darter. Stas. 37, 38, 43. Both of these stations are similar in size and habitat quality.

43. Stizostedion vitreum vitreum (Mitchill)-walleye. Sta. 14. Reported by Comiskey and Etnier (1972) to be fairly numerous in the main river.

#### Family Sciaenidae-drums.

44. Aplocheilichthys grunniens Rafinesque-freshwater drum. Sta. 37. First record for BSFCR system. One specimen collected.

#### Acknowledgments

The authors would like to thank the personnel of the U.S. National River and Recreation Area for their aid in conducting field work. We would also like to thank Drs. David A. Etnier (University of Tennessee-Knoxville) and Frank J. Bulow (Tennessee Technological University) for their help in identifying certain troublesome species. This project was funded by the U.S. Army Corps of Engineers-Nashville District. Cooperators for the Tennessee Cooperative Fishery Research Unit are the U.S. Fish and Wildlife Service, Tennessee Wildlife Resource Agency, and Tennessee Technological University.

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9. downstream of the confluence with Williams Creek Scott Co., KY: no fish collected.
- Troublesome Creek (W)
10. at mouth, McCreary Co., KY: 18,20,27,28,30,33, 34.
11. downstream of the confluence with Cliff Branch, McCreary Co., KY: 17,18.
12. 300 meters upstream of the confluence with Cliff Branch, McCreary Co., KY: 17,18.
- Williams Creek (E)
13. downstream of confluence with Grassy Fork, Scott Co., TN: 4,12,14,20,23,24,27,29,32,33,34,40.
14. upstream of the confluence with Puncheoncamp Creek, Scott Co., TN: 6,7,10,13,14,20,21,23, 25,27,28,29,30,32,33,34,35,36,39,40,43.
15. headwaters, Scott Co., TN: 4,18,19,27,30.
- Grassy Fork of Williams Creek (E)
16. at mouth, Scott Co., TN: 1,18,20,23,33.
17. downstream of the confluence with Indian Rock Branch, Scott Co., TN: 17, 18.
18. upstream of Indian Rock Branch, Scott Co., TN: no fish collected.
- Puncheoncamp Creek (E)
19. at mouth, Scott Co., TN: 4,14,18,20,23,27,28, 32,33,34,35,40.
20. near Chestnut Ridge, Scott Co., TN: 18,30.
21. near Puncheon Knob, Scott Co., TN: 18.
- No Business Creek (W)
22. at mouth, Scott Co., TN: 1,7,10,13,14,23,25,28, 29,32,33,34,36.
23. at the confluence with Betty Branch, Scott Co., TN: 4,7,13,14,20,25,29,33.
24. at the confluence with Anderson Cave Branch, Scott Co., TN: 1,4,7,13,14,18,20,21,25,32,33.
- Parch Corn Creek
25. at mouth, Scott Co., TN: 4,20,23,25,27,28,30, 32,33,36.
26. upstream of the confluence with Right Prong, Scott Co., TN: 4,18,20,32,33,36.
27. headwaters, Scott Co., TN: 4.
- Station Camp Creek (W)
28. at mouth, Scott Co., TN: 1,6,20,25,27,28,30, 31,32,33,35,40.
29. downstream of the confluence with Chariot Creek, Scott Co., TN: 1,4,7,11,13,14,15,18,20,25,28,29, 30,32,33,34,35,40.
30. at the confluence with Middle Creek, Scott Co., TN: 4,7,11,13,14,15,18,20,25,27,29,30,32,33,40.
- Laurel Fork of Station Camp Creek (W)
31. at mouth, Scott Co., TN: 1,4,6,18,20,23,25,27, 28,30,32,33,34,35,40.
32. 1 1/2 mile upstream of mouth, Scott Co., TN: 2,4,17,18,25.
33. downstream of the confluence with Rockhouse Branch, Scott Co., TN: 2,3,6,17,18.
- Bandy Creek (W)
34. at mouth, Scott Co., TN: 6,17,18,20,32,33.
35. near White Pine, Scott Co., TN: 17,18.
36. headwaters, Scott Co., TN: no fish collected.
- North White Oak Creek (W)
37. at mouth, Scott Co., TN: 1,6,9,10,11,20,25,26, 27,29,30,32,33,35,40,42,44.
38. near Zenith, Fentress Co., TN: 4,6,9,14,20,25, 27,29,32,33,34,36,40,42.
39. at the confluence with Lick Branch, Fentress Co., TN: 4,6,7,17,20,25,27,29.
- Laurel Fork of North White Oak Creek (W)
40. mouth, Scott Co., TN: 1,4,6,7,10,14,18,20,23, 25,27,28,30,32,34,41.
41. downstream of the confluence with Hatfield Creek, Fentress Co., TN: 3,17,18,27.
- Table 1. Sampling sites, locations, and species distribution of fish collected from the Big South Fork of the Cumberland River system, Tennessee and Kentucky. (w=western tributary; e=eastern tributary).
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- Rock Creek (W)
1. near Yamacrow, McCreary Co., KY: no fish collected.
2. near Wright's Camp, Scott Co., TN: 1,4,5,7,9, 14,15,18,20,21,23,25,29,32,33,34,37.
3. at Pickett State Park, Pickett Co., TN:18,20,37.
- Roaring Paunch Creek (E)
4. at mouth, McCreary Co., KY: 27,28,30,40.
5. near Barthell, McCreary Co., KY: 18,27,28,30,38.
6. near Revelo, McCreary Co., KY: 4,13,18,25,27, 30,38.
- Bear Creek (E)
7. at mouth, McCreary Co., KY: no fish collected.
8. Turkey Branch, a tributary to Bear Creek, McCreary Co., KY: 18.

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42. at Tennessee Route 154, Fentress Co., TN: 16,17, 18,27.

Pine Creek (E)

43. at mouth, Scott Co., TN: 4,13,20,22,25,27,28, 29,30,31,42.  
44. 2 miles upstream of mouth, Scott Co., TN: 18, 27, 31.  
45. near Toomy, Scott Co., TN: 18,27.

White Oak Creek (W)

46. at mouth, Scott Co., TN: 4,7,14,15,18,20,25,28, 32,33,34,35.  
47. near Horseshoe Bend, Scott Co., TN: 7,9,10,13, 18,20,25,27,28,29,32,33,34,36,41.  
48. near Rugby, Morgan Co., TN: 4,6,7,8,9,10,11,13, 14,15,18,20,25,28,29,32,33,34,35,36.

manuscripts redone on a different word processor were such that we decided instead to go with what you see here.

Several individuals have recently inquired about the availability of new fish buttons for this year. Glenn Clemmer informs us these should be available shortly.

It has come to our attention that a number of Council members are not members of the American Society of Ichthyologists and Herpetologists. We understand, of course, that individuals support the SEFC for different reasons, and that some may only be ichthyologists peripherally. Nevertheless, we urge that you consider joining ASIH if you are not already a member, since the journal of that society, *Copeia*, is one of the best "bargins" in the biological journal field and contains a wealth of high-quality scientific papers. Subscription rates are \$18 for students, \$24 for domestic members (including Canada and Mexico) and \$27 for foreign members.

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For reasons of economy we have decided to go to a photo-offset style for this (and possibly future) issues of the Southeastern Fishes Council Proceedings. You will also note that, for the first time, we have opted to include several papers in a single issue, which again was done for reasons of economy. We trust that SEFC members will appreciate and understand the need for doing so.

We apologize for the unjustified margins, and hope that these will not be repeated in the future. The manuscripts were originally typed with justified margins, but the finished product was so esthetically displeasing and so wasteful of space that we had little choice but to reject them in that form. The costs involved (not to mention loss of time) in having these

George Fenwick of The Nature Conservancy recently contacted the Southeastern Fishes Council regarding possible sites to be purchased by his organization. Members present at the 1984 annual meeting in Memphis were polled about worthy localities, and a list of 19 sites was developed. No priorities were assigned to the sites other than for the Conasauga River, TN and GA, which was the consensus top choice. Members willing to "go to bat" for each site in the form of a short description of its value and uniqueness were also recorded, and the lists forwarded to the Conservancy. Interested members may contact George H. Burgess, Secretary-Treasurer, Florida State Museum, University of Florida, Gainesville 32611 for further information, or additional suggested sites.

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