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# THE UNIONIDAE (MOLLUSCA: BIVALVIA) OF PENINSULAR FLORIDA

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# THE UNIONIDAE (MOLLUSCA: BIVALVIA) OF PENINSULAR FLORIDA

RICHARD I. JOHNSON

SYNOPSIS: This is a study of the Unionidae, or fresh-water mussels, of peninsular Florida, considered here as that region below the Suwannee River system in the west and the St. Marys River system in the east. As thus defined the area has a unionid fauna of 12 species belonging to 6 genera; 9 of these species also occur in the Apalachicolan region to the west and north where there are 49 species in 17 genera; 2 of these also occur in the Southern Atlantic Slope region, which has 37 species and 11 genera. One species is clearly of Southern Atlantic Slope origin, while two others are endemic. The paucity of the fauna and distribution of the species give credence to the geological evidence that most of peninsular Florida was inundated sometime during the Pliocene or early Pleistocene, and that it has since been repopulated by Unionidae mostly from the west and north.

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## INTRODUCTION

In peninsular Florida the Unionidae offer two advantages as a group of animals for zoogeographic study. There are a reasonable number of species, most of which are clearly distinguishable; they have a limited mode of distribution, being unable to pass over land from one drainage system to another. Their ability to move between drainage systems is dependent on the mobility of fishes to which the glochidia attach themselves. For this reason the distribution of the species of Unionidae may afford evidence of former stream confluences and of lowland flooding in the coastal regions that were, or are, reduced to base level.

The Unionacea of most of the Apalachicolan region were studied by Clench and Turner (1956). They supported the idea that the fauna was distributed by mechanical means, though they were vague as to what these mechanical means might have been.

Clench and Turner described 32 of the 49 species of Apalachicolan Unionacea. The distribution of this fauna was reinterpreted (Johnson, 1970), and the Southern Atlantic Slope species were revised. The distribution of these faunas gave evidence of a former confluence of the headwaters of the Alabama-Coosa, Apalachicola, and Savannah river systems. Exception was taken to Clench and Turner's theory of distribution so far as the Unionacea are concerned, as the zoogeographic evidence failed to show that unionid distribution is fortuitous. In peninsular Florida the unionids offer no examples of stream capture that can be demonstrated specifically, but their distribution does not indicate that it occurred by any passive agents other than natural fish hosts.

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## Geology and Topography of Peninsular Florida as Related to the Unionid Fauna.

### Geology and Topography

Present day peninsular Florida occupies only part of a much larger unit, the Florida Plateau. This platform is nearly 500 miles long and from 250 to 400 miles wide. The Plateau is part of the continent and is probably an extension of the metamorphic rocks of the Georgia Piedmont that are buried under some 4,000 feet of sedimentary rocks that are mostly limestone.

During the millions of years it has been in existence, the Plateau has been alternately dry land or covered by shallow seas. It appears to be one of the world's more stable areas. There is no faulting, with just a slight doming in the north central portion. The Plateau is nearly level, the highest part (near Haines City, Polk County) being little more than 325 feet above sea level. Nearly two-thirds of the state is below the 50-foot contour.

### Marine Shore Lines

Cooke (1945: 248) recognized seven Pleistocene shore lines in peninsular Florida, but MacNeil (1950:99), basing his identification of marine shore lines on the coexistence of shore-line scarps, regarded only four of these as peaks of Pleistocene flooding (Table 1). Russell (1957: 427-428), on the basis of the complete melting of the polar ice, cast doubt on the extent of Pleistocene flooding, as did Oaks and Coch (1963) on the basis of cores made in Virginia. They postulated six cycles of Pleistocene seas with maximum heights 45 feet above present levels.

The highest recognized marine shore line in peninsular Florida is at a level of from 215 to 270 feet (depending on the authority) above the present one. All of Florida was inundated except for several small islands in the vicinity of Polk County. Cooke (1945: 273, fig. 43) thought this flooding, which formed the Brandywine terrace (Citronelle formation in the southeast), took place in the early Pleistocene during the Aftonian interglacial stage, but Alt and Brooks (1965: 408), on the basis of new geological evidence, concluded that this flooding took place during the Upper Miocene. Laessle (1968) later confirmed this dating with botanical evidence. It is not possible to tell if any of the present fresh-water mollusks have persisted since the Upper Miocene.[1]

The highest Pleistocene shore line recognized by MacNeil (1950, pl. 1), the Okefenokee or Sunderland of Cooke (1945, 278, fig. 43), not specifically recognized by Alt and Brooks (1965) or Alt (1968), was formed sometime during the Pliocene when the sea level was 150 feet higher

[1] Orange (Ocala) Island referred to by Clench and Turner (1956: 104) was a land mass separated from the continent by the Suwannee Strait during the late Oligocene (Vaughn, 1910: 156) and its existence appears to have no bearing on the present molluscan fauna.

TABLE 1.— CORRELATION OF MARINE SHORE LINES

| Alt and Brooks (1965) and Alt (1968) | | Cooke)1946) | | | MacNeil (1950) | |
|---|---|---|---|---|---|---|
| Age | Altitude (feet) | Shore Line | Altitude (feet) | Shore Line | Altitude (feet) | Stage |
| Sangamon | 5-10 | (Silver Bluff) | 5 | Silver Bluff | 8-10 | Post-Wisconsin |
| Yarmouth interglacial | 25-30 | Pamlico | 25 | Pamlico | 25-35 | Mid-Wisconsin glacial recessionl |
| Aftonian interglacial | 45-50 | Talbot | 42 | | | |
| Late Pliocene or Early Pleistocene | 70-80 | Penholoway | 70 | Wicomico | 100 | Sangamon interglacial |
| Pliocene | 90-100 | Wicomico | 100 | | | |
| | | Sunderland | 170 | Okefenokee | 150 | Yarmouth interglacial |
| Upper Miocene | 215-250 | Coharie | 215 | | | |
| | | Brandywine | 270 | (not recognized) | | Aftonian interglacial |

than the present level. All that remained of the peninsula was part of Trail Ridge, which formed a large, pear-shaped promontory in Bradford and Clay Counties; there were three irregular, roughly parallel ridges in Polk and Highlands Counties in Central Florida; high hills between Dade City and Brooksville in Pasco and Hernando Counties stood as islands; to the north numerous small hills stood above the 150 foot level; and a large expanse of rocks of the Hawthorne Formation formed an island farther north in Alachua County.

The Wicomico Shore line (Cooke, 1945: 281, fig. 44) is the least sharply defined of the shores recognized by MacNeil, which might indicate that the sea stood at this level for a comparatively short time. It was formed during the Pliocene (Alt, 1968: 92) when the sea level was 90 to 100 feet higher than the present level. Florida was again reduced to a number of islands in Pasco, Hernando, Citrus, Sumter, and Marion Counties. Hubbell (1954: 48, 49 [*in*] Olson et al; 1956: 86), in sophisticated papers on the flightless dung beetle, genus *Mycotrupes*, concluded on zoogeographical evidence that the five species that now live on "islands" of sandy plains or hills separated by marshes or other nonsandy habitats, evolved on actual islands in the interglacial seas and that some land areas persisted in Florida throughout the Pleistocene. Swift (1970: 325) said of a total primary freshwater fauna of 47 species that now inhabits either the St. Johns or Suwannee rivers or both, "Only three species of primary fresh water fishes apparently arose in south or central Florida" and supported the view of moderate Pleistocene flooding. Thompson (1968: 15), on the basis of the distribution of 35 species of Floridian Hydrobiidae, a group of fresh and brackish water snails, suggested that a peninsula persisted throughout the Pleistocene and refuted the marine origin of any of the terraces other than the Pamlico. My interpretation of his data, (with the exception of the two species *Hylalopyrgus brevissimus* (Pilsbry) and *H. aequicostatus* (Pilsbry) that may have had refugia, or else speciated on islands in the Wicomico sea) is that many of the species migrated into peninsular Florida after Wicomico flooding. A number of the species have not fully occupied the older part of the peninsula, nor penetrated beyond the Pamlico Terrace, which suggests a rather recent repopulation probably from the west and north. Among the 12 species of Unionidae, aside from *Elliptio buckleyi* (Lea), which may have persisted on the peninsula prior to the Pliocene[1], and *Villosa amygdala* (Lea), which may have speciated from *V. lienosa* (Conrad), on one of the larger land masses, the remaining species have repopulated the peninsula since Wicomico flooding.

The Pamlico Shore Line (Cooke, 1945: 297, fig. 47), the best preserved of the Pleistocene shores, was formed during the Yarmouth interglacial stage when the sea was 20 to 30 feet above present levels. At this time the shape of Florida was much as it is today, except that the

[1] *Unio caloosaensis* Dall (1895, Trans. Wagner Free Inst. Sci., 3 (3): 688, pl. 25, figs. 5, 12b found in the Pliocene marls of the Caloosahatchie River) is either *E. buckleyi* (Lea) or very close to it.

peninsula was narrower and shorter, terminating near Lake Okeechobee. Off the southwestern end of the peninsula was a large oval island. A long, wide lagoon, including the present St. Johns River, extended southward from Orange Bluff on St. Marys River to Sanford, and was separated from the open ocean by a chain of large islands.

The shore extended much farther out on the continental shelf as little as 11,000 years ago (Emery, 1967, fig. 9). At that time it may have been easier for Unionidae to disperse along a largely baseleveled coast, which might explain the presence of one unionid, *Elliptio dariensis* (Lea), found only in the Altamaha and St. Johns river systems. The distribution of some species of Hydrobiidae (Thompson, 1968), presently restricted to the ocean side of the Pamlico shore, offers striking evidence of repopulation and rapid speciation in this area.

## Drainage Systems

Peninsular Florida (Figure 1) averages over 50 inches of rain a year. Much of this sinks into the ground, as the soil is loose and sandy, and is stored up as a great reservoir of ground water, some of which seeps to the surface in artesian springs. These springs usually rise through deep vertical holes in the underlying limestone and result from rain that fell on a higher level. Most of the isolated springs have no Unionidae in them, but those that form the sources of rivers often have at least *Elliptio icterina* (Conrad) or *E. buckleyi* (Lea). Many of the springs contain endemic species of Hydrobiidae (Thompson, 1968).

Wherever the surface of the ground dips below the water table, lakes are formed and, when there is an outlet at a lower level, water flows away as a surface stream. Many lake basins are the result of the dissolution of underlying limestone, though some occupy former sea floor depressions.

Particularly in the highlands the landscape is dotted with solution impressions. Some of these basins lie between the limits of fluctuation of the water table, and while they contain water in the wet seasons, during

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Figure 1. Drainages of peninsular Florida and relevant ones in the Apalachicolan and Southern Atlantic Slope regions. The major drainage areas of peninsular Florida are indicated by the dashed lines (after U.S. Dept. Interior, Geol. Survey. 1960. Water Supply paper 1304, pl. 1).

Apalachicolan Region: 1. Apalachicola River, 2. Ochlockonee R., 3. St. Marks R., 4. Aucilla R., 5. Econfina R., 6. Suwannee R., 7. St. Marys R., 8. Satilla R.

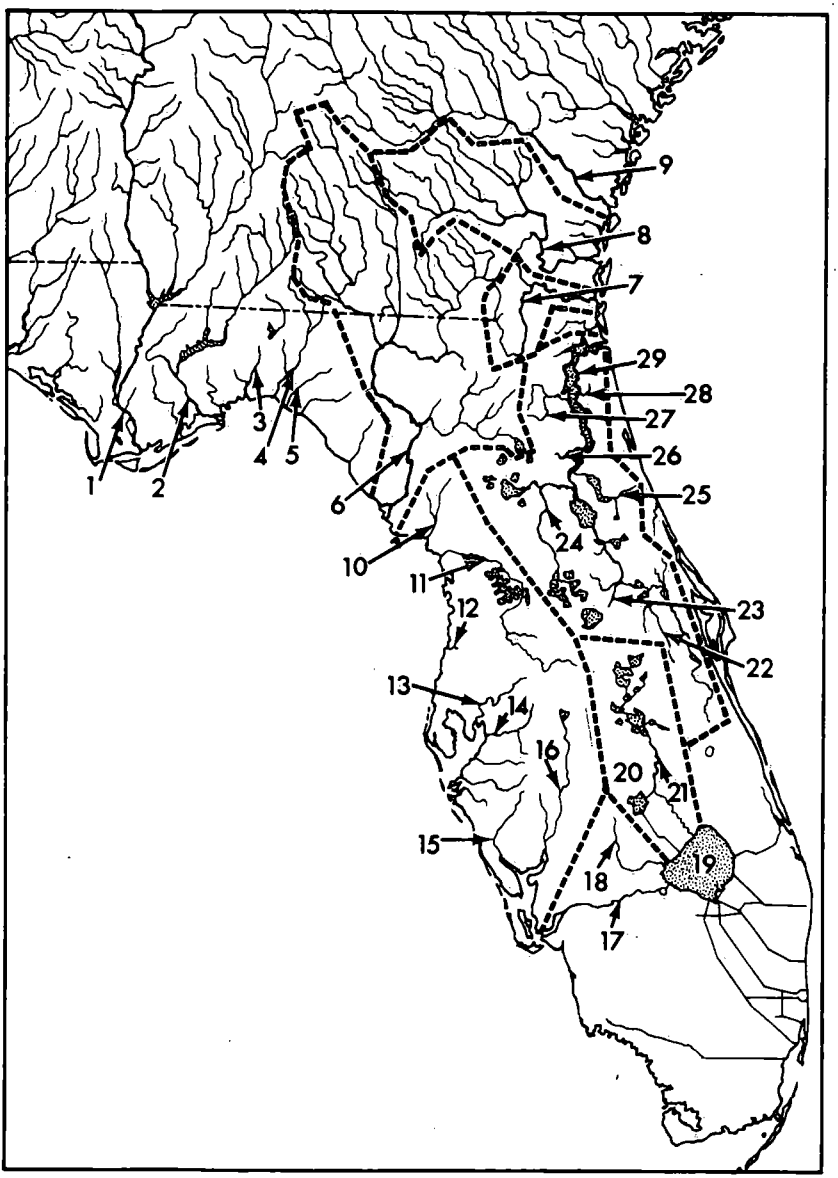
Southern Atlantic Slope Region: 9. Altamaha River.

Peninsular Florida Region: 10. Waccasassa River, 11. Withlacoochee R., 12. Pithlachascotee R., 13. Hillsborough R., 14. Alafia R., 15. Myakka R., 16. Peace R.

Kissimmee River System and Everglades: 17. Caloosahatchee River, 18. Fisheating Creek, 19. Lake Okeechobee, 20. Istokpoga R., 21. Kissimmee R.

St. Johns River System: 22. Econlockhatchee River, 23. Wekiva R., 24. Oklawaha R., 25. Haw Creek, 26. Rice Cr., 27. Black Cr., 28. Julington Cr., 29. St. Johns R.

times of drought they may be completely dry. Many of the lake basins are simple sinks that have always been tributary to the groundwater supply, while others at one time or another have formed part of the surface drainage and are therefore connected with the river systems. The history of the lakes is complicated by the fluctuations of the sea level during the Pleistocene. A number of presently isolated lakes contain *Elliptio buckleyi*



(Lea). Specimens of this species from some of the larger sandy-bottomed lakes, such as Griffin, Eustis, Harris, and Dora that are subject to rather heavy wave action, show considerable ecophenotypic variation and were named *Unio cunninghami* by Wright.

SUWANNEE RIVER SYSTEM.—This system originates in southwestern Georgia and flows over a large portion of the Florida peninsula, but the unionid fauna is Apalachicolan (Johnson, 1970: 267, 269). The headwaters are above maximum Pliocene flooding, and some species may have had refugia there during that time. At present the Suwannee River has its headwaters on the Sunderland or Okefenokee terrace in the very acid Okefenokee Swamp. No unionids are known from the Suwannee above its confluence on the west with the Withlacoochee River (not of the Withlacoochee system described below), a sandy-bottomed stream. On the east the Suwannee is joined by the Santa Fe, which with its principal tributary, the New River, drains much of the north central part of the peninsula.

WACCASASSA RIVER SYSTEM.—The Waccasassa River, with its largest tributary, Otter Creek, is a small system in Levy County. It is poorly connected with the swamps and ponds of Gilchrist County, and is the first entirely peninsular system flowing into the Gulf of Mexico. These spring-fed streams flow over limestone, and *Elliptio icterina* (Conrad) and *Villosa vibex* (Conrad) are the only Unionidae found in them.

WITHLACOOCHEE RIVER SYSTEM.—The Withlacoochee River originates in Polk County and follows a generally northerly course past Lake Tsala Apopka and enters the Gulf at latitude 29°N. The lake connects in several places with the river, which flows northwestward along its northern edge; it has a very intricate shoreline and contains many islands. There is no large expanse of water. At the beginning of the Pleistocene, during the Aftonian interglacial stage when the sea was some 42 feet higher, it was probably a broad, partly silted bay or estuary, separated from the Gulf by narrow straits at Dunnellon. On the eastern side of the river is Lake Panasoffkee, a large body of water connected to the river. Vaughan (1910: 149) suggested that the Withlacoochee River may have captured the headwaters of the Hillsborough and Oklawaha rivers. If this is true, any exchange of the fauna must have occurred before *Lampsilis teres* (Rafinesque) reached this system, as this is now its southern terminus.

SMALLER WEST COAST DRAINAGE SYSTEMS.—In Citrus, Hernando, Pasco, and Pinellas Counties are a number of small streams and ponds of recent origin that do not belong to any general, well defined system. In Hernando County the very short Weekiwachee River is formed by Weekiwachee Springs. It contains only *Uniomerus tetralasmus* (Say). Further south, in Pasco County, is the Pithlachascotee River, which contains *Elliptio jayensis* (Lea) and *U. tetralasmus*. In Lake Jovita (Clear Lake), Pasco County, and Lake Tarpon at Tarpon Springs, Pinellas County, only *Elliptio buckleyi* (Lea) occurs.

Hillsborough County contains several small systems, including the Hillsborough, Alafia, and Little Manatee river systems, all of which discharge into the Gulf in the vicinity of Tampa. As can be seen from Table 2, the fauna of the Hillsborough River is sufficiently extensive to suggest stream capture with the Withlacoochee River.

The Alafia River system appears to contain only three species, *Elliptio icterina* (Conrad), *E. jayensis* (Lea), and *Uniomerus tetralasmus* (Say), while no unionids have yet been found in the Little Manatee or Manatee river systems.

Below the Manatee River, in Manatee County, is another small system, the Myakka, which contains six species.

PEACE RIVER SYSTEM.—The Peace River system rises in Polk County among a number of lakes that it drains on the west side of the 150-foot contour. It flows from north to south and enters the Gulf at Charlotte Harbor. As Table 2 shows, its fauna is very similar to that of the Myakka River.

KISSIMMEE RIVER SYSTEM AND EVERGLADES.—The Kissimmee River, whose headwaters are a number of large lakes in Orange County, and its principal tributary, the Istokpoga River, drain into Lake Okeechobee. Cooke (1939:107) suggested that Lake Istokpoga, Lake Kissimmee and perhaps other lakes of the Kissimmee Basin such as Lake Okeechobee,

TABLE 2.—DISTRIBUTION OF UNIONIDAE IN PENINSULAR FLORIDA AND ADJACENT REGIONS.

| Drainages | Species[1] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Apalachicolan | | X | | X | X | X | X | X | X | X | | X |
| Waccasassa | | X | | | | | | | | X | | |
| Withlacoochee | | X | X | | X | | X | X | X | X | X | X |
| Hillsborough | | X | | X | X | | X | X | X | X | X | |
| Myakka | | | X | | X | X | | | X | X | X | |
| Peace | | X | X | X | X | X | | X | X | X | X | |
| Kissimmee and Everglades | | X | X | X | X | X | | X | | | X | |
| St. Johns | X | X | X | X | X | X | | X | X | X | X | |
| St. Marys | | X | | | | X | | | X | | | |
| Altamaha | X | X | | | X | X | | | | X | | |

[1] 1. *Elliptio dariensis;* 2. *E. icterina;* 3. *E. buckleyi;* 4. *E. jayensis;* 5. *Uniomerus tetralasmus;* 6. *Anodonta couperiana;* 7. *A. peggyae;* 8. *Carunculina parva;* 9. *Villosa villosa;* 10. *V. vibex;* 11. *V. amygdala;* 12. *Lampsilis teres.*

may have been hollows in the [Pliocene] sea bottom; in any event, the former are on higher terraces than the latter, and older.

Lake Okeechobee, one of the larger lakes in North America, is from 25 to 31 miles across. The lake is very shallow, and was not more than 15 to 20 feet deep before canals and dikes were built. Its principal outlet is now the Caloosahatchee River, which drains westward to the Gulf at Fort Myers. In former times during the rainy season it often overflowed its southern bank, which was only a few inches higher than the surrounding country, and flowed south over the Everglades.

ST. JOHNS RIVER SYSTEM. – The St. Johns River is unique among the rivers of the United States, as it flows from south to north for nearly 200 miles, and its headwaters are less than 20 feet above sea level. It is a relatively new river – its upper valley above Lake Harney did not come into existence until the late Pleistocene when a barrier island, now the east bank of the river, accumulated in the Pamlico Sea. From Lake Hellen Blazes the river wanders through grassy marshes broken by the expansions of Lakes Sawgrass, Washington, Winder, and Poinsett. Between Lakes Harney and George the river channel is little more than 100 yards wide and is 8 to 20 feet deep, broken by the expansions of Lake Monroe about 8 feet deep, Lake Beresford 5 to 10 feet deep, and Lake Dexter 2 to 10 feet deep. At Lake George the river expands to a width of 6 to 7 miles and maintains a remarkably uniform depth of 9 to 11 feet for all of its 11-mile length. Tidal effects are still felt over 103 miles from the mouth. At Palatka the tidal range is still 2.5 feet. Beck (1965: 118) pointed out that the degree of salinity varies in the river unexpectedly from the discharge of mesohaline springs in Marion County and further noted that, "this stream cannot be included in any of the designated types, as it has reaches of swamp-and-bog characteristics, others that have sand-bottomed characteristics, and stretches not comparable to either. The chemical characteristics of this river defy summarizing, for anything reported for one reach would be untrue of reaches a few miles upstream or downstream." In any event, the salinity is sufficient for a brackish water mactrid bivalve, *Rangia cuneata* (J. E. Gray), to live as far upstream as Lake Harney, Seminole County. *Elliptio jayensis* (Lea) and *Uniomerus tetralasmus* (Say) attain great size in the big shallow lakes. Many of the species of *Elliptio* show considerable ecophenotypic variation. Among the springs that flow directly into the St. Johns River are Benson's mineral spring and Blue Springs, both in Volusia County, and Alexander Springs in Lake County. All contain endemic species of Hydrobiidae.

WEKIVA RIVER DRAINAGE. – Among the smaller rivers that drain into the St. Johns River is the Wekiva River of Orange and Seminole Counties. This small system has its sources in Seminole and Rock Springs in Orange County and in Wekiwa [*sic*] and Sanlando Springs in Seminole County. These are all sulphur springs, and each supports endemic species of Hydrobiidae. Specimens of *Elliptio icterina* (Conrad) from these springs

tend to be heavy, inflated, and produced basally with a golden periostracum, but specimens in the spring runs become compressed and subrhomboidal, ending in a broad biangulation below the medial line with the periostracum usually yellowish or brownish, sometimes with green rays.

OKLAWAHA RIVER DRAINAGE—The largest tributary of the St. Johns River is the Oklawaha, which enters from the west between Lake George and Palatka where the water is still tidal. Its principal source is the group of large lakes that includes Griffin, Eustis, Harris, and Dora, all mostly in Lake County, and which are separated from one another by peaty muck. The Oklawaha is joined by Orange Creek whose source is Orange Lake in Alachua County. Cooke (1939: 110) suggested that some of the headwaters have been in existence ever since the Sunderland terrace [Upper Miocene] emerged from the sea, though most of the lakes and all of the lower reaches are of more recent origin.

BLACK CREEK DRAINAGE.—This small system enters the St. Johns River from the west between Palatka and Jacksonville. It appears to be of Pleistocene origin as it flows over the Talbot and Pamlico terraces. The unionid fauna is now effectively separated from the St. Johns by salt water. Specimens of *Elliptio icterina* (Conrad) closely resemble those of the St. Marys River, the next system to the north, whose waters are rather acid. Black Creek contains *Elliptio dariensis* (Lea) which is found in the Altamaha River, Georgia, to the north, but not in the intervening St. Marys or Satilla river systems.

JULINGTON CREEK DRAINAGE.—This small system enters the St. Johns River from the east a few miles south of Jacksonville. It is of recent origin like the St. Johns itself. Its unionid fauna is remarkable because of the large size that individual specimens attain.

## DISTRIBUTION OF THE FLORIDA UNIONIDAE

### REGIONS

In order to understand the distribution of the Unionidae of peninsular Florida and to emphasize the paucity of species found there, a few remarks on the unionid fauna of the regions to the west and north are needed.

The Apalachicolan region has been generally regarded by previous authors (H. and A. van der Schalie, 1950: 450; Clench and Turner, 1956) as consisting of the river systems from the Escambia to the Suwannee that flow into the Gulf of Mexico. Although they flow into the Atlantic Ocean, the St. Marys and Satilla river systems are now also included in this region, as their modest unionid faunas consist entirely of species found in the Apalachicolan region, the dominant species in them being *Elliptio crassidens crassidens* (Lamarck) (Johnson, 1970: 305) and *E. c. downiei* (Lea) (Johnson, 1970:307) respectively. The former is abundant in the Interior Basin and is found in the Alabama-Coosa and Apalachi-

cola river systems. It is missing in the Ochlockonee and Suwannee river systems and from peninsular Florida and the Southern Atlantic slope regions, both as defined below. *E.c. crassidens*[1] appears in the Pliocene of peninsular Florida, indicating its presence in this general area for a long time.

The Apalachicolan region as defined above has a unionid fauna of 49 species. Of these, 19 have affinities with species to the west; 9 are endemic to the region; 3 others extend into peninsular Florida; and 11 more are restricted to individual river systems. Three species that were probably once endemic to the Apalachicolan region have spread into the Atlantic Slope region, and four Atlantic Slope species have spread in the opposite direction through a onetime confluence of the headwaters of the Apalachicola and Savannah river systems (Johnson, 1970: 268, text fig. 1).

To the east and north of the Apalachicolan region is the Southern Atlantic Slope region, which extends from the Altamaha River system in Georgia to the James River system in Virginia. This fauna contains 37 species, of which 4 are found in the Apalachicolan region as well.

The peninsular Florida region, defined here as a separate region, is that area below the Suwannee River system in the west and the St. Marys

[1] Described as: *Elliptio pachyodon* Pilsbry 1953 [in] Olsson, A. A. and A. Harbison, Pliocene Moll. Southern Florida. Acad. Nat. Sci. Phila., Monog. 8 p. 447, pl. 65, fig. 8 (St. Petersburg [Pinellas Co.], Florida; holotype ANSP 18586).

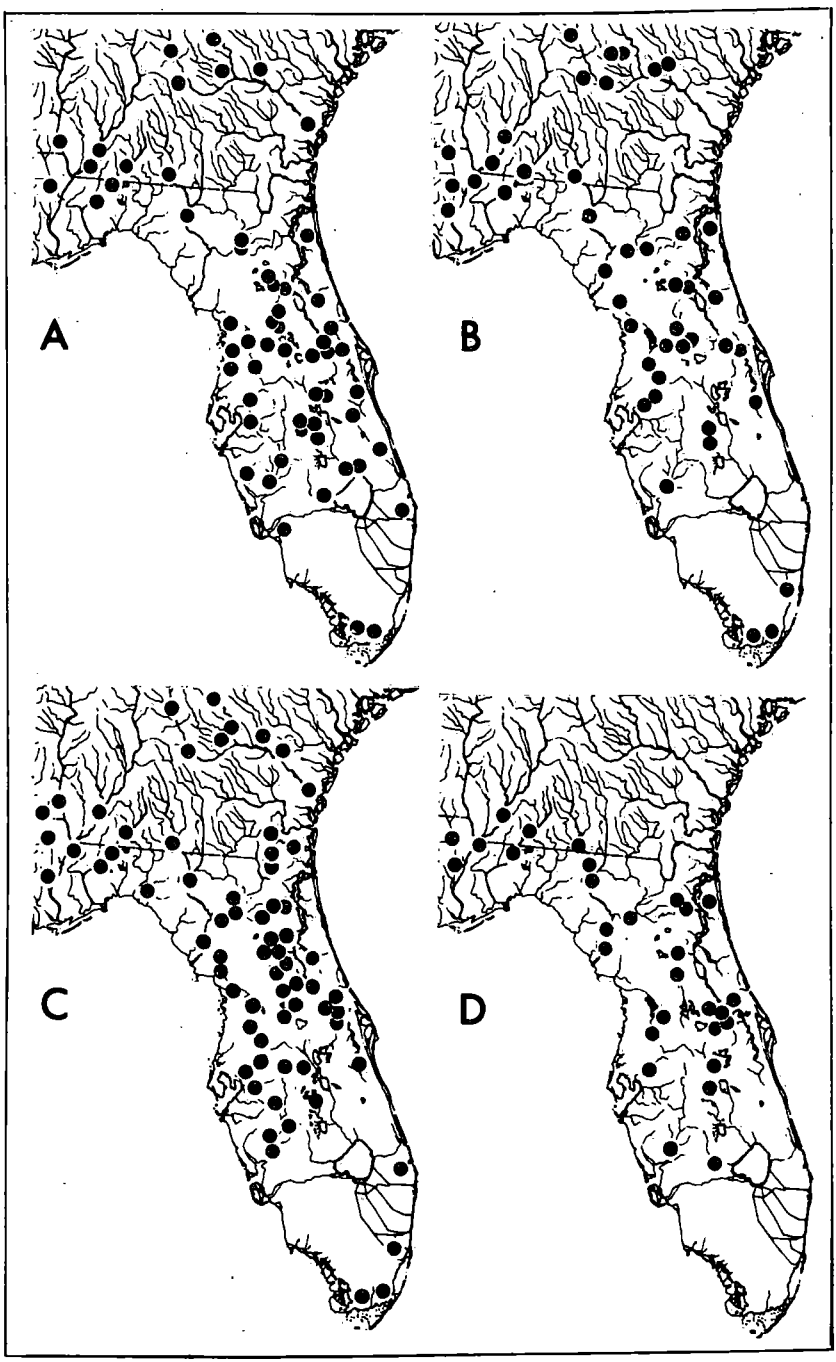
FIGURE 2. Species of Unionidae that appear to have migrated into peninsular Florida subsequent to maximum Pliocene flooding, mostly from the west.

A. *Uniomerus tetralasmus* (Say). Widely distributed in the Interior Basin, West Gulf Coastal region, Alabama-Coosa River system, and Apalachicolan region: Rio Grande River system, Texas, east to the Suwannee River system, Florida; Peninsular Florida; Southern Atlantic Slope: Altamaha River system, Georgia, north to the Nottaway River of the Chowan River system, North Carolina. As this species is absent in the two intervening river systems between the St. Johns and the Altamaha, it probably spread into Florida from the west.

B. *Villosa vibex* (Conrad). West Gulf Coastal region, Alabama-Coosa River system and Apalachicolan region: Pearl River system, Mississippi, east to the Suwannee River system, Florida; Peninsular Florida; Southern Atlantic Slope: Altamaha River system, Georgia, north to the coastal ponds of the Cape Fear River system, North Carolina. As this species is absent in the two intervening river systems between the St. Johns and Altamaha, it probably spread into Florida from the west.

C. *Elliptio (Elliptio) icterina* (Conrad). Apalachicolan region: Escambia River system, Florida, east to the St. Marys River system, Georgia; Peninsular Florida; Southern Atlantic Slope: Altamaha River system, Georgia, north to the White Oak River, North Carolina. The ecophenotypic variation in this species suggests that it entered Florida from both the west and north.

D. *Carunculina parva* (Barnes). Widely distributed in the Interior Basin, Apalachicolan region, and Peninsular Florida. It is replaced in the Southern Atlantic Slope region by *C. pulla* (Conrad) and must have reached peninsular Florida from the west.


A
B
C
D

River system in the northeast. The validity of this area as a region was recently substantiated by Gilbert and Bailey (1972) who found that following Pliocene reconnection of insular Florida and the rest of the southeastern United States, the freshwater fish, *Notropis emiliae peninsularis*, invaded the neighboring river systems to the north, the Suwannee, Ochlockonee, St. Marys, and Satilla, where it came into contact and integrated with the nominate subspecies.

## Generic Affinities

Only six genera of Unionidae occur in peninsular Florida: *Elliptio, Uniomerus, Anodonta, Carunculina, Villosa,* and *Lampsilis.* These six genera are also represented by species in the Southern Atlantic Slope and Apalachicolan regions. The Southern Atlantic Slope region has 11 genera, 9 of which are represented in the Apalachicolan region where the total is 17 genera.

## Summary and Analysis of Distribution

Twelve species comprise the unionid fauna of the peninsular Florida

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Figure 3. Species of Unionidae that appear to have migrated into peninsular Florida probably since the formation of the Pamlico Terrace, during the Yarmouth interglacial stage:

A. Open circles: *Lampsilis* (Lampsilis) *teres* (Rafinesque). Widely distributed in the Interior Basin; West Gulf Coastal region, Alabama-Coosa River system, Apalachicolan region, and Peninsular Florida; Northern Mexico, Rio Grande River system, Texas, east to the Withlacoochee River system, Florida. This species' shallow penetration into the peninsula shows its recent arrival. Solid circles: *Elliptio (Elliptio) dariensis* (Lea). Known only from the Altamaha River system, Georgia, and the St. Johns River system, Florida. It appears to have spread southward from the Altamaha rather recently when the shore line extended farther to the east. In any event it entered the St. Johns subsequent to the formation of the Pamlico Terrace, as the St. Johns River lies east of it.

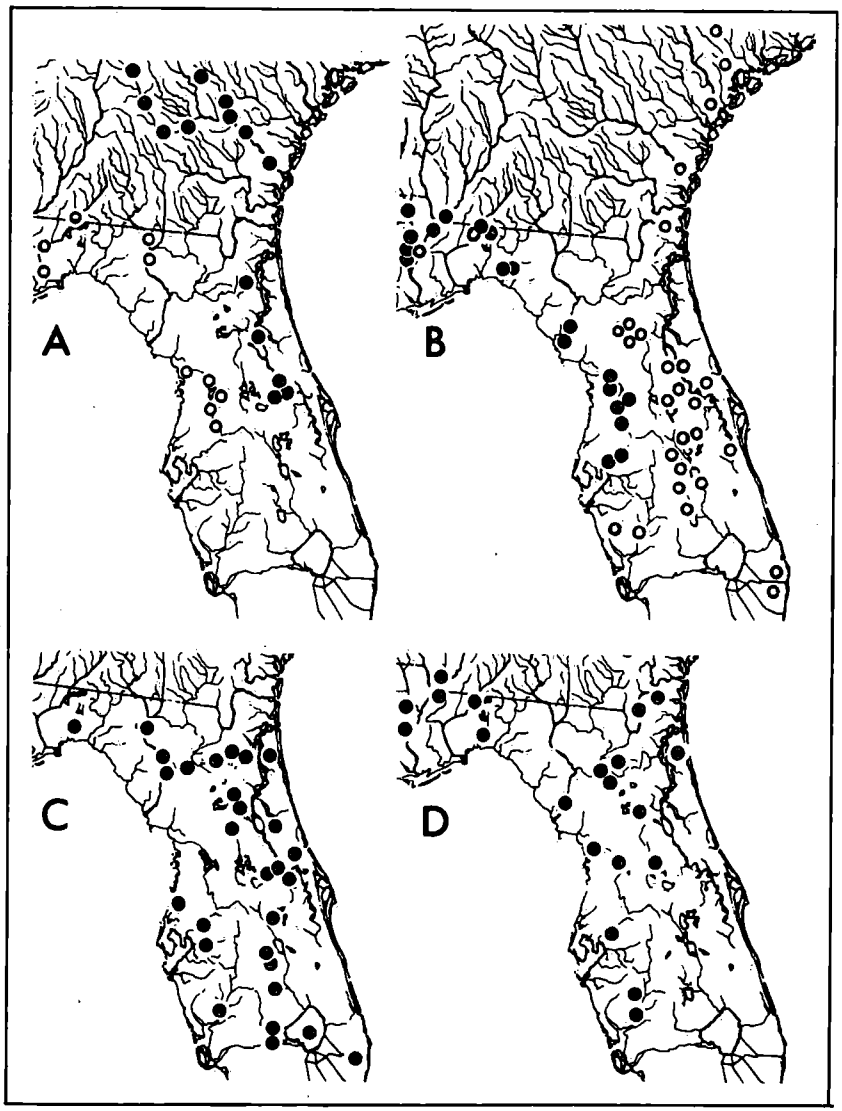
Species of Unionidae that appear to have migrated into peninsular Florida from the Apalachicolan or Atlantic Slope regions:

B. Open circles: *Anodonta couperiana* Say. Apalachicolan region: Apalachicola, Ochlockonee, and St. Marys River systems; Peninsular Florida; Atlantic Slope region: Altamaha River system Georgia, north to the Cape Fear River system, North Carolina. The apparent absence of this species from the Suwannee and Withlacoochee river systems suggests that it entered the Apalachicola River system from a former confluence with the Savannah River system and that it spread into the Florida peninsula from the north. Closed circles: *Anodonta peggyae* Johnson. Apalachicolan region: Choctawhatchee River system, east to the Suwannee River system; Peninsular Florida: Withlacoochee and Hillsborough River systems.

C. *Elliptio (Elliptio) jayensis* (Lea). Apalachicolan region: St. Marks and Suwannee River systems; Peninsular Florida.

D. *Villosa villosa* (Wright). Apalachicolan region: Apalachicola River system, east to the St. Marys River system, Georgia; Peninsular Florida.

region (Table 2). Nine are also found in the Apalachicolan region, and among these four are clearly of more western origin, while three may have had their origin in the Apalachicolan region. Of two species found in both the Atlantic Slope and Apalachicolan regions, one appears to have spread into the peninsula from both the west and north, the other from the north. One other species is from the Atlantic Slope region. Two species are endemic.



*Uniomerus tetralasmus, Villosa vibex, Carunculina parva,* and *Lampsilis teres* extend west beyond the Apalachicolan region. Two of these, *U. tetralasmus* and *V. vibex* also occur in the Southern Atlantic Slope region, but as they are absent in two intervening river systems (St. Marys and Satilla) between the Altamaha and St. Johns, they probably found their way into Florida from the west. *Carunculina parva* and *L. teres* clearly came from the west.

*Villosa villosa, Elliptio jayensis,* and *Anodonta peggyae* may have had their origin in the Apalachicolan region or in peninsular Florida. There is evidence that *Elliptio icterina* and *Andonta couperiana* spread into the Apalachicolan region from a former confluence with the Apalachicola and Savannah rivers, *E. icterina* reached peninsular Florida from both the west and north, and *A. couperiana* reached it from the north. *Elliptio dariensis,* though its distribution is now discontinuous, evidently spread into the St. Johns River system from the Altamaha River system of the Atlantic Slope. *Villosa amygdala* and *Elliptio buckleyi* are endemic to peninsular Florida. The former is closely related to *V. lienosa* of the Apalachicolan region, and *E. buckleyi* is close to E. *icterina.*

## A Revision of the Florida Unionidae

In spite of the provincial restrictions of this paper each of the species studied has been completely monographed, including those that occur elsewhere. The synonymy of each species is believed to be complete, and while the modern species concept has been assiduously applied, infallibility of judgement is not claimed. If there are composite species, they will probably be found among the ubiquitous *Elliptio.*

Most of the Unionidae of Florida were described by Isaac Lea and Timothy A. Conrad before the middle of the last century. Between 1883 and 1934 the Wrights, father and son, described 52 species of mollusks, mostly Unionidae from Florida (Johnson, 1967). The Wrights were unsophisticated naturalists who redescribed many of the species, some of which had already been described several times over.

Simpson (1892: 405-406) discussed the collectors of Florida Unionidae up to that time. Many collections of Florida unionids have been made since, including extensive ones by G.W. Van Hyning and E.P. St. John. These specimens are in the Florida State Museum in Gainesville. In 1962 my family and I, accompanied by Samuel L.H. Fuller, spent 6 weeks collecting in peninsular Florida at some 140 stations. Our collecting was facilitated by drought conditions.

The primary systematic studies of the Floridian Unionidae are those of Charles T. Simpson. His *Notes on the Unionidae of Florida and the Southeastern States* (1892) was the first attempt at a revision of these species. A non-critical revision was later made by H. von Ihering, *Os*

*Unionidos da Florida* (1895). Simpson subsequently published a *Synopsis of the Naiades* (1900), which was expanded into the *Descriptive Catalogue of the Naiades* (1914). These works were revisions of the naiades on a world-wide basis. Simpson's conclusions concerning most of the Floridian species remained unchanged until the publication of Frierson's, *A Classified and Annotated Check List of the North American Naiades* (1927) in which some of Simpson's synonymies were modified. Haas in *Superfamilia Unionacea* (1969a) essentially followed Frierson and largely ignored the more recent work of Clench and Turner, *The Freshwater Mollusks of Alabama, Georgia and Florida from the Escambia to the Suwannee River* (1956). In *Superfamily Unionacea*, Haas (1969 b) only discussed the genera.

The anatomically-based classification of the genera of Unionacea proposed by Ortmann (1911, 1912) is used here. Since Ortmann's time, a few necessary taxonomic changes have been made, but no one has substantially modified his concepts of the North American genera until recently. Heard and Guckert, (1970) in a work on the higher classification of Unionacea, interpreted the phylogenetic relationships of these animals on reproductive features and not on shell characters. They placed *Elliptio* and *Uniomerus*, as well as *Cyclonaias, Hemistena, Lexingtonia, Plethobasus* and *Pleurobema*, in the subfamily *Pleurobeminae*, and put *Elliptio buckleyi* (Lea) in the genus *Popenaias*

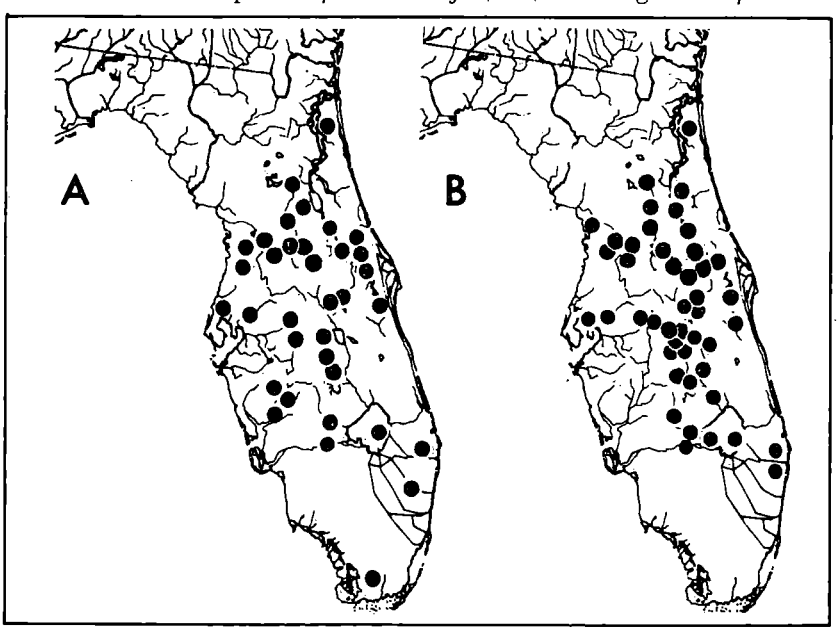



FIGURE 4. Two species that may have survived on island refugia during Wicomico flooding in the Pliocene:

A. *Villosa amygdala* (Lea). Peninsular Florida. Replaced in the Apalachicolan region by *lienosa* (Conrad) and in the Atlantic Slope region by *delumbus* (Conrad).

B. *Elliptio (Elliptio) buckleyi* (Lea). Peninsular Florida.

Frierson in a new subfamily *Popenaiadinae*. These families differ in a single way, the *Pleurobeminae* are tachytictic (*i.e.* the larvae have a short term incubation) whereas the *Popenaiadinae* are bradytictic (*i.e.* the larvae have a long term incubation).

Fuller (1971: 141) in a phylogenetic list of the Savannah River system Unionidae rejected the work of Heard and Guckert (1970) reverting to the scheme of Ortmann. I am not yet able to evaluate the validity of *Pleurobeminae* and *Popenaiadinae*, and, as they do not appear to be germane to the understanding of the zoogeography of the fauna in this study, they are ignored here. This is not to imply that I regard shell characters or anatomical structures as more important than reproductive features.

Valentine and Stansbery (1971: 13) also discussed the subfamilies of Unionidae, but their paper was written before the new system of Heard and Guckert appeared.

## Systematic Section

The following abbreviations have been used in the text and figure captions.

ANSP — Academy of Natural Sciences of Philadelphia, Pennsylvania
UF — Florida State Museum, University of Florida, Gainesville, Florida
MCZ — Museum of Comparative Zoology, Cambridge, Massachusetts
UMMZ—Museum of Zoology, University of Michigan, Ann Arbor, Michigan
USNM —United States National Museum, Washington, D.C.

Synonymy. — For ease of reference full citations are included for each taxon. Elsewhere in the text references are abbreviated and may be found in the bibliography.

Isaac Lea often rushed brief Latin descriptions of his new species into print, a practice common in his time. These were subsequently followed by adequate descriptions and figures, which were then reprinted as "Observations on the Genus Unio." Only page references are included here for this work, as the plates and figures were not renumbered, but are the same as in the preceeding reference. Lea generally gave several localities where each of his species had been found and did not select types, but he always figured a single specimen for which he gave measurements. In lieu of the use of the word 'type,' under Article 73 (b) Int. Code Zool. Nomen. (1964), this is an "equivalent expression" and these specimens are regarded as holotypes. During the early part of the century W. B. Marshall located most of these figured specimens in the USNM.

With a few mentioned exceptions, all the types and type localities were relocated. The latter are often rendered more specific from data on original labels, by references to standard atlases, modern county maps, or U.S. Geological Survey maps. These additional data are given in brackets.

Unless specifically mentioned to the contrary, all extant types have been examined. Almost none of Say's primary types have survived, and many of Conrad's are missing, whereas most of Lea's have been located.

Only pertinent references are included. Simpson (1914) and Clench and Turner (1956) are referred to only when the present synonymy is similar, or when the differences are easily reconcilable.

DESCRIPTIONS.—Within the formal description, novelty of language from one to another is introduced only when it serves to elucidate the differences between the species. The discussion of the various characters follows the same sequence throughout. The measurements are only intended to convey the general size of specimens from a given station or to illustrate sexual dimorphism when relevant.

HABITAT.—Given only as observed in the Florida peninsula.

REMARKS.—These are designed primarily to aid in differentiating one species from another within the Apalachicolan, Southern Atlantic Slope, and peninsular Florida regions.

RANGE.—The range covers the total area even for widely distributed species.

SPECIMENS EXAMINED.—The records, limited to the area of the study, are based mostly on specimens in the major collections mentioned above under abbreviations. All specimens listed have been examined. Sometimes the same records are found in several museums, and those in the MCZ are given preference. It is to be assumed that all records are in this museum, unless specifically mentioned to the contrary.

Insofar as possible, the records are arranged from headwaters to the mouth of the rivers, and from west to east or south to north.

FIGURES.—When available, types are generally used to illustrate the various species. Often more than one illustration is included to show intraspecific variation. Some of the data on the plate captions are not repeated elsewhere.

## SUPERFAMILY UNIONACEA Thiele 1935
## Family UNIONIDAE (Fleming 1828) Ortmann 1911
## Subfamily UNIONINAE (Swainson 1840) Ortmann 1910
## Genus *Elliptio* Rafinesque
## Subgenus *Elliptio* Rafinesque

*Elliptio* Rafinesque, 1819, Jour. de Physique, de Chimie, d'Hist. Nat. (Paris), 88: 426 [*nomen nudum*]. Rafinesque, 1820, Ann. Gén. des Sci. Physiques (Bruxelles), 5: 291. Species listed: *E. nigra* Rafinesque, *E. crassa* (Say), *E. viridis* Rafinesque, *E. fasciata* Rafinesque.

TYPE SPECIES—*Unio nigra* Rafinesque. Subsequent designation, Ortmann, 1912, Ann. Carnegie Mus., 8: 266. The previous use of *Unio crassidens* Lamarck as type species by Simpson, (1900, Proc. U.S. Natl. Mus., 22: 700) is invalid because Rafinesque did not include Lamarck's name in his list of species. H.B. Baker (1964, Nautilus, 78: 33) pointed out that Rafinesque consistently used *Elliptio* as feminine (e.g. *E. nigra*) and that therefore the name should be thus treated.

Speciation within *Elliptio* has occurred primarily in the Apalachicolan, peninsular Florida, and Southern Atlantic Slope regions. In these regions the species of *Elliptio* are the most abundant Unionidae. *Elliptios* are often found in environments where no other Unionidae live, as some of them have an unusually wide environmental tolerance, even to silting and pollution. As a consequence some of the species have developed many ecophenotypes, and at a given station there often appears to be less interspecific variation than intraspecific variation between localities. This has led to a plethora of names applied to the several species.

### *Elliptio (Elliptio) dariensis* (Lea)
Figures 3A, 5A-C

*Unio dariensis* Lea 1842, Trans. Amer. Philos. Soc., 8: 246 pl. 26, fig. 61 ([Altamaha River] near Darien [McIntosh Co.], Georgia; figured holotype USNM 85691). Lea, 1842, Obs. Unio, 3: 84.

*Unio monroensis* Lea 1843, Desc. Twelve Uniones. (Lake Monroe, Florida). Lea, 1846, Trans. Amer. Philos, Soc., 9: 279 pl. 41, fig. 8; figured holotype USNM 85169. Lea, 1848, Obs. Unio, 4: 37.

*Unio websterii* B.H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 113, pl. 2, fig. 2 (Lake Woodruff, Volusia Co., Florida; lectotype USNM 125697, selected by Johnson, 1967, Occ. Papers on Moll., 3: 10, pl. 7, fig. 2).

*Unio hartwrightii* B.H. Wright 1896, Nautilus, 9: 121, pl. 2, figs. 4-6 (Lake Beresford [Volusia Co.], Florida; holotype USNM 151031, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 6, pl. 7, fig. 1 and the type locality further restricted on the basis of the original label to: [St. Johns River], Blue Springs [3 mi. S Lake Beresford, Volusia Co.], Florida).

*Elliptio (Elliptio) dariensis* (Lea). Johnson, 1970, Bull. Mus. Comp. Zool., 140 (6): 310, pl. 6.

DESCRIPTION.—Shell often large, exceeding 100 mm in length. Outline subrhomboidal or subtrapezoidal. Valves rather flat to subinflated, thin but strong, inequilateral. Anterior end regularly rounded; posterior end occasionally a little produced and slightly biangulate, but more often obliquely truncated. Ventral margin straight or slightly curved. Dorsal margin straight, forming a sharp angle with the obliquely descending posterior margin. Posterior ridge usually very sharp with a faint secondary ridge above. Posterior slope rather broad, but well defined, with numerous wrinkles on it. Umbos full to inflated, but rather low, located in the anterior third of the shell, their sculpture consisting of five or six double-looped bars, slightly more elevated and angular behind the sinus. Periostracum smooth and yellowish with fine green rays when young, becoming darker greenish-yellow, dark chestnut, or blackish; generally smooth on the disk but sometimes roughened, especially on the posterior slope.

Left valve with two heavy, rough pseudocardinal teeth, the more anterior one slightly smaller and a little lower. Hinge line rather short and broad with two short slightly curved, granular, lateral teeth. Right

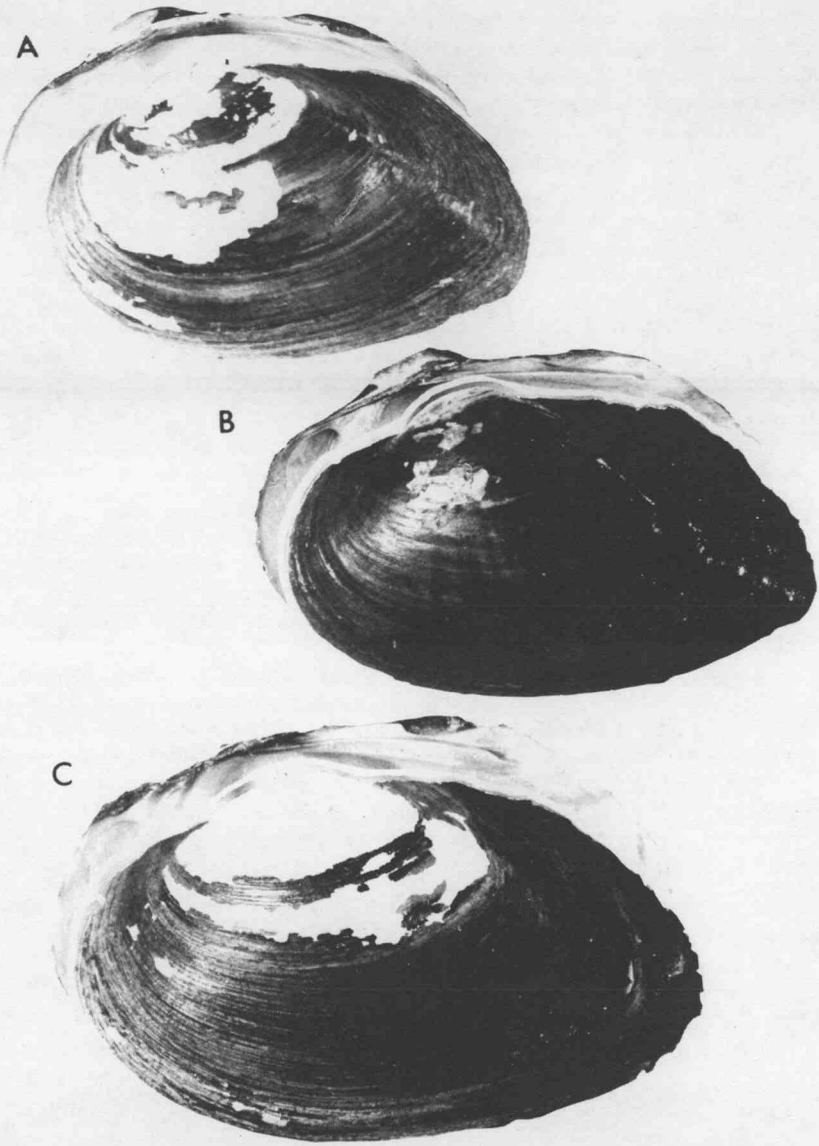



Figure 5[1]. *Elliptio (Elliptio) dariensis* (Lea). A. Holotype of *Unio monroensis* Lea. Lake Monroe, Florida. USNM 851691. L 69, H 42, W 26. B. Holotype of *Unio hartwrightii* B. H. Wright. [St. Johns River], Blue Springs [3 mi. S of Lake Beresford, Volusia Co.], Florida. USNM 151031. L 78, H 47, W 31. C. Lectotype of *Unio websteri* B. H. Wright. Lake Woodruff, Volusia Co., Florida. USNM 125697. L 96, H 57, W 33.

[1] All figures slightly reduced. Measurements in mm: L = length, H = height, W = width.

valve with one chunky, serrated pseudocardinal; one lateral tooth. Beak cavities shallow, with a few dorsal muscle scars under the hinge plate. Anterior adductor muscle scars deep, posterior ones and palial line distinct. Nacre generally purple, sometimes white, occasionally yellow.

MEASUREMENTS.—L 106 mm, H 60 mm, W 37 mm (St. Johns River [town of] Lake Monroe, Seminole Co.); L 96 mm, H 57 mm, W 33 mm (Lake Woodruff, Volusia Co., lectotype of *U. websteri* Wright); L 78 mm, H 47 mm, W 31 mm (St. Johns River, Blue Springs, 3 mi. S of Lake Beresford, Volusia Co., holotype of *U. hartwrightii* Wright).

HABITAT.—Generally found in sand, in flowing water.

REMARKS.—*Elliptio dariensis* (Lea) is restricted to the St. Johns River system, Florida, and the Altamaha River system, Georgia. In the latter system it reaches its greatest size, some individuals exceeding 130 mm in length. It is close to *Elliptio c. crassidens* (Lamarck) of the Apalachicolan region, but the shell of *dariensis* is never as ponderous; the posterior ridge is consistently much sharper, especially in immature individuals; and the posterior slope, though generally wrinkled, does not have the strong radial pattern of *E. c. crassidens*.

The especially sharp posterior ridge and relatively thin shell with its yellowish, finely green-rayed periostracum that becomes dark chestnut, separate this species from any other in peninsular Florida.

RANGE.—Peninsular Florida: St. Johns River system. Southern Atlantic Slope: Altamaha River system, Georgia.

SPECIMENS EXAMINED.—ST. JOHNS RIVER DRAINAGE. Econlockhatchee River, near confluence with St. Johns River; St. Johns River, 1 mi. ESE of Osceola; St. Johns River, 4 mi. E of Sanford; St. Johns River [town of] Lake Monroe; Lake Monroe; all Seminole Co. Lake Beresford; Lake Woodruff, both Volusia Co. St. Johns River, Georgetown; Putnam Co. (FSM). LAKE REGION DRAINAGE. Lake Virginia, near entrance of Lake Sue Canal, Winter Park; Orange Co. BLACK CREEK DRAINAGE. North Fork, Black Creek, 14 mi. SW of Orange Park, Clay Co.

### *Elliptio (Elliptio) icterina* (Conrad)
Figures 2C, 6A-H

*Unio icterinus* Conrad, [May] 1834, New Fresh Water Shells United States, p. 41, pl. 6, fig. 5 (muddy shore, Savannah River, opposite Augusta [Richmond Co.], Georgia; figured holotype ANSP 41381). Published in May, *teste* Conrad, 1853, Proc. Acad. Nat. Sci. Phila., 6: 244, and not disputed by Lea, 1854, Proc. Acad. Nat. Sci. Phila., 7: 336-349. Conrad, 1836, Monography Unionidae, no. 4, p. 39, pl. 18, fig. 2.

*Unio raveneli* Conrad, [May] 1834, New Fresh Water Shells United States, p. 39, pl. 6, fig. 4 (Wateree Canal; since found in the small creeks near Cooper River; vicinity of Santee Canal; *all* South Carolina; 2 syntypes ANSP 41370, the smaller one agrees with Conrad's description, but is not the figured specimen, which appears to be *Elliptio complanata* (Lightfoot). The second specimen is *Elliptio lanceolata* (Lea); *non Unio ravenelianus* Lea, 1834).

*Unio watereensis* Lea 1836, Synopsis Unionidae, p. 31. New name for *Unio raveneli* Conrad, 1834, *non Unio ravenelianus* Lea, 1834. As pointed out by Simpson, 1900, Proc. U.S. Nat. Mus., 22: 748; this change was unnecessary.

*Unio confertus* Lea, [August or September] 1834, Trans. Amer. Philos. Soc., 5: 103, pl. 16, fig. 47 (Santee Canal, South Carolina; type not in USNM [presumed lost]). Lea, 1834, Obs. Unio, 1: 215. Published in August or September 1834, *teste* Lea, 1854, Proc. Acad. Nat. Sci. Phila., 7: 244.

*Unio lugubris* Lea 1834, Trans. Amer. Philos. Soc., 6: 30, pl. 9, fig. 25 ([Altamaha River], Hopeton, near Darien [McIntosh Co.], Georgia; figured holotype USNM 85638). Lea, 1838, Obs. Unio, 2: 30, *non* Say, 1832.

*Unio geddingsianus* Lea 1840, Proc. Amer. Philos. Soc., 1: 285 (Congaree River, South Carolina). Lea, 1842, Trans. Amer. Philos. Soc., 8: 202, pl. 11, fig. 15; figured holotype USNM 85650. Lea, 1842, Obs. Unio, 3: 40.

*Unio fuscatus* Lea 1843, Desc. Twelve Uniones (Black Creek, Florida). Lea, 1846, Trans. Amer. Philos. Soc., 9: 277, pl. 40, fig. 4; figured holotype USNM 85243. Lea, 1848, Obs. Unio, 4: 35.

*Unio occultus* Lea 1843, Desc. Twelve Uniones (Black Creek; Lake Monroe; *both* Florida). Lea, 1846, Trans. Amer. Philos. Soc., 9: 279, pl. 41, fig. 7; figured holotype USNM 85247, from Black Creek. Lea, 1848, Obs. Unio, 4: 37.

*Unio limatulus* Conrad 1849, Proc. Acad. Nat. Sci. Phila., 4: 154 (Savannah River, [Georgia]; type not in ANSP [presumed lost]). Conrad, 1850, Jour. Acad. Nat. Sci. Phila., (2) 1: 276, pl. 37, fig. 9. Conrad, 1853, Proc. Acad. Nat. Sci. Phila., 6: 251.

*Unio tuomeyi* Lea 1852, Trans. Amer. Philos. Soc., 10: 256, pl. 13, fig. 4 (Abbeville District [Savannah River drainage], South Carolina; figured holotype USNM 85669). Lea, 1852, Obs. Unio, 5: 12.

*Unio whiteianus* Lea 1852, Trans. Amer. Philos. Soc., 10: 258, pl. 14, fig. 8 (near Savannah [Chatham Co.], Georgia; figured holotype USNM 85658). Lea, 1852, Obs. Unio, 5: 14.

*Unio barrattii* Lea 1852, Trans. Amer. Philos. Soc., 10: 256, pl. 13, fig. 5 (Abbeville District [Savannah River drainage], South Carolina; figured holotype USNM 86010). Lea, 1852, Obs. Unio, 5: 12.

*Unio pullatis* Lea 1856, Proc. Acad. Nat. Sci. Phila., 8: 262 (Creeks near Columbus [Muscogee Co.], Georgia). Changed to:

*Unio pullatus* Lea 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 57, pl. 8, fig. 39; figured holotype USNM 86020. Lea, 1858, Obs. Unio, 6: 57.

*Unio coruscus* Gould 1856, Proc. Boston Soc. Nat. Hist., 6: 15 (River Saint John's, near Lake Beresford, Florida; measured holotype MCZ 169097, figured by Frierson, 1911, Nautilus, 25, pl. 1, figs. 1-3 and by Johnson, 1964, U.S. Natl. Mus., Bull. no. 239, p. 60, pl. 32, fig. 3).

*Unio micans* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 85 (Catawba River, Gaston Co.; Deep River, Gulf [Chatham Co.]; *both* North Carolina). Lea, 1862, Jour. Acad. Nat. Sci. Phila., (2) 5: 59, pl. 3, fig. 207; figured holotype USNM 85077 from the Catawba River. Lea, 1862, Obs. Unio, 8: 63.

*Unio obnubilus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 169 (Buckhead Creek,

Burke Co., Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 84, pl. 17, fig. 64; figured holotype USNM 85646. Lea, 1858, Obs. Unio 6: 84.

*Unio opacus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 169 (Buckhead Creek, Burke Co., Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 86, pl. 18, fig. 66; figured holotype USNM 85546. Lea, 1858, Obs. Unio, 6: 86.

*Unio similis* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 169 (Buckhead Creek, Burke Co., Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 91, pl. 19, fig. 71; figured holotype USNM 85653. Lea, 1858, Obs. Unio, 6: 91.

*Unio sublatus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 169 ([Chattahoochee River], Uchee Bar, below Columbus [Muscogee Co.], Georgia). Lea, 1858 Jour. Acad. Nat. Sci. Phila., (2) 4: 82, pl. 16, fig. 62; figured holotype USNM 85897. Lea, 1858, Obs. Unio, 6: 82.

*Unio viridicatus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 170 (Buckhead Creek, Burke Co., Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 87, pl. 18, fig. 67; figured holotype USNM 85551. Lea, 1858, Obs. Unio, 6: 87.

*Unio tetricus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 170 (Flint River, near Albany [Dougherty Co.], Georgia). Lea, 1859, Jour. Acad. Nat. Sci. Phila., (2) 4: 195, pl. 22, fig. 78; figured holotype USNM 85655. Lea, 1859, Obs. Unio, 7: 13.

*Unio aequatus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 170 (Buckhead Creek, Burke Co., Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 89, pl. 19, fig. 69; figured holotype USNM 85561. Lea, 1858, Obs. Unio, 6: 89.

*Unio aquilus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 172 (Flint River, Macon [County], Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 92, pl. 20, fig. 72; figured holotype USNM 85993. Lea, 1858, Obs. Unio, 6: 92.

*Unio viridiradiatus* Lea 1859, Proc. Acad. Nat. Sci. Phila., 11: 154 (Big Uchee River [=Creek, Russell Co., Alabama] near Columbus, Georgia). Lea, 1860, Jour. Acad. Nat. Sci. Phila., (2) 4: 336, pl. 53, fig. 161; figured holotype USNM 86018). Lea, 1860, Obs. Unio, 8: 18.

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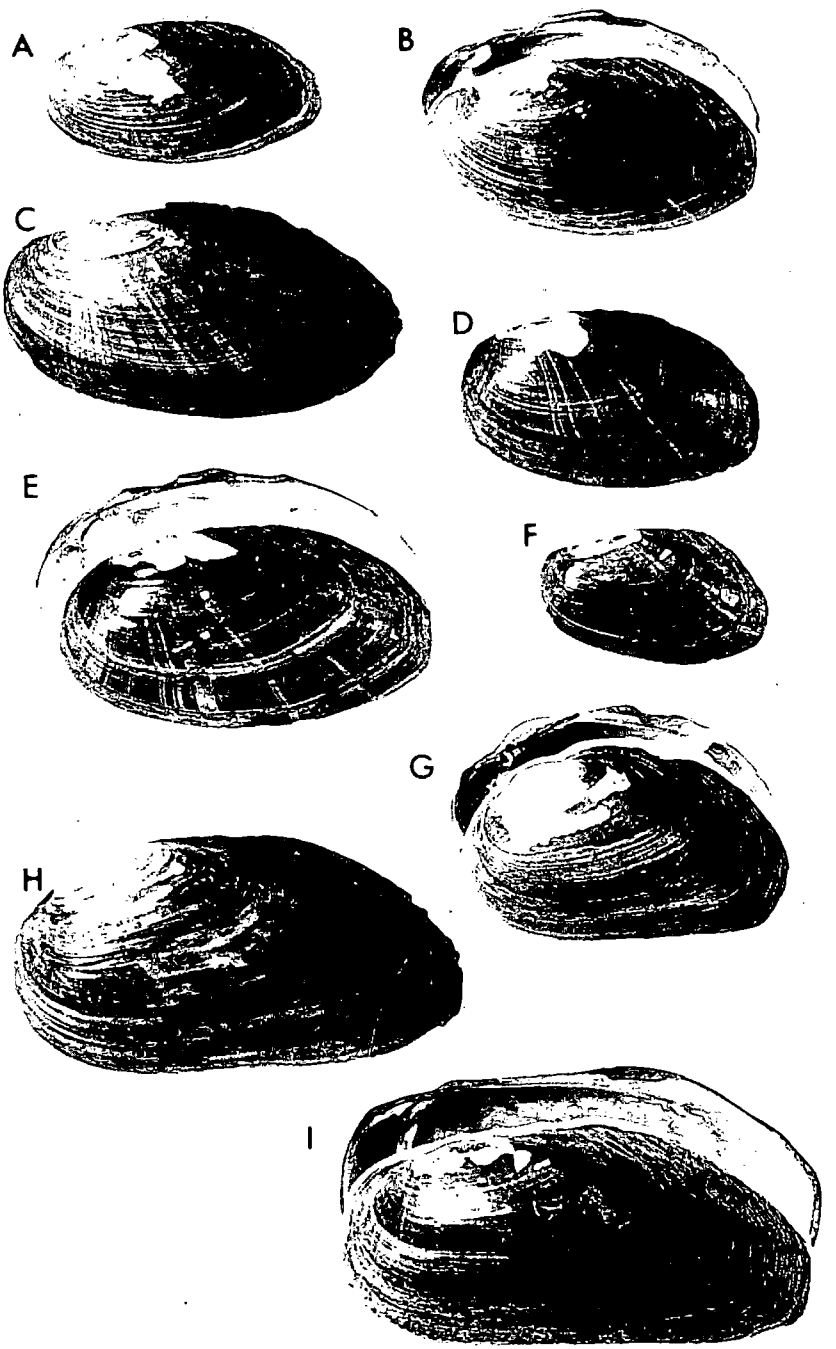
FIGURE 6[1]. *Elliptio (Elliptio) icterina* (Conrad). A. Holotype of *Unio fuscatus* Lea. Black Creek, Florida. USNM 85243. L 43, H 23, W 13. B. Holotype of *Unio occultus* Lea. Black Creek, Florida. USNM 85247. L 52, H 38, W 19. C. Holotype of *Unio simpsoni* B.H. Wright. Lake Woodruff, Volusia Co., Florida. USNM 151038. L 59, H 31, W 16. D. Holotype of *Unio fryanus* B.H. Wright, Lake Ashby, Volusia Co., Florida. USNM 151032. L 44, H 25, W 16. E. Lectotype of *Unio burtchianus* S.H. Wright. St. Marys River, Nassau Co., Florida. USNM 149653. L 52, H 29, W 18. F. Lectotype of *Unio diazensis* S. H. Wright. Lake Diaz, Volusia Co., Florida. USNM 149652. L 34, H 20, W 13. G. Holotype of *Elliptio maywebbae* B. H. Wright. Near Seminole Springs [*3.4 mi. NE Sorrento*], 15 mi. SE of Eustis [Lake Co.], Florida. USNM 425354. L 52, H 30, W 23. H. Holotype of *Unio nolani* B. H. Wright. Creek flowing into St. Johns River, near Palatka [Putnam Co.], Florida. USNM 151030. L 71, H 36, W 22.

*Elliptio (Elliptio) buckleyi* (Lea). I. Holotype of *Unio pinei* B. H. Wright. Unnamed lake in the Witthacoochee [Withlacoochee] River region of Hernando Co., Florida. USNM 150127. L 74, H 34, W 22.

[1] Slightly reduced; measurements in mm, L = length, H = height, W = width.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*Unio hepaticus* Lea 1859, Proc. Acad. Nat. Sci. Phila., 11: 154 (Salkahatchie River, South Carolina). Lea, 1860, Jour. Acad. Nat. Sci. Phila., (2) 4: 348, pl. 57, fig. 173; figured holotype USNM 85559. Lea, 1860, Obs. Unio, 8:30.

*Unio viridans* Lea 1859, Proc. Acad. Nat. Sci. Phila., 11: 170 (near Columbus [Muscogee Co.], Georgia). Lea, 1860, Jour. Acad. Nat. Sci. Phila., (2) 4: 337, pl. 54, fig. 162; figured holotype USNM 85579. Lea, 1860, Obs. Unio, 8: 19.

*Unio verutus* Lea 1859, Proc. Acad. Nat. Sci. Phila., 11: 171 (Flat Rock Creek, near Columbus [Muscogee Co.], Georgia). Lea, 1860, Jour. Acad. Nat. Sci. Phila., (2) 4: 335, pl. 53, fig. 160; figured holotype USNM 85899. Lea, 1860, Obs. Unio, 8: 17.

*Unio ocmulgeensis* Lea 1861, Proc. Acad. Nat. Sci. Phila., 13: 38 (Little Ocmulgee River, Lumber City [Telfair Co.], Georgia). Lea, 1862, Jour. Acad. Nat. Sci. Phila., 5: 95, pl. 14, fig. 243; figured holotype USNM 85901. Lea, 1862, Obs. Unio, 8: 99.

*Unio merceri* Lea 1862, Proc. Acad. Nat. Sci. Phila., 14: 169 (Lee Co., [Flint River drainage], Georgia). Lea, 1862, Jour. Acad. Nat. Sci. Phila., (2) 5: 209, pl. 31, fig. 278; figured holotype USNM 86057. Lea, 1863, Obs. Unio, 9: 31.

*Unio lucidus* Lea 1863, Proc. Acad. Nat. Sci. Phila., 15: 192 (Livingston's Creek, Brunswick Co., [NE corner of Columbus Co., Cape Fear River drainage], North Carolina). Lea, 1866, Jour. Acad. Nat. Sci. Phila., (2) 6: 9, pl. 2, fig. 6; figured holotype USNM 85242. Lea, 1867, Obs. Unio, 11: 13.

*Unio livingstonensis* Lea 1863, Proc. Acad. Nat. Sci. Phila., 15: 192 (Livingston's Creek, Brunswick Co., [NE corner of Columbus Co., Cape Fear River drainage] North Carolina). Lea, 1866, Jour. Acad. Nat. Sci. Phila., 6: 14, pl. 4, fig. 11; figured holotype USNM 85536. Lea, 1867, Obs. Unio, 11: 18.

*Unio ablatus* [*sic*] Lea 1863, Proc. Acad. Nat. Sci. Phila., 15: 193 (Long Creek, Gaston Co., North Carolina). Changed to:

*Unio oblatus* Lea 1866, Jour. Acad. Nat. Sci. Phila., (2) 6: 13, pl. 4, fig. 10; figured holotype USNM 86001. Lea, 1867, Obs. Unio, 11: 17.

*Unio radiolus* Lea 1871, Proc. Acad. Nat. Sci. Phila., 23: 192 (Ogeechee River, Liberty Co., Georgia). Lea, 1874, Jour. Acad. Nat. Sci. Phila., (2) 8: 21, pl. 6, fig. 18; figured holotype USNM 85621. Lea, 1874, Obs. Unio, 13: 25.

*Unio cuspitatus* Lea 1872, Proc. Acad. Nat. Sci. Phila., 24: 159 (Buckhead Creek, Burke Co., Georgia; Abbeville District [Savannah River drainage], South Carolina). Lea, 1874, Jour. Acad. Nat. Sci. Phila., (2) 8: 43, pl. 14, fig. 50; figured holotype USNM 86014, from Buckhead Creek. Lea, 1874, Obs. Unio, 13: 47.

*Unio hastatus* Lea 1873, Proc. Acad. Nat. Sci. Phila., 25: 423 (New Market, Abbeville District [Savannah River drainage], South Carolina). Lea, 1874, Jour. Acad. Nat. Sci. Phila., (2) 8: 56, pl. 19, fig. 54; figured holotype USNM 86013. Lea, 1874, Obs. Unio, 13: 60.

*Unio fryanus* B.H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 113, pl. 2, fig. 1 (Lake Ashby, Volusia Co., Florida; figured holotype USNM 151032, re-figured by Johnson, 1967, Occ. Papers on Moll., 3: 6, pl. 8, fig. 5).

*Unio nolani* B. H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 116, pl. 4, fig.

11 (a creek flowing into St. Johns River, near Palatka [Putnam Co.], Florida; holotype USNM 151030, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 7, pl. 10, fig. 4).

*Unio simpsoni* B.H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 117, pl. 5, fig. 1 (Lake Woodruff, Volusia Co., Florida; holotype USNM 151038, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 8, pl. 8, fig. 2).

*Unio burtchianus* S.H. Wright 1897, Nautilus, 10: 137 (St. Marys River, Nassau Co., Florida; lectotype USNM 149653, selected by Johnson, 1967, Occ. Papers on Moll., 3: 5, pl. 8, fig. 4, possibly the specimen figured by Simpson, 1900, Proc. Acad. Nat. Sci. Phila., p. 80, pl. 4, fig. 8).

*Unio diazensis* S.H. Wright 1897, Nautilus, 11: 5 (Lake Diaz, Volusia Co., Florida; lectotype USNM 149652, selected by Johnson, 1967, Occ. Papers on Moll., 3: 6, pl. 8, fig. 6).

*Unio dispalans* B.H. Wright 1899, Nautilus, 13: 50 (Suwannee River, Florida; holotype USNM 159986, figured by Simpson, 1900, Proc. Acad. Nat. Sci. Phila., p. 80, pl. 1, fig. 9. refigured by Johnson, 1967, Occ. Papers on Moll., 3: 6, pl. 8, fig. 3).

*Unio singularis* B.H. Wright 1899, Nautilus, 13: 75 (Spring Creek, [a branch of the Flint River], Decatur Co., Georgia; measured holotype USNM 159988, figured by Johnson, 1967, Occ. Papers on Moll., 3: 8, pl. 5, fig. 7).

*Elliptio maywebbae* B.H. Wright 1934, Nautilus 48: 28; 47, pl. 13, figs. 5-8 (near Seminole Springs [3.4 mi. NE Sorrento], 15 miles SE Eustis [Lake Co.], Florida, refigured by Johnson 1967, Occ. Papers on Moll., 3: 7, pl. 10, fig. 3).

*Elliptio cylindraceus* Frierson 1927, Check List North American Naiades, p. 29, new name for *Unio lugubris* Lea, 1838, *non* Say, 1832.

*Elliptio strigosus* (Lea). *partim.* Clench and Turner, 1956, Bull. Florida State Mus., 1: 165.

*Elliptio (Elliptio) icterina* (Conrad). Johnson, 1970, Bull. Mus. Comp. Zool., 140 (6): 325, pl. 9, figs. 2-10, pl. 10, figs. 1-3.

DESCRIPTION.—Shell generally small to medium, seldom reaching over 100 mm in length. Outline variable; subquadrate, to subelliptical, sometimes rather pointed. Valves subinflated, subsolid to very solid, inequilateral. Anterior end regularly rounded; posterior end generally biangulate near the base, though sometimes rather produced and pointed. Ventral margin straight or slightly arcuate, sometimes obliquely descending. Dorsal margin slightly curved or almost straight, meeting the obliquely descending posterior margin in a more or less distinct angle. Hinge ligament long and low. Posterior ridge broadly rounded, generally faintly double. Posterior slope flat to slightly concave, sometimes with very faint radial sculpture present. Umbos broad and full but very low, located in the anterior quarter of the shell, their sculpture consisting of several double-looped ridges. Disk surface generally flat or slightly concave when an umbonal-ventral sulcus is present. Periostracum generally fine and shiny, though sometimes heavy and rough, black, brownish-black, yellowish-brown, or bright yellow, chestnut, often with numerous very fine green rays.

Left valve with two stumpy pseudocardinal teeth, one in front of the other, often of about equal height. Hinge line short and narrow; two long, straight lateral teeth. Right valve with two roughly parallel pseudocardinals, the posterior one apt to be serrated and chunky, the more anterior one low and vestigial; one lateral tooth. Beak cavities very shallow, with a few dorsal muscle scars. Anterior and posterior adductor muscle scars and pallial line all distinct. Nacre generally purplish, though sometimes salmon, bluish-white, or pinkish; posteriorly iridescent.

MEASUREMENTS.—L 85 mm, H 41 mm, W 29 mm (Black Creek, 2 mi. E of [town of] Kingsley Lake, Clay Co.); L 76 mm, H 39 mm, W 27 mm (Lake Beresford, Volusia Co.); L 56 mm, H 30 mm, W 17 mm (Magnesia Springs, 3.5 mi. W of Hawthorne, Alachua Co.).

HABITAT.—Found in lakes, ponds, small streams and large rivers in nearly every type of substrate. *Elliptio icterina* (Conrad) is sometimes found with *E. buckleyi* (Lea) and other Unionidae, but like *E. buckleyi* it is often found alone. One or the other of these species is generally more abundant than other unionids at a given station.

REMARKS.—*Elliptio icterina* (Conrad) is a highly variable species and a number of populations have been named, some several times over. While some populations are often more or less identifiable, there is usually a gradual transition between one river system and the next, such that while specimens from extremes of the range bear little resemblance to one another, there appears to be no point at which subspecies can be separated. There is often a great deal of ecophenotypical variation, even at what appears to be a single station, the extremes usually connected by intergrades.

In the Apalachicolan region *E. icterina* can be confused with *E. complanata* (Lightfoot) (Johnson, 1970: 314) and *E. arctata* (Conrad) (Johnson, 1970:331). The latter is a rare species outside the Alabama River system. It is distinctly and consistently arcuate with compressed valves, whereas *icterina* has a generally straight or curved ventral margin, is bluntly or acutely pointed posteriorly, and when occasionally produced postbasally, the valves are somewhat inflated. *Elliptio icterina* occurs with *E. complanata* in the Chattahoochee River system, and it can be distinguished from *E. complanata* by its less rhomboidal, more elongate, often pointed shape.

The most common form *E. icterina* takes in the Apalachicolan region is subrhomboidal to subelliptical, sometimes appearing quite pointed posteriorly if the biangulated posterior ridge ends near the medial line. The tendency to be pointed is more prevalent in specimens from the Apalachicolan region and western rivers of peninsular Florida than in those from the Southern Atlantic Slope. The similarity between the populations of this species from the Chattahoochee River and the upper Savannah River, first noted in the localities of some of the taxa Isaac Lea described, affords evidence of the commingling of the headwaters of these two systems. The shell form just described includes most of the taxa Simp-

son (1914, 2: 661) grouped under *U. tuomeyi* Lea and Clench and Turner (1956: 165-169) under *Elliptio strigosus* (Lea).

Noteworthy are the populations from Moccasin Creek of Econfina Creek, Bay Co., Florida, on the Gulf Coast; Black Creek, Florida; St. Marys and Canoochee Rivers, Georgia; all on the Atlantic Slope, which resemble one another more than they do those from the several intervening river systems. The shells from these rivers tend to be solid, to be more uniformly biangulate posteriorly, and to have a rather characteristic yellowish-brown to shiny chestnut periostracum often with fine dark green rays.

In northern Florida is a smaller ecophenotype that lives in lakes. It has a heavy shell and tends to be generally oval.

In the Wekiva and Oklawaha Rivers of the St. Johns River system, Florida, occurs a very thin, compressed subrhomboidal ecophenotype, the shells of which end in a broad biangulation below the medial line, but which tend to become heavier, more inflated, and produced post-basally toward the headwaters of the streams and in springs. This shell form occurs again in abundance in Buckhead Creek of the Ogeechee River system, Georgia which, like these Floridian rivers, is rich in carbonates; it also occurs in Brier Creek of the Savannah River system, Georgia, and the Salkahatchie River, South Carolina. That the shape of the shell is environmentally controlled is illustrated by the close resemblance of shells from Magnesia Springs, 3 mi. W Hawthorne, Alachua Co., Florida, the headwaters of the Ogeechee River, and Cedar Spring, 2 mi. SE Bamberg, Bamberg Co., South Carolina. Though from widely separated drainage systems, shells from these stations bear a closer resemblance to one another than to specimens from other stations in their respective drainage systems. The shell form just described includes most of the taxa Simpson (1914) grouped under *Unio obnubilis* Lea (p. 641) and some of those under *Unio confertus* Lea (p. 639).

Some specimens of *E. icterina*, especially from the tidal areas of Atlantic Slope rivers, are elongate and inflated with a tendency for the ventral margin to be slightly arcuate. The periostracum is often rough and black. This shell form includes most of the taxa Simpson (1914: 639) grouped under *Unio confertus* Lea.

On the Atlantic Slope of Georgia, *E. icterina* (Conrad) is most easily confused with *E. complanata* (Lightfoot) with which it is associated at many stations, but *complanata* is quite consistently rhomboidal, and the valves are less apt to be inflated. The periostracum of *icterina* is sometimes bright yellow or chestnut and is generally more shiny and smooth than that of *complanata*.

In peninsular Florida, *E. icterina* can be confused with *E. buckleyi* (Lea), under which see Remarks. Morrison (1972: 38) regarded *Elliptio icterina* (Conrad) 1834 as a synonym of *E. congaraea* (Lea) 1831, but as Johnson (1970: 309) pointed out, *congaraea*, with its fine ridges radiating from the upper posterior ridge to the dorsal margin, is closer to *E. cras-*

*sidens crassidens* (Lamarck) than to *icterina*, which is more similar to *E. complanata* (Lightfoot) (Johnson, 1970: 328). As both *icterina* and *congaraea* are good species, Morrison's attempt to resurrect *raveneli* as the taxon for the former is unnecessary.

RANGE.—Apalachicolan region: Escambia River system, east to the St. Marys River system, Georgia. Peninsular Florida. Southern Atlantic Slope: Altamaha River system, Georgia, north to the White Oak River, North Carolina.

SPECIMENS EXAMINED.—WACCASASSA RIVER SYSTEM: Blue Springs, 3 mi. W Bronson; Waccasassa River, 4 mi. NE [town of] Otter Creek, both Levy Co. WITHLACOOCHEE RIVER SYSTEM: Withlacoochee River, 9 mi. N Dade City; Withlacoochee River, 1 mi. NW Lacoochee, both Pasco Co. Little Withlacoochee River, Rerdell; Withlacoochee River, Istachatta; both Hernando Co. Lake Tsala, Apopka, Citrus Co.; Withlacoochee River, Dunnellon; Marion Co.; Sulphur Spring, near Withlacoochee River, N Red Level; Citrus Co. HILLSBOROUGH RIVER SYSTEM: Itchepackesassa Creek; Hillsborough River, Morris Bridge, 14 mi. NE Tampa; Lake Thonotosassa, 2.5 mi. WNW Antioch; Hillsborough River, 4 mi. NE Temple Terrace; all Hillsborough Co. ALAFIA RIVER SYSTEM: Fishhawk Creek, 2 mi. S Lithia; Hillsborough Co. PEACE RIVER SYSTEM: Lake Gibson, Gibsonia; Polk Co. Payne Creek, 1.1 mi. S Bowling Green; Charley Apopka Creek, 1.5 mi. N Gardner; both Hardee Co. Horse Creek, 8 mi. W Arcadia; Charlie Creek, 3 mi. SW Nocatee; Prairie Creek; Peace River, 1.5 mi. below Arcadia; all De Soto Co. KISSIMMEE RIVER SYSTEM AND EVERGLADES: KISSIMMEE RIVER DRAINAGE: Lake Verona, Avon Park; Highlands Co. Alligator Lake, 4 mi. SE Ashton, Osceola Co. Weohyakapka Creek, 5 mi. ESE Hesperides; Lake Rosalie, 4 mi. ENE Hesperides; both Polk Co. LAKE OKEECHOBEE DRAINAGE: Seven Mile Tower Road, 3.5 mi. S Tamiami Trail, Everglades National Park; canal, W of Bridge no. 22, Tamiami Trail; both Dade Co. Snake Creek, 9 mi. W. Hallandale; Broward Co. Loxahatchee Creek, 6 mi. W Jupiter; Palm Beach Co. ST. JOHNS RIVER SYSTEM: ST. JOHNS RIVER DRAINAGE: Ditch near Lake Washington, 6 mi. W Eau Gallie; Lake Poinsett, 10 mi. WNW Coca; both Brevard Co. Puzzle Lake, 7 mi. SE Geneva; Little Econlockhatchee River, 3.5 mi. S Oviedo; Econlockhatchee River, near confluence with St. Johns River; Lake Horseshoe, Chuluota; Lake Catherine, Chuluota; Lake Jessup; Gee Creek, near North Orlando; St. Johns River, Sanford; St. Johns River, [town of] Lake Monroe; all Seminole Co. Lake Ashby, 8 mi. NE Osteen; St. Johns River, near Lake Beresford; Spring Garden Lake, 1 mi. NW De Leon Springs; all Volusia Co. Alexander Spring Creek, 5 mi. S Astor Park; Lake Co. Lake Kerr, 3 mi. SW Kerr City; Marion Co. Crescent Lake; Lake Stella, Crescent City; both Putnam Co. Lake Howell; Seminole Co. WEKIVA RIVER DRAINAGE. Seminole Springs, 15 mi. SE Eustis, Lake Co. Rock Springs Creek; Wekiva River [Seminole Co.], 12 mi. NW Winter Park; Wekiva River, 10 mi. below Rock Springs; all Orange Co. Wekiva River, 7 mi. WSW [town of] Lake Monroe; Seminole Co. Wekiva River, Rutland Ferry, 7 mi. S Sorrento, Lake Co. OKLAWAHA RIVER DRAINAGE. Lake Minneola, Clermont; Lake Lucy, 2 mi. N Groveland; both Lake Co. Mill Creek, Apopka, Orange Co. Lake Harris; Sumter Co. Lake Eustis, Tavares; Lake Saunders; Lake Griffin; all Lake Co. Lake Weir, Oklawaha; Juniper Creek, 12 mi. E Lynn; Lake Lou, 5 mi. NE Lynn; Orange Creek, 1 mi. N Orange Springs; Oklawaha River, Eureka Springs; all Marion Co. Magnesia Spring,

3.5 mi. W Hawthorne; Cross Creek, 5 mi. NW Island Grove; Hatchet Creek, Hawthorne Road, NE Gainesville; Hogtown Creek, 3 mi. SW Gainesville; all Alachua Co. Morris Lake 12 mi. N Johnson; Lake Winnott, 4 mi. S Melrose; Redwater Lake, 4 mi. W Johnson; Little Orange Creek; all Putnam Co. RICE CREEK DRAINAGE: Rice Creek, 7.3 mi. WNW Palatka, Putnam Co. HAW CREEK DRAINAGE: Lake Dias, 5 mi. ENE De Leon Springs, Volusia Co. Lake Disston, 5 mi. SW Deanville; Little Haw Creek, 2 mi. SW Deanville; both Flagler Co. BLACK CREEK DRAINAGE. Black Creek, 2 mi. E [town of] Kingsley Lake; North Fork, Black Creek, 14 mi. SW Orange Park; South Fork, Black Creek, 1 mi. SW Middleburg; South Fork, Black Creek, 8 mi. E Kingsley; Black Creek, 10 mi. NW Green Cove Springs; all Clay Co.

### *Elliptio (Elliptio) buckleyi* (Lea)
Figures 4B, 6I, 7A-G

*Unio buckleyi* Lea 1843, Desc. Twelve Uniones (Lake George and Lake Monroe, Florida). Lea, 1846, Trans. Amer. Philos. Soc. 9: 276, pl. 39, fig. 2; figured holotype USNM 85236, from Lake George. Lea, 1848, Obs. Unio, 4: 34.

*Unio cunninghami* B. H. Wright 1883, Proc. Acad. Nat. Sci. Phila., p. 58, pl. 1, figs. 1-4 (Lakes of Sumter Co., Florida; lectotype ANSP 41348a, selected by Johnson, 1967, Occ. Papers on Moll., 3: 5, pl. 13, fig. 2 and the type locality restricted to Lake Harris, Yalaha, Lake Co., Florida).

*Unio orcuttii* S. H. Wright 1888, West American Scientist, 4: 60, pl. 3 (Manatee River [Manatee Co.]; West Coast of Florida; Lake Myakka; figured holotype USNM 309971, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 7, pl. 9, fig. 1 and the type locality restricted to [Horse Creek, near] Manatee River [Manatee Co.], Florida. As this species has not been found subsequently in either the Manatee or Horse Creek drainages, the type locality is probably erroneous, and is here restricted to Upper Myakka Lake, Sarasota Co., Florida.)

*Unio dalli* B. H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 119, pl. 6, fig. 1 (Lake Beresford, Volusia Co., Florida; figured holotype USNM 151037, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 5, pl. 10, fig. 2).

*Unio dorei* B. H. Wright 1888, Proc. Acad. Nat. Sci., Phila., 115, pl. 3, fig. 1 (Lake Monroe, Florida; holotype USNM 151034, refigured by Johnson, 1967. Occ. Papers on Moll., 3: 6, pl. 9, fig. 2).

*Unio hinkleyi* B. H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 117, pl. 4, fig. 3 (Lake Monroe, Florida; holotype USNM 151033, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 7, pl. 11, fig. 1).

*Unio ferrissii* Marsh 1891, Nautilus, 5: 30 ( a small creek near Palatka [Putnam Co.], Florida; location of type not known, but figured by Simpson, 1892, Proc. U. S. Natl. Mus., 15: 423, pl. 66, figs. 1-2).

*Unio pinei* B. H. Wright 1897, Nautilus, 11: 40 (unnamed lake in Witthacoochee [Withlacoochee] River region of Hernando Co., Florida; holotype USNM 150127, figured by Simpson, 1900, Proc. Acad. Nat. Sci. Phila., p. 80, pl. 3, fig. 1, and refigured by Johnson, 1967, Occ. Papers on Moll., 3: 8, p. 10, fig. 5).

*Unio (Unio) caloosaensis* Dall 1898, Trans. Wagner Free Inst. Sci., 3 (4): 688, pl.

25, figs. 5, 12 b (Pliocene marls of the Caloosahatchie River, Florida, type USNM 107745 [not seen]).

*Unio subluridus* Simpson 1900, Proc. U. S. Natl. Mus., 15: 432, pl. 73, figs. 3-4 (Orange Springs, Volusia [Marion] Co., Florida; figured holotype USNM 104002).

*Unio tenuisculus* Frierson 1911, Nautilus, 25: 29, pl. 1, figs. 4-6 (Reedy Lake, Polk Co., Florida; lectotype, here selected, UMMZ 96321, portrayed in figs. 4, 6).

*Unio (Elliptio) sanctrumjohanium* B. H. Wright 1933, Nautilus, 47: 17, pl. 1 (Lake Druid, near Floral City [Citrus Co.] Florida; holotype USNM 424738, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 8, pl. 9, fig. 3).

*Unio (Elliptio) webbianus* B. H. Wright 1934, Nautilus, 47: 94, pl. 10, figs. 1-2 (Lake Consuelo [or Little Lake, SE Floral City, just outside village limits] near Floral City, Citrus Co., Florida; holotype USNM 424923, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 10, pl. 9, fig. 4).

*Unio (Elliptio) webbianus hartii* B. H. Wright 1934, Nautilus, 47: 95, pl. 10, figs. 3-4 (Lake Consuelo [or Little Lake, SE Floral City, just outside village limits] near Floral City, Citrus Co., Florida; holotype USNM 424925, refigured by Johnson, 1967, Occ. Papers on Moll., 3: 6, pl. 9, fig. 5).

*Popenaias buckleyi* (Lea). Heard and Guckert, 1970, Malacologia, 10: 340, 348.

DESCRIPTION.—Shell generally small to medium, seldom reaching 100 mm in length. Outline somewhat variable though generally subtrapezoidal, sometimes obovate. Valves subinflated to inflated, subsolid to very solid, inequilateral. Anterior end often subtruncate, sometimes regularly rounded; posterior end slightly biangulate near the base, but not very produced. Ventral margin straight or slightly curved. Dorsal margin straight, sometimes forming a wing and a sharp angle with the obliquely descending posterior margin hinge ligament short and low. Posterior ridge often rather sharp, though sometimes rounded. Posterior slope rather flat, occasionally with faint radial sculpture. Umbos rather full and high, located in the anterior third of the shell, their sculpture consisting of several double-looped ridges. Disk surface flat. Periostracum varying from fine and shiny

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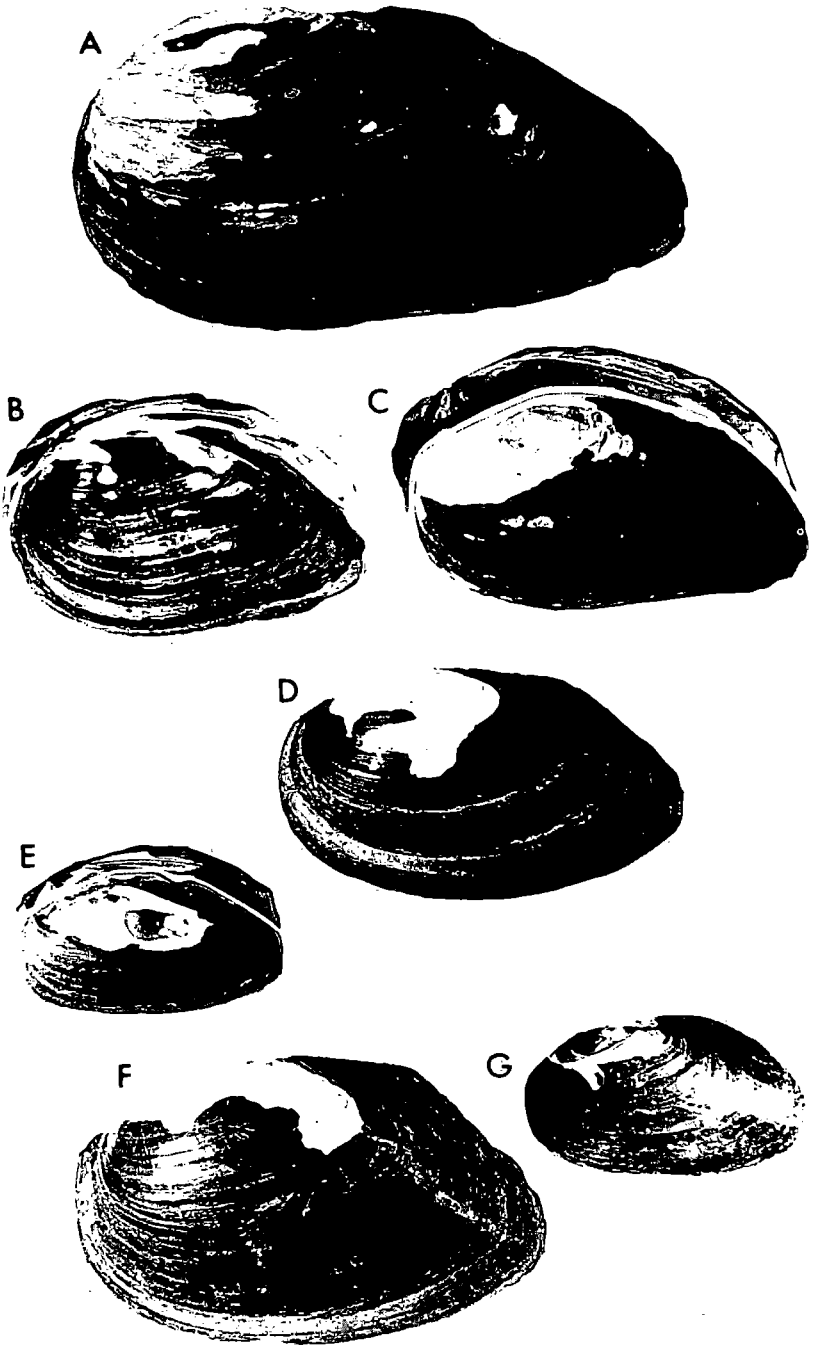
FIGURE 7[1]. *Elliptio (Elliptio) buckleyi* (Lea). A. Holotype of *Unio buckleyi* Lea. Lake George, Florida. USNM 85236. L 93, H 48, W 38 (slightly reduced). B. Lectotype of *Unio cunninghami* B. H. Wright. [Lake Harris, Yalaha, Lake Co.], Florida. ANSP 41348a. L 48, H 29, W 24 (nat. size, reversed image). C. Holotype of *Unio dallii* B. H. Wright. Lake Beresford, Volusia Co., Florida. USNM 15-1037. L 63, H 35, W 21 (slightly reduced). D. Holotype of *Unio orcuttii* S. H. Wright. [Upper Lake Myakka, Sarasota Co., Florida]. USNM 308971. L 58, H 34, W 25 (slightly reduced). E. Lectotype of *Unio tenuisculus* Frierson. Reedy Lake, Polk Co., Florida, UMMZ 96312, L 36.5 H 20, W 14.5 (nat. size, reversed image); F. Holotype of *Unio dorei* B. H. Wright. Lake Monroe, [Volusia Co.], Florida. USNM 151034. L 65, H 40, W 31 (slightly reduced). G. Holotype of *Unio subluridus* Simpson. Orange Springs, Volusia [Marion] Co., Florida. USNM 104002. L 41, H 25, W 15 (slightly reduced).

[1] Measurements in mm, L = length, H = height, W = width.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yellowish or greenish with numerous darker green rays to rough and black or brownish.

Left valve with two rather variable, stumpy pseudocardinal teeth, often of equal height, but with the hinder one sometimes higher. Hinge line very short and narrow; two long, straight lateral teeth. Right valve with two roughly parallel pseudocardinals, the posterior one apt to be serrated and chunky, the more anterior one low and vestigial; one lateral tooth. Beak cavities very shallow with a few dorsal muscle scars. Anterior and posterior muscle scars and pallial line all distinct. Nacre purplish, salmon, bluish white, or pinkish, posteriorly iridescent.

MEASUREMENTS.—L 94 mm, H 50 mm, W 36 mm (Lake George, holotype of *U. buckleyi* Lea); L 73 mm, H 38 mm, W 25 mm (Lake Monroe, Volusia Co., holotype of *Unio hinkleyi* Wright); L 48 mm, H 29 mm, W 24 mm (Lake Harris, Yalaha, Lake Co., lectotype of *Unio cunninghami* Wright).

HABITAT.—Found in lakes, ponds, small streams, and large rivers, in nearly every type of substrate, but seems to prefer sandy bottoms.

REMARKS.—*Elliptio buckleyi* (Lea) is endemic to peninsular Florida and exhibits considerable variation, but it can be confused only with the considerably more variable forms of the more widely spread *E. icterina* (Conrad). *E. buckleyi* tends to be rather consistently subtrapezoidal, less apt to be produced posteriorly and generally more inflated with a distinct posterior ridge. Many specimens are characterized by the anterior dorsal margin forming a sharp angle with a somewhat truncated anterior margin.

While many examples from favorable environments are shiny yellowish-brown or greenish, sometimes with fine green rays, others, especially from some of the larger lakes, tend to have coarse brownish or blackish periostracum, are dwarfed with heavier shells, and have a tendency for the posterior end to extend below the base line. These forms from the larger lakes were named *U. cunninghami* Wright. A diminutive population in Reedy Lake, Polk Co., was named *U. tenuisculus* Frierson.

RANGE.—Peninsular Florida.

SPECIMENS EXAMINED.—WITHLACOOCHEE RIVER SYSTEM: Lake, 6 mi. NNW Panasoffkee; Lees Lake, Panasoffkee; both Sumter Co. Lake Druid, near Floral City; Little Lake, SE Floral City; Lake Tsala Apopka, Hernando; all Citrus Co. Withlacoochee River, near Inglis; Levy Co. MYAKKA RIVER SYSTEM: Myakka River, near Manatee [River]; Manatee Co. Upper Lake Myakka; Myakka River between upper and lower lakes, both Sarasota Co. PEACE RIVER SYSTEM: Lake Agnes, Polk City; Lake Gibson, Gibsonia; Lake Alfred, [town of] Lake Alfred; Lake Rochelle, 1 mi. S [town of] Lake Alfred; Lake Fannie, 3 mi. SE [town of] Lake Alfred; Lake Hamilton, 4 mi. SSW Haines City; Lake Howard, Winter Haven; Lake Silver, Winter Haven; Lake Roy, Winter Haven; Lake McLeod [town of] Eagle Lake; Dinner Lake, 1.5 mi. ESE Waverly; all Polk Co. KISSIMMEE RIVER SYSTEM AND EVERGLADES: ISTOKPOGA RIVER DRAINAGE: Lake Lee, Waverly; Lake Starr, [town of] Lake of the Hills; Lake Amoret, Highland Park; Reedy Lake, 2.5 mi. E Frostproof; Lake Arbuckle; Silver Lake, Frostproof; all Polk Co. Lake Brentwood, 2 mi. N

Avon Park; Lake Viola, N Avon Park; Lake Verona, Avon Park; Lake Lotela, 2 mi. SE Avon Park; Bonnet Lake, 3 mi. N Sebring; Dinner Lake, 2 mi. N Sebring; Lake Jackson (Rex Beach Lake), 2 mi. NW Sebring; Lake June in Winter, 3 mi. W [town of] Lake Placid; Lake Istokpoga, 6 mi. E [town of] Lake Placid; Istokpoga Canal, 4.6 mi. NW Cornwall; all Highlands Co. KISSIMMEE RIVER DRAINAGE: East Tohopekaliga Lake, Narcoossee; Emerald Lake, 1 mi. SE St. Cloud; Alligator Lake, 4 mi. SE Ashton; Tohopekaliga Lake, Kissimmee; Lake Kissimmee; all Osceola Co. Lake Hatchineka; Lake Aurora, Hesperides; Lake Rosalie, 4 mi. NE Hesperides; Tiger Lake, 7 mi. ESE Hesperides; Weohyakapa Lake, 4 mi. SE Hesperides; all Polk Co. Lake Marion, 3 mi. WNW Kenansville, Osceola Co. Kissimmee River, Basinger; Gum Tree Slough, near Basinger; Kissimmee River, 10 mi. S Basinger; Taylor Creek; all Okeechobee Co. LAKE OKEECHOBEE DRAINAGE: Fisheating Creek, Palmdale; Fisheating Creek, 1 mi. S Lakeport; Caloosahatchie River, Moore Haven; all Glades Co. Lake Okeechobee, 2 mi. N Canal Point; Lake Osborne, 2.5 mi. NW Lantana; Clear Lake, West Palm Beach; all Palm Beach Co. Lake Okeechobee, 2.4 mi. N Port Mayaca, Martin Co. ST. JOHNS RIVER SYSTEM.—ST. JOHNS RIVER DRAINAGE: St. Johns Marsh; ditch near Lake Washington, 6 mi. W Eau Gallie; Lake Poinsett, Rockledge; all Brevard Co. Puzzle Lake, 7 mi. SE Geneva; Lake Harney, 3 mi. NE Geneva; tributary of Econlockhatchee River, 2.5 mi ENE Oviedo; Lake Jessup, 5 mi. N Oviedo; St. Johns River [town of] Lake Monroe; all Seminole Co. Lake Monroe, near Enterprise; Lake Woodruff; both Volusia Co. Econlockhatchee River, E Orlando, Orange Co. St. Johns River, Crows Bluff; St. Johns River, Astor; Lake George; all Lake Co. OKLAWAHA RIVER DRAINAGE: Lake Butler, Windermere; Lake Bessie, Windermere; Lake Down, Windermere; all Orange Co. Lake Lucy, 2 mi. N Groveland; Pine Island Lake, 6 mi. S Groveland; Lake Minnehaha, 2 mi. S Clermont; Lake Minneola, Clermont; Lake Apopka, 2.5 mi. S Monteverde; all Lake Co. Lake Carleton, 2 mi. W Tangerine, Orange Co. Lake Griffin, Leesburg; Lake Beauclaire, 2 mi. S Mt. Dora; Lake Dora, Tavares; Lake Gertrude, Mt. Dora; Lake Saunders, 1 mi. E Tavares; Lake Harris, 4 mi. NW Tavares; Silver Lake, 5 mi. NW Tavares; Lake Griffin, Leesburg; Lake Eustis, Tavares; Lake Yale, Grand Island; [Haines Creek] 5 mi. W Eustis; Oklawaha River; all Lake Co. Lake Weir, Oklawaha; Oklawaha River; Lake Kerr, 3 mi. SW Kerr City; all Marion Co. Cross Creek, 5 mi. NW Island Grove, Alachua Co. Little Orange Creek, 3 mi. E Hawthorne; ditch, W of bridge, Orange Creek, Orange Spring; both Putnam Co. HAW CREEK DRAINAGE: Lake Stella, Crescent City, Putnam Co. JULINGTON CREEK DRAINAGE. Durbin Creek, 1 mi. WSW Bayard; lake on Julington Creek, 2 mi. W Bayard; both Duval Co.

*Elliptio (Elliptio) jayensis* (Lea)

Figures 3C, 8 A-F, 9A

*Unio jayensis* Lea 1838 Trans. Amer. Philos. Soc., 6: 28, pl. 9, fig. 23 (Florida; figured holotype USNM 86031). Lea 1838 Obs. Unio, 2: 28.

*Unio aheneus* Lea 1843, Desc. Twelve Uniones (Black Creek, Florida); Lea, 1846, Trans. Amer. Philos. Soc., 9: 280, pl. 41, fig. 9; figured holotype USNM 86030. Lea, 1848, Obs. Unio, 4; 38.

*Unio waltoni* B.H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 114, pl. 2, fig. 3

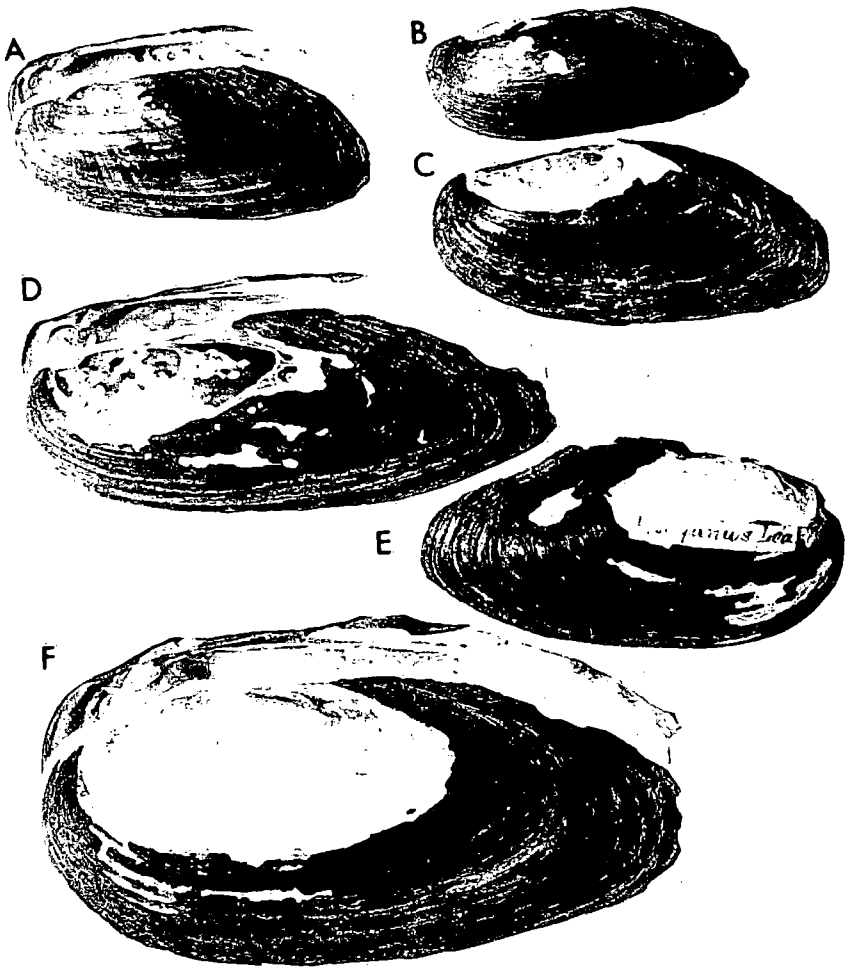


FIGURE 8[1]. *Elliptio (Elliptio) jayensis* (Lea). A. Holotype of *Unio aheneus* Lea. Black Creek, Florida. USNM 86030. L 53, H 24, W 14. B. Lectotype of *Unio buxtoni* B. H. Wright. Lakelets of Marion Co., Florida. USNM 150131. L 46, H 20, W 15. C. Lectotype of *Unio oscari* B. H. Wright. A creek from Lake Osceola, Winter Park, [Orange Co.], Florida. USNM 123526. L 59, H 26, W 23. D. Lectotype of *Unio waltoni* B. H. Wright. Lake Woodruff, Volusia Co., Florida. USNM 91145. L 78, H 28, W 16. E. Holotype of *Unio jayensis* Lea. Florida. USNM 86031. L 65, H 32, W 22 based on single valve. F. Holotype of *Unio tryoni* B. H. Wright. Lake Woodruff [Spring Garden Lake], near De Leon Springs, Volusia Co., Florida. USNM 151036. L 98, H 45, W 32.

[1] Slightly reduced, measurements in mm, L = length, H = height, W = width.

(Lake Woodruff, Volusia Co., Florida; lectotype USNM 91145 selected by Johnson, 1967, Occ. Papers on Moll., 3: 9, pl. 11, fig. 5).

*Unio marshii* B.H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 118, pl. 5, fig. 2 (Lake Woodruff, Volusia Co., Florida; holotype USNM 151028 from [St. Johns River] Blue Springs [3 mi. S Lake Beresford], refigured, and the type locality thus restricted, by Johnson, 1967, Occ. Papers on Moll., 3: 7, pl. 12, fig. 2).

*Unio tryoni* B. H. Wright 1888, Proc. Acad. Nat. Sci. Phila., p. 120 pl. 6, fig. 2 (Lake Woodruff [Spring Garden Lake] near DeLeon Springs, Volusia Co., Florida; holotype USNM 151036, refigured by Johnson, 1967, Occ Papers on Moll., 3: 9, pl. 12, fig. 1).

*Unio oscari* B. H. Wright 1892, Nautilus, 5: 124 (a creek from Lake Osceola, at Winter Park [Orange Co.], Florida). Wright, 1896, Nautilus, 9: 122, pl. 2, figs. 1-3; lectotype USNM 123526, selected by Johnson, 1967, Occ. Papers on Moll., 3: 8, pl. 11, fig. 3.

*Unio suttoni* B. H. Wright 1897, Nautilus, 11: 56 ([Smith] Lake, near Candler, Marion Co., Florida; holotype USNM 150129 figured by Johnson, 1967, Occ. Papers on Moll., 3: 9, pl. 11, fig. 2).

*Union buxtoni* B. H. Wright 1897, Nautilus, 11: 55 (Lakelets of Marion Co., Florida; lectotype USNM 150131, selected by Johnson, 1967, Occ. Papers on Moll. 3: 5, pl. 11, fig. 4).

DESCRIPTION. – Shell generally medium in size, not exceeding 70 mm in length over most of its range, except in the St. Johns River system where specimens often reach 90 mm. Outline elongate-trapezoidal, or elongate-oval, often a little more than twice as long as high. Valves usually compressed or sub-compressed, occasionally subinflated, thin to subsolid, inequilateral. Anterior end regularly rounded; posterior end more or less sharply pointed, often below the medial line. Ventral margin straight or slightly curved. Dorsal margin straight, generally forming a sharp angle with the obliquely descending posterior slope. Hinge ligament rather long and low. Posterior ridge subangular with a secondary ridge above it; the ridges sometimes cause the point to be slightly biangulate. Umbos very low, located in the anterior fourth of the shell, their sculpture consisting of corrugated, longitudinal ridges. Disks usually flat, rarely slightly concave, because of a slight umbonal-ventral sulcus. Periostracum fine, subshiny, greenish yellow, with very fine green rays of varying width, especially when young or from favorable habitats, often becoming rough and black with age.

Left valve with two stumpy pseudocardinal teeth, one in front of the other, both somewhat triangular; the hinder one may be vestigial. Hinge line rather short and narrow; two long, straight lateral teeth. Right valve with two roughly parallel pseudocardinals, the posterior one inclined to be triangular, serrated, and chunky, the more anterior one low and vestigial; one lateral tooth. Beak cavities very shallow, with a few dorsal muscle scars. Anterior and posterior adductor muscle scars and pallial

line all distinct. Nacre white, bluish-white, pinkish, purplish, posteriorly iridescent.

MEASUREMENTS.—L 93 mm, H 43 mm, W 28 mm (Lake Beresford, Volusia Co.); L 93 mm, H 33 mm, W 22 mm (Lake Woodruff, Volusia Co., paralectotype of *U. waltoni* Wright); L 57 mm, H 28 mm, W 17 mm (Little Haw Creek, 2 mi S of Deanville, Flagler Co.).

HABITAT.—Generally lives in sand, but sometimes in mud, usually where the current is not very swift.

REMARKS.—*Elliptio jayensis* (Lea) can only be confused with *E. icterina* (Conrad) and *E. buckleyi* (Lea) in peninsular Florida, but it is usually easily distinguished from either of them because it is more elongate, being generally over twice as long as high.

The shell varies considerably in the ratio of height to length, the sharpness of the posterior point, whether the point is above or below the medial line, the degree of inflation, and the thickness of the valves. When they are visible the very fine green rays of varying width are characteristic and do not resemble those of any other Floridian unionid.

*E. jayensis* is close to *E. lanceolata* (Lea) (Johnson, 1970: 333), which is found in the Apalachicolan and Atlantic Slope regions, but not in peninsular Florida. While both species exhibit many similar variations, *jayensis* is generally smaller, with a tendency to be higher posteriorly. The dorsal margins are not generally parallel, and *jayensis* has more numerous, finer, darker green rays.

*E. jayensis* (Lea) was described from a single, thin, not very characteristic valve, probably from the St. Johns River system where the species is most abundant and where individuals reach the greatest size and diversity of form, especially in the several great lakes of the system.

RANGE.—Apalachicolan region: St. Marks River system. Suwannee River system. Peninsular Florida.

SPECIMENS EXAMINED.—PITHLACHASCOTEE RIVER SYSTEM: Pithlachascotee River, 2 mi. W Gowers Corner; Pasco Co. HILLSBOROUGH RIVER SYSTEM: Hillsborough River, Morris Bridge, 14 mi. NE Tampa; Hillsborough Co. ALAFIA RIVER SYSTEM: Fishhawk Creek, 2 mi. S Lithia, Hillsborough Co. PEACE RIVER SYSTEM: Peace River Drainage. Peace River, Arcadia, De Soto Co. KISSIMMEE RIVER SYSTEM: AND EVERGLADES: ISTOKPOGA DRAINAGE. Tohopekaliga Lake, Kissimmee; Osceola Co. Lake Istokpoga, 6 mi. E [town of] Lake Placid;

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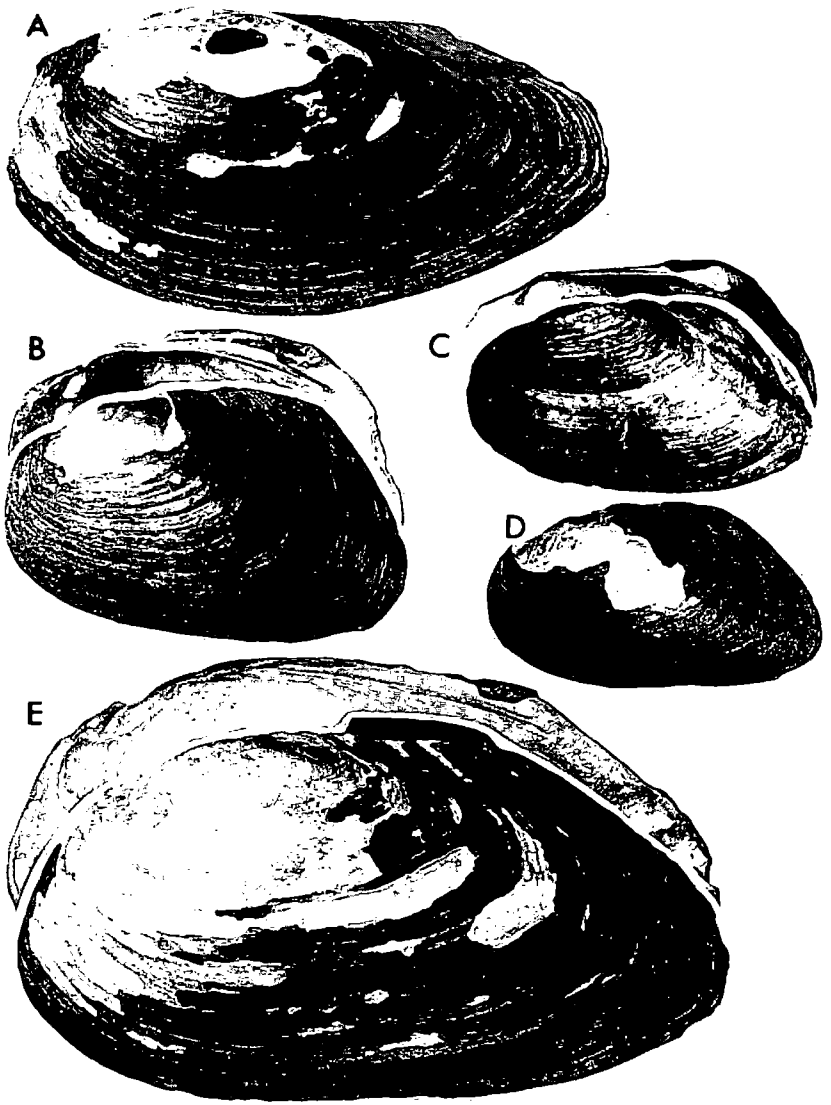
FIGURE 9[1]. *Elliptio (Elliptio) jayensis* (Lea). A. Holotype of *Unio marshii* B. H. Wright. [St. Johns River] Blue Springs [3 mi. S of Lake Beresford, Volusia Co., Florida]. USNM 151028. L 90, H 47, W 33 (slightly reduced).

*Uniomerus tetralasmus* (Say). B. Holotype of *Unio blandingianus* Lea. St. Johns River, Florida, USNM 85715. L 57, H 35, W 22 (slightly reduced). C. Holotype of *Unio jewettii* Lea. Sink of Noonan's [Newnan's] Lake, [Alachua Co.], Florida. USNM 85374. L 49, H 28, W 17 (slightly reduced). D. Lectotype of *Unio paludicolus* Gould. Everglades of Florida. MCZ 169278. L 46, H 39, W 14 (1.1 X). E. Holotype of *Unio buddianus* Lea. Lake George, Florida. USNM 85606. L 97, H 53, W 31 (slightly reduced).

[1] Measurements in mm, L = length, H = height, W = width.

Istokpoga Canal, 4.5 mi. NW Corwell; both Highlands Co. KISSIMMEE RIVER DRAINAGE. Lake Arbuckle; Lake Rosalie, 4 mi. NE Hesperides; Tiger Lake, 7 mi. ESE Hesperides; all Polk Co. LAKE OKEECHOBEE DRAINAGE. Fisheating Creek, 1 mi. S Palmdale; Caloosahatchie River, above lock, Moore Haven; all Glades Co. Canals, West Palm Beach, Palm Beach Co. Lake Okeechobee. ST. JOHNS RIVER SYSTEM: ST. JOHNS RIVER DRAINAGE. Little Econlockhatchee River, 3.5 mi. S Oviedo; Econlockhatchee River, near confluence with St. Johns River; Gee Creek, near North Orlando; St. Johns River, 4 mi. E Sanford;



all Seminole Co. Lake Ashby, 8 mi. NE Osteen; Lake Woodruff; both Volusia Co. LAKE REGION DRAINAGE. Lake Maitland, Winter Park; Creek from Lake Osceola, Winter Park; both Orange Co. OKLAWAHA RIVER DRAINAGE: Smith Lake, 1 mi. W Candler; Oklawaha River, 1 mi. E White Ferry; Oklawaha River, Moss Bluff, 5 mi. NE Lynn; Orange Creek, 1 mi. N Orange Springs; all Marion Co. Redwater Lake, 4 mi. W Johnson; Putnam Co. HAW CREEK DRAINAGE: Lake Disston, 5 mi. SW Deanville; Little Haw Creek, 2 mi. SW Deanville; both Flagler Co. BLACK CREEK DRAINAGE: Black Creek, 2 mi. E [town of] Kingsley Lake; North Fork, Black Creek, 14 mi. SW Orange Park; Black Creek, 10 mi. NW Green Cove Springs; all Clay Co. JULINGTON CREEK DRAINAGE. Durbin Creek, 1 mi. WSW Bayard; lake on Julington Creek, 2 mi. W Bayard; both Duval Co.

## Genus *Uniomerus* Conrad

*Uniomerus* Conrad 1853, Proc. Acad. Nat. Sci. Phila., 6: 268. Species listed: *U. declivis* Say, *camptodon* Say, *subcroceus* Conrad, *sayii* Ward, *rivularis* Conrad, *perrectus* [*sic*] Conrad, *symmetricus* Lea, *excultus* Conrad.

Type species, *Unio tetralasmus* Say. Subsequent designation, Simpson, 1900, Proc. U.S. Natl. Mus., 22: 739. Since *U. excultus* Conrad is included in Simpson's synonymy of *U. tetralasmus*, the subsequent selection of the former by Clench and Turner (1956, Bull. Florida State Mus., 1: 176) is invalid under Article 69 (a) (iv) of the Int. Code Zool. Nomen. (1964). Ortmann, 1912, Ann. Carnegie Mus., 8: 272.

Frierson (1927: 34-35) listed a number of species and subspecies under *Uniomerus*. Like *Elliptio*, *Uniomerus*, has a wide range of environmental tolerance, and while there are a number of ecophenotypes, the genus appears to be monotypic. This view is supported by Fuller (1971: 142)

### *Uniomerus tetralasmus* (Say)

Figure 2A, 9 B-E.

*Unio tetralasmus* Say, [September] 1831, American Conchology, no. 3 [no pagination], pl. 23 (Bayou St. John [not located], near New Orleans, Louisiana; type not in ANSP [lost]).

*Unio obesus* Lea 1831, Trans. Amer. Philos. Soc., 4: 96, 108, pl. 13, fig. 26 (York River, Virginia [corrected to Georgia; Maj. Leconte on p. 108]; figured holotype USNM 85366, labeled, "Little Ogeechee River [Hancock Co], Georgia; Maj. Leconte"). Lea. 1834, Obs. Unio, 1: 106, 118. Clench and Turner (1956, Bull. Florida State Mus., 1: 178) did not see the type, and their restriction of the type locality is invalid.

Lea (1854, Proc. Acad. Nat. Sci. Phila., 7:243) claimed that this description appeared toward the end of 1831. It was reported during 1832 (Jan.-March number: Amer. Jour. Sci., 22: 169 [probably appeared in April]). There is no way to be sure which name has priority, but Say's name is certainly better known, and should be used for this species.

*Unio declivis* Say, 1831 [1832], Transylvania Jour. Medicine, 4: 527 (Bayou

Teche, Louisiana). Say, 1832, American Conchology, no. 4 [no pagination], pl. 35; 3 syntypes ANSP 41698 from Mr. Barabino, all smaller than figured type).

*Unio camptodon* Say, 1832, American Conchology, no. 5 [no pagination], pl. 42 (opposite to New Orleans [Jefferson Parish, Louisiana], in ponds; type not in ANSP [lost]).

*Unio geometricus* Lea 1832, Trans. Amer. Philos. Soc., 5: 38, pl. 4, fig. 10 (Bayou Teche, Louisiana; figured holotype USNM 85712 [not seen]) Lea, 1834, Obs. Unio, 1: 150.

*Unio blandingianus* Lea 1834, Trans. Amer. Philos. Soc., 5: 101, pl. 15, fig. 44 (St. Johns River, Florida; figured holotype USNM 85715). Lea, 1834, Obs. Unio, 1: 213.

*Unio declivis* Conrad, 1836, *non* Say. See under: *Unio rivularis* Conrad, 1853.

*Unio excultus* Conrad 1838, Monography Unionidae, no. 11, p. 99, pl. 55, fig. 1 (New Orleans [Orleans Parish], Louisiana; type ANSP 20427 [lost]).

*Unio sayii* Ward 1839, [in Tappan], Amer. Jour. Sci., 35: 268, pl. 3, fig. 1 (Walnut Creek, and Ohio Canal, near Circleville [Pickaway Co.], Ohio; [location of type unknown]).

*Unio paralellus* Conrad 1841, Proc. Acad. Nat. Sci. Phila., 1: 20 *non* Sowerby 1840. Changed to:

*Unio porrectus* Conrad 1854, Jour. Acad. Nat. Sci. Phila. (2) 2: 296, pl. 26, fig. 7 ([Pearl River] Jackson [Hinds Co.], Mississippi; figured holotype ANSP 42847).

*Unio buddianus* Lea 1843, Desc. Twelve Uniones (Lake George and Lake Monroe, Florida). Lea, 1845, Trans. Amer. Philos. Soc., 9: 277, pl. 40, fig. 5; figured holotype USNM 85606, from Lake George. Lea, 1848, Obs. Unio, 4: 35.

*Unio symmetricus* Lea 1845, Trans. Amer. Philos. Soc., 10: 73, pl. 4, fig. 11 (Red River, Alexandria [Rapides Parrish], Louisiana; figured holotype USNM 85604). Lea, 1848, Obs. Unio, 4: 47.

*Unio paludicolus* Gould 1845, Proc. Boston Soc. Nat. Hist., 2: 53 (Everglades of Florida; lectotype MCZ 169278, selected by Johnson, 1964, U.S. Natl. Mus., Bull. 239, p. 121, pl. 31, fig. 3).

*Unio ineptus* Lea 1852, Trans. Amer. Philos. Soc., 10: 261, pl. 15, fig. 12 (Abbeville District [Savannah River drainage], South Carolina; figured holotype USNM 85326). Lea, 1852, Obs. Unio, 5: 17.

*Unio hebes* Lea 1852, Trans. Amer. Philos. Soc., 10: 267, pl. 18, fig. 21 (Oconee River, near Athens [Clarke Co.], Georgia; figured holotype USNM 85383). Lea, 1852, Obs. Unio, 5: 23.

*Unio rivularis* Conrad 1853, Proc. Acad. Nat. Sci. Phila., 6: 257. New name for *Unio declivis* Conrad 1836, *non* Say 1831, [in] Monography Unionidae, no. 5, p. 45, pl 23, fig. 1 (small creek in Greene Co., Alabama; figured holotype ANSP 42852).

*Unio paludicolor* Conrad 1853, Proc. Acad. Nat. Sci. Phila., 6: 254. Error for *U. paludicolus* Gould.

*Unio subcroceus* Conrad 1854, Jour. Acad. Nat. Sci. Phila., (2) 2: 297, pl. 27, fig. 1 (one of the tributaries to Canadian River, Arkansas; figured holotype ANSP 41406a.

*Unio manubius* Gould 1855, Proc. Boston Soc. Nat. Hist., 5: 229 (Chihuahua, 60 mi. from Camp Ringgold = Rio Agualeguas, 3 mi. NE General Treviño, Nuevo Leon [State, Mexico], *teste* Taylor, 1967, Veliger, 10: 154; holotype MCZ 169447, figured by Johnson, 1964, U.S. Natl. Mus., Bull. 239, p. 108, pl. 32, fig. 5).

*Unio columbensis* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 31 (Creeks near Columbus [Muscogee Co.], Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 75, pl. 14, fig. 55; figured holotype USNM 85360. Lea, 1858, Obs. Unio, 6: 75.

*Unio jamesianus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 84 ([Pearl River] Jackson [Hinds Co.], Mississippi). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 53, pl. 6, fig. 35; figured holotype USNM 85365). Lea, 1858, Obs. Unio, 6: 52.

*Unio plantii* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 171 (Flint River, near Macon [Co.], Georgia). Lea. 1859, Jour. Acad. Nat. Sci. Phila., (2) 4: 192, pl. 21, fig. 76; figured holotype USNM 85005. Lea, 1859, Obs. Unio, 7: 10. [Known only from the holotype which is a pathological specimen.].

*Unio cicur* Lea 1861, Proc. Acad. Nat. Sci. Phila., 13: 39 (Little Ocmulgee River, Georgia). Lea, 1862, Jour. Acad. Nat. Sci. Phila., (2) 5: 93, pl. 13, fig. 241; figured holotype USNM 85532. Lea, 1862, Obs. Unio, 8:97.

*Unio squalidus* Lea 1863, Proc. Acad. Nat. Sci. Phila., 15: 192 (Neuse River, near Raleigh [Wake Co.]; Roanoke River, near Wheldon [Halifax Co.]; Deep River; *all* North Carolina). Lea, 1866, Jour. Acad. Nat. Sci. Phila., (2) 6: 22, pl. 7, fig. 20; figured holotype USNM 85376, from Roanoke River. Lea, 1867, Obs. Unio, 11: 26.

*Unio electrinus* Reeve 1865, Conch. Iconica, 16, *Unio*, pl. 25, fig. 121 ([locality unknown] Cuming coln; type, British Mus. (Nat. Hist.) [lost]).

*Unio bisselianus* Lea 1867, Proc. Acad. Nat. Sci. Phila., 15: 81, (Bissels Pond, Charlotte [Mecklenberg Co.], North Carolina). Lea, 1868, Jour. Acad. Nat. Sci. Phila., (2) 6: 277, pl. 37, fig. 90; figured holotype USNM 85373. Lea, 1869, Obs. Unio, 12: 37.

*Unio jewettii* Lea 1867, Proc. Acad. Nat. Sci. Phila., 11: 81 (sink of Noonan's [Newnans] Lake [Alachua Co.], Florida). Lea, 1868, Jour. Acad. Nat. Sci. Phila., (2) 6: 276, pl. 37, fig. 89; figured holotype USNM 85374. Lea, 1869, Obs. Unio, 12: 36.

*Unio rivicolus* Conrad 1868, Amer. Jour. Conch., 4: 280, pl. 18, fig. 4 (brook near Tampa [Hillsborough Co.], Florida; figured holotype ANSP 41411).

*Unio pawensis* Lea 1868, Proc. Acad. Nat. Sci. Phila., 20: 161 (Paw Creek [Mecklenberg Co.], Beaver Co. [=Creek, Gaston Co.], Catawba Run [Gaston and Mecklenberg Cos.]). Lea, 1868, Jour. Acad. Nat. Sci. Phila., (2) 6: 302, pl. 45, fig. 114; figured holotype USNM 85380, labeled, "Beaver Creek, [into?] Catawba Run, North Carolina". Lea, 1869, Obs. Unio, 12: 62.

*Uniomerus obesus* (Lea). Clench and Turner, 1956, Bull. Florida State Mus., 1: 177, pl. 5, fig. 2.

*Uniomerus tetralasmus* (Say). La Rocque, 1967, Geol. Survey, Ohio, Bull., 62 (2): 178 fig. 67.

*Uniomerus tetralasmus camptodon* (Say). La Rocque, 1967, Geol. Survey, Ohio, Bull., 62 (2): 180.

*Uniomerus tetralasmus sayi* (Ward). La Rocque, 1967, Geol. Survey, Ohio, Bull., 62 (2): 181.

*Uniomerus tetralasmus* (Say). Johnson, 1970, Bull. Mus. Comp. Zool., 140 (6): 339, pl. 12, figs 1-6.

*Uniomerus tetralasmus* (Say). Valentine and Stansbery, 1971, Sterkiana, no. 42, p. 22.

DESCRIPTION.—Shell generally medium, though sometimes large reaching over 114 mm in length. Outline rhomboidal or elongate rhomboidal. Valves subinflated or inflated, subsolid. Anterior end regularly rounded or slightly truncated; posterior end usually somewhat produced. Ventral margin incurved. Dorsal margin curved, generally forming a sharp angle with the almost straight posterior margin. Hinge ligament long and narrow, located posterior to the umbos. Posterior ridge rounded, ending in a point or feeble biangulation at the base of the shell, sometimes rendering older specimens a bit arcuate. Posterior slope often with two radial sulci. Umbos low to slightly elevated, located in the anterior quarter of the shell, their sculpture consisting of five or six heavy ridges that form a rounded angle on the posterior ridge, in front of which they tend to be corrugated. Periostracum generally black and slightly rough, but with a satiny sheen over most of the surface. Sometimes the surface is smooth and shiny, especially in the umbonal area, and may then be brownish-yellow, or yellowish mixed with green, but not rayed.

Left valve with two ragged, subequal pseudocardinal teeth, and two straight lateral teeth. Right valve with one triangular pseudocardinal often with a vestigial tooth above it; one lateral tooth. Beak cavities compressed, but with several muscle scars; anterior adductor muscle scars deep, posterior ones faint. Pallial line distinct. Nacre white, bluish-white, or pinkish to lurid purple.

MEASUREMENTS.—L 119 mm, H 70 mm, W 45 mm (St. Johns River [town of], Lake Monroe, Seminole Co.); L 98 mm, H 58 mm, W 41 mm (Lake on Julington Creek, 2 mi W of Bayard, Duval Co.); L 58 mm, H 36 mm, W 23 mm (Lake Louisa, 6 mi. SSE of Clermont, Lake Co.).

HABITAT.—Generally lives in smaller streams and ponds in sand, usually where the current is not swift.

REMARKS.—*Uniomerus tetralasmus* (Say) can be confused in the Apalachicolan and Southern Atlantic Slope regions with *Elliptio complanata* (Lightfoot) and *E. icterina* (Conrad). In peninsular Florida, *U. tetralasmus* is quite distinct from all species except *E. icterina*. In general, *tetralasmus* is more inflated, proportionately higher, more acutely angular where the dorsal margin meets the posterior one, and very often has a characteristic satiny periostracum. The yellowish brown, unrayed periostracum and bluish white or pinkish nacre differentiate *tetralasmus* from *icterina*, which has a sometimes bright yellow or chestnut, often rayed periostracum and more variety in nacre color.

*Uniomerus tetralasmus* (Say) is generally common throughout the Apalachicolan region, peninsular Florida, and Southern Atlantic Slope rivers of Georgia. It becomes scarce in the Carolinas, where the periostracum is more apt to be smooth, similar to specimens from the Interior Basin. In peninsular Florida this species achieves its greatest size in the St. Johns River system.

Under the name *Uniomerus obesus*, Valentine and Stansbery (1971: 22) call attention to the ecophenotypic variation of *tetralasmus*, which they regard as a coastal species ranging from North Carolina to southern Florida to Texas, by mentioning the occurrence of a population of *obesus* in Arkansas.

RANGE.—Interior Basin: Mississippi drainage, generally north to about latitude 40°, Ohio River. West Gulf Coastal region, Alabama-Coosa River system, and Apalachicolan region: Rio Grande River system, Texas, east to the Suwannee River system, Florida. Peninsular Florida. Southern Atlantic Slope: Altamaha River system, north to the Nottaway River of the Chowan River system, North Carolina.

SPECIMENS EXAMINED.—WITHLACOOCHEE RIVER SYSTEM:—Withlacoochee River, 1 mi. W Lacoochee; Pasco Co. Little Withlacoochee River, Rerdell; Hernando Co. Lake, 6 mi NNW Panasoffkee; Sumter Co. Lake Tsala Apopka, Floral City, Citrus Co. Withlacoochee River, Dunnellon; Marion Co. WEEKIWACHEE RIVER DRAINAGE: Mud Springs, 3.5 mi. NW Berkeley; Hernando Co. PITHLACHASCOTEE RIVER SYSTEM:—Pithlachascotee River, 2 mi. W Gowers Corner; Pasco Co. HILLSBOROUGH RIVER SYSTEM:—Hillsborough River, 4 mi. NE Temple Terrace; Hillsborough Co. ALAFIA RIVER SYSTEM:—Branch of Howells Creek, 3 mi. S Plant City; Hillsborough Co. MYAKKA RIVER SYSTEM:—Upper Myakka Lake; Myakka River; both Sarasota Co. PEACE RIVER SYSTEM:—Haines Lake [town of] Lake Alfred; Lake Hamilton, 4 mi. SSW Haines City; Silver Lake, Winter Haven; all Polk Co. PEACE RIVER SYSTEM:—Payne Creek, 4.25 mi. N. Wauchula, Hardee Co. Wares Creek; Manatee Co. Horse Creek, 8 mi. W Arcadia; Peace River, 1.25 mi. below Arcadia; both De Soto Co. KISSIMMEE RIVER SYSTEM AND EVERGLADES:—ISTOKPOGA DRAINAGE: Tohopekaliga Lake, Kissimmee; East Tohopekaliga Lake, Narcoossee; Emerald Lake, 1 mi. SE St. Cloud; all Osceola Co. KISSIMMEE RIVER DRAINAGE: Lake Rosalie, 4 mi. NE Hesperides; Tiger Lake, 7 mi. ESE Hesperides; both Polk Co. Gum Tree Slough, near Basinger; Taylor Creek; both Okeechobee Co. LAKE OKEECHOBEE DRAINAGE. Fisheating Creek, 1 mi. S Lakeport; 4 mi. S Fort Myers, Lee Co. (USNM). Cypress Swamp, 4 mi. S Monroe Station, Collier Co. Paradise Key, Royal Palm Park, Everglades National Park; Dade Co. Canals, West Palm Beach; Palm Beach Co. 10 mi. SW Fellsmere; St. Lucie Co. (ANSP). ST. JOHNS RIVER SYSTEM:—ST. JOHNS RIVER DRAINAGE: Ditches between Deer Park and Melbourne; ditch near Lake Washington, 6 mi. W Eau Gallie; Lake Poinsett, 10 mi. WNW Cocoa; all Brevard Co. Lake Harney, 3 mi. NE Geneva; St. Johns River, 1 mi. ESE Osceola; Econlockhatchee River, near confluence with St. Johns River, Lake Jessup, 3 mi. N Oviedo; St. Johns River [town of] Lake Monroe; all Seminole Co. Lake Ashby, 8 mi. NE Osteen; St. Johns River, Lemon Bluff, 3 mi. SE Osteen; Lake Woodruff; all Volusia Co. Lake Killarney, Winter Park; canal from Lake Virginia to Lake Sue, Winter Park; both Orange Co. OKLAWAHA RIVER DRAINAGE: Lake Louisa, 6

mi. SSE Clermont; Lake Minnehaha, 2 mi. S Clermont; both Lake Co. Indian Lake, 6 mi. N Silver Springs; Halfmoon Lake, 6 mi. SE Lynn; Lake Lou, 5 mi. NE Lynn; all Marion Co. Shands Canal, 3 mi. NE Micanopy; Alachua Co. Orange Creek, 1 mi. N Orange Springs, Marion Co. Little Orange Creek, 3 mi. E Hawthorne, Putnam Co. Hatchet Creek, Hawthorne Road, NE Gainesville; Prairie Creek, at outlet of Newnans Lake, 4 mi. SE Gainesville; Bivens Arm, 2 mi. SW Gainesville; all Alachua Co. HAW CREEK DRAINAGE: Little Haw Creek, 2 mi. SW Deanville; Flagler Co. JULINGTON CREEK DRAINAGE. Durbin Creek, 1 mi. WSW Bayard; lake on Julington Creek, 2 mi. W Bayard; both Duval Co.

## Subfamily ANODONTINAE (Rafinesque, 1820), Ortman, 1910.

### Genus *Anodonta* Lamarck

### Subgenus *Anodonta* Lamarck

*Anodonta* Lamarck 1799, Memoires de la Soc. d'Hist. Nat. de Paris, p. 87.

Type species: *Mytilus cygneus* Linnaeus. Monotypic.

Placed on the Official List of Generic Names in Zoology (1926) Opinion 94. Reconfirmed (1959) Opinions and Declarations rendered by Int. Comm. Zool. Nomen., 20 (28) 303-310, Opinion 561.

### Subgenus *Utterbackia* F.C. Baker

*Utterbackia* F.C. Baker 1927, American Midland Nat., 10: 221, 222. (misspelled as *Utterbachia* on p. 221)

Type species: *Anodonta imbecillis* [*sic*] Say. Original designation. *Utterbackiana* Frierson 1927, Check List North American Naiades, p. 17. Type species, *Anodonta suborbiculata* Say. Monotypic.

Under the subgenus *Lastena* Rafinesque (not available for use here as the type is *Anodonta lata* Rafinesque, *teste* Ortmann and Walker, (1922: 32), Frierson included all of the taxa mentioned in the present paper except *A. suborbiculata* Say of the Interior Basin. For this he introduced the subgeneric name *Utterbackiana*, on the basis that that species is dioecious, but as mentioned below, this is an unreliable basis for classification and the shell morphology is clearly that of *Utterbackia*.

Morrison (*in* Walter, 1956: 265) stated that *Anodonta imbecilis*, like *A. cygnea* of Europe and Asia, is monoecious and has flat umbos and therefore belongs to *Anodonta*.

Heard (1966: 31) showed clearly that sexuality is an unreliable means of classifying *Anodonta*. Neither *A. cygnea* nor *imbecilis* are uniformily hermaphroditic, though each species contains some monoecious individuals. The flat umbos of *Utterbackia* and *Anodonta s.s.* appear to be a convergent character. *Utterbackia* is quite isolated from *Anodonta*. In North America the latter is restricted to the Pacific region. All four species of *Utterbackia* are more delicate than *cygnea*, and individuals of each of the species may exhibit fine rays toward the umbos, which are lacking in *cygnea* or any other *Anodonta*.

In the Interior Basin are two species of *Utterbackia, suborbiculata* and *imbecilis;* the latter is also found in the Apalachicolan and Southern Atlantic Slope regions, but not in peninsular Florida. Speciation has taken place in the Southeastern states, where two additional species occur, *couperiana* and *peggyae.*

*Anodonta (Utterbackia) couperiana* Lea
Figures 3B, 10 A-B

*Anodonta cowperiana* [*sic*] Lea 1840, Proc. Amer. Philos. Soc., 1: 289 (Hopeton, near Darien [McIntosh Co.], Georgia). Changed to:

*Anodonta couperiana* Lea 1842, Trans. Amer. Philos. Soc., 8: 227, pl. 20, fig. 46; figured type, not in USNM [lost]. Lectotype, USNM 86673, selected by Johnson, 1965, Breviora, Mus. Comp. Zool., no. 213, p. 3, pl. 2, fig. 4. Lea, 1842, Obs. Unio, 3:65.

*Anodonta dunlapiana* Lea 1842, Proc. Amer. Philos. Soc., 2: 225 (South Caroling). Lea, 1842, Trans. Amer. Philos. Soc., 8: 248, pl. 27. fig. 65; figured type, not in USNM [lost] Lectotype, here selected, USNM 86564, fig 10A, Charleston, Charleston Co., South Carolina. Lea, 1842, Obs. Unio, 3:86.

*Anodonta cowperiana* [*sic*] Lea, Clench and Turner, 1956, Bull. Florida State Mus., 1: p. 183, pl. 6, fig 3.

DESCRIPTION.—Shell medium to large, reaching 93 mm in length. Outline subelliptical to subcircular. Valves somewhat inflated, thin, fragile, and smooth. Anterior end regularly rounded; posterior end somewhat pointed. Ventral margin broadly curved. Dorsal margin straight and long, usually forming a distinct wing-like angle where it meets the obliquely descending posterior margin. Hinge ligament short but prominent. The posterior margin joins the curved ventral margin at a point near the medial line. Posterior ridge broadly rounded. Posterior slope slightly concave. Umbos low and broad, seldom extending above the dorsal margin, located in the anterior third of the shell, their sculpture consisting of a number of delicate subconcentric undulations. Periostracum smooth and shiny, except the posterior slope which may be roughened. Surface of the shell straw yellow to yellowish-green usually with numerous, generally fine green rays, sometimes with distinctly darker rays on the posterior slope.

No hinge plate or teeth; muscle scars inconspicuous and poorly defined. Nacre bluish-white and iridescent.

MEASUREMENTS.—L 93 mm, H 52 mm, W 38 mm (St. Johns River [town of] Lake Monroe, Seminole Co.); L 75 mm, H 44 mm, W 31 mm (same as above); L 64 mm, H 40 mm, W 28 mm (Lake Ashby, 8 mi. NE of Osteen, Volusia Co.).

HABITAT.—Prefers sandy or muddy bottoms of ponds and slow-moving streams.

REMARKS.—In peninsular Florida *Anodonta couperiana* Lea can only only be confused with *A. peggyae* Johnson. Both species have umbos that

do not extend above the dorsal margin, but *couperiana* is elliptical in outline and pointed posteriorly, the point ending near the medial line, the dorsal and ventral margins roughly parallel. *A. peggyae* is subrhomboidal in outline, with a biangulation that ends near the base. When the dorsal margin is held straight, the ventral margin often descends obliquely toward the broad posterior basal biangulation.

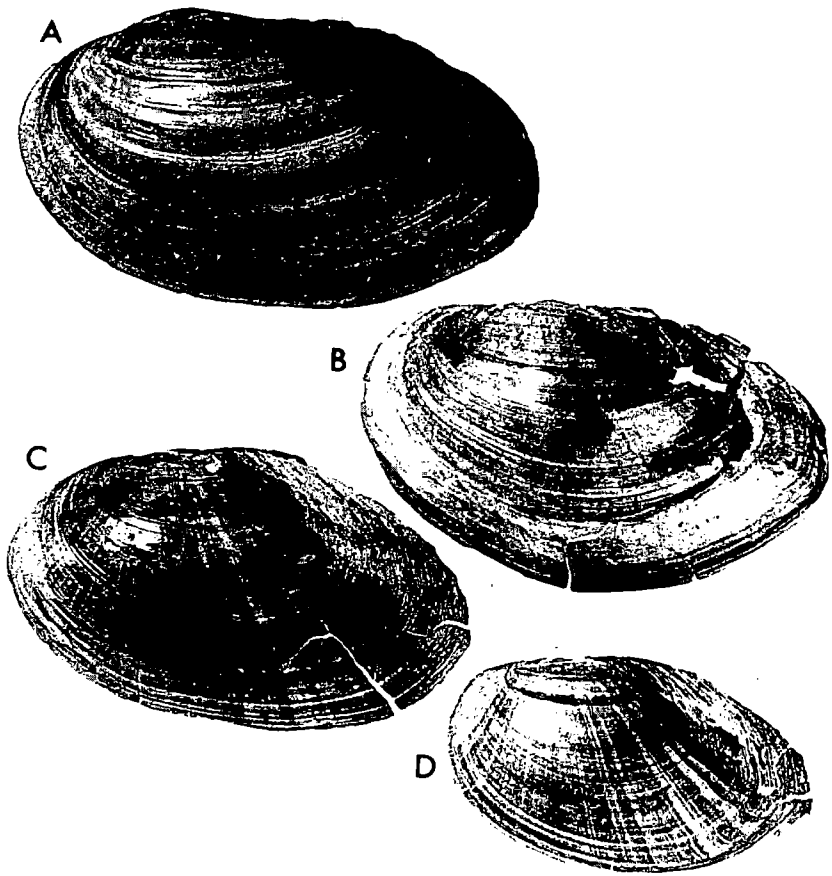



FIGURE 10[1]. *Anodonta (Utterbackia) couperiana* Lea. A. Lectotype of *Anodonta dunlapiana* Lea. Charleston, Charleston Co., South Carolina. USNM 86564. L 83, H 46, W 35. B. Lectotype of *Anodonta couperiana* Lea. Hopeton, near Darien, [McIntosh Co.], Georgia. USNM 86673. L 67, H 38, W 29.

*Anodonta (Utterbackia) peggyae* Johnson. C. Holotype of *Anodonta peggyae* Johnson. Lake Talquin, Leon Co., Florida. MCZ 251040. L 71, H 43, W 24. D. Paratype of *Anodonta peggyae* Johnson. Same as holotype. MCZ 251041. L 54, H 33, W 19.

[1] Slightly reduced, measurements in mm, L = length, H = height, W = width.

In the Apalachicolan and Southern Atlantic Slope regions, *A. couperiana* can be confused with *A. imbecilis* Say, but *couperiana* differs by having broad green rays, which are especially fine on the disk, and by its broadly curved ventral margin, which renders the shell proportionately much higher. In *imbecilis* the ventral margin is almost straight and parallel to the dorsal one. The height/length ratio of *couperiana* is about 2 to that of 1.5 in *imbecilis*.

*A. couperiana* is common in central Florida where individuals tend to be small and often locally abundant. In peninsular Florida large specimens are found in the St. Johns River system. The largest specimens occur in the Southern Atlantic Slope region, where the species is scarce.

The apparent absence of this species from the Suwannee and Withlacoochee river systems suggests that it entered the Apalachicola River system from a former confluence with the Savannah River system, and that it spread into the Florida peninsula from the north.

RANGE.—Apalachicolan region: Apalachicola, Ochlockonee and St. Marys river systems. Peninsular Florida. Southern Atlantic Slope: Altamaha River system, Georgia, north to the Cape Fear River system, North Carolina.

SPECIMENS EXAMINED.— MYAKKA RIVER SYSTEM: Upper Lake Myakka; Sarasota Co. PEACE RIVER SYSTEM: Peace River, Arcadia; De Soto Co. KISSIMMEE RIVER SYSTEM AND EVERGLADES:—KISSIMMEE RIVER DRAINAGE: East Tohopekaliga Lake, Narcoossee; Tohopekaliga Lake, Kissimmee; Lake Hatchieha, Lake Marion, 3 mi. WNW Kenansville; all Osceola Co. Lake Rosalie, 4 mi. NE Hesperides; Lake Howard, Winter Haven; Weohyakapka Lake, Indian Lake Estates; Tiger Lake, 7 mi. ESE Hesperides; all Polk Co. Lake Bonnet, 3 mi. N Sebring; Lake Istokpoga; both Highlands Co. LAKE OKEECHOBEE DRAINAGE: Fisheating Creek, 1 mi. S Palmdale; Glades Co. Canal, 2 mi. NW Lantana; Lake Osborne, 2 mi. SW Lantana; both Palm Beach Co. ST. JOHNS RIVER SYSTEM:—ST. JOHNS RIVER DRAINAGE: Lake Winder; Brevard Co. Lake Harney (ANSP); Econlochatchee River, near confluence with St. Johns River; Lake Jessup, 3 mi. N Oviedo; St. Johns River [town of] Lake Monroe; all Seminole Co. Lake Ashby, 8 mi. NE Osteen; Lake Woodruff; Spring Garden Lake, 1 mi. NW De Leon Springs; all Volusia Co. St. Johns River, Astor; Blue Creek (ANSP); both Lake Co. Lake George, S end Drayton Island; Putnam Co. OKLAWAHA RIVER DRAINAGE: John Lake, 1 mi. S Oakland; Orange Co. Lake Beauclaire, 2 mi. S Mt. Dora (ANSP); Lake Griffin, Leesburg; both Lake Co. Lake Eaton, 6 mi. NE Lynn; Marion Co. Cross Creek, 5 mi. NW Island Grove; Lochloosa Lake, 1 mi. N. Lochloosa; Shands Canal, 3 mi. NE Micanopy; Prairie Creek, 6 mi. SE Gainesville; Newnans Lake, 6 mi. E Gainesville; River Styx (USNM); all Alachua Co.

*Anodonta (Utterbackia) peggyae* Johnson
Figure 3B, 10 C-D

*Anodonta imbecilis* Say. *partim.* Clench and Turner, 1956, Bull. Florida State Mus., 1: 187, pl. 6, fig. 2, paratype of *Anodonta peggyae*, MCZ 251041.

*Anodonta peggyae* Johnson 1965, Breviora, Mus. Comp. Zool., no. 213, pl. 2, figs. 1-3 (Lake Talquin [formed by a dam on the Ochlockonee River], Leon County public fishing ground, Leon Co., Florida, holotype MCZ 251040)

DESCRIPTION. – Shell small to medium, reaching a little over 80 mm in in length. Outline subrhomboidal, valves slightly inflated, thin, fragile, and smooth. Anterior end regularly rounded; posterior end more broadly rounded and slightly biangulate just above the base. Ventral margin broadly curved and obliquely descending. Dorsal margin straight or slightly curved, usually forming a distinct wing-like angle where it meets the obliquely descending posterior margin. Posterior ridge broadly rounded, posterior slope sometimes slightly concave. Umbos low and broad, not extending above the dorsal margin, located in the anterior third of the shell, their sculpture consisting of seven or eight low, delicate, slightly double-looped undulations. Periostracum smooth and shiny, except the posterior slope which may be slightly roughened. Surface of the shell straw yellow to yellowish-green, sometimes very dark green, with numerous, generally fine, green rays over the entire surface. The rays are distinctly darker on the posterior slope.

No hinge plate or teeth; muscle scars inconspicuous and poorly defined. Nacre bluish-white and iridescent.

MEASUREMENTS. – L 71 mm, H 43 mm, W 24 mm (Lake Talquin, Leon Co., holotype); L 66 mm, H 35 mm, W 20 mm (Lees Lake, Panasoffkee, Sumter Co.), L 63 mm, H 32 mm, W 20 mm (same as above).

HABITAT. – Prefers sandy or muddy bottoms of ponds and slow-moving streams.

REMARKS. – In peninsular Florida *Anodonta peggyae* Johnson can be be confused only with *A. couperiana* Lea. *A. peggyae* is subrhomboidal in outline with a posterior biangulation that ends near the base. When the dorsal margin is held straight, the ventral margin is often obliquely descending toward the broad posterior basal biangulation. *A. couperiana* is elliptical in outline and pointed posteriorly, the point ending near the medial line. The dorsal and ventral margins are approximately parallel. In the Apalachicolan region, *peggyae* can also be confused with *A. imbecilis* Say, but *imbecilis* has an elongate elliptical shell, a posterior point ending near the medial line, an almost straight ventral margin parallel to the dorsal one, and a rather uniformly green periostracum. *A. peggyae* differs from *imbecilis* in that, with the hinge line held horizontal, it has a subrhomboidal shell with a less acute point located near the base, a ventral margin that slopes obliquely from the dorsal one, and a periostracum with numerous green rays that are especially fine on the disk.

RANGE. – Apalachicolan region: Choctawhatchee River system, east to the Suwannee River system. Peninsular Florida: Withlacoochee and Hillsborough river systems.

SPECIMENS EXAMINED.—WITHLACOOCHEE RIVER SYSTEM: Withlacoochee River, 1 mi. NW Lacoochee, Pasco Co. Little Withlacoochee River, Rerdell, Hernando Co. Lees Lake, Panasoffkee; lake, 6 mi. NNW Panasoffkee; both

Sumter Co. Lake Tsala Apopka, Floral City, Citrus Co. HILLSBOROUGH RIVER SYSTEM: Blackwater Creek, 8 mi. N Plant City; Hillsborough River, 4 mi. NE Temple Terrace; both Hillsborough Co.

## Subfamily LAMPSILINAE (Ihering 1901) Ortman, 1910.

### Genus *Carunculina* Baker

*Toxolasma* Rafinesque 1831, Continuation of Monog. Bivalve Shells River Ohio (Phila.), p. 2 Species listed: *Unio cyclips, U. cinerescens, U. lividus, U. flexus,* all Rafinesque.

Type species, *Unio lividus* Rafinesque. By elimination, Frierson, 1914, Nautilus, 28: 7. Ortmann and Walker, 1922, Occ. Papers, Mus. Zool., Univ. Mich. no. 112, pp. 54, 55, showed that *U. lividus* is a *nomia dubia* and that therefore *Toxolasma* must be disregarded. Nevertheless, on the mere statement of Morrison (1969:24) that: "*Toxolasma livida* Raf. 1831 (=*glans* Lea Dec. 1831)", Valentine and Stansbery (1971: 29) have resurrected this name, claiming that it has priority over *Carunculina.*

*Corunculina* 'Simpson', 1898, [*in*] F. C. Baker,[1] Bull. Chicago Acad. Sci., 3 (1), p. 109.

Type species, *Unio parvus* Barnes. Monotypic.

*Carunculina,* corrected in the index and on errata sheet, and reconfirmed by Simpson, 1900, Proc. U. S. Natl. Mus., 22: 563. Ortmann, 1912, Ann. Carnegie Mus., 8: 377. *partim.* (under *Eurynia)*

Call (1896) monographed *Carunculina,* and indicated that it included only a few very variable species. He probably correctly reduced to synonymy many of the taxa subsequently recognized as valid species by Simpson (1914, 1: 148-161) and Frierson (1927: 87-89).

### *Carunculina parva* (Barnes)

Figures 2D, 11 A-B

*Unio parvus* Barnes 1823, American Jour. Sci. (1) 6: 174, pl. 13, fig. 8 (Fox River [Wisconsin]; [type presumed lost]).

*Unio paulus* Lea, 1840, Proc. Amer. Philos. Soc., 1: 287 (Chattahoochee River, Columbus [Muscogee Co.] Georgia). Lea, 1842, Trans. Amer. Philos. Soc., 8: 213, pl. 15, fig. 29; figured holotype USNM 85274. Lea, 1842, Obs. Unio, 3: 51.

*Unio minor* Lea, 1843, Desc. Twelve Uniones (Lake Monroe and Lake George, Florida). Lea, 1846, Trans. Amer. Philos. Soc., 9: 276, pl. 39, fig. 3; figured holotype USNM 85310 from Lake George, Lea, 1848, Obs. Unio, 4: 34.

*Unio marginis* Lea, 1865, Proc. Acad. Nat. Sci. Phila., 16: 89 (Blue Springs [Albany] Dougherty Co., Georgia). Lea, 1869 Jour. Acad. Nat. Sci. Phila., (2) 6: 225, pl. 31, fig. 69; figured holotype USNM 85295. 1869, Lea, Obs. Unio, 12: 15.

[1] H. B. Baker (1964, Nautilus, 78:33) pointed out that as Simpson contributed nothing in the original publication of this genus (under article 51 (c), 1964 edition of the International Code Zool. Nomen.) the authority for *Carunculina* must be F. C. Baker.

*Unio cromwellii* Lea, 1865, Proc. Acad. Nat. Sci. Phila., 16: 89 (Kiokee Creek near [W] Albany, Dougherty Co., Georgia) Lea, 1869, Jour. Acad. Nat. Sci. Phila., (2) 6: 258, pl. 31, fig. 73; figured holotype USNM 85280. Lea, 1869, Obs. Unio, 12: 18.

*Unio corvinus* Lea, 1868, Proc. Acad. Nat. Sci. Phila., 20: 144 (Flint River, Georgia; Darien? [McIntosh Co., Georgia]; Neuse River, Raleigh [Wake Co.] North Carolina). Lea 1869, Journ. Acad. Nat. Sci. Phila., (2) 6: 310, pl. 48, fig. 123; figured holotype USNM 85277 from Flint River, Georgia. Lea, 1869, Obs. Unio, 12: 70.

*Unio stearnsi* B. H. Wright, 1888, Check List North American Unionidae (Portland, Oregon) p. 5, *nomen nudum;* Listed as a synonym of *Lampsilis minor* Lea, by Simpson, 1900. Proc. U.S. Natl. Mus. 22: 562.

*Unio singleyanus* Marsh: 1891, Nautilus, 5: 29 (Palatka, Florida; type figured by Simpson, 1892, Proc. U.S. Natl. Mus., 15: 426, pl. 68, figs, 4, 5, USNM [not located].

*Carunculina parva cahni* F. C. Baker, 1927, American Midland Nat. 10: 222 (Neosha Mill Pond, Dodge Co., Wisconsin; holotype U. of Illinois Z17341, figured by Baker, Bull. Univ. Wisconsin, no. 1527, p. 253, pl. 105, fig. 14).

*Corunculina [sic] paula* (Lea). Clench and Turner, 1956 Bull. Florida State Mus., 1: 193, pl. 8, fig. 5.

*Carunculina parva* (Barnes). La Rocque, 1967, Geol. Survey, Ohio, Bull., 62, (2): 263, fig. 153.

*Toxolasma parva* (Barnes). Valentine and Stansbery, 1971, Sterkiana, no. 42, p. 29.

DESCRIPTION. — Shell small, seldom reaching over 35 mm in length. Outline of female obovate; male elliptical. Valves subinflated, generally thin. Anterior end regularly rounded. Posterior end of females more broadly rounded and subtruncated below the medial line; males somewhat pointed. Ventral margin straight or slightly curved in males. In females marsupial swelling causes the margin to be somewhat convex a little posterior of the center. Dorsal margin slightly curved, usually forming a distinct angle with the obliquely descending posterior margin. Posterior ridge faintly double or, more often, quite indistinct. Umbos prominent, hardly elevated above the hinge line, located in the anterior third of the shell, their sculpture consisting of several ridges parallel to the growth lines. Periostracum generally with distinct growth lines, often satiny, generally blackish, occasionally yellowish or olive, and with very fine obscure green rays.

Left valve with two raised, triangular, occasionally crenulate pseudocardinal teeth, one in front of the other. Hinge line short, generally very narrow, in front of two short straight lateral teeth. Right valve with one rather chunky, triangular pseudocardinal; one lateral tooth. Beak cavities shallow, with a few dorsal muscle scars under the hinge plate. Anterior adductor muscle scars well impressed, posterior ones faint. Pallial line distinct anteriorly. Nacre bluish-white or pink to purplish iridescent.

MEASUREMENTS. — L 39 mm, H 25 mm, W 16 mm (Lake Min-

nehaha, 2 mi S of Clermont, Lake Co., male); L 34 mm, H 22 mm, W 15 mm (same as above, female); L 37 mm, H 21 mm, W 17.5 mm (Lake Killarney, Winter Park, Orange Co., male); L 27 mm, H 17.5 mm, W 14 mm (same as above, female).

HABITAT.—Lives in shallow water near the edges of streams and ponds, generally in mud, sometimes in sand.

REMARKS.—In peninsular Florida some specimens of *Carunculina parva* (Barnes) can occasionally be confused with *Villosa*. Both genera exhibit similar sexual dimorphism, but the species of *Villosa* are quite different from *parva*. All three species of *Villosa* (*villosa, vibex,* and *amygdala*) attain much larger size, have thinner, generally yellowish, distinctly rayed shells, whereas *parva* is heavier for its size, blackish, and only rarely obscurely rayed. The hinge teeth in *parva* tend to be chunky while those of *Villosa* tend to be more delicate.

*Carunculina parva* differs from *C. pulla* (Conrad) of the Atlantic Slope region by having an indistinct posterior ridge and a satiny periostracum; *C. pulla* has a sharp posterior ridge with a second less prominent ridge above it. The periostracum of *pulla* is generally much rougher with heavy growth lines.

Call (1896) first pointed out that except for *C. glans* (Lea), which is restricted to the Interior Basin, there appears to be but one other species of *Carunculina* in the Interior Basin, Apalachicolan and peninsular Florida regions. He was not followed by Simpson (1914: 148-161) or by Clench and Turner (1956: 193). The latter used the name *paula* for this species as this nominal form has its type locality within the region covered by their study.

RANGE.—Interior Basin generally, from western New York west Minnesota, south to Arkansas. Apalachicolan region. Peninsular Florida.

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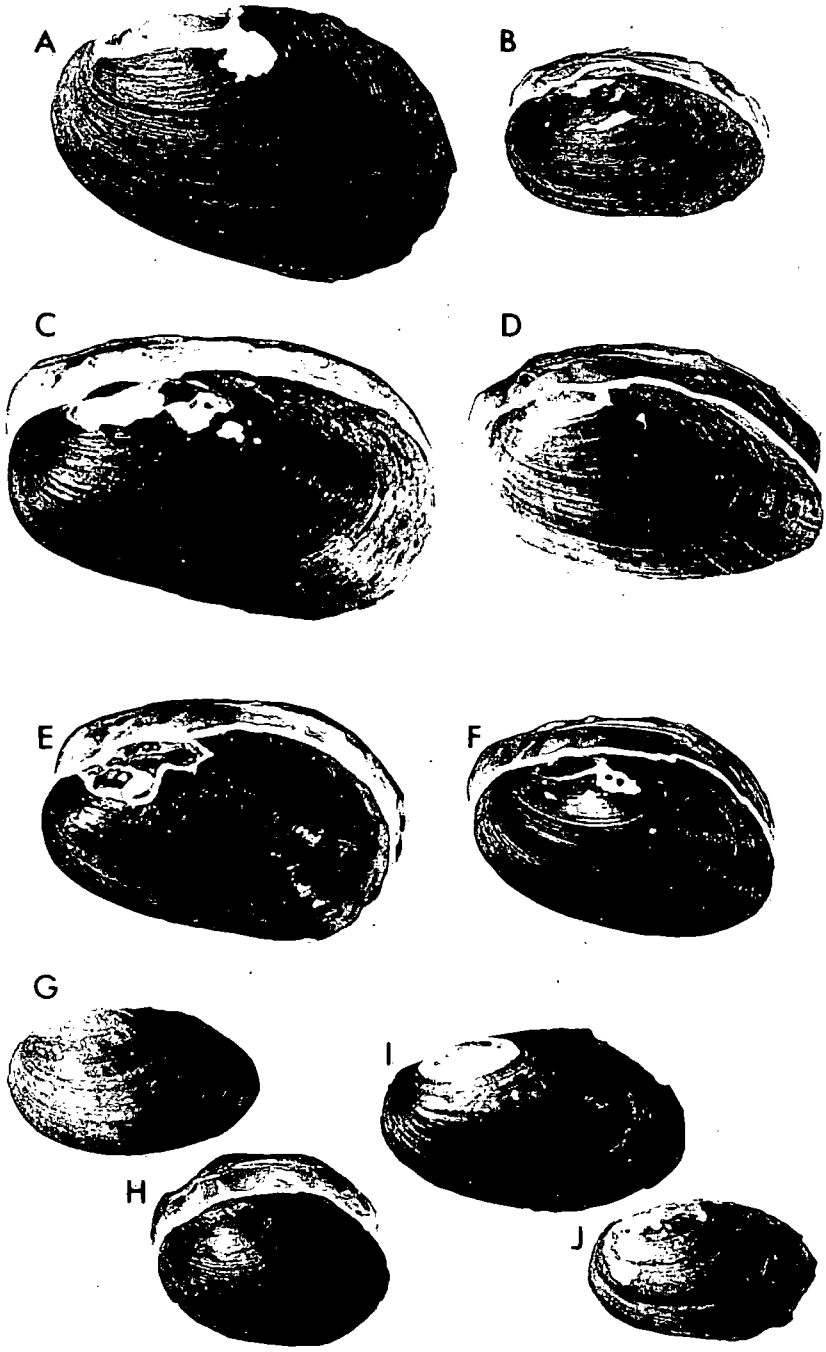
FIGURE 11[1]. *Carunculina parva* (Barnes). A. Holotype of *Unio minor* Lea. Lake George, Florida. USNM 85310. L. 22, H 15, W 10, female (2.5 X). B. *Carunculina parva* (Barnes). Durbin Creek, 1 mi. WSW Bayard, Duval Co., Florida. MCZ 269273. L 35, H 20, W 15, male (nat. size).

*Villosa villosa* (B. H. Wright). C. Lectotype of *Unio villosus* B. H. Wright. Suwannee River [Luraville], Suwannee Co., Florida. USNM 150503. L 57, H 28, W 18, female (nat. size). D. Holotype of *Lampsilis wrightiana* Frierson. Volusia Co., Florida. UMMZ 91179. L 50, H 27, W 18, male (slightly reduced, reversed image).

*Villosa vibex* (Conrad). E. Lectotype of *Unio averellii* B. H. Wright. Lake Ashby, Volusia Co., Florida. USNM 91142. L 48, H 30, W 18, female (nat. size). F. Paralectotype of *Unio averellii* B. H. Wright. Same as lectotype. MCZ 252169. L 42, H 25, W 15, male (nat. size).

*Villosa amygdalum* (Lea). G. Holotype of *Unio trossulus* Lea. Lake Monroe, Florida. USNM 84705. L 35, H 21, W 16, male (nat. size). H. Holotype of *Unio amygdalum* Lea. Lake George, Florida. USNM 86127. L 32, H 22, W 15, female (nat. size). I. Lectotype of *Unio papyraceus* Gould. Everglades of Florida. USNM 86125. L 41, H 25, W 15.2 (nat. size). J. Holotype of *Unio vesicularis* Lea. Lake Okeechobee, Florida. USNM 85292. L 32, H 19, W 13 (nat. size).

[1] Measurements in mm, L = length, H = height, W = width.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SPECIMENS EXAMINED.—WITHLACOOCHEE RIVER SYSTEM:—Little Withlacoochee River, Rerdell, Hernando Co. Lees Lake, Panasoffkee; Sumter Co. HILLSBOROUGH RIVER, SYSTEM: — Hillsborough River, 4 mi. NE Temple Terrace, Hillsborough Co. PEACE RIVER SYSTEM: — Peace River, Arcadia; De Soto Co. KISSIMMEE RIVER SYSTEM AND EVERGLADES:—KISSIMMEE RIVER DRAINAGE: Tohopekaliga Lake, Kissimmee; Alligator Lake, near Kissimmee; both Osceola Co. Lake Rosalie, 4 mi. NE Hesperides; Tiger Lake, 7 mi, ESE Hesperides; both Polk Co. LAKE OKEECHOBEE DRAINAGE: Fisheating Creek, 1 mi. S Palmdale; Glades Co. ST. JOHNS RIVER SYSTEM:—ST. JOHNS RIVER DRAINAGE: Econlokhatchee River, near confluence with St. Johns River; Puzzle Lake, 7 mi. SE Geneva; Lake Jessup, 5 mi. N Oviedo; Wekiva River, 7 mi. WSW [town of] Lake Monroe; all Seminole Co. Lake Ashby, 8 mi. NE Osteen; Lake Monroe, near Enterprise; both Volusia Co. Lake Killarney, Winter Park; Orange Co. OKLAWAHA RIVER DRAINAGE: Lake Minneola, Clermont; Lake Minnehaha, 2 mi. S Clermont; both Lake Co. Lake Lou, 5 mi. NE Lynn; Lake Eaton, 6 mi. NE Lynn; Orange Creek, 1 mi. N Orange Springs; all Marion Co. BLACK CREEK DRAINAGE: North Fork, Black Creek, 14 mi. SW Orange Park; South Fork, Black Creek, 1 mi. SW Middleburg; both Clay Co. JULINGTON CREEK DRAINAGE: Durbin Creek, 1 mi. WSW Bayard; Duval Co.

## Genus *Villosa* Frierson

*Micromya* Agassiz 1852, Archiv für Naturgeschichte, 18 (1), p. 47. Species listed: *Unio lapillus* Say, *Margaritana fabula* Lea, *M. curreyana* Lea, *non Micromya* Rondani 1840 (Insecta).

Type species: *Unio lapillus* Say. Subsequent designation, Herrmannsen, 1852, Indicis Generum Malacozoorum, Supp. et Corr., p. 83. Ortmann, 1912, Ann. Carnegie Mus., 8: 337. *partim.*

*Villosa* Frierson, 1927, Check List North American Naiades, pp. 11, 80.

Type species, *Unio villosus* Wright. Original designation.

At this writing, it is impossible to tell how many species *Villosa* contains. Frierson (1927: 70-79) included under *Lampsilis,* subgenus *Ligumia,* many taxa that other authors have included under *Micromya* (=*Villosa*). Except for the type species, the taxa Frierson (1927: 80, 81) listed under *Villosa* are species of *Carunculina*. Despite the systematic confusion within this genus, it is clear that the majority of its species occur in the Interior Basin.

### *Villosa villosa* (B. H. Wright)

Figures 3D, 11 C-D

*Unio villosus* B. H. Wright 1898, Nautilus, 12: 32 :Suwannee River [Luraville], Suwannee Co., Florida; syntype USNM 150503, figured by Simpson, 1900, Proc. Acad. Nat. Sci. Phila., p. 77, pl. 1 fig. 1, selected as lectotype by Johnson, 1967, Occ. Papers on Moll., 3: 9, pl. 8 fig. 1).

*Lampsilis villosus* (Wright). Simpson, 1914, Cat. Naiades, 1: 143.

*Lampsilis wrightiana* Frierson 1927, Check List North American Naiades, p. 81 (Volusia Co., Florida; holotype UMMZ 91179, figured by Frierson, 1928, Nautilus 41: 139, pl. 2, fig 3).

*Villosa villosa* (Wright). Clench and Turner, 1956, Bull. Florida State Mus., 1: 213, pl. 4, fig 2.

DESCRIPTION.—Shell usually small, seldom exceeding 60 mm in length. Outline elongate elliptical. Valves subinflated, generally thin, and translucent. Anterior end regularly rounded. Posterior end of females slightly more broadly rounded; males quite pointed. Ventral margin almost always broadly curved except in females where a slight marsupial swelling, somewhat posterior of the center, renders it straight or slightly convex. Dorsal margin straight with a very slight, if noticeable, angle where it meets the obliquely descending posterior margin. Hinge ligament small. Posterior ridge broadly rounded, double in the male; obscured by a slight marsupial swelling in the female. Posterior slope slightly concave. Umbos moderately swollen, slightly elevated above the hinge line, located in the anterior quarter of the shell, their sculpture consisting of several fine, low, slightly double-looped ridges. Surface of the shell with irregular growth lines, occasionally smooth and shiny, but usually covered with either rough or distinctly satiny periostracum, especially on the posterior slope. Periostracum sometimes subshiny, greenish-yellow, dark greenish, or more often brownish-black, the entire surface of the shell with broad green rays interspersed with narrow ones, sometimes only visible in transmitted light.

Left valve with two delicate pseudocardinal teeth, one in front of the other, the anterior one somewhat triangular, the hind one inclined to be vestigial. Hinge line short and narrow in front of two, short, straight lateral teeth. Right valve with two triangular, narrow, parallel pseudocardinals separated by a narrow pit, the more anterior tooth quite vestigial, sometimes absent; one low lateral tooth. Beak cavities shallow, a few dorsal muscle scars under the hinge plate. Anterior adductor muscle scars well impressed, posterior ones faint, if visible. Pallial line distinct anteriorly. Nacre bluish-white, occasionally yellowish-white, and iridescent, especially posteriorly.

MEASUREMENTS.—L 57 mm, H 28 mm, W 18 mm (Suwannee River, Luraville, Suwannee Co., lectotype, female); L 54 mm, H 29 mm, W 21 mm (Peace River, near Arcadia, DeSoto Co., male); L 45 mm, H 25 mm, W 19 mm (same as above, female).

HABITAT.—"Limited to spring-fed streams and clear rivers" (Clench and Turner 1956: 214), but this report did not include the rather acidic and muddy St. Marys River, where the species also occurs.

REMARKS.—*Villosa villosa* Wright bears a resemblance to *Villosa vibex* Conrad, which is more broadly distributed and extends over the whole range of *V. villosa*. Both show sexual dimorphism. In the female of *villosa* the post basal swelling generally shows less tendency to extend below the ventral margin, and if somewhat posteriorly pointed, the point is higher. The male is pointed posteriorly, as in *vibex*, but the shell is proportionately longer. *V. villosa* often has a distinctive roughened periostracum that produces a satiny luster.

RANGE.—Apalachicolan region: Apalachicola River system, east to the St. Marys River system, Georgia. Peninsular Florida.

SPECIMENS EXAMINED.—WITHLACOOCHEE RIVER SYSTEM:—Lake Tsala Apopka, Hernando Co. Withlacoochee River, Dunnellon, Marion Co. HILLSBOROUGH RIVER SYSTEM: Hillsborough River, 10 mi. N Tampa, Hillsborough Co. MYAKKA RIVER SYSTEM: Myakka River, just E Myakka City, Manatee Co. Upper Myakka Lake, Sarasota Co. PEACE RIVER SYSTEM: Horse Creek, 8 mi. W Arcadia; ponds along Peace River, 1.25 mi. below Arcadia; both De Soto Co. ST. JOHNS RIVER SYSTEM: OKLAWAHA RIVER DRAINAGE: Lake Eustis, Tavares, Lake Co. Cross Creek between Lake Lochloosa and Orange Lake, 19 mi. S Gainesville, Alachua Co. JULINGTON CREEK DRAINAGE: Durbin Creek, 1 mi. WSW Bayard; lake on Julington Creek, 2 mi. W Bayard; both Duval Co.

*Villosa vibex* (Conrad)

Figures 2B, 11 E-F

*Unio vibex* Conrad, [May] 1834, New Fresh Water Shells United States, p. 31, pl. 4, fig. 3 (Black Warrior River, South of Blount's Spring [Blount Co.], Alabama; figured holotype ANSP 56488a). Published in May, *teste* Conrad, 1853, Proc. Acad. Nat. Sci. Phila., 6: 243.

*Unio modioliformis* Lea, [August or September] 1834, Trans. Amer. Philos. Soc., 5: 97, pl. 13, fig. 40 (Santee Canal, South Carolina; probable figured holotype USNM 85029 [differs slightly from figure]). Lea, 1834, Obs. Unio, 1: 209. Published in August or September, *teste* Lea, 1854, Proc. Acad. Nat. Sci. Phila., 7: 244.

*Unio exiguus* Lea 1840, Proc. Amer. Philos. Soc., 1: 287 (Chattahoochee River, near Columbus [Muscogee Co.], Georgia). Lea, 1842, Trans. Amer. Philos. Soc., 8: 191, pl. 7, fig. 1; figured holotype USNM 84974. Lea, 1842, Obs. Unio, 3: 29.

*Unio stagnalis* Conrad 1849, Proc. Acad. Nat. Sci. Phila., 4: 152 (inhabits mill ponds, Ogeechee River, Georgia, J. H. Couper [loaned]). Conrad, 1850, Jour. Acad. Nat. Sci. Phila., (2) 1: 275, pl. 37, fig. 2; figured holotype MCZ 178778, purchased from J. H. Couper.

*Unio prevostianus* Lea 1852, Trans. Amer. Philos. Soc., 10: 269, pl. 19, fig. 24 (Eutowah [Etowah] River [North West], Georgia; figured holotype, C. M. Wheatley Colln. in ANSP [lost]). Lea, 1852, Obs. Unio, 5: 25.

*Unio nigrinus* Lea 1852, Trans. Amer. Philos. Soc., 10: 284, pl. 24, fig. 44 (West Florida; figured holotype USNM 86132). Lea, 1852, Obs. Unio, 5: 40.

*Unio gracilior* Lea 1856, Proc. Acad. Nat. Sci. Phila., 8: 262 (Buckhead Creek [Burke Co.]; Tobesaufke [Tobasofkee] Creek, near Macon [Bibb Co.]; *both* Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 56, pl. 8, fig. 38; figured holotype USNM 85088 [localities not separated]. Lea, 1858, Obs. Unio, 6: 56.

*Unio rutilans* Lea 1856, Proc. Acad. Nat. Sci. Phila., 8: 262 (Othcalooga [Oothkalooga] Creek, Gordon Co.; Columbus [Muscogee Co.]; both Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 59, pl. 9, fig. 41; figured holotype USNM 85093 from [Oothkalooga] Creek. Lea, 1858, Obs. Unio, 6: 59.

*Unio subellipsis* Lea 1856, Proc. Acad. Nat. Sci. Phila., 8: 262 (creeks near Columbus [Muscogee Co.], Georgia). Lea, 1858, Jour. Acad. Nat. Sci. Phila., (2) 4: 62, pl. 10, fig. 44; figured holotype USNM 85095. Lea, 1858, Obs. Unio, 6: 62.

*Unio sudus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 170 (Dry Creek, near Columbus [Muscogee Co.]; Macon [Bibb Co.]; both Georgia). Lea, 1859, Jour. Acad. Nat. Sci. Phila., (2) 4: 194, pl. 21, fig. 77; figured holotype USNM 85155 from Dry Creek. Lea, 1859, Obs. Unio, 7: 12.

*Unio obfuscus* Lea 1857, Proc. Acad. Nat. Sci. Phila., 9: 172 (Flint River, near Macon [Co.], Georgia). Lea, 1859, Jour. Acad. Nat. Sci. Phila., (2) 4: 197, pl. 22, fig. 80; figured holotype USNM 85089. Lea, 1859, Obs. Unio, 7: 15.

*Unio dispar* Lea 1860, Proc. Acad. Nat. Sci. Phila., 12: 305 (Columbus [Muscogee Co.], Georgia). Lea, 1860, Jour. Acad. Nat. Sci. Phila., (2) 4: 327, pl. 51, fig. 153; figured holotype USNM 85101. Lea, 1860, Obs. Unio, 8: 9.

*Unio averillii* B. H. Wright, Unio: 1888, Proc. Acad. Nat. Sci. Phila., 40: 115, pl. 3, fig. 4 (Lake Ashby, Volusia Co., Florida; syntype figured by Simpson, 1892, Proc. U.S. Natl. Mus., 15: 414, pl. 56, fig. 6 [not located]). Lectotype USNM 91142, selected by Johnson, 1967, Occ. Papers on Moll., 3: 5, pl. 7, fig. 4.

*Villosa vibex* (Conrad). Clench and Turner, 1956, Bull. Florida State Mus., 1: 209, pl. 4, fig. 4.

DESCRIPTION.—Shell usually small, not exceeding 60 mm in length, though occasionally reaching 100 mm. Outline subelliptical. Valves subinflated, generally thin and translucent. Anterior end regularly rounded; posterior end of females more broadly rounded; males somewhat pointed. Ventral margin straight or slightly curved in males, often slightly arcuate in females. Dorsal margin straight with a very slight, if noticeable, angle where it meets the obliquely descending posterior margin. Hinge ligament small. Posterior ridge broadly rounded. Posterior slope slightly concave, occasionally with faint wrinkles and ridges. Umbos moderately swollen, slightly elevated above the hinge line, located in the anterior quarter of the shell, their sculpture consisting of several fine, low, slightly double-looped ridges. Surface of the shell generally rather smooth, but roughened by periostracum posteriorly. Periostracum usually subshiny, greenish-yellow or yellowish-brown to almost black, the entire surface with numerous, broad, greenish rays, which in darker specimens can be seen in transmitted light.

Left valve with two delicate pseudocardinal teeth, one in front of the other, the anterior one somewhat triangular, the hind one inclined to be vestigial. Hinge line rather long and very narrow in front of two short, straight lateral teeth. Right valve with two triangular, narrow, parallel pseudocardinals separated by a narrow pit, the more anterior tooth vestigial, sometimes absent; one lateral tooth. Beak cavities shallow, a few dorsal muscle scars under the hinge plate. Anterior adductor muscle scars well impressed, posterior ones faint, if visible. Pallial line distinct anter-

iorly. Nacre bluish-white, sometimes pinkish or purple, iridescent posteriorly.

MEASUREMENTS.—L 76 mm, H 41 mm, W 23 mm (Lake Minneola, Clermont, Lake Co., female); L 73 mm, H 38 mm, W 24 mm (Oklawaha River, Eureka Springs, Marion Co., male); L 60 mm, H 35 mm, W 22 mm (same as above, female).

HABITAT.—Lives in small rivers, creeks, and lakes, in mud or soft sand, particularly where rich in vegetable detritus.

REMARKS.—In peninsular Florida *Villosa vibex* (Conrad) can be confused with *V. amygdala* (Lea) with which it is often found living. *V. vibex* has broader, less distinct, green rays. Sexual dimorphism is not so apparent in *vibex* as it is in *amygdala*. The males of both species tend to be somewhat pointed posteriorly. Females of *vibex* tend to be broadly rounded, rendering the shell slightly arcuate, while the females of *amygdala* are greatly inflated, with the posterior margin subangulate dorsally and truncate below. In the Apalachicolan region *vibex* can be confused with *V. lienosa* (Conrad). See remarks under *V. amygdala* (Lea).

RANGE.—West Gulf coastal region, Alabama-Coosa River system and Apalachicolan region: Pearl River system, Mississippi, east to the Suwannee River system, Florida. Peninsular Florida. Southern Atlantic Slope region: Altamaha River system, Georgia, north to the coastal ponds of the Cape Fear River system, North Carolina.

SPECIMENS EXAMINED.—WACCASASSA RIVER SYSTEM: Waccasassa River, Levy Co. WITHLACOOCHEE RIVER SYSTEM: Withlacoochee River, 9 mi. N Dade City; Withlacoochee River, 1 mi. NW Lacoochee; both Pasco Co. Little Withlacoochee River, Rerdell, Hernando Co. Shady Brook, 2 mi. S Coleman; Lake, 6 mi. NNW Panasoffkee; both Sumter Co. Withlacoochee River, Dunnellon, Marion Co. HILLSBOROUGH RIVER SYSTEM: Hillsborough River, Morris bridge, 14 mi. NE Tampa; Hillsborough River, 4 mi. NE Temple Terrace; Fishhawk Creek, 2 mi. S Lithia; all Hillsborough Co. PEACE RIVER SYSTEM: Peace River, 1.4 mi. below Arcadia; De Soto Co. KISSIMMEE RIVER SYSTEM AND EVERGLADES:—KISSIMMEE RIVER DRAINAGE: Reedy Lake; Polk Co. Lake Verona, Avon Park; Highlands Co. LAKE OKEECHOBEE DRAINAGE: Seven Mile Tower Road, 3.5 mi. S Tamiami Trail, Everglades Natl. Park; W of Bridge no. 22, Tamiami Trail; both Dade Co. Snake Creek, 9 mi. W Hallandale; Broward Co.

ST. JOHNS RIVER SYSTEM:—ST. JOHNS RIVER DRAINAGE Ditch near Lake Washington, 6 mi. W Eau Gallie; Lake Poinsett (USNM); both Brevard Co. Puzzle Lake, 7 mi. SE Geneva; Lake Jessup, St. Johns River at S end of Lake Monroe; both Seminole Co. Spring Garden Lake, 1 mi. NW De Leon Springs, Volusia Co. Rice Creek, 7.3 mi. WNW Palatka; Putnam Co. Near St. Augustine; St. Johns Co. (USNM). OKLAWAHA RIVER DRAINAGE. Lake Minneola, Clermont; Lake Lucy, 2 mi. N Groveland; Lake Eustis, Tavares; Lake Saunders, Tavares; Lake Griffin; all Lake Co. Lake Weir, Oklawaha; Juniper Creek, 12 mi. E Lynn; both Marion Co. Cross Creek, 5 mi. NW Island Grove, Alachua Co. Orange Creek, 1 mi. N Orange Springs; Oklawaha River, Eureka Springs; both Marion Co. HAW CREEK DRAINAGE: Lake Dias, 5 mi. ENE De Leon Springs; Volusia Co. BLACK CREEK DRAINAGE: North Fork, Black Creek, 14 mi. SW Orange Park, Clay Co.

*Villosa amygdala* (Lea)
Figures 4A, 11 G-J, 12A

*Unio amygdalum* Lea, 1843, Desc. Twelve Uniones (Lake George, Florida). Lea, 1846, Trans. Amer. Philos. Soc., 9: 275, pl. 39, fig. 1; figured holotype USNM 86127. Lea, 1848, Obs. Unio, 4: 33.

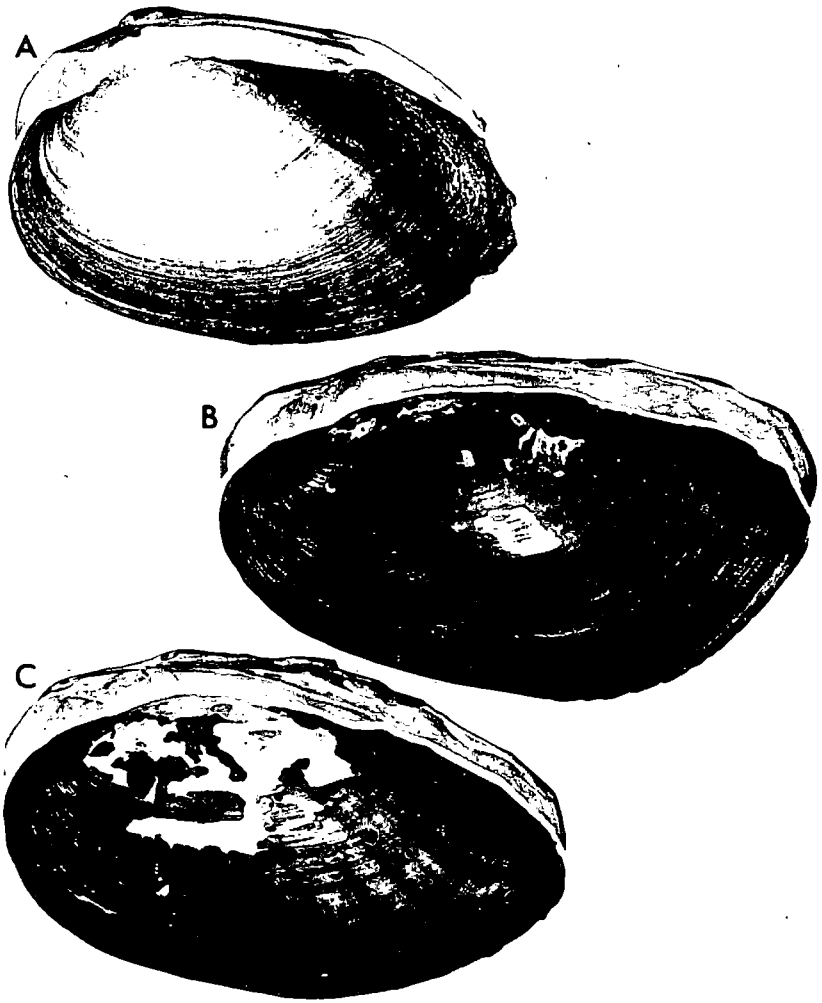


FIGURE 12[1]. *Villosa amygdala* (Lea). A. Lectotype of *Unio lepidus* Gould. Lake Monroe, Florida. MCZ 169223. L 63, H 35, W 25 (1.1 X).

*Lampsilis (Lampsilis) teres* (Rafinesque). B. *Lampsilis (Lampsilis) teres* (Rafinesque). Sampson Lake, 4 mi. W of Starke, Bradford Co., Florida. MCZ 237516. L 81, H 41, W 29, female (nat. size). C. *Lampsilis (Lampsilis) teres* (Rafinesque). Lake Tsala Apopka, Hernando Co., Florida. MCZ 237509. L 78, H 39, W 29, male (nat. size).

[1] Measurements in mm, L = length, H = height, W = width.

*Unio trosculus* Lea, 1843, Desc. Twelve Uniones. (Lake Monroe, Florida). Changed to:

*Unio trossulus* Lea, 1846, Trans. Amer. Philos. Soc., 9: 278, pl. 40, fig. 6; figured holotype USNM 84705. Lea, 1848, Obs. Unio, 4: 36.

*Unio papraceus* Gould, 1845, Proc. Boston Soc. Nat. Hist., 2: 53 (Everglades of Florida: lectotype USNM 86125 selected by Johnson, 1964, U.S. Natl. Mus., Bull. 239, p. 122, pl. 31, fig. 2).

*Unio lepidus* Gould 1856, Proc. Boston Soc. Nat. Hist., 6: 15 (Lake Monroe, Florida; lectotype MCZ 169223 selected by Johnson, 1964, U.S Natl. Mus., Bull. 239, p. 100, pl. 31, fig. 1).

*Unio vesicularis* Lea 1872, Proc. Acad. Nat. Sci. Phila., 24: 156 (Lake Ocheechobee [Okeechobee], Florida). Lea, 1874, Jour. Acad. Nat. Sci. Phila., (2) 8: 37, pl. 12, fig. 34; figured holotype USNM 85292. Lea, 1874, Obs. Unio, 13: 41.

*Unio singleyanus* Marsh 1891, Nautilus, 5: 29 (small creek near Pilatka [Palatka, Putnam Co.], Florida: [location of type unknown] figured by Simpson, 1892, Proc. U.S. Natl. Mus., 15: 426, pl. 68, figs. 4,5).

*Villosa vibex amygdala* (Lea). Clench and Turner, 1956, Bull. Florida State Mus., 1: 211, pl. 4, fig. 1.

DESCRIPTION – Shell usually small, not exceeding 50 mm in length, though occasionally reaching 65 mm. Outline subelliptical. Valves subinflated, generally thin and translucent. Anterior end regularly rounded, posterior end of females more broadly rounded, males somewhat pointed. Ventral margin straight or slightly curved, often slightly arcuate in females. Dorsal margin straight with a slight angle where it meets the obliquely descending posterior margin. Posterior ridge broadly rounded, posterior slope slightly concave. Umbos moderately swollen, somewhat elevated above the hinge line, located in the anterior quarter of the shell, their sculpture consisting of several fine, low, slightly double-looped ridges. Surface of the shell generally rather smooth, but roughened by periostracum posteriorly. Periostracum generally quite dull, sometimes sub-shiny, greenish-yellow, sometimes blackish, the surface usually covered with narrow, light green rays, which in darker specimens can be seen in transmitted light.

Left valve with two delicate pseudocardinal teeth, one in front of the other, the anterior one somewhat triangular, the hind one apt to be vestigial. Hinge line very narrow, in front of two short, straight lateral teeth. Right valve with two triangular, narrow, parallel pseudocardinals separated by a narrow pit, the more anterior tooth vestigial, sometimes absent; one lateral tooth. Beak cavities shallow, a few dorsal muscle scars under the hinge plate. Anterior adductor muscle scars well impressed, posterior ones faint, if visible. Pallial line distinct posteriorly. Nacre almost always uniformly bluish-white and iridescent posteriorly.

MEASUREMENTS. – L 65 mm, H 34 mm, W 23 mm (lake on Julington Creek, 2 mi. W of Bayard, Duval Co., male); L 55 mm, H 32 mm, W 21 mm (Lake Eaton 5 mi. NE of Lynn Marion Co., male); L44 mm H 27 mm, W 17.5 mm (same as above, female).

HABITAT.—Lives in mud or soft sand of rivers and lakes, particularly when rich in vegetable detritus.

REMARKS.—In peninsular Florida *Villosa amygdala* Lea can only be confused with *V. vibex* (Conrad) with which it is often found living. The rays of *amygdala* are narrower, generally sharper, and of a lighter green than those of *vibex*. The surface of *amygdala* is generally less shiny, and the shell is more inflated and generally heavier. Sexual dimorphism is more apparant in *amygdala*. The males of both species tend to be somewhat pointed posteriorly, but females of *amygdala* are more inflated, with the posterior margin subangulate dorsally and broadly truncate below, while females of *vibex* tend to be less inflated and more broadly rounded posteriorly, rendering the ventral margin slightly arcuate.

*Villosa amygdala* is most closely related to *V. lienosa* (Conrad) which is found in the Interior Basin and extends along the Gulf Coast from Texas to the Suwannee River, Florida. Both species show similar sexual dimorphism, but *lienosa* has a consistently heavier shell that is less elongate and less inflated than that of *amygdala*. Unlike the latter, *lienosa* is infrequently rayed, and usually has a purplish nacre, while that of *amygdala* is white.

*V. amygdala* is replaced in the Atlantic Slope region from the Altamaha River system, Georgia to the Neuse River system, North Carolina, by *V. delumbis* (Conrad), which is similarly sexually dimorphic. *V. delumbis* has a rather consistently thin shell with a light yellow or light greenish-yellow periostracum covered by narrow green rays that are characteristically broken by growth rests.

RANGE.—Peninsular Florida

SPECIMENS EXAMINED.—WITHLACOOCHEE RIVER SYSTEM: Lake Jovita (Clear Lake), St. Leo, Pasco Co. Lees Lake, Panasoffkee, Lake, 6 mi. NNW Panasoffkee; both Sumter Co. Lake Consuelo, near Floral City; Lake Tsala Apopka, Hernando; Withlacoochee River, near Crystal River; all Citrus Co. HILLSBOROUGH RIVER SYSTEM:—Lake Tarpon, Tarpon Springs; Pinellas Co. Hillsborough River, 4 mi. NE Temple Terrace, Hillsborough Co. PEACE RIVER SYSTEM: Lake Hamilton, 4 mi. SSW Haines City; Polk Co. Silver Lake, Tavares, Lake Co. Horse Creek [De Soto and Hardee Cos.]. Charlie Creek, 3 mi. SW Nocatee; Peace River 1.25 mi. below Arcadia; both De Soto Co. KISSIMMEE RIVER SYSTEM AND EVERGLADES:—KISSIMMEE RIVER DRAINAGE. East Tohopekaliga Lake, Narcoossee; Lake Tohopekaliga, Kissimmee; Lake Marion, 3 mi. WNW Keansville; all Osceola Co. Lake Rosalie, 4 mi. NE Hesperides; Lake Weohyakapka, Indian Lake Estates; Tiger Lake, 7 mi. ESE Hesperides; all Polk Co. Lake Viola, Avon Park; Bonnet Lake, 3 mi. N Sebring; both Highlands Co. LAKE OKEECHOBEE DRAINAGE. Fisheating Creek, 1 mi. S Lakeport; Caloosahatchee River, above lock, Moore Haven; both Glades Co. Lake Okeechobee, St. Lucie Co. Lake Okeechobee, 2 mi. N Canal Point; canal from Lake Okeechobee [town of] South Bay; both Palm Beach Co. Canal, 10 mi. E Monroe Station; Collier Co. Seven Mile fire tower, 7 mi. S Tamiami Trail, Everglades National Park; Dade Co. Lake Osborne, 2.5 mi. NW Lantana; Palm Beach Co. ST. JOHNS RIVER SYSTEM: ST. JOHNS RIVER DRAINAGE.—Ditch, near Deer Park; Osceola Co. Ditch, near Lake Washington, 6 mi. W Eau Gallie; Brevard Co. Puzzle Lake, 7 mi. SE Geneva; Lake Harney, 3 mi. SE Geneva; Econlockhatchee River, near confluence with

St. Johns River; Lake Jessup, 3 mi. N Oviedo; St. Johns River, 4 mi. E Sanford; Lake Monroe, Sanford; all Seminole Co. Lake Ashby, 8 mi. NE Osteen; St. Johns River, near Enterprise; Lake Beresford; Spring Garden Lake, 1 mi. NE DeLeon Springs; Lake Woodruff; all Volusia Co. St. Johns River, Astor; Blue Creek, above Lake George; both Lake Co. Lake Kerr, 3 mi. SW Kerr City; Marion Co. OKLAWAHA RIVER DRAINAGE. Black Lake, 3 mi. SW Oakland; John Lake, 1 mi. S Oakland; both Orange Co. Lake Apopka, 2.5 mi. S Monteverde; Lake Harris, Tavares; Lake Yale, [town of] Grand Island; Lake Griffin, Leesburg; all Lake Co. Lake Weir, Oklawaha; Halfmoon Lake, 6 mi. N Lynn; Lake Eaton, 5 mi. NE Lynn; Oklawaha River, Eureka Springs; all Marion Co. Redwater Lake, 4 mi. W. Johnson, Putnam Co. JULINGTON CREEK DRAINAGE. Lake on Julington Creek, 2 mi. W Bayard; Duval Co.

## Genus *Lampsilis* Rafinesque

*Lampsilis* Rafinesque 1820, Ann. Gén. des Sci. Physiques (Bruxelles) 5: 298. Species listed: *Lampsilis cardium* Rafinesque, *Lampsilis ovata* (Say), *Lampsilis fasciola* Rafinesque.

Type species, *Unio ovatus* Say. Subsequent designation, Herrmannsen, 1847, Indicis Generum Malacozoorum, 1: 575. Ortmann, 1912, Ann. Carnegie, Mus., 8: 345.

## Subgenus *Lampsilis*

The species of *Lampsilis* described in this paper belongs to subgenus *Lampsilis*. Frierson (1927: 67-86) listed 10 other subgenera, 3 of which are of his own creation. One of them, *Villosa*, is now used in place of *Micromya* Agassiz (see under *Villosa*). To comment on the other subgenera is not in the scope of this paper, but on cursory examination, I disagree substantially with Frierson's classification both on a generic and specific level.

Subgenus *Lampsilis*, while clearly of Interior Basin origin, appears to have speciated about equally there and in the Apalachicolan and Atlantic Slope regions.

### *Lampsilis (Lampsilis) teres* (Rafinesque)
Figure 3A, 12 B, C

*Unio teres* Rafinesque 1920, Ann. Gen. Sci. Physiques (Bruxelles), 5: 321 (La rivière Wabash [Indiana]; syntype in Poulson colln., not in ANSP [lost], figured by Conrad, 1836, Monography Unionidae, no. 6, p. 52, pl. 38, here selected as type figure. Call, 1900, 24th Ann. Rept. Dept. Geol. and Nat. Res. Indiana (1899), p. 452, pl. 18.

*Unio anodontoides* Lea 1831, Trans. Amer. Philos. Soc., 4: 81, pl. 8, fig. 11 (Mississippi, Alabama, and Ohio rivers; type not in USNM or ANSP [lost]). Lea, 1831, Obs. Unio, 1: 91.

*Unio floridensis* Lea 1852, Trans. Amer. Philos. Soc., 10: 274, pl. 21, fig. 31 (Chá-chá-chi River, West Florida, figured holotype ANSP 42081. Clench and Turner (1956: 202) restricted the type locality to the Choctawatchee River, 1 mi. W Caryville, Holmes Co., Florida). Lea, 1852, Obs. Unio, 5: 30.

*Lampsilis fallaciosus* Smith 1899, Bull. U.S. Fish Comm. for 1898, 18: 291, pl. 79 (mouths of narrow arms of [Mississippi River], near Muscatine, [Muscatine Co., Iowa]; [location of type unknown].

*Lampsilis anodontoides* (Lea). Ortmann and Walker, 1922, Occ. Papers, Mus. Zool., Univ. Michigan, no. 112, p. 60.

*Lampsilis anodontoides floridensis* (Lea). Clench and Turner, 1956, Bull. Florida State Mus., 1: 201, pl. 3, fig. 1.

*Lampsilis anodontoides* (Lea). La Rocque, 1967, Geol. Survey, Ohio, Bull., 62(2): 213, fig. 98.

*Lampsilis anodontoides* form *anodontoides* (Lea). Valentine and Stansbery, 1971, Sterkiana, no. 42, p. 30.

*Lampsilis anodontoides fallaciosa* Smith. La Rocque, 1967, Geol. Survey, Ohio, Bull., 62 (2): 215

*Lampsilis anodontoides* form *fallaciosa* Smith. Valentine and Stansbery, 1971, Sterkiana, no. 42, p. 30.

DESCRIPTION.—Shell medium in size, seldom exceeding 100 mm in length. Outline elliptical or subelliptical. Valves slightly inflated, thin, but strong, inequilateral. Anterior end regularly rounded; posterior end of both male and female shell terminating in a point two-thirds of the way up from the base. Ventral margin straight in males; somewhat arcuate in females because of marsupial swelling. Dorsal margin straight, forming a sharp angle with the obliquely descending posterior margin. Posterior ridge low and rounded, posterior slope slightly concave. Umbos rather full, but not high, located in the anterior quarter of the shell, their sculpture consisting of numerous ridges looped in the middle but open posteriorly. Periostracum generally smooth except on the posterior slope where it may be roughened, usually shiny yellow or straw, occasionally brownish, sometimes with fine green rays over the entire surface, but more often, if present, limited to the posterior end.

Left valve with two subcompressed pseudocardinal teeth, the hind one somewhat elongated. Hinge line short and narrow, in front of two delicate straight lateral teeth. Right valve with two triangular, narrow pseudocardinals separated by a narrow pit, the more anterior tooth vestigial; one lateral tooth. Beak cavities shallow, a few dorsal muscle scars under the hinge plate. Anterior adductor muscle scars deep, posterior ones and pallial line distinct. Nacre white to pale pink, somewhat iridescent.

MEASUREMENTS.—L 90 mm, H 41 mm, W 30 mm (Lees Lake Panasoffkee, Sumter Co., male); L 75 mm, H 37 mm, W 24 mm (Withlacoochee River, Dunnellon, Marion Co., male); L 73 mm, H 37 mm, W 23 mm (same as above, female).

HABITAT.—Lives in sand in either swift or slowly moving water.

REMARKS.—In peninsular Florida, *Lampsilis teres* Rafinesque cannot be confused with any other species. It is distinguished by its long elliptical shape and shiny yellow, sometimes green rayed periostracum.

Clench and Turner (1956: 158), following Simpson (1914:91), recog-

nized *floridensis* (Lea) as a subspecies of *L. anodontoides*, but admitted that "young specimens of the typical form would be difficult to separate from this subspecies." It is true that specimens of this species tend to be smaller and thinner toward the southern end of its range, but *floridensis* is not a subspecies as this concept is currently understood.

It is unfortunate that this species is best known under the name *anodontoides*, but it has been repeatedly pointed out (Say, 1834, pt. 6 [no pagination]; Conrad, 1834: 72; Férussac, 1835: 27; Kuester, 1854: 68; Call, 1899: 452; Utterback, 1916: 442 (179); and Frierson, 1927: 70) that Rafinesque's name, *teres*, has priority. Ortmann and Walker (1922: 60), quoting Pilsbry, offered specious reasons for rejecting this name on the basis that it might be *Lampsilis fallaciosa* Smith. The latter is an ecophenotypic variant that exhibits green rays on the surface of the shell. Valentine and Stansbery (1971:30), recognized this variant, but they persist in using the taxon *fallaciosa*. The name *teres* can hardly be considered *nomen oblitum* under Article 23 (b) of the International Code (1964). There is no choice but to recognize it, or ask the Commission to suppress it.

RANGE.—Interior Basin generally. West Gulf Coastal region. Alabama-Coosa River system, Apalachicolan region and peninsular Florida; Northern Mexico, Rio Grande River system, Texas, east to the Withlacoochee River system, Florida.

SPECIMENS EXAMINED.—Withlacoochee River System:—Withlacoochee River 9 mi. N Dade City, Withlacoochee River, 1 mi. NW Lacoochee; both Pasco Co. Little Withlacoochee River, Rerdell; Withlacoochee River, Istachatta (USNM); both Hernando Co. Lees Lake, Panasoffkee; lake, 6 mi. NNW Panasoffkee; both Sumter Co. Lake Tsala Apopka, Floral City; Citrus Co. Withlacoochee River, Dunnellon; Marion Co.

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*ablatus* Lea, *Unio*
*aequatus* Lea, *Unio*
*aheneus* Lea, *Unio*
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*amygdala* (Lea), *Villosa vibex*
*amydalum* Lea, *Unio*
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