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RECENT FRESHWATER MUSSEL (BIVALVIA: UNIONACEA) RECORDS FROM
THE NORTH RIVER SYSTEM, FAYETTE AND TUSCALOOSA COUNTIES,
ALABAMA

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ABSTRACT

Collections of freshwater mussels (Bivalvia: Unionacea) at 30 stations in the North River system of Fayette and Tuscaloosa Counties, Alabama from 1991-96 yielded 14 species and the Asian clam, *Corbicula fluminea* (Müller 1774). Eight species were collected alive, five were represented by fresh dead material, and one by a single weathered shell. Two species later receiving federal protection, the dark pigtoe, *Pleurobema furvum* (Conrad 1834), and the orange-nacre mucket, *Lampsilis perovalis* (Conrad 1834), were collected. Another protected species previously reported from the North River system, the triangular kidneyshell, *Ptychobranthus greenii* (Conrad 1834), was not collected, nor was *Pleurobema hagleri* (Frierson 1900), a species known from the drainage but considered extinct by the U.S. Fish and Wildlife Service (USFWS). No mussels were collected at four of the 30 stations.

INTRODUCTION

The mussel and fish faunas of the Mobile River Basin are noteworthy for their high degrees of endemism, and the basin is second only to the Tennessee River in terms of freshwater mussel diversity (Williams, 1982). This diversity is attributed to the physiographic heterogeneity of the basin and associated aquatic habitats, geographic barriers such as the Fall Line, and close proximity to adjacent drainages with diverse faunas (Williams et al., 1992). Hinkley (1906) reported 40 mussel species from the Tombigbee River system alone, whereas Williams et al. (1992) report that 50 species are known from in the upper Tombigbee (upstream of the confluence of the Tombigbee and Black Warrior Rivers) and 48 in the Black Warrior. Impoundment, eutrophication, sedimentation, pollution, and channel modifications, and the resultant fragmenting of populations, have likely contributed to declines in the freshwater mussel fauna (Hartfield, 1994; Mott and Hartfield, 1994).

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Currently, 17 species of mussels in the Mobile River Basin are recognized as endangered or threatened by the USFWS (1987; 1990; and 1993) and 14 Mobile basin endemics in the genus *Pleurobema* are considered extinct by the USFWS (Hartfield, 1994). The type locality for one of these extinct species, *P. hagleri* (Frierson, 1900), is the North River near Tynes, and was known to exist prior to 1920 (van der Schalie, 1981). (Note: there is no record of such a community, and the correct spelling is probably ATyner@, a community reported by Rich [1979] to have once existed in the North River vicinity, Tuscaloosa County, but whose post office was discontinued in 1901). Ortmann (1923) reported four specimens of *P. hagleri* from the H. H. Smith collection from the North River and Valley Creek, Jefferson County.

A water quality and biological study of the Lake Tuscaloosa watershed (Mettee et al., 1990) found that runoff from coal-mining operations affected the water quality and biological communities of the system. Increases in average annual specific conductance values of 230% (32-74 $\mu\text{S}/\text{cm}$) in Lake Tuscaloosa at the spillway and 1,165% (17-198 $\mu\text{S}/\text{cm}$) in Turkey Creek along with declines in fish abundance were observed at several stations over a 10- to 15-year period.

STUDY AREA

The Mobile River Basin is the largest Gulf Coast river basin east of the Mississippi River, draining 113,139 km² in Alabama, Mississippi, Georgia, and Tennessee, including 83,416 km², or 62%, of the land area of Alabama (Mettee et al., 1996). The Black Warrior River drains 16,130 km² in north central Alabama, including portions of the Cumberland Plateau and East Gulf Coastal Plain physiographic sections (Mettee et al., 1996). The North River is a major tributary of the Black Warrior River and drains an area of 1,100 km² in Fayette, Tuscaloosa, and Walker Counties. The eastern part of the drainage occurs in the Warrior Basin District of the Cumberland Plateau, and the western and southeastern portions drain the Fall Line Hills District of the East Gulf Coastal Plain (Bodiford, 1981). The North River joins the Black Warrior River at the Fall Line near Tuscaloosa.

The North River drainage is underlain by two geologic formations. Rock strata of the Pottsville Formation of Pennsylvanian age are exposed along the northeastern part of the watershed. More permeable Coker Formation of Cretaceous age crops out in western and southern parts of the watershed. Streamflow rates in the upper North River are influenced by these formations, with streams draining sand and gravel deposits of the Coker Formation having well-sustained base flows during even the driest years, and those draining the more impermeable Pottsville Formation experiencing quick changes in flow from wet to dry seasons and reduced flows during dry seasons, and may be reduced to isolated pools.

North River within the study area varied from 20-25 meters in width at the downstream sampling stations to 5-7 meters at the most upstream station (30). In the vicinity of a proposed water supply reservoir in Fayette County (just upstream of station 14) stream widths averaged 12-15 meters. Stream habitat ranged from long pools with slow current to short shoal areas containing riffles and runs with slow to moderate current. Substrate was typical of streams in the region, dominated by sand and gravel. Bedrock areas where

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underlying rock strata were exposed were interspersed with boulders, cobble, gravel, and sand. Some shoal areas contained rooted aquatic vegetation. Down timber and detritus provided microhabitats and nutrients, and often the stream passage was blocked from bank to bank by logjams. Most sampling was conducted during the fall when streams were at or near base flow. Evidence of beaver (*Castor canadensis* Kuhl) activity was observed at most stations, and in several reaches beaver dams extended across the main channel of North River. At these sites, pool habitat was increased and riffle habitat was reduced from inundation. At most stations stream banks were stable and vegetated. Bottomland hardwoods and pine plantations were present in much of the watershed and clear-cuts were observed sporadically throughout the watershed. Fields for row crops such as corn and soybeans were frequently encountered, though most were separated from the stream by strips of trees or brush. Evidence of recent and historical surface mining operations was observed near many stations within the watershed. Small deltas of silt or sand mixed with coal particles were observed at tributary/river confluences.

MATERIALS AND METHODS

Sampling was confined to the river reach upstream of Lake Tuscaloosa, a water supply reservoir in the lower portion of the drainage impounded in 1969. Stations were located with the aid of county highway maps or U.S. Geological Survey 1:250,000 topographic maps and were reached via canoe, bridge crossing, or foot trail.

Collections were made by hand, often with a mask and snorkel or viewing bucket. Some specimens also were collected from animal middens. All collections were strictly qualitative, and effort expended between stations varied. Factors influencing the collections included personnel involved, conditions at time of collection such as depth and clarity of water and weather, and time constraints. Collections at each station generally persisted until reasonable effort had been expended searching all available habitat for mussels. In addition to noting species present, we noted physical habitat and obvious or potential sources of impact within each stream reach and station. Voucher specimens were retained by the authors, or were deposited in the Florida Museum of Natural History, the Mississippi Museum of Natural Science, or the Ohio State University Museum of Biological Diversity. Nomenclature follows Turgeon et al. (1998).

RESULTS AND DISCUSSION

Collections at 30 stations in the North River system [Figure 1] yielded 14 species of native freshwater mussels (224 total live and dead specimens) and the exotic Asian clam, *Corbicula fluminea* (Müller 1774) [Table 1, Appendix 1]. Live specimens of eight species, fresh dead specimens of five species, and one species represented by a single weathered dead shell were collected. Two species subsequently protected under the Endangered Species Act, the dark pigtoe, *Pleurobema furvum* (Conrad 1834) and the orange-nacre mucket, *Lampsilis perovalis* (Conrad 1834), were collected alive. We did not collect the triangular kidneyshell, *Ptychobranthus greenii* (Conrad 1834), a species also subsequently protected by the Act that

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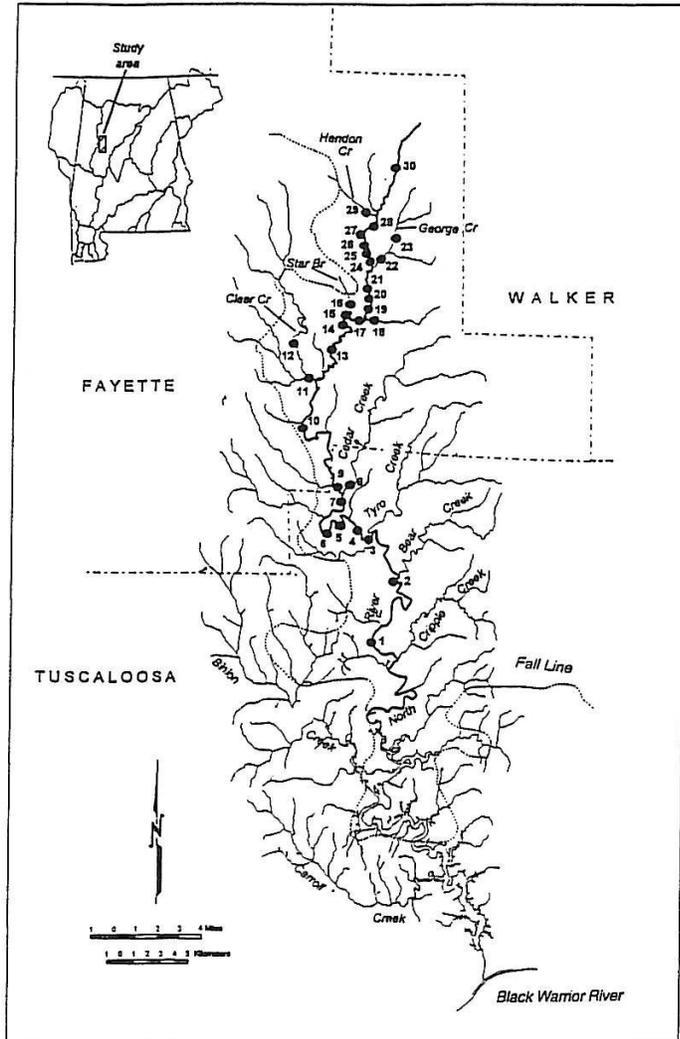


Figure 1. Map of the study area showing collection stations, relevant county boundaries, and position of the Fall Line.

Table 1-Summary of mussel collections in the North River system, Alabama, 1991-96. Numbers in parentheses after common names are numbers collected and percent relative abundance, respectively. A=Alive, FD=Fresh dead, WD=Weathered dead

Taxon/Common name	Station	Condition
<i>Amblyma plicata</i> (Say, 1817) threeridge (1,0.45)	1	FD
<i>Elliptio arca</i> (Conrad, 1834) Alabama spike (3,1.3)	6, 8	FD
<i>E. arcata</i> (Conrad, 1834) delicate spike (3,1.3)	1, 5, 6	FD
<i>Lampsilis ornata</i> (Conrad, 1835) southern pocketbook (15,6.7)	1, 7, 8, 11, 15	FD
<i>L. perovolis</i> (Conrad, 1834) orange-nacre mucket (10,4.5)	1, 4, 7, 9, 10	FD
<i>L. s. clalbornensis</i> (L. Lea, 1838) southern fatmucket (27,12.1)	2, 6, 7, 8, 9, 10, 11, 12, 13, 20, 21, 22, 28	A
<i>L. teres</i> (Rafinesque, 1820) yellow sandshell (1,0.45)	8	A
<i>Pterobema firvum</i> (Conrad, 1834) dark pigtoe (26,11.6)	6, 7, 11	FD
<i>Pyganodon grandis</i> Say, 1829 giant floater (1,0.45)	19	FD
<i>Quadrula asperata</i> (L. Lea, 1861) Alabama orb (37,16.5)	1, 2, 3, 4, 5, 6, 7, 10, 13	A
<i>Sisphilitus subvexus</i> (Conrad, 1834) southern creekmussel (50,22.3)	1, 2, 3, 6, 7, 8, 10, 11, 12, 13, 14, 15, 17, 19, 20, 21, 22, 23, 25, 26, 27, 28	A
<i>Tritogonia verrucosa</i> (Rafinesque, 1820) pistolgrip (12,5.4)	1, 2, 3, 4, 6, 7, 10	FD
<i>Pillosa liliensis</i> (Conrad, 1834) little spectaclecase (17,7.6)	7, 8, 9, 11, 12, 17, 20, 22	FD
<i>V. vibex</i> (Conrad, 1834) southern rainbow (21,9.4)	5, 8, 11, 12, 13, 15, 20, 21, 22, 24, 25, 26, 27, 28	FD
<i>Corbicula fluminea</i> (Müller, 1774) Asian clam	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 19, 20, 21	A

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was reported by van der Schalie (1981) to occur in the drainage before 1920, nor the brown pigtoe, *Pleurobema hagleri* (Frierson 1900), another species known from the drainage before 1920. *Corbicula* was commonly encountered throughout the study area with the exception of a few headwater and tributary stations (Table 1). No mussels were collected at the most upstream main channel station (30) and at three small headwater tributary stations (16, 18, 29).

The most widely distributed species were the southern creekmussel, *Strophitus subvexus* (Conrad 1834), collected at 23 of 30 stations, the southern rainbow, *Villosa vibex*, collected at 14 stations, and *Lampsilis straminea claibornensis* (I. Lea 1838), collected at 13 stations. Numerically dominant mussels collected in the study area include *S. subvexus* (N=50), *Quadrula asperata* (I. Lea 1861) (N=37), *L. s. claibornensis* (N=27), *Pleurobema furvum* (N=26), and *Villosa vibex* (N=21). Station 7 yielded the most diverse and abundant fauna, with 39 specimens from eight species and *Corbicula* present. A nearby tributary, Cedar Creek (station 8), yielded seven species, as did the main channel station (9) immediately upstream. The following are brief accounts of species collected.

Amblema plicata (Say 1817) A single fresh dead shell of the commercially valuable three ridge was collected at the most downstream station sampled (station 1). It is common and widespread, tolerant of a wide variety of habitats, and seems capable of thriving in polluted water (Oesch, 1995).

Elliptio arca (Conrad 1834) Fresh dead and weathered dead shells of the Alabama spike were collected in the North River main channel (station 6) and in a small tributary (station 8). Stansbery (1976) considered this species (as *E. arcus*) endangered.

Elliptio arcata (Conrad 1834) The delicate spike was reported by H. H. Smith (in van der Schalie, 1981) at Hagler's Mill in 1911. Fresh dead and weathered dead shells were collected at North River stations 1, 5, and 6.

Lampsilis ornata (Conrad 1835) The southern pocketbook is a tolerant species common in the Mobile Basin. Fresh dead and weathered dead shells were collected at three main channel stations (1, 7, 15) and two tributary stations (8, 11).

Lampsilis perovalis Stansbery (1976) considered the orange-nacre mucket endangered, and in 1993 it was subsequently listed under the Endangered Species Act as a threatened species. During this survey it was found alive at two main channel stations (1, 7) and as fresh or weathered dead material at three main channel stations (4, 9, 10).

Lampsilis straminea claibornensis The southern fatmucket was widespread and common (both alive and as fresh or weathered dead material) throughout the drainage and was collected at both main channel (2, 6, 7, 9, 10, 13, 20, 21, 28) and tributary (8, 11, 12; 22) stations.

Lampsilis teres (Rafinesque 1820) A weathered dead shell of the normally widespread and common yellow sandshell was collected in a single tributary (station 8).

Pleurobema furvum The dark pigtoe was collected alive at two main channel stations (6, 7) and fresh dead at one main channel station (11). One collection at station 7 yielded 15 fresh dead specimens recovered from an animal midden near a shallow gravel riffle along with shells of six other mussel species.

Pyganodon grandis (Say 1829) One fresh dead specimen of the giant floater was

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collected in the upper main channel (station 19) in an area impacted by beavers (i.e., large deposits of unconsolidated sand and silt with reduced flow), providing its preferred habitat of mud or a mud-gravel mix in quiet water (Oesch 1995). *Pyganodon grandis* was known as *Anodonta grandis* until the phylogenetic relationship among North American *Anodonta* was revised by Hoeh (1990).

Quadrula asperata (I. Lea 1861) The Alabama orb is a common, widespread, and morphologically variable species tolerant of a wide variety of habitat conditions. It was collected at nine main channel stations (1, 2, 3, 4, 5, 6, 7, 10, 13).

Strophitus subvexus (Conrad 1834) The southern creekmussel is widespread and common in the Mobile basin. During this survey it was collected at 17 main channel stations (1, 2, 3, 6, 7, 10, 13, 14, 15, 17, 19, 20, 21, 25, 26, 27, 28) and at stations in three tributaries (8, 11, 12, 22, 23). It was the most frequently encountered and most abundant species collected.

Tritogonia verrucosa (Rafinesque 1820) The pistolgrip was collected at seven main channel stations (1, 2, 3, 4, 6, 7, 10), including a single live specimen at station 7. It is commonly found in larger creeks and rivers.

Villosa lienosa (Conrad 1834) The little spectaclecase is a common and widespread species in small to medium streams, which was collected at four upper main channel stations (7, 9, 17, 20) and at stations in three tributaries (8, 11, 12, 22). Only one live individual was found (station 7).

Villosa vibex (Conrad 1834) The southern rainbow is a common and widespread species in headwater streams and was found throughout the study area in both upper main channel (5, 13, 15, 20, 21, 24, 25, 26, 27, 28) and tributary (8, 11, 12, 22) stations.

Unionid mussels are uncommon to rare in the upper North River system at the present time. The lack of historical or recent mussel surveys in the North River system makes it difficult to speculate on the present biological condition of the mussel fauna or to predict future trends in species abundance or composition. However, based on the apparent loss of such species as *Pleurobema hagleri* and *Psychobranchus greenii* and the precipitous decline of mussel diversity and abundance in other parts of the Black Warrior system, it is presumed that the North River mussel fauna also has been severely depleted.

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Appendix 1-Summary of stations sampled for freshwater mussels in the North River, Fayette and Tuscaloosa Counties, Alabama, 1991-96.

Station no.	Locality	Coordinates
1-	North River at Samantha, Tuscaloosa County Hwy. 38	T. 18 S., R. 10 W., sec. 16/17
2-	North River near mouth of Bear Creek, Tuscaloosa County	T. 17 S., R. 10 W., sec. 34
3-	North River 0.1 mile upstream of Wittson Bridge, Tusc. Co.	T. 17 S., R. 10 W., sec. 29
4-	North River 0.4 mile upstream of Wittson Bridge, Tusc. Co.	T. 17 S., R. 10 W., sec. 20
5-	North River 0.3 mile downstream of Tuscaloosa Co. Hwy. 63	T. 17 S., R. 10 W., sec. 19
6-	North River upstream of Tuscaloosa County Hwy. 63	T. 17 S., R. 10 W., sec. 19
7-	North River below confluence of Cedar Cr. Tuscaloosa Co.	T. 17 S., R. 10 W., sec. 18
8-	Cedar Creek near confluence with North River, Tuscaloosa Co.	T. 17 S., R. 10 W., sec. 18
9-	North River upstream of confluence Cedar Cr. Tuscaloosa Co.	T. 17 S., R. 10 W., sec. 18
10-	North River at Alabama Hwy. 18, Fayette County	T. 16 S., R. 11 W., sec. 26
11-	Clear Creek downstream of Alabama Hwy. 13, Fayette County	T. 16 S., R. 11 W., sec. 14
12-	Clear Creek upstream of Fayette County Hwy. 93	T. 16 S., R. 11 W., sec. 11
13-	North River at Fayette County Hwy. 30	T. 16 S., R. 10 W., sec. 7
14-	North River at proposed dam site, Fayette County	T. 15 S., R. 10 W., sec. 31
15-	North River upstream of proposed dam site, Fayette County	T. 15 S., R. 10 W., sec. 31
16-	Star Branch near confluence with North River, Fayette County	T. 15 S., R. 10 W., sec. 31
17-	North River downstream of Cane Creek, Fayette County	T. 15 S., R. 10 W., sec. 32
18-	Cane Creek near confluence with North River, Fayette County	T. 15 S., R. 10 W., sec. 32
19-	North River near Laney Branch, Fayette County	T. 15 S., R. 10 W., sec. 29
20-	North River downstream of unnumbered Fayette County Hwy.	T. 15 S., R. 10 W., sec. 29
21-	North River upstream of unnumbered Fayette County Hwy.	T. 15 S., R. 10 W., sec. 29
22-	George Creek near confluence with North River, Fayette Co.	T. 15 S., R. 10 W., sec. 20
23-	George Creek upstream of Fayette County Hwy. 63	T. 15 S., R. 10 W., sec. 16
24-	North River west of Fayette County Hwy. 63	T. 15 S., R. 10 W., sec. 17
25-	North River west of Fayette County Hwy. 63 (upstream of 24)	T. 15 S., R. 10 W., sec. 17
26-	North River west of Fayette County Hwy. 63 (upstream of 25)	T. 15 S., R. 10 W., sec. 17
27-	North River downstream of Lowery Branch, Fayette County	T. 15 S., R. 10 W., sec. 8
28-	North River at Fayette County Highway 63	T. 15 S., R. 10 W., sec. 5/8
29-	Hendon Creek east of Fayette County Highway 63	T. 15 S., R. 10 W., sec. 5
30-	North River at Alabama Highway 102, Fayette County	T. 14 S., R. 10 W., sec. 28