

FUSCONAIA APALACHICOLA, A NEW SPECIES OF FRESHWATER
MUSSEL (BIVALVIA: UNIONIDAE) FROM PRECOLUMBIAN
ARCHAEOLOGICAL SITES IN THE APALACHICOLA BASIN OF
ALABAMA, FLORIDA, AND GEORGIA

JAMES D. WILLIAMS

U.S. Geological Survey, Biological Resources Division
7920 NW 71st Street, Gainesville, Florida 32653

AND

ARLENE FRADKIN

Department of Anthropology
Florida Atlantic University, Boca Raton, Florida 33431

ABSTRACT

Fusconaia apalachicola, a new unionid mussel, is described from four precolumbian archaeological sites in the Apalachicola Basin. The sites range in age from A.D. 500 to 1350. *Fusconaia apalachicola* is absent from recent collections but was likely extant when Europeans arrived in North America. Its extinction was likely due to pollution and habitat destabilization resulting from agriculture and development in the Apalachicola Basin beginning in the early 1800s. This species is known only from this basin and only from archaeological contexts. It is the first species of the genus *Fusconaia* known to occur within the Apalachicola Basin. Based on conchological characters it appears to be most closely related to *F. rotulata* which is endemic to the Escambia River drainage in south Alabama and west Florida.

INTRODUCTION

Within the southeastern United States, the eastern drainages of the Gulf of Mexico harbor a diverse unionid mollusk fauna. This fauna consists of widespread taxa that occur from the Mississippi Basin eastward and south Atlantic drainages westward into the eastern Gulf (Burch, 1975). This region is also inhabited by a relatively large number of endemic mussel taxa. The endemic mussel fauna in the eastern Gulf drainages, Escambia River east to Suwannee River, consists of 26 species and one genus, *Elliptoideus* Frierson, 1927 (Butler, 1989; Williams and Butler, 1994).

Much of the eastern Gulf region endemism is centered in the Apalachicola Basin, which is drained by the Apalachicola, Chattahoochee, and Flint rivers. The Apalachicola Basin is the largest drainage east of the Mobile Basin and drains portions of eastern Alabama, western Georgia, and northwestern Florida. Within the region, the Apalachicola Basin supports the greatest number of freshwater mollusk species as well as endemics (Butler, 1989; Clench and Turner, 1956). The mussel fauna of the Basin consists of 33 species, of which 10 are endemic (Brim Box and Williams, in press).

The genus *Fusconaia* is widespread in the Mississippi Basin and Gulf of Mexico drainages where it is represented by 13 species. In the Atlantic Coast drainages,

however, the genus *Fusconaia* is represented by a single species, *F. masoni* (Conrad, 1834) (Potomac River drainage south to the Savannah River drainage). In the eastern Gulf drainages from the Mobile Basin eastward, the genus *Fusconaia* is represented by *F. cerina* (Conrad, 1838) and *F. ebena* (Lea, 1831) (Mobile Basin and westward), *F. escambia* Clench & Turner, 1956 (Escambia and Yellow river drainages), *F. rotulata* (Wright, 1899) (Escambia River drainage), and *F. succissa* (Lea, 1852) (Escambia River drainage east to Choctawhatchee River). *Fusconaia apalachicola* n. sp. was endemic to the Apalachicola Basin, the only species of *Fusconaia* known from this basin, and was the easternmost representative of the genus on the Gulf Coast.

Fusconaia apalachicola was discovered in the process of identifying mollusks in a faunal sample from a precolumbian archaeological site located along the main channel of the upper Apalachicola River, Liberty County, northwest Florida. An additional 13 species of unionid mussels were found in archaeological samples in the Apalachicola Basin. While all 13 species are well represented in museum collections of recent mollusks, it appears that *F. apalachicola* disappeared before modern malacologists or shell collectors could collect live or fresh shells.

MATERIALS AND METHODS

Comparative archaeological material of *Fusconaia apalachicola* was obtained from three museum research collections. We examined faunal collections housed in the Florida Museum of Natural History, Gainesville, Florida (FLMNH), the Bureau of Archaeological Research, Division of Historic Resources, Department of State, Tallahassee, Florida (FLBAR), and the Columbus Museum, Columbus, Georgia (uncataloged). Material of other species of *Fusconaia* was obtained from the FLMNH, the Alabama Malacological Research Center, Mobile, Alabama (AMRC), the National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM), and U.S. Geological Survey, Gainesville, Florida collections.

Type material was designated for specimens in the collection of the FLMNH. Additional specimens from the FLBAR collections were designated as type material and deposited at the North Carolina State Museum of Natural Sciences, Raleigh, North Carolina (NCSM), the University of Tennessee McClung Museum, Knoxville, Tennessee (UTMM), and the USNM.

A total of 56 specimens of *Fusconaia apalachicola* was identified in the FLMNH precolumbian archaeological sample from Site 8LI76, Liberty County, Florida. We also identified specimens of *F. apalachicola* in the FLBAR collections from the Sycamore Site 8GD13, Gadsden County, Florida, and from the Scholz Steam Plant Site 8JA104, Jackson County, Florida. Of the specimens examined, we borrowed 24 of the most complete valves for comparative study, 14 from the Sycamore Site and 10 from the Scholz Steam Plant Site. These three sites were located along the main channel in the upper reach of the Apalachicola River (Figure 1).

We also examined material from the Chattahoochee and Flint rivers housed in the Columbus Museum, Georgia. One additional specimen of *Fusconaia apalachicola* was found in a faunal sample from the Omussee Creek Site 1HO26, Houston County, southeast Alabama (Figure 1). This specimen is the only record from the Chattahoochee River and the only occurrence of the species outside the state of Florida.

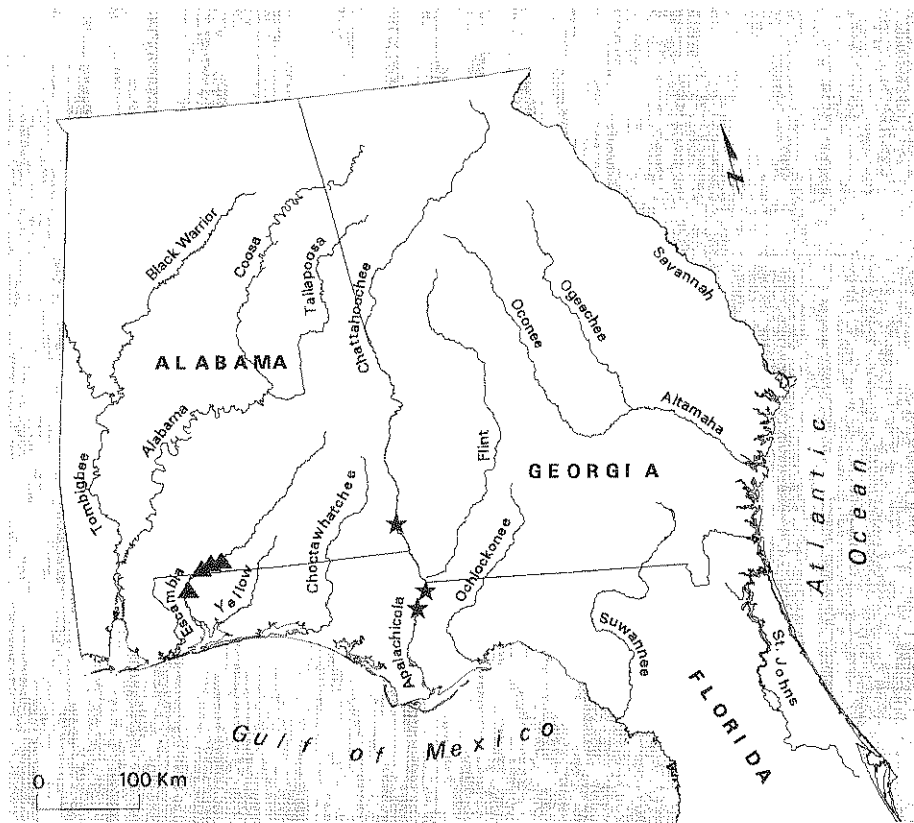


Figure 1. Distribution of *Fusconaia apalachicola* (stars) in the Chattahoochee River system, Alabama and Georgia, and in the Apalachicola River system, Florida, and *Fusconaia rotulata* (triangles) in the Escambia River drainage, Alabama and Florida.

None of the valves of *Fusconaia apalachicola* were complete, although many were missing only a small portion of the posterior end of the shell. Also, there was only a trace of periostracum on a few of the archaeological specimens. The lack of complete valves prevented us from taking total length measurements for comparative purposes. Instead of using total length of the shell, we utilized a measurement of the inter-adductor muscle scar distance taken from the anterior margin of the anterior adductor mussel scar to the anterior margin of the posterior mussel scar. These landmarks were chosen because they were moderately distinct and represented the only measurement of length that could be taken with any degree of accuracy. The width of the shell was taken by measuring the maximum extent of inflation in one valve. The interdentum was used as a base for this measurement as it provided a relatively flat platform to rest one arm of the calipers. This measurement was difficult to obtain on the archaeological material since a portion of the posterior and/or

ventral margin was usually missing. Measurements were taken on both left and right valves. Dial calipers were used to take all measurements which were rounded off to the nearest tenth of a millimeter.

Fusconaia apalachicola, new species
Apalachicola ebonyshell
Figures 2a and 2b

Fusconaia sp. or *Fusconaia* cf. *rotulata*, Fradkin (1995a).

Quincuncina infucata (in part) Percy (1976).

Fusconaia succissa, *Quincuncina burkei*, and *Q. infucata* (in part) Milanich (1974).

HOLOTYPE: FLMNH 05260690.1 (left valve). Florida, Liberty County, Site 8LI76, located 500 m east of the Apalachicola River (T1N; R8W; SE ¼ Sec. 1) near river mile 88 (U.S. Army Corps of Engineers), about 5 miles N of Bristol (Figure 2a).

PARATYPES: *Malacological Collections*.—Florida, Gadsden County, Sycamore Site 8GD13, located near the east bank of the Apalachicola River, at N 30°37'39" latitude and W 84°53'46" longitude: FLMNH 271727 (formerly cataloged as FLBAR 74.68.53.1 [right valve]); NCSM 4694 (formerly cataloged as FLBAR 74.68.156.3 [right valve]; FLBAR 74.68.156.4 [left valve]); NCSM 4695 (formerly cataloged as FLBAR 74.68.168.1 [left valve]; FLBAR 74.68.168.2 [left valve]; FLBAR 74.68.168.3 [left valve]); USNM 880618 (formerly cataloged as FLBAR 74.68.150.1 [right valve]; FLBAR 74.68.150.2 [right valve]); USNM 880617 (formerly cataloged as FLBAR 74.68.157.1 [left valve]); UTM 3410 (formerly cataloged as FLBAR 74.68.157.2 [right valve]; FLBAR 74.68.158.1 [right valve]; FLBAR 74.68.158.2 [left valve]; FLBAR 74.68.158.3 [left valve]).

Florida, Jackson County, Scholz Steam Plant Site 8JA104, located near the west bank of the Apalachicola River, 3.25 miles southeast of Sneads (T3N; R7W; SW ¼ Sec. 12): FLMNH 271728 (formerly cataloged as FLBAR 75.138.01.1 [left valve]).

Archaeological Collections.—Florida, Liberty County, Site 8LI76, located 500 m east of the Apalachicola River (T1N; R8W; SE ¼ Sec. 1) at river mile 88 (U.S. Army Corps of Engineers), about 5 miles N of Bristol: FLMNH 05260528.1 (right valve); FLMNH 05260528.2 (right valve); FLMNH 05260528.3 (left valve); FLMNH 05260528.4 (right valve); FLMNH 05260528.5 (left valve); FLMNH 05260528.6 (left valve); FLMNH 05260528.7 (left valve); FLMNH 05260528.8 (right valve); FLMNH 05260528.9 (right valve); FLMNH 05260528.10 (right valve); FLMNH 05260528.11 (right valve); FLMNH 05260560.1 (left valve); FLMNH 05260560.2 (right valve); FLMNH 05260560.3 (right valve); FLMNH 05260560.4 (right valve); FLMNH 05260560.5 (left valve); FLMNH 05260560.6 (right valve); FLMNH 05260690.2 (right valve); FLMNH 05260690.3 (right valve).

Florida, Jackson County, Scholz Steam Plant Site 8JA104, located near the west bank of the Apalachicola River, 3.25 miles southeast of Sneads (T3N; R7W; SW ¼ Sec. 12): FLBAR 75.138.01.2 (right valve); FLBAR 75.138.01.3 (right valve); FLBAR 75.138.01.4 (left valve); FLBAR 75.138.01.5 (left valve); FLBAR 75.138.01.6 (left valve); FLBAR 75.138.01.7 (right valve); FLBAR 75.138.01.8 (right valve).

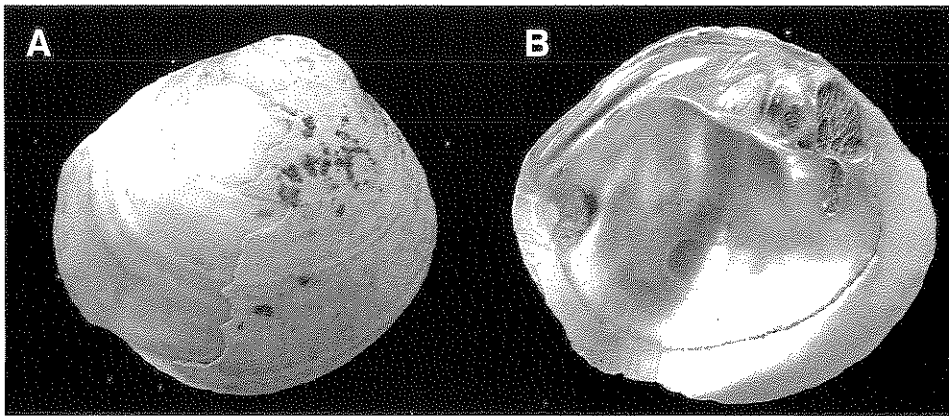


Figure 2. A) *Fusconaia apalachicola*. Holotype, FLMNH 05260690.1 (right valve). Florida, Liberty County, Site 8LI76, located 500 m east of the Apalachicola River (T1N; R8W; SE 1/4 Sec. 1) near river mile 88, about 5 miles N of Bristol, Florida. B) *Fusconaia apalachicola*. Paratype, FLMNH 05260528.9 (right valve). Florida, Liberty County, Site 8LI76, located 500 m east of the Apalachicola River (T1N; R8W; SE 1/4 Sec. 1) near river mile 88, about 5 miles N of Bristol, Florida. Photo © by Richard Bryant.

OTHER MATERIAL EXAMINED BUT NOT DESIGNATED AS TYPES: Alabama, Houston County, Omussee Creek Site 1HO26, located at the mouth of Omussee Creek (Area I NW slope) where it joins the Chattahoochee River, at Columbia, Alabama: uncataloged, Columbus Museum, Georgia (left valve). Florida, Liberty County, Site 8LI76, located 500 m east of the Apalachicola River (T1N; R8W; SE 1/4 Sec. 1) at river mile 88 (U.S. Army Corps of Engineers), about 5 miles N of Bristol: FLMNH 05260585.1 (right valve); FLMNH 05260585.2 (left valve); FLMNH 05260585.3 (left valve); FLMNH 05260603.1 (right valve); FLMNH 05260603.2 (left valve); FLMNH 05260603.3 (left valve); FLMNH 05260603.4 (right valve); FLMNH 05260603.5 (left valve); FLMNH 05260603.6 (left valve); FLMNH 05260603.7 (left valve); FLMNH 05260603.8 (left valve); FLMNH 05260603.9 (left valve); FLMNH 05260603.10 (left valve); FLMNH 05260631.1 (right valve); FLMNH 05260631.2 (right valve); FLMNH 05260631.3 (left valve); FLMNH 05260647.1 (left valve); FLMNH 05260647.2 (right valve); FLMNH 05260647.3 (right valve); FLMNH 05260647.4 (right valve); FLMNH 05260647.5 (left valve); FLMNH 05260660.1 (right valve); FLMNH 05260702.1 (left valve); FLMNH 05260718.1 (right valve); FLMNH 05260718.2 (left valve); FLMNH 05260724.1 (right valve); FLMNH 05260724.2 (left valve). Florida, Jackson County, Scholz Steam Plant Site 8JA104, located near the west bank of the Apalachicola River, 3.25 miles southeast of Sneads (T3N; R7W; SW 1/4 Sec. 12): FLBAR 75.138.02.1 (left valve); FLBAR 75.138.02.2 (right valve). Florida, Gadsden County, Sycamore Site 8GD13, located near the east bank of the Apalachicola River, at North 30°37'39" latitude and West 84°53'46" longitude: FLBAR 74.68.164.1 (right valve).

DIAGNOSIS: *Fusconaia apalachicola* can be distinguished from other species of *Fusconaia* by the following characteristics. *Fusconaia apalachicola* has a smooth shell, lacks any trace of a posterior ridge, moderately compressed, valve depth about 2.4 times into inter-adductor muscle scar distance, circular in outline, hinge plate broad and angular, and the beak cavity is deep and compressed (Figures 2a and 2b). *Fusconaia*

succissa has a poorly defined broadly rounded posterior ridge, moderately inflated, the shell is oval in outline, rounded anteriorly, broadly convex posteriorly, hinge plate broad and arcuate, and the beak cavities are moderately deep and open. *Fusconaia escambia* has a well developed posterior ridge ending in a point posteriorly, the hinge plate is broad and strongly arcuate, and the beak cavities are moderately deep and open. The posterior slope is slightly concave. *Fusconaia rotulata* is moderately inflated and has a faint posterior ridge with one or two additional ridges on the posterior slope. Outline of the shell circular to oval, typically oval, beak cavities are moderately deep and compressed, and the hinge plate is broad and angular.

Fusconaia apalachicola has been misidentified as *Quincuncina infucata*, the sculptured pigtoe, by Milanich (1974) and Percy (1976). This species has a moderately thick shell, subcircular in outline, and moderately inflated. Surface of shell varies from almost smooth to faintly sculptured with small nodules or nodulous ridges arranged in chevron-shaped pattern. Posterior slope flat to slightly concave; the posterior ridge narrowly rounded, shell tapering to a blunt point on the base line posteriorly. The beak cavities are shallow, compressed.

DESCRIPTION: *Fusconaia apalachicola* is characterized by a smooth moderately thick shell, lack of a posterior ridge, circular in outline, compressed, and with beaks (eroded in all individuals in this sample) anterior to the center of the shell. Internally the beak cavities are deep and compressed, and the interdentum is broad and smooth. There are two thick pseudocardinals in the left valve. The crest of the dorsal pseudocardinal tooth ranges from parallel to the lateral teeth to a slightly anterior-dorsal/posterior-ventral orientation. The crest of the ventral pseudocardinal tooth is tangential to or passes through the posterior margin of the anterior adductor muscle scar. There is a single pseudocardinal in the right valve. The laterals are typically straight, but may be slightly curved, two in the left valve and one in the right valve. While nacre color cannot be determined with certainty on archaeological material, there has been no indication that it was colored. The periostracum remained partially intact on two individuals and appeared to be black.

The two best characters for distinguishing *Fusconaia apalachicola* (Figure 2) from *F. rotulata* (Figure 3) are its circular outline and more compressed shell. In *F. apalachicola* the ratio of valve depth to inter-adductor muscle scar distance ranges from 2.2 to 2.7 with a mean of 2.4 (N=20). The ratio of valve depth to inter-adductor muscle scar distance in *F. rotulata* ranges from 1.9 to 2.4 with a mean of 2.1 (N=13). The relationship of shell width and length are presented in Figure 4. Use of outline and degree of compression of the shell for taxonomic purposes in unionids, however, is often viewed with skepticism as these characters can be influenced by environment. In headwater populations of some species the shell is more compressed and round in shape when compared to downstream populations (Ball, 1922; Ortmann, 1920). However, our use of these characters in distinguishing *F. rotulata* from *F. apalachicola* is appropriate as both species occur in similar environments, the main channel of the lower portions of large rivers on the lower Coastal Plain.

Additional evidence that supports the recognition of *Fusconaia apalachicola* as a distinct species is found in the zoogeography of aquatic organisms in the eastern Gulf drainages. There are several distinct and well documented breaks in east/west

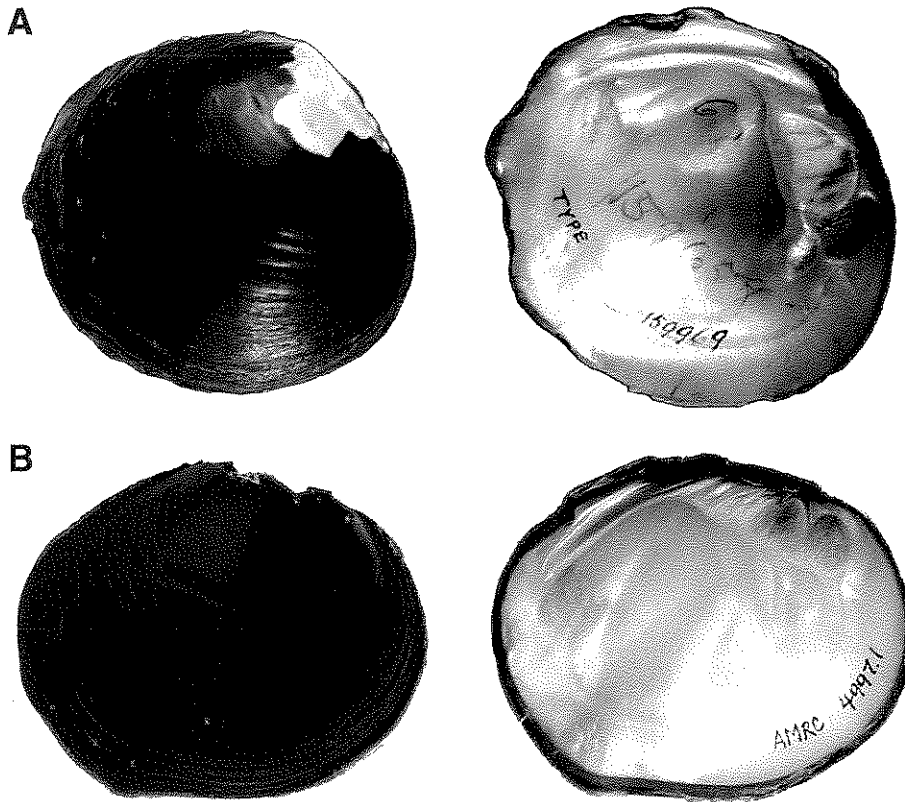


Figure 3. A) *Fusconaia rotulata*. Holotype, USNM 159969, length 46 mm. Escambia River, Escambia County, Florida. B. H. Wright. Photo by Jim Williams. B) *Fusconaia rotulata*. AMRC 4997.1, length 61 mm. Conecuh River, 1 mile above Alabama Highway 41, south of East Brewton, Escambia County, Alabama. 17 August 1996. Photo © by Richard Bryant.

distribution of aquatic species in the eastern Gulf drainages. One of the most pronounced breaks in distribution of aquatic fauna occurs between the west Florida rivers, the Escambia, Yellow, and Choctawhatchee, and the Apalachicola, Chattahoochee, and Flint rivers. This is reflected in the large number of endemic mussels and fishes in the two areas and the reduced number of species that the two areas share in common (Swift et al., 1986; Brim Box and Williams, in press; Clench and Turner, 1956).

DISTRIBUTION: Based on the material available, the Apalachicola ebonyshell appears to have been restricted to the Apalachicola Basin (Figure 1). We currently have material from the Apalachicola River in Florida and Chattahoochee River on the Alabama and Georgia border in southeastern Alabama. We also examined two

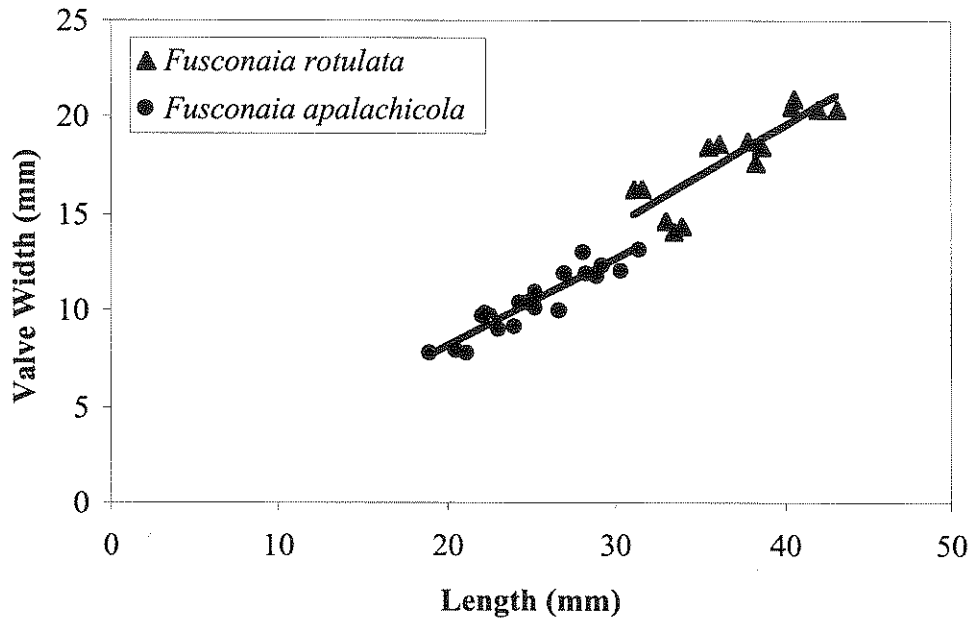


Figure 4. Relationship of valve width to length (distance from anterior margin of the anterior muscle scar to the anterior margin of the posterior muscle scar) in *Fusconaia rotulata* and *Fusconaia apalachicola*.

archaeological faunal collections housed at the Columbus Museum, Georgia. Of the two samples, one was from a site on the Chattahoochee River in east Alabama, the Abercrombie Site (1RU61), Russell County. The other site was the Cannon Site on the Flint River (9CP108), Crisp County, Georgia. These samples had similar species assemblages but did not contain *Fusconaia apalachicola*. We also examined one sample from an archaeological site (8WL81) in the Choctawhatchee River drainage, Walton County, west Florida, but no specimens of *F. apalachicola* or *F. rotulata* were present (Fradkin, 1995b).

The four archaeological sites, three in Florida and one in Alabama, that contained specimens of *Fusconaia apalachicola* range in age from A.D. 500 to 1350. The three Florida sites are located along the main channel of the upper reach of the Apalachicola River (Figure 1). Site 8LI76, Liberty County (Maymon et al., 1996), and the Sycamore Site (8GD13), Gadsden County (Milanich, 1974), are situated along the east side of the river. The Scholz Steam Plant Site (8JA104), Jackson County, is located on the west side of the river (Percy, 1976). All three are inland sites and were occupied during the middle or late Weeden Island culture period, ranging from approximately A.D. 500 to 1000. The Omussee Creek Site (1HO26) (Figure 1), Houston County, Alabama, is located on the lower Chattahoochee River and dates to the Rood phase of the Mississippian period, approximately A.D. 900 to 1350 (Schnell et al., 1981).

ETYMOLOGY: Derivation of the word Apalachicola is not clear. One interpretation is that Apalachicola is derived from the Hitchiti Indian words apalahchi = on the other side, and okli = people, referring to people who live on the other side of the river (Read, 1937). Another interpretation is from the Choctaw word Apelichi = ruling place, and Okla = people, meaning people of the ruling place (Boyd, 1956). We apply this name in reference to the species' restricted distribution to the Apalachicola Basin. Apalachicola ebonyshell is suggested for the common name for *Fusconaia apalachicola*.

DISCUSSION

Mussel collections from the Apalachicola Basin date from 1833, when T. A. Conrad traveled across the Chattahoochee and Flint rivers. He collected mussels from the Flint River but was unable to sample the Chattahoochee River (Wheeler, 1935). Between 1830 and 1870, Isaac Lea described more than 60 species from the Apalachicola Basin, of which only 10 are currently recognized as valid. In the early 1900s, H. H. Smith of the Alabama Museum of Natural History collected large numbers of mollusks from the Apalachicola Basin. In a comprehensive study of the Apalachicola Basin mussels, Brim Box and Williams (in press) examined most of the available museum collections and 350 samples collected between 1990 and 1997, but no *Fusconaia* were found. During the past 150 years, there has been considerable effort expended in the collection of mussels in the Apalachicola Basin. Many of these samples were collected prior to major alterations in the watershed. It appears that no individuals of *F. apalachicola* were ever encountered.

The causal factors and time of extinction of *Fusconaia apalachicola* are not known. The presence and abundance of this mussel in archaeological remains dated to A.D. 1350 suggests that it was most likely extant when the Europeans arrived in North America. If this assumption is correct, then it likely disappeared in response to environmental change associated with settlement and development of the Apalachicola Basin. Significant habitat alterations in the Apalachicola Basin were well underway in the early 1800s. Glenn (1911) reported that 60% of the uplands on the Chattahoochee River, between its headwaters near Gainesville, Georgia, downstream to Atlanta, had been cleared. Sediment from the cleared lands had filled the river channel to the point that many ferries on the Chattahoochee River could not operate during most of the year (Glenn, 1911). Logs cut along the Chattahoochee River were floated downstream to sawmills on an island at Columbus, Georgia, where they were cut into lumber and the sawdust and bark dumped in the river. Cotton mills in Columbus were also dumping waste, fibers, and metal based-dies into the river (Brim Box and Williams, in press).

One of the more common mussels in archaeological faunal samples in the Apalachicola and Chattahoochee rivers, *Elliptoideus sloatianus*, is known in the Chattahoochee River from only two individuals collected in the 1830s (Brim Box and Williams, in press). While *E. sloatianus* persisted in the Apalachicola and Flint rivers, its early extirpation from the Chattahoochee was most likely due to the pollution of the river in the 1800s.

Based on conchological characters, *Fusconaia apalachicola* appears to be most closely

related to *F. rotulata*, which is endemic to the Escambia River drainage in Escambia County, Alabama, and in Escambia and Santa Rosa counties, Florida. Wright (1899) described *Fusconaia rotulata* as a new species and placed it in the genus *Unio* based on a single specimen. Simpson (1900a) reexamined the type specimen and, based on the characters of this individual, assigned it to the genus *Obovaria*. Subsequent workers (Heard, 1979; Johnson, 1967a, 1967b, 1969; Simpson, 1900b, 1914; Turgeon et al., 1998) continued to recognize *rotulata* as a species of *Obovaria*. After examining the type and additional specimens of *rotulata* and comparing conchological characters (teeth, hinge plate, and deep umbo pocket) with other species of *Obovaria* and *Fusconaia*, Williams and Butler (1994) concluded that, based on conchological characters, *rotulata* was a species of *Fusconaia*, not *Obovaria*. *Fusconaia rotulata* most closely resembles *F. ebena*, which is widespread in the Mississippi Basin and along the Gulf coast eastward to the Alabama River system. The other two species of eastern Gulf drainage *Fusconaia*, *F. escambia* and *F. succissa*, are easily distinguished from *F. rotulata* by the presence of a well developed posterior ridge.

The habitat of *Fusconaia apalachicola* and *F. rotulata* appears to have been very similar. *Fusconaia rotulata* is confined to the main channel of the Escambia River in areas with moderate current and a mixture of sand and gravel substrates. Based on museum records and recent collections, both species also appear to have very restricted distributions, being limited to large rivers in the lower Coastal Plain ecoregion. The small number of *F. rotulata* located in museum collections along with those found in a recent survey of the main channel of the Escambia River indicate that it has been rare during the past 100 years. Until additional archaeological samples from the Apalachicola Basin are analyzed, it is not possible to assess the prehistoric rarity of *F. apalachicola*. In proportion to other unionids in archaeological samples where it was found, *F. apalachicola* appeared to be uncommon; however, this perception may be due to the small number of samples examined. The rarity of *F. rotulata* may be due in part to the difficulty of collecting mussels that occur in deeper waters of the main channel of a river.

While the extinction of *Fusconaia apalachicola* is significant, it also has serious implications for the future of *F. rotulata*. The extinction of *F. apalachicola* was most likely due to the alteration of its main channel riverine habitat. The abusive land use practices in the 1800s, during the development of the Chattahoochee and Flint river watersheds, resulted in drastically altered hydrology of these systems (Glenn, 1911; Brim Box and Williams, in press) which most likely extended downstream to the Apalachicola River. *Fusconaia rotulata*, like *F. apalachicola*, has a limited geographic distribution and is restricted to the main channel of the Escambia and Conecuh rivers. These factors, in combination with the current alteration of land, riparian, and stream habitats in the Escambia River watershed, make *F. rotulata* an at risk species with a high probability of extinction.

Mussel samples from the three Florida sites where *Fusconaia apalachicola* was found also contained the following 13 species: *Amblema neislerii*, *Elliptio crassidens*, *E. icterina*, *Elliptioideus sloatianus*, *Glebula rotundata*, *Lampsilis straminea claibornensis*, *L. teres*, *Medionidus penicillatus*, *Megaloniaias nervosa*, *Pleurobema pyriforme*, *Quincuncina infucata*, *Villosa lienosa*, and *V. vibex*. Only five mussels, *Elliptio crassidens*, *E. icterina*, *Elliptioideus sloatianus*, *Pleurobema pyriforme*, and *Quincuncina infucata*, were present

in the sample from the mouth of Omussee Creek on the Chattahoochee River, Houston County, Alabama. In the Apalachicola Basin, these species typically occur in large creeks and rivers in a substrate of gravel, sand, clay, or mixture of sand and clay. *Fusconaia apalachicola* is the only species of unionid known to become extinct before it was discovered and described. Based on abundant archaeological samples from the southeastern United States, no other extinct species have been found which were undescribed.

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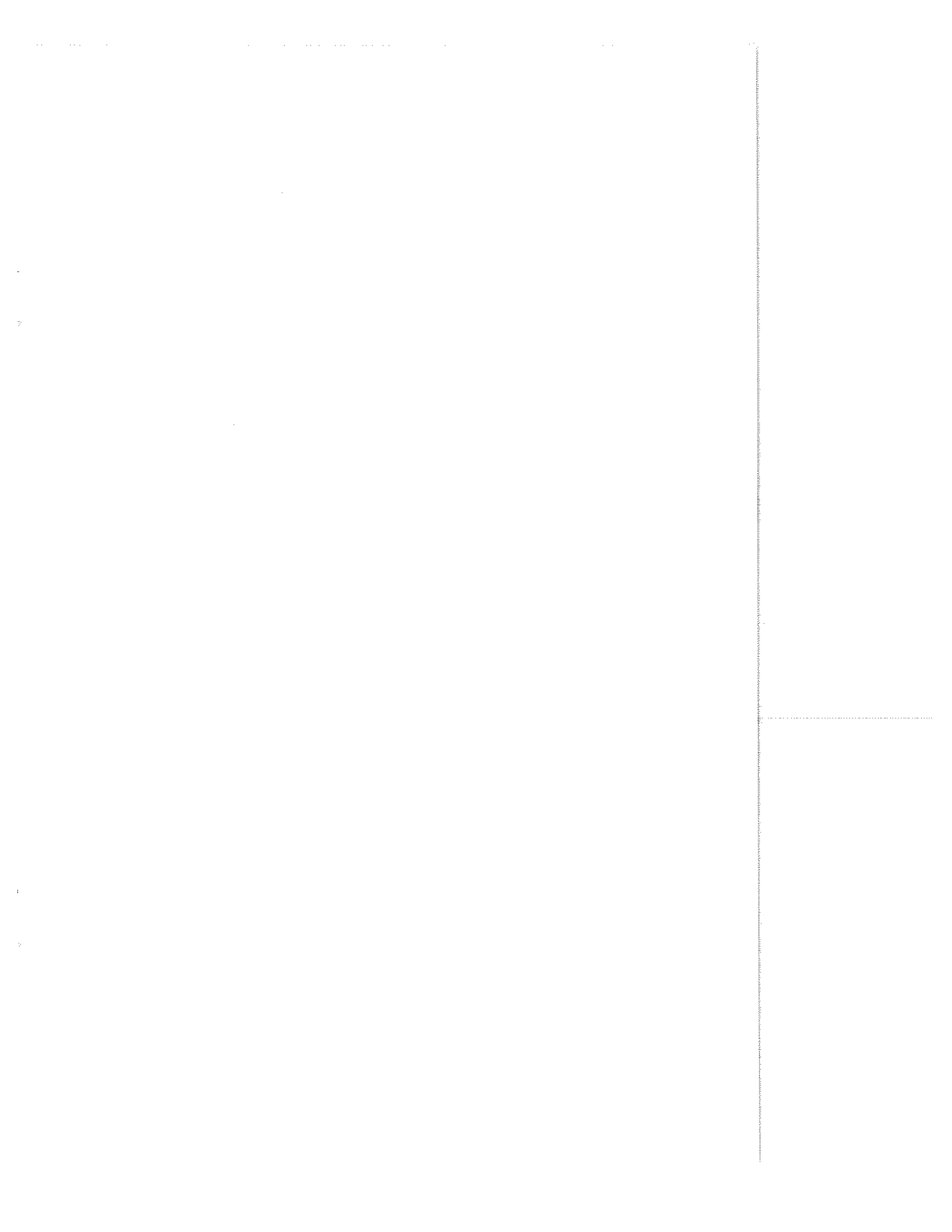
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LITERATURE CITED

- BALL, G. H. 1922. Variation in fresh-water mussels. *Ecology* 3: 93–121.
- BOYD, M. F. (ed.). 1956. A provisional gazetteer of Florida place-names of Indian derivation either obsolescent or retained together with others of recent application. Florida Geological Survey, Special Publication No. 1. 158 pp.
- BRIM BOX, J., AND J. D. WILLIAMS. In press. Unionid mollusks of the Apalachicola Basin in Alabama, Florida, and Georgia. *Bull. Alabama Mus. Nat. Hist.* 320 pp.
- BURCH, J. B. 1975. Freshwater unionacean clams (Mollusca: Pelecypoda) of North America. Malacological Publications, Hamburg, Michigan. 204 pp.
- BUTLER, R. S. 1989. Distributional records for freshwater mussels (Bivalvia: Unionidae) in Florida and south Alabama, with zoogeographic and taxonomic notes. *Walkerana* 3: 239–261.
- CLENCH, W. J., AND R. D. TURNER. 1956. Freshwater mollusks of Alabama, Georgia, and Florida from Escambia to the Suwannee River. *Bull. Florida State Mus. Biol. Sci.* 1: 97–239.
- FRADKIN, A. 1995a. Animal resource use at an inland Weeden Island Site: Analysis of faunal remains from Site 8LI76, Liberty County, Florida. Report on file, Environmental Archaeology, Florida Museum of Natural History, Gainesville, Florida. 52 pp.
- FRADKIN, A. 1995b. Animal resource use at an inland Weeden Island village: Analysis of faunal remains from Site 8WL81, Walton County, Florida. Report on file, Environmental Archaeology, Florida Museum of Natural History, Gainesville, Florida. 43 pp.

- GLENN, L. C. 1911. Denudation and erosion in the southern Appalachian region and the Monongahela Basin. U.S. Geological Survey Professional Paper 72. 137 pp.
- HEARD, W. H. 1979. Identification manual of the freshwater clams of Florida. Florida Dept. of Environmental Regulation Technical Series 4: 1-82.
- JOHNSON, R. I. 1967a. Illustrations of all the mollusks described by Berlin and Samuel Hart Wright. Occasional Papers on Mollusks, Museum of Comparative Zoology, Harvard University 3: 1-35.
- JOHNSON, R. I. 1967b. Additions to the unionid fauna of the Gulf drainage of Alabama, Georgia and Florida (Mollusca: Bivalvia). *Breviora* 270: 1-21.
- JOHNSON, R. I. 1969. Further additions to the Unionid fauna of the Gulf drainage of Alabama, Georgia and Florida. *The Nautilus* 83: 34-35.
- MAYMON, J. H., T. F. MAJAROV, F. VENTO, M. WILLIAMS, A. FRADKIN, C. T. BROWN, K. M. CHILD, AND J. C. CLARKE. 1996. Phase III data recovery at Site 8LI76 for the proposed Florida gas transmission phase III expansion project, Liberty County, Florida. Final report prepared for Florida Gas Transmission Company, Houston, Texas. 418 pp.
- MILANICH, J. T. 1974. Life in a 9th century Indian household. A Weeden Island Fall-Winter site on the upper Apalachicola River, Florida. Bureau of Historical Sites and Properties, Bulletin 4: 1-44. Division of Archives, History, and Records Management, Department of State, Tallahassee, Florida.
- ORTMANN, A. E. 1920. Correlation of shape and station in fresh water mussels (naides). *Proc. Amer. Philos. Soc.* 59: 269-312.
- PERCY, G. W. 1976. Salvage investigations at the Scholz Steam Plant Site (8JA104), a middle Weeden Island habitation site in Jackson County, Florida. Bureau of Historic Sites and Properties, Miscellaneous Projects Report Series No. 35. Division of Archives, History, and Records Management, Department of State, Tallahassee, Florida. 150 pp.
- READ, W. A. 1937. Indian Place Names in Alabama. Louisiana State University Studies, No. 29. Revised edition with a Foreword, Appendix, and Index by J. B. McMillan. 1984. University of Alabama Press, Tuscaloosa, Alabama. 107 pp.
- SCHNELL, F. T., V. J. KNIGHT, JR., AND G. S. SCHNELL. 1981. Cemochechobee. Archaeology of a Mississippian Ceremonial Center on the Chattahoochee River. University Presses of Florida, Gainesville, Florida. 290 pp.
- SIMPSON, C. T. 1900a. New and unfigured Unionidae. *Proc. Acad. Nat. Sci. Phila.* 52: 74-86.
- SIMPSON, C. T. 1900b. Synopsis of the naiades, or pearly freshwater mussels. *Proc. U.S. Natl. Mus.* 22: 501-1044.
- SIMPSON, C. T. 1914. A descriptive catalogue of the naiades or pearly freshwater mussels. Bryant Walker (Detroit). Parts I-III. 1540 pp.
- SWIFT, C. C., C. R. GILBERT, S. A. BORTONE, G. H. BURGESS, AND R. W. YERGER. 1986. Zoogeography of the freshwater fishes of the southeastern United States: Savannah River to Lake Pontchartrain. pp. 213-266. *In*: C. H. Hocutt and E. O. Wiley (eds.). *The Zoogeography of North American Freshwater Fishes*. Wiley, New York. 526 pp.
- TURGEON, D. D., J. F. QUINN, JR., A. E. BOGAN, E. V. COAN, F. G. HOCHBERG, W. G. LYONS, P. M. MIKKELSEN, R. J. NEVES, C. F. E. ROPER, G. ROSENBERG, B. ROTH, A. SCHELTEMA, F. G. THOMPSON, M. VECCHIONE, AND J. D. WILLIAMS. 1998. Common and scientific names of aquatic invertebrates from the United States and Canada: mollusks, 2nd edition. American Fisheries Society, Special Publication 26, Bethesda, Maryland.
- WHEELER, H. E. 1935. Timothy Abbott Conrad, with particular reference to his work in Alabama one hundred years ago. *Bull. Amer. Paleo.* 23: 1-157.
- WILLIAMS, J. D., AND R. S. BUTLER. 1994. Class Bivalvia, Order Unionoida, freshwater bivalves. pp. 53-128. *In*: M. Deyrup and R. Franz (eds.). *Rare and Endangered Biota of Florida, Vol. II: Invertebrates*. University Florida Press, Gainesville, Florida. 798 pp.
- WRIGHT, B. H. 1899. New southern unios. *The Nautilus* 13: 22-23.



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