

STATUS OF THE FRESHWATER MUSSEL (BIVALVIA: UNIONIDAE)
FAUNA IN THE CAHABA RIVER SYSTEM, ALABAMA

Stuart W. McGregor¹, Patrick E. O'Neil¹ and J. Malcom Pierson²

ABSTRACT

A study by the Geological Survey of Alabama documented 23 species of native freshwater mussels in 17 genera and one exotic bivalve in the Cahaba River downstream of Centerville in 45 collections. The first record from the Cahaba River system for one species, *Plectomerus dombeyanus*, was reported. Current status of all freshwater mussel species known from the Cahaba River system was discussed. Of the 23 species of freshwater mussels collected during that study, 14 were represented by live individuals, six by fresh dead shells, and three by relic shells only. The species most frequently encountered was *Lampsilis ornata* (34 stations), followed by *Quadrula asperata* (31 stations), *Obliquaria reflexa* (29 stations), *Elliptio crassidens* (21 stations), *Potamilus purpuratus* (20 stations), and *Lampsilis teres* (13 stations). No mussels were found at eight stations. Evidence of recent recruitment was observed for four species: *Q. asperata*, *L. ornata*, *L. teres*, and *O. reflexa*. A cumulative total of 43 species in 25 genera (adjusted to Turgeon *et al.*, 1998) from literature records and this study are reported from the drainage from 1933-94. Fresh dead specimens of threatened *Lampsilis altilis* and endangered *Psychobranchus greenii* and relic specimens of endangered *Pleurohema decisum* are reported from this and other recent surveys.

Key words: freshwater mussels, Cahaba River, endangered species, Alabama

INTRODUCTION

Seventeen species of freshwater mussels historically known from the Mobile River basin are currently listed as endangered or threatened by the U.S. Fish and Wildlife Service. Eleven of those species historically occurred in the Cahaba River (Table 1). The decline of the mussel fauna is due to the collective effects of sedimentation, eutrophication, pollution, impoundment and channel modification (Hartfield, 1994). Other factors affecting the distribution and abundance of freshwater mussels in North America include possible competition by exotic species such as the Asian clam, *Corbicula fluminea* (Müller 1774) and the zebra mussel, *Dreissena polymorpha* (Pallas 1771). *Corbicula* invaded the Cahaba River some time after 1935 and had an unknown effect on the native mussel population (Baldwin, 1973). The zebra mussel had a well-documented and profound affect in a very short time on native mussel populations in northern lakes

¹Geological Survey of Alabama, 420 Hackberry Lane, P.O. Box 869999, Tuscaloosa, Alabama 35486-6999, U.S.A.

²204 Stetson Lane, Arabaster, Alabama 35007, U.S.A.

TABLE 1. Mussel species historically known to occur in the Cahaba River currently under Federal protection. E = Federally listed endangered. T = Federally listed threatened.

Species	Status/Year listed
<i>Epioblasma metastriata</i> (Conrad 1838)	E/1993
<i>Epioblasma othcalogensis</i> (L. Lea 1857)	E/1993
<i>Epioblasma penita</i> (Conrad 1834)	E/1987
<i>Lampsilis altilis</i> (Conrad 1834)	T/1993
<i>Lampsilis perovalis</i> (Conrad 1834)	T/1993
<i>Medionidus acutissimus</i> (L. Lea 1831)	T/1993
<i>Medionidus parvulus</i> (L. Lea 1860)	E/1993
<i>Pleurobema decisum</i> (L. Lea 1831)	E/1993
<i>Pleurobema perovatum</i> (Conrad 1834)	E/1993
<i>Pleurobema taitianum</i> (L. Lea 1834)	E/1987
<i>Pygostomus greenii</i> (Conrad 1834)	E/1993

and rivers in the United States and Canada, but has not been reported from the Mobile River basin.

Numerous studies of the Cahaba River mollusk fauna and the river's water-quality have been published through the years. Lewis (1876) catalogued many freshwater and land shells of Alabama, including numerous species of freshwater mussels from the Cahaba River reported by various collectors. His locality information was vague, but included species listed from the Cahaba River drainage specifically and the Alabama River system generally. Other mussel collections from the Cahaba River have been reported by other authors, including Johnson (1967), Frey *et al.* (1976), and Stansbery (1983a,b,c). However, only two comprehensive mussel surveys of the drainage have been completed to date (van der Schalie, 1938; Baldwin, 1973).

In a report on freshwater mussels collected in the Cahaba River system in 1933 and 1935, van der Schalie (1938) stated that the Cahaba River was "unusually productive conchologically," yielding 42 species in 23 genera from 34 stations in the system (Table 2). He reported that the most prominent dangers to the Cahaba River mussel fauna were the possibility of pollution by acid-containing mine wastes, heavy concentrations of industrial wastes and sewage from Birmingham, and the disturbance of the natural conditions in the river by dam construction.

In a study of the changes in the Cahaba River mussel fauna over a 40-year period, Baldwin (1973) reported 31 species in 21 genera from 19 stations (Table 2). He reported that 12 species had increased in abundance and 34 species had decreased in abundance during that time period. Baldwin (1973) supported van der Schalie's (1938) predictions regarding potential impacts to the mussel fauna of the Cahaba River and commented that pollution from coal fields and strip

TABLE 2. Comparison of various surveys of Cahaba River mussel fauna.

Species	van der Schalie (1938)	Baldwin (1973)	Pierson (1991)	Shepard and others (1994)	Current study
<i>Anbisma plicata</i> (Say 1817)	X	X	X	X	
<i>Ellipsaria lineolata</i> (Rafinesque 1820)	X	X	X		X
<i>Elliptio areolaris</i> (Conrad 1834)	X				
<i>Elliptio areolaris</i> (Conrad 1834)	X	X	X		
<i>Elliptio crassidens</i> (Lamarck 1819)	X	X	X	X	X
<i>Epioblasma metastriata</i> (Conrad 1838)	X	X			
<i>Epioblasma penita</i> * (Conrad 1834)					
<i>Fusconia cerina</i> ** (Conrad 1838)	X	X	X	X	X
<i>Fusconia chena</i> (L. Lea 1831)	X	X	X		X
<i>Lampsilis altilis</i> (Conrad 1834)	X	X		X	
<i>Lampsilis ornata</i> (Conrad 1835)	X	X	X	X	X
<i>L. straminea claihorensis</i> (L. Lea 1838)	X	X	X	X	X
<i>Lampsilis teres</i> (Rafinesque 1820)	X	X	X	X	X
<i>Lasmigona complanata alabamensis</i> Clarke 1985	X	X	X		X
<i>Lasmigona holstonia</i> (L. Lea 1838)	X				
<i>Leptodea fragilis</i> (Rafinesque 1820)	X	X			
<i>Ligumia recta</i> (Lamarck 1819)	X	X		X	X
<i>Medionidus acutissimus</i> (L. Lea 1831)	X	X			
<i>Medionidus parvulus</i> * (L. Lea 1860)	X				
<i>Megalomus nervosa</i> (Rafinesque 1820)	X			X	X
<i>Obolonia reflexa</i> Rafinesque 1820	X	X	X	X	X
<i>Obolonia jacksoniana</i> *** (Pierson 1991)	?	?	X		
<i>Obolonia um, alor</i> *** (L. Lea 1845)	?	?	X		X
<i>Plecopterus dombeana</i> (Valenciennes 1827)					X
<i>Pleurobema decisum</i> (L. Lea 1831)	X	X	X	X	
<i>Pleurobema perovatum</i> (Conrad 1834)	X				
<i>Pleurobema rubellum</i> (Conrad 1834)	X				
<i>Pleurobema taitianum</i> (L. Lea 1834)	X				
<i>Polanilla purpuratus</i> (Lamarck 1819)	X	X	X	X	X
<i>Pygostomus greenii</i> (Conrad 1834)	X	X		X	
<i>Pygostomus grandis</i> (Say 1829)			X		
<i>Quadrula apiculata</i> (Say 1829)	X	X	X		X
<i>Quadrula asperata</i> (L. Lea 1861)	X	X	X	X	X
<i>Quadrula micaneva</i> (Rafinesque 1820)	X	X	X		X
<i>Quadrula umphreana</i> (L. Lea 1852)	X	X		X	X
<i>Toxostoma ref. corvanculus</i> (L. Lea 1866)	X				X
<i>Tringonia verrucosa</i> (Rafinesque 1820)	X	X	X	X	X
<i>Trunculus donaxiformis</i> (L. Lea 1828)	X		X		X
<i>Unio merus tenuissimus</i> **** (Say 1831)	X	X			
<i>Unio merus tenuissimus</i> (Say 1831)	X	X			
<i>Unio merus tenuissimus</i> (Say 1831)	X	X	X	X	X
<i>Villosa hienosa</i> (Conrad 1834)	X	X			
<i>Villosa nebulosa</i> (Conrad 1834)	X	X			
<i>Villosa vanuxemiensis umbrans</i> (L. Lea 1857)	X				
<i>Villosa vibex</i> (Conrad 1834)	X	X			
<i>Corbicula fluminea</i> (Müller 1774)		X	X	X	X

*Collected in the early 20th century and reported by Stansbery (1983a).

**Collected by Kevin Roe, University of Alabama, 1994.

***These species were previously reported by van der Schalie (1938) or Baldwin (1973).

****This species was collected by H.H. Smith early in the 20th century and both van der Schalie and Baldwin received the same collections.

mining had caused considerable acid run-off, and housing developments near the river in Birmingham had increased twofold the amount of waste entering the river from the time of van der Schalie's (1938) study. In 1994, Dr. David H. Stansbery of the Ohio State University Museum of Biological Diversity (OSUM) reexamined the shells collected during Baldwin's (1973) study and reported "at least" 31 species in a letter of findings to the U.S. Fish and Wildlife Service (USFWS).

In a status survey of the southern clubshell, *Pleurobema decisum* (L. Lea 1831), Pierson (1991) reported 27 species of freshwater mussels in 16 genera and *Corbicula*, including nine mussel species collected alive and 11 collected as fresh dead material, from nine stations in the main channel of the Cahaba River and in the lower Little Cahaba River (Table 2). Pierson (1991) observed that the Cahaba River continued to experience water quality problems such as organic enrichment from sewage treatment facilities, siltation from urban and suburban development, and chemical spills and run off from wood treatment facilities. Another concern he addressed was coal-seam methane drilling activities and related discharges. Badly eroded specimens of *P. decisum* were found at only one station during that study, near Heiberger in Perry County.

Shepard *et al.* (1994) reported results of water-quality and biological studies in the upper Cahaba River drainage. They indicated that water quality problems in the Cahaba River were symptomatic of a stressed aquatic community and that dissolved oxygen problems occurred in certain areas of the river, probably due to benthic and algal respiration. Improved dissolved oxygen levels downstream of one wastewater treatment plant were reported, but the potential for water-quality impairment upstream due to discharge of ammonia and chlorination by-products from other wastewater treatment plants remained high. Fish and benthic macroinvertebrate communities were reported to be present and functional, but their productivity and balance were not within the range expected in unimpaired communities. Nineteen species of freshwater mussels in 13 genera and *Corbicula* were recorded in six collections at four stations (Table 2). Specimens of eight of those mussel species were collected alive.

Other studies of the Cahaba River drainage have addressed other important aspects of this biologically diverse system. Harris and others (1984) cataloged 146 species of caddisflies (Trichoptera) from the Cahaba River. O'Neil (1984) in a review of historical water-quality data collected from the upper Cahaba River, noted that the river upstream of the confluence with Buck Creek, as well as Shades Creek and the upper Little Cahaba River, had experienced elevated levels of nitrogen and phosphorous compounds, heavy metals, and low dissolved oxygen levels. Mayden & Kuhadja (1989) stated that the Cahaba River is the most ichthyologically diverse free-flowing river in North America, relative to its size. Pierson *et al.* (1989) cataloged 131 fish species from the Cahaba River

system, including 18 endemic to the Mobile basin, and noted that the Cahaba River is an important refuge for many of these species. Fitzpatrick (1996) reported that though the Cahaba River rises in the Birmingham metropolitan area it retains most of its pristine qualities as an undisturbed watershed, and reported 24 species and subspecies of crawfishes from the drainage.

In 1994 the Geological Survey of Alabama (GSA) was contracted by the Alabama Department of Conservation and Natural Resources (ADCNR) to perform a survey of the lower Cahaba River for freshwater mussels, with specific attention to species listed as endangered or threatened by the Endangered Species Act. This report summarizes the results of that survey and comments on the current status of all species recorded from the drainage.

STUDY AREA

The Cahaba River is currently the longest free-flowing river in the state of Alabama, stretching about 305 kilometers (190 miles) from its headwaters in the Alabama Valley and Ridge Physiographic Section in St. Clair County to its confluence with the Alabama River in Dallas County in the East Gulf Coastal Plain Physiographic Section. It is a major south-flowing tributary of the Alabama River, draining an area of approximately 4,725 km² (1,825 mi²) and ranges in elevation from about 290 meters (960 feet) in its headwaters to about 30 meters (100 feet) at its confluence with the Alabama River near Selma (Pierson *et al.*, 1989). The main channel flows through St. Clair, Jefferson, Shelby, Bibb, Perry, and Dallas counties, and also drains portions of Tuscaloosa and Chilton counties. Our study was confined to the lower half of the river, beginning at the Fall Line in Centreville and proceeding downstream in the Coastal Plain to just above the reservoir influence of the Alabama River in Perry County, covering about 130 kilometers (80 miles) of river.

METHODS

Collections were made using various techniques in an effort to examine all available habitats. Live specimens were hand-collected in shallow areas of the river, often with the aid of a viewing bucket. Mask and snorkel and SCUBA were employed in deeper water. Fresh dead and relic shells were found by walking stream banks, islands, and gravel and sand bars searching for deposited material and shell middens.

When mussels were found at a station efforts were continued until diminishing returns had been reached. Notes on the physical nature of the stream, such as clarity, substrate and presence or absence of vegetation were maintained. Terms for various zones of the river used in species accounts were determined by van der Schalie (1938). The small river zone includes the main channel from the vicinity of Trussville downstream to the mouth of the upper Little Cahaba River, the medium river zone proceeds from that point downstream to the vicinity of Centreville, and the large river zone begins about seven river miles downstream of Centreville and proceeds to the mouth.

Specimens collected were recorded as either alive, fresh dead, or relic. Most live specimens were identified and immediately returned to the substratum. Live specimens sacrificed for later identification were relaxed in a chilled cooler and are preserved in 80% ethanol. Voucher specimens of fresh dead and relic shells and some preserved specimens were accessioned into the reference collection at OSUM. Species reported herein follow current nomenclature presented in Turgeon *et al.* (1998).

RESULTS AND DISCUSSION

During this study, collections were made at 45 stations in the main channel of the Cahaba River from Centreville, Bibb County, downstream to the vicinity of Suttle, Perry County (Table 3). A total of 23 species of freshwater mussels in 17 genera was collected (Table 4). Collection localities described in Table 3 correspond to Table 4. A collection of relic *Plectomerus domheyanus* (Valenciennes 1827) shells at a single station during this study represented a new tributary record for that species. *Corbicula* was encountered throughout the system, but *Dreissena* not encountered. Four species displayed evidence of recent recruitment: *Lampsilis ornata* (Conrad 1835), *Lampsilis teres* (Rafinesque 1820), *Obliquaria reflexa* Rafinesque 1820, and *Quadrula asperata* (L. Lea 1861). No mussels were collected at eight stations (Table 4). In addition to the 23 species collected during this study, three additional species were collected at about the same time in the headwaters and reported by Shepard *et al.* (1994), bringing the total currently known from the drainage to 26 species. Among those species were relic specimens of *Pleurobema decisum* and a fresh dead *Ptychobranchus greenii*, both of which are federally endangered. The *P. decisum* specimens were collected near the upstream limit for that species defined by van der Schalie (1938) and Baldwin (1973).

The decline of mussel diversity in the Cahaba River noted by Baldwin (1973) is still in evidence and is manifested by the continued loss of species. He reported that 34 species had been reduced in number and 12 had increased in number, and that the total species number present in the drainage had fallen from 43 to 31 species from the time of van der Schalie's (1938) study. Results of the present study indicated that seven species have not been reported since van der Schalie (1938) and an additional five species have not been reported since Baldwin (1973). Two new species have been added since Baldwin (1973), bringing the cumulative total for the drainage to 43 species in 25 genera (Table 2).

Though the present survey only covered the lower reaches of the Cahaba River, all species known from the Cahaba River are discussed in the following species accounts. Collections from the Cahaba River made during this study deposited at OSUM occupy collection numbers OSUM:1994:0121-0123, OSUM:1994:0126-0131, OSUM:1994:0143 and OSUM:1994:0155.

TABLE 3. Summary information for collection stations in the lower Cahaba River, Alabama, August-September, 1994.

Station No.	Date	Location
1	Sept. 22	Island at unnamed tributary, Perry Co., T. 18 N., R. 9 E., sec. 17
2	Sept. 22	Gravel bar on right bank, Perry Co., T. 18 N., R. 9 E., sec. 18
3	Sept. 22	Island above unnamed tributary, Perry Co., T. 18 N., R. 9 E., sec. 7, 18
4	Sept. 22	Below high bluff at tributary, Perry Co., T. 18 N., R. 8 E., sec. 12
5	Sept. 22	Gravel bars downstream of Rice Creek, Perry Co., T. 18 N., R. 8 E., sec. 11
6	Sept. 22	At sand island, Perry Co., T. 19 N., R. 8 E., sec. 1
7	Sept. 22	Gravel bar downstream of Radford, Perry Co., T. 19 N., R. 8 E., sec. 36
8	Sept. 22	Opposite Waters Creek, Perry Co., T. 19 N., R. 9 E., sec. 30
9	Sept. 22	Gravel bar in bend, Perry Co., T. 19 N., R. 8 E., sec. 25
10	Sept. 22	Sand bars, Perry Co., T. 19 N., R. 8 E., sec. 11
11	Sept. 22	Pool, Perry Co., T. 19 N., R. 8 E., sec. 10
12	Sept. 22	Gravel bar downstream of "S" curve, Perry Co., T. 19 N., R. 8 E., sec. 2
13	Aug. 21	Downstream of AL Hwy. 14 bridge, Sprott, Perry Co., T. 20 N., R. 8 E., sec. 35
14	Aug. 21	Gravel bar upstream of AL Hwy. 14 bridge, Perry Co., T. 20 N., R. 8 E., sec. 26
15	Aug. 21	Gravel shore below bend, Perry Co., T. 20 N., R. 8 E., sec. 23
16	Aug. 21	Downstream of Perry Lake, Perry Co., T. 20 N., R. 8 E., sec. 23
17	Aug. 21	Shallow riffle at sand bar SE of Perry Lake, Perry Co., T. 20 N., R. 8 E., sec. 23
18	Aug. 21	Sand bar NE of Round Lake, Perry Co., T. 20 N., R. 8 E., sec. 23, 24
19	Sept. 20	Gravel bar downstream of Old Town Creek, Perry Co., T. 20 N., R. 8 E., sec. 10
20	Sept. 20	Sand bank NE of Marietta Church, Perry Co., T. 20 N., R. 8 E., sec. 10
21	Sept. 20	Right bank at head of long pool, Perry Co., T. 20 N., R. 8 E., sec. 3
22	Sept. 20	Gravel bar, mouth of Potato Patch Creek, Perry Co., T. 21 N., R. 8 E., sec. 32
23	Sept. 20	Gravel bar, Perry Co., T. 21 N., R. 8 E., sec. 27
24	Sept. 15	Gravel bar downstream of Jericho Bridge, Perry Co., T. 21 N., R. 8 E., sec. 28
25	Sept. 13	At Jericho Bridge, Perry Co., T. 21 N., R. 8 E., sec. 28
26	Sept. 15	Gravel bar NE of Jericho Bridge, Perry Co., T. 21 N., R. 8 E., sec. 15
27	Sept. 15	Gravel bar upstream of Taylor's Creek, Perry Co., T. 21 N., R. 8 E., sec. 11
28	Sept. 15	Gravel bar upstream of Blue Girth Creek, Perry Co., T. 21 N., R. 8 E., sec. 11
29	Sept. 15	Gravel bar at lower end of long pool, Perry Co., T. 21 N., R. 9 E., sec. 6
30	Sept. 15	Near U.S. Forest Service Boundary, Bibb Co., T. 22 N., R. 9 E., sec. 32
31	Sept. 15	Gravel bar downstream Harrisburg Bridge, Bibb Co., T. 22 N., R. 9 E., sec. 32
32	Sept. 14	Gravel/mud shore, Bibb Co., T. 22 N., R. 9 E., sec. 29
33	Sept. 14	Gravel bar downstream of Cooper Island, Bibb Co., T. 22 N., R. 9 E., sec. 21
34	Sept. 14	Lower end of Cooper Island, Bibb Co., T. 22 N., R. 9 E., sec. 21
35	Sept. 14	Upper end of Cooper Island, Bibb Co., T. 22 N., R. 9 E., sec. 15, 16, 21, 22
36	Sept. 14	Gravel bar upstream of Cooper Island, Bibb Co., T. 22 N., R. 9 E., sec. 15, 16
37	Sept. 14	Gravel bar, Bibb Co., T. 22 N., R. 9 E., sec. 14
38	Sept. 14	Gravel bank, Bibb Co., T. 22 N., R. 9 E., sec. 11, 14
39	Sept. 1	Stations 39-42 were at various locations in broad bend from downstream of Gully Creek to upstream of Sandy Creek, Bibb Co., T. 22 N., R. 9 E., sec. 1, 2, 11, 12
40	Sept. 1	"
41	Sept. 1	"
42	Sept. 1	"
43	Sept. 1	Old mill dam 0.5 mi. south of Fandale, Bibb Co., T. 22 N., R. 9 E., sec. 2
44	Sept. 1	Pool 0.25 mi. downstream of U.S. Hwy. 82, Bibb Co., T. 22 N., R. 9 E., sec. 26
45	Sept. 1	At U.S. Hwy. 82 bridge, Bibb Co., T. 22 N., R. 9 E., sec. 26

TABLE 4. Mussel species and condition of specimens collected in the lower Cahaba River, Alabama, 1994.

Species	1	2	3	4	5	6	7	8	9	10
<i>Ellipsaria lineolata</i> (Rafinesque 1820)	-	-	-	-	-	-	-	-	R	-
<i>Elliptio crassidens</i> (Lamarck 1819)	R	-	FD	-	-	R	A	R	R	A
<i>Fusconaia cerina</i> ** (Conrad 1838)	-	-	-	-	-	-	-	-	-	-
<i>Fusconaia ebena</i> (L. Lea 1831)	-	-	FD	-	-	-	FD	FD	FD	FD
<i>Lampsilis ornata</i> (Conrad 1835)	FD	R	A	-	R	A	FD	A	FD	FD
<i>L. straminea clabornensis</i> (L. Lea, 1838)	-	-	-	-	-	-	-	-	-	-
<i>Lampsilis teres</i> (Rafinesque 1820)	-	-	-	-	-	A	A	-	-	A
<i>Lasnigona complanata alabamensis</i> Clarke 1985	R	-	-	-	-	-	FD	-	-	FD
<i>Leptodea fragilis</i> (Rafinesque 1820)	-	-	-	-	-	FD	-	-	-	-
<i>Ligumia recta</i> (Lamarck 1819)	-	-	-	-	-	-	-	-	FD	-
<i>Megalomias nervosa</i> (Rafinesque 1820)	-	-	-	-	-	-	-	-	-	-
<i>Obliquaria reflexa</i> Rafinesque 1820	FD	-	FD	-	R	R	A	FD	-	FD
<i>Obovaria unicolor</i> (L. Lea 1845)	-	-	R	-	-	R	-	R	-	-
<i>Plectomerus dombyanus</i> (Valenciennes 1827)	-	-	-	-	-	-	-	-	-	R
<i>Potamilius purpuratus</i> (Lamarck 1819)	-	R	-	-	-	FD	R	-	-	FD
<i>Quadrula apiculata</i> (Say 1829)	-	-	-	-	-	R	-	-	-	-
<i>Quadrula asperata</i> (L. Lea 1861)	FD	R	FD	-	R	FD	FD	A	FD	FD
<i>Quadrula metanevra</i> (Rafinesque 1820)	-	-	FD	-	-	-	-	-	-	-
<i>Quadrula tumphiana</i> (L. Lea 1852)	-	-	-	-	-	-	-	-	-	-
<i>Toxolasma</i> ref. <i>corvum</i> ulus (L. Lea 1868)	-	-	-	-	-	-	-	-	-	A
<i>Tritogonia verrucosa</i> (Rafinesque 1820)	-	-	-	-	-	-	-	R	-	-
<i>Truncilla donaciformis</i> (L. Lea 1828)	FD	-	-	-	-	-	-	-	-	FD
<i>Villosa lianosa</i> (Conrad 1834)	-	-	-	-	-	-	-	-	-	-

McGregor, O'Neil and Pierson

TABLE 4 (cont.).

Species	11	12	13	14	15	16	17	18	19	20	21	22
<i>Ellipsaria lineolata</i>	-	-	-	A	-	-	-	-	-	-	-	FD
<i>Elliptio crassidens</i>	-	R	-	-	-	-	-	FD	-	-	FD	FD
<i>Fusconaia cerina</i> **	-	-	-	-	-	-	-	-	-	-	-	-
<i>Fusconaia ebena</i>	-	R	-	FD	-	-	-	-	-	-	-	-
<i>Lampsilis ornata</i>	-	FD	A	A	A	A	A	A	FD	-	FD	FD
<i>L. straminea clabornensis</i>	-	-	-	-	-	-	-	-	FD	-	-	R
<i>Lampsilis teres</i>	-	-	-	-	-	A	A	A	-	-	-	-
<i>Lasnigona complanata alabamensis</i>	-	-	FD	R	-	-	-	A	R	-	FD	-
<i>Leptodea fragilis</i>	-	-	-	-	-	-	-	-	R	-	-	-
<i>Ligumia recta</i>	-	R	-	-	-	-	-	-	-	-	-	-
<i>Megalomias nervosa</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Obliquaria reflexa</i>	-	-	A	A	-	A	-	A	FD	-	FD	-
<i>Obovaria unicolor</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Plectomerus dombyanus</i>	-	-	-	-	-	-	-	-	-	-	-	R
<i>Potamilius purpuratus</i>	-	-	-	FD	-	-	A	-	R	-	-	FD
<i>Quadrula apiculata</i>	-	-	-	FD	-	-	-	-	R	-	-	-
<i>Quadrula asperata</i>	-	FD	FD	A	-	A	-	A	FD	-	FD	A
<i>Quadrula metanevra</i>	-	-	-	A	-	A	-	-	-	-	-	-
<i>Quadrula tumphiana</i>	-	-	-	FD	-	-	-	-	-	-	R	FD
<i>Toxolasma</i> sp.	-	-	-	-	-	-	A	-	-	-	-	-
<i>Tritogonia verrucosa</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Truncilla donaciformis</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Villosa lianosa</i>	-	-	-	-	-	-	-	-	R	-	-	-

Mussels of Cahaba River

TABLE 4 (cont.).

Species	23	24	25	26	27	28	29	30	31	32	33	34
<i>Ellipsaria lineolata</i>	-	R	-	-	FD	-	A	A	-	-	A	-
<i>Elliptio crassidens</i>	-	R	-	-	-	R	A	A	R	FD	R	-
<i>Fusconaia cerina</i> **	-	-	-	-	-	-	-	A	-	-	-	-
<i>Fusconaia ebena</i>	-	-	-	-	-	-	R	A	-	-	-	-
<i>Lampsilis ornata</i>	FD	A	-	A	A	A	A	A	A	A	A	-
<i>L. straminea clathornensis</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lampsilis teres</i>	-	A	-	A	A	A	A	A	A	-	-	-
<i>Lasmigona complanata alabamensis</i>	R	-	-	-	A	R	R	A	A	-	-	-
<i>Leptodea fragilis</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Ligumia recta</i>	-	-	-	-	-	R	-	-	-	-	-	R
<i>Megalania nervosa</i>	-	-	-	-	-	-	FD	-	-	-	R	-
<i>Obliquaria reflexa</i>	FD	-	-	A	A	A	A	A	R	FD	A	FD
<i>Obovaria unicolor</i>	-	-	-	A	-	-	-	FD	-	-	-	-
<i>Plectomerus dombeyana</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Potamilus purpuratus</i>	FD	A	-	-	-	FD	FD	A	A	FD	-	A
<i>Quadrula apiculata</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Quadrula asperata</i>	FD	A	-	FD	-	-	R	A	FD	A	A	A
<i>Quadrula metanevra</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Quadrula rumphiana</i>	FD	-	-	-	-	-	-	A	-	-	-	-
<i>Toxolasma</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-
<i>Tritogonia verrucosa</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Truncilla donaciformis</i>	-	-	-	-	-	A	-	-	-	-	-	-
<i>Villosa lioussa</i>	-	-	-	-	-	-	-	-	-	-	-	-

TABLE 4 (cont.).

Species	34	35	36	37	38	39	40	41	42	43	44	45
<i>Ellipsaria lineolata</i>	-	-	R	R	-	-	-	-	-	-	-	-
<i>Elliptio crassidens</i>	-	A	-	R	-	-	-	-	-	-	-	FD
<i>Fusconaia cerina</i> **	-	-	-	-	-	-	-	-	-	-	-	-
<i>Fusconaia ebena</i>	-	R	-	-	-	-	-	-	-	-	-	-
<i>Lampsilis ornata</i>	-	A	FD	FD	R	-	-	-	R	-	-	-
<i>L. straminea clathornensis</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lampsilis teres</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Lasmigona complanata alabamensis</i>	-	-	-	R	-	-	-	-	-	-	-	-
<i>Leptodea fragilis</i>	-	-	-	-	-	FD	R	FD	-	-	-	-
<i>Ligumia recta</i>	-	-	-	-	-	-	-	-	-	-	-	R
<i>Megalania nervosa</i>	R	-	-	-	-	-	-	-	-	-	-	-
<i>Obliquaria reflexa</i>	FD	FD	FD	R	-	R	R	-	R	-	-	-
<i>Obovaria unicolor</i>	-	-	-	R	-	-	-	-	-	-	-	-
<i>Plectomerus dombeyana</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Potamilus purpuratus</i>	A	-	FD	FD	-	R	-	-	R	-	-	-
<i>Quadrula apiculata</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Quadrula asperata</i>	A	A	A	FD	-	R	-	-	-	-	-	FD
<i>Quadrula metanevra</i>	-	-	R	-	-	-	-	-	-	-	-	-
<i>Quadrula rumphiana</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Toxolasma</i> sp.	-	-	-	-	-	-	-	-	-	-	-	-
<i>Tritogonia verrucosa</i>	-	-	R	-	-	-	-	-	-	-	-	-
<i>Truncilla donaciformis</i>	-	-	-	-	-	-	-	-	-	-	-	-
<i>Villosa lioussa</i>	-	-	-	-	-	-	-	-	-	-	-	-

Ambleria plicata (Say 1817), threeridge

Van der Schalie (1938) collected *Ambleria plicata* (reported as *Ambleria perplicata*) in small to medium river zones from Centreville upstream. Baldwin (1973) reported *A. plicata* (as *A. perplicata*) to be the fourth most abundant species in the Cahaba River and the dominant species at Anita in Shelby County, and common throughout the river. Pierson (1991) reported relic shells only, and Shepard *et al.* (1994) reported fresh dead and relic shells. No specimens were found during the present study.

Ellipsaria lineolata (Rafinesque 1820), butterfly

Van der Schalie (1938) reported *Ellipsaria lineolata* (as *Plagiola lineolata*) in the large river zone. Baldwin (1973) reported this species (as *P. lineolata*) as far upstream as Centreville and stated that the numbers he collected compared favorably with those of van der Schalie (1938). Pierson (1991) reported collecting live specimens, while Shepard *et al.* (1994) did not report this species. *Ellipsaria lineolata* was collected alive at four stations during this study.

Elliptio arca (Conrad 1834), Alabama spike

This species was reported (as *Elliptio dilatatus*) by van der Schalie (1938) from a single specimen collected in the medium river zone. *Elliptio arca* has not been collected in the Cahaba River since.

Elliptio arctata (Conrad 1834), delicate spike

This species was reported (as *Elliptio arctatus*) to be rather abundant by van der Schalie (1938) and Baldwin (1973) in the small and medium river zones upstream of Centreville. Pierson (1991) reported weathered dead *E. arctata* in the Cahaba and Little Cahaba Rivers.

Elliptio crassidens (Lamarck 1819), elephantear

Van der Schalie (1938) reported *Elliptio crassidens* to be common in the large river zone of the Cahaba River. Baldwin (1973) reported it had increased in abundance since the time of van der Schalie's (1938) study. Pierson (1991) also reported live *E. crassidens*, and it accounted for 93.7% of the total yield of live specimens at four stations upstream of Centreville by Shepard *et al.* (1994). *Elliptio crassidens* was collected alive at five stations and as fresh dead and relic at 16 additional stations during this study.

Epioblasma metastrata (Conrad 1838), upland combshell

Epioblasma metastrata (reported as *Dysnomia metastrata*), currently listed as a federally endangered species, was reported to be common in the small to

medium river zone and found sparingly in the large river zone by van der Schalie (1938). Baldwin (1973) reported the species from the same river zones, but greatly reduced in numbers since the time of van der Schalie's (1938) study. Pierson (1991) and Shepard *et al.* (1994) did not report finding this species. No specimens were found during the present study.

Epioblasma penita (Conrad 1834), southern combshell

A single record of *Epioblasma penita*, currently listed as federally endangered, is known from the Cahaba River. It was collected by "Dr. Hartman" at "Cahawba (sic) R., Perry Co., Ala." in the 19th century and was deposited in the U.S. National Museum (USNM), catalog specimen USNM 84472 (Stansbery, 1983c).

Fusconaia cerina (Conrad 1838), Gulf pigtoe

Fusconaia cerina was reported by van der Schalie (1938) (as *Fusconaia rubida*) to be abundant throughout the lower two-thirds of the main channel of the river. Baldwin (1973) found the same distribution but reported the abundance to be "about one-half" that of van der Schalie's (1938) study. Pierson (1991) reported fresh dead specimens, while Shepard *et al.* (1994) reported a single live specimen and several fresh dead and relic shells. No specimens were found during this study. However, a fresh dead shell collected a short time after this study at the U.S. Highway 82 bridge in Centreville by Kevin Roe of the University of Alabama (UA) was brought to our attention and is included in Table 2.

Fusconaia ebena (L. Lea 1831), ebonyshell

Van der Schalie (1938) and Baldwin (1973) reported similar numbers ("relatively abundant") of *Fusconaia ebena* (as *F. ebenus*) in the lower reaches of the Cahaba. Pierson (1991) reported fresh dead specimens while Shepard *et al.* (1994) did not collect it in the headwaters. *Fusconaia ebena* was collected alive at one station during this study.

Lampsilis altilis (Conrad 1834), finelined pocketbook

Lampsilis altilis, currently listed as a federally threatened species, was reported (as *L. clarkiana*) to be abundant in the small to medium river zones by van der Schalie (1938) and Baldwin (1973). Pierson (1991) did not report the species. However, he did report *L. perovalis* from the lower Little Cahaba River downstream of Bulldog Bend. These morphologically similar species were both described from the Alabama River at Claiborne by Conrad in 1834, and their proper taxonomic status is currently considered problematic (Kevin Roe, UA, personal communication, 1999). The USFWS Final Rule (1993) designating *L. perovalis* a threatened species includes the Cahaba River system in the historic

range of the species. Shepard *et al.* (1994) did not report the species, and none were found during this study. However, a single fresh dead shell was collected at Bulldog Bend by GSA personnel during an unrelated study in 1991, and a live specimen was reported by Randy Haddock of the Cahaba River Society from the upper Little Cahaba River in March, 1998.

Lampsilis ornata (Conrad, 1835) southern pocketbook

Van der Schalie (1938) found *Lampsilis ornata* (reported as *L. excavata*) to be very common, with as many as 60 specimens at one station in the large river zone. He reported it to be more common in the small to large river habitat as opposed to creeks. Baldwin (1973) reported *L. ornata* (as *L. excavata*) to be the dominant species collected at one station in the large river zone, and commented that its numbers were reduced by "about one half" from the time of van der Schalie's (1938) study. Pierson (1991) reported finding this species alive in the lower Cahaba River during his study, and Shepard *et al.* (1994) reported the species as relic material upstream of Centreville. By far the dominant species collected during this study, *L. ornata* was encountered alive at 19 stations and fresh dead or relic at an additional 15 stations throughout the study area. Evidence of recent recruitment was indicated by the presence of many juveniles.

Lampsilis straminea claihornensis (I. Lea 1838), southern fatmucket

Lampsilis straminea claihornensis (reported as *L. claihornensis*) was reported by van der Schalie (1938) to be less abundant than other members of the genus. Baldwin (1973) found it to be the most abundant species in the genus, found throughout the river but most abundant in the medium river zones upstream of Centreville. Pierson (1991) reported relic shells, while Shepard *et al.* (1994) reported a few live specimens. One fresh dead and several relic specimens were found during this study at two stations.

Lampsilis teres (Rafinesque 1820), yellow sandshell

Van der Schalie (1938) and Baldwin (1973) both reported *Lampsilis teres* (reported as *L. anodontoides*) as common and preferring medium to large river habitats but found occasionally in the headwaters. Pierson (1991) and Shepard *et al.* (1994) reported live specimens. *Lampsilis teres* was the second most widespread species encountered alive during this study, collected alive at 13 stations. Very small specimens of *L. teres* were often collected, and the species displayed a marked preference for silty/sandy substrates.

Lasmigona complanata alabamensis Clarke 1985, Alabama heelsplitter

Van der Schalie (1938) reported *Lasmigona complanata alabamensis* (reported as *L. complanata*) as present, but uncommon, in the medium to large river zones of the Cahaba. Baldwin (1973) encountered about the same number of individuals (reported as *L. complanata*) during his study. Pierson (1991) reported fresh dead *L. c. alabamensis* during his survey, but it was not reported by Shepard *et al.* (1994). *Lasmigona c. alabamensis* was represented by a few specimens collected alive at four stations and fresh dead at several other stations during this study.

Lasmigona holstonia (I. Lea 1838), Tennessee heelsplitter

Van der Schalie (1938) reported this species from extreme headwater locations and suggested it is geologically a relatively recent invader to the Mobile River basin from the Tennessee River drainage. It is considered a species of the Cumberlandian fauna of the southern Appalachians and is generally restricted to headwater habitats. *Lasmigona holstonia* has not been reported from the Cahaba since van der Schalie (1938).

Leptodea fragilis (Rafinesque 1820), fragile papershell

Van der Schalie (1938) and Baldwin (1973) both reported *Leptodea fragilis* as common in the medium to large river zone as far upstream as Shelby County Highway 29, but absent in the headwaters. Pierson (1991) reported live specimens, but Shepard *et al.* (1994) did not report the species from the headwaters. This species was collected as fresh dead material at three stations during the present study.

Ligumia recta (Lamarck 1819), black sandshell

Van der Schalie (1938) reported *Ligumia recta* (as *L. r. latissima*) from three stations in the large river zone. Baldwin (1973) found the species at four stations, but reported it to be uncommon. Pierson (1991) did not report the species, and Shepard *et al.* (1994) found only relics in the headwaters. Fresh dead specimens of *L. recta* were found at one station and relic specimens at three other stations during this study.

Medionidus acutissimus (I. Lea 1831), Alabama moccasins shell

Van der Schalie (1938) reported 7A specimens of *Medionidus acutissimus*, which is currently listed as federally threatened, throughout the main channel of

the Cahaba River, while Baldwin (1973) found only four specimens. Pierson (1991) and Shepard *et al.* (1994) reported none, and none were found during this study.

Medionidus parvulus (L. Lea 1860), Coosa moccasinshell

Van der Schalie (1938) reported a large series of *Medionidus parvulus* taken at Lily Shoals in the early part of the 20th Century by R. E. Call and H. H. Smith and commented on morphological differences between it and *M. acutissimus*. He suggested that it was greatly reduced in abundance from the earlier collection. It has not been reported from the Cahaba River since.

Megaloniais nervosa (Rafinesque 1820), washboard

Van der Schalie (1938) reported *Megaloniais nervosa* (as *M. gigantea*) to be rare in the Cahaba, occurring at only one station in the large river zone. Baldwin (1973) and Pierson (1991) did not collect the species. Shepard *et al.* (1994) reported a single fresh dead specimen in the upper Cahaba. This commercially valuable species was collected as fresh dead material at one station and as relic material at a few others during this study.

Obliquaria reflexa Rafinesque 1820, threehorn wartyback

Obliquaria reflexa was reported by both van der Schalie (1938) and Baldwin (1973) as widely distributed in the medium to large river zones in the Cahaba River. Pierson (1991) and Shepard *et al.* (1994) also reported live specimens during their studies. *Obliquaria reflexa* was the third most widespread species encountered during this study, reported alive from 11 stations and fresh dead and relic from 18 additional stations. Juvenile specimens were frequently encountered.

Obovaria jacksoniana (Frierson 1912), southern hickorynut

Van der Schalie (1938) reported *Obovaria subrotunda* to be common, but restricted to the large river zone and Baldwin (1973) collected few specimens in the same zone. However, the current understanding is that *O. subrotunda* does not occur in the Cahaba River, and those specimens should be recognized as either *O. jacksoniana* or *O. unicolor*. Pierson (1991) reported relic shells of *O. jacksoniana*. Shepard *et al.* (1994) did not report the species from the headwaters and it was not collected during the present study.

Obovaria unicolor (L. Lea 1845), Alabama hickorynut

See discussion of *Obovaria jacksoniana* for van der Schalie (1938) and Baldwin (1973) accounts. Pierson (1991) reported fresh dead *O. unicolor* during his study, while Shepard *et al.* (1994) did not record either species in the headwaters. This species was collected alive at one station during this study and as fresh dead and relic material at several other stations.

Plectomerus dombeyanus (Valenciennes 1827), bankclimber

A new species record for the system was made when a relic shell of *Plectomerus dombeyanus* was found at a single locality during this study. The species is widespread and relatively common elsewhere in the Mobile basin. It prefers mud or mud-gravel stream beds with moderate to sluggish current (Oesch, 1995).

Pleurobema decisum (L. Lea 1831), southern clubshell

Pleurobema decisum (also reported as *P. instructum*), currently listed as a federally endangered species, was reported throughout the middle reaches of the Cahaba River, especially the medium river zones, by both van der Schalie (1938) and Baldwin (1973). Van der Schalie (1938) further commented that *P. decisum* was the most common member of the genus in the Cahaba River, but Baldwin (1973) indicated that numbers had decreased "by about half" from the time of van der Schalie's (1938) study. Pierson (1973) reported a few badly eroded valves at one station in the lower Cahaba River, while Shepard *et al.* (1994) reported a few relic specimens upstream near Helena, Shelby County. No specimens were found during this study.

Pleurobema perovatum (Conrad 1834), ovate clubshell

Pleurobema perovatum (reported as *P. mux* and *P. simulans*), currently listed as a federally endangered species, was reported by van der Schalie (1938) from throughout the main river channel but was not abundant. It has not been reported from the Cahaba River system since.

Pleurobema rubellum (Conrad 1834), Warrior pigtoe

Van der Schalie (1938) reported a single specimen of *Pleurobema rubellum* from the lower Cahaba River and suggested that it belongs to the *P. mux-simulans* complex. It was not reported in subsequent accounts. Hartfield (1994) states that there are no records of *P. rubellum* for at least 50 years, and therefore the USFWS presumes the species to be extinct.

Pleurobema taitianum (L. Lea 1834), heavy pigtoe

Three specimens of *Pleurobema taitianum* (as *P. cordatum*), currently federally listed as endangered, were reported from three stations in the medium and large river zones of the Cahaba (van der Schalie, 1938; Williams, 1982). It has not been reported in subsequent accounts.

Potamilus purpuratus (Lamarck 1819), bleufer

Potamilus purpuratus was reported (as *Proptera purpurata*) by van der Schalie (1938), to be common in the medium to large river zones and absent in the headwaters. Baldwin (1973) reported *P. purpuratus* to be very common throughout the medium and large river zones and one of the most abundant species in the river. Baldwin (1973) indicated it had increased in abundance since van der Schalie's (1938) study. Pierson (1991) reported fresh dead *P. purpuratus* during his survey. A single live *P. purpuratus* was reported from the headwaters by Shepard *et al.* (1994). One specimen was collected alive at each of five stations and fresh dead and relic specimens were found at 14 additional stations during this study.

Ptychobranchius greenii (Conrad 1834), triangular kidneyshell

Van der Schalie (1938) reported *Ptychobranchius greenii*, which is currently listed as federally endangered, to be more common in the small river zone upstream of Centreville, but occasionally collected further downstream. Baldwin (1973) reported similar numbers during his study. Pierson (1991) did not report the species. Shepard *et al.* (1994) reported a single fresh dead specimen upstream at Shelby County Highway 29. None were found during this study.

Pyganodon grandis (Say 1829), giant floater

Pyganodon grandis is apparently a recent invader of the Cahaba River, as Pierson (1991) first reported fresh dead specimens of the species from the system. It has not been reported since. According to Oesch (1995) it prefers quiet water with a mud or mud-gravel bottom and may adapt to a lake environment.

Quadrula apiculata (Say 1829), southern mapleleaf

Van der Schalie (1938) reported this species (as *Quadrula aspera*) to be closely related to *Q. quadrula* of the Tennessee River drainage, and indicated it is probably a southern race of that species. He found it throughout the river, though less common in the headwaters. Pierson (1991) reported fresh dead specimens. Shepard *et al.* (1994) did not report the species from the headwaters. *Quadrula apiculata* was collected fresh dead at one station and as relic material at two

stations during this study.

Quadrula asperata (L. Lea 1861), Alabama orb

Van der Schalie (1938) reported *Quadrula asperata* under three different names: *Q. pustulosa*, *Q. cahabensis*, and *Q. vallata*, and discussed the likelihood of synonymy within the group. Baldwin (1973) reported the species to be widely distributed (found at 16 stations), abundant (the sixth-most abundant species collected) and variable in form throughout the Cahaba River. Pierson (1991) and Shepard *et al.* (1994) also reported live specimens of *Q. asperata*. It was found alive at 12 stations and fresh dead or relic at 19 additional stations during this study. Numerous juveniles were collected.

Quadrula metanevra (Rafinesque 1820), monkeyface

Van der Schalie (1938) reported *Quadrula metanevra* as locally abundant in the lower Cahaba River, while Baldwin (1973) found only two specimens in the lower Cahaba. Pierson (1991) reported live specimens, but Shepard *et al.* (1994) collected none in the headwaters. *Quadrula metanevra* was collected alive at two stations during this study.

Quadrula rumphiana (L. Lea 1852), ridged mapleleaf

Van der Schalie (1938) reported *Quadrula rumphiana* as common in the medium to large river zones in the Cahaba and reported it as unique to Alabama and Georgia. Baldwin (1973) collected it in the same river zones and suggested that it had increased in abundance since the time of van der Schalie's (1938) study. Pierson (1991) reported fresh dead specimens, while Shepard *et al.* (1994) did not collect it in the headwaters. *Quadrula rumphiana* was collected alive at two stations and as fresh dead and relic material at four other stations during this study.

Toxolasma ref. *corvuculus* (L. Lea 1838), southern purple lilliput

Van der Schalie (1938) reported two species of *Toxolasma* (as *Carunculina corvuculus* and *C. cromwelli*) in the small to medium size zones far upstream of Centreville. He also reported them to be remarkably similar, with the best distinguishing characters nacre color and beak sculpture, which he admitted were dubious characters at best. Baldwin (1973), Pierson (1991), and Shepard *et al.* (1994) reported neither during their respective studies. *Toxolasma* ref. *corvuculus* was collected alive at one station during this study (unidentified past genus, the specimen is in the collection of Paul Bartfield, USFWS, Jackson, Mississippi). *Toxolasma cromwelli* is no longer recognized by Turgeon *et al.*

(1998). Jim Williams of the U.S. Geological Survey, Biological Resources Division (BRD) (personal communication, 2000) considers *T. cromwelli* a synonym of *T. paulus*, and reports records of *T. parvus* and *T. corvunculus* from the Cahaba. David Stansbery (OSUM, personal communication, 2000) indicated that the genus *Toxolasma* in the Gulf drainages is problematic and suggested the need for further study of the group. Richard Johnson (MCZ, personal communication, 2000) considers the group to be fairly small, and considers the species in the Cahaba River to be *T. parva*.

Tritogonia verrucosa (Rafinesque 1820), pistolgrip

Van der Schalie (1938) reported *Tritogonia verrucosa* to have an "unusually wide distribution" in the Cahaba River system, being especially abundant in the small river zone. He also commented on the tendency of specimens with purple nacre to be more common in the headwaters and less common downstream, where almost all specimens had white nacre, but acknowledged that this is probably a local characteristic. Baldwin (1973) found the species to be greatly reduced in numbers during his study, while Pierson (1991) reported fresh dead specimens and Shepard *et al.* (1994) reported relics. Only a few relic specimens were found at two stations during this study.

Truncilla donaciformis (L. Lea 1828), fawnsfoot

Van der Schalie (1938) reported the distribution of *Truncilla donaciformis* to be puzzling, since it did not seem to have a restricted distribution pattern and was found from the headwaters to the lowermost large river zones. However, he found it to be more abundant in the lower reaches of the Cahaba River. Baldwin (1973) did not report this species. Pierson (1991) reported fresh dead specimens, while Shepard *et al.* (1994) did not report the species from the headwaters. *Truncilla donaciformis* was collected alive at one station and fresh dead at two other stations during this study.

Uniomorus tetralasmus (Say 1831), pondhorn

Van der Schalie (1938) and Baldwin (1973) reported single specimens of *Uniomorus tetralasmus* from two locations in the Cahaba River, collected by H.H. Smith, from upstream and downstream of Centreville. It has not been reported from the Cahaba River since, and none were found during the present study.

Utterbackia imbecillis (Say 1829), paper pondshell

Van der Schalie (1938) reported *Utterbackia imbecillis* (as *Anodonta imbecillis*) from the zone of creeks and small river. Baldwin (1973) collected one specimen in

the headwaters. Neither Pierson (1991) nor Shepard *et al.* (1994) reported this species, and it was not found during the present study.

Villosa lienosa (Conrad 1834), little spectaclecase

Villosa lienosa is primarily a species of headwaters and small creeks, but was reported (as *Micromya lienosa*) by van der Schalie (1938) throughout the entire Cahaba River system. Baldwin (1973) found the species to be most abundant at the confluence of the lower Little Cahaba and Cahaba rivers in Bibb County. Pierson (1991) reported fresh dead specimens, while Shepard *et al.* (1994) reported relics only. One relic shell was collected during this study.

Villosa nebulosa (Conrad 1834), Alabama rainbow

Villosa nebulosa was reported (as *Micromya nebulosa*) by van der Schalie (1938) to be rare in the Cahaba and almost exclusively restricted to the headwaters. An exception was the presence of *V. nebulosa* at Lily Shoals in the medium river zone, suggesting that a creek-like environment existed at these shoals. He also discussed the resemblance of *V. nebulosa* in the Cahaba to members of that species complex in the Tennessee drainage and suggested that it probably invaded the Cahaba from the north as a result of stream capture. Baldwin (1973) reported the species from the small river zone but not from the headwaters. Neither Pierson (1991) nor Shepard *et al.* (1994) reported the species and it was not collected during the present study.

Villosa vanuxemensis umbrans (L. Lea 1857), Coosa creekshell

Villosa vanuxemensis umbrans was reported (as *Micromya vanuxemensis*) by van der Schalie (1938) to have a very irregular distribution, being found primarily in the medium river zone with a few specimens in the large river zone. It has not been reported since van der Schalie (1938) and was not encountered during the present study.

Villosa vibex (Conrad 1834), southern rainbow

Villosa vibex was reported (as *Micromya vibex*) by van der Schalie (1938) to be confined to creeks and the small river zone of the Cahaba. He stated that some of the specimens from the extreme headwaters were unusually thick, and suggested it is a reflection of ecological adjustments or possible crossbreeding with the related *V. nebulosa*. Baldwin (1973) collected one specimen in a tributary (Six Mile Creek). Pierson (1991) and Shepard *et al.* (1994) did not report the species and none were collected during the present study.

CONCLUSIONS

Comparison of the results of freshwater mussel surveys of all or parts of the Cahaba River by van der Schalie (1938), Baldwin (1973), and Pierson (1991), with results of surveys conducted as part of a study by Shepard *et al.* (1994), and this study indicate that the mussel fauna of the Cahaba River is in a state of decline. Results of water-quality studies by Shepard *et al.* (1994) provide evidence that there are severe impacts to the system attributable to various mechanisms, namely those causing increased eutrophication or other water-quality effects from permitted wastewater discharge, and those associated with urban and other non-point stormwater runoff. These results substantiate the concerns to the quality and fate of the habitat expressed by earlier researchers. Recent collections in the lower Cahaba River of two species new to the drainage (*Plectomerus dombeyanus* and *Pyganodon grandis*) which are known to inhabit mud or mud-gravel substrate in lakes and sluggish streams and the preference for sandy habitats by one of the most abundant species in the river (*Lampsilis teres*) suggests that the stable gravel habitat once abundant in the Cahaba River might be compromised.

ACKNOWLEDGMENTS

Several individuals assisted in the completion of this report and their contributions are hereby acknowledged. Paul Hartfield of the USFWS Endangered Species Office in Jackson, Mississippi, assisted in field collections and identification of some specimens. Dr. David H. Stansbery and Kathy G. Borror of OSUM assisted with identifications of some specimens and with nomenclature problems. Matt Hicks, then of UA and currently with the Mississippi Department of Environmental Quality, assisted in field collections. Nick Nichols of ADCNR and his staff at Marion Fish Hatchery provided valuable information on river access points and provided technical assistance. Kevin Roe of UA provided reference material from the Cahaba River and current information regarding DNA research. Jim Williams of BRD assisted with taxonomic and nomenclature questions. Richard Johnson of the Museum of Comparative Zoology at Harvard University (MCZ) and Art Bogan of the North Carolina State Museum (NCSM) assisted with nomenclature problems. Jeff Garner of the Alabama Division of Wildlife and Freshwater Fisheries provided valuable editorial comments. Randy Haddock of the Cahaba River Society provided information about recent mollusk collections in the drainage. Irene Thompson of the Geological Survey of Alabama assisted in formatting tables.

LITERATURE CITED

- BALDWIN, C.S. 1973. *Changes in the freshwater mussel fauna in the Cahaba River over the past 40 years*. Unpublished Masters Thesis, Tuskegee Institute, Alabama. 45 pp.
- FITZPATRICK, J.F., Jr. 1996. The Cahaba River of Alabama: A microcosm of impact studies? *Freshwater crayfish*, 11: 87-98.
- FREY, P.J., HOWARD, H.S., MURPHY, P.J., RASHCKE, R.L., SHULTZ, D.A., SMITH, D.R., & TRUE, HOWARD. 1976. Upper Cahaba River report. Environmental Impact Statement under Sect 201, PL 92-500. Environmental Protection Agency, Athens, Georgia. 59 pp.
- HARRIS, S.C., LAGO, P.K., & O'NEIL, P.E. 1984. Trichoptera of the Cahaba River system in Alabama. *Entomological News*, 95: 103-112.
- HARTFIELD, P. 1994. *Status review of select mussel species in the Mobile River basin*. U.S. Fish and Wildlife Service, Jackson, Mississippi. 3 pp. [unpublished]
- HOEH, W.R. 1990. Phylogenetic relationships among eastern North American *Anodonta* (Bivalvia: Unionidae). *Malacological Review*, 23: 63-82.
- JOHNSON, R.J. 1967. Additions to the unionid fauna of the gulf drainages of Alabama, Georgia and Florida (Mollusca: Bivalvia). *Breviora*, 270, 21 pp.
- LEWIS, J. 1876. Fauna of Alabama: Freshwater and land shells of Alabama. Alabama Geological Survey report of progress for 1876, p. 61-100. [unpublished]
- MAYDEN, R.L. & KUHADJA, B.R. 1989. Systematics of *Notropis cahabae*, a new cyprinid fish endemic to the Cahaba River of the Mobile Basin. *Bulletin Alabama Museum of Natural History*, 9, 16 pp.
- OESCH, R.D. 1995. *Missouri naiades: A guide to the mussels of Missouri*. The Missouri Department of Conservation, Jefferson City. 271 pp.
- O'NEIL, P.E. 1984. *Historical surface water-quality analysis of the Cahaba River basin north of Centerville, Alabama*. Alabama Geological Survey Open-file report, 86 pp. [unpublished]
- PIERSON, J.M., HOWELL, W.M., STILES, R.A., NIETTEE, M.F., O'NEIL, P.E., SUTKUS, R.D., & RAMSEY, J.S. 1989. Fishes of the Cahaba River system in Alabama. *Geological Survey of Alabama Bulletin*, 134, 183 pp.
- PIERSON, J.M. 1991. Status survey of the Southern Clubshell, *Pleurobema decisum*. Open-file report to the U.S. Fish and Wildlife Service, 50 pp. [unpublished]
- SHEPARD, T.E., O'NEIL, P.E., MCGREGOR, S.W. & HARRIS, S.C. 1994. Water-quality and biomonitoring studies in the Upper Cahaba River drainage of Alabama. *Geological Survey of Alabama Bulletin*, 160, 118 pp.
- STANSBERY, D.H. 1983a. The status of *Pleurobema decisum*. The Ohio State University Museum of Zoology, Columbus, 10 pp. [unpublished]
- STANSBERY, D.H. 1983b. The status of *Pleurobema taitianum*. The Ohio State University Museum of Zoology, Columbus, 10 pp. [unpublished]
- STANSBERY, D.H. 1983c. The status of *Epiclasmia penita*. The Ohio State University Museum of Zoology, Columbus, 15 pp. [unpublished]
- TURGEON, D.D., QUINN, F.F., Jr., BOGAN, A.E., COAN, E.V., HOCHBERG, F.G., LYONS, W.G., MIKKELSEN, P.M., NEVES, R.J., OPER, C.F.E., ROSENBERG, G., ROTH, B., SCHELTMA, A., THOMPSON, F.G., VECCHIONE, M., & WILLIAMS, J.D. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: mollusks: second edition. *American Fisheries Society Special Publication*, 26, 526 pp.
- USFWS (United States Fish and Wildlife Service). 1993. Endangered and threatened wildlife and plants: endangered status for eight freshwater mussels and threatened status for three freshwater mussels in the Mobile River drainage. *Federal Register*, 58 (50):14330-14340.
- VAN DER SCHALIE, H. 1938. The naiades (fresh-water mussels) of the Cahaba River in northern Alabama. *Occasional Papers of the Museum of Zoology, University of Michigan*, 392, 29 pp.
- WILLIAMS, J.D. 1982. *Distribution and habitat observations of selected Mobile basin unionid mollusks*. In: Miller, A.C. (ed.), *Report of freshwater mollusks workshop*. U.S. Army Engineer Waterways Experiment Station Environmental Laboratory, Vicksburg, Mississippi. 184 pp. [unpublished]