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Gary Mason
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Natchez Trace Parkway
2680 Natchez Trace Parkway
Tupelo, MS 38801



Dear Mr. Mason:

Enclosed are two copies of the reports that were made for the Mississippi Wildlife Heritage Fund, with collections from two of the sites from the Natchez Trace Parkway waters. Conditions of the permit required two copies of the report. The fish collections were deposited in the Auburn University Vertebrate Collection. The mussel specimens were deposited with the Mississippi Museum of Natural Science. The information will be used for the Master's thesis that I am currently working on. The permit number was NATR-99-01.

If there are any questions, contact me at (334) 887-9262 or by e-mail at phillbw@mail.auburn.edu.

Sincerely,

A handwritten signature in cursive script that reads "Bryan Phillips".

Bryan Phillips

Site #5, #3

Are ON NATR Land

Fishes and mussels of the Bear Creek drainage, Mississippi

A report prepared for the Mississippi Wildlife Heritage Fund

December 1999

By:

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INTRODUCTION

Bear Creek (Tennessee River system) has long been regarded as a unique stream, primarily because the fish fauna contains species from both the Tennessee River and the Mobile Basin (Wall 1968, Starnes and Etnier 1986, Boschung 1992). These representatives from the Mobile Basin are found nowhere else in the Tennessee River system. Although most authors support the idea of headwater piracy of Tombigbee River tributaries by the Tennessee River to explain these distributions (Wall 1968, Starnes and Etnier 1986, Boschung 1992), others support the contention that fishes crossed drainage divisions during periods of inundation by interglacial seas (Mettee et al. 1996).

A distributional survey of fishes was conducted for the Bear Creek system, Alabama and Mississippi, by Wall (1968), who made 94 collections over a two-year period. Since this time no comprehensive survey of this stream has been conducted, although several collections have been made in the area over time (P. O'Neil, pers. comm.). Since 1968, four reservoirs have been constructed on the Bear Creek system, and it is likely that these impoundments have had dramatic impacts on the aquatic community. Surrounding land use has also changed dramatically since the 1960's, and could pose potential threats to surrounding aquatic ecosystems.

The objectives of this study were to: re-visit many of the sites sampled in Mississippi by Wall (1968) and sample both the fish and mussel communities; and to compare the data for fishes with Wall's (1968) Mississippi collections.

Literature Cited

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- Starnes, W. C. and D. A. Etnier. 1986. Drainage evolution and fish biogeography of the Tennessee and Cumberland River drainages. p. 325-361 IN: Hocutt, C. H. and E. O. Wiley (eds.) Zoogeography of North American freshwater fishes. Wiley-Interscience, New York.
- Wall, B. R. 1968. Studies on the fishes of the Bear Creek drainage of the Tennessee River system. M. S. Thesis, University of Alabama. 96 p.

TABLE 1. List of species and number of specimens (percent relative abundance in parentheses) collected from each site. Locations of sites described in Appendix. GPS locations and date of collection listed in Appendix. Total number of species shared between sampling periods for sites 1-2 is four and four, respectively. No data from 1968 is available for site 3.

Species	<u>Site 1</u>		<u>Site 2</u>		<u>Site 3</u>	
	1968	1999	1968	1999	1999	1999
<i>Campostoma oligolepis</i>	3 (7.1)	5 (4.3)	0	3 (9.1)	6 (13.0)	6 (13.0)
<i>Cyprinella spiloptera</i>	0	6 (5.1)	1 (1.1)	3 (9.1)	7 (15.2)	7 (15.2)
<i>Cyprinella whipplei</i>	11 (26.2)	0	1 (1.1)	0	0	0
<i>Luxilus chrysocephalus</i>	7 (16.7)	51 (43.6)	26 (28.3)	2 (6.1)	6 (13.0)	6 (13.0)
<i>Nocomis micropogon</i>	0	1 (0.9)	0	0	0	0
<i>Notropis atherinoides</i>	11 (23.8)	0	0	0	0	0
<i>Notropis rubellus</i>	0	0	8 (8.7)	0	0	0
<i>Notropis volucellus</i>	0	0	0	0	1 (2.2)	1 (2.2)
<i>Opsopoeodus emilae</i>	0	0	16 (17.4)	0	0	0
<i>Pimephales notatus</i>	0	1 (0.9)	0	1 (3.0)	2 (4.3)	2 (4.3)
<i>Pimephales vigilax</i>	0	0	8 (8.7)	0	0	0
<i>Semotilus atromaculatus</i>	0	5 (4.3)	0	0	2 (4.3)	2 (4.3)
<i>Erimyzon oblongus</i>	0	0	0	0	1 (2.2)	1 (2.2)
<i>Hypentelium nigricans</i>	0	14 (12.0)	0	0	4 (8.7)	4 (8.7)
<i>Moxostoma erythrum</i>	0	10 (8.5)	0	0	0	0
<i>Noturus nocturnus</i>	0	0	4 (4.3)	0	0	0
<i>Fundulus olivaceus</i>	1 (2.4)	0	0	3 (9.1)	0	0
<i>Gambusia affinis</i>	0	2 (1.7)	0	1 (3.0)	0	0
<i>Cottus caroliniae</i>	2 (4.8)	0	0	0	0	0
<i>Lepomis macrochirus</i>	1 (2.4)	0	0	1 (3.0)	0	0
<i>Lepomis marginatus</i>	0	0	0	2 (6.1)	0	0
<i>Lepomis megalotis</i>	2 (4.8)	1 (0.9)	2 (2.2)	3 (9.1)	0	0
<i>Micropterus punctulatus</i>	0	5 (4.3)	2 (2.2)	0	2 (4.3)	2 (4.3)
<i>Micropterus salmoides</i>	1 (2.4)	0	0	1 (3.0)	0	0
<i>Etheostoma histrio</i>	0	0	1 (1.1)	0	0	0
<i>Etheostoma rufileineatum</i>	0	0	0	2 (6.1)	8 (17.4)	8 (17.4)
<i>Percina phoxacephala</i>	2 (4.8)	0	10 (10.9)	0	0	0
<i>Percina sciera</i>	2 (4.8)	16 (13.7)	13 (14.1)	11 (33.3)	7 (15.2)	7 (15.2)
Total number of individuals	42	117	92	33	46	46
Species richness	11	12	12	12	11	11

TABLE 2. List of species and number of specimens (percent relative abundance in parentheses) collected from each site. Locations of sites described in Appendix. GPS locations and date of collection listed in Appendix. Total number of species shared between sampling periods for sites 4, 6, and 7, is seven, one, and one, respectively. No data from 1968 is available for site 5.

Species	<u>Site 4</u>		<u>Site 5</u>		<u>Site 6</u>		<u>Site 7</u>	
	1968	1999	1999	1968	1999	1968	1999	
<i>Campostoma oligolepis</i>	0	2 (3.0)	19 (19.8)	0	0	0	0	
<i>Cyprinella spiloptera</i>	0	8 (12.1)	4 (4.2)	0	0	0	0	
<i>Cyprinella whipplei</i>	4 (12.9)	6 (9.1)	0	0	0	0	0	
<i>Luxilus chrysocephalus</i>	4 (12.9)	7 (10.6)	0	6 (60.0)	0	0	0	
<i>Notemigonus crysoleucas</i>	2 (6.5)	0	0	1 (10.0)	0	0	0	
<i>Notropis telescopus</i>	0	0	1 (1.0)	0	0	0	0	
<i>Notropis rubellus</i>	4 (12.9)	0	0	0	0	0	0	
<i>Notropis volucellus</i>	0	4 (6.1)	12 (12.5)	0	0	0	0	
<i>Pimephales vigilax</i>	0	3 (4.5)	4 (4.2)	0	0	0	0	
<i>Hypentelium nigricans</i>	0	12 (18.2)	19 (19.8)	0	0	0	0	
<i>Moxostoma duquesnei</i>	0	3 (4.5)	0	0	0	0	0	
<i>Noturus miurus</i>	0	2 (3.0)	0	0	0	0	0	
<i>Esox americanus</i>	0	0	0	0	0	0	1 (5.9)	
<i>Fundulus catenatus</i>	0	0	2 (2.1)	0	0	0	0	
<i>Fundulus olivaceus</i>	1 (3.2)	3 (4.5)	0	3 (30.0)	5 (15.6)	4 (80)	0	
<i>Gambusia affinis</i>	0	0	2 (2.1)	0	2 (6.3)	0	2 (11.8)	
<i>Cottus caroliniae</i>	1 (3.2)	4 (6.1)	16 (16.7)	0	0	0	0	
<i>Lepomis gulosus</i>	0	0	0	0	3 (9.4)	0	4 (23.5)	
<i>Lepomis macrochirus</i>	0	1 (1.5)	0	0	19 (59.4)	1 (20)	8 (47.1)	
<i>Lepomis marginatus</i>	0	0	2 (2.1)	0	0	0	0	
<i>Lepomis megalotis</i>	9 (29.0)	0	0	0	3 (9.4)	0	0	
<i>Lepomis miniatus</i>	0	0	0	0	0	2 (11.8)	0	
<i>Micropterus punctulatus</i>	1 (3.2)	2 (3.0)	0	0	0	0	0	
<i>Micropterus salmoides</i>	0	0	6 (6.3)	0	0	0	0	
<i>Etheostoma rufileuctum</i>	1 (3.2)	1 (1.5)	6 (6.3)	0	0	0	0	
<i>Percina caprodes</i>	2 (6.5)	0	2 (2.1)	0	0	0	0	
<i>Percina sciera</i>	2 (6.5)	8 (12.1)	1 (1.0)	0	0	0	0	
Total number of individuals	31	66	96	10	32	5	17	
Species richness	11	15	14	3	5	2	5	

and *Nocomis micropogon* were collected during the current survey, and both species are known from the Bear Creek drainage (Wall 1968, Mettee et al., 1996).

In general, the physical habitat present at sampling sites appeared stable. Some channel degradation is occurring at Site 1 due to heavy off road vehicle use (e.g., riding them through the channel and across gravel beds). The channelized portion of Bear Creek at Belmont and Golden was not sampled. It was readily apparent that both water quality and physical habitat were extremely degraded at these sites (steep, deep channel with high turbidity; numerous decomposing carcasses; absence of woody debris or other stream structure).

Mussels were found at three sites reported in this survey, only two of which were in Mississippi (Tables 5 - 7). A total of 21 unionid species were collected during the current study (including Site 5), as compared to 24 species by Ortmann (1924), 17 by Isom and Yokley (1968) and 18 by McGregor et al. (1996). McGregor et al. (1996) did not collect in Mississippi, and eight species found during the current survey were not found in that study (Tables 5 - 7). Three of these were found in earlier surveys, however (Ortmann 1924, Isom and Yokley 1968). Four species were found by McGregor et al. but were not found in this survey. Both Isom and Yokley (1968) and McGregor et al. (1996), in more comprehensive mussel surveys of Bear Creek, concluded that the mussel fauna has changed significantly over time. Included in this change has been the loss of numerous sensitive species, possibly due to habitat degradation (McGregor et al., 1996).

METHODS AND MATERIALS

Collections were made at eleven sites in 1999 (Fig.1, Appendix). Nine of these sites were previously sampled by Wall (1968). Wall surveyed twelve Mississippi sites in the Bear Creek system in 1968. Sites of potential conservation or unusual records of species were selected for re-sampling in 1999. Two additional sites on the Natchez Trace Parkway were sampled. Three sites sampled by Wall (1968) were not accessible by road. All sample sites for 1999 were recorded using a Magelleon model 2000 GPS unit.

Sampling procedures for fish used in the original survey were followed as closely as possible. Seines (10 feet in length) were used for all collections, with a sampling duration of 30-45 minutes. All accessible habitat was sampled. Fish were anesthetized using clove oil and preserved in 10% formalin. Processed fish were stored in 75% ethanol. All fish identifications were determined by C. E. Johnston. In 1968, collections were made on a variety of dates. In 1999, collections were made primarily in January and June (Appendix). Collections from 1968 were deposited at the University of Alabama. Collections from 1999 were deposited in the Auburn University Vertebrate Collection.

Mussel fauna was sampled at each site. Sampling procedures for mussel fauna consisted of snorkeling and hand picking. All live mussels were released. Mussels were identified by J. T. Garner. Mussels will be vouchered at the Mississippi Museum, and identification will be further determined by Paul Hartfield (USFWS, Jackson).

RESULTS AND DISCUSSION

A total of 35 species was collected during the current (1999) study, as compared to 36 species collected during the 1968 survey (Wall 1968) (Tables 1 - 4). No major faunal shifts are noticeable from these data. Any subtle changes, such as the absence of *Cyprinella whipplei* and *Notropis atheriniodes* from the 1999 Site 1 collection, could be attributed to sampling or seasonal bias between the two collections. No major changes in species or guild dominance are detectable. In general, the dominant species present in 1968 are still present in 1999 samples.

As expected, larger sites such as those in the main channel of Bear Creek (Sites 1 - 5), have slightly higher species richness than tributary sites (Sites 6 - 11) (Tables 1 - 4). For all sites, species richness is similar between the 1968 and 1999 surveys (Tables 1 - 4). Species composition, examined as the number of species in common, of sites ranged from 25% - 55%. Differences in species composition are usually due to the presence/absence of uncommon species, and not to changes in dominant faunal elements.

No threatened or endangered fishes were collected or observed during this survey. *Etheostoma rufilineatum*, known in Mississippi only from Bear and Yellow creeks, is still present in this system. However, *Percina phoxacephala*, also known in Mississippi only from Bear and Yellow creeks, was not collected at historical locations in the present study, suggesting further work may be necessary to establish the continued presence of the species in the state. *Etheostoma nigripinne* and *Etheostoma zonistium*, known in Mississippi from the Tennessee River, Bear and Yellow creeks, were both collected during the current survey, as were two minnows with the same distributions in Mississippi, *Cyprinella spiloptera* and *Lythrurus ardens*. Both *Nocomis leptcephalus*

TABLE 3. List of species and number of specimens (percent relative abundance in parentheses) collected from each site. Locations of sites described in Appendix. GPS locations and date of collection listed in Appendix. Total number of species shared between sampling periods for sites 8-10 is three, three, and five, respectively.

Species	Site 8		Site 9		Site 10	
	1968	1999	1968	1999	1968	1999
<i>Lampetra</i> sp.	0	0	0	1 (2.2)	0	2 (6.9)
<i>Campostoma oligolepis</i>	0	1 (4.8)	0	0	0	0
<i>Luxilus crysocephalus</i>	1 (2.3)	8 (38.1)	9 (7.1)	0	122 (52.6)	3 (10.3)
<i>Lythrurus ardens</i>	0	1 (4.8)	0	0	0	0
<i>Lythrurus bellus</i>	1 (2.3)	0	0	0	0	0
<i>Nocomis leptocephalus</i>	0	2 (9.5)	46 (36.2)	2 (4.4)	1 (0.4)	0
<i>Notemigonus crysoleucas</i>	0	0	0	0	6 (2.6)	0
<i>Notropis baileyi</i>	23 (53.5)	1 (4.8)	52 (40.9)	32 (71.1)	59 (25.4)	17 (58.6)
<i>Semotilus atromaculatus</i>	0	0	1 (1.6)	0	0	0
<i>Erimyzon oblongus</i>	0	0	0	0	2 (0.9)	1 (3.4)
<i>Hypentelium nigricans</i>	0	0	1 (0.8)	0	0	0
<i>Moxostoma erythrurum</i>	0	0	0	0	2 (0.9)	0
<i>Noturus funebris</i>	0	0	0	2 (4.4)	0	0
<i>Esox americanus</i>	1 (2.3)	0	0	0	3 (1.3)	0
<i>Esox niger</i>	0	0	1 (0.8)	0	0	0
<i>Fundulus olivaceus</i>	8 (18.6)	0	0	1 (2.2)	19 (8.2)	4 (13.8)
<i>Aphredoderus sayanus</i>	0	0	0	0	1 (0.4)	0
<i>Lepomis cyanellus</i>	1 (2.3)	0	1 (0.8)	0	6 (2.6)	0
<i>Lepomis macrochirus</i>	0	0	2 (1.6)	0	0	0
<i>Lepomis megalotis</i>	0	5 (23.8)	0	3 (6.7)	0	1 (3.4)
<i>Etheostoma nigripinne</i>	0	0	5 (3.9)	0	1 (0.4)	0
<i>Etheostoma nigrum</i>	4 (9.3)	0	0	0	0	0
<i>Etheostoma zonistium</i>	4 (9.3)	3 (14.3)	8 (6.3)	4 (8.9)	10 (4.3)	1 (3.4)
Total number of individuals	43	21	127	45	232	29
Species richness	8	7	10	7	12	7

TABLE 4. List of species and number of specimens (percent relative abundance in parentheses) collected from the site. Locations of sites described in Appendix. GPS locations and date of collection listed in Appendix. Total number of species shared between sampling periods for site 11 is three.

Species	Site 11	
	1968	1999
<i>Campostoma oligolepis</i>	5 (20.8)	10 (31.2)
<i>Clinostomus funduloides</i>	1 (4.2)	0
<i>Luxilus chrysocephalus</i>	4 (16.7)	5 (15.6)
<i>Notropis baileyi</i>	0	1 (3.1)
<i>Semotilus atromaculatus</i>	0	1 (3.1)
<i>Fundulus olivaceus</i>	0	8 (25.0)
<i>Lepomis megalotis</i>	0	3 (9.3)
<i>Etheostoma nigripinne</i>	14 (58.3)	4 (12.5)
Total number of individuals	24	32
Species richness	4	7

TABLE 5. Species list of mussels found at Bear Creek (Site 2). L = live; FD = fresh dead; WD = weathered dead; R = relict

Leptodea fragilis 1FD

Total 1 sp.

TABLE 6. Species list of mussels found at Bear Creek (Site 4). L = live; FD = fresh dead; WD = weathered dead; R = relict

<i>Amblema plicata</i>	1FD
<i>Anodonta grandis</i>	1FD
<i>Cyclonaias tuberculata</i>	1FD
<i>Elliptio crassidens</i>	1WD
<i>Elipsaria lineolatus</i>	1WD
<i>Leptodea fragilis</i>	1WD
<i>Ligumia recta</i>	1WD
<i>Megalonaias nervosa</i>	1WD
<i>Obliquaria reflexa</i>	2FD
<i>Potomilus alatus</i>	1WD
<i>Ptychobranhus fasciolaris</i>	1WD
<i>Quadrula pustulosa</i>	1FD
* <i>Strophitus undulatus</i>	1FD
 <i>Corbicula fluminea</i>	 Common

Total 14 spp.

TABLE 7. Species list of mussels found at Bear Creek (Site 5). L = live; FD = fresh dead; WD = weathered dead; R = relict

<i>Amblema plicata</i>	9L
<i>Cyclonaias tuberculata</i>	1L
<i>Elliptio crassidens</i>	5L, 5FD
* <i>Fusconia ebona</i>	1L
<i>Lampsilis ovata</i>	1L
* <i>Lasmigona complanata</i>	1L, 1WD
<i>Leptodea fragilis</i>	6FD, 4WD
<i>Lexingtonia dolabelloides</i>	1L
<i>Megalonaias nervosa</i>	7L, 3WD
<i>Obliquaria reflexa</i>	3L, 1FD, 2 WD
<i>Potomilus alatus</i>	7L
<i>Ptychobranhus fasciolaris</i>	1R
* <i>Quadrula cylindrica</i>	1L
<i>Quadrula pustulosa</i>	4FD
<i>Quadrula quadrula</i>	2R
* <i>Tritogonia verrucosa</i>	1L, 1R
<i>Truncilla truncata</i>	1L

Corbicula fluminea Common

Total 18 spp.

*not reported in previous surveys

Appendix. Sites surveyed during 1968 and 1999. GPS locations for sites surveyed in 1999. Date of collection of survey sites.

<u>Site</u>	<u>Location of site</u>
*1	Bear Creek; 2.5 miles E Dennis, Tishomingo Co., Mississippi GPS: 34 33' 54" N, 88 11' 24" W. Collection date: 6/16/99
2	Bear Creek; Tishomingo State Park, 4.0 miles SE Tishomingo, Tishomingo Co., Mississippi; GPS: 34 36' 25" N, 88 10' 10" W. Collection date: 6/15/99
✓ *3	Bear Creek; 3.0 miles E Tishomingo, Natchez Trace Parkway, Tishomingo Co., Mississippi; GPS: 34 36' 39" N, 88 11' 16" W. Collection date: 6/15/99
4	Bear Creek; 4.0 miles E Tishomingo, Hwy. 30, Tishomingo Co., Mississippi GPS: 34 38' 05" N, 88 09' 15" W. Collection date: 6/15/99
✓ 5	Bear Creek; 7.0 miles E Tishomingo, Natchez Trace Parkway, Colbert Co., Alabama; GPS: 34 39' 37" N, 88 05' 32" W. Collection date: 6/16/99
*6	Cripple Deer Creek; 3.0 miles NE Tishomingo, Co. road 992, Tishomingo Co., Mississippi; GPS: 34 39' 52" N, 88 11' 31" W. Collection date: 1/12/99
*7	Cripple Deer Creek; 4.0 miles N Tishomingo, Hwy. 25, Tishomingo Co., Mississippi GPS: 34 41' 55" N, 88 13' 14" W. Collection date: 1/12/99
*8	Little Cripple Deer Creek; 5.0 miles S Iuka, Co. road 957, Tishomingo Co., Mississippi GPS: 34 44' 04" N, 88 11' 51" W. Collection date: 1/11/99
*9	Pennywinkle Creek; 4.5 miles SE Iuka, Co. road 201, Tishomingo Co., Mississippi GPS: 34 44' 15" N, 88 08' 08" W. Collection date: 1/11/99
*10	Pennywinkle Creek; 3.5 miles SE Iuka, Co. road 995, Tishomingo Co., Mississippi GPS: 34 44' 32" N, 88 09' 19" W. Collection date: 1/11/99
*11	Clear Creek; 2.0 miles W Alabama/Mississippi state line, Co. road 255, Tishomingo Co., Mississippi; GPS: 34 46' 24" N, 88 07' 43" W. Collection date: 1/11/99

* no mussels found at this site.