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**FRESHWATER MOLLUSKS OF ALABAMA,  
GEORGIA, AND FLORIDA  
FROM THE ESCAMBIA TO THE SUWANNEE RIVER**

**William J. Clench and Ruth D. Turner**



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# FRESHWATER MOLLUSKS OF ALABAMA, GEORGIA, AND FLORIDA FROM THE ESCAMBIA TO THE SUWANNEE RIVER

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<sup>1</sup>[William J. Clench is Curator and Ruth D. Turner is Research Associate in the Department of Mollusks, Museum of Comparative Zoology, Cambridge, Massachusetts. Both authors participated in the field work upon which this report is based. During that period the senior author served as Collaborator on the staff of the Florida State Museum.—Ed.]

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## INTRODUCTION

The beginnings of this study go back some years to when Peter Okkelberg<sup>2</sup> and the senior author made a survey of the upper Flint, Chattahoochee, and Altamaha Rivers in Georgia and Alabama. This trip, in essence, was to be a preliminary expedition to determine, from the material collected, just what river systems should be investigated later in greater detail. Sickness, and later the death, of Dr. Walker, who was to finance the program, precluded a continuance of this work.

In 1933 Henry Vander Schalie and the senior author made a survey of the Unionid fauna of the Cahawba River in Alabama. We crossed Georgia on our way south and again made several stations in the regions drained by the Apalachicola river system. During additional trips to the south various members of this museum have added a few more stations in this general area.

Many other collectors have played an important part in supplying records for this study. Most of these records are based upon materials received in exchange from the University of Michigan, the University of Alabama, and on materials in the University of Florida Collections.

In the spring of 1953 the University of Florida<sup>3</sup> became greatly interested in the Chattahoochee area of Florida, the site of the Jim Woodruff dam. This dam is being built across the Apalachicola River just below the two confluents that create it, the Chattahoochee and Flint Rivers. Specialists in many fields of zoology and botany were called to aid in the survey of territory that was shortly to be inundated. The main idea was to collect and preserve such material as would be destroyed by flooding, and to resurvey the same area in the years to come to determine what changes might occur in the biota. It is astonishing and catastrophic that so little interest has prevailed elsewhere, particularly in the south, where vast changes have been made by the construction of power dams. Surely much damage to the local fauna occurred long before these dams were built, but now much data that might have been obtained are lost forever.

The party working on the mollusks in 1953 consisted of the authors and Mrs. Clench. In 1954 J. C. Dickinson, as administrator of the project, was granted additional funds for a continuance of this survey.

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<sup>2</sup>Then Professor of Zoology, University of Michigan; now Professor Emeritus.

<sup>3</sup>A United States National Park Service contract, and a National Science Foundation grant, issued through the Florida State Museum and the Department of Biology, University of Florida, made possible, in part, field work in connection with this study.

A broadening of the problem appeared inevitable, and with an additional grant from the Museum of Comparative Zoology, a survey of the river systems from the Escambia east to the Suwannee was made possible during August and September of 1954. The party collecting mollusks consisted of the authors and Donald F. McMichael. The success of this trip was a product of the weather. The south experienced widespread drought that was declared by many local observers to be the worst in 30 to 50 years. A few years earlier, P. Okkelberg and the senior author were unable to collect in the lower Flint or Chattahoochee Rivers because of the high water. In 1953 the same high water conditions existed. In 1954 the rivers were exceedingly low and clear, making possible the collection of a rich fauna unavailable during a period of normal or high water.

#### HISTORICAL RESUME

The historical record is clouded owing to lack of details about the early collectors. Isaac Lea of Philadelphia, a man of wide friendships, described most of the species of the Unionidae found in this area. A host of collectors, Bishop Elliott, E. R. Showalter, W. Spillman, G. Hallenbeck, Dr. Boykin, Major LeConte, G. White, J. Postell, J. H. Couper, H. M. Neisler, and others, contributed to his large collection. Lea was a man of considerable means and was able to publish his descriptions in a sumptuous fashion, particularly for that time. Preliminary descriptions appeared in the *Proceedings of the Academy of Natural Sciences, Philadelphia*. A little later these same brief diagnoses reappeared in the *Transactions of the American Philosophical Society* or the *Transactions of the Academy of Natural Sciences, Philadelphia*, with more detailed descriptions, remarks, and beautiful figures. A certain number of sets of these later studies were repaged, then grouped and issued under the title of "Observations on the Genus Unio."<sup>4</sup>

In 1834 T. A. Conrad published a booklet with illustrations of several American freshwater shells. He collected a few species in the Flint River, very probably at Albany. He traveled extensively through

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<sup>4</sup>The plates retained their original numbers, as the numbers had been engraved along with the rest of the plate. This has been the source of concern by workers and librarians as the various volumes of the "Observations" have no continuity of plate numbers. The so-called missing numbers are plates on other subjects that appeared originally in the *Transactions* or elsewhere. Fortunately, a detailed bibliography of Lea was compiled by N. P. Scudder (1885). All pertinent data are given in detail.

much of Alabama and through limited areas of Georgia wherein he made many notable discoveries. Lea and Conrad became exceedingly antagonistic toward one another, and their discord regarding publication dates was second only to the Marsh and Cope controversy of a few generations ago. We highlight this only because the antagonism caused Lea to deposit his extensive collection in the United States National Museum, and not in the Academy at Philadelphia under whose auspices many of his studies had been published. Conrad's types are scattered, and many are lost. A few are in Philadelphia, but his main collection was stored in Cambridge, Massachusetts, about 1870, and then lost. We have done everything to locate it, but with no success.

Many of the so-called "cabinets" of Lea's day are also lost. He usually mentioned under each species he described the name of the collector, and then added, for example, "My cabinet, and the cabinet of Rev. George White." Just what has happened to the many cabinets is unknown to us. Some may exist in our larger museums, but we fear that most of them ceased to be when their owners lost interest, or their inheritors failed to recognize or understand the importance of these collections.

Locality data were frequently in error. This is understandable, for at that time there was a lack of interest in, or understanding of, the importance of such data. Collections were made, possibly over a wide area, then labelled at a later date. Memory certainly failed in many instances. Mollusks from Macon County on the Flint River—the Apalachicola system—were frequently listed as "Macon" which is a city on the Ocmulgee River, a major tributary of the Altamaha River—a totally different system. Also, several type localities are given as "Flint River near Macon, Georgia." In some instances reference was made to the city of Macon, and the river in question was not the Flint River but the Ocmulgee. Thus, these original errors persisted, were copied and republished with occasional new errors added to increase the complexity of the problem. Certain of these errors are going to be very difficult to prove. Many type localities have been destroyed. In one instance, a whole river, the Chattahoochee, once rich in mollusks, now appears to be nearly barren of these animals. Continued destruction will proceed at an accelerated pace. Industrial expansion continues in the south, and many industries produce waste products deleterious to mollusks. However, the greatest source of damage seems to be land erosion and consequent silting of the rivers. Many species of Unionidae were described originally from the Chat-

tahoochee River, Columbus, Georgia. Most were described during the middle of the past century. In 1929 P. Okkelberg and the senior author failed to find a single freshwater mollusk at this locality.

More recently (1955), Herbert Athearn located a limited number of species both above and below Columbus, Georgia, in the Chattahoochee River. Probably there are many other places which possess some material, but, on the whole, the river now has only a small fraction of a once rich fauna.

The most recent study within this area is that of Vander Schalie in 1940. This paper considers the distribution and ecology of the freshwater mussels of the Chipola River, a major tributary of the lower Apalachicola River.

#### ACKNOWLEDGEMENTS

We are exceedingly grateful to many people who have aided in making this study possible. Angus Gohlson, of Chattahoochee, Florida, was helpful in taking us to many localities not easily located by those unfamiliar with the area about Chattahoochee.

We are also indebted to a host of collectors who have furnished much of the material that formed the basis of this study. To H. A. Rehder, R. T. Abbott, and Henry Vander Schalie we owe our sincere thanks for time and trouble in checking type material and for the loan of types which we needed for many species in this study. To Herbert Athearn, of Cleveland, Tennessee, we are grateful for the loan of material collected on two trips, one to the Chipola River and the other to the upper Chattahoochee River region.

The photographs are the work of Frank White, staff photographer at the Biological Laboratories, Harvard University.

## DISCUSSION OF THE FAUNA

In the systematic part of this report we have treated monographically all of the species known to occur in the rivers from the Escambia east to the Suwannee. From this study some interesting facts have emerged, and these seem to indicate that the fauna of this area has been derived from the west, is depauperate, and must be fairly old. There is also evidence that a central area of the Floridian peninsula remained isolated for a sufficient period of time to allow the development of several endemic elements. This area has been referred to as "Orange Island" by Vaughan (1910) and Woodson (1947).

A WESTERLY DERIVED FAUNA.—The relationships of most of the species and genera found in the area encompassed by this report are with species and genera of the Coosa-Alabama and Tennessee river systems. Only two genera are endemic in the area, namely, *Quincuncina* and *Notogillia*. The genus *Quincuncina* is close in its relationship with *Fusconaia*, a genus of wide distribution in the Coosa-Alabama and Mississippi river systems. *Notogillia*, a genus containing only a single recent species, has its relationship with the genus *Somatogyrus* of the same river systems. A species and subspecies have recently been described in *Notogillia* from the Pliocene of St. Petersburg, Florida, by Pilsbry (1953: 439).

How this fauna arrived in the area is difficult to say—mechanically or by stream capture? We are inclined to favor the former possibility, simply because there are so many genera absent which should occur if stream capture had been at all prevalent. Distribution by stream capture would have necessitated a sequence of captured streams from the Apalachicola to the Suwannee in order to explain the presence of several species. The absence of other species present in the Apalachicola and Ochlockonee, but not in the Suwannee, would then be hard to explain. Accidental dispersal, however, can at least be credited to some factor in the life cycle of a species. That is, certain species are more susceptible to mechanical transport and, therefore, are more successful in making accidental trips from one drainage system to another. In many instances these species are more adaptable and, consequently, are more likely to survive when introduced into a new area. Time is important. Streams in this area, at least in the upland region, have probably been in existence since the mid-Tertiary, and perhaps much longer. Considering this length of time, a successful introduction once in a thousand years could easily account for the present fauna. It is unfortunate, however, that there is no fossil

record of any freshwater mollusks in the upland country between the Escambia and the Suwannee Rivers.

It must be remembered that most of the Unionidae or freshwater mussels are, in the larval stage, parasitic on some species of fish. The proper host or hosts would have to be present for an introduced species to survive. Also, parasitized fish introduced into a new stream would be a factor in mussel dispersal. Probably wide ranging species of mussels can parasitize several species of fish while those with a limited range are probably limited to a single fish host. However, nothing is known regarding host specificity of the mussels in this area.

A DEPAUPERATE FAUNA.—The absence of many genera, and a great lack in number of species within this entire area, denotes a depauperate molluscan fauna. Such genera as *Pleurocera*, *Anculosa*, and *Apella* in the Pleuroceridae, and *Proptera*, *Quadrula*, *Tritogonia*, and *Obovaria* in the Unionidae, are entirely absent. These are only a few of the many genera that do not occur within this region, but which are exceedingly common in the Coosa-Alabama river system, and in most instances even extend into the rivers to the north.

A FAIRLY OLD FAUNA.—The rather large number of endemic forms (27) would indicate an element of antiquity. It would appear that regardless of the vicissitudes of the coastal plain, and even parts of the lower upland country, the headwaters of certain of these streams, particularly the Chattahoochee and Flint Rivers have persisted for a considerable period of geologic time, certainly since the mid-Tertiary, and perhaps much longer.

EVIDENCE OF "ORANGE ISLAND."—There appears to be some good evidence among the freshwater mollusks for the existence of an island in what is now central Florida during the period of fluctuation of the epicontinental Pliocene and Pleistocene seas. Though the differences between many of the species of central and southern Florida and the regions to the north are not great, they exist in sufficient numbers to warrant an explanation.

Although the central area of Florida is beyond the scope of this paper, several species that occur in it have been dealt with because they have a direct bearing on our problem. For a few genera we have included all of the species which occur in central and southern Florida. Naturally we can set no exact limits on the maximum size of such an island area; we can suggest, however, that it must have been large, at least large enough to have had a freshwater drainage system with some lakes and perhaps some fairly large creeks. Dall (1903) held the opinion that freshwater lakes were "constantly existing since the Ocala

islands were raised above the sea." Earlier in this same work he refers to this area as the "island of Florida."

**DISTRIBUTION OF THE SPECIES.**—In the accompanying table, Distribution of Species, only records from the Escambia, Choctawhatchee, Apalachicola, Ochlockonee, and Suwannee Rivers have been included. Records from the Yellow, Econfina,<sup>5</sup> Aucilla, Fenholloway, and Steinhatchee, are too limited, and their inclusion would not aid in this problem. We have included all of the Unionidae and all of the Prosobranch gastropods, but have omitted the Sphaeridae and the Pulmonate gastropods as their numbers are relatively small.

Several facts of importance are vividly portrayed in this chart. First, the greatest amount of endemism occurs in the Apalachicola river system, which points to the great antiquity and stability of at least its upper part. Second, there are many species which do not extend to the east or south beyond the Suwannee River. This is undoubtedly explained by the fact that at the time of "Orange Island" this area was inundated. However, as the land came into existence the Suwannee River was populated by elements which had existed in the upper Withlacoochee River, its most important tributary. Since that time only a few species have extended their range to the south.

It is impossible at this time to explain the lack of many gastropods in the Ochlockonee River. A number of collecting stations were made on this river, and many areas appeared suitable. However, very few gastropods were found, and it seems particularly strange that no species of such common, widespread genera as *Goniobasis*, *Viviparus*, and *Pomacea* were collected.

The occurrence of *Goniobasis dickinsoni* (a new species described later in this paper) in the upper reaches of two different river systems, where the small tributaries nearly meet one another, probably indicates mechanical distribution, or possibly general flooding of this low-lying area.

It is interesting to note the lack of endemic species in the smaller river systems such as the Ochlockonee and the Suwannee, rivers whose headwaters do not extend far into the uplands. During the period of greatest submergence most of the area drained by these rivers was inundated. If endemic species ever did exist in these two rivers they

<sup>5</sup>There are two Econfina Rivers in Florida, one in Washington County and the other in Taylor County. Also, there are two Withlacoochee Rivers; the southernmost is an independent stream that enters the Gulf of Mexico about 25 miles south of Cedar Keys, Florida. The other Withlacoochee River has its origin in southern Georgia, and is an important confluent of the Suwannee River.

## DISTRIBUTION OF SPECIES

SPECIES (Arranged geographically according to their oc- currence in the river sys- tems from west to east)	AREAS TO THE N AND W	ESCAMBIA SYSTEM	CHOCTAWHATCHEE SYSTEM	APALACHICOLA SYSTEM	OCHLOCKNEE SYSTEM	SUWANNEE SYSTEM	"ORANGE ISLAND"	AREAS TO THE S AND E
<i>Lampsilis a. floridensis</i>	O	X	X	X	X	X	X	O
<i>Elliptio strigosus</i>	O	X	X	X	X	X	X	O
<i>Villosa vibex</i>	O	X	X	X	X	X	X	O
<i>Villosa lienosa</i>	O	X	X	X	X	X		
<i>Anodonta imbecilis</i>	O	X	X	X	X	X		
<i>Lampsilis claibornensis</i>	O	X	X	X	X	X		
<i>Anodonta hallenbecki</i>	O	X	X	X				
<i>Glebulia rotundata</i>	O	X	X	X				
<i>Elliptio c. incrassatus</i>	O	X		X				
<i>Lampsilis excurvatus</i>	O	X						
<i>Margaritana hembeli</i>	O	X						
<i>Unio merus obesus</i>		X	X	X	X	X	X	O
<i>Campeloma geniculum</i>		X	X	X	X	X		
<i>Crenodonta boykiniana</i>		X		X	X			
<i>Goniobasis curvicostata</i>		X	X	X				
<i>Anodontoides elliotti</i>		X		X				
<i>Pleurobema strodeanum</i>		X	X					
<i>Lampsilis australis</i>		X	X					
<i>Fusconaia succissa</i>		X	X					
<i>Fusconaja escambia*</i>		X						
<i>Corunculina paula</i>			X	X	X	X	X	O
<i>Pomacea paludosa</i>			X	X		X	X	O
<i>Viviparus georgianus</i>			X	X		X	X	O
<i>Goniobasis floridensis</i>			X	X		X	X	O
<i>Lioplax pilsbryi</i>			X	X	X	X		
<i>Anodonta gibbosa</i>			X	X	X			
<i>Lampsilis subangulata</i>			X	X	X			
<i>Quincuncina burkei</i>			X					
<i>Elliptio mcMichaeli*</i>			X					
<i>Goniobasis clenchi</i>			X					



## DISTRIBUTION OF SPECIES (Continued)

SPECIES (Arranged geographically according to their oc- currence in the river sys- tems from west to east)	AREAS TO THE N AND W	ESCAMBIA SYSTEM	CHOCTAWHATCHEE SYSTEM	APALACHICOLA SYSTEM	OCHLOCKONEE SYSTEM	SUWANNEE SYSTEM	"ORANGE ISLAND"	AREAS TO THE S AND E
<i>Notogillia wetherbyi</i>				X	X	X	X	O
<i>Villosa villosa</i>				X	X	X	?	O
<i>Quincuncina infucata</i>				X	X	X		
<i>Medionidus penniculatus</i>				X	X	X		
<i>Pleurobema pyriforme</i>				X	X	X		
<i>Elliptio sloatianus</i>				X	X			
<i>Crenodonta neisleri</i>				X				
<i>Alasmidonta triangulata</i>				X				
<i>Elliptio chipolaensis</i>				X				
<i>Goniobasis athearni</i> *				X				
<i>Goniobasis boykiniiana</i>				X				
<i>Goniobasis catenoides</i>				X				
<i>Goniobasis viennaensis</i>				X				
<i>Goniobasis albanyensis</i>				X				
<i>Goniobasis dickinsoni</i> *			X					
<i>Villosa v. amygdala</i>							X	O
<i>Viviparus g. wareanus</i>							X	O
<i>Anodonta cowperiana</i>							X	O
<i>Campelema floridense</i>							X	
<i>Goniobasis vanhyningiana</i>							X	

X—present in the system or region indicated.

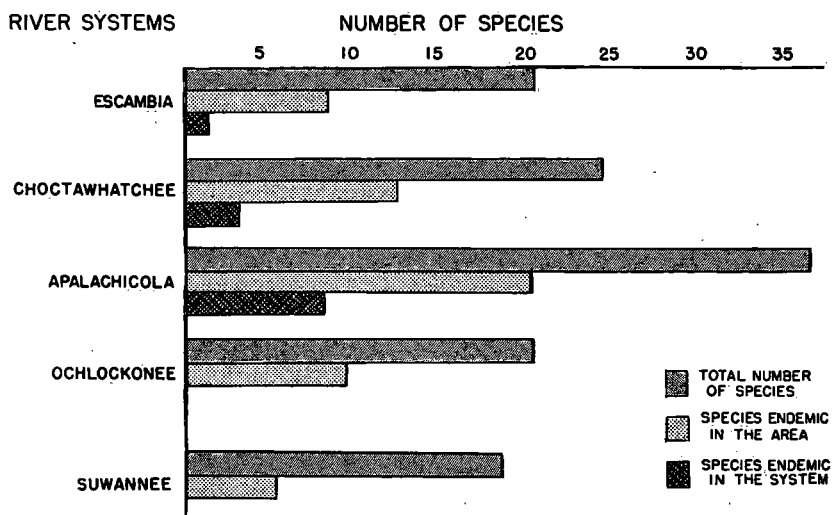
O—range extends out of the area covered in this report, either to the north and west or to the south and east.

\*A new species to be described later in this paper.

were destroyed by the invasion of the Pleistocene seas. Such a species could have been *Elliptio pachyodon* Pilsbry, described from the Pliocene of St. Petersburg. It is closely related to *Elliptio crassidens incrasatus* Lea, a species which today does not occur east of the Apalachicola system.

The species listed in the table for "Orange Island" are by no means all that occur. The few listed are those which, for one reason or another, concerned us in our survey. A complete picture of the endemicity in the "Orange Island" area can be obtained only after a monographic study of all of the species found in the Florida peninsula.

Three species which are found in the Escambia and the Apalachicola river systems apparently do not occur in the Choctawhatchee river system. With the data at hand we are unable to explain this situation.



It is possible, of course, that with further collecting they will be found in the Choctawhatchee system, though this seems unlikely as collections from this region are reasonably good, the species concerned are large and conspicuous, and elsewhere they are reasonably common.

Indicative of the great endemicity of this area is the fact that of the forty-five species listed in the table as ranging from the Escambia River to the Suwannee River only eleven extend to the west and north. Of the remainder, twenty-seven are endemic, while seven extend from the area southward into central Florida.

The text figure shows graphically the relative number of species occurring in each river system, as well as the endemicity within each area and each system.

## SYSTEMATICS

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

ANSP—Academy of Natural Sciences, Philadelphia

MCZ—Museum of Comparative Zoology

MZUM—Museum of Zoology, University of Michigan

USNM—United States National Museum

[Where a full synonymic citation is lacking, reference to the bibliography is implied. The style of the synonymies is the responsibility of the editor, not of the authors—Ed.]

## VIVIPARIDAE.

Genus *Viviparus* Montfort

*Viviparus* Denys de Montfort (1810, *Conchyliologie Systématique* (Paris), 2: 247).

Type species, *Viviparus fluviorum* Montfort (= *Helix vivipara* Linné), original designation.

Shells globose to moderately attenuate with pronounced convex whorls. Generally thin in structure, but strong. Usually colored greenish to dark brown or black, and occasionally with spiral bands of dark brown.

The animal is sluggish and prefers quiet water where there is vegetation and a soft substrate of mud or muddy sand.

*Viviparus georgianus* Lea

## Plate 1 Figures 1-4

*Paludina georgiana* Lea (1834, *Trans. Amer. Philos. Soc.* (n.s.), 5: 116, pl. 19, fig. 85), Hopeton, near Darien, Georgia. Lea, 1834 (1: 228, pl. 19, fig. 85).

*Vivipara georgiana* var. *altior* Pilsbry (1892, *Nautilus*, 5: 142), aboriginal shell heap, left bank Hitchen's Creek, near entrance of St. Johns River into Lake George, Florida.

*Viviparus contectoides compactus* Pilsbry (1916, *Nautilus*, 30: 42), Dougherty, Georgia.

*Viviparus contectoides limi* Pilsbry (1918, *Nautilus*, 32: 71); [new name for *compactus* Pilsbry, 1916; non Kobelt, 1906].

*Viviparus contectoides goodrichi* Archer (1933, *Nautilus*, 47: 19, pl. 3, figs. 1-3), tributary to the Chipola River, 5 mi. NE Marianna, Jackson Co., Florida.

DESCRIPTION.—Shell subglobose in outline and varying in size, large specimens reaching about 44 mm. (about 1¾ inches) in length, imperforate or with a narrow slitlike umbilicus. Usually rather thin in structure, but strong and smooth. Color yellowish or olivaceous green

to dark brownish green, banded or uniform in color. Banded specimens usually have four dark reddish-brown bands about evenly spaced. Whorls 4 to 5, strongly convex, and generally with a slight shoulder. Spire somewhat extended and produced at an angle of from 50° to 65°. Aperture ovate to subcircular. Outer lip thin, parietal lip consisting of a thickened glaze. Columella narrow and arched. Suture deeply indented. Sculpture consisting only of fine growth lines. Young specimens have a few spiral threads which eventually disappear as they grow older. Operculum corneous, thin, with concentric growth lines and a submarginal nucleus.

LENGTH*	WIDTH	
mm.	mm.	
44	35	Holotype, <i>V. goodrichi</i> Archer
26	19.5	Holotype, <i>V. georgiana</i> Lea
26	21	Lectotype, <i>V. compactus</i> (=limi) Pilsbry

\*All measurements in this paper are based upon single specimens, usually the largest available or others that are typical examples.

**TYPES.**—The holotype of *V. georgianus* Lea is in the United States National Museum (106252), and is from Hopeton, near Darien, Georgia. Paratypes are in the Museum of Comparative Zoology (186792). The lectotype of *V. contectoides compactus* Pilsbry, here selected, is in the Academy of Natural Sciences, Philadelphia, (27731) from Dougherty County, Georgia. The holotype of *V. contectoides goodrichi* Archer is in the Museum of Comparative Zoology (92432), from a spring-fed creek [Spring Creek, or a tributary of it] 5 miles northeast of Marianna, Jackson County, Florida. The holotype of *V. georgiana altior* Pilsbry is in the Academy of Natural Sciences, Philadelphia, and paratypes are in the Museum of Comparative Zoology (78391).

**REMARKS.**—This is an exceedingly variable species. Though the extremes appear to be quite different, every kind of an intergrade exists between them. These differences appear to have no pattern, but occur sporadically throughout the range of the species, probably controlled by a combination of inheritance and ecology. The distribution of this species is very spotty. It generally is not found in the larger rivers, but in the sloughs that may margin them or in smaller creeks, lakes, ponds, and springs. There may be considerable distances between colonies, and each colony is usually rather uniform as to size, shape, and coloration of the shells. Colonies can exist where there is a great deal of soft mud and vegetation in quiet water, but may also occur in sandy areas where the water is quiet.

The form named *georgianus* Lea is somewhat attenuate, rather solid, bandless, and dark olivaceous green in color (pl. 1, fig. 3). The form *limi* Pilsbry is exceedingly close in all characters to the typical form, but is banded (pl. 1, fig. 4). The form *goodrichi* Archer is subglobose in shape and much larger. The type lot has both banded and unbanded forms (pl. 1, fig. 1). The brief notes above are based on the actual type specimens. Many other lots that we have examined are intermediate between these several forms.

*Viviparus georgianus* Lea differs from *V. g. wareanus* Küster by being larger and generally a little less attenuate. Nevertheless even this subspecies can be matched in size with specimens of *georgianus* from Kiokee Creek (form *limi*), Terrell County, Georgia.

The form *altior* Pilsbry is much attenuated and probably an extreme in this regard. However, many examples in Lake Monroe, Seminole County, Florida, are identical with certain of the paratypes from the kitchen-midden series, though none matches the extreme of the attenuated specimens. We have no recent examples from Hitchen's Creek, the site of the midden, but these specimens may only represent rheophilous examples.

Our only examples of *georgianus* in the Choctawhatchee system came from a tributary, Holmes Creek; however, it may well exist in the lower reaches of this system.

RANGE.—From the Peace River in southwest Florida the species ranges north to the Savannah River, Georgia, and west to the Choctawhatchee river system.

SPECIMENS EXAMINED.—

#### PEACE RIVER SYSTEM

*Florida*: Peace River.

#### WITHLACOOCHEE RIVER SYSTEM

*Florida*: Withlacoochee River, 9 mi. N Dade City, Pasco Co.; Withlacoochee River, near Dunnellon, Marion Co.

#### ST. JOHNS RIVER SYSTEM

*Florida*: Lake Jessup; Wekiva River, 15 mi. NW Winter Park; Lake Monroe; all Seminole Co. Benson Springs; Lake Woodruff; Spring Garden Creek, near DeLeon Springs; all Volusia Co. Silver Springs; Oklawaha River, 2 mi. E Orange Springs; both Marion Co. Silver Springs, Lake George; Lake George; both Putnam Co.

#### SUWANNEE RIVER SYSTEM

SANTA FE RIVER DRAINAGE.—*Florida*: Poe Spring, Santa Fe River, 3 mi. S High Springs; Santa Fe River, High Springs; both Alachua Co. Ichucknee River below the main spring, Columbia Co.

WITHLACOOCHEE RIVER DRAINAGE.—*Georgia*: Withlacoochee River, Olympiä, Lowndes Co. *Florida*: Withlacoochee River, Blue Springs, Madison Co.

SUWANNEE RIVER DRAINAGE.—*Florida*: Suwannee River, Ellaville; Suwannee River at mouth of Withlacoochee River; both Madison Co. Suwannee River below

mouth of Santa Fe River, Gilchrist Co. Suwannee River, Oldtown, Dixie Co.  
**STEINHATCHEE RIVER SYSTEM**

*Florida*: Steinhatchee River, 9 mi. E Salem, Taylor Co.

**APALACHICOLA RIVER SYSTEM**

**FLINT RIVER DRAINAGE.**—*Georgia*: Kiokee Creek, 15 mi. SE Dawson, Terrell Co. Creek, 6 mi. W Albany, Dougherty Co. Keels Creek, 2.3 mi. S Leary, Calhoun Co. Spring Creek, Colquitt, Miller Co. Spring Creek, Reynoldsville, Seminole Co. Spring Creek, near Brinson; Four Mile Creek, 3 mi. SW Bainbridge; Paul Clark Spring, 2½ mi. W Recovery; Sealey's Spring, 5 mi. NW Recovery; Shackleford Spring, 3 mi. NW Recovery; Blue Spring, 7½ mi. W Recovery; *all* Decatur Co.

**CHIPOLA RIVER DRAINAGE.**—*Florida*: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; creek, 5 mi. NE Marianna; Chipola River, 5½ mi. W Greenwood; *all* Jackson Co. Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

**CHOCTAWHATCHEE RIVER SYSTEM**

*Florida*: Holmes Creek, 3 mi. E Bonifay, Holmes Co.

**ALTAMAHA RIVER SYSTEM**

**ALTAMAHA RIVER DRAINAGE.**—*Georgia*: Altamaha River, near Darien, McIntosh Co.

**OCMULGEE RIVER DRAINAGE.**—*Georgia*: Oscewickee Springs, 10 mi. S Abbeville, Wilcox Co.

**SAVANNAH RIVER SYSTEM**

*Georgia*: Savannah River.

*Viviparus georgianus wareanus* Küster

Plate 1 Figure 5

*Paludina wareana* 'Shuttleworth' Küster (1852, Conchylien-Cabinet (2), 1, pt. 21: 21, pl. 4, figs. 10-11), Ostflorida im Ware-See.

*Viviparus wallonii* Tryon (1866, Amer. Jour. Conchol., 2: 108, pl. 10, fig. 2), St. Johns River, Florida.

**DESCRIPTION.**—Shell medium to rather small, reaching about 25 mm. (1 inch) in length, though it is generally a little less. Shell somewhat attenuate, with rather compact whorls, and usually banded, but occasionally bandless forms occur. In all respects it appears to be exceedingly close to typical *georgianus* Lea.

LENGTH mm.	WIDTH mm.	
24	18	Lake Tohopekaliga, Kissimmee, Ocala Co., Florida
21.5	17	Canal Point, Lake Okeechobee, Palm Beach Co., Florida
21	16.5	Lake Weir, Marion Co., Florida

**TYPES.**—The location of the types of *V. wareanus* Küster is unknown. According to Küster, the specimens he described were in the Charpentier Collection, and Sherborn (1940) states that the Charpentier collection went to the Vaux Museum. The original specimens

were collected by F. Rugel in "Ware-See," probably Lake Weir, Marion Co., Florida. The holotype of *V. waltonii* Tryon is in the Academy of Natural Science, Philadelphia, and is from the St. Johns River, Florida.

REMARKS.—We are admitting *wareanus* as a subspecies because of its pattern of distribution. It overlaps *georgianus* in its distribution as well as in its morphological characters, but those occurring in the upper St. Johns drainage and the Okeechobee drainage are remarkably uniform. In Lake George and other areas in the lower and middle St. Johns drainage, both forms occur with much intermixing.

RANGE.—From Lake Okeechobee this subspecies ranges north into Lake and Marion Counties in the Oklawaha River drainage.

SPECIMENS EXAMINED.—

#### LAKE OKEECHOBEE SYSTEM

Florida: Lake Okeechobee at Canal Point and Pahokee, Palm Beach Co. Fellsmere, Indian River Co. Lake Hutchineha; Lake Tohopekaliga, Kissimmee; both Ocala Co.

#### ST. JOHNS RIVER SYSTEM

OKLAWAHA RIVER DRAINAGE.—Florida: Lake Dora, Tavares; Lake Harris; Lake Eustis, Tavares; Lake Griffin, Leesburg; all Lake Co. Oklawaha River; Lake Weir; both Marion Co.

### Genus *Campeloma* Rafinesque

*Campeloma* Rafinesque (1819, Journal de Physique de Chimie d'Histoire Naturelle (Paris), 88: 423).

Type species, *C. crassula* Rafinesque, monotypic.

Shell rather large, occasionally reaching 61.5 mm. (nearly 2½ inches) in length, subglobose to subovate, imperforate and usually rather solid. Color light green to dark olivaceous green. Whorls smooth, usually rounded or slightly shouldered. Aperture oval with a simple lip. Columella and parietal wall generally thickened. Operculum with a submarginal nucleus (parietal margin) and concentric growth lines.

There are few genera among our North American freshwater mollusks that remain in a more confused state than *Campeloma*. It is widespread from the Mississippi river system east to the Atlantic States and is usually abundant where it occurs. Morphologically the shell shows but minor differences between the species, and the legion of names employed has so confused the issue that no attempt has been made to monograph the genus since that of Binney in 1865. Time does not permit a revision for this report. The soft anatomy may well

provide important clues to relationships; and with a basis of anatomical details, the nomenclatorial tangle probably will not be impossible to unravel.

So far as we understand this complex, only a single species, *C. geniculum* Conrad, occurs in this area, and it is found in most streams from the Escambia River to the Suwannee. Another species, *Campeloma floridense* Call, occurs in east-central Florida in Volusia, Marion, and Orange Counties. This species appears closely related to *C. geniculum* Conrad, differing mainly by having the interior of the aperture colored a dark brown, having the spire less attenuate, and being somewhat lighter in structure. A few specimens, however, are white within the aperture. We have been unable to trace any species of *Campeloma* along the east coast, south of the Altamaha River in Georgia until the genus reappears in the upper reaches of the St. Johns River, Florida.

*Campeloma geniculum* Conrad

Plate 1 Figures 7-8

*Paludina geniculum* Conrad (1834: 48, pl. 8, fig. 3), Flint River, Georgia.

*Campeloma rufum geniculiforme* Pilsbry (1916, Nautilus, 30: 42), Dooley Co., Georgia.

DESCRIPTION.—Shell somewhat extended, reaching 44 mm. (about  $1\frac{3}{4}$  inches) in length, imperforate, solid, and smooth. Olivaceous green in color with occasional and somewhat irregular axial streaks of greenish black. Interior of aperture a pale bluish white. Whorls  $5\frac{1}{2}$  to 6, strongly convex, and with a slight shoulder. Spire extended and produced at an angle of about  $50^\circ$ . Aperture subovate. Outer lip thin; parietal lip consisting of a thickened glaze. Columella narrow and arched. Suture rather deeply indented. Sculpture almost absent. Under a 14X lens, there appear to be numerous, irregular and fine, spiral, incised lines. Operculum corneous, having concentric growth lines and a submarginal (parietal margin) nucleus.

LENGTH*	WIDTH	
mm.	mm.	
43	35.5	Flint River, Bainbridge, Decatur Co., Georgia
33	24	Suwannee River, Oldtown, Dixie Co., Florida
27.5	17.5	Chipola River, Scotts Ferry, Calhoun Co., Florida

\*Tip of spire corroded away on all specimens.

TYPES.—The holotype of *Campeloma geniculum* Conrad is in the Academy Natural Sciences, Philadelphia (29199). The type locality, Flint River, Georgia, is here restricted to the Flint River, Albany,



Georgia, as it was very probably here that Conrad obtained his specimens. The holotype of *Campeloma rufum geniculiforme* Pilsbry is in the Academy of Natural Sciences, Philadelphia (122782), from Dooly County, Georgia.

REMARKS.—This is a widespread and abundant species in the Flint river system. At one time it was probably just as abundant in the Chattahoochee, but as mentioned in the introduction, silting has probably killed it out. It appeared rather common in the kitchen middens along the lower Chattahoochee.

*Campeloma geniculum* Conrad is characterized by having rather strongly shouldered whorls. The shell is dark olivaceous green in color, and it is smooth or has faint growth lines. It lives generally along stream margins, preferring a sand-silt substratum and is most abundant at the base of plant roots. It moves freely and is one of the first mollusks to seek the margin of a stream following a rise in water level.

RANGE.—The range extends from the Suwannee River west to the Escambia River.

#### SPECIMENS EXAMINED.—

#### SUWANNEE RIVER SYSTEM

WITHLACOOCHEE RIVER DRAINAGE.—*Georgia*: Withlacoochee River, Olympia, Lowndes Co. *Florida*: Withlacoochee River, Blue Springs, Madison Co.

SUWANNEE RIVER DRAINAGE.—*Florida*: Suwannee River, near mouth of Withlacoochee River; Suwannee River, Ellaville, Madison Co. Suwannee River, Oldtown, Dixie Co. Santa Fe River, 3 mi. S High Springs, Alachua Co.

#### OCHLOCKONEE RIVER SYSTEM

*Georgia*: Attapulgus Creek, 2 mi. NW Amsterdam, Decatur Co. Ochlockonee River, between Reno and Beachton, Grady Co. *Florida*: Ochlockonee River, near Jackson's Bluff; Ochlockonee River, 11 mi. NW Tallahassee; Ochlockonee River, about 8 mi. W Tallahassee; Lake Talquin, Ochlockonee River (southeast shore); all Leon Co. Little River, 3½ mi. E Quincy, Gadsden Co. Ochlockonee River, 7½ mi. E Hosford, Liberty Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Creek, 6 mi. NW Vienna; North Fork, Pennahatchee Creek, 4 mi. N Vienna; both Dooly Co. Flint River, mouth of Gum Creek; Gum Creek, 2 mi. N Cordele; Cordele Springs, Cordele; Cedar Creek, 6 mi. SW Cordele; Swift Creek, 12 mi. SW Cordele; Flint River, 2 mi. W Warwick; all Crisp Co. Jones Creek, 2 mi. S Oakfield; Abrams Creek, 5 mi. S Oakfield; Abrams Creek, 3 mi. W Doles; spring, 3 mi. W Doles; Mill Creek, 8 mi. S Oakfield; all Worth Co. Lees Creek, 5 mi. S DeSoto; Muckalee Creek, 4 mi. NE Leesburg; creek, 7 mi. NW Albany; all Lee Co. Cooleewahee Creek, Newton, Baker Co. East Fork, Chickasawhatchee Creek, 5 mi. SW Dawson, Terrell Co. Ichawaynochaway Creek, 6 mi. N Morgan, Calhoun Co. Flint River, Albany, Dougherty Co. Flint River, Bainbridge; Flint River, Recovery; Spring Creek, Brinson; Paul Clark Spring, 2½ mi. W Recovery; Shackleford Spring, 3 mi. NE Recovery;

Sealey's Spring, 5 mi. NW Recovery; Blue Spring, 7½ mi. W Recovery; *all* De-catur Co. Spring Creek, Reynoldsville; Spring Creek, 2½ mi. S Reynoldsville; *both* Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Chattahoochee River, West Point, Troup Co. Ossahatchee Creek, 3 mi. S Waverly Hall; Mulberry Creek, Mitchell Bridge, 3 mi. S Mountain Hill; *both* Harris Co. *Alabama*: Chattahoochee River, Phenix City, Russell Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee; Mosquito Creek, ½ mi. E Chattahoochee; Mosquito Creek, River Junction; *all* Gadsden Co. Stream 5.2 mi. N Blountstown; stream 3 mi. N Blountstown; *both* Calhoun Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Big Creek, 8 mi. W Malone; Reedy Creek, 6 mi. W Malone; Chipola River, 5½ mi. W Greenwood; creek, 5 mi. NE Marianna; Chipola River, 1 mi. N Marianna; Spring Creek, 3 mi. SE Marianna; Chipola River, 3 mi. S Marianna; creek 4.4 mi. NNW Sink Creek; Chipola River, 1 mi. W Sink Creek; *all* Jackson Co. Chipola River, 2½ mi. SE Chason; Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

*Alabama*: Pea River, Geneva; Choctawhatchee River, 2 mi. E Geneva; *both* Geneva Co. *Florida*: Choctawhatchee River, 8 mi. W Miller Cross Roads; Holmes Creek, 3 mi. E Bonifay; Hurricane Creek, 5 mi. E Miller Cross Roads; Holmes Creek, about 1 mi. W Graceville; *all* Holmes Co. Choctawhatchee River, 1 mi. W Caryville, Washington Co. Creek, S Pine Log Creek, Pine Log State Forest, Bay Co. Creek, 3 mi. E Bruce, Walton Co.

#### YELLOW RIVER SYSTEM

*Florida*: Yellow River, Milligan, Okaloosa Co.

#### ESCAMBIA RIVER SYSTEM

*Alabama*: Little Patsaliga Creek; Patsaliga Creek, 1 mi. W Luverne; *both* Crenshaw Co.

### *Campeloma floridense* Call

#### Plate 1 Figure 9

*Campeloma floridense* Call (1886, Bull. Washburn College Lab., 1: 159, pl. 6, fig. 7), Florida; [in synonymy of *C. limum* Anthony].

*Campeloma floridense* Call. Pilsbry (1916, Nautilus, 30: 42).

DESCRIPTION.—Shell somewhat extended, reaching 35 mm. (1 3/8 inches) in length, imperforate, rather solid and smooth. Color a uniform dark olivaceous green; within the aperture adult specimens usually colored a dark brownish red. Whorls 5 to 6, strongly convex, and with a slight shoulder. Spire moderately extended and produced at an angle of 50° to 65°. Aperture subcircular. Outer lip thin; parietal lip consisting of a thin glaze. Columella narrow and arched. Suture rather deeply indented. Sculpture consisting of microscopical spiral threads which are crossed with equally fine axial growth lines.

Operculum corneus with concentric growth lines and a submarginal (parietal margin) nucleus.

LENGTH*	WIDTH.	
mm.	mm.	
30	22	Moccasin Branch, St. Johns Co., Florida
33.5	21.5	Jordans Ferry, Oklawaha River, 2 mi. E Orange Springs, Marion Co., Florida
28.5	20	Lectotype

\*All specimens measured were corroded at the spire with the loss of 2 to 4 mm.

**TYPES.**—The lectotype, here selected, is in the Museum of Comparative Zoology (189592), and is from the Wekiva River, Orange County, Florida. Paratypes are from the same locality.

**REMARKS.**—We are in full agreement with Pilsbry (*loc. cit.*) that the name *floridense* Call should stand. It first appeared as given above in the synonymy of *C. limum* Anthony, but Call's description was based mainly upon specimens from the upper St. Johns River, and these are quite distinct from *limum* Anthony, a species from South Carolina.

This species differs from *geniculum* by being somewhat smaller, lighter in structure, and in having the dark reddish-brown coloration within the aperture. In addition, the microscopic sculpture appears to be a little stronger.

This is a remarkable species as it occupies a small area in central Florida in the upper St. Johns river system. It is completely isolated from the only other species of *Campeloma* in Florida, *C. geniculum*, which does not occur, so far as we can detect, south of the Suwannee River.

**RANGE.**—The upper St. Johns river system, Florida.

**SPECIMENS EXAMINED.**—

#### ST. JOHNS RIVER SYSTEM

Florida: Moccasin Branch, St. Johns Co. Wekiva River, Orange Co. Jordans Ferry, Oklawaha River, 2 mi. E Orange Springs, Marion Co. Blue Springs, Volusia Co.

#### Genus *Lioplax* Troschel

*Lioplax* Troschel (1857, Das Gebiss der Schnecken, I: 100, pl. 7, fig. 5). Clench and Turner (1955: 1-20).

Type species, *Paludina (Lioplax) subcarinata* Say, monotypic.

**DESCRIPTION.**—Shell ovate, usually turreted, imperforate or only

minutely perforate, and carinate at least on the earlier whorls. Color generally a light to dark olivaceous green. Microscopic sculpture of the shell consists of fine spiral threads. Operculum with the nucleus subcentral and with the lines of growth in a paucispiral arrangement in the early stage, then having concentric growth lines develop during the later stages.

*Lioplax pilsbryi* Walker

Plate 1 Figure 10

*Lioplax pilsbryi* Walker (1905, Nautilus, 18: 133, pl. 9, figs. 1-3), Chipola River, Florida. Clench and Turner (1955: 16, pl. 3, figs. 1-6).

*Lioplax pilsbryi choctawhatchensis* Vanatta (1935, Nautilus, 49: 66), Horseshoe Lake, Choctawhatchee River, Washington Co., Florida.

**DESCRIPTION.**—Shell reaches about 28 mm. in length, is rather solid in structure, the spire somewhat extended. Shell is imperforate and usually carinated, particularly on the early whorls. Color light olivaceous green to blackish green with the interior of the aperture bluish green. Whorls 7, and usually moderately to strongly convex with a well pronounced shoulder. Spire somewhat extended and produced at an angle of about 50°. Aperture subcircular to ovate with the outer lip thin, the inner lip composed of a thickened callus. The outer lip in profile is strongly sigmoid. Generally imperforate. Suture deeply impressed. Sculpture consisting of a well developed carina, usually high up on the whorl forming the shoulder. On the body whorl the carina becomes well rounded. Microscopic sculpture consists of fine spiral and somewhat beaded threads which are crossed by somewhat irregular, sigmoid growth lines. Operculum with a subcentral nucleus. Periostracum rather heavy and colored olivaceous green to almost black.

LENGTH	WIDTH	WHORLS	
mm.	mm.	mm.	
27.2	18	5	(apex corroded) Lectotype
28	20	5	(apex corroded) Paratype
27.5	19	5	(apex corroded) Paratype

**TYPES.**—The lectotype of *Lioplax pilsbryi* Walker is in the Museum of Zoology, University of Michigan; paratypes are in the Museum of Comparative Zoology. The type locality is the Chipola River, 2 miles east of Clarksville, Calhoun County, Florida. The holotype of *L. p. choctawhatchensis* Vanatta is in the Academy of Natural Sciences,

Philadelphia (162240), and is from Horseshoe Lake, Choctawhatchee River, Washington County, Florida.

REMARKS.—This is the most distinctive member of the genus *Lioplax*. It is dark in color and has developed a broad and flattened whorl shoulder. It is completely imperforate, and the sculpture generally is far more pronounced on the body whorl than that existing in any other species.

*Lioplax pilsbryi* Walker reaches its greatest development in the Chipola River. It was exceedingly abundant at most stations we investigated in this river. It appears to thrive best where there is a good admixture of sand, mud, and decaying vegetation. Individuals of this species were rare and rather small at the stations where we found them in the Choctawhatchee and Ochlockonee Rivers. Here they were living in rather coarse sand with very little plant detritus.

It is possible that this species may occur in the Aucilla, Econfinia (Taylor County), Fenholloway, and Steinhatchee Rivers in Florida.

RANGE.—This species ranges from the Choctawhatchee River east to the Suwannee River, Florida. In the Apalachicola system it extends north as far as Columbus, Georgia, on the Chattahoochee River, and to the mouth of Gum Creek, Crisp County, Georgia, on the Flint River.

#### SPECIMENS EXAMINED.—

#### SUWANNEE RIVER SYSTEM

Florida: Suwannee River, Fannin Spring, Gilchrist Co. Suwannee River, Oldtown, Dixie Co. Suwannee River, Ellaville; Suwannee River at mouth of Withlacoochee River; both Madison Co.

#### OCHLOCKONEE RIVER SYSTEM

Florida: Ochlockonee River, 8 mi. W Tallahassee, Leon Co. Ochlockonee River, 7½ mi. E Hosford, Liberty Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—Georgia: Flint River, mouth of Gum Creek, Crisp Co. Spring Creek near Brinson, Decatur Co. Spring Creek, 2½ mi. S Reynoldsville; Spring Creek, Reynoldsville; both Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—Georgia: Chattahoochee River, Columbus, Muscogee Co. Alabama: Uchee Creek, Russell Co.

CHIPOLA RIVER DRAINAGE.—Florida: Big Creek, 8 mi. W Malone; Chipola River, 1 mi. N Marianna; Chipola River, 3 mi. S Marianna; Chipola River, 1 mi. W Sink Creek; all Jackson Co. Chipola River, 2½ mi. SE Chason; Chipola River, about 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; all Calhoun Co.

#### ECONFINA RIVER SYSTEM

Florida: Econfinia River,<sup>6</sup> Bay Co.

<sup>6</sup>This is not the Econfinia River, Taylor County, Florida.

## CHOCTAWHATCHEE SYSTEM

PEA RIVER DRAINAGE.—*Alabama*: Pea River,  $\frac{1}{2}$  mi. SE Geneva, Geneva Co.

CHOCTAWHATCHEE RIVER DRAINAGE.—*Florida*: Choctawhatchee River, 8 mi. W. Miller Cross Roads; Choctawhatchee River, 1 mi. W Caryville; *both* Holmes Co. Horseshoe Lake, Choctawhatchee River, Washington Co.

## PILIDAE

Genus *Pomacea* Perry

*Pomacea* Perry (1810, *Arcana*, pl. 12, with description in-Signature G5).

Type species, *Pomacea maculata* Perry, monotypic.

Shells usually large, globose, generally thin but strong, colored yellowish green to dark olivaceous green, and frequently banded. Operculum corneous.

This genus is widely distributed in South and Central America, and in the West Indies it occurs in Cuba, Jamaica, and certain of the Lesser Antilles. In the southeastern states there is but a single species, and this is restricted to Florida and extreme southern Georgia.

*Pomacea paludosa*<sup>7</sup> Say

## Plate 1 Figure 6

*Ampullaria depressa* Say (1824 (in Keating, W. H.), A narrative of an expedition to the source of the St. Peters River, Appendix 2, p. 264), small creek tributary to St. Johns River and Lake George, Florida. *Non A. depressa* Lamarck, 1804 or Risso, 1826.

*Ampullaria paludosa* Say (1829, *New Harmony Disseminator*, p. 260); [new name for *A. depressa* Say, 1824; *non* Lamarck, 1804].

*Ampullaria hopetonensis* Lea (1834, *Trans. Amer. Philos. Soc.*, 5: 115, pl. 19, fig. 84), Hopeton, near Darien, Georgia. Lea, 1834 (1: 227, pl. 19, fig. 84).

*Ampullaria penesma* 'Say' DeKay (1843, *Zoology of New York*, 5: 124).

*Ampullaria disseminata* 'Say' DeKay (1843, *Zoology of New York*, 5: 124).

*Ampullaria penesima* 'Say' Binney (1865, *Smithsonian Miscellaneous Collections*, 143, pt. 3: 5) [error for *penesma* 'Say' DeKay].

*Ampullaria pinei* Dall (1898, *Nautilus*, 12: 75), Homosassa River, Florida.

*Pomacea paludosa flava* 'Pilsbry' M. Smith (1937, *East Coast marine shells* (Ann Arbor, Michigan), p. 147), central Everglades and near Miami, Florida.

*Pomacea paludosa lutea* Farfante (1942, *Memorias de la Sociedad Cubana de Historia Natural*, 16: 51) [*nomen nudum*].

<sup>7</sup>*Ampullaria rotundata* Say (1829, *New Harmony Disseminator*, p. 245), St. Johns River; Florida. The species received by Say from Captain LeConte, although described as coming from the upper St. Johns River, is apparently one of the several species that LeConte had obtained from Calcutta, India. See Clench (1955, *Nautilus*, 68: 107).

DESCRIPTION.—Shell globose, rather large, reaching about 65 mm. (2½ inches) in length, thin in structure and perforate. Color a dark olivaceous green to straw yellow, and generally having about 10 to 15 narrow spiral bands of reddish brown. These bands are generally separate, though occasionally groups of bands may become fused. Occasional specimens are found that are semialbinistic with the green and reddish bands absent, the color remaining being a light straw yellow. Whorls 5, and strongly globose. Spire depressed, only slightly elevated above the body whorl. Aperture large, subovate. Outer lip thin, inner lip consists of a thin glaze on the parietal wall. Columella thin and slightly arched. Umbilicus narrow and partially covered by the columella reflection. Suture slightly indented. The shell is generally smooth, but occasional examples show faint malleations and fine axial growth lines. Operculum corneus, thin, with concentric growth lines around a submarginal nucleus.

LENGTH	WIDTH	
mm.	mm.	
64	61	Wakulla Springs, Florida
62	57.5	Silver Springs, Ocala, Florida
43	41.5	Fellsmere, Florida

TYPES.—Types of *Ampullaria depressa* Say are in the Academy of Natural Sciences, Philadelphia; the lectotype, here selected, is number 50580. The type locality is the upper St. Johns River and Lake George, Florida. Paratypes of *Ampullaria hopetonensis* Lea from Hopeton near Darien, Georgia, are in the Museum of Comparative Zoology (151580).

REMARKS.—This species shows a rather wide range of variation in the size, color, and thickness of the shell. However, any one population appears to be quite uniform. It is widely distributed throughout all of central and southern Florida in rivers, lakes, ponds, and even roadside ditches. In the northern part of the state it is rather rare, and here it is limited generally to the large springs and spring-fed creeks. Early records indicate that it existed in southeastern Georgia at least as far north as the lower Altamaha River, but we have seen no specimens collected recently from anywhere in this river system. Our only Georgia record in this survey is from Sealey's Spring on the lower reaches of Spring Creek, Seminole County.

As stated above, the distribution of this species in northern Florida and southern Georgia is restricted to the large springs and spring-fed creeks. This is probably due to the fact that these springs remain

warmer during the winter months than do the streams carrying surface run-off.

Their pinkish-white, calcareous eggs are laid in clusters above the water line on vegetation, boats, logs, or other surfaces.

A small, reddish-brown race of *paludosa* from the vicinity of Miami, Florida, has been named *miamiensis* Pilsbry. However, it appears to be little more than a local population. Paratypes are in the Museum of Comparative Zoology from the Miami River, Miami, Florida. The form *flava* 'Pilsbry' Smith is only a partial albino which is a uniform pale yellow in color. Individual examples occur sporadically throughout the range of the species.

RANGE.—Southern Georgia, Florida, and Cuba.

SPECIMENS EXAMINED.—

#### SUWANNEE RIVER SYSTEM

SANTA FE RIVER DRAINAGE.—*Florida*: Ichucknee River, 5 mi. NW Fort White, Columbia Co. Santa Fe River, 3 mi. N High Springs; Poe Spring, Santa Fe River, 3 mi. S High Springs; *both* Alachua Co.

SUWANNEE RIVER DRAINAGE.—*Florida*: Suwannee River, Fannin Springs, Gilchrist Co.

#### ECONFINA RIVER SYSTEM

*Florida*: Econfina River, 18 mi. W Perry, Taylor Co.

#### ST. MARKS RIVER SYSTEM

WAKULLA RIVER DRAINAGE.—*Florida*: Wakulla Springs, Wakulla; St. Marks Game Refuge, St. Marks; *both* Wakulla Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Sealey's Spring, 7½ mi. SW Reynoldsville, Seminole Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Spring Creek, 3 mi. E Marianna; Chipola River, 1 mi. N Marianna; *both* Jackson Co. Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

HOLMES CREEK DRAINAGE.—*Florida*: Holmes Creek, 1 mi. W Graceville, Jackson Co.

### BULIMIDAE

#### Genus *Somatogyrus* Gill

*Somatogyrus* Gill (1863, Proc. Acad. Nat. Sci. Phila., p. 34).

Type species, *Amnicola depressa* Tryon., original designation.

Shells small, reaching about 8 mm. Usually rather thick and solid, imperforate, or very narrowly umbilicate and smooth. Body whorl large and inflated. Spire usually short; the apical whorls sometimes spirally punctate. Aperture oblique; the lip sharp. Operculum corneous,



paucispiral, and with an eccentric nucleus. Proboscis broad and flat. Tentacles short and flattened. Verge broad, compressed, and bifid.

*Somatogyrus substriatus* Walker

Plate 1 Figure 12

*Somatogyrus substriatus* Walker (1906, Nautilus, 19: 97, pl. 5, fig. 1), Tennessee River at Florence, Alabama.

DESCRIPTION.—Shell small, reaching 5 mm. (about 3/16 inch) in length, globose, smooth, imperforate or nearly so, and rather solid. Color a rather light greenish yellow. Aperture large, oblique, and subcircular. Lip simple and often somewhat thickened. Columella arched and thickened. Umbilicus occasionally present as an exceedingly narrow slit. Suture slightly indented. Sculpture consists of a series of fine oblique, striated lines which are probably only fine and regular growth lines. Operculum corneus, thin, transparent, multi-spiral, and with an eccentric nucleus.

LENGTH mm.	WIDTH mm.	
5	4.5	Tombigbee River, Columbus, Lowndes Co., Mississippi
4	3.5	Choctawhatchee River, 9 mi. S Ozark, Dale Co., Alabama

TYPES.—Holotype, Museum of Zoology, University of Michigan [Walker Collection] from the Tennessee River, Florence, Alabama. Paratype, Museum Comparative Zoology (68458) from the same locality.

REMARKS.—Only two lots of this species are known from the area covered by this report, and these are the first reported outside of the Alabama-Tennessee river systems. This species is probably more widespread, but its small size has made it difficult to locate.

RANGE.—Rivers of Alabama.

SPECIMENS EXAMINED.—

APALACHICOLA RIVER SYSTEM

CHATTAHOOCHEE RIVER DRAINAGE.—Alabama: Uchee Creek, Fort Mitchell, Russell Co.

CHOCTAWHATCHEE RIVER SYSTEM

Alabama: Choctawhatchee River, 9 mi. S Ozark, Dale Co.

Genus *Notogillia* Pilsbry

*Notogillia* Pilsbry: (1953: 439).

Type species, *Hydrobia wetherbyi* Dall, original designation.

Shell small, reaching about 8.5 mm. in length, subglobose, and smooth. Whorls  $4\frac{1}{2}$  to 5 and strongly globose. Suture impressed. Aperture large, subovate, with the outer lip thickened. Operculum corneous, paucispiral.

*Notogillia wetherbyi* Dall

Plate 7 Figure 6

*Amnicola nuttalliana* 'Lea' Frauenfeld (1863, Verhandlungen der Kaiserlich-Königlichen zoologisch-botanischen Gesellschaft in Wien, 13: 1029), Silver Springs, Fort King, [near Ocala], Florida, *Non A. nuttalliana* Lea.

*Hydrobia* (?) *wetherbyi* Dall (1885, Proc. U. S. Nat. Mus. 8 (17):258, pl. 17, fig. 10), Lake Eustis, Florida.

DESCRIPTION.—Shell small, not exceeding 9 mm. (about  $\frac{3}{8}$  inch) in length, subglobose, rather solid, imperforate, and smooth. Color a dull straw yellow to a dark olivaceous brown, and within the aperture it is colored a bluish purple. Whorls  $4\frac{1}{2}$  and strongly convex. Spire slightly extended, being about the length of the aperture, and produced at an angle of about  $70^\circ$ . Aperture subovate to subcircular and holostomatous. Both outer and inner lips thickened. Suture well impressed. Sculpture consists of exceedingly fine axial growth lines with only the faintest traces of a spiral sculpture.

LENGTH mm.	WIDTH mm.	
8.5	5.5	Chipola River, Scotts Ferry, Calhoun Co., Florida
6	4.5	Leesburg, Lake Co., Florida

TYPES.—The holotype of *Hydrobia wetherbyi* Dall is in the United States National Museum (32123) and is from Lake Eustis, Florida. Wetherby is the collector.

REMARKS.—*Notogillia wetherbyi* is a species that apparently is limited to the clear water of springs, creeks which are largely spring-fed, or lakes. Its distribution is apparently spotty, though perhaps it has been overlooked owing to its small size.

Range.—From the upper reaches of the St. Johns River, north and west to the Chipola River, Florida:

SPECIMENS EXAMINED.—

ST. JOHNS RIVER SYSTEM

ST. JOHNS RIVER DRAINAGE.—Florida: Lake George, Marion Co. Lake Apopka; Leesburg; Lake Eustis; Silver Springs near Ocala; all Lake Co. Lake Jessup, Seminole Co.

## SUWANNEE RIVER SYSTEM

SUWANNEE RIVER DRAINAGE.—*Florida*: Fannin Spring, Gilchrist Co.

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Blue Spring, Flint River, 7½ mi. W Recovery, Decatur Co. Sealey's Spring, 7½ mi. SW Reynoldsville, Seminole Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Big Creek, 8 mi. W Malone; Spring Creek, 3 mi. E Marianna; Chipola River, 1 mi. N Marianna; Chipola River, 3 mi. S Marianna; Chipola River, 1 mi. W Sink Creek; all Jackson Co. Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; all Calhoun Co.

Genus *Pomatiopsis* Tryon

*Pomatiopsis* Tryon (1862, Proc. Acad. Nat. Sci., Phila., p. 452).

Type species, *Amnicola lapidaria* Say; monotypic.

Shell small, reaching about 8 mm. in length, attenuate, rather thin, smooth, and umbilicate. Aperture slightly expanded with a simple lip. Operculum corneus and paucispiral. Foot not as long as the shell. Proboscis large and longer than the tentacles. Verge large, simple, convoluted, with the outer margin rounded and smooth, and the inner margin sharp and wrinkled.

*Pomatiopsis lapidaria* Say

## Plate I Figure 11

*Cyclostoma lapidaria* Say (1817, Jour. Acad. Nat. Sci., Phila., 1: 13), no locality.

*Pomatiopsis lapidaria* Say. Abbott (1948, Proc. U. S. Nat. Mus., 98. (3222): 57-68, pls. 3-4).

DESCRIPTION.—Shell small, reaching about 8 mm. (about ¼ inch) in length, attenuate, umbilicate, and smooth. Color dark olivaceous brown to yellowish brown. Whorls 7 and strongly convex. Spire greatly extended and produced at an angle of about 22°. Aperture subcircular and usually holostomatous. Lip simple, thin or only slightly thickened. Columella arched. Umbilicus small, but fairly deep. Sculpture consists of fine axial growth lines. Operculum thin, transparent, paucispiral, and with an excentric nucleus.

LENGTH mm.	WIDTH mm.	
7	3.8	Grand Rapids, Kent Co., Michigan
6.2	4.5	Torrey Park, 10 mi. S Chattahoochee, Liberty Co., Florida
6.5	3.5	Niagara Falls, Niagara Co., New York

**TYPES.**—Say's types of *P. lapidaria* have apparently been lost. He gave no type locality, but as specimens are known to occur along the Delaware River, this can be taken to be the type locality.

**REMARKS.**—These are the first known records for this species from the state of Florida. It is widely distributed from southern Ontario west to Minnesota and south into Alabama and Florida. It also occurs in the east, from New York south to Virginia. It has a spotty distribution and is perhaps quite colonial in habit. It lives in damp to wet situations, usually in the flood plains of streams, under stones, wood, and other debris.

**RANGE.**—See Remarks above.

**SPECIMENS EXAMINED.**—

#### APALACHICOLA RIVER SYSTEM

APALACHICOLA RIVER DRAINAGE.—*Florida*: West bank, Apalachicola River, Chatahoochee, Jackson Co. Torreya Park, 10 mi. S Chattahoochee, Liberty Co.

#### PLEURO CERIDAE

This family contains more names and probably more species than any other family among the freshwater mollusks of North America. The greatest numbers of species occur in the vast Ohio river system and in the Alabama-Coosa river system. Rivers of the Atlantic watershed, and rivers of Alabama, Georgia, and Florida draining into the Gulf of Mexico east of the Alabama-Coosa River have but few species. The main issue has been an attempt to allocate the large number of names to the various species occurring within the area covered by this report. As mentioned elsewhere, much of the older material lacked data entirely or possessed faulty data, and the synonyms presented are to be accepted with this fact in mind.

In general, where the various species occur, specimens may be found in considerable numbers, and sometimes they occur in incredible numbers. Though most species are bottom feeders, a few will be found on water plants, feeding on algae and dead vegetable matter.

Of several genera in this family, only the genus *Goniobasis* occurs in southeastern Alabama, and in Florida and Georgia southeast of the Alabama-Coosa drainage.

#### Genus *Goniobasis* Lea

*Goniobasis* Lea (1862, Proc. Acad. Nat. Sci., Phila., p. 262).

Type species, *Goniobasis osculata* Lea, subsequent designation, Hanibel, 1912.

Shells small to moderate in size, attenuate, and imperforate. They may be smooth or have sculpture consisting of axial costae, spiral threads, or nodules; many species are carinate. Aperture subrhomboidal with a simple outer lip, the base subangular, and not canaliculate. Columella smooth and not twisted. Operculum corneous and paucispiral.

The genus is widely distributed from the Mississippi Valley eastward to western New England, and from Florida north to the Great Lakes. A small number of species occur from northern California north to Washington.

*Goniobasis floridensis* Reeve

Plate 2 Figures 7-9

*Melania floridensis* Reeve (1860, *Conchologia Iconica*, 12: *Melania*, pl. 45, no. 334), Florida.

*Melania etowahensis* 'Lea' Reeve (1861, *Conchologia Iconica*, 12: *Melania*, pl. 55, no. 426), Georgia. *Non M. etowahensis* Lea, 1862.

*Melania papillosa* 'Anthony' Reeve (1861, *Conchologia Iconica*, 12: *Melania*, pl. 59, no. 467), Florida.

*Goniobasis canbyi* Lea (1862, *Proc. Acad. Nat. Sci., Phila.*, p. 271), Lake Monroe, Florida, collected by W. Canby; Etowah and Tennessee Rivers, Georgia, collected by J. Postell.

*Goniobasis couperii* Lea (1862, *Proc. Acad. Nat. Sci., Phila.*, p. 271), Etowah River, [Georgia], received from Couper and collected by J. Postell.

*Goniobasis downieana* Lea (1862, *Proc. Acad. Nat. Sci., Phila.*, p. 272), Etowah River, [Georgia], collected by J. Postell.

*Goniobasis effosa* M. Smith<sup>8</sup> (1938, *Nautilus*, 51: 91), fossil of the Tertiary of Belle Glade, Florida.

*Goniobasis posti* 'Pilsbry and Johnson' Goodrich (1942: 3) [*nomen nudum*].

*Goniobasis catenaria cancellata* 'Say' Goodrich (1942: 3). *Non Melania cancellata* Say, 1829.<sup>8</sup>

DESCRIPTION.—Shell elongate, reaching 27 mm. (about 1 inch) in length, imperforate, rather thin in structure, and heavily sculptured. Color generally a dark chocolate brown to almost black. Whorls 9 to 10 and slightly convex. Early two to four whorls are usually corroded away. Spire extended, conical, and produced at an angle of about 20°. Aperture subquadrate in outline. Parietal lip consists of a thin callus. Outer lip thin, and when viewed in profile appears as a flattened sigmoid curve. Columella straight to slightly arched and rather narrow. Suture moderately indented. Sculpture consists of

<sup>8</sup>*Melania cancellata* Say [= *Melanoides tuberculata* Müller]. Clench (1955, *Nautilus*, 68: 107), a species from Asia.

strong, and usually straight to slightly arcuate, costae which are inclined to be somewhat more numerous on the early whorls. These are crossed by four or five spiral threads, and these become strongly nodulose where the two intersect. The peripheral cord or thread is generally much the largest, the nodules are correspondingly large. On the body whorl below the peripheral thread there are five or six spiral threads without any nodules.

LENGTH*	WIDTH	
mm.	mm.	
24	8.5	Chipola River, Scotts Ferry, Calhoun Co., Florida
23.5	11.5	Chipola River, 2 mi. E Clarksville, Calhoun Co., Florida
25	10	Spring Creek, 3 mi. E Marianna, Jackson Co., Florida

\*Tip of spire corroded in all specimens.

**TYPES.**—The holotype of *Melania floridensis* Reeve is probably in the British Museum. Cotypes of *etowahensis* Reeve and *papillosa* Reeve are in the Museum of Comparative Zoology. The types of *Goniobasis canbyi*, *couperii*, and *downieana*, all of Lea, are in the United States National Museum. On Anthony's original labels of *papillosa* the locality is given as Enterprise, Florida, and we here select the Wekiva River, Enterprise, Florida, as the type locality.

**REMARKS.**—The name *Goniobasis catenaria* has been used in error for years for this widespread Floridian species. Although members of the same complex, they are remotely related and are very different species. Say's *catenaria* came originally from Eutaw Springs, St. Johns, Berkeley County, South Carolina, a locality now obliterated by the impoundment of the waters of the Santee River creating Lake Marion. The senior author had the pleasure of visiting this spring several years ago with William Mazýck, and of collecting a fine series of this species before the area was inundated.

*Goniobasis floridensis* Reeve appears to be directly related to *G. boykiniana* Lea of the Chattahoochee river system. Young specimens of this latter form are very similar to *G. floridensis*, though the adults of *G. boykiniana* differ in being much larger, proportionately wider, and in having the sculpture far more pronounced. See remarks under *G. vanhyningiana* also.

This is an exceedingly variable species; hardly two populations are exactly alike, and the extremes are quite different. However, the differences are largely the degree of strength or weakness of any of the several sculptural characters. For example, the peripheral spiral cord may be strongly developed with large tubercles, while in another

series this cord may not be pronounced at all. Superficially this makes the shells look quite dissimilar, while in fact, this difference is only one of degree. Individuals in any one population are usually uniform, a fact which emphasizes the apparent differences between populations.

*Goniobasis floridensis* lives under a variety of conditions though it appears to prefer the large freshwater springs and spring-fed streams and rivers. However, it is equally at home in still water, such as in the pond formed by the dam on Spring Creek near Marianna, Florida. It occurs also in swift water below the dam. Bottom conditions such as mud, rock, or weeds seem equally favorable.

We were unable to find this species at any of the six stations that we made on the Ochlockonee River, nor have we seen any specimens that had been collected in this river system.

We possess two lots of this species taken from Holmes Creek, one of the tributaries of the Choctawhatchee River, and these are the only records that we have seen west of the Apalachicola river system. This is another anomaly regarding distribution between Holmes Creek and some of the upper tributaries of the Chipola River. Also see remarks under *G. dickinsoni*, a new species described later in this paper.

**RANGE.**—From the upper reaches of the St. Johns River and the Hillsborough River in central Florida, north and west to the Apalachicola River and the upper reaches of Holmes Creek (see Remarks). So far as we can determine this species does not occur in the Ochlockonee river system.

#### SPECIMENS EXAMINED.—

##### ST. JOHNS RIVER SYSTEM

*Florida:* Beecher Run, 3 mi. S Welaka, Putnam Co. St. Johns River, near DeLand; Orange City; *both* Volusia Co. Silver Creek and Juniper Creek, Lake George; Silver Springs, 5 mi. E Ocala; *all* Marion Co. Alexander Spring; Lake Harris; *both* Lake Co. Wekiva River, Sanford, Seminole Co.

##### HILLSBOROUGH RIVER SYSTEM

*Florida:* Sulphur Springs, Tampa, Hillsborough Co.

##### WITHLACOOCHEE RIVER SYSTEM

*Florida:* Lake Panasoffkee, Withlacoochee River; Sumterville; *both* Sumter Co. Rainbow Springs, Juliette, Marion Co.

##### WACCASASSA RIVER SYSTEM

*Florida:* Waccasassa River, 24 mi. NE Cedar Keys.

##### SUWANNEE RIVER SYSTEM

*Florida:* Withlacoochee River, 10 mi. E Madison; Suwannee River, Ellaville; *both* Madison Co. Suwannee River, Oldtown, Dixie Co. Ichucknee River, 5 mi. N Fort White, Columbia Co. Ichucknee River, Hildreth, Suwannee Co. Poe Spring, Santa Fe River, 3 mi. S High Springs, Alachua Co.

## WAKULLA RIVER SYSTEM

*Florida*: Wakulla Spring, Wakulla Co.

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Spring Creek, Brinson, Decatur Co. Spring Creek, Reynoldsville; Spring Creek, 2½ mi. S Reynoldsville; *both* Seminole Co. Sealey's Spring, 5 mi. NW Recovery; Shackleford Spring, 3 mi. N Recovery; Blue Spring, 7½ mi. W Recovery; Paul Clark Spring, 2½ mi. W Recovery; *all* Decatur Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Big Creek, 8 mi. W Malone; Reedy Creek, 6 mi. W Malone; Blue Spring Lake, 5 mi. ENE Marianna; tributary of Chipola River, 3 mi. NE Marianna; Chipola River, 1 mi. N Marianna; Spring Creek Pond, 3 mi. S Marianna; Chipola River, 3 mi S Marianna; Thomas Mill Pond, 8 mi. S Marianna; creek 2½ mi. NW Sink Creek; Chipola River, 1 mi. W Sink Creek; Chipola River, 5½ mi. W Greenwood; *all* Jackson Co. Chipola River, 2½ mi. SE Chason; Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

## CHOCTAWHATCHEE RIVER SYSTEM

HOLMES CREEK DRAINAGE.—*Alabama*: Holmes Creek, near Fadette, Geneva Co.  
*Florida*: Holmes Creek, Vernon, Washington Co.

*Goniobasis vanhyningiana* Goodrich

## Plate 3 Figure 7

*Goniobasis vanhyningiana* Goodrich (1921, Occas. Pap. Mus. Zool., Univ. Mich., no. 91: 2, pl. 1, figs. 2-3), creek below Seminole Springs, Lake Co., Florida.

DESCRIPTION.—Shell elongate, reaching 15 mm. (about ½ inch) in length, imperforate, rather thin in structure, and moderately sculptured. Color generally a dark blackish brown, with some specimens showing axial streaks of red brown when viewed from within the aperture. Whorls 9 or 10 and slightly convex. Spire extended, conical, and produced at an angle of about 20°. Early 4 to 5 whorls usually corroded away. Aperture subquadrate in outline. Parietal lip consists of a thin callus. Outer lip thin, and when viewed in profile it appears as a flattened sigmoid curve. Columella slightly arched and rather narrow. Suture moderately indented. Sculpture consists of weak to moderately strong, arcuate costae, which are more numerous on the early whorls. In many adult specimens the body whorl is almost entirely smooth. In very young specimens there is a well developed carina which is generally beaded, but disappears entirely in the adult shell. Spiral sculpture absent.

LENGTH mm.	WIDTH mm.	
16	7	Alexander Spring Creek, near Summit, Lake Co., Florida
14	5.5	Creek below Seminole Spring, Lake Co., Florida
13	4.7	Holotype



**TYPES**.—Holotype, in the Museum of Zoology, University of Michigan. Paratypes in the Museum of Comparative Zoology (93755). The type locality is a creek below Seminole, Lake County, Florida; T. Van Hynning is the collector.

**REMARKS**.—This species is close in its relationship to *Goniobasis floridensis* Reeve. It differs by being much smaller and in lacking both the beading and spiral sculpture, at least in the adult stage. Young specimens of *vanhynningiana* are difficult to distinguish from typical *floridensis*, but they are not so highly sculptured and lack the spiral cords below the periphery of the whorl. This species is restricted to a small area in Orange and Lake Counties in east central Florida.

It appears to be a good species; we have seen no specimens that could be called intergrades. *Goniobasis floridensis* Reeve occurs in the same general drainage system, but we have no records of the two species occurring in the same locality.

**RANGE**.—Restricted to the springs and small streams in the upper St. Johns River drainage of Orange and Lake Counties, Florida.

**SPECIMENS EXAMINED**.—

#### ST. JOHNS RIVER SYSTEM

*Florida*: Rock Spring Creek, Orange Co. Alexander Spring Creek, near Summit; Seminole Run; creek below Seminole, Seminole Springs; *all* Lake Co.

#### *Goniobasis athearni*, new species

Plate 2 Figure 6

**DESCRIPTION**.—Shell subelongate, reaching about 16 mm. ( $\frac{3}{4}$  inch) in length, rather thin in structure, and heavily sculptured. Color generally a dark chocolate brown to almost black. Whorls 9 to 10 and slightly convex. Spire somewhat extended, conical, and produced at an angle of about  $25^{\circ}$ . Early whorls usually corroded away. Aperture subovate in outline. Parietal lip consists of a thin callus. Outer lip thin, and when viewed in profile is nearly straight. Columella straight to slightly arched and rather narrow. Suture moderately indented. Sculpture consists of numerous spiral threads which are strongly nodulose above the periphery. Below the periphery the nodules are much smaller, weaker, or may be entirely lacking. The beads on the threads are usually in axial alignment. Axial costae exceedingly weak and usually completely absent. The peripheral thread is generally the largest.

LENGTH mm.	WIDTH mm.	
14.5	9	Holotype
12.5	6	Chipola River, 1 mi. W Sink Creek, Jackson Co., Florida
16	9	Chipola River, 2 mi. E Clarksville, Calhoun Co., Florida

**TYPES.**—Holotype, in the Museum of Comparative Zoology (190102), from the Chipola River, 2½ miles southeast of Chason, Calhoun County, Florida. Paratypes from the same locality are in the Museum of Comparative Zoology and the University of Florida Collections. Additional paratypes are from the Chipola River, 3 miles south of Marianna.

**REMARKS.**—*Goniobasis athearni* is exceedingly close in its relationship to *G. floridensis* Reeve. The sculpture is similar, but differs in *athearni* by having only nodules and not the axial costae. In addition, the shell of *G. floridensis* is more attenuate, has straighter sides, and the aperture is smaller in proportion to the length of the shell.

It seems rather remarkable that these two closely related species should exist in the same streams and at the same stations.

**RANGE.**—*Goniobasis athearni* is limited to the central part of the Chipola river system. Only one station was made outside of the Chipola proper, this being a small creek, 2½ miles northwest of Sink Creek in Jackson County.

**SPECIMENS EXAMINED.**—

#### APALACHICOLA RIVER SYSTEM

**CHIPOLA RIVER DRAINAGE.**—*Florida*: Chipola River, 1 mi. N Marianna; Chipola River, Marianna; Chipola River, 3 mi. S Marianna; Chipola River, 1 mi. W Sink Creek; creek 2½ mi. NW Sink Creek; *all* Jackson Co. Chipola River, 2½ mi. SE Chason; Chipola River, 2 mi. E Clarksville; *both* Calhoun Co.

#### *Goniobasis boykiniana* Lea

#### Plate 5 Figures 5-6

*Melania boykiniana* Lea (1840, Proc. Amer. Philos. Soc., 1: 289), Chattahoochee River, Columbus, Georgia. Lea (1842, Trans. Amer. Philos. Soc. (n.s.), 8: 228, pl. 6, fig. 59). Lea, 1863 (3: 66, pl. 6, fig. 59).

*Goniobasis hallenbeckii* Lea (1862, Proc. Acad. Nat. Sci., Phila., p. 271), Randall's Creek, near Columbus, Georgia. Lea (1862, Jour. Acad. Nat. Sci., Phila., 5: 339, pl. 38, fig. 203). Lea, 1863 (9: 161, pl. 38, fig. 203).

**DESCRIPTION.**—Shell elongate, reaching about 35 mm. (1 3/8 inches) in length, imperforate, rather thin in structure, and heavily sculptured. Color a yellowish brown to dark brown. When viewed from within the aperture there are 1 to 5 spiral bands of dark red brown which

are best seen by transmitted light. Whorls probably 9 to 10 and slightly convex. Early two to four whorls are usually corroded away. Spire extended, conical, and produced at an angle of about 25°. Aperture subovate in outline. Parietal lip consists of a thickened callus. Outer lip thin, and when viewed in profile appears as a flattened sigmoid curve. Columella straight to slightly arched and rather narrow. Suture moderately indented. Sculpture consists of 9 to 10 spiral threads which are crossed by rather strong axial costae above the periphery. Rather strong nodules are produced where the costae cross the spiral threads. Below the periphery the spiral threads are somewhat irregular, but not nodulose. The peripheral carina is most pronounced, giving the whorl an angulation at this point.

LENGTH*	WIDTH	
mm.	mm.	
31.5	13.5	Chattahoochee River, Columbus, Georgia
30	15	Ditto
28	11.5	Ditto
27.5	13	Ditto

\*Tip of spire corroded in all specimens.

**TYPES.**—The holotype of *Goniobasis boykiniana* Lea is in the United States National Museum and is from the Chattahoochee River, Columbus, Georgia. The holotype of *G. hallenbeckii* Lea is also in the United States National Museum and is from Randall's Creek near Columbus, Georgia.

**REMARKS.**—So far as we now know, this species is nearly extinct. All the early records were from the Chattahoochee River and Randall's Creek in the vicinity of Columbus, Georgia. The latest date that we can assign to this material is 1855. Sometime after that date, overfarming and the consequent silting of this river apparently destroyed most of its mollusk fauna. Herbert Athearn collected a few specimens of this species in 1955, near West Point, Troup County, Georgia.

This is one of the largest species of *Goniobasis*, and it is possibly the progenitor of the abundant and more widely distributed *G. floridensis* Reeve. It differs from this species by being much larger and having the nodules more developed, and in being yellowish brown rather than nearly black.

**RANGE.**—Known only from the Chattahoochee River, Georgia.

**SPECIMENS EXAMINED.**—

#### APALACHICOLA RIVER SYSTEM

**CHATTAHOOCHEE RIVER DRAINAGE.**—*Georgia*: Chattahoochee River, West Point,

Troup Co. Chattahoochee River, Columbus; Randall's Creek, Columbus; both Muscogee Co.

*Goniobasis catenoides* Lea

Plate 3 Figure 8

*Melania catenaria* Lea (1840, Proc. Amer. Philos. Soc., 1: 289), Chattahoochee River, Columbus, Georgia. *Non catenaria* Say, 1822.

*Melania catenoides* Lea (1842, Trans. Amer. Philos. Soc. (n.s.), 8: 228, pl. 6, fig. 60), Chattahoochee River, Columbus, Georgia. Lea, 1863 (3: 66, pl. 6, fig. 60); [new name for *catenaria* Lea; *non* Say].

*Melania modesta* Lea (1845, Proc. Amer. Philos. Soc., 4: 166). Lea (1858, Trans. Amer. Philos. Soc., 10: 86, pl. 9, fig. 34), Chattahoochee River, Columbus, Georgia.

DESCRIPTION.—Shell elongate, reaching probably 25 mm. (1 inch) in length, imperforate, rather heavy in structure, and moderately sculptured. Color generally a dark yellow brown and rarely with three to five red-brown bands of color. Whorls probably 9 to 10 and moderately convex. Early two to four whorls usually corroded away. Spire extended and produced at an angle of about 27°. Aperture ovate in outline. Parietal lip consists of a thin callus. Outer lip thin, and when viewed in profile it appears as a nearly straight line. Columella slightly arched and narrow. Suture moderately indented. Sculpture consists of 11 to 12 spiral threads which are generally beaded, particularly above the periphery. The peripheral thread is usually the largest, which creates a carina particularly noticeable on the early whorls. Axial costae absent or only slightly developed. Rarely the shell is smooth or nearly so.

LENGTH*	WIDTH	
mm.	mm.	
23	11	Chattahoochee River, Columbus, Georgia
22	11	Ditto
20	11.5	Ditto
15	7	Holotype of <i>G. modesta</i> Lea

\*All specimens heavily corroded, with a loss of perhaps 2 to 4 mm.

TYPES.—The holotypes of *Goniobasis catenaria* Lea (*G. catenoides* Lea) and *G. modesta* Lea are in the United States National Museum, both are from the Chattahoochee River, Columbus, Georgia.

REMARKS.—This species, so far as we know now, is extinct. The small series that we have was collected at Columbus, Georgia, by Mr. Gesner in 1855. Though only known from Columbus, this species probably had a fairly wide distribution in the Chattahoochee River

and apparently was exterminated by river silt.

*Goniobasis catenoides* appears to be closest in relationship to *G. albanyensis*, but differs by having far less sculpture, by being larger, and by having beaded spiral threads. In *albanyensis* the beads on the later whorls become lengthened.

*Goniobasis modesta* Lea appears to be just a young specimen of *G. catenoides* which is not sculptured.

RANGE AND RECORDS.—Known only from the Chattahoochee River, Columbus, Georgia.

*Goniobasis viennaensis* Lea

Plate 5 Figures 7-8

*Goniobasis viennaensis* Lea (1862, Proc. Acad. Nat. Sci., Phila., p. 267), near Vienna, Dooly Co., Georgia, in a small stream [Pennahatchee Creek] tributary to the Flint River. Lea, 1862 (9: 137, pl. 37, fig. 160).

DESCRIPTION.—Shell elongate, reaching about 25 mm. (about 1 inch) in length, imperforate, rather thin in structure, and usually strongly sculptured. Color a straw yellow to dark yellowish brown and frequently banded with dark reddish brown. Whorls 9 to 10 and slightly convex. Early two to four whorls usually corroded away. Spire extended, conical, and produced at an angle of about 20°. Aperture subquadrate in outline. Parietal lip consists of a thin callus. Outer lip thin, and when viewed in profile appears as a nearly straight line. Columella nearly straight. Suture moderately indented. Sculpture consists of numerous, arcuate, axial costae, which are faintly nodulose at the whorl periphery. Occasional specimens have a subsutural row of faint nodules, while in others there may be a third row. Base of the shell usually smooth, but in some specimens there may be a series of fine spiral threads. Rare examples may be entirely smooth.

LENGTH*	WIDTH
mm.	mm.

21.5	10.3
------	------

North Fork, Pennahatchee Creek, 4 mi. N Vienna, Dooly Co., Georgia

21	9.5
----	-----

Swift Creek, 12 mi. SW Cordele, Crisp Co., Georgia

19.5	9.5
------	-----

Mill Creek, 8 mi. S Oakfield, Worth Co., Georgia

\*Early whorls corroded away.

TYPES.—The holotype of *Goniobasis viennaensis* Lea is in the United States National Museum and is from Pennahatchee Creek near Vienna, Dooly County, Georgia.

REMARKS.—This species is close in its relationship to *G. curvicastrata* Reeve. It differs in being wider in proportion to its length, being nodulose, and in having the outer lip when viewed in profile, seen as a straight line and not as a sigmoid curve.

RANGE.—This species is restricted to the smaller streams in the central Flint River area. It does not occur in the Flint River proper.

SPECIMENS EXAMINED.—

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Cedar Creek, 5 mi. SW Cordele; Swift Creek, 12 mi. SW Cordele; *both* Crisp Co. North Fork, Pennahatchee Creek, 4 mi. NW Vienna, Dooly Co. Lee's Creek, 5 mi. S DeSoto, Lee Co. Abrams Creek, 5 mi. S Oakfield; Jones Creek, 2 mi. S Oakfield; Mill Creek, 8 mi. S Oakfield; *all* Worth Co.

#### *Goniobasis curvicastrata* Reeve

#### Plate 2 Figures 4-5

*Melania curvicastrata* Reeve (1861, *Conchologia Iconica*, 12: *Melania*, plate 58, no. 462), Florida, United States.

*Melania densicostata* Reeve (1861, *Conchologia Iconica*, 12: *Melania*, plate 58, no. 465), Florida, United States.

*Goniobasis doolyensis* Lea (1862, *Proc. Acad. Nat. Sci., Phila.*, 14: 266), Tennessee [and] near Vienna, Dooly Co., Georgia. Lea (1863, *Jour. Acad. Nat. Sci., Phila.* (n.s.), 5: 315, pl. 37, fig. 159). Lea, 1863 (9: 137, pl. 37, fig. 159).

*Goniobasis inclinans* Lea (1862, *Proc. Acad. Nat. Sci., Phila.*, 14: 267), New Albany [Albany], Georgia; Etowah, Georgia, and Tuscumbia, Alabama. Lea (1863, *Jour. Acad. Nat. Sci., Phila.* (n.s.), 5: 318, pl. 37, fig. 165). Lea, 1863 (9: 140, pl. 37, fig. 165).

*Melania induta* Lea (1862, *Proc. Acad. Nat. Sci., Phila.*, 14: 267), near Vienna, Dooly Co., Georgia. Lea (1863, *Jour. Acad. Nat. Sci., Phila.* (n.s.), 5: 319, pl. 37, fig. 166). Lea, 1863 (9: 141).

*Goniobasis ucheensis* Lea (1862, *Proc. Acad. Nat. Sci., Phila.*, p. 270), Little Uchee River, below Columbus, Georgia [Russell Co., Alabama]. Lea (1863, *Jour. Acad. Nat. Sci., Phila.* (n.s.), 5: 334, pl. 38, fig. 194). Lea, 1863 (9: 156, pl. 38, fig. 194).

*Goniobasis elliotti* Lea (1862, *Proc. Acad. Nat. Sci., Phila.*, p. 271), Fannin County, Georgia; Uchee and Little Uchee Rivers, Alabama. Lea (1863, *Jour. Acad. Nat. Sci., Phila.* (n.s.), 5: 338, pl. 38, fig. 201). Lea, 1863 (9: 160, pl. 38, fig. 201).

*Goniobasis gesneri* Lea (1868, *Proc. Acad. Nat. Sci., Phila.*, p. 151), Uchee River, [Russell County], Alabama.

DESCRIPTION.—Shell elongate, reaching about 31.7 mm. (about 1¼ inches) in length, imperforate, rather thin in structure, and strongly sculptured. Color a light yellow to dark yellowish brown, uniform in color, or with three to four narrow bands of dark mahogany brown. There is generally a subsutural light area. Whorls 9 to 10 and nearly

flat sided. Spire extended, conical, and produced at an angle of about  $27^{\circ}$ . Early two to four whorls are generally corroded away. Aperture subquadrate in outline. Parietal lip consists of a thin callus. Outer lip thin, and when seen in profile it appears as a flattened sigmoid curve. Columella straight to slightly arched and rather narrow. Suture moderately indented. Axial sculpture consists of numerous, strong, arcuate costae, which are formed on the upper half of the whorl. Spiral sculpture consists of one or two fine threads, which may be slightly beaded where the threads and costae cross one another. There is usually a fairly strong peripheral carina. In addition, there are fine axial growth lines which are also arcuate. In some colonies the axial costae are greatly reduced, and in a few rare instances the shells are nearly smooth.

LENGTH mm.	WIDTH mm.	
31.7	11.5	Pigeon Creek, 4 mi. N Pigeon Creek Post Office, Butler Co., Alabama
23.0	9.2	Big Creek, 8 mi. W Malone, Jackson Co., Florida
22.8	9.0	Ditto
20.5	8.0	Flint River, Albany, Dougherty Co., Georgia
19.0	7.0	Ditto

**TYPES.**—The types of *G. curvicostata* Reeve and *densicostata* Reeve are probably in the British Museum, but originally contained in the Cuming Collection. The types of *G. doolyensis*, *gesneri*, *elliottii*, and *ucheensis*, all of Lea, are in the United States National Museum.

**REMARKS.**—This is one of the most common and widespread species in the area covered by this report. It is a rather variable species, a fact which is reflected in the large number of synonyms given above. It appears to be closely related to both *G. viennaensis* Lea and *G. albanyensis* Lea. The most characteristic features of typical specimens of this species are the slightly arcuate costae and the lack of nodules. See also remarks under *albanyensis* and *viennaensis*. In the Escambia River forms occur which are brightly banded with dark reddish brown, while specimens from other stations have bands which are relatively inconspicuous or they may be absent.

This species may be found in the larger rivers as well as many of the smaller creeks.

**RANGE.**—From the Flint River of the Apalachicola system, the species occurs west to the Escambia River.

**SPECIMENS EXAMINED.**—

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: North Fork Pennahatchee Creek, 4 mi. NW Vienna; spring, 8 mi. NW Vienna; *both* Dooly Co. Swift Creek, 12 mi. SW Cordele; Gum Creek, 2 mi. N Cordele; Cedar Creek, 6 mi. SW Cordele; Cordele Springs, Cordele; *all* Crisp Co. Lee's Creek, 5 mi. S DeSoto, Lee Co. West Fork Chickasawhatchee Creek, Dawson; West Fork Chickasawhatchee Creek, 5 mi. E Dawson; *both* Terrell Co. Abrams Creek, 5 mi. S Oakfield; Abrams Creek, 3 mi. W Doles; Mill Creek, 8 mi. S Oakfield; Jones Creek, 2 mi. S Oakfield; spring, 3 mi. W Doles; *all* Worth Co. Creek, 7 mi. NW Albany; Flint River, Albany; Radium Spring, 4 mi. SE Albany; *all* Dougherty Co. Spring Creek, Colquett, Miller Co. Spring Creek, near Brinson, Decatur Co.

APALACHICOLA RIVER DRAINAGE.—*Georgia*: Mosquito Creek, 2 mi. SW Recovery, Decatur Co. *Florida*: Mosquito Creek, ½ mi. E Chattahoochee; Mosquito Creek, 1 mi. S Chattahoochee; *both* Gadsden Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Mulberry Creek, Mitchell Bridge, 3 mi. S Mountain Hill, Harris Co. Sandy Creek, 5 mi. N Fort Gaines, Clay Co. Sawhatchee Creek, 14 mi. NW Donalsonville; Sawhatchee Creek, 10 mi. NW Donalsonville; Kirkland Creek, 6 mi. NW Donalsonville; *all* Seminole Co. *Alabama*: Uchee Creek, Fort Mitchell, Russell Co. Howard Creek, 1 mi. S Gordon, Houston Co.

CHIPOLA RIVER DRAINAGE.—*Alabama*: Big Creek near Taylor, Houston Co. *Florida*: Big Creek, 8 mi. W Malone; Reedy Creek, 6 mi. W. Malone; stream, 1½ mi. N Campbelltown; Chipola River, 1 mi. N Marianna; Chipola River, ½ mi. E Marianna; Spring Creek, Merritts Mill, 3 mi. E Marianna; Chipola River, 3 mi. S Marianna; creek, 2.4 mi. NNW Sink Creek; Chipola River, 1 mi. W Sink Creek; Thomas Mill Pond, 8 mi. S Marianna; Chipola River, 5½ mi. W Greenwood; *all* Jackson Co. stream, 5.2 mi. N Blountstown; Chipola River, 2½ mi. SE Chason; Chipola River, 2 mi. E Clarksville; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

## CHOCTAWHATCHEE RIVER SYSTEM

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: East Fork, Choctawhatchee River, 8 mi. W Abbeville, Henry Co. West Fork, Choctawhatchee River, 7 mi. E Ozark; Choctawhatchee River, Newton; *both* Dale Co. Choctawhatchee River, 2 mi. E Geneva, Geneva Co. *Florida*: Choctawhatchee River, 8 mi. W Miller Cross Roads; Choctawhatchee River, 1 mi. W Caryville; Hurricane Creek, 5 mi. E Miller Cross Roads; Holmes Creek, 3 mi. E Bonifay; *all* Holmes Co.

PEA RIVER DRAINAGE.—*Alabama*: Pea River, ½ mi. SW Geneva, Geneva Co.

## YELLOW RIVER SYSTEM

YELLOW RIVER DRAINAGE.—*Florida*: Yellow River, Milligan, Okaloosa Co.

## ESCAMBIA RIVER SYSTEM

ESCAMBIA RIVER DRAINAGE.—*Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

CONECUH RIVER DRAINAGE.—*Alabama*: Pigeon Creek, 4 mi. N Pigeon Creek Post Office, Butler Co. Little Patsaliga Creek, 1 mi. W Rutledge, Crenshaw Co. Battle Creek, 2 mi. NW Brooklyn; Blue Springs Creek; Burnt Corn Creek, 1 mi. W Repton; *all* Conecuh Co. Burnt Corn Creek, 3 mi. W Appleton; Burnt Corn Creek, Brewton; *both* Escambia Co. Branch of the Conecuh River, 8 mi. WSW Andalusia, Covington Co.



*Goniobasis albanyensis* Lea

## Plate 3 Figure 6

*Goniobasis albanyensis* Lea (1864, Proc. Acad. Nat. Sci., Phila., p. 4), near Albany and Blue Spring, Baker [Dougherty] Co., Georgia. Lea (1866, Jour. Acad. Nat. Sci., Phila., 6: 141, pl. 23, fig. 49). Lea, 1867 (11: 97, pl. 23, fig. 49).

DESCRIPTION.—Shell imperforate, medium in size, reaching 19 mm. in length, and rather light in structure. Color a dull yellowish brown with spiral cords of blackish brown. Whorls 6 to 7, the early whorls usually corroded. The whorls are slightly convex. Spire acute, extended, and nearly flat sided. Aperture subovate with the outer lip thin; the inner lip appears as a thin glaze. Siphonal canal barely indicated. Columella short and arched. Suture only slightly indented. Sculpture consists of 10 to 13 spiral cords more or less evenly disposed over the whorls. Axial costae well developed on the early whorls, sometimes lacking on the body whorl.

LENGTH mm.	WIDTH mm.	WHORLS mm.	
19.5	9	6½	Spring Creek, Reynoldsville, Georgia
18.2	8.4	6+	Ditto
15.8	8	6	Ditto

TYPES.—The holotype of *G. albanyensis* Lea is in the United States National Museum and is from near Albany, Dougherty County, Georgia.

REMARKS.—This species differs from *G. curvicostata* Lea by having a somewhat larger shell and in having the axial costae usually quite nodulose. It occasionally invades spring-fed creeks, but is usually confined to the larger rivers. It is abundant in the upper Flint River, particularly in the vicinity of Albany.

RANGE.—Formerly this species probably occupied all of the Apalachicola system. At the present time it is limited to the Flint River drainage and tributaries of the Chattahoochee River. Silting has probably killed it out of the main stream. We found it in the Apalachicola River, only on the Flint River side, just below the town of Chattahoochee, Florida.

SPECIMENS EXAMINED.—

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—Georgia: Flint River, mouth of Gum Creek, Crisp Co. Flint River, 2 mi. N Albany; Flint River, Albany; Radium Spring, Flint River,

4 mi. SE Albany; Flint River, 10 mi. S Albany; *all* Dougherty Co. Flint River, Newton, Baker Co. Flint River, Bainbridge; Flint River, Recovery; *both* Decatur Co. Spring Creek, Reynoldsville; Spring Creek, 2½ mi. S Reynoldsville; *both* Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Flat Shoal Creek, 5 mi. SE West Point; Mulberry Creek, 3 mi. S Mountain Hill; *both* Harris Co. *Alabama*: Uchee Creek, 6 mi. NE Seale; Uchee Creek; Fort Mitchell; *both* Russell Co. Howard Creek, 1 mi. S Gordon, Houston Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee, Gadsden Co.

### *Goniobasis clenchi* Goodrich

#### Plate 3 Figures 4-5

*Goniobasis clenchi* Goodrich (1924, *Nautilus*, 38: 46, figs. 1-4), Choctawhatchee River, Newton, Dale Co., Alabama.

DESCRIPTION.—Shell elongate, reaching about 30 mm. (about 1½ inches) in length, imperforate, rather thin in structure, and strongly sculptured. Color varies from a chestnut brown to a dark chocolate brown. Whorls 9 to 10 and nearly flat sided. Spire extended, conical, and produced at an angle of about 25°. Early two to three whorls are generally corroded away. Aperture subquadrate in outline. Parietal lip consists of a thin callus. Outer lip thin, and it appears as a flattened sigmoid curve when viewed in profile. Columella straight to slightly arched and rather thin. Suture somewhat indented. Sculpture consists of 9 to 12 spiral cords, those above the periphery are nodulose, those below the periphery are without nodules. Axial sculpture consists of numerous and rather low arcuate costae or riblets, and the nodules on the cords are usually produced at the junction of the cords and the costae. In addition, there are numerous and usually fine arcuate growth lines. Operculum subcircular and paucispiral. Periostracum thin, persistent, and chestnut to dark chocolate brown in color.

LENGTH mm.	WIDTH mm.	
29	12	Choctawhatchee River, 1 mi. W Caryville, Washington Co., Florida
24	8	Holotype
24	9.5	Choctawhatchee River, 8 mi. W Miller Cross Roads, Holmes Co., Florida
23	10	Flat Creek, 8 mi. SW Samson, Geneva Co., Alabama

TYPES.—The holotype of *G. clenchi* is in the Museum of Zoology, University of Michigan. Paratypes are in the University of Michigan,

and in the Museum of Comparative Zoology (51282). The type locality is Choctawhatchee River, Newton, Dale County, Alabama.

REMARKS.—This is a distinctive species apparently related to *curvicaustata* Lea. It differs, however, in the development of its spiral sculpture and in the production of numerous nodules.

RANGE.—Apparently limited to the Choctawhatchee river system.

SPECIMENS EXAMINED.—

#### CHOCTAWHATCHEE RIVER SYSTEM

Alabama: West Fork, Choctawhatchee River, 7 mi. E Ozark; Choctawhatchee River, Newton; east branch Choctawhatchee River; all Dale Co. Flat Creek, 8 mi. SW Samson; Choctawhatchee River, 2 mi. E Geneva; Pea River, ½ mi. SW Geneva; all Geneva Co. Florida: Choctawhatchee River, 8 mi. W Miller Cross Roads, Holmes Co. Choctawhatchee River, 1 mi. W Caryville, Washington Co.

#### *Goniobasis dickinsoni* new species

##### Plate 2 Figure 10

DESCRIPTION.—Shell elongate, reaching about 26 mm. (about 1 inch) in length, imperforate, rather thin in structure, and slightly sculptured. Color a rather dark yellowish brown. Whorls 9 to 10 and flat sided. Spire extended, conical, and produced at an angle of about 20°. Early two to four whorls are generally corroded away. Aperture subquadrate in outline. Parietal lip consists of a thin callus. Outer lip thin, and when viewed in profile appears as a flattened sigmoid curve. Columella straight to slightly arched and rather narrow. Suture moderately indented. Sculpture consists of weak to strong arcuate axial costae, which are most numerous on the early whorls. Spiral cords absent, or limited to three or four on the base of the shell. Axial growth lines strong and arcuate. There is generally a strongly developed peripheral carina.

LENGTH	WIDTH	
mm.	mm.	
26	11	Holotype
26.5	10.0	Paratype
23.0	10.0	Hurricane Creek, 5 mi. E Miller Cross Roads, Holmes Co., Florida
24.5	9.5	Big Creek near Taylor, Houston Co., Alabama

TYPES.—The holotype is in the Museum of Comparative Zoology (191771), and is from Holmes Creek, 1 mile west of Graceville, Florida. Paratypes from the same locality are in the Museum of Comparative Zoology (191772), the University of Florida Collections, the United

States National Museum, and the Museum of Zoology, University of Michigan.

REMARKS.—This is a distinctive species, apparently not closely related to any other species in this area. It appears, however, to be closest to *G. curvicastrata* Reeve from which it differs by having straight-sided whorls, possessing a well-formed peripheral carina, and being nearly devoid of sculpture.

Its distribution is exceedingly interesting as it occupies limited but adjacent areas in two different drainage systems, these being the headwaters of the Chipola River and the upper reaches of Holmes and Hurricane Creeks, the latter two streams being in the Choctawhatchee system. Stream capture or transport by mechanical means may be the explanation. It is to be remembered that this is a region of low relief with only a few feet in elevation actually separating these two systems.

RANGE.—Upper tributaries of the Chipola River in Florida and Alabama, and the tributaries of the Choctawhatchee immediately to the west.

SPECIMENS EXAMINED.—

APALACHICOLA RIVER SYSTEM

CHIPOLA RIVER DRAINAGE.—*Alabama*: Reedy Creek, near Ashford; Big Creek, near Taylor; *both* Houston Co. *Florida*: Stream, 1½ mi. N Campbellton, Jackson Co.

CHOCTAWHATCHEE RIVER SYSTEM

HOLMES CREEK DRAINAGE.—*Florida*: Hurricane Creek, 5 mi. E Miller Cross Roads; Holmes Creek, 3 mi. E Bonifay; *both* Holmes Co. Holmes Creek, about 1 mi. W Graceville, Jackson Co.

ORDER PULMONATA

The following few species of the order Pulmonata are not to be taken as an index of completeness. There are probably many more species than we have considered, but we failed to find them on the two trips—1953 and 1954—in the lower reaches of these rivers. However, this is not good country for this order of snails. Freshwater pulmonates thrive best in areas of lakes, ponds, and small streams, not in large rivers or creeks subject to high water and heavy silting. Freshwater pulmonates are rare and difficult to find in all of the region from the Ohio River south to the Suwannee. Below the Suwannee, in the lake region of Florida, they increase greatly in both species and numbers.

## PHYSIDAE

Genus *Physa* Draparnaud

*Physa* Draparnaud (1801, Tableau des Mollusques Terrestres et Fluviales de la France (Paris), p. 31, 52).

Type species, *Physa fontinalis* Linné

Shells small to medium in size, sinistral, attenuate, usually shining, brown to light amber in color, and imperforate. Aperture elongate and possesses a simple lip which may be slightly thickened a little below the edge. Radula has a few denticles on the central tooth; the lateral teeth are denticulate and with an apophysis.

*Physa pumilia* Conrad

## Plate 4 Figure 8

*Physa pumilia* Conrad (1834, Amer. Jour. Sci., 25: 343), Randon's Creek, near Claiborne, Alabama.

*Physa showalterii* Lea (1864 Proc. Acad. Nat. Sci., Phila., p. 115), Uniontown, Alabama. Lea, 1867 (11: 126, pl. 24, fig. 92).

DESCRIPTION.—Shell sinistral, medium in size, reaching 16 mm. (about  $\frac{3}{4}$  inch) in length, thin, elliptical in outline, smooth and shining. Color brownish yellow to brown. Nuclear whorls reddish brown. Whorls  $5\frac{1}{2}$  to 6, somewhat inflated, and strongly convex. Spire extended and acute. Aperture elliptical and somewhat flaring at the base. Outer lip thin. Inner lip consists of a thin glaze on the parietal wall. Columella slightly twisted and broadening above. Suture slightly impressed. Sculpture consists of fine growth lines and equally fine spiral threads, which together give a reticulated pattern when seen under magnification of 15-20X.

LENGTH	WIDTH
mm.	mm.

13.5	7.5
11	5.5

Alaga Hole, 8 mi. W Recovery, Decatur Co., Georgia
Pond, $7\frac{1}{2}$ mi. SW Recovery, Decatur Co., Georgia

TYPES.—The location of Conrad's type of *P. pumilia* is unknown. The type locality is Randon's Creek, near Claiborne, Alabama. The holotype of *P. showalterii* Lea is in the United States National Museum.

REMARKS.—This species is found in quiet water of springs, ponds,

and the backwater areas of larger streams. See also remarks under *P. crocata* Lea.

RANGE.—From the lower Mississippi River this species ranges east to Georgia and south to the southern part of Florida.

SPECIMENS EXAMINED.—

SUWANNEE RIVER SYSTEM

WITHLACOOCHEE RIVER DRAINAGE.—*Florida*: Withlacoochee River, Blue Spring, 10 mi. E Madison, Madison Co.

SUWANNEE RIVER DRAINAGE.—*Florida*: Suwannee River, White Springs, Columbia Co. Suwannee River, Ellaville, Madison Co. Santa Fe River, Poe Springs, Alachua Co. Ichucknee River, 5 mi. NW Fort White, Suwannee Co.

ECONFINA RIVER SYSTEM

*Florida*: Econfina River, 18 mi. W Perry, Taylor Co.

WAKULLA RIVER SYSTEM

*Florida*: Wakulla Spring, Wakulla River, Wakulla Co.

OCHLOCKONEE RIVER SYSTEM

*Georgia*: Ochlockonee River, between Reno and Beachton, Grady Co.

APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Cordele Springs, Cordele, Crisp Co. East Fork, Chickasawhatchee River, 5 mi. E Dawson, Terrell Co. Flint River, 2 mi. N Albany; Radium Spring, 4 mi. SE Albany; both Dougherty Co. Cypress Creek, Baker Co. Alaga Hole, 8 mi. W Recovery; pond, 7½ mi. SW Recovery; Paul Clarke Spring, 2½ mi. W Recovery; all Decatur Co. Spring Creek, Reynoldsville, Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Alabama*: Opelika, Lee Co. Big Uchee Creek, 6 mi. NE Seale, Russell Co. Irving Mill Creek, 10 mi. S Gordon, Houston Co. *Florida*: Cypress swale, 1 mi. N Sneads, Jackson Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Blountstown, Calhoun Co.

CHOCTAWHATCHEE RIVER SYSTEM

PEA RIVER DRAINAGE.—*Alabama*: Pea River, Elamville, Barbour Co.

ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Evergreen, Conecuh Co.

*Physa crocata* Lea

Plate 4 Figure 9

*Physa crocata* Lea (1864, Proc. Acad. Nat. Sci., Phila., p. 114), Lafayette, Walker Co., Georgia. Lea, 1867 (11: 125, pl. 24, fig. 90).

*Physa oleacea* Tryon (1866, Amer. Jour. Conchology, 2: 6) [in part], Bridgeport, Alabama; and Lake Superior.

DESCRIPTION.—Shell sinistral, medium in size, reaching 12 mm. (about ½ inch) in length, imperforate, elliptical, and shining. Color usually straw yellow to light horn. Whorls 4½ to 5, rather inflated,

and rounded. Nuclear whorls reddish brown. Spire slightly obtuse, not produced. First whorl above the aperture bulges slightly beyond the otherwise straight contour of the spire. Aperture rounded, elongate, slightly flared at the base. Palatal lip acute and marginate. Parietal lip present only as a slight deposit on the body whorl. Columella usually straight, sometimes slightly inclined to the left, sometimes slightly twisted. Suture slightly impressed, not indented. Sculpture consists of fine growth lines; cross striae absent. Axial rest bands yellowish externally, dark brownish red internally, and sometimes quite thickened.

LENGTH	WIDTH	
mm.	mm.	
12.8	7.8	Silver Creek, Rome, Floyd Co., Georgia
10.3	7	Fish hatchery, Warm Springs, Meriwether Co., Georgia
9.8	5.6	Lafayette, Walker Co., Georgia (Paratype).

**TYPES.**—The holotype of *P. crocata* Lea is in the United States National Museum (134813) and is from Lafayette, Walker County, Georgia. The holotype of *P. oleacea* Tryon is in the Academy of Natural Sciences, Philadelphia.

**REMARKS.**—According to F. C. Baker (1910: 492), Tryon's *P. oleacea* from the Lake Superior region are young *Physa gyrina* Say, whereas his specimens from Bridgeport, Alabama are unquestionably *Physa crocata* Lea. *Physa crocata* Lea is readily differentiated from *P. pumilia* Conrad by being more globose, and generally in having a somewhat heavier shell which is lighter in color and has a more pronounced whorl shoulder.

**RANGE.**—Upper reaches of the Chattahoochee and Flint Rivers and throughout most of the Coosa-Alabama and Tennessee river systems.

**SPECIMENS EXAMINED.**—

#### APALACHICOLA RIVER SYSTEM

**FLINT RIVER DRAINAGE.**—*Georgia*: Fish hatchery, Warm Springs, Meriwether Co.

**CHATTAHOOCHEE RIVER DRAINAGE.**—*Georgia*: Chattahoochee River, West Point, Troup Co. Chattahoochee River, Franklin, Heard Co.

#### LYMNAEIDAE

##### Genus *Pseudosuccinea* Baker

*Pseudosuccinea* Baker (1908, Science (n.s.), 27: 943).

Type species, *Lymnaea columella* Say, original designation.

Shells small to medium in size, usually thin, smooth, and imperforate. Generally the spire is short, and the body whorl is large and expanded. The columella is slightly twisted.

*Pseudosuccinea columella* Say

Plate 4 Figure 10

*Lymnaea columella* Say (1817, Jour. Acad. Nat. Sci., Phila., 1: 14), no locality given [probably near Philadelphia].

*Pseudosuccinea columella* Say. Baker (1911, Chicago Acad. Sci., Spec. Publ., 3: 163, pl. 23, figs. 8-20; pl. 24, figs. 1-4).

DESCRIPTION.—Shell fragile, small, reaching 23 mm. (about 1 inch) in length, thin in structure, nearly smooth, and imperforate. Color straw yellow to brownish yellow. Spire short. Aperture ovate and large. Outer lip thin. Parietal wall thinly glazed. Columella narrow, arched, and slightly twisted. Suture impressed. Sculpture, as seen under magnification of 10-14X consists of numerous but fine spiral threads crossed by fine axial growth lines.

LENGTH	WIDTH
mm.	mm.

11.5

8.5

Flint River, Recovery, Decatur Co., Georgia

7.3

4.6

Irving Mill Creek, 10 mi. S Gordon, Houston Co., Alabama

TYPES.—The holotype of *Lymnaea columella* Say is in the Academy of Natural Sciences, Philadelphia (58791). The type locality, though not given by Say, is probably in the vicinity of Philadelphia.

REMARKS.—This is a widely distributed species, though it is rare in the area covered by this report. Specimens from the southern states are, on the average, smaller than those from the north. This species prefers quiet water along the larger streams and rivers.

RANGE.—This species occurs from Florida west to Texas and north into Canada.

SPECIMENS EXAMINED.—

APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Flint River, Recovery, Decatur Co. Spring Creek, Reynoldsville, Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Chattahoochee River, West Point, Troup Co. *Alabama*: Irving Mill Creek, 10 mi. S Gordon, Houston Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Blountstown, Calhoun Co.



## ANCYLIDÆ

Genus *Ferrissia* Walker

*Ferrissia* Walker (1903, *Nautilus*, 17: 15).

Type species, *Ancylus rivularis* Say, original designation.

Shells small, conical, thin, with the apex posterior and slightly inclined to one side. The shell may be smooth on the apex or radially striate.

*Ferrissia (Laevapex) dalli* Walker

## Plate 1 Figure 13

*Ferrissia (Laevapex) dalli* Walker (1920, *Nautilus*, 33: 102), Lake Helena, Volusia Co., Florida.

DESCRIPTION.—Shell depressed, conical, reaching 6.5 mm. ( $\frac{1}{4}$  of an inch) in length, oval, thin and fragile. Color a light yellowish brown. Apex subacute and inclined toward the right. Anterior slope slightly convex; posterior slope slightly concave. Apex faintly sculptured with radial threads.

LENGTH mm.	WIDTH mm.	HEIGHT mm.	
6.5	4.5	1.5	Holotype
4	3	1.4	Blue Spring, $7\frac{1}{2}$ mi. SW Recovery, Decatur Co., Georgia

TYPES.—The holotype is in the Museum of Zoology, University of Michigan (Walker Collection) and is from Lake Helena, Volusia County, Florida.

REMARKS.—We found but a single series of this species within the area covered by this report. It appears to be rather abundant in the lake region of central Florida.

RANGE.—Probably limited to southern Georgia, southern Alabama, and most of Florida.

SPECIMENS EXAMINED.—

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Blue Spring,  $7\frac{1}{2}$  mi. SW Recovery, Decatur Co.

## MARGARITANIDAE

This is a family containing only two genera and but few species; these all occur in the northern hemisphere—North America, Europe, and Asia. Members of this family differ from the Unionidae by having the gills without distinct interlamellar septa, or if the septa are present, they are oblique to the gill filaments.

Genus *Margaritana* Schumacher

*Margaritana* Schumacher (1817, Essai d'un Nouveau Système des Habitations des Vers Testacés, p. 123).

Type species, *Margaritana fluviatilis* Schumacher (= *Mya margaritifera* Linné), monotypic.

Shells generally elongate, usually arcuate, and with the umbos low and not full. Sculpture consists of numerous curved ridges which emanate along the posterior ridge, remain strong on the posterior slope, and generally flatten and then disappear on the disc. Hinge teeth generally imperfect or not fully developed, with two pseudocardinal teeth in the left valve and one pseudocardinal in the right valve. The gills are without water tubes, but have scattered interlamellar connections.

The reference to sculpture in this general description covers only *M. hembeli* Conrad; most other members of this genus are smooth or nearly so.

*Margaritana hembeli* Conrad

## Plate 5 Figure 1

*Unio hembeli* Conrad (1838, Monography of the family Unionidae (Philadelphia), p. 93, pl. 51, figs. 1-3), locality unknown.

*Margaritana hembeli* Conrad. Ortmann (1912: 235, figs. 3-3a). Simpson (1914: 523).

DESCRIPTION.—Shell medium in size, reaching 95 mm. (3¾ inches) in length, rather solid in structure, subquadrate in outline, and sculptured. Color a dark olivaceous brown to blackish brown. Posterior slope nearly flat with the posterior ridge poorly defined. Shell tapering to an angulated point posteriorly. Umbos anterior to the center, broad, but not high or full. Ligament short and rather wide. Periostracum somewhat smooth and shiny on the disc, roughened on the ventral margin and over the posterior slope. Sculpture consists of

numerous, rather irregular, enchevroned costae which are built upon the posterior ridge and extend over a part of the disc as well as over the posterior slope to the dorsal margin of the valve. The strength of the sculpture is somewhat variable, with occasional specimens being nearly smooth.

Nacre bluish white and only moderately iridescent. Both anterior and posterior muscle scars are well defined. Hinge plate long and fairly wide. Right valve with one crenulated and triangular, pseudocardinal tooth. Left valve with two subequal, crenulated, and triangular, pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
112	57	32.5	Spring Creek, near Clearwater, about 20 mi. S Alexandria, Rapides Parish, Louisiana
95	50	29.5	Burnt Corn Creek, Conecuh Co., Alabama
87	44	27	Otter Creek, branch of Murder Creek, near Evergreen, Conecuh Co., Alabama
72	38	20.5	Horse Creek, near Luverne, Crenshaw Co., Alabama

**TYPES.**—The location of the type specimen of *Margaritana hembeli* Conrad is unknown. It is not at the Academy of Natural Sciences, Philadelphia, where some of Conrad's types are located.

**REMARKS.**—This is a remarkable species and not closely related to any other species found in this area. The original specimens were sent to Conrad from New Orleans, Louisiana, but he states in his original description that "no locality was given."

This species is known only from the small tributaries of the Escambia River in Alabama and from a small spring-fed creek, a tributary to Bayou Cocodrie, in Louisiana. This is a remarkable distribution; it is known from no localities between these two systems.

**RANGE.**—So far as now known this species is restricted to the Escambia river system and the Bayou Teche system.

#### SPECIMENS EXAMINED.—

#### ESCAMBIA RIVER SYSTEM

**CONECUH RIVER DRAINAGE.**—*Alabama*: Horse Creek, near Luverne, Crenshaw Co. Burnt Corn Creek, near Burnt Corn, Monroe Co. Hunters Creek, 8 mi. SW Evergreen; Otter Creek, branch of Murder Creek, near Evergreen; both Conecuh Co.

#### BAYOU TECHE SYSTEM

**BAYOU COCODRIE DRAINAGE.**—*Louisiana*: A spring creek, near Clearwater, about 20 mi. S Alexandria, Rapides Parish.

## UNIONIDAE

The problem concerning the Unionidae of this area is, perhaps, just as great as it is elsewhere in the southern states. Errors of considerable magnitude were made by the earlier describers, particularly by Isaac Lea, who had received most if not all of his material from others. These people who sent material to Lea, failed, in many cases, to give exact data, and in many cases these data were in error. A duplication of place names can account for certain of these errors. There is a Macon County on the Flint River, Georgia, several miles removed from the city of Macon, which is on the Ocmulgee River, a totally different drainage system. The name Macon appears frequently in Lea's type localities for species that are now known to be limited to the Chattahoochee-Flint system and do not occur in the Altamaha system of which the Ocmulgee is a major tributary.

Far too many names exist for the species that are found in this region. Names were based on single, or at best few, specimens; and trivial differences were used as diagnostic characters. When large series are studied these characters are found to have no significance.

Genus *Fusconaia* Simpson

*Fusconia* Simpson (1900: 784).

*Fusconaja* 'Simpson' Ortmann (1912, Ann. Carnegie Museum (Pittsburgh), 8: 240) [emendation for *Fusconaia* Simpson].

Type species, *Unio trigonus* Lea, original designation.

Shell subcircular, triangular, or subelliptical in outline. Posterior ridge usually poorly defined. Umbos broad and full, often high, usually curved inward and forward, and sculptured with a few, coarse, parallel ridges which curve upward posteriorly. Periostracum usually dark. Shell smooth. Hinge plate of moderate width and usually strongly arcuate. Pseudocardinal teeth strong. Nacre white, salmon, or purple. All four gills are used as the marsupia.

*Fusconaia succissa* Lea

## Plate 7 Figure 5

*Unio succissus* Lea (1852, Trans. Amer. Philos. Soc., 10: 275, pl. 21, fig. 32), West Florida.

*Unio cacao* Lea (1859, Proc. Acad. Nat. Sci., Phila., 11: 154), Chacktahachie [Choctawhatchee] River, West Florida. Lea, 1852 (8: 26, pl. 56, fig. 169).

*Quadrula wrighti* Simpson (1914: 868), Pine Barren Creek, Escambia Co., Florida.

DESCRIPTION.—Shell small to medium in size, reaching 60 mm. (about 2 3/8 inches) in length, subcircular in outline, heavy in structure, smooth, and inflated. Color olivaceous brown when young, turning to a dark brownish black in older specimens. Posterior slope nearly flat with the posterior ridge poorly defined. Shell rounded posteriorly. Umbos anterior to the center, broad and full, but not high. Ligament short and narrow. Periostracum smooth on the disc and somewhat roughened on the posterior slope.

Nacre white to purplish, though generally only the margin is purple and this surrounds a more or less white interior. (This coloration has faded in most of the older material in collections.) Young specimens may be entirely purple. Both anterior and posterior muscle scars are clearly outlined. Hinge plate broad and strongly arcuate. Right valve with two—one large and one small—irregular pseudocardinal teeth. Left valve with two subequal pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
60	43	32.5	Yellow River, Milligan, Okaloosa Co., Florida
56	43.5	31	Hollis Creek, Sanford, Covington Co., Alabama
47.5	38	22.5	Escambia River, 3 mi. SE Century, Escambia Co., Florida

TYPES.—The holotypes of *Fusconaia succissa* Lea and the two synonyms are in the United States National Museum. We here limit the type locality to the Choctawhatchee River, Caryville, Holmes County, Florida. This is on the route of the old Spanish Trail, and it is quite possible that Lea's original material came from this part of the river.

REMARKS.—There is no question that *Quadrula wrighti* Simpson is identical with this species. In essence, it appears to be an adult form with the purple nacre more or less restricted to the shell margin. In younger specimens, such as the one which Lea described as *U. cacao*, the entire inner surface of the shell may be purple.

This species is confined to the Choctawhatchee, Yellow, and Escambia river systems. It is not a rare species, and it is found in the large rivers as well as the small streams. It is a rather uniform species, showing but little variation, other than size, from one locality to another.

RANGE.—The species occurs from the Choctawhatchee river system west to the Escambia river system.

SPECIMENS EXAMINED.—

## CHOCTAWHATCHEE RIVER SYSTEM

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: East Fork, Choctawhatchee River, 8 mi. W Abbeville, Henry Co. East Fork, Choctawhatchee River, 9 mi. N Pinckard; West Fork, Choctawhatchee River, near Blackman's Mill; West Fork, Choctawhatchee River, 7 mi. E Ozark; Claybank Creek; Choctawhatchee River, near Newton; *all* Dale Co. Choctawhatchee River, 2 mi. E Geneva; and near Gilleys Mill Creek; *both* Geneva Co. *Florida*: Choctawhatchee River, 1 mi. W Caryville, Washington Co. Choctawhatchee River, 8 mi. W Miller Cross Roads, Holmes Co. Choctawhatchee River, Cowford Bridge; Bruce Creek; *both* Walton Co.

PEA RIVER DRAINAGE.—*Alabama*: Pea River near Elamville, and near Burke's Place; *both* Barbour Co. Pea River, 8 mi. NW Arifton, Dale Co. Pea River, Flemings Mill, Coffee Co. Pea River, 2½ mi. SW Geneva, Geneva Co.

## YELLOW RIVER SYSTEM

YELLOW RIVER DRAINAGE.—*Alabama*: Hollis Creek, near Sanford, Covington Co. *Florida*: Yellow River, Milligan, Okaloosa Co.

## ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Patsaliga Creek, 1 mi. W Luverne; Conecuh River, near Searight, and near Brantley; *all* Crenshaw Co. Murder Creek, near Evergreen, Conecuh Co. Patsaliga Creek; Conecuh River, near Dunn's Crossing; *both* Covington Co.

ESCAMBIA RIVER DRAINAGE.—*Alabama*: Escambia River near Pollard; Escambia River near Flomaton; *both* Escambia Co. *Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

*Fusconaia escambia* new species

## Plate 7 Figure 3-4

DESCRIPTION.—Shell small to medium in size, reaching 46 mm. (about 1¾ inches) in length, subcircular in outline, heavy in structure, smooth, and inflated. Color reddish brown when young, becoming a dark blackish brown in older specimens. Posterior slope slightly concave with a well defined posterior ridge. Shell pointed posteriorly, forming an angle of a little over 90°. Umbos slightly anterior to the center, broad, full, and high. Ligament short and narrow. Periostracum smooth on the upper part of the disc, slightly roughened on the posterior slope and along the ventral margin.

Nacre white (rare) to a deep salmon and highly iridescent posteriorly. Both anterior and posterior muscle scars are clearly outlined. Hinge plate broad and strongly arcuate. Right valve with one large crenulated pseudocardinal tooth. Left valve with two subequal crenulated teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
46	38	22	Holotype
45	35	19	Paratype
41.5	36.5	21.5	Paratype

**TYPES.**—The holotype is in the Museum of Comparative Zoology (191470) and is from the Escambia River, 3 miles southeast of Century, Escambia County, Florida. Paratypes from the same locality are in the Museum of Comparative Zoology and the University of Florida Collections.

**REMARKS.**—This species, though somewhat similar to *Fusconaia succissa* Lea, is quite a distinct species and differs in several characters. *Fusconaia escambia* has a well defined posterior ridge and a pointed posterior margin. In *F. succissa* the posterior ridge is absent or very poorly defined, and posteriorly the valves are rounded rather than strongly angulate. In addition, the umbos of *F. escambia* are much higher, and the nacre of this new species is a deep salmon in color; very different from the purple coloration of *F. succissa*.

**RANGE.**—Known only from the type locality.

### Genus *Quincuncina* Ortmann

*Quincuncina* Ortmann (1922, *Nautilus*, 36: 1).

Type species, *Quincuncina burkei* Walker, original designation.

Shells rather small, subcircular to subelliptical in outline, rather solid, and usually dark colored. The nacre is bluish white. Hinge plate narrow, but supporting well-developed pseudocardinal teeth. Disc and posterior slope usually well sculptured with chevron-shaped or short irregular ridges. All four gills are used as marsupia.

This genus occurs in the Choctawhatchee River east to the Suwannee River. Its relationships are nearest to *Fusconaia*, a genus of wide distribution in central and southern North America.

### *Quincuncina infucata* Conrad

#### Plate 4 Figure 6

*Unio infucatus* Conrad (1834: 45, pl. 3, fig. 2), Flint River, Georgia.

*Unio securiformis* Conrad (1849, *Ann. and Mag. Nat. Hist.*, 4: 300), Flint River, Georgia. Conrad (1849, *Jour. Acad. Nat. Sci., Phila.* (n.s.), 1: 275, pl. 37, fig. 1).

*Unio kleinianus* Lea (1852, *Proc. Amer. Philos. Soc.*, 5: 251), Suwannee River, Florida. Lea, 1852 (5: 21, pl. 17, fig. 18).

*Quadrula infucata* Conrad. Simpson (1914: 864).

*Quincuncina infucata* Conrad. Ortmann. (1922, *Nautilus*, 36: 3).

**DESCRIPTION.**—Shells small, reaching about 50 mm. (about 2 inches) in length, solid in structure, subcircular in outline, and inflated. Color variable, ranging from brown or greenish brown to almost jet black, the majority of specimens being a dark blackish brown. Posterior

slope flat to slightly concave; the posterior ridge poorly defined. Shell tapering to a blunt and rounded point posteriorly. Umbos anterior to the center, broad and low. Ligament rather short and thick. Periostracum smooth on the disc, slightly roughened on the posterior slope. Most of the surface of the disc is sculptured with small chevron-shaped subnodulose ridges. The posterior slope has somewhat stronger arcuate ridges. The surface on some shells, however, is only faintly sculptured, or is entirely smooth.

Nacre generally bluish white and iridescent posteriorly. Anterior and posterior muscle scars clearly outlined. Hinge plate wide and rather thick. There are two pseudocardinal teeth in each valve.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
50	39	28	Ochlockonee River, 7 mi. S Cairo, Grady Co., Georgia
48	40	30.5	Flint River, Recovery, Decatur Co., Georgia
48	35	24	Chattahoochee River, Columbus, Muscogee Co., Georgia

**TYPES.**—The location of the types of *Q. infucata* Conrad and *Q. securiformis* Conrad is unknown to us. The type locality is the Flint River, Georgia. We here limit the type locality to the Flint River, Albany, Dougherty County, Georgia, as it was probably at this place that Conrad obtained the material. The type of *Q. kleiniana* Lea is in the United States National Museum and is from the Suwannee River, Florida.

**REMARKS.**—This is a rather rare and highly variable species. The shells may be smooth to highly sculptured with chevron-shaped subnodulose ridges. Completely smooth shells are rare. Conrad's *infucata*, as listed above, was based on a smooth specimen; his *securiformis* was a slightly sculptured one.

This species occurs mainly in the deeper portions of the rivers, generally under trash, and it is seldom located by the siphonal openings.

Individuals of this species from the Flint, Apalachicola, and Chipola Rivers are relatively smooth, having the sculpture limited to the upper part of the disc. Elsewhere throughout the range of the species the shells are rather heavily sculptured.

**RANGE.**—From the Suwannee River, the range extends west to the Apalachicola river system.

**SPECIMENS EXAMINED.**—



## SUWANNEE RIVER SYSTEM

WITHLACOOCHEE RIVER DRAINAGE.—*Florida*: Withlacoochee River, Blue Spring, Madison Co.

SUWANNEE RIVER DRAINAGE.—*Florida*: Suwannee River, Ellaville, Madison Co. Santa Fe River, Worthington Springs, Union Co. Suwannee River, Oldtown, Dixie Co.

## OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—*Georgia*: Ochlockonee River; 7 mi. S Cairo; Ochlockonee River, between Reno and Beachton; *both* Grady Co. *Florida*: Ochlockonee River, 1 mi. below Jackson Bluff; Ochlockonee River, 11 mi. NW Tallahassee; Ochlockonee River, about 8 mi. W Tallahassee; *all* Leon Co. Little River, 3½ mi. E Quincy, Gadsden Co. Ochlockonee River, 7½ mi. E Hosford, Liberty Co.

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Little Patsiliga Creek, near Butler; Patsiliga Creek; *both* Taylor Co. Flint River, 8 mi. W Cordele, Crisp Co. Mill Creek, 8 mi. S Oakfield, Worth Co. Flint River, Albany; Flint River, River Bend, 8 mi. S Albany; *both* Dougherty Co. Flint River, Bainbridge; Flint River, Recovery; *both* Decatur Co. Spring Creek, Reynoldsville, Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Chattahoochee River, Cobb Co. Chattahoochee River, West Point, Troup Co. Mulberry Creek, Mitchell Bridge, 3 mi. SSE Mountain Hill, Harris Co. Chattahoochee River, Columbus, Muscogee Co. *Alabama*: Cowikee Creek, 6 mi. N Eufaula, Barbour Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee; Mosquito Creek, ½ mi. E Chattahoochee; *both* Gadsden Co. Apalachicola River, Blountstown, Calhoun Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Big Creek, 8 mi. W Malone; Reedy Creek, 6 mi. W Malone; Chipola River, 1 mi. N Marianna; *all* Jackson Co. Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

*Quincuncina burkei* Walker

## Plate 4 Figure 5

*Quincuncina burkei* Walker (1922, Nautilus, 36: 3, pl. 1, figs. 1, 4), Sikes Creek, tributary of the Choctawhatchee River, Barbour Co., Alabama.

DESCRIPTION.—Shell small, reaching 60 mm. (about 2¼ inches) in length, subelliptical in outline, inflated, and strong. Color brownish yellow to a dark brownish black. Posterior slope slightly concave; the posterior ridge usually well defined. Shell tapering to a blunt point posteriorly. Umbos are well anterior to the center, broad, though not high and full. Ligament short and small. Periostracum smooth and shining on the disc, somewhat roughened on the posterior slope and near the ventral margin. Sculpture consists of small chevron-shaped ridges over most of the disc in young specimens. In older specimens the sculpture is confined to the upper part of the disc, while

on the posterior slope these ridges become parallel. A few specimens are smooth on the disc, but there always appears to be a few ridges on the upper posterior slope.

Nacre bluish white. Anterior muscle scars well defined. Posterior muscle scars only slightly impressed. Hinge plate small. Right valve with one moderately large pseudocardinal tooth; left valve with two.

LENGTH mm.	HEIGHT mm.	BREADTH mm.	
59	33	26	Holmes Creek, 1 mi. W Graceville, Jackson Co., Florida
58	32.5	20	Beaver Creek, near Taylor, Houston Co., Alabama
51	32	22.5	Panther Creek, Pinckard, Houston Co., Alabama

**TYPES.**—The holotype of this species is in the Museum of Zoology, University of Michigan (originally in the Walker Collection as 41626). The type locality is Sikes Creek, a tributary of the Choctawhatchee River, Barbour County, Alabama.

**REMARKS.**—This species is not closely related to *infucata* of the Apalachicola river system. It differs from *infucata*, by being far more attenuate and in having a more pronounced posterior ridge. It is interesting to note that in both these species there is a great deal of variation in the intensity and extent of sculpture.

Members of this species should not be confused with those of the genus, *Medionidus* which they resemble.

**RANGE.**—This species is restricted to the Choctawhatchee river system.

**SPECIMENS EXAMINED.**—

#### CHOCTAWHATCHEE RIVER SYSTEM

**CHOCTAWHATCHEE RIVER DRAINAGE.**—*Alabama*: Choctawhatchee River, 8 mi. W Abbeville, Henry Co. Choctawhatchee River, Newton, Dale Co. Little Choctawhatchee River, near Dothan, Houston Co. Little Choctawhatchee River, 5 mi. S Pinckard; Panther Creek near Pinckard; *both* Dale Co. Beaver Creek, near Taylor; Bear Creek, near Taylor; *both* Houston Co. *Florida*: Choctawhatchee River, 8 mi. W Miller Cross Roads; Holmes Creek, 3 mi. E Bonifay; *both* Holmes Co. Holmes Creek, 1 mi. W Graceville, Jackson Co.

#### Genus *Crenodonta* Schlüter

*Amblesma* Rafinesque (1820; Annales Générales des Sciences Physiques (Bruxelles), 5: 314). Type species, *Amblesma costata* Rafinesque, subsequent designation, Walker, 1918. *Non Amblesma* Rafinesque, 1819.

*Crenodonta* Schlüter (1838, Kurzgefasstes systematisches Verzeichniss Meiner Conchyliensammlung (Halle), p. 33).

Type species, *Unio plicatus* Say, subsequent designation; Simpson, 1900.

In 1819 Rafinesque (Journal des Physiques de Chimie d'Histoire Naturelle (Paris), 88: 427) instituted the genus *Amblema* with a brief description and with *A. ovalis* as the type, it being the only species mentioned. This species is completely unknown, and the brief and poor generic description is quite inadequate as a diagnosis. In 1820, as noted in the synonymy above, Rafinesque again used this name with a generic definition. His second use was, of course, a homonym, and as such was invalid. Unfortunately, other workers in this family have overlooked or ignored the earlier use of *Amblema*. In 1838 Schlüter instituted the name *Crenodonta* and gave as his first species *Unio plicatus* Say, and this was subsequently designated as the type species of *Crenodonta* by Simpson in 1900.

The shells are subquadrate to subtrapezoidal in outline, thick, and with the umbos somewhat elevated. Sculpture generally consists of large diagonal plicae. Umbonal sculpture consists of coarse, double-looped corrugations which extend over the upper part of the disc. Periostracum dark brown to nearly black. Pseudocardinal teeth relatively large and ragged; lateral teeth long and well developed. Nacre generally white. Marsupia occupying all four gills.

This genus is widely distributed from the Ochlockonee River west to the Mississippi system and north to the upper St. Lawrence system.

### *Crenodonta boykiniana* Lea

#### Plate 9 Figure 3

*Unio boykinianus* Lea (1840, Proc. Amer. Philos. Soc., 1: 288), Chattahoochee River, Columbus, Georgia. Lea, 1842 (3: 46, pl. 13, fig. 22).

*Quadrula boykiniana* Lea. Simpson (1914: 824).

DESCRIPTION.—Shell large, reaching 168 mm. (about 6¾ inches) in length, subquadrate in outline, solid in structure, and moderately inflated. Color olivaceous green in young specimens to blackish brown in adults. Posterior slope slightly concave with the posterior ridge absent or only poorly defined. Young shells are generally winged on the dorsal margin of the posterior slope. As the shell becomes adult, the wing becomes less pronounced. The shell tapers to a blunt point posteriorly and is rounded anteriorly. Umbos are anterior to the center, fairly broad, and not full. Ligament long and wide. Periostracum

shiny in young specimens, satiny in older specimens. Sculpture covers almost the entire surface of the shell. In the umbonal area of young specimens there are numerous, rather high, chevron-shaped ridges, which are irregular and generally connected to one another. Below the umbos the ridges become more pronounced, subradial in alignment, and curved upward over the posterior slope. Specimens occurring in slow-flowing streams have three to five larger ridges extending from the umbo to the posterior end.

Nacre bluish white and moderately iridescent over most of the inner surface. Anterior and posterior muscle scars well defined. Hinge plate broad. Right valve with two pseudocardinal teeth—one large and corrugated, the other small and laminated. Left valve with two pseudocardinal teeth—one narrow and bladeliike, the other broad and deeply furrowed.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
168	118	54	Chattahoochee River, West Point, Troup Co., Georgia
153	100	64	Dead Lake, Chipola River, Chipola Park, Calhoun Co., Florida
93	71	39	Escambia River, 3 mi. SE Century, Escambia Co., Florida

**TYPES.**—The holotype of *C. boykiniana* Lea is in the United States National Museum and is from the Chattahoochee River at Columbus, Georgia. Idiotypes are in the Museum of Comparative Zoology (141087) and are from the same locality.

**REMARKS.**—This is the largest freshwater mussel in this area. It is found mainly in the larger rivers and in areas where there is a sandy-mud bottom.

Its relationships appear to be close to *C. perplicata* Conrad of the Coosa river system and to *C. gigantea* Barnes of the Ohio river system. It is variable in several characters. In areas of sluggish rivers, specimens become much stouter, a little more elongate, and develop heavier ridges.

*Crenodonta boykiniana* is trapezoid or subquadrate in outline, while *perplicata* Conrad appears more circular in outline. The sculpturing is more complex and irregular in young specimens of *C. boykiniana*.

**RANGE.**—From the Ochlockonee River the species occurs west to the Escambia River, however, we have seen no specimens from the Choctawhatchee River.

**SPECIMENS EXAMINED.**—

## OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—*Florida*: Ochlockonee River, Jacksons Bluff; Ochlockonee River, 8 mi. W Tallahassee; both Leon Co.

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Flint River, Albany; Flint River, 8 mi. S Albany; both Dougherty Co. Flint River, Bainbridge; Flint River, Recovery; both Decatur Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Chattahoochee River, West Point, Troup Co. Chattahoochee River, Columbus, Muscogee Co. Chattahoochee River, Georgetown, Quitman Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Dead Lake, Chipola River, Chipola Park, Calhoun Co.

## ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Sepulga River, Conecuh Co.

ESCAMBIA RIVER DRAINAGE.—*Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

*Crenodonta neisleri* Lea

## Plate 2 Figure 1

*Unio neislerii* Lea (1858, Proc. Acad. Nat. Sci., Phila., 2: 165), Flint River at Lanier, Georgia.<sup>9</sup> Lea, 1859 (7: 30, pl. 26, fig. 93).

*Quadrula neislerii* Lea. Simpson (1914: 829).

DESCRIPTION.—Shell medium in size, reaching 84 mm. (about 3¼ inches) in length, subquadrate in outline, solid in structure, strongly sculptured, and moderately inflated. Color a dark brownish black. Posterior slope slightly concave with the posterior ridge poorly defined. Shell rounded both posteriorly and anteriorly. Umbos well anterior to the center, broad, but not full. Ligament moderately long and somewhat thickened. Periostracum somewhat shiny and satiny. Sculpture usually covers the entire shell. The umbo with small chevron-shaped ridges which merge into heavy, nearly parallel ridges extending posteriorly.

Nacre bluish white and usually highly iridescent posteriorly. Anterior and posterior muscle scars well defined. Right valve with one large corrugated, and one small laminated, pseudocardinal tooth. Left

<sup>9</sup>Lanier does not appear on modern maps. It was a small town, perhaps a logging camp, situated near the Flint River, about 10 miles north of Oglethorpe, Macon County, Georgia. It is not to be confused with a town of the same name on modern maps which is in Bryan County, some 35 miles west of Savannah, Georgia.

Lea, in his Observations (*op. cit.*), refers to another locality as Macon, Georgia. This is an error for Macon County, Georgia, and we have two paratypes so labeled; probably all specimens came from a single source.

valve with two subequal pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
84	57	46.5	Dead Lake, Chipola River, Chipola Park, Calhoun Co., Florida
69	52	33	Flint River, Macon Co., Georgia
62.5	49	35.5	Apalachicola River, Chattahoochee, Gadsden Co., Florida

**Types.**—Holotype in the United States National Museum from the Flint River at Lanier, [10 miles north of Oglethorpe], Macon County, Georgia. Paratypes in the Museum of Comparative Zoology (189796) are from the same locality and were received from Dr. Neisler.

**Remarks.**—This is a rather rare species, though it can be locally abundant. It differs rather sharply from *C. boykiniana* Lea; specimens of the same size differ in that the ridges in *neisleri* are parallel, while those in *boykiniana* are radiating. In addition, the shape of *boykiniana* is affected materially by the presence of a "wing," while in *neisleri* the posterior end is rounded. It is quite possible that this species is now extinct in the upper reaches of the Flint River. To our knowledge it has not been obtained on the lower Flint River north of Bainbridge, Decatur County, since the latter part of the last century.

*Crenodonta neisleri* was amazingly abundant in Dead Lake, on the lower Chipola River. It appeared to be the most dominant species at the station where we collected. Ten to fifteen specimens occurred in every square meter, for a length of 200 meters, along the lake shore that we surveyed. Like most "rare" species they can be locally abundant. Elsewhere we found this species to be rare.

**Range.**—This species is limited to the Apalachicola River system.

**Specimens examined.**—

#### APALACHICOLA RIVER SYSTEM

**FLINT RIVER DRAINAGE.**—*Georgia*: Flint River, Macon Co. Flint River, Recovery, Decatur Co.

**APALACHICOLA RIVER DRAINAGE.**—*Florida*: Apalachicola River, Chattahoochee, Gadsden Co.

**CHIPOLA RIVER DRAINAGE.**—*Florida*: Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; both Calhoun Co.

#### Genus *Pleurobema* Rafinesque

*Pleurobema* Rafinesque (1820, Annales Générales des Sciences Physiques (Bruxelles) 5: 313).

Type species, *Pleurobema cuneata* Rafinesque (= *U. clava* Lamarck). Subsequent designation, Simpson, 1900—so far as we can trace.

Shell solid, triangular, rhomboid or subelliptical in outline, and usually with a prominent umbonal region. Umbos usually well anterior to the center, incurved, and pointed forward. Umbo sculpture consists of a few irregular, and often broken ridges, concentrically arranged, and occasionally in a semiradial pattern. Posterior ridge usually poorly defined, usually low and rounded. Periostracum light brown to nearly black, shiny to dull, and occasionally rayed or with broken rays. Hinge plate strong, usually narrow, and generally arcuate.

Marsupium occupies the entire outer gills.

*Pleurobema strodeanum* B. H. Wright

Plate 8 Figure 4

*Unio strodeanus* B. H. Wright (1898, *Nautilus*, 12: 5), Escambia River, West Florida.

*Pleurobema strodeana* B. H. Wright, Simpson (1900a: 81, pl. 1, fig. 3). Simpson (1914: 787).

*Pleurobema patsaligensis* Simpson (1900a: 82, pl. 2, fig. 1), Little Patsaliga Creek, [Crenshaw Co.], southeastern Alabama. Simpson (1914: 788).

DESCRIPTION.—Shell small in size, reaching about 58 mm. (about 2¼ inches) in length, rather thin, subelliptical in outline, smooth, and not inflated. Color dark olivaceous brown to blackish brown and occasionally weakly rayed. Posterior slope faintly concave, with the posterior ridge generally poorly defined. Shell tapers to a blunt point posteriorly. Umbos anterior to the center, broad, but not high or full. Ligament short and narrow. Periostracum shiny to somewhat satiny. Sculpture limited to one or more threadlike ridges on the posterior slope, paralleling the posterior ridge.

Nacre bluish white and highly iridescent posteriorly. Both the anterior and posterior muscle scars clearly outlined. Hinge plate long and narrow. Right valve with one large and irregular pseudo-cardinal tooth. Left valve with two subequal and irregular pseudo-cardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
58	37.5	22.5	Sandy Creek, Evergreen, Conecuh Co., Alabama
57	33	20.5	Panther Creek, near Pinckard, Dale Co., Alabama
44	29	17.5	Patsaliga Creek, Crenshaw Co., Alabama

**TYPES.**—The holotype of *Pleurobema strodeanum* B. H. Wright from the Escambia River, Florida; and the holotype of *Pleurobema patsaligensis* Simpson from Little Patsaliga Creek, Alabama; are in the United States National Museum. In the Museum of Comparative Zoology there are paratypes of *P. patsaligensis* (20179, 210276) and *P. strodeanum* (210277).

**REMARKS.**—This species is somewhat spotty in its occurrence. It may be locally abundant, while in other apparently similar areas it is rare. It is found in small streams as well as large rivers. See also remarks under *P. pyriforme* Lea.

**RANGE.**—This species is confined to the Choctawhatchee and Escambia Rivers of western Florida and southern Alabama.

**SPECIMENS EXAMINED.**—

#### CHOCTAWHATCHEE RIVER SYSTEM

**CHOCTAWHATCHEE RIVER DRAINAGE.**—*Alabama*: East Fork, Choctawhatchee River, 8 mi. W Abbeville, Henry Co. Sikes Creek, Barbour Co. Little Choctawhatchee River, near Dothan, Houston Co. Choctawhatchee River, near Newton; Little Choctawhatchee River, 5 mi. S Pinckard; Little Choctawhatchee River, near Wicksburg; Panther Creek, near Pinckard; *all* Dale Co. Choctawhatchee River, 2 mi. E Geneva, Geneva Co. *Florida*: Hurricane Creek, 5 mi. E Miller Cross Roads; Choctawhatchee River, 8 mi. W Miller Cross Roads; *both* Holmes Co. Choctawhatchee River, 1 mi. W Caryville, Washington Co.

**PEA RIVER DRAINAGE.**—*Alabama*: Pea River, Flemings Mill, Coffee Co. Pea River, ½ mi. SW Geneva, Geneva Co.

#### YELLOW RIVER SYSTEM

**YELLOW RIVER DRAINAGE.**—*Alabama*: Yellow River, Harmony, Covington Co.

#### ESCAMBIA RIVER SYSTEM

**CONECUH RIVER DRAINAGE.**—*Alabama*: Little Patsaliga Creek, Crenshaw Co. Sandy Creek, Evergreen; Murder Creek, near Evergreen; *both* Conecuh Co.

**ESCAMBIA RIVER DRAINAGE.**—*Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

### *Pleurobema pyriforme* Lea

#### Plate 8 Figure 6

*Unio striatus* Lea (1840, Proc. Amer. Philos. Soc., 1: 287), Chattahoochee River, Columbus, Georgia. Lea, 1842 (3: 41, pl. 12, fig. 16). *Non U. striatus* Goldfuss, 1837.

*Unio pyriforme* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 31), near Columbus, Georgia. Lea, 1858 (6: 69, pl. 12, fig. 50).

*Unio modicus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 171), Chattahoochee River, near Columbus, Georgia. Lea, 1860 (7: 22, pl. 24, fig. 86).

*Unio bulbosus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 172), Flint River near Macon, Georgia [this is very probably the Flint River, Macon Co., Georgia].



The city of Macon is on the Ocmulgee River, a major tributary of the Altamaha River]. Lea, 1859 (7: 9, pl. 21, fig. 75).

*Unio amabilis* Lea (1865, Proc. Acad. Nat. Sci., Phila., 9: 89), Butler, Taylor Co., Georgia. Lea, 1869 (12: 17, pl. 31, fig. 72).

*Unio reclusum* B. H. Wright (1898, Nautilus, 11: 111) Ocklocknee [Ochlockonee] River, Leon Co., Florida.

*Pleurobema reclusa* B. H. Wright, Simpson (1900a: 82, pl. 1, fig. 2). Simpson (1914: 783).

*Unio harperi* B. H. Wright (1899, Nautilus, 13: 6), Altamaha, Suwannee, and Flint Rivers.

*Pleurobema harperi* B. H. Wright. Simpson (1900a: 81, pl. 1, fig. 10). Simpson (1914: 782).

*Pleurobema simpsoni* Vanatta (1915, Proc. Acad. Nat. Sci., Phila., 67: 559); [new name for *U. striatus* Lea, 1840; *non* Rafinesque, 1820; *non* Goldfuss, 1837].

DESCRIPTION.—Shell small, reaching about 56 mm. (about 2¼ inches) in length, moderately thick, subovate in outline, smooth, and inflated. Color variable, ranging from a yellowish brown to dark brown and sometimes almost black. Occasional specimens, particularly young, are faintly rayed. Posterior slope slightly concave with the posterior ridge poorly defined. Shell tapers to a blunt point posteriorly. Umbos well anterior to the center, broad though not high, but rather full. Ligament short and fairly wide. Periostracum smooth and shiny over the entire shell, with occasional specimens dull or satiny on the posterior slope. Sculpture consists of fine radial ridges at the umbonal region. This character is seldom seen as the umbonal area is often badly corroded. Some specimens have one or more fine thread-like ridges on the posterior slope, which run parallel to the posterior ridge.

Nacre whitish to a dull salmon and highly iridescent at the posterior end. Both anterior and posterior muscle scars clearly outlined. Hinge plate narrow, long, and arched in the central region. Right valve with one large, irregular pseudocardinal tooth. Left valve with two subequal pseudocardinal teeth.

LENGTH mm.	HEIGHT mm.	BREADTH mm.	
56	31.5	24	Ochlockonee River, 7 mi. S Cairo, Grady Co., Georgia
47.5	27	17.5	Mill Creek, 8 mi. S Oakfield, Worth Co., Georgia
42	25.5	17	Santa Fe River, Worthington Springs, Union Co., Florida

TYPES.—The holotypes of *Pleurobema pyriforme* Lea and *striatum*

Lea are in the United States National Museum. The type locality is the Chattahoochee River, Columbus, Georgia. The types of the synonyms of Lea and Wright enumerated above are also in the United States National Museum. The type localities are given in the synonymy. The Museum of Comparative Zoology has paratypes of *Pleurobema reclusum* Wright and *P. harperi* Wright.

REMARKS.—This is a variable species, particularly so far as the color of the periostracum is concerned—a variable character which appears to have no geographic pattern. This species is relatively rare and is perhaps only locally abundant.

Berlin H. Wright was in error in recording this species [under *harperi*] from the Altamaha River, Liberty County, Georgia. No member of this genus is known to occur in the Altamaha river system, and probably none occurs in the entire Atlantic drainage area.

This species differs from *P. strodeanum* Wright of the Escambia and Choctawhatchee Rivers by having a heavier shell, being more sharply pointed posteriorly, and by being far more inflated. *Pleurobema strodeanum* has a more elliptical to subcircular outline than *pyriforme*, which is subovate. In color *strodeanum* is a more uniform dark brownish black, while *pyriforme* ranges from a light golden brown to dark brownish black.

RANGE.—From the Suwannee River the species ranges west to the Apalachicola river system.

SPECIMENS EXAMINED.—

#### SUWANNEE RIVER SYSTEM

SUWANNEE RIVER DRAINAGE.—*Florida*: Santa Fe River, Worthington Springs, Union Co.

#### OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—*Georgia*: Ochlockonee River, between Reno and Beachton; Ochlockonee River, 7 mi. S Cairo; *both* Grady Co. *Florida*: Ochlockonee River, 11 mi. NW Tallahassee, Leon Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Patsiliga Creek and Little Patsiliga Creek; *both* Taylor Co. Stream 6 mi. N Vienna, Dooly Co. Gum Creek, 2 mi. N Cordele; Cedar Creek, Cordele; Cedar Creek, 6 mi. SW Cordele; Swift Creek, 12 mi. SW Cordele; *all* Crisp Co. Lee Creek, Chokey, Lee Co. Jones Creek, 2 mi. S Oakfield; Abrams Creek, 5 mi. S Oakfield; Mill Creek, 8 mi. S Oakfield; *all* Worth Co. Flint River, Albany, Dougherty Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Columbus, Muscogee Co. Sawatchee Creek, 4 mi. NW Donalsonville, Seminole Co.

CHIPOLA RIVER DRAINAGE.—*Alabama*: Cowarts Creek, near Cowarts, Houston Co. *Florida*: Big Creek, 8 mi. W Malone, Jackson Co. Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *both* Calhoun Co.

Genus *Elliptio* Rafinesque

*Elliptio* Rafinesque (1819, Journal de Physique et de Chimie d'Histoire Naturelle (Paris), 88: 426) [*nomen nudum*]. Rafinesque (1820, Annales Générales des Sciences Physiques (Bruxelles), 5: 291). Simpson (1900b: 700).

Type species, *Unio nigra* Rafinesque (= *Unio crassidens* Lamarck), subsequent designation, Simpson, 1900.

Shell inequilateral, ovate to elongate in outline, rounded anteriorly, bluntly pointed or biangulate posteriorly, and generally arcuate when fully adult. Umbos usually broad, but not high. Shell moderately compressed, seldom inflated, and with few exceptions the shell is not heavy. Sculpture moderate, and when present it is generally restricted to the posterior slope. A few exceptions occur, such as in *Elliptio sloatianus* Lea and *E. spinosus* Lea, which have strong sculpture on the disc. Periostracum generally dark in color, and usually rough along the ventral margin and on the posterior slope; it may be either rough or smooth on the disc. Hinge plate generally long and narrow, with two pseudocardinal teeth and two lateral teeth in the left valve; one pseudocardinal tooth and one lateral tooth in the right valve. Marsupia occupy the entire length of the outer gills. They form thick smooth pads when filled with glochidia.

This genus is probably more confused than any other in the Unionidae of North America. The limits of distribution of the many species are still unknown, and it is exceedingly difficult to assign taxonomic limits to any one species. Most of the difficulty, besides the lack of marked differential characters to separate the various species, lies in the fact that they are able to live in environments which are impossible for many other genera. They may exist under the most adverse conditions, withstanding pollution, silting, and other seemingly unfavorable conditions. The result is that local populations may show marked differences in size, color, thickness, and shape of shell, as a direct result of the environment. This, unfortunately, has led to a large number of names which have been based upon these ecological forms.

*Elliptio strigosus* Lea

## Plate 8 Figure 2

*Unio strigosus* Lea (1840, Proc. Amer. Philos. Soc., 1: 287), Chattahoochee River, Columbus, Georgia. Lea, 1842 (3: 36, pl. 9, fig. 9 [a malformed specimen]).

*Unio tortuosus* Lea (1840, Proc. Amer. Philos. Soc., 1: 287), Chattahoochee River, Columbus, Georgia. Lea, 1842 (3: 42, pl. 12, fig. 17).

- Unio accultus* Lea (1843, Descriptions of twelve new species of Uniones, [no pagination]), Black Creek and Lake Monroe, Florida. Lea 1846, Trans. Amer. Philos. Soc., 9: 279, pl. 41, fig. 7). Lea, 1848 (4: 37, pl. 41, fig. 7).
- Unio fraternus* Lea (1852, [in part] Trans. Amer. Philos. Soc., 10: 263, pl. 16, fig. 15), Chattahoochee River records only.
- Unio nigellus* Lea (1852, Proc. Amer. Philos. Soc., 5: 251), Chattahoochee River, Columbus, Georgia. Lea, 1852 (5: 39, pl. 24, fig. 42).
- Unio pullatis* Lea (1856, Proc. Acad. Nat. Sci., Phila., p. 262), creeks near Columbus, Georgia.
- Unio pullatus* Lea, 1858 (6: 57, pl. 8, fig. 39), creeks near Columbus, Georgia.
- Unio extensus* Lea (1857, Proc. Acad. Nat. Sci., Phila., p. 31), Dry Creek, Columbus, Georgia. Lea, 1858 (6: 67, pl. 12, fig. 49).
- Unio sublatus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 169), Uchee Bar, below Columbus, Georgia. Lea, 1858 (6: 82, pl. 16, fig. 62).
- Unio tetricus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 170), Flint River, near Albany, Georgia. Lea, 1859 (7: 13, pl. 22, fig. 78).
- Unio fumatus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 171), Chattahoochee River, near Columbus, Georgia. Lea, 1858 (6: 88, pl. 18, fig. 68).
- Unio purpurellus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 171), Flint River, near Albany, Georgia. Lea, 1859 (7: 16, pl. 23, fig. 81).
- Unio aquilus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 172), Flint River, near Macon [Co.], Georgia; and Chattahoochee River at Roswell, Georgia. Lea, 1858 (6: 92, pl. 20, fig. 2).
- Unio postelli* Lea (1858, Proc. Acad. Nat. Sci., Phila., p. 165), Randall's Creek, near Columbus, Georgia; and Carters Creek, Baldwin Co., Georgia. Lea, 1859 (7: 32, pl. 26, fig. 94); [in part—Columbus record only. The specimen from Carters Creek, Baldwin Co., Georgia—Oconee drainage—was selected by Simpson to be the lectotype (U.S. Nat. Mus. 85470), and this is not *strigosus*].
- Unio viridans* Lea (1859, Proc. Acad. Nat. Sci., Phila., p. 170), near Columbus, Georgia. Lea, 1862 (8: 19, pl. 54, fig. 162).
- Unio viridiradiatus* Lea (1859, Proc. Acad. Nat. Sci., Phila., p. 154), Big Uchee River, [Russell Co.], Alabama. Lea, 1862 (8: 18, pl. 53, fig. 161).
- Unio merceri* Lea (1862, Proc. Acad. Nat. Sci., Phila., 14: 169), Lee Co., Georgia. Lea, 1863 (9: 31, pl. 31, fig. 278).
- Unio hallenbeckii* Lea (1859, Proc. Acad. Nat. Sci., Phila., p. 170), Flat Rock Creek and Four Mile Creek, near Columbus, Georgia. Lea, 1859 (8: 10, pl. 51, fig. 154).
- Unio salebrosus* Lea (1859, Proc. Acad. Nat. Sci., Phila., p. 170), Flat Rock Creek, near Columbus, Georgia. Lea, 1859 (8: 14, pl. 52, fig. 157).
- Unio verutus* Lea (1859, Proc. Acad. Nat. Sci., Phila., p. 171), Flat Rock Creek, near Columbus, Georgia. Lea, 1859 (8: 17, pl. 53, fig. 160).
- Unio basalis* Lea (1872, Proc. Acad. Nat. Sci., Phila., p. 161), Carter's Creek, near Columbus, Georgia. Lea, 1874 (13: 52, pl. 16, fig. 46).
- Unio doolyensis* Lea (1873, Proc. Acad. Nat. Sci., Phila., p. 424), Flint River, Dooly Co., Georgia. Lea, 1874 (13: 68, pl. 22, fig. 60).
- Unio invanutus* Lea (1873, Proc. Acad. Nat. Sci., Phila., p. 424), Columbus, Georgia. Lea, 1874 (13: 70, pl. 22, fig. 62).
- Unio gesneri* Lea (1873, Proc. Acad. Nat. Sci., Phila., p. 424), Uchee River near Columbus, Georgia [Russell Co., Alabama]. Lea, 1874 (13: 69, pl. 22, fig. 61).

DESCRIPTION.—Shell small to medium in size, reaching about 107

mm. ( $4\frac{1}{4}$  inches) in length. Moderately thick in shell structure, smooth, subelliptical in outline, and not inflated. Color a dull to shiny black, sometimes dark blackish brown or brown, or sometimes greenish. Occasionally specimens occur that are rayed. Posterior slope flat to faintly concave. Posterior ridge not well defined. Shell tapers to a blunt point posteriorly. Umbos well anterior to the center, broad, but not high or full. Ligament moderately long and narrow. Periostracum usually smooth and shiny on the disc, but somewhat scaly and dull on the ventral margin and over the posterior slope.

Nacre variable, generally purplish, but ranging through salmon bronze to pink and whitish. Nacre generally iridescent on the posterior third. Both anterior and posterior muscle scars clearly outlined; hinge plate long and narrow. Right valve with one fairly large, pointed, pseudocardinal tooth. Left valve with two, one large and one small, pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
100	48	24.5	Mosquito Creek, Chattahoochee, Florida
107	50	30.5	Ditto
79	39	22.5	Flint River, Recovery, Decatur Co., Georgia
69	34	19	Sandy Creek, Evergreen, Conecuh Co., Alabama

**TYPES.**—The lectotype of *Elliptio strigosus* Lea is in the United States National Museum (85890) and is from the Chattahoochee River, Columbus, Georgia.

We have seen most, if not all, of the specimens regarded as types of the various synonyms given above. These are all in the collection of the United States National Museum. The type localities of the various forms are given in the synonymy.

**REMARKS.**—This is the most abundant freshwater mussel in this area. It may not be the most abundant species at any one station, but it occurs rather frequently, and sometimes may be the only species occurring at any single station. This is particularly true of stations made on many of the small creeks. It is exceedingly variable in size, shape, coloration, and in other characters. Much of this may be due to a wide adaptive ability, the varied ecological conditions under which this species may exist being expressed in the morphology of the shell structure. Under favorable conditions this species produces large individuals having rather heavy shells, clear white to pink nacre, and smooth and shiny periostracum. In unfavorable ecological places, the shells are small, somewhat irregular in shape, with dull

periostracum; and nacre clouded with "oil spots." These spots are circular or subcircular layers of olivaceous organic material secreted over areas on the inner surface of the valves opposite corroded areas on the outer surface of the shell.

The large synonymy given above attests the differences between populations of this species. These differences represent only populations of ecological forms or simple selected examples. However, a large geographical series indicates the impossibility of segregation of any of these forms under separate names, even in the sense of a subspecies.

We have held this species under the name *strigosus* Lea, the oldest of the several names employed for examples named from type localities in this region. It is possible that *Elliptio arctatus* Conrad, 1834, described from specimens collected in the Black Warrior River of Alabama (Coosa-Alabama drainage) may be the same species. Our present collections are not rich enough from the Coosa-Alabama river system to be sure, but it is a point to be considered in future studies of this species. Consequently, under range we have been indefinite, at least regarding *strigosus* distribution towards the west.

In a series of this species that we collected at Holmes Creek near Graceville, Florida, many specimens were twisted either to the left or right. We could not determine what factor or factors were responsible for this rather rare condition.

RANGE.—Probably from the Coosa-Alabama system east and south into central Florida.

#### SPECIMENS EXAMINED.—

#### WACCASASSA RIVER SYSTEM

Florida: Otter Creek, Otter Creek (town); Waccasassa River, 4 mi. NE Otter Creek (town); both Levy Co.

#### SUWANNEE RIVER SYSTEM

SANTA FE RIVER DRAINAGE.—Florida: Santa Fe River, Worthington Springs, Union Co. Santa Fe River, N of Bland; Santa Fe River, Poe Springs; both Alachua Co. Santa Fe River, Columbia Springs, Columbia Co.

SUWANNEE RIVER DRAINAGE.—Georgia: Long Pond, Twin Lakes, Lowndes Co. Florida: Suwannee River, Ellaville, Madison Co. Suwannee River, Oldtown, Dixie Co.

WITHLACOOCHEE RIVER DRAINAGE.—Georgia: Withlacoochee River, Olympia, Lowndes Co. Florida: Withlacoochee River, Blue Spring, Madison Co.

#### ECONFINA RIVER SYSTEMS

Florida: Econfina River, 15 mi. W Perry, Taylor Co. Moccasin Creek, Econfina, Bay Co.

#### OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—Georgia: Ochlockonee River, 7 mi. S Cairo; Ochlockonee River, between Reno and Beachton; both Grady Co. Florida: Little

River,  $3\frac{1}{2}$  mi. E Quincy, Gadsden Co. Ochlockonee River, 11 mi. NW Tallahassee; Ochlockonee River, 8 mi. W Tallahassee; Lake Talquin, Ochlockonee River; all Leon Co. Ochlockonee River,  $7\frac{1}{2}$  mi. E Hosford, Liberty Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Line Creek, Coweta Co. Patsiliga Creek, Taylor Co. North Fork, Pennhatchee Creek, 4 mi. NW Vienna, Dooly Co. Gum Creek, 2 mi. N Cordele; Swift Creek, 12 mi. SW Cordele; Flint River, 10 mi. W Cordele; all Crisp Co. Lee's Creek, 5 mi. S DeSoto; Lee Co. East Fork, Chickasawhatchee Creek, 5 mi. SE Dawson, Terrell Co. Jones Creek, 2 mi. S Oakfield; Abrams Creek, 5 mi. S Oakfield; Mill Creek, 8 mi. S Oakfield; all Worth Co. Flint River, Albany; Flint River, River Bend, 8 mi. S Albany; both Dougherty Co. Coolecwahee Creek, Newton; Ichawaynochaway Creek, 10 mi. SW Newton; both Baker Co. Spring Creek, at Colquitt, Miller Co. Spring Creek, Reynoldsville, Seminole Co. Four Mile Creek, 3 mi. SE Bainbridge; Flint River, Bainbridge; Flint River, Recovery; all Decatur Co.

CHATTAHOCHEE RIVER DRAINAGE.—*Georgia*: Marietta, Cobb Co. Mulberry Creek, Mitchell Bridge, 3 mi. SE Mountain Hill, Harris Co. Chattahoochee River, Georgetown, Quitman Co. Sawhatchee Creek, 4 mi. NW Donalsonville, Seminole Co. *Alabama*: Black Mud Creek; Uchee Creek, Fort Mitchell; both Russell Co. Cowikee Creek, near Hawkinsville, Barbour Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Mosquito Creek, Chattahoochee, Gadsden Co. Stream, 5 mi. N Blountstown, Calhoun Co.

CHIPOLA RIVER DRAINAGE.—*Alabama*: Cowart's Creek, near Cowart; Big Creek, near Madrid; both Houston Co. *Florida*: Big Creek, 8 mi. W Malone; stream  $1\frac{1}{2}$  mi. N Campbellton; Chipola River, 1 mi. N Marianna; Spring Creek, 3 mi. E Marianna; Chipola River, 3 mi. S Marianna; Chipola River, 12 mi. S Marianna; Chipola River, Marianna Falls; Chipola River, Merritt's Bridge, Marianna; all Jackson Co. Chipola River near Altha; Chipola River,  $2\frac{1}{2}$  mi. SW Chason; Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Chipola River, near Pole Bluff Landing; Dead Lake, Chipola Park; all Calhoun Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

HOLMES CREEK DRAINAGE.—*Florida*: Holmes Creek, 1 mi. W Graceville; Holmes Creek, 3 mi. E Bonifay; both Holmes Co. Holmes Creek, Millers Ferry, Washington Co.

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: East Fork, Choctawhatchee River, 8 mi. W Abbeville; Van's Mill Creek, near Abbeville; both Henry Co. Choctawhatchee River, Newton; Bear Creek, 8 mi. S Pinckard; both Dale Co.

PEA RIVER DRAINAGE.—*Alabama*: Pea River, W of Elamville, Barbour Co. Pea River, 8 mi. NW Arifton, Dale Co.

#### YELLOW RIVER SYSTEM

*Florida*: Yellow River, Milligan, Okaloosa Co.

#### ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Conecuh River near Young Blood, Pike Co. Patsaliga Creek, 13 mi. N Searight, Crenshaw Co. Sandy Creek, Evergreen; Murder Creek near Evergreen; Hunters Creek, 8 mi. SW Evergreen; Burnt Corn Creek, 2 mi. W Belleville; all Conecuh Co. Burnt Corn Creek, Escambia Co.

ESCAMBIA RIVER DRAINAGE.—*Alabama*: Escambia River, Flomaton, Escambia Co. *Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

*Elliptio mcmichaeli*, new species

## Platé 7 Figures 1-2

*Elliptio fraternus* of authors, in part. *Non* Lea, 1852.

DESCRIPTION.—Shell medium to fairly large in size, reaching 100 mm. (about 4 inches) in length, subelliptical in outline, rather thin in structure, and not inflated. Color a dark brownish black, with occasional young specimens being faintly rayed. Posterior slope slightly concave with the posterior ridge fairly well defined. Shell tapers to a blunt point posteriorly. Umbos well anterior of the center, broad, but not high. Ligament rather long and narrow. Periostracum smooth and somewhat shiny on the disc, slightly roughened along the anterior margin, and on the posterior slope. Sculpture variable, but when present consists of a series of rather small arcuate ridges which are confined to the region of the posterior slope. This sculpture can be fairly strong on certain individuals and absent on others.

Nacre white to pale pink or salmon, and highly iridescent posteriorly. Both anterior and posterior muscle scars well defined. Hinge plate long and narrow. Right valve with one pseudocardinal tooth. Left valve with one small and one large pseudocardinal tooth.

LENGTH mm.	HEIGHT mm.	BREADTH mm.	
101	49	32	Choctawhatchee River, 8 mi. W Abbeville, Henry Co., Alabama
92	50	25.5	Pea River, ½ mi. SW Geneva, Geneva Co., Alabama
88	51	26.5	Ditto
91	50	27	Holotype.

TYPES.—The holotype is in the Museum of Comparative Zoology (191922) and is from the Choctawhatchee River, 8 miles west of Miller Cross Roads, Holmes County, Florida, on Florida State Route 2. Paratypes are in the Museum of Comparative Zoology; University of Florida Collections; United States National Museum; Academy of Natural Sciences, Philadelphia; Museum of Zoology, University of Michigan; and University Museum, University of Alabama.

REMARKS.—This species has been referred to *E. fraternus* Lea, we think, erroneously. The type locality for *fraternus* is Abbeville, South Carolina, in the Savannah river system. From all records available to us, there appears to be nothing equivalent to *fraternus* in either the Apalachicola or the Altamaha river systems. These are two vast



rivers systems between the Choctawhatchee and the Savannah river systems.

*Elliptio mcMichaeli* is a variable species within fairly narrow limits. It is related to the *Elliptio fraternus* complex by having similar sculpture and shape. However, it differs by being larger and by having occasional specimens show salmon coloration. It is also related to *E. incrassatus* Lea, having a similar, though less pronounced, sculpture, and in having occasional specimens show the salmon coloration. It differs, however, in being much lighter in weight, in being proportionately more elongate and much less inflated, than *incrassatus*. In any large sample from the Choctawhatchee system, some extreme individuals are found along with the typical individuals. This may, at least in part, answer the question as to why typical *incrassatus* does not occur in the Choctawhatchee River, though it occurs on either side in both the Escambia and the Apalachicola river systems. It is a guess on our part that perhaps during some period in the history of the Choctawhatchee river system *incrassatus* was present and hybridized with some other *Elliptio*, perhaps of the *fraternus* type. This hybridization is now reflected by the specimens representing the extremes in the variation of this species.

RANGE.—This species is confined to the Choctawhatchee river system.

#### SPECIMENS EXAMINED.—

#### CHOCTAWHATCHEE RIVER SYSTEM

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: East Fork, Choctawhatchee River, 8 mi. W Abbeville, Henry Co. Choctawhatchee River, near Newton, Dale Co. Choctawhatchee River, 2 mi. E Geneva, Geneva Co. *Florida*: Choctawhatchee River, 8 mi. W Miller Cross Roads, Holmes Co. Choctawhatchee River, 1 mi. W Caryville, Washington Co. Choctawhatchee River at Oakey Bend; South Oakey Bend; Inlet Lake to Bushy Point; near mouth of Sandy Creek; 3 mi. E Red Bay; at Cowford Ferry; 5 mi. SE Bruce; all Walton Co.

PEA RIVER DRAINAGE.—*Alabama*: Pea River near Elamville, Barbour Co. White-water Creek, 7 mi. N Elba; Pea River, Flemmings Mill; *both* Coffee Co. Flat Creek, 8 mi. SW Samson; Pea River, ½ mi. SW Geneva; *both* Geneva Co.

#### *Elliptio crassidens incrassatus* Lea

#### Plate 8 Figure 1

*Unio incrassatus* Lea (1840, Proc. Amer. Philos. Soc., 1: 286), Chattahoochee River, near Columbus, Georgia. Lea (1840, Trans. Amer. Philos. Soc., 8: 271, pl. 16, fig. 34). Lea, 1842 (3: 55, pl. 16, fig. 34).

*Unio danielsii* B. H. Wright (1899, Nautilus, 13: 31), Spring Creek, Decatur Co., Georgia.

DESCRIPTION.—Shell medium to fairly large in size, reaching 100 mm. (about 4 inches) in length, subelliptical to subcircular in outline, solid in structure, heavy, and somewhat inflated. Color dark greenish brown to almost black with occasional specimens, particularly young, showing a few greenish rays. Posterior slope slightly concave, the posterior ridge usually well defined. Shell tapers to a blunt point posteriorly. Umbos anterior to the center, broad, and moderately high. Ligament rather long and thick. Periostracum smooth and shiny on the disc though somewhat satiny along the anterior margin and roughened on the posterior slope with numerous, irregular, somewhat curved ridges. The sculpture on the posterior slope is variable, some specimens lack this feature almost entirely.

Nacre salmon pink to somewhat purplish in color and highly iridescent posteriorly. Both anterior and posterior muscle scars are clearly outlined. Hinge plate long. Right valve with one large and one small pseudocardinal tooth. Left valve with two subequal pseudocardinal teeth.

LENGTH mm.	HEIGHT mm.	BREADTH mm.	
100	62	40	Escambia River, 3 mi. SE Century, Escambia Co., Florida
79	54	35	Dead Lake, Chipola River, Chipola Park, Calhoun Co., Florida
84	49	30.5	Flint River, 8 mi. S Albany, Dougherty Co., Georgia

TYPES.—The holotypes of *E. incrassatus* Lea and *E. danielsii* B. H. Wright are in the United States National Museum. The type locality for *E. incrassatus* Lea is the Chattahoochee River, Columbus, Georgia; and for *E. danielsii* B. H. Wright it is Spring Creek, Decatur Co., Georgia.

REMARKS.—The measurements given above are for specimens collected in the area covered by this report, those coming from the Coosa river system may be 10 to 20 mm. longer.

This is a variable species; there is a considerable range in the length-height ratio, and, in addition, the female specimens are proportionately shorter and broader than the male. The shells can become greatly thickened—one valve measures 10 mm. in thickness just below the umbo. This particular specimen is from the Escambia River.

This species seems to be entirely absent in the Choctawhatchee River, though it is common in both the Escambia and the Apalachicola systems. It is also widely distributed in the Alabama-Coosa system.

We agree with Simpson (1914: 608) that *incrassatus* is only a subspecies of the widely distributed *E. crassidens* Lamarck.

Typical *crassidens* has a much larger, heavier shell, lacks the sculpture on the posterior slope, and has the posterior ridge much less pronounced than in *incrassatus*. Though the two extremes are distinct, there are all degrees of intergradation between the two forms.

RANGE.—Apalachicola river system west to the Amite River, Louisiana, but absent in the Choctawhatchee River.

SPECIMENS EXAMINED.—

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Ichawynochaway Creek, 10 mi. SW Newton, Baker Co. Flint River, 10 mi. W Cordele, Crisp Co. Flint River, Albany; Flint River, 8 mi. S Albany; *both* Dougherty Co. Flint River, Bainbridge; Flint River, Recovery; *both* Decatur Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Chattahoochee River, Columbus; Chattahoochee River, Fort Benning; *both* Muscogee Co. *Alabama*: Uchee Creek, Fort Mitchell, Russell Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Big Creek, 8 mi. W Malone; Chipola River, 1 mi. N Marianna; *both* Jackson Co. Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

#### ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Conecuh River near Brantley; Patsaliga River, 13 mi. N Searight; Patsaliga Creek, near Searight; *all* Crenshaw Co. Conecuh River, Bozeman's Landing, Covington Co. Sepulga River, near Herbert, Conecuh Co.

ESCAMBIA RIVER DRAINAGE.—*Alabama*: Escambia River near Flomaton, Escambia Co. *Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

### *Elliptio sloatianus* Lea

#### Plate 9 Figure 2

*Unio sloatianus* Lea (1840, Proc. Amer. Philos. Soc., 1: 287), Chattahoochee River, Georgia. Lea, 1842 (3: 55, pl. 16, fig. 33). Simpson (1914: 604).

*Unio atro-marginatus* Lea (1840, Proc. Amer. Philos. Soc., 1: 288), Chattahoochee River, Columbus, Georgia. Lea, 1842 (3: 45, pl. 13, fig. 21).

*Unio plectrophorus* Conrad (February 1849, Proc. Amer. Philos. Soc., 4: 154), Flint River, Georgia.

*Unio aratus* Conrad (October 1849, Ann. and Mag. Nat. Hist. (2), 4: 302), Flint River, Georgia.

*Unio plectrophorus* Conrad (1850, Jour. Amer. Philos. Soc., 1: 277, pl. 38, fig. 7) [correction for *plectrophorus* Conrad].

DESCRIPTION.—Shell large, reaching 149 mm. (about 6 inches) in length, subrhomboidal in outline, solid in structure, and strongly

sculptured. Color dark blackish brown. Posterior slope slightly concave with the posterior ridge moderately well defined. Shell tapers to a blunt point posteriorly and is rounded anteriorly. Umbos anterior to the center, fairly broad, but not high or full. Ligament long and thick. Periostracum shiny in young specimens, shiny to dull in older specimens. Sculpture variable; on the posterior slope it consists of a series of irregular ridges that are slightly arcuate; on the disc the ridges are usually small, subradial in arrangement, and become weak or absent near the ventral margin particularly on older specimens. Occasionally young specimens may be devoid of sculpture on the disc.

Nacre a deep purple over most of the inner surface, a pale whitish pink in the central disc area, and highly iridescent posteriorly. Anterior and posterior muscle scars well defined. Right valve with one large and one small corrugated pseudocardinal tooth. Left valve with two subequal pseudocardinal teeth.

LENGTH mm.	HEIGHT mm.	BREADTH mm.	
149	94	57	Dead Lake, Chipola River, Calhoun Co., Florida
140	90	50.5	Flint River, Baker Co., Georgia
137	75	39.5	Flint River, Bainbridge, Decatur Co., Georgia

**TYPES.**—The holotype of *E. sloatianus* Lea is in the United States National Museum. The type locality is the Chattahoochee River, Georgia. We here limit the type locality to Columbus, Georgia. The holotype of *atromarginatus* Lea is also in the United States National Museum. Cotypes of *E. plectrophorus* Conrad from the Flint River, Georgia, are in the Museum of Comparative Zoology (28339 and 178840).

**REMARKS.**—Conrad published the same paper in two different journals as indicated above under *plectrophorus* and *aratus*. The only change was to substitute the name *aratus* for *plectrophorus*, the descriptions being almost identical.

This is a relatively rare species and is apparently confined to larger rivers and streams. It is the most highly sculptured species in the genus *Elliptio*, and in this regard it approximates somewhat *Crenodonta boykiniana* Lea. It differs from that species by being proportionately longer, in having a purple rather than bluish-white nacre, and in having subradial sculpture on the disc. In addition *C. boykiniana* has a rather pronounced wing.

Frierson (1927: 33) created the subgenus *Elliptoideus* for this species and stated that it differed from typical *Elliptio* by having the marsupia developed in all four gills—only the outer gills are utilized as marsupia in typical *Elliptio*.

RANGE.—The Ochlockonee and Apalachicola river systems.

SPECIMENS EXAMINED.—

#### OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—*Georgia*: Ochlockonee River, 7 mi. S Cairo; Ochlockonee River between Reno and Beachton; *both* Grady Co. *Florida*: Ochlockonee River, 11 mi. NW Tallahassee; Ochlockonee River, 8 mi. W Tallahassee; *both* Leon Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Flint River, Baker Co. Flint River, Bainbridge; Flint River, Recovery; *both* Decatur Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Chattahoochee River, Columbus, Muscogee Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Dead Lake, Chipola River, Chipola Park, Calhoun Co.

### *Elliptio chipolaensis* Walker

#### Plate 8 Figure 3

*Unio chipolaensis* Walker (1905, Nautilus, 18: 135, pl. 9, figs. 6-7), Chipola River, Florida.

DESCRIPTION.—Shell small in size, reaching 78 mm. (about 3 inches) in length, subelliptical in outline, moderately strong in structure, and somewhat inflated. Color a dark chestnut brown to blackish brown, the darker color appearing around the umbos. Occasionally there are one to three dark concentric bands. Posterior slope slightly concave with the posterior ridge poorly defined. Shell tapers to a rounded point posteriorly; is rounded anteriorly. Umbos anterior to the center, fairly broad, but not high or full. Ligament moderately short and narrow. Periostracum fairly shiny on the disc, but usually dull and satiny on the posterior slope.

Nacre salmon colored, the color being most intense in the central area. Posteriorly the salmon color grades to bluish white and is iridescent. Posterior and anterior muscle scars well defined. Right valve with one corrugated pseudocardinal tooth, and left valve with two subequal corrugated pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
78	41	29	Big Creek, 8 mi. W Malone, Jackson Co., Florida
64	36	25.5	Dead Lake, Chipola River, Chipola Park, Calhoun Co., Florida
64	35	23	Chipola River, 1 mi. N Marianna, Jackson Co., Florida

TYPES.—The holotype of *U. chipolaensis* Walker is in the Museum of Zoology, University of Michigan. We here restrict the type locality to the Chipola River, 1 mile north of Marianna, Jackson County, Florida, a locality from which we have a good series.

REMARKS.—This is an endemic species in the Chipola River. It is rather rare, though it does occur throughout most of the length of the river proper and its the smaller tributaries. It appears to be a distinct form and not particularly closely related to other species of *Elliptio* in this system. It is distinguished by its chestnut brown exterior and salmon colored interior.

RANGE.—Chipola River.

SPECIMENS EXAMINED.—

#### APALACHICOLA RIVER SYSTEM

CHIPOLA RIVER DRAINAGE.—Florida: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; Chipola River, about 1 mi. N Marianna; all Jackson Co. Chipola River, 2½ mi. SE Chason; Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; all Calhoun Co.

#### Genus *Uniomereus* Conrad

*Uniomereus* Conrad (1853, Proc. Acad. Nat. Sci., Phila. 6: 268).

Type species, *Unio excultus* Conrad (= *Unio tetralasmus* Say).

We here select *Unio excultus* Conrad to be the type species for this genus. The previous use of *Unio tetralasmus* Say for the type was in error as this name was not included by Conrad among the several that he listed as belonging to this genus.

The shells are trapezoidal in outline, usually inflated, and with the umbos full, but not high. Periostracum usually satiny in appearance, somewhat rough, and dark in color. Pseudocardinal teeth small; lateral teeth delicate and curved. Only the outer gills serve as marsupia.

*Uniomergus obesus* Lea

## Plate 5 Figure 2

- Unio obesus* Lea (1831, Trans. Amer. Philos. Soc., 4: 96, pl. 13, fig. 26), York River, Virginia. Lea, 1834 (1: 106, 118, pl. 13, fig. 26), locality corrected to Georgia.
- Unio blandingianus* Lea (1834, Trans. Amer. Philos. Soc., 5: 101, pl. 15, fig. 44), St. Johns River, Florida. Lea, 1834 (1: 213, pl. 15, fig. 44).
- Unio declivis* Conrad (1836, Monography of the family Unionidae, p. 45, pl. 23, fig. 1), Creek, Green Co., Alabama.
- Unio paludicolus* Gould (1845, Proc. Boston Soc. Nat. Hist., 2: 53), Florida Everglades.
- Unio ineptus* Lea (1852, Trans. Amer. Philos. Soc., 10: 261, pl. 15, fig. 12), Abbeville District, South Carolina. Lea, 1852 (5: 17, pl. 15, fig. 12).
- Unio hebes* Lea (1852, Trans. Amer. Philos. Soc., 10: 267, pl. 18, fig. 21), Oconee River near Athens, Georgia. Lea, 1852 (5: 23, pl. 18, fig. 21).
- Unio rivularis* Conrad (1853, Proc. Acad. Nat. Sci., Phila., 6: 257), [new name for *Unio declivis* Conrad; non Say].
- Unio columbensis* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 31), creeks near Columbus, Georgia. Lea, 1858 (6: 75, pl. 14, fig. 55).
- Unio cicur* Lea (1861, Proc. Acad. Nat. Sci., Phila., 13: 39), Little Ocmulgee River, Georgia. Lea, 1862 (8: 97, pl. 13, fig. 241).
- Unio squalidus* Lea (1863, Proc. Acad. Nat. Sci., Phila., p. 192), Neuse River near Raleigh; Roanoke River near Weldon and Deep River, North Carolina. Lea, 1867 (11: 26, pl. 7, fig. 20).
- Unio bisseillianus* Lea (1867, Proc. Acad. Nat. Sci., Phila., p. 81), Bissels Pond, Charlotte, North Carolina. Lea, 1868 (12: 37, pl. 37, fig. 90).
- Unio jewettii* Lea (1867, Proc. Acad. Nat. Sci., Phila., p. 81), sink of Noonan's [Newnans] Lake, Gainesville, Florida. Lea, 1869 (12: 36, pl. 37, fig. 89).
- Unio rivicolus* Conrad (1868, Amer. Jour. Conchology, 4: 280, pl. 18, fig. 4), brook near Tampa, Florida.
- Unio pawensis* Lea (1868, Proc. Acad. Nat. Sci., Phila., p. 161), Paw Creek, Beaver Co. and Catawba Run, North Carolina. Lea, 1869 (12: 62, pl. 45, fig. 114).

DESCRIPTION.—Shell medium to large in size, reaching 114 mm. (about 4½ inches) in length, rather solid in structure, smooth, sub-elliptical to subquadrate in outline, and inflated. Color a uniform dark brownish black. Posterior slope slightly concave and generally with a fairly well-defined posterior ridge. Shell tapers to a rounded point posteriorly. Umbos well anterior to the center, broad, and full but not high. Ligament long and narrow. Periostracum slightly roughened, but with a satiny sheen over most of the shell, occasionally smooth and shiny over the umbonal area.

Nacre usually whitish, but sometimes approaching a purplish bronze; iridescent posteriorly. Anterior muscle scars clearly marked; posterior muscle scars poorly defined. Hinge plate long and narrow,

supporting strong lateral teeth. Right valve with a rather large, triangular-shaped, pseudocardinal tooth. Left valve with two subequal, but fairly large, pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
114	61	39	Ogeechee River, near Barton, Jefferson Co., Georgia
87	45	30	Miakka Lake, Sarasota Co., Florida
81	48	32.5	Columbus, Muscogee Co., Georgia

**TYPES.**—The holotype of *U. obesus* Lea, as well as all of the other species of Lea listed in the synonymy above, are in the United States National Museum. The original type locality, York River, Virginia, was subsequently changed by Lea to Georgia, as noted in the synonymy above. We here restrict the type locality to Columbus, Georgia, one of the many localities given by Lea for his several synonyms. The type of *U. paludicolus* Gould is in the New York State Museum.

**REMARKS.**—This species appears to be limited mainly to lakes and to the smaller streams. Though widely distributed it is not common at any one locality. So far as we can detect there are no real differences between specimens from central and southern Florida, and those from elsewhere in the range of the species.

In general appearance this species is fairly close to *Elliptio strigosus* Lea, but is much more inflated. The nacre is usually whitish, and never has the dark purplish bronze of *strigosus*. In addition, *U. obesus* is proportionately higher and has a slightly roughened periostracum with a high satiny sheen, while *strigosus* is smooth over the entire shell.

**RANGE.**—This species extends from the Everglades of southern Florida north to North Carolina, and west to the Escambia River.

**SPECIMENS EXAMINED.**—

**EVERGLADES DRAINAGE SYSTEM**

*Florida:* Paradise Key, Royal Palm Park, Everglades National Park, Dade Co. Canals, West Palm Beach; 10 mi. W Jupiter; Loxahatchee Creek, 6 mi. W Jupiter; all Palm Beach Co.

**PEACE RIVER SYSTEM**

*Florida:* Peace River, near Arcadia, DeSoto Co.

**MIAKKA RIVER SYSTEM**

*Florida:* Miakka River; Lake Miakka; both Sarasota Co.

**OKEECHOBEE DRAINAGE SYSTEM**

*Florida:* Lake Tohopekaliga, Kissimmee, Ocala Co. Gum Free Slough near Bassenger; Tyler Creek; both Okeechobee Co.



## ST. JOHNS RIVER SYSTEM

*Florida*: Canals between Deer Park and Melbourne; ditch near Lake Washington, 6 mi. W Eau Gallie; *both* Brevard Co. Canal from Lake Virginia to Lake Sue, Winter Park, Orange Co. Econlockhatchee River near confluence with St. Johns River, Seminole Co. Oklawaha River, Marion Co. Little Orange Creek, 3 mi. E Hawthorne, Putnam Co. Hatchet Creek, NE Gainesville; Shands Canal, 3 mi. NE Micanopy; Prairie Creek, near Gainesville; Newnans Lake, near Gainesville; *all* Alachua Co.

## WITHLACOOCHEE RIVER SYSTEM

*Florida*: Lake Tsla Apopka, Citrus Co.

## SUWANNEE RIVER SYSTEM

*Georgia*: Withlacoochee River, about 5 mi. NW Valdosta, Lowndes Co. *Florida*: Suwannee River, 6 mi. NE Ellaville, Suwannee Co.

## OCHLOCKONEE RIVER SYSTEM

*Georgia*: Ochlockonee River, 7 mi. S Cairo, Grady Co. Attapulcus Creek, 2 mi. NW Amsterdam, Decatur Co. *Florida*: Little River, 3½ mi. E Quincy, Gadsden Co. Ochlockonee River, 11 mi. NW Tallahassee, Leon Co. Ochlockonee River, 7½ mi. E Hosford, Liberty Co.

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Cedar Creek, 11 mi. NE Vienna; Pennahatchee Creek, Vienna; *both* Dooly Co. Abrams Creek, 3 mi. W Doles, Worth Co. Flint River, 2 mi. N Albany, Dougherty Co. Ichawaynochaway Creek, 5½ mi. NE Morgan, Calhoun Co. Bainbridge, Decatur Co. Spring Creek, Reynoldsville, Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Alabama*: Mill Creek, near Phenix City, Russell Co. *Georgia*: Near Columbus, Muscogee Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Mosquito Creek, Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Small creek, 9 mi. NW Marianna, Jackson Co.

## CHOCTAWHATCHEE RIVER SYSTEM

*Alabama*: Van's Mill Creek, near Abbeville, Henry Co. Sikes Creek, Easterling Mill, Barbour Co.

## YELLOW RIVER SYSTEM

*Alabama*: Poley Creek, near Opp, Covington Co.

## ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Beaman's Creek, near Youngblood; Mill Creek, near Youngblood; Patsaliga Creek, Shady Grove; *all* Pike Co. Oakywoods Creek, Butler Co. Boggy Branch, Conecuh River, near Searight; Sandy Creek, near Brantley; Dry Creek, near Brantley; *all* Crenshaw Co.

Genus *Alasmidonta* Say

*Alasmidonta* Say (1818, Jour. Acad. Nat. Sci., Phila., 1: 459).

Type species, *Monodonta undulata* Say, monotypic.

Shell medium to large in size, generally rhomboid in outline, inflated, and with a well developed posterior ridge. Beaks full and high, with coarse, concentric or slightly double-looped bars. Periostracum

rayed and shiny. Hinge with two pseudocardinal teeth in the left valve and one in the right; laterals imperfect or wanting. Beak cavities deep. Nacre bluish, white, or pinkish. Only outer gills serve as marsupia.

*Alasmidonta triangulata* Lea

Plate 5 Figure 4

*Margaritana triangulata* Lea. (1858, Proc. Acad. Nat. Sci., Phila., 10: 138), Chattahoochee River, Columbus, Georgia. Lea (1859, Jour. Acad. Nat. Sci., Phila., 4: 228, pl. 32, fig. 111). Lea, 1859 (7: 46, pl. 32, fig. 111).

*Strophitus wrightianus* Walker (1901, Nautilus, 15: 65, pl. 3), tributaries of the Flint River, Baker Co., [Ichawaynochaway Creek?], Georgia. Simpson (1914: 357).

*Alasmidonta triangulata* Lea. Simpson (1914: 509).

DESCRIPTION.—Shell medium in size, reaching about 70 mm. (2¾ inches) in length, thin but strong, subtriangular in outline, and inflated. Color in young specimens a dark yellowish green or bluish green and strongly rayed, particularly when seen with transmitted light. In adult specimens the color is a glossy brownish black, and in transmitted light they appear finely rayed. Posterior slope margined by a strong angle. The surface of the posterior slope is finely rugose. Surface of the disc and anterior slope nearly smooth. Beaks anterior to the center, high and full. Ligament short and small. Periostracum smooth on the disc and somewhat scaly over the lower part of the posterior slope.

Nacre bluish white to salmon pink. Anterior muscle scars well defined. Hinge plate narrow and extends below as a buttress as far as the pedal retractor scar. Right valve with a single pseudocardinal tooth. Left valve with two short and pointed pseudocardinals.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
69	46	38.5	Flint River, Bainbridge, Decatur Co., Georgia
63	46	37	Flint River, Recovery, Decatur Co., Georgia
61	40	35	Dead Lake, Chipola River, Chipola Park, Calhoun Co., Florida

TYPES.—The holotype is in the United States National Museum and is from the Chattahoochee River, Columbus, Georgia. Paratypes are in the Museum of Comparative Zoology (165696) and are from the same locality. The holotype of *A. wrightiana* Walker is in the

Museum of Zoology, University of Michigan.

REMARKS.—This is a rare species throughout its range. The original specimens came from the Chattahoochee River near Columbus, Georgia, and were described as having a white nacre and a length of only 40 mm. In the lower reaches of the system the shells become much darker in color, and the nacre may be a deep salmon pink. In the original description Lea also cited the locality of Sawney's Creek, South Carolina. The validity of this locality is certainly open to question. This species is distantly related to *Alasmidonta arcula* Lea of the Altamaha river system, Georgia. Both species are in the subgenus *Bullella* Simpson.

This is a species of the rivers and larger creeks to judge by the records we have seen. It seems to prefer sandy mud, particularly in and around rock pools.

Simpson (1914) changed the type locality of *wrightianus* to the Ochlockonee River. This is certainly an error, the original locality of Walker is correct.

RANGE.—Limited to the Apalachicola river system.

SPECIMENS EXAMINED.—

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Patsiliga Creek, Taylor Co. Flint River, Bainbridge; Flint River, Recovery; *both* Decatur Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Mulberry Creek, Mitchell Bridge, 3 mi. S Mountain Hill, Harris Co. Chattahoochee River, Columbus, Muscogee Co. *Alabama*: Uchee Creek, Fort Mitchell, Russell Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Dead Lake, Chipola River, Chipola Park, Calhoun Co.

#### Genus *Anodontoides* Simpson

*Anodontoides* Simpson (1898 (*in* Baker, F. C.), Bull. Chicago Acad. Sci., 3, pt. 1: 72). Type species, *Anodonta ferussaciana* Lea, subsequent designation, Simpson, 1900.

Shells medium in size, elliptical in outline, inflated, thin, and with a poorly defined posterior ridge. Umbos full, with subparallel concentric ridges. Periostracum smooth, shiny and frequently rayed. Hinge plate slightly curved and lacking teeth, or having only small rudiments of teeth. Nacre bluish white. Marsupia occupying only the outer gills.

*Anodontooides elliotti* Lea

## Plate 5 Figure 3

*Margaritana elliottii* Lea (1858, Proc. Acad. Nat. Sci., Phila., 10: 138), Chattahoochee River, near Columbus, Georgia. Lea, 1859 (7: 44, pl. 31, fig. 108).

DESCRIPTION.—Shell medium in size, reaching 71 mm. (about 2¾ inches) in length, thin, smooth, subelliptical in outline, and inflated. Color a blackish brown when adult, brown to greenish brown when young. Usually heavily rayed with green when viewed with transmitted light. Posterior slope flat; posterior ridge poorly defined. Shell tapers to a rounded point posteriorly. Umbos anterior to the center, broad though not high, and rather full. Ligament rather long and narrow. Periostracum smooth and shiny on the disc, but somewhat scaly and dull on the posterior slope.

Nacre bluish white and highly iridescent posteriorly. Anterior muscle scars clearly outlined, posterior muscle scars obscure. Hinge plate exceedingly narrow. Right valve with one rather long, but low and narrow, pseudocardinal tooth. Left valve with a single, somewhat bifurcated, narrow and small, pseudocardinal tooth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
71	35.5	25.5	Mosquito Creek, Chattahoochee, Gadsden Co., Florida
70	38	27.5	Uchee Creek, 10 mi. S Gerard, Russell Co., Alabama
67	33	23	Chattahoochee River, West Point, Troup Co., Georgia

TYPES.—The holotype of *Anodontooides elliotti* Lea is in the United States National Museum. The type locality is the Chattahoochee River, near Columbus, Georgia.

REMARKS.—This species appears to be exceedingly rare. It apparently prefers slack water areas in the larger rivers and the slow flowing larger creeks. It is not close to any other species in this region.

This is probably the species that Vander Schalie (1940: 197) called *Strophitus spillmanii* Lea.

RANGE.—So far as known this species is limited to the Escambia and the Apalachicola river systems. It is apparently absent in the Choctawhatchee river system.

SPECIMENS EXAMINED.—

## APALACHICOLA RIVER SYSTEM

CHATTAHOOCHEE RIVER DRAINAGE.—Georgia: Chattahoochee River, West Point,

Troup Co. *Alabama*: Uchee Creek, 10 mi. S Gerard; Uchee Creek, Fort Mitchell; Uchee Creek, near McKalls; *all* Russell Co. Cowikee Creek, 6 mi. N Eufaula, Barbour Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Mosquito Creek, 1 mi. S Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; Chipola River, 1 mi. N Marianna; *all* Jackson Co.

#### ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Oakywoods Creek, Butler Co. Dry Creek, Brantley, Crenshaw Co.

### Genus *Anodonta* Lamarck

*Anodonta* Lamarck (1799, *Memoirs Société d'Histoire Naturelle de Paris* p. 87).  
Type species, *Mytilus cygneus* Linné, monotypic.

Shells elliptical, smooth, thin, inflated, and often winged posteriorly. Umbos usually high, full, and sculptured with numerous more or less parallel ridges which are generally double-looped. Hinge without teeth. Nacre dull to shiny. Marsupia occupy the whole of the outer gills.

### *Anodonta cowperiana* Lea

#### Plate 6 Figure 3

*Unio cowperiana* Lea (1840, *Proc. Amer. Philos. Soc.*, 1: 289), Hopeton, near Darien, Georgia.

*Anodonta cowperiana* Lea (1842, *Trans. Amer. Philos. Soc.*, 8: 227, pl. 20, fig. 46), Hopeton, near Darien, Georgia. Lea, 1842 (3: 65, pl. 20, fig. 46).

*Anodonta dunlapiana* Lea (1842, *Proc. Amer. Philos. Soc.*, 2: 225), South Carolina. Lea (1842, *Trans. Amer. Philos. Soc.*, 8: 248, pl. 27, fig. 65). Lea, 1842 (3: 86, pl. 27, fig. 65).

DESCRIPTION.—Shell medium to large in size, reaching 110 mm. (4¼ inches) in length, subelliptical to subcircular in outline, thin in structure, fragile, smooth, and somewhat inflated. Color light straw yellow to yellowish green with numerous and generally fine, copper-green rays. Posterior slope slightly concave; the posterior ridge poorly defined. Shell tapers to a blunt point posteriorly. Umbos anterior to the center, low, fairly broad, and seldom extend above the dorsal margin. Ligament short and small. Periostracum smooth and shiny over the entire shell except the posterior slope where it is slightly roughened.

Nacre bluish white and somewhat iridescent over the entire interior surface of the shell. All muscle scars are inconspicuous and poorly defined. Hinge plate and teeth are lacking.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
110	67	49	Edisto River, Dorchester Co., South Carolina
95	58	42	Pond near Savannah, Chatham Co., Georgia
84	47	36	Lake Jessup, Seminole Co., Florida

TYPES.—The holotype of *Anodonta cowperiana* Lea is in the United States National Museum. The type locality is Hopeton, near Darien, Georgia. The holotype of *Anodonta dunlapiana* Lea is in the United States National Museum also.

REMARKS.—This is a beautiful species and is readily differentiated from other *Anodonta* by having numerous green radiating lines, and by having low umbos. It appears to be most closely related to *Anodonta imbecilis* Say, but is readily distinguished by the ventral margin, which is broadly curved in *A. cowperiana* and nearly straight in *A. imbecilis*. In addition, *cowperiana* is much higher in proportion to its length than *imbecilis*, as shown by the measurements; the height-length ratio of *cowperiana* is about 2 and that of *imbecilis* is 1.5. As given under the ranges, *A. imbecilis* and *A. cowperiana* occupy distinct geographic areas.

RANGE.—From the Peace River in southwestern Florida the species ranges east into the Okeechobee drainage, north into the upper St. Johns system, and occurs again in coastal Georgia and South Carolina.

SPECIMENS EXAMINED.—

PEACE RIVER SYSTEM

Florida: Peace River, Arcadia, De Soto Co.

OKEECHOBEE SYSTEM

Florida: Lake Tohopekaliga, Kissimmee, Osceola Co. Lake Hatchineha, Osceola Co.

HILLSBOROUGH RIVER SYSTEM

Florida: Blackwater Creek, 8 mi. N Plant City, Hillsborough Co.

ST. JOHNS RIVER SYSTEM

Florida: Winder Lake, St. Johns River, Brevard Co. Econlockhatchee River near St. Johns River; Lake Jessup; both Seminole Co. Lake Woodruff, Volusia Co. Shands Canal, 3 mi. NE Micanopy; Prairie Creek, 6 mi. SE Gainesville; Lake Newnan, 6 mi. E Gainesville; all Alachua Co.

SAVANNAH RIVER SYSTEM

Georgia: Pond near Savannah, Chatham Co.

EDISTO RIVER SYSTEM

South Carolina: Sandpit, Edisto River, Dorchester Co.

*Anodonta gibbosa* Say

Plate 6 Figure 1

*Anodonta gibbosa* Say (1824 (in Keating, W. H.), Narrative of an expedition to the

source of the St. Peters River, 2: 265, pl. 14, figs. 3-4), South Carolina. Simpson (1914: 397).

*Anodonta dariensis* Lea (1858, Proc. Acad. Nat. Sci., Phila., 10: 139), Hopeton, near Darien, Georgia. Lea, 1859 (7: 48, pl. 28, fig. 99).

**DESCRIPTION.**—Shell medium in size, reaching 120 mm. (4¾ inches) in length, subelliptical in outline, thin in structure, smooth, and inflated. Color greenish brown to blackish brown, and faintly rayed with green. Posterior slope slightly concave; the posterior ridge poorly defined. Shell tapers to a blunt point posteriorly. Umbos are anterior to the center, rather full, and extend above the dorsal margin. Ligament fairly long and narrow. Periostracum smooth on the disc and anterior slope, roughened on the posterior slope.

Nacre bluish white and iridescent over the entire inner surface of the shell. All muscle scars are inconspicuous and poorly defined. Hinge plate and teeth are lacking.

LENGTH mm.	WIDTH mm.	BREADTH mm.	
140	81	61	Tanvat Pond, 3 mi. N Sneads, Jackson Co., Florida
120	60	42.5	Oakey Bend Lake, Choctawhatchee River, Walton Co., Florida
112	65	41.5	Horseshoe Lake, Choctawhatchee River, Washington Co., Florida
100	52	42.5	Chipola River, 2 mi. E Clarksville, Calhoun Co., Florida

**TYPES.**—The location of Say's type of *A. gibbosa* is unknown. It is not in the Academy of Natural Sciences, Philadelphia, where many of Say's types may be found. The type locality is South Carolina. The holotype of Lea's *A. dariensis* is in the United States National Museum. The type locality is Hopeton, near Darien, Georgia.

**REMARKS.**—This is a species of fairly wide distribution in the south, and like other *Anodonta* it occurs in quiet waters, usually where there is an abundance of sandy mud. This species differs from *A. imbecilis* Say by being larger, having the ventral margin more rounded, by being inflated, and in having the umbos swollen and extending above the dorsal margin of the shell.

**RANGE.**—South Carolina to northern Florida and west to the Choctawhatchee River.

**SPECIMENS EXAMINED.**—

#### OCHLOCKONEE RIVER SYSTEM

**OCHLOCKONEE RIVER DRAINAGE.**—Florida: Ochlockonee River, 8 mi. W Tallahassee; Lake Talquin, Ochlockonee River; both Leon Co.

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Flint River, Recovery; Four Mile Creek, 3 mi. SW Bainbridge; *both* Decatur Co. Spring Creek, Reynoldsville, Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Alabama*: Uchee Creek, Fort Mitchell; Big Uchee Creek, Young's Bridge, 6 mi. NE Seale; *both* Russell Co. *Florida*: Tanvat Pond, 3 mi. N Sneads, Jackson Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; *both* Jackson Co. Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

## CHOCTAWHATCHEE RIVER SYSTEM

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: Choctawhatchee River, Geneva Co.

*Florida*: Choctawhatchee River, 1 mi. W Caryville, Holmes Co. Oakey Bend Lake, Choctawhatchee River; Bushy Point Lake, Choctawhatchee River; Inlet Lakes, Choctawhatchee River; *all* Walton Co. Crawford Lake, Choctawhatchee River; Horseshoe Lake, Choctawhatchee River; *both* Washington Co.

*Anodonta hallenbeckii* Lea

## Plate 9 Figure 1

*Anodonta hallenbeckii* Lea (1858, Proc. Acad. Nat. Sci., Phila., 10: 138), Uphapee [Uphapee] Creek, Macon Co., Georgia [Alabama]. Lea, 1859 (7: 50, pl. 32, fig. 112).

*Anodonta gesnerii* Lea (1858, Proc. Acad. Nat. Sci., Phila., 10: 139), Uphapee [Uphapee] Creek, Macon Co., Alabama. Lea, 1859 (7: 49, pl. 31, fig. 109).

DESCRIPTION.—Shell large, reaching 181 mm. (about 7¼ inches) in length, elliptical in outline, fairly thick in structure, moderately inflated, and generally having numerous rather irregular concentric ridges. Color yellowish green to dark brown. Occasionally the green coloration may be in concentric bands, and a few specimens may be faintly rayed with green. Posterior slope flattened; the posterior ridge poorly defined. Shell tapers to a smoothly rounded point posteriorly; Umbos anterior to the center, broadened, and extend above the dorsal margin. Ligament narrow and long. Periostracum smooth over the entire disc, slightly roughened on the posterior slope.

Nacre bluish white and moderately iridescent over the entire inner surface. All muscle scars are inconspicuous and poorly defined. Hinge plate and teeth are lacking.

LENGTH mm.	HEIGHT mm.	BREADTH mm.	
181	87	70	Paratype from Uphapee Creek, Macon Co., Alabama
138	68	51.5	Cypress Creek, 3 mi. SW Elamville, Barbour Co., Alabama
128	74	53	Mill pond, Conasauga River, Conasauga, Tennessee



**TYPES.**—The holotypes of *A. hallenbecki* Lea and *A. gesneri* Lea are in the United States National Museum. Paratypes of each are in the Museum of Comparative Zoology, and the type locality for both is Uphapee Creek, Macon County, Alabama.

**REMARKS.**—Lea made a curious mistake in the type locality of *A. hallenbecki*, assigning it as he did to Macon County, Georgia. As stated above, both came from the same locality, Uphapee Creek, Macon County, Alabama.

This species attains a large size as the measurements of the paratype indicate. However, most of the specimens we have seen are much smaller than this.

This species is readily differentiated from *A. gibbosa* Say by being much larger, proportionately much longer, and by having a somewhat thickened shell. The concentric ridges noticeable in *A. hallenbecki* are probably only stages of growth.

The distribution as given below is a little unusual, and perhaps mechanical distribution has played a part. Like other *Anodonta* they require a specialized habitat—usually quiet water with a fairly soft substrate—not at all common along the big southern rivers. Wherever such conditions exist, *Anodonta* is usually present in considerable numbers.

**RANGE.**—Chattahoochee River west to the Alabama-Coosa river system and north to the Tennessee river system.

**SPECIMENS EXAMINED.**—

#### APALACHICOLA RIVER SYSTEM

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Columbus, Muscogee Co. *Alabama*: Uchee Creek, Russell Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

PEA RIVER DRAINAGE.—*Alabama*: Cypress Creek, 3 mi. SW Elamville, Barbour Co.

#### ALABAMA-COOSA RIVER SYSTEM

COOSA RIVER DRAINAGE.—*Tennessee*: Conasauga River, Conasauga, Polk Co. *Georgia*: Conasauga River, Lower Kingsbridge, 3 mi. W Fashion, Murray Co. Oothkalooa Creek, near Calhoun, Gordon Co. Silver Creek, Rome; Big Dry Creek, Rome; both Floyd Co. *Alabama*: Uphapee Creek, Macon Co.

TOMBIGBEE RIVER DRAINAGE.—*Alabama*: Jones Lake, Vernon, Lamar Co.

#### TENNESSEE RIVER SYSTEM

*Alabama*: Flint Creek, 3 mi. NW Hartselle, Morgan Co.

*Anodonta imbecilis* Say

Plate 6 Figure 2

*Anodonta imbecilis* Say (1829, New Harmony Disseminator, 2: 355), Wabash River. Simpson (1914: 395).

**DESCRIPTION.**—Shell medium to large in size, reaching 111 mm. ( $4\frac{1}{4}$  inches) in length, subelliptical in outline, thin, smooth, and not inflated. Color is a vivid green or blue green to a dark greenish brown; generally finely rayed with pale straw yellow. Posterior slope slightly concave; the posterior ridge poorly defined. Shell tapers to a blunt point posteriorly. Umbos anterior to the center, very low and seldom extending above the dorsal margin. Ligament short and small. Periostracum smooth and shiny over the entire surface.

Nacre bluish white and iridescent over the entire inner surface of the shell. All muscle scars are inconspicuous and poorly defined. Hinge plate and teeth are lacking.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
111	59	42.5	San Rafael, Cameron Co., Texas
101	49	37.5	Mosquito Creek, Chattahoochee, Gadsden Co., Florida
81	44	27	Chattahoochee River, Phenix City, Russell Co., Alabama

**TYPES.**—The location of the holotype of *Anodonta imbecilis* Say is unknown. It is not in the Academy of Natural Sciences, Philadelphia, where many of Say's types are to be found. The type locality is the Wabash River, and it is here limited to the immediate region of New Harmony, Indiana.

**REMARKS.**—This species is widely distributed in much of eastern North America from Canada south to northern Florida. It is found in quiet water, usually in mud or muddy sand.

This species differs from *Anodonta gibbosa* Say by having a straight dorsal margin with low and inconspicuous umbos. In addition, it is not inflated, it is longer in proportion to its height, and it has a straight ventral margin.

See also remarks under *A. cowperiana* Lea.

**RANGE.**—In the area covered by this report, it is found from the Suwannee River west to the Escambia River. The species, however, is widely distributed in the Mississippi river system and in rivers west to Texas.

**SPECIMENS EXAMINED.**—

#### SUWANNEE RIVER SYSTEM

SUWANNEE RIVER DRAINAGE.—*Florida*: Suwannee River, Oldtown, Dixie Co.

#### OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—*Florida*: Little River, 7 mi. SW Havana, Gadsden Co. Ochlockonee River near Bloxham; Ochlockonee River, 8 mi. W Tallahassee;

Lake Talquin, Ochlockonee River; *all* Leon Co. Ochlockonee River, 7½ mi. E Hosford, Liberty Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Flint River, Bainbridge; Four Mile Creek, 3 mi. SW Bainbridge; Flint River, Recovery; Blue Spring, Flint River, 7½ mi. W Recovery; *all* Decatur Co. Spring Creek, Reynoldsville; Spring Creek, 2½ mi. S Reynoldsville; *both* Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Alabama*: Chattahoochee River, Phenix City, Russell Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Mosquito Creek, Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Spring Creek, 3 mi. E Marianna, Jackson Co. Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Chipola River, Pole Bluff Landing; Dead Lake, Chipola River, Chipola Park; Dead Lake, Chipola River, Idlewood; *all* Calhoun Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

HOLMES CREEK DRAINAGE.—*Florida*: Holmes Creek, 1 mi. W Graceville, Jackson Co.

CHOCTAWHATCHEE RIVER DRAINAGE.—*Florida*: Inlet Lakes, Choctawhatchee River; Bushy Point Lake, Choctawhatchee River; *both* Walton Co. Horseshoe Lake, Choctawhatchee River, Washington Co.

#### ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Jeffcoats Lake near Youngblood, Pike Co. Lake Hasclox Bridge, Patsaliga River, Crenshaw Co.

ESCAMBIA RIVER DRAINAGE.—*Alabama*: Escambia River, Flomaton, Escambia Co. Branch of the Escambia River, 4½ mi. W Jay, Santa Rosa Co.

### Genus *Medionidus* Simpson

*Medionidus* Simpson (1900a: 77).

Type species, *Unio conradicus* Lea, original designation.

Shell small, subelliptical in outline, somewhat solid and strong, with a fairly well defined posterior ridge. Usually sculptured with single or bifurcated ridges on the posterior slope. Marsupia occupy the central areas of the outer gills.

### *Medionidus penicillatus* Lea

#### Plate 6 Figure 7

*Unio penicillatus* Lea (1857, Proc. Acad. Nat. Sci., Phila., p. 171), Chattahoochee River, near Columbus; near Atlanta; and Flint River, near Albany; Georgia. Lea, 1859 (7: 21, pl. 23, fig. 85).

*Unio walkeri* B. H. Wright (1897, Nautilus, 11: 91), Suwannee River, Madison Co., Florida.

*Unio kingii* B. H. Wright (1900, Nautilus, 13: 138), branch of Flint River, Baker Co., Georgia.

*Medionidus walkerii* B. H. Wright. Simpson (1900a: 77, pl. 1, fig. 5).

*Medionidus simpsonianus* Walker (1905, Nautilus, 18: 136), Calvary, Georgia.

**DESCRIPTION.**—Shell small, reaching 53 mm. (about 2¼ inches) in length, subelliptical in outline, and rather solid in structure. Color yellowish brown to nearly black, usually rayed with narrow, interrupted, greenish lines. Posterior slope nearly flat and sculptured throughout its entire length with rather strong arcuate ridges; the remainder of the shell is smooth. Posterior ridge usually well defined. Shell tapers to a blunt point posteriorly. Umbos a little anterior to the center, fairly broad, but not high. Ligament short and narrow. Periostracum smooth and shiny on the disc, somewhat satiny and a little roughened along the ventral margin, and dull on the posterior slope.

Nacre usually bluish white, occasionally a pale pink or salmon, and iridescent posteriorly. Anterior muscle scars well defined, posterior scars obscure. Hinge plate small. Right valve has one small pseudo-cardinal tooth. Left valve has one small and one fairly large pseudo-cardinal tooth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
52	26	21	Flint River, Bainbridge, Decatur Co., Georgia
46	23	15	Ochlockonee River, 7 mi. S Cairo, Grady Co., Georgia
46	25	18	Suwannee River, Ellaville, Madison Co., Florida

**TYPES.**—The holotype of *Unio penicillatus* Lea is in the United States National Museum; the type locality is here restricted to the Chattahoochee River at Columbus, Georgia, one of the localities given by Lea. The holotype of *walkeri* B. H. Wright from the Suwannee River [Ellaville] Madison County, Florida, and the holotype of *kingi* B. H. Wright from a branch of the Flint River, Baker County, Georgia, are also in the United States National Museum. The holotype of *Medionidus simpsonianus* Walker is in the Museum of Zoology, University of Michigan. Paratypes of *kingi*, *walkeri*, and idiotypes of *penicillatus* are in the Museum of Comparative Zoology.

**REMARKS.**—We can detect no specific differences among the several forms given in the synonymy above. *Medionidus penicillatus* is a variable species, particularly in coloration and in shape, but these differences all grade into one another.

The locality "near Atlanta, Georgia" given by Lea is certainly in error. No member of this genus has been recorded for the Altamaha river system.

This species is found in streams and rivers where there is moderate current, and lives mainly in sand and gravel.

RANGE.—From the Suwannee River west to the Chipola River.

SPECIMENS EXAMINED.—

#### SUWANNEE RIVER SYSTEM

SANTA FE RIVER DRAINAGE.—*Florida*: Santa Fe River, Worthington Springs, Union Co.

SUWANNEE RIVER DRAINAGE.—*Florida*: Suwannee River, Ellaville, Madison Co. Suwannee River, Fannin Springs, Gilchrist Co. Suwannee River, Oldtown, Dixie Co.

WITHLACOOCHEE RIVER DRAINAGE.—*Florida*: Withlacoochee River, Blue Spring, Madison Co.

#### OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—*Georgia*: Ochlockonee River, 7 mi. S. Cairo; Ochlockonee River between Reno and Beachton; *both* Grady Co. *Florida*: Ochlockonee River, 11 mi. NW Tallahassee; Ochlockonee River, 8 mi. W Tallahassee; *both* Leon Co. Ochlockonee River, Wakulla Co. Little River, 3½ mi. E Quincy, Gadsden Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Stream, 6 mi. N Vienna, Dooly Co. Gum Creek, 2 mi. N Cordele; Cedar Creek, 6 mi. SW Cordele; *both* Crisp Co. Jones Creek, 2 mi. S Oakfield; Mill Creek, 8 mi. S Oakfield; *both* Worth Co. Branch of Flint River, Baker Co. Flint River, Albany, Dougherty Co. Flint River, Bainbridge; Flint River, Recovery; *both* Decatur Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Mulberry Creek, 3 mi. SSE Mountain Hill, Harris Co. Chattahoochee River, Columbus, Muscogee Co. Sawhatchee Creek, about 14 mi. NW Donalsonville, Early Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Alabama*: Cowarts Creek, Cowart, Houston Co. *Florida*: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; Chipola River, 1 mi. N Marianna; small creek, 7½ mi. NW Altha; Chipola River, 2½ mi. E Chason; *all* Jackson Co. Chipola River, 2 mi. E Clarksville; Dead Lake, Chipola River, Chipola Park; *both* Calhoun Co.

### Genus *Glebulula* Conrad

*Glebulula* Conrad (1853, Proc. Acad. Nat. Sci., Phila., p. 268).

Type species, *Unio rotundatus* Lamarck, monotypic.

Shell solid, inflated, elliptical, bluntly pointed posteriorly, and with a well-defined posterior ridge. Umbos low and smooth. Periostracum blackish brown and satiny. Pseudocardinal teeth moderately large and with crenulated edges. Gills nearly equal in size and united the whole length of the abdominal sac. Marsupia occupy the posterior half of the outer gills.

*Glebula rotundata* Lamarck

## Plate 8 Figure 7

*Unio rotundata* Lamarck (1819, Histoire Naturelle des Animaux sans Vertèbres, 6: 75), locality unknown.

*Unio suborbiculata* Lamarck (1819, Histoire Naturelle des Animaux sans Vertèbres, 6: 81), locality unknown.

*Unio glebulus* Say (1831, Transylvania Journal, 4: 526), Bayou Teche, St. Mary Parish, Louisiana.

*Unio subglobosus* Lea (1834, Trans. Amer. Philos. Soc., 5: 30, pl. 2, fig. 3), Bayou Teche, Louisiana. Lea, 1834 (1: 142, pl. 2, fig. 3).

*Unio grandensis* Conrad (1855, Proc. Acad. Nat. Sci., Phila., 7: 256), Rio Grande, Texas.

*Unio granadensis* 'Conrad' Simpson (1914: 289) [error for *grandensis* Conrad].

*Glebula rotundata* Lamarck. Simpson (1914: 287).

DESCRIPTION.—Shell large, reaching 107 mm. (4¼ inches in length, solid in structure, elliptical in outline, and greatly inflated. Color a dark ashen black; young specimens are a brownish black. Posterior slope generally flat to slightly concave and margined by a fairly well defined posterior ridge. Shell tapers to a rounded or somewhat truncate end posteriorly. Umbos anterior to the center, broad, and usually not high. Ligament long and fairly thick. Periostracum in young shells almost satiny, somewhat smooth on the disc, but slightly roughened ventrally and on the extremities.

Nacre bluish white to a deep purplish pink; the posterior areas are rather highly iridescent. Hinge plate narrow. Pseudocardinal teeth in both valves radially laminate with the outer edges serrate.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
107	91	66.5	Lake Concordia, Concordia Parish, Louisiana
96	70	44	Lake Verret, Assumption Parish, Louisiana
50	38	22	Apalachicola River, Blountstown, Calhoun Co., Florida

TYPES.—The types of *G. rotundata* and *G. suborbiculata* Lamarck are probably in the Paris Museum. As the original localities for both of the above are unknown, we here select Bayou Teche, St. Mary Parish, Louisiana, as the type locality; this is also the type locality for two of the synonyms given above. The type of *G. subglobosa* Lea is in the United States National Museum. The type of *G. glebulus* Say is in the Academy of Natural Sciences, Philadelphia. The location of Conrad's type of *G. grandensis* is unknown.

REMARKS.—This is an exceedingly rare species in the area covered

by this report, and, so far as we can determine, it is limited to the lower reaches of the rivers. It appears to reach its greatest development in southern Louisiana.

RANGE.—Eastern Texas east to the Apalachicola River, Florida.

SPECIMENS EXAMINED.—

#### APALACHICOLA RIVER SYSTEM

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Blountstown, Calhoun Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Dead Lake, Chipola River, Chipola Park, Calhoun Co.

#### ESCAMBIA RIVER SYSTEM

ESCAMBIA RIVER DRAINAGE.—*Florida*: Escambia River, Escambia Co.

### Genus *Corunculina* Simpson

*Corunculina* Simpson (1898 (in Baker, F. C.), Bull. Chicago Acad. Sci., 3, pt. 1: 109). Type species, *Lampsilis parvus* Barnes, monotypic.

Shell small, inflated, ovate to elliptical in outline, and with a poorly defined posterior ridge. Umbos anterior to the center and sculptured with strong, simple, concentric ridges. Periostracum dark brown to brownish yellow or greenish, and occasionally feebly rayed. Pseudocardinal teeth compressed; laterals short and straight. Nacre white, bluish white, or pinkish, and iridescent, particularly posteriorly. Marsupia developed only on the outer gills.

### *Corunculina paula* Lea

#### Plate 8 Figure 5

*Unio paulus* Lea (1840, Proc. Amer. Philos. Soc., 1: 287), Chattahoochee River, Columbus, Georgia. Lea, 1842 (3: 51, pl. 15, fig. 29).

*Unio minor* Lea (1843, Descriptions of twelve new species of Unios, (Philadelphia)), Lake Monroe and Lake George, Florida. Lea, 1848 (4: 34, pl. 39, fig. 3).

*Unio cromwellii* Lea (1865, Proc. Acad. Nat. Sci., Phila., p. 89), Kioksee Creek, Albany, Dougherty Co., Georgia. Lea, 1869 (12: 18, pl. 31, fig. 73).

*Unio marginis* Lea (1865, Proc. Acad. Nat. Sci., Phila., p. 89), Blue Springs, [Albany], Dougherty Co., Georgia. Lea, 1869 (12: 15, pl. 31, fig. 69).

*Unio stearnsi* B. H. Wright (1888, Check List of North American Unionidae (Portland, Oregon), p. 5), [*nomen nudum*]. Simpson (1914: 146), [listed in the synonymy of *Lampsilis minor* Lea (= *Corunculina paula* Lea)].

DESCRIPTION.—Shell small in size, reaching 40 mm. (about 1½ inches) in length, generally solid in structure, smooth, somewhat inflated, and elliptical in outline. Color greenish or brownish to almost black; occasional specimens are rayed with green. Posterior slope nearly

flat with the posterior ridge poorly defined. Umbos anterior to the center, broad and full, but not high. Ligament short and narrow. Periostracum satiny and generally rough over the entire surface of the shell.

Nacre bluish white to pinkish and highly iridescent posteriorly. Both anterior and posterior muscle scars well defined. Hinge plate long and narrow. Right valve with one small pseudocardinal tooth. Left valve with two subequal pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
40.5	23	17	Suwannee River, Fannin Spring, Gilchrist Co., Florida
36	21	15.5	Chattahoochee River, Columbus, Muscogee Co., Georgia
34	20	14	Reedy Creek, Madrid, Houston Co., Alabama

**TYPES.**—The holotype of *C. paula* Lea and all of the other species of Lea and Wright mentioned in the synonymy above are in the United States National Museum. The type locality for this species is the Chattahoochee River, Columbus, Georgia.

**REMARKS.**—This small species can be exceedingly abundant. It is an active species and will follow the rise and fall of a stream seeking the shallow water of the margins. In muddy situations the periostracum remains satiny in appearance and is somewhat rough to the touch. In sandy areas the periostracum is worn smooth, and the shells are shiny. In the Santa Fe River, many specimens found were a bright green, a condition which was also true of a number of other species which were found there. Sexual dimorphism may be fairly pronounced in this species, the males being evenly and rather narrowly rounded posteriorly while the females are truncated and, in addition, are far more inflated.

**RANGE.**—Peace River in southern Florida north to the St. Johns River and west to the Yellow River in western Florida.

**SPECIMENS EXAMINED.**—

**PEACE RIVER SYSTEM**

*Florida:* Peach River, and pond near Arcadia; both DeSoto Co.

**OKEECHOBEE SYSTEM**

*Florida:* Lake Okeechobee, 2 mi. N Canal Point, Palm Beach Co. Alligator Lake near Kissimmee; Lake Tohopekaliga; both Osceola Co.



## ST. JOHNS RIVER SYSTEM

*Florida*: Puzzle Lake, 7 mi. SE Geneva; Econlockhatchee River near confluence with St. Johns; *both* Seminole Co.

## SUWANNEE RIVER SYSTEM

*SANTA FE RIVER DRAINAGE.—Florida*: Santa Fe River, N of High Springs; Santa Fe River Sink, E of High Springs; *both* Alachua Co. Santa Fe River, Worthington Springs, Union Co.

*SUWANNEE RIVER DRAINAGE.—Florida*: Suwannee River, Ellaville, Madison Co. Suwannee River; Fannin Springs, Gilchrist Co. Suwannee River, Oldtown, Dixie Co.

*WITHLACOOCHEE RIVER DRAINAGE.—Georgia*: Withlacoochee River, Olympia, Lowndes Co. *Florida*: Withlacoochee River, Blue Springs, 10 mi. E Madison, Madison Co.

## OCHLOCKONEE RIVER SYSTEM

*Georgia*: Attapulgis Creek, 2 mi. NW Amsterdam, Decatur Co. *Florida*: Ochlockonee River, 11 mi. NW Tallahassee; Ochlockonee River, 8 mi. W Tallahassee; *both* Leon Co. Little River, 3½ mi. E Quincy, Gadsden Co.

## APALACHICOLA RIVER SYSTEM

*FLINT RIVER DRAINAGE.—Georgia*: Stream, 6 mi. N Vienna, Dooly Co. Gum Creek, 2 mi. N Cordele; Cedar Creek, 6 mi. SW Cordele; Swift Creek, 12 mi. SW Cordele; *all* Crisp Co. Small creek, 6 mi. SE Leesburg; Lee's Creek, 5 mi. S DeSoto; *both* Lee Co. East Fork Chickasawhatchee Creek, 5 mi. SE Dawson; Kiokee Creek, 15 mi. SE Dawson; *both* Terrell Co. Abrams Creek, 3 mi. N Doles; Abrams Creek, 5 mi. S Oakfield; Mill Creek, 8 mi. S Oakfield; *all* Worth Co. Creek, 4½ mi. NE Morgan, Calhoun Co. Creek, 6 mi. W Albany, Dougherty Co. Four Mile Creek, 3 mi. S Bainbridge; Spring Creek, near Brinson; Flint River, Recovery; Blue Spring, 7½ mi. W Recovery; *all* Decatur Co. Spring Creek, Reynoldsville, Seminole Co.

*CHATTAHOOCHEE RIVER DRAINAGE.—Georgia*: Columbus, Muscogee Co. Sawhatchee Creek, 4 mi. NW Donalsonville, Seminole Co.

*APALACHICOLA RIVER DRAINAGE.—Florida*: Apalachicola River, Chattahoochee; Mosquito Creek, Chattahoochee; *both* Gadsden Co.

*CHIPOLA RIVER DRAINAGE.—Alabama*: Goff Creek, near Smyrna; Reedy Creek, Madrid; small creek, 13 mi. E Dothan; Big Creek, near state line; *all* Houston Co. *Florida*: Stream 1½ mi. N Campbellton; Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; Chipola River, 1 mi. N Marianna; Spring Creek, 3 mi. E Marianna; Chipola River, 1 mi. W Sink Creek; *all* Jackson Co. Chipola River near Pole Bluff Landing; Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

## CHOCTAWHATCHEE RIVER SYSTEM

*CHOCTAWHATCHEE RIVER DRAINAGE.—Alabama*: Campbells Creek, Clio, Barbour Co. Pea River, 8 mi. NW Arnton; Pike Co. Little Patsaliga Creek; Dry Creek, near Brantley; *both* Crenshaw Co. Choctawhatchee River, 2 mi. E Geneva, Geneva Co. *Florida*: Holmes Creek, 1 mi. W Graceville, Jackson Co. Hurricane Creek, 5 mi. E Miller Cross Roads; Choctawhatchee River, 1 mi. W Caryville; *both* Holmes Co.

## YELLOW RIVER SYSTEM

*Florida*: Yellow River, Milligan, Okaloosa Co.

Genus *Lampsilis* Rafinesque

*Lampsilis* Rafinesque (1820, *Annales Générales Sciences Physiques* (Bruxelles), 5: 298).

Type species, *Unio ovatus* Say, subsequent designation, Simpson, 1900.

Shell moderately large, subcircular to elliptical in outline, and generally inflated. Posterior slope well defined. Umbos prominent, anterior to the center, usually high, and sculptured with rather coarse sinuate ridges. Outer surface smooth and shiny on the disc and anterior slope, often somewhat roughened on the posterior slope. Color yellowish to dark brown; often rayed with green.

Nacre white to bluish white or pink. Pseudocardinal teeth small, generally with two in each valve.

This genus is widely distributed in all of eastern North America from southern Canada to Florida and west to the Mississippi River.

*Lampsilis subangulata* Lea

## Plate 2 Figure 2

*Unio subangulatus* Lea (1840, *Proc. Amer. Philos. Soc.*, 1: 287), Chattahoochee River, Columbus, Georgia. Lea; 1842 (3: 47, pl. 13, fig. 23).

*Lampsilis subangulata* Lea. Simpson (1914: 125-126).

*Unio kirklandianus* S. H. Wright (1897, *Nautilus*, 10: 136), Ochlockonee River, Leon Co., Florida.

*Lampsilis kirklandiana* Wright. Simpson (1900a: 76, pl. 1, fig. 7). Simpson (1914: 126).

DESCRIPTION.—Shell medium in size, reaching about 85 mm. (about 3 3/8 inches) in length, thin but strong, smooth, subelliptical in outline, and somewhat inflated. Color a golden brown to dark chestnut brown; numerous rays of light to dark emerald green. These rays vary in width from fine lines to bands reaching 4 mm. in width. Occasional specimens may be smooth and dark brownish black with only faint traces of rays, even when seen with transmitted light. Posterior slope concave, the ridge rounded. Shell tapers to a blunt point posteriorly. Umbos anterior to the center, broad though not high, and rather full. Ligament short and small. Periostracum smooth and shiny on the disc, but somewhat scaly and dull on the posterior extremity.

Nacre whitish to bluish white or salmon in color and highly iridescent at the posterior end. Both anterior and posterior muscle scars clearly outlined. Hinge plate narrow. Right valve has one large and one small, somewhat spatulate, pseudocardinal tooth; the larger of the two is irregularly but finely serrate. Left valve with two nearly

equal, somewhat thickened and serrate pseudocardinals.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
84	41	31.5	Spring Creek, Reynoldsville, Seminole Co., Georgia
70	35	26.5	Mosquito Creek, 1 mi. S Chattahoochee, Gadsden Co., Florida
69	37.5	27	Ochlockonee River, 7 mi. S Cairo, Grady Co., Georgia

**TYPES.**—The lectotype of *L. subangulata* Lea from the Chattahoochee River, Columbus, Georgia, is in the United States National Museum (85081). Paratypes of *L. kirklandiana* S. H. Wright from the Ochlockonee River, Florida, are in the Museum of Comparative Zoology (189802) and the United States National Museum (149648).

**REMARKS.**—This is one of the most beautiful of our North American freshwater clams. It appears to prefer small creeks and spring-fed rivers, at least to judge from the material we have seen. Though it occurs in the Choctawhatchee river system it is exceedingly rare there—we have seen but two specimens.

In relationship it appears to be close to *Lampsilis australis* Simpson, from which it differs in being more attenuate and pointed posteriorly, being more inflated, having more definitive rays, and having a more highly polished surface. In addition, the posterior slope of *subangulata* is more excavated, the ridge is more clearly defined, and the nacre is more iridescent.

**RANGE.**—From the Ochlockonee River west to the Choctawhatchee River.

**SPECIMENS EXAMINED.**—

#### OCHLOCKONEE RIVER SYSTEM

**OCHLOCKONEE RIVER DRAINAGE.**—*Georgia*: Ochlockonee River, 7 mi. S Cairo; Ochlockonee River between Reno and Beachton; stream near Calvary; *all* Grady Co. *Florida*: Ochlockonee River, 7½ mi. E Hosford, Liberty Co.

**LITTLE RIVER DRAINAGE.**—*Florida*: Little River, 3½ mi. W Quincy; Little River, 7 mi. WSW Havana; *both* Gadsden Co.

#### APALACHICOLA RIVER SYSTEM

**FLINT RIVER DRAINAGE.**—*Georgia*: Patsiliga Creek, near Butler, Taylor Co. Jones Creek, 2 mi. S Oakfield; Mill Creek, 8 mi. S Oakfield; *both* Worth Co. Flint River, Albany, Dougherty Co. Ichawaynochaway Creek, 10 mi. SW Newton; Coolewahee Creek, Newton; Minnsville; *all* Baker Co. Flint River, Bainbridge, Decatur Co. Spring Creek, Reynoldsville; Spring Creek, 2½ mi. S Reynoldsville; *both* Seminole Co.

**CHATTAHOOCHEE RIVER DRAINAGE.**—*Alabama*: Uchee Creek, Fort Mitchell, Russell Co. Cowikee Creek, 6 mi. N Eufaula, Barbour Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Mosquito Creek, ½ mi. E Chattahoochee; Mosquito Creek, 1 mi. S Chattahoochee; *both* Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; Chipola River, 1 mi. N Marianna; *all* Jackson Co. Chipola River, Pole Bluff Landing; Chipola River near Alpha; Chipola River, Scotts Ferry; Chipola River, 2 mi. E Clarksville; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

HOLMES CREEK DRAINAGE.—*Florida*: Holmes Creek, 1 mi. W Graceville, Holmes Co.

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: Choctawhatchee River, 2 mi. E Geneva, Geneva Co.

### *Lampsilis excavatus* Lea

#### Plate 3 Figure 3

*Unio ovatus ornatus* Conrad (1835, Monography of the family Unionidae of North America (Philadelphia), p. 4) [*nomen nudum*].

*Unio lineatus* Lea (1840, Proc. Amer. Philos. Soc., 1: 287), Chattahoochee River, Columbus, Georgia. Lea (1842, Trans. Amer. Philos. Soc., 8: 206, pl. 12, fig. 20). Lea, 1842 (3: 44, pl. 12, fig. 20) [*non Unio lineata* Bory de St. Vincent, 1827].

*Unio excavatus* Lea (1857, Proc. Acad. Nat. Sci., Phila., p. 32), Othcalooga Creek, Gordon Co., Georgia; Etowah, Georgia; Alabama River, Claiborne, Alabama. Lea (1858, Jour. Acad. Nat. Sci., Phila., 4: 71, pl. 13, fig. 52). Lea, 1858 (6: 71, pl. 13, fig. 52).

*Unio ornatus* Sowerby (1866, Conchologia Iconica, 16: *Unio*, pl. 31, sp. 162), Alabama.

*Lampsilis binominatus* Simpson (1900b: 528) [new name for *Unio lineatus* Lea, 1840; *non Unio lineata* 'Valenciennes' Bory de St. Vincent, 1827].

*Lampsilis excavatus* Lea. Simpson (1914: 41).

DESCRIPTION.—Shell medium to moderately large in size, reaching 100 mm. (4 inches) in length, rather thin but strong, broadly oval to subcircular in outline, and inflated. Color a light straw yellow to dark brownish yellow with a few rays of light to dark emerald green. These rays vary from fine lines to bands reaching about 2 mm. in width. Posterior slope is concave, margined by a fairly well defined ridge, and occasionally has a second ridge in its mid-area. Shell tapers somewhat posteriorly. Umbos anterior to the center, broad, high, and full. Ligament short and broad. Periostracum shiny and smooth over most of the shell, but slightly roughened on the posterior slope.

Nacre white to bluish white and highly iridescent posteriorly. Both anterior and posterior muscle scars clearly outlined. Hinge plate narrow. Right valve has two subequal pseudocardinal teeth. Left valve has two, pointed pseudocardinals—one large and one small.

LENGTH	WIDTH	BREADTH	
mm.	mm.	mm.	
100	72	54.5	Black Warrior River, Jefferson Co., Alabama
96	73	56	Pearl River, Jackson Co., Mississippi
82.5	59	38.5	Escambia River, 3 mi. SE Century, Escambia Co., Florida

**TYPES.**—Cotypes of *L. excavatus* Lea are in the United States National Museum and are from Oothcalooga [Oothkalooga] Creek, Gordon Co., Georgia. The type locality was limited by Simpson (1914: 42) from the several localities given by Lea. Cotypes of *L. lineatus* labelled as from the Chattahoochee River, Columbus, Georgia, are also in the United States National Museum, and idiotypes of *L. lineatus* Lea, presumably from the type lot, are in the Museum of Comparative Zoology (146976).

**REMARKS.**—This species is somewhat smaller than its analogue, *L. ovata* Say, of the Mississippi river system. It is also darker in color, and the posterior slope is not so well defined as in Say's species.

In our opinion *L. lineatus* Lea (= *excavatus* Lea) had an incorrect locality assigned to it. We have seen nothing approaching this species east of the Escambia River. The idotype which we possess is identical with young specimens of *L. excavata* from the Coosa river system of Alabama and Georgia.

**RANGE.**—From the Escambia river system of Alabama and western Florida this form ranges west to the Pearl River in Mississippi.

**SPECIMENS EXAMINED** (for the area covered in this report).—

#### ESCAMBIA RIVER SYSTEM

**ESCAMBIA RIVER DRAINAGE.**—*Alabama:* Escambia River, near Poland, Escambia Co. *Florida:* Escambia River, 3 mi. E Century, Escambia Co.

### *Lampsilis australis* Simpson

#### Plate 2 Figure 3

*Lampsilis australis* Simpson (1900: 75, pl. 2, fig. 2), Little Patsaliga Creek, southeastern Alabama.<sup>10</sup>

*Lampsilis jonesi* Vander Schalie (1934, Nautilus, 47: 125), Pea River, at Priston's Mill, Dale Co., Alabama.

<sup>10</sup>Not to be confused with Little Patsiliga Creek, Flint River drainage, in Taylor County, Georgia, a locality frequently mentioned in older records. Though the pronunciation is similar, the spelling is different.

DESCRIPTION.—Shell medium in size, reaching about 72 mm. ( $2\frac{3}{4}$  inches) in length, thin but strong, subtriangular in outline, and moderately inflated. Color yellowish green to blackish brown; usually numerous rays of dark emerald green. There is often a concentric pattern of the same colors brought about by minor interruptions in the green rays. Posterior slope flattened; the ridge poorly defined. Shell tapers to a blunt point posteriorly. Occasional specimens exhibit a weak ridge down the center of the posterior slope. Surface of the disc and anterior slope smooth. Umbos well anterior to the center, rather low, and not full. Ligament short and small. Periostracum thin, shiny, and slightly rugose or scaly on the posterior slope.

Nacre bluish white and moderately iridescent. Muscle scars well defined. Right valve with one small pseudocardinal tooth. Left valve with two nearly equal pseudocardinals.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
72	39	25	Conecuh River, Covington Co., Alabama
70	33	22	Little Patsaliga Creek, Crenshaw Co., Alabama
61	34	21	Little Choctawhatchee River, near Pinckard, Dale Co., Alabama

TYPES.—A paratype of *L. australis* Simpson from Little Patsaliga Creek, Alabama, is in the Museum of Comparative Zoology (20154) and was received from L. S. Frierson. Paratypes of *L. jonesi* Vander Schalie from the Pea River near Elamville, Barbour County, Alabama, are in the Museum of Comparative Zoology (98802). The holotype is in the Museum of Zoology, University of Michigan.

REMARKS.—This species is close in its relationship to *L. subangulata* Lea; however, *australis* differs from *subangulata* by having the nacre always bluish white with no indication of salmon coloration, by having the posterior end a little more rounded, and by having the dark greenish rays much finer and far less conspicuous. In addition, the posterior slope of *australis* is nearly flat, hardly concave, and many specimens have a secondary ridge running from the umbos to the posterior margin.

*Lampsilis jonesi* Vander Schalie appears to us to be an absolute synonym of *L. australis*. Apparently Vander Schalie completely overlooked this species of Simpson and compared his only with *subangulata* Lea.

RANGE.—This species is confined to the Choctawhatchee and Escambia river systems.

SPECIMENS EXAMINED.—

## CHOCTAWHATCHEE RIVER SYSTEM

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: Little Choctawhatchee River, Houston Co. Little Choctawhatchee River near Pinckard; East Fork Choctawhatchee River, Midland City; *both* Dale Co. East Fork Choctawhatchee River, 8 mi. W Abbeville, Henry Co. West Fork, Choctawhatchee River, Blue Spring, Barbour Co.

PEA RIVER DRAINAGE.—*Alabama*: Pea River, Andrew's Fish Trap; Pea River, near Elamville; *both* Barbour Co. Pea River, Flemings Mill, Coffee Co.

## ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Conecuh River, Bozeman's Landing, Covington Co. Conecuh River, Searight; Little Patsaliga Creek, near Luverne; *both* Crenshaw Co. Burnt Corn Creek, 3 mi. W Appleton, Escambia Co.

*Lampsilis anodontoides floridensis* Lea

## Plate 3 Figure 1

*Unio floridensis* Lea (1852, Trans. Amer. Philos. Soc. (n.s.), 10: 274, pl. 21, fig. 31),

Chácktáhachi River, West Florida. Lea, 1852 (5: 30, pl. 21, fig. 31).

*Lampsilis anodontoides floridensis*. Lea. Simpson (1914: 91).

DESCRIPTION.—Shell medium in size, reaching about 112 mm. ( $4\frac{1}{2}$  inches) in length, thin but strong, and generally only slightly inflated. Color pale to dark yellowish brown; occasionally with a few rather widely spaced dark greenish rays which seldom exceed 2 mm. in width. Posterior slope is flattened and has a rounded posterior ridge. Shell tapers to a blunt point posteriorly. Umbos well anterior to the center, broad, but not high or full. Ligament rather long and narrow. Periostracum smooth and shiny on the disc, but somewhat scaly and dull on the posterior slope.

Nacre somewhat iridescent, white to pale pink; the pinkish area is generally confined to the central dorsal area. Both anterior and posterior muscle scars are well marked. Hinge plate narrow. Right valve has pointed pseudocardinal teeth—one large and one small—which are slightly rugose. Left valve with two subequal pseudocardinals.

LENGTH	WIDTH	BREADTH	
mm.	mm.	mm.	
112	55	36.5	Spring Creek, Reynoldsville, Seminole Co., Georgia
87	40	26.5	Choctawhatchee River, 1 mi. W Caryville, Holmes Co., Florida
99	43.5	29.5	Flint River, Bainbridge, Decatur Co., Georgia

TYPES.—The holotype of *L. floridensis* Lea is in the United States National Museum and is from the Chácktáhachi [Choctawhatchee]

River of western Florida. We here restrict the type locality to the Choctawhatchee River, 1 mile west of Caryville, Holmes County, Florida, which is possible the locality where Major LeConte collected the material for *I. Lea*, this being on the old Spanish Trail.

REMARKS.—This subspecies ranges widely throughout the northern Gulf area. It is fairly abundant and can stand silting far better than most other species. This and *Glebula rotundata* Lamarck were the only species we found in the Apalachicola River below Chattahoochee. It differs from the typical species in being smaller, having a much thinner shell, and having the umbos a little more depressed. However, young specimens of the typical form would be difficult to separate from this subspecies.

We have a lot of three specimens of *floridensis* from Kissimmee, Osceola County, Florida. This we have not included in our records as there is a possibility of an error. However, this subspecies does occur in the Withlacoochee River, Pasco County, and it is possible that it has extended its range. If so, it may have entered the Okeechobee drainage system.

RANGE.—From the Withlacoochee River, west central Florida, this form occurs west through the Gulf states to Texas.

SPECIMENS EXAMINED.—

#### WITHLACOOCHÉE RIVER SYSTEM<sup>11</sup>

Florida: Withlacoochee River, 9 mi. N Dade City, Pasco Co.

#### SUWANNEE RIVER SYSTEM

WITHLACOOCHÉE RIVER DRAINAGE.—Florida: Withlacoochee River, Blue Spring, Madison Co.

SUWANNEE RIVER DRAINAGE.—Florida: Suwannee River, 6 mi. NE Ellaville, Suwannee Co. Suwannee River, Fannin Spring, Gilchrist Co.

#### OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—Georgia: Ochlockonee River, 7 mi. S Cairo; Ochlockonee River, between Reno and Beachton; both Grady Co. Florida: Ochlockonee River, 8 mi. W Tallahassee, Leon Co. Ochlockonee River, 7½ mi. E Hosford, Liberty Co.

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—Georgia: Flint River, 10 mi. W Cordele, Crisp Co. Flint River, Albany; Flint River, 10 mi. S Albany; both Dougherty Co. Ichawaynochaway Creek, 10 mi. SW Newton; Flint River, Newton; both Baker Co. Flint River, Bainbridge; Flint River, Recovery; both Decatur Co. Spring Creek, Reynoldsville; Spring Creek, 2½ mi. S Reynoldsville; both Seminole Co.

CHATTAHOOCHEE RIVER DRAINAGE.—Alabama: Uchee Creek, Fort Mitchell, Russell Co. Cowikee Creek, 6 mi. N Eufaula, Barbour Co. Georgia: Chattahoochee River, Georgetown, Quitman Co.

<sup>11</sup>This is not the Withlacoochee River of northern Florida which is a branch of the Suwannee River.



APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee; Mosquito Creek, ½ mi. E Chattahoochee; Mosquito Creek, 1 mi. E River Junction; *all* Gadsden Co. Apalachicola River, near Blountstown, Calhoun Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

PEA RIVER DRAINAGE.—*Alabama*: Pea River, Geneva, Geneva Co.

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: Choctawhatchee River, 2 mi. E Geneva, Geneva Co. *Florida*: Choctawhatchee River, 8 mi. W Miller Cross Roads; Choctawhatchee River, 1 mi. W Caryville; *both* Holmes Co. Choctawhatchee River, Yellow Bluff, Walton Co.

#### ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Patsaliga Creek, 13 mi. N Searight; Conecuh River, Searight; *both* Crenshaw Co. Conecuh River, Bozeman's Landing, Covington Co.

ESCAMBIA RIVER DRAINAGE.—*Alabama*: Escambia River, Flomaton, Escambia Co. *Florida*: Escambia River, 3 mi. E Century, Escambia Co.

### *Lampisilis claibornensis* Lea

#### Plate 3 Figure 2

*Unio claibornensis* Lea (1838, Trans. Amer. Philos. Soc. 6: 105, pl. 24, fig. 115). Alabama River, Claiborne, Alabama. Lea, 1838 (2: 105, pl. 24, fig. 115).

*Unio obtusus* Lea (1840, Proc. Amer. Philos. Soc., 1: 287), Chattahoochee River, Columbus, Georgia. Lea, 1842 (3: 39, pl. 11, fig. 13).

*Unio pallescens* Lea (1845, Proc. Amer. Philos. Soc., 4: 164), Tuscaloosa, Alabama. Lea, 1848 (4: 53, pl. 7, fig. 20).

*Unio oratus* Conrad (1849, Ann. and Mag. Nat. Hist. (2), 4: 301), Flint River, Georgia. Conrad (1850, Jour. Acad. Nat. Sci., Phila. (n.s.), 1: 276, pl. 37, fig. 6).

*Lampisilis claibornensis* Lea. Simpson (1914: 70).

DESCRIPTION.—Shell moderately large, reaching 97 mm. (about 4 inches) in length, solid, subcircular in outline, and greatly inflated. Color light to dark yellowish brown. Very young specimens often faintly rayed with green. Posterior slope concave; the ridge rounded. Shell tapers to a broad and blunt point posteriorly. Umbos anterior to the center, broad, and moderately high. Ligament rather long and fairly thick. Periostracum smooth and shiny on the disc, somewhat roughened on the posterior slope.

Nacre bluish white to light pink and highly iridescent. Both anterior and posterior muscle scars clearly outlined. Hinge plate rather thick. Right valve has one large thickened, and one small thin, pseudocardinal tooth. Left valve has two nearly equal, thickened pseudocardinals.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
97	69	54	Ochlockonee River, 7½ mi. E Hosford, Liberty Co., Florida
95	61	49.5	Ochlockonee River, between Reno and Beachton, Grady Co., Georgia
75	47	37.5	Flint River, Bainbridge, Decatur Co., Georgia
73	44	37	Lake Talquin, Ochlockonee River, Leon Co., Florida

**TYPES.**—Holotypes of *L. claibornensis* Lea from the Alabama River, Claiborne, Alabama; *L. obtusus* Lea from the Chattahoochee River, Columbus, Georgia; and *L. pallescens* Lea from Tuscaloosa, Alabama; are all in the United States National Museum.

**REMARKS.**—This widely distributed species is abundant throughout this area in the rivers as well as many of the smaller streams. It is a rather uniform species in both shape and color, and its globose form readily distinguishes it from all other species in the region. This species frequents sandy areas where the bottom is fairly firm. *Lamp-silis claibornensis* Lea and *Anodonta imbecilis* Say were the only two species of bivalves that we were able to find at the single station made in Lake Talquin. This lake was formed by damming the Ochlockonee River near Bloxham, Leon County, Florida.

**RANGE.**—This species occurs from the Suwannee river system west to eastern Texas.

**SPECIMENS EXAMINED:—**

**SUWANNEE RIVER SYSTEM**

**WITHLACOOCHEE RIVER DRAINAGE.**—*Florida*: Withlacoochee River, Blue Springs, Madison Co.

**SUWANNEE RIVER DRAINAGE.**—*Florida*: Suwannee River, Ellaville, Madison Co. Suwannee River, Fannin Spring, Gilchrist Co.

**OCHLOCKONEE RIVER SYSTEM**

**OCHLOCKONEE RIVER DRAINAGE.**—*Georgia*: Ochlockonee River, 7 mi. S Cairo; Ochlockonee River, between Reno and Beachton; *both* Grady Co. Attapulugus Creek, 2 mi. NW Amsterdam, Decatur Co. *Florida*: Quincy Creek, 1 mi. E Quincy; Little River, 3½ mi. E Quincy; *both* Gadsden Co. Ochlockonee River, Jackson Bluff; Ochlockonee River, 8 mi. W Tallahassee; Lake Talquin, Ochlockonee River near Bloxham; *all* Leon Co. Ochlockonee River, 7½ mi. E Hosford, Liberty Co.

**APALACHICOLA RIVER SYSTEM**

**FLINT RIVER DRAINAGE.**—*Georgia*: Flint River, 10 mi. W Cordele, Crisp Co. Mill Creek, 8 mi. S Oakfield, Worth Co. Flint River, 10 mi. S Albany, Dougherty Co. Flint River, Bainbridge; Flint River, Recovery; *both* Decatur Co. Spring Creek, Reynoldsville; Spring Creek, 2½ mi. below Reynoldsville; *both* Seminole Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Apalachicola River, Chattahoochee, Gadsden Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; Chipola River, 1 mi. N Marianna; *all* Jackson Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: West Fork, Choctawhatchee River, near Blackmans Mill; Choctawhatchee River, 10 mi. N Pinckard; Claybank Creek; *all* Dale Co. Choctawhatchee River, 2 mi. S Geneva, Geneva Co. *Florida*: Choctawhatchee River, 8 mi. W Miller Cross Roads; Choctawhatchee River, 1 mi. W Caryville; *both* Holmes Co.

PEA RIVER DRAINAGE.—*Alabama*: Pea River, Elamville, Barbour Co. Pea River, Flemings Mill, Coffee Co. Pea River, ½ mi. S Geneva, Geneva Co.

#### YELLOW RIVER SYSTEM

YELLOW RIVER DRAINAGE.—*Alabama*: Hollis Creek, near Sanford, Covington Co. *Florida*: Yellow River, Milligan, Okaloosa Co.

#### ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Mill Creek, Youngblood; Conecuh River, Hollville; *both* Pike Co. Conecuh River, near Brantley; Conecuh River, Searight; Little Patsaliga Creek, near Luverne; Hortons Lake, Patsaliga Creek, 10 mi. N Searight; *all* Crenshaw Co. Pigeon Creek, 4 mi. N Pigeon Creek, Butler Co. Conecuh River, Bozeman's Landing; Conecuh River, Dunn's Crossing; *both* Covington Co.

ESCAMBIA RIVER DRAINAGE.—*Alabama*: Escambia River, near Flomaton, Escambia Co. *Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

### Genus *Villosa* Frierson

*Micromya* Agassiz (1852, Archiv für Naturgeschichte, 18 (1): 47), type species, *Unio fabilis* Lea, subsequent designation, probably Simpson, 1900. *Non Micromya* Rondani, 1840 [Insecta].

*Villosa* Frierson (1927: 11, 80).

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

Shells small to medium in size, seldom longer than 100 mm., suboval or subelliptical in outline, and rounded or moderately truncate (females) posteriorly. Beak sculpture double-looped. Color greenish, yellowish, brownish, or nearly black, and usually rayed with green. Marsupia occupy the posterior part of the outer gills in numerous distinctly marked ovisacs.

### *Villosa lienosa* Conrad

#### Plate 4 Figures 3 and 7

*Unio lienosus* Conrad (1834, Amer. Jour. Sci. and Arts, 25: 339, pl. 1, fig. 4), small streams in South Alabama.

*Unio saxeus* Conrad (1840, Monography of the family Unionidae (Philadelphia), p. 109, pl. 60, fig. 1), Alabama River, Claiborne, Alabama.

- Unio caliginosus* Lea (1845, Proc. Amer. Philos. Soc., 4: 165), Red River at Alexandria, Louisiana. Lea, 1848 (4: 53, pl. 7, fig. 21).
- Unio gouldi* Lea (1845, Proc. Acad. Nat. Sci., Phila., 4: 165), Tuscaloosa, Alabama. Lea, 1848 (4: 50, pl. 6, fig. 16).
- Unio nigerrimus* Lea (1852, Trans. Amer. Philos. Soc., 10: 268, pl. 18, fig. 23), Alexandria, Louisiana. Lea, 1852 (5: 24, pl. 18, fig. 23).
- Unio proximus* Lea (1852, Trans. Amer. Philos. Soc., 10: 271, pl. 20, fig. 27), Georgia. Lea, 1852 (5: 27, pl. 20, fig. 27).
- Unio concestator* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 31), creeks near Columbus, Georgia. Lea, 1858 (6: 66, pl. 12, fig. 48).
- Unio apicinus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 32), Othcalooga Creek, Gordon Co., Georgia. Lea, 1857 (6: 76, pl. 14, fig. 56).
- Unio fallax* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 32), streams near Columbus, Georgia; and French Broad River, Tennessee. Lea, 1858 (6: 79, pl. 15, fig. 59).
- Unio intercedens* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 32), streams near Columbus, Georgia. Lea, 1858 (6: 77, pl. 15, fig. 57).
- Unio linguaeformis* Lea (1860, Proc. Acad. Nat. Sci., Phila., 12: 305), Columbus, Georgia. Lea, 1862 (8: 27, pl. 56, fig. 170).
- Unio porphyreus* Lea (1861, Proc. Acad. Nat. Sci., Phila., 13: 60), Coosa River, Alabama. Lea, 1862 (8: 84, pl. 10, fig. 228).
- Unio fontanus* Conrad (1866, Amer. Jour. Conchology, 2: 279, pl. 15, fig. 13), rivulets near Vicksburg, Mississippi.
- Unio genuinus* Lea (1868, Proc. Acad. Nat. Sci., Phila., p. 161), Bissel's Pond, Charlotte, North Carolina. Lea, 1868 (12: 64, pl. 46, fig. 117).
- Unio unicostatus* B. H. Wright (1899, Nautilus, 13: 69), Spring Creek, Decatur Co., Georgia.

DESCRIPTION.—Shell medium in size, reaching 73 mm. (about 3 inches) in length, fairly thin but strong, smooth, subelliptical in outline, and usually inflated. Color generally a dark brownish black, though occasional specimens may be a chestnut brown and young specimens may be greenish brown. A few specimens may be faintly rayed with green. Posterior slope flattened with the posterior ridge poorly defined. There is a marked sexual dimorphism in this species. Male specimens are bluntly pointed posteriorly, while female specimens are definitely angulated and far more inflated. Umbos well anterior to the center, broad and full, but not high. Ligament rather long and narrow. Periostracum smooth on the upper disc, somewhat roughened or satiny on the ventral margin and over the posterior slope.

Nacre variable in color, ranging from whitish through various shades of pink and salmon to a deep purple. It is highly iridescent posteriorly. Anterior muscle scars well defined. Posterior scars poorly defined. Hinge plate long and narrow. Right valve with two—one large and one small—pseudocardinal teeth, which are rather coarsely

crenulate. Left valve with two—one large and one small—pseudo-cardinal teeth, which are less coarsely crenulate.

LENGTH mm.	HEIGHT mm.	BREADTH mm.		
73	44	34	♀	Holmes Creek, 1 mi. W Graceville, Holmes
62	37	26	♂	Co., Florida
60	38	28.5	♀	Mosquito Creek, Chattahoochee, Gadsden
65	37.5	29	♂	Co., Florida
56	36.5	24	♀	Attapulgis Creek, 2 mi. NW Amsterdam,
57	33.5	22.5	♂	Decatur Co., Georgia

**TYPES.**—The holotype of *Villosa lienosa* Conrad is in the Academy of Natural Sciences, Philadelphia (9747). The type locality is small creeks in southern Alabama. We have seen specimens, originally from the Showalter collection, which bear the locality Big Prairie Creek, Marengo County, Alabama, and they are labelled as topotypes. The type specimens of all of the above synonyms by Lea and B. H. Wright are in the United States National Museum.

**REMARKS.**—This is a species of wide distribution in this region, particularly in the smaller rivers and creeks. Occasionally it is the only species found. It prefers mud, particularly when rich in vegetable detritus.

Sexual dimorphism in this species is pronounced; the females are greatly inflated with the posterior margin subangulate dorsally and truncate below. The males are only moderately inflated and are regularly and narrowly rounded posteriorly.

**RANGE.**—From the Suwannee river system in Florida the species ranges west to Texas and north to the Ohio River.

#### SPECIMENS EXAMINED.—

#### SUWANNEE RIVER SYSTEM

WITHLACOOCHÉE RIVER DRAINAGE.—*Georgia*: Withlacoochee River, Olympia, Lowndes Co. *Florida*: Withlacoochee River, Blue Spring, Madison Co.

SUWANNEE RIVER DRAINAGE.—*Florida*: Suwannee River, Ellaville, Madison Co. Suwannee River, Fannin Springs, Gilchrist Co.

SANTA FE RIVER DRAINAGE.—*Florida*: Santa Fe River, Worthington Springs, Union Co. Santa Fe River Sink, Alachua Co.

#### OCHLOCKONEE RIVER SYSTEM

OCHLOCKONEE RIVER DRAINAGE.—*Georgia*: Ochlockonee River, 7 mi. S Cairo; Ochlockonee River between Reno and Beachton; *both* Grady Co. Attapulgis Creek, 2 mi. NW Amsterdam, Decatur Co. *Florida*: Little River, 3½ mi. E Quincy; Little River, 7 mi. WSW Havana; *both* Gadsden Co. Ochlockonee River, 8 mi. W Tallahassee; Ochlockonee River, 11 mi. NW Tallahassee; *both* Leon Co.

## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: North Fork, Pennahatchee Creek, 4 mi. NW Vienna, Dooly Co. Gum Creek, 2 mi. N Cordele; Flint River, 10 mi. W Cordele; Cedar Creek, Cordele; Cedar Creek, 6 mi. SW Cordele; Swift Creek, 12 mi. SW Cordele; *all* Crisp Co. Lee's Creek, 5 mi. S DeSoto, Lee Co. East Fork, Chickasawhatchee Creek, 5 mi. SE Dawson, Terrell Co. Jones Creek, 2 mi. S Oakfield; Abrams Creek, 3 mi. N Doles; Abrams Creek, 5 mi. S Oakfield; Mill Creek, 8 mi. S Oakfield; *all* Worth Co. Ichawaynochaway Creek, 5½ mi. NE Morgan, Calhoun Co. Cooleewahee Creek, Newton, Baker Co. Flint River, Albany; Flint River, 10 mi. S Albany; *both* Dougherty Co. Spring Creek, Reynoldsville; Spring Creek, 2½ mi. S Reynoldsville; *both* Seminole Co. Flint River, Bainbridge; Flint River, Recovery; *both* Decatur Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Bull Creek, near Columbus; Chattahoochee River, Columbus; *both* Muscogee Co. Sawhatchee Creek, 10 mi. NW Donalsonville, Seminole Co. *Alabama*: Big Uchee Creek, Youngs Bridge, 6 mi. NE Seale, Russell Co. Cowikee Creek, 6 mi. N Eufaula, Barbour Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Mosquito Creek, Chattahoochee; Apalachicola River, Chattahoochee; *both* Gadsden Co. Apalachicola River, Blountstown, Calhoun Co.

CHIPOLA RIVER DRAINAGE.—*Alabama*: Goff Creek, near Smyrna; Cowarts Creek, near Cowarts; Rocky Creek, near Pansey; Spring Creek, near Madrid; Reedy Creek near Madrid; Big Creek near state line; *all* Houston Co. *Florida*: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; Spring Creek, 3 mi. E Marianna; Chipola River, 1 mi. N Marianna; creek 2.4 mi. NNW Sink Creek; Chipola River, 1 mi. W Sink Creek; *all* Jackson Co. Chipola River, Look and Tremble Falls, near Altha; Chipola River, 2 mi. E. Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; *all* Calhoun Co.

## CHOCTAWHATCHEE RIVER SYSTEM

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: Little Choctawhatchee River, near Wicksburg; Little Choctawhatchee River, 5 mi. S Pinckard; East Fork, Choctawhatchee River near Midland City; West Fork, Choctawhatchee River, 7 mi. E Ozark; *all* Dale Co. Little Choctawhatchee River near Drews Bridge; Little Choctawhatchee River near Dothan; Bear Creek, Dothan; *all* Houston Co. East Fork Choctawhatchee River, 8 mi. W Abbeville; Van's Mill Creek, near Abbeville; *both* Henry Co. Beaver Creek, near Malvern; Choctawhatchee River, near mouth Gilley's Mill Creek; Choctawhatchee River, 2 mi. E Geneva; Hurricane Creek, 2½ mi. E Hartford; *all* Geneva Co. *Florida*: Choctawhatchee River, 8 mi. W Miller Cross Roads; Choctawhatchee River, 1 mi. W Caryville; Holmes Creek, 1 mi. W Graceville; Hurricane Creek, 5 mi. E Miller Cross Roads; *all* Holmes Co. *PEA RIVER DRAINAGE*.—*Alabama*: Pea River, near Elamville, Barbour Co. Pea River, at Preston Mill, Dale Co. Pea River, ½ mi. SW Geneva, Geneva Co.

## YELLOW RIVER SYSTEM

YELLOW RIVER DRAINAGE.—*Alabama*: Hollis Creek, near Sanford; Yellow River near Opp; Yellow River, Harmony; *all* Covington Co. *Florida*: Yellow River, Milligan, Okaloosa Co.

## ESCAMBIA RIVER SYSTEM

CONECUH RIVER DRAINAGE.—*Alabama*: Olustee Creek, near Shady Grove, Pike Co.

Little Patsaliga Creek, near Luverne; Horse Creek, near Luverne; Dry Creek, Brantley; Conecuh River, near Brantley; Conecuh River, Searight; *all* Crenshaw Co. Oakwoods Creek, Butler Co. Conecuh River, Bozeman's Landing; Covington Co. Sandy Creek, near Evergreen; Murder Creek, near Evergreen; Hunter Creek, Evergreen; *all* Conecuh Co.

ESCAMBIA RIVER DRAINAGE.—*Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

*Villosa vibex* Conrad

Plate 4 Figure 4

*Unio vibex* Conrad (1834: 31, pl. 4, fig. 3), Black Warrior River, S of Blount's Spring, Alabama.

*Unio exiguus* Lea (1840, Proc. Amer. Philos. Soc., 1: 287), Chattahoochee River, Columbus, Georgia. Lea, 1842 (3: 29, pl. 7, fig. 1).

*Unio prevostianus* Lea (1852, Trans. Amer. Philos. Soc., 10: 269, pl. 19, fig. 24), Etowah River, Georgia. Lea, 1852 (5: 25, pl. 19, fig. 24).

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

*Unio rutilans* Lea (1856, Proc. Acad. Nat. Sci., Phila., 8: 262), Oothcalooga [Oothkaloo] Creek, Gordon Co., Georgia. Lea, 1858 (6: 59, pl. 9, fig. 41).

*Unio subellipsidis* Lea (1856, Proc. Acad. Nat. Sci., Phila., 8: 262), creeks near Columbus, Georgia. Lea, 1858 (6: 62, pl. 10, fig. 44).

*Unio sudus* Lea (1857, Proc. Acad. Nat. Sci., Phila., 9: 170), Dry Creek near Columbus, Georgia. Lea, 1859 (7: 12, pl. 21, fig. 77).

*Unio dispar* Lea (1860, Proc. Acad. Nat. Sci., Phila., 12: 305), Columbus, Georgia. Lea, 1862 (8: 309, pl. 51, fig. 153).

DESCRIPTION.—Shell medium in size, reaching 100 mm. (4 inches) in length, thin in structure, smooth, subelliptical in outline, and usually inflated. Color variable, ranging from a light yellowish brown to almost black, and generally with numerous and fairly broad greenish rays. In the darker specimens the rays can usually be seen in transmitted light. Posterior slope moderately concave with the posterior ridge poorly defined. Posterior margin broadly rounded, being somewhat broader in the female. Umbos well anterior to the center, broad and full, but not high. Ligament short and narrow. Periostracum smooth on the disc, roughened on the posterior slope and near the ventral margin.

Nacre bluish white to pink and purple, and highly iridescent posteriorly. Anterior muscle scars well defined. Posterior scars poorly defined. Hinge plate long and exceedingly narrow. Right valve with one small, triangular, and crenulate pseudocardinal tooth. Left valve with two—one large and one small—pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH		
mm.	mm.	mm.		
100	47	29.5	♂	Flint River, Bainbridge, Decatur Co.,
85	45	35	♀	Georgia
73	42	26.5	♀	Suwannee River, Oldtown, Dixie Co.,
66.5	37	23	♂	Florida
65	36	25	♀	Santa Fe River, near Bland, Alachua Co.,
65.5	36.5	22.5	♂	Florida

**TYPES.**—The location of the holotype of *Villosa vibex* Conrad is unknown. The type specimens of all of Lea's species listed in the synonymy above are in the United States National Museum.

**REMARKS.**—Sexual dimorphism is not as strongly developed in this species as it is in *V. lienosa* Conrad. In *V. vibex* the posterior end of the female is broadly rounded, while the males are bluntly angulate. In addition, the females are rather more inflated than the males. Many specimens, however, are impossible to sex by the shells alone. Young specimens are more highly colored and have the greenish rays more prominent. This species differs from *V. lienosa* by being generally larger, having a much thinner shell, and having the rays far more prominent.

**RANGE.**—This species extends from southern Florida west to the Pearl River, Mississippi (Simpson, 1914), and north to the Savannah river system.

**SPECIMENS EXAMINED.**—

**WITHLACOOCHEE RIVER SYSTEM**

*Florida:* Withlacoochee River, 9 mi. N Dade City, Pasco Co.

**WACCASASSA RIVER SYSTEM**

*Florida:* Waccasassa River, Levy Co.

**SUWANNEE RIVER SYSTEM**

**SANTA FE RIVER DRAINAGE.**—*Florida:* New River, SW Lake Butler; Santa Fe River, Worthington Springs; *both* Union Co. Rocky Creek, E La Crosse; Santa Fe River, N Bland; Santa Fe River, NW High Springs; Santa Fe River, Poe Springs; *all* Alachua Co. Ichucknee River, 5 mi. NW Fort White, Columbia Co.

**SUWANNEE RIVER DRAINAGE.**—*Florida:* Suwannee River, Jasper, 6 mi. above Ellaville; Suwannee River, Ellaville; *both* Madison Co. Suwannee River, Old Town, Dixie Co.

**WITHLACOOCHEE RIVER DRAINAGE.**—*Georgia:* Withlacoochee River, Olympia, Lowndes Co.

**OCHLOCKONEE RIVER SYSTEM**

**OCHLOCKONEE RIVER DRAINAGE.**—*Georgia:* Attapulgus Creek, 2 mi. NW Amsterdam, Decatur Co. Ochlockonee River, 7 mi. S Cairo, Grady Co. *Florida:* Little River, 3½ mi. E Quincy, Gadsden Co. Ochlockonee River, 11 mi. NW Tallahassee; Ochlockonee River, 8 mi. W Tallahassee; *both* Leon Co.

**APALACHICOLA RIVER SYSTEM**

**FLINT RIVER DRAINAGE.**—*Georgia:* Stream, 6 mi. N Vienna; North Fork Penna-



hatchee Creek, 4 mi. NW Vienna; Pennahatchee Creek, Vienna; all Dooly Co. Gum Creek, 2 mi. N Cordele; Flint River, 10 mi. W Cordele; Cedar Creek, 6 mi. SW Cordele; Swift Creek, 12 mi. SW Cordele; all Crisp Co. Lee's Creek, 5 mi. S DeSoto, Lee Co. East Fork Chickasawhatchee Creek, 5 mi. SE Dawson; Kicke Creek, 15 mi. SE Dawson; both Terrell Co. Jones Creek, 2 mi. S Oakfield; Abrams Creek, 3 mi. W Doles; Abrams Creek, 5 mi. S Oakfield; Mill Creek, 8 mi. S Oakfield; all Worth Co. Ichawaynochaway Creek, 5½ mi. NE Morgan, Calhoun Co. Cooleewahee Creek, Newton, Baker Co. Creek 6 mi. W Albany, Dougherty Co. Spring Creek, Reynoldsville, Seminole Co. Flint River, Bainbridge; Flint River, Recovery; Four Mile Creek, 3 mi. SW Bainbridge; all DeCATUR Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Chattahoochee River, Franklin, Heard Co. Chattahoochee River, West Point, Troup Co. Mulberry Creek, 3 mi. SSE Mountain Hill, Harris Co. Chattahoochee River, Columbus; Randall's Creek, near Columbus; Bull Creek, Columbus; all Muscogee Co. Sawhatchee Creek, 4 mi. NW Donalsonville, Seminole Co. *Alabama*: Uchee Creek, Fort Mitchell, Russell Co. Cowikee Creek, 6 mi. N Eufaula, Barbour Co.

APALACHICOLA RIVER DRAINAGE.—*Florida*: Mosquito Creek, ½ mi. E Chattahoochee, Gadsden Co. Stafford Creek, 3 mi. N Blountstown, Calhoun Co.

CHIPOLA RIVER DRAINAGE.—*Alabama*: Goff Creek, near Smyrna; Cowarts Creek, near Cowarts; Rocky Creek near Pansey; Reedy Creek, near Madrid; Beaver Creek, near Taylor; Spring Creek, near Madrid; all Houston Co. *Florida*: Reedy Creek, 6 mi. W Malone; Big Creek, 8 mi. W Malone; creek, 2.4 mi. NNW Sink Creek; Spring Creek, 3 mi. E Marianna; Chipola River, 1 mi. N Marianna; all Jackson Co. Chipola River, 2½ mi. SE Chason; Chipola River, Look and Tremble Falls, near Alpha; Chipola River, 2 mi. E Clarksville; Chipola River, Scotts Ferry; Dead Lake, Chipola River, Chipola Park; all Calhoun Co.

#### CHOCTAWHATCHEE RIVER SYSTEM

CHOCTAWHATCHEE RIVER DRAINAGE.—*Alabama*: East Fork, Choctawhatchee River, 8 mi. W Abbeville, Henry Co. Bear Creek, near Dothan, Houston Co. Little Choctawhatchee River; Alexanders Creek and Panther Creek, near Pinckard; all Dale Co. Hurricane Creek at railroad crossing, Geneva Co. *Florida*: Holmes Creek, 1 mi. W Graceville; Holmes Creek, 3 mi. E Bonifay; Hurricane Creek, .5 mi. E Miller Cross Roads; Choctawhatchee River, 8 mi. W Miller Cross Roads; all Holmes Co. Horseshoe Lake, Choctawhatchee River; Holmes Creek, Millers Ferry; both Washington Co.

#### YELLOW RIVER SYSTEM

*Alabama*: Yellow River, near Opp; Yellow River, Harmony; both Covington Co. *Florida*: Yellow River, Milligan, Okaloosa Co.

#### ESCAMBIA RIVER SYSTEM

*Alabama*: Beaman's Creek, near Youngblood, Pike Co. Little Patsaliga Creek; Horse Creek, near Luverne; Dry Creek, Brantley; all Crenshaw Co. Gin Creek, near Evergreen, Conecuh Co. *Florida*: Escambia River, 3 mi. SE Century, Escambia Co.

*Villosa vibex amygdala* Lea

Plate 4 Figure 1

*Unio amygdalum* Lea (1843, Descriptions of twelve new species of Unios (Philadelphia), single sheet), Lake George, Florida. Lea (1845, Trans. Amer. Philos. Soc., 9: 275, pl. 39, fig. 1), Lea, 1848 (4: 33, pl. 39, fig. 1).

- Unio trosculus* Lea (1843, Descriptions of twelve new species of Unios (Philadelphia), single sheet), Monroe Lake, Florida.
- Unio trossulus* Lea (1845, Trans. Amer. Philos. Soc., 9: 278, pl. 40, fig. 6). Lea, 1848 (4: 36, pl. 40, fig. 6) [error for *trosculus* Lea].
- Unio papyraceus* Gould (1845, Proc. Boston Soc. Nat. Hist., 2: 53), Everglades, Florida [near Cape Florida, Simpson (1892: 427)]. Simpson (1892: 427, pl. 68, fig. 2).
- Unio lepidus* Gould (1856, Proc. Boston Soc. Nat. Hist., 6: 15), creek, near Lake Monroe, Florida. Simpson (1892: 426, pl. 68, fig. 1; pl. 69, fig. 3).
- Unio vesicularis* Lea (1872, Proc. Acad. Nat. Sci., Phila., p. 156), Lake Ocheechebee [Okeechobee], Florida. Lea (1874, Jour. Acad. Nat. Sci., Phila. (n.s.), 8: 37, pl. 12, fig. 34). Lea, 1874 (13: 41, pl. 12, fig. 34).
- Unio averellii* B. H. Wright (1888, Proc. Acad. Nat. Sci., Phila., p. 115, pl. 3, fig. 2), Lake Ashby, Volusia Co., Florida.
- Unio singleyanus* W. B. Marsh (1891, Nautilus, 5: 29), small creek near Palatka [Palatka], Florida. Simpson (1892: 426, pl. 68, figs. 4-5).
- Lampsilis wrightiana* Frierson (1927: 81), Volusia Co., Florida.

DESCRIPTION.—Shell small to medium in size, reaching 63 mm. (about 2½ inches) in length, thin in structure, smooth, subelliptical in outline, and usually inflated. Color variable, ranging from a light straw yellow to nearly black, and generally possessing numerous green rays. Posterior slope moderately concave with the posterior ridge poorly defined. Posterior end broadly to narrowly rounded. Umbos well anterior to the center, broad and full, but not high. Ligament short and narrow. Periostracum smooth on the disc, somewhat roughened on the posterior slope and near the ventral margin.

Nacre bluish white and highly iridescent, particularly at the posterior end. Anterior muscle scars well defined. Posterior scars poorly defined. Hinge plate long and exceedingly narrow. Right valve with a single, small, triangular, and crenulate pseudocardinal tooth. Left valve with two—one large and one small—pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH.	
mm.	mm.	mm.	
63	35	25.5	Holotype of <i>U. lepidus</i> Gould
57	34	21	Pincrest, Monroe Co., Florida
52	31.5	17.5	Lake Ashby, Volusia Co., Florida

TYPES.—The type of *U. amygdalum* Lea, as well as all of the species of Lea and B. H. Wright listed in the synonymy above, are in the United States National Museum. The holotype of *U. lepidus* Gould is in the New York State Museum. The location of the holotype of *U. papyraceus* Gould is unknown. There are, however, a series of paratypes in the United States National Museum. The holotype of *Lampsilis wrightiana* Frierson is in the Museum of Zoology, University

of Michigan. The type locality is Lake George, Florida.

REMARKS.—This subspecies differs from the typical form by being a little smaller on the average, generally thinner, and by having the greenish rays more pronounced. In addition, *amygdala* is a little higher in proportion to its length.

The distribution of this subspecies corresponds rather closely with that of *Anodonta cowperiana*, and *Viviparus georgianus wareanus*.

RANGE.—This subspecies is distributed rather uniformly in the St. Johns, Okeechobee, and Peace River drainages.

SPECIMENS EXAMINED.—

#### OKEECHOBEE RIVER SYSTEM

Florida: Pinecrest, 50 mi. W Miami in Monroe Co. Canals W of Palm Beach; Jupiter Inlet; both Palm Beach Co. Lake Tohopekaliga, Kissimmee, Osceola Co. Lake Wales, Polk Co.

#### WITHLACOOCHEE RIVER SYSTEM

Florida: Lake Tsala Apopka; Lake Consuelo; both Citrus Co.

#### PEACE RIVER SYSTEM

Florida: Peace River, Arcadia; pond near Arcadia; both DeSoto Co.

#### ST. JOHNS RIVER SYSTEM

Florida: 2.5 mi. W Melbourne, Osceola Co. Ditch near Lake Washington, 6 mi. W Eau Gallie, Brevard Co. Econlockhatchee River, near confluence with St. Johns River; Puzzle Lake, 7 mi. SE Geneva; Sanford; Lake Jessup; all Seminole Co. Lake Monroe near Enterprise; St. Johns River near Enterprise; Lake Ashby; Lake Beresford; all Volusia Co. Lake Eustis, Tavares, Lake Co. Jacksonville, Duval Co.

### *Villosa villosa* Wright

#### Plate 4 Figure 2

*Unio villosus* B. H. Wright (1898, *Nautilus*, 12: 32), Suwannee River, Suwannee Co., Florida.

*Lampsilis villosus* Wright. Simpson (1900: 77, pl. 1, fig. 1).

DESCRIPTION.—Shell small to medium in size, reaching 65.5 mm. (about 2½ inches) in length, rather thin in structure, smooth, somewhat inflated, and elliptical in outline. Color a rather uniform blackish brown with green rays visible in transmitted light. Posterior slope slightly concave with the posterior ridge poorly defined. Umbos well anterior to the center, broad and full, but not high. Ligament rather short and narrow. Periostracum satiny and generally rough over the entire surface of the shell.

Nacre bluish white and highly iridescent, particularly posteriorly. Anterior muscle scars well defined. Posterior scars poorly defined. Hinge plate long and narrow. Right valve with one large and one

small (often obsolete) pseudocardinal tooth. Left valve with two sub-equal pseudocardinal teeth.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
65.5	32	24.5	Mosquito Creek, Chattahoochee, Gadsden Co., Florida
57	29.5	21.5	Spring Creek, Seminole Co., Georgia
40.5	21.5	14.5	Suwannee River, Suwannee Co., Florida (paratype)

**TYPES.**—The holotype of *Unio villosa* Wright is in the United States National Museum. Paratypes are in the Museum of Comparative Zoology (186836). The type locality is Suwannee River, Suwannee County, Florida.

**REMARKS.**—This species appears to be quite rare, and, so far as we can now determine, it is limited to spring-fed streams and clear rivers.

This species differs from *V. vibex* Conrad by possessing a peculiar type of roughened periostracum which produces a satiny lustre. The shell is rayed with green, but these rays are rendered obscure by the periostracum. They are, however, readily visible in transmitted light. Proportionately *V. villosa* is more elongate than *vibex* with the dorsal and central margins more or less parallel.

**RANGE.**—This species extends from the Suwannee River west to the lower reaches of the Apalachicola river system.

**SPECIMENS EXAMINED.**—

#### SUWANNEE RIVER SYSTEM

*Florida:* Suwannee River, Suwannee Co. Suwannee River, Fannin Spring, Gilchrist Co.

#### OCHLOCKONEE RIVER SYSTEM

*Florida:* Ochlockonee River,  $7\frac{1}{2}$  mi. E Hosford, Liberty Co. Lake Talquin, Ochlockonee River, Leon Co.

#### APALACHICOLA RIVER SYSTEM

**FLINT RIVER DRAINAGE.**—*Georgia:* Spring Creek, Decatur Co.

**APALACHICOLA RIVER DRAINAGE.**—*Florida:* Mosquito Creek, Chattahoochee, Gadsden Co.

**CHIPOLA RIVER DRAINAGE.**—*Florida:* Chipola River, 1 mi. W Sink Creek, Jackson Co. Dead Lake, Chipola River, Chipola Park, Calhoun Co.

#### SPHAERIIDAE

Shells nonnacreous, thin, and generally under one inch in length. Hinge has cardinal teeth and both anterior and posterior lateral teeth, but no hinge plate. Pallial line simple.

Until a complete revision is made of the entire family Sphaeriidae, no definite statement can be made regarding the distribution of any of its species.

### Genus *Sphaerium* Scopoli

*Sphaerium* Scopoli (1777, Intr. Hist. Nat. p. 397), [we have not seen this publication].

Type species, *Tellina cornea* Linné. Walker (1918: 86).

Shell oval, equilateral, and with the umbos more or less centrally located. Nepionic valves not distinctly separated from the later growth stages. There are two cardinal teeth in each valve.

### *Sphaerium stamineum* Conrad

#### Plate 6 Figure 5

*Cyclas staminea* Conrad (1834, Amer. Jour. Sci., 25: 342, pl. 1, fig. 5), small streams in southern Alabama.

*Sphaerium stamineum* Conrad. Pilsbry (1946, Nautilus, 59: 83, text fig. 1).

DESCRIPTION.—(from Pilsbry, *loc. cit.*)—"The shell is oval with the posterior end somewhat truncate obliquely, the anterior rounded, the upper and basal margins about equally curved, the beaks moderately full but low, not projecting much above the hinge-line. The lunule is distinct, wide; escutcheon very narrow. The surface is slightly glossy, finely, subregularly rib-striate throughout, the striae extending on the ends, and well developed on the beaks. Color straw yellow, fading to light grayish olive near the beaks. The hinge is moderately curved, the ligament occupying more than half of its width. Right cardinal tooth angular, the posterior limb longer than the anterior, neither ramus bifid. Left anterior cardinal triangular, somewhat excavated below, its crest therefore the shape of an inverted V. Anterior laterals heavy, towards the cardinals curving under the level of the hinge; posterior laterals rather slender."

LENGTH mm.	HEIGHT mm.	BREADTH mm.	
14.4	10.7	8	Greer Creek, Marengo Co., Alabama
11.2	8.5	6	Mulberry Creek, 3 mi. SSE Mountain Hill, Harris Co., Georgia
11.0	9.0	6	Paul Clark Spring, 2½ mi. W Recovery, De- catur Co., Georgia

**TYPES.**—The holotype of *Sphaerium stamineum* Conrad is in the Academy of Natural Sciences, Philadelphia (10186). A paratype is in the Museum of Comparative Zoology (19434). The type locality is small streams in southern Alabama.

**REMARKS.**—Until a complete revision is made of the entire family Sphaeriidae, no definite statement can be made regarding the distribution of this species. It is a rare species in this area and apparently is limited to springs and spring-fed creeks.

**RANGE.**—Probably widely distributed throughout the southern states.

**SPECIMENS EXAMINED.**—

**APALACHICOLA RIVER SYSTEM**

**FLINT RIVER DRAINAGE.**—*Georgia*: Alaga Hole, 8 mi. W Recovery; Paul Clark Spring, 2½ mi. W Recovery; both Decatur Co.

**CHATTAHOOCHEE RIVER DRAINAGE.**—*Georgia*: Mulberry Creek, Mitchell Bridge; 3 mi. SSE Mountain Hill, Harris Co.

**Genus *Pisidium* Pfeiffer**

*Pisidium* Pfeiffer (1821, Naturg. deutsch. Land-Moll. (1), pp. 17, 123), [we have not seen this publication].

Type species, *Tellina amnica* Müller. Walker (1918: 88).

Shell rounded, oval or obliquely wedge-shaped, inequilateral, and with the umbos well posterior to the center. Two cardinal teeth in each valve; anterior and posterior laterals well developed.

*Pisidium dubium* Say

Plate 6 Figure 4

*Pisidium virginicum* of authors; non Gmelin, 1790.

*Cyclas dubia* Say (1816, Nicholson's Encyclopedia, Conchology, pl. 1, fig. 10), Delaware River, Pennsylvania.

*Pisidium dubium* Say. Pilsbry (1946, Nautilus, 59: 86, text fig.)

**DESCRIPTION.**—Shell reaching 8 mm. (about ⅓ inch) in length, rather strong, inequilateral, subinflated, and with the umbos well posterior to the center. Color light straw yellow to dark olivaceous brown. Sculpture consists of numerous concentric threadlike ridges.

Interior of shell bluish white. Muscle scars well defined. There are two cardinal teeth in each valve, the lateral teeth are elongate, and there are two in the right and one in the left valve.

LENGTH	HEIGHT	BREADTH	
mm.	mm.	mm.	
7.2	6.6	4.6	Big Creek, 8 mi. W Malone, Jackson Co., Florida
6.5	6.5	4.6	Flint River, Recovery, Decatur Co., Georgia

**TYPES.**—The holotype of *Pisidium dubium* Say is in the Academy of Natural Sciences, Philadelphia (59830), and is from the Delaware River, Pennsylvania, probably near Philadelphia.

**REMARKS.**—This is a rare species within the area covered by this report; only one or two specimens were taken at each of the localities given below.

We fully agree with Pilsbry that the name *virginicum* Gmelin should be discarded. The figure in Lister to which Gmelin referred is completely unrecognizable.

**RANGE.**—Probably widely distributed throughout all of the southern states, at least as far north as Pennsylvania.

#### SPECIMENS EXAMINED.—

#### APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—*Georgia*: Flint River, Recovery, Decatur Co.

CHATTAHOOCHEE RIVER DRAINAGE.—*Georgia*: Chattahoochee River, West Point, Troup Co. *Florida*: Cypress swale, 1 mi. N Sneads, Jackson Co.

CHIPOLA RIVER DRAINAGE.—*Florida*: Big Creek, 8 mi. W Malone; Chipola River, 1 mi. N Marianna; both Jackson Co. Chipola River, 2 mi. E Clarksville, Calhoun Co.

#### Genus *Byssanodonta* d'Orbigny

*Byssanodonta* d'Orbigny (1846, Voyage dans l'Amerique Meridionale, 5: 621).

Type species, *Byssanodonta paranensis* d'Orbigny, monotypic.

The shells are small, usually under 10 mm. in length, thin, and spotted with blackish areas of pigmentation. The valves are nearly equilateral, the umbos subcentral, and each has a single cardinal tooth.

#### *Byssanodonta singleyi* Pilsbry

#### Plate 6 Figure 6

*Sphaerium* (*Limosina*) *singleyi* Pilsbry (1889, Proc. Acad. Nat. Sci., Phila., p. 88, pl. 3, figs. 14-15), Cedar Creek, Hudson Co., Texas.

*Eupera singleyi* Pilsbry. Walker (1915, Nautilus, 29: 82). M. Smith (1927, Nautilus, 41: 54). Goodrich (1944, Nautilus, 58: 48).

DESCRIPTION.—Shell small in size, reaching 7 mm. (about  $\frac{1}{4}$  inch) in length, subcircular to suboval in outline, thin in structure, and inflated. Color a rather dark straw yellow and irregularly mottled with black. Posterior slope flat; posterior ridge poorly defined; shell tapers slightly posteriorly. Umbos a little anterior to the center, fairly high and full. Ligament short and narrow. Periostracum dull over the entire surface. Sculpture consists of numerous and fine concentric ridges; the beak areas comparatively smooth.

Interior of valve a smoky blue gray; the mottled coloration of black extends only to the pallial line. Muscle scars and pallial line well defined. Hinge plate narrow. Cardinal teeth feeble to absent, anterior and posterior laterals well developed. In the right valve there are two broadened areas having sockets. In the left valve there are two teeth which fit into the sockets of the opposing valve.

LENGTH mm.	HEIGHT mm.	BREADTH mm.	
7.	5.5	3.6	Spring Creek, Reynoldsville, Seminole Co., Georgia
5.5	4.2	3.5	Ditto

TYPES.—The holotype of *B. singleyi* Pilsbry is in the Academy of Natural Sciences, Philadelphia, and is from Cedar Creek, Hudson County, Texas.

REMARKS.—This is a rare species though it may be abundant locally. Herbert Athearn collected it on exposed roots of trees that margined Spring Creek at Reynoldsville, Georgia. This same habitat preference was reported upon by Walker (*loc. cit.*) for individuals which were obtained by L. S. Frierson at Bayou Pierre, DeSoto Parish, Louisiana.

*Byssanodonta singleyi* Pilsbry may be more abundant than is indicated by the few known records that have been published. It has been found alive as stated above, living on the rootlets of trees that extend into the water. Because of their small size and unusual habitat they would be readily overlooked unless they were sought for particularly. M. Smith (*loc. cit.*) has recorded it from an "island in [the upper] St. John's River near Blue Springs" in Volusia County, Florida. Goodrich (*loc. cit.*) records it from five localities in the Alabama-Coosa river system in Alabama.

The genus occurs in the West Indies, Central and South America, and in Africa.

RANGE.—The species occurs in northern Florida, Georgia, west into Texas and south into Mexico.

SPECIMENS EXAMINED.—



## APALACHICOLA RIVER SYSTEM

FLINT RIVER DRAINAGE.—Georgia: Spring Creek, Reynoldsville, Seminole Co.

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PLATES

## PLATE 1

FIG. 1.—*Viviparus georgianus goodrichi* Archer. Spring-fed creek, 5 mi. NE Marianna, Jackson Co., Florida. Holotype, MCZ 92432; slightly enlarged.

FIG. 2.—*Viviparus georgianus altior* Pilsbry, Hitchins Creek, near Lake George, Putnam Co., Florida. Paratype, MCZ 53884; 1.4X.

FIG. 3.—*Viviparus georgianus* Lea. Hopeton, near Darien, McIntosh Co., Georgia. Lectotype, USNM 106252; 1.4X.

FIG. 4.—*Viviparus georgianus limi* Pilsbry. Dougherty Co., Georgia. Lectotype, ANSP 27731; 1.4X.

FIG. 5.—*Viviparus georgianus wareanus* Küster. Lake Okēechobee, Canal Point, Palm Beach Co., Florida. MCZ 104280; 1.4X.

FIG. 6.—*Pomacea paludosa* Say. Wakulla Springs, Wakulla Co., Florida. MCZ 191621; natural size.

FIGS. 7-8.—*Campeloma geniculum* Conrad. Flint River, Bainbridge, Decatur Co., Georgia. MCZ 190336; 1.4X.

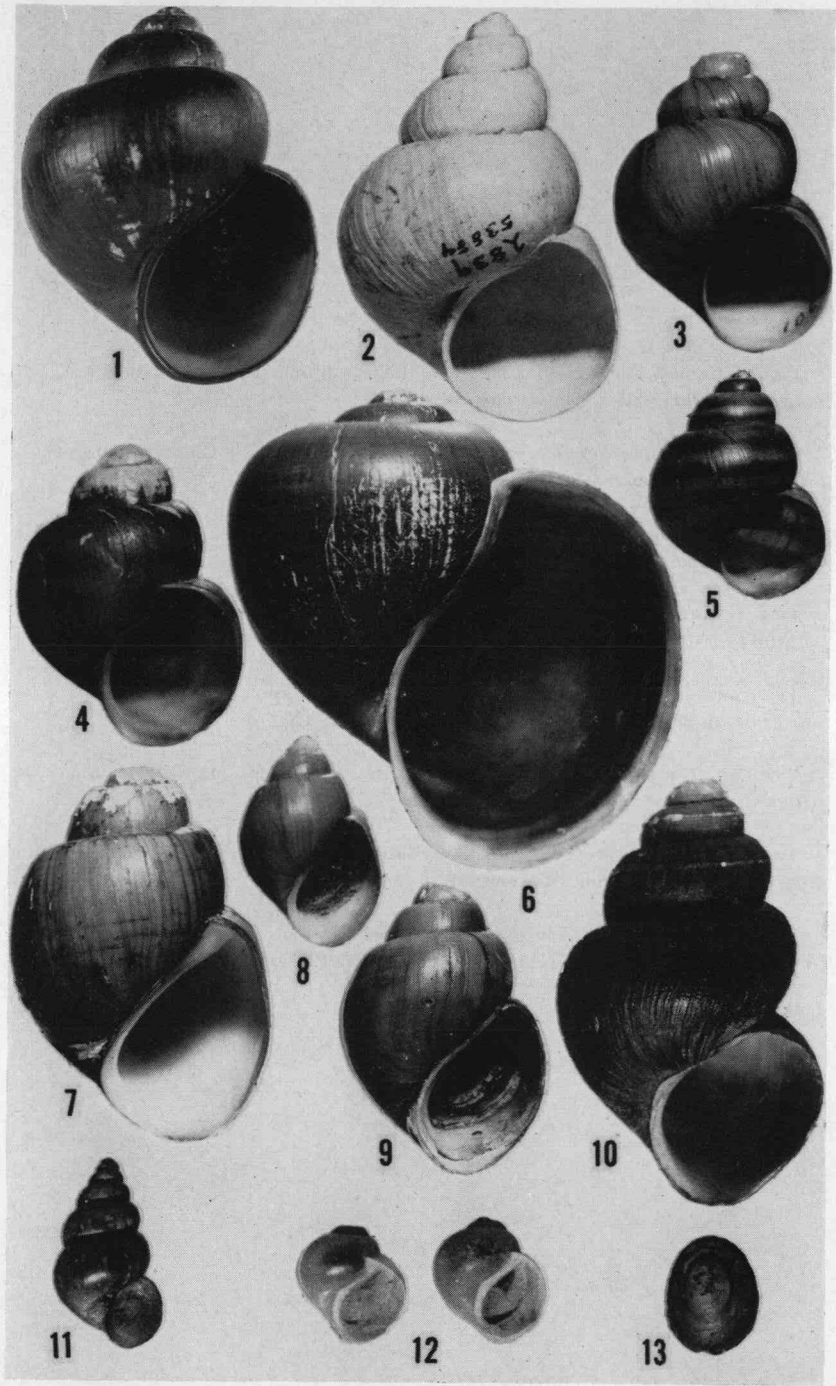
FIG. 9.—*Campeloma floridense* Call. Wekiva River, Orange Co., Florida. Lectotype, MCZ 189592; 1.4X.

FIG. 10.—*Lioplax pilsbryi* Walker. Chipola River, Florida. Lectotype, MZUM; 1.8X.

FIG. 11.—*Pomatiopsis lapidaria* Say. Apalachicola River, Chattahoochee, Gadsden Co., Florida. MCZ 191835; 4X.

FIG. 12.—*Somatogyrus substriatus* Walker. Choctawhatchee River, 9 mi. S Ozark, Dale Co., Alabama. MCZ 186763; 4X.

FIG. 13.—*Ferrissia dalli* Walker. Blue Spring, 7½ mi. SW Recovery, Decatur Co., Georgia. MCZ 190427; 4X.



## PLATE 2

FIG. 1.—*Crenodonta neisleri* Lea. Dead Lake, Chipola River, Chipola Park, Calhoun Co., Florida. MCZ 190284; natural size.

FIG. 2.—*Lampsilis subangulata* Lea. Mosquito Creek, 1 mi. S Chattahoochee, Gadsden Co., Florida. MCZ 190080; natural size.

FIG. 3.—*Lampsilis australis* Simpson. Little Patsaliga Creek, Crenshaw Co., Alabama. Paratype, MCZ 20154; natural size.

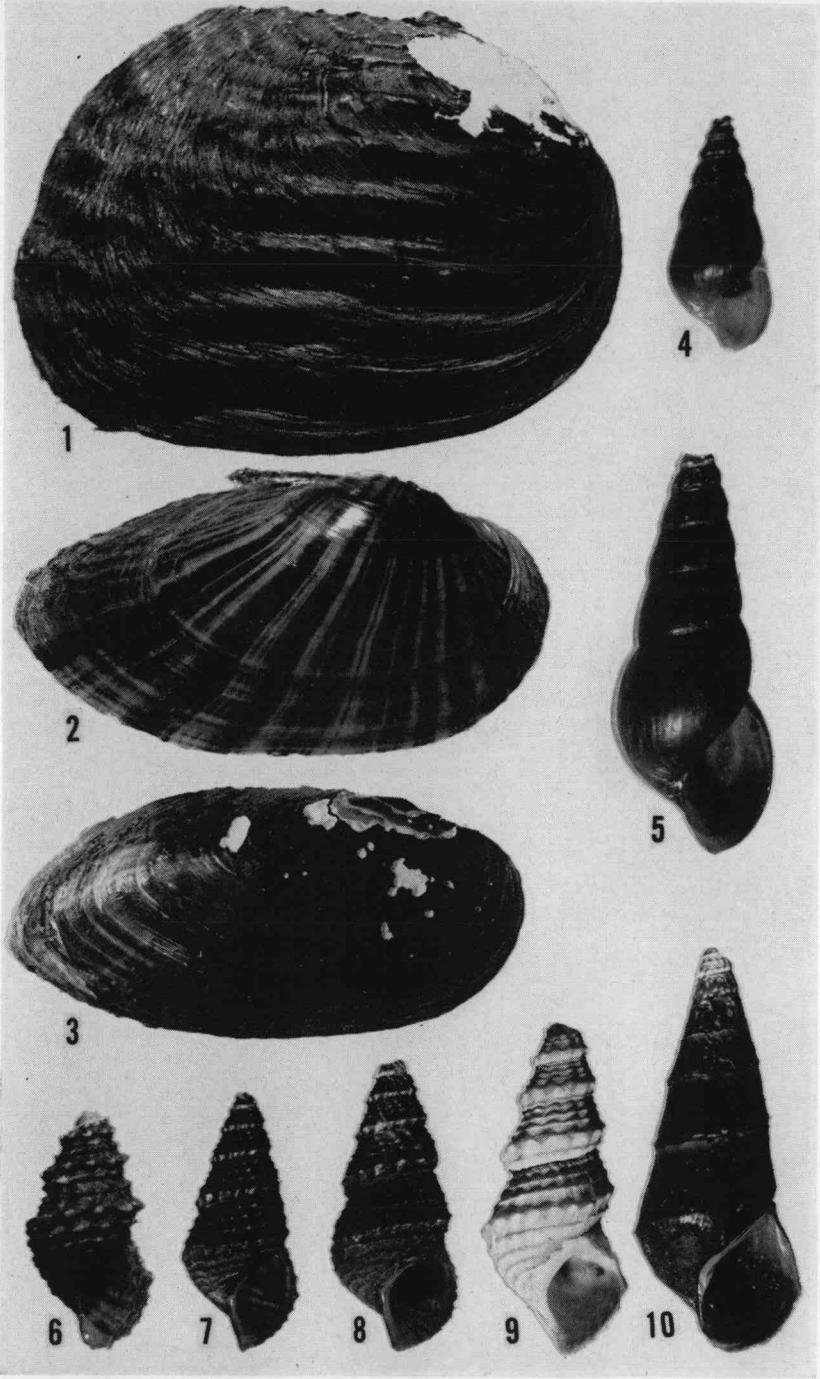
FIGS. 4-5.—*Goniobasis curvicostata* Reeve. Mosquito Creek, 2 mi. SW Recovery, Decatur Co., Georgia. MCZ 190069; both 2.3X.

FIG. 6.—*Goniobasis athearni* Clench and Turner. Chipola River, 2½ mi. SE Chas-son, Calhoun Co., Florida. Holotype, MCZ 190102; 2X.

FIGS. 7-8.—*Goniobasis floridensis* Reeve. Blue Spring, 7½ mi. SW Recovery, Decatur Co., Georgia. MCZ 190417; both 2.4X.

FIG. 9.—*Goniobasis papillosa* 'Anthony' Reeve (= *G. floridensis* Reeve). Enterprise, Volusia Co., Florida. Cotypte, MCZ 50234; 2.4X.

FIG. 10.—*Goniobasis dickinsoni* Clench and Turner. Holmes Creek, 1 mi. W Graceville, Jackson Co., Florida. Holotype, MCZ 191771; 2.4X.



## PLATE 3

FIG. 1.—*Lampsilis anodontoides floridensis* Lea. Flint River, Recovery, Decatur Co., Georgia. MCZ 191862; natural size.

FIG. 2.—*Lampsilis claibornensis* Lea. Lake Talquin, Ochlockonee River, Leon Co., Florida. MCZ 190371; natural size.

FIG. 3.—*Lampsilis excavatus* Lea. Escambia River, 3 mi. SE Century, Escambia Co., Florida. MCZ 191847; natural size.

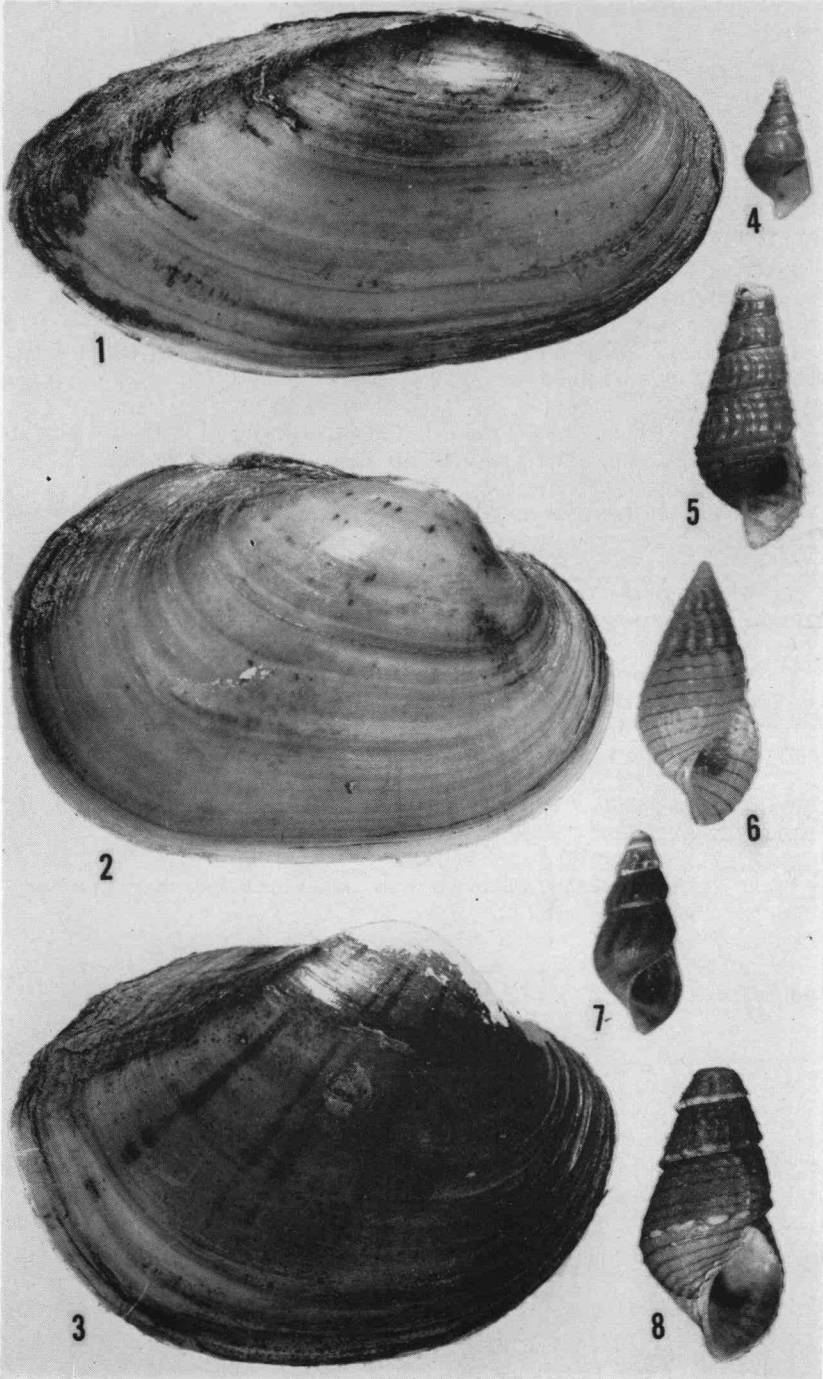
FIGS. 4-5.—*Goniobasis clenchi* Goodrich. Choctawhatchee River, Newton, Dale Co., Alabama. Paratypes, MCZ 91724; both 2X. Fig. 4, young.

FIG. 6.—*Goniobasis albanyensis* Lea. Flint River, Bainbridge, Decatur Co., Georgia. MCZ 190406; 2X.

FIG. 7.—*Goniobasis vanhyningiana* Goodrich. Seminole Run, Lake Co., Florida. Paratype, MCZ 51342; 2X.

FIG. 8.—*Goniobasis catenoides* Lea. Chattahoochee River, Columbus, Muscogee Co., Georgia. MCZ 186749; 2.4X.





## PLATE 4

FIG. 1.—*Villosa vibex amygdala* Lea. Canals, West Palm Beach, Palm Beach Co., Florida. MCZ 104093; natural size.

FIG. 2.—*Villosa villosa* Wright. Mosquito Creek, Chattahoochee, Gadsden Co., Florida. MCZ 191775; natural size.

FIGS. 3 and 7.—*Villosa licnosa* Conrad. Chipola River, 2 mi. E Clarksville, Calhoun Co., Florida. MCZ 191939; natural size. Fig. 3, male; fig. 7, female.

FIG. 4.—*Villosa vibex* Conrad. Waccasassa River, Levy Co., Florida. MCZ 203850; natural size.

FIG. 5.—*Quincuncina burkei* Walker. Beaver Creek, near Taylor, Houston Co., Alabama. MCZ 144608; natural size.

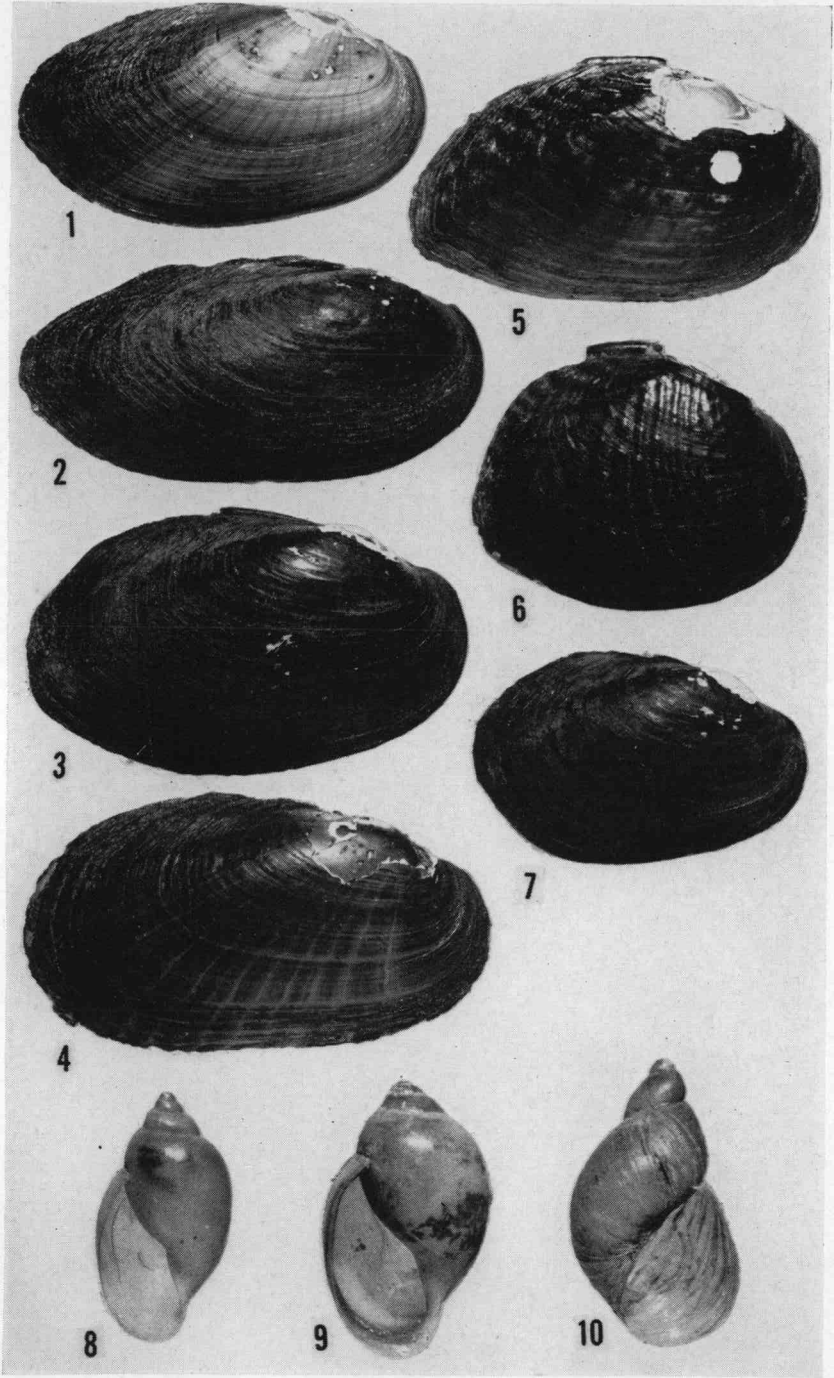
FIG. 6.—*Quincuncina infucata* Conrad. Ochlockonee River, 7 mi. S Cairo, Grady Co., Georgia. MCZ 190341; natural size.

FIG. 7.—See figure 3.

FIG. 8.—*Physa pumilia* Conrad. Pond, 7½ mi. SW Recovery, Decatur Co., Georgia. MCZ 186837; 3X.

FIG. 9.—*Physa crocata* Lea. Doe River, Roan Mountain Station, Carter Co., Tennessee. MCZ 56245; 3X.

FIG. 10.—*Pseudosuccinea columella* Say. Flint River, Recovery, Decatur Co., Georgia. MCZ 190431; 3X.



## PLATE 5

FIG. 1.—*Margaritana hembeli* Conrad. Horse Creek, near Luverne, Crenshaw Co., Alabama. MCZ 148819; natural size.

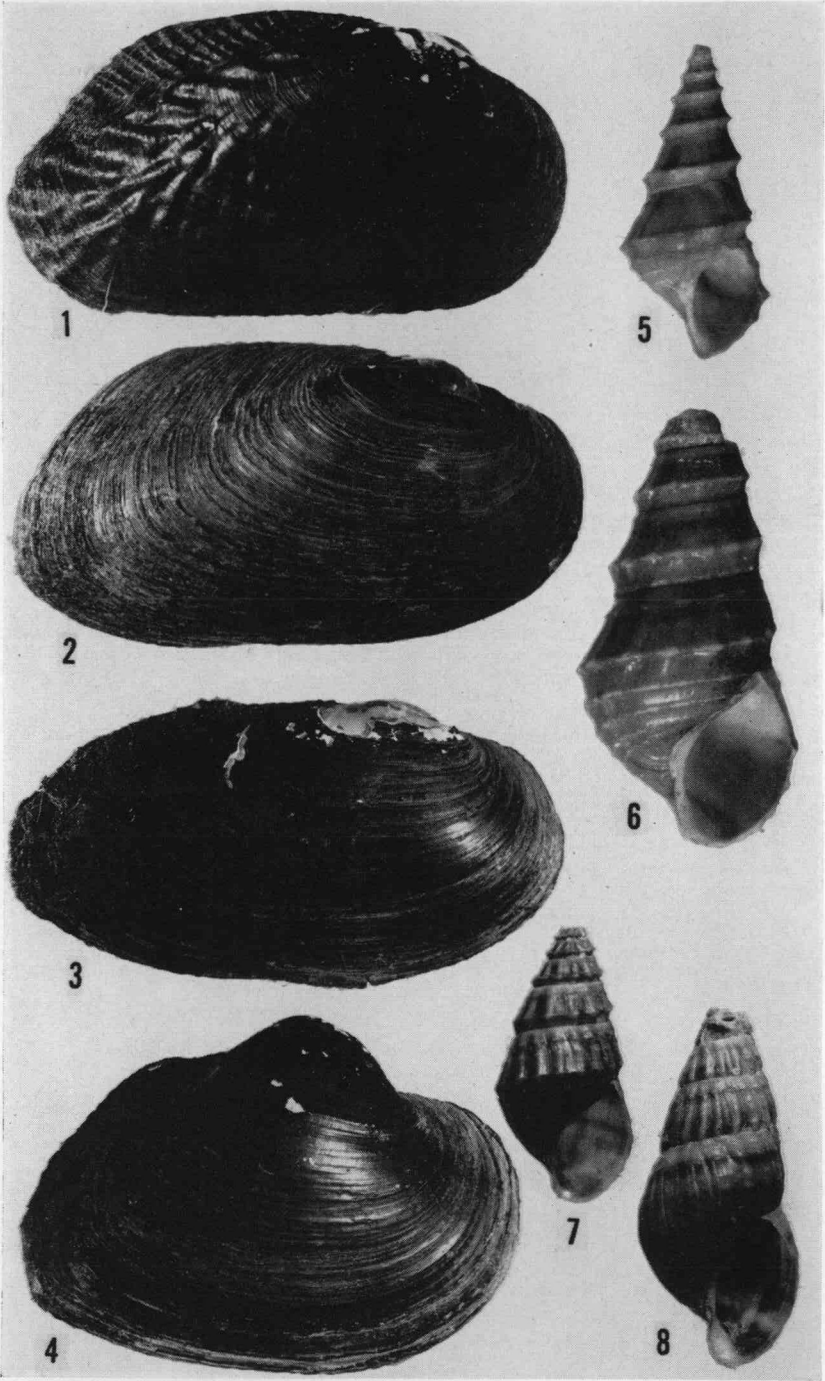
FIG. 2.—*Uniomereus obesus* Lea. Withlacoochee River, 5 mi. NW Valdosta, Lowndes Co., Georgia. MCZ 191997; natural size.

FIG. 3.—*Anodontoides elliotti* Lea. Mosquito Creek, 1 mi. S Chattahoochee, Gadsden Co., Florida. MCZ 190085; natural size.

FIG. 4.—*Alasmidonta triangulata* Lea. Flint River, Recovery, Decatur Co., Georgia. MCZ 190390; natural size.

FIGS. 5-6.—*Goniobasis boykiniiana* Lea. Chattahoochee River, Columbus, Muscogee Co., Georgia. MCZ 103599; both 2X. Fig. 5, young.

FIGS. 7-8.—*Goniobasis viennaensis* Lea. Swift Creek, 12 mi. SW Cordele, Crisp Co., Georgia. MCZ 91761; both 2X. Fig. 7, young.



## PLATE 6

FIG. 1.—*Anodonta gibbosa* Say. Lake Talquin, Ochlockonee River, Leon Co., Florida. MCZ 191765; natural size.

FIG. 2.—*Anodonta imbecilis* Say. Lake Talquin, Ochlockonee River, Leon Co., Florida. MCZ 191840; natural size.

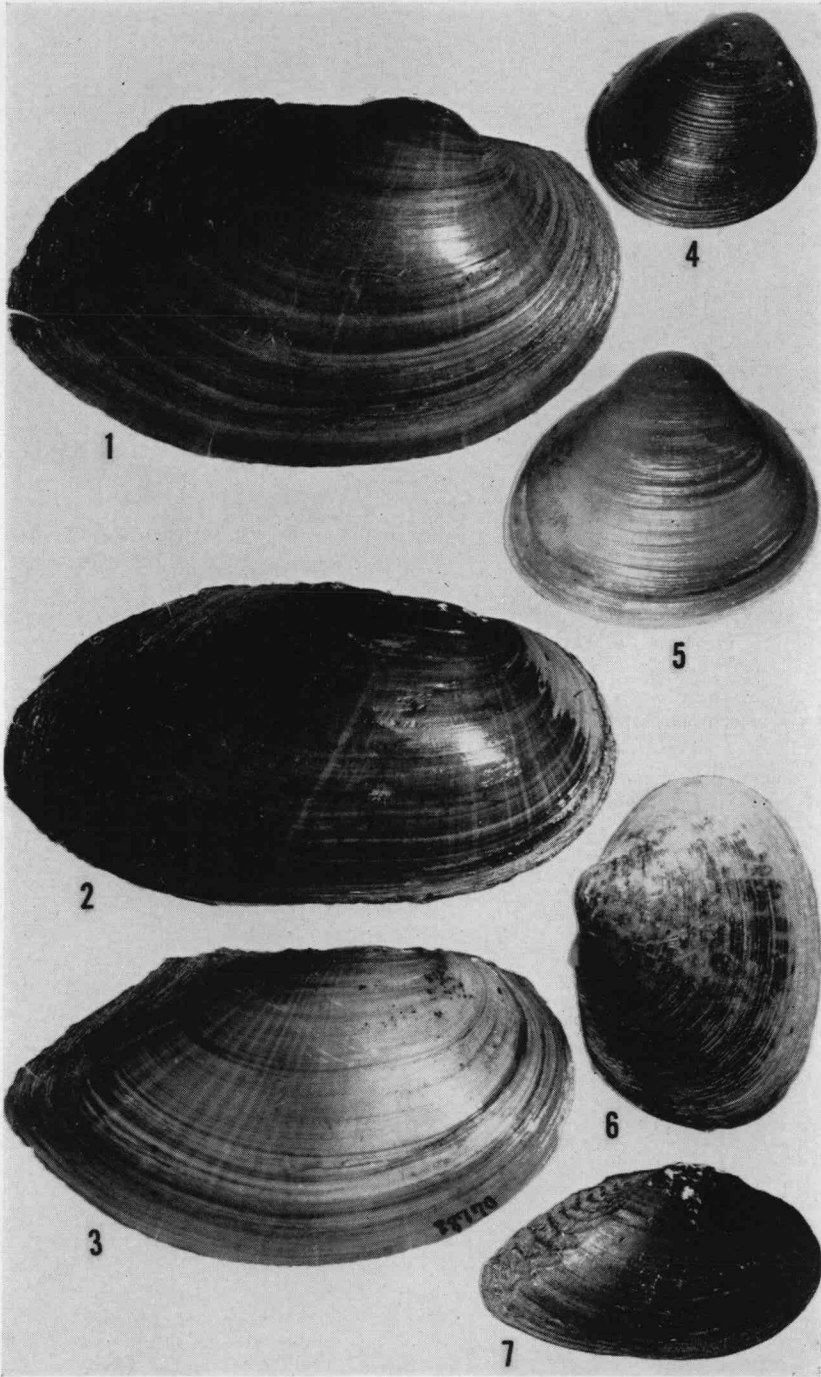
FIG. 3.—*Anodonta cowperiana* Lea. Peace River, Arcadia, DeSoto Co., Florida. MCZ 88770; natural size.

FIG. 4.—*Pisidium dubium* Say. Chipola River, 1 mi. N Marianna, Jackson Co., Florida. MCZ 191809; about 4X.

FIG. 5.—*Sphaerium stamineum* Conrad. Alabama. Cotype, MCZ 19434; about 4X.

FIG. 6.—*Byssanodonta singleyi* Pilsbry. Spring Creek, Reynoldsville, Seminole Co., Georgia. MCZ 190100; 6.3X.

FIG. 7.—*Medionidus penicillatus* Lea. Flint River, Recovery, Decatur Co., Georgia. MCZ 190306; natural size.



## PLATE 7

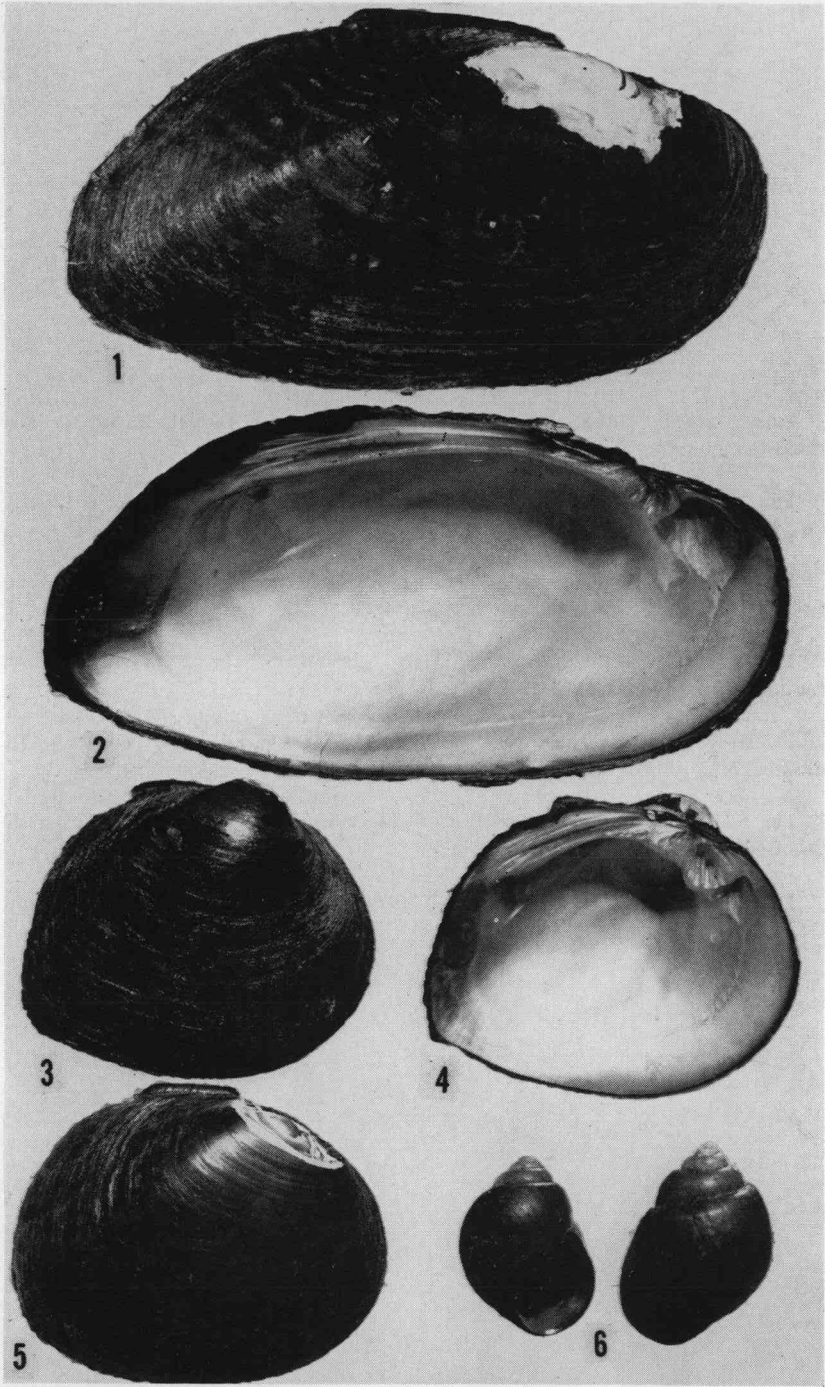
FIGS. 1-2.—*Elliptio memichaeli* Clench and Turner. Choctawhatchee River, 8 mi. W Miller Cross Roads, Holmes Co., Florida. Holotype, MCZ 191922; natural size.

FIGS. 3-4.—*Fusconaia escambia* Clench and Turner. Escambia River, 3 mi. E Century, Escambia Co., Florida. Holotype, MCZ 191470; natural size.

FIG. 5.—*Fusconaia succissa* Lea. Murder Creek, Evergreen, Conecuh Co., Alabama. MCZ 144639; natural size.

FIG. 6.—*Notogillia wetherbyi* Dall. Chipola River, Scotts Ferry, Calhoun Co., Florida. MCZ 190399; 3X.





## PLATE 8

FIG. 1.—*Elliptio crassidens incrassatus* Lea. Dead Lake, Chipola River, Chipola Park, Calhoun Co., Florida. MCZ 191869; natural size.

FIG. 2.—*Elliptio strigosus* Lea. Ochlockonee River, 7½ mi. E Hosford, Liberty Co., Florida. MCZ 191891; natural size.

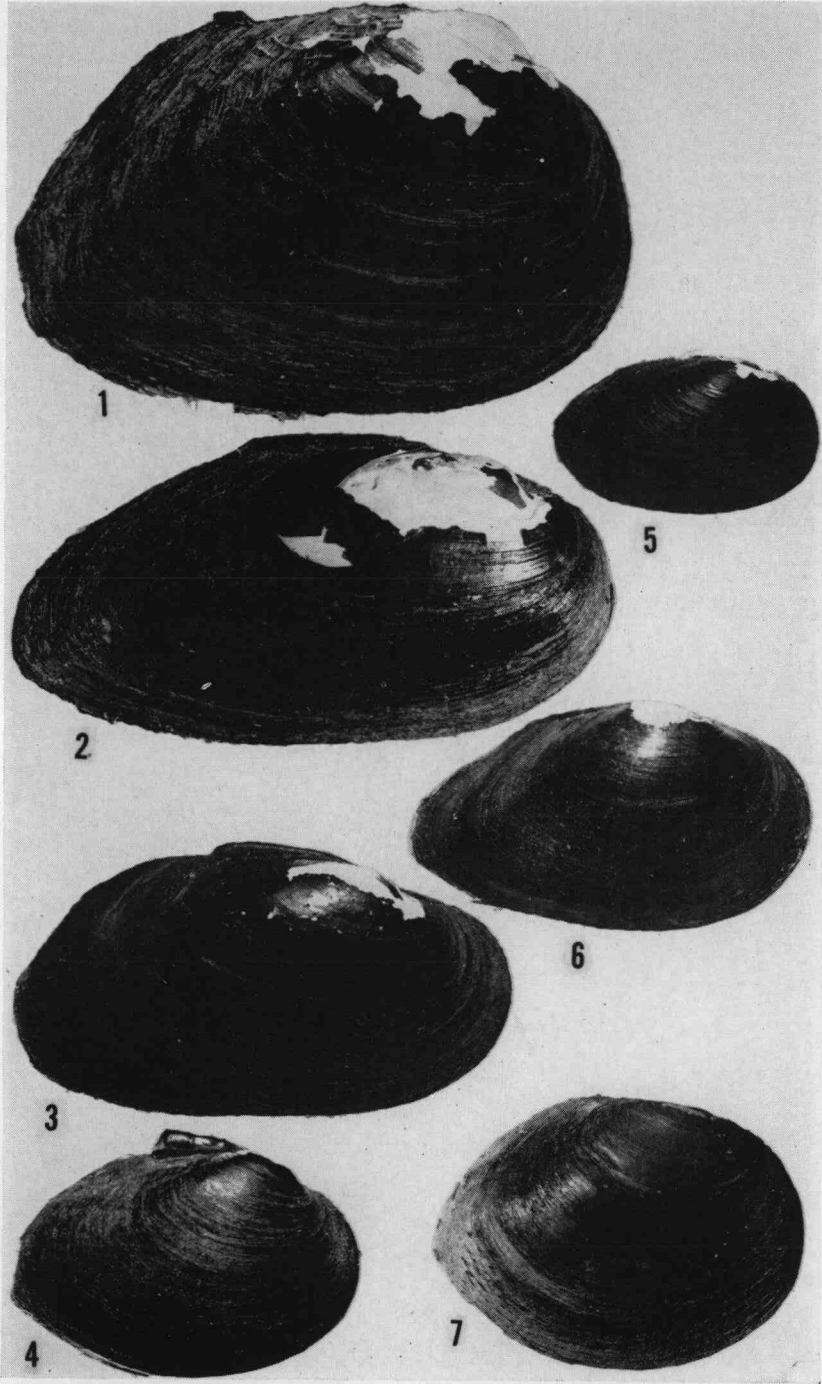
FIG. 3.—*Elliptio chipolaensis* Walker. Chipola River, 1 mi. N Marianna, Jackson Co., Florida. MCZ 190295; natural size.

FIG. 4.—*Pleurobema strodeanum* Wright. Escambia River, 3 mi. SE Century, Escambia Co., Florida. MCZ 191934; natural size.

FIG. 5.—*Corunculina paula* Lea. Mosquito Creek, Chattahoochee, Gadsden Co., Florida. MCZ 191719; natural size.

FIG. 6.—*Pleurobema pyriforme* Lea. Ochlockonee River, 7 mi. S Cairo, Grady Co., Georgia. MCZ 191925; natural size.

FIG. 7.—*Glebula rotundata* Lamarck. Apalachicola River, Blountstown, Calhoun Co., Florida. MCZ 190394; natural size.



## PLATE 9

FIG. 1.—*Anodonta hallenbecki* Lea. Uphapee Creek, Macon Co., Alabama. Paratype, *A. gesneri* (= *A. hallenbecki* Lea), MCZ 152882; about 0.8X.

FIG. 2.—*Elliptio sloatianus* Lea. Flint River, Recovery, Decatur Co., Georgia. MCZ 190279; about 0.8X.

FIG. 3.—*Crenodonta boykiniana* Lea. Escambia River, 3 mi. SE Century, Escambia Co., Florida. MCZ 190292; about 0.8X.

