

A SURVEY OF THE FISHES OF BIG CREEK IN SOUTHWESTERN INDIANA

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ABSTRACT. A 32-station survey of the fishes of Big Creek in southwestern Indiana was conducted during the summer of 2008. Over 4000 specimens representing 40 species and 11 families were collected. Nineteen species reported from previous surveys of Big Creek conducted between 1888 and 1986 were absent (most notably, the previously common *Notemigonus crysoleucus*), and eleven species new to the drainage were collected, four of them alien or domestic invasives. These changes, along with a paucity of darters and the dominance of *Cyprinella spiloptera*, are consistent with Big Creek's recent history as a degraded watershed.

Keywords: Posey County, fish faunal changes, degraded watershed

Big Creek drains approximately 664 km² in southwestern Indiana. The main channel of Big Creek originates in northwestern Vanderburgh County and flows northwest 4 km before passing through southern Gibson County (2.5 km) and then southwest through Posey County for 46.8 km, emptying into the Wabash River 12.5 km northwest of Mt. Vernon. Over 20 perennial headwater streams directly feed Big Creek (Fig 1).

Like many rural and agricultural areas in Indiana, the Big Creek watershed has experienced significant wetland draining, deforestation, channelizing, and other modifications. In the early 1900's, the Army Corps of Engineers dredged Big Creek from its headwaters in Vanderburgh County to the confluence with the Wabash, thus removing its natural meanders. Spoil removed to create the straight channel was cast to the side, creating small dikes disconnecting the channel from its floodplain. Many of the tributaries were also subsequently dredged and straightened. Following the establishment of the Regulated Drain System in 1965, Big Creek and some of its tributaries came under county control. As

part of the county's efforts to make Big Creek an effective drain for the surrounding farmland (and in compliance with state regulations), the planting of trees or the establishment of permanent structures was prohibited within 20 m on either side of Big Creek.

Channel modifications resulted in bank instability: channel erosion is now widespread, and the lowered elevation of the main channel affects even those streams that have not been modified, causing headcuts that reach into upland farm fields. In 2006, the Indiana Department of Environmental Management placed Big Creek and segments of two of its tributaries on a list of impaired waterways. In 2007, a comprehensive study of the Big Creek watershed was initiated by the Soil and Water Conservation District of Posey County to establish baseline data for use in guiding efforts to mitigate the damage caused by a century of management for rapid drainage.

Several fish surveys have included parts of the Big Creek drainage, although none were comprehensive. Jordan (1890) found 22 species in seven families at one site on lower Big Creek. Gerking (1945) surveyed two sites on Big Creek and reported 30 species in 10 families. More recently, Kozel et al. (1981) surveyed the fishes of Posey County, reporting 30 species in eight families from 11 sites in the Big Creek drainage, and Grannan & Lodato (1986) reported 14

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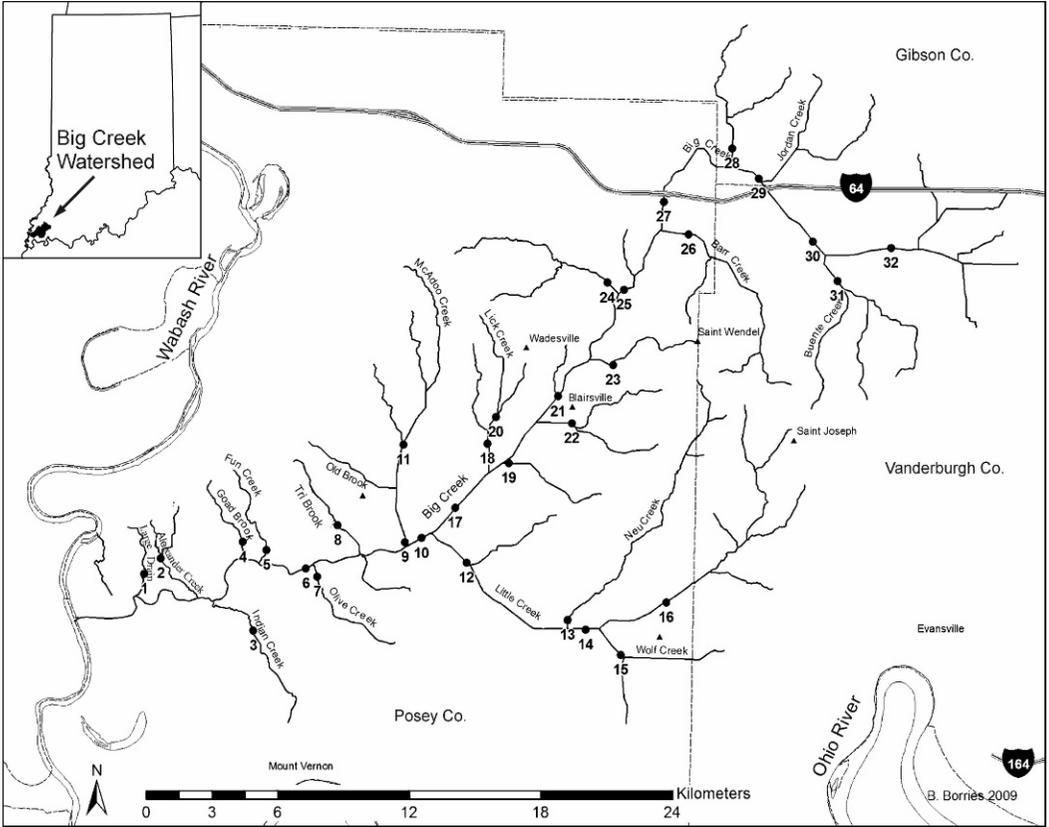


Figure 1.—Big Creek and its tributaries in southwestern Indiana. Numbered dots are sampling stations.

species in six families from 13 headwater sites in the Big Creek drainage. Collectively, these surveys reported 11 families and 49 species in Big Creek and its tributaries.

The goals of this survey were to (1) comprehensively survey the fishes of the Big Creek drainage, (2) document changes in the fish fauna that have occurred, especially since the most recent surveys conducted in the 1980's, and (3) augment the efforts of the Soil and Water Conservation District of Posey County to describe the current status of the Big Creek drainage.

METHODS

The Big Creek watershed is part of the Interior River Lowland Ecoregion. The land use is 71% row crop agriculture, 12% pasture and residential lawns, 11% upland forest, and less than 2% forested wetland. The remaining 4% consists of small amounts of suburban areas, open water, herbaceous wetland, and

primary growth shrubland. Forested areas are largely isolated woodlots, most 130 ha or less in size. Native riparian vegetation is almost nonexistent around nearly 70% of the streams and other defined channels. Soils are mostly silt-loam wind blown loess deposits with varying amounts of clays. Topography ranges from level to slopes of 40% gradient (Borries 2008).

We sampled 32 stations on Big Creek and its tributaries between 3 June and 22 July 2008 (Table 1). Twenty-two stations were headwater sites (drainage area ≤51.8 km² (20 mi²); Dufour 2002), and 10 sites were wadable (drainage >51.8 km²). Sampling was conducted using seines of the following sizes (length x width): 2.5 m × 1.8 m, 4 mm mesh; 3 m × 1.8 m, 6 mm mesh; 3.7 m × 2.5 m, 9 mm mesh. We sampled at least 50 m linear distance of stream at each station, devoting effort to all habitats (riffles, shallows, and pools) available. Fishes captured were held in buckets and

Table 1.—Station numbers, drainage areas (km²), and locations of Big Creek collection sites in Posey, Vanderburgh, and Gibson counties.

Station number	Drainage area	Location	
		Stream and access road	Latitude Longitude
Posey County			
1	3.9	Large Drain at Curtis Rd.	38°00.9' 87°59.0'
2	5.4	Alexander Creek at Bundy Rd.	38°01.0' 87°58.5'
3	20.7	Indian Creek at Copperline Rd.	37°59.3' 87°55.6'
4	2.9	Goad Brook at French Rd.	38°01.4' 87°55.9'
5	9.8	Fun Creek at French Rd.	38°01.2' 87°55.2'
6	579.4	Big Creek at Hwy 69	38°00.8' 87°53.9'
7	9.1	Olive Creek at CR 250S	38°00.2' 87°53.4'
8	6.5	Tri Brook at CR 100S	38°01.8' 87°52.9'
9	45.8	McAdoo Creek Spring Switch Rd.	38°01.4' 87°50.9'
10	495.7	Big Creek at Oliver Rd.	38°01.5' 87°50.4'
11	30.0	McAdoo Creek at Springfield Rd.	38°03.8' 87°50.9'
12	158.3	Little Creek at John Mills Rd.	38°00.9' 87°48.9'
13	40.7	Neu Creek at CR 850E	37°59.6' 87°45.8'
14	78.5	Little Creek at Ford Rd.	37°59.4' 87°45.3'
15	23.1	Wolf Creek at Wildeman Rd.	37°59.6' 87°45.8'
16	45.6	Little Creek at St. Phillips Rd.	38°00.1' 87°42.6'
17	324.0	Big Creek at CR 450E	38°07.6' 87°44.1'
18	14.5	Lick Creek at Metz Rd.	38°03.8' 87°48.3'
19	10.9	Brandt Lateral at Huey Rd.	38°03.4' 87°47.7'
20	8.0	Lick Creek at Haines Rd.	38°04.5' 87° 48.1'
21	269.4	Big Creek at Haines Rd.	38°00.8' 87°53.9'
22	14.3	Big Creek tributary on Stierly Rd.	38°04.4' 87°45.7'
23	10.9	Clear Creek at Schmidt Rd.	38°05.8' 87°44.5'
24	33.9	Caney Creek at Wagon Wheel Rd.	38°07.9' 87°45.2'
25	212.1	Big Creek at John Will Rd.	38°07.6' 87°44.1'
26	35.0	Barr Creek at St. Wendel-Cynthiana Rd.	38°08.9' 87°42.2'
27	162.9	Big Creek at Water Tank Rd.	38°09.7' 87° 42.9'
Gibson County			
28	16.6	Neuman Lateral at CR 1200N	38°10.9' 87°40.8'
29	124.8	Big Creek at CR 525W	38°10.2' 87°39.9'
Vanderburgh County			
30	89.1	Big Creek at Nisbet Rd.	38°08.8' 87°38.3'
31	28.2	Buente Creek at Baseline Rd.	38°07.8' 87°37.5'
32	43.0	Pond Flat Ditch at St. Joseph Rd.	38°08.6' 87°35.8'

identified to species using a 15 cm × 23 cm × 6 cm glass viewing aquarium. Those that could be identified were recorded and released; those that could not be identified with confidence were sorted and counted, and a representative sample killed in 10% formalin for identification in the laboratory. All fishes returned to the lab were deposited in the University of Southern Indiana collection.

RESULTS AND DISCUSSION

We collected 4165 individuals representing 40 species and 11 families. Species richness was similar between the 22 headwater sites (32 species in nine families) and the 10 wadable

sites (33 species in nine families; Table 2). Spotfin Shiner (*Cyprinella spiloptera*) was the most common species, occurring at all stations and accounting for 30% of the individuals collected. Bluntnose Minnow (*Pimephales notatus*) and Steelcolor Shiner (*C. whipplei*) occurred at over 90% of the stations. Three species were each represented by a single specimen: Silver Redhorse (*Moxostoma anisurum*), Black Bullhead (*Ameiurus melas*), and Bluntnose Darter (*Etheostoma chlorosoma*); the latter was the only percid collected.

Eight species found in Big Creek were absent from its tributaries: Longnose Gar (*Lepisosteus osseus*), Gizzard Shad (*Dorosoma cepedianum*),

Grass Carp (*Ctenopharyngodon idella*), Silver Carp (*Hypophthalmichthys molitrix*), Bighead Carp (*H. nobilis*), Fathead Minnow (*P. promelas*), Quillback (*Carpoides carpio*), and Black Crappie (*Pomoxis nigromaculatus*). Seven species were limited to headwater sites: Creek Chub (*Semotilus atromaculatus*), River Carp-sucker (*Carpoides carpio*), Lake Chubsucker (*Erinmyzon sucetta*), Silver Redhorse, Black Bullhead, Pirate Perch (*Aphredoderus sayanus*), and Bluntnose Darter.

Jordan's 1888 survey (1890) was apparently limited to a single site in lower Big Creek, possibly in the area of station 6 (Fig. 1). Gerking (1945) visited two sites on Big Creek, one near station 27 and the other between station 6 and the Wabash River. Kozel et al. (1981) visited three sites on Big Creek and eight headwater sites. Grannan and Lodato's (1986) survey concentrated on darters, with 13 of 14 of their sites in tributaries of Big Creek; the remaining site was a slough where Big Creek joins the Wabash River. While these surveys differ significantly among themselves and with our survey in terms of objectives and collection methods, some comparisons are possible. Only two species – Bluntnose Minnow (*Pimephales notatus*) and Blackstripe Topminnow (*Fundulus notatus*) were found in all five surveys (Table 3). Nineteen species reported in at least one of the previous surveys were absent in the current survey. While 11 of these were found in only one survey, Golden Shiner (*Notemigonus crysoleucus*) were found in all previous surveys, and Silver Chub (*Macrhybopsis storeriana*) were reported in three surveys. Kozel et al. (1981) reported Golden Shiner at over half of their Big Creek stations, so their absence in the current survey was particularly surprising.

We collected 13 species that had not been found in previous surveys. Lake Chubsucker and Silver Redhorse were represented by single individuals. Four species – Grass Carp (*Ctenopharyngodon idella*), Silver Carp (*Hypophthalmichthys molitrix*), Bighead Carp (*H. nobilis*), and Mosquitofish (*Gambusia affinis*) are exotics (Simon et al. 1992) that were likely rare or absent from Big Creek during previous surveys. Largemouth Bass (*Micropterus salmoides*) is now fairly common in Big Creek (10 stations), which may be due to stocking efforts.

Sand Shiner (*Notropis stramineus*) and River Shiner (*N. blennioides*) were found at both headwater and wadable sites in the current

study but were absent from previous surveys. The Sand Shiner was particularly widespread, occurring at 24 of 32 stations. Similarly, the Spotfin Shiner has become the most common species in Big Creek, occurring at all stations. The Spotfin Shiner was the most common species collected at eight of 10 wadable stations and 15 of 22 headwater stations. This species was relatively rare or absent in most previous surveys (Table 3).

Jordan's (1890) survey of a single Big Creek site yielded 22 species in seven families, while Gerking's (1945) survey found 20 species in eight families at one site and 22 species in eight families at the other. Only three sites (stations 10, 17 and 21) in the current survey yielded similar levels of diversity, although four or five species at each of these sites are alien (Grass Carp, Bighead Carp, Silver Carp) or domestic (Western Mosquitofish, Largemouth Bass) invasives. Jordan's 1888 collection included six darter species - Blackside (*Percina maculata*), Slenderhead (*P. phoxocephala*), Johnny (*Etheostoma nigrum*), Mud (*E. asprigene*), Slough (*E. gracile*), and Bluntnose (Jordan, 1890). Subsequent surveys found only the Slough Darter (Gerking, 1945 and Kozel et al. 1981) or the Bluntnose Darter (current survey). Moreover, a 1998 survey of darters in Posey County that included 14 sites on tributaries of Big Creek failed to find any darters (Bandoli 1998). The two *Percina* species found by Jordan are usually found over gravel or rocky substrates, which are rare habitats in Posey County outside the Wabash River. The four species of *Etheostoma* found by Jordan are often found in sluggish, turbid water over sand/silt substrates (Page 1983). These habitats are still common in the Big Creek watershed, and Johnny Darter, Slough Darter, and Mud Darter occur in other streams in Posey County (Bandoli 1998), so their apparent absence in Big Creek is surprising.

The Big Creek watershed has undergone extensive anthropogenic modification since Jordan's visit in 1888. Dredging and straightening of the main channel and some of the tributaries would have dramatically changed seasonal flow; deforestation has led to bank destabilization, and the subsequent erosion has increased turbidity and covered benthic structures used as refuges and breeding sites by many fish species. Agriculture, oil wells, and residential developments may have further

Table 2.—Fish species collected in Big Creek and its tributaries in the summer of 2008. Numbers are site locations as in Table 1 and Figure 1; numbers in parentheses are numbers of individuals. Headwaters are sites with drainage areas $\leq 51.8 \text{ km}^2$ (20 mi^2); wadable sites drain $>51.8 \text{ km}^2$.

Scientific name (Common name)	Headwater sites	Wadable sites
Lepisosteidae		
<i>Lepisosteus osseus</i> (Longnose Gar)		10(2)
Clupeidae		
<i>Dorosoma cepedianum</i> (Gizzard Shad)		6(78), 10(10), 17(6), 21(19), 25(2)
Cyprinidae		
<i>Campostoma anomalum</i> (Central Stoneroller)	1(2), 2(1), 3(1), 7(6), 9(5), 11(1), 15(2), 18(1), 19(5), 22(12), 23(3), 24(6), 28(3), 31(3), 32(2)	12(2), 14(2), 21(9), 29(14), 30(7)
<i>Ctenopharyngodon idella</i> (Grass Carp)	1(11), 2(2), 3(137), 4(69), 5(43), 7(14), 8(14), 9(13), 11(29), 13(58), 15(33), 16(59), 18(42), 19(50), 20(19), 22(13), 23(72), 24(131), 26(42), 28(12), 31(9), 32(29)	6(3), 10(2), 17(2), 21(7), 25(1)
<i>Cyprinella spiloptera</i> (Spotfin Shiner)	3(72), 4(4), 5(3), 7(2), 9(6), 11(5), 13(3), 15(6), 16(1), 18(9), 19(7), 20(1), 22(3), 23(13), 24(23), 26(7), 28(1), 31(2), 32(17)	6(18), 10(52), 12(10), 14(34), 17(55), 21(45), 25(68), 27(44), 29(79), 30(50)
<i>Cyprinella whipplei</i> (Steelcolor Shiner)	4(1)	6(12), 10(11), 12(3), 14(9), 17(9), 21(25), 25(38), 27(19), 29(35), 30(39)
<i>Cyprinus carpio</i> (Common Carp)	3(2), 9(3), 19(2), 31(1)	10(1), 12(2), 17(3), 21(2)
<i>Hypognathus nuchalis</i> (Mississippi Silvery Minnow)		6(3), 10(18), 12(3), 17(7), 21(1), 25(14)
<i>Hypophthalmichthys molitrix</i> (Silver Carp)		6(73), 10(3), 17(10), 21(1)
<i>Hypophthalmichthys nobilis</i> (Bighead Carp)		6(3), 17(1)
<i>Lythrurus umbratilis</i> (Redfin Shiner)	7(32), 8(1), 11(19), 18(4), 22(1), 24(1), 26(5), 31(50), 32(21)	25(3), 27(25), 29(18), 30(33)
<i>Notropis atherinoides</i> (Emerald Shiner)	1(1), 3(37), 5(9), 8(1), 9(1), 11(1), 13(2), 15(2), 19(3)	17(1), 21(3), 25(5), 30(1)
<i>Notropis blennioides</i> (River Shiner)	3(12), 5(2), 7(12), 9(5), 11(1), 19(2)	6(1), 21(1)
<i>Notropis buccata</i> (Silverjaw Minnow)	1(1), 7(5), 11(2), 15(3), 16(17), 18(4), 20(4), 22(2), 23(13), 24(24), 26(2), 31(9)	10(2), 14(7), 17(1), 21(10), 27(1), 29(6)
<i>Notropis stramineus</i> (Sand Shiner)	3(1), 4(15), 5(13), 7(1), 8(3), 9(4), 11(2), 15(17), 16(12), 18(4), 19(1), 22(3), 23(7), 24(11), 26(8), 28(18), 31(9)	10(1), 12(1), 14(5), 21(6), 27(3), 29(3), 30(1)
<i>Phenacobius mirabilis</i> (Suckermouth Minnow)	1(1), 3(3), 7(8), 11(7), 19(3), 22(3), 24(3), 32(1)	10(1), 17(2), 21(4), 29(1)
<i>Pimephales notatus</i> (Bluntnose Minnow)	1(9), 2(13), 3(12), 4(16), 5(33), 7(36), 8(5), 9(2), 11(8), 13(10), 15(19), 16(1), 18(35), 19(19), 20(20), 22(43), 23(41), 24(39), 26(45), 28(38), 31(28), 32(10)	10(5), 12(13), 14(19), 17(7), 21(1), 25(4), 27(4), 29(23), 30(32)
<i>Pimephales promelas</i> (Fathead Minnow)	9(1), 18(1), 19(1)	12(5), 14(1), 17(1)
<i>Pimephales vigilax</i> (Bullhead Minnow)	1(23), 2(3), 3(19), 4(11), 7(36), 8(6), 11(9), 13(2), 15(4), 18(16), 22(6), 24(6), 31(3)	10(2), 21(2), 25(2)
<i>Semotilus atromaculatus</i> (Creek Chub)		

Table 2.—Continued.

Scientific name (Common name)	Headwater sites	Wadable sites
Catastomidae		
<i>Carpoides carpio</i> (River Carpsucker)	3(2)	21(1), 27(2)
<i>Carpoides cyprinus</i> (Quillback)	19(1), 22(2), 24(2)	14(2)
<i>Erimyzon oblongus</i> (Creek Chubsucker)	4(2)	6(8), 10(18), 12(34), 14(33), 17(13), 21(46), 25(13),
<i>Erimyzon sucetta</i> (Lake Chubsucker)	5(1), 9(2), 19(5)	27(4), 30(1)
<i>Ictiobus bubalus</i> (Smallmouth Buffalo)	9(2), 19(3)	10(3), 12(12), 17(5), 21(10)
<i>Ictiobus cyprinellus</i> (Bignmouth Buffalo)	9(1)	
<i>Moxostoma anisurum</i> (Silver Redhorse)		
Ictaluridae		
<i>Ameiurus melas</i> (Black Bullhead)	4(1)	29(1)
<i>Ameiurus natalis</i> (Yellow Bullhead)	8(3), 22(1), 24(1), 32(1)	6(1), 10(1), 12(2), 17(3), 25(1), 27(1)
<i>Ictalurus punctatus</i> (Channel Catfish)	31(1)	
Aphredoderidae		
<i>Aphredoderus sayanus</i> (Pirate Perch)	19(1), 22(8), 24(8)	
Fundulidae		
<i>Fundulus notatus</i> (Blackstripe Topminnow)	2(2), 3(1), 4(2), 5(1), 7(18), 11(6), 13(4), 15(1), 16(6),	12(1), 14(10), 17(3), 21(10), 27(1), 29(1), 30(10)
	18(6), 19(4), 23(1), 26(6), 28(3), 31(34), 32(36)	
Poeciliidae		
<i>Gambusia affinis</i> (Western Mosquitofish)	5(1), 8(2), 19(2), 22(4), 24(4)	10(1), 17(3), 30(1)
Atherinidae		
<i>Labidesthes sicculus</i> (Brook Silverside)	31(1)	6(2), 21(5)
Centrarchidae		
<i>Lepomis cyanellus</i> (Green Sunfish)	1(1), 3(1), 5(3), 8(3), 22(1), 24(1), 26(2), 31(1), 32(1)	14(3), 27(1), 29(1), 30(1)
<i>Lepomis macrochirus</i> (Bluegill)	1(2), 4(7), 5(22), 7(3), 8(13), 13(4), 15(10), 16(5),	12(2), 14(23), 17(1), 27(5), 29(8), 30(8)
	18(2), 19(11), 20(1), 22(15), 23(2), 24(11), 26(14),	
	28(2), 31(22), 32(5)	
<i>Lepomis megalotis</i> (Longear Sunfish)	26(2), 31(9), 32(10)	10(2), 12(2), 14(3), 17(1), 27(5), 29(7), 30(2)
<i>Micropterus salmoides</i> (Largemouth Bass)	5(1), 8(8), 15(2), 16(2), 31(2)	10(5), 12(2), 14(7), 17(2), 27(1)
<i>Pomoxis nigromaculatus</i> (Black Crappie)		10(21), 17(4), 21(1), 25(1)
Percidae		
<i>Etheostoma chlorosoma</i> (Bluntnose Darter)	1(1)	

Table 3.—Changes in the Big Creek fish fauna over 120 years. Results of four previous surveys (Jordan's 1888 survey (Jordan, 1890); Gerking (1945), Kozel et al. 1981), and Grannan & Lodato (1986)) are compared to the current (2008) survey, reported as the number of sites where each species was collected. Numbers in parentheses are the total number of collection sites in each survey.

Species	1888 (1)	1945 (2)	1981 (11)	1986 (14)	2008 (32)
Lepisosteidae					
<i>Lepisosteus osseus</i>		1			1
Clupeidae					
<i>Dorosoma cepedianum</i>		2	1		5
Esocidae					
<i>Esox americanus</i>			2		
Cyprinidae					
<i>Campostoma anomalum</i>			4	3	20
<i>Ctenopharyngodon idella</i>					5
<i>Cyprinella spiloptera</i>		2	2		32
<i>C. whipplei</i>	1		2		29
<i>Cyprinus carpio</i>		2	3		5
<i>Hybognathus nuchalis</i>	1	2			10
<i>Hypophthalmichthys molitrix</i>					4
<i>H. nobilis</i>					2
<i>Luxilus chrysocephalus</i>	1				
<i>Lythrurus umbratilis</i>			6		13
<i>Macrhybopsis storeriana</i>	1	1	1		
<i>Notemigonus crysoleucas</i>	1	1	6	1	
<i>Notropis atherinoides</i>	1	2			13
<i>N. blennioides</i>					8
<i>N. buccata</i>		2	4	3	18
<i>N. stramineus</i>					24
<i>N. volucellus</i>		1	6		
<i>Opsopoeodus emiliae</i>	1				
<i>Phenacobius mirabilis</i>		1	3		12
<i>Pimephales notatus</i>	1	2	7	4	31
<i>P. promelas</i>					3
<i>P. vigilax</i>	1	1	1		6
<i>Semotilus atromaculatus</i>		1	8	8	13
Catastomidae					
<i>Carpiodes carpio</i>		1			1
<i>C. cyprinus</i>		1	1		2
<i>C. velifer</i>	1				
<i>Catostomus commersonii</i>			2	1	
<i>Erimyzon oblongus</i>		2	1		4
<i>E. sucetta</i>					1
<i>Ictiobus bubalus</i>			1		12
<i>I. cyprinellus</i>					6
<i>Moxostoma anisurum</i>					1
Ictaluridae					
<i>Ameiurus melas</i>		1	2	1	1
<i>A. natalis</i>	1		2	3	5
<i>A. nebulosus</i>			1		
<i>Ictalurus punctatus</i>	1	1			7
<i>Noturus gyrinus</i>	1	1			
<i>N. miurus</i>			1		

Table 3.—Continued.

Species	1888 (1)	1945 (2)	1981 (11)	1986 (14)	2008 (32)
Aphredoderidae					
<i>Aphredoderus sayanus</i>	1	1		2	3
Fundulidae					
<i>Fundulus notatus</i>	1	2	9	5	23
Poeciliidae					
<i>Gambusia affinis</i>					8
Atherinidae					
<i>Labidesthes sicculus</i>					3
Centrarchidae					
<i>Lepomis cyanellus</i>		2	10	5	13
<i>L. gulosus</i>		1	1		
<i>L. macrochirus</i>		1	4	4	24
<i>L. humilis</i>	1				
<i>L. megalotis</i>		2	2	1	10
<i>L. microlophus</i>				1	
<i>Micropterus salmoides</i>					10
<i>M. dolomieu</i>			1		
<i>Pomoxis annularis</i>		1	2		
<i>P. nigromaculatus</i>					4
Percidae					
<i>Etheostoma asprigene</i>	1				
<i>E. chlorosoma</i>	1				1
<i>E. gracile</i>	1	1	1		
<i>E. nigrum</i>	1				
<i>Percina maculata</i>	1				
<i>P. phoxocephala</i>		1			
Sciaenidae					
<i>Aplodinotus grunniens</i>		1			

stressed the watershed with periodic releases of pollutants. While it is not possible to link specific modifications to changes in the fish fauna, it is clear that changes have occurred. Three changes stand out: the apparent extirpation of the Golden Shiner, the dramatic decline in darters, and the dominance of the Spotfin Shiner. Jordan (1890) and Gerking (1945) both collected the Golden Shiner. Kozel et al. (1981) found Golden Shiner at six stations on Big Creek tributaries, many of which were sampled in the current study. Grannan & Lodato (1986) reported this species at only one of 14 Big Creek stations. This suggests that their decline and possible extirpation is relatively recent. Trautman (1981) noted that the Golden Shiner is less tolerant of turbidity, and blamed

anthropogenic changes that increased turbidity and siltation for the extirpation of this species from many previously-occupied drainages in Ohio between 1955 and 1980. The apparent extirpation from Big Creek of the Johnny Darter, Slough Darter, and Mud Darter, and the extreme rarity of the Bluntnose Darter, despite their tolerance of turbidity, also suggests that the watershed has been extensively degraded by anthropogenic modifications.

While Gerking (1945) found Spotfin Shiner at both of his sites on Big Creek, Kozel et al. (1981) found them at just two of 14 sites, and Grannan & Lodato (1986) did not find this species at any of 13 headwater sites. Their current ubiquity and numerical dominance in the Big Creek watershed suggests a relatively

recent increase in this species. Trautman (1981) observed that the Spottfin Shiner is often the most numerous shiner in areas characterized by turbid water and pollutants. He attributed their success in these conditions to their ability to attach eggs to the undersides of structures, allowing successful reproduction despite heavy siltation. These conditions are typical throughout Big Creek (Borries, 2008).

Comparisons between our survey and those conducted over the last century suggest significant changes in the fishes of Big Creek. It would appear likely that many of these changes are the result of the anthropogenic modifications that have occurred in this watershed over that period. Hopefully, needed changes in drainage management and projects aimed at mitigating past degradations will improve the watershed. It will be interesting to see if these endeavors have an impact on the fishes of Big Creek.

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