Rare and Endangered Biota of Florida

VOLUME IV. INVERTEBRATES

EDITED BY

MARK DEYRUP &
RICHARD FRANZ

Co-Chairs, Special Committee on Invertebrates
Florida Committee on Rare and Endangered Plants and Animals

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Class Bivalvia
Order Unionoida

Freshwater Bivalves

INTRODUCTION: Three families of bivalve mollusks are found in the fresh waters of Florida, two native and one exotic or nonnative. The two families of native bivalve mollusks, pea clams (family Sphaeriidae) and freshwater mussels (family Unionidae), once occurred in most freshwater habitats in the state. In many aquatic habitats they formed an important component of the benthic community. The pill clams, which inhabit small ponds, lakes, freshwater wetlands, canals, small creeks, and large rivers, are especially important food of waterfowl and, to a lesser extent, fishes. Mussels are more likely to be found in creeks, rivers, and lakes, where they may form extensive beds. Mussels are preyed upon by several species of fishes, turtles, birds, and small mammals.

The third family of bivalve mollusks in the state of Florida, family Corbiculidae, is represented by one species, the exotic Asian clam, *Corbicula fluminea*. This species was first discovered in the United States on the West Coast (Washington) in 1938 (Burch 1944) and has spread throughout the entire United States, causing economic and ecological problems. The Asian clam was first discovered in Florida in 1960 (Schneider 1967) and has now successfully invaded almost every drainage system in the state (Bass 1974). In some lakes and streams, it has reached densities of several hundred individuals per square meter of substrate. Its abundance may have contributed to the decline of certain native mussels. This point, however, is difficult to prove because unrelated environmental perturbations in most systems make cause and effect relationships nearly impossible to demonstrate.

These three families of mollusks are very distinctive in appearance and are easily distinguished on the basis of size, shape, and shell characteristics. In Florida, the pea clams (also known as pill or fingernail clams) are small, rarely exceeding 15 mm in length, and very thin shelled. Mussels or freshwater clams are usually mature at more than 25 mm and have thicker shells. The exotic Asian clam is somewhat intermediate between the two families of native clams, in both size and shell thickness. It may reach 45 mm in length, but individuals rarely exceed 32 mm. The most distinctive feature of the Asian clam is the evenly spaced concentric ridges which cover the entire shell.

In North America, the family Sphaeriidae is represented by 38 species and

4 genera (Turgeon et al. 1988). Four species are exotics, apparently introduced from Europe, but none of these occur in the state of Florida (Turgeon et al. 1988). Twelve species are reported from Florida but none are endemic to the state (Heard 1979). Although we are not aware of any precipitous decline in these sphaeriids, we also have no data that indicate their populations are stable; their conservation status should therefore be considered unknown.

The family Unionidae in North America is represented by about 297 species and subspecies (Turgeon et al. 1988). Although this fauna has been studied since the early 1800s, there are unresolved questions regarding the validity of numerous species. Problems also exist in the definition or limits of certain genera. Very few genera and species have an adequate diagnosis and description based on anatomy of soft tissues. This information is critical to our understanding of generic and specific concepts in unionid mollusks. The identification of some species is difficult using conchological characters alone.

Several fairly extensive reports (Simpson 1900a; Walker 1905; van der Schalie 1940; Clench and Turner 1956; Johnson 1967, 1969, 1970; Heard 1979; Butler 1989) on Florida unionids have been published during the past century. Most addressed regional faunas, zoogeographic, and taxonomic problems, with little or no information on basic biology. The unusual life history of unionids, a life cycle typically including a larval stage which is parasitic on the gills and fins of one or more species of fishes, presents some very difficult problems when one considers protection and recovery actions. Conservation activities must consider ecological requirements for the unionids and their host fish; however, neither the host fish nor other basic requirements such as temperature, dissolved oxygen, and stream flow, are known for unionids in Florida. Research on the life history of unionids is desperately needed.

We record a total of 52 species of unionids in Florida. This number is conservative, as additional unionids, including described forms currently placed in synonymy with other species, as well as undescribed species, will undoubtedly be recognized in the future. *Elliptio* is one example of a genus that may have several valid biological species that are not currently recognized by malacologists. Five of the 52 unionid species known from Florida, *Alasmidonta wrightiana*, *Elliptio buckleyi*, *E. chipolaensis*, *Medionidus walkeri*, and *Villosa amygdala*, appear to be restricted to the state.

Of the 52 freshwater mussels known from Florida, 28 species (54%) are deemed worthy of a conservation category. Five species are endangered, 14 are threatened, 5 are of special concern, and 4 are of undetermined status. Only 3 unionids were included in the 1982 FCREPA list; the increase reflects a better understanding of the threats to these mollusks.

Most of the biological diversity in freshwater stream-dwelling organisms in Florida is found in the panhandle and in northern peninsula regions. The unionids are no exception, as there are only 10 species known to occur in the peninsula south of the Suwannee and St. Johns rivers. In Florida, the most

diverse unionid fauna is in the Apalachicola River drainage, which is inhabited by 28 species. Species of unionids in other rivers are as follows: Choctawhatchee (23 species); Escambia (23 species); Ochlockonee (18 species); Suwannee (14 species); and Yellow River (12 species).

All 28 species assigned conservation status in Florida are confined to the Apalachicolan Region, defined as the drainages from the Escambia to the Suwannee River (Butler 1989). Sixteen (57%) of these species are restricted in the state to single river systems. Seven species occur in only two drainages, and the remaining five species occur in three drainage systems.

Diversity of unionid mollusks in Florida would be even greater if the Apalachicolan Region drainages were not beheaded by the state boundary, with most of the stream habitat in Alabama and Georgia. Protection of this diverse freshwater mussel assemblage depends in part on the stewardship of adjacent states since the rivers traversing the Florida panhandle originate in the states of Alabama and Georgia. Although many point sources of water pollution have been addressed by adjacent states in recent years, others continue to be a problem.

One of the most significant pollution problems for aquatic organisms involves a non-point source, silt. This pollution comes from improperly managed agricultural lands, road construction, and other development activities. These pollution problems may originate in adjacent states, but they are not confined to those areas. Florida has its share of pollution and siltation problems which need to be addressed if we are going to conserve our aquatic resources.

The only two major impoundments in the panhandle area are the Jim Woodruff Dam (constructed in the mid-1950s) on the Apalachicola River (Lake Seminole) and the Jackson Bluff Dam (constructed in the late 1920s) on the Ochlockonee River (Lake Talquin). These two dams and reservoirs drastically altered the free-flowing upstream areas they impounded as well as the riverine areas downstream. For example, the disappearance of *Alasmidonta wrightiana* in the 1930s (last known collections) may be associated with the impoundment of the Ochlockonee River. This impoundment not only destroyed riverine habitat of the mussel, but blocked the upstream movement of anadromous fishes that may have served as the host of the glochidia. The dam on Dead Lake, which further impounded a flow-through natural basin on the lower Chipola River, was removed in December 1987 because of deteriorating water quality in the shallow lake. The removal of this dam returned the river to its natural flow. However, we estimate at least two decades will be required to flush out the accumulated silt and re-establish the natural pre-impoundment littoral zone.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

Endangered

Triangle Floater

Alasmidonta undulata (Say)

DESCRIPTION: The triangle floater is a thin-shelled, medium-sized species, reaching lengths of about 70 mm (2.7 in). It is oval to subtriangular in shape and is inflated with high, broad umbos anterior to the center. A high and prominently angled posterior ridge ends in a point near the base. The epidermis in adults is dark greenish brown to black and is faintly rayed in transmitted light. The pseudocardinal teeth-one in the right valve, two in the left valve-are stumpy and thick. Lateral teeth are poorly developed or absent. The nacre is usually bluish white, but may be salmon to pink in some individuals.

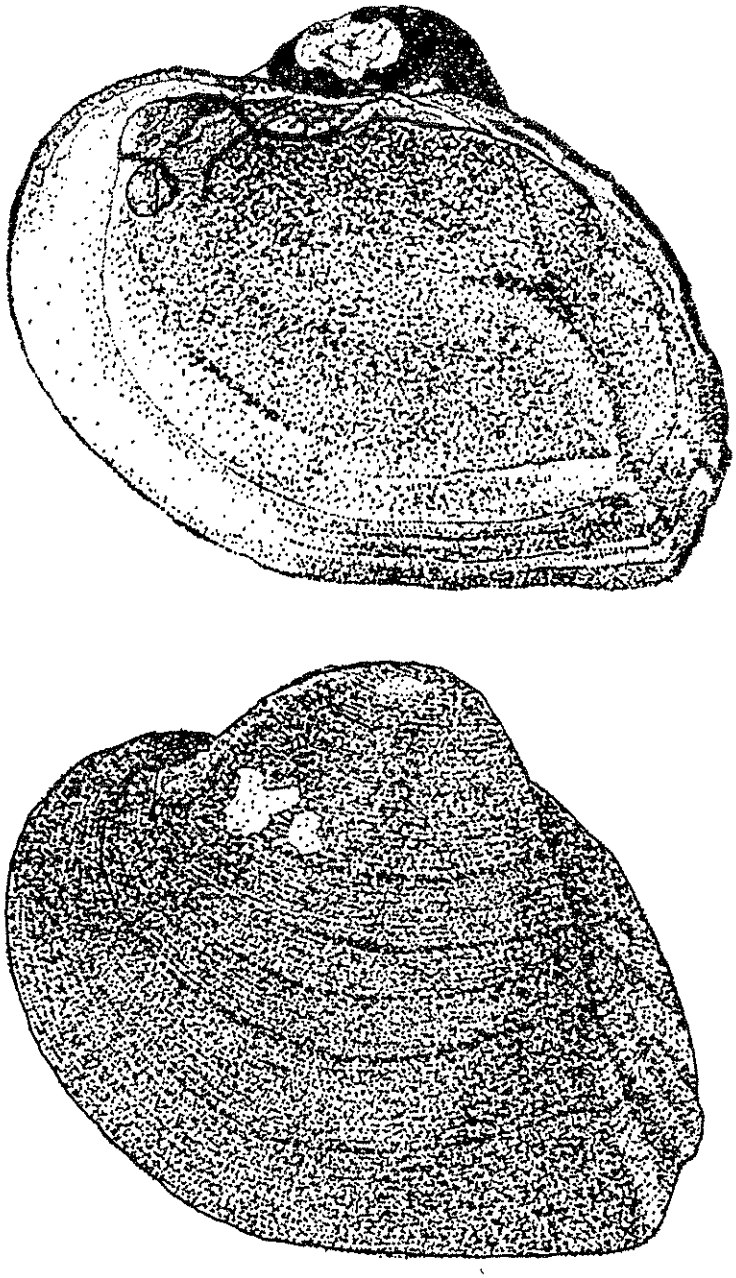
RANGE: On the Atlantic coast *Alasmidonta undulata* occurs from the St. Lawrence River system in Canada south to the Ogeechee River system, Georgia (Clarke 1981). On the Gulf Coast, *A. undulata* is restricted to the Apalachicola River system in Alabama, Georgia, and Florida (Clench and Turner 1956; Clarke 1981). In Florida, it is reported from a few localities in the main channel of the Apalachicola and lower Chipola rivers.

HABITAT: Triangle floaters have been taken in waters ranging from large creeks to large rivers. This species is found in sand or sand and mud substrate in moderate current.

LIFE HISTORY AND ECOLOGY: There is no life history or ecological information available for the Apalachicola drainage population of this species. Although little is known about Atlantic Coast populations, they have been reported as gravid for most of the year (Ortmann 1919; Clarke 1981).

SPECIALIZED OR UNIQUE CHARACTERISTICS: The angular posterior ridge, high umbos, shell outline, and near absence of lateral teeth serve to differentiate the triangle floater from other sympatric species in Florida.

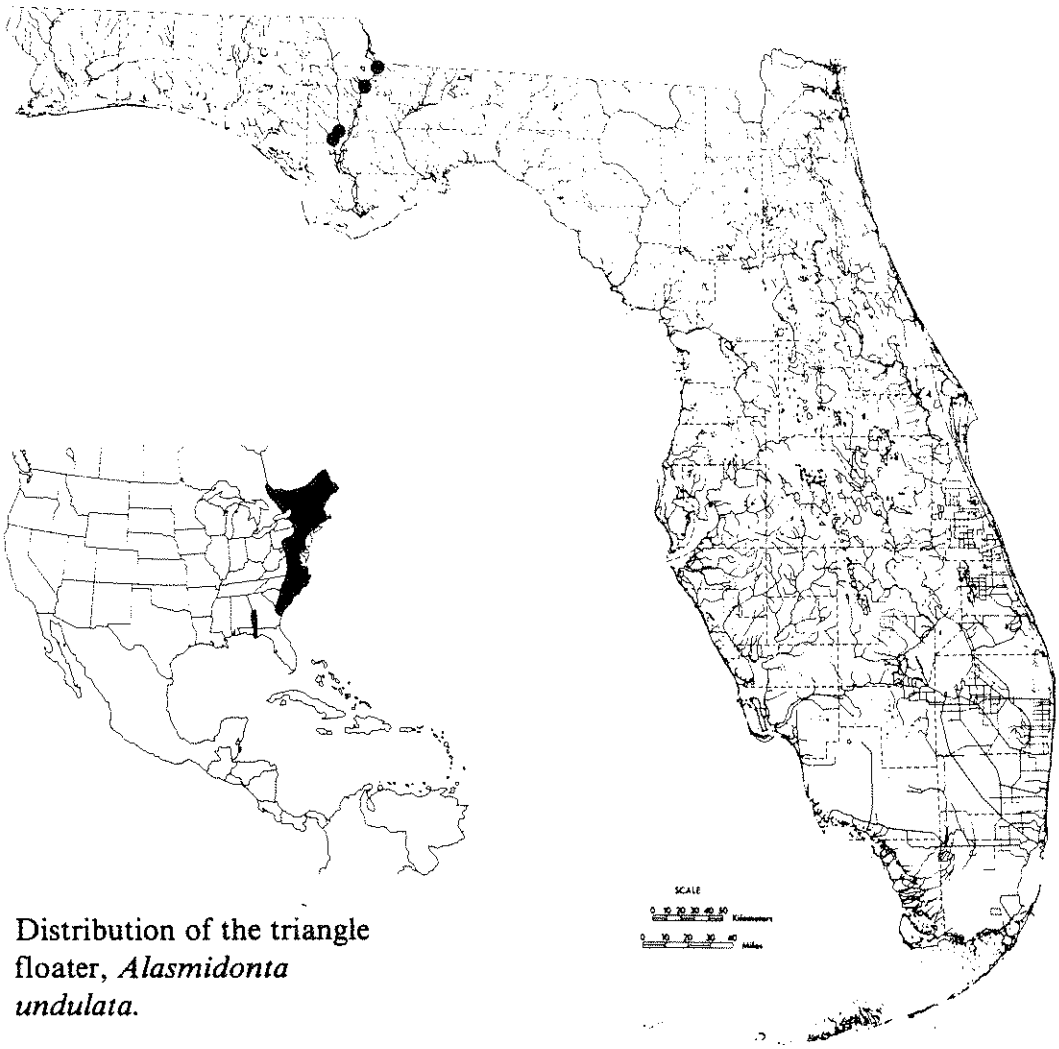
BASIS FOR STATUS CLASSIFICATION: In the past 20 years, only a single live specimen has been found (Chipola River, Scotts Ferry, Calhoun County, in 1986). The limited distribution and threat from dredging activities in the Apalachicola River are the major factors in determining the conservation status of the triangle floater.



Triangle Floater, *Alasmidonta undulata*, UF 403, length 51 mm (2.0 in). Florida, Calhoun County, Dead Lake, Chipola River at Chipola Park, 32 km (20 mi) south of Blountstown (illustration by Tracy Smith).

RECOMMENDATIONS: Protection of the Chipola River is essential to the survival of this species in Florida. Current status of the species in the Apalachicola River proper should be determined to provide for its protection during maintenance dredging of the channel.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.



Distribution of the triangle floater, *Alasmidonta undulata*.

FAMILY UNIONIDAE

Endangered

Apalachicola Floater

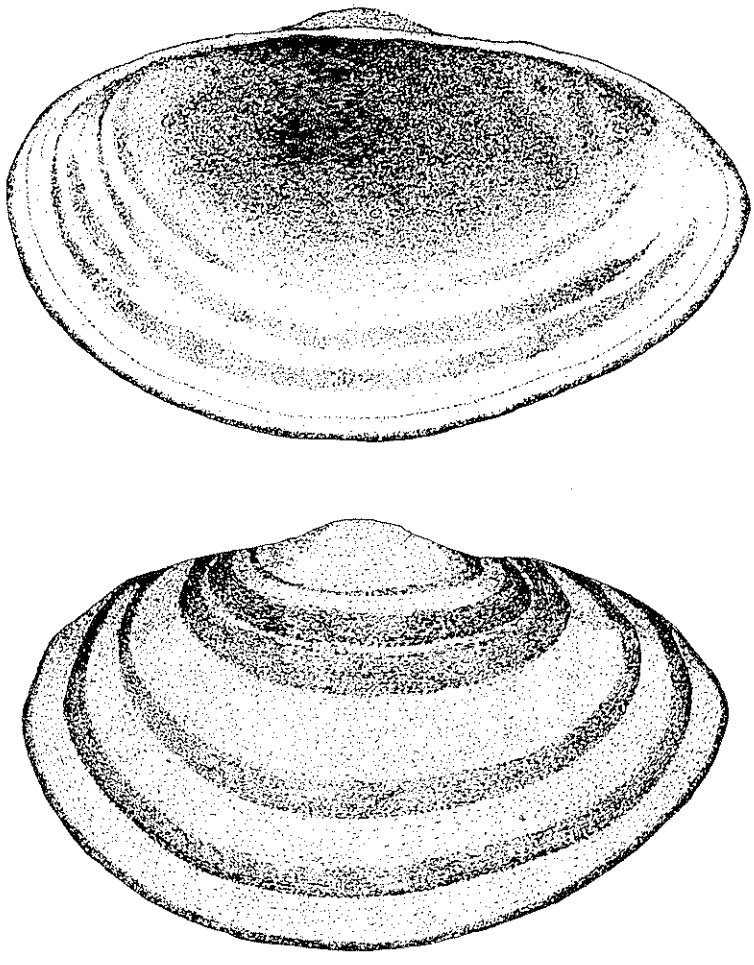
Anodonta sp. (undescribed)

DESCRIPTION: This large undescribed species of the genus *Anodonta* attains a length of at least 139 mm (5.5 in). It is oval and very inflated, almost as wide as it is high in large individuals. The dimensions for the largest known specimen are 139 mm long, 82 mm (3.2 in) high and 63 mm (2.5 in) wide. In large individuals the umbos extend above the hinge line and are

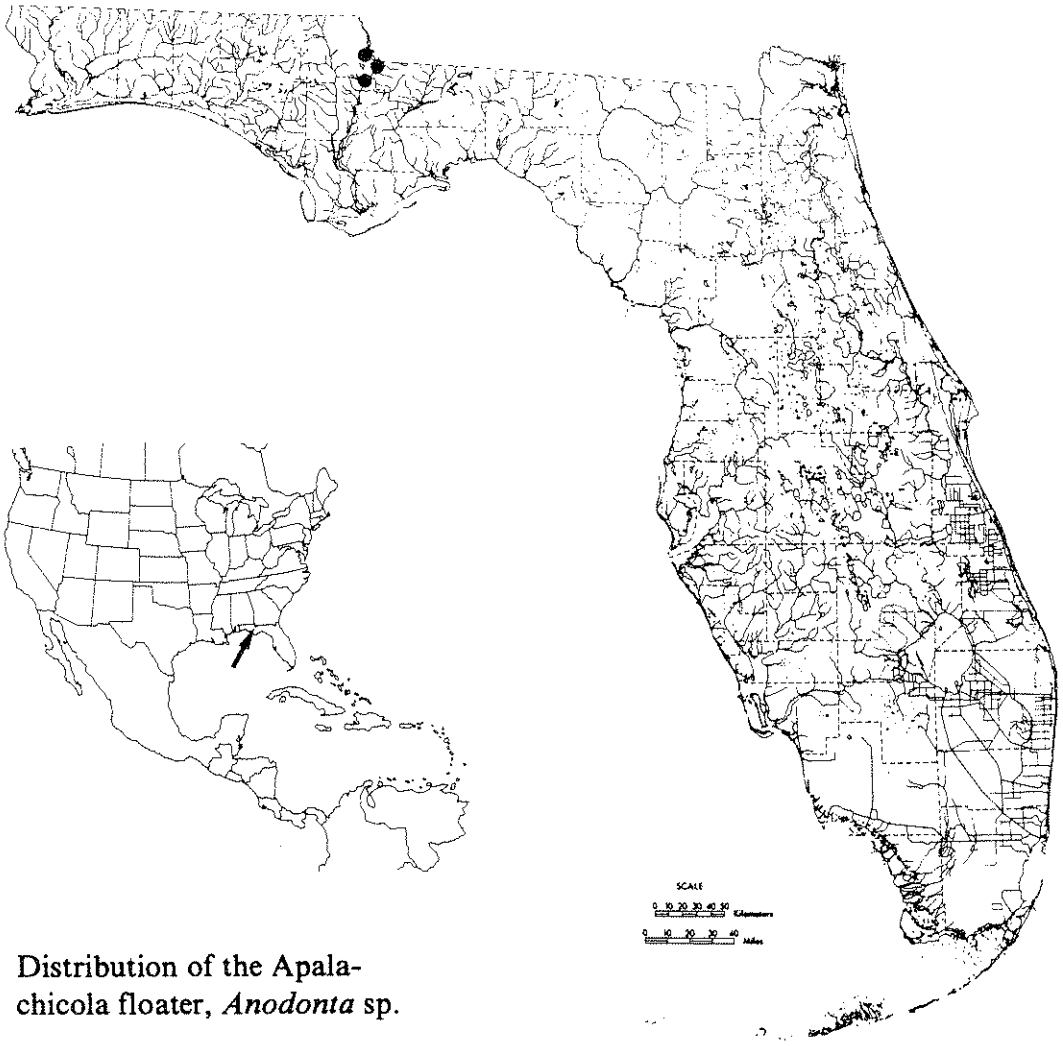
sculptured with simple loops. The surface of the shell is smooth except posteriorly, where it becomes somewhat roughened. Most of the shell is yellowish olive to light brown. Dark olive to brown concentric bands are present on some individuals. Internally, the valves are completely toothless. The nacre is white with some pinkish to purplish color. A formal description of the Apalachicola floater is being prepared by Mark E. Gordon and Walter R. Hoeh.

RANGE: The total range of this species is unclear at this time, but appears to be confined to the Apalachicola River system in Florida. It has been collected from three localities in Calhoun, Gadsden, and Jackson counties. It might occur in the Chattahoochee River in Alabama and Georgia and in the Flint Fiver in Georgia, but no specimens are known from these rivers. One collection (Tanvat Pond, Jackson County, Florida), from the Chattahoochee River floodplain was reported by Clench and Turner (1956) as *Anodonta gibbosa.*

HABITAT: Like most species of the genus *Anodonta*, the Apalachicola floater inhabits waters with little or no current, such as floodplain lakes and backwater areas of the Apalachicola River in mud substrates. No other habitat information is available.



Apalachicola Floater, *Anodonta* sp., UF 1915, length 141 mm (5.5 in). Florida, Jackson County, Tanvat Pond, 4.8 km (3 mi) north of Sneads (illustration by Tracy Smith).



Distribution of the Apalachicola floater, *Anodonta* sp.

LIFE HISTORY AND ECOLOGY: Heard (1979) described various aspects of the reproductive biology of the Apalachicola floater as *Anodonta couperiana*. Females displayed early oogenesis in early August and were spent by late August. A single hermaphroditic individual was also noted in the population.

SPECIALIZED OR UNIQUE CHARACTERISTICS: As presently known, the Apalachicola floater has the most restricted distribution of all North American species of the genus *Anodonta*.

BASIS FOR STATUS CLASSIFICATION: Alteration of the habitat by impoundment and dredging activities and the rarity of the species are the bases for assigning endangered status to the Apalachicola floater.

RECOMMENDATIONS: Habitat protection for the known populations is essential to the conservation of this species. Surveys are needed in suitable habitat in the vicinity of Lake Seminole and the Apalachicola River main-

stem. Biological studies to determine the current distribution, life history, and habitat requirements should be conducted to plan for the conservation and recovery of this species.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Endangered

Round Ebonyshell

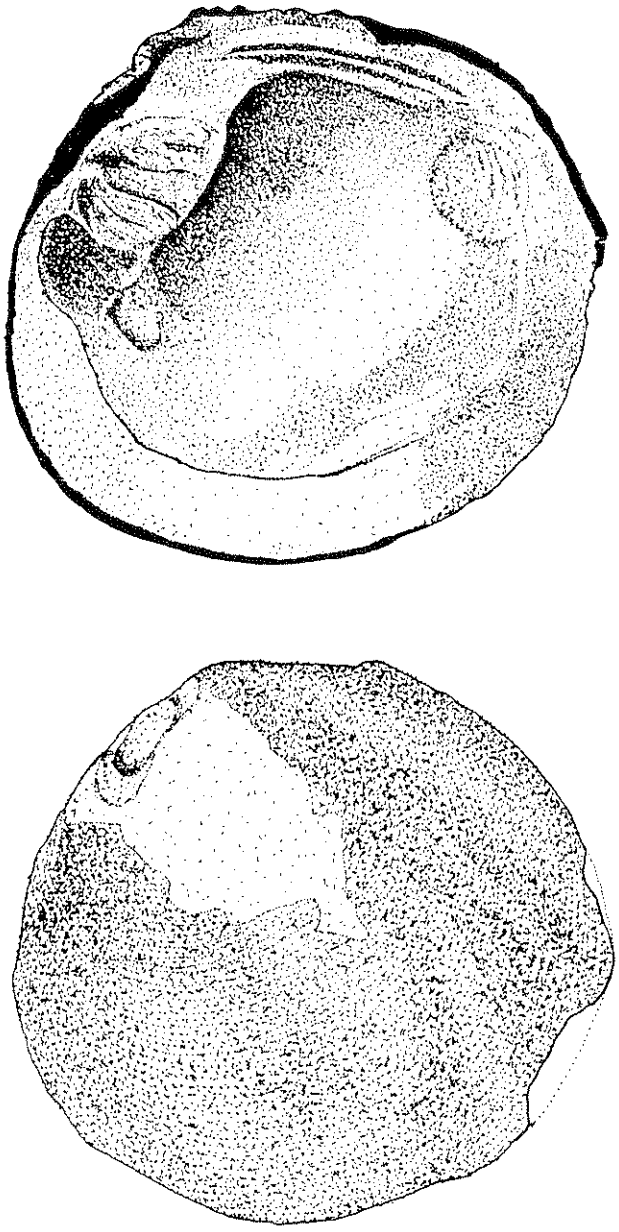
Fusconaia rotulata (Wright)

DESCRIPTION: *Fusconaia rotulata* is a medium-sized species that attains a length of approximately 65 mm (2.5 in). It has an almost circular outline and heavy, somewhat inflated, thick shell with a smooth black epidermis. Internally, the umbonal pocket is very deep and wide. The pseudocardinal teeth are low and usually double in the left valve and single in the right valve. The lateral teeth are long, slightly curved, and separated from the pseudocardinal teeth by a broad smooth interdentum. The nacre is typically white to silvery, and iridescent.

This species was originally placed in the genus *Unio* by Wright (1899). Simpson (1900b) reexamined the type specimen and assigned it to the genus *Obovaria*. Subsequent workers (Simpson 1914; Johnson 1967, 1969; Turgeon et al. 1988) have continued to recognize *rotulata* as a species of *Obovaria*. After examining several specimens of this species and making comparisons with species of *Obovaria* and *Fusconaia*, it is very clear, based on conchological characters (teeth and deep umbo pocket), that *rotulata* is 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 east to the Alabama River system.

RANGE: *Fusconaia rotulata* is endemic to the Escambia River drainage in Escambia County, Alabama, and Escambia and Santa Rosa counties, Florida (Johnson 1969; Burch 1975). In Florida, it has been taken from near the Alabama border downstream to Molino.

HABITAT: This mussel is confined to the main channel of the Escambia River in areas with moderate current and a mixture of sand and gravel substrates.

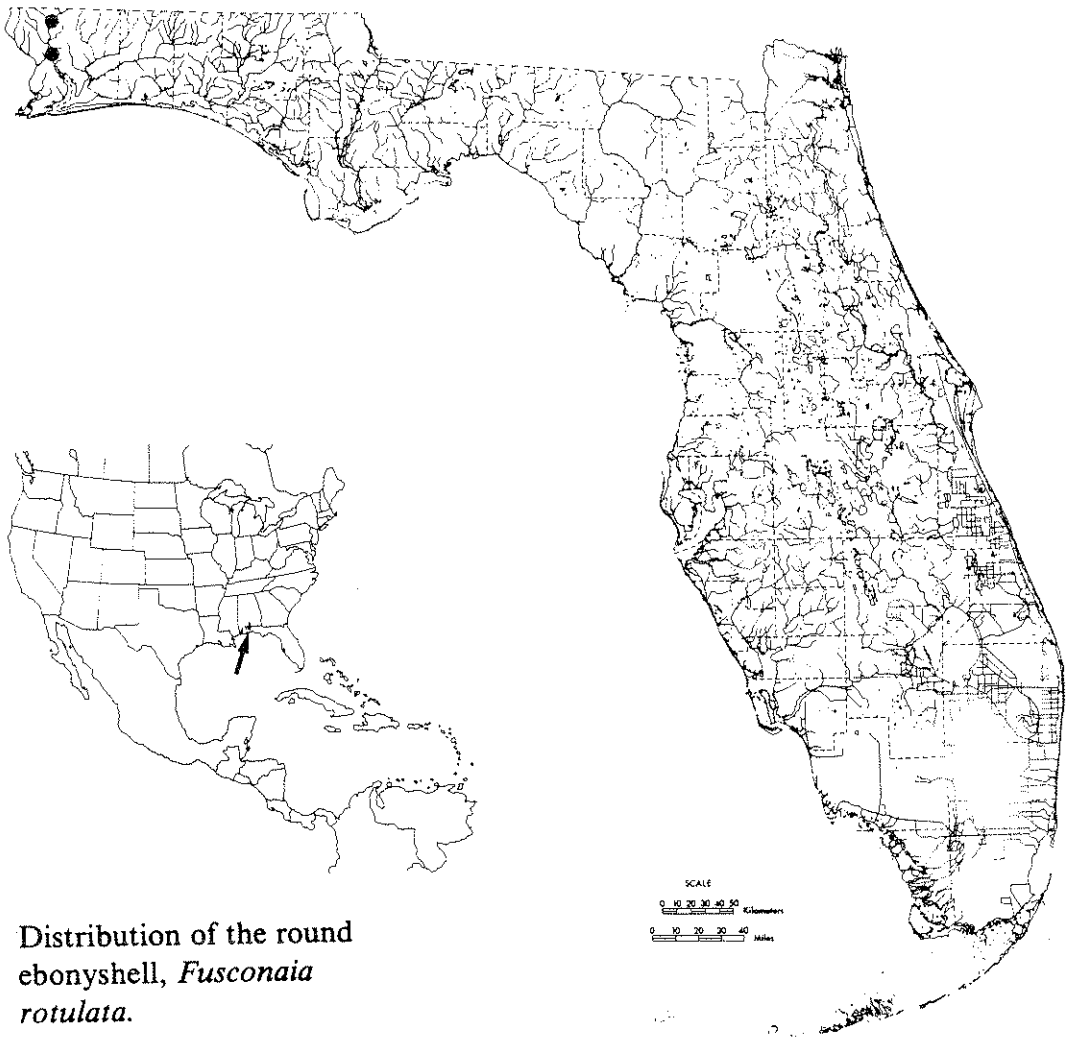


Round Ebonyshell, *Fusconaia rotulata*, USNM 159969 (type), length 45.5 mm (1.8 in). Florida, Escambia County, Escambia River (illustration by Tracy Smith).

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Based on current records, the round ebonyshell has one of the most restricted distributions of any extant North American unionid. Shell morphology allows easy differentiation from other species in the Escambia River.

BASIS FOR STATUS CLASSIFICATION: The restricted distribution of *F. rotulata* and habitat degradation in the Escambia River are the basis for the endangered status of this species.



Distribution of the round ebonyshell, *Fusconaia rotulata.*

RECOMMENDATIONS: Protection of the Escambia River is essential to the survival of *F. rotulata.* Efforts to reduce the silt load and other pollutants would contribute to the conservation of this species. Because most of the Escambia River system is in Alabama, a joint effort of Alabama and Florida will be required to improve the water quality of this system.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Endangered

Ochlockonee Moccasinshell

Medionidus simpsonianus Walker

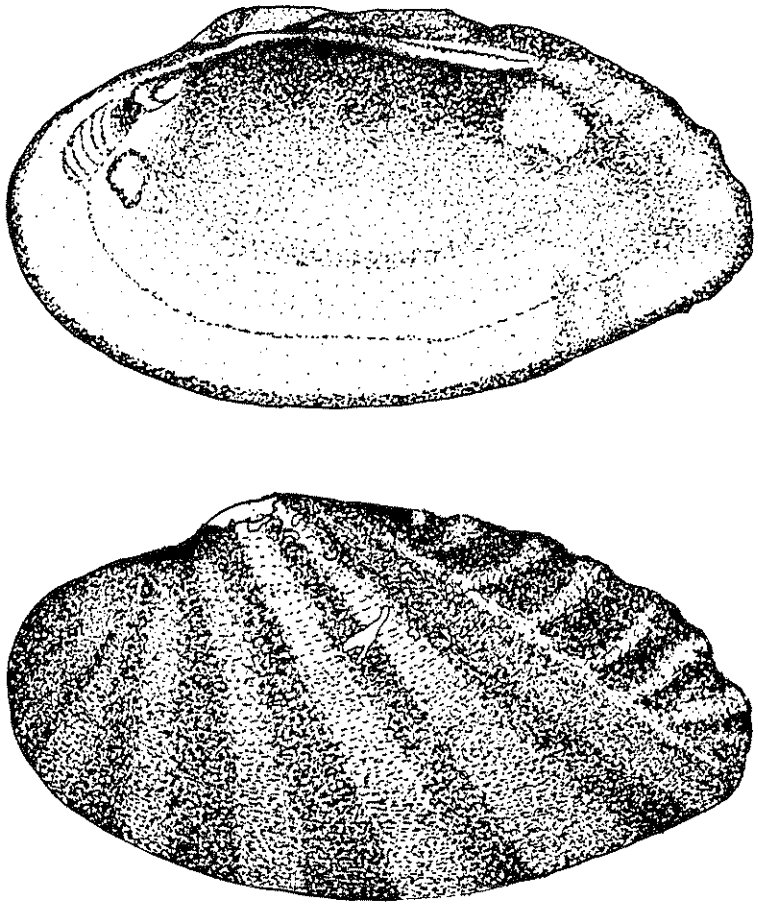
DESCRIPTION: The Ochlockonee moccasinshell is a small species, generally under 55 mm (2.5 in) in length. It is slightly elongate-elliptical in outline, the posterior end obtusely rounded at the shell's median line and the ventral margin broadly curved. The posterior ridge is moderately angular and covered its entire length with well developed, irregular ridges. Sculpture may also extend onto the disk below the ridge. Surface texture is smooth. The color is light brown to yellowish green, with dark green rays formed by a series of connected chevrons or undulating lines across the length of the shell. Internal characters include thin straight lateral teeth and compressed pseudocardinal teeth. There are two laterals and two pseudocardinals in the left valve and one lateral and one pseudocardinal in the right valve. The nacre is bluish white.

Considerable confusion has clouded *Medionidus* taxonomy in the eastern Gulf Coast region. Van der Schalie (1940) recorded *M. penicillatus* and *M. kingi* from the Chipola River system. *Medionidus penicillatus* was the only member of the genus recognized from the Gulf drainages east of the Mobile basin by Clench and Turner (1956) and Burch (1975). In a list of unionids from the Apalachicolan Region, Johnson (1970) erroneously reported both *M. penicillatus* and *M. walkeri* (Wright 1897) from the Apalachicola River system and the latter species in the Ochlockonee and Suwannee rivers as well. In a monograph of the genus, Johnson (1977) recognized *M. penicillatus*, *M. walkeri*, and a third form, *M. simpsonianus*, the latter two species endemic to the Suwannee and Ochlockonee river systems, respectively. These three species of *Medionidus* are generally recognized by malacologists today (Turgeon et al. 1988).

RANGE: *Medionidus simpsonianus* is endemic to the Ochlockonee River system in Georgia and Florida (Johnson 1977). In Florida the species has been recorded from the lower mainstem (Wakulla County, no specific locality) upstream in Gadsden and Leon counties to the Georgia portion of the river and from the Little River, the system's largest tributary (Johnson 1977). Clench and Turner (1956) erroneously synonomized *M. simpsonianus* under *M. penicillatus*; their Ochlockonee River records for *M. penicillatus* were actually *M. simpsonianus*.

HABITAT: The Ochlockonee moccasinshell inhabits large creeks to medium-sized rivers in substrates of sand with some gravel in moderate current.

LIFE HISTORY AND ECOLOGY: Unknown.

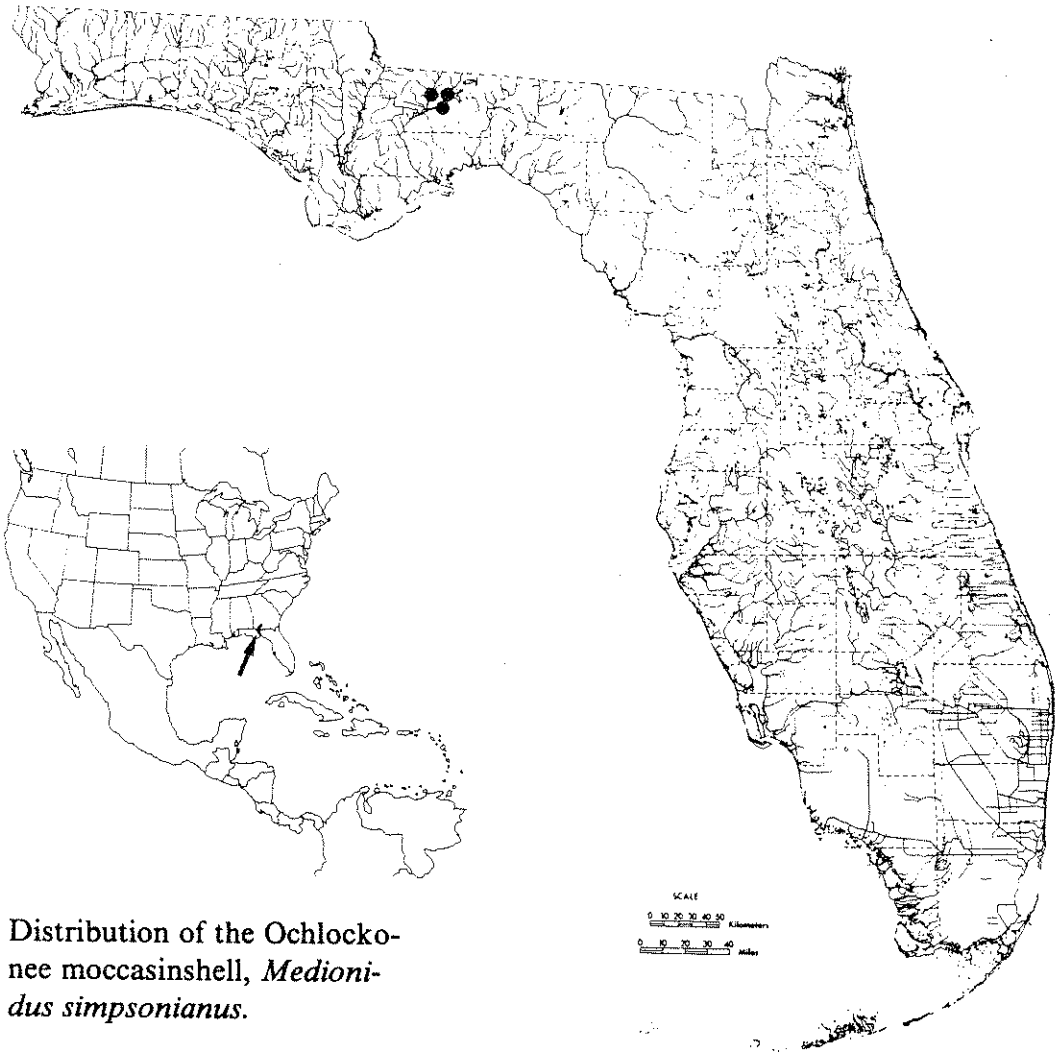


Ochlockonee Moccasinshell, *Medionidus simpsonianus*, UF 8399, length 34.5 mm (1.4 in). Florida, Leon County, Ochlockonee River, 11.2 km (7 mi) west of Tallahassee (illustration by Tracy Smith).

UNIQUE OR SPECIALIZED CHARACTERISTICS: The small size and characteristic sculpture distinguish *M. simpsonianus* from other species in the Ochlockonee River system. The characteristic ray pattern and the medial position of the posterior slope distinguish it from other *Medionidus* species in Florida.

BASIS FOR STATUS CLASSIFICATION: One live *M. simpsonianus* has been found since 1975 (one specimen in 1990; G. T. Watters, pers. comm.) at a site (U.S. Highway 27 crossing, Gadsden-Leon counties, Florida) where it was once fairly common. Construction of a new bridge span in the mid-1970s may have had a detrimental effect on the population (W. H. Heard, pers. comm.) A few dead shells have appeared infrequently in recent collections. Although it may have been overlooked because of its diminutive size and affinity for stream channels, endangered status is warranted for the Ochlockonee moccasinshell in Florida.

RECOMMENDATIONS: This is the second extremely uncommon mussel (see *Alasmidonta wrightiana* account) endemic to the Ochlockonee River. A thorough survey of the mainstem upstream and downstream of Lake Talquin and principal tributaries is needed to determine the present status of Florida populations of the Ochlockonee moccasinshell.



Distribution of the Ochlockonee moccasinshell, *Medionidus simpsonianus.*

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Threatened

Fat Threeridge

Amblema neislerii (Lea)

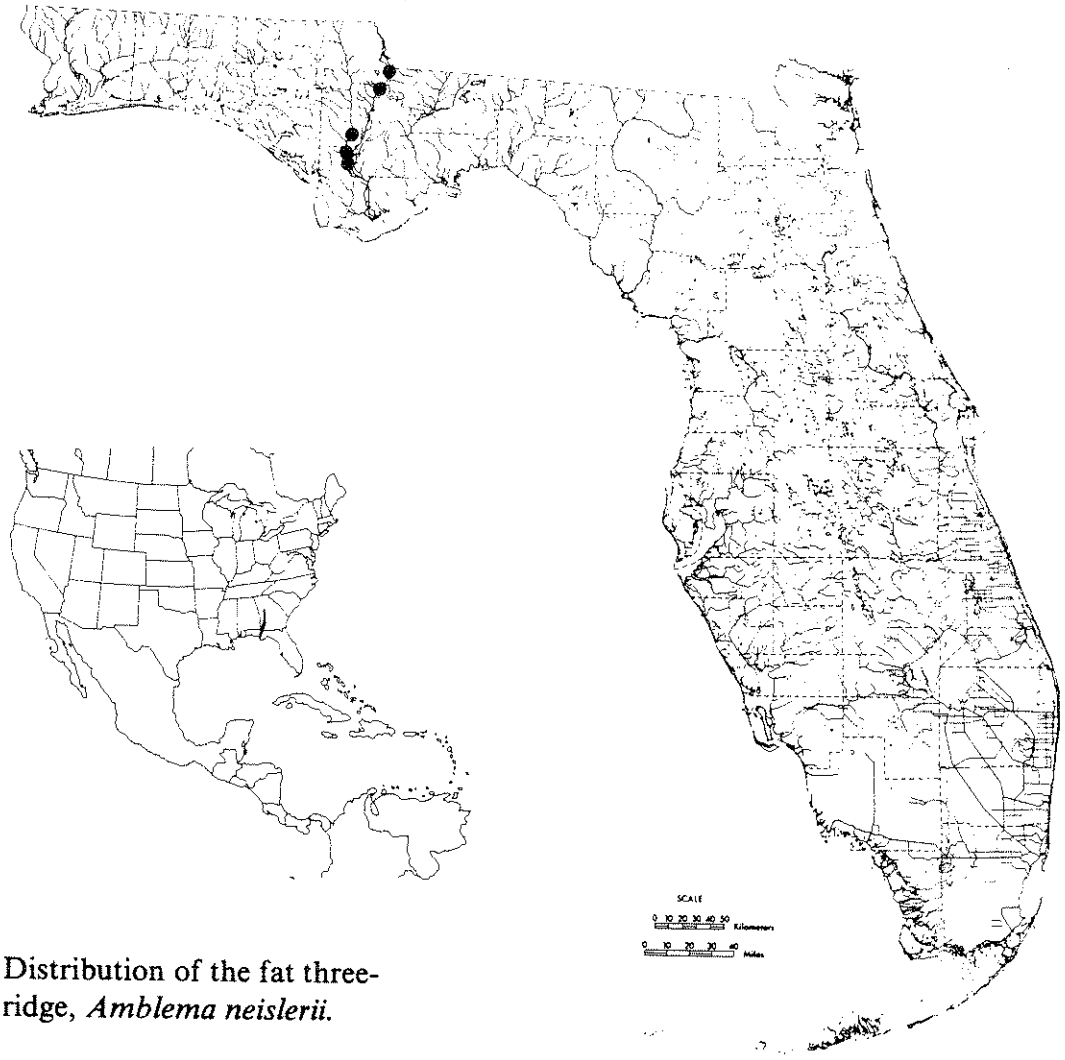
DESCRIPTION: *Amblema neislerii* is medium-sized to large, subquadrate, inflated, solid, and heavy shelled. It reaches a length of 102 mm (4.0 in). Older, larger individuals are so inflated that their width approximates their

height. The umbos are in the anterior quarter of the shell. The dark brown to black shell is strongly sculptured with seven to nine prominent horizontal parallel ridges. Internally, there are two subequal pseudocardinals in the left valve and typically one large and one small tooth in the right valve. The nacre is bluish white to light purplish and very iridescent.

RANGE: An Apalachicola River system endemic, the fat threeridge is restricted to the Flint River in Georgia and the Apalachicola and Chipola rivers in Florida (Clench and Turner 1956; Burch 1975). In the Apalachicola River it is known from two localities in Calhoun and Gadsden counties, Florida. Its distribution in the Chipola River extends from Scotts Ferry, Calhoun County, downstream to Wewahitchka, Gulf County, Florida.

There are two published records of *Amblema neislerii* from the Escambia River in Florida. The first was by Wright (1897), who listed it as one of several species occurring with a new species he was describing. The second re-

Fat Threeridge, *Amblema neisleri,* UF 229775, length 65.8 mm (2.6 in). Florida, Gulf County, Chipola River, Florida Highway 22 east of Wewahitchka (illustration by Tracy Smith).



Distribution of the fat three-ridge, *Amblema neislerii.*

port was Heard (1979), who listed *A. neislerii* as occurring in the Escambia River drainage in Florida. These records are believed to be based on *A. perplicata* not *A. neislerii.* All specimens of *Amblema* from the Escambia River in Florida and Alabama that we have examined are *A. perplicata.*

HABITAT: *Amblema neislerii* inhabits the main channel of small to large rivers in slow to moderate current. Substrate varies from gravel and rocky rubble to a mixture of sand and sandy mud.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The seven to nine horizontal parallel ridges and the highly inflated appearance of larger specimens make *A. neislerii* one of the most distinctive unionids in Florida.

BASIS FOR STATUS CLASSIFICATION: The restriction of *A. neislerii* to the main channels of the Chipola and Apalachicola rivers makes it vulnerable to a variety of environmental perturbations. The most serious threat is

probably maintenance dredging in the Apalachicola River. High population levels of the exotic Asian clam *Corbicula fluminea* may also be adversely affecting this species.

RECOMMENDATIONS: Habitat protection in the Chipola and Apalachicola rivers is the highest priority in the conservation of *A. neislerii*. Effects of dredging on *A. neislerii* in the Apalachicola River should be determined as soon as possible. A battery salvage operation in the Chipola drainage is now an Environmental Protection Agency Superfund site. Maintenance of water quality in this system will help protect the sizable population in the lower reach of the Chipola River.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

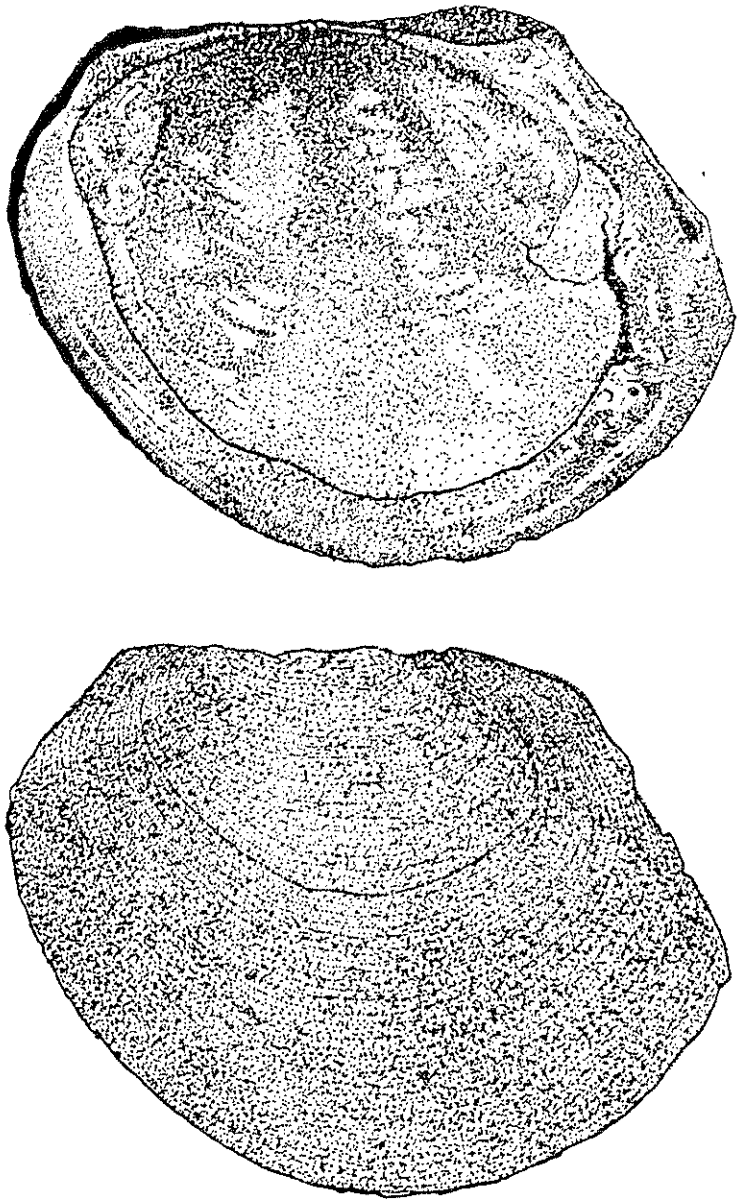
Threatened

Flat Floater

Anodonta suborbiculata Say

DESCRIPTION: The flat floater is a large species that reaches over 130 mm (5.0 in) in length. The shell is compressed with a suborbiculate outline. The valves are thin but strong and fit imprecisely, leaving gaps both anteriorly and posteriorly. The ventral margin is rounded. A low posterior ridge forms a rounded point medially. At each end of the straight dorsal margin, wing-like structures are present, most prominent posteriorly. The umbos are low, compressed, and do not extend above the hinge line. Beak sculpture consists of a few irregular undulations with series of small but sharp tubercles. The periostracum is smooth and shining, and pale yellowish-green with fine green rays. Older specimens may become more yellow and tend to lose the raying. Internally, the umbonal cavity is shallow and adductor scars are indistinct. The valves are completely toothless as in other members of the genus. Nacre color is silvery, but some specimens may exhibit a purplish or bluish iridescence.

RANGE: *Anodonta suborbiculata* occurs in Gulf of Mexico drainages from the Trinity River in Texas east to Florida and north in the Mississippi River basin to southeastern Minnesota (Johnson 1980). In Florida, the flat floater is restricted to two localities in the Escambia River system, which is the southeasternmost portion of its range. In the Escambia drainage in Alabama,



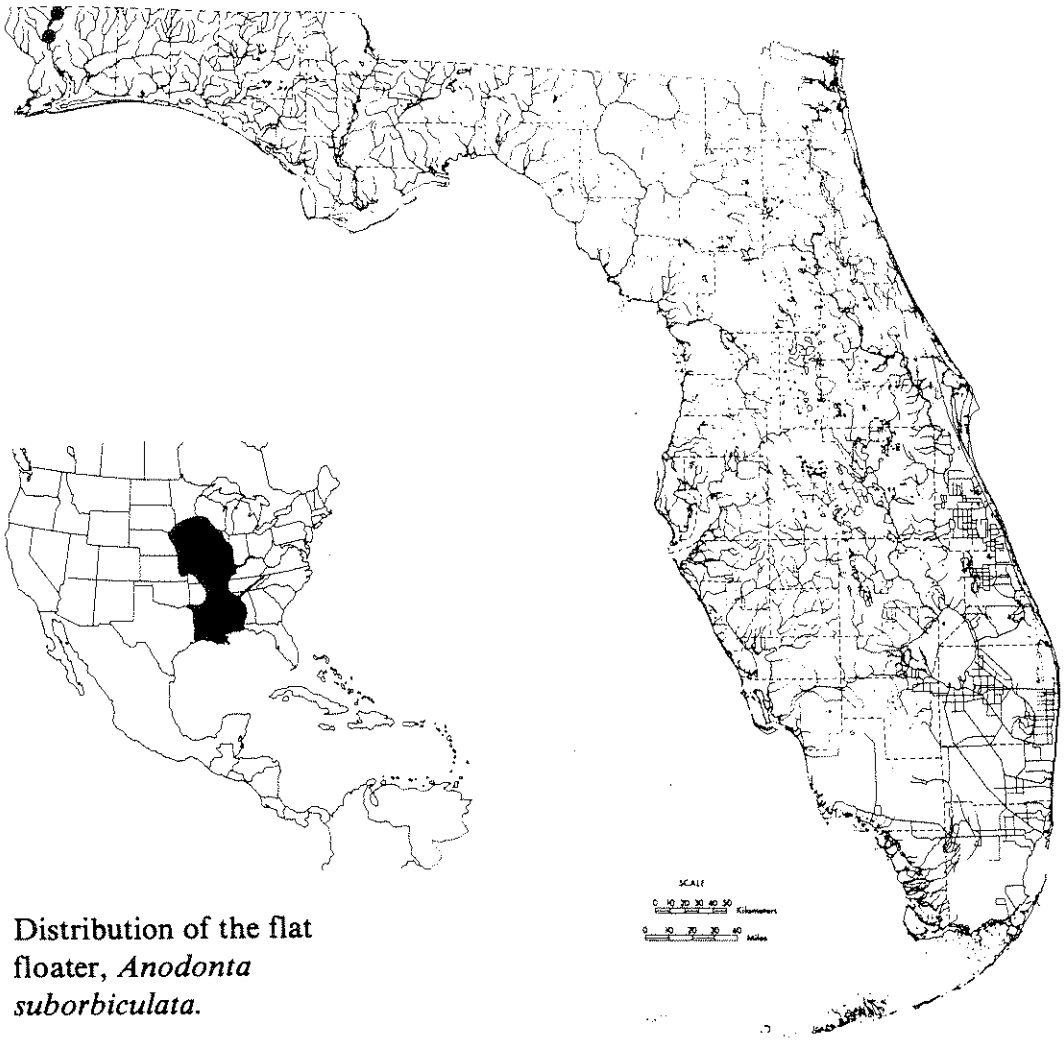
Flat Floater, *Anodonta suborbiculata*, UF 134930, length 48 mm (1.9 in). Florida, Escambia–Santa Rosa counties, Escambia River, Florida Highway 4 crossing, 2.8 km (1.4 mi) east of Century (illustration by Tracy Smith).

it is known only from Gantt Lake, an impoundment on the Conecuh River in Covington County (Johnson 1969).

HABITAT: The flat floater is generally found in medium-sized creek to large river backwaters as well as in oxbows, sloughs, and impoundments with muddy substrates (Johnson 1980; Gordon 1984). In Florida this species has been found in riverine habitat in sand with slow current (Butler 1989).

LIFE HISTORY AND ECOLOGY: Surber (1915) illustrated a glochidium of *A. suborbiculata.*

SPECIALIZED OR UNIQUE CHARACTERISTICS: The unique outline, compressed umbo below the hingeline, and the complete lack of hinge teeth



Distribution of the flat floater, *Anodonta suborbiculata.*

easily distinguish the flat floater from other freshwater mussels in extreme northwestern Florida.

BASIS FOR STATUS CLASSIFICATION: *Anodonta suborbiculata* is known in Florida from two records in the Escambia River system: Chumuckla Springs, Santa Rosa County, and the Escambia River near Century, Escambia-Santa Rosa counties (Butler 1989). These two collections of single specimens were made 70 years apart. The restricted distribution and sporadic occurrence of *A. suborbiculata* in Florida is the basis for its threatened status.

RECOMMENDATIONS: Thorough surveys of the sloughs, oxbows, and backwater swamps of the extensive Escambia River floodplain are needed to determine the status and conservation needs of *A. suborbiculata* in Florida.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

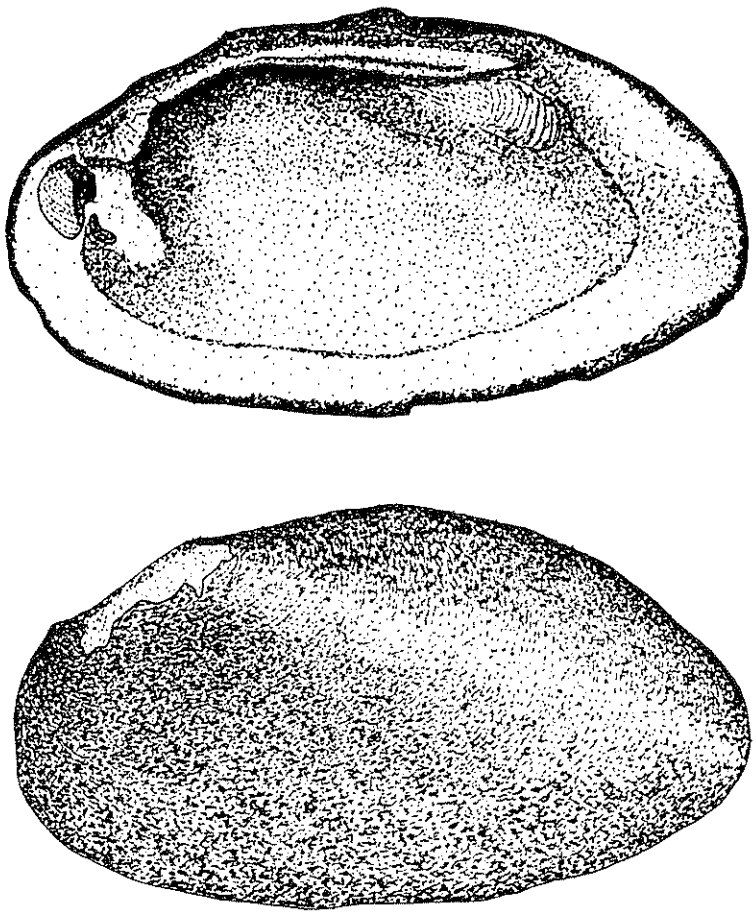
FAMILY UNIONIDAE

Threatened

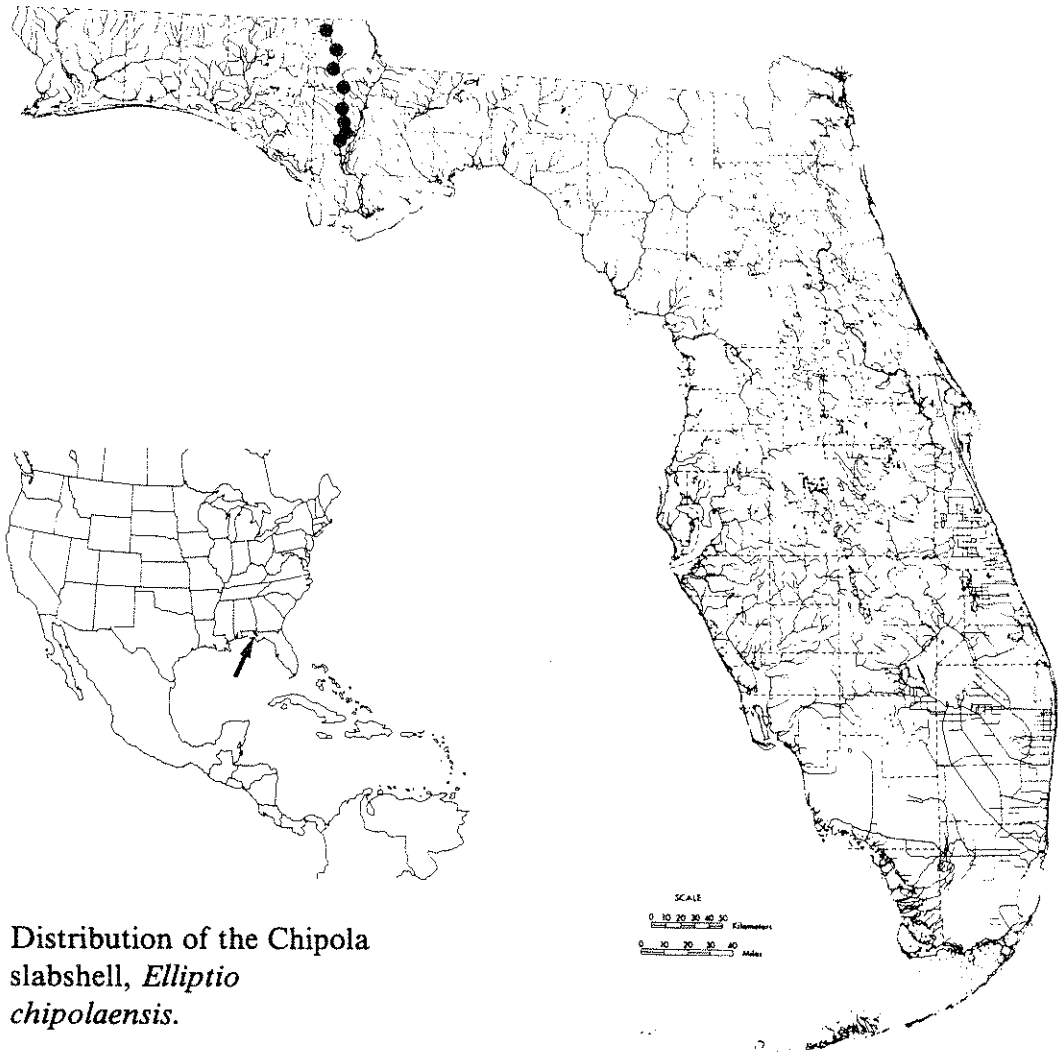
Chipola Slabshell

Elliptio chipolaensis (Walker)

DESCRIPTION: This medium-sized species achieves a length of about 85 mm (3.3 in). The shell is ovate to subelliptical, somewhat inflated and with the posterior ridge starting out rounded but flattening to form a prominent biangulate margin. The surface is smooth and chestnut colored. Dark brown coloration may appear in the umbonal region and the remaining surface may exhibit alternating light and dark bands. The umbos are prominent, well above the hingeline. Internally, the umbonal cavity is rather deep. The lateral teeth are long, slender, and slightly curved; two in the left and one in the right valve. The pseudocardinal teeth are compressed and crenulate; two in the left and one in the right valve. Nacre color is salmon, becoming more intense dorsally and somewhat iridescent posteriorly.



Chipola Slabshell, *Elliptio chipolaensis*, UF 4977, length 56.1 mm (2.2 in). Florida, Calhoun County, Chipola River, 3.2 km (2 mi) east of Clarksville (illustration by Tracy Smith).



Distribution of the Chipola slabshell, *Elliptio chipolaensis.*

RANGE: An endemic of the Chipola River drainage (van der Schalie 1940; Clench and Turner 1956), *E. chipolaensis* is generally distributed in the river mainstem and the lower portion of larger tributaries. The species apparently does not inhabit the river downstream from Dead Lake (Gulf County) and is also absent from most of the tributaries including the Alabama portion of the system (van der Schalie 1940).

HABITAT: *Elliptio chipolaensis* inhabits silty sand substrate of large creeks and the main channel of the Chipola River in slow to moderate current.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Among southern unionids, the Chipola slabshell is the only species that exhibits the combined characters of light and dark banded epidermis with a salmon nacre. At present, it is the only known mussel endemic to the Chipola River drainage.

BASIS FOR STATUS CLASSIFICATION: Any major habitat degradation in the Chipola drainage may seriously jeopardize the existence of *E. chipolaensis*. The restricted distribution of this endemic to a small river system also contributes to its threatened status.

RECOMMENDATIONS: Maintaining quality habitat in the Chipola River should insure the continued existence of the Chipola slabshell. An Environmental Protection Agency Superfund project on the site of a battery salvage operation near the river should help in achieving this goal.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

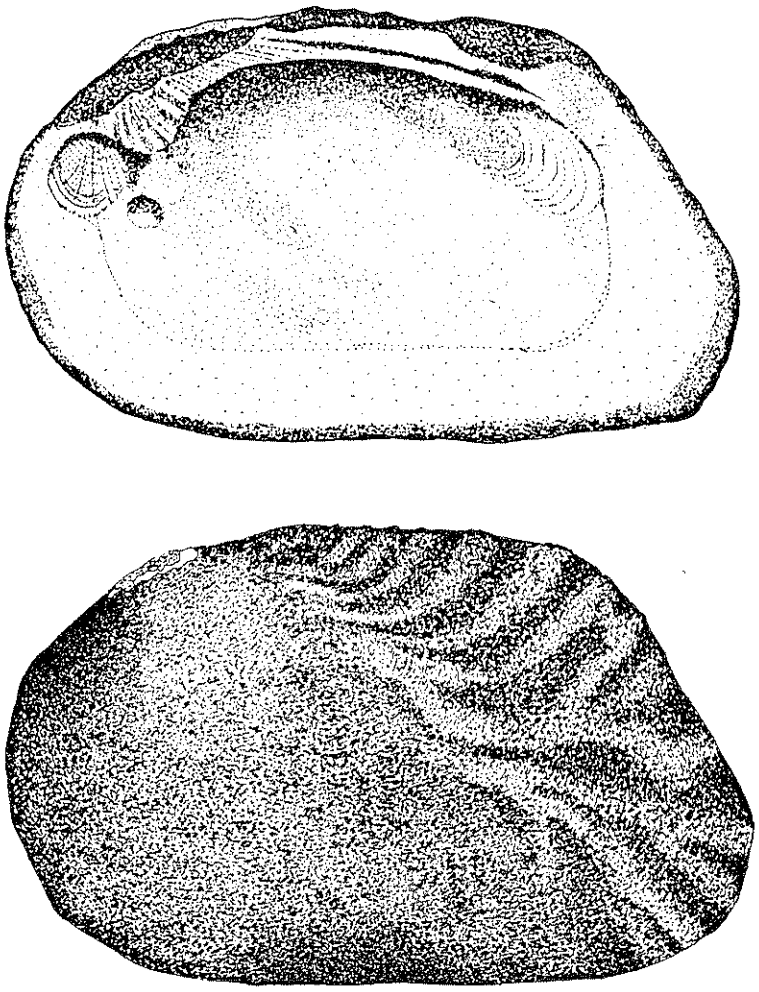
Threatened

Purple Bankclimber

Elliptoideus sloatianus (Lea)

DESCRIPTION: The purple bankclimber is the second largest freshwater mollusk in Florida, attaining a length of 203 mm (8.0 in). Its brownish black to black shell is subrhomboidal, moderately inflated, heavy, and strongly sculptured. A well developed posterior ridge extends from the umbos to the posterior ventral margin of the shell. The posterior slope and the disk just anterior to the posterior ridge are sculptured by several irregular ridges that vary greatly in development. Umbos are low, extending just above the dorsal margin of the shell. Internally, there is one pseudocardinal tooth in the right valve and two in the left valve. The lateral teeth are very thick and slightly curved. Nacre color is whitish near the center of the shell, becoming deep purple toward the margin, and very iridescent posteriorly. *Elliptoideus sloatianus* was considered a species of the genus *Elliptio* until Frierson (1927) erected the subgenus *Elliptoideus* based on the presence of glochidia in all four gills instead of two gills as is characteristic of the genus *Elliptio*.

RANGE: *Elliptoideus sloatianus* is known only from the Apalachicola River system in Alabama, Georgia, and Florida and from the Ochlockonee River in Florida (Clench and Turner 1956; Burch 1975). Historically, it occurred in the Chattahoochee River upstream to Columbus, Georgia, but has not been collected in that river since the mid-1800s. It has been collected, however, in the Flint River, an Apalachicola River tributary, in Georgia in recent years.

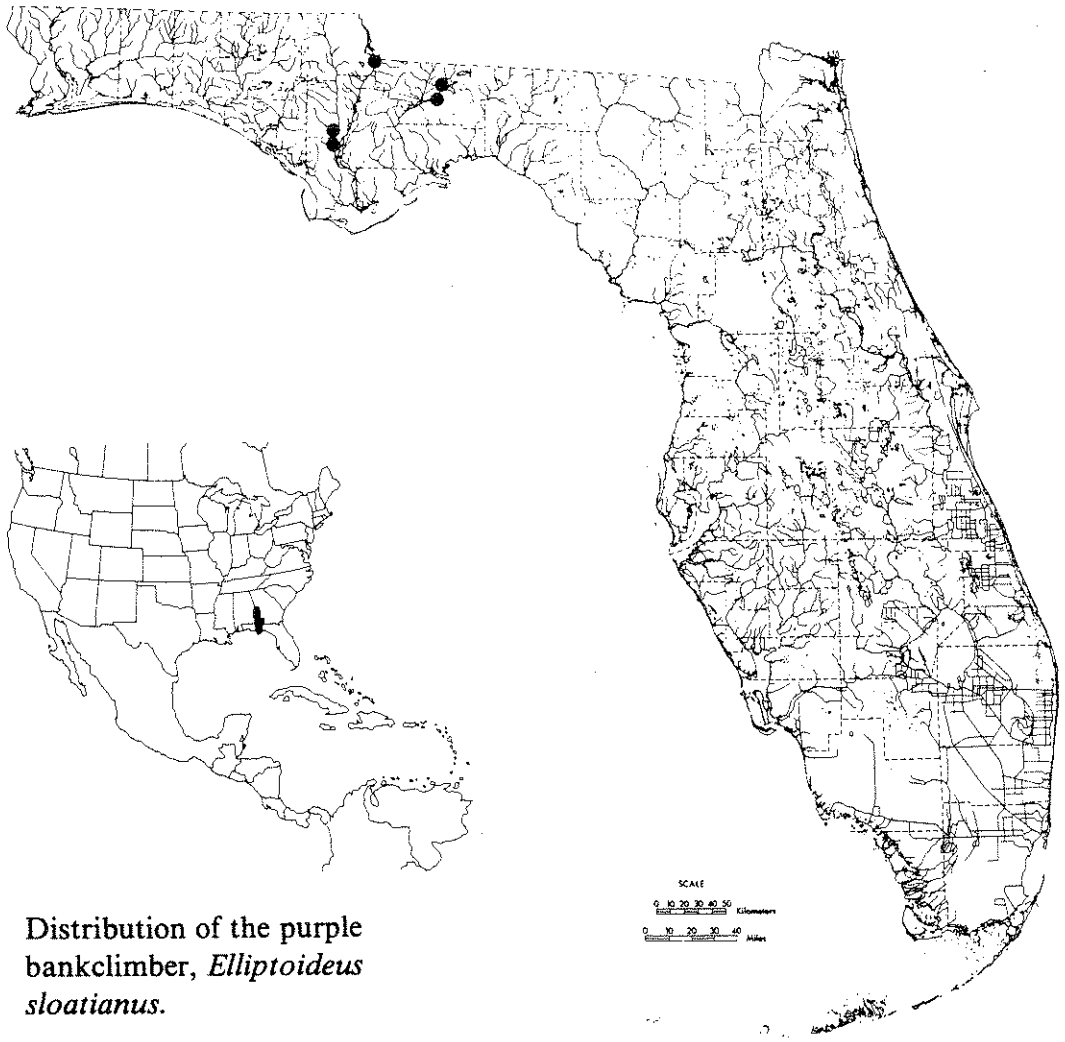


Purple Bankclimber, *Elliptoideus sloatianus*, UF 360, length 113 mm (4.4 in). Florida, Gadsden County, Apalachicola River (east bank) at Chattahoochee (illustration by Gina Collins).

In Florida, it occurs in the Apalachicola River below Jim Woodruff Dam downstream in the vicinity of the U.S. Highway 90 crossing at Chattahoochee, Gadsden County. Records from the Chipola River are from Dead Lake, Calhoun County. In the Ochlockonee River, it is known from three localities west and northwest of Tallahassee, in Gadsden and Leon counties. Heard (1979) reported one shell of *Elliptoideus* from the Escambia River near Century. In the absence of other records from the Escambia River and the intervening drainages, we believe this record is probably based on the conchologically similar *Plectomerus dombeyanus*.

HABITAT: The purple bankclimber inhabits small to large rivers in slow to moderate current over sand or sand mixed with mud or gravel substrates.

LIFE HISTORY AND ECOLOGY: The biology of *E. sloatianus* is essentially unknown. Lea (1863a) briefly described the soft anatomy based on three male specimens. Heard and Guckert (1971) included *Elliptoideus* in a group of unionid mollusks which were characterized by having all four gills serve as marsupial demibranchs and a tachytictic (short term breeders carrying glochidia only during summer) reproductive strategy.



Distribution of the purple bankclimber, *Elliptoideus sloatianus*.

SPECIALIZED OR UNIQUE CHARACTERISTICS: *Elliptoideus* is a monotypic genus and represents one of the two largest freshwater mollusks in the state of Florida.

BASIS FOR STATUS CLASSIFICATION: This species is confined to the Apalachicola and Ochlockonee river systems. In the Apalachicola River it is known only from the area below Jim Woodruff Dam downstream for a distance of about 1.5 km (1 mi). While it has been found living in this area in recent years, the population is dominated by very large, old individuals. It has not been found in the Chipola River since the 1950s so its current status in this system is unknown. In the Ochlockonee River the purple bankclimber appears to be confined to the upper reaches of the river, above Lake Talquin in Gadsden and Leon counties. Based on observations during the past 15 years, populations in this area appear stable. Continued success of the Ochlockonee population depends mostly on good water quality from the headwaters in southwest Georgia. Habitat alteration resulting from maintenance dredging in the Apalachicola River is a threat to the purple bankclimber.

Threatened status for *Elliptoideus* is based on its restricted distribution, uncertainty of the Chipola River population, and the age structure of the population in the Apalachicola River.

RECOMMENDATIONS: A thorough survey to determine the current status of *Elliptoideus* in the Apalachicola and Chipola rivers is needed before conservation actions can be initiated in these rivers. The survey should also determine the reproductive status of the population below Jim Woodruff Dam. In the Ochlockonee River, protection of the existing population and actions to prevent deterioration of riparian habitat and water quality are the highest priority conservation activities. A survey of the Ochlockonee River below Lake Talquin should be undertaken to determine whether population might exist there.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

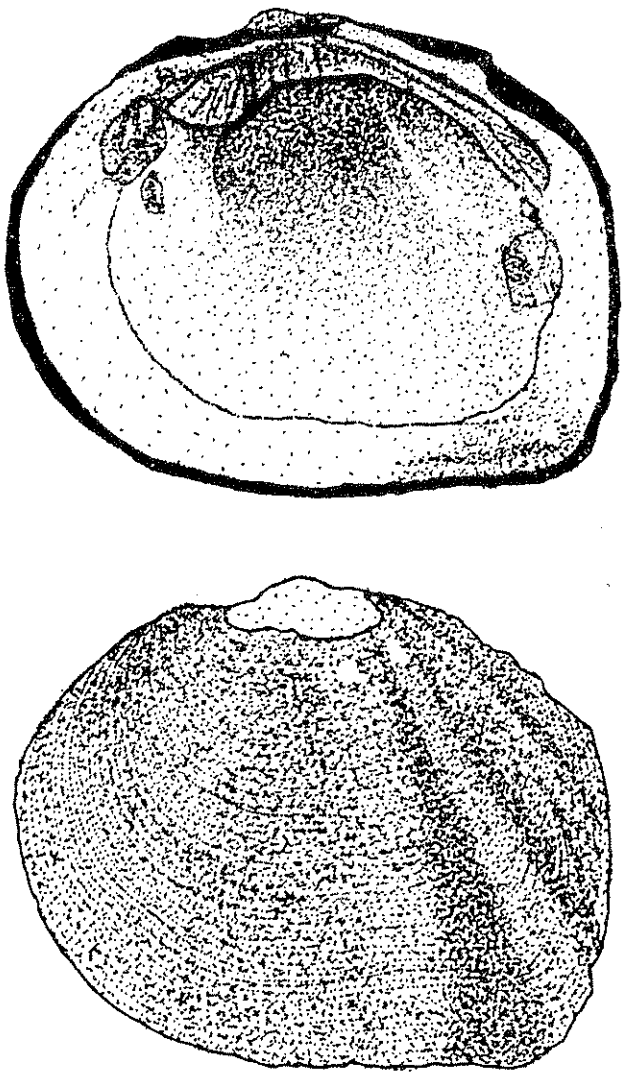
Threatened

Narrow Pigtoe

Fusconaia escambia (Clench and Turner)

DESCRIPTION: *Fusconaia escambia* is a small species, rarely exceeding 50 mm (2.0 in) in length, and subcircular in outline. It has a smooth, moderately heavy shell, somewhat inflated and with broad, full, and high umbos. The posterior ridge is well developed and ends in a point (angle slightly more than 90°) posteriorly. The posterior slope is slightly concave. Color of *F. escambia* varies from dark reddish brown to blackish. Internally the hinge plate is broad, heavy, and slightly arcuate. There is one large pseudocardinal tooth in the right valve and two in the left valve. The nacre is highly iridescent and white to salmon colored.

RANGE: The narrow pigtoe was first discovered in the Escambia River near Century, Escambia-Santa Rosa counties, Florida, which was designated the type locality (Clench and Turner 1956). Subsequently, it was found to occur upstream in the Conecuh River below Gantt Lake, Covington County, Alabama. Johnson (1969) reported the first record of *F. escambia* from the Yellow River, Okaloosa County, Florida.



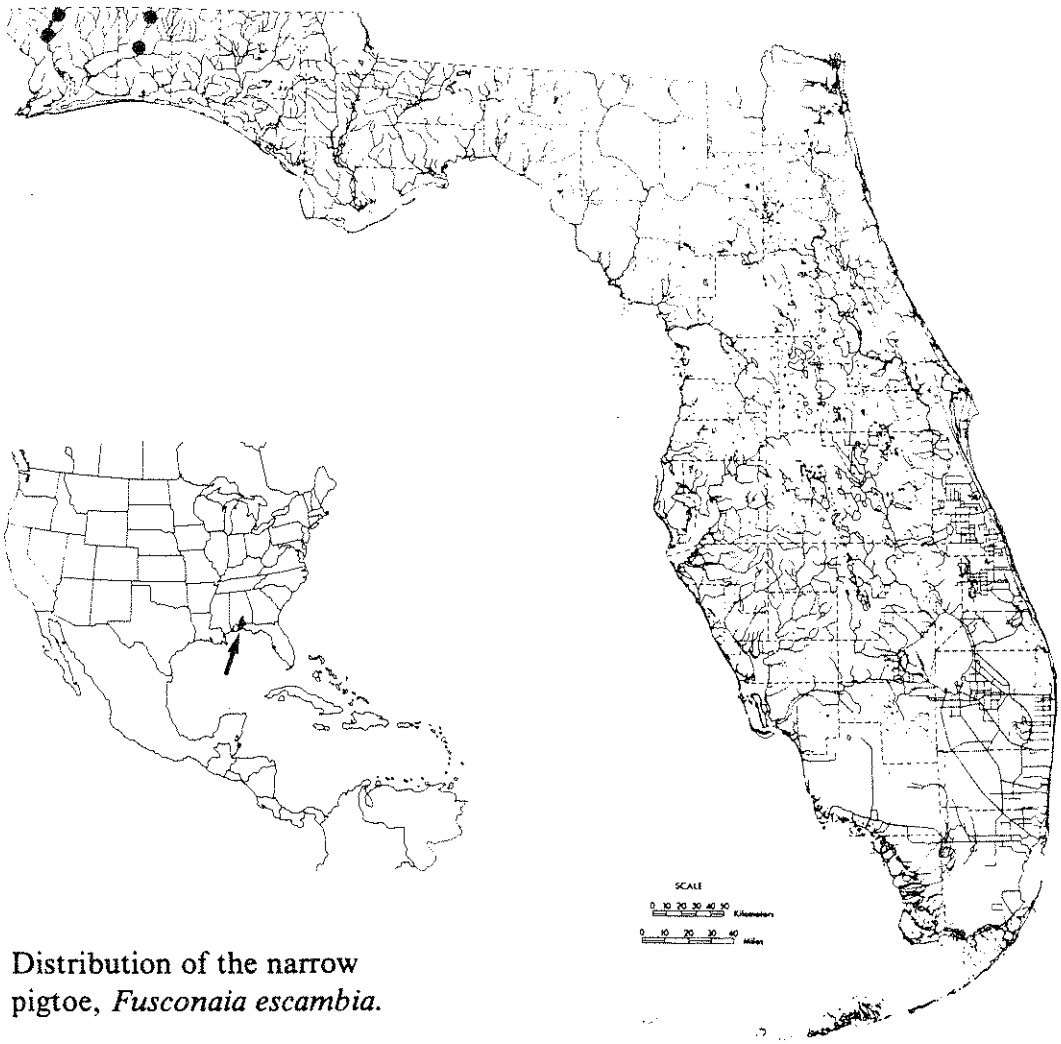
Narrow Pigtoe, *Fusconaia escambia*, UF 4997 (paratype), length 41 mm (1.6 in). Florida, Escambia County, Escambia River, 4.8 km (3 mi) southeast of Century (illustration by Tracy Smith).

HABITAT: *Fusconaia escambia* inhabits the main channel of small to medium-sized rivers with slow to moderate current over gravel, gravel mixed with sand, or a silty sand substrate.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: *Fusconaia escambia* appears to be the southeasternmost representative of the *F. flava* species group, which is more widespread in the western Gulf Coast drainages and the Mississippi River system.

BASIS FOR STATUS CLASSIFICATION: The limited distribution of *F. escambia*, restricted habitat and paucity of collections, and deterioration of water quality in the Escambia River are the major reasons for assigning threatened conservation status.



Distribution of the narrow pigtoe, *Fusconaia escambia.*

RECOMMENDATIONS: Protection of habitat in the Escambia and Yellow rivers is crucial to the conservation of *F. escambia.* Of these two rivers the Escambia River is probably the most important since it potentially supports the largest population. A thorough survey of the Escambia and Yellow rivers to determine current distribution and population levels of *F. escambia* is also needed.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

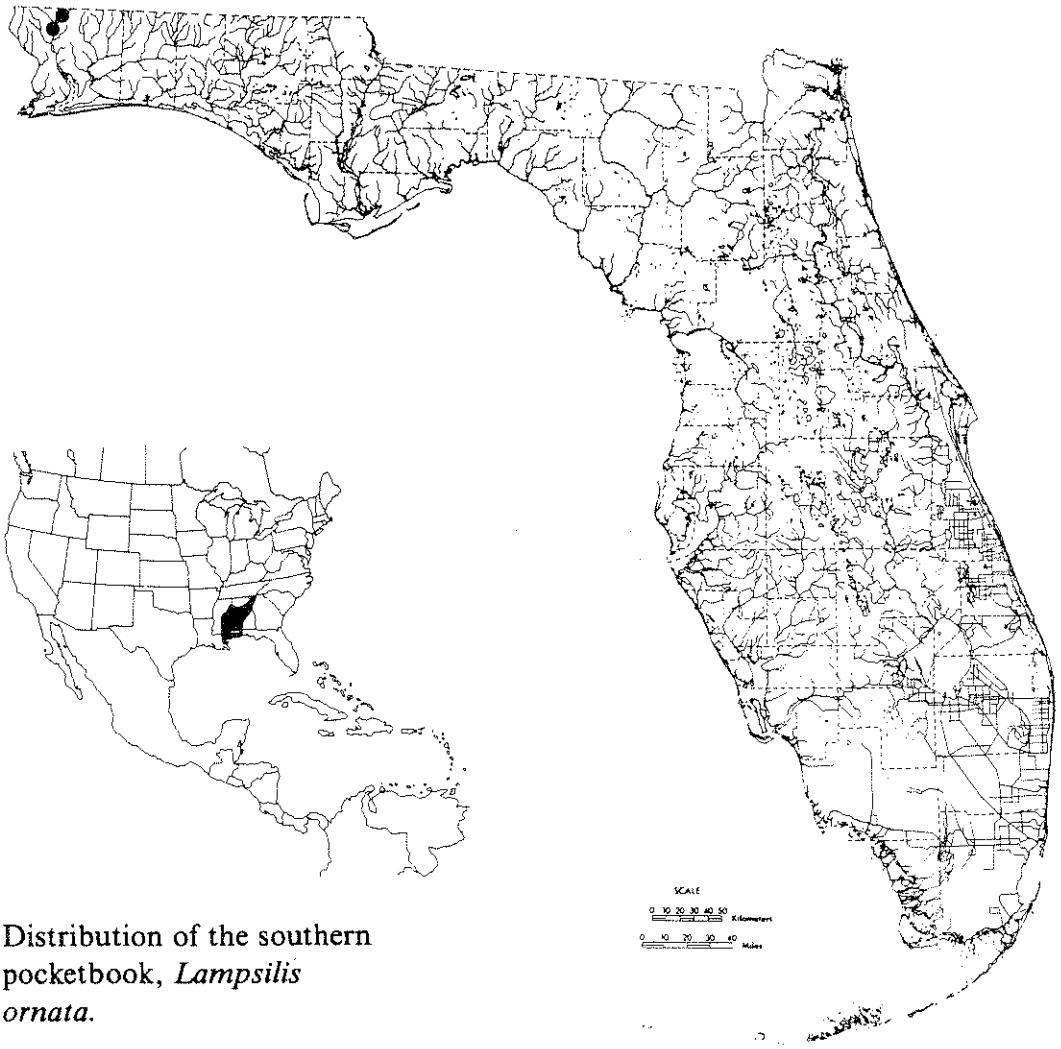
FAMILY UNIONIDAE

Threatened

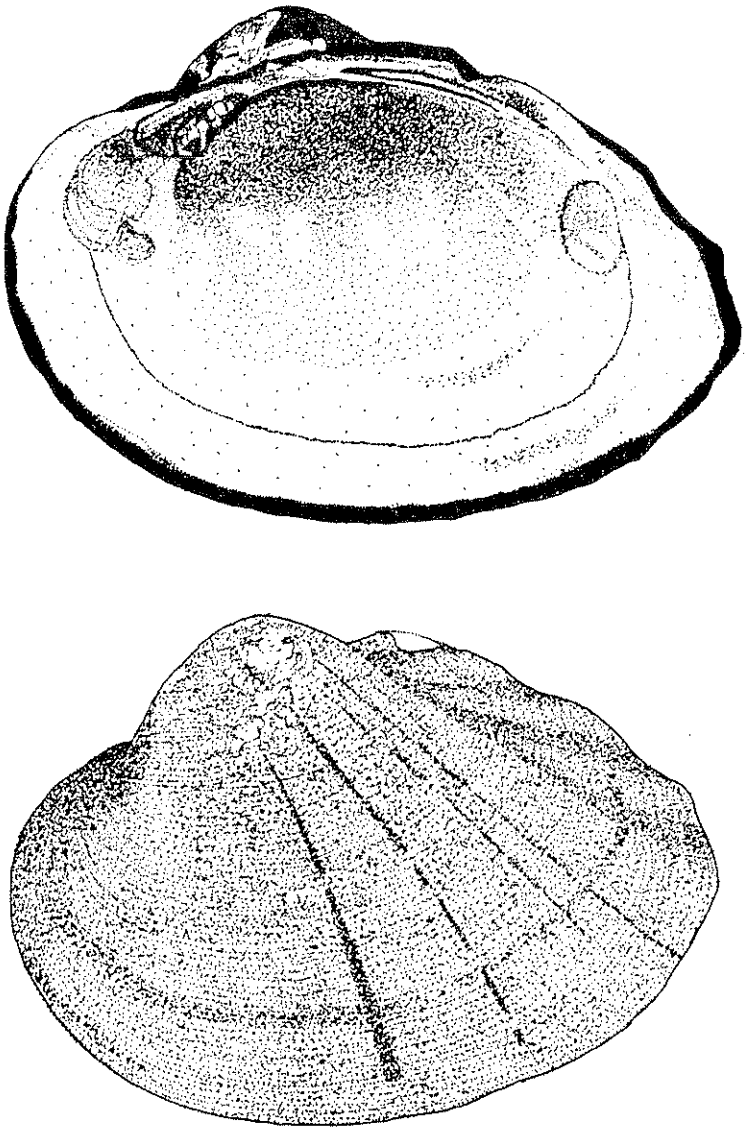
Southern Pocketbook

Lampsilis ornata (Conrad)

DESCRIPTION: *Lampsilis ornata* is a large mussel that reaches about 125 mm (4.9 in) in length. The shell is inflated and broadly oval with an angular posterior ridge. Umbos, appearing high and full, are located anterior to the center of the shell. The epidermis is smooth and shining on the disk, becoming somewhat roughened and wrinkled on the posterior slope. *Lampsilis ornata* is yellow to brownish yellow with narrow light to dark green rays. There are two compressed pseudocardinal teeth in the left valve; the larger anterior tooth is triangular in outline. The two small lateral teeth are located near the middle of the hinge plate. In the right valve there are two moderately compressed pseudocardinals and a single, high lateral tooth. Internally, the nacre is white or bluish white to pale salmon and somewhat iridescent.



Distribution of the southern pocketbook, *Lampsilis ornata*.



Southern Pocketbook, *Lampsilis ornata*, UF 20740, length 78.6 mm (3.1 in). Florida, Escambia County, Escambia River, 4.8 km (3 mi) southeast of Century (illustration by Tracy Smith).

RANGE: The southern pocketbook occurs in eastern Gulf drainages from the Amite River of Louisiana (Vidrine 1985) eastward to the Escambia River system of Alabama and Florida (Clench and Turner 1956; Burch 1975). In Florida, it is known only from the main channel of the Escambia River near the Alabama border downstream to McDavid in northern Escambia and Santa Rosa counties.

HABITAT: *Lampsilis ornata* is typically found in large creeks to rivers where it inhabits sand and gravel substrates with slow to moderate current. It has also been found in pools and backwater areas where there is little current and the substrate is predominantly mud.

LIFE HISTORY AND ECOLOGY: There is very little published information on the life history of *L. ornata*. Lea (1874) briefly described and figured the glochidia, but provided no information on the reproductive period. Ortmann (1924) reported a gravid female from the Black Warrior River, Ala-

bama, collected 15 October 1912, and briefly described the soft anatomy of the female and the glochidia.

SPECIALIZED OR UNIQUE CHARACTERISTICS: In Florida, *L. ornata* is the only unionid with a high umbo, angular posterior ridge, and yellowish color with green rays.

BASIS FOR STATUS CLASSIFICATION: The conservation status of this species is based on its restricted distribution in Florida and its low population levels in the Escambia River.

RECOMMENDATIONS: Action should be taken to protect the remaining habitat of *L. ornata* in Florida. The states of Alabama and Florida should address the pollution problems in the Escambia drainage which potentially degrade the Florida portion of the river.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

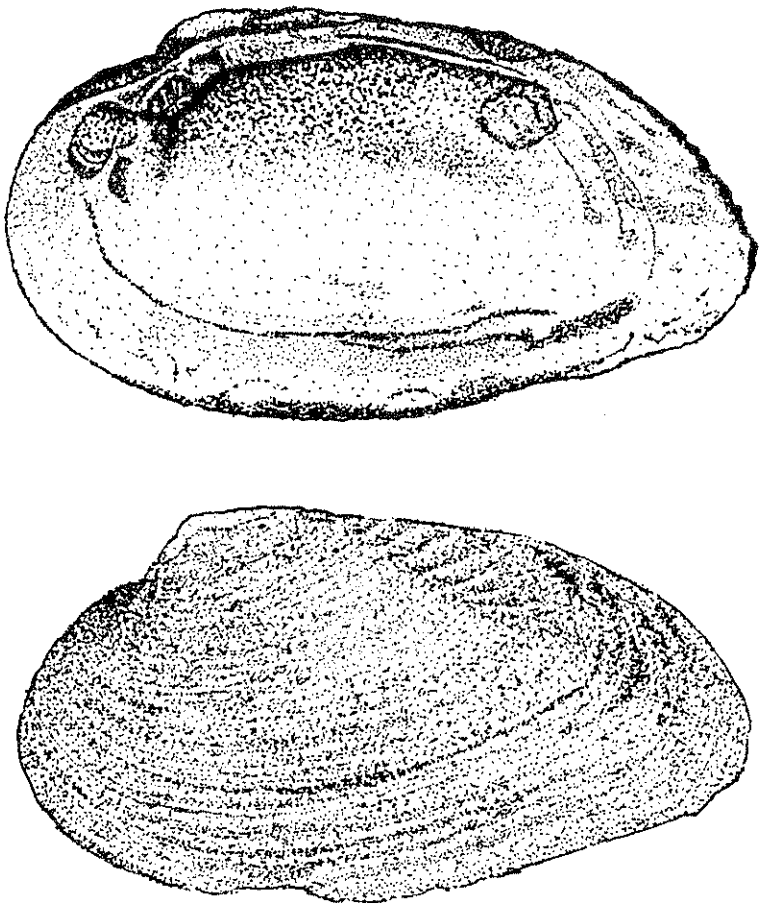
FAMILY UNIONIDAE

Threatened

Gulf Moccasinshell

Medionidus penicillatus (Lea)

DESCRIPTION: *Medionidus penicillatus* reaches a length of about 55 mm (2.2 in) and is elongate-elliptical or rhomboidal and fairly inflated, and has relatively thin valves. The ventral margin is nearly straight or slightly rounded. The posterior ridge is rounded to slightly angled and intersects the end of the shell at the base line. Females tend to have the posterior point above the ventral margin and are somewhat more inflated. Sculpturing consists of a series of thin, radially oriented plications along the length of the posterior slope. The remainder of the surface is smooth and yellowish to greenish brown with fine, typically interrupted green rays. The left valve has two stubby pseudocardinal and two arcuate lateral teeth. The right valve has one pseudocardinal and one lateral tooth. Nacre color is smokey purple or greenish and slightly iridescent at the posterior end. (See the DESCRIPTION section of *Medionidus simpsonianus* Walker for a discussion of the taxonomic history of eastern Gulf Coast drainages of *Medionidus*).



Gulf Moccasinshell, *Medionidus penicillatus*, UF 4161, length 45.4 mm (1.8 in). Florida, Jackson County, Spring Creek, 4.8 km (3 mi) southeast of Marianna (illustration by Tracy Smith).

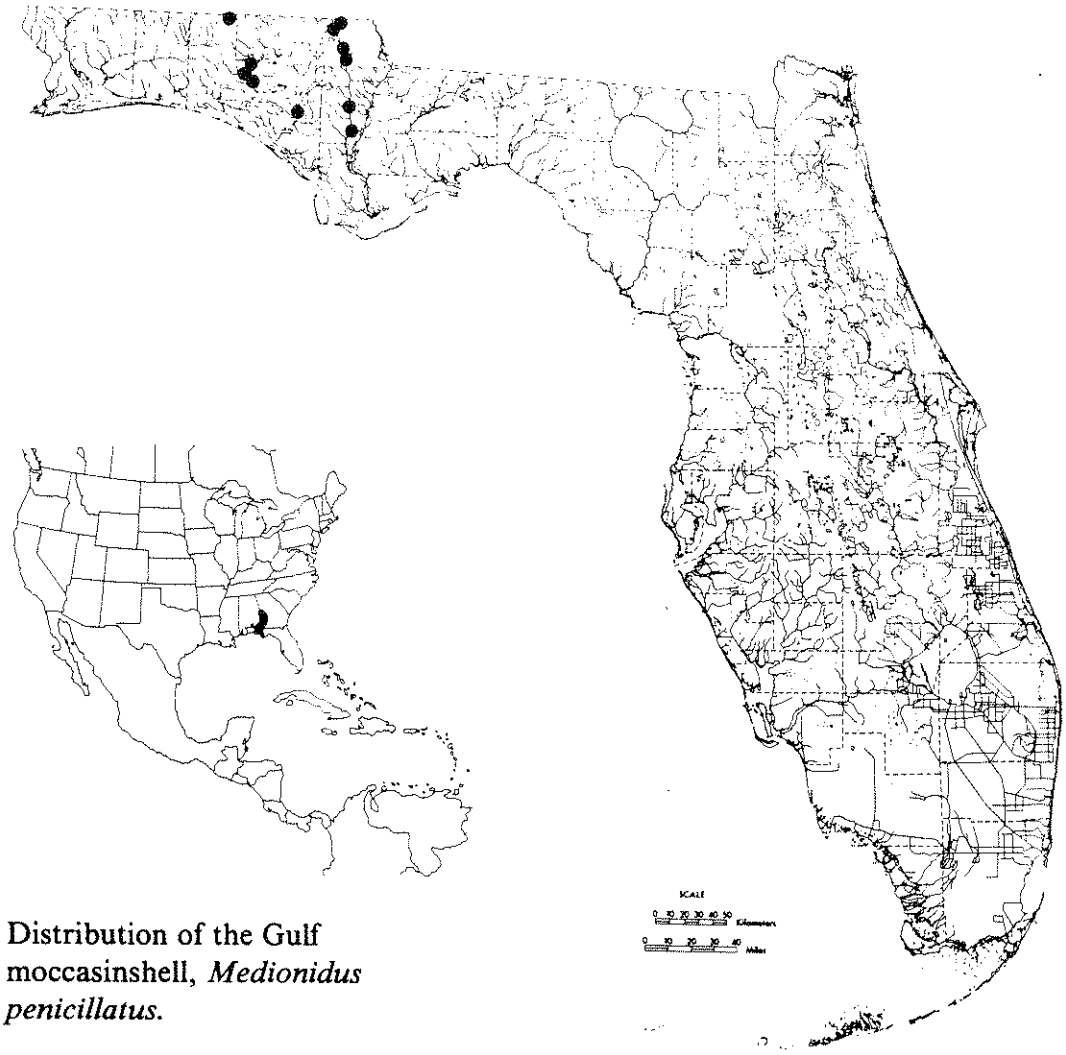
RANGE: The gulf moccasinshell is reported from the Yellow River in Alabama and Apalachicola River system in Alabama, Georgia, and Florida. It has also been found in the Econfina Creek drainage (Johnson 1977), and the Choctawhatchee River system (Butler 1989), both in Florida. Florida records are from Walton (Choctawhatchee River system), Bay (Econfina Creek drainage), Jackson and Calhoun (Chipola River drainage), and Gadsden (Apalachicola River) counties.

HABITAT: The gulf moccasinshell inhabits medium-sized creeks to large rivers with sand and gravel substrates in slow to moderate currents.

LIFE HISTORY AND ECOLOGY: Very little is known about *M. penicillatus*. Lea (1858) figured the subspatulate glochidium and later discussed the soft anatomy (Lea 1863a).

UNIQUE OR SPECIALIZED CHARACTERISTICS: This species is not easily confused with any other species in its range, except *Quincuncina burkei* in the Choctawhatchee River system.

BASIS FOR STATUS CLASSIFICATION: Although known from several stations in the Chipola River drainage (van der Schalie 1940) and single sites on the Apalachicola River and Econfina Creek, recent material from Florida



Distribution of the Gulf moccasinshell, *Medionidus penicillatus.*

drainages is scarce. The gulf moccasinshell has recently been found live in Econfina Creek, Bay County (two specimens in 1987), and the lower Chipola River mainstem above Dead Lake near Scotts Ferry, Calhoun County (one specimen in 1988). The population reported from Chattahoochee on the Apalachicola River in Gadsden County (Clench and Turner 1956; Johnson 1977) is most likely extirpated. The present status of *M. penicillatus* in the Yellow and Choctawhatchee river systems is unknown.

RECOMMENDATIONS: Protecting the nearly pristine Chipola and Econfina watersheds will aid in the perpetuation of *M. penicillatus* in Florida. Abundance (1,000+ per square meter) of the Asian clam *Corbicula fluminea* (Müller) has drastically altered the substrate microhabitat at the Chattahoochee site, making it unlikely that *M. penicillatus* could inhabit that area. Research on negative effects of *C. fluminea* on native unionids is needed to determine future conservation strategies of this and other species.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

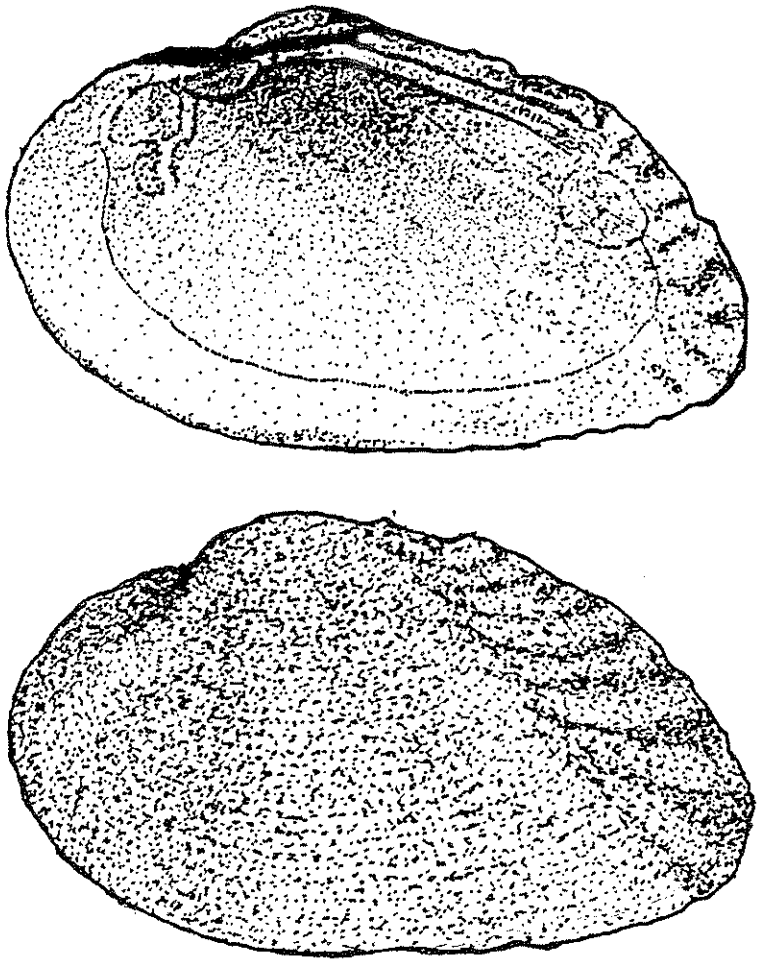
FAMILY UNIONIDAE

Threatened

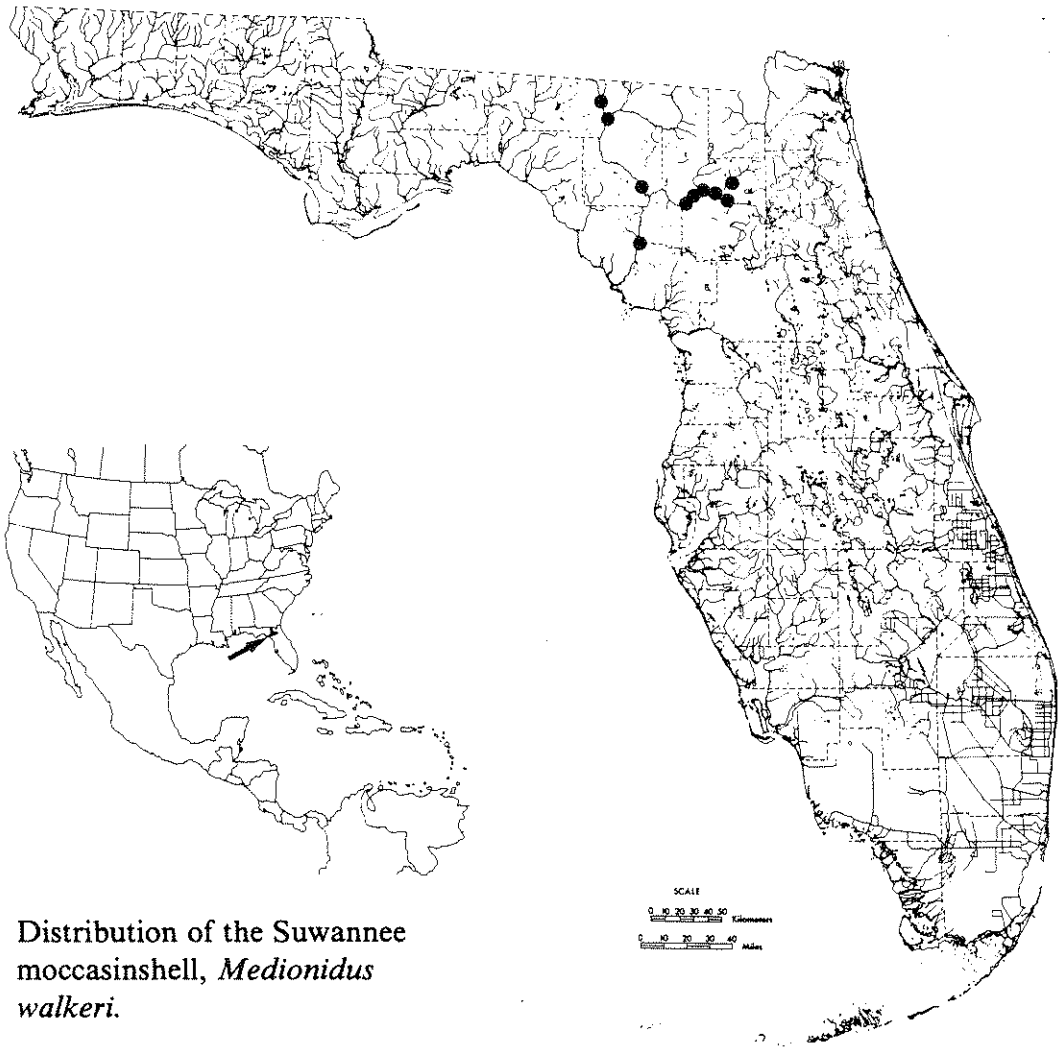
Suwannee Moccasinshell

Medionidus walkeri (Wright)

DESCRIPTION: The Suwannee moccasinshell is a small species rarely exceeding 50 mm (2.0 in) in length. The shell is subrhomboid and moderately inflated, and the valves are relatively thick. The high, angular posterior ridge and slope have a series of coarse, radially-curved corrugations that sometimes extend onto the disk. The umbos are high and located on the anterior third of the shell. The periostracum is greenish to black with inconspicuous broad green rays. Females are longer than males and have postbasal swelling and posterior point above the ventral margin. Internally, the left valve has two compressed pseudocardinal and two short lateral teeth. The right valve has single pseudocardinal and lateral teeth. Nacre color varies from bluish white to light pinkish. (See the DESCRIPTION section of *Medionidus simpsonianus* for a discussion of the taxonomic history of *Medionidus* species in eastern Gulf Coast drainages).



Suwannee Moccasinshell, *Medionidus walkeri*, UF 133932, length 41.5 (1.6 in). Florida, Suwannee County, Suwannee River at Branford (illustration by Tracy Smith).



Distribution of the Suwannee moccasinshell, *Medionidus walkeri*.

RANGE: *Medionidus walkeri* is endemic to the Suwannee River system in Florida (Johnson 1977) and recorded from sites along the mainstem from Fanning Springs (Levy County) upstream to the Withlacoochee River confluence at Ellaville (Madison-Suwannee counties), at Blue Spring on the Withlacoochee River (Madison County), and in the Santa Fe River drainage above the Santa Fe Sink (Alachua, Bradford, and Union counties). Records for *M. penicillatus* from the Suwannee River system (Clench and Turner 1956; Burch 1975) are actually *M. walkeri*. At present, no records are available in the Georgia portions of the Withlacoochee or Alapaha rivers, the major northern tributaries of the Suwannee River system.

HABITAT: Clear medium-sized creeks to rivers with muddy sand or sand with some gravel in slow to moderate current.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The sharp posterior ridge and generally dark and rayless shells distinguish *M. walkeri* from other

Medionidus species in the Gulf drainage. The Suwannee moccasinshell is apparently one of the few unionids endemic to the state of Florida.

BASIS FOR STATUS CLASSIFICATION: Johnson (1977) stated that *M. walkeri* was abundant at the type locality (Suwannee River, Ellaville, Madison County), but uncommon at other localities. Although the New River (Santa Fe River drainage) has yielded numerous specimens in the past 15 years, it is presently rare in the drainage. Large series were collected 55 years ago, but the present status of the population at the Santa Fe River Sink (Alachua County) is unknown. Phosphate mining has affected the Suwannee River system upstream of Ellaville and may have contributed to the decline of the once large population known from the type locality. These adverse effects and the restricted distribution of the low density populations are the basis for the threatened status of the Suwannee moccasinshell in Florida.

RECOMMENDATIONS: The most pristine refugium for this diminutive species remains the upper Santa Fe River drainage. The population in the New River must be protected by ensuring good water quality and protection of riparian areas. Lack of development in the watershed should aid in the perpetuation of the Suwannee moccasinshell. Thorough inventories of known localities, particularly in the Santa Fe watershed, and upper Suwannee and Withlacoochee rivers, are required to determine the present status of *M. walkeri.*

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Threatened

Oval Pigtoe

Pleurobema pyriforme (Lea)

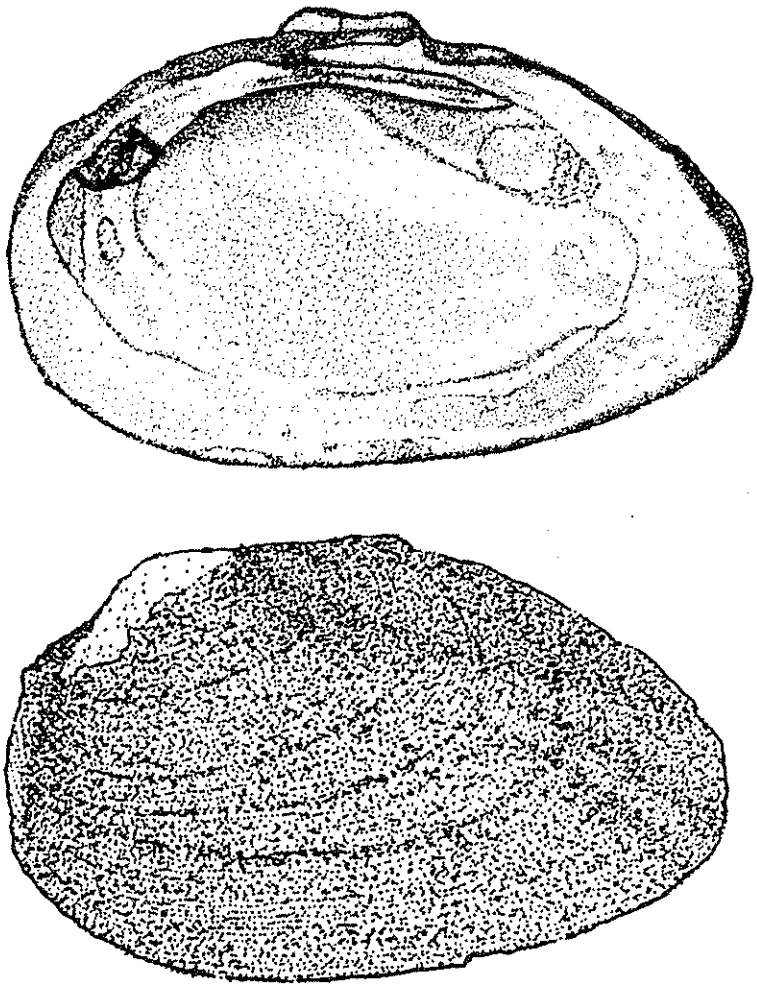
DESCRIPTION: *Pleurobema pyriforme* is a small to medium-sized species that attains a length of about 60 mm (2.4 in). The shell is suboviform compressed, with a shiny smooth epidermis. The periostracum is yellowish or chestnut, rayless, with distinct growth lines. The posterior slope is biangulate and forms a blunt point on the posterior margin. The umbos are slightly elevated above the hingeline. As is typical of the genus, no sexual dimorphism is displayed in shell characters. Internally, the pseudocardinal teeth are fairly

large, crenulate, and double in both valves. The lateral teeth are somewhat shortened, arcuate and double in each valve. Nacre color varies from salmon to bluish white and is iridescent posteriorly.

RANGE: The oval pigtoe is an Apalachicola River system endemic, with a Florida range restricted to the Chipola River drainage. Earlier records of *Pleurobema* east of the Apalachicola River (Ochlockonee and Suwannee rivers) by Clench and Turner (1956), Johnson (1970), Burch (1975) and Heard (1979) refer to *P. reclusum*, which those authors considered a synonym of *P. pyriforme* (see DESCRIPTION section of the *P. reclusum* account). We recognize records of the oval pigtoe from headwater tributaries in Jackson County and sites along the lower river mainstem downstream to Dead Lake, Calhoun County.

HABITAT: *Pleurobema pyriforme* occurs in medium-sized creeks to small rivers where it inhabits silty sand to sand and gravel substrates, usually in slow to moderate current. Stream channels with clean substrates appear to offer the best habitat for the oval pigtoe.

LIFE HISTORY AND ECOLOGY: Unknown.



Oval Pigtoe, *Pleurobema pyriforme*, UF 413, length 43.1 mm (1.7 in). Florida, Jackson County, Chipola River, 1.6 km (1 mi) north of Marianna (illustration by Tracy Smith).

Distribution of the oval pigtoe, *Pleurobema pyriforme.*

SPECIALIZED OR UNIQUE CHARACTERISTICS: In Florida, *P. pyriforme* is restricted to the Chipola River drainage.

BASIS FOR STATUS CLASSIFICATION: Recent collections have located a population at a lower mainstem site and a tributary, Dry Creek. However, any drastic changes in water quality in the Chipola River drainage could eradicate *P. pyriforme* from Florida waters. The restricted range and potential water quality problems in the Chipola River are the basis for threatened conservation status for the oval pigtoe.

RECOMMENDATIONS: An inventory of the poorly surveyed lower Chipola mainstem and the larger tributaries in the system is needed to determine the extent of Florida populations.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

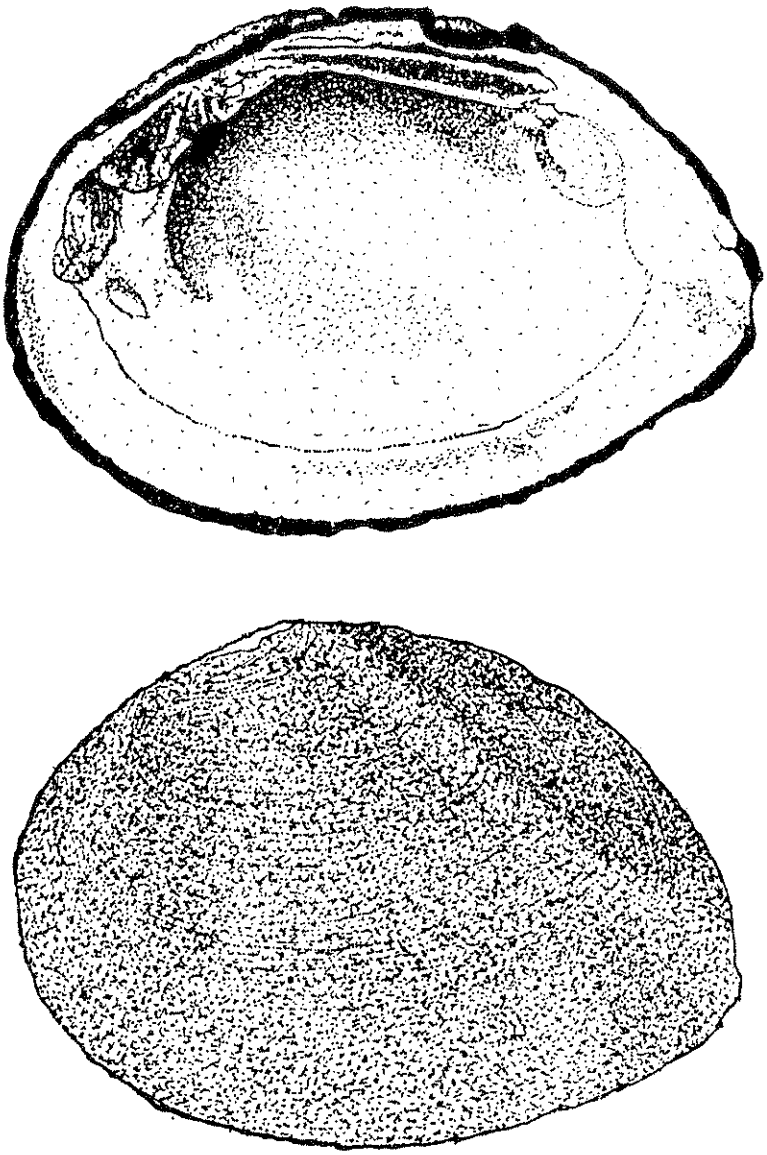
Threatened

Fuzzy Pigtoe

Pleurobema strodeanum (Wright)

DESCRIPTION: *Pleurobema strodeanum* is a small to medium-sized species that reaches a length of approximately 61 mm (2.4 in). The outline of the shell is subtriangular or subcircular with a broadly rounded ventral margin. The posterior margin is obtusely angular, resulting from the broad, biangulated, and flattened posterior slope. The surface is usually slightly roughened, appearing satiny or clothlike, although some specimens may appear smooth. Surface color is dark green to black and rayless. The umbos are somewhat pointed and barely extend above the hingeline. The pseudocardinal teeth are prominent and double in each valve. The lateral teeth are well developed, arcuate and also double in each valve. The color of the nacre is white, oftentimes with a bluish tint, and slightly iridescent marginally.

Distribution of the fuzzy pigtoe, *Pleurobema strodeanum*.



Fuzzy Pigtoe, *Pleurobema strodeanum*, UF 4973, length 38.4 mm (1.5 in). Florida, Escambia County, Escambia River, 4.8 km (3 mi) southeast of Century (illustration by Tracy Smith).

RANGE: The fuzzy pigtoe occurs in the Escambia and Choctawhatchee river systems of Alabama and Florida and in the geographically intermediate Yellow River in Alabama (Clench and Turner 1956; Burch 1975). There are several Florida collections from the Choctawhatchee mainstem and from several of its tributaries in Walton and Holmes counties. Two records are known for the Escambia River, Escambia and Santa Rosa counties, Florida.

HABITAT: An inhabitant of medium-sized creeks to rivers, *P. strodeanum* occurs in sand and silty sand substrates in slow current.

LIFE HISTORY AND ECOLOGY: Unknown.

BASIS FOR STATUS CLASSIFICATION: The fuzzy pigtoe is known from several localities in the Choctawhatchee River system. However, material from elsewhere in Florida is scarce. Recent material from Florida locali-

ties in general is scant and most records are 35 to 55 years old. For these reasons, Florida populations of this species should be considered threatened.

RECOMMENDATIONS: Sites that historically sustained populations of *P. strodeanum*, particularly the Choctawhatchee River system, need to be resurveyed to determine the present status of populations in Florida.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Threatened

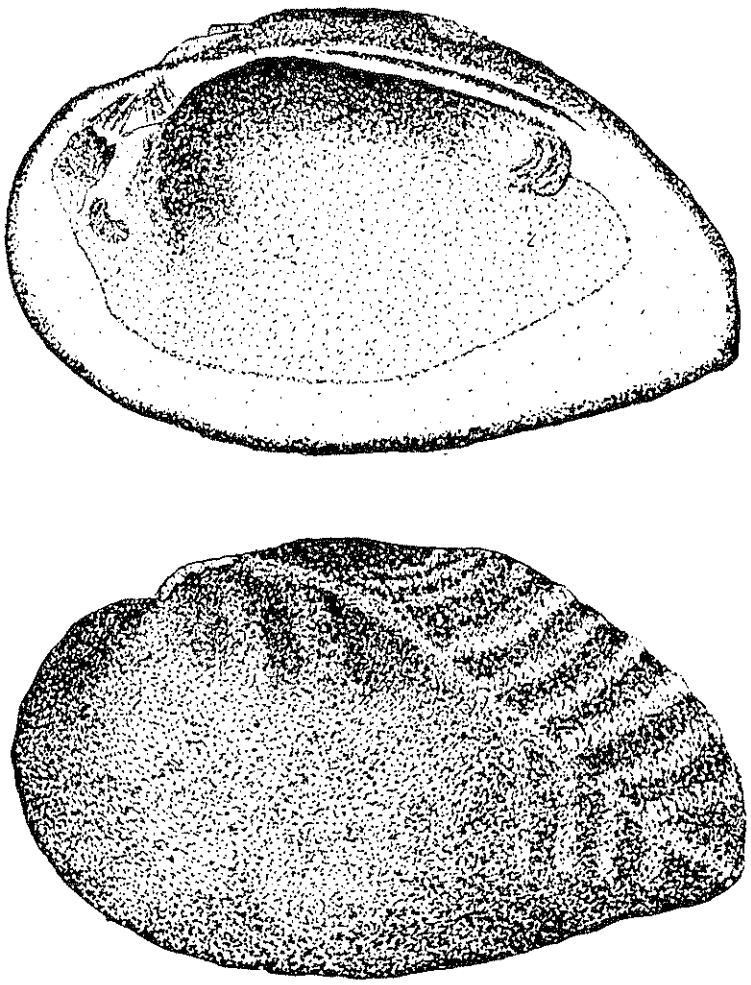
Tapered Pigtoe

Quincuncina burkei Walker

DESCRIPTION: The tapered pigtoe is a small to medium-sized mussel that attains a length of 71 mm (2.8 in), but generally is less than 50 mm (2.0 in) in length. Subelliptical to subtriangular in outline, the shell has a fairly sharp posterior ridge that intersects the posterior end near the base line, which is nearly straight. Series of radial plications appear in rows down the posterior slope and, when present on the disk, appear as chevron shaped sculpture. The degree of sculpture is sometimes reduced, particularly on the disk. The surface is uniformly dark brown and shiny, but roughened anteriorly and posteriorly. Young individuals may appear light brown with faint green rays. The pseudocardinal teeth are fairly strong and well developed; two in the left and one in the right valve. The lateral teeth are fairly thick and somewhat arcuate; two in the left and one in the right valve. The color of the nacre is bluish white.

RANGE: *Quincuncina burkei* is an endemic of the Choctawhatchee River system of Alabama and Florida (Clench and Turner 1956; Burch 1975). In Florida it has been found in the mainstem sites and in several of the tributaries in Holmes, Jackson, Walton, and Washington counties.

HABITAT: An inhabitant of medium-sized creeks to large rivers, *Q. burkei* lives in stable sand with some gravel to silty sand substrates in slow to moderate current.



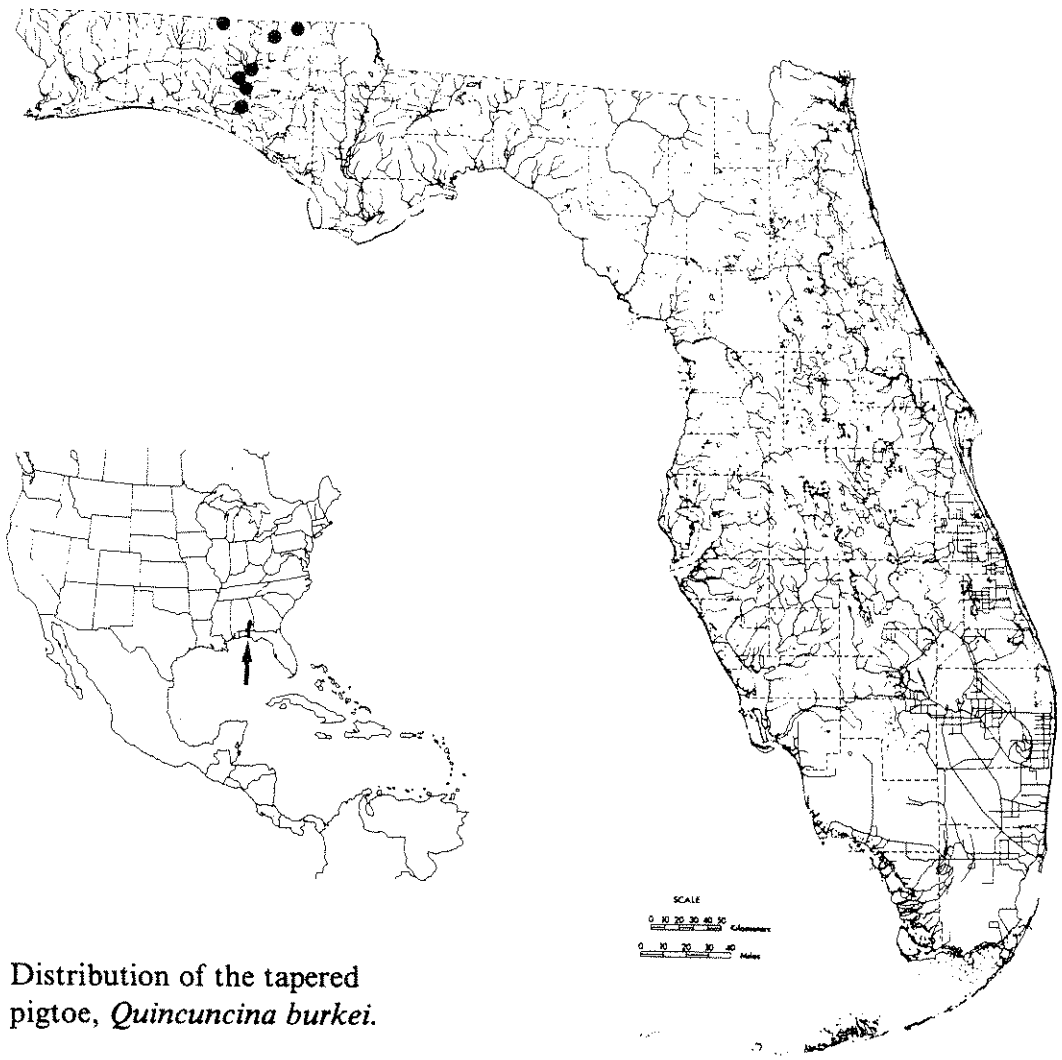
Tapered Pigtoe, *Quincuncina burkei*, UF 64976, length 44.8 mm (1.8 in). Florida, Jackson County, Holmes Creek near Graceville (illustration by Gina Collins).

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The shell sculpture and size of *Quincuncina burkei* readily separate it from other Florida unionids with the possible exception of *Medionidus penicillatus*.

BASIS FOR STATUS CLASSIFICATION: Collections of *Q. burkei* along the Choctawhatchee River mainstem in Florida are generally over 50 years old. Its current status in that system is not known. Good populations apparently remain in a few tributaries in Holmes and Walton counties. Restriction to large stream habitat in a single drainage system increases the vulnerability of this species.

RECOMMENDATIONS: Mainstem Choctawhatchee River sites are in need of surveys to ascertain the status of the tapered pigtoe in river habitat. Preservation of good water quality in tributaries should aid in the preservation of *Q. burkei* in Florida.



Distribution of the tapered pigtoe, *Quincuncina burkei.*

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Threatened

Southern Creekmussel

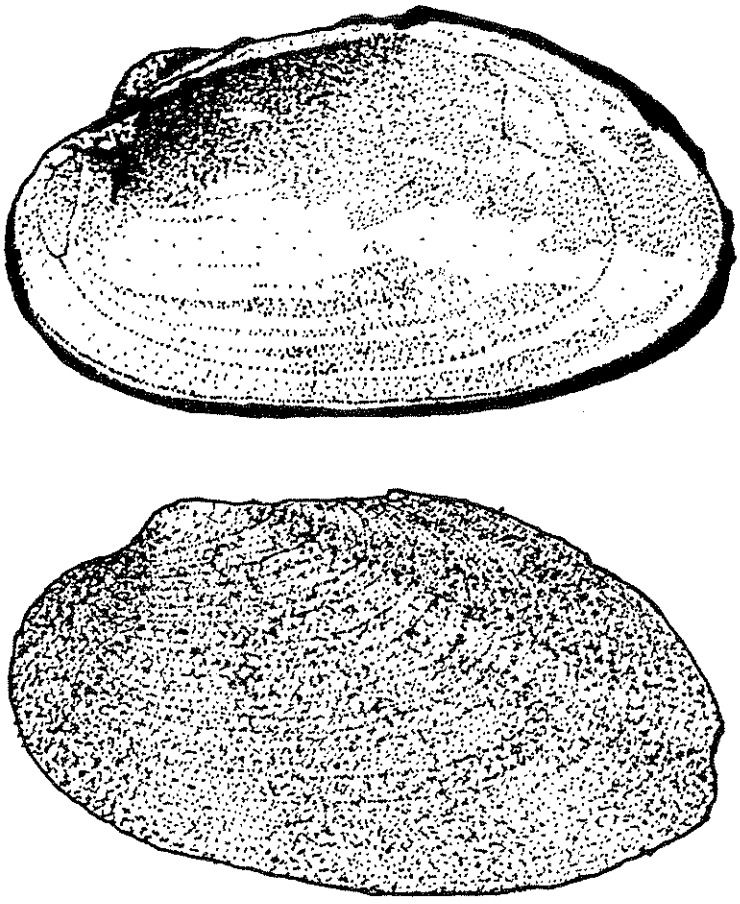
Strophitus subvexus (Conrad)

DESCRIPTION: The southern creekmussel is a moderately large species that attains a length of 181 mm (7.1 in), although a length of less than 125

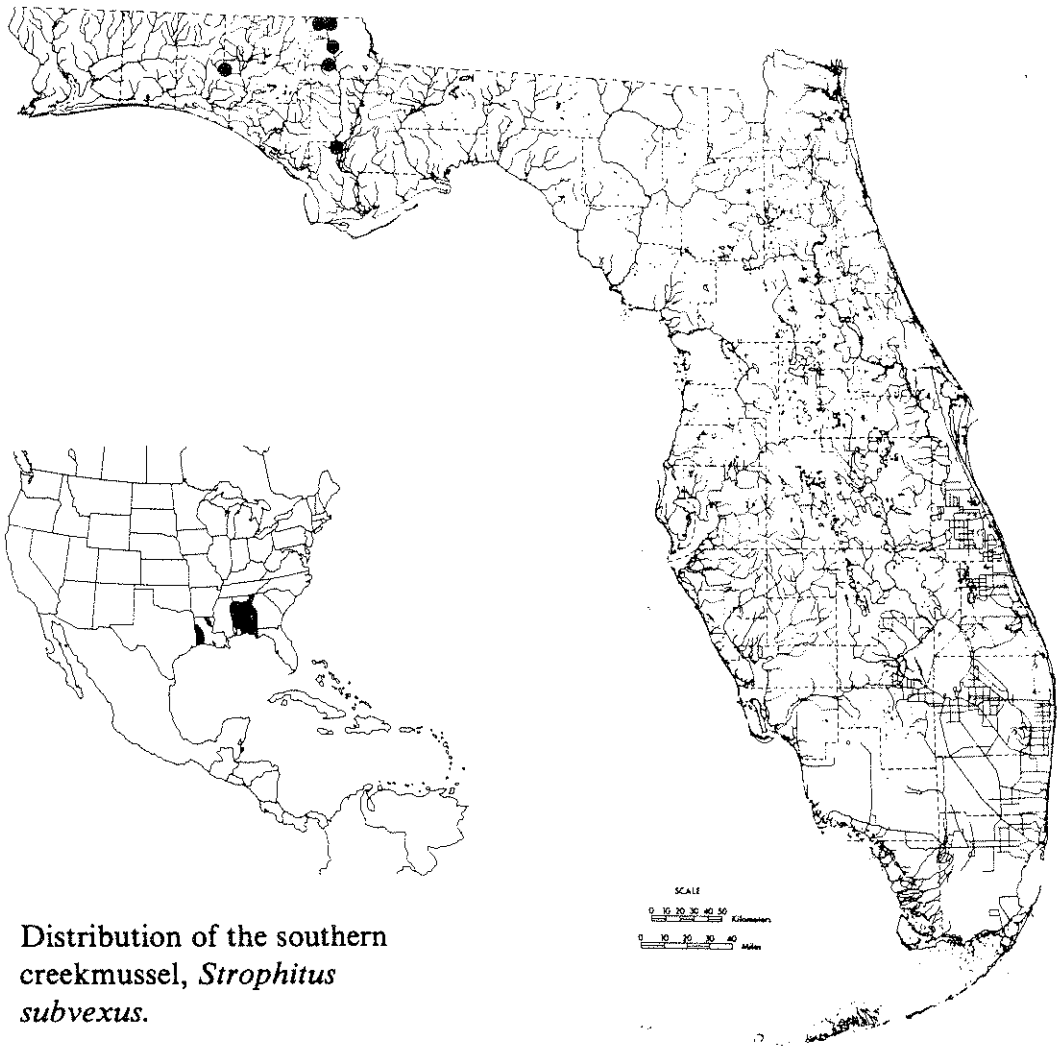
mm (4.9 in) is more common. It is suboval to elliptical in outline and moderately inflated. The anterior end is rounded and the posterior end is subtruncate to rounded. The dorsal margin is short and broadly rounded. The ventral margin is nearly straight to slightly arcuate in larger individuals. Umbos, located near the anterior third of the shell, have low concentric ridges and are slightly inflated and usually raised above the hinge line. Shell thickness varies from thin to moderately thick. Periostracum color varies from greenish yellow to brownish with green rays often present on the posterior slope. A single low, stumpy, pseudocardinal tooth is present in each valve; lateral teeth are absent. Color of the nacre is typically bluish white and iridescent.

The generic and specific recognition of *S. subvexus* has varied during the past century. It was reported by Clench and Turner (1956) as *Anodontoides Elliotti*, and by van der Schalie (1940) as *Strophitus spillmani*. Johnson (1967) reexamined the systematic and taxonomic questions and recognized one species on the Gulf Coast, *Strophitus subvexus*, a decision that is currently followed by most researchers.

RANGE: *Strophitus subvexus* occurs in most Gulf Coast drainages from the Sabine River in Louisiana (Vidrine 1985) east to the Apalachicola River system in Florida and Georgia (Johnson 1967; Burch 1975). In Florida the southern creekmussel is known from several localities in the Chipola River system and one locality in the Choctawhatchee River system (White Creek,



Southern Creekmussel, *Strophitus subvexus*, UF 4996, length 47 mm (1.8 in). Florida, Jackson County, Chipola River, 1.6 km (1 mi) north of Marianna (illustration by Tracy Smith).



Distribution of the southern creekmussel, *Strophitus subvexus.*

Walton County). The Florida records are based on collections made prior to 1957 except for a recent (1988) live collection of a single specimen from Dry Creek, a Chipola River tributary.

HABITAT: The southern creekmussel, as its vernacular name implies, typically inhabits small to large creeks, but individuals have been found in small to large rivers. Substrate varies from sand to sandy mud in slow or no current.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: *Strophitus subvexus* is one of two Florida mussels (see *Anodontoides radiatus* account) with a single pseudocardinal tooth in each valve and no lateral teeth.

BASIS FOR STATUS CLASSIFICATION: The paucity of records and the fact that only one of these is recent suggest that the survival of this species in Florida is in jeopardy. The single known collection from the Choctawhatchee

River system was taken in 1933. It is possible that the only Florida population presently surviving is in the Chipola River drainage. While the main channel of the Chipola River has experienced periodic water quality problems, some tributaries have remained in fair condition.

RECOMMENDATIONS: Actions to prevent deterioration of the remaining habitat are needed immediately. A survey of the Chipola River system is needed to determine the extent and number of populations in that system. The Choctawhatchee River system needs to be surveyed to determine whether populations of the southern creekmussel are extant there.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

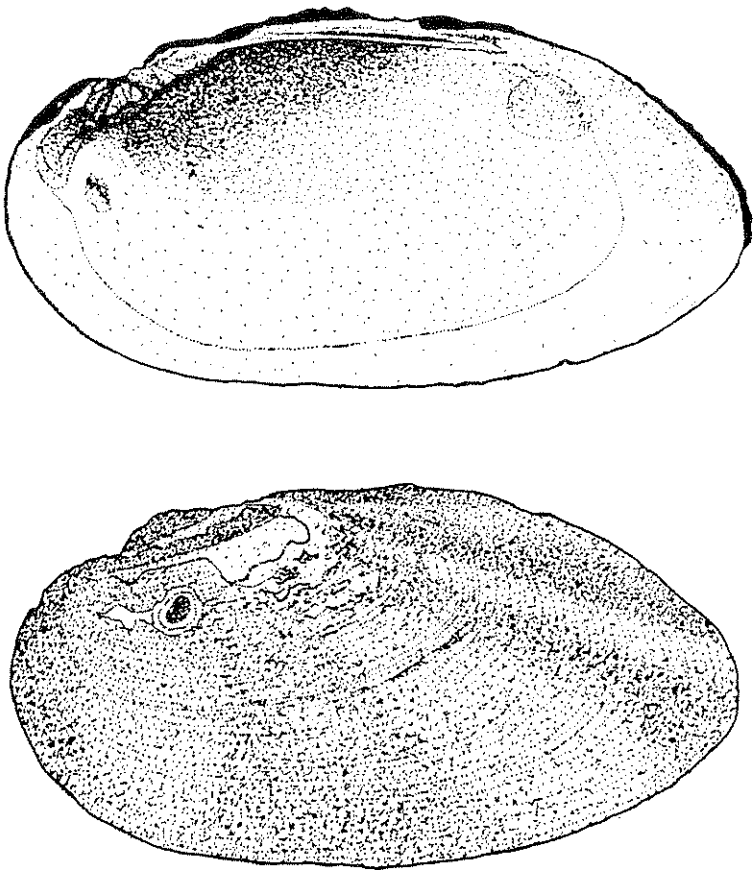
Threatened

Southern Sandshell

Villosa australis (Simpson)

DESCRIPTION: *Villosa australis* is a medium-sized species that attains a length of about 72 mm (2.8 in). The shell is subelliptical, moderately inflated with a low rounded posterior slope, and the bluntly pointed posterior end is above the longitudinal axis. The surface is smooth and shiny, generally dark brown or black over much of the shell except portions of the margins, which may abruptly appear greenish yellow with green rays of variable width. Young shells lack the dark brown or black coloration. Sexual dimorphism is not as pronounced in *V. australis* as in several other *Villosa* species. Female shells, however, are more inflated in the postbasal area and appear less pointed than male shells. Internally, the umbonal cavities are moderately deep, the hinge teeth thin and slightly arcuate whereas the pseudocardinal teeth are rather thick and well developed; two in the left valve and one in the right valve. The nacre is bluish white and moderately iridescent posteriorly.

Previous investigators have generally placed this species in the genus *Lampsilis* (Simpson 1900a,b, 1914; Clench and Turner 1956; Athearn 1964; Burch 1975; Turgeon et al. 1988). However, for this report the species has been placed in *Villosa* following Heard (1979), who made the designation based on the absence of mantle flaps, and presence of branchial villi, characters typical of the genus *Villosa*. Species of the genus *Lampsilis* are defined, in part, by the presence of well defined mantle flaps.

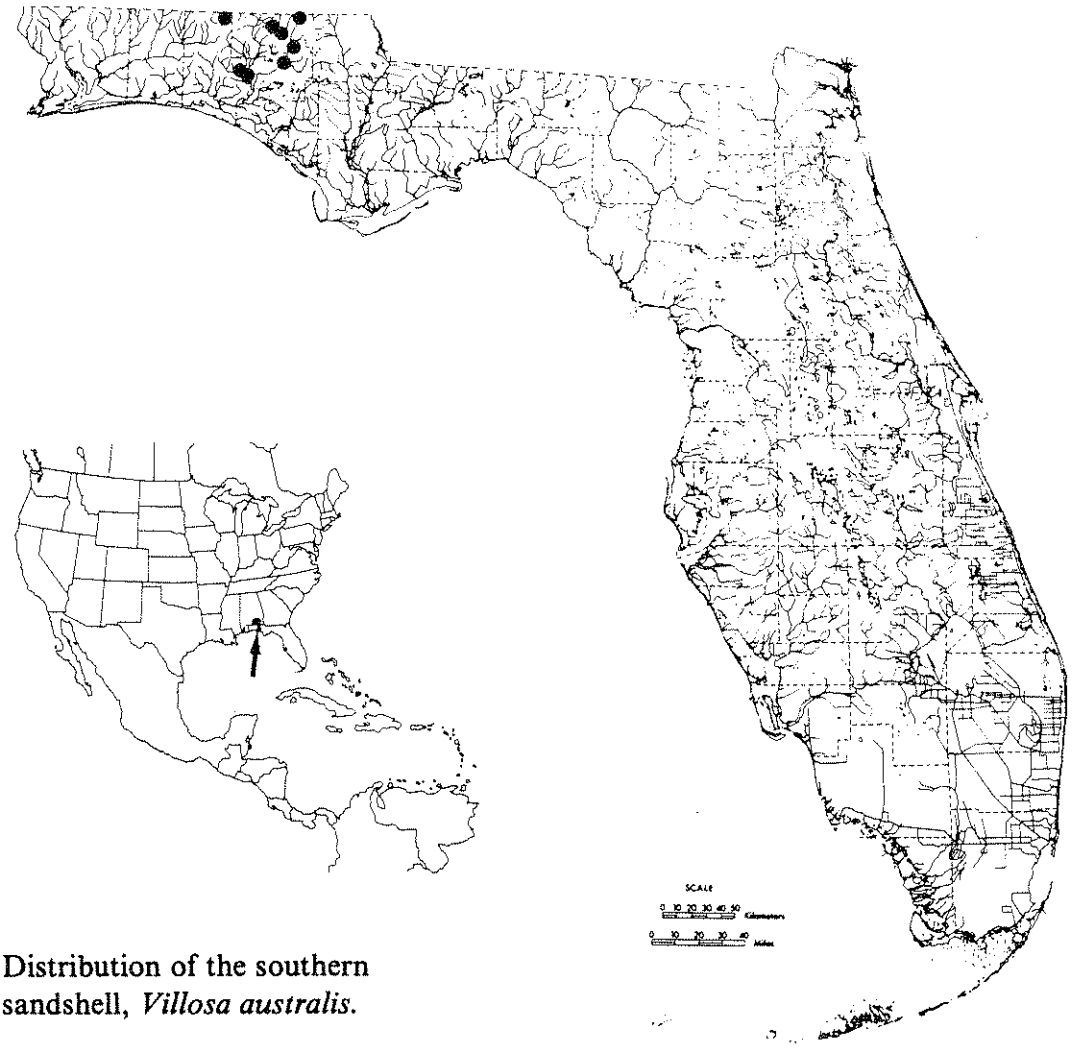


Southern Sandshell, *Villosa australis*, UF 2600, length 74.9 mm (2.9 in). Florida, Walton County, White Creek (illustration by Tracy Smith).

RANGE: The southern sandshell is found in the Escambia, Yellow, and Choctawhatchee river systems in Alabama and Florida (Fuller and Bereza 1973; Burch 1975). At present, however, no records are known for the Florida portions of the Escambia or the Yellow river systems. This presumably limits its distribution in Florida to tributaries of the Choctawhatchee River system and possibly the mainstem in Holmes, Jackson, Walton, and Washington counties.

HABITAT: *Villosa australis* generally occurs in clear medium-sized creeks to rivers. It inhabits sand substrates with woody debris in channels with slow to moderate current.

LIFE HISTORY AND ECOLOGY: Nothing has been published on the biology of *V. australis*. However, it may be unique among unionids in discharging the entire contents of the gravid inner pair of marsupial gills into a single glochidial mass or "super" conglutinate. This phenomenon was observed by one of the authors (RSB) and W. R. Hoeh in Limestone Creek, Walton County, Florida, on 25 June 1988. The "super" conglutinate was found in a long gelatinous strand dangling from woody debris below a female mussel partially buried in the sand. The glochidial mass resembles a caterpillar or grub and, when tangled in sticks in flowing water, presumably presents itself as an easy meal to potential host fish.



Distribution of the southern sandshell, *Villosa australis.*

SPECIALIZED OR UNIQUE CHARACTERISTICS: The dark shell, abruptly margined by greenish yellow, is unique among southern unionids. Fuller and Bereza (1973) suggested that this species belonged to a yet undescribed genus, but failed to note specific reasons for its distinctiveness. *Villosa australis* may be deserving of generic status based on its unique mode of expelling glochidia.

BASIS FOR STATUS CLASSIFICATION: Records of *V. australis* in Florida are limited to a few localities. Generally uncommon, it appears to be thriving only in Limestone Creek, the only sizable tributary of the Pea River (Choctawhatchee River system) in the state. Siltation may preclude the continued existence of this clean water species in the Choctawhatchee River mainstem in Florida.

RECOMMENDATIONS: Preserving the water quality of streams in the Choctawhatchee River system is paramount in the protection of the southern sandshell. High quality streams should be surveyed to locate additional populations of this interesting mussel.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Threatened

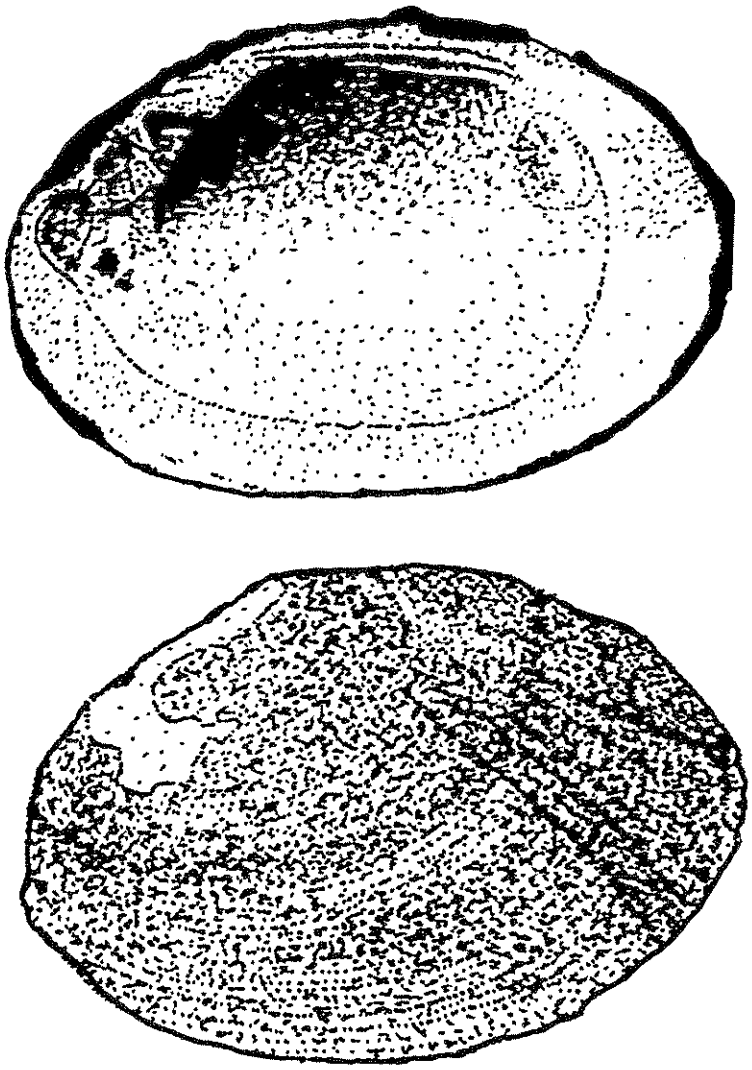
Choctaw Bean

Villosa choctawensis Athearn

DESCRIPTION: The shell of this small species measures no more than 42 mm (1.6 in). Subelliptical in shape, it is fairly inflated with a slightly thickened margin. The posterior ridge is low and rounded. The surface is chestnut to brownish black with fine green rays of variable extent. Shell texture is shiny smooth on the disk, but may be roughened to varying degrees, particularly ventrally and posteriorly. Female shells are truncate to broadly rounded posteriorly, whereas male specimens display a more evenly rounded or bluntly pointed posterior margin. Umbo sculpture consists of a few thin undulating ridges. The umbonal cavities are somewhat deep, whereas the anterior adductor scar is well defined. The left valve has two moderately thickened, nearly straight lateral teeth and two well developed pseudocardinal teeth. The right valve has one prominent and a vestigial secondary lateral tooth and one large and one or two poorly developed pseudocardinal teeth. Nacre color varies from white to a blotched smokey brown, and is somewhat iridescent posteriorly.

RANGE: According to Athearn (1964), Johnson (1967), and Burch (1975) the Choctaw bean is endemic to the Choctawhatchee River system in Alabama and Florida. Butler (1989) extended its range to include the Yellow River system in Alabama and Florida as well as the Escambia River system in Alabama. Records for the Florida portion of the Escambia, however, were unknown until a specimen was recently located in the Smithsonian Institution from the Escambia River, near Century, Escambia and Santa Rosa counties. In Florida, this species is also reported from the mainstem Choctawhatchee River from the vicinity of the FL Highway 20 crossing upstream to the U.S. Highway 90 crossing and Yellow River near the Alabama border in Okaloosa County.

HABITAT: *Villosa choctawensis* inhabits small to medium-sized rivers with sand to silty sand substrates in moderate to swift current (Athearn 1964).



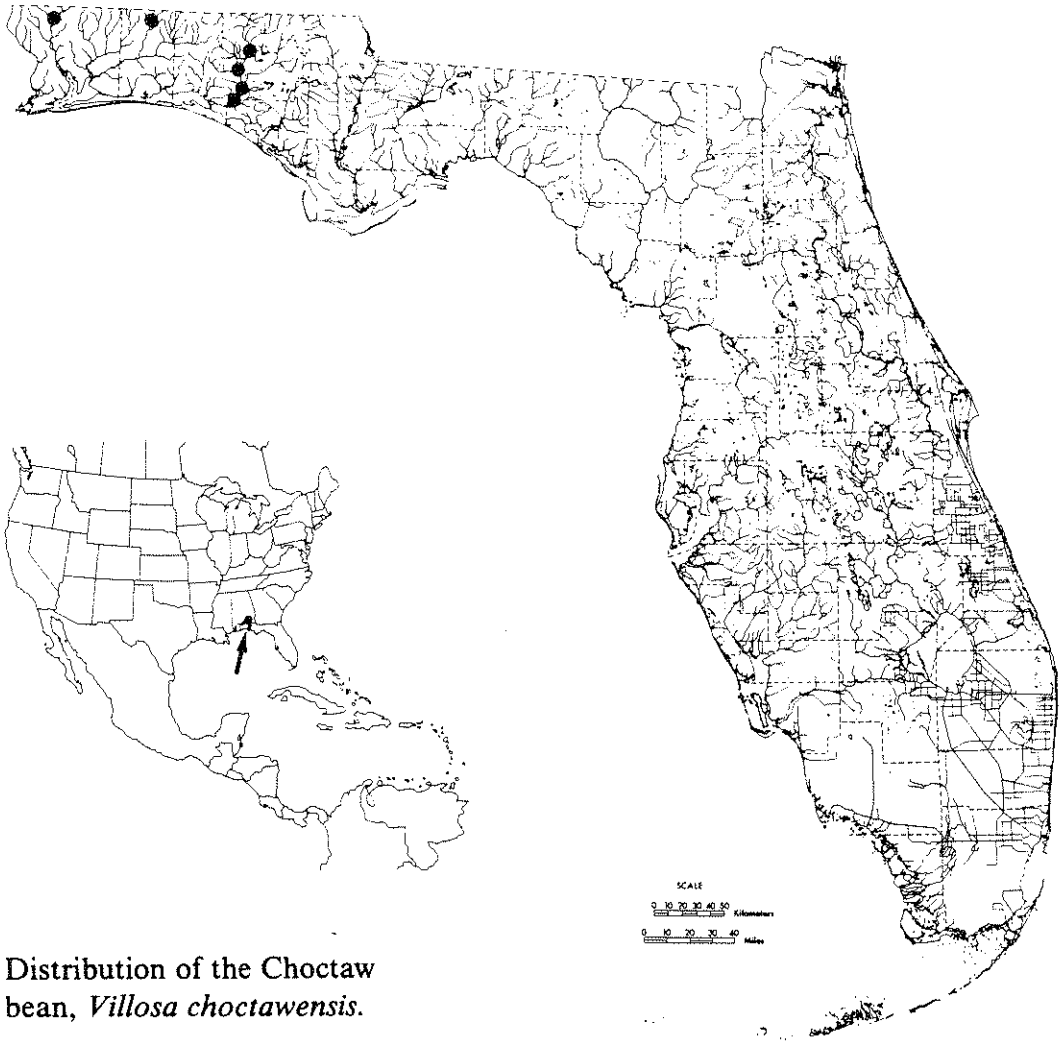
Choctaw Bean, *Villosa choctawensis*, UF 18868, length 34.7 mm (1.4 in). Florida, Holmes County, Choctawhatchee River, 3.2 km (2 mi) southwest of Caryville (illustration by Tracy Smith).

LIFE HISTORY AND ECOLOGY: Unknown.

BASIS FOR STATUS CLASSIFICATION: Because of its apparent rarity and restriction in Florida to several sites along the mainstem of the Choctawhatchee River and single sites on the Escambia and Yellow rivers, *V. choctawensis* is deserving of threatened status.

RECOMMENDATIONS: The maintenance of high water quality in the Escambia, Yellow, and Choctawhatchee rivers should safeguard populations of this threatened species.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.



Distribution of the Choctaw bean, *Villosa choctawensis*.

FAMILY UNIONIDAE

Species of Special Concern

Purple Pigtoe

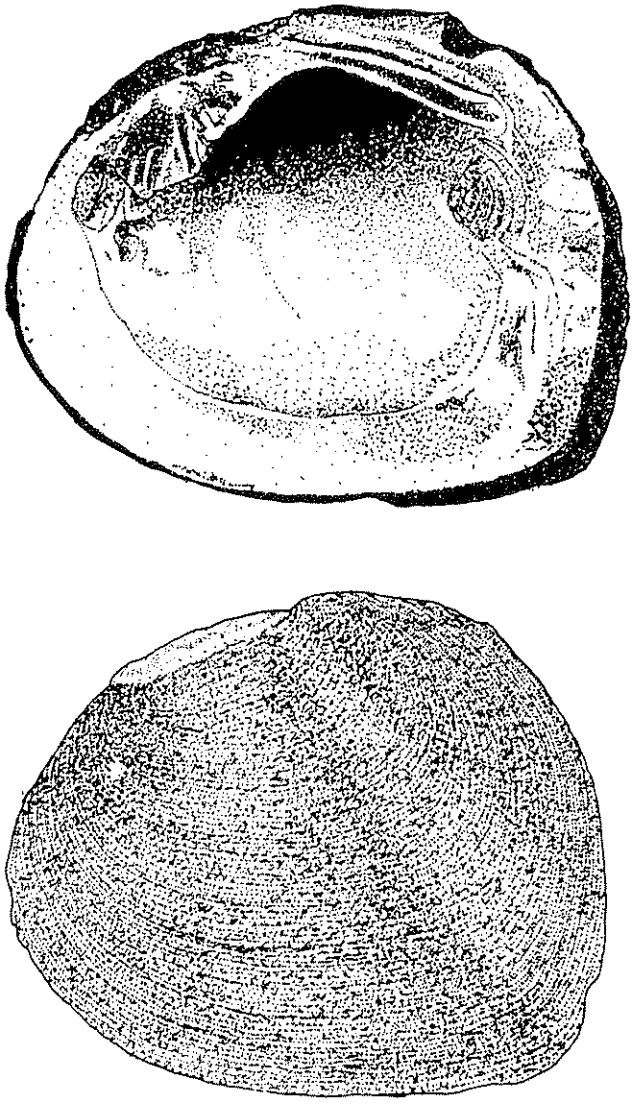
Fusconaia succissa (Lea)

DESCRIPTION: *Fusconaia succissa* is a medium-sized species that attains a length of about 60 mm (2.4 in). The shell is subcircular in outline and has a poorly developed posterior ridge. Specimens in the western portion of its range tend to be thicker shelled than those in eastern drainages. Olivaceous

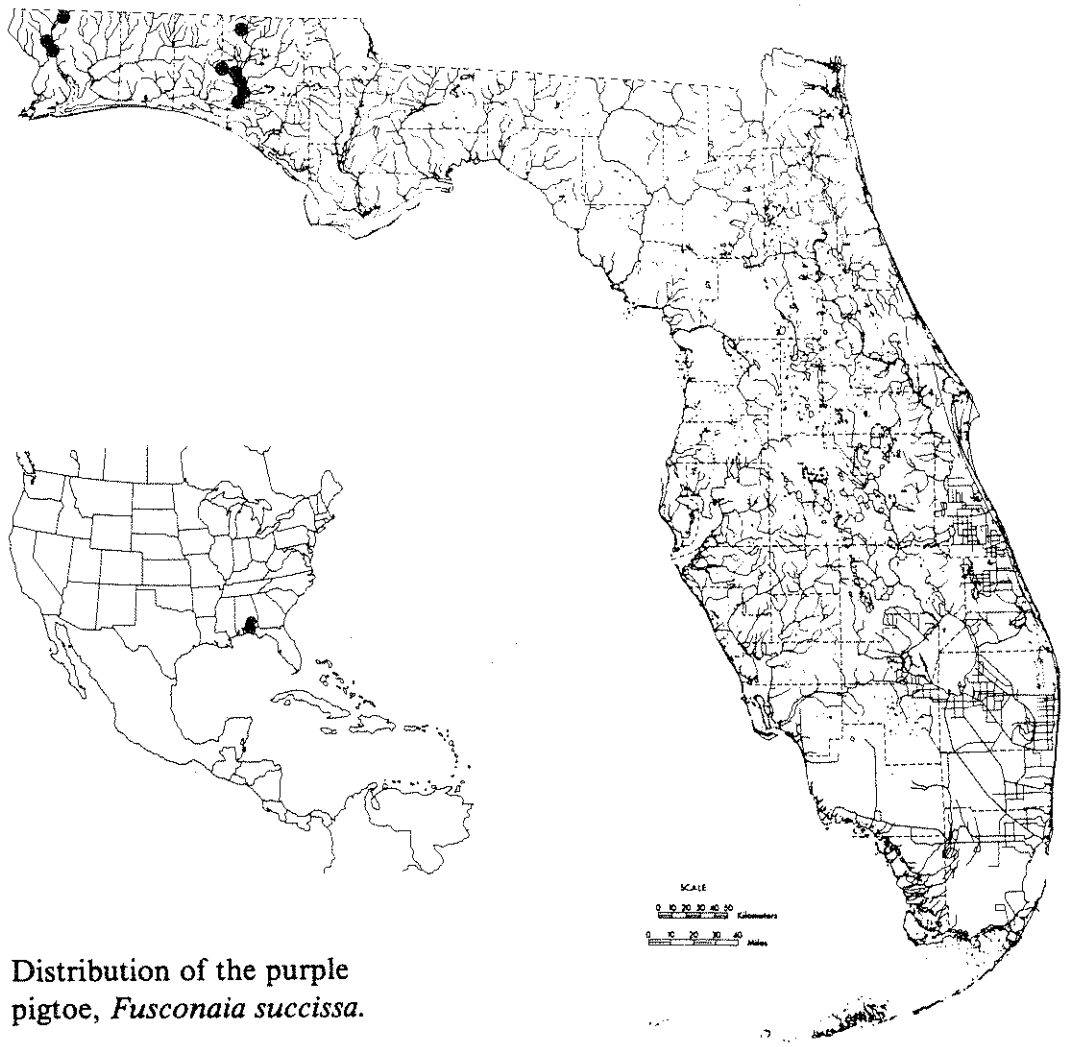
brown to nearly black in older specimens, the periostracum is rayless and generally smooth in appearance. The umbos, anterior of center, are broad but not full and high. Internally the hinge plate is arcuate and broad and produces a well-defined umbonal cavity. The pseudocardinal teeth are heavy. The lateral teeth are slightly arcuate. The adductor muscle scars are pronounced both anteriorly and posteriorly. Nacre color is generally purplish but specimens may display a white center with age.

RANGE: *Fusconaia succissa* ranges from the Escambia to Choctawhatchee river systems in Alabama and Florida (Clench and Turner 1956; Burch 1975). Collections from Florida include localities in the Escambia and Yellow rivers and several sites in the Choctawhatchee River system.

HABITAT: *Fusconaia succissa* inhabits medium-sized creeks to rivers with substrates of mud to silty sand in slow to no current.



Purple Pigtoe, *Fusconaia succissa*, UF 3452, length 48.5 mm (1.9 in). Florida, Escambia County, Escambia River (illustration by Tracy Smith).



Distribution of the purple pigtoe, *Fusconaia succissa.*

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The purple pigtoe is the southeasternmost species of the genus *Fusconaia* in Gulf of Mexico drainages.

BASIS FOR STATUS CLASSIFICATION: Restricted to three river systems, *F. succissa* is generally known from scattered localities. Suitable nonmainstem habitat is practically nonexistent in the Escambia and Yellow river systems. In the Choctawhatchee system, where it was historically abundant and widespread, *F. succissa* now appears to be declining. Recent Florida collections have generally been small and sporadic. A status of special concern appears appropriate for this species.

RECOMMENDATIONS: Establishing guidelines for water quality and stream maintenance in the three drainage systems where *F. succissa* occurs are imperative to its continued existence. Surveys, particularly in the Chocta-

whatchee River system, are needed to ascertain the present Florida distribution of this species.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Species of Special Concern

Round Pearlshell

Glebula rotundata (Lamarck)

DESCRIPTION: *Glebula rotundata* is a medium-sized to large species reaching 107 mm (4.2 in) in length. The shell is moderately inflated, with an elliptical or oval outline. The valves are solid but not heavy. The umbos are relatively low. A moderately prominent posterior ridge separates the disk from the flat or slightly concave posterior slope. The posterior end is either rounded or slightly pointed. Females display some post-basal swelling. The periostracum appears satiny on the disk and becomes more clothlike along the shell margins. Color varies from dark brown in the young to nearly black in older individuals. Internally, the pseudocardinal teeth are radially laminate with serrate edges. Nacre color is generally purplish but may appear bluish white in some individuals. The posterior region is highly iridescent.

RANGE: *Glebula rotundata* occurs primarily in the lower Mississippi River basin in Louisiana and southern Mississippi and along the Gulf Coast in drainages from east Texas to Florida (Burch 1975). Disjunct localities are known from the Rio Grande River (Simpson 1900a), Oklahoma (Branson 1969), Arkansas (Gordon 1983), and Kentucky (Schuster 1988). It has been reported in Florida from the Escambia River (Escambia County, no specific locality data, thus this record is not on distribution map), Chipola and Apalachicola rivers (Clench and Turner 1956; Heard 1979). Butler (1989) reported it from the lower Choctawhatchee River system in Florida.

HABITAT: The round pearlshell is most frequently found in the lower portions of rivers in Florida. It inhabits small to large rivers and associated sloughs, oxbows, and backwaters. Typical substrates of the round pearlshell are mud and silt in slack current. Collections in the Apalachicola River were in silty sand with slow current.

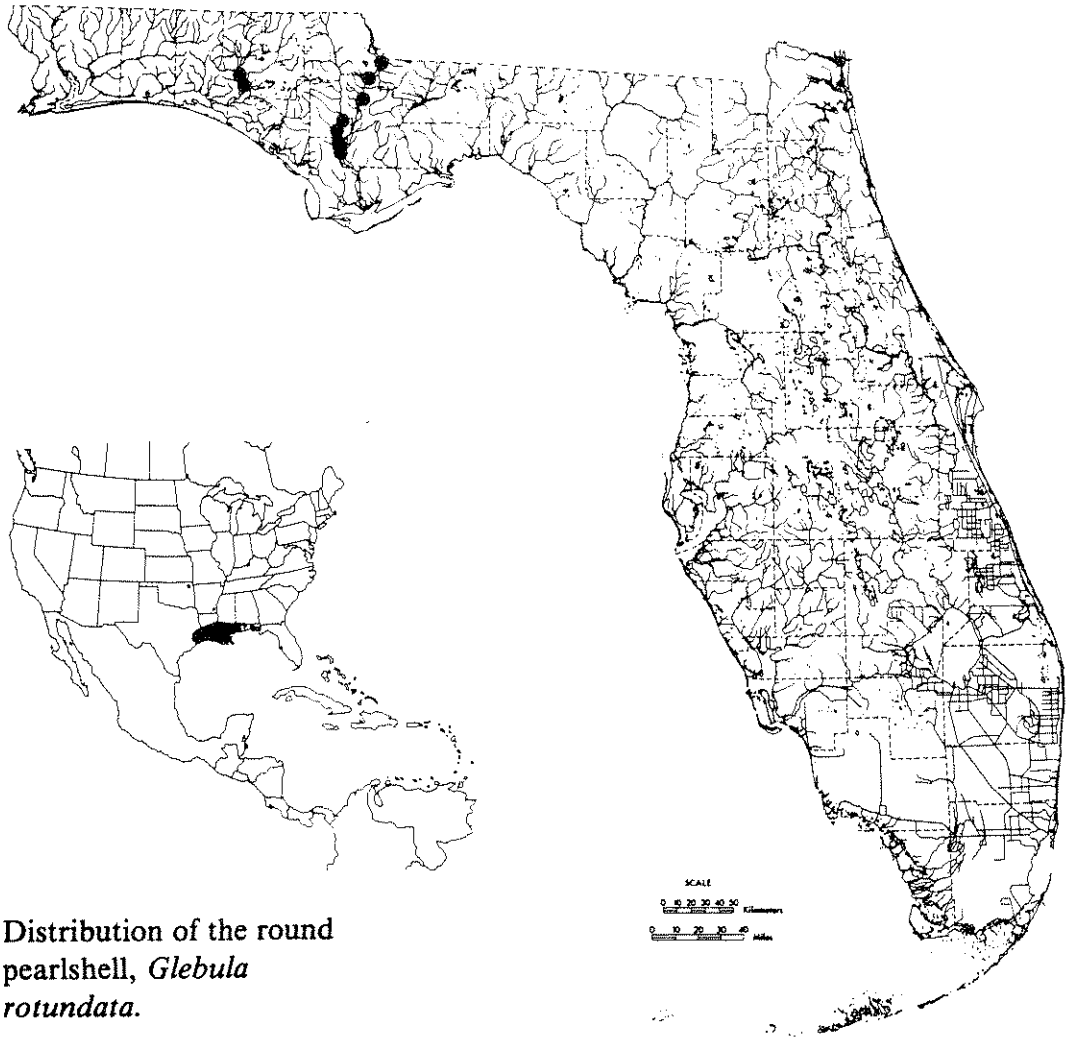
Round Pearlshell, *Glebula rotundata*, UF 229776, length 57 mm (2.3 in). Florida, Gulf County, Dead Lake at Gates Fish Camp (illustration by Tracy Smith).

LIFE HISTORY AND ECOLOGY: Little is known about *G. rotundata.* The marsupia occupy the posterior portion of the outer demibranchs (Burch 1975).

SPECIALIZED OR UNIQUE CHARACTERISTICS: The structure of the pseudocardinal teeth set this monotypic genus apart from all others.

BASIS FOR STATUS CLASSIFICATION: *Glebula rotundata* in Florida is known from a few localities in the main channel of three rivers. Although it may occur commonly in localized areas, such as Dead Lake (Chipola River) and the lower Apalachicola River (Butler 1989), records from the Escambia and Choctawhatchee rivers are several decades old.

RECOMMENDATIONS: Surveys of the Escambia and Choctawhatchee rivers are crucial in determining the present status of *G. rotundata.* The termination of barge channel maintenance activities in the Apalachicola would



Distribution of the round pearlshell, *Glebula rotundata.*

aid in the perpetuation of *G. rotundata* in this river, the easternmost drainage in its range.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Species of Special Concern

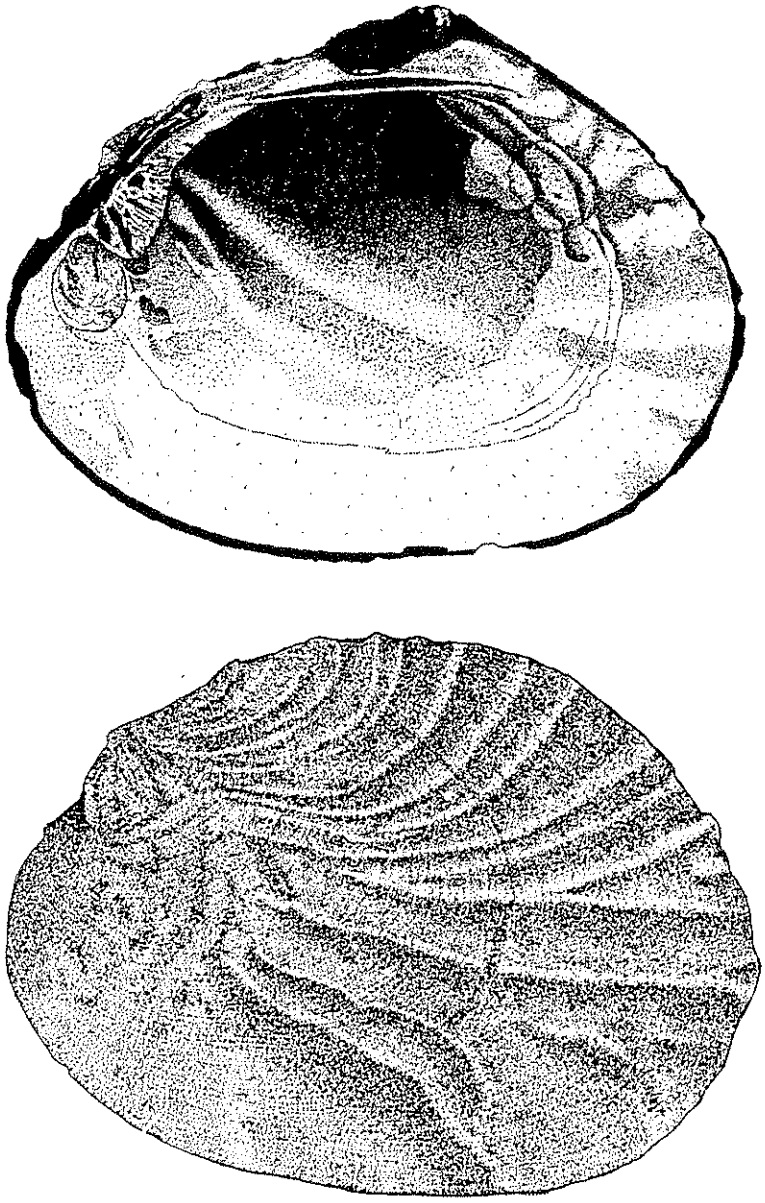
Round Washboard

Megalonaias boykiniana (Lea)

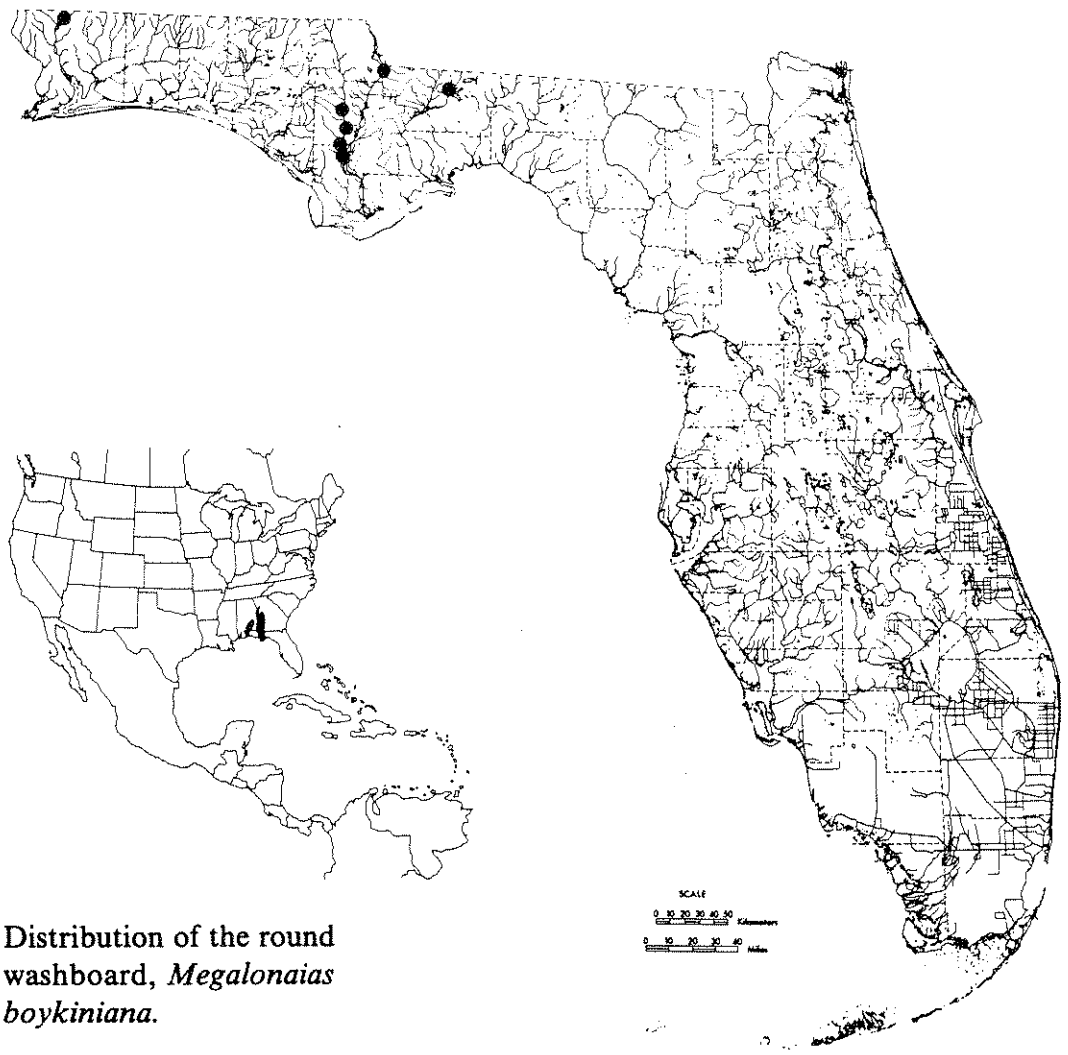
DESCRIPTION: *Megalonaias boykiniana* is the largest mollusk found in the freshwaters of Florida and reaches lengths of 203 mm (8.0 in). The shell

is thick, moderately inflated, subrhomboidal to somewhat round in outline and dark brown to black. It is heavily sculptured and has corrugated plications, which are best developed posteriorly, and a poorly developed, rounded posterior ridge. The umbos are anterior to the center, elevated and often sculptured with double-looped zigzag ridges. Cavities of the umbos are deep. The hinge plate is broad with two pseudocardinal teeth in each valve. Nacre is iridescent white to bluish white, but may be purplish in larger specimens.

RANGE: *Megalonaias boykiniana* occurs in the larger Gulf Coast drainages of Alabama and Florida from the Escambia River system east to the Ochlockonee River (Clench and Turner 1956). In Florida, it is known from the Escambia, Chipola, Apalachicola, and Ochlockonee rivers and a few of their large tributaries. The only Florida records are from the main channel of the Escambia River near Century, Escambia and Santa Rosa counties. Recent



Round Washboard, *Megalonaias boykiniana*, UF 47220, length 105 mm (4.1 in). Florida, Leon County, Ochlockonee River, 17.6 km (11 mi) northwest of Tallahassee (illustration by Tracy Smith).



Distribution of the round washboard, *Megalonaias boykiniana.*

Florida records are restricted to a few localities in the main channels of the Chipola, Apalachicola, and Ochlockonee rivers. It appears to be absent from the Yellow and Choctawhatchee river systems. Although these rivers have not been thoroughly sampled, because of its large size *M. boykiniana* is unlikely to be overlooked.

HABITAT: In Florida, *M. boykiniana* has been reported from large creeks, but usually occurs in the main channels of small to large rivers. The composition of the substrate varies from sand and sandy mud, to gravel and limerock rubble in slow to moderate current.

LIFE HISTORY AND ECOLOGY: Very little information is available on the biology of *M. boykiniana.* Generic characters include all four demibranchs marsupial, long term breeders (bradytictic) and glochidia hookless (Heard and Guckert 1971). Lea (1863a) briefly described the soft anatomy of a nongravid female.

SPECIALIZED OR UNIQUE CHARACTERISTICS: *Megalonaias boykiniana* is the largest freshwater mussel in Florida. Maximum size of individuals

varies; the population in the Ochlockonee River produces smaller individuals than the Apalachicola River population (Heard 1979).

BASIS FOR STATUS CLASSIFICATION: *Megalonaias boykiniana* is known from limited reaches of four rivers in addition to two collections from large creeks made over 50 years ago. Based on current data, the population in the Escambia River is restricted to the area near the Alabama border. Its distribution in the Chipola River appears presently limited to about 20 km of the main channel of the lower river in the vicinity of Dead Lake. The population in the Apalachicola River is the most extensive, but is also under the greatest threat. Alteration of habitat, both substrate and water quality, from maintenance dredging in the Apalachicola River is a serious threat to all freshwater mussels in that river. In the Ochlockonee River, collections are known from a few localities upstream of Lake Talquin. The primary habitat of this mussel, the main channel of rivers, leaves it vulnerable to all modifications of water quality in the watershed upstream of where it occurs.

RECOMMENDATIONS: A thorough survey to determine the distribution of populations of the round washboard in the four rivers where it occurs is needed before proceeding with conservation measures. The most critical of the four rivers is the Apalachicola River. This river has the largest population and is also the most threatened because of the reoccurring maintenance dredging of the waterway. Future studies to determine the habitat and reproductive requirements will be needed to prepare plans for the protection of Florida's largest freshwater mollusk.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Species of Special Concern

Florida Pigtoe

Pleurobema reclusum (Wright)

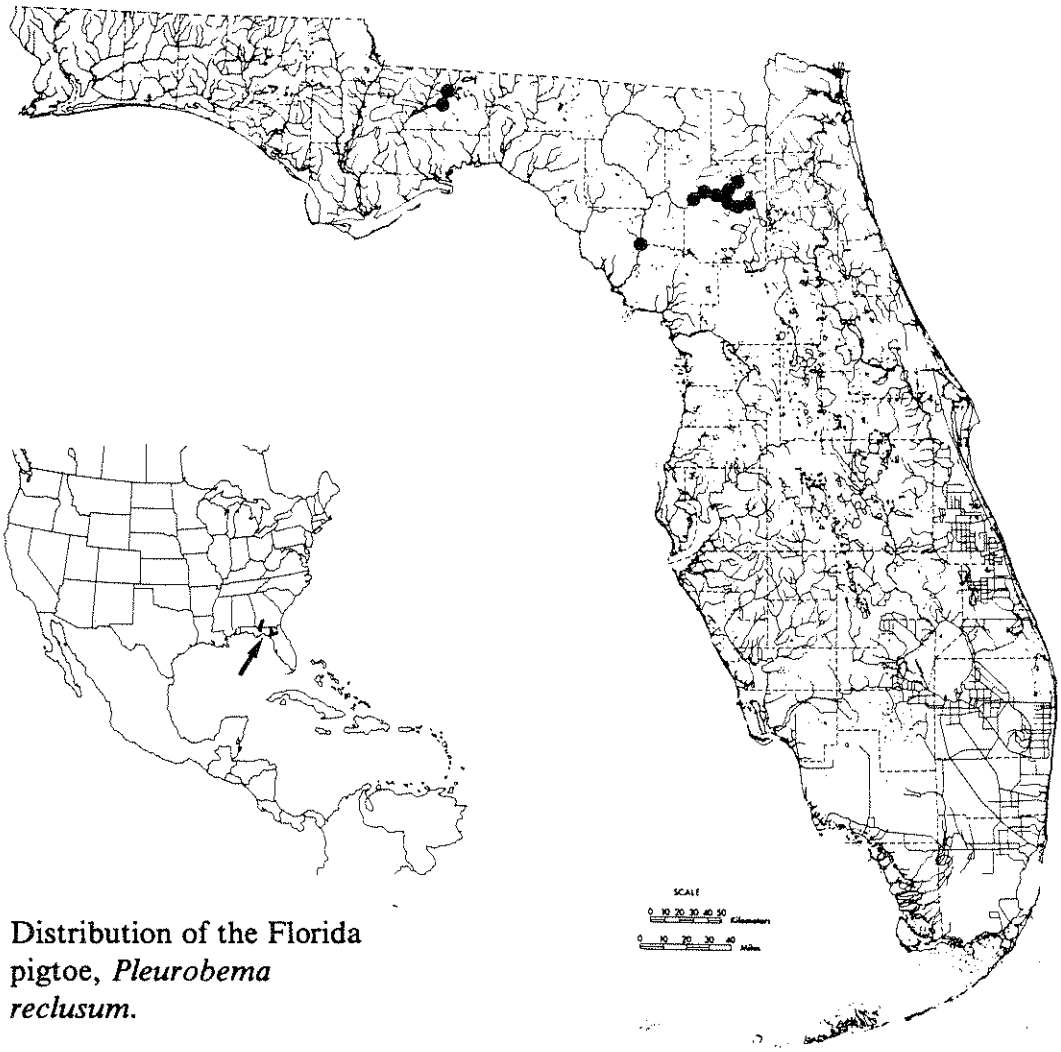
DESCRIPTION: *Pleurobema reclusum* is a small to medium-sized mussel that reaches about 55 mm (2.2 in) in length. The shell is ovate or triangular, smooth, somewhat polished dorsally, and moderately inflated. The uniformly curved ventral margin becomes moderately pointed posteriorly. Two slightly raised ridges form the posterior ridge. Color ranges from dark brown to al-

most black in western populations, whereas eastern populations are tannish brown with distinct growth lines. The umbos are fairly prominent and are characterized by four or five coarse, irregular loops. Internally, the pseudocardinal teeth are solid and prominent; two in the left and one in the right valve. The lateral teeth are slightly arcuate; two in the left and two in the right valve. Nacre color is generally bluish white and iridescent, particularly posteriorly.

Pleurobema reclusum has not been recognized as a distinct species since Simpson (1914). Having examined numerous lots from the Ochlockonee and Suwannee river systems, we consider *P. reclusum* distinct from *P. pyriforme*, the species with which most recent authors (e.g., Clench and Turner 1956; Johnson 1970) have synonomized *P. reclusum*. Although some differences are evident between Ochlockonee and Suwannee river populations of *P. reclusum* (see SPECIALIZED OR UNIQUE CHARACTERISTICS section), these two populations are considered a single species at this time.

RANGE: *Pleurobema reclusum* occurs in the Ochlockonee and Suwannee river systems in Georgia and Florida. Florida populations on the Ochlockonee River are known from a few sites in Gadsden and Leon counties. The Suwannee River system population is apparently restricted to Florida and is

Florida Pigtoe, *Pleurobema reclusum*, UF 134949, length 46.5 mm (1.8 in). Florida, Gadsden County, Ochlockonee River, 9.3 km (5.8 mi) southeast of Havana (illustration by Tracy Smith).



Distribution of the Florida pigtoe, *Pleurobema reclusum*.

found predominantly in the upper Santa Fe River drainage above the Santa Fe Sink in Alachua, Bradford, and Union counties. The lower Suwannee River at Fanning Springs, Levy County, is the only known occurrence of *P. reclusum* in the Suwannee system outside the Santa Fe River.

HABITAT: *Pleurobema reclusum* inhabits medium-sized creeks to rivers with slow current in sand or sand and gravel substrates.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: *Pleurobema reclusum* is the southeasternmost representative of its genus. Specimens from the Ochlockonee River are dark brown or black and reach greater size than the tan colored specimens from the Suwannee River system.

BASIS FOR STATUS CLASSIFICATION: The Florida pigtoe is primarily restricted to the free flowing Ochlockonee River mainstem from Lake Talquin upstream to the Georgia border, where the species is uncommon. Addi-

tionally, a few sites in the upper Santa Fe River drainage are known, including the New River, which has the best remaining population of *P. reclusum.*

RECOMMENDATIONS: Surveys for additional populations and repeated surveys of historical sites in the Suwannee River system should be conducted. Protection of the Ochlockonee River and upper Santa Fe River drainage is critical to the well-being of *P. reclusum.*

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

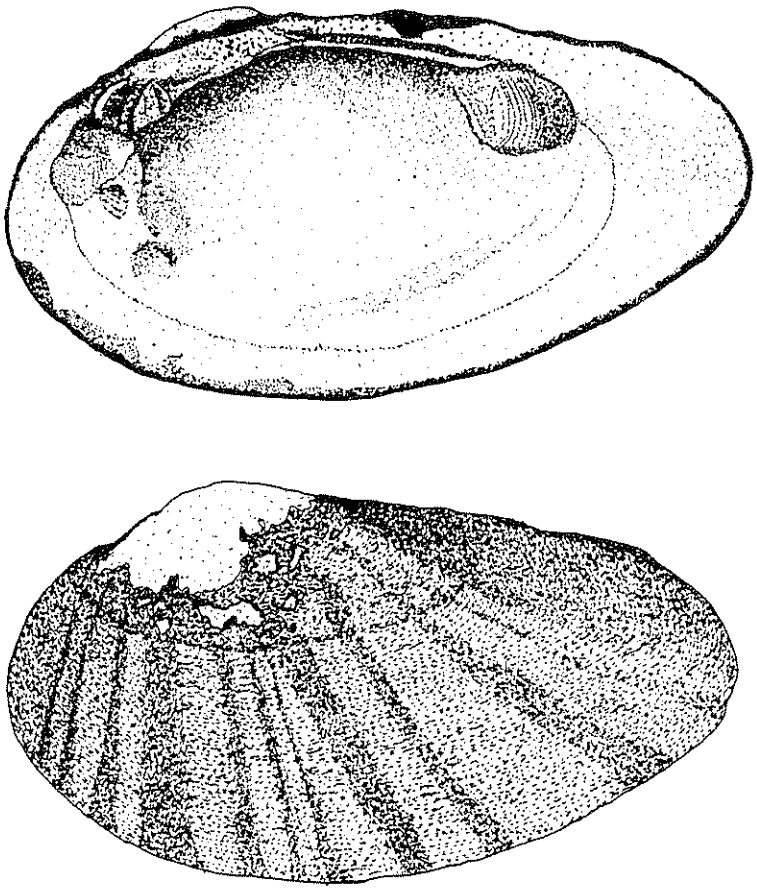
Species of Special Concern

Shiny-Rayed Pocketbook

Villosa subangulata (Lea)

DESCRIPTION: *Villosa subangulata* is a medium-sized mussel that reaches approximately 85 mm (3.3 in) in length. The shell is subelliptical, with broad, somewhat inflated umbos and a rounded posterior ridge. The shell is fairly thin but solid. The surface is smooth and shiny, light yellowish brown with fairly wide bright emerald green rays over the entire length of the shell. Older individuals may appear much darker brown with obscure raying. Female specimens are more inflated postbasally, whereas males appear to be more pointed posteriorly. Internally, the pseudocardinal teeth are double and fairly large and erect in the left valve, and one large tooth and one spatulate tooth in the right valve. The nacre is white, with some individuals exhibiting a salmon tint in the vicinity of the umbonal cavity. (See DESCRIPTION section of the *Villosa australis* account and Simpson, 1900, for justification of the generic name of the shiny-rayed pocketbook).

RANGE: *Villosa subangulata* occurs in the Chipola, Apalachicola, and Ochlockonee river systems in Alabama, Georgia, and Florida. Clench and Turner (1956) and Burch (1975) erroneously reported it from the Choctawhatchee River system; these records are based on *V. australis.* In Florida, *V. subangulata* is most common and widespread in the Chipola River system, Jackson and Calhoun counties. Other localities include one site in Mosquito Creek (an Apalachicola River tributary) and three sites in the Ochlockonee River system.



Shiny-Rayed Pocketbook, *Villosa subangulata*, UF 418, length 67.4 mm (2.6 in). Florida, Calhoun County, Chipola River, 3.2 km (2 mi) east of Clarksville (illustration by Tracy Smith).

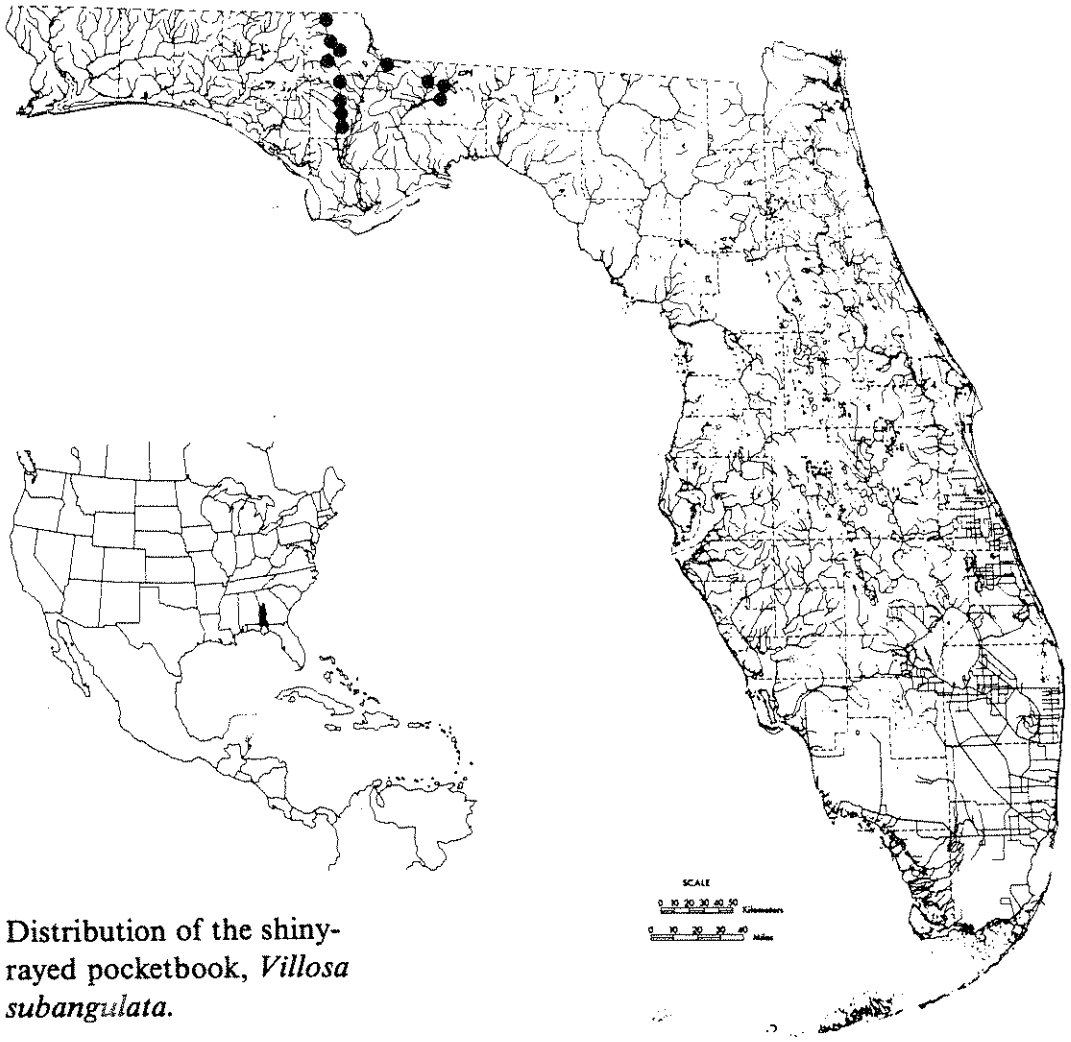
HABITAT: *Villosa subangulata* inhabits medium-sized creeks to rivers in clean or silty sand substrates in slow to moderate current.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The yellow shell and brilliant emerald rays make *V. subangulata* one of the most colorful and easily distinguished mussels in Florida streams.

BASIS FOR STATUS CLASSIFICATION: *Villosa subangulata* appears to have relatively healthy populations in the Chipola River, but not elsewhere in Florida. Although some sizable lots representing Ochlockonee River localities are found in museums, the species is now uncommon there. Futhermore, *V. subangulata* may already be extirpated from Mosquito Creek, where it has not been collected in 35 years. Mosquito Creek is the only known Florida locality for *V. subangulata* in the Apalachicola River system outside the Chipola River drainage.

RECOMMENDATIONS: Maintaining water quality in the Chipola River is critical to the shiny-rayed pocketbook. A battery salvage plant that once polluted the system is now an Environmental Protection Agency Superfund site. Such efforts will undoubtedly aid in preserving this unique species.



Distribution of the shiny-rayed pocketbook, *Villosa subangulata.*

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Status Undetermined

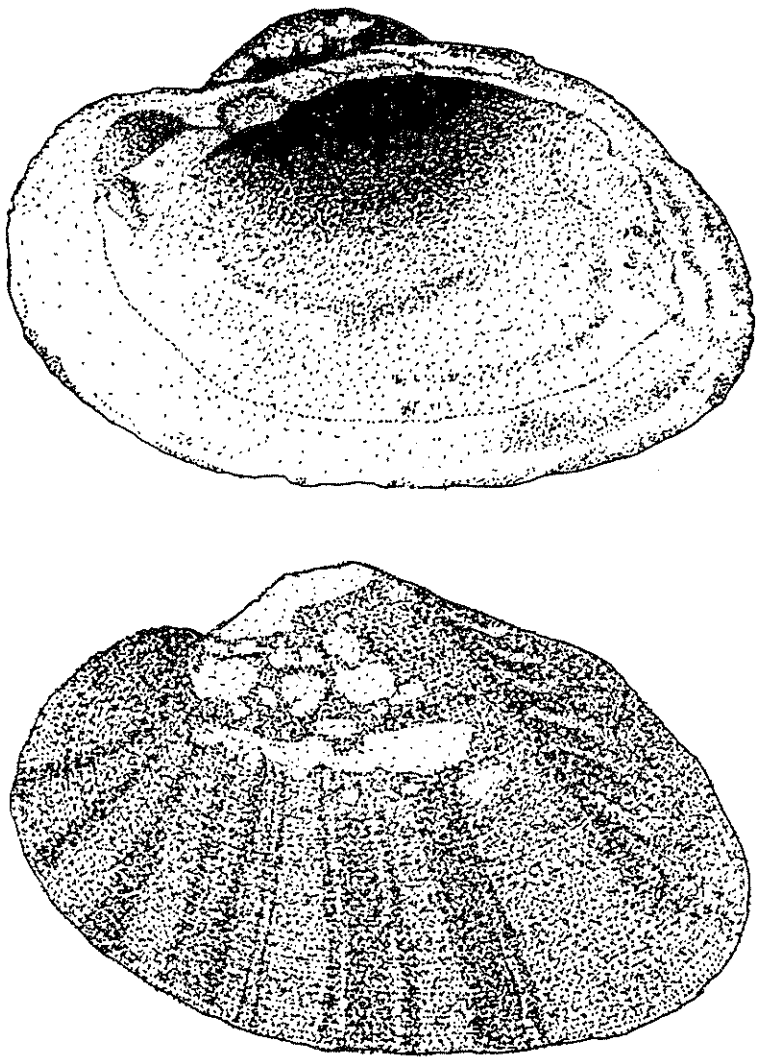
Ochlockonee Arc-Mussel

Alasmidonta wrightiana (Walker)

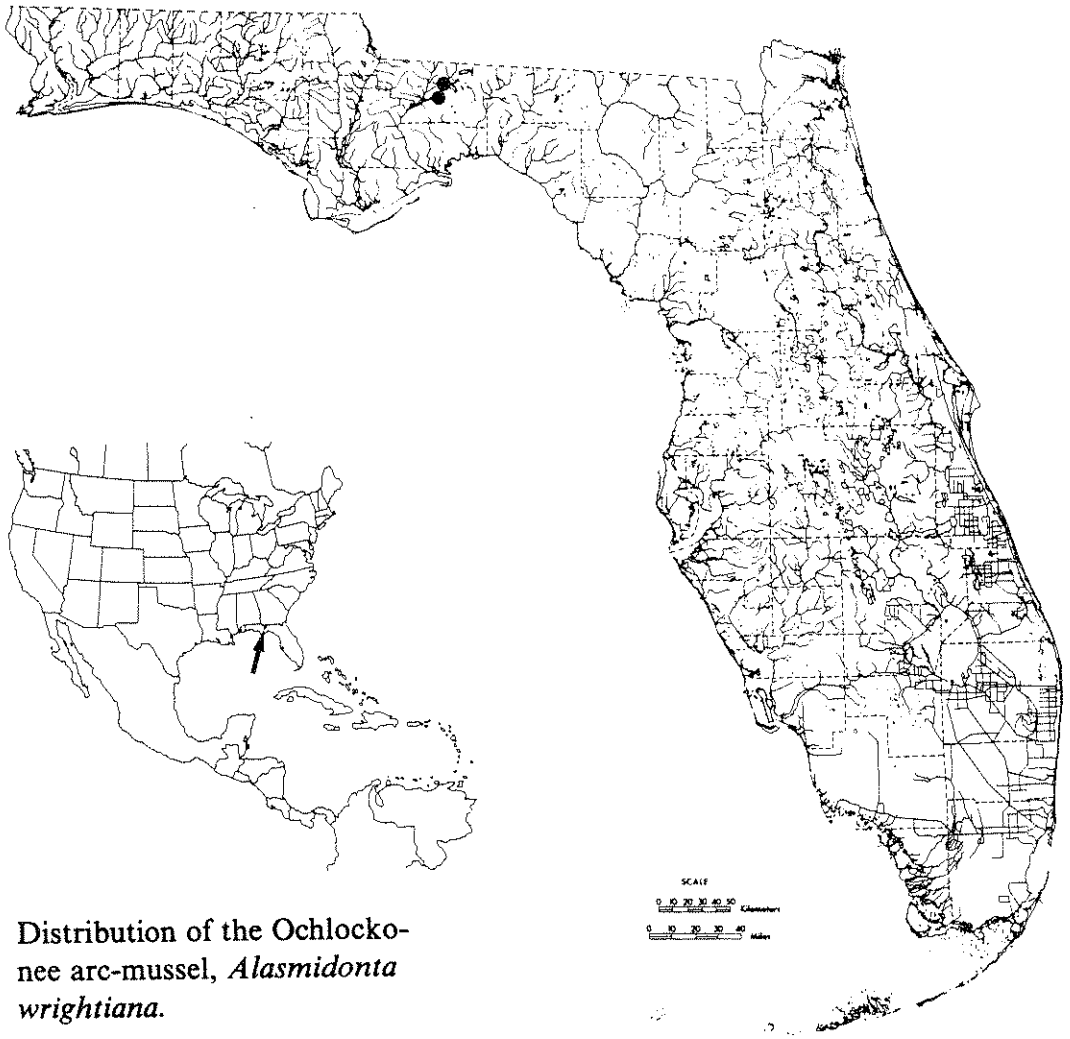
DESCRIPTION: *Alasmidonta wrightiana* is a subrhomboidal, moderately inflated, moderately thick-shelled, small to medium-sized species that reaches a length of 57 mm (2.2 in). The umbos are full and high and extend well

above the dorsal margin. Shell sculpturing is prominent on the broad, slightly concave posterior slope. In some specimens, there are a few poorly developed radial ridges on the anterior portion of the disk. The periostracum is light to dark brown, somewhat cloth-like and, in adults, marked with prominent dark green to black rays of varying widths. Internally, the pseudocardinal teeth are poorly developed, one or two in the left valve, one in the right valve. The lateral teeth are very short and low. The umbonal cavities are broad and deep. Nacre color is bluish white to somewhat pinkish near the umbonal cavities.

Clarke (1981) in his monograph of *Alasmidonta* and related genera found only four individuals in his survey of natural history museums. An additional 11 specimens are in the Florida Museum of Natural History and bring to 15 the total number of specimens available for study. Johnson (1967) corrected Clench and Turner (1956) who considered *A. wrightiana* as a synonym of *A. triangulata*. According to Clarke (1981) *A. triangulata* is a synonym of *A. undulata*.



Ochlockonee Arc-mussel, *Alasmidonta wrightiana*, UF 8371, length 54.4 mm (2.1 in). Florida, Leon County, Ochlockonee River, 12.8 km (8 mi) west of Tallahassee (illustration by Tracy Smith).



Distribution of the Ochlockonee arc-mussel, *Alasmidonta wrightiana.*

RANGE: *Alasmidonta wrightiana* is endemic to the Ochlockonee River in Florida (Johnson 1967; Burch 1975). It is known from two mainstem sites upstream of Lake Talquin in Gadsden and Leon counties. Confusion surrounding the collection locality of the type specimen resulted in the species being reported from the Flint River in Georgia (Walker 1901). This error was subsequently corrected by Walker (in Simpson 1914).

HABITAT: There is no specific information describing the habitat of the Ochlockonee arc-mussel. The Ochlockonee River, where the species has been taken, has a sandy mud substrate, with quiet backwater pools and runs of slow to moderate current. Much of this species' habitat was probably inundated by Lake Talquin.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: As presently known, *A. wrightiana* has one of the most restricted distributions of any North American unionid mollusks.

BASIS FOR STATUS CLASSIFICATION: The last specimens of the Ochlockonee arc-mussel were collected in the Ochlockonee River, 8 miles west of Tallahassee, Gadsden and Leon counties, on 13 November 1931. Numerous collections have been made in the upper Ochlockonee River, which still supports a good unionid assemblage, but no *A. wrightiana* have been found. The species was reported as possibly extinct by Turgeon et al. (1988). It is premature to consider this species extinct until a thorough survey of the Ochlockonee River has been undertaken. Undetermined status is based on the lack of surveys and collections in the lower portion of the Ochlockonee River (below Jackson Bluff Dam) and the extreme upper portion near the Georgia state line.

RECOMMENDATIONS: A thorough survey of the entire main channel of the Ochlockonee River is the highest priority research for the Ochlockonee arc-mussel. The Florida portion of the river should be examined first and, if no specimens are found, the search should be expanded to include larger tributaries and the headwaters of the river in Georgia. Pending the results of the survey, every effort should be made to maintain or improve water quality and protect riparian habitat in the Ochlockonee River and its tributaries.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

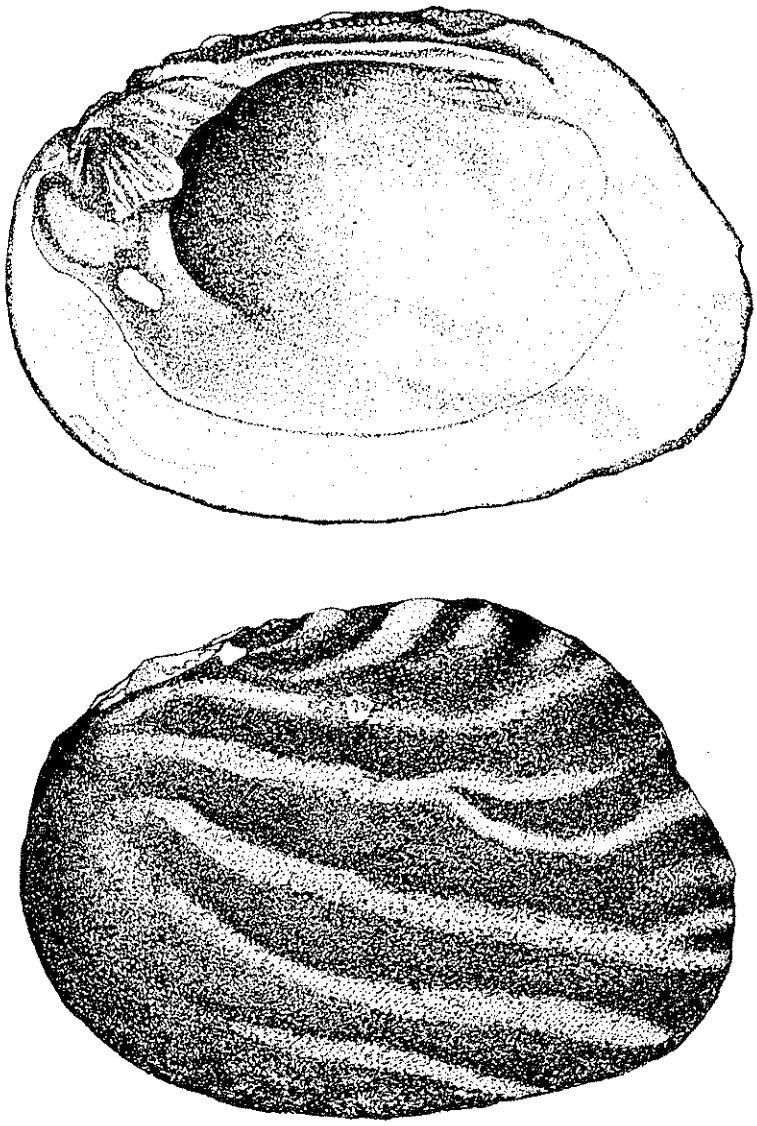
FAMILY UNIONIDAE

Status Undetermined

Roundlake

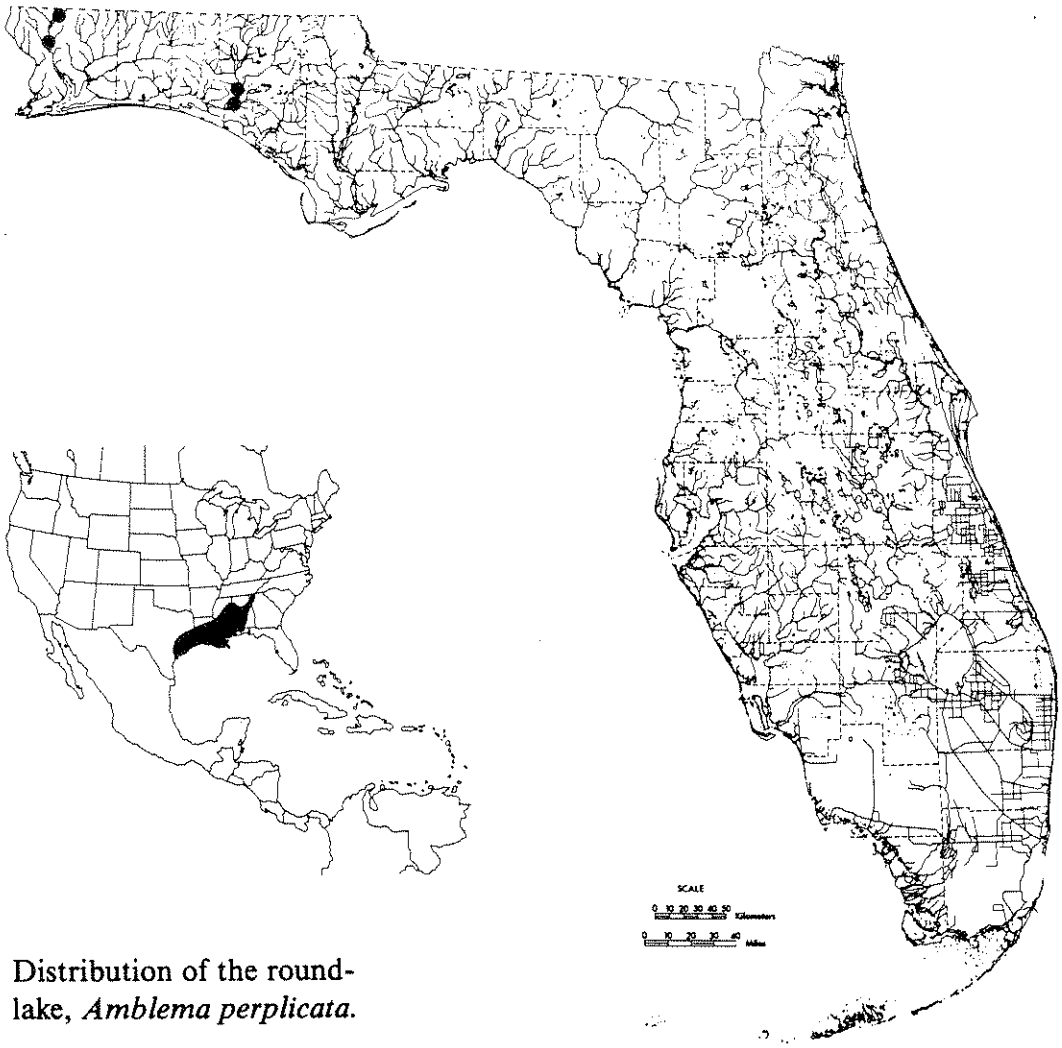
Amblema perplicata (Conrad)

DESCRIPTION: *Amblema perplicata* is large and reaches 127 mm (5.0 in) in length. It is heavy shelled, quadrate to subrhomboid, and typically dark brown to black. It is moderately inflated with five to seven prominent folds which are almost parallel to the dorsal margin. Many specimens exhibit concentric growth-rest periods which form prominent ridges and grooves that tend to break the folds where they intersect. The umbos are low and raised slightly above the hinge line. Internally, the large pseudocardinal teeth, two in the left valve and two or three in the right valve, are separated from the lateral teeth by a wide interdentium. The umbonal cavities are moderately deep. Nacre color is typically white with a purple tint posteriorly. Turgeon et al. (1988) considered *A. perplicata* a subspecies of the wide ranging species *A. plicata*.



Roundlake, *Amblema perplicata*, UF 1481, length 87.5 mm (3.4 in). Florida, Walton County, Picket Retch Lake (illustration by Gina Collins).

RANGE: Although the range of *A. perplicata* has never been precisely delineated, it is generally considered to be the lower Mississippi River system and Gulf Coast drainages from central Texas east to the Choctawhatchee River system, Florida. Distribution records for *A. perplicata* in Florida are from the Escambia River, Escambia County, and the Choctawhatchee River system in Walton County. Shells collected during the 1930s from Picket Retch Lake, Walton County, were sent to several museums and collectors and appear to be the basis for the report of *A. perplicata* from the Yellow River (Burch 1975). Butler (1989) correctly assigned specimens from this locality to the Choctawhatchee River system. Records exist for the roundlake in the Escambia River in Alabama, but not from the Yellow or Choctawhatchee river systems in Alabama. The records of *A. neislerii* from the Escambia River are based on *A. perplicata* (see RANGE section of the *A. neislerii* account). The range of *A. perplicata* in Florida is apparently confined to the lower portions of the Escambia and Choctawhatchee river systems.



Distribution of the round-lake, *Amblema perplicata.*

HABITAT: *Amblema perplicata* inhabits large creeks to rivers and floodplain lakes in areas with slow or no current. It is found in a variety of substrates including clay, mud, sand, and sand mixed with gravel.

LIFE HISTORY AND ECOLOGY: There are several reports on the anatomy and reproduction of *A. plicata*, but only three (Frierson 1904; Ortmann 1912, 1914) are based on its southern sibling species *A. perplicata*. Frierson (1904) was the first to report on gravid females of *A. perplicata*. The two Louisiana specimens, one collected on 7 June 1901 and one on 19 August 1903, had glochidia in all four gills. Ortmann (1912) reported gravid females discharging glochidia from Bayou Pierre in southwestern Mississippi on 6 August 1910. Subsequently, Ortmann (1914) reported females from Arkansas and Louisiana carrying mature glochidia between 26 June 1911 and 1 August 1912. Measurements for these glochidia were: length 0.20 mm; height 0.21 mm (1/100 in).

SPECIALIZED OR UNIQUE CHARACTERISTICS: The large, heavy, folded shell of *A. perplicata* makes it one of the most distinctive unionids in its range.

BASIS FOR STATUS CLASSIFICATION: Habitat degradation from siltation in both the Escambia and Choctawhatchee rivers, much of which comes from upstream areas in Alabama, has likely affected this species in the past. Restriction of *A. perplicata* to short sections of two rivers and the absence of collections of this species during the past 55 years leave its Florida status in question.

RECOMMENDATIONS: A survey to determine the extent of existing populations is needed to determine priorities of conservation actions. There are no museum records from the Choctawhatchee and Escambia river systems since 1934 and 1915, respectively. However, it has been collected in the Escambia River in Alabama during the past 10 years. Once the current Florida range is determined, protection of existing populations is a high priority.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

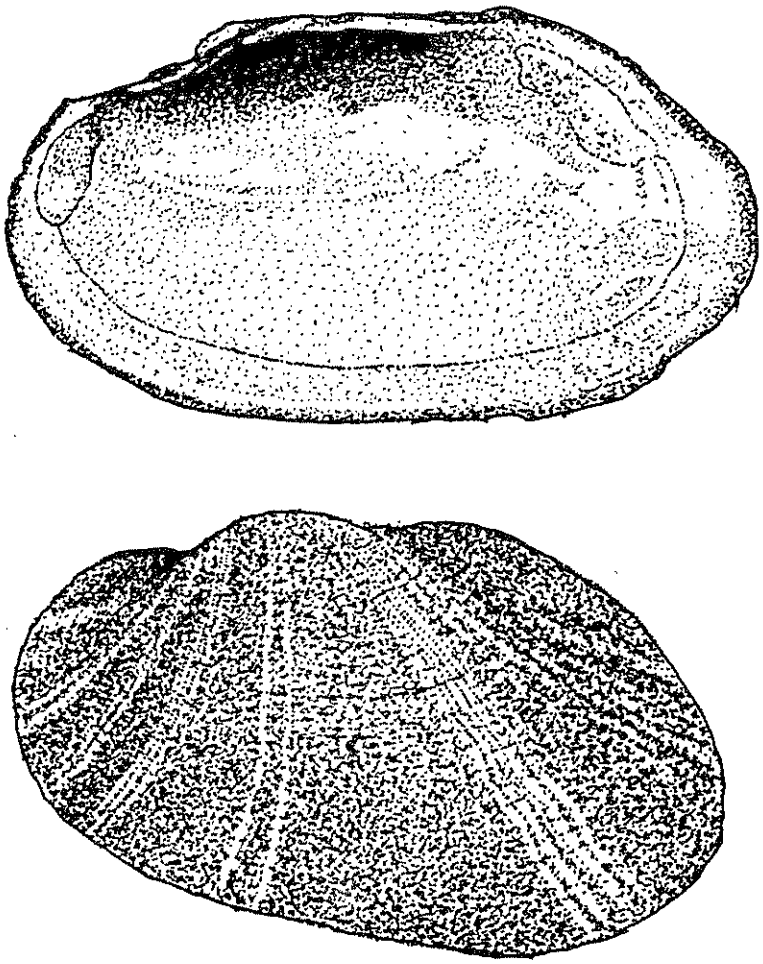
Status Undetermined

Rayed Creekshell

Anodontoides radiatus (Conrad)

DESCRIPTION: *Anodontoides radiatus* is a small to medium-sized species that reaches 75 mm (2.9 in) in length and is moderately inflated, thin, and suboval to elliptical in outline. Anteriorly the shell is rounded but posteriorly it is somewhat pointed. The posterior ridge is broad and rounded; the posterior slope is flat. Umbos of the shell are moderately inflated, slightly raised above the hinge line, and positioned toward the anterior third of the shell. The surface of the shell is smooth, brownish to olive brown with prominent dark green rays of varying widths over the entire shell. Internally, there is a single rudimentary pseudocardinal tooth in the left valve and a long, narrow and low pseudocardinal in the right valve. The hinge plate is thin and the lateral teeth are absent. The umbonal cavities are broad and shallow. Nacre is iridescent, bluish white, and often stained with light yellow spots.

In the absence of basic biological data, this species has been placed in five genera. It is retained in the genus *Anodontoides* until the soft anatomy can be critically examined. The genus *Anodontoides* was described by Simpson (Baker 1898).

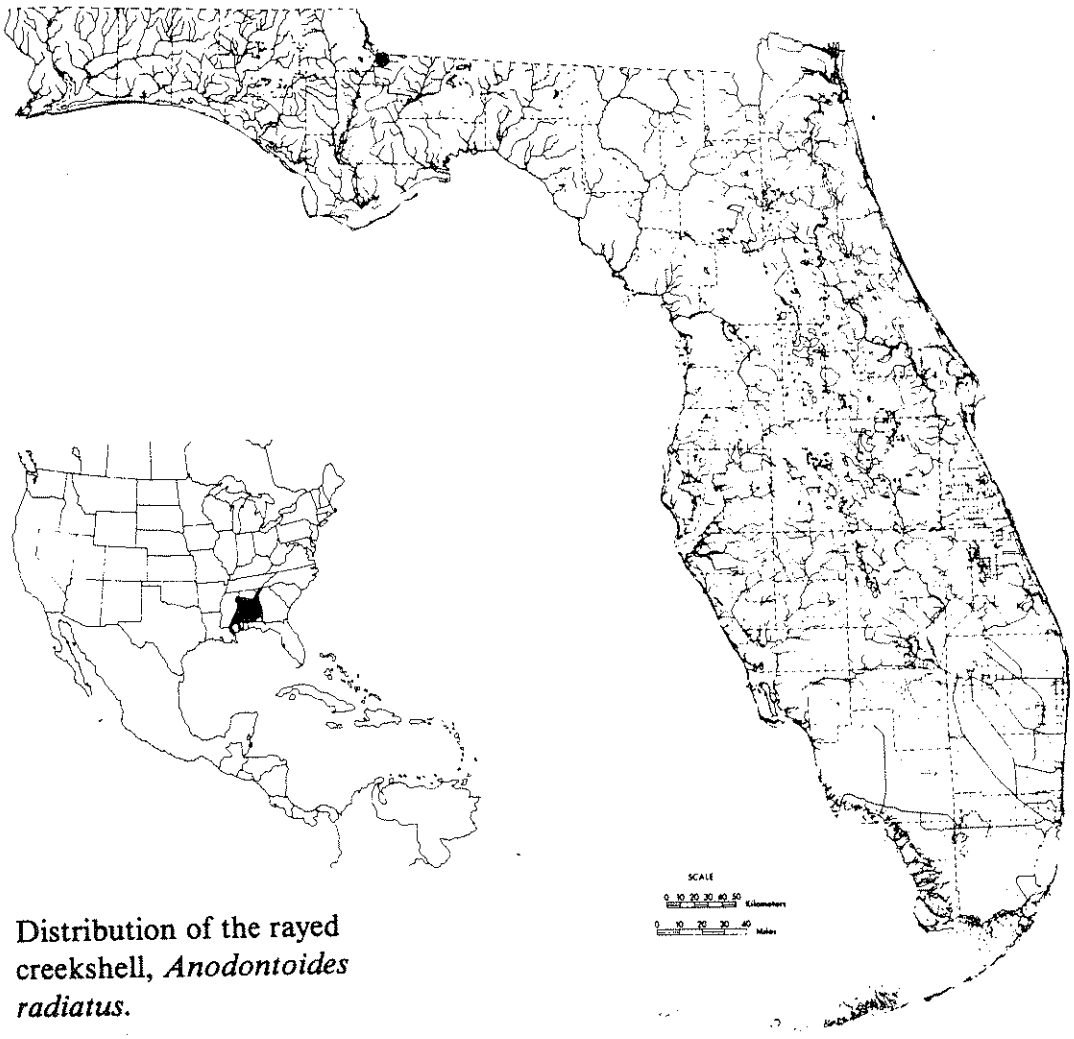


Rayed Creekshell, *Anodontoides radiatus*, UF 64075, length 49.5 mm (1.9 in). Alabama, Russell County, Uchee Creek near Nuckalls (illustration by Tracy Smith).

RANGE: *Anodontoides radiatus* occurs in Gulf Coast drainages from the Tickfaw River system, Louisiana (Vidrine 1985), eastward to the Apalachicola river system (Johnson 1967). In this area, it appears to be absent from the Yellow, Choctawhatchee, and Chipola rivers. In Florida, *A. radiatus* is known only from Mosquito Creek, a tributary of the Apalachicola River, in Gadsden County (Clench and Turner 1956). It has been collected from several localities in the Escambia River system in Alabama but has not been found in this system in Florida. *Anodontoides radiatus* has been confused with *Strophitus subvexus* by some investigators (Clench and Turner 1956). Johnson (1967) reexamined material reported by Clench and Turner (1956) and pointed out that their records from the Chipola River were based on *Strophitus* not *Anodontoides*.

HABITAT: Although the rayed creekshell is known from large rivers (e.g., Chattahoochee River, Muscogee County, Georgia), most collections are from small to medium-sized creeks, presumably its typical habitat, where it occurs in mud, sandy mud, or sand and gravel substrates.

LIFE HISTORY AND ECOLOGY: Information on the life history of the rayed creekshell is limited to a brief description of its soft anatomy (Lea 1863a). This description, under the synonym *Anodonta showalterii*, is based



Distribution of the rayed creekshell, *Anodontoides radiatus*.

on specimens from the Coosa River in Alabama. Of the two specimens examined by Lea (1863a), at least one was a gravid female with glochidia in the entire outer gill.

SPECIALIZED OR UNIQUE CHARACTERISTICS: None.

BASIS FOR STATUS CLASSIFICATION: There is only one verifiable record of the rayed creekshell in Florida and it was collected more than three decades ago. The absence of distribution records may indicate rarity but might also reflect the lack of collecting effort in the small headwater woodland streams. Undetermined status is deemed appropriate until additional data are available.

RECOMMENDATIONS: A thorough survey of small headwater streams in the Apalachicola and Escambia river systems is urgently needed. Mosquito Creek should be sampled first in order to determine the status of *A. radiatus* in that tributary system. The Chipola River drainage, an Apalachicola River tributary, has received considerable attention from collectors in recent years and for this reason is a lower priority for survey work.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Status Undetermined

Bankclimber

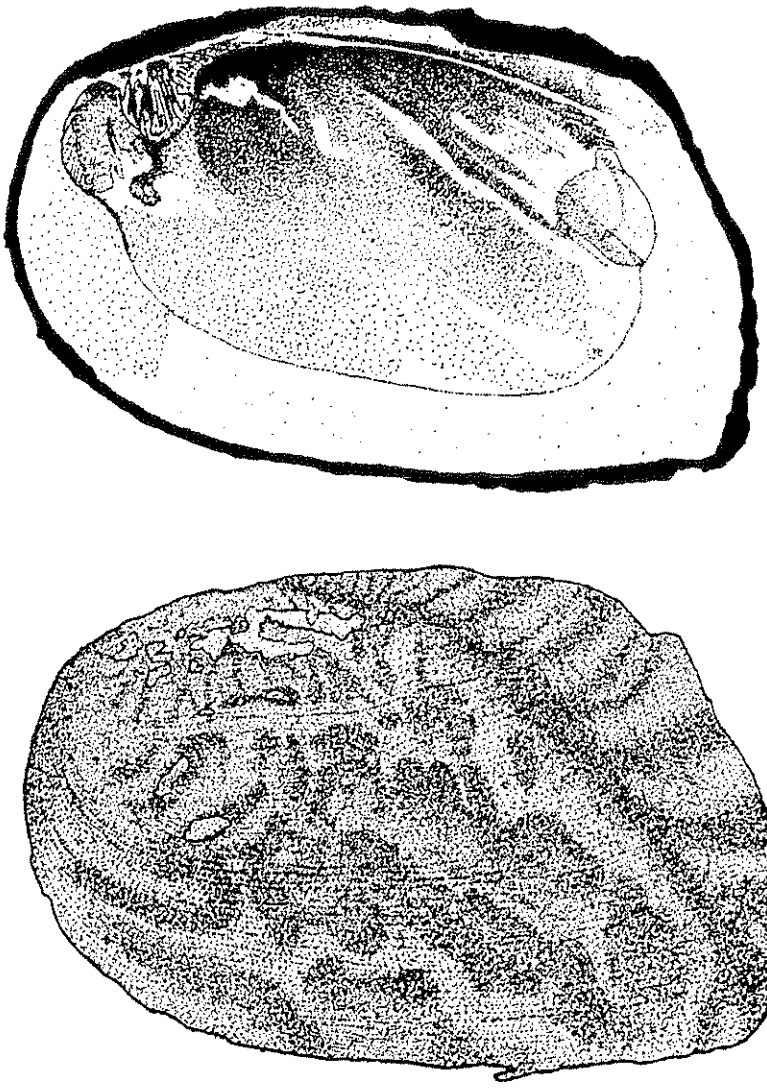
Plectomerus dombeyanus (Valenciennes)

DESCRIPTION: This large dark brownish to black, heavy-shelled mussel attains a length of 150 mm (5.9 in). It is moderately inflated and quadrate to rhomboid in shape, with a well developed posterior ridge which ends at the base of the shell. The posterior margin of the shell is truncate above and may be biangulate below. On the surface of the shell there are a few oblique folds anterior and posterior to the posterior ridge. Internally, the umbonal cavities are moderately deep. The lateral teeth are long, moderately high, and slightly curved, whereas the pseudocardinal teeth are large and ragged; two in the left valve and one in the right valve. Nacre color varies from purple to purplish white.

RANGE: *Plectomerus dombeyanus* occurs in coastal plain streams of the Gulf drainages from east Texas east to the Mobile basin in Alabama (Burch 1975) and the Escambia River system in Alabama and Florida (Heard 1979). There are two possible records of this species from the state of Florida. One record came from the Escambia River near Century, Escambia and Santa Rosa counties (Heard 1979). According to Heard (1979), this collection consisted of a single shell which he speculated may have washed down from upstream areas in Alabama. The record of *Elliptoideus sloatianus* from the Escambia River near Century is probably based on the conchologically similar *P. dombeyanus*, thus representing the second record of this species from the state.

HABITAT: *Plectomerus dombeyanus* inhabits medium-sized to large rivers and oxbow lakes with slow current. It is typically found in mud, or mud mixed with sand substrates, but occasionally has been found in rivers with moderate current and a sand and gravel substrate.

LIFE HISTORY AND ECOLOGY: The only life history information on *Plectomerus* is a brief description of soft parts by Lea (1863), Frierson (1904), and Ortmann (1912). Frierson (1904) examined "dozens" of gravid



Bankclimber, *Plectomerus dombeyanus*, UF 229777, length 82.2 mm (3.2 in). Alabama, Baldwin County, Tensaw Lake at Upper Bryants (Brants) Landing about 1.6 km (1 mi) northwest of Vaughn (illustration by Tracy Smith).

females and found all four gills being utilized as marsupia for glochidia and reported gravid females from May to September. Heard and Guckert (1971) assigned *Plectomerus* to a group of unionids which exhibit a tachytictic (short term breeders carrying glochidia only during summer months) reproductive strategy.

SPECIALIZED OR UNIQUE CHARACTERISTICS: The genus *Plectomerus* is monotypic and reaches its easternmost distribution along the Gulf Coast in the Escambia River system of Alabama and Florida.

BASIS FOR STATUS CLASSIFICATION: Because only two specimens of *P. dombeyanus* are known from Florida, a status classification of undetermined seems appropriate at this time.

RECOMMENDATIONS: A survey of the main channel of the Escambia River is needed to determine the status of this species. Results of a survey could be used to determine future conservation actions.

Distribution of the bank-climber, *Plectomerus dombeyanus*.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

FAMILY UNIONIDAE

Status Undetermined

Southern Kidneyshell

Ptychobranchus jonesi (van der Schalie)

DESCRIPTION: *Ptychobranchus jonesi* is a medium-sized species that reaches a length of about 65 mm (2.5 in). The shell is inflated and elongate-

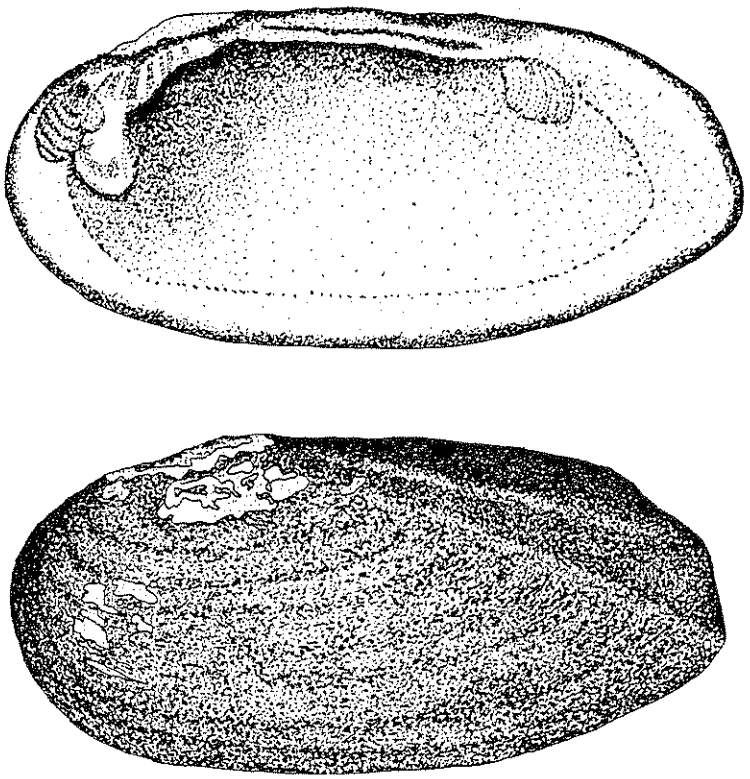
elliptical, and the posterior ridge is double with scalloped margins between the ridge extremities. Its epidermis is subshiny, olivaceous green to dark brown with irregular, usually obscure, green rays. A nearly straight to slightly concave ventral margin and a postbasal swelling are characteristic of females, whereas the ventral margin of males is broadly rounded. Internal characteristics include two thin and slightly arcuate lateral teeth and two solid compressed pseudocardinal teeth in the left valve. The right valve has a thin, slightly arcuate lateral tooth and two pseudocardinal teeth; one well developed, the other rudimentary. Nacre color is bluish white with some posterior iridescence.

RANGE: Burch (1975) reported *P. jonesi* from the Choctawhatchee and Escambia river systems in Alabama and Florida. However, Butler (1989) reported the first substantiated Florida records from two localities in the Choctawhatchee River system in Walton County. The species has yet to be discovered in the Yellow River system or the Florida portion of the Escambia River system.

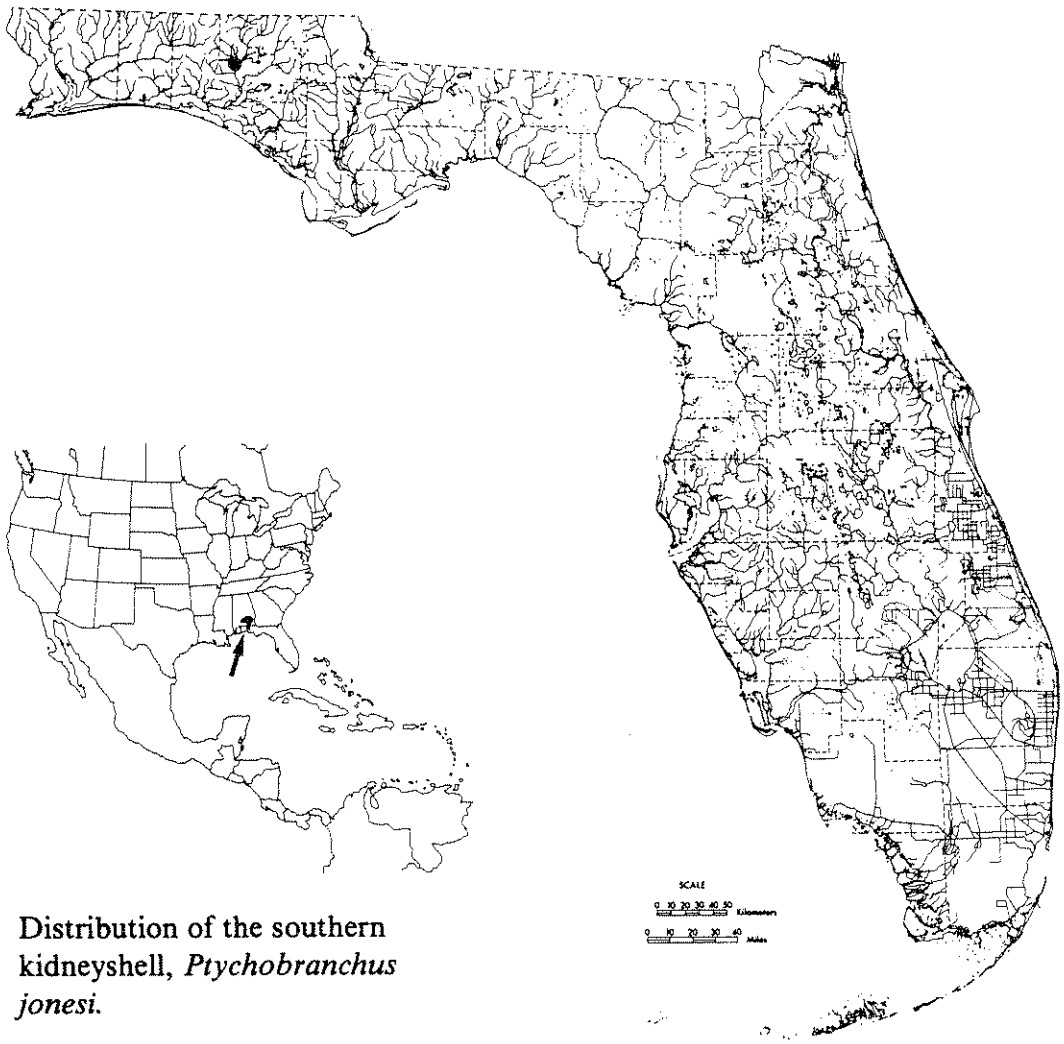
HABITAT: Found in medium-sized creeks to rivers, *P. jonesi* inhabits silty sand substrates with woody debris in slow current.

LIFE HISTORY AND ECOLOGY: Unknown.

SPECIALIZED OR UNIQUE CHARACTERISTICS: Athearn (1964), in correcting Clench and Turner's (1956) assumption that *P. jonesi* was syn-



Southern Kidneyshell, *Ptychobranchus jonesi*, UF 65567 (paratype), length 61 mm (2.4 in). Alabama, Covington County, Conecuh River, Rozemans Landing near Crenshaw County line (illustration by Gina Collins).



Distribution of the southern kidneyshell, *Ptychobranchus jonesi*.

onymous with *Villosa australis*, noted, among other differences, the characteristic double scalloping of the posterior margin of *P. jonesi*. *Ptychobranchus* is the only genus of North American Unionidae known to have folded or pleated marsupial gills.

BASIS FOR STATUS CLASSIFICATION: *Ptychobranchus jonesi* is known in Florida from only three specimens collected at two localities, both representing collections made 55 years ago (Butler 1989). Without thoroughly sampling the Choctawhatchee River system, it cannot be firmly stated that *P. jonesi* persists in Florida.

RECOMMENDATIONS: The Choctawhatchee River system needs to be surveyed to determine the present status of *P. jonesi* in Florida.

PREPARED BY: James D. Williams, National Biological Survey, 7920 N.W. 71st Street, Gainesville, FL 32653, and Robert S. Butler, U.S. Fish and Wildlife Service, 6620 Southpoint Drive South, Jacksonville, FL 32216.

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