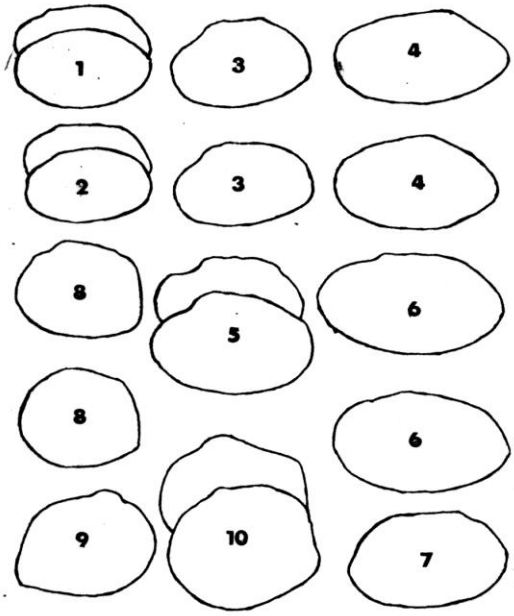
THE HISTORICAL DISTRIBUTIONS OF FRESHWATER MUSSELS IN LOUISIANA
by
MALCOLM F. VIDRINE

Legend

FRONT COVER
(All shells ca. actual size)



Anodontoides radiatus (Conrad, 1834)

Figure 1, 2, and 7. Louisiana. St. Helena Parish. Twelve Mile Creek at Rte. LA 1045. 19 December 1976. Dan Bereza and MFV.

Strophitus undulatus (Say, 1817)

Figure 3. Arkansas. Montgomery County. Ouachita River at Rte. U. S. 270. 12 August 1978. Darryl Clark, Bill Bell, and MFV.

Figure 4. Louisiana. Union Parish. Bayou D'Arbonne at Rte. U. S. 167. 18 May 1977. Mike McCown and MFV.

Strophitus subvexus (Conrad, 1834)

Figure 5. *Strophitus* sp. cf. *subvexus*. Louisiana. Vernon Parish. Drake's Creek ca. 0.5 miles below Lookout Road in Kisatchie National Forest. 8 August 1992. MFV.

Figure 6. Louisiana. Tangipahoa Parish. Tangipahoa River at Rte. LA 38. 26 August 1979. Dan Bereza, Macky Vidrine, and MFV. 30 May 1977. Dirk Kavanagh, Darryl Clark, Alan Neumann, and MFV.

Fusconaia cerina (Conrad, 1838)

Figure 8. Louisiana. St. Helena Parish. Twelve Mile Creek at Rte. LA 1045. 19 December 1976. Dan Bereza and MFV.

Fusconaia flava (Rafinesque, 1820)

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Fusconaia askewi (Marsh, 1896)

Figure 10. Louisiana. Rapides Parish. Calcasieu River at intersection of Rtes. LA 112 and 121, Hineston. 21 September 1991. Bruno Borsari and MFV.

The Historical Distributions of Freshwater Mussels in Louisiana

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DEDICATED TO

Daniel J. Bereza and Samuel L. H. Fuller

who challenged me to study mites in freshwater mollusks
and Louisiana mussels

and

the late **Nell B. Causey**

who often told me, "To avoid mistakes in print,
don't publish!"

and

the late **Selwyn S. Roback**

who told me, "A work of science is never complete; however,
publish what you have completed in a timely fashion!"

and

H. Dickson Hoese

who showed me how to balance research and family

and
last but not least

my family

who would not let me quit doing research!

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I am exceedingly grateful to three reviewers, who commented on an earlier version of this manuscript. Paul Hartfield, Raymond Neck and John Harris suggested a great number of changes, and I have used many of them. Their comments greatly improved the effort, but still many errors persist for which I am entirely responsible.

Nell Causey, my major professor for my M. S. degree, and Joyce Crawford introduced me to freshwater mussels in 1971, and I later introduced Louisiana mussels to numerous friends and colleagues including Sam Fuller, Dan Bereza, Ed Stern, Tom Dietz, Mary Curry, Bob Parker, Darryl Clark, Don Gowan and Mark LaSalle. My interest in the symbionts of the mussels was my entry point to the study of mussels and remains the main thrust of my research.

Ed Stern traversed eastern Louisiana and southern Mississippi collecting mussel shells and generated his dissertation (Stern 1976). Years ago we discussed many of his specimens and shared several collecting trips and shells.

Dan Bereza, Sam Fuller and I sought to crack the rest of the puzzle. During the 1970's, we worked extensively in western Louisiana from the Atchafalaya Basin to the Sabine and Neches Rivers in Texas and Louisiana to the northern border of Louisiana into Arkansas. Dan and Sam were persistent and prepared series of relaxed species for study of soft anatomy, while I searched for parasites and symbionts. Darryl Clark, Mark LaSalle, Alan Pounds, Don Gowan and my oldest son, Macky, routinely volunteered their services in collecting. Bob Parker and Courtney Hackney were instrumental in helping me to understand the life history of mussels. Dick Hoese, my major professor for my doctorate, secured every opportunity for me to pursue my work.

Recently, Gary Lester, Steve Shively, Richard Martin, and others have made considerable contributions on the mussels of Louisiana. Several gentlemen, Charles Stagg, Charles Allen, Steve Parris, Bennie Fontenot, and Steven George were instrumental in returning my interests to freshwater mussels by seeking my assistance which forced me to dig back into the library on mussels and to get my feet wet again. With the help of Steven George, Charles Allen, Harland Guillory, Ron Dimock, Jim Cordes, and Bruno Borsari, I was able to begin and complete this effort.

Numerous individuals have helped me collect mussels over the years, and I have chosen to acknowledge them by placing names of collectors with the plate legends. The opportunity to work with these specimens is the result of these friends who took time to go on an adventure with me.

I have adapted Maxwell Mayeaux's text in our recent article as part of the Introduction.

I had the opportunity to view specimens from two museums. Years ago I walked the halls of the Academy of Natural Sciences of Philadelphia (ANSP), while holding a Jessup Fellowship. There I looked at the numerous Louisiana mussel lots and photographed a few. Recently, Robert Jones of the Mississippi Museum of Natural Sciences (MMNS) kindly lent me key specimens for examination and photography.

I am most grateful to my wife, Gail, who has made more than a small contribution to this effort. Her generousity extends in all directions, even to the actual publishing of the book. Our children, Daniel and Caroline, and our parents have provided us with emotional support and have sacrificed valuable potential shared time. My son, Macky, although busy doing his thing in Atlanta, made his mark on this work years ago.

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PREFACE

Each of us has a different perspective on freshwater mussels, e.g., biogeography, taxonomy, ecology, and this effort will provide a little for everyone. This is by all means a preliminary work, since I have not had the opportunity to view and assess the large number of lots of mussels from the state of Louisiana held in various museums; however, such an effort would have delayed me in providing the following information for at least several years. I plan to provide another book which will deal with the symbionts of these mussels in Louisiana and adjacent waters; therefore, I have not presented any of this information in this report. Many taxonomic problems exist among the mussel species groups in Louisiana and adjacent waters. As much as I would have liked to resolve these, my effort is limited to merely presenting them.

The future of freshwater mussels has become entirely dependent upon the further actions of man. The best possible scenario for the future of mussels depends upon the development of an informed public and a supported scientific effort. Although Louisiana contains a very diverse faunal assemblage, literally no funds are available for the study of mussels. In a recent effort to develop a controlled mussel harvesting industry in the state, the over-riding concern was the tremendous lack of information on the locations of this state's communities and populations, and, further, the near total absence of biological information on the life histories and requirements for the survival of the mussels. This book begins the education process and provides general information in regards to the first deficiency, the lack of mussel distribution records. However, the "historical" in the title means just that in the largest sense of the word. Most of the records provided are at least ten years old. During the last couple of years, I have revisited some of the stations that contained the most diverse mussel assemblages. The results were devastating, as in many of these stations, few mussels remained. For example a striking memory involves the return to the Louisiana Irrigation Canal system in southwest Louisiana, where my son, Macky, and I had sampled during the early 1980's. This irrigation canal system was abandoned by local rice farmers, and the canal bed was dry and densely overgrown with willow seedlings taller than I am. Unfortunately, most bayous and rivers are used as sewers and agricultural runoff ditches, and my return to many of these now channelized canals deepened my concern.

With this in mind, I hope this effort provides an opportunity for the freshwater mussels to get the best possible future. In the long run, the loss of the mussels is symptomatic of nature unbalanced and predicts for me an unraveling of the very fabric within which humans are themselves knitted.

PART I

INTRODUCTION

The freshwater mussels (Unionacea: Margaritiferidae and Unionidae) which inhabit Louisiana's lakes, rivers, and bayous are very valuable and possibly the most overlooked renewable natural resources which the State possesses. Many species are quite valuable for their shells and the pearls which are sometimes found in them. Not all of the 65 species which inhabit our state are commercially valuable, but all have an inherent ecological value in the stream and river systems in which they live. These mussels are valuable as filtering mechanisms, removing particles suspended by the river's flow, and as indicator organisms displaying evidence of the stream's general health. They also host and support a highly diverse symbiotic flora and fauna, which comprise the primary macrobenthos of lakes and streams.

Native Americans utilized the meat from the freshwater mussels as food and used the shells for tools and eating utensils. Shell middens (piles of discarded shell) located all over the central United States indicate that many Indians depended a great deal upon the mussel resources available to them.

In the late 1800's and early 1900's, freshwater mussels were the resource from which pearl buttons were made. There were hundreds of factories making buttons from mussel shells which came from the rivers of the Mississippi River drainage. Thousands of tons of mussel shells were taken by commercial harvesters who in turn sold them to the button factories which cut, drilled, and polished the pearlescent shell into buttons. Factories located in Louisiana produced buttons made from mussels harvested from Caddo Lake and other bodies of water. This inherent value brought attention to an otherwise overlooked, if not completely ignored, group of organisms.

With the advent of the plastics industry, pearl buttons were soon replaced with inexpensive plastic, and the mother-of-pearl button industry collapsed. Little attention was given to these mussels for decades except for the beautifully iridescent mother-of-pearl which is used for exquisite inlay work in fine furniture, art, and knife and gun handles.

The cultured pearl industry, which originated in Japan, made the freshwater mussel valuable once again. Experiments to culture pearls by the Japanese in the early 1900's led them to try various substances to implant into the pearl oyster. This substance would provide a nucleus around which the pearly nacre or mother-of-pearl can form. The substance which proved to be the best nucleus was beads made from mussel shell which came from rivers of the United States.

Since these mussels are at present the only source of material to produce nuclei for the Japanese cultured pearl industry, the value of some mussels has increased dramatically. Mussels which are most suitable for the production of nuclei are the large, thick-shelled river mussels with very dense layers of mother-of-pearl. Washboard, three-ridge, ebonyshell, mapleleaf and pimpleback are the common names of the harvestable mussels in Louisiana for this industry.

Another commercial aspect of freshwater mussels is the occurrence of natural pearls which can be quite valuable. Few mussels contain pearls, however, and the pearls that are usually found are often small or misshapen (baroque). Caddo Lake, which spans the border between Louisiana and Texas, was the site of an active pearl fishery in the early 1900's.

Mussels which are commercially valuable frequently form densely packed beds in the bottoms and sloping sides of rivers. Being heavy-shelled, they are very well adapted to their flowing environment, in which they filter feed upon plankton and organic material in the flowing river water. Some of these mussels can live to be 50-60 years old and can grow to 7-9 pounds.

A mussel in its natural position lies partially buried in the mud, sand or gravel in the bottom of the stream, river, or lake. Removal of the mussel and replacement in the exact position removed usually does not

harm mussels. However, improper replacement could readily kill the mussel by smothering it. It usually "stands on its head", i. e. it lies in the mud with the anterior end down with its posterior end up. The posterior end is usually pointed or otherwise sharp in order to sense currents and best use currents in the internal flow mechanism. After removal from the stream bed, the collector is tempted to returned the mussel pointed end down--an act that will usually kill the mussel.

Most mussels are normally embedded in the river substrate and are found in areas where there is little shifting bottom material. Freshwater mussels are able to move about but are relatively sedentary in habit and many cannot survive in a shifting bottom. With little experience, a collector can locate stable bottoms and the mussels that make a living there.

Freshwater mussels are filter feeders and the mechanism used to gather food involves thousands of microscopic hair-like structures which cover the flaps located inside the shell. These fine structures, called cilia, filter and sort plankton and organic material which are then transported to the mouth by the sweeping action of the cilia. Since river mussels rely upon the river's flow to bring food to them, they normally have little need to move from the spot in which they are buried.

The freshwater mussel's reproductive strategy includes a parasitic relationship with a fish host. The female mussel is fertilized by the male and each egg develops into a larva called a glochidium. Thousands of glochidia are produced by every female. The almost microscopic glochidium looks very much like a tiny mussel except that the two valves begin snapping open and shut when released or removed and may have obvious spines or teeth. The female mussel retains the glochidia in specialized brood pouches, called marsupia, located in the gills. At certain times of the year, when conditions are right, the female releases the glochidia into the water. Many female mussels have developed highly modified fleshy structures which attract fish. These structures may resemble small fish, worms, or aquatic insects. The host fish attacks the fleshy lure and obtains a mouthful of glochidia. Free glochidia on the bottom of the stream may clasp onto fins or gills of the fish. Generally failure results in death, but a few kinds of mussels apparently have moderate success without fish.

When the host fish, such as a catfish, bluegill, or freshwater drum (gaspergou), comes into contact with the glochidium, the two valves of the glochidium snap violently and clamp shut on the gills or fins of the fish. The glochidium is then embedded in the flesh of the fish and forms a cyst. Within a week or so, the encysted glochidium transforms itself into a miniature mussel with an active foot and inactive shell. It is equipped with a sticky thread which wraps around debris in the stream after the miniature mussel releases from the fish. This small mussel literally dangles from this string for nearly a year before it attains a size sufficient to implant itself into the bottom of the stream. The failed glochidia and these small mussels provide a buffet meal for other animals, such that usually very few of these young survive.

It takes as long as 5-10 years to reach sexual maturity and as long as 20 years for a young mussel to grow to a size large enough to be used for pearl nuclei. We remain rather ignorant of most of these facts as they relate to the warmer climates of Louisiana waters, and thus we report figures from more northern climes where the mussels have been studied more. However, for these reasons, mussels are very susceptible to overfishing. The states which allow the commercial harvest of freshwater mussels have very strict regulations placed upon the commercial fishery in order to prevent overfishing and allow the resource to remain viable to the economy of the state.

State waters will be open for freshwater mussel harvest in 1993. With luck and foresight, the citizens of Louisiana will be able to conservatively utilize yet another of its many natural, renewable resources. The key word here is *renewable*, and it is itself worth

discussing. Some kinds of mussels are already in dire need of help and protection. Three species in Louisiana are in such condition and are legally protected by the Federal Endangered Species Act. These include the Louisiana pearlshell (*Margaritifera hembeli*), the inflated heelsplitter (*Potamilus inflatus*), and the pink mucket (*Lampsilis abrupta*). Areas where these mussels occur are not to be open for harvesting for obvious reasons. Mussels in general are very sensitive to pollution of many kinds, and thus, the renewable nature of this resource depends directly upon water quality.

Competition from invading mussels may lead to the demise of this resource within the next decade. Two invaders, the Asiatic clam (*Corbicula*) and the zebra mussel (*Driessena*), are now in Louisiana. The Asiatic Clam was first found in Louisiana in the early 1960's and has since spread to nearly every stream where it numbers in the billions. It competes for space with native freshwater mussels, but the native mussels have managed to hold there own for the past 30 years. However, the zebra mussel, a recent introduction into the Great Lakes from Europe, was first found in Louisiana early in 1993 in the Mississippi River. These aliens grow a vigorous series of byssal threads used to attach to a substrate and hold on for life. In the northern states, these mussels are clasping so tightly to the native freshwater mussels as to prevent them from filtering water and natives are dying in large numbers. While some suggest that the zebra mussels will not do well in Louisiana's warmer waters, the evidence will soon be apparent. Both of these introduced mussels have free-swimming larvae called veligers. The opportunity for survival of this larval form is apparently much greater than that of the glochidium.

The future of the commercial mussel harvesting industry in the United States is at risk, but more importantly, the resource is at risk. Our best defense against the total loss of this resource is knowledge. Education, economics, and environment are so closely linked, especially in the freshwater mussel harvesting industry, that we cannot accept the sacrifice of this resource due to greed or the lack of foresight. This report is intended to assist in the education role, although it is not intended to serve as an extended introduction to freshwater mussel biology. Excellent, inexpensive sources that meet this need are available (Oesch 1984, Harris and Gordon 1990, Buchanan 1980, Williams and Schuster 1989, and Cummings and Mayer 1992). Excellent review articles, *e. g.*, Fuller (1974), serve to link introductory studies to the science of freshwater mussels. Slightly dated, but excellent, introductions to the diversity of North American mussels (Burch 1973 and 1975b) are available. Unfortunately, no comprehensive works are available on the primary states of concern: Louisiana, Texas, Mississippi, and Arkansas.

However many useful books and major articles are available on freshwater mussels of other states and Canada:
Canada (Clarke 1973 and 1981a), Midwest United States (Cummings and Mayer 1992), Alabama (Hurd 1974, Stansbery 1976, and Williams *et al.* 1992), Arkansas (Call 1895, Johnson 1980, and Harris and Gordon 1990), Kansas (Murray and Leonard 1962), Illinois (Parmalee 1967), Wisconsin (Baker 1928 and Mathiak 1979), Tennessee (Starnes and Bogan 1988 and Yokley 1973), Ohio (Williams and Schuster 1989), Missouri (Oesch 1984 and Buchanan 1980), Oklahoma (Lake Texoma) (Valentine and Stansbery 1971), upper Mississippi River (Fuller 1978b and 1985), South Atlantic Slope (Johnson 1970 and Sepkoski and Rex 1974), Peninsula Florida (Johnson 1972b), Pennsylvania (Ortmann 1911 and 1919), Apalachicola (Clench and Turner 1956, Fuller and Bereza 1973, and Johnson 1967), South Carolina (Fuller 1971 and 1978a), and North Carolina (Fuller 1977).

This report attempts to serve two purposes: 1) to introduce freshwater mussels and their historical and/or known distributions in Louisiana, and 2) to challenge colleagues and novices to develop an interest in this remarkable faunal assemblage, such that the piecemeal state of knowledge that exists at present can grow to an extent needed to

preserve and protect the state's fauna. Nationally, there are nearly 300 species of native freshwater mussels. At present, 18 species are extinct, 42 are federally endangered or threatened (and protected), and 70 species are candidates for protection (Helfrich *et al.* 1992). The beauty of freshwater mussels and their roles as a bioindicators are presented in popular articles (Madson 1985, Stolzenburg 1992, Imlay 1977, and George *et al.* 1993).

Study of Louisiana's freshwater mussels prior to 1890 was essentially limited to species descriptions, with the single exception of a species list compiled by Featherman (1872). Vaughan (1892 and 1893) and Frierson (1897, 1898, 1899a, 1899b, 1902, 1903, 1911 and 1923) were the first to actually conduct survey work in Louisiana. Since 1900, a number of lists have been provided.

Early in the 1800's, many species were described by leading authorities from shells sent to them from Louisiana by travelers or residents. The first list of Louisiana freshwater mussels was by A. Featherman (1872). Most of these mussels were from southwestern Louisiana. T. Wayland Vaughan was the first serious mussel expert to list species and discuss distributions of Louisiana mussels (Vaughan 1892 and 1893). He introduced Lorraine Screven Frierson to mussels in 1888, and Frierson in turn introduced John K. Strecker to mussels. The lineage constitutes an important part of history, and it helps explain where and when varied distributional surveys were carried out. These men admired each other's tenacity, and this is apparent in their writings (see Strecker 1929). Johnson (1972a) commented on Frierson's fight to get priority for the mussel names originally assigned by C. Rafinesque, a poor Frenchman, who apparently was more than ignored by the famous and wealthy American, I. Lea. He also commented on Frierson's strong arguments against the higher classification of mussels designed by Ortmann and Walker (1922).

Frierson's crowning piece of work was his book published in 1927. This book essentially made him a permanent part of the mussel literature. In 1978, I coauthored an article dealing with Frierson, who greatly inspired me (Vidrine and Schwartz (1978). Frierson provides a good starting point for this discourse, since he ties together the work of Vaughan before him and all others after him. He also paints clearly the collecting experience in Louisiana, a tropically hot region with streams that are often muddy and difficult to access.

During the first half of the 1900's, papers by Shira (1913), Coker (1915), Vanatta (1910), Moore (1909) and Miller (1936) appeared. Each of these provided important records. Shira and Coker were commercialistic--button and pearl oriented; but they went on to publish one of the most heralded papers on freshwater mussels (Coker *et al.* 1921). Vanatta examined Moore's collections. Moore was as an archaeologist and anthropologist who worked the northern rivers of Louisiana. These records are extremely important, since they had not been repeated in part until this decade. Miller (1936) compiled a list of mussels from the Baton Rouge area in Louisiana.

Strecker (1931) published on Texas mussels and relied mainly on Frierson's names, thus the two states developed mussels names together. A great gap occurs in time before Louisiana mussels again become an integral part of the literature.

The most thorough survey involved eastern Louisiana (Florida Parishes) by Stern (1976). He rather convincingly proved that the eastern Louisiana assemblage was very similar to that of the Tombigbee/Alabama-Coosa drainages (Eastern Gulf Provinces). Grantham (1969) had made a general study of Mississippi mussels. This work has more recently continued with Hartfield and others. However, most of the remaining parts of the state are poorly studied. Vidrine (1985) compiled a list of the records of freshwater mussels by river drainage. Many taxonomic problems remain in this diverse group. Vidrine (1989b) presented mussel/mite distributions in rivers of Louisiana and adjacent waters.

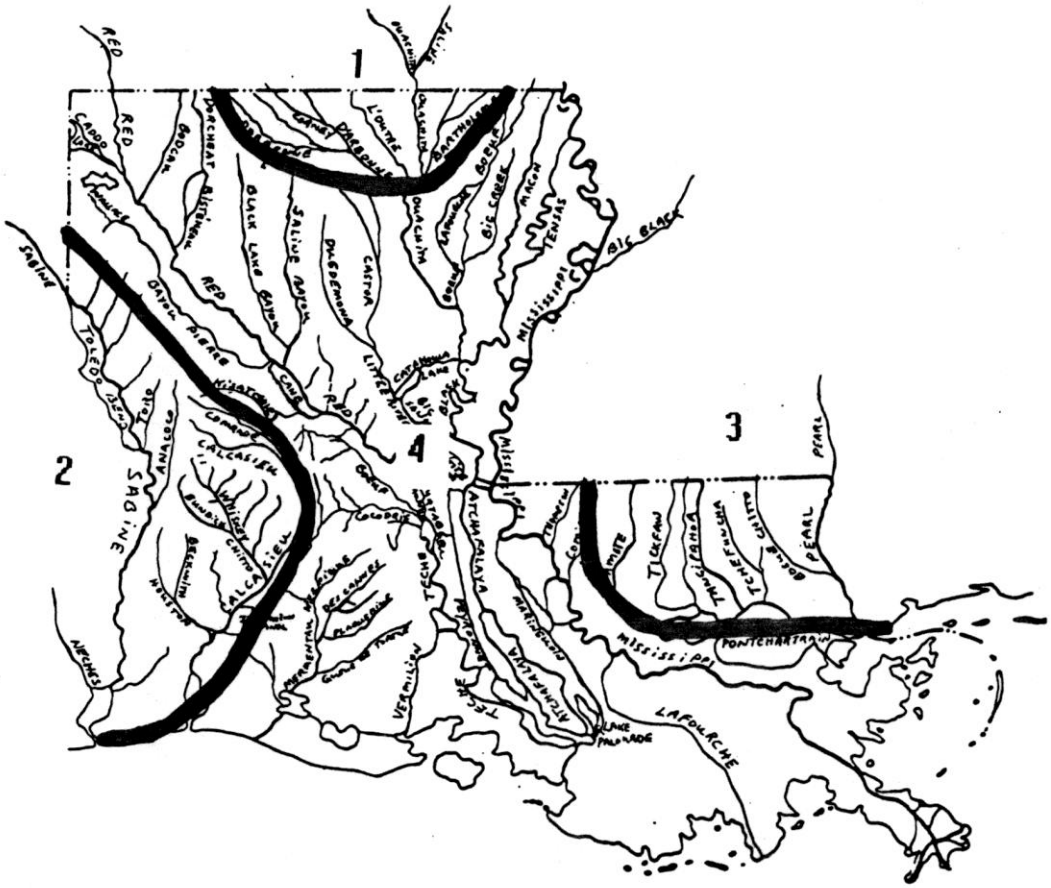
Checklists provided by surveys in surrounding states include Arkansas (Gordon *et al.* 1980, Gordon 1981, Johnson 1980, Harris and Gordon 1987 and 1990), Oklahoma (Valentine and Stansbery 1971), Mississippi (Hinkley 1906, Grantham 1969, Stern 1976, Vidrine and Clark 1983, Hartfield and Rummel 1985, Hartfield and Ebert 1986, Hartfield 1988, 1989, and in press) and Texas (Singley 1893, Read 1954, Read and Oliver 1953, Murray and Roy 1968, Roback *et al.* 1980, Strecker 1931, Neck 1982a, b, and c, 1984, 1986, and 1990, Vidrine 1990c, Schafer *et al.* 1992). North American checklists are collectively treated by Burch (1973 and 1975b) and Turgeon *et al.* (1988). The higher taxonomy of the group is treated by Davis and Fuller (1981) and Smith and Wall (1984).

The large majority of the records presented in this report are from the following works: eastern Louisiana (Stern 1976, Grantham 1969, Hartfield 1988, Hartfield and Rummel 1985, and Hartfield and Ebert 1986), northwestern Louisiana (Vaughan 1892 and 1893, Frierson 1899a, and Shira 1913), central and western Louisiana (my collections). I have had the opportunity to repeat some of the earlier stations but not all. Many are disturbed by human actions or completely altered. My collections are mainly from streams at their intersections with highways and usually rather small lots for parasite surveys. Most of the sampling was done in shallow water at low water stages in rivers. Large rivers and deep portions of smaller rivers have not been searched. Therefore, many species have been overlooked in certain localities, and much of Louisiana has not been searched for mussels adequately or at all.

Additional regional surveys in Louisiana that were used to compile this checklist include: Bereza *et al.* (1976), Branson (1966), Crawford (1972), Coker (1915), Curry and Vidrine (1976 and 1977), Curry *et al.* (1981), DeRouen and Vidrine (1975), Kuckyr and Vidrine (1975), Miller (1936), Moore (1909), Parker *et al.* (1984), Parker *et al.* (1980), Stern and Felder (1978), Vanatta (1910), Vidrine (1973, 1974, 1978, 1980, 1985, 1988b, 1989a and b, 1990a, b and c, 1991a, and b, 1992a and b), Vidrine and Bereza (1976, 1977 and 1978a), Vidrine and Clark (1981a and b and 1983), Vidrine and DeRouen (1976a and 1976b), Vidrine and Vidrine (1976), Vidrine *et al.* (1975), Vidrine *et al.* (1976), Vidrine *et al.* (in press), George and Vidrine (in prep.), and Hartfield (1988, 1989, and in press).

Miller *et al.* (1986) described mussel community structure in the Tangipahoa River in Mississippi. Vidrine and Clark (1983) described mussel community structure in the Amite River in Mississippi.

Map 1. Distribution of mussel-positive collecting localities, 1970-82. Solid dots represent mussels-positive localities sampled by the author and colleagues and localities represented in museum samples examined. Unionid faunal zones and provinces (according to Roback *et al.* 1980): 1. North Atlantic, 2. South Atlantic, 3. Peninsula Florida, 4. Apalachicolan, 5. Mobile Basin, 6. Central Gulf Coast, 7. Western Gulf Coast, 8. Interior Basin, 8A. Ozarkian Province, 8B. Cumberlandian Province, 9. Great Lakes-St. Lawrence, 10. Pacific, 11. Mexican Pacific, and 12. Mexican Gulf Coast. The Eastern Gulf drainages would include numbers 4, 5 and 6.



Map 2. Biogeographic regions based on the distributions of freshwater mussels in Louisiana.
1. north central Louisiana, which closely resembles the Ouachita River drainage in Arkansas (Ouachita subprovince of Ozark in the Mississippi Interior Basin),
2. southwestern Louisiana, which closely resembles southeastern Texas,
3. southeastern Louisiana, which closely resembles the Alabama River drainage system, Central Gulf portion of the Eastern Gulf Coast, and
4. the Mississippi and Red River floodways of the Mississippi Interior Basin.

Essential works (Fuller 1974, McMahon 1991, and Pennak 1989) provide a basic introduction to the value of freshwater mussels and the ecological pressures which alter their lives. Hackney *et al*. (1992) provided numerous papers on the biodiversity of streams of the southeastern United States. Davis (1968) edited an interesting series of papers on the history of the rivers of Louisiana.

PART II

SYSTEMATICS OF THE FRESHWATER MUSSELS OF LOUISIANA

Although taxonomy of Louisiana freshwater mussels remains unsettled, Table 1 is an attempt to align species-taxa as closely as I could to the AFS list (Turgeon *et al*. 1988) and changes suggested by Hoeh (1990). Many problems exist with this somewhat artificial scheme of mine--and many populations and species-taxa deserve a closer look.

Biogeographically, I have summarized the known records of mussels to my best knowledge. My own collections and those of Daniel J. Bereza (Philadelphia, PA) account for more than 20,000 shells and relaxed specimens from Louisiana. The value of the study of the soft anatomy of mussels cannot be overstated (Fuller and Bereza 1974). The majority of Louisiana has only been cursorially searched for mussels.

Phenotypic plasticity of freshwater mussels results in great difficulty in identification and is maddening (Neck 1982a). For this and other reasons, a complete key to the Louisiana species is not provided. Such keys in recent books, *e.g.*, Burch (1975b) and Oesch (1984), are available and useful. However, keys to separate taxa and comments on identifying shells of the more difficult complexes are provided.

In general the following information is presented in order to advise readers on some of the pitfalls which can be avoided in identifying mussels. A series of shells (and opportunity to view soft anatomy in some cases) is needed to make a firm identification. Older and younger shells are useful while misleading, while a series of age classes should make the identification dependable. In cases of sexual dimorphism, both sexes of shells are highly useful. For most species this should be ample for identification. In other cases, only a mussel specialist can make a firm determination.

Further, geographic variation is prominent. From river to river, shells vary. But even within the same river drainage, headwater forms are different from river forms of the same species. Many species that inhabit both small and large parts of rivers have been called by at least two names. Where headwater forms are generally flattened and elongate, large river forms are thickened and shortened.

Color at first seems to be a great character. The periostracum is highly colored, even rayed, in some species and genus level groups. While this is useful, the darkening of shells by chemicals in the water obscures such "give-away" traits. Color of nacre is also a useful trait, but it too can vary greatly. Brightly colored species are found in canals and clear streams, although it is not uncommon to have to scrape encrustment from the periostracum (= epidermis) of the shells to see these colors.

Plate XX provides figures identifying the location of key terms useful in interpreting the species descriptions; while the legend for this plate contains a list of related terms. Maps 1 and 2 are provided to define the biogeographic provinces used in the this section. These maps are repeated and discussed in the Biogeographic Summary.

Table 1. List of mussels of Louisiana modified from AFS list (Turgeon *et al*. 1988) and Hoeh's (1990) changes with possible unrecorded or historical residents and non-unionacean natives and exotic species.

Margaritiferidae	
Margaritiferinae	
Margaritifera hembeli (Conrad, 1838)	Louisiana pearlshell
Unionidae	
Anodontinae	
Pyganodon grandis (Say, 1829)	giant floater
Utterbackia imbecillis (Say, 1829)	paper pondshell
Anodonta suborbiculata Say, 1831	flat floater
Alasmidonta marginata Say, 1818	elktoe
Anodontoides radiatus (Conrad, 1834)	rayed creekshell
Strophitus subvexus (Conrad, 1834)	southern creekmussel
Strophitus undulatus (Say, 1817)	squawfoot
Arcidens confragosus (Say, 1829)	rock-pocketbook
Lasmigona complanata (Barnes, 1823)	white heelsplitter
Ambleminae	
Amblemini	
Amblema plicata (Say, 1817)	threeridge
Megalonaias nervosa (Rafinesque, 1820)	washboard
Plectomerus dombeyanus (Valenciennes, 1827)	bankclimber
Quadrula pustulosa (Lea, 1831)	pimpleback
Quadrula mortoni (Conrad, 1835)	western pimpleback
Quadrula refulgens (Lea, 1868)	purple pimpleback
Quadrula nodulata (Rafinesque, 1820)	wartyback
Quadrula apiculata (Say, 1829)	southern mapleleaf
Quadrula quadrula (Rafinesque, 1820)	mapleleaf
Quadrula cylindrica (Say, 1817)	rabbitsfoot
Quadrula metanevra (Rafinesque, 1820)	monkeyface
Tritogonia verrucosa (Rafinesque, 1820)	pistolgrip
Pleurobemini	
Pleurobema pyramidatum (Lea, 1840)	pyramid pigtoe
Pleurobema beadleanum (Lea, 1861)	Mississippi pigtoe
Pleurobema riddelli (Lea, 1861)	Louisiana pigtoe
Elliptio crassidens (Lamarck, 1819)	elephant ear
Elliptio dilatata (Rafinesque, 1820)	spike
Elliptio arca (Conrad, 1834)	Alabama spike
Elliptio arctata (Conrad, 1834)	delicate spike
Fusconaia askewi (Marsh, 1896)	Texas pigtoe
Fusconaia cerina (Conrad, 1838)	Gulf pigtoe
Fusconaia flava (Rafinesque, 1820)	Wabash pigtoe
Fusconaia ebena (Lea, 1831)	ebonyshell
Uniomerus tetralasmus (Say, 1831)	pondhorn
Uniomerus declivus (Say, 1831)	tapered pondhorn
Lampsilini	
Actinonaias ligamentina (Lamarck, 1819)	mucket
Ellipsaria lineolata (Rafinesque, 1820)	butterfly
Glebula rotundata (Lamarck, 1819)	round pearlshell
Lampsilis abrupta (Say, 1831)	pink mucket
Lampsilis cardium (Rafinesque, 1820)	plain pocketbook
Lampsilis satura (Lea, 1852)	sandbank pocketbook
Lampsilis ornata (Conrad, 1835)	southern pocketbook
Lampsilis siliquoidea (Barnes, 1823)	fatmucket
Lampsilis hydiana (Lea, 1838)	Louisiana fatmucket
Lampsilis claibornensis (Lea, 1838)	southern fatmucket
Lampsilis teres (Rafinesque, 1820)	yellow sandshell
Ligumia recta (Lamarck, 1819)	black sandshell
Ligumia subrostrata (Say, 1831)	pondmussel
Leptodea fragilis (Rafinesque, 1820)	fragile papershell

Table 1. Cont'd.

Potamilus amphichaenus (Frierson, 1898)	Texas heelsplitter
Potamilus inflatus (Lea, 1831)	inflated heelsplitter
Potamilus ohiensis (Rafinesque, 1820)	pink papershell
Potamilus capax (Green, 1832)	fat pocketbook
Potamilus purpuratus (Lamarck, 1819)	bleufer
Ptychobranchus occidentalis (Conrad, 1836)	Ouachita kidneyshell
Toxolasmus parvus (Barnes, 1823)	lilliput
Toxolasmus texasensis (Lea, 1857)	Texas lilliput
Obliquaria reflexa Rafinesque, 1820	threehorn wartyback
Obovaria jacksoniana (Frierson, 1912)	southern hickorynut
Obovaria olivaria (Rafinesque, 1820)	hickorynut
Obovaria subrotunda (Rafinesque, 1820)	round hickorynut
Obovaria unicolor (Lea, 1845)	Alabama hickorynut
Truncilla donaciformis (Lea, 1828)	fawnsfoot
Truncilla truncata Rafinesque, 1820	deertoe
Villosa lienosa (Conrad, 1834)	little spectaclecase
Villosa vibex (Conrad, 1834)	southern rainbow

Other mussels suspect of possibly having been in Louisiana:

Cyprogenia aberti (Conrad, 1850)	western fanshell
Villosa iris (Lea, 1829)	rainbow
Lasmigona costata (Rafinesque, 1820)	fluted shell

Non-unionacean clams (natives and exotics)

Dreissena polymorpha (Pallas)	zebra mussel
Polymesoda caroliniana (Bosc)	Carolina marsh clam
Rangia cuneata Gray	brackish-water clam
Corbicula fluminea (Muller)	Asiatic clam
Sphaeriacea (Sphaeridae) (many species)	fingernail clams
Musculium spp.	
Sphaerium spp.	
Eupera spp.	
Pisidium spp.	

In this section, each major taxon is treated under a separate heading, including families, subfamilies, tribes, genera, and species. The species treatments of the native freshwater mussels include: partial synonomy, description, type locality, general distribution, and comments. The plates are placed on the covers of the book and in a central section entitled "Plates". Distribution maps are placed as close as possible to the species treatment.

The major concern of this report is the historical distributions of freshwater mussels (Unionacea--mussels with glochidia) in Louisiana. Two families occur in North America with approximately 65 species in Louisiana.

Family **Margaritiferidae** Haas, 1940

Animal characters: Absence of both a structurally formed diaphragm and vertical gill septa; hookless glochidia, however one species with irregular marginal, ventral teeth.

Shell characters: Shell of an unusual conchiolin layering and with mantle attachment scars on shell. (Smith and Wall 1984).

Comments: While Davis and Fuller (1981) reduced Margaritiferidae to subfamily level (Margaritiferinae in Unionidae), Smith and Wall (1984) argued for the reinstatement of Margaritiferidae to family level. Collectively, these two papers provide an excellent introduction to the systematics of the higher categories of freshwater mussels. Only a single species in the genus *Margaritifera* occurs in Louisiana.

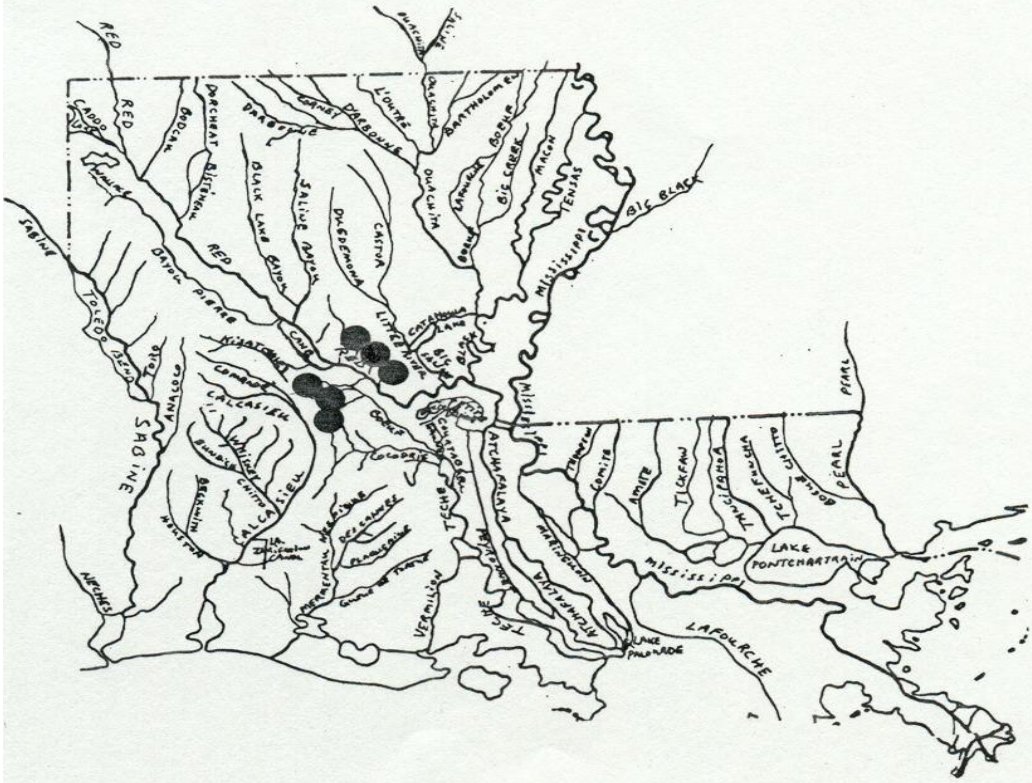
Genus *Margaritifera* Schumacher, 1816

Animal characters: Demibranch lamellae are held apart by randomly arranged trunks of interlamellar connective tissue. The ctenidia thus lack water tubes, and the eggs and/or larvae are incubated in a flaccid sac. All four demibranchs are marsupial. It lacks a separate supra-anal opening (i. e. there is no subdivision of the excurrent mantle aperture by fusion of the opposing mantle margin), and there is no clear demarcation of the anterior boundary of incurrent aperture. At the posterior end of the gills, the diaphragm is incomplete and formed only by ctenidia. Glochidia are tiny and hookless (Baker 1928, Davis and Fuller 1981, Smith and Wall 1984).

Shell characters: Shells generally elongate, usually arcuate, and umbos low and not full. Sculpture consists of numerous curved ridges which emanate along the posterior ridge, remain strong on the posterior slope, hinge teeth generally imperfect or not fully developed, two pseudocardinals in left valve, and one in right valve.

Comments: A single species occurs in Louisiana.

Map 3. Historical distribution of *Margaritifera hembeli* in North America.



Map 4. Historical distribution of *Margaritifera hembeli* in Louisiana.

Margaritifera hembeli (Conrad, 1838)
Louisiana pearlshell

Figures A-C
Plate I
Maps 3 and 4

Partial synonomy:
Margaritifera hembeli (Conrad, 1838), Vidrine 1985, 1989b, Turgeon *et al*. 1988, Smith and Wall 1984, Smith 1988, Stern 1976
Margaritana hembeli (Conrad, 1838), Simpson 1914, Frierson 1927 (p. 24)

Description: Shell oblong, obovate to subrhomboid, sometimes a little arcuate, subsolid to solid, inequilateral; beaks moderately full, their sculpture not seen; posterior ridge low, rounded or somewhat doubled; anterior end feebly pointed below the median line and sometimes angled at the base; surface with crude, uneven growth lines; posterior end with more or less distinctly marked with corrugated sculpture, often divaricately plicate; epidermis tawny-brownish or blackish; left valve with two low, stumpy, rough pseudocardinals and two remote, feeble laterals; right valve with one pseudocardinal and behind it a vestige of a second with one lateral; laterals granular with traces of vertical striation; muscle scars impressed, the anterior rough, the posterior elliptical; nacre whitish or lurid purplish with numerous pits (Simpson 1914, p. 523). S. L. H. Fuller commented on the relative smoothness of some Louisiana specimens in Burch (1975b).

Type locality: New Orleans, LA.

General Distribution: Samll streams in central Louisiana.

Comments: This species usually occurs in small sandy creeks and has been considered rare since the early 1970's (Stansbery 1971 and Vidrine 1978). It has been a federally listed endangered species since 1988. Louisiana Natural Heritage Program (1985) surveyed the known range of this species. Johnson (1983) described the Alabama populations, *M. marrianae* Johnson 1983. Clench and Turner (1956) discussed the Alabama populations and made mention of the Louisiana populations in Spring Creek, Bayou Cocodrie drainage. Recently, it has been discovered in the Catahoula Ranger District in streams flowing westward into the Red River (G. Lester, K. Brown, and R. Martin, personal communication, 1992). This highly unusual mussel can form beds of thousands of individuals in small, oligotrophic streams. Smith (1988) studied the reproductive cycle of this species and suspected that they are gravid during the winter months.

Family **Unionidae** Fleming, 1828

Animal characters: Presence of both a structurally formed diaphragm and vertical gill septa; glochidia variable with hooks, teeth, etc., or smooth.

Shell characters: Shell not of an unusual conchiolin layering and without mantle attachment scars on shell.

Comments: Two subfamilies occur in Louisiana. Each of these has a number of genera and many species.

Key to the subfamilies in Louisiana:

1a. Glochidia with teeth, hooks, and spines; mussel shells without or with some reduction in hinge teeth (pseudocardinals and/or laterals).....Subfamily Anodontinae
1b. Glochidia without hooks or spines, if so, then glochidial shell is hatchet-shaped; mussel shells with obvious, usually well developed hinge teeth.....Subfamily Ambleminae

Subfamily **Anodontinae** Swainson, 1840

Animal characters: With true septa parallel to gill filaments; water tubes tripartite; with supra-anal opening distinct; diaphragm slightly incomplete; additional tissue at distal margin of marsupial dembranchs; large subtriangular glochidia with hooks and numerous spines (Davis and Fuller 1981).

Shell characters: Shells without hinge teeth or with some reduction in hinge teeth (pseudocardinals and/or laterals).

Comments: Eight genera occur in Louisiana. Most species are headwater or lenthic elements.

Key to the genera in Louisiana:

1a. Hinge teeth absent.....2
1b. Hinge teeth present.....5

2a. With obvious raised umbos (beaks).....3
2b. Without obvious raised umbos.....4

3a. Beaks swollen.....Genus *Pyganodon*
3b. Beaks not swollen.....Genus *Strophitus*

4a. Shell obviously longer than wide.....Genus *Utterbackia*
4b. Shell nearly as wide as long.....Genus *Anodonta*

5a. Shell surface with obvious undulations.....Genus *Arcidens*
5b. Shell surface smooth or lacking obvious undulations.....6

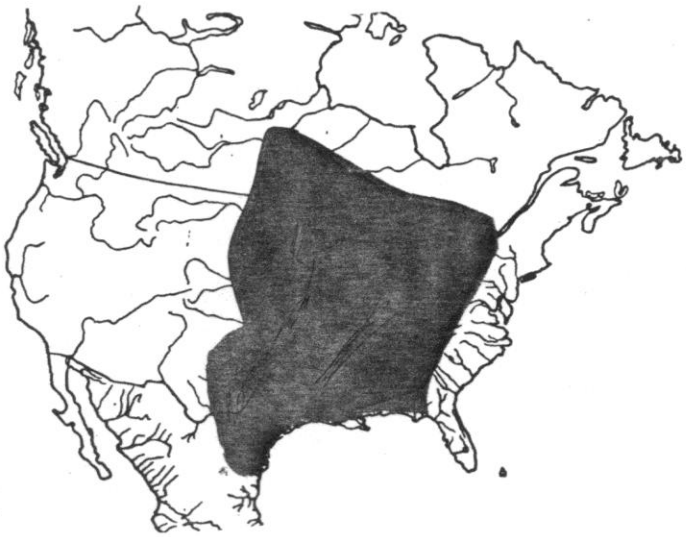
6a. Shell with flattened posterior ridge.....Genus *Alasmidonta*
6b. Shell with rounded posterior ridge.....7

7a. Shells laterally compressed and nearly circular in outline; pseudocardinals rather well developed.....Genus *Lasmigona*
7b. Shells not as above.....8

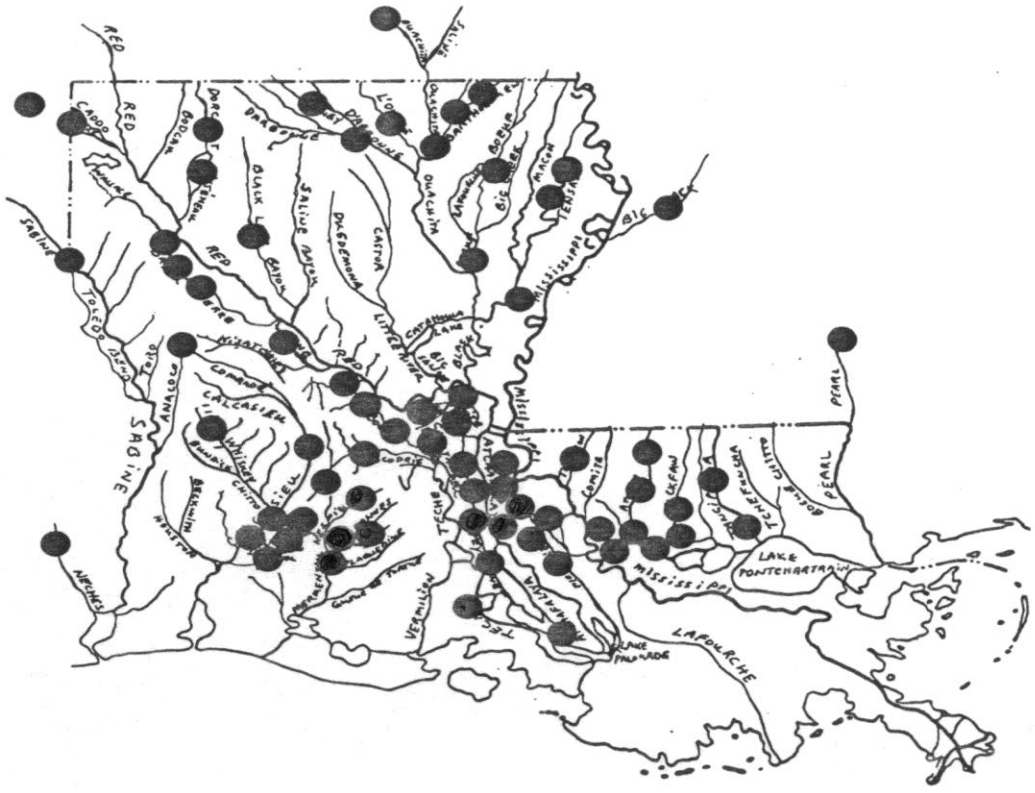
8a. Shell subrhomboidal, subelliptical, or trapezoidal; epidermis greenish to dark; umbos not strongly anterior.Genus *Strophitus*
8b. Shell elliptical; epidermis yellowish; umbos anterior and almost pointing anteriorly.....Genus *Anodontoides*

Genus *Pyganodon* Crosse and Fischer, 1893

Shell characters: Shell lacking hinge teeth (both pseudocardinals and laterals); beaks sculptured with double-looped; shell thin to moderately thick; usually beaks elevated. This genus separated from *Anodonta* and *Utterbackia* by electrophoretic characters, but the shell morphology of the three genera suffer a high degree of ecophenotypic plasticity.(After Hoeh 1990).
Comments: Only one, highly variable species occurs in Louisiana.



Map 5. Historical distribution of *Pyganodon grandis* in North America.



Map 6. Historical distribution of *Pyganodon grandis* in Louisiana.

Pyganodon grandis (Say, 1829)
giant floater

Figures D-G
Plate I
Maps 5 and 6

Partial synonomy:
Pyganodon grandis (Say, 1829), Hoeh 1990
Anodonta grandis Say, 1829, Vidrine 1985, 1989b, Turgeon *et al.*, 1988, Simpson 1914, Stern 1976, Hartfield 1988, Strecker 1931, Neck 1986, 1990, Roback *et al.* 1980, Murray and Roy 1968, Gordon *et al.* 1980, Frierson 1927 (p. 14)
Anodonta stewartiana Lea, 1834, Vaughan 1892, 1893, Coker 1915, Frierson 1899a
Anodonta gigantia Lea, 1838, Vaughan 1893
Anodonta corpulenta Cooper, 1834, Vaughan 1893, Shira 1913
Anodonta opaca Lea, 1852, Vaughan 1893, Vanatta 1910, Frierson 1899a
Anodonta virens-stewartiana Lea, 1834, Frierson 1899b

Description: Shell long ovate, subrhomboid or subelliptical, generally rather strong, subinflated, inequilateral; beaks usually full and more or less elevated above the dorsal line, their sculpture consisting of a few strong, irregular, broken ridges, which are sharply, double looped, the bases of the loops nearly or quite nodulous; posterior ridge full, frequently more or less double and ending behind in a rounded or feebly biangulate point at the median line; post-dorsal wing low, obliterated in old specimens; upper anterior edge either slightly angled or rounded; base line curved; epidermis greenish-brown or brownish-green, rarely faintly rayed, but showing about three broad, dark rays on the posterior slope; beak cavities varying from shallow to moderately deep, not compressed; nacre bluish-white, rarely tinted purple, sometimes a little thickened in front (Simpson 1914, p. 418).

Type locality: Fox River of the Wabash.

General distribution: Mississippi Interior Basin, Western Gulf and Eastern Gulf drainages.

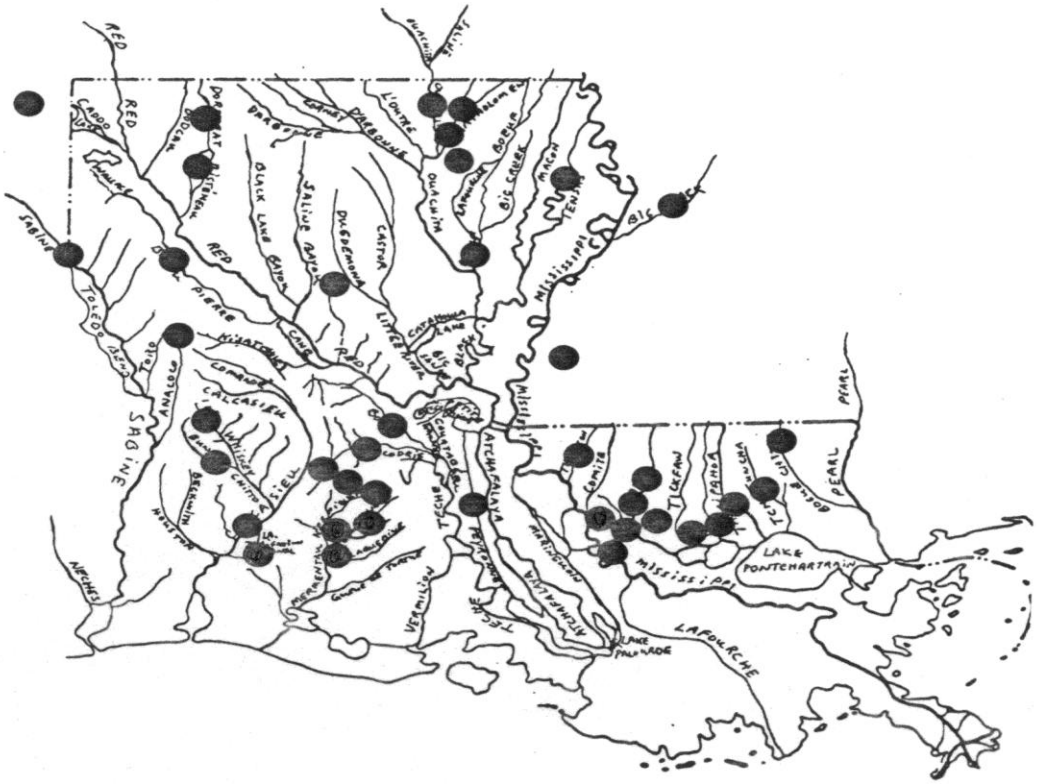
Comments: This variable species had many older names. This is a readily obvious species with umbos rising above the hinge line and neither pseudocardinal nor hinge teeth. This species can only be confused with the edentulous forms of *S. undulatus*. Penn (1939) studied the life history of *P. grandis* in New Orleans.

Genus *Utterbackia* Baker, 1927

Shell characters: Shell lacking hinge teeth (both pseudocardinals and laterals); shell thin; usually beaks low. This genus separated from *Anodonta* and *Pyganodon* by electrophoretic characters, but the shell morphology of the three genera suffer a high degree of ecophenotypic plasticity.(After Hoeh 1990).

Comments: Only one species occurs in Louisiana.

Map 7. Historical distribution of *Utterbackia imbecillis* in North America.



Map 8. Historical distribution of *Utterbackia imbecillis* in Louisiana.

Utterbackia imbecillis (Say, 1829)
paper pondshell

Figures H-K
Plate I
Maps 7 and 8

Partial synonomy:
Utterbackia imbecillis (Say, 1829), Hoeh 1990
Anodonta imbecillis Say, 1829, Vidrine 1985, 1989b, Turgeon *et al.* 1988, Simpson 1914, Vaughan 1892, Frierson 1899a, 1899b, Stern 1976, Hartfield 1988, Murray and Roy 1968, Neck 1986, 1990, Gordon *et al.* 1980, Roback *et al.* 1980
Anodonta ohiensis of authors, not (Rafinesque, 1820), Strecker 1931, Frierson 1927 (p. 17)

Description: Shell oblong, thin, with dorsal and ventral lines nearly parallel, pointed behind at or above the median line, inequilateral, convex or inflated; beaks compressed or flattened, not projecting above the nearly or quite straight dorsal line, their sculpture consisting of a few rather feeble, irregular, broken ridges, which are sometimes faintly double looped; posterior ridge low, curved down in the middle; epidermis generally smooth, yellowish-green or blue-green, often banded and feebly rayed, with two or more wide, ill-defined, dark rays on the posterior slope; muscle scars scarcely visible; nacre pale blue or bluish-white (Simpson 1914, p. 395).

Type locality: Wabash River.

General distribution: Mississippi Interior Basin, Western Gulf and Eastern Gulf, and Atlantic Slope drainages.

Comments: This species could easily be in any pond. Parker *et al.* (1980) discussed fish hosts. A thin shelled species with umbos no higher than the hinge line and no teeth whatsoever inside the shells. *Anodonta ohiensis* is now considered the type for another thin shelled species *Potamilus ohiensis. Utterbackia imbecillis* can number in the thousands in a single pond, as was the case in the water traps at Briarwood Country Club in Baton Rouge in the 1970's.

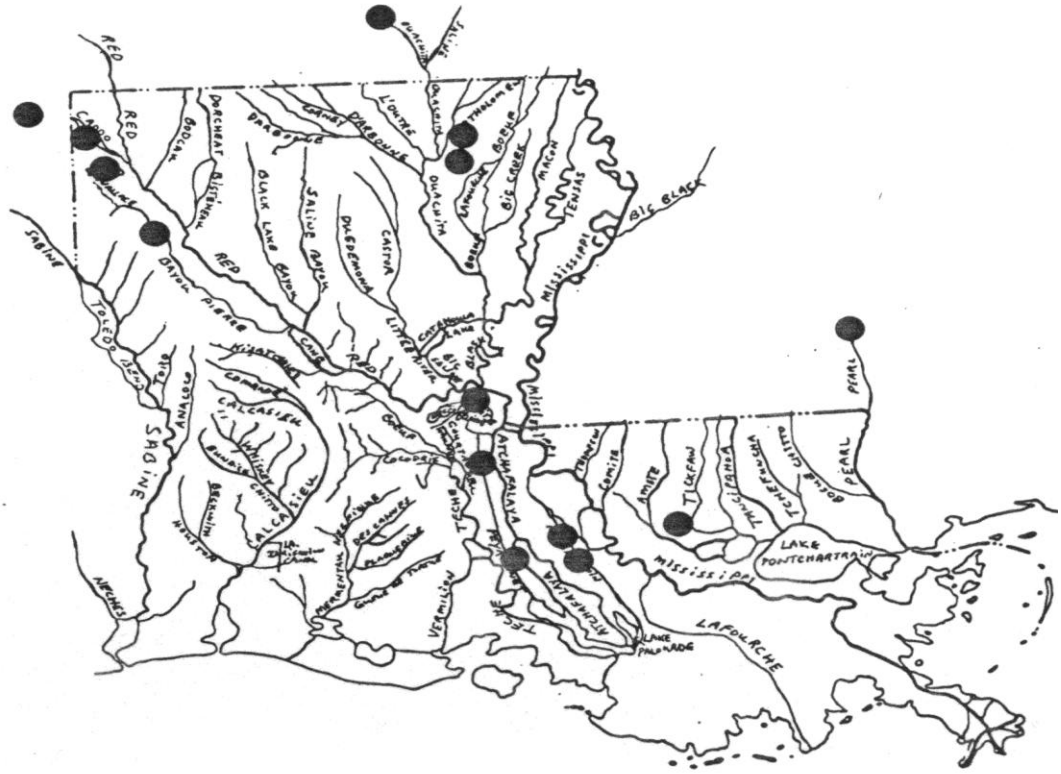
Genus *Anodonta* Lamarck, 1799

Shell characters: Shell lacking hinge teeth (both pseudocardinals and laterals); shell thin; usually beaks low.

Comments: Only one species occurs in Louisiana; however, Hartfield (1988) discussed another possible species, *Anodonta* sp. cf. *suborbiculata* in the Pearl River in Mississippi. This genus has recently been re-evaluated by Hoeh (1990). He divided the North American species into three genera based upon electrophoretic characters, and he discussed the high degree of ecophenotypic plasticity among these genera. The description of *Anodonta sensu lato* follows:

Animal characters: Branchial opening with yellowish papillae, anal smooth to slightly crenulated; supra-anal generally small, removed from anal by long mantle connection; inner lamina of inner gills free from one-half to entire length; palpi usually long and large; only outer gills marsupial; when marsupia are gravid, ventral edge distends and secondary water-tubes appear, ovisacs simple,

Map 9. Historical distribution of *Anodonta suborbiculata* in North America.



Map 10. Historical distribution of *Anodonta suborbiculata* in Louisiana.

undiv

undivided, dark brown when gravid with mature glochidia; no conglutinates formed; glochidia large, brownish, spined, spadiform.

Shell characters: Shell ellipical, inflated, thin, slightly alated; disk smooth; beaks full-high, sculpturing distinct, double-looped, angled upward centrally; epidermis polished, brightly colored; hinge teeth completely lacking. Utterback (1915-16: 262).

Anodonta suborbiculata Say, 1831
flat floater

Figures L-O
Plate I
Maps 9 and 10

Partial synonomy:
Anodonta suborbiculata Say, 1831, Hoeh 1990, Turgeon *et al*., 1988, Vidrine, 1985, 1989b, Simpson 1914, Vaughan 1893, Frierson 1899a, Stern 1976, Gordon *et al*. 1980, Harris and Gordon 1987, Frierson 1927 (p. 17)

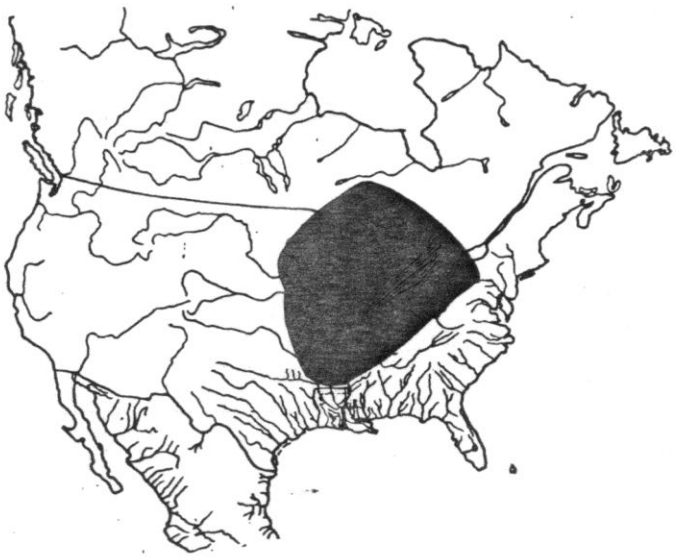
Description: Shell large, irregularly short ovate, thin but strong, gaping in front and behind, subinflated, with low beaks, which are compressed in young shells but fuller in old ones, their sculpture a few irregular, feeble undulations, each bar usually having small, sharp tubercles, these tubercles form two imperfectly radiating rows; dorsal line somewhat curved, ending in front and behind in a small wing or angle; dorsal slope truncated, its outline incurved just above the low posterior ridge; the rounded posterior point about at the median line; base line rounded; anterior end rounded, sometimes cut away a little below; surface smooth and shining in young shells, pale, yellow-green, beautifully and delicately rayed, with three broad rays behind; in old shells the outer growth is concentrically sculptured and the epidermis is smoky or ashy, often banded and nearly or quite rayless; nacre silvery and iridescent, tinted bluish or purplish (Simpson 1914, p. 490).
Type locality: Ponds near the Wabash River.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

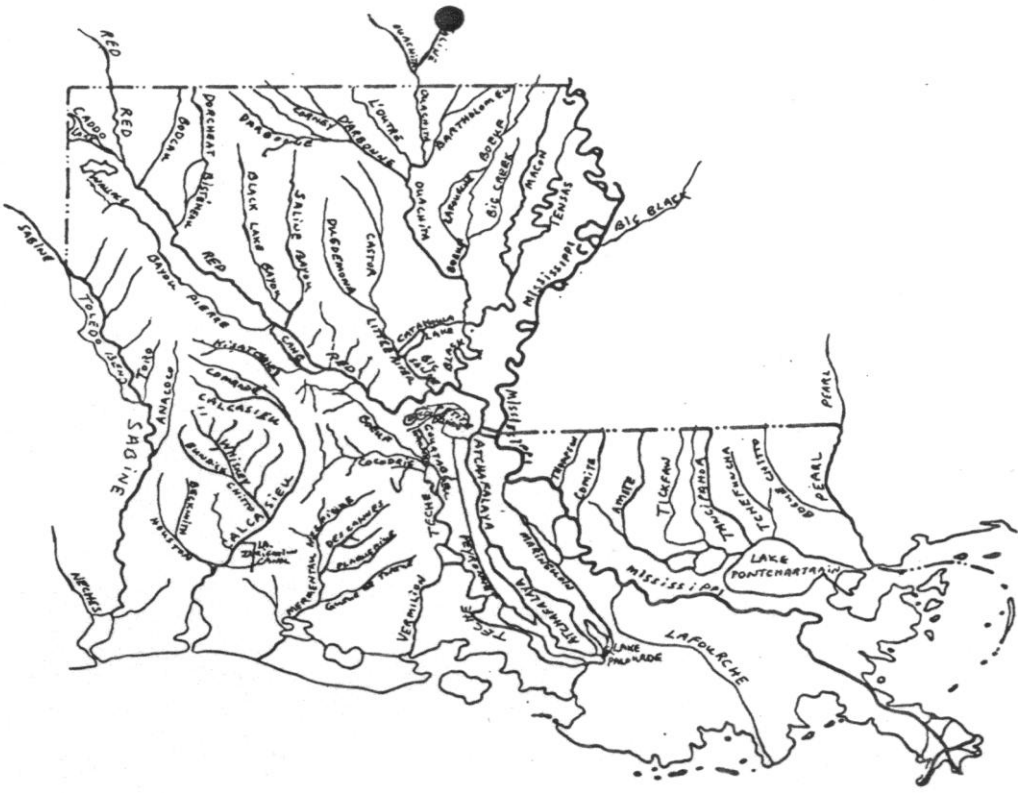
Comments: This species is common in the Atchafalaya Basin at Henderson Swamp. Frierson (1899a) reported it from Edwards lake, and Vaughan (1893) reported it from Caddo lake. Neck (1982c) and Mather *et al*. (1990) reported it from Texas among the following rivers: Sabine, Neches, and San Jacinto. I found *A. suborbiculata* in the Lake of the Pines on the Caddo drainage in Texas, in Calion Lake on the Ouachita River in Arkansas, and in a borrow pit next to Interstate 10 in eastern Louisiana (Tickfaw River drainage). *Anodonta* sp. cf. *suborbiculata* Hartfield 1988 is possibly a new species in the Pearl River drainage of Mississippi and possibly Louisiana. Whereas *A. suborbiculata* is very colorful, usually rayed, and literally a round shell with umbos not raised above the hinge line, *Anodonta* sp. cf. *suborbiculata* has slighly raised umbos and is offround. Both completely lack teeth inside the shell.

Genus *Alasmidonta* Say, 1818

Animal characters: Mantle connection between anal and supra-anal openings moderately long; inner laminae of inner gills free from



Map 11. Historical distribution of *Alasmidonta marginata* in North America.



Map 12. Historical distribution of *Alasmidonta marginata* in Louisiana.

visceral mass or more or less connected to it; outer gills only marsupial; when charged, distended at ventral edges, water canals facing laminae present, central ovisacs undivided; no conglutinates, embryos held in mucus masses; glochidium large, spined, subtriangular, hinge line straight, or nearly so.

Shell characters: Shell subquadrate to subtrapezoidal, thin, inflated; disk smooth; beaks heavily sculptured with irregular concentric bars--the later ones being more or less undulate; epidermis olivaceous to burnt orange with broken rays; pseudocardinals present, laterals reduced; beak and branchial cavities deep; nacre white to pearl blue. Utterback (1915-16: 270)

Comments: A single species may occur in Louisiana.

Alasmidonta marginata Say, 1818
elktoe

Figures A-C
Plate II
Maps 11 and 12

Partial synonomy:
Alasmidonta marginata Say 1819, Vidrine 1989b, Turgeon *et al.*, 1988, Simpson 1914, Gordon *et al.* 1980, Roback *et al.* 1980
Decurambis marginata (Say, 1818), Frierson 1927 (p. 21)

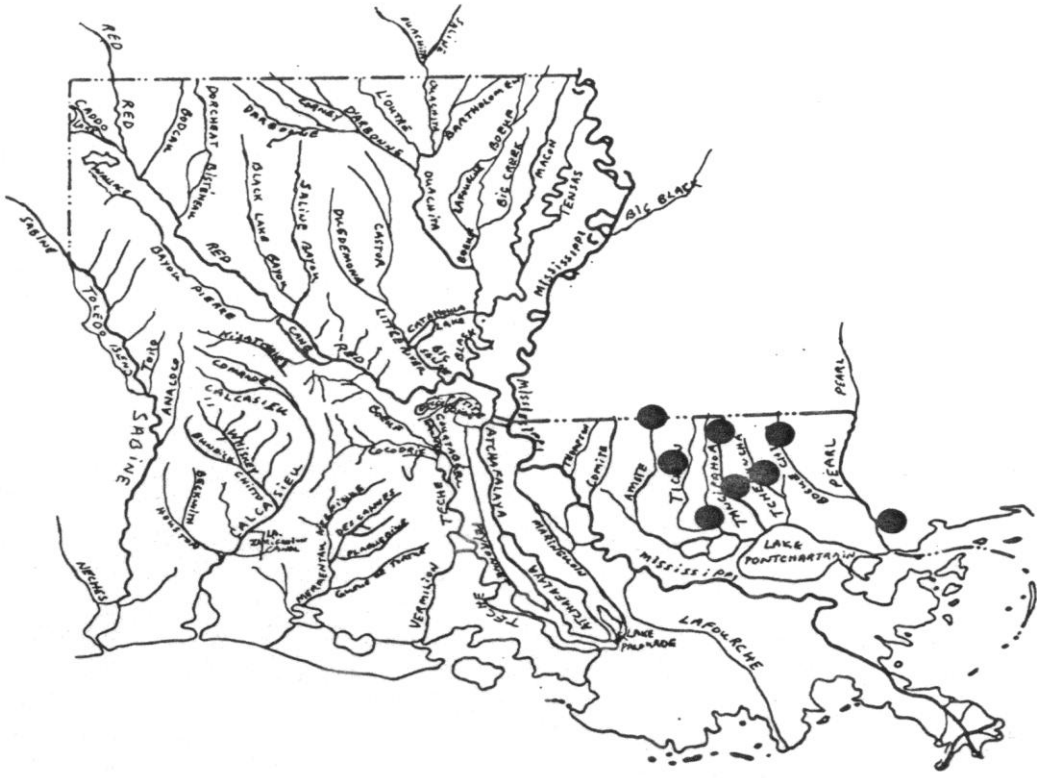
Description: Shell medium to rather large, long rhomboid, nearly or quite equilateral, subsolid to solid, subinflated; beaks very full, high, sculptured with a few strong corrugations, which tend to be doubly looped; posterior ridge very high and angled, ending behind in a point at the base of the shell, behind the ridge there is a decided oblique truncation and the truncated area is rather finely corrugated; growth lines uneven; epidermis smooth, shining, greenish, ashy or smoky-green with narrow yellowish rays and broken, clouded green ones; left valve with one small, compressed, sharp tooth in front of the beak; right valve with a small anterior tooth; laterals almost or quite wanting; beak cavities rather deep; nacre white or bluish, sometimes straw-color, rarely reddish or purple; prismatic border distinct (Simpson 1914, p. 504).

Type locality: Scioto River, Chillicothe, Ohio.

General distribution: Mississippi Interior Basin and North Atlantic slope drainages. This species is yet to be reported from Louisiana.

Comments: Clarke (1981b) re-examined this genus. Steven George (pers. comm., 1992) found shells of this species in the lower Saline River in Arkansas in 1992, which may indicate it as a possible resident in northern Louisiana. The species was quite common in the upper Ouachita River in Arkansas in the 1970's based upon my collections. Only a few river miles upstream in the Saline River are three additional species which may be residents of Louisiana: *Villosa iris, Lasmigona costata* and *Cyprogenia aberti*. The extreme similarities between Saline River in Arkansas and her sister drainage, Bayou Bartholomew, may further hint at their occurrence in Louisiana.

Map 13. Historical distribution of *Anodontoides radiatus* in North America.



Map 14. Historical distribution of *Anodontoides radiatus* in Louisiana.

Genus *Anodontoides* Simpson, 1898

Animal characters: Marsupium occupying the outer gills only. Walker (1918: 57).

Shell characters: Shell elliptical, inflated, thin, with a faint posterior ridge, sometimes constricted at the center of the base; beaks rather full, with a few not very coarse, subparallel, concentric ridges which are curved up rather suddenly behind; back of these are fine radiating ridges; epidermis smooth and shining, often rayed; hinge line incurved in front of the beaks, edentulous or bearing the merest rudiments of teeth; nacre bluish-white.

Comments: Only a single species occurs in Louisiana. The AFS list (Turgeon *et al*. 1988) placed this species in the above genus. However, Stern (1976) placed it in the genus *Strophitus*.

Anodontoides radiatus (Conrad, 1834)
rayed creekshell

Figures 1,2 and 7 and D-I
Front Cover and Plate II
Maps 13 and 14

Partial synonomy:
Anodontoides radiatus (Conrad, 1834), Johnson 1967, Turgeon *et al*. 1988
Strophitus radiatus (Conrad, 1834), Stern 1976 (in part), Simpson 1914, Vidrine 1985, 1989b (in part), Hartfield 1988, Frierson 1927 (p. 23)

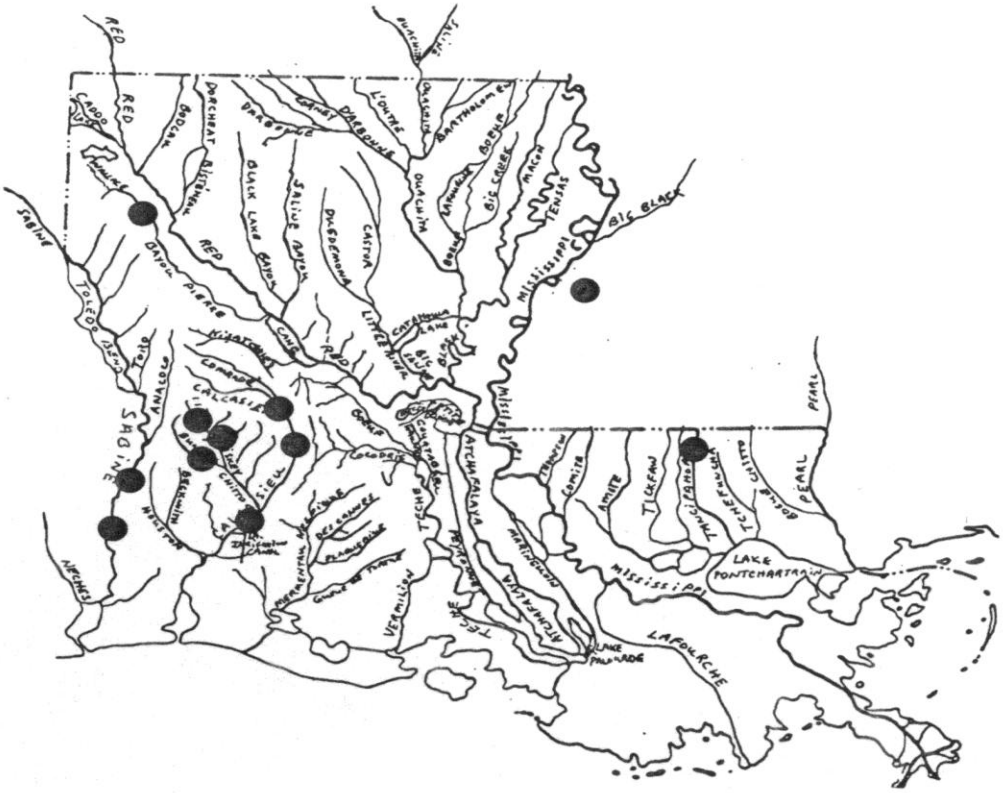
Description: Shell ovate-acute, ventricose; posterior end produced and pointed at the end; pseudocardinal tooth in the right valve elongated and anterior to and distant from the beak; pseudocardinal tooth in the left valve elongated, and situated immediately under the beak; beaks prominent and pointed at the apex, which has two or three profound undulations; epidermis light olive, beautifully rayed with dark green; cavity capacious; nacre waxen-yellowish (Simpson 1914, p. 356).

Type locality: small streams in south Alabama.

General distribution: Gulf drainages, from Alabama-Coosa River system of Alabama to the Apalachicola River of Georgia and Florida (Johnson 1967); Louisiana and Mississippi possibly as far west as the Amite River.

Comments: Stern (1976) discussed this taxon, and there appear to two readily confused species in eastern Louisiana: *S. subvexus* and *A. radiatus*. Stern (1976) argued for the use of the name *Strophitus* but the AFS list uses *Anodontoides*. Hartfield (in press) reports both species from every drainage in the Lake Maurepas-Pontchartrain-Borne drainage. Specimens from Twelve Mile Creek have yellow periostracum with green rays, which is distinctive from the greenish periostracum of *S. subvexus*. The umbo in these specimens is more anterior than in the *S. subvexus*. Hartfield (1988) treats the southeastern Louisiana taxon as *Strophitus subvexus*. Specimens borrowed from MMNS were *Strophitus subvexus*. Johnson (1967) illustrated these species and more completely developed their synonomies. Frierson (1927) contended that when in perfect condition this is possibly the most beautiful shell in the United States

Map 15. Historical distribution of *Strophitus subvexus* in North America.



Map 16. Historical distribution of *Strophitus subvexus* in Louisiana.

Genus *Strophitus* Rafinesque, 1820

Animal characters: Branchial opening densely papillose; anal papillose or crenulate; mantle connection between anal and supra-anal not long and bordered by square, black spots; inner gills larger, inner laminae free from, or united to, the visceral mass; palpi united anterodorsad for most of their length, color of soft parts variable but with the tendency to have certain parts (such as foot, adductors, mantle edge at branchial opening) orange in color; marsupium peculiar, consisting of ovisacs divided into many compartments at right angles to the laminae; conglutinates short, solid cords (termed *placentulae* by Ortmann).

Shell characters: Shell subrhomboid or subelliptical, subsolid, inflated, with low post-umbonal ridge; disk smooth; beaks rather full, sculptured with rather heavy concentric bars upcurved behind; epidermis rayed or rayless, polished; hinge teeth mere rudiments, sometimes entirely absent. Utterback (1915-16: 311).

Comments: Two or three species occur in Louisiana. These provide an excellent opportunity for further research. Southwestern Louisiana specimens from the Calcasieu River system, *Strophitus* sp. cf. *subvexus*, appear morphologically intermediate between the *S. subvexus* and the dentate *S. undulatus* phenotypes, yet it has a well developed swelling along the entire hinge line.

Key to the species in Louisiana:

1a. Shell completely lacking hinge teeth and swellings in this region.....*S. undulatus*
1b. Shell with at least swellings along hinge line.....2

2a. Distributed in northern Louisiana.....*S. undulatus*
2b. Distributed in southern Louisiana.....*S. subvexus*

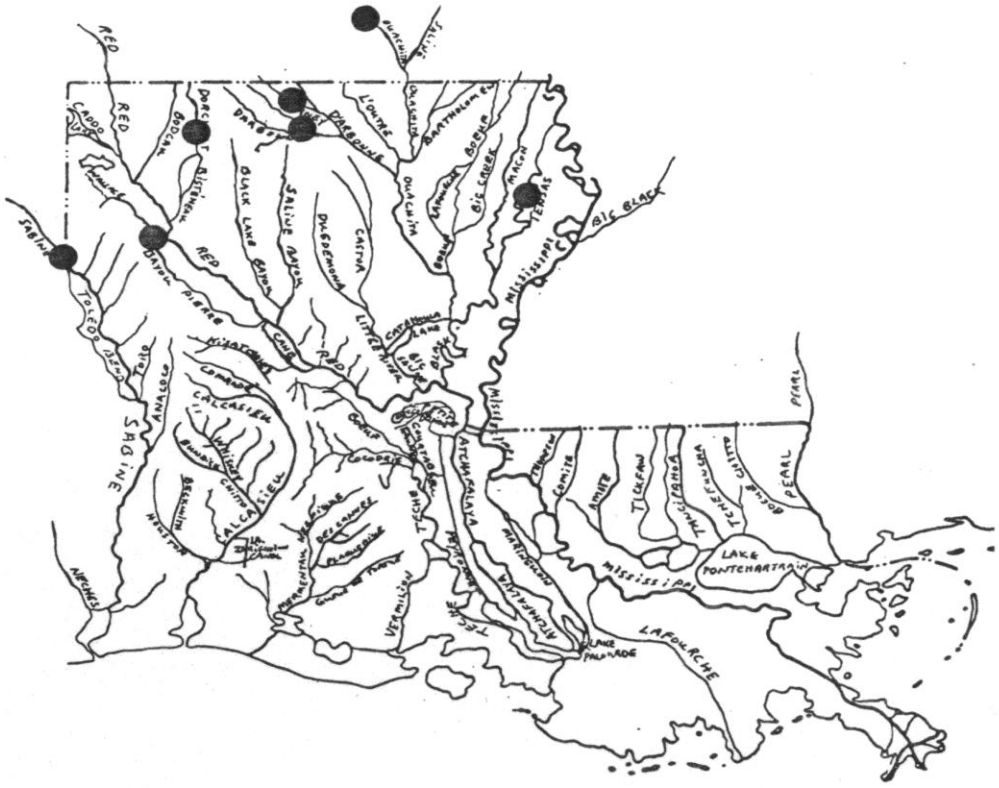
Strophitus subvexus (Conrad, 1834)
southern creekmussel

Figures 5-6 and J-O
Front Cover and Plate II
Maps 15 and 16

Partial synonomy:
Strophitus subvexus (Conrad, 1834), Hartfield 1988, Simpson 1914, Vidrine 1985, 1989b, Turgeon *et al.*, 1988, Johnson 1967, Murray and Roy 1968, Stern 1976, Strecker 1931, Frierson 1927 (p. 23)
Strophitus radiatus (Conrad, 1834), Stern 1976 (in part), Vidrine 1985, 1989b (in part)
Anodonta subvexa Conrad, 1834, Frierson 1899a
Anodonta edentula (Say, 1829), Frierson 1899b

Description: Shell suboval, inflated, thin; anterior end rounded; posterior end subtruncated; posterior dorsal margin elevated and abruptly rounded at the extremity; callus resembling an incipient tooth; shell with prominent beaks, undulated at the apex and not distant from the middle of the valve; umbo inflated; umbonal region angulated, and space behind with radiating lines; epidermis olive and rather obscurely rayed; cavity very capacious, most so behind the middle; nacre bluish, stained with a light waxen-yellow (Simpson 1914, p. 355).

Map 17. Historical distribution of *Strophitus undulatus* in North America.



Map 18. Historical distribution of *Strophitus undulatus* in Louisiana.

Type locality: Black Warrior River, Alabama.

General distribution: Gulf drainages from Pascagoula River system of Mississippi to the Apalachicola River system of Georgia and Florida (Johnson 1967); southern Mississippi, eastern Louisiana drainages and western Louisiana drainages.

Comments: Raymond Neck (pers. comm., 1992) considers this species as *S. undulatus* in Texas, but I treat it as *Strophitus* sp. cf. *subvexus* for the western populations in Louisiana (Calcasieu and Sabine River drainages). Specimens west of the Sabine River may indeed be *S. undulatus*, *e.g.*, specimens from the San Jacinto, Colorado and Brazos Rivers. Frierson (1899a) reported it from Edwards Lake as *Anodonta subvexa*. Shells from MMNS and from Tangipahoa River at LA 38, Louisiana, represent this taxon. I have specimens from Tangipahoa River mixed with specimens of *A. radiatus*. Young shells in western Louisiana are darkly rayed but older specimens turn nearly black. Good plates of the *sensu stricto* form are presented in Johnson (1967). I am unable to determine which of Stern's localities in eastern Louisiana represent this species.

Strophitus undulatus (Say, 1817)
squawfoot

Figures 3-4, P and A-F
Front Cover and Plates II and III
Maps 17 and 18

Partial synonomy:
Strophitus undulatus (Say, 1817), Vidrine 1985, 1989b, Simpson 1914, Turgeon *et al*. 1988, Stern 1976, Murray and Roy 1968, Gordon *et al*. 1980, Strecker 1931 (?), Frierson 1927 (p. 22)
Strophitus edentulus (Say, 1818), Simpson 1900, Vanatta 1910
Anodonta tetragona Lea, 1845, Vaughan 1892, 1893, Frierson 1899a
Anodonta edentula (Say, 1829), Frierson 1899b
Unio plicatus (Lea, 1870), Vaughan 1893 (see below)

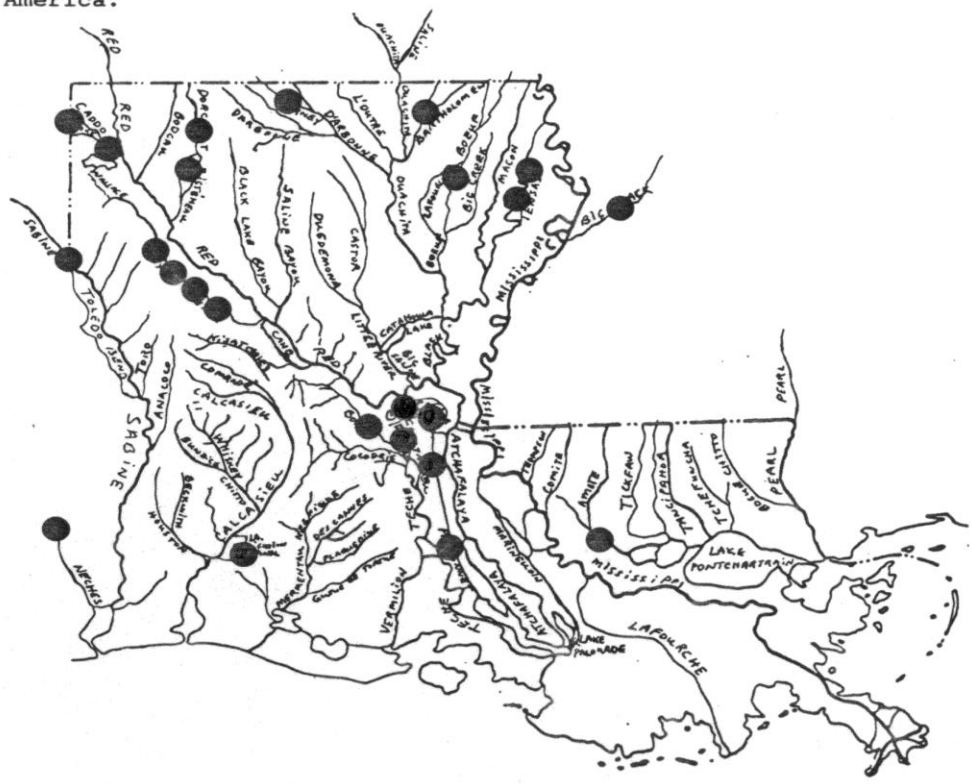
Description: Shell generally subrhomboid, scarcely inflated, rather thin, inequilateral, with high beaks, whose sculpture consists of a few very strong ridges running parallel with the growth lines, turning up somewhat behind; behind these there are usually a few radial lirae; posterior ridge generally well developed and angular, sometimes double; surface with fine growth lines; epidermis dull ashy, ashy-green or smoky, often with faint, darker rays; hinge line narrow, somewhat incurved in front of beak, having the merest vestiges of pseudocardinals and no laterals; beak cavities not deep; nacre bluish, often straw-colored, buff or pale salmon in the shell cavities (Simpson 1914, p. 349).

Type locality: Not given.

General distribution: Mississippi Interior Basin drainages.

Comments: The edentulous form (*Anodonta tetragona* in Vaughan 1893) occurred in Corney Bayou; I have found it in Cypress Creek and Bayou D'Arbonne of the same drainage in the 1970's. This form surely looks like *Pyganodon* sp. when large and like *Anodontoides ferussacianus* when young. Typical specimens occur in Tensas River. Vidrine (1985) reported it with teeth from Little Corney Bayou and Dugdemona River---these specimens are apparently lost. Frierson (1899a) reported it in the Sabine. Vaughan (1892 and 1893) reported it from northern

Map 19. Historical distribution of *Arcidens confragosus* in North America.



Map 20. Historical distribution of *Arcidens confragosus* in Louisiana.

Louisiana. *Unio plicatus* (Lea, 1870) in Vaughan (1893) is possibly a synonym of *Anodontoides ferussacianus* (Lea, 1834). Vaughan (1893) reported a single specimen from Bayou Pierre. This shell is probably *P. grandis* or *S. undulatus*.

Genus *Arcidens* Simpson, 1900

Animal characters: Branchial opening densely set with papillae; anal finely serrated; supra-anal long with short mantle connection to anal; inner gills wider in front than outer, inner laminae of inner gills free; palpi large, united two-thirds of their length antero-dorsad; marsupium Anodontinae both in external and internal structures; glochidium spined, hinge line undulate.

Shell chracters: Shell somewhat rhomboidal, inflated with rather high, full beaks; disk and beaks profusely sculptured, the latter coarsely double-looped, the spinuous, tuberculed loops extending in two divergent rows upon the disk; the former with oblique folds on the post-ventrad part with pustulated expansions along the post-umbonal ridge; pseudocardinals present but only traces of laterals are seen; nacre white. Utterback (1915-16: 253).

Comments: A single, highly variable species occurs in Louisiana.

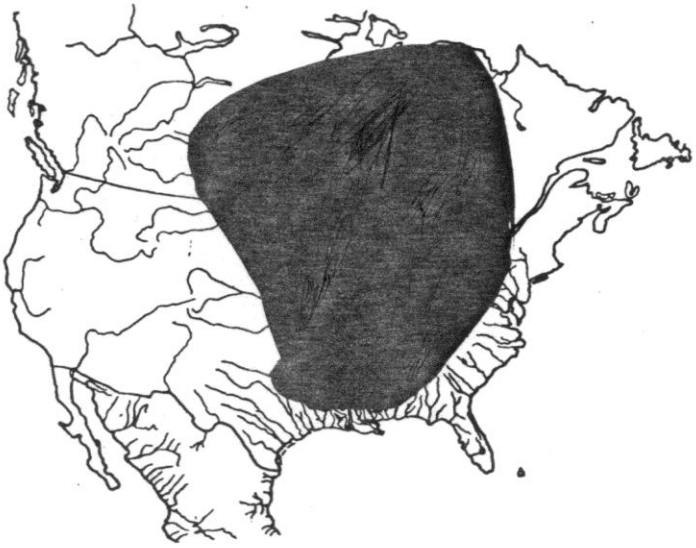
Arcidens confragosus (Say, 1829)
rock-pocketbook

Figures G-L
Plate III
Maps 19 and 20

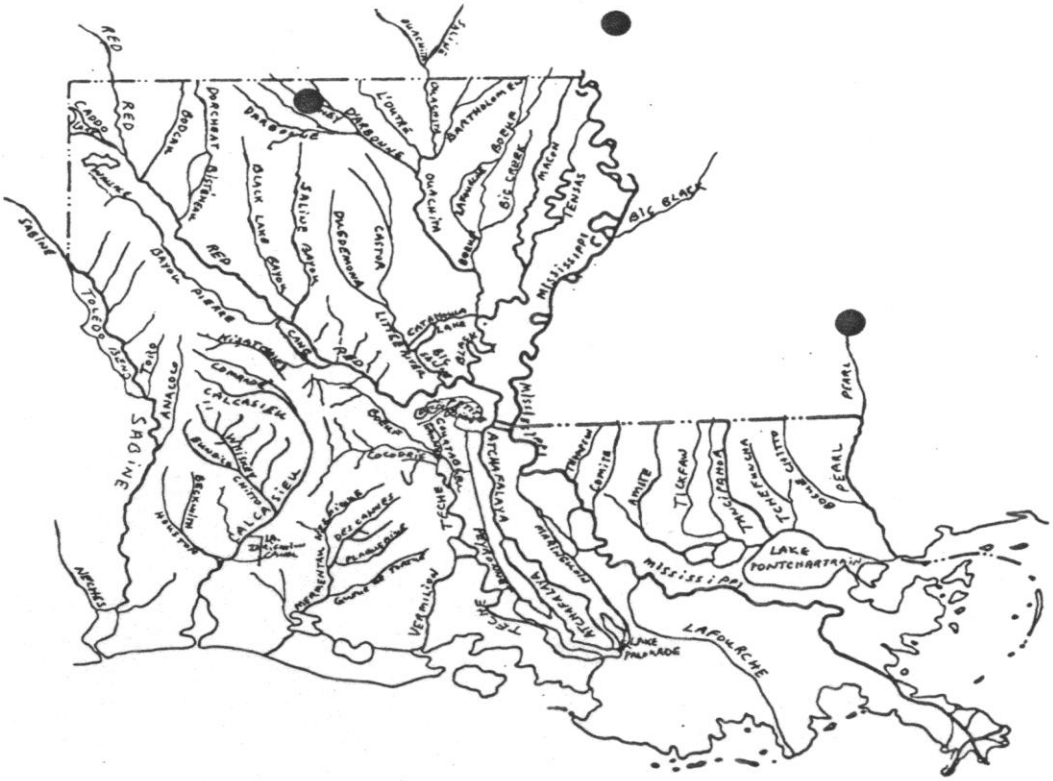
Partial synonomy:
Arcidens confragosus (Say, 1829), Vidrine 1985, 1989b, Simpson 1914, Turgeon *et al*. 1988, Stern 1976, Murray and Roy 1968, Roback *et al*. 1980, Gordon *et al*. 1980, Strecker 1931, Hartfield 1988, Shira 1913, Neck 1990, Johnson 1980, Frierson 1927 (p. 21)
Margaritana confragosa (Say, 1829), Vaughan 1892, 1893, Frierson 1899a, 1899b

Description: Shell rhomboid, inflated, subsolid, slightly inequilateral; beaks high and full, their sculpture consisting of irregular, double-looped ridges, the bases of the loops being developed into strong, pinched-up nodules, which extend out onto the disk of the shell; in front of and behind the loops there are a number of radiating, wavy, subnodulous or small ridges; from the anterior row of knobs extending backwards and downwards there is a series of strong folds and these are crossed by wrinkled, radiating, sometimes zigzagged, threads; the posterior slope has radial, wrinkled sculpture, while the anterior base usually has merely concentric striae; posterior ridge rather high; post-dorsal region almost winged; epidermis brownish-green with dark bands, sometimes clouded; left valve with an arched, somewhat elongated tooth under the beak, which often curves upward; in front of this is a compressed tooth; right valve with a strong, subcompressed tooth in front of the beak; at the beak the hinge plate is cut away for the reception of the tooth in the left valve; laterals reduced to blurred, uneven vestiges; beak cavities deep; muscle scars shallow; nacre bluish-white, dull, often with uneven radial sculpture, with a wide prismatic border (Simpson 1914, p. 475).

Type locality: New Orleans, LA.



Map 21. Historical distribution of *Lasmigona complanata* in North America.



Map 22. Historical distribution of *Lasmigona complanata* in Louisiana.

General distribution: Mississippi Interior Basin and western Gulf drainages (Johnson 1980).

Comments: Clarke (1981b) re-examined this genus. *Arkansia wheeleri* Walker and Ortmann, 1912, a relative in Arkansas, is discussed by Harris and Gordon (1987) and Gordon (1981). Johnson (1980) illustrated the southern distribution of these species. Both species have distinctive sculpture and distinctive pseudocardinal and hinge teeth.

Genus *Lasmigona* Rafinesque, 1831

Animal characters: Branchial opening with short papillae; anal smooth, or finely crenulated; supra-anal larger or smaller than anal, separated by more or less long mantle connection; gills bowed ventral, septa and water tubes well developed; inner lamina of inner gills free from visceral mass; marsupium occupying outer gills, padlike and with secondary water tubes, when charged; glochidia large, spadiform, spined, hinge line undulate; palpi sicklelike, united for one-half of their length anterio-dorsad; color of soft parts usually yellowish.

Shell characters: Shell elliptical to oval, compressed, smooth except for costae sometimes on posterior dorsal ridge; beak sculpture double-looped, or sinuate-concentric; pseudocardinals always present; laterals imperfect or even absent; nacre white or bluish. Utterback (1915-16: 249 and Clarke 1985).

Comments: Two subspecies possibly occur in Louisiana. *Lasmigona complanata complanata* (Barnes, 1823) in the Mississippi River system and western Louisiana and *L. c. alabamensis* (Clarke, 1985) in the Pearl River system in eastern Louisiana are yet to be verified as residents within the state. A third taxon, *Lasmigona costata* occurs in the Ouachita and Saline drainages in Arkansas and may be a resident of Louisiana.

Lasmigona complanata (Barnes, 1823)
white heelsplitter
(includes both subspecies)

Figures M-O
Plate III
Maps 21 and 22

Partial synonomy:
Lasmigona complanata complanata (Barnes, 1823), Turgeon *et al.* 1988, Stern 1976, Hartfield 1988, Gordon *et al.* 1980, Roback *et al.* 1980, Valentine and Stansbery 1971, Neck 1982, 1984
Lasmigona complanata alabamensis Clarke, 1985
Symphynota complanata (Barnes, 1823), Simpson 1914
Margaritana complanata Barnes, 1823, Vaughan 1893
Lasmigona complanata (Barnes, 1823), Frierson 1927 (p. 20), Vidrine 1989b

Description: Shell large, solid, irregularly elliptical, obovate or subrhomboid, inequilateral, compressed; beaks low, decidedly flattened, their sculpture consisting of coarse, doubly-looped, subnodulous ridges with radiating raised threads behind; young shell produced into a high, often angular post-dorsal wing, which is truncated behind making the outline of growth somewhat triangular;
as the shell becomes old this wing breaks off and is worn away; posterior ridge low, sometimes double and ending behind in a biangulation on the median line; base rounded, full behind the middle; surface with rude

growth lines, often somewhat plicate on the posterior slope; epidermis dark green in young shells, blackened in old ones, scarcely shining; left valve with two strong, uneven pseudocardinals, the hinder generally divided, sometimes somewhat chevron-shaped; right valve with one or two pseudocardinals, which are frequently split and imperfect; laterals very much reduced in both valves; muscle scars large; nacre white, thickened in front, with a wide border outside the pallial line (Simpson 1914, p. 490).

Type locality: Wisconsin; Fox River.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages (Clarke 1985), with no recent records within the state of Louisiana.

Comments: Clarke (1985) re-examined this genus. Pearl River specimens may represent the Alabama heelsplitter: *Lasmigona complanata alabamensis* Clarke, 1985. Vaughan (1893) reported this species in Corney Bayou, LA. Neck (1982c) reported this species from Lake Lewisville (Trinity River drainage in Texas). *Lasmigona costata* (Rafinesque, 1820) (Plate XIX, Figure Q) is found in both the Saline and Ouachita Rivers in Arkansas and is a possible historical resident of Louisiana.

Subfamily **Ambleminae** Modell, 1942 (*sensu* Davis and Fuller, 1981)

Animal characters: With true septa parallel to gill filaments, water tubes present (not tripartite); with supra-anal opening, but excurrent aperture sometimes entire; diaphragm slightly incomplete; no additional connective tissue at distal (ventral) margin of marsupial demibranch; glochidia with neither hooks nor teeth, except for *Potamilus*, which is divergent; glochidia without numerous spines; glochidia shape variable and size is medium (Davis and Fuller 1981).

Comments: Three tribes occur in Louisiana and include a large number of genera and species. These species are extremely variable in shell morphology and overlap in phenotypic characters, thus they are very difficult to separate without the use of soft part anatomy. However, with practice, the tribes and genera are relatively easy to separate and verify.

Key to the tribes in Louisiana:

1a. Right valve and left valve similar in pustulation at or near bilaterally symmetrical; shells pustulated, nodulated, undulated, or otherwise not smooth.....Tribe Amblemini
1b. Shell smooth or in a single species with nodules the shells are not bilaterally symmetrical.....2

2a. Marsupium occupies entire outer gills; shells not sexually dimorphic; post-basal mantle unmodified.....Tribe Pleurobemini
2b. Marsupium restricted; shells dimorphic; post-basal mantle modified.....Tribe Lampsilini

Tribe **Amblemini** (*sensu* Davis and Fuller, 1981)

Animal characters: Tetragenous (mostly) or ectobranchous; septa not

perforated; marsupia not confined to restricted region of the demibranchs; no specialized mantle structure; marsupial water tubes not extending beyond distal margins of the demibranch lamellae.

Shell characters: Shells generally heavily sculptured (Davis and Fuller 1981).

Comments: Five genera occur in Louisiana.

Key to the genera in Louisiana:

1a. Shell with undulations only; no pustules or nodules.....2
1b. Shell with pustules, even if only on umbonal region.....3

2a. Shell with obvious posterior ridge.....Genus *Plectomerus*
2b. Shell lacking obvious posterior ridge.....Genus *Amblema*

3a. Shell with pustules only on umbonal region; surface of shell commonly with undulations.....Genus *Megalonaias*
3b. Shell variably pustulose and lacking obvious undulations.....4

4a. Shell noticeable elongate.....5
4b. Shell outline round or quadrate (square).....Genus *Quadrula*

5a. Shell with numerous small pustules.....Genus *Tritogonia*
5b. Shell with large tubercles and few if any pustules.....
.....Genus *Quadrula*

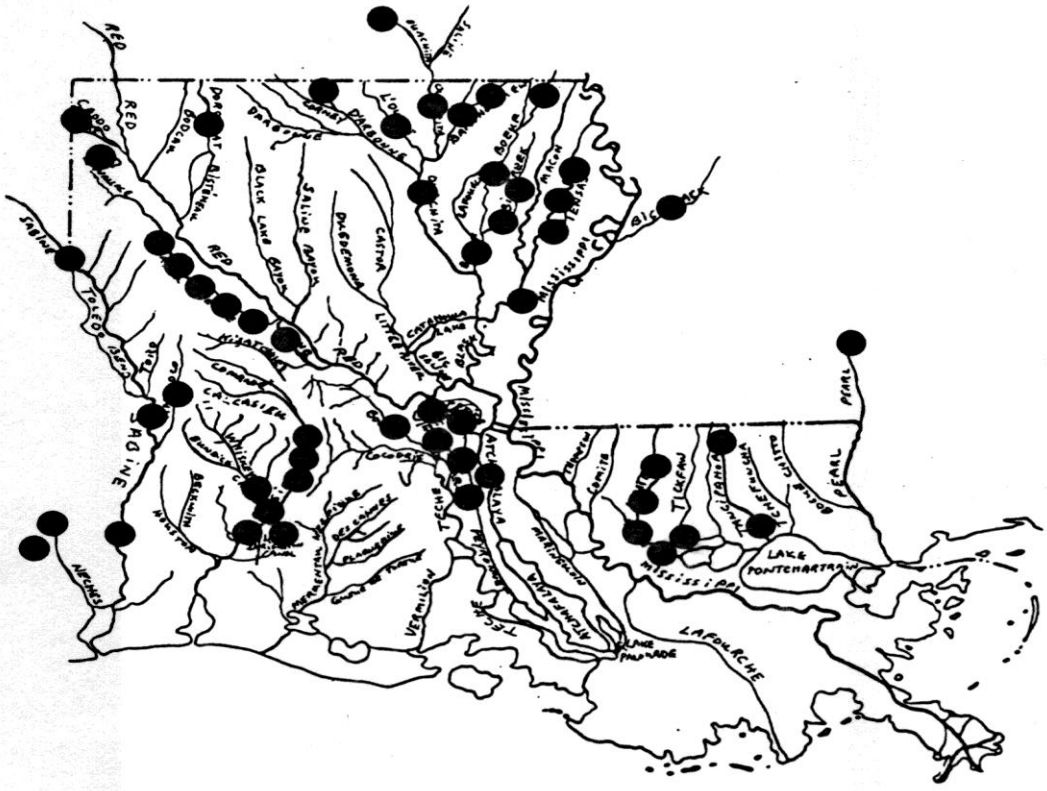
Genus *Amblema* Rafinesque, 1820

Animal characters: Branchial opening with few small arboreal papillae; anal large, very slightly crenulated; supra-anal separated from anal by very short mantle connection, sometimes no connection at all; gills large, inner wider and longer, outer connected high up to mantle antero-ventrad; inner laminae of inner gills free from visceral mass; palpi long, falcate, united most of their length antero-dorsad; marsupia occupy all four gills; ovisacs of inner being wider, when gravid ovisacs expand transversely; conglutinates white, compressed, leaflike in shape; discharged through anal passage in rather broken or loose masses; glochidia small, spineless, subovate.

Shell characters: Shell subquadrate to subtrapezoidal, thick; beaks more or less elevated; sculptured with concentric lines slightly angled at the base of the post-umbonal ridge and disappearing out upon the disk or continued there in a zigzag pattern of irregular broken pustules, nodules and oblique, undulated or plicated folds, the latter disposed across the posterior half; hinge teeth heavy and well developed; beak cavities deep crevices under rather wide interdentum; vein markings on antero-pallial margin distinct; nacre usually white. Utterback (1915-16: 113).

Comments: A single, highly variable species occurs in Louisiana.

Map 23. Historical distribution of *Amblema plicata* in North America.



Map 24. Historical distribution of *Amblema plicata* in Louisiana.

Amblema plicata (Say, 1817)
threeridge

Figures P-S
Plate III
Maps 23 and 24

Partial synonomy:
Amblema plicata plicata (Say, 1817), Turgeon *et al*. 1988
Amblema plicata (Say, 1817), Vidrine 1985, 1989b, Davis and Fuller 1981, Stern 1976, Hartfield 1988, Neck 1990, Gordon *et al*. 1980, Roback *et al*. 1980, Burch 1975b, Frierson 1927 (p. 60)
Quadrula plicata (Say, 1817), Simpson 1914, Vanatta 1910, Coker 1915
Unio perplicatus Conrad, 1841, Vaughan 1893, Frierson 1899a, 1899b
Unio boykinianus Lea, 1840, Vaughan 1892, 1893 (?see Frierson 1899a)
Amblema plicata costata Rafinesque, 1820, Strecker 1931
Amblema plicata perplicata (Conrad, 1841), Turgeon *et al*. 1988, Strecker 1931, Frierson 1927 (p. 61)
Amblema costata (Rafinesque, 1820), Murray and Roy 1968
Quadrula perplicata (Conrad, 1841), Simpson 1914, Vanatta 1910
Amblema perplicata (Conrad, 1841), Murray and Roy 1968, Stern 1976
Unio undulatus Barnes, 1823, Vaughan 1893

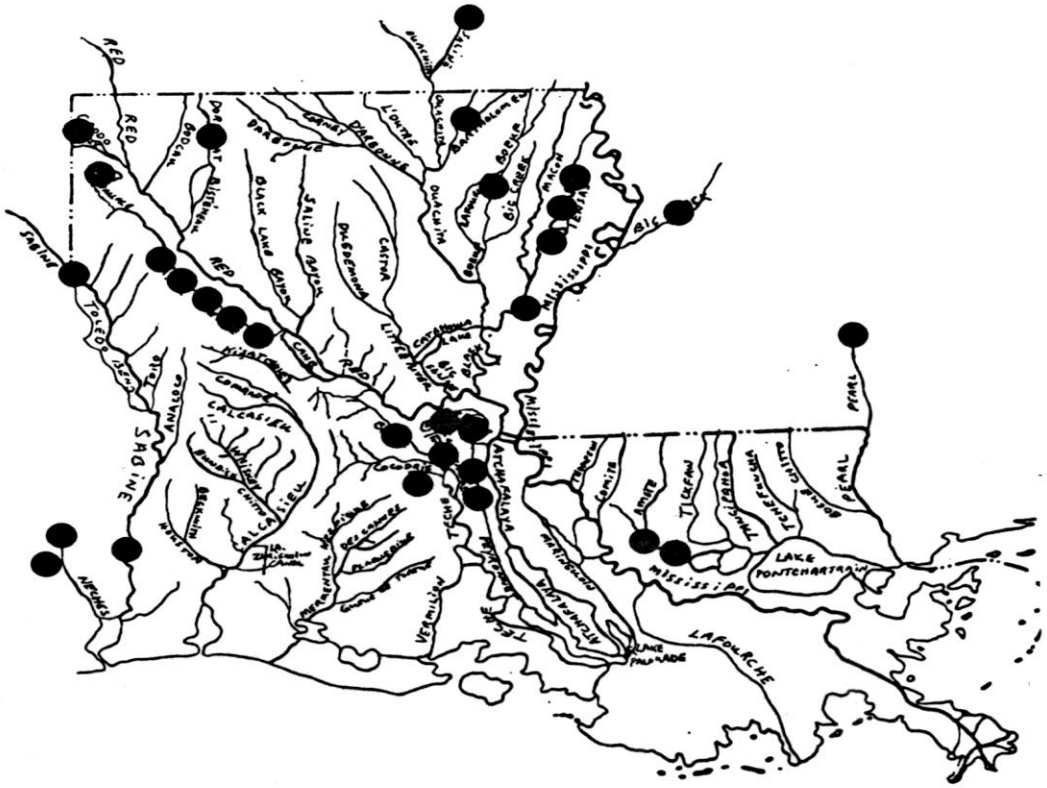
Description: Shell subquadrate or subrhomboid, inflated, solid, ineqilateral; beaks full and high, turned forward over a well-marked lunule, their sculpture consisting of a few coarse, irregular, somewhat corrugated ridges; anterior end generally narrowed a little, rounded and often cut away somewhat below; base line rounded or nearly straight; dorsal slope often carried up into a low wing, obliquely truncated behind; posterior ridge rounded; above it there is often a wide, shallow, radial depression; surface with uneven, concentric sculpture and having usually several very strong, irregular ridges below the posterior ridge running nearly parallel to it; posterior slope with or without radial ridges; epidermis yellow-green, brownish or blackish, generally coarse and rough; left valve with two strong, radial pseudocardinals, which are often split into a number of denticles, with two strong laterals; right valve with three pseudocardinals, the middle one large and frequently much split, with one lateral, which is sometimes partly double; beak cavities deep, compressed; muscle scars shallow, the anterior very rough; nacre white and iridescent behind; pallial line strongly crenate (Simpson 1914, p. 814).

Type locality: Lake Erie.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: This is sometimes a commercially valuable species in the cultured pearl industry. Burch (1975b) used only a single taxon for this group. Strecker reported both forms from the Red, Sabine, Neches rivers. Many old names exist for this variable species-group. Oesch (1984) discussed the variable nature of this taxon and suggested treating both *plicata* and *perplicata* as one species-taxon. *Amblema perplicata* (Conrad, 1841) is often considered a different species, but here I follow Oesch (1984) and use only one name for this variable group. Stern (1976) contended that most of Louisiana is inhabited by this latter form, thus *A. perplicata*'s description follows:
Shell subrhomboid, inflated, solid, inequilateral; beaks full and high turned forward over a well-marked lunule, their sculpture a few

Map 25. Historical distribution of *Megalonaias nervosa* in North America.



Map 26. Historical distribution of *Megalonaias nervosa* in Louisiana.

strong, irregular bars; anterior end rounded, a little narrower than the posterior end, often cut away a little below; base line curved; post-dorsal slope usually developed into a slight wing, the posterior part obliquely truncate; surface with light, irregular, concentric ridges, and with very strong, oblique ridges on the hinder half of the disk that run well on to or cross the posterior ridge; epidermis dark brown or nearly black, often subshining; pseudocardinals strong, radial, much split, two in the left valve and three in the right; two laterals in the left valve and one in the right; muscle scars shallow, the anterior ones rough; beak cavities deep, compressed; nacre white, generally purple-tinted and iridescent behind (Simpson 1914, p. 817). Type locality: Jackson, LA.

Genus *Megalonaias* Utterback, 1915

Animal characters: Branchial opening very large with short papillae; anal and supra-anal also large, almost smooth, separated by short but distinct mantle connection; inner laminae of inner gills partly free from visceral mass, sometimes almost entirely connected; palpi long, enormous; soft parts tan-colored with gills brownish; marsupia occupying all four gills; enormous when gravid, padlike, not so distended at ventral edge; conglutinates sole-shaped, brown, rather solid; glochidia large, ventral margin obliquely rounded, hinge line long.

Shell characters: Shell large, ponderous, broadly rhomboid, moderately inflated; post-dorsal ridge alated, sculptured with regular upcurved undulations; post-umbonal ridge broken with coarse plications running more or less parallel with it; beaks rather low, sculptured with coarse double-looped corrugations which extend out as nodules at base of post-ridge and as zigzag ridges all over umbonal region to upper part of disk; epidermis black; pseudocardinals heavy; laterals long and straight; interdentum short; beak cavities narrowly deep; scars very deeply impressed--especially anterior retractor cicatrix (scar or scarlike marking); nacre white to pink. Utterback (1915-16: 123).

Comments: A single species occurs in Louisiana.

Megalonaias nervosa (Rafinesque, 1820)
washboard

Figures A-D
Plate IV
Maps 25 and 26

Partial synonomy:
Megalonaias nervosa (Rafinesque, 1820), Turgeon *et al.*, 1988, Oesch 1984
Amblema gigantea (Barnes, 1823), Vidrine 1985, 1989b, Davis and Fuller 1981, Strecker 1931, Frierson 1927 (p. 62)
Quadrula heros (Say 1829), Simpson 1914, Coker 1915, Shira 1913
Unio multiplicatus Lea, 1831, Vaughan 1892, 1893, Frierson 1899a, 1899b
Quadrula hero dombeyana Valenciennes, 1827, Vanatta 1910 (?)
Megalonaias gigantea (Barnes, 1823), Hartfield 1988, Gordon *et al.* 1980, Roback *et al.* 1980, Murray and Roy 1968

Description: Shell long rhomboid or long quadrate, subinflated to inflated, solid, inequilateral; posterior ridge usually full, rounded; beaks rather full and high, their sculpture strong, double looped or zigzag ridges; dorsal line straight or lightly curved; anterior end rounded, generally angled above; base line straight or a little curved; posterior end almost squarely or somewhat obliquely truncate and

angled above where it joins the low dorsal wing, rounded below; surface with uneven, concentric sculpture, all, except the anterior basal part, more or less covered with oblique folds and nodules. The earlier growth is usually densely covered with subradial or chevron-shaped, nodulous plications; frequently the sculpture in front is decidedly nodulous; epidermis brownish or blackish; pseudocardinals elevated, radial, radially striate; laterals straight or slightly curved; muscle scars large, the anterior ones with rough nacreous matter; beak cavities deep, compressed; nacre whitish, often blotched with lurid color, much thinner and iridescent behind; pallial line remote (Simpson 1914, p. 825).

Type locality: Fox River, tributary of the Wabash.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: *Quadrula heros dombeyana* (see Vanatta 1910) may be the squat form of this species, which is common in northern Louisiana. This species commonly beds in rivers to considerable depth and sometimes has a commercially valuable shell used in the cultured pearl industry. It is apparently absent in the Mermentau and Calcasieu Rivers.

Genus *Plectomerus* Lamarck, 1853

Animal characters: Branchial opening with well developed papillae, anal with minute papillae; anal opening separated from supra-anal by moderately long connection of the margins of the mantle; inner laminae of inner gills free, except at the anterior end; posterior margins of palpi connected for about one-half of their length; in females water tubes are crowded and narrow, chiefly in outer gills; all four gills built for marsupial function. Ortmann (1912: 249).

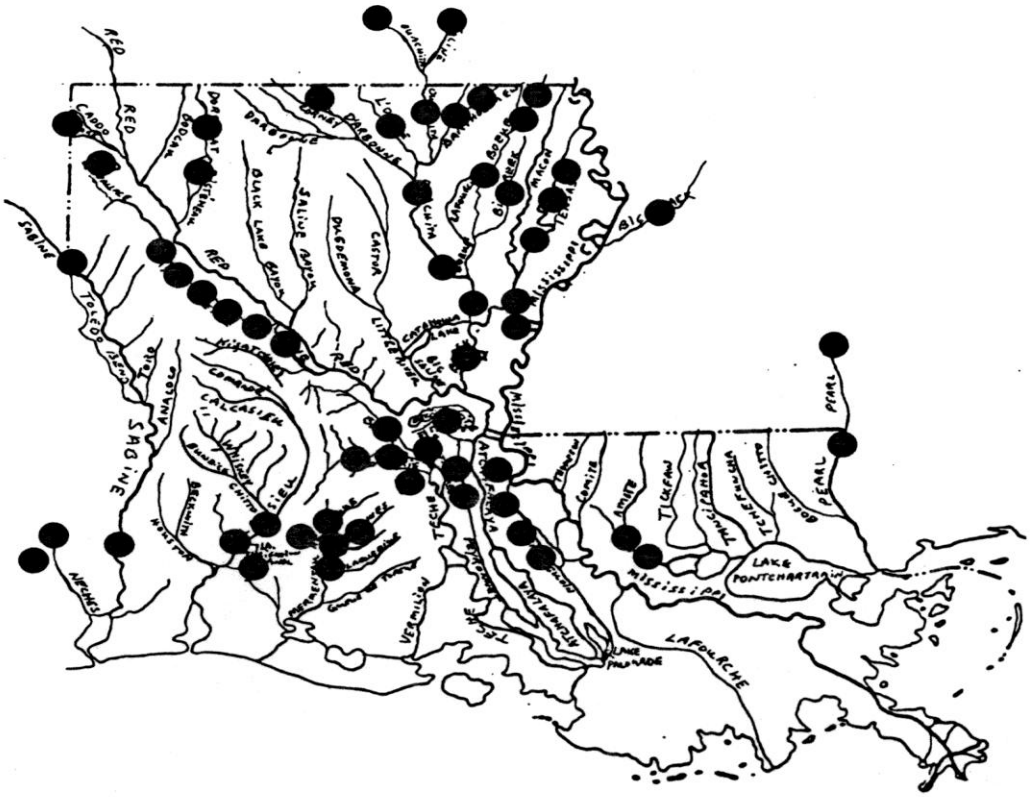
Shell characters: Shell large, moderately thick, quadrate; dorsal margin straight; ventral margin straight; posterior end truncated above; shell moderately inflated to compressed; posterior ridge high and prominent and separating numerous plications which, anteriorly, roughly parallel the posterior ridge; beaks low and only slightly raised above the hinge line; large pseudocardinals and long laterals; beak cavity shallow; nacre purple; muscle scars impressed. Oesch 1984: 79.

Comments: A single species occurs in Louisiana.

Plectomerus dombeyanus (Valenciennes, 1827)
bankclimber
Figures E-G
Plate IV
Maps 27 and 28

Partial synonomy:
Plectomerus dombeyanus (Valenciennes, 1827), Turgeon *et al.* 1988, Neck 1986, Gordon *et al.* 1980, Roback *et al.* 1980, Stern 1976, Hartfield 1988
Amblema dombeyana (Valenciennes, 1827), Vidrine 1985, 1989b, Davis

Map 27. Historical distribution of *Plectomerus dombeyanus* in North America.



Map 28. Historical distribution of *Plectomerus dombeyanus* in Louisiana.

and Fuller 1981, Strecker 1931
Amblema (Plectomerus) dombeyana (Valenciennes, 1827), Frierson 1927 (p. 62)
Quadrula trapezoides (Lea, 1831), Simpson 1914, Vaughan 1892, 1893, Vanatta 1910
Unio trapezoides Lea, 1831, Vaughan 1893, Frierson 1899a, 1899b, Coker 1915, Shira 1913
Plectomerus trapezoides (Lea, 1831), Murray and Roy 1968

Description: Shell long rhomboid, subinflated to inflated, solid, inequilateral; beaks only moderately full and high, their sculpture consisting of a few decidedly nodulous corrugations; posterior ridge strong and high, often pinched up into a sharp angle, ending in a point at the base of the shell; anterior end a little narrowed and rounded; base line straight; post-dorsal area somewhat winged; posterior end obliquely truncated with a slightly curved outline; surface with a few oblique folds in front of the posterior ridge and on the posterior end there are curved folds; umbonal region with lengthened nodules arranged in zigzagged patterns; epidermis brownish or blackish; pseudocardinals ragged, radially split; laterals long; muscle scars large, the anterior ones filled with roughened nacre; beak cavities moderately deep; pallial line remote; nacre purple-red (Simpson 1914, p. 830).

Type locality: Lake St. Joseph, LA.

General distribution: Southern portion of Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: Frierson (1902) described a variant of this species, *pentogonoides*, from the Calcasieu River in Louisiana. "This shell differs from the type in having the dorsum very much arched or bent midway. The posterior is widely biangulated. The effect being that the outline forms nearly an equilateral pentagon, hence the name. Aside from its form, it differs in being much smaller and frequently entirely devoid of plication on either its sides or posterior slope. A striking peculiarity is that the posterior end of the ligament is perpendicularly over the center of the base, whereas in the ordinary *trapezoides* the end is situated about three-fourths of the distance from the anterior to the posterior" (Simpson 1914). Frierson (1927) dropped this varietal name because it apparently closely resembled the figure of the type specimen provided by Valenciennes. This species can become very large, but its purplish-blue nacre is undesirable for most commercial needs. It readily beds by the hundreds to thousands in some southern Louisiana streams.

Genus *Quadrula* Rafinesque, 1820

Animal characters: Branchial opening large with short arboreal papillae; anal smooth to finely dentate; supra-anal very large, briefly and loosely connected to anal by mantle edges; inner laminae of inner gills free from visceral mass; palpi large, somewhat sickle-shaped; color of soft part not bright, except for brownish gills and palpi tannish or soiled white; marsupia occupying all four gills; when gravid, ovisacs swell moderately in center; ventral edge obtusely pointed; conglutinates white, leaflike, sometimes divided at distal ends; glochidia small to medium in size, subovate, spineless.

Shell characters: Shell roundly quadrate, or subrhomboidal, occasionally elongate with moderately high beaks sculptured with three or four parallel ridges developed on post ridge to nodules; disks usually sculptured; epidermis generally dark colored, rayless or with greenish splotched paintings; pseudocardinals heavy, double in both valves, ragged; laterals doubled in left, single in right; beak cavities deep,

compressed or creviced; shells mostly not sexually dimorphic. Utterback (1915-16: 130).

Comments: At least eight species occur in Louisiana. These very variable species create an enigma in species separation. Separation of the *Q. pustulosa/mortoni/refulgens* complex defies any key in my experience.

Key to the species in Louisiana:

1a. Body parts with melanin (black pigment); shells with large tubercles especially on posterior ridge.....2
1b. Body parts pure white; shells pustulate or with a few tubercles and nodules on places other than posterior ridge.....3

2a. Shell elongate.....*Q. cylindrica*
2b. Shell quadrate.....*Q. metanevra*

3a. Shell with obvious median sulcus.....4
3b. Shell without obvious median sulcus.....5

4a. Shell with a row of pustules on either side of the obvious sulcus; epidermis usually dark green or black.....*Q. quadrula*
4b. Shell with a row of nodules on either side of an obscure sulcus; epidermis usually tan or yellowish.....*Q. nodulata*

5a. Shell square in outline.....6
5b. Shell rounded in outline.....7

6a. Shell with strong posterior ridge and completely covered with minute pustules.....*Q. apiculata*
6b. Shell with rounded posterior ridge and pustules of varying numbers and sizes, usually centrally located and spreading outward on the shell surface.....*Q. pustulosa*

7a. Distributed in the Eastern Gulf drainages.....*Q. refulgens*
7b. Distributed west of the Eastern Gulf drainages.....*Q. mortoni*

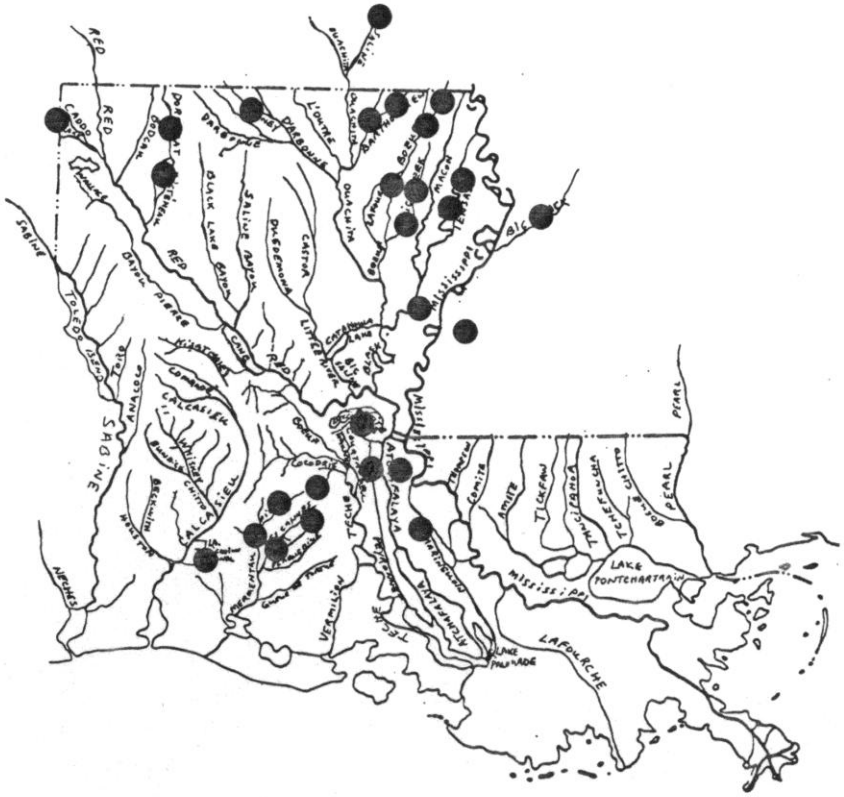
Quadrula pustulosa (Lea, 1831)
pimpleback

Figures H-J
Plate IV
Maps 29 and 30

Partial synonomy:
Quadrula pustulosa pustulosa (Lea, 1831), Turgeon *et al*. 1988
Quadrula pustulosa (Lea, 1831), Vidrine 1985, 1989b, Simpson 1914, Stern 1976, Shira 1913, Coker 1915, Strecker 1931 (?), Gordon *et al*. 1980, Murray and Roy 1968, Frierson 1927 (p. 48)
Unio pustulosus Lea, 1831, Frierson 1899a, Vaughan 1892
Unio schoolcraftii Lea, 1870, Vaughan 1893

Description: Shell subquadrate, subrhomboid, subtriangular or suborbicular, generally inflated, solid, inequilateral; beaks full and high, turned forward over a deep lunule, their sculpture a few coarse corrugations; anterior end rounded; base straight or lightly

Map 29. Historical distribution of *Quadrula pustulosa* in North America.



Map 30. Historical distribution of *Quadrula pustulosa* in Louisiana.

curved; posterior end squarely or obliquely truncated, usually well-angled behind the ligament; posterior ridge only slightly developed, rounded; there is often a slight radial depression above it; surface, excepting at the anterior part, usually more or less covered with warty or lachrymose tubercles, sometimes nearly or quite smooth; epidermis tawny or tawny-greenish in young shells, often with a wide, broken, bright green ray, dirty brownish in old shells; pseudocardinals strong, triangular, more or less ragged, two in the left valve and three in the right; lateral of the right valve sometimes partly doubled; beak cavities deep, compressed; muscle scars impressed; nacre white, thinner and iridescent posteriorly (Simpson 1914, p. 848).

Type locality: Ohio; Alabama River.

General distribution: Mississippi Interior Basin drainages.

Comments: This is sometimes a commercially valuable shell in the cultured pearl industry. Three names will be used in an attempt to follow the official list of mussels, and challenge authorities to explain these taxa. Using names generally accepted for western Louisiana (Raymond Neck, pers. comm., 1993) and eastern Louisiana (Paul Hartfield, pers. comm.), these species are divided in part based upon distribution. I suffer no imposition by authors who chose to use the name *Q. pustulosa* for all of the varied species-taxa included in this report. The plasticity of the shells of this group of taxa is truly maddening (Neck 1982a). Rather consistently in my experience, specimens of typical *Q. pustulosa* have a distinctively thicker shell as compared to the following two species-taxa.

Quadrula mortoni (Conrad, 1835)
western pimpleback

Figures 1-4 and K-N and A-L
Back Cover and Plates IV and V
Maps 31, 32 and 33

Partial synonomy:
Quadrula pustulosa mortoni (Conrad, 1835), Turgeon *et al.* 1988, Strecker 1931, Murray and Roy 1968, Frierson 1927 (p. 49)
Quadrula pustulosa (Lea, 1831), Vidrine 1985, 1989b (in part)
Quadrula mortoni (Conrad 1836), Simpson 1914, Frierson 1927, Neck 1990
Unio turgidus Lea, 1838, Vaughan 1892, 1893
Quadrula sphaerica Lea, 1868, Vanatta 1910 (?)
Unio refulgens Lea, 1868, Frierson 1899b
Unio sphaericus Lea, 1868, Frierson 1899a, 1899b
Quadrula nodifera (Conrad, 1841), Simpson 1914, Vanatta 1910, Murray and Roy 1968
Unio nodiferus Conrad, 1836, Vaughan 1893
Quadrula pustulosa group var., Roback *et al.* 1980

Description: Shell subquadrate, inflated, subsolid, sometimes solid when old, inequilateral; beaks high and full, turned forward over a lunule; posterior ridge well developed, angled or narrowly rounded, rarely somewhat doubled below, ending at the base of the shell in a blunt point; anterior end rounded, sometimes slightly, obliquely truncate above; base line straight or lightly curved; outline of dorsal slope curbed or raised in the middle to an angle; surface varying from almost smooth to densely pustulous, pustules generally covering the whole shell; epidermis ashy-brown or lurid brown, having a greenish tint and sometimes a broad, broken, green ray when young; pseudocardinals triangular, not greatly

split up; lateral of the right valve scarcely double; beak cavities deep, compressed; muscle scars impressed; nacre whitish with a purplish tint, purple and iridescent behind (Simpson 1914, p. 853).

Type locality: Bayou Teche, LA.

General distribution: Southern portion of Mississippi Interior Basin and Western Gulf drainages.

Comments: Conrad's illustration of this species looks just like the highly pustulate shell from Bayou Courtableu and Bayou Maringuoin (East Atchafalaya Basin levee borrow canal). *Unio turgidus* Lea, 1838, was described from near New Orleans, Louisiana, and may be a synonym of *Q. refulgens*. The overall similarities between this accepted taxon (Turgeon *et al*. 1988) and *Quadrula nodifera* (Conrad 1841) create several problems. In this paper, I follow the trend to accept the first, but I give attention to *Q. nodifera*. Thus, a description of *Q. nodifera* follows:
Shell subquadrate or subrhomboid, inflated, moderately solid, somewhat inequilateral; beaks full and high; anterior end rounded, usually a little narrowed; base line curved in front, straight behind; posterior end rounded from the beaks to the lower end of the posterior ridge; posterior ridge moderately developed, subangular, ending in front of the extreme posterior end of the shell; surface smooth or having a few scattered nodules; epidermis dull, dirty or grayish-brown; pseudocardinals triangular, much split up into radial denticles; lateral of the right valve double or single; beak cavities rather deep; muscle scars small, impressed; nacre white or lurid, often blotched (Simpson 1914, p. 857).

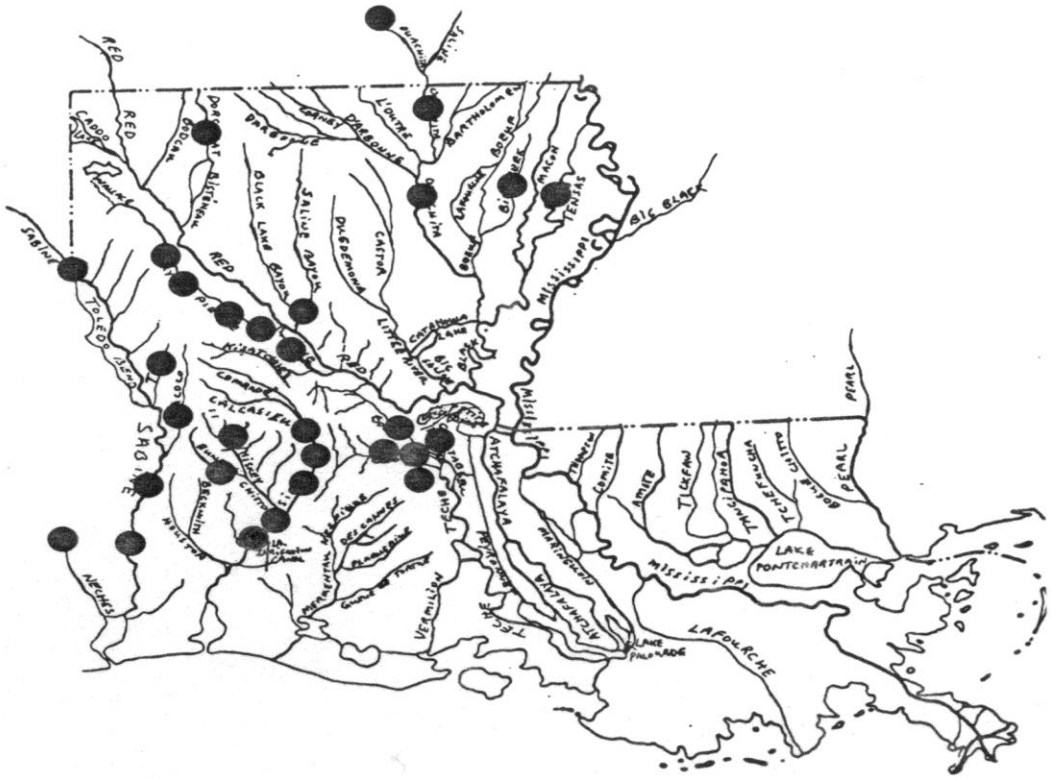
Type locality: Jackson, LA. (apparently from Thompson Creek).

General distribution: Southern Mississippi Interior Basin and Western Gulf drainages.

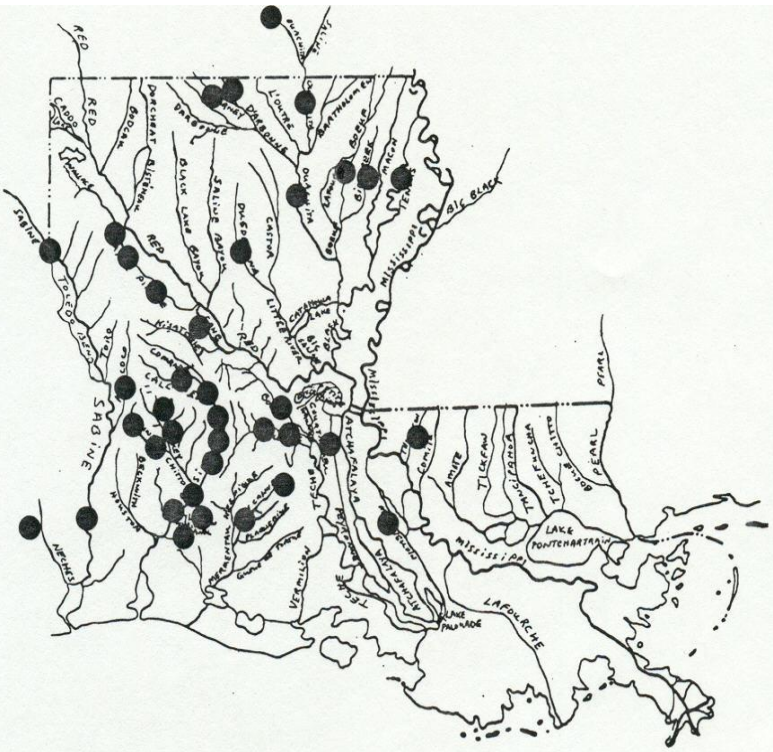
Comments: Ortmann (1926) and Frierson (1927) considered *Q. nodifera* synonomous with *Q. mortoni*. The "nodifera" form may simply be a nearly apustulose to moderately pustulose ecophenotype of *Q. mortoni*. The following quote from Roback *et al*. (1980) illustrates the need for more study of this group:

> The nearly apustulose entity referred to ... in this paper as *Quadrula pustulosa* group var. is the predominant representative of the *Quadrula pustulosa* group found by us in the Neches River, TX through the Calcasieu River, LA drainages. It was one of the two most heavily infested mussel taxa by *Ablabesmyia* sp. in Village Creek, TX. Although all other nominal *Q. pustulosa* group taxa from the Gulf Coast drainage east of Calcasieu River, LA were treated as *Quadrula pustulosa* for the purpose of this paper, the importance of *Quadrula pustulosa* group var. necessitates separate mention of it in this paper. By a coincidence, this entity is conchologically distinctive enough from the other nominal members of the *Q. pustulosa* group such that it was initially difficult not to consider it a species distinct from them.
>
> *Q. pustulosa* group var. most closely approximates the *Q. nodifera* (Conrad 1841) phenotype, whose type locality is Jackson, LA (on a tributary to Mississippi River in eastern Louisiana). However, the Mississippi River has apparently formed a barrier to the dispersal of some mussel taxa in Louisiana (at least), and therefore, it is not known whether or not the *Q. nodifera* topotype populations in eastern Louisiana and the *Q. pustulosa* group var.

Map 31. Historical distribution of *Quadrula mortoni* in North America.



Map 32. Historical distribution of *Quadrula mortoni* in Louisiana.



Map 33. Historical distribution of *Quadrula nodifera* (= *Quadrula mortoni*) in Louisiana. This specific status of *Quadrula nodifera* remains uncertain, but I am generally able to discern its phenotype; however it is treated as a synonym of the latter species. This map depicts historical records and those that I have sufficient reason to suggest that the shells belong to this taxon. A comparison of the distribution of *Q. mortoni* shells and *Q. nodifera* shells shows them to be almost identical in Louisiana, and resolution of this taxonomic problem might best be carried out in Texas, where I consider each to be more limited in distribution and more distinctive conchologically.

populations of the Texas-Louisiana border region are members of the same clade within the *Q. pustulosa* complex but with a discontinuous distribution, or whether both entities were independently derived within the *Q. pustulosa* group.

Ortmann (1926) considered *Q. nodifera* synonomous with *Q. mortoni* (Conrad 1836) (type locality: Bayou Teche, Louisiana), an entity to which many western Louisiana and eastern Texas *Q. pustulosa* group specimens are referred to. Although the shells of *Q. pustulosa* group var. examined are not consistent with the *Q. mortoni* phenotype, no significant species level difference could be discerned in the incidence of alleles and loci of several isoenzyme systems from preliminary electrophoretic results (G. M. Davis, S. L. H. Fuller, and D. J. Bereza, unpublished) on limited samples of *Q. mortoni* from San Jacinto River, TX, *Q. pustulosa s.s.* from Mississippi River in Wisconsin, *Q. pustulosa* group specimens from West Fork Amite River, MS, and the *Q. pustulosa* group var. from Neches River drainage, TX and Calcasieu River, LA. No significant anatomical differences are apparent among these entities either. Therefore, it is not clear what level of genetic distinction exists between *Q. pustulosa* group var., and the other members of the *Q. pustulosa* group".

This taxonomic problem is no better resolved a full decade later.

Quadrula refulgens (Lea, 1868)
purple pimpleback

Figures M-R
Plate V
Maps 34 and 35

Partial synonomy:
Quadrula refulgens (Lea, 1868), Hartfield 1988, Turgeon *et al.* 1988, Simpson 1914
Quadrula pustulosa (Lea, 1831), Vidrine 1985, 1989b (in part), Stern 1976
Quadrula pustulosa refulgens (Lea, 1868), Frierson 1927 (p. 49)
Quadrula sphaerica Lea, 1868, Frierson 1927 (considered merely a younger specimen)

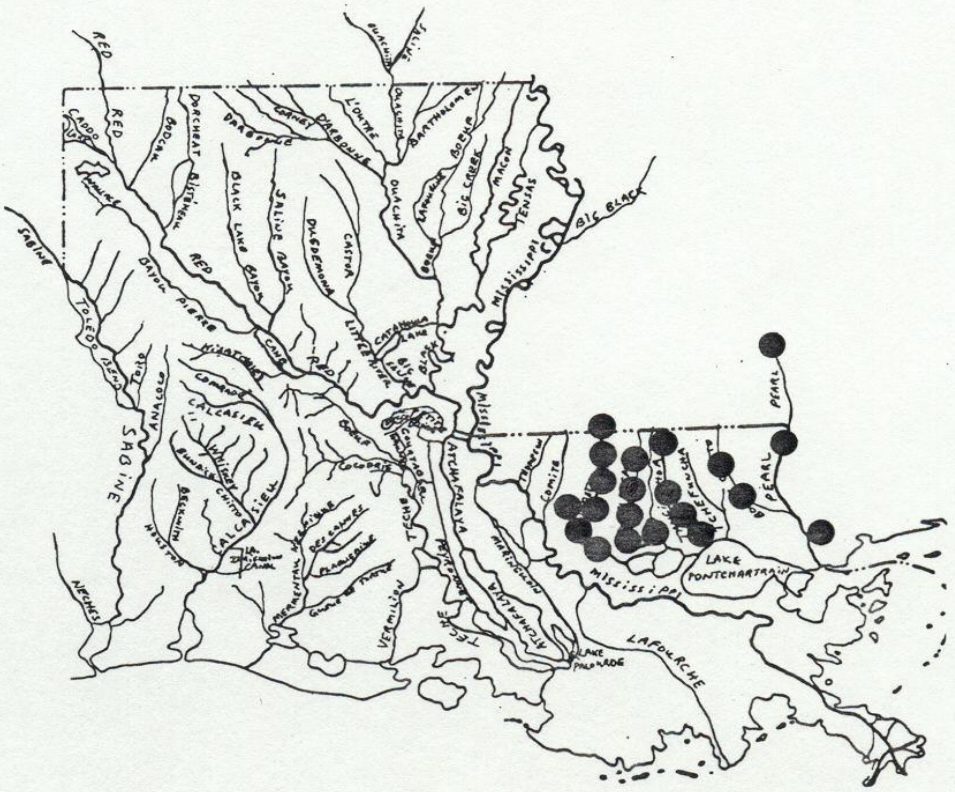
Description: Shell subelliptical, subcompressed to slightly inflated, somewhat inequilateral; beaks elevated but not inflated, their sculpture a few coarse, nodulous ridges; posterior ridge subangular, ending in a blunt point near the base of the shell; anterior end rounded or very little truncate above; base line curved; outline of dorsal slope curved, often raised to an angle in the middle; on the disk there is a wide band extending from the umbonal region to the base that is covered with large, low, rather even nodules; epidermis reddish-chestnut, subshining; pseudocardinals triangular, ragged, two in the left valve and three in the right; lateral in the right valve single or double; beak cavities deep, compressed; muscle scars small, impressed; nacre purple or violet, iridescent behind (Simpson 1914, p. 855).

Type locality: Oktibbiha River, Lauderdale Co., Mississippi.

General distribution: Eastern Gulf drainages.

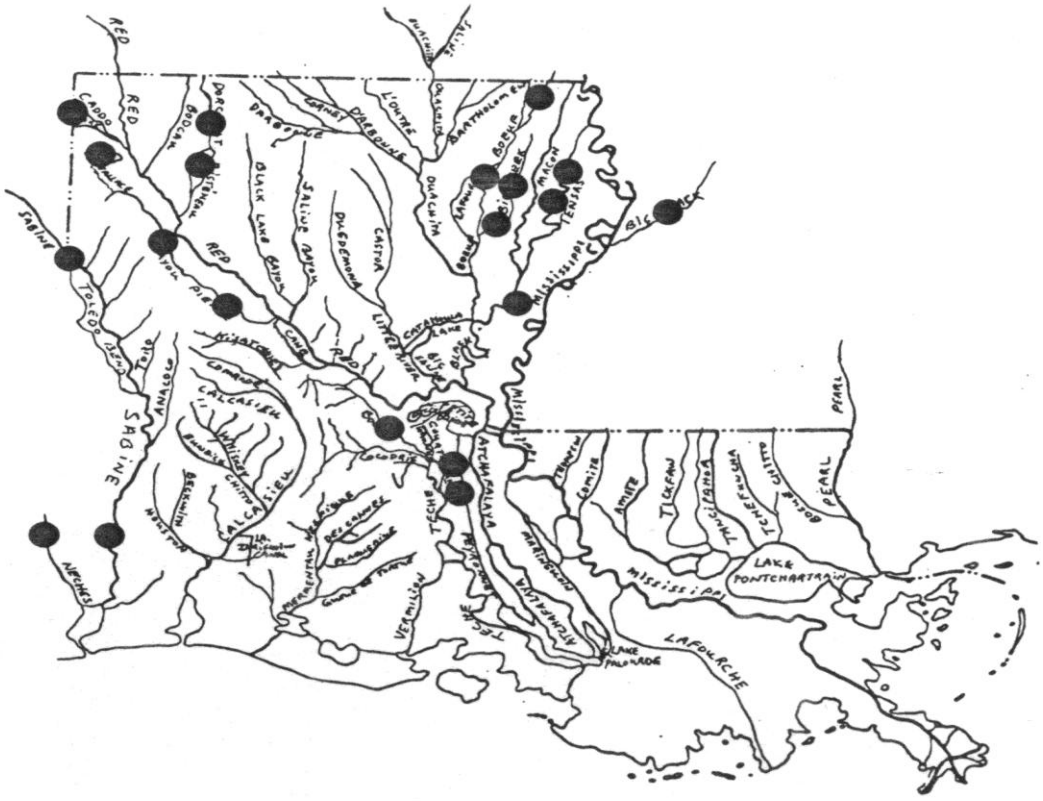
Comments: Much as the case for the western Louisiana complex, this species varies from few pustules to many. The similarities between *Q. mortoni* and *Q. refulgens* appear to not only overlap with nominal

Map 34. Historical distribution of *Quadrula refulgens* in North America.



Map 35. Historical distribution of *Quadrula refulgens* in Louisiana.

Map 36. Historical distribution of *Quadrula nodulata* in North America.



Map 37. Historical distribution of *Quadrula nodulata* in Louisiana.

Q. nodifera but also overlap with each other to an extent that I routinely use geographical ranges to separate these species.

Quadrula nodulata (Rafinesque, 1820)
wartyback
Figures S-X
Plate V
Maps 36 and 37

Partial synonomy:
Quadrula nodulata (Rafinesque, 1820), Vidrine 1985, 1989b, Turgeon *et al*. 1988, Stern 1976, Gordon *et al*. 1980, Murray and Roy 1968, Roback *et al*. 1980, Strecker 1931, Frierson 1927 (p. 49)
Quadrula pustulata (Lea, 1834), Simpson 1914, Shira 1913, Coker 1915
Unio pustulatus Lea, 1834, Vaughan 1892, 1893, Frierson 1899a

Description: Shell subquadrate, inflated, slightly inequilateral, solid; beaks high and full, turned forward over a lunule, their sculpture a few coarse, irregular corrugations; posterior ridge well developed, narrowly rounded or subangular, sometimes inclined to be double below; anteror end rounded, sometimes feebly angled above; base line slightly curved; posterior end almost squarely truncated, sinused in the middle surface with a few large warts or pustules, often arranged in two imperfect rows, one on the posterior ridge, the other some distance in front of it; epidermis generally smooth, subshining, ashy-green in young shells, rarely feebly rayed, ashy-brown in old shells; pseudocardinals considerably split; lateral of the right valve single or double; beak cavities deep, compressed; anterior scars small, deep; nacre white, iridescent behind (Simpson 1914, p. 856).

Type locality: Ohio; Tennessee.

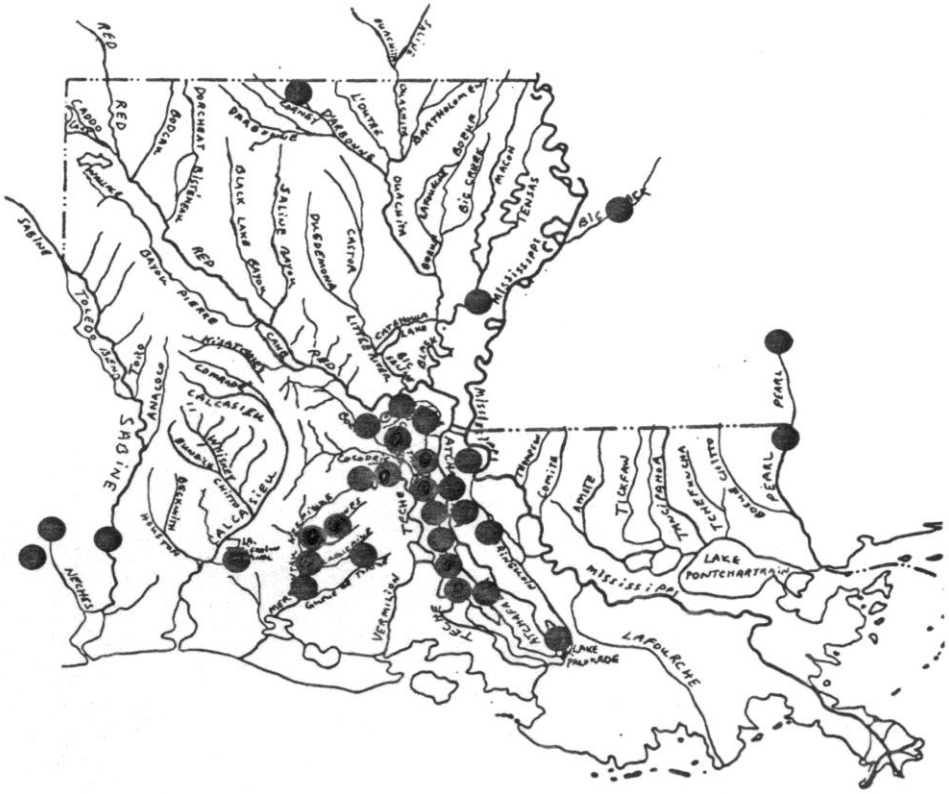
General distribution: Mississippi Interior Basin and Western Gulf drainages.
Comments: This species appears to hybridize with *Q. mortoni*, especially in the Bayou Teche drainage. This species is not common anywhere in Louisiana to my knowledge.

Quadrula apiculata (Say, 1829)
southern mapleleaf
Figures A-H
Plate VI
Maps 38 and 39

Partial synonomy:
Quadrula apiculata (Say, 1829), Vidrine 1985, 1989b, Simpson 1914, Turgeon *et al*. 1988, Vanatta 1910, Stern 1976, Hartfield 1988, Neck 1984, 1990, Roback *et al*. 1980
Tritogonia nobilis (Conrad, 1854), Coker 1915, Murray and Roy 1968
Quadrula quadrula apiculata (Say, 1829), Strecker 1931, Neck 1986, Frierson 1927 (p. 47)
Quadrula quadrula (Rafinesque, 1820), Murray and Roy 1968 (in part)

Description: Shell subrhomboid, rather short, slightly inequilateral, subsolid to solid; beaks high, moderately full; posterior ridge well developed, narrowly rounded, angled or showing a tendency to be double, ending in a point or feeble biangulation at

Map 38. Historical distribution of *Quadrula apiculata* in North America.



Map 39. Historical distribution of *Quadrula apiculata* in Louisiana.

the base of the shell; in front of and behind it there are radial depressions; anterior end rounded, sometimes obliquely truncated above; basal lines sinused in front of the posterior ridge; outline of dorsal slope raised to an angle behind the ligament, squarely or obliquely truncate below; surface covered with fine, close pustules, which are often laid down in zigzag patterns; epidermis greenish in young shells, ashy-brown in old ones, dull; pseudocardinals, radial, somewhat split; lateral of right valve partly double; beak cavities moderately deep; anterior scars well impressed; nacre white, iridescent behind (Simpson 1914, p. 846).

Type locality: New Orleans, LA.

General distribution: Southern portion of Mississippi Interior Basin, Eastern Gulf, and Western Gulf drainages.

Comments: In 1978, I found a specimen in Blue River, Oklahoma. In this species the pustules are almost all the same size and the shell is very square in outline. Neck (1986) reported that it is abundant in Lake Tawakoni on the upper Sabine in Texas. This is one of the species which is able to often coexist with *Rangia cuneata* and reside in the southern (coastal) reaches of Louisiana streams.

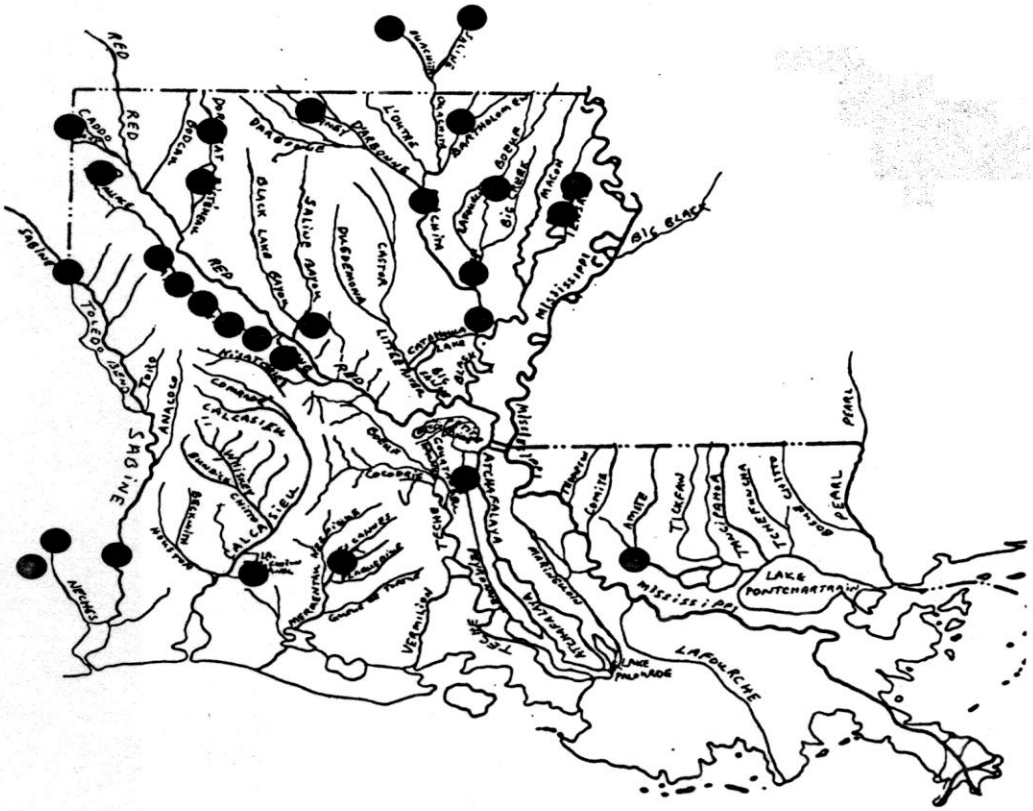
Quadrula quadrula (Rafinesque, 1820)
mapleleaf

Figures I-Q
Plate VI
Maps 40 and 41

Partial synonomy:
Quadrula quadrula (Rafinesque, 1820), Vidrine 1985, 1989b, Turgeon *et al*. 1988, Gordon *et al*. 1980, Roback *et al*. 1980, Neck 1984, Murray and Roy 1968, Stern 1976, Hartfield 1988, Frierson 1927 (p. 47)
Quadrula lachrymosa (Lea, 1828), Simpson 1914
Unio asper Lea, 1831, Vaughan 1893, Frierson 1899a, 1899b
Unio lachrymosus Lea, 1828, Vaughan 1892, 1893, Frierson 1899a
Quadrula asperrima Lea, 1831, Vanatta 1910
Quadrula fragosa (Conrad, 1836), Shira 1913
Quadrula quadrula aspera Lea, 1831, Strecker 1931

Description: Shell subrhomboid, subinflated, solid, somewhat inequilateral; beaks high and full, their sculpture doubly looped or zigzagged bars, with radial threads behind them; posterior ridge well developed, generally somewhat double, ending at the base of the shell in a feeble biangulation; in front of and behind it there is a wide, radial depression; anterior end rounded; base line incurved in front of the posterior ridge; posterior end squarely or somewhat obliquely truncated, with a sinus in the middle; anterior to the middle of the shell, there is usually a wide radial swelling; surface generally more or less covered with tubercles, excepting in front of the ridge; the sculpture on this and the posterior ridge often stronger than elsewhere; epidermis greenish in young shells, greenish-brown, brown or tawny in old ones, usually somewhat shining, sometimes feebly rayed; pseudocardinals very strong, triangular, ragged; lateral of the right valve somewhat double; anterior scars well impressed; beak cavities moderately deep; nacre white, thinner and iridescent behind; pallial line deep, roughened, remote in front (Simpson 1914, p. 841).

Map 40. Historical distribution of *Quadrula quadrula* in North America.



Map 41. Historical distribution of *Quadrula quadrula* in Louisiana.

Type locality: Ohio.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages; sporadic but widespread in Louisiana. Not uncommonly found with populations of *Q. apiculata*.

Comments: This species is sometimes a commercially valuable shell in the cultured pearl industry. Specimens are unique usually with two obvious rows of larger pustules and a sulcus between them. The number of smaller pustules is quite variable.

Quadrula cylindica (Say, 1817)
rabbitsfoot
Figures U and C-D
Plates VI and VII
Maps 42 and 43

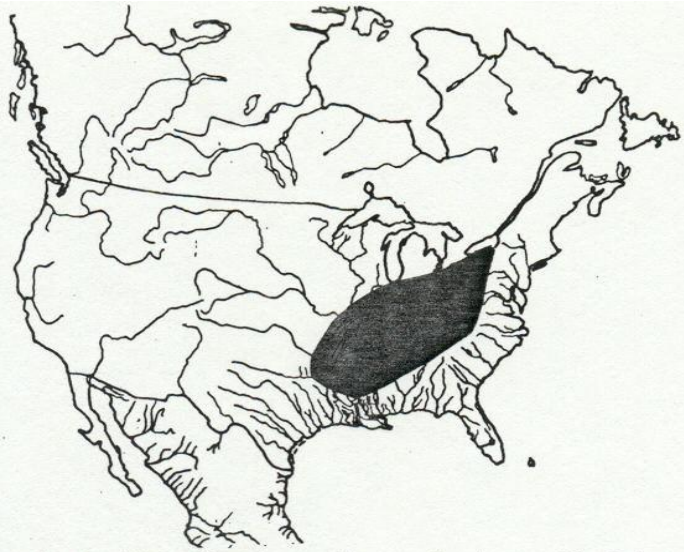
Partial synonomy:
Quadrula cylindrica cylindica (Say, 1817), Turgeon *et al*. 1988
Orthonymus cylindrica (Say, 1817), Davis and Fuller 1981, Vidrine 1985, 1989b, Vidrine and Wilson 1991
Quadrula cylindrica (Say, 1817), Simpson 1914, Vanatta 1910, Stern 1976, Gordon *et al*. 1980, Roback *et al*. 1980, Harris and Gordon 1987
Quadrula (Orthonymus) cylindrica (Say, 1817), Frierson 1927 (p. 51)

Description: Shell much elongate, inflated and having parallel dorsal and ventral lines so that it is almost cylindrical, inequilateral, solid; beaks rather full and elevated, turned forward over a deep, wide lunule, their sculpture a few irregular, strong ridges that are nodulous on the posterior ridge; posterior ridge full, rounded; above it there is usually a wide, radial impression that sometimes ends in a slight sinus behind; anterior end rounded, subangular above; posterior end squarely or obliquely truncate; sometimes there is a point below the median line; surface with irregular, concentric sculpture, having a row of knobs extending along the posterior ridge, often more or less covered with lachrymous nodules and plications; epidermis straw-color, tawny, yellowish-green or greenish-yellow, generally overlaid with a pattern of triangular, green blotches, these are sometimes developed into radial stripes as if they had been painted on and had drizzled down; sometimes the green blotches are so close that they are only separated by narrow, greenish-yellow, zigzag lines, the whole smooth and somewhat shining; pseudocardinals radially split; laterals long and straight; anterior scars impressed; beak cavities deep, compressed; nacre silvery white, rarely purplish, iridescent and much thinner behind (Simpson 1914, p. 832).

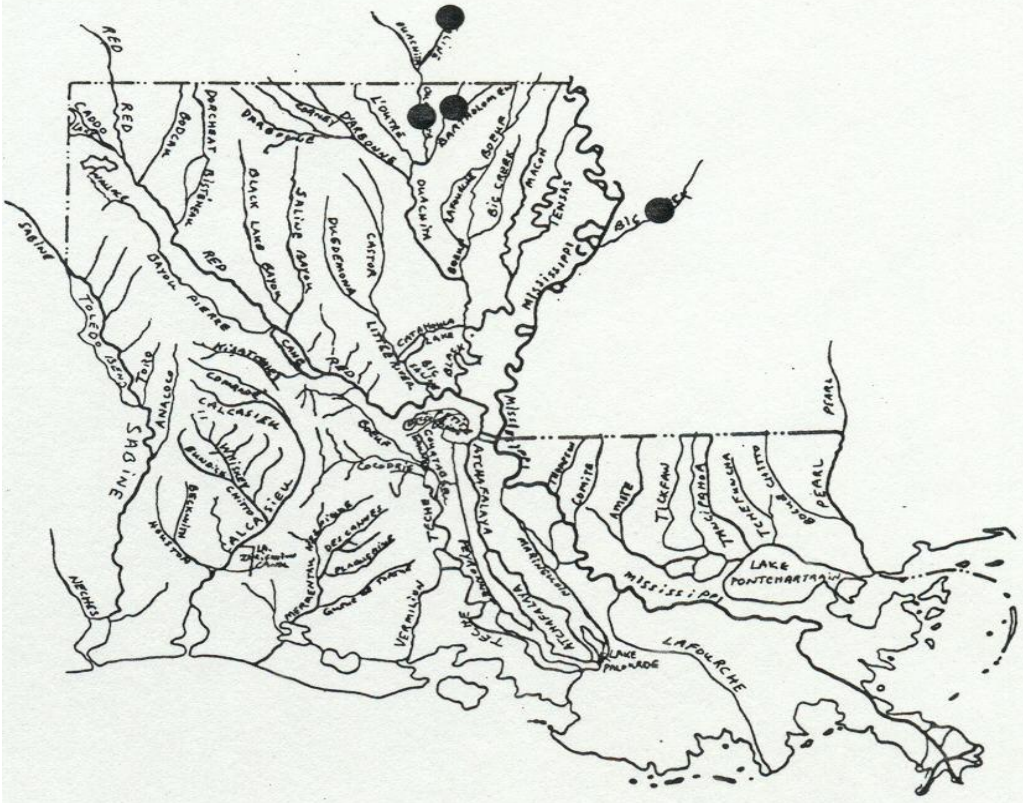
Type locality: Wabash River.

General distribution: Mississippi Interior Basin drainages.

Comments: Moore (1909) and Vanatta (1910) reported it from Ouachita River in Louisiana. George and Vidrine (in prep.) report it from Bayou Bartholomew. Davis and Fuller (1981) placed this species into the genus *Orthonymus*, but this move has been ignored by most recent authors. The black flesh of both this and the next species is so unusual that I am surprised that any opportunity to change the genus was not exercised.

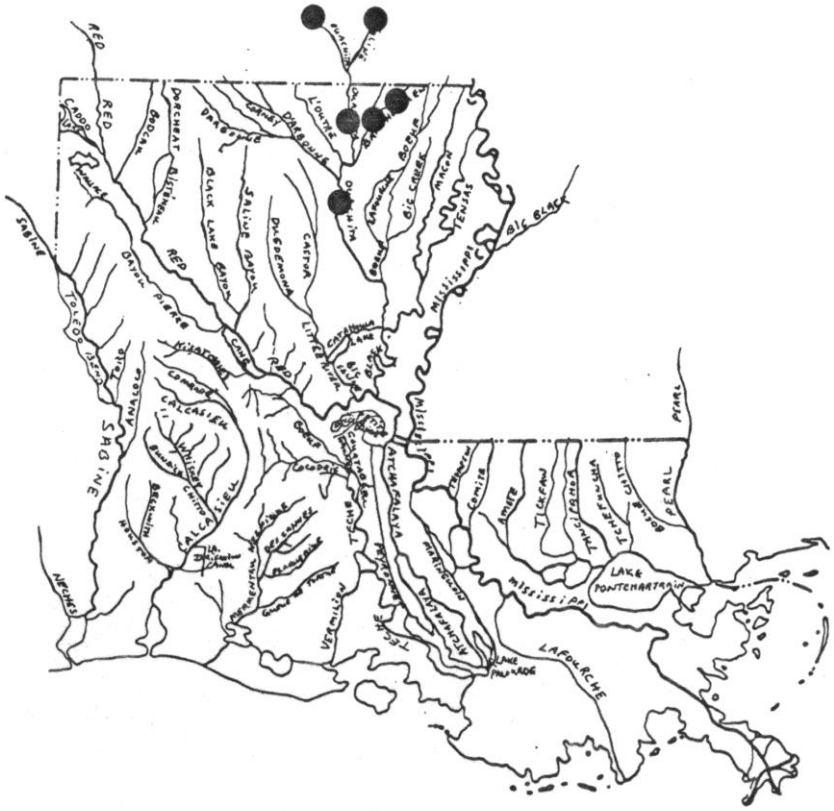


Map 42. Historical distribution of *Quadrula cylindrica* in North America.



Map 43. Historical distribution of *Quadrula cylindrica* in Louisiana.

Map 44. Historical distribution of *Quadrula metanevra* in North America.



Map 45. Historical distribution of *Quadrula metanevra* in Louisiana.

Quadrula metanevra (Rafinesque, 1820)
monkeyface

Figures S-T and A-B
Plates VI and VII
Maps 44 and 45

Partial synonomy:
Orthonymus metanevra (Rafinesque, 1820), Vidrine 1985, 1989b, Davis and Fuller 1981
Quadrula metanevra (Rafinesque, 1820), Simpson 1914, Turgeon *et al*. 1988, Vanatta 1910, Stern 1976, Gordon *et al*. 1980
Quadrula (Orthonymus) metanevra (Rafinesque, 1820), Frierson 1927 (p. 51)

Description: Shell irregularly rhomboid, more or less inflated, solid, inequilateral; beaks rather full and high, turned forward over a narrow lunule, their sculpture a few strong, irregular ridges, which are nodulous on the posterior ridge; posterior ridge elevated, rounded, separated from the rest of the shell in front and behind by a radial depression; anterior end rounded; base line straight or incurved behind the middle; dorsal slope obliquely truncated, the sulcation above the posterior ridge ending in a well-marked sinus; surface more or less covered with lachrymose knobs or tubercles, a row on the posterior ridge often marked with small, dark green, triangular patches, subshining to dull and rough; pseudocardinals ragged, two in the left valve and three in the right; laterals short; anterior scars small, impressed; beak cavities deep, compressed; nacre white, rarely pinkish, greatly thickened at the anterior base (Simpson 1914, p. 834).

Type locality: Kentucky River.

General distribution: Mississippi Interior Basin drainages.

Comments: Moore (1909) and Vanatta (1910) reported it from Ouachita River in LA. George and Vidrine (in prep.) report it from Bayou Bartholomew.

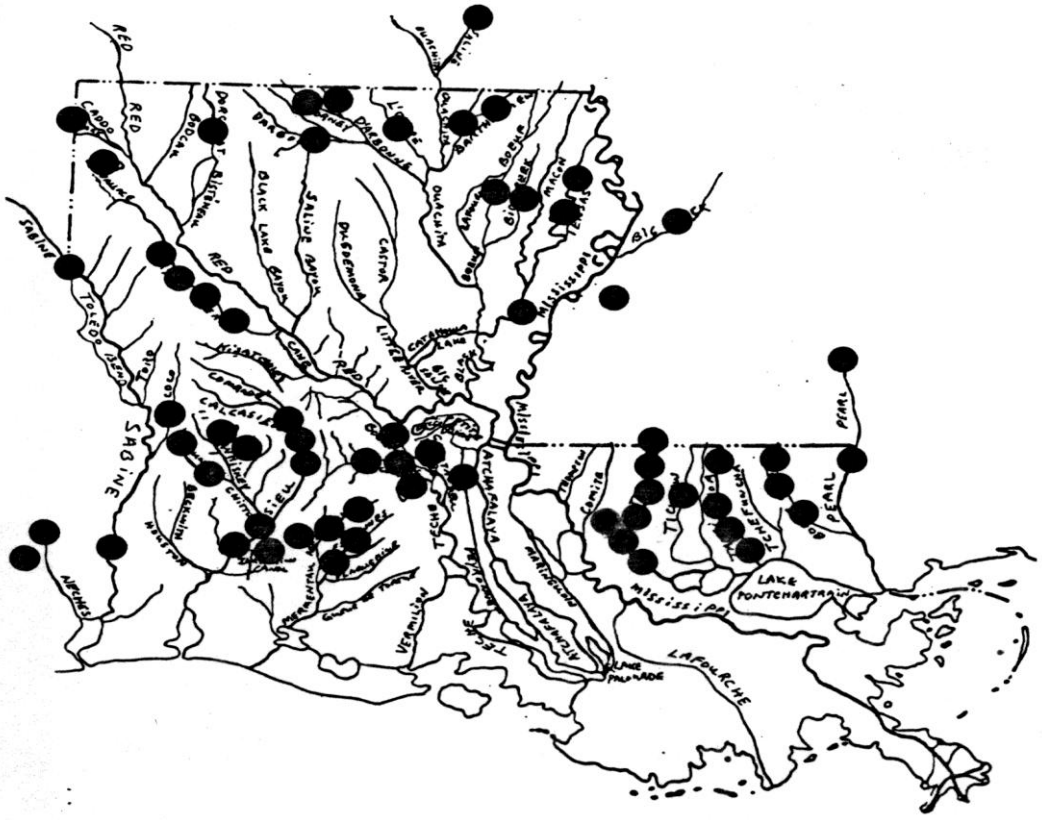
Genus *Tritogonia* Agassiz, 1852

Animal characters: Marsupium occupying all four gills. Body parts white.

Shell characters: Shell solid, elongate, rhomboid, having a strong, irregular posterior ridge; obliquely truncated behind in the male; in the female this region is somewhat compressed and expanded into a broad wing; base curved; whole surface, except the rounded wing of the female, covered with pustules; beaks rather low, incurved and turned forward over the well developed lunule; beak sculpture strong, consisting of irregular, sub-parallel ridges which are curved upwards behind and fine radiating ridges in front of and behind them; epidermis dark olive; hinge plate rather narrow; pseudocardinals strong, ragged; laterals long and straight, near to the pseudocardinals; cavity of the beaks rather deep, compressed; female shell more compressed than that of the male. Walker (1918: 45).

Comments: A single species occurs in Louisiana.

Map 46. Historical distribution of *Tritogonia verrucosa* in North America.



Map 47. Historical distribution of *Tritogonia verrucosa* in Louisiana.

Tritogonia verrucosa (Rafinesque, 1820)
pistolgrip

Figures E-K
Plate VII
Maps 46 and 47

Partial synonomy:
Tritogonia verrucosa (Rafinesque, 1820), Vidrine 1985, 1989b, Turgeon *et al*. 1988, Neck 1990, Murray and Roy 1968, Gordon *et al*. 1980, Roback *et al*. 1980, Stern 1976, Hartfield 1988
Tritogonia tuberculata (Barnes, 1823), Simpson 1914, Shira 1913
Unio tuberculatus Barnes, 1823, Vaughan 1892, 1893, Frierson 1899a
Quadrula obesa Vanatta, 1910
Quadrula verrucosa (Rafinesque, 1820), Strecker 1931
Quadrula (Tritogonia) verrucosa (Rafinesque, 1820), Frierson 1927 (p. 48)

Description: Shell large, elongated, solid, subrhomboid, scarcely inflated, inequilateral; with a decided, curved, elevated ridge, which ends well forward on the posterior base, in front of which for a long distance there is a shallow excavation; beaks low, compressed, sculptured with strong, irregular, corrugated ridges that turn up behind; surface covered as far back as the posterior ridge with irregular, different sized pustules, which sometimes form somewhat chevron-shaped figures; behind the ridge the sculpture consists of strong, irregular, curved, corrugated and often knobbed ridges; epidermis greenish-brown, or brown, dark green in young shells; left valve with two ragged, triangular pseudocardinals and two straight laterals; right valve with one large pseudocardinal, a small one in front of and vestigial teeth behind it, with one lateral, which in heavy shells may be partly double; beak cavities moderately deep, compresssed; anterior scars rough; posterior scars oval; nacre white, rarely purple. In this remarkable species the male shell is obliquely truncate at the posterior base, behind the posterior ridge and ends in a somewhat blunt point considerably above the base line. From this point running towards the beaks there is generally a row of low, broad nodules or knobs that extend upward in ridges. In the female shell this area is much smoother, and is extended into a broad, rounded wing (Simpson 1914, p. 318).

Type locality: Wisconsin.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: This is an extraordinary species with distinctive male and female shells that for a long time were considered as different species. This species can be found in small creeks and large rivers; it is truly an ecological enigma. Young specimens in western Louisiana have emerald green periostraca, while young specimens in eastern Louisiana have banana yellow periostraca.

Tribe **Pleurobemini** (*sensu* Davis and Fuller, 1981)

Animal characters: Ectobranchous (mostly) or tetragenous; septa not perforated; marsupia rarely confined to restricted region of the demibranchs; no specialized mantle structure; marsupial water tubes not extending beyond distal margins of the demibranch lamellae.

Shell characters: Shells generally smooth (Davis and Fuller 1981).

Comments: Four genera occur in Louisiana. Much like the quadrulas, these provide an identification enigma.

Key to the genera in Louisiana:

1a. Shell with two obvious long, fine furrows on the post-dorsal slope.....Genus *Uniomerus*
1b. Shell lacking above markings.....2

2a. Body parts yellow, orange, red; posterior ridge rather sharply angled; umbos somewhat raised or turned anteriorly.....Genus *Fusconaia*
2b. Body parts whitish; shells variable.....3

3a. Shells elongate, umbos not raised much above hinge line.....Genus *Elliptio*
3b. Shells round to triangular, umbos usually raised much above hinge line.....Genus *Pleurobema*

Genus *Pleurobema* Rafinesque, 1820

Animal characters: Anal opening with short mantle connection to supra-anal; inner gills much longer, inner laminae free from visceral mass; palpi small, very pointed; only outer gill marsupial; ovisacs distend but little when gravid; conglutinates white, narrowly leaflike or lanceolate, not broken; glochidium small, spineless, subovate.

Shell characters: Shell subtrapezoidal, subquadrate, rounded or elongated, upright, or, when oblique, with beaks produced anteriorly; beaks usually rather full and high, sculptured obscurely with concentric ridges not extending out on the disk; disk without sculpture; epidermis olivaceous, reddish brown or even black, rays more or less present in umbonal region; hinge teeth well developed; umbonal cavities moderately deep; nacre generally whitish or red. Utterback (1915-16: 186).

Comments: Three species occur in Louisiana. A possible new species, *Pleurobema* sp. cf. *beadleanum*, was recognized by Hartfield (1988).

Key to species in Louisiana:

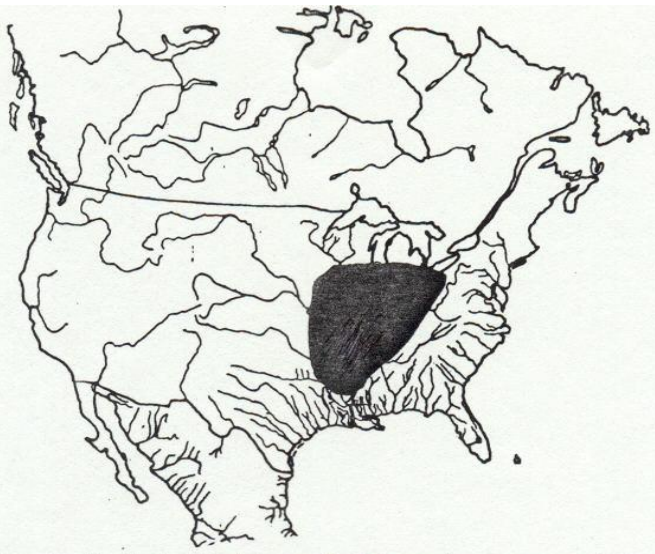
1a. Umbos slightly raised above hinge line.....*P. beadleanum*
1b. Umbos prominently raised above hinge line.....2

2a. Umbos turned anteriorly; interdentum obvious.....*P. pyramidatum*
2b. Umbos not turned; interdentum sparse.....*P. riddelli*

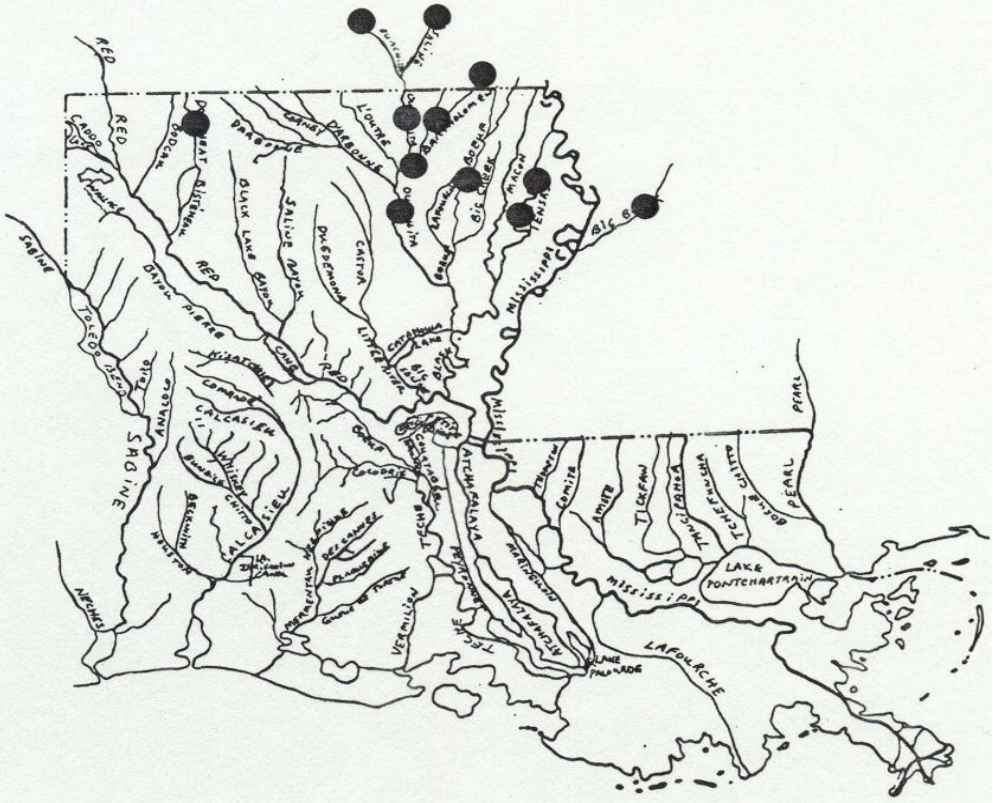
Pleurobema pyramidatum (Lea, 1840)
pyramid pigtoe

Figures L-W
Plate VII
Maps 48 and 49

Partial synonomy:
Pleurobema pyramidatum (Lea, 1840), Turgeon *et al.* 1988, Stern 1976
Pleurobema cordatum pyramidatum (Lea, 1834), Murray and Leonard



Map 48. Historical distribution of *Pleurobema pyramidatum* in North America.



Map 49. Historical distribution of *Pleurobema pyramidatum* in Louisiana.

1962, Gordon *et al*. 1980, Harris and Gordon 1987
Pleurobema cordatum (Rafinesque, 1820), Vidrine 1985, 1989b
Pleurobema rubrum (Rafinesque, 1820), Hartfield and Rummel 1986, Cummings and Mayer 1992
Quadrula pyramidata (Lea, 1834), Simpson 1914, Vanatta 1910
Quadrula obliquata (Rafinesque, 1820), Frierson 1927 (p. 52)
Unio cuneus Conrad, 1840, Vaughan 1893 (? synonym for *P. cordatum* in Simpson 1914, p. 896 and Johnson (1980))
Quadrula coccinea cunea (Conrad, 1841), Frierson 1927 (p. 53)

Description: Shell generally, when adult, having the outline of a scalene or right-angled triangle, the beaks being placed at the extreme anterior point and often projecting in advance of the rest of the shell, subinflated or inflated, solid; beaks high and full, turned forward over a wide, deep lunule that passes forward under them; anterior end truncated squarely or with a slope below and usually having a large, faint second lunule; base line nearly or quite straight; outline of dorsal slope lightly curved; posterior ridge,low, rounded, ending in a rounded point at the base of the shell; median ridge very high, rounded, curved, usually separated from the posterior ridge by a radial, concave depression; surface with irregular growth lines; epidermis brown to blackish, brownish-green and rayed in young shells, scarcely subshining; pseudocardinals radial, often oblique, torn; lateral of right valve more or less double; muscle scars small, deep; beak cavities deep, compressed; nacre rose-colored or white, rarely yellowish or salmon, thinner and iridescent behind (Simpson 1914, p. 888).

Type locality: Ohio.

General distribution: Mississippi Interior Basin drainages.
Comments: George and Vidrine (in prep.) report this very variable species in Bayou Bartholomew. Commonly specimens in Bayou Bartholomew have pinkish nacre, but specimens from Boeuf River and Tensas River usually have white nacre.

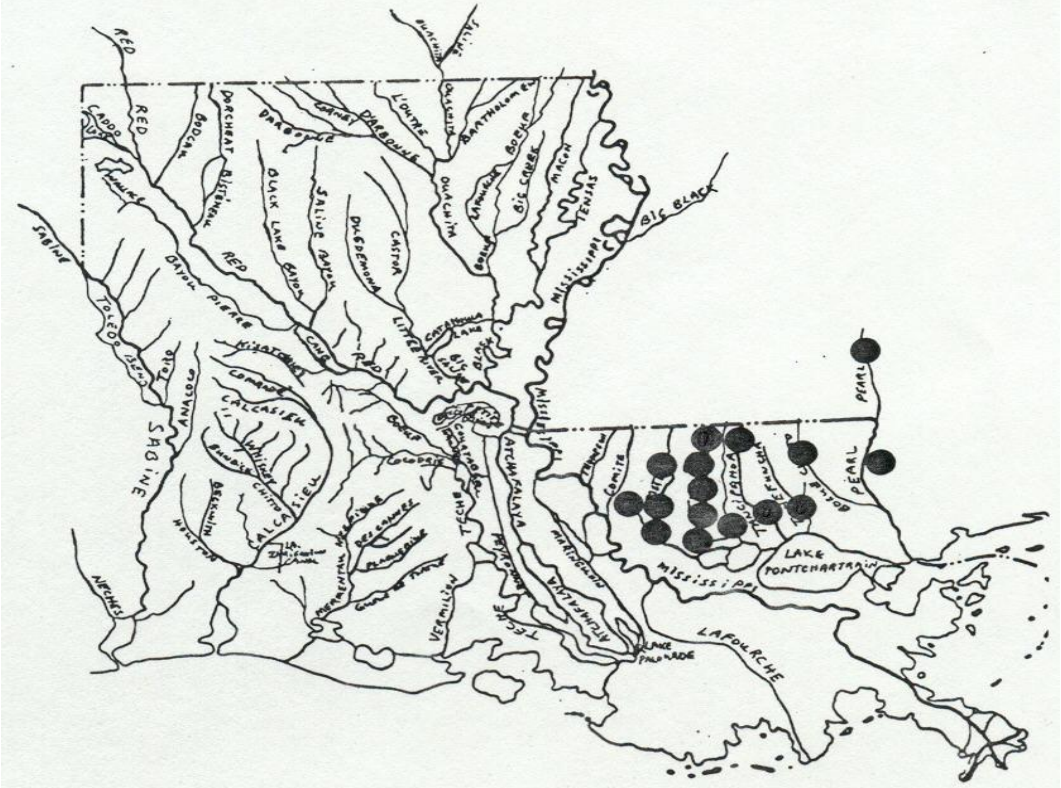
Pleurobema beadleanum (Lea, 1861)
Mississippi pigtoe

Figures A-E
Plate VIII
Maps 50 and 51

Partial synonomy:
Pleurobema beadleanum (Lea, 1861), Turgeon *et al*. 1988, Hartfield 1988
Elliptio beadleiana (Lea, 1861), Vidrine 1985, 1989b, Stern 1976
Quadrula beadleiana (Lea, 1861), Simpson 1914
Quadrula beadleana (Lea, 1861), Frierson 1927 (p. 57)
Fusconaia beadleiana (Lea, 1861), Murray and Roy 1968 (?)

Description: Shell subrhomboid or subtriangular, inflated, solid; beaks full and high, placed almost centrally; posterior ridge well developed, subangular; anterior end rounded, sometimes slightly truncate above; base line well curved; posterior end obliquely subtruncated; surface with strong, irregular, concentric growth lines; epidermis rich reddish-brown, scarcely shining; pseudocardinals triangular; laterals curved, that of the right valve partly double; muscle scars deep; beak cavities not very deep; nacre

Map 50. Historical distribution of *Pleurobema beadleanum* in North America.



Map 51. Historical distribution of *Pleurobema beadleanum* in Louisiana.

whitish, purple tinted or salmon (Simpson 1914, p. 869).

Type locality: Pearl River, Jackson, MS.

General distribution: Eastern Gulf drainages.

Comments: This species has suffered a long list of generic changes. *Pleurobema* sp. cf. *beadleanum* Hartfield 1988, either a large and thick form of this species or an entirely new species, from the Amite and Pearl Rivers is possibly a new species. It is a possible resident of western Louisiana, but I cannot substaniate a record of this species from west of the Mississippi River.

Pleurobema riddelli (Lea, 1861)
Louisiana pigtoe

Figures 5-8 and F-K
Back Cover and Plate VIII
Maps 52 and 53

Partial synonomy:
Pleurobema riddelli (Lea, 1861), Vidrine 1985, 1989b, Turgeon *et al.* 1988, Murray and Roy 1968, Stern 1976, Neck 1984, Roback *et al.* 1980
Quadrula riddelli (Lea, 1861), Simpson 1914, Strecker 1931, Frierson 1927 (p. 54)
Unio houstonensis Lea, 1859, Vaughan 1892 (= *U. friersoni* in Frierson 1899a) *Unio houstonensis* Lea, 1859, was described from the Houston River in Harris County, Texas, and is not believed to occur in Louisiana (Neck, pers. comm.). This is a species in the genus *Quadrula*.
Unio riddelli Lea, 1861, Frierson 1899b
Fusconaia friersoni (Wright, 1896), Vidrine 1985, Stern 1976
Quadrula friersoni (Wright, 1896), Simpson 1914, Frierson 1927, Strecker 1931, Murray and Roy 1968, Frierson 1927 (p. 54)
Unio friersoni Wright, 1896, Frierson 1899a

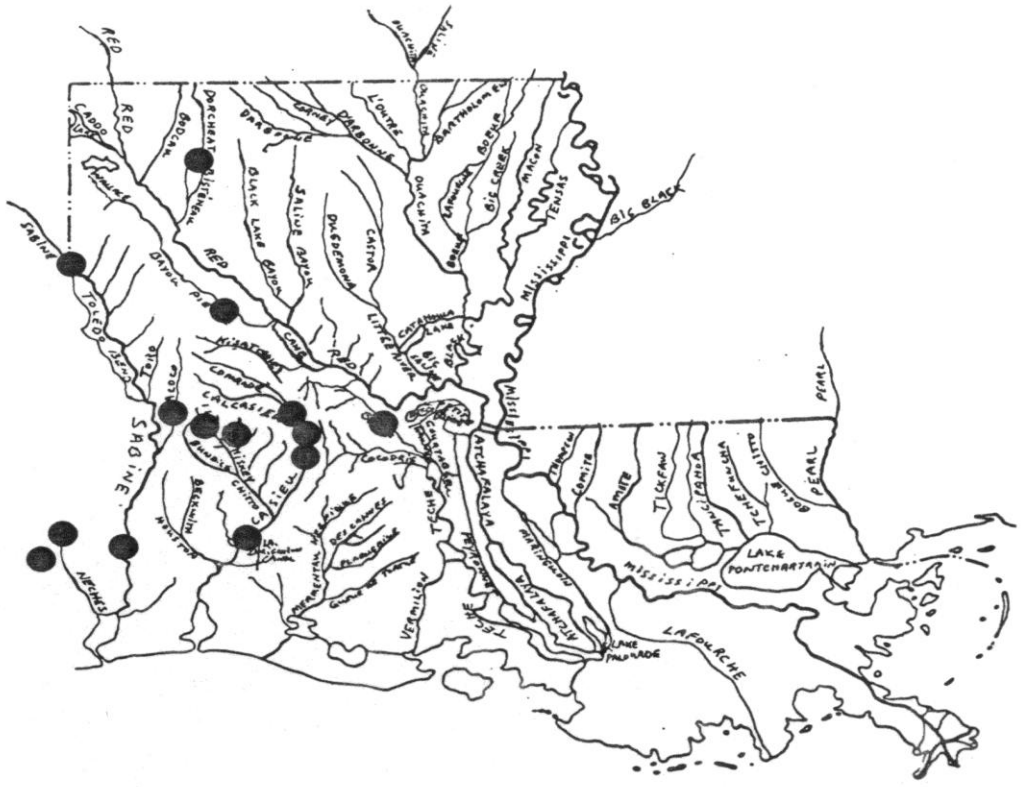
Description: Shell short, subquadrate, inflated, solid, equilateral or nearly so; beaks high and full, turned forward over a lunule, their sculpture consisting of numerous corrugated ridges that are strongly curved up behind; posterior ridge elevated, carinated throughout, ending in a point near the base of the shell; anterior end almost evenly rounded, having a slight oblique truncation above; base line rounded; posterior end almost squarely truncated, the upper part sometimes overhanging a little, with an angle behind the ligament; surface unevenly, concentrically striate; epidermis greenish-brown; pseudocardinals rough, irregular; laterals short, that in the right valve somewhat double; muscle scars small, deep; beak cavities moderately deep, compressed; nacre bluish-white, thinner and iridescent behind. The overhanging of the posterior truncation and the rounded base will distinguish it from *F. friersoni* (Simpson 1914, p. 878).

Type locality: Dallas, TX.

General distribution: Western Gulf drainages and southern portion of Mississippi Interior Basin.

Comments: This species is so similar to *Unio friersoni* (= *Pleurobema friersoni* (Wright, 1896)) that Neck (1984) suggested their synonomy and it is here followed. However the description of this taxon

Map 52. Historical distribution of *Pleurobema riddelli* in North America.



Map 53. Historical distribution of *Pleurobema riddelli* in Louisiana.

follows (see illustrations on Back Cover (Figures 5 and 6):

Shell triangular, inflated, solid, nearly or quite equilateral; beaks very high and full, their sculpture apparently consisting of numerous oblique corrugations; posterior ridge high, angled, ending near the base of the shell; anterior end obliquely subtruncated above, rounded below; base line in adult shells nearly straight; outline of dorsal slope curved, often elevated into a low angle behind the ligament; surface irregularly, concentrically striate; epidermis varying from ashy-brown to reddish-brown; pseudocardinals triangular rough; lateral of right valve partly double; beak cavities moderately deep, compressed; muscle scars small, impressed; nacre whitish to purple (Simpson 1914, p. 879). Type locality: Bayou Pierre, DeSoto Parish, LA.

Comments: I found a live specimen in Bayou Pierre at Rte LA 174 in 1974. The shell appears to be identical to *P. riddelli*. Strecker (1931) contended that *Unio friersoni* was found in the Red River westward to the Trinity River. Frierson (1927) stated that the type locality of this species having been drained, the species is extinct, so far as is known. The species always has white flesh, and ova in two gills. Johnson (1972a) illustrated this species. The presence of this species in Bayou Pierre and Bayou Teche may be a result of stream capture by these streams which interdigitate headwaters with the Sabine and Calcasieu Rivers.

Genus *Elliptio* Rafinesque, 1820

Animal characters: Branchial and anal openings large with many small papillae; mantle connections between anal and supra-anal short, or moderately so; gills wide, very much round ventrad, inner wider but not much longer, inner laminae almost entirely free from visceral mass; palpi medium size; color of soft parts whitish, suffused with black; only outer gills marsupial; glochidia small, suboval, spineless.

Shell characters: Shell thick, heavy, subsolid, rhomboid-ovate; longitudinal axis straight, disk smooth, beaks rather low, not near anterior end; sculptured with a few fine concentric ridges angled at the base of the post-umbonal ridge; epidermis brown to black, faintly rayed or rayless; hinge teeth heavy; nacre varying from white to deep purple and violet. Utterback (1915-16: 198).

Comments: Four species possibly occur in Louisiana.

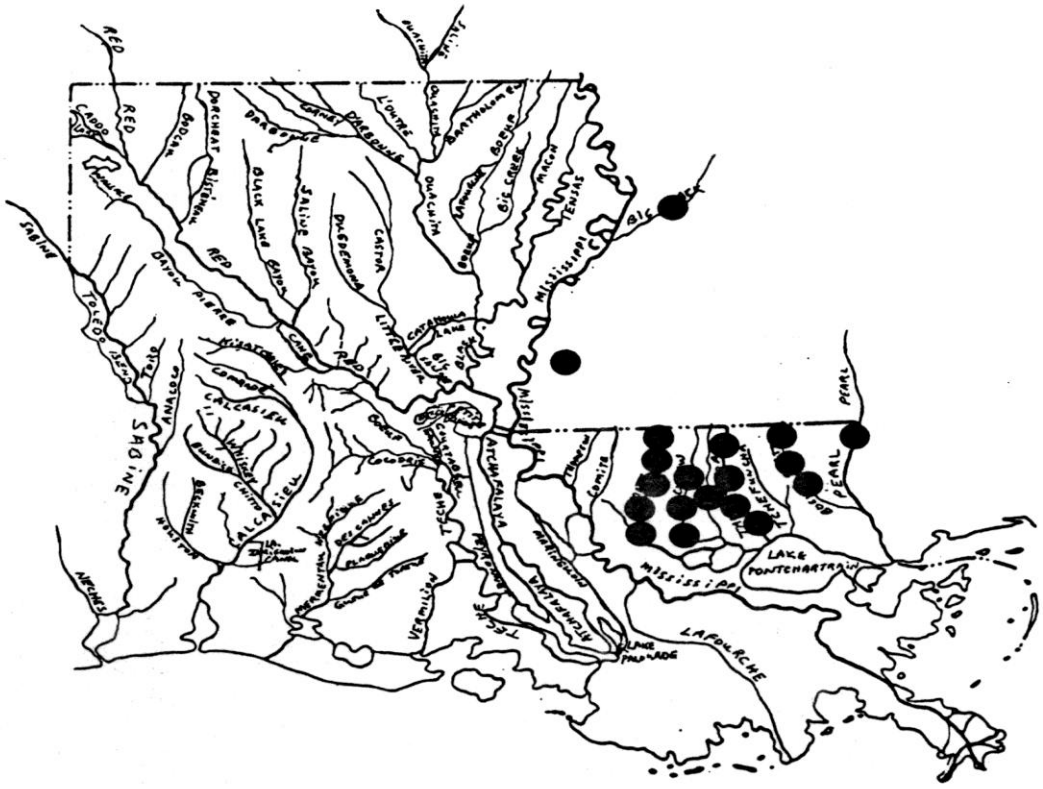
Key to the species in Louisiana:

1a. Shell barely twice as long as wide.....*E. crassidens*
1b. Shell obviously twice or more as long as wide.....2

2a. Nacre usually distinctly purple; restricted to western Louisiana.....*E. dilatata*
2b. Nacre usually white; restricted to Eastern Gulf drainages.....3

3a. Shell thick; hinge teeth prominent.....*E. arca*
3b. Shell thin; hinge teeth weak.....*E. arctata*

Map 54. Historical distribution of *Elliptio crassidens* in North America.



Map 55. Historical distribution of *Elliptio crassidens* in Louisiana.

Elliptio crassidens (Lamarck, 1819)
elephant ear

Figures L-O
Plate VIII
Maps 54 and 55

Partial synonomy:
Elliptio crassidens (Lamarck, 1819), Stern 1976, Vidrine 1985, 1989b, Hartfield 1988, Turgeon *et al*. 1988
Unio crassidens Lamarck, 1819, Simpson 1914
Elliptio niger (Rafinesque, 1820), Frierson 1927 (p. 25)

Description: Shell ponderous, convex or subinflated, subrhomboid, inequilateral; beaks full and elevated, their sculpture a few coarse ridges running nearly parallel with the growth lines; posterior ridge well developed and angled, sometimes faintly double below and ending behind at the base of the shell usually in a biangulation; base line straight or incurved in old specimens; outline of posterior slope subtruncate, slightly curved; surface with rude, irregular growth lines; posterior slope often having a few wrinkles; epidermis thick, reddish-brown or chestnut; left valve with two strong, rough pseudocardinals and two heavy laterals; right valve with one strong pseudocardinal with a small tooth in front of and behind it, with one very solid lateral; beak cavities very shallow with a few small scars; muscle scars small and deep; pallial line impressed, crenate; nacre purplish or salmon (Simpson 1914, p 606).

Type locality: Mississippi and other rivers and lakes.

General distribution: Mississippi Interior Basin and Eastern Gulf drainages.

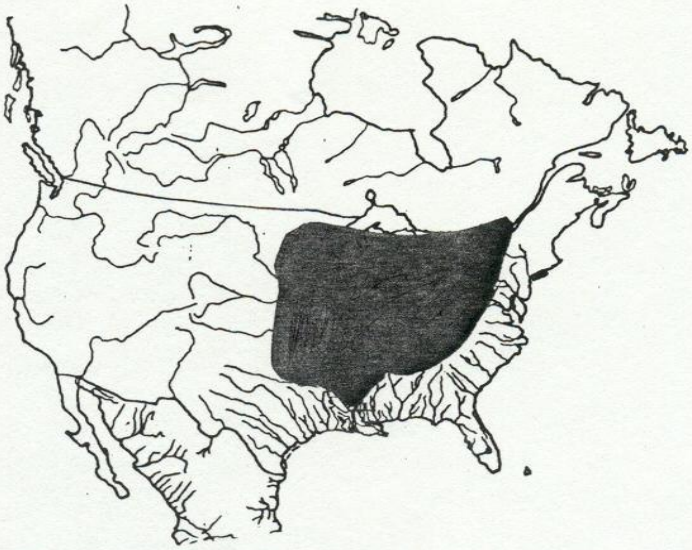
Comments: This large species can form beds in the streams in southern Mississippi and eastern Louisiana (Vidrine and Clark 1983).

Elliptio dilatata (Rafinesque, 1820)
spike

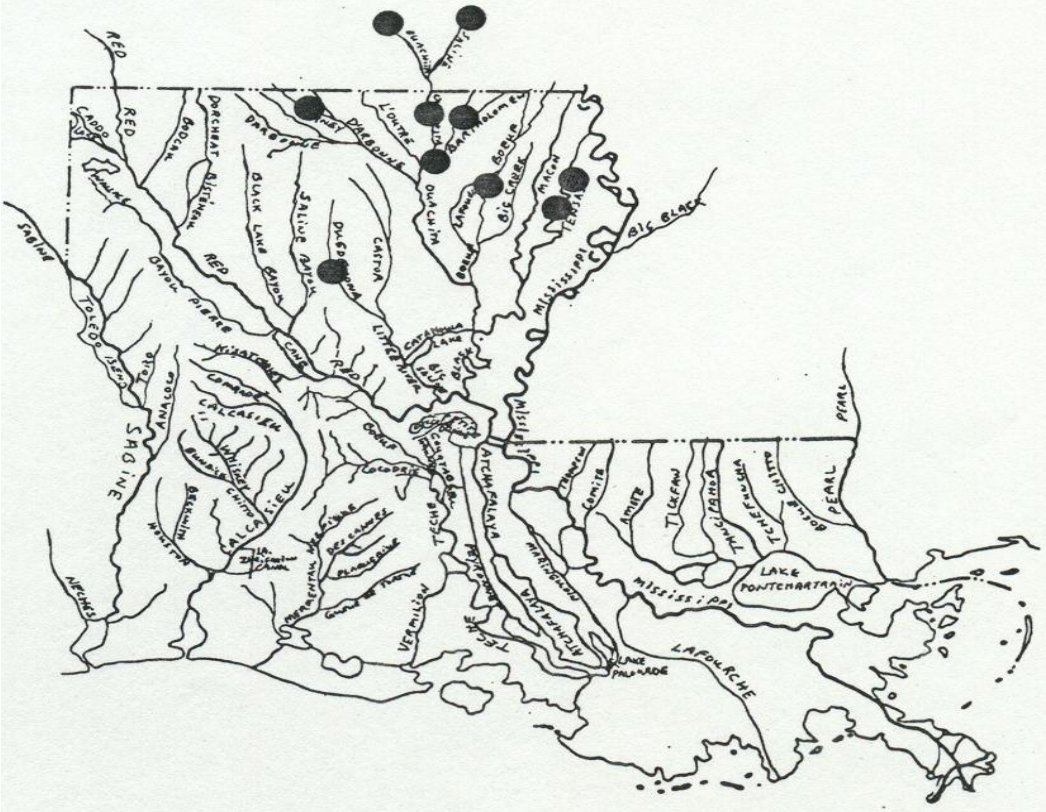
Figures P-R
Plate VIII
Maps 56 and 57

Partial synonomy:
Elliptio dilatata (Rafinesque, 1820), Frierson 1927, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Stern 1976, Gordon *et al*. 1980, Murray and Roy 1968, Frierson 1927 (p. 33)
Unio gibbosus Barnes, 1823, Simpson 1914, Vaughan 1893, Vanatta 1910
Unio subgibbosus Lea, 1857, Vanatta 1910

Description: Shell elongated, generally solid, rarely inflated, sometimes subcompressed, decidedly inequilateral, usually a little higher in front and often arcuate, especially in an adult state; beaks not much elevated above the curved dorsal line, generally subcompressed, turned a little forward over a well-developed lunule, their sculpture a number of strong, often crude, subcorrugated, longitudinal bars, which are sometimes slightly doubly looped; posterior ridge well developed, subangular or rounded, curved and placed close to the dorsal line, rarely double and ending behind in a point or biangulation at or near the base of the shell; surface with uneven growth lines, sometimes concentrically sculptured;



Map 56. Historical distribution of *Elliptio dilatata* in North America.



Map 57. Historical distribution of *Elliptio dilatata* in Louisiana.

epidermis dull, greenish or yellowish-brown in young shells, darker when old, often faintly rayed in young specimens; left valve with two rather small, stumpy or subcompressed pseudocardinals; right valve with one, having occasionally a vestigial tooth in front of and behind it; laterals club-shaped, one in the right valve which is sometimes double, and two in the left; beak cavities exceedingly shallow; dorsal scars immediately under the hinge; muscle scars deep; pallial line impressed, crenate; nacre deep purple, salmon, straw-colored or white, obliquely ribbed (Simpson 1914, p. 597).
Type locality: Wisconsin.

General distribution: Mississippi Interior Basin drainages.

Comments: Simpson (1914, p. 599) described var. *subgibbosus* from Saline River, Arkansas, as follows:
Shell small, solid, inflated or subinflated, with a posterior ridge. Typically subrhomboid and slightly full on the base line.

Elliptio arca (Conrad, 1834)
Alabama spike

Figures A-B
Plate IX
Maps 58 and 59

Partial synonomy:
Elliptio arca (Conrad, 1834), Hartfield 1988, Turgeon *et al*. 1988
Elliptio dilatata (Rafinesque, 1820), Grantham 1969
Unio gibbosus var. *arcus* Conrad, 1834, Simpson 1914
Elliptio dilatata arcus (Conrad, 1834), Frierson 1927 (p. 34)

Description: Shell very similar to that of *E. dilatata*. Shell small, thick and ponderous, subinflated, arcuate (Simpson 1914, p. 599).

Type locality: Alabama River.

General distribution: Eastern Gulf Drainages.

Comments: Grantham (1969) reported this species from the Pearl River in Mississippi as *E. dilatata*. Hartfield (1988) reported this species from the Pearl River in Mississippi, and it could be a resident of Louisiana. Hartfield (in press) reports it from the Amite River in Louisiana.

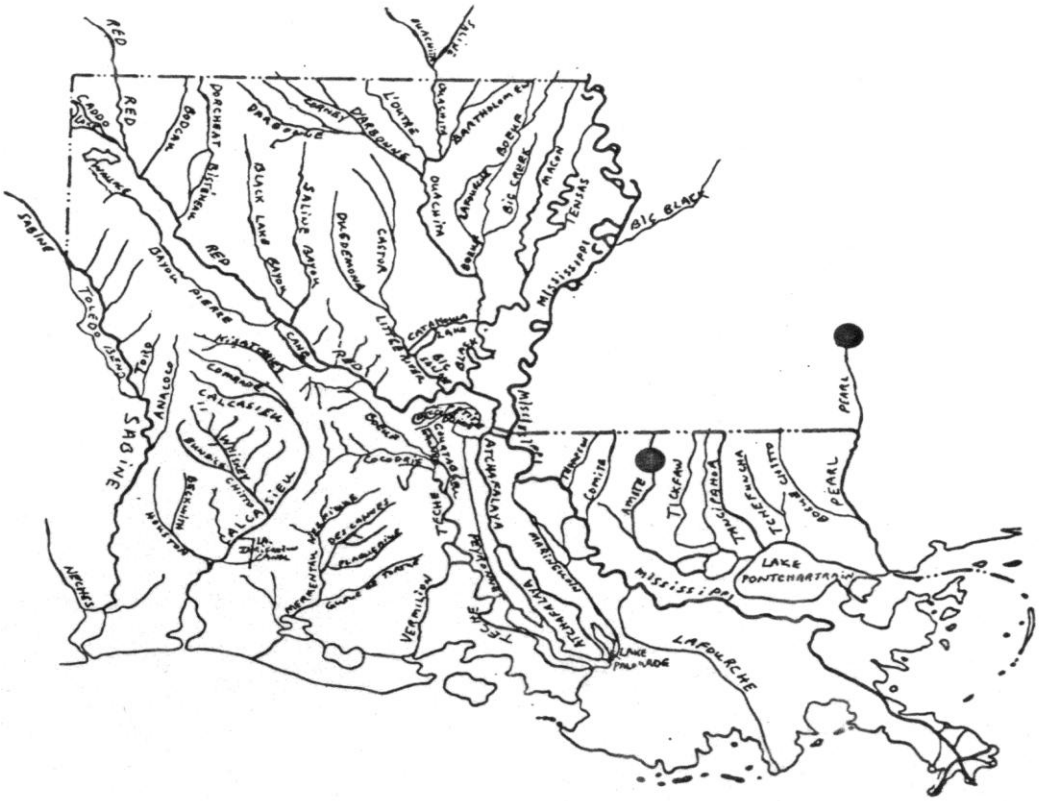
Elliptio arctata (Conrad, 1834)
delicate spike

Figures C-E
Plate IX
Maps 60 and 61

Partial synonomy:
Elliptio arctata (Conrad, 1834), Hartfield 1988, Turgeon *et al*. 1988, Frierson 1927 (p. 28)
Unio arctatus Conrad, 1834, Simpson 1914

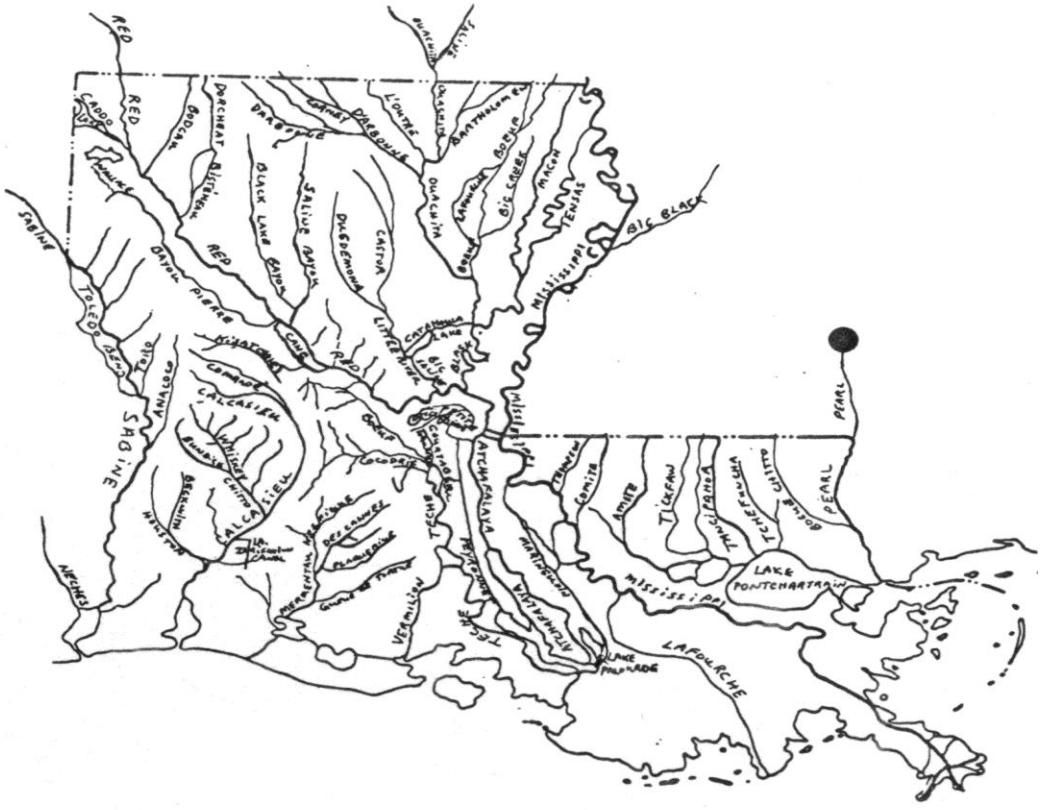
Description: Shell elongated, compressed or subcompressed, usually arcuate, inequilateral, subsolid; beak low, compressed, their sculpture strong, corrugated ridges, which nearly follow the growth

Map 58. Historical distribution of *Elliptio arca* in North America.



Map 59. Historical distribution of *Elliptio arca* in Louisiana.

Map 60. Historical distribution of *Elliptio arctata* in North America.



Map 61. Historical distribution of *Elliptio arctata* in Louisiana.

lines; posterior ridge low, usually faintly double, ending behind below the median line in a somewhat rounded biangulation; dorsal slope obliquely truncated; basal line usually incurved; surface smoothish, or marked with irregular growth lines; epidermis greenish-yellow to tawny-brown, red-brown or black, feebly rayed, smooth and shining in young or finely preserved adult specimens, rough and dark in old ones; left valve with two low, small but stumpy, pseudocardinals and two remote laterals; right valve with one pseudocardinal and one lateral; beak cavities very shallow; muscle scars not deep; nacre purple, rarely white, iridescent behind, usually dull in front (Simpson 1914, p. 644).

Type locality: Black Warrior and Alabama Rivers.

General distribution: Eastern Gulf drainages.

Comments: Hartfield (1988) reported this from Strong River in the Pearl River drainage in Mississippi. No records exist for this species in Louisiana, but there is a reasonable possibility that it once was a part of the Pearl River fauna in Louisiana.

Genus *Fusconaia* Simpson, 1900

Animal characters: Branchial opening with dense yellowish tentacles; anal smooth; supra-anal separated from anal by very short connection; laminae of inner gills free from visceral mass; palpi rather large; all four gills marsupial, ovisacs when gravid subcylindrical; conglutinates same shape, usually reddish, subsolid and discharged whole; glochidium subovate, somewhat small, spineless; colors of soft parts usually brilliant orange or red.

Shell characters: Shell roundly quadrate or triangular; disk smooth; beaks elevated, sculptured with concentric ridges angled a base of prominent post-umbonal ridge; epidermis reddish to brown with fine, rather uninterrupted, rays when young; hinge teeth well developed; beak cavities deep; nacre white. Utterback (1915-16: 103).

Comments: Four species occur in Louisiana. Separation of species is based more upon geographic distribution than shell morphology because the ecophenotypic variation among species nearly equals that between species. All of the species demonstrate significant stream-size induced morphology, with larger streams having heavy, inflated shells and small steams having thin, compressed shells.

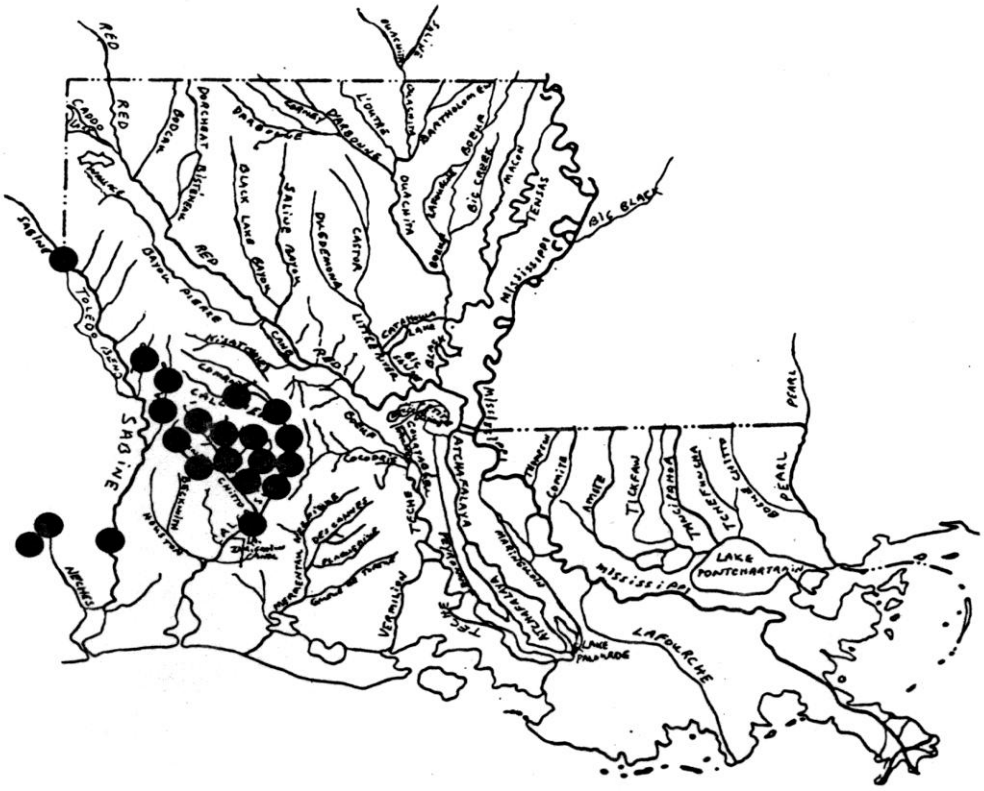
Key to the species in Louisiana:

1a. Umbos turned anteriorly; shell thick and massive.....*F. ebena*
1b. Umbos not turned; shells moderately thick.....2

2a. Epidermis usually yellow; restricted to Eastern Gulf drainages in Louisiana.....*F. cerina*
2b. Epidermis tan, brown, or reddish, rarely yellow; restricted to streams of the Mississippi River and west in Louisiana.....3

3a. Umbo generally obviously elevated and swollen; posterior ridge somewhat pronounced.....*F. flava*
3b. Umbo not elevated or slightly so and not swollen; posterior ridge rounded to obscure.....*F. askewi*

Map 62. Historical distribution of *Fusconaia askewi* in North America.



Map 63. Historical distribution of *Fusconaia askewi* in Louisiana.

Fusconaia askewi (Marsh, 1896)
Texas pigtoe

Figures 10 and G-L
Front Cover and Plate IX
Maps 62 and 63

Partial synonomy:
Fusconaia askewi (Marsh, 1896), Turgeon *et al*. 1988, Stern 1976, Neck 1984, Murray and Roy 1968, Valentine and Stansbery 1971
Fusconaia lananensis (Frierson, 1900), Vidrine 1985, 1989b, 1990c, Roback *et al*. 1980
Quadrula askewi (Marsh, 1896), Simpson 1914, Strecker 1931, Frierson 1927 (p. 57)
Unio askewi Marsh, 1896, Frierson 1899a, 1899b
Unio cerinus Conrad, 1838, Frierson 1899b (?)
Unio chunii Lea, 1861, Frierson 1899b

Description: Shell somewhat rhomboid, inflated, almost or quite equilateral, rather solid; beaks full and high; posterior ridge full, generally angled above, sometimes biangulate below; anterior end rounded, obliquely truncate above; base line generally a little sinuate in front of the posterior ridge; outline of dorsal slope generally curved, sometimes raised into an angle behind the ligament; surface somewhat concentrically sculptured; epidermis dark reddish-brown, dull; pseudocardinals triangular, ragged; laterals curved; beak cavities moderately deep; muscle scars small; nacre whitish or pinkish (Simpson 1914, p. 869). *Fusconaia* generally have yellow to orange flesh with scarlet eggs, whereas other genera with similar shells (*Quadrula, Elliptio* and *Pleurobema*) have white flesh and inconspicuously colored eggs. Of the *Quadrula*, the *"Orthonymus"* group has blackish (melanistic) pigment distributed in the body soft parts as an exception.

Type locality: Village Creek, Hardin Co., and Sabine River, Texas.

General distribution: Western Gulf drainages and possibly the southern portion of the Mississippi Interior Basin drainages.

Comments: I have a specimen from Cane River and a specimen from Bayou Pierre, both of which strongly resemble this species. It is possible that this species has moved into the southern portion of the Mississippi Interior Basin by stream capture. The headwaters of Cane River (Kisatchie Bayou) essentially interdigitates with the Anacoco Bayou headwaters of the Sabine River and the Comrade Creek headwaters of the Calcasieu River on Peason Ridge in western Louisiana. This may also account for the presence of *P. riddelli* in the same drainages. The type locality of *Unio chunii* Lea is the Trinity River near Dallas, and this may be actually *F. askewi*. This species is extremely closely related to *Fusconaia lananensis* (Frierson, 1900), which is apparently restricted to Texas drainages. Here is a description of this latter species:

Shell quadrate to triangular, nearly equilateral, anterior margin rounded. Base round in front, nearly straight behind. Posterior oblique, biangular, slightly emarginate. Dorsum curved; smooth, nearly polished above, striate below and upon the posterior slope. Lines of growth distinct and ill-defined. Dark reddish-brown, sometimes a little olive, obscurely radiate. Beaks eroded, umbos low, somewhat inflated. Anterior slope rounded. Lateral slope flattened. Posterior ridge angular near the beaks, becoming obsolete near the base. Ligament brown, smooth, medium sized. Shell of medium thickness, thinner behind. Teeth double in left valve, single in right. Laterals rather thin, nearly straight. Cardinals stumpy. Muscle scars well marked, generally separate, sometimes

confluent. Pallial line distinct in front, less so behind. Cavity of shell dish-like; of the beaks deep and full. Sometimes the dorsal muscle scars are situated in the extreme end of the beak cavity, but generally upon the base of cardinal and dorsal plate. Nacre rose-color, with blotches of yellow surrounded by brown. Cavity nearly always studded with numerous pearly excrescences (Simpson 1914, p. 870). Flesh of the animal whitish or salmon-colored exteriorly, but shows scarlet when cut. Eggs carried in all four gills, very red, and the gravid animal thus presents a striking appearance (Frierson, 1900). Type locality: Lanana Creek, also Banita Creek, near Nacogdoches, Texas.

Comments: Strecker (1931) reported this species as only in Neches River Drainage. *F. lananensis* (a species also included in the AFS list) is closely allied to *F. askewi*, both by its conchological and anatomical characteristics. It may be differentiated from that shell by being longer, more compressed, more oblique, and its shell is never so inflated and thickened in front as *askewi* and not so acutely angled on the posterior ridge. Internally, *lananensis* is rose-colored nearly invariably and the color is uniformly spread over its surface. *Askewi* is mostly white, and, when colored (pink) the color is almost always confined exterior to the pallial line. Finally, *askewi* never possess those peculiar excrecences, which seem to belong to *lananensis* (Simpson 1914, p. 870). Roback *et al*. (1980) used this name for Village Creek specimens, but they apparently are *F. askewi*.

Fusconaia cerina (Conrad, 1838)
Gulf pigtoe

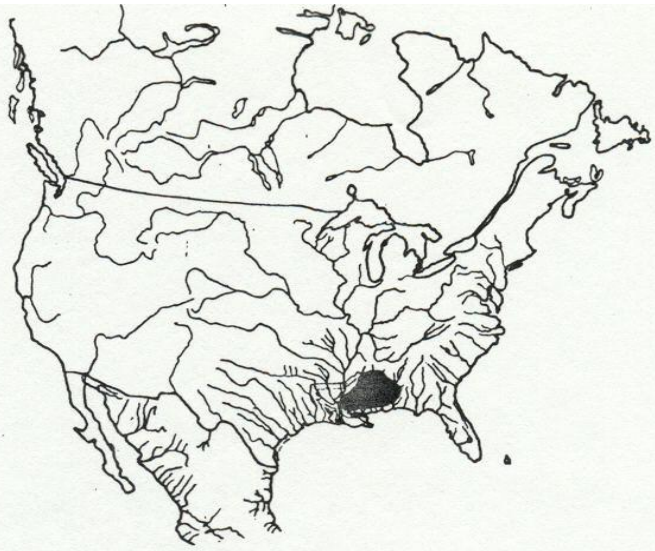
Figures 8 and M-Q
Front Cover and Plate IX
Maps 64 and 65

Partial synonomy:
Fusconaia cerina (Conrad, 1838), Hartfield 1988, Turgeon *et al*. 1988, Murray and Roy 1968 (?)
Fusconaia flava (Rafinesque, 1820), Stern 1976, Vidrine 1985, 1989b
Quadrula cerina (Conrad, 1838), Simpson 1914
Quadrula flava (Rafinesque, 1820), Frierson 1927 (p. 55) (in part)
Unio cerinus Conrad, 1838

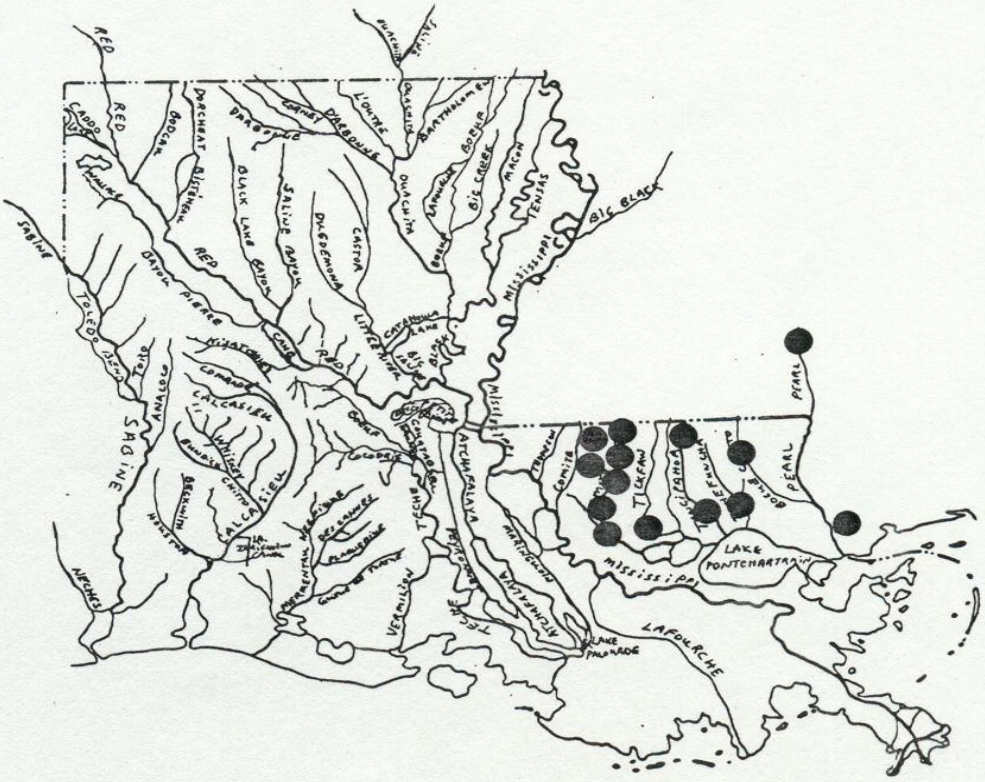
Description: Shell rhomboid, convex to subinflated, subsolid, inequilateral; beaks somewhat full and high; posterior ridge well developed, subangular, often slightly double below, ending in a feeble biangulation at the base of the shell; anterior end rounded; base line straight or lightly curved; outline of dorsal slope raised to an angle in the middle, obliquely truncate below; surface with faint, uneven, concentric sculpture; epidermis brownish to reddish-brown, generally showing feeble rest marks, rather cloth-like when fresh; pseudocardinals triangular, rough; laterals curved, that of the right valve usually single; muscle scars impressed; beak cavities moderately deep; nacre whitish, pinkish, purplish or red (Simpson 1914, p. 873).

Type locality: New Orleans, LA.

General distribution: Eastern Gulf drainages.



Map 64. Historical distribution of *Fusconaia cerina* in North America.



Map 65. Historical distribution of *Fusconaia cerina* in Louisiana.

Comments: Frierson (1899a) reported it in Sabine River and Red River, but later synonomizes it with *F. flava*. Simpson (1914) suggested that this species occurs from eastern Texas to Arkansas to Alabama.

Fusconaia flava (Rafinesque, 1820)
Wabash pigtoe

Figures 9 and A-H
Front Cover and Plate X
Maps 66 and 67

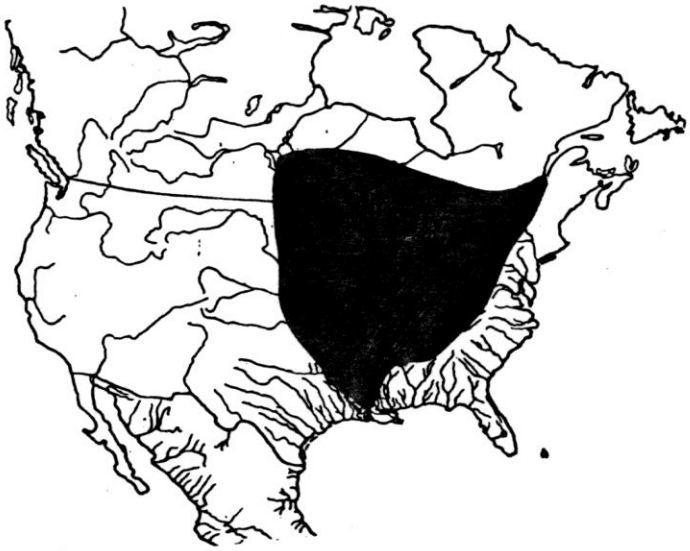
Partial synonomy:
Fusconaia flava (Rafinesque, 1820), Vidrine 1985, 1989b, Turgeon *et al*. 1988, Murray and Roy 1968, Valentine and Stansbery 1971, Gordon *et al*. 1980
Fusconaia flava undata (Barnes, 1823), Gordon *et al*. 1980
Quadrula undata (Barnes, 1823), Simpson 1914, Coker 1915, Shira 1913, Frierson 1927 (p. 54)
Unio chunii Lea, 1861, Vaughan 1892, 1893, Frierson 1899a
Unio trigonus Lea, 1831, Vaughan 1892, 1893, Frierson 1899a
Unio cerinus Conrad, 1838, Vaughan 1893
Quadrula trigona Lea, 1831, Vanatta 1910
Quadrula undata chunii Lea, 1861, Strecker 1931
Quadrula flava (Rafinesque, 1820), Frierson 1927 (p. 55) (in part)

Description: Shell triangular, inflated, solid, slightly inequilateral; beaks very high and full, turned forward over a lunule, their sculpture a few irregular ridges, which turn up behind and occasionally two or three rayed lirae behind them; anterior end ususally obliquely truncate above and angular in front of the lunule, though rarely evenly rounded; base line straight or lightly sinused in from of the posterior ridge; outline of dorsal slope often curved, raised into a low angle behind the ligament; posterior ridge well developed, angled or narrowly rounded, ending in a blunt point at the base line; in front of the posterior ridge there is generally a wide, radial depression and in front of this is the greatest diameter; surface with uneven growth lines; epidermis brownish-green and faintly rayed in the young state, greenish-brown, brownish or blackish in the old shell, rather dull; pseudocardinals strong, torn; lateral of the right valve often partly double; muscle scars very deep; beak cavities moderately deep; nacre white, salmon or rose-tinted, thinner behind (Simpson 1914, p. 880).

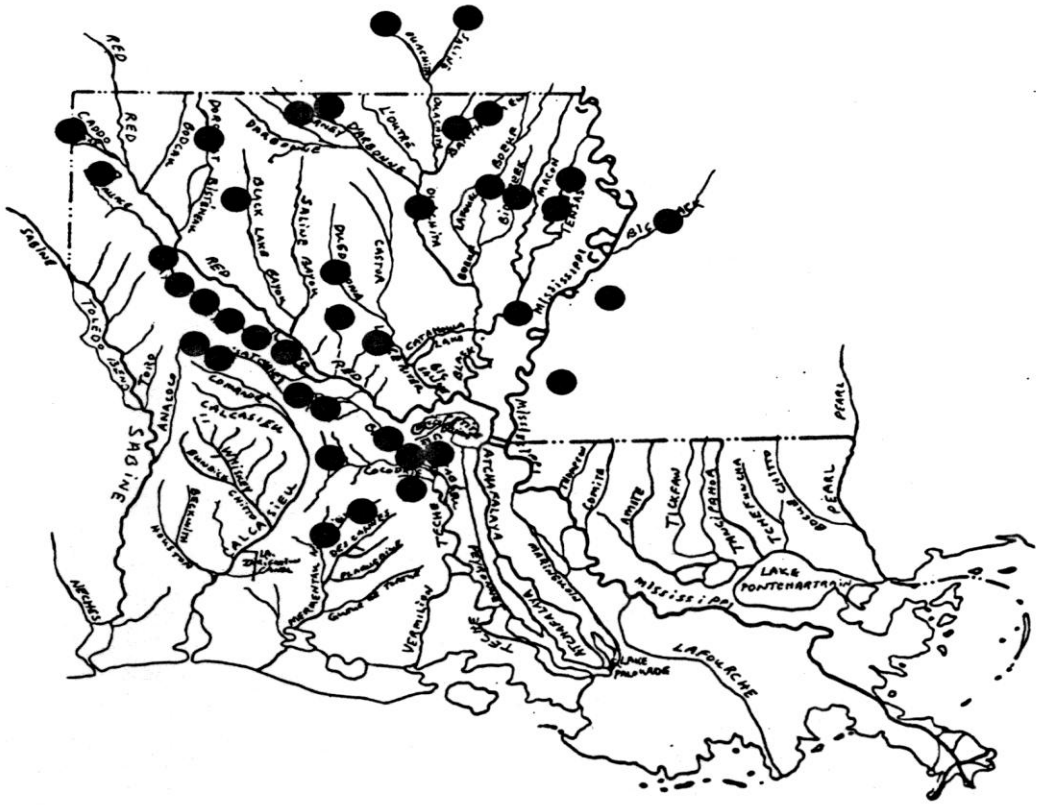
Type locality: Wisconsin and Fox Rivers.

General distribution: Mississippi Interior Basin drainages.

Comments: This species is extremely variable and shows tremendous conchological changes in streams of different sizes. Stern (1976) showed these differences for eastern Louisiana specimens, which are now considered *F. cerina*. These differences are obvious even in the specimens in the plates: (Plate IX) Figure P is a creek (headwater) form, which is compressed with low beaks, while Figures N and O are main river forms, which are more inflated with elevated beaks. Similar variation is apparent in other species in the genus.

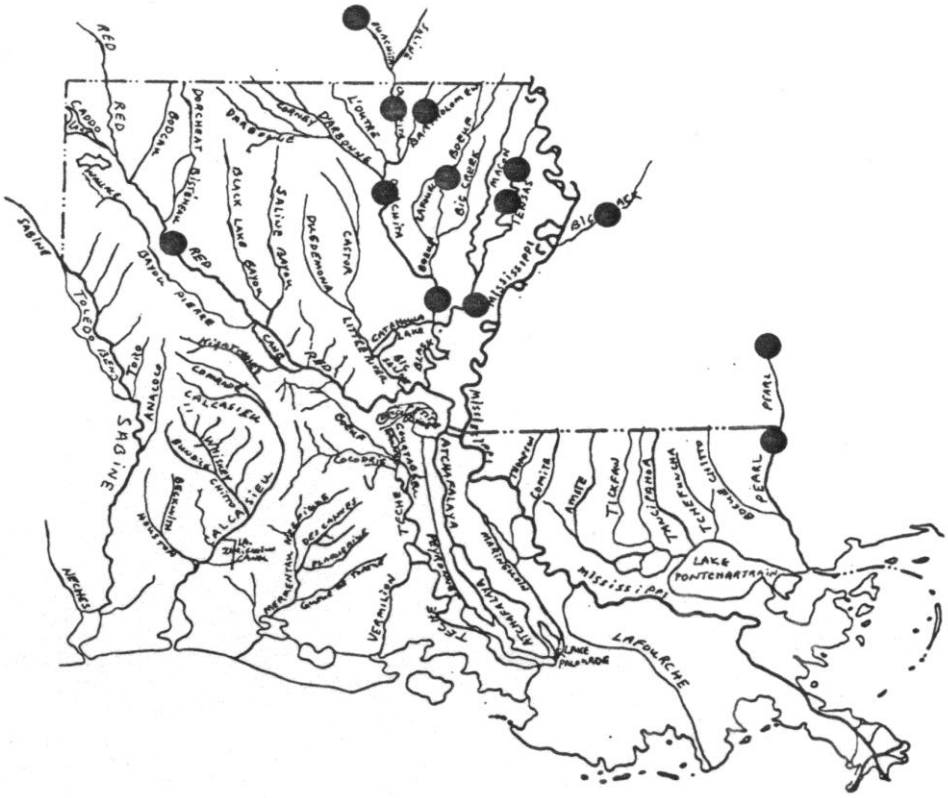


Map 66. Historical distribution of *Fusconaia flava* in North America.



Map 67. Historical distribution of *Fusconaia flava* in Louisiana.

Map 68. Historical distribution of *Fusconaia ebena* in North America.



Map 69. Historical distribution of *Fusconaia ebena* in Louisiana.

Fusconaia ebena (Lea, 1831)
ebonyshell

Figures I-J
Plate X
Maps 68 and 69

Partial synonomy:
Fusconaia ebena (Lea, 1831), Stern 1976, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Murray and Roy 1968, Hartfield 1988, Gordon *et al*. 1980
Quadrula ebenus (Lea, 1831), Simpson 1914, Vanatta 1910, Coker 1915
Unio ebenus Lea, 1831, Frierson 1899a
Quadrula antrosa (Rafinesque, 1820), Frierson 1927 (p. 55)

Description: Shell subquadrate or subelliptical, inflated, solid, very inequilateral; beaks exceedingly high, full, turned inward and forward over a lunule, their sculpture a few rather feeble corrugations; anterior end squarely or obliquely truncate above under the sometimes overhanging beaks, rounded below; base rounded, straight or incurved in old shells; outline of dorsal slope a full curve; posterior ridge rather low, often somewhat double, curved; surface with low, irregular, concentric ridges; epidermis tawny-brown, reddish-brown or blackish, usually wrinkled; pseudocardinals subradial, usually curved, split and torn; lateral of the right valve disposed to be double; muscle scars deep; beak cavities very deep, compressed; nacre white, thinner and iridescent behind (Simpson 1914, p. 897).

Type locality: Ohio River.

General distribution: Mississippi Interior Basin and Eastern Gulf drainages.

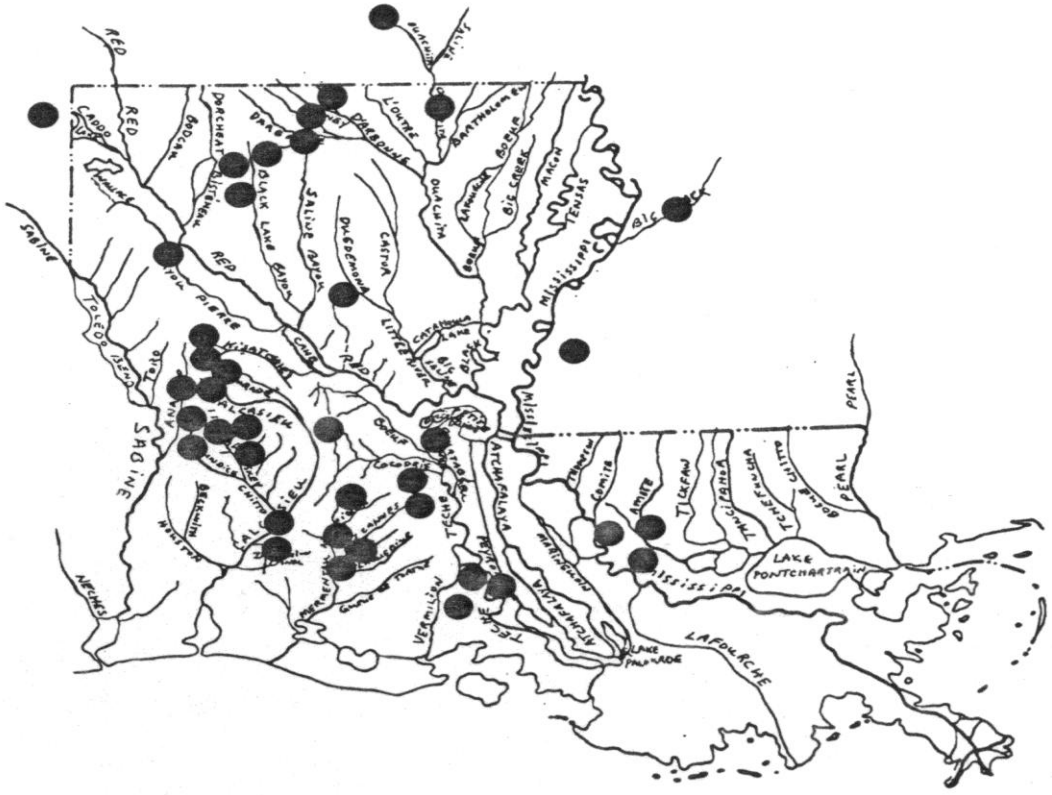
Comments: This species sometimes has a commercially valuable shell in the cultured pearl industry. George and Vidrine (in prep.) report this species from Bayou Bartholomew. It is abundant but closely resembles the endangered species, *L. abrupta*. Thus it is not suggested that it be collected or harvested in this stream in order to protect the endangered species. The shells are extremely variable, and the mussels have an apparent preference for deeper waters.

Genus *Uniomerus* Conrad, 1853

Animal characters: Both branchial and anal openings papillose and crenulate; supra-anal closely and loosely connected to anal; inner laminae of inner gills free from the visceral mass almost their full length; palpi short, almost as wide as long; color of soft parts mostly a soiled white, gills brownish; gills only marsupial in outer ones; when gravid, rather distended lengthwise in center, tapering at the ventral edge, ovisacs not divided; septa wavy; conglutinates white, sole-shaped; glochidia medium in size, semi-elliptical, higher than long; hinge line straight.

Shell characters: Shell trapezoidal, rather obtusely pointed behind; disk smooth with the exception of roughened growth lines; beaks low, sculptured with several coarse concentric ridges which curve abruptly upward behind where they are crowded closely together; epidermis rayless, shiny, yellowish to black; pseudocardinals compressed; laterals nearly straight; nacre whitish to bluish. Utterback (1915-16: 204).

Map 70. Historical distribution of *Uniomerus tetralasmus* in North America.



Map 71. Historical distribution of *Uniomerus tetralasmus* in Louisiana.

Comments: Two highly variable species occur in Louisiana.

Key to the species in Louisiana:

1a. Shell slightly alate posteriorly and not drawn to a posterior point.....*U. tetralasmus*
1b. Shell not alate; posterior end drawn to a point.....*U. declivus*

Uniomerus tetralasmus (Say, 1831)
pondhorn

Figures K-Q
Plate X
Maps 70 and 71

Partial synonomy:
Uniomerus tetralasmus (Say, 1831), Stern 1976, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Hartfield 1988, Gordon *et al*. 1980, Neck 1986, Murray and Roy 1968
Unio tetralasmus Say, 1831, Simpson 1914
Unio camptodon Say, 1832, Vaughan 1893, Frierson 1899a
Unio symmetricus Lea, 1845, Vaughan 1893, Frierson 1899a
Unio jamesianus Lea, 1857, Vaughan 1893, Frierson 1899a
Elliptio tetralasmus Say, 1831, Strecker 1931, Frierson 1927 (p. 34)

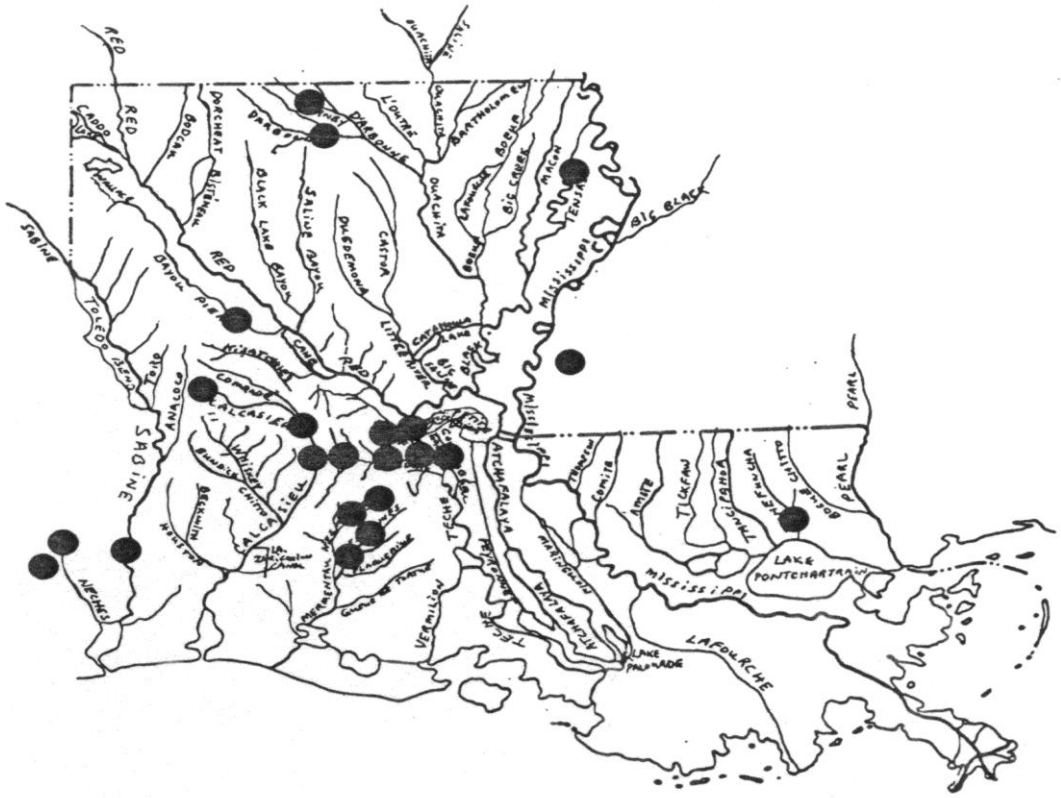
Description: Shell elongated with dorsal and ventral lines nearly parallel, convex to subinflated, rather thin to subsolid, inequilateral; beaks somewhat full and elevated, their sculpture consisting of six or seven moderate concentric ridges, which are evenly and rapidly rounded up behind; posterior ridge widely rounded, ending behind in a point just below the median line; on the dorsal slope there are two radiating furrows, the slope being slightly, obliquely truncate behind; anterior end evenly rounded; surface with feeble, concentric sulcations, and traces of very fine radial sculpture; epidermis yellowish-brown or ashy-brown, banded with lighter color, rather smooth, often subshining; pseudocardinals two in each valve, the upper in the right valve small, all subcompressed, dorsal scars immediately under the beaks; muscle scars smooth and shallow; nacre white (Simpson 1914, p. 705).

Type locality: Bayou St. John, New Orleans, LA

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: Frierson (1903) argued for the validity of the two species in this genus in Louisiana. Both species are very variable, and many names have been applied to varied ecophenotypes.

Map 72. Historical distribution of *Uniomerus declivus* in North America.



Map 73. Historical distribution of *Uniomerus declivus* in Louisiana.

Uniomerus declivus (Say, 1831)
tapered pondhorn

Figures R-U
Plate X
Maps 72 and 73

Partial synonomy:
Uniomerus declivus (Say, 1831), Stern 1976, Turgeon *et al*. 1988, Hartfield 1988, Roback *et al*. 1980
Uniomerus tetralasmus (Say, 1831), Vidrine 1985, 1989b (in part)
Unio tetralasmus var. *declivus* Say 1831, Simpson 1914
Unio declivus Say, 1831, Vaughan 1893, Frierson 1899a
Elliptio declivus (Say, 1831), Strecker 1931, Frierson 1927 (p. 34)
Uniomerus tetralasmus declivus (Say, 1831), Murray and Roy 1968

Description: Shell of moderate size, subrhomboid, somewhat rounded on the base line; posterior ridge high, narrowly rounded and standing out somewhat distinctly from the rest of the shell; dorsal slope having a wide, shallow, radial furrow just above and reaching to the posterior ridge, decidely obliquely truncated; surface brown, unevenly sulcated and rough; nacre sometimes purple-tinted (Simpson 1914, p 708).

Type locality: Bayou Teche, LA.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: The "*declivus*" form never grows in ponds nor in small streams, while the "*tetralasmus*" form grows nowhere else (Frierson 1927).

PLATE I

PLATE I

(All shells ca. 60.0% actual size)

Margaritifera hembeli (Conrad, 1838) Louisiana pearlshell

Figure A. Louisiana. Rapides Parish. Brown Creek northwest of Gardner, Kisatchie National Forest. 1 October 1973. S. L. H. Fuller and MFV.
Figure B. Louisiana. Rapides Parish. Loving Creek at unimproved road west of Woodworth in Kisatchie National Forest. 17 August 1977. Jim Jackson, Alan Pounds and MFV.
Figure C. Same as Fig. A.

Pyganodon grandis (Say, 1829) giant floater

Figure D. Louisiana. Ouachita Parish. Bayou DiSiard ca. 1 mile above dam in Monroe. 6 July 1985. Macky Vidrine and MFV.
Figure E. Louisiana. Richland Parish. Boeuf River at Rte. LA 157, north of Rayville. 11 July 1992. Steven George, Charles Allen and MFV.
Figure F. Louisiana. Jefferson Davis Parish. Louisiana Irrigation Canal at Rte. U. S. 90. 11 February 1984. Gail Vidrine, Macky Vidrine and MFV.
Figure G. Louisiana. Iberville Parish. East Atchafalaya Basin levee borrow canal at Rte. I-10. 29 April 1976. S. L. H. Fuller, Dan Bereza and MFV.

Utterbackia imbecillis (Say, 1829) paper pondshell

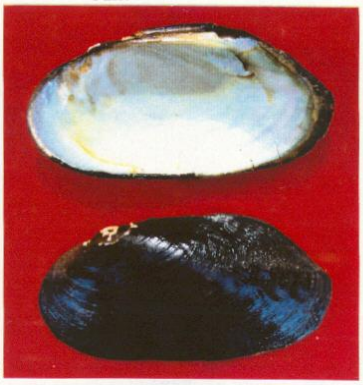
Figure H. Louisiana. Evangeline and St. Landry Parishes. Bayou des Cannes south of Rte. U. S. 190. August 1989. Pat Mire and MFV.
Figure I. Louisiana. Vernon Parish. Drake's Creek at Lookout Road. 19 August 1991. Charles Allen, Dawn Allen and MFV.
Figure J. Same as Figure H.
Figure K. Same as Figure I.

Anodonta suborbiculata Say, 1831 flat floater

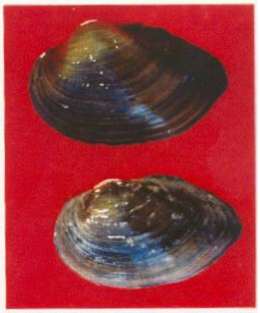
Figure L. Louisiana. St. Martin Parish. Atchafalaya Basin at Henderson Swamp. June 1976. Mike McCown and MFV.
Figure M. (MMNS 2168) *Anodonta sp. cf. suborbiculata* Hartfield). Mississippi. Marion County. Pearl River, in vicinity of Columbia. 24 April 1986. P. Hartfield and Stewart.
Figure N. Louisiana. St. Landry Parish. West Atchafalaya Basin borrow canal (Bayou Courtableu) ca. 0.5 miles north of Rte. U. S. 190. 18 August 1978. Bob Parker, Beverly Williams and MFV.
Figure O. Louisiana. Iberville Parish. East Atchafalaya Basin levee borrow canal at Rte. I-10. 13 October 1972. Bill LeGrande and MFV.

PLATE I

A

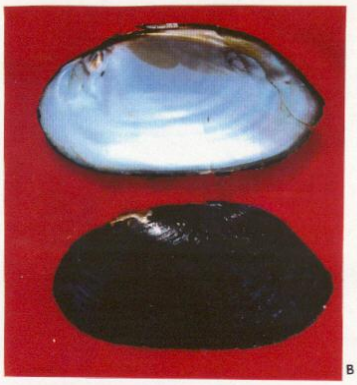


C



D

E



B

Margaritifera hembeli (Conrad, 1838)

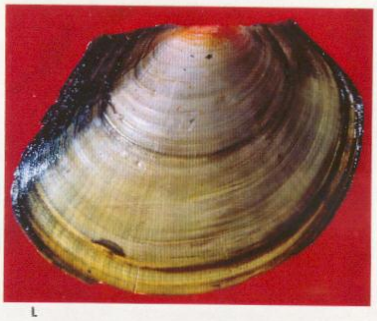
F

G

Pyganodon grandis (Say, 1829)

H

I

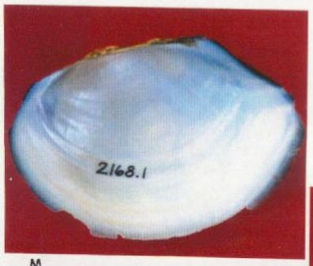


L

J

K

Utterbackia imbecillis (Say, 1829)



M

O

N

Anodonta suborbiculata Say, 1831

PLATE II

PLATE II

(All shells ca. 70.0% actual size)

Alasmidonta marginata Say, 1818 elktoe

Figures A-C. Arkansas. Montgomery County. Ouachita River at Rte. U. S. 270. 12 August 1978. Darryl Clark, Bill Bell and MFV. 15 and 16 August 1985. Gail Vidrine, Macky Vidrine and MFV.

Anodontoides radiatus (Conrad, 1834) rayed creekshell

Figures D-F. Louisiana. St. Helena Parish. Twelve Mile Creek at Rte. LA 1045. 19 December 1976. Dan Bereza and MFV.
Figure G. Louisiana. Tangipahoa Parish. Tangipahoa River at Rte. LA 38. 26 August 1979. Dan Bereza, Macky Vidrine and MFV. 30 May 1977. Dirk Kavanagh, Darryl Clark, Alan Neumann and MFV
Figures H-I. Same as Figure D.

Strophitus subvexus (Conrad, 1834) southern creekmussel

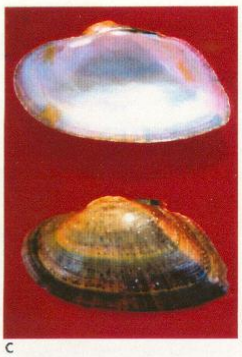
Figures J-K. (MMNS 2377) (Labelled *Strophitus radiatus*) Mississippi. Rankin County. Howard's Creek, T4NR1E sec 11, under powerline below bridge, just off MS Hwy 49. 1 August 1986. H. G. Lutrich, Jr.
Figure L. Louisiana. Beauregard Parish. Bundicks Creek at Rte. LA 113. 19 July 1975. Blake Vidrine and MFV.
(= *Strophitus sp. cf. subvexus*). (Young specimen).
Figure M. Louisiana. Rapides Parish. Calcasieu River at intersection of Rtes. LA 112 and 121, Hineston. 21 September 1991. Bruno Borsari and MFV. (= *Strophitus sp. cf. subvexus*).
Figure N. Louisiana. Vernon Parish. Drake's creek ca. 0.5 miles below Lookout Road in Kisatchie National Forest. 8 August 1992. MFV.
Figure O. same as figure M.

Strophitus undulatus (Say, 1817) squawfoot

Figure P. Arkansas. Montgomery County. Ouachita River at Rte. U. S. 270. 12 August 1978. Darryl Clark, Bill Bell and MFV.

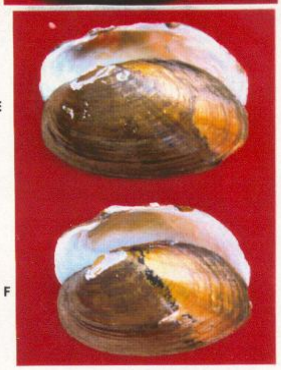
PLATE II

Alasmidonta marginata Say, 1818 A B

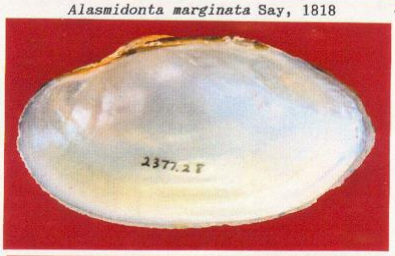


C

D



E F

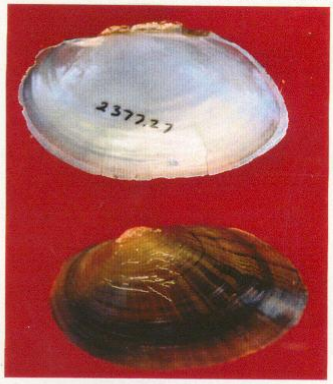


G

Anodontoides radiatus (Conrad, 1834)

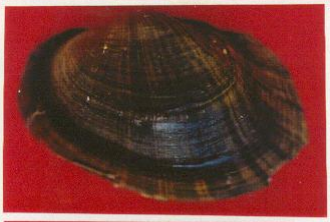
J

Strophitus subvexus (Conrad, 1834)

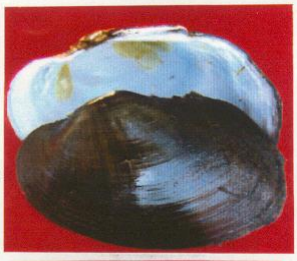


K

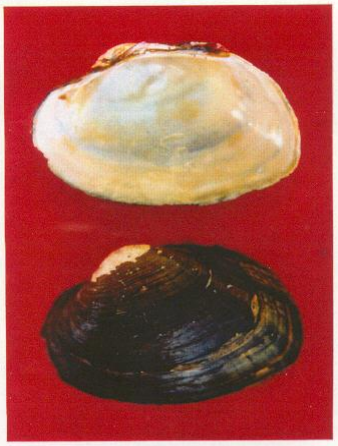
H I



L



M



P

Strophitus undulatus (Say, 1817)

N

O

PLATE III

PLATE III

(All shells ca. 70.0% actual size except MNOQ which are ca. 50.0%)

Strophitus undulatus (Say, 1817) squawfoot

Figures A-E. Louisiana. Union Parish. Bayou D'Arbonne at Rte. U. S. 167. 18 May 1977. Mike McCown and MFV. (edentulous form).
Figure F. Louisiana. Madison Parish. Tensas River at Rte. LA Spur 577. 10 August 1978. Darryl Clark, Bill Bell and MFV.

Arcidens confragosus (Say, 1829) rock-pocketbook

Figure G. Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV.
Figure H. Texas. Hardin and Jasper Counties. Neches River at Rte. U. S. 96, Silsbee. 5 January 1978. Dan Bereza, Darryl Clark, Mary Curry, Jim Leemann, Betty Everitt and MFV.
Figure I. Louisiana. Richland Parish. Boeuf River at Rte. LA 157, north of Rayville. 11 July 1992. Steven George, Charles Allen and MFV.
Figures J-L. same as figure G.

Lasmigona complanata (Barnes, 1823) white heelsplitter

Figure M. (MMNS 2165) Mississippi. Marion County. Pearl River in vicinity of Columbia. 24 April 1986. Paul Hartfield and Jim Stewart.
Figure N. Oklahoma. Bryan County. Blue River at Rtes. U. S. 69 and 75, south of Armstrong and north of Durant. 13 August 1978. Darryl Clark, Bill Bell and MFV.
Figure O. Same as Figure M.

Amblema plicata (Say, 1817) threeridge

Figure P. Louisiana. Allen Parish. Calcasieu River at Rte. U. S. 190, west of Kinder. 6 June 1977. Mary Curry, Betty Everitt, Bill Bell, Darryl Clark, Macky Vidrine and MFV.
Figure Q. Louisiana and Texas border. Calcasieu Parish and Newton County. Sabine River at Rte. LA 12, Deweyville. 15 August 1980. Darryl Clark, Mark LaSalle, Macky Vidrine and MFV.
Figure R. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figure S. Louisiana. Morehouse and West Carroll Parishes. Boeuf River at Rte. LA 585. 11 July 1992. Steven George, Charles Allen and MFV.

PLATE III

Strophitus undulatus (Say, 1817)

PLATE IV

PLATE IV

(All shells ca. 70.0% actual size)

Megalonaias nervosa (Rafinesque, 1820) washboard

Figure A. Louisiana and Texas border. Calcasieu Parish and Newton County. Sabine River at Rte. LA 12, Deweyville. 15 August 1980. Darryl Clark, Mark LaSalle, Macky Vidrine and MFV.
Figure B. Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV. (young)
Figure C. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figure D. Same as figure B.

Plectomerus dombeyanus (Valenciennes, 1827) bankclimber

Figure E. Louisiana. Iberville Parish. East Atchafalaya Basin levee borrow canal at Rte. I-10. 29 April 1976. S. L. H. Fuller, Dan Bereza and MFV.
Figure F. Louisiana. Richland Parish. Boeuf River at Rte. LA 157, north of Rayville. 11 July 1992. Steven George, Charles Allen and MFV.
Figure G. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

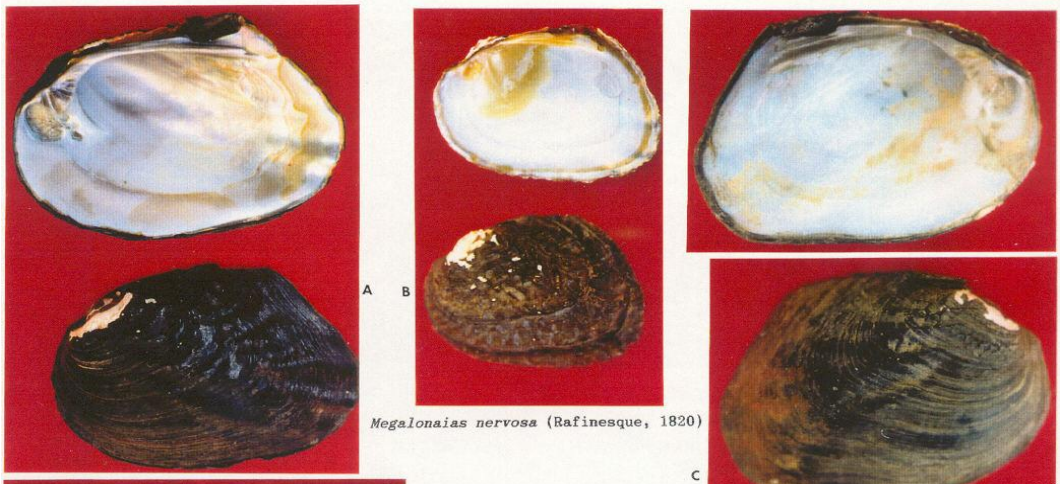
Quadrula pustulosa (Lea, 1831) pimpleback

Figure H. Louisiana. Evangeline and St. Landry Parishes. Bayou des Cannes south of Rte. U. S. 190. August 1989. Pat Mire and MFV.
Figures I-J. Louisiana. Morehouse and West Carroll Parishes. Boeuf River at Rte. LA 585. 11 July 1992. Steven George, Charles Allen and MFV.

Quadrula mortoni (Conrad, 1835) western pimpleback

Figure K. Louisiana. St. Landry Parish. West Atchafalaya Basin borrow canal (Bayou Courtableu) ca. 0.5 miles north of Rte. U. S. 190. 18 August 1978. Bob Parker, Beverly Williams and MFV.
Figures L-M. Louisiana. Allen Parish. Calcasieu River at Rte. U. S. 190, west of Kinder. 6 June 1977. Mary Curry, Betty Everitt, Bill Bell, Darryl Clark, Macky Vidrine and MFV. L = nodifera M = mortoni
Figure N. Louisiana. Iberville Parish. East Atchafalaya Basin levee borrow canal at Rte. I-10. 29 April 1976. S. L. H. Fuller, Dan Bereza and MFV.

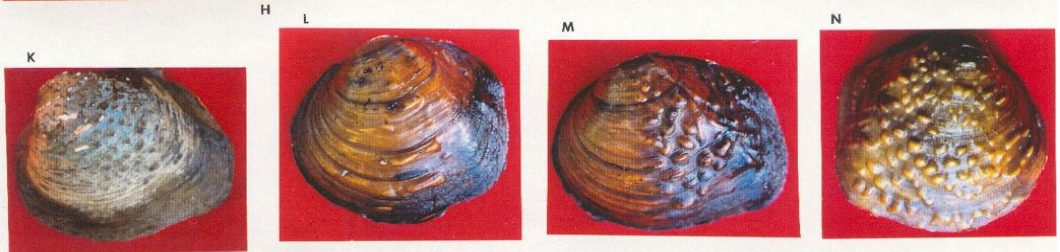
PLATE IV



Megalonaias nervosa (Rafinesque, 1820)

Plectomerus dombeyanus (Valenciennes, 1827)

Quadrula pustulosa (Lea, 1831)



Quadrula mortoni (Conrad, 1835)

PLATE V

PLATE V

(All shells ca. 70.0% actual size)

Quadrula mortoni (Conrad, 1835) western pimpleback

Figures A-B. Louisiana. Rapides Parish. Bayou Boeuf at Rte. U. S. 71, Meeker. 15 July 1978. Darryl Clark, Bill Bell, Macky Vidrine and MFV.
Figures C-D. Louisiana. Rapides Parish. Calcasieu River at intersection of Rtes. LA 112 and 121, Hineston. 21 September 1991. Bruno Borsari and MFV.
Figures E-F. Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV.
Figure G. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figures H-I. Texas. Hardin County. Village Creek at Rte. U. S. 6. 2 June 1978. Bill Bell, Don Gowan, Darryl Clark and MFV.
Figure J. (resembles figured type) Louisiana. St. Landry Parish. West Atchafalaya Basin borrow canal (Bayou Courtableu) ca. 0.5 miles north of Rte. U. S. 190. 18 August 1978. Bob Parker, Beverly Williams and MFV.
Figure K. Texas. Jefferson County. Rice canal at Rte. U. S. 90 east of China. 24 August 1978. Dan Bereza, Selwyn Roback and MFV.
Figure L. Texas. Montgomery County. West Fork San Jacinto River at Rte. I-45, ca. 6 miles south of Conroe. 11 August 1977. Connie Boone and MFV.

Quadrula refulgens (Lea, 1868) purple pimpleback

Figures M-O. (MMNS 2490) Louisiana. Amite River from Magnolia to Pt. Vincent. 12 May 1988. Hartfield and Majure.
Figure P. Louisiana. Tangipahoa Parish. Tangipahoa River at Rte. LA 38. 26 August 1979. Dan Bereza, Macky Vidrine and MFV. 30 May 1977. Dirk Kavanagh, Darryl Clark, Alan Neumann and MFV.
Figure Q. Same as figure M.
Figure R. Same as figure P.

Quadrula nodulata (Rafinesque, 1820) wartyback

Figures S-T. Texas. Hardin and Jasper Counties. Neches River at Rte. U. S. 96, Silsbee. 5 January 1978. Dan Bereza, Darryl Clark, Mary Curry, Jim Leemann, Betty Everitt and MFV.
Figures U-V. These have nodules on the beak as typical for the species; however, the remainder of the shell surface is smooth or with one or two nodules--these may be hybrids of *Q. nodulata* and *Q. mortoni*. Louisiana. St. Landry Parish. West Atchafalaya Basin borrow canal (Bayou Courtableu) ca. 0.5 miles north of Rte. U. S. 190. 18 August 1978. Bob Parker, Beverly Williams and MFV.
Figure W. Louisiana. Rapides Parish. Bayou Boeuf at Rte. U. S. 71, Meeker. 15 July 1978. Darryl Clark, Bill Bell, Macky Vidrine and MFV.
Figure X. Texas. Jefferson County. Rice canal at Rte. U. S. 90 east of China. 24 August 1978. Dan Bereza, Selwyn Roback and MFV.

PLATE V

Quadrula mortoni (Conrad, 1835)

Quadrula refulgens (Lea, 1868)

Quadrula nodulata (Rafinesque, 1820)

PLATE VI

PLATE VI

(All shells ca. 70.0% actual size)

Quadrula apiculata (Say, 1829) southern mapleleaf

Figure A. Texas. Hardin and Jasper Counties. Neches River at Rte. U. S. 96, Silsbee. 5 January 1978. Dan Bereza, Darryl Clark, Mary Curry, Jim Leemann, Betty Everitt and MFV.
Figure B. Louisiana. Jefferson Davis Parish. Louisiana Irrigation Canal at Rte. U. S. 90. 11 February 1984. Gail Vidrine, Macky Vidrine and MFV.
Figures C-D. Same as figure A.
Figure E. Louisiana. St. Martin Parish. Bayou Peyronnet ca. 1 km north of Rte. I-10, Henderson. 15 June 1979. Bob Parker, Darryl Clark, Betty Everitt and MFV.
Figures F-H. Louisiana. Acadia Parish. Mamou Irrigation Canal at intersection of Rte. LA 368 and 97. 1 September 1973. Numa Vidrine, Pat Vidrine and MFV.

Quadrula quadrula (Rafinesque, 1820) mapleleaf

Figures I-L. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figure M. Louisiana and Texas border. Calcasieu Parish and Newton County. Sabine River at Rte. LA 12, Deweyville. 15 August 1980. Darryl Clark, Mark LaSalle, Macky Vidrine and MFV.
Figure N. Texas. Hardin and Jasper Counties. Neches River at Rte. U. S. 96, Silsbee. 5 January 1978. Dan Bereza, Darryl Clark, Mary Curry, Jim Leemann, Betty Everitt and MFV.
Figure O. Same as figure I.
Figures P-Q. Louisiana. St. Landry Parish. West Atchafalaya Basin borrow canal (Bayou Courtableu) ca. 0.5 miles north of Rte. U. S. 190. 18 August 1978. Bob Parker, Beverly Williams and MFV.
Figure R. Same as figure I.

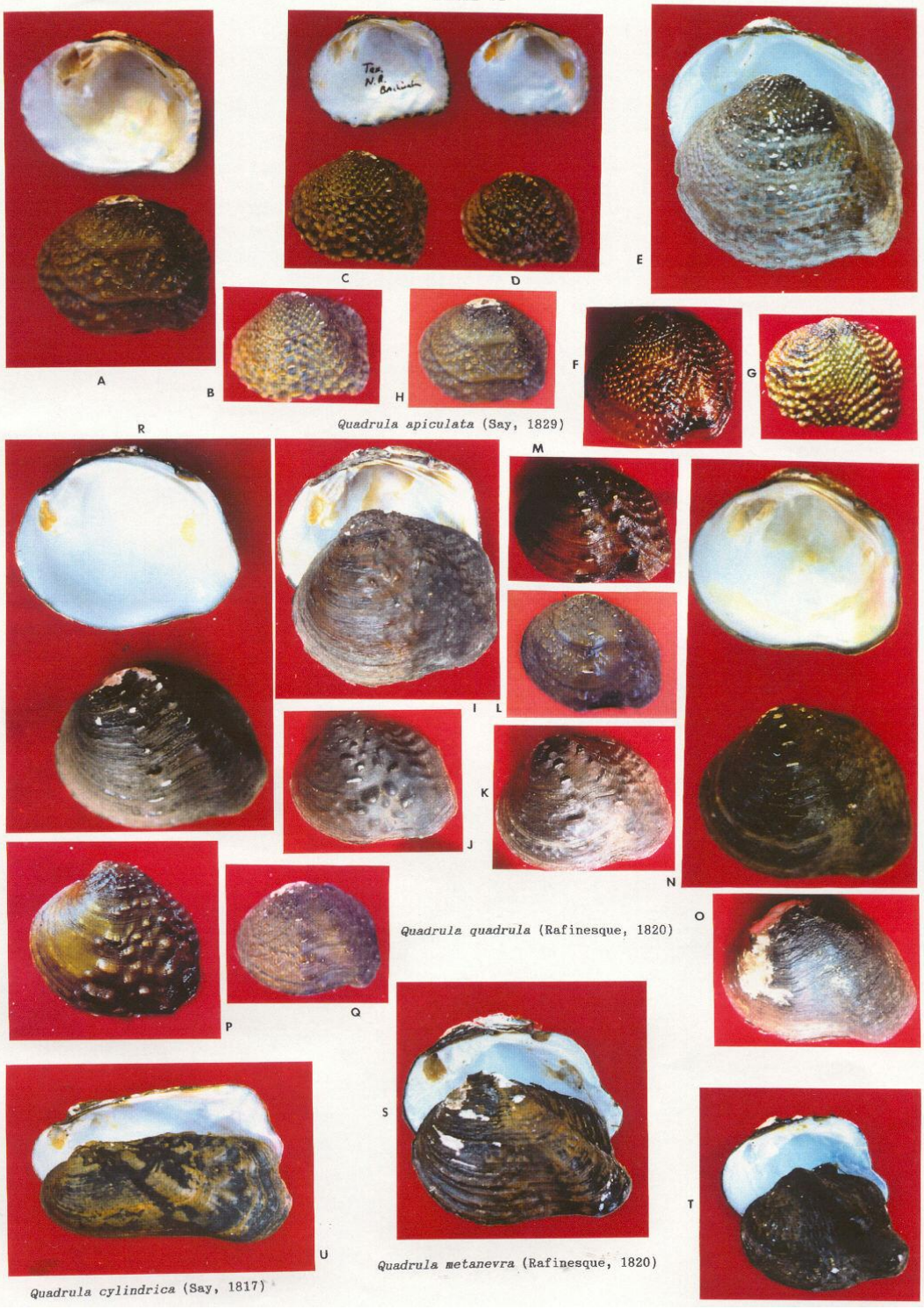
Quadrula metanevra (Rafinesque, 1820) monkeyface

Figures S-T. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

Quadrula cylindrica (Say, 1817) rabbitsfoot

Figure U. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

PLATE VI



Quadrula apiculata (Say, 1829)

Quadrula quadrula (Rafinesque, 1820)

Quadrula metanevra (Rafinesque, 1820)

Quadrula cylindrica (Say, 1817)

PLATE VII

PLATE VII

(All shells ca. 70.0% actual size)

Quadrula metanevra (Rafinesque, 1820) monkeyface

Figure A. Arkansas. Grant and Dallas Counties. Saline River at Rte. U. S. 167. 11 August 1978. Bill Bell, Darryl Clark and MFV.
Figure B. (ANSP) Ouachita River, LA. 1908. C. Moore.

Quadrula cylindrica (Say, 1817) rabbitsfoot

Figure C. Arkansas. Grant and Dallas Counties. Saline River at Rte. U. S. 167. 11 August 1978. Bill Bell, Darryl Clark and MFV.
Figure D. (ANSP) Ouachita River, LA. 1908. C. Moore.

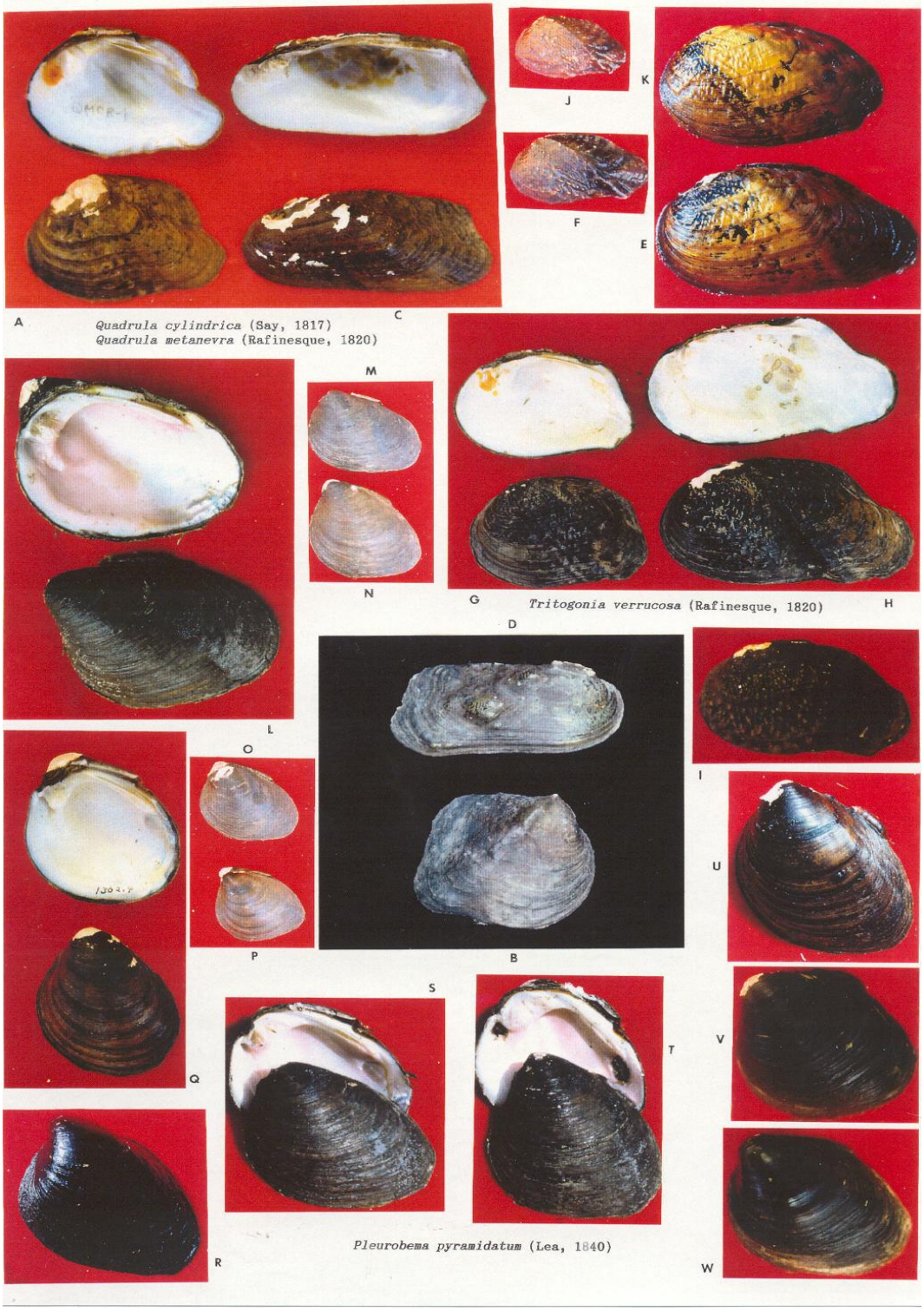
Tritogonia verrucosa (Rafinesque, 1820) pistolgrip

Figure E. (female) Mississippi. Amite County. West Fork Amite River ca. 14 miles west of Gillsburg. 21 December 1977. Dan Bereza, Darryl Clark and MFV 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.
Figure F. (female) Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figures G-H. (g=male h = female) Louisiana. Evangeline and St. Landry Parishes. Bayou des Cannes south of Rte. U. S. 190. August 1989. Pat Mire and MFV.
Figure I. (young male) Louisiana. Rapides Parish. Calcasieu River at intersection of Rtes. LA 112 and 121, Hineston. 21 September 1991. Bruno Borsari and MFV.
Figure J. (male) Same as figure F.
Figure K. (male) Same as figure E.

Pleurobema pyramidatum (Lea, 1840) pyramid pigtoe

Figures L-P. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figure Q. (MMNS 1362) Mississippi. Hinds and Yazoo Counties. Big Black River, R4WT7W, sec 27, NW/4. October 9 1980. Rummel and Hartfield.
Figure R. Louisiana. Richland Parish. Boeuf River at Rte. LA 157, north of Rayville. 11 July 1992. Steven George, Charles Allen and MFV.
Figures S-T. Same as figure L.
Figure U. Same as figure Q.
Figures V-W. Louisiana. Madison Parish. Tensas River at Rte. LA Spur 577. 10 August 1978. Darryl Clark, Bill Bell and MFV.

PLATE VII



Quadrula cylindrica (Say, 1817)
Quadrula metanevra (Rafinesque, 1820)

Tritogonia verrucosa (Rafinesque, 1820)

Pleurobema pyramidatum (Lea, 1840)

PLATE VIII

PLATE VIII

(All shells ca. 70.0% actual size)

Pleurobema beadleanum (Lea, 1861) Mississippi pigtoe

Figures A-C. Louisiana. St. Helena Parish. Twelve Mile Creek at Rte. LA 1045. 19 December 1976. Dan Bereza and MFV.
Figures D-E. (MMNS 2485) (*Pleurobema sp. cf. beadleanum* Hartfield) Louisiana. Amite River from Magnolia to Pt. Vincent. May 12, 1988. Hartfield and Majure.

Pleurobema riddelli (Lea, 1861) Louisiana pigtoe

Figure F. Texas. Hardin County. Village Creek at Rte. U. S. 96. 2 June 1978. Bill Bell, Don Gowan, Darryl Clark and MFV.
Figures G-H. Louisiana. Natchitoches and Red River Parishes. Bayou Pierre at Rte. LA 174. 22 August 1974. Blake Vidrine and MFV.
Figure I. Same as figure F.
Figure J. Louisiana. Vernon Parish. Drakes Creek at Lookout Road. October 1989. MFV.
Figure K. Louisiana. Rapides Parish. Bayou Boeuf at Rte. U. S. 71, Meeker. 15 July 1978. Darryl Clark, Bill Bell, Macky Vidrine and MFV.

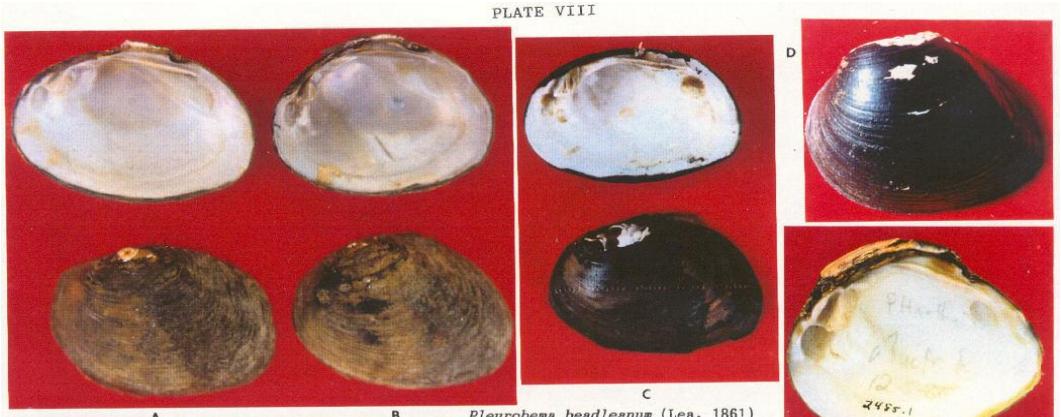
Elliptio crassidens (Lamarck, 1819) elephant ear

Figure L. Louisiana. Tangipahoa Parish. Tangipahoa River at Rte. LA 38. 26 August 1979. Dan Bereza, Macky Vidrine and MFV. 30 May 1977. Dirk Kavanagh, Darryl Clark, Alan Neumann and MFV.
Figure M. Mississippi. Amite County. West Fork Amite River ca. 14 miles west of Gillsburg. 21 December 1977. Dan Bereza, Darryl Clark and MFV. 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.
Figures N-O. Same as figure L.

Elliptio dilatata (Rafinesque, 1820) spike

Figures P-Q. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figure R. Louisiana. Richland Parish. Boeuf River at Rte. U. S. 80. 15 August 1975. Dan Bereza and MFV.

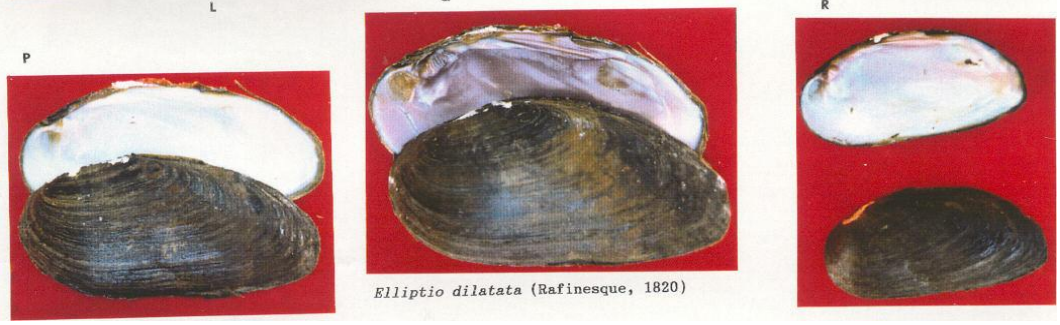
PLATE VIII



Pleurobema beadleanum (Lea, 1861)

Pleurobema riddelli (Lea, 1861)

Elliptio crassidens (Lamarck, 1819)



Elliptio dilatata (Rafinesque, 1820)

PLATE IX

PLATE IX

(All shells ca. 70.0% actual size)

Elliptio arca (Conrad, 1834) Alabama spike

Figures A-B. (MMNS 1436) Mississippi. Leake County. Pearl River, Walkiah. 27 Sept. 1967. B. J. Grantham.

Elliptio arctata (Conrad, 1834) delicate spike

Figures C-D. (MMNS 3757) Mississippi. George County. Pascagoula River from confluence of Leaf and Chickasawhay rivers downstream to Wilkerson Ferry. 18 May 1988. P. Hartfield.
Figure E. (MMNS 96) Mississippi. Simpson County. Strong River, s/2, 1/4 SEC line between SW/4 and SE/4 Sec 27, 1.25 mi. NNW of Pinola. 7 Sept. 1979. R. Rummel and P. Hartfield.

Fusconaia askewi (Marsh, 1896) Texas pigtoe

Figure F. Louisiana. Rapides Parish. Calcasieu River at intersection of Rtes. LA 112 and 121, Hineston. 21 September 1991. Bruno Borsari and MFV.
Figure G. Texas. Hardin County. Village Creek at Rte. U. S. 96. 2 June 1978. Bill Bell, Don Gowan, Darryl Clark and MFV.
Figure H. Louisiana. Natchitoches and Red River Parishes. Bayou Pierre at Rte. LA 174. 22 August 1974. Blake Vidrine and MFV.
Figures I-J. Louisiana. Rapides Parish. Calcasieu River at intersection of Rtes. LA 112 and 121, Hineston. 21 September 1991. Bruno Borsari and MFV.
Figure K. Louisiana. Vernon Parish. Birds Creek at Lookout Road. August 1992. Charles Allen, Harland Guillory, Jim Cordes and MFV.
Figure L. Louisiana. Allen Parish. Calcasieu River at Rte. U. S. 190, west of Kinder. 6 June 1977. Mary Curry, Betty Everitt, Bill Bell, Darryl Clark, Macky Vidrine and MFV.

Fusconaia cerina (Conrad, 1838) Gulf pigtoe

Figures M-O. (MMNS 1444) Mississippi. Hinds County. Pearl River, 100 yds above low-head dam. 26 April 1968. Cliburn and Brode and Woods and Grantham.
Figure P. Louisiana. St. Helena Parish. Twelve Mile Creek at Rte. LA 1045. 19 December 1976. Dan Bereza and MFV.
Figure Q. Mississippi. Amite County. West Fork Amite River ca. 14 miles west of Gillsburg. 21 December 1977. Dan Bereza, Darryl Clark and MFV. 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.


A
B
F
G
H
Elliptio arca (Conrad, 1834)
C
D
E
Elliptio arctata (Conrad, 1834)
I
J
Fusconaia askewi (Marsh, 1896)
K
L
Q
M
N
O
P
Fusconaia cerina (Conrad, 1838)

PLATE X

PLATE X

(All shells ca. 70.0% actual size)

Fusconaia flava (Rafinesque, 1820) Wabash pigtoe

Figures A-B. Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV.
Figures C-D. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figure E. Louisiana. Rapides Parish. Bayou Boeuf at Rte. U. S. 71, Meeker. 15 July 1978. Darryl Clark, Bill Bell, Macky Vidrine and MFV.
Figure F. Louisiana. Bienville Parish. Castor Creek near Castor between Rtes. LA 507 and 4. 28 November 1975. MFV.
Figures G-H. Same as figure C.

Fusconaia ebena (Lea, 1831) ebonyshell

Figures I-J. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

Uniomerus tetralasmus (Say, 1831) pondhorn

Figure K. Louisiana. Bienville Parish. Castor Creek near Castor between Rtes. LA 507 and 4. 28 November 1975. MFV.
Figures L-N. Louisiana. Lincoln Parish. Cypress Creek at Rte. U. S. 167, north of Ruston. 14 August 1975. Richard Franz, Dan Bereza and MFV.
Figure O. Louisiana. Iberia Parish. Pond off northern end of Admiral Doyle Drive, Military Base. 27 July 1975. Dan Bereza and MFV.
Figure P. Louisiana. Union Parish. Bayou D'Arbonne at Rte. U. S. 167. 18 May 1977. Mike McCown and MFV.
Figure Q. Same as figure L.

Uniomerus declivus (Say, 1831) tapered pondhorn

Figure R. Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV.
Figure S. Louisiana and Texas border. Calcasieu Parish and Newton County. Sabine River at Rte. LA 12, Deweyville. 15 August 1980. Darryl Clark, Mark LaSalle, Macky Vidrine and MFV.
Figure T. Same as figure S.
Figure U. Louisiana. Evangeline and St. Landry Parishes. Bayou des Cannes south of Rte. U. S. 190. August 1989. Pat Mire and MFV.

PLATE X

Fusconaia flava (Rafinesque, 1820)

Fusconaia ebena (Lea, 1831)

Uniomerus tetralasmus (Say, 1831)

Uniomerus declivus (Say, 1831)

PLATE XI

PLATE XI

(All shells ca. 70.0% actual size)

Actinonaias ligamentina (Lamarck, 1819) mucket

Figures A-B. Arkansas. Montgomery County. Ouachita River at Rte. U. S. 270. 12 August 1978. Darryl Clark, Bill Bell and MFV. 15 and 16 August 1985. Gail Vidrine, Macky Vidrine and MFV.
Figure C. Louisiana. Madison Parish. Tensas River at Rte. U. S. 80. 10 August 1978. Darryl Clark, Bill Bell and MFV.
Figures D-E. Arkansas. Bradley and Ashley Counties. Saline River ca. 6 miles south of Johnsonville. Summer 1992. Steven George.

Ellipsaria lineolata (Rafinesque, 1820) butterfly

Figure F. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figure G. (ANSP) Louisiana. Ouachita River. 1908. C. Moore.
Figure H. Same as figure F.

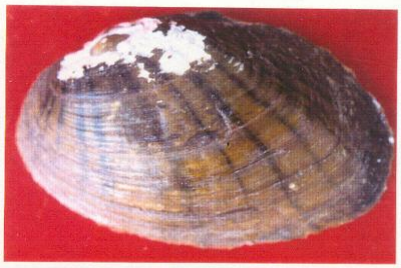
Glebula rotundata (Lamarck, 1819) round pearlshell

Figures I-J. (i=male j=female) Louisiana. St. Martin Parish. Bayou Peyronnet ca. 1 km north of Rte. I-10, Henderson. 15 June 1979. Bob Parker, Darryl Clark, Betty Everitt and MFV.
Figure K. Louisiana and Texas border. Calcasieu Parish and Newton County. Sabine River at Rte. LA 12, Deweyville. 15 August 1980. Darryl Clark, Mark LaSalle, Macky Vidrine and MFV.
Figure L. Louisiana. Jefferson Davis Parish. Louisiana Irrigation Canal at Rte. U. S. 90, Iowa. 11 February 1984. Gail Vidrine, Macky Vidrine and MFV.
Figures M-N. Same as figure I.

Lampsilis sp. (either *L. abrupta* or *L. siliquoidea*)

Figure P. Louisiana. Madison Parish. Tensas River at Rte. U. S. 80. 10 August 1978. Darryl Clark, Bill Bell and MFV.

PLATE XI



A

DE

Actinonaias ligamentina (Lamarck, 1819)

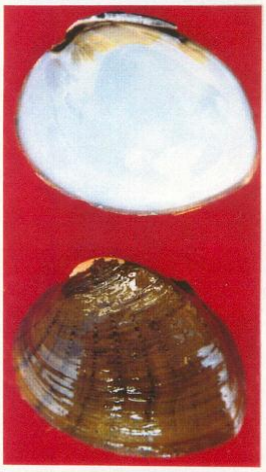
B

G

C

F

Ellipsaria lineolata (Rafinesque, 1820)



H

I

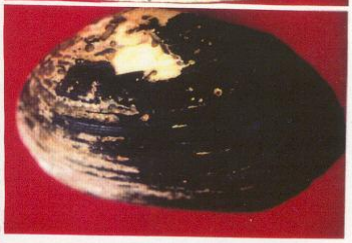
J

Glebula rotundata (Lamarck, 1819)

K

N

O



L

M

Lampsilis sp.

PLATE XII

PLATE XII

(All shells ca. 70.0% actual size)

Lampsilis abrupta (Say, 1831) pink mucket

Figures A-D. (a=male b = female c= male d=female) Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

Lampsilis cardium (Rafinesque, 1820) plain pocketbook

Figure E. (male) (MMNS 1608) (*Lampsilis ovata ventricosa*) Mississippi. Big Black River at Pickens. 20 April 1965. JWC.
Figures F-G. (female) (MMNS 748) (*Lampsilis ovata ventricosa*) Mississippi. Big Black River, gravel bar, 100 yds upstream from 14 Mile Creek, east bank. 16 June 1980. Paul Hartfield.
Figure H. (male) Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

Lampsilis satura (Lea, 1852) sandbank pocketbook

Figure I. (female) Louisiana. Beauregard Parish. Bundicks Creek at Rte. LA 113. 19 July 1975. Blake Vidrine and MFV.
Figure J. (male) Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figures K-U. same as I. (females = kmoqsu males= lnprt)

PLATE XII

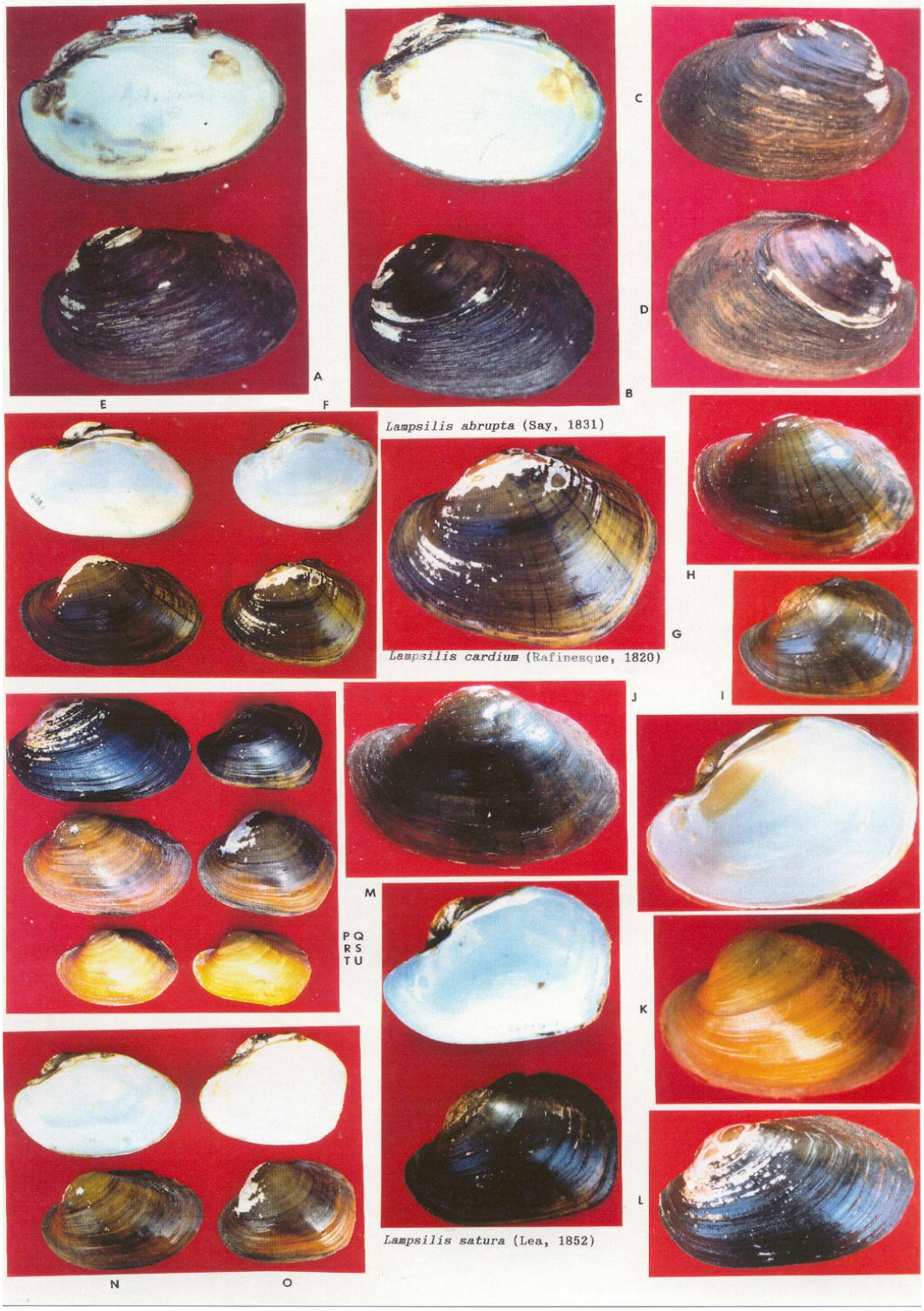

A
B
C
D
E
F
Lampsilis abrupta (Say, 1831)
G
H
Lampsilis cardium (Rafinesque, 1820)
I
J
K
L
M
P
Q
R
S
T
U
Lampsilis satura (Lea, 1852)
N
O

PLATE XIII

PLATE XIII

(All shells ca. 70.0% actual size, except GVW which are 40.0%)

Lampsilis ornata (Conrad, 1835) southern pocketbook

Figures A-B. (a=male b= female) (MMNS 2478) Louisiana. Amite River from Magnolia to Pt. Vincent, LA. May 12, 1988. Hartfield and Majure.

Figures C-F. (ce=male df= female) Mississippi. Amite County. West Fork Amite River ca. 14 miles west of Gillsburg. 21 December 1977. Dan Bereza, Darryl Clark and MFV. 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.

Lampsilis siliquoidea (Barnes, 1823) fatmucket

Figures G-H. (g=male h=female) Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

Figures I-J. (i=female j=male) (MMNS 1913)(labelled as *Lampsilis radiata luteola*) Mississippi. Copiah County. Bayou Pierre, R7ET10N, Old Hazelhurst-Pt. Gibson road, 28 July 1983. Paul Hartfield.

Lampsilis hydiana (Lea, 1838) Louisiana fatmucket

Figure K. (male) Louisiana. Vernon Parish. Drake's Creek at Lookout Road. 9 August 1992. MFV.

Figure L. (female) Louisiana. Acadia Parish. Mamou Irrigation Canal at intersection of Rte. LA 368 and 97. 1 September 1973. Numa Vidrine, Pat Vidrine and MFV.

Figures M-N. (m=male n=female) Louisiana. Lincoln Parish. Cypress Creek at Rte. U. S. 167, north of Ruston. 14 August 1975. Richard Franz, Dan Bereza and MFV.

Figure O. (male) Louisiana. Beauregard Parish. Bundicks Creek at Rte. LA 113. 19 July 1975. Blake Vidrine and MFV.

Figures P-Q. (p=male q=female) Louisiana. Rapides Parish. Bayou Boeuf at Rte. U. S. 71, Meeker. 15 July 1978. Darryl Clark, Bill Bell, Macky Vidrine and MFV.

Figure R. (young male) Same as figure K.

Figure S. (female) Louisiana. St. Landry Parish. West Atchafalaya Basin borrow canal (Bayou Courtableu) ca. 0.5 miles north of Rte. U. S. 190. 18 August 1978. Bob Parker, Beverly Williams and MFV.

Figures T-U. (t=female u=male young) Same as figure O.

Figures V-W. (large) (v=female w=male) Louisiana. Iberville Parish. East Atchafalaya Basin levee borrow canal at Rte. I-10. 29 April 1976. S. L. H. Fuller, Dan Bereza and MFV.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V W
Lampsilis ornata (Conrad, 1835)
Lampsilis siliquoidea (Barnes, 1823)
Lampsilis hydiana (Lea, 1838)

PLATE XIV

PLATE XIV

(All shells ca. 70.0% actual size, except JKEOP which are 40.0%)

Lampsilis claibornensis (Lea, 1838) southern fatmucket

Figures A-B. (a=male b= female) Mississippi. Leake County. Yockanookany River at Rte. MS 429. 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.

Figures C-D. (c=male d=female) (MMNS 2506)(labelled as *Lampsilis straminea claibornensis*) Louisiana. Amite River at Hwy 63 to Magnolia. 6 November 1988. Hartfield and Majure.

Figure E. (female) Louisiana. Tangipahoa Parish. Tangipahoa River at Rte. LA 38. 26 August 1979. Dan Bereza, Macky Vidrine and MFV. 30 May 1977. Dirk Kavanagh, Darryl Clark, Alan Neumann and MFV.

Lampsilis teres (Rafinesque, 1820) yellow sandshell

Figure F. (male) Louisiana. Evangeline and St. Landry Parishes. Bayou des Cannes south of Rte. U. S. 190. August 1989. Pat Mire and MFV.

Figures G-H. Louisiana. Allen Parish. Calcasieu River at Rte. U. S. 190, west of Kinder. 6 June 1977. Mary Curry, Betty Everitt, Bill Bell, Darryl Clark, Macky Vidrine and MFV.

Figure I. (male) Mississippi. Leake County. Yockanookany River at Rte. MS 429. 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.

Figures J-K. (j=female k=male) Louisiana and Texas border. Calcasieu Parish and Newton County. Sabine River at Rte. LA 12, Deweyville. 15 August 1980. Darryl Clark, Mark LaSalle, Macky Vidrine and MFV.

Figure L. (male) Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV.

Figure M. (male) Louisiana. Iberville Parish. East Atchafalaya Basin levee borrow canal at Rte. I-10. 29 April 1976. S. L. H. Fuller, Dan Bereza and MFV.

Ligumia recta (Lamarck, 1819) black sandshell

Figure N. (female) Louisiana. Richland Parish. Boeuf River at Rte. U. S. 80. 20 August 1979. Dan Bereza and MFV.

Figures O-P. (o=male p=female) General Biology laboratory specimens.

PLATE XIV


A
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D
Lampsilis claibornensis (Lea, 1838)
G
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I
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L
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Lampsilis teres (Rafinesque, 1820)
F
N
O
Ligumia recta (Lamarck, 1819)
P

PLATE XV

PLATE XV

(All shells ca. 70.0% actual size, except NPQR which are 50.0%)

Ligumia subrostrata (Say, 1831) pondmussel

Figures A-B. (a=male b=female) Louisiana. Evangeline Parish. Millers Lake, south landing off Rte. LA 376. Blake Vidrine, Blaine Vidrine and MFV.
Figures C-E. (c,d=male e=female) Louisiana. East Baton Rouge Parish. Water traps at Briarwood Country Club off Airline Highway. 1972. Joyce Crawford and MFV.
Figures F-G. (f=female g=,male) Louisiana. Union Parish. Bayou D'Arbonne at Rte. U. S. 167. 18 May 1977. Mike McCown and MFV.
Figure H. (female) Same as figure C.

Leptodea fragilis (Rafinesque, 1820) fragile papershell

Figure I. Louisiana. Allen Parish. Calcasieu River at Rte. U. S. 190, west of Kinder. 6 June 1977. Mary Curry, Betty Everitt, Bill Bell, Darryl Clark, Macky Vidrine and MFV.
Figures J-L. Louisiana. Iberville Parish. East Atchafalaya Basin levee borrow canal at Rte. I-10. 29 April 1976. S. L. H. Fuller, Dan Bereza and MFV.

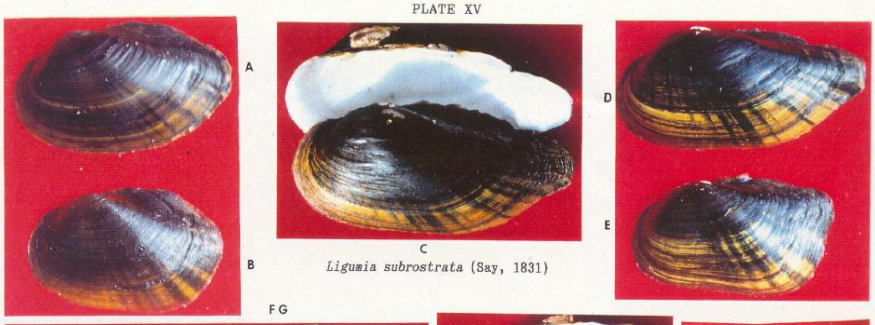
Potamilus amphichaenus (Frierson, 1898) Texas heelsplitter

Figures M-O. Texas. Hardin and Jasper Counties. Neches River at Rte. U. S. 96, Silsbee. 5 January 1978. Dan Bereza, Darryl Clark, Mary Curry, Jim Leemann, Betty Everitt and MFV.

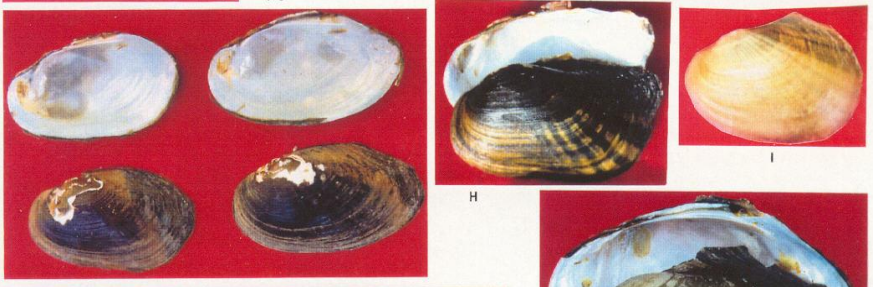
Potamilus inflatus (Lea, 1831) inflated heelsplitter

Figure P. (MMNS 2498) Louisiana. Amite River, Hwy 63 to Magnolia, LA. November 5 1988. Hartfield and Majure.
Figure Q. Louisiana Natural Heritage Program. Louisiana. Amite River.
Figure R. Same as figure P.

PLATE XV



Ligumia subrostrata (Say, 1831)



Leptodea fragilis (Rafinesque, 1820)

Potamilus amphichaenus (Frierson, 1898)

Potamilus inflatus (Lea, 1831)

PLATE XVI

PLATE XVI

(All shells ca. 70.0% actual size, except GJI which are 50.0%)

Potamilus ohiensis (Rafinesque, 1820) pink papershell

Figures A-C. Louisiana. Morehouse and West Carroll Parishes. Boeuf River at Rte. LA 585. 11 July 1992. Steven George, Charles Allen and MFV.
Figure D. Louisiana. St. Landry Parish. Pond off Atchafalaya River inside levee and south of Krotz Springs. 26 July 1977. Dan Bereza and MFV.

Potamilus capax (Green, 1832) fat pocketbook

Figures E-F. (females) (MMNS 3387) Mississippi. Jefferson County. West end of Gilliam Chute at dirt road crossing, T10NR11E sec 10. 25 August 1992. T. Majure.

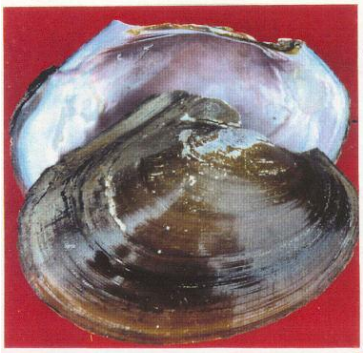
Potamilus purpuratus (Lamarck, 1819) bleufer

Figure G. (male) Louisiana. Evangeline and St. Landry Parishes. Bayou des Cannes south of Rte. U. S. 190. August 1989. Pat Mire and MFV.
Figure H. (young) Louisiana. Allen Parish. Calcasieu River at Rte. U. S. 190, west of Kinder. 6 June 1977. Mary Curry, Betty Everitt, Bill Bell, Darryl Clark, Macky Vidrine and MFV.
Figure I. (female) Same as figure G.
Figure J. (male) Same as figure H.
Figure K. (female) Same as figure H.

Ptychobranchus occidentalis (Conrad, 1836) Ouachita kidneyshell

Figure L. (male) Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.
Figure M. (male) Arkansas. Montgomery County. Ouachita River at Rte. U. S. 270. 12 August 1978. Darryl Clark, Bill Bell and MFV. 15 and 16 August 1985. Gail Vidrine, Macky Vidrine and MFV.

PLATE XVI



A

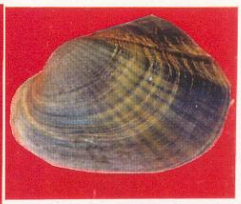
B

C

Potamilus ohiensis (Rafinesque, 1820)

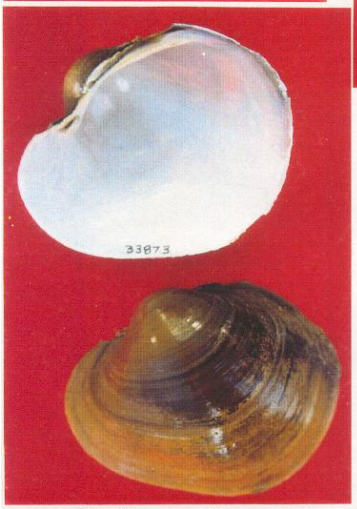
D

F

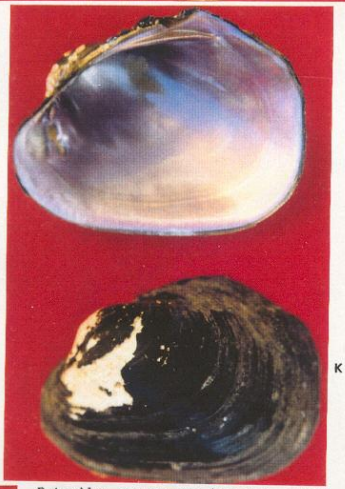


H

I



E *Potamilus capax* (Green, 1832)



K

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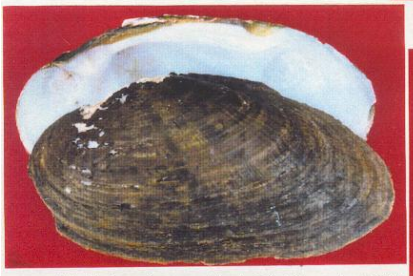
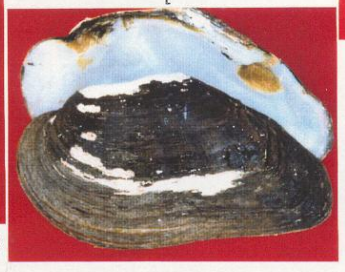


M

Potamilus purpuratus (Lamarck, 1819)



G

Ptychobranchus occidentalis (Conrad, 1836)

PLATE XVII

PLATE XVII

(All shells ca. 80.0% actual size)

Toxolasmus parvus (Barnes, 1823) lilliput

Figures A-B. (a=male b=female) Louisiana. Natchitoches Parish. Kisatchie Bayou at Rte. LA 117, Kisatchie. 22 May 1984. Gail Vidrine and MFV.
Figures C-D. (c=male d= female) Louisiana. Vernon Parish. Drake's Creek at Lookout Road. 9 August 1992. MFV.
Figure E. (female) Same as Fig A.

Toxolasmus texasensis (Lea, 1857) Texas lilliput

Figures F-G. (f=male g=female) Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV.
Figures H-I. (h=male i=female) Louisiana. Iberville Parish. East Atchafalaya Basin levee borrow canal at Rte. I-10. 29 April 1976. S. L. H. Fuller, Dan Bereza and MFV.
Figures J-K. (j=male k=female) Louisiana. Jefferson Davis Parish. Louisiana Irrigation Canal at Rte. U. S. 90. 11 February 1984. Gail Vidrine, Macky Vidrine and MFV.
Figure L. Texas. Jefferson County. Rice canal at Rte. U. S. 90 east of China. 24 August 1978. Dan Bereza, Selwyn Roback and MFV.

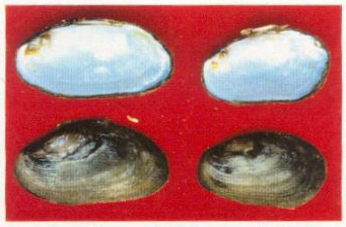
Obliquaria reflexa Rafinesque, 1820 threehorn wartyback

Figure M. Texas. Hardin and Jasper Counties. Neches River at Rte. U. S. 96, Silsbee. 5 January 1978. Dan Bereza, Darryl Clark, Mary Curry, Jim Leemann, Betty Everitt and MFV.
Figures N-Q. Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV.
Figure R. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

Obovaria jacksoniana (Frierson, 1912) southern hickorynut

Figures S-T. (s=male t=female) Louisiana. Natchitoches Parish. Kisatchie Bayou at Rte. LA 117, Kisatchie. 22 May 1984. Gail Vidrine and MFV.
Figure U. (male) Mississippi. Leake County. Yockanookany River at Rte. MS 429. 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.
Figures V-W. (v=male w=female) Louisiana. Allen Parish. Calcasieu River at Rte. U. S. 190, west of Kinder. 6 June 1977. Mary Curry, Betty Everitt, Bill Bell, Darryl Clark, Macky Vidrine and MFV.
Figure X. (female) Same as figure U.
Figure Y. (male) Mississippi. Amite County. West Fork Amite River ca. 14 miles west of Gillsburg. 21 December 1977. Dan Bereza, Darryl Clark and MFV. 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.

PLATE XVII



A B

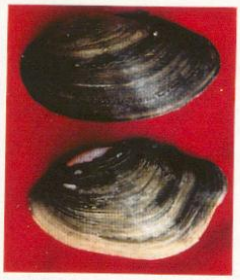
C D

E

Toxolasmus parvus (Barnes, 1823)

F

Toxolasmus texasensis (Lea, 1857) G



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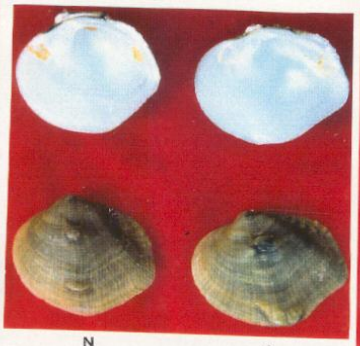

N O

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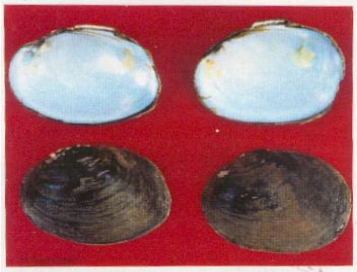
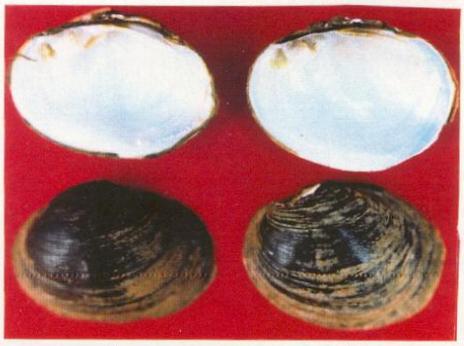
Obliquaria reflexa Rafinesque, 1820 R

S T



Obovaria jacksoniana (Frierson, 1912) U



V W

PLATE XVIII

PLATE XVIII

(All shells ca. 80.0% actual size)

Obovaria olivaria (Rafinesque, 1820) hickorynut

Figures A-B. Louisiana. Morehouse Parish. Bayou Bartholomew at Rte. U. S. 425, north of Log Cabin. 26 September 1992. Steven George, Charles Allen and MFV.

Obovaria subrotunda (Rafinesque, 1820) round hickorynut

Figures C-F. (MMNS 1751) Mississippi. Attala and Holmes Counties. Big Black River, above Goodman. 6 August 1981. Hartfield and Huffman.

Obovaria unicolor (Lea, 1845) Alabama hickorynut

Figures G-H. Louisiana. St. Helena and East Feliciana Parishes. Amite River at Rte. LA 10. 8 April 1977. Ken Eyster.
Figure I. Mississippi. Leake County. Yockanookany River at Rte. MS 429. 2 July 1978. Beth Clark, Darryl Clark, Bill Bell and MFV.
Figure J. Louisiana. Tangipahoa Parish. Tangipahoa River at Rte. LA 38. 26 August 1979. Dan Bereza, Macky Vidrine and MFV. 30 May 1977. Dirk Kavanagh, Darryl Clark, Alan Neumann and MFV.
Figure K. Same as figure I.

Truncilla donaciformis (Lea, 1828) fawnsfoot

Figure L. Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV.
Figures M-0. Texas. Hardin and Jasper Counties. Neches River at Rte. U. S. 96, Silsbee. 5 January 1978. Dan Bereza, Darryl Clark, Mary Curry, Jim Leemann, Betty Everitt and MFV.

Truncilla truncata Rafinesque, 1820 deertoe

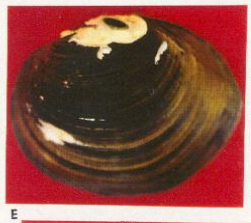
Figure P. Louisiana. St. Martin Parish. Bayou Peyronnet 12 miles north of Rte. Interstate 10. 11 September 1976. MFV.
Figures Q-W. Louisiana. St. Landry Parish. Bayou Wauksha at Rte. LA 10. 7 July 1984. Macky Vidrine and MFV. 14 June 1985. Gail Vidrine and MFV.
Figure X. Same as fig. P.
Figure Y. Same as Fig. S.

PLATE XVIII

A

B

C



E

Obovaria olivaria (Rafinesque, 1820)

G H

D

F

Obovaria subrotunda (Rafinesque, 1820)

I

J

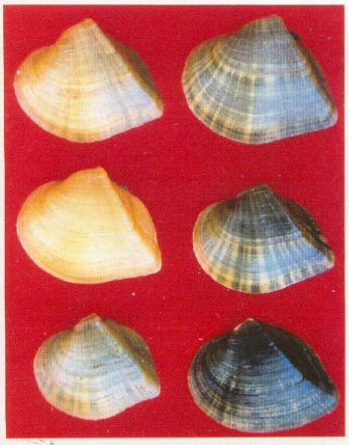
K

L

M N O

Obovaria unicolor (Lea, 1845)

Truncilla donaciformis (Lea, 1828)



Q R S T U V

W

P

X

Y

Truncilla truncata Rafinesque, 1820

PLATE XIX

PLATE XIX

(All shells ca. 70.0% actual size)

Villosa lienosa (Conrad, 1834) little spectaclecase

Figures A-B. (a=male b=female) Louisiana. Beauregard Parish. Bundicks Creek at Rte. LA 113. 19 July 1975. Blake Vidrine and MFV.
Figures C-D. (c=male d=female) Louisiana. Lincoln Parish. Cypress Creek at Rte. U. S. 167, north of Ruston. 14 August 1975. Richard Franz, Dan Bereza and MFV.
Figures E-F. (e=female f=male) Louisiana. Bienville Parish. Castor Creek near Castor between Rtes. LA 507 and 4. 28 November 1975. MFV. (before light scrubbing).
Figures G-H. (g=female h=male) Same as figure E. (after scrubbing)
Figure I. (male) Louisiana. Vernon Parish. Drake's Creek at Lookout Road. 9 August 1992. MFV.

Villosa vibex (Conrad, 1834) southern rainbow

Figures J-M. (females=lj males =km before and after scrubbing and mineral oil) Louisiana. St. Helena Parish. Twelve Mile Creek at Rte. LA 1045. 19 December 1976. Dan Bereza and MFV.

Cyprogenia aberti (Conrad, 1850) western fanshell

Figure N. Arkansas. Fulton County. South Fork Spring River at Rte. AK 9, ca.. 1.5 mi. northeast of Salem. 14 August 1979. Dan Bereza and MFV.

Villosa iris (Lea, 1829) rainbow

Figures O-P. This shell resembles *Lampsilis hydiana* and *Villosa vibex* (see text under systematic treatment of *V. vibex*).
Arkansas. Grant and Dallas Counties. Saline River at Rte. U. S. 167. 11 August 1978. Bill Bell, Darryl Clark and MFV.

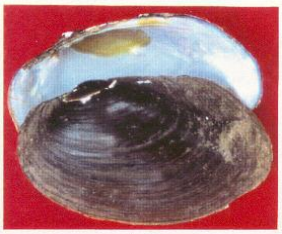
Lasmigona costata (Rafinesque, 1820) flutted shell
Figure Q. Arkansas. Grant and Dallas Counties. Saline River at Rte. U. S. 167. 11 August 1978. Bill Bell, Darryl Clark and MFV.

Rangia cuneata Gray brackish-water clam
Figure R. Louisiana. Jefferson Davis Parish. Louisiana Irrigation Canal at Rte. U. S. 90. 11 February 1984. Gail Vidrine, Macky Vidrine and MFV.

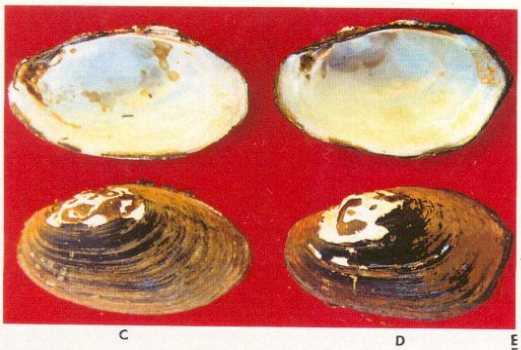
Dreissena polymorpha (Pallas) zebra mussel
Figure S. Thomas Dietz (LSU).
Polymesoda caroliniana (Bosc) carolina marsh clam
Figure T. Louisiana. Vermilion Parish. Vermilion Bay. 1977.

Corbicula fluminea (Muller) Asiatic clam
Figure U. Louisiana. Allen Parish. Calcasieu River at Rte. U. S. 190. 6 June 1977. Mary Curry, Betty Everitt, Bill Bell, Darryl Clark, Macky Vidrine and MFV.

PLATE XIX



A

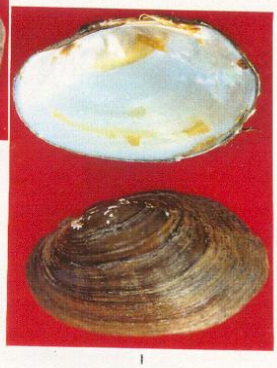


C D E F

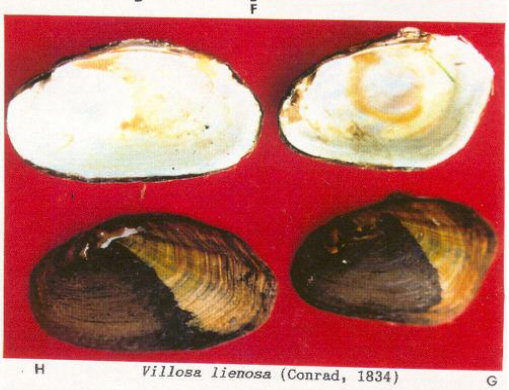
B

R

Rangia cuneata Gray



I



H *Villosa lienosa* (Conrad, 1834) G

S

Dreissena polymorpha (Pallas)

O

P

Villosa iris (Lea, 1829)

T

Polymesoda caroliniana (Bosc)

K L

M J

Q

U

Corbicula fluminea (Muller)

N

Lasmigona costata (Rafinesque, 1820)

Cyprogenia aberti (Conrad, 1850)

Villosa vibex (Conrad, 1834)

PLATE XX

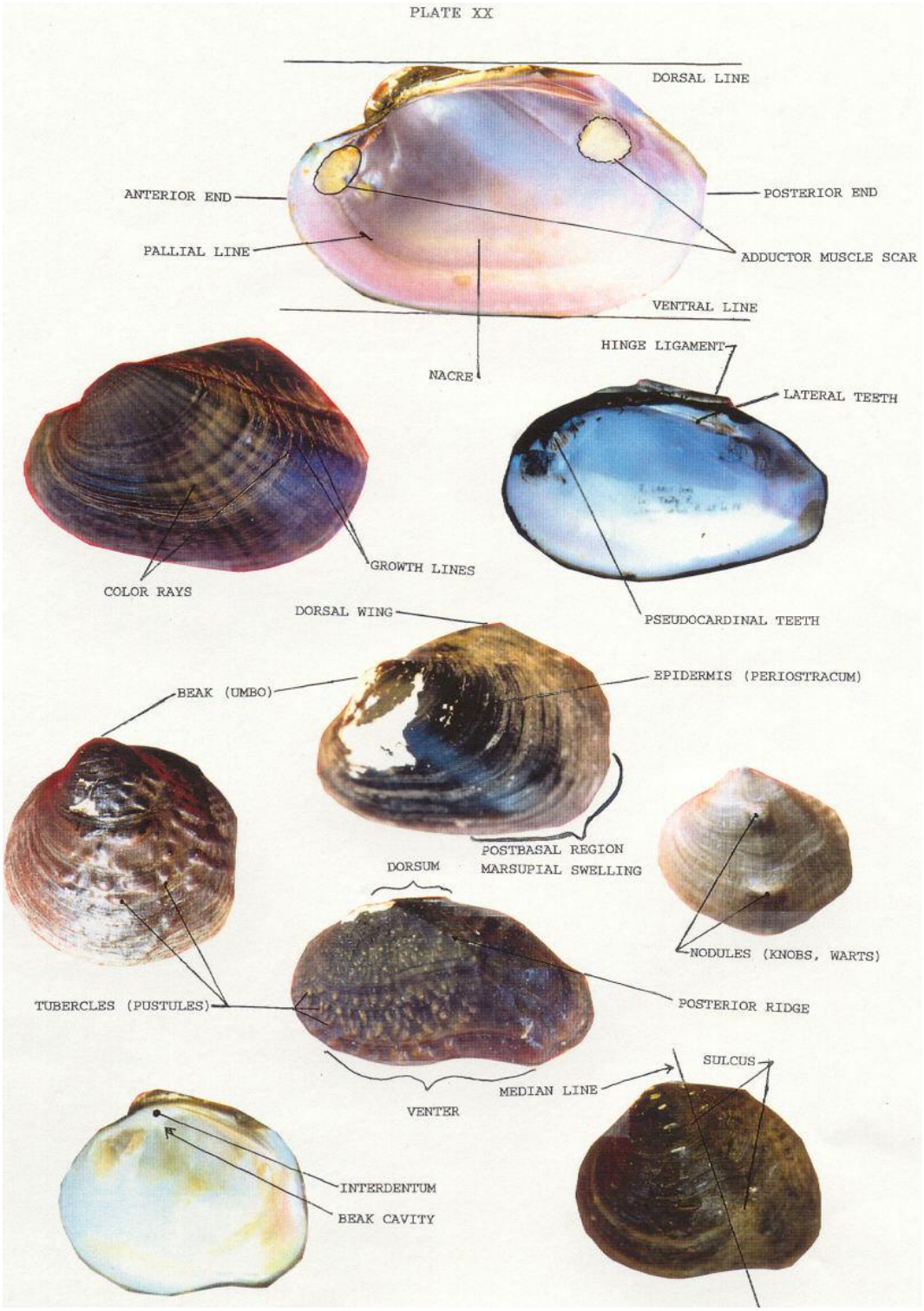
PLATE XX

Figures illustrating key terms and their locations on shells of various mussel species. Any introductory general invertebrate zoology book will provide additional figures and terms, especially as they relate to the anatomy of soft parts.

GLOSSARY

Alate--winged, having expansions like wings, especially along the hinge line; usually possessing an obvious dorsal wing
Anal opening--excurrent siphon above branchial opening
Anterior end--the shorter end of shell as measured from the umbo
Beak--the umbo or part of shell raised along the dorsal margin
Beak cavity--the depression or pocket on the inside of each valve leading into the beak
Beak sculpture--the raised loops, ridges, or bumps on the umbo
Branchial opening--incurrent siphon leading to the gill chamber
Compressed--appearing to be laterally flattened
Conglutinates--gelatinous material enclosing the glochidia in one ovisac
Dorsal--opposite of ventral; toward the upper part of shell with the umbo (ultimate portion called the dorsum)
Epidermis--periostracum; outer layer on the surface of shell
Equilateral--having all sides nearly equal
Gills--divided into demibranchs and ctenidia; ciliated leaflike structures, two per side, used in respiration and brooding young
Growth lines--darkened lines on the surface of shell indicating rest periods during growth, sometimes colored forming bands
Hinge--elastic part connecting the two shells dorsally
Hinge teeth--teeth along the hinge line, includes pseudocardinals and laterals
Inflated--appearing to be laterally swollen
Interdentum--flattened shell area between pseudocardinals and laterals
Laterals--usually straight teeth located anteroventral to umbo
Lunule--depressed area immediately anterior to the umbo
Mantle--tissue which secretes the shell; attached to pallial line
Marsupium--part of gill used to brood eggs and glochidia
Muscle scars--impressions made on the shell where muscles attach
Nacre--pearly interior of the shell; often iridescent and colored
Nodule--small node, knot or knob on shell
Pallial line--curved line with muscle scars where mantle attaches to the shell
Palpi--labial palps; anterior, flat flaps located around the mouth
Post-basal region--posteroventral portion of the shell
Posterior end--the longer end of shell as measured from the umbo
Posterior ridge--ridge beginning at beak and extending posteriorly
Posterior slope--posterior plate; plate between posterior ridges
Pustule--any pimplelike or blisterlike swelling or elevation
Quadrate--appearing to be square
Ray--colored line or group of lines extending from umbo, or appearing to do so, to the edge of the shell
Serrate--saw-toothlike in appearance
Solid--thick or heavy
Sulcus--a shallow depression or large furrow; usually elongated
Supra-anal opening--opening above anal opening
Truncate--having end of shell or posterior slope squared off
Triangular--appearing to have three sides
Tubercle--a rounded projection on the shell (or bone of animals)
Undulate--plicate; having plications or smooth round raised ridges
Ventral--toward lower part of shell; ultimate portion called venter

PLATE XX


DORSAL LINE
ANTERIOR END
POSTERIOR END
PALLIAL LINE
ADDUCTOR MUSCLE SCAR
VENTRAL LINE
NACRE
HINGE LIGAMENT
LATERAL TEETH
GROWTH LINES
COLOR RAYS
PSEUDOCARDINAL TEETH
DORSAL WING
EPIDERMIS (PERIOSTRACUM)
BEAK (UMBO)
POSTBASAL REGION
MARSUPIAL SWELLING
DORSUM
NODULES (KNOBS, WARTS)
TUBERCLES (PUSTULES)
POSTERIOR RIDGE
SULCUS
MEDIAN LINE
VENTER
INTERDENTUM
BEAK CAVITY

Tribe **Lampsilini** (*sensu* Davis and Fuller, 1981)

Animal characters: Ectobranchous; septa not perforated; marsupia confined to restricted region of the demibranchs; many taxa with specialized mantle structure; marsupial water tubes extending beyond distal margins of the demibranch lamellae.

Shell characters: Shells noted for the sexual dimorphism especially in the post basal region. Shells generally smooth (Davis and Fuller 1981).

Comments: Thirteen genera occur in Louisiana.

Key to the genera in Louisiana:

1a. Shells with obvious nodules.....Genus *Obliquaria*
1b. Shells smooth.....2

2a. Shells with obvious truncation on the posterior slope.....3
2b. Shells without obvious truncation on the posterior slope.....7

3a. Truncation severe with an extremely sharp angle near umbo.....4
3b. Truncation less severe with moderately sharp angle near umbo...5

4a. Shells with obvious posterior point.....Genus *Truncilla*
4b. Shells without obvious posterior point.....Genus *Ellipsaria*

5a. Shell elongate and sometimes arcuate along ventral margin.....
.....Genus *Ptychobranchus*
5b. Shell obovate and rounded on ventral margin.....6

6a. Shell obviously rayed with yellowish epidermis; pseudocardinals not serrated.....Genus *Lampsilis*
6b. Shell brownish to grey and without rays; serrated pseudocardinals.....Genus *Glebula*

7a. Shells thin and alate.....8
7b. Shells thin but not alate or neither thin nor alate.....9

8a. Epidermis yellow.....Genus *Leptodea*
8b. Epidermis dark, not yellow.....Genus *Potamilus*

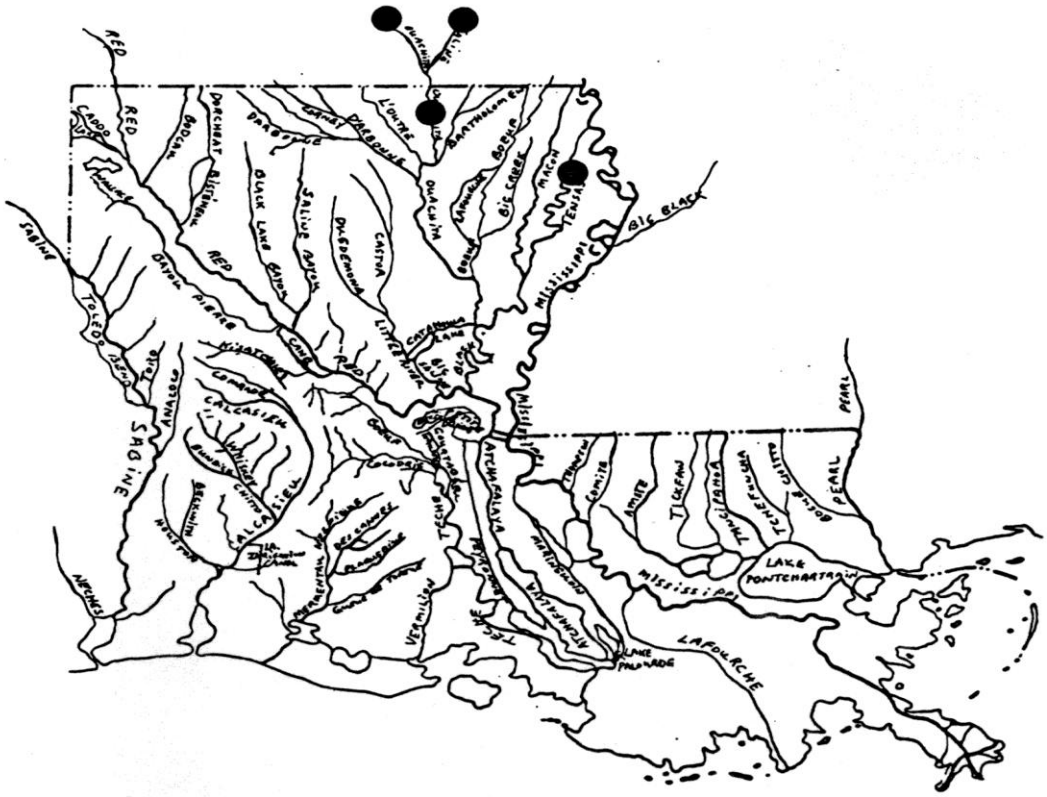
9a. Shells decidedly elongate.....10
9b. Shells decidedly ovate to obovate.....12

10a. Shell small, epidermis rough, seldom colored other than dark; females with fleshy caruncle.....Genus *Toxolasmus*
10b. Shell larger, epidermis variable, yellow, dark brown, or black and commonly rayed with green; no caruncle.....11

11a. Shell yellow, seldom rayed.....Genus *Lampsilis*
11b. Shell not yellow.....Genus *Ligumia*

12a. Shell thick, ovate in outline; obvious posterior ridge; epidermis yellowish, often rayed with green, nacre white.....
.....Genus *Actinonaias*
12b. Shell moderately thick; posterior ridge reduced and rounded; epidermis yellow to black, often rayed, nacre variable in color from purple and blue to white.....13
13a. Nacre purple to red.....14
13b. Nacre generally white, occassionally with pink.....15

Map 74. Historical distribution of *Actinonaias ligamentina* in North America.



Map 75. Historical distribution of *Actinonaias ligamentina* in Louisiana.

14a. Shell large and thick or exceedingly thin.....Genus *Potamilus*
14b. Shell small to medium and moderately thick.....Genus *Villosa*

15a. Shell essentially round in outline.....16
15b. Shell oval to slightly elongate in outline.....18

16a. Outline shape resulting from post basal development; some yellow in epidermis 17
16b. Simply round in outline.....Genus *Obovaria*

17a. Nacre pure white.....Genus *Lampsilis*
17b. Nacre light pink or purplish.....Genus *Potamilus*

18a. Epidermis tan, green, not truly yellow.....Genus *Obovaria*
18b. Epidermis yellowish with rays or hint of rays.....19

19a. Shell thick .....Genus *Lampsilis*
19b. Shell thin .....Genus *Villosa*

Genus *Actinonaias* Fischer and Crosse, 1894

Shell characters: "Shell ovate or subelliptical; distinctly longer than high; compressed or slightly inflated; without or with indistinct posterior ridge. Disk not sculptured. Beaks moderately anterior; never in middle of the shell and never very near the anterior end. Beak sculpture poorly developed, consisting of a few faint bars, which have a tendency to become double-looped, with the central part between the loops obliterated. Epidermis yellowish to greenish, generally with distinct rays. Male and female shell differing in shape, but the difference often hardly noticeable. Soft parts agreeing with those of *Obovaria* in every respect; the glochidia also of the same type." (Ortmann), Baker (1928: 217).

Comments: A single species occurs in Louisiana.

Actinonaias ligamentina (Lamarck, 1819)
mucket

Figures A-E
Plate XI
Maps 74 and 75

Partial synonomy:
Actinonaias ligamentina (Lamarck, 1819), Turgeon *et al*. 1988
Actinonaias carinata (Barnes, 1823), Vidrine 1985, 1989b, Gordon *et al*. 1980
Lampsilis ligamentina (Lamarck, 1819), Simpson 1914
Lampsilis ligamentinus gibbus Simpson, 1900, Vanatta 1910
Actinonaias carinata gibba (Simpson, 1900), Stern 1976, Gordon *et al*. 1980
Lampsilis carinata pinguis Lea, 1857, Frierson 1927 (p. 80)

Description: Shell solid, almost regularly long elliptical, rounded in front, rounded slightly or pointed behind about midway up from the base of the shell, young and adult specimens moderately inflated, old specimens decidedly swollen, having a low, rounded posterior ridge, slightly gaping at the anterior base; old shells having a well-developed lunule running through under the beaks; beaks scarcely inflated, low, their sculpture consisting of very faint, doubly-looped, irregular ridges; ligament large, long; surface nearly smooth or marked with rude, irregular, low, concentric ridges, tawny to pale greenish with broad,

rather faint and somewhat broken rays; left valve with two small pseudocardinals and two remote, rather small laterals; right valve with two pseudocardinals, the anterior smaller, and sometimes a small posterior third tooth, with one high lateral; beak cavities not deep; muscle scars large, well impressed and smooth; nacre white or pink, much thickened in front of old shells; female shells very slightly produced at posterior base (Simpson 1914, p. 79).

Type locality: Ohio River.

General distribution: Mississippi Interior Basin drainages.

Comments: I found 5 pairs of valves in the Tensas River in 1978. Vanatta (1910) reported this species from the Ouachita River in Louisiana.

Genus *Ellipsaria* Rafinesque, 1820

Animal characters: Anal opening smooth, connected to supra-anal by close mantle attachment; inner laminae of inner gills free or partly connected to visceral mass; gills brownish--all soft parts tannish; marsupium rather reniform, consisting of 40-50 well defined ovisacs; conglutinates lanceolate, not very solid; glochidium spatulate, very much higher than long, spineless, very large.

Shell characters: Shell sub-triangular, solid, not greatly inflated, with square-cornered post-umbonal ridge and flat post-dorsad; disk smooth; beaks pointed, rather high, sculptured with faint double-looped ridges; epidermis yellow with broken rays; pseudocardinals low and jagged; laterals rather stout, straight or slightly curved; nacre white. Utterback (1915-16: 350).

Comments: A single species occurs in Louisiana.

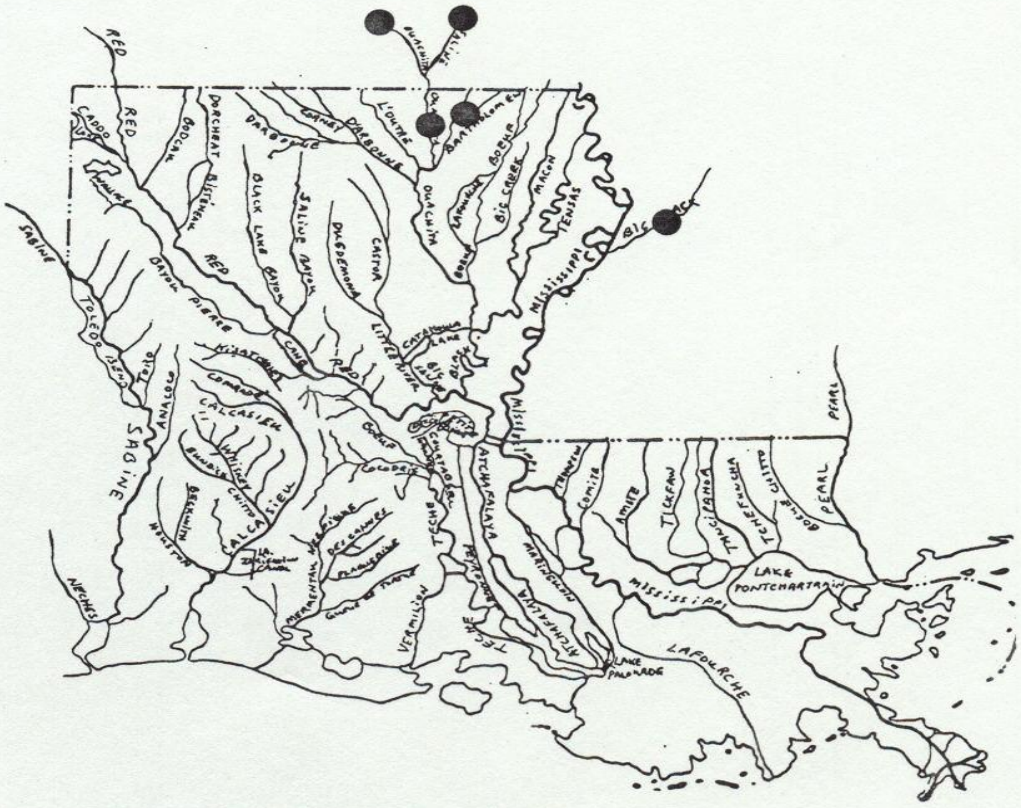
Ellipsaria lineolata (Rafinesque, 1820)
butterfly

Figures F-G
Plate XI
Maps 76 and 77

Partial synonomy:
Ellipsaria lineolata (Rafinesque, 1820), Vidrine 1985, Turgeon *et al*. 1988
Plagiola securis (Lea, 1829), Simpson 1914, Vanatta 1910
Plagiola lineolata (Rafinesque, 1820), Stern 1976, Gordon *et al*. 1980, Frierson 1927 (p. 89)

Description: Shell subtriangular, solid, subcompressed or scarcely inflated, with a sharply defined up-curved posterior ridge, behind which it is truncated; region of the beaks and a considerable area of the upper part of the shell compressed; beak sculpture consisting of a few irregular, slightly doubly-looped ridges; beaks curved forward over a small, wide lunule passing back under the hinge, where it is filled with epidermal matter; ligament small, brown; surface with irregular, often rude, sometimes almost sulcate, growth lines; epidermis rather smooth, but showing fine, wrinkled loops under a glass, tawny or yellowish-green, generally with faint, broken rays, which are made up of dots or lunate or arrow-head

Map 76. Historical distribution of *Ellipsaria lineolata* in North America.



Map 77. Historical distribution of *Ellipsaria lineolata* in Louisiana.

markings; they are sometimes composed of alternately lighter and darker dashes; hinge strong, the plate often flattened; left valve with two triangular, ragged pseudocardinals, a faint anterior third one, and two slightly curved laterals; right valve with three pseudocardinals, the middle one the largest, and two laterals, the lower the smaller; beak cavities moderately deep; muscle scars impressed, the anterior ones ragged; nacre silvery-white. The male and female shells differ widely, the former are much the larger and are considerably compressed; the female shell is somewhat humped, is more or less inflated, is considerably produced at the posterior base and gaps a little in front and behind (Simpson 1914, p. 304).

Type locality: Ohio.

General distribution: Mississippi Interior Basin drainages.

Comments: Vanatta (1910) reported this species from the Ouachita River in Louisiana. George and Vidrine (in prep.) report this species from Bayou Bartholomew.

Genus *Glebula* Conrad, 1853

Animal characters: Gills nearly equal in size and united the whole length of the abdominal sac. Marsupia occupy the posterior half of the outer gills.

Shell characters: 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 (serrated in appearance). Nacre bluish white to purplish pink. Clench and Turner 1956.

Comments: A single species occurs in Louisiana.

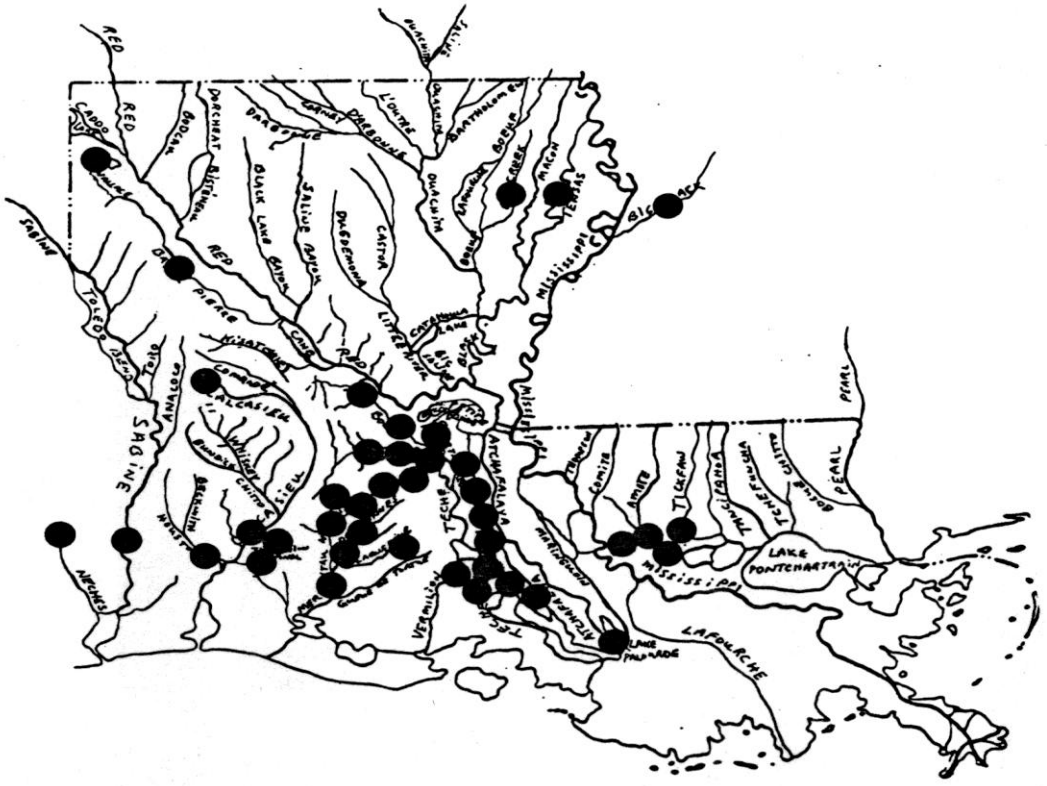
Glebula rotundata (Lamarck, 1819)
round pearlshell

Figures I-N
Plate XI
Maps 78 and 79

Partial synonomy:
Glebula rotundata (Lamarck, 1819), Vidrine 1985, 1989b, Turgeon *et al*. 1988, Simpson 1914, Gordon *et al*. 1980, Roback *et al*. 1980, Stern 1976, Hartfield 1988
Glebula suborbiculata (Lamarck, 1819), Strecker 1931, Murray and Roy 1968, Frierson 1927 (p. 91)
Unio rotundatus Lamarck, 1819, Vaughan 1893, Frierson 1899a

Description: Shell somewhat elliptical, inflated, rather solid; beaks generally flattened or compressed, though often full in old specimens, without sculpture; posterior ridge moderate, angular and sometimes slightly double; epidermis brownish, cloth-like in unworn shells, not rayed; left valve with two pseudocardinals, which are often split into numerous radiating, nodulous lamellae, with two remote laterals, the lower the larger; right valve with two pseudocardinals, the upper small and compressed, the lower much split, and one lateral, which is sometimes slightly double; hinge plate narrowed and rounded in front of the laterals; beak cavities moderate, not compressed, showing numerous dorsal scars under the hinge plate; muscle scars large, impressed, smooth, the posterior

Map 78. Historical distribution of *Glebula rotundata* in North America.



Map 79. Historical distribution of *Glebula rotundata* in Louisiana.

one semicircular; nacre dull purplish. Female shell slightly inflated at posterior base, sometimes having a slight sinuosity behind the swelling (Simpson 1914, p. 287).

Type locality: not given.
General distribution: Southern portions of Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages. This freshwater mussel coinhabits some (i. e., syntopic) localities with *Rangia cuneata* in the Louisiana freshwater marshes and bayous.

Comments: Parker (1979) and Parker *et al*. (1984) unravelled the puzzling life history of this species. Its choice of host fishes and multiple annual glochidial broods help explain both its abundance and its distribution. This species and *Plectomerus dombeyanus* are indicative of the central Gulf drainages (van der Schalie and van der Schalie 1950).

Genus *Lampsilis* Rafinesque, 1820

Animal characters: Branchial and anal opening papillose; supra-anal not very large, separated from the anal by a moderate connection; inner laminae of inner gills connected to the visceral mass; sometimes a small hole is left post-dorsad of foot; marsupium usually kidney-shaped, distended, consisting of many ovisacs which are distinct, extended below original edge of sterile marsupium when gravid into blunt, pigmented beads; mantle edge double posteriorly, the inner one antero-ventrad to branchial opening developed into a ribboned flap usually produced into a tentacled lobe at its end located about the lowest post-ventrad point; conglutinate not solid; glochidia rather large, subelliptic.

Shell characters: Shell elliptical to ovate; disk smooth; beaks sculptured by the sinuate or double-looped type, sometimes with a tendency of the posterior loop to become broken; epidermis usually smooth, thin and shiny, often brilliantly rayed. Hinge has two pseudocardinals and two laterals in left and two pseudocardinals and one lateral in the right valve; female shell has an inflation at the post-ventral region of shell just over the marsupia. Utterback (1915-16: 441).

Miscellaneous remarks: The differentiation of the mantle antero-ventrad to branchial opening into a flap marks this genus as among the highest of the Lampsilini. The flap is so developed with tentacles and papillae that it is often extended externally and waved to and fro so as to produce almost the best possible aeration for the embryos.

Comments: Eight species occur in Louisiana.

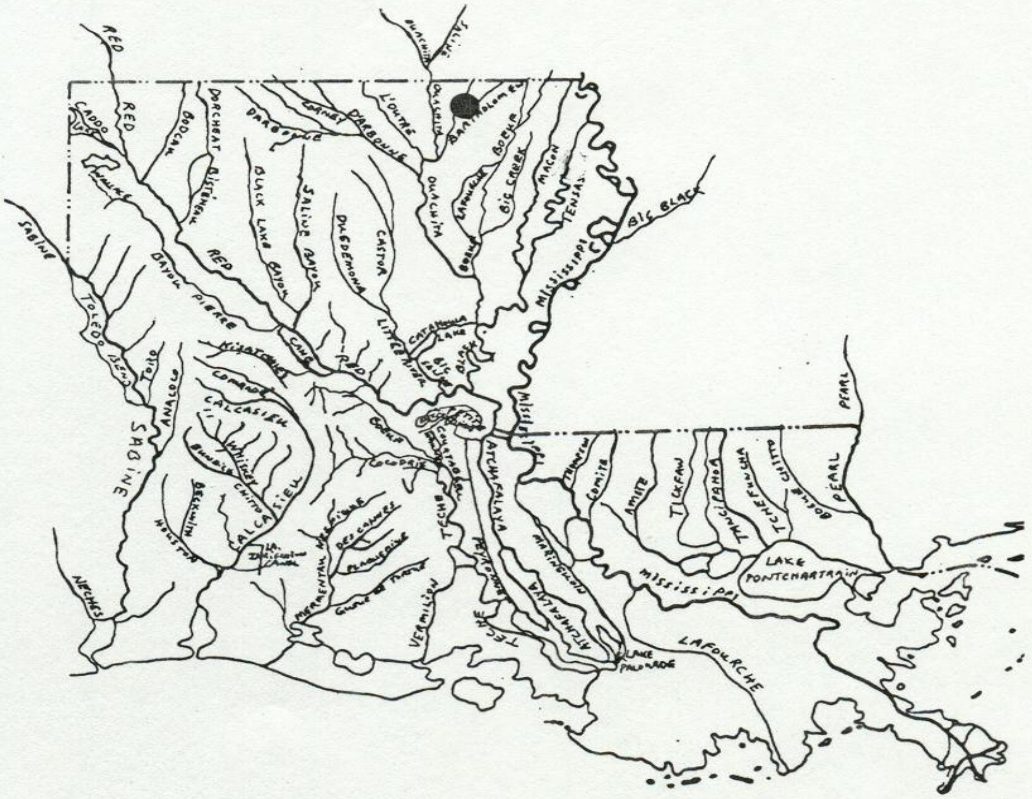
Key to the species in Louisiana:

1a. Shell decidedly elongate and usually yellow and rayless.....
.....*L. teres*
1b. Shell elliptical to nearly round in outline.....2

2a. Shell epidermis lacking obvious rays.....3
2b. Shell epidermis with obvious rays.....4

3a. Shell very thick; pink flush in beak cavity.....*L. abrupta*
3b. Shell moderately thick; nacre white.....*L. claibornensis*

Map 80. Historical distribution of *Lampsilis abrupta* in North America.



Map 81. Historical distribution of *Lampsilis abrupta* in Louisiana.

4a. Shell with distinctly angled posterior ridge.....*L. ornata*
4b. Shell with posterior ridge evenly rounded.....5

5a. Shell inflated, almost round in outline in females.....6
5b. Shell somewhat compressed, elliptical in females but with obvious post basal marsupial swelling 7

6a. Color rays on shell distinct and extending upon the umbo; shell noteably thickened.....*L. cardium*
6b. Color rays on shell less distinct and not extending upon the umbo; shell moderately thick.....*L. satura*

7a. Shell slightly elongated and thickened; color rays not extending well upon the umbo; uncommon in Louisiana.....*L. siliquoidea*
7b. Shell more rounded, but highly variable in Louisiana; extremely common in Louisiana especially west of the Mississippi River; color rays commonly extend well upon the umbo.....*L. hydiana*

Lampsilis abrupta (Say, 1831)
pink mucket

Figures A-D
Plate XII
Maps 80 and 81

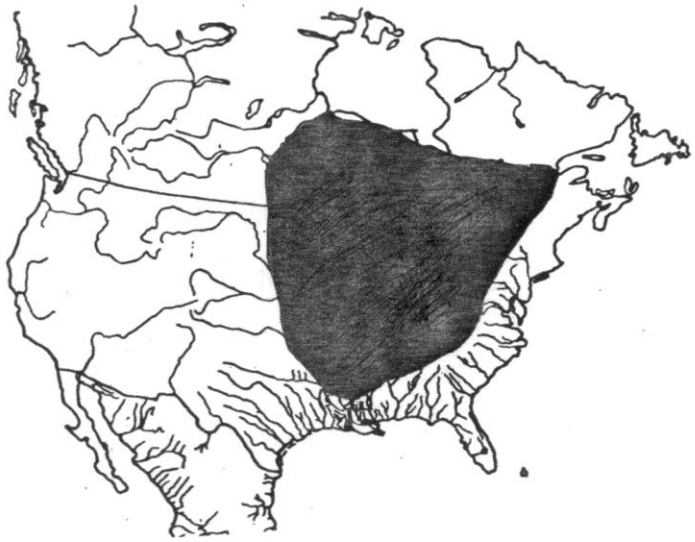
Partial synonomy:
Lampsilis orbiculata (Hildreth, 1828), Simpson 1914, Gordon *et al.* 1980, Burch 1975, Harris and Gordon 1987, Gordon 1981
Lampsilis abrupta (Say, 1831), Turgeon *et al.* 1988, Frierson 1927 (p. 80),

Description: Shell somewhat inflated with a well-marked posterior ridge, elliptical, solid, gaping at the anterior base; beaks moderately elevated, with very faint sculpture; lunule elongated, surface generally having wide, low, concentric ridges, the rest periods often marked by a sulcus, tawny to pale, dirty olive, sometimes feebly rayed; ligament large and full; left valve with two triangular pseudocardinals and two strong laterals; right valve with two pseudocardinals, the posterior triangular and large, the anterior small, there is sometimes a third small pseudocardinal posterior to the other two, there is one strong high lateral; posterior muscle scars large, rather deep; nacre white to salmon-tinted. The male is pointed behind about midway up from the base; the female shell has a well-developed post basal swelling (Simpson 1914, p. 76).

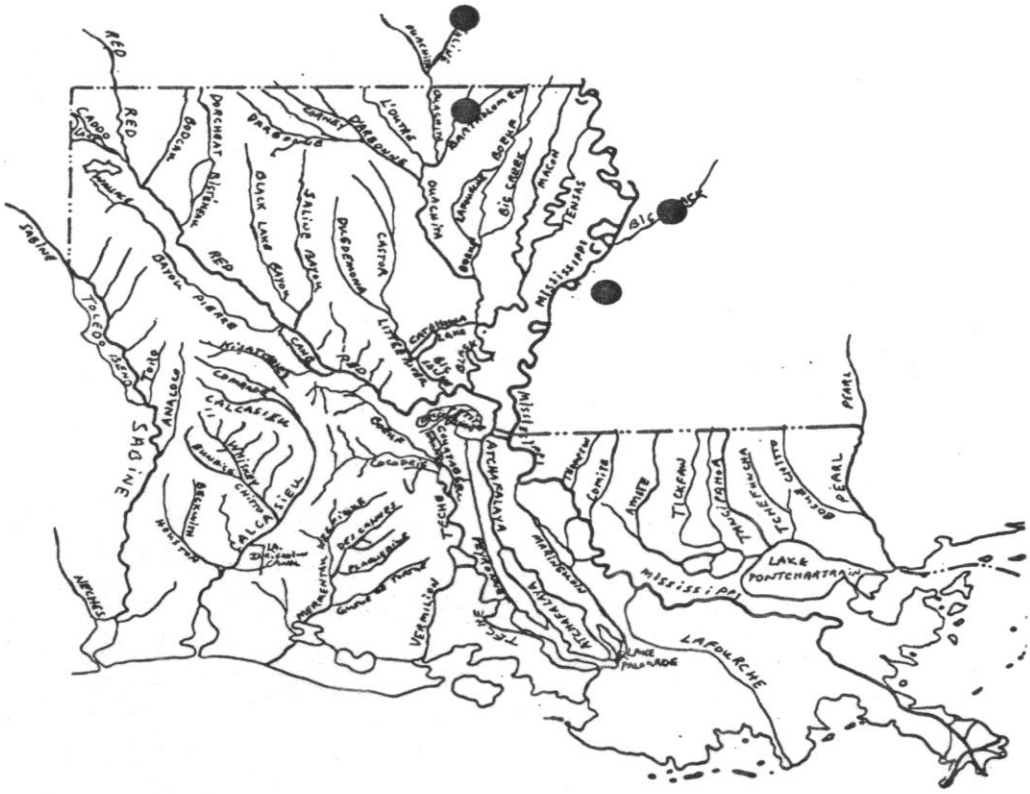
Type locality: Muskingum River, Ohio.

General distribution: Mississippi Interior Basin drainages.

Comments: This is a federally endangered species usually discussed in combination with *Lampsilis higginsi* (Lea, 1857) (Fuller 1978b and Gordon 1981). Louisiana specimens can be easily confused with *A. ligamentina* and *F. ebena*, thus collection of mussels in streams with this species should be limited to those with expertise sufficient to separate these similar conchological entities. In 1978, I found a specimen (apparently long since dead, Plate XI, Figure P) from Tensas River at Rte. U. S. 80 in Louisiana. This specimen is treated as *Lampsilis* sp., since it could be a very old *Lampsilis siliquoidea* (Paul Hartfield, pers. comm.).



Map 82. Historical distribution of *Lampsilis cardium* in North America.



Map 83. Historical distribution of *Lampsilis cardium* in Louisiana.

Lampsilis cardium (Rafinesque, 1820)
plain pocketbook

Figures E-H
Plate XII
Maps 82 and 83

Partial synonomy:
Lampsilis cardium (Rafinesque, 1820), Turgeon *et al*. 1988, Frierson 1927 (p. 67)
Lampsilis ventricosa (Barnes, 1823), Simpson 1914, Hartfield and Rummel 1985
Lampsilis ovata ventricosa (Barnes, 1823), Gordon *et al*. 1980, Gordon 1981, Murray and Roy 1968

Description: Shell large, rather solid, obovate, inflated, with very full, high beaks, which have a few coarse, irregular corrugations that are inclined to be doubly looped; surface generally nearly smooth, the rest periods well marked; epidermis normally shining, greenish, greenish-yellow or brownish with broad, bright green rays. In old shells the rays are often nearly or quite wanting. Hinge line usually incurved in front of the beaks and outcurved behind them; ligament large and prominent, extending under the beaks, and narrow in front of them. There are two, somewhat compressed pseudocardinals in the left valve, the posterior high and triangular in outline, the anterior lower, both of these are in front of the beak; the hinge plate is narrow and rounded behind, and there are two rather short, slender laterals; right valve with two compressed pseudocardinals, the lower the higher, separated by a deep, nearly parallel-sided socket, and one high, curved lateral, which is sharply truncated behind; beak cavities deep and wide; muscle scars not deep, smooth, the hinder semicircular; nacre brilliant, silvery, bluish-white or sometimes a beautiful pink. In the female shell the marsupial swelling is pronounced, the shell generally higher than that of the male (Simpson 1914, p. 38).

Type locality: Wisconsin River; Mississippi River, Prairie du Chien, Wisconsin.

General distribution: Mississippi Interior Basin drainages.

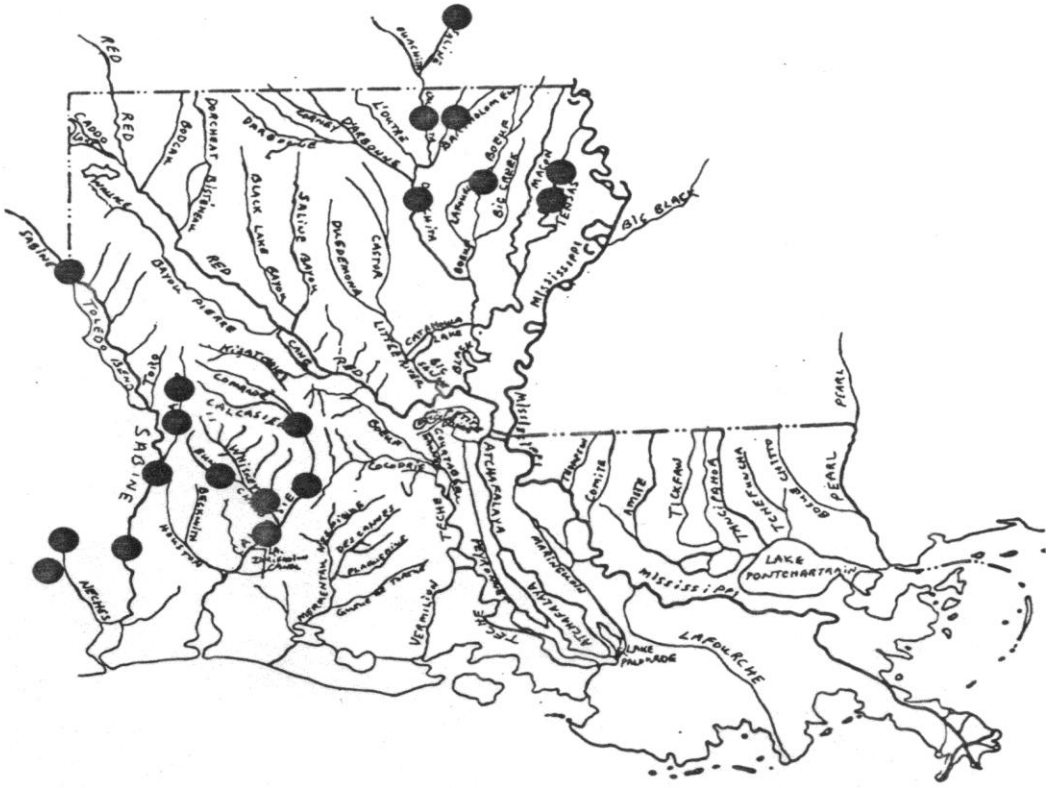
Comments: This species was recently found in Bayou Bartholomew (George and Vidrine, in prep.). Cvancara (1963) and Kraemer (1970) discussed the remarkable diversity and mantle modifications in the genus *Lampsilis*. The overall similarities in *L. cardium, L. satura,* and *L. ornata* present a dynamic enigma in identification. Detailed study of these species in order to determine their relationships is direly needed. Each of these species has a dramatically developed fish-like extension on the post-basal mantle, which actively moves aggressively mimicking a small fish.

Lampsilis satura (Lea, 1852)
sandbank pocketbook

Figures I-U
Plate XII
Maps 84 and 85

Partial synonomy:
Lampsilis satura (Lea, 1852), Vidrine 1985, 1989b, 1990c, Turgeon *et al*. 1988, Stern 1976, Roback *et al*.1980, Neck 1984, 1990, Harris

Map 84. Historical distribution of *Lampsilis satura* in North America.



Map 85. Historical distribution of *Lampsilis satura* in Louisiana.

and Gordon 1990
Lampsilis ventricosa var. *satura* (Lea, 1852), Simpson 1914
Lampsilis ventricosus satur (Lea, 1852), Vanatta 1910
Unio satur Lea, 1852, Frierson 1899a, 1899b
Lampsilis ovata ventricosa (Barnes, 1823), Murray and Roy 1968 (in part)
Lampsilis cardium satura (Lea, 1852), Strecker 1931, Frierson 1927 (p. 67)

Description: A form rather common in southwestern waters. It is greatly inflated, with livid or smoky-colored, sometimes blackish epidermis, and the marsupial swelling is remarkably developed. It gradually merges into the type (*L. cardium*)(Simpson 1914, p. 41). The female shell is often described as truncately swollen.

Type locality: Alexandria; Lake Calcashue (?Calcasieu), New Orleans, La.

General distribution: Southern portions of the Mississippi Interior Basin and Western Gulf drainages.

Comments: Valentine and Stansbery (1971) contend this species is limited to southwestern Louisiana and eastern Texas drainages. "True *L. satura* occurs in a few Texas and Louisiana streams which flow directly into Gulf of Mexico." In Louisiana, this species is most common in the middle reaches of the Calcasieu River system. The brilliant white nacre easily precludes confusion of this species with conchologically similar species in the genus *Potamilus*.

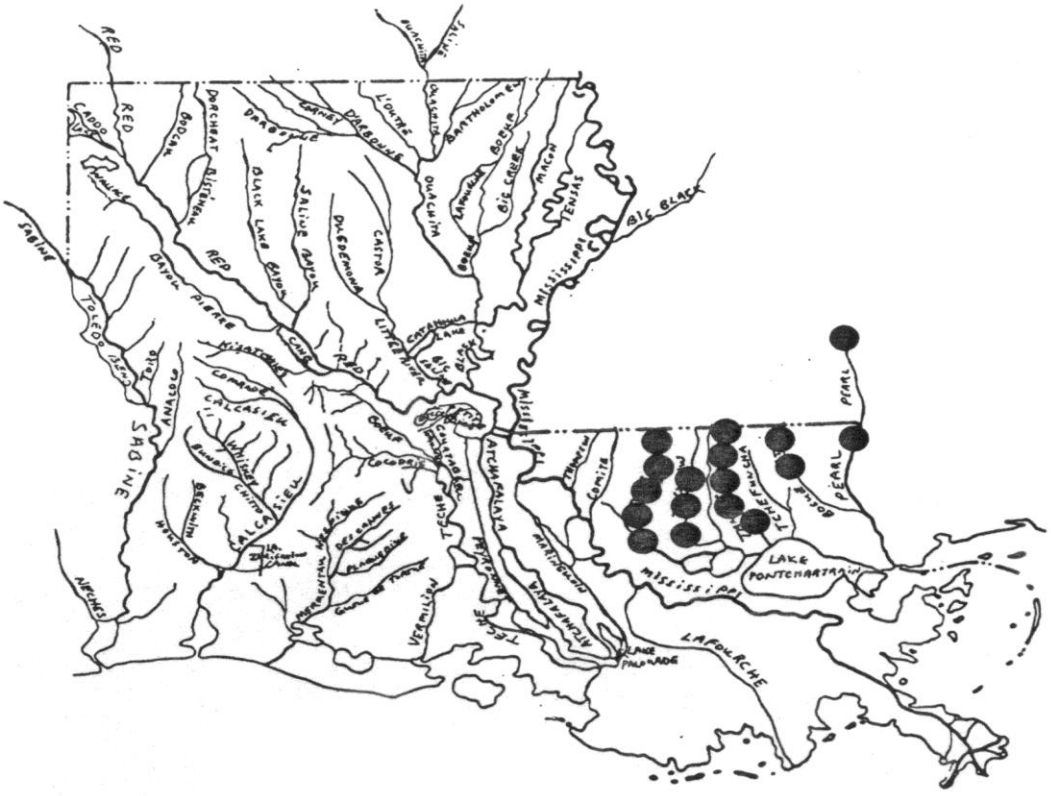
Lampsilis ornata (Conrad, 1835)
southern pocketbook

Figures A-F
Plate XIII
Maps 86 and 87

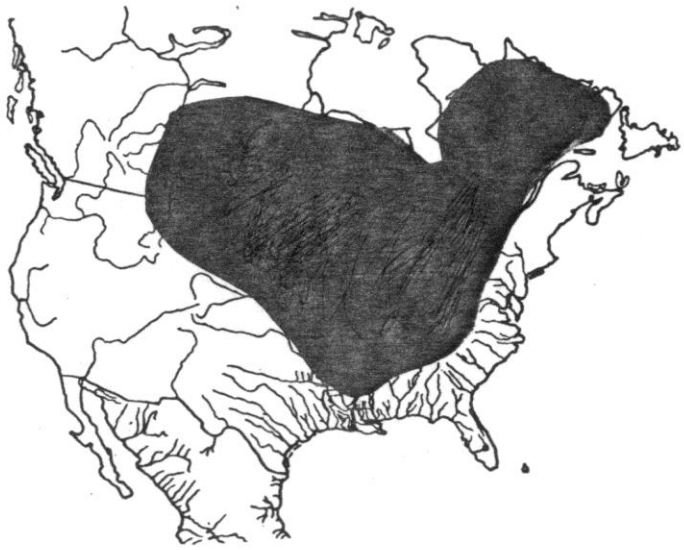
Partial synonomy:
Lampsilis ornata (Conrad, 1835), Frierson 1927, Hartfield 1988, Turgeon *et al*. 1988, Frierson 1927 (p. 68)
Lampsilis excavata (Lea, 1857), Stern 1976, Vidrine 1985, 1989b, Simpson 1914

Description: Shell inflated, subsolid, the male irregularly ovate or rhomboid, the female obovate, with a high, decided posterior ridge; beaks high and full; ligament large, brown, extending forward in a narrow excavation in front of the beaks; epidermis smooth and shining on the disk, roughened and wrinkled on the somewhat truncated posterior slope, tawny or greenish-yellow, showing a few green rays; hinge line with a slight double curve, rounded in front of the beaks and behind them; two pseudocardinals in the left valve, one behind the other, the anterior much the larger, with a triangular outline, both are compressed and situated in front of the beak; there are two small remote laterals and the middle of the hinge plate is narrow and rounded; right valve with two subcompressed, triangular pseudocardinals, the lower the larger, and one high lateral truncated behind; beak cavities deep and wide; muscle scars shallow, smooth; nacre white. The female shell is somewhat inflated at the post-basal outline; it is not so sharp at the posterior end as the male shell. In the male shell the posterior point is about one half the distance up from the base to the top; in the female it is a little higher (Simpson 1914, p 41).

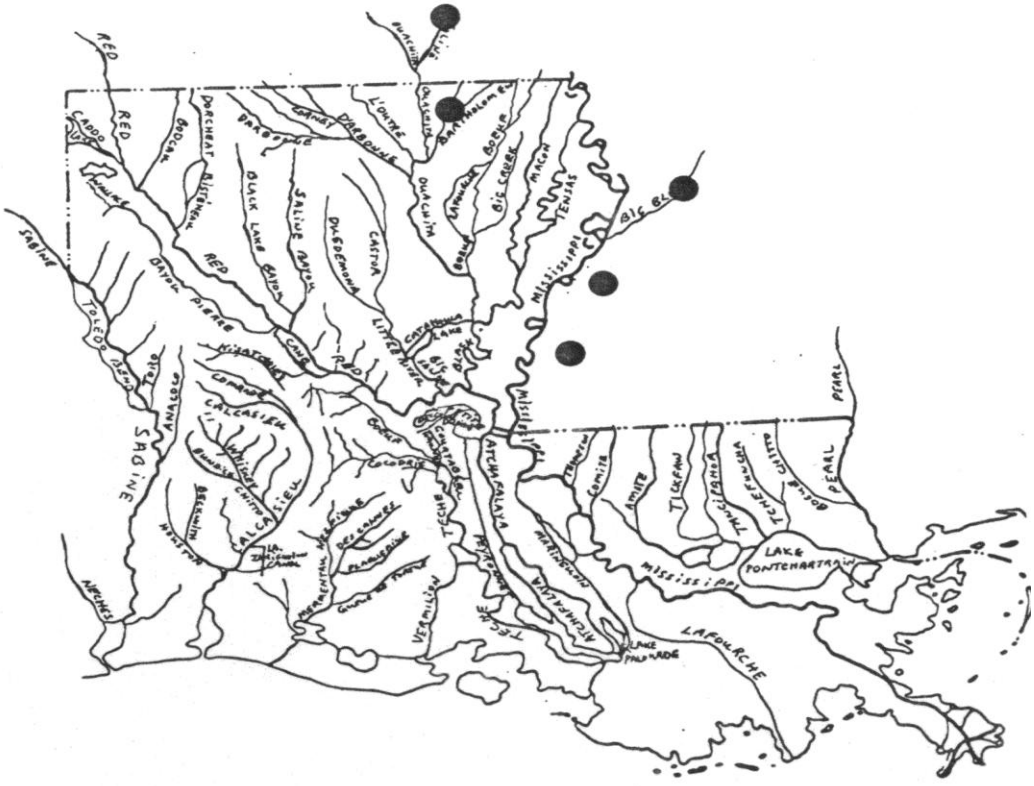
Map 86. Historical distribution of *Lampsilis ornata* in North America.



Map 87. Historical distribution of *Lampsilis ornata* in Louisiana.



Map 88. Historical distribution of *Lampsilis siliquoidea* in North America.



Map 89. Historical distribution of *Lampsilis siliquoidea* in Louisiana.

Type locality: Othcalooga Creek, Georgia.

General distribution: Eastern Gulf drainages and Ouachita River system in Arkansas.

Comments: Hartfield (1988) listed the rivers where this species occurs in eastern Louisiana. Johnson (1980) reported it from the Saline River in Arkansas. Harris and Gordon (1987) and John Harris (pers. comm., 1993) suggested that this species may indeed be in Arkansas. I have several specimens that closely resemble this species from both the Ouachita River and the Saline River in Arkansas.

Lampsilis siliquoidea (Barnes, 1823)
fatmucket

Figures 13-14 and G-J
Back Cover and Plate XIII
Maps 88 and 89

Partial synonomy:
Lampsilis siliquoidea (Barnes, 1823), Turgeon *et al*. 1988
Lampsilis luteola (Lamarck, 1819), Simpson 1914
Lampsilis radiata siliquoidea (Barnes, 1823), Gordon *et al*. 1980, Murray and Roy 1968
Lampsilis fasciata (Rafinesque, 1820), Frierson 1927 (p. 72)

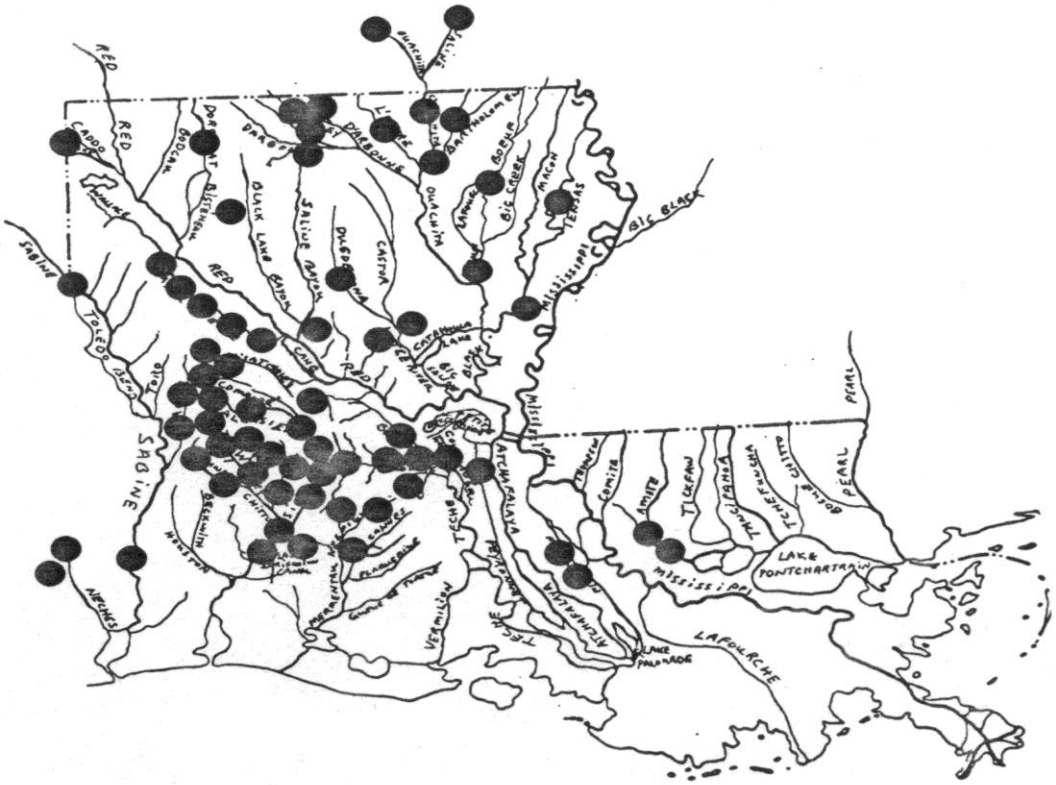
Description: Shell oblong, solid, subinflated or inflated, rather higher behind with moderately full beaks; beak sculpture consisting of exceedingly fine, doubly-looped ridges, the posterior loops which are sometimes turned up behind and sometimes open; rarely is the sculpture a little corrugated or broken; surface with somewhat irregular growth lines, sculpture sometimes slightly concentric, rest periods few and usually well marked; epidermis smooth and shining, generally straw-colored, yellowish or greenish-yellow, often becoming brown in old shells, and normally exhibiting bright rays throughout, which may be narrow or wide; ligament long, sometimes showing a narrow lunule in front of the beaks; left valve with two pseudocardinals, usually a little compressed, the posterior under the beak, the anterior higher and larger, and two long, rather near laterals, the hinge plate much narrowed at their anterior end; right valve with two pseudocardinals, the lower the much larger, and one lateral, which is sometimes a little truncate behind; muscle scars large, well marked, smooth; beak cavities rather shallow, exhibiting a row of four or five dorsal scars; pallial line well marked; nacre white, bluish-white, straw-colored or pink, usually bright, wider in front. Female shell with a most decided marsupial swelling, and having a blunt posterior point somewhat higher up (three-fifths of the height) than that of the male (about half way up), and it is usually more inflated (Simpson 1914, p. 60).

Type locality: Susquehanna and Mohawk Rivers.

General distribution: Mississippi Interior Basin drainages.

Comments: George and Vidrine (in prep.) report this species from Bayou Bartholomew. This species occurs in the streams in western Mississippi which drain into the Mississippi River. A single pair of empty valves of a very worn specimen was taken in the Tensas River at Rte. U. S. 80 and is treated as *Lampsilis* sp., since it appears to strongly resemble males of *L. abrupta* (see Plate XI, figure P).

Map 90. Historical distribution of *Lampsilis hydiana* in North America.



Map 91. Historical distribution of *Lampsilis hydiana* in Louisiana.

Lampsilis hydiana (Lea, 1838)
Louisiana fatmucket

Figures 10-11 and K-W
Back Cover and Plate XIII
Maps 90 and 91

Partial synonomy:
Lampsilis hydiana (Lea, 1838), Stern 1976, Vidrine 1985, 1989b, 1990c, Turgeon *et al.* 1988, Simpson 1914, Roback *et al.* 1980, Hartfield 1988, Coker 1915, Neck 1990, Gordon *et al.* 1980, Murray and Roy 1968, Vanatta 1910
Unio hydianus Lea, 1838, Vaughan 1892, 1893, Frierson 1899a, 1899b
Unio approximus Lea, 1845, Vaughan 1893
Unio obtusus Lea, 1840, Vaughan 1893
Lampsilis luteola, Lamarck, 1819, Shira 1913
Lampsilis claibornensis, Lea, 1838, Shira 1913
Lampsilis fasciata hydiana (Lea, 1838), Strecker 1931, Frierson 1927 (p. 72)

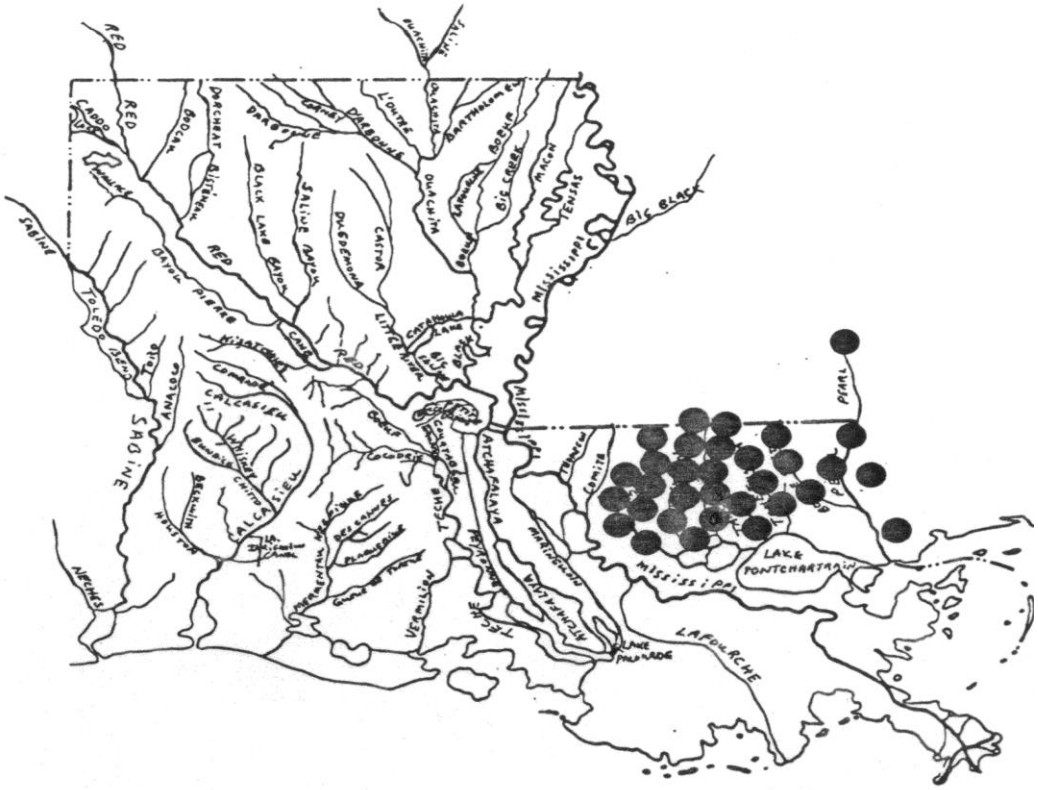
Description: Shell of moderate size, normally subsolid but sometimes rather thin, long elliptical, ordinarily much inflated; beaks full and high, their sculpture delicate, consisting of faint, somewhat corrugated double loops, the hinder open behind; surface smooth and shining, sometimes faintly concentrically sculptured, greenish, waxy-yellow, beautifully and boldly rayed with green. In some cases the rays are broad and very distinct, in others they are split into numerous fine rays with a wider ray of the ground color between them. Occasional shells are scarcely rayed at all. Left valve bearing two sharp, sometimes slightly compressed pseudocardinals, and often having a small anterior lamellar third tooth near the shell edge; right valve with two pseudocardinals, the lower the larger; laterals curved, one in the right valve and two in the left; anterior muscle scars well marked; posterior scars faint; nacre generally rich silvery, though sometimes bluish and lurid brown in the cavity of the beaks. The male shell is somewhat pointed behind about midway up from the base; that of the female is rather blunt behind and decidedly swollen at the post-basal region (Simpson 1914, p. 66).

Type locality: Teche River, LA.

General distribution: Southern portion of Mississippi Interior Basin, Eastern Gulf (Amite River) and Western Gulf drainages.

Comments: This highly variable species is extremely common in creeks and medium sized streams in western Louisiana. Stern (1976) contended that *L. claibornensis* and this species possibly produce hybrids in eastern Louisiana. This is the most abundant mussel in the headwater creeks of the Calcasieu River system (Vidrine 1988b, 1989a, 1989b, and 1992a). The specimen labelled and illustrated on the Back Cover (Figure 9) and on Plate XIX (Figures O-P) is considered to be *Villosa iris* (Lea, 1829) (original determination by Daniel J. Bereza); however, John Harris (Pers. Comm.) suspects that it may indeed be *L. hydiana*. I have had no opportunity to collect or study a series of these shells, either species, from Arkansas, and I follow the original determination, since Dan Bereza had an opportunity to examine the soft anatomy and prepared it for study using electrophoretic methods.

Map 92. Historical distribution of *Lampsilis claibornensis* in North America.



Map 93. Historical distribution of *Lampsilis claibornensis* in Louisiana.

Lampsilis claibornensis (Lea, 1838)
southern fatmucket

Figures 12 and A-E
Back Cover and Plate XIV
Maps 92 and 93

Partial synonomy:
Lampsilis straminea claibornensis (Lea, 1838), Hartfield 1988, Turgeon *et al*. 1988
Lampsilis straminea (Conrad, 1834), sensu Stern 1976, non Conrad
Lampsilis claibornensis (Lea, 1838), Simpson 1914, Roback *et al*. 1980, Vidrine 1985, 1989b
Lampsilis fasciata claibornensis (Lea, 1838), Frierson 1927 (p. 72)

Description: Shell solid, elliptical, greatly inflated when old, beaks scarcely elevated or inflated, their sculpture not seen; surface slightly concentrically sculptured but rather smooth, varying from greenish straw-colored to tawny-brown, sometimes having a few faint rays on the posterior slope; the rest of the shell is generally rayless; lunule scarcely developed; left valve with two rather small pseudocardinals and two strong laterals, the lower the larger; right valve with two pseudocardinals, the upper the smaller and one strong lateral; muscle scars well impressed; beak cavities moderately deep; nacre bright silvery, sometimes pink or salmon tinted, a little thicker in front. Male shell somewhat pointed behind about midway up from the base; female shell but slightly produced in the post-basal region, generally nearly round behind (Simpson 1914, p. 70).

Type locality: Alabama River, Claiborne, AL.

General distribution: Eastern Gulf drainages.

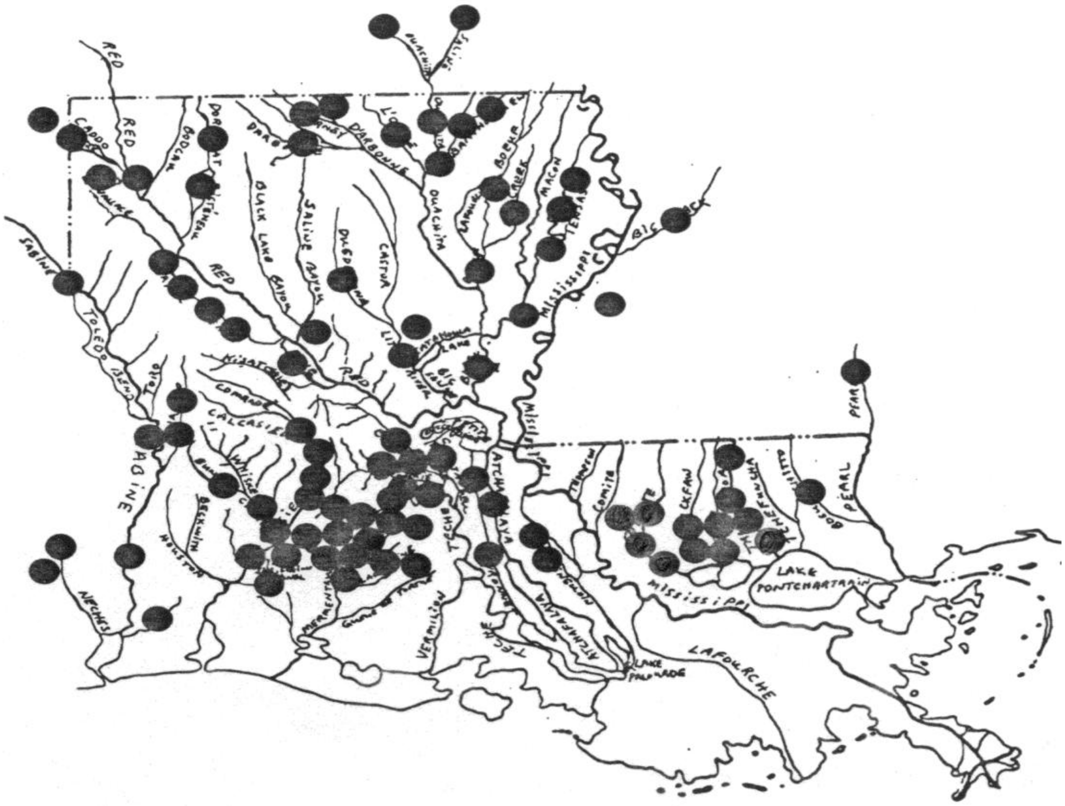
Comments: This is a very common species in eastern Louisiana creeks. Debate over the occurrence of this species in western Louisiana persists. This may indeed be a variety of *Lampsilis straminea* (Conrad, 1834). The description of *L. straminea* follows:

Shell long elliptical or long obovate, not greatly inflated, subsolid, with a slight posterior ridge; beaks not full or high, their sculpture not seen; surface usually sculptured with stong concentric ridges, rather shining, buff, straw-colored or greenish-yellow, often having faint rays on the posterior slope, and sometimes a few faint ones on the body of the shell; each valve having two pseudocardinals, the upper one in the right being compressed and smaller; left valve with two lamellar laterals; right valve with one lateral; beak cavities moderately deep; anterior muscle scars impressed; posterior scars faint; nacre bluish-white, rather dull, often with a dark spot in the region of the beak cavities, scarcely thickened in front. Male shell pointed behind, about midway up from the base; female shell often much produced at the posterior base, rounded or subtruncate behind (Simpson, 1914, p. 72).

Type locality: small streams in southern Alabama

Comments: Paul Hartfield (pers. comm., 1992) considered *Lampsilis straminea sensu stricto* to only occur in streams of the Tombigbee River system.

Map 94. Historical distribution of *Lampsilis teres* in North America



Map 95. Historical distribution of *Lampsilis teres* in Louisiana.

Lampsilis teres (Rafinesque, 1820)
yellow sandshell

Figures F-M
Plate XIV
Maps 94 and 95

Partial synonomy:
Lampsilis teres (Rafinesque, 1820), Vidrine 1985, 1989b, 1990c, Turgeon *et al*. 1988, Hartfield 1988, Roback *et al*. 1980, Strecker 1931, Neck 1990, Frierson 1927 (p. 70)
Lampsilis anodontoides (Lea, 1834), Simpson 1914, Stern 1976, Gordon *et al*. 1980, Murray and Roy 1968
Unio anodontoides Lea, 1834, Vaughan 1892, 1893, Frierson 1899a, 1899b
Lampsilis fallaciosus (Smith, 1899), Vanatta 1910, Shira 1913, Coker 1915
Lampsilis anodontoides fallaciosus (Smith, 1899), Stern 1976

Description: Shell large, elongate, with dorsal and ventral lines nearly parallel, rounded in front, pointed behind, more or less inflated, solid; beaks rather full but not high, their sculpture consisting of numerous distinct ridges looped in the middle but open behind; posterior ridge low and rounded; surface smooth and shining, but often having concentric growth ridges in front; tawny to pale straw color, sometimes with a few rays on the posterior slope, the rest of the shell generally rayless; there is often a large brown flush in the umbonal region; ligament large and long; left valve with two subcompressed pseudocardinals, the hinder somewhat elongated, and two long, nearly straight, delicate laterals; right valve with two pseudocardinals, the upper faint, and one lateral; beak cavities not deep; muscle scars rather large, well impressed; nacre white, cream-colored, salmon-tinted or pink, slightly thicker in front. Both male and female shells end behind in a point two-thirds of the way up from the base; the female shell has a large, rounded marsupial swelling and is slightly incurved at the central base (Simpson 1914, p. 90).

Type locality: Mississippi, Alabama, and Ohio Rivers.

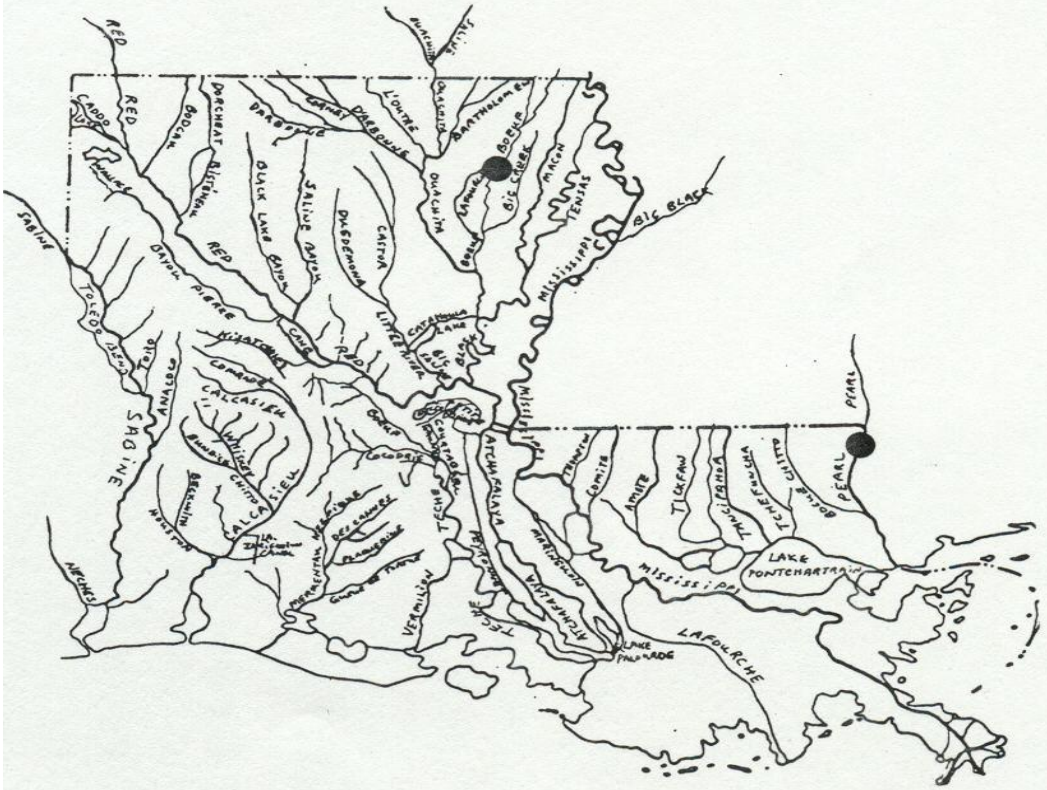
General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: This species includes *Lampsilis fallaciosa* Smith 1899 in Simpson 1914, p. 92. It is rayed in some streams, but generally a population will contain a mix of rayed and unrayed specimens. The degree of male and female shell dimorphism is highly variable. This is probably the most widely distributed mussel species in Louisiana.

Genus *Ligumia* Swainson, 1840

Animal characters: Differs from those of *Villosa* in the structure of its rough mantle edge antero-ventrad to branchial opening being more differentiated into a greater number and longer row of papillae on the inner edge extending down quite to the central part of the ventral edge. These papillae are often quite tentacular and are rather regular and uniform in shape and size and are never widely separated as in the case of the *Villosa* mantle edge of this anterior branchial border. Its inner laminae of the inner gills are usually entirely connected with the visceral mass; however, a small hole is sometimes left at the posterior end post-dorsad to the foot.

Map 96. Historical distribution of *Ligumia recta* in North America.



Map 97. Historical distribution of *Ligumia recta* in Louisiana.

Shell characters: In shell characters there are no great distinctions to be considered as a group since the chief distinguishing characteristic is in the post-mantle edge as above discussed. Its beak sculpturing is identical with that of the *Villosa* shell, being sinuated or double-looped, the posterior loops being more or less broken behind. Utterback (1915-16: 438).

Comments: Two species occur in Louisiana. The noted form, *Unio mississippensis*, is also common in at least one stream.

Key to species in Louisiana:

1a. Shell very thick, elongate, epidermis smooth and nearly dark black, uncommon in Louisiana.....*L. recta*
1b. Shell distinctly rayed, not black; epidermis smooth to roughened, rather common in creeks and ponds.....*L. subrostrata*

Ligumia recta (Lamarck, 1819)
black sandshell

Figures N-P
Plate XIV
Maps 96 and 97

Partial synonomy:
Ligumia recta (Lamarck, 1819), Stern 1976, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Roback *et al*. 1980, Hartfield 1988, Gordon *et al*. 1980, Murray and Roy 1968
Lampsilis recta (Lamarck, 1819), Simpson 1914, Frierson 1927 (p. 70)

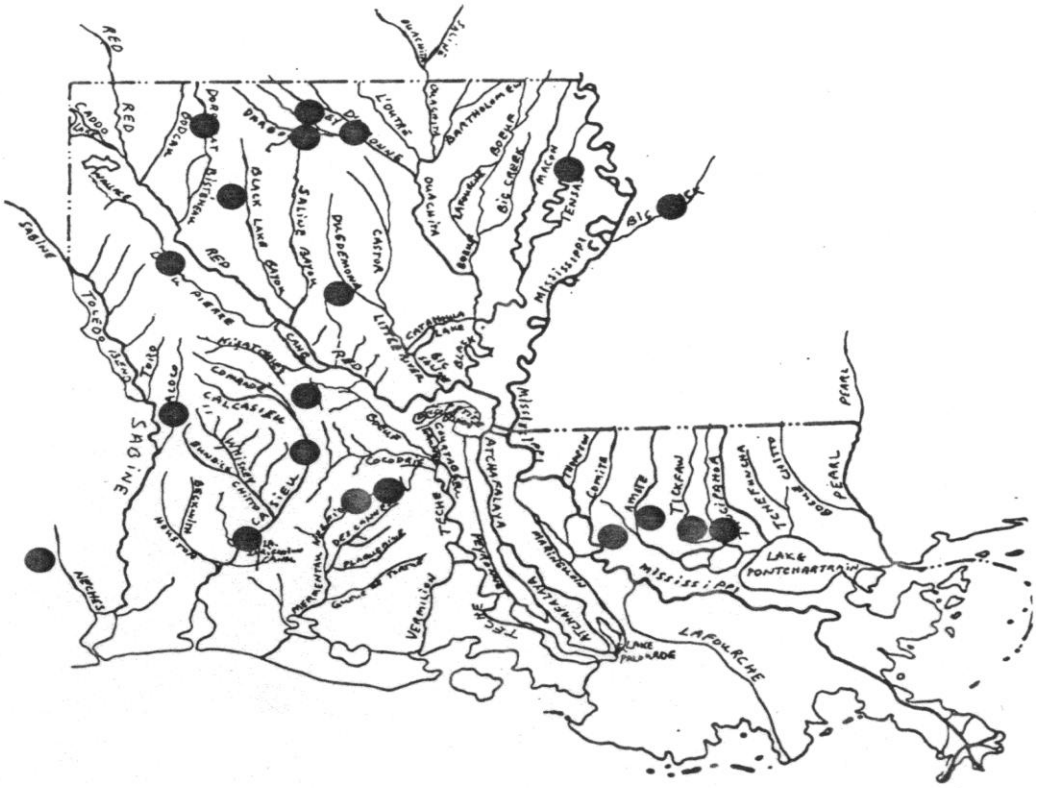
Description: Shell large, elongated, dorsal and ventral lines nearly parallel, solid, inflated, rounded in front, pointed behind; with full but rather low beaks, whose sculpture consists of faint, delicate ridges, scarcely doubly looped; posterior ridge rather low, rounded; ligament long; surface faintly and irregularly, concentrically sculptured, varying from black to olive-green, generally lighter colored in the umbonal region, the young and sometimes older shells often faintly rayed; left valve with two long nearly equal, ragged, erect pseudocardinals and two long, slightly curved laterals; right valve with one pseudocardinal, a feeble, compressed one above it, and one lateral with a vestige of a second below it; muscle scars well impressed, smooth; beak cavities shallow, with two or three deep dorsal scars; nacre purple or bluish-white, often whitish, with a purple flush at the beak cavities. The male shell is drawn out behind and ends in a blunt point about midway up from the base; the female shell has a long, rounded marsupial swelling and ends in a more blunt point two-thirds of the way up from the base (Simpson 1914, p. 95).

Type locality: Lake Erie.

General distribution: Mississippi Interior Basin and Eastern Gulf drainages.

Comments: The only Louisiana specimens examined are from Boeuf River in northern Louisiana.

Map 98. Historical distribution of *Ligumia subrostrata* in North America.



Map 99. Historical distribution of *Ligumia subrostrata* in Louisiana.

Ligumia subrostrata (Say, 1831)
pondmussel

Figures A-H
Plate XV
Maps 98 and 99

Partial synonomy:
Ligumia subrostrata (Say, 1831), Stern 1976, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Hartfield 1988, Neck 1986, Gordon *et al*. 1980, Murray and Roy 1968, Bereza *et al*. 1976
Lampsilis subrostrata (Say, 1831), Simpson 1914, Strecker 1931, Frierson 1927 (p. 77)
Unio mississippiensis Conrad, 1850, Vaughan 1892, 1893
Unio rutersvillensis Lea, 1859, Frierson 1899a

Description: Shell elongated, irregularly elliptical, subsolid, somewhat inflated, with moderately full beaks sculptured with numerous delicate ridges that are sharply drawn up in the middle; very slightly winged; round in front and rather sharply pointed behind; growth lines irregular; posterior ridge moderately developed; surface dull, dirty greenish-yellow, generally having faint, wide, wavy rays on the hinder portion, often having concentric bands of lighter and darker color; teeth compressed, two pseudocardinals in each valve, the upper in the right valve smaller; one lamellar lateral in the right valve and two in the left; muscle scars shallow; beak cavities moderate; nacre bluish-white, scarcely thicker in front. The dorsal and ventral lines of the male shell are nearly parallel; it is more or less angled at the post-base and ends behind in a rather sharp point above the middle; the female shell is narrowed in front, with a very large, rounded marsupial swelling, in front of this the basal line is incurved (Simpson 1914, p. 99).

Type locality: Wabash River.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

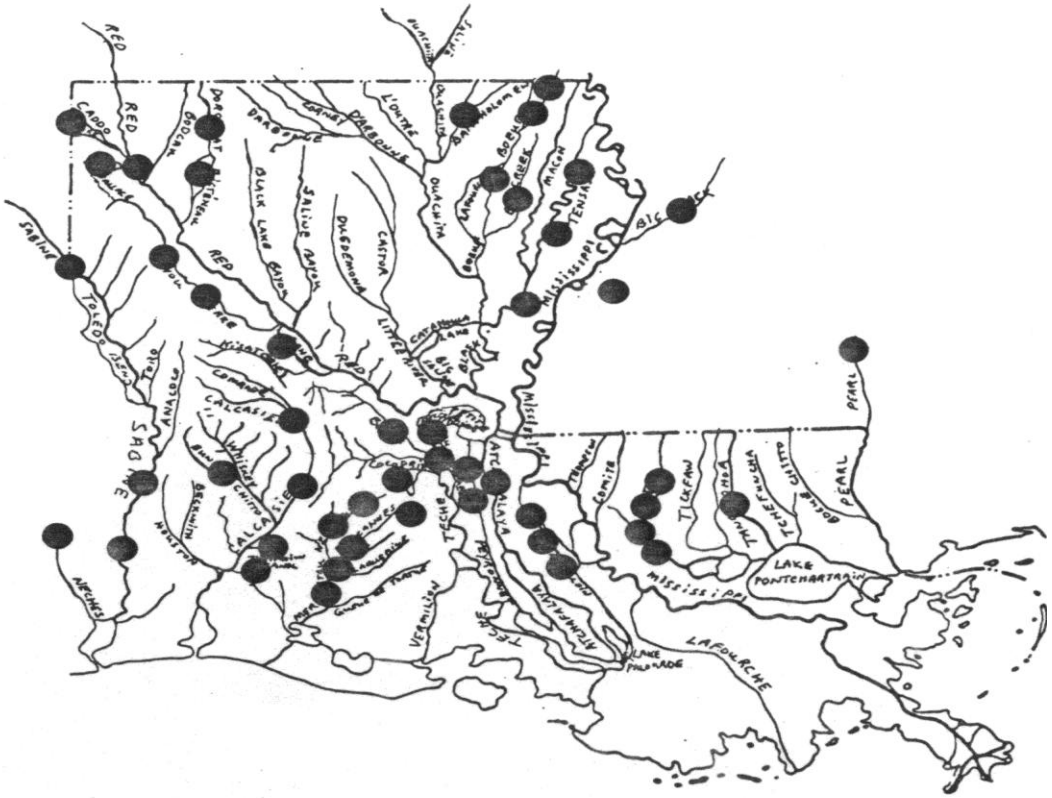
Comments: The variety, *Unio mississippiensis* Conrad 1850 (Plate XV, Figures A and B), is common in upper Bayou Nezpique (Mermentau River drainage). *Ligumia subrostrata* is abundant in creeks in northern Louisiana and in some ponds in different parts of the state. Thomas H. Dietz, his students and colleagues have used this species as "physiological model" using Louisiana populations. The first paper (Dietz 1974) has been followed by a long series of papers.

Genus *Leptodea* Rafinesque, 1820

Animal characters: Siphonal openings large, inclined to be tubular; supra-anal high, well separated from anal; inner laminae of inner gills entirely connected to visceral mass; palpi free their whole length post-dorsad; color of soft parts grayish with yellowish papillae on blackened mantle edge or branchial opening; marsupium kidney-shaped, consisting of several ovisacs occupying posterior part of outer gills; conglutinates white, leaflike, not very solid; glochidia very small, subovate; spineless, hinge line short, slightly curved.

Shell characters: Shell thin, sub-elliptical, alated, compressed; post-umbonal ridge lacking; disk smooth; umbones low, marked with fine concentric lines followed by later double-looped bars; epidermis glistening tawny, rayed; sexual dimorphism shown in wider,

Map 100. Historical distribution of *Leptodea fragilis* in North America.



Map 101. Historical distribution of *Leptodea fragilis* in Louisiana.

more blunt vertically at posterior end of female shell; hinge teeth reduced to rudiments. Utterback (1915-16: 351).

Comments: A single species occurs in Louisiana.

Leptodea fragilis (Rafinesque, 1820)
fragile papershell

Figures I-L
Plate XV
Maps 100 and 101

Partial synonomy:
Leptodea fragilis (Rafinesque, 1820), Stern 1976, Vidrine 1985, 1989b, Turgeon *et al.* 1988, Roback *et al.* 1980, Hartfield 1988, Neck 1986, 1990, Gordon *et al.* 1980, Murray and Roy 1968
Lampsilis gracilis (Barnes, 1823), Simpson 1914, Coker 1915, Shira 1913
Unio gracilis Barnes, 1823, Vaughan 1892, 1893, Frierson 1899a, 1899b
Lampsilis fragilis (Rafinesque, 1820), Strecker 1931, Frierson 1927 (p. 82)

Description: Shell large, thin, obovate, subcompressed to subinflated, with generally low compressed beaks having very feeble sculpture, which shows a tendency to be doubly looped; posterior ridge almost wanting, with two or sometimes three radial raised lines on the posterior slope; there is a moderately developed posterior wing, which is broken away in adult specimens showing the long ligament, and in front of the hinge the young shell is angular; surface rather smooth, with faint, irregular growth lines, greenish-yellow or pale smoky-brownish, green and generally rayed; left valve with two feeble, compressed pseudocardinals and two remote, often imperfect, laterals; right valve with one pseudocardinal and one truncate lateral; beak cavities shallow, showing a row of ill-developed muscle scars running in the direction of the retractor muscle scar; adductor scars large, faint, the anterior irregular; nacre faint purplish and bluish. Generally the male and female are much alike, the former is sometimes a little rhomboid and ends in a wide, rounded point about on the median line. The female shell is a little fuller and more rounded on the post-basal region, and sometimes has a well-developed marsupial swelling (Simpson 1914, p. 181).

Type locality: Wisconsin River and the "Lakes"

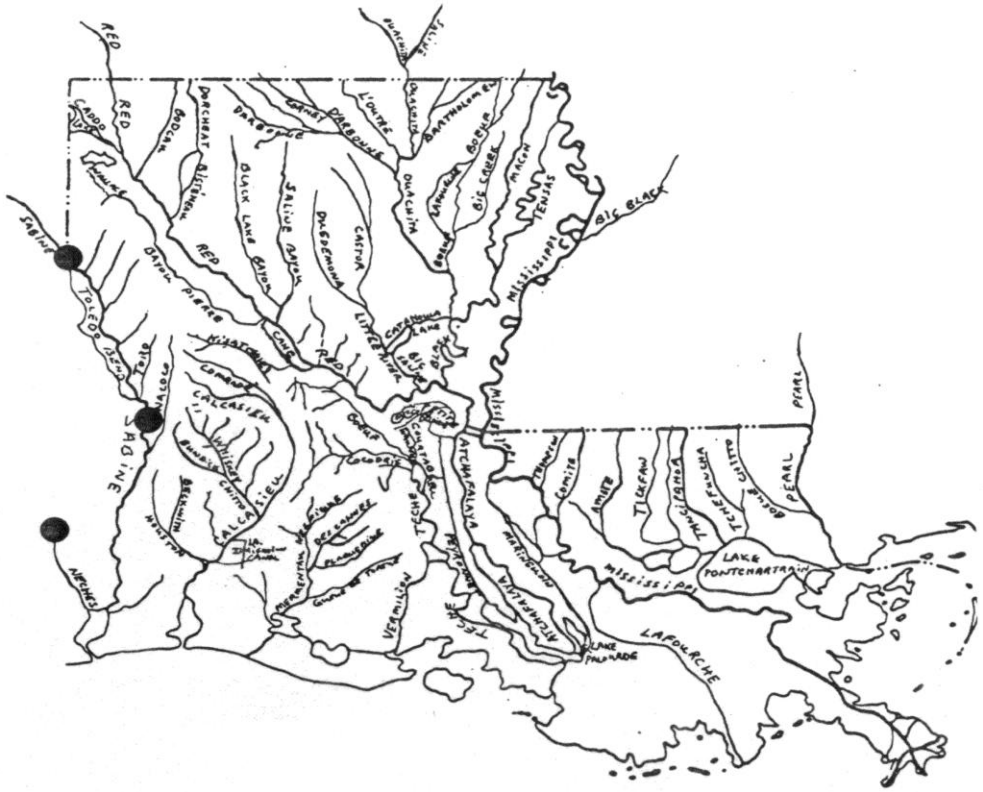
General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainage.

Comments: This thin-shelled species is extremely variable, but it is rather easy to identify with its highly reduced pseudocardinal and hinge teeth. Dark shells can be confused with *P. ohiensis*. *Leptodea leptodon* (Rafinesque, 1820), a related species, has been reported in the Ouachita River in Arkansas (Harris and Gordon 1987).

Genus *Potamilus* Rafinesque, 1818

Animal characters: Branchial opening with dense papillae; anal crenulated; supra-anal small, moderately closely connected to anal; inner laminae entirely connected to visceral mass; palpi only

Map 102. Historical distribution of *Potamilus amphichaenus* in North America.



Map 103. Historical distribution of *Potamilus amphichaenus* in Louisiana.

slightly antero-dorsad; marsupia reniform, occupying posterior part of outer gills, consisting of several ovisacs; conglutinates not solid, broken; glochidium ax-head or celt-shape (ligulate), usually armed with two spines at each corner of ventral edge of each valve; mantle border antero-ventrad to branchial opening slightly lamellar with crenulations only.

Shell characters: Shell subelliptic to subovate, solid to thin, strongly alated post-dorsad; disk smooth; hinge fairly well developed; beaks low, sculptured by the early bars of fine concentric arrangement and later one of double-looped type--sometimes rather nodulous at base of post ridge; sexually dimorphic, the female shell being wider posteriorly by the expansion of the post-ventrad edge of the shell. Utterback (1915-16: 388).

Comments: Five species occur in Louisiana. This very variable group deserves further study. Gordon (1990) recently reviewed the status of the name *Proptera* Rafinesque, 1819, and the debate over the name continues. The AFS list name is followed in this report.
Key to the species in Louisiana.

1a. Shell decidedly alate (highly developed posterior dorsal wing); purplish nacre.....2
1b. Shell not alate; nacre white, pink or purple.....3

2a. Distributed in Eastern Gulf drainages.....*P. inflatus*
2b. Distributed west of Eastern Gulf drainages.....*P. ohiensis*

3a. Shell thin, compressed, elliptical in outline..*P. amphichaenus*
3b. Shell thick, inflated, more ovate to round in outline.....4

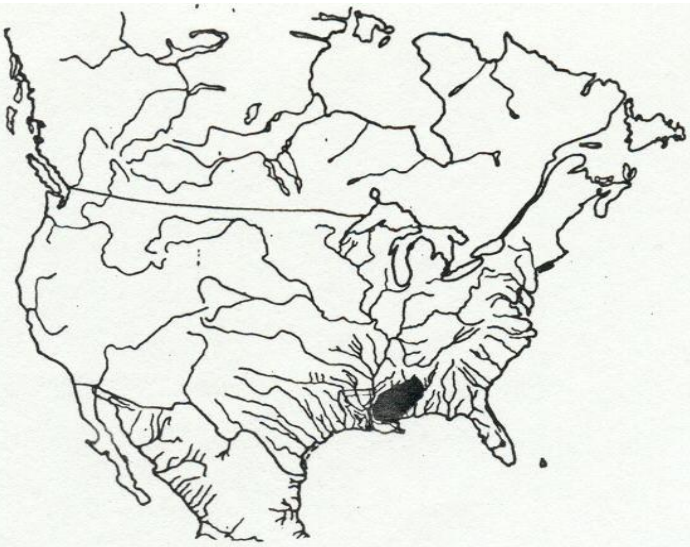
4a. Nacre brilliant red to purple; epidermis dark....*P. purpuratus*
4b. Nacre pinkish to white; epidermis yellowish.....*P. capax*

Potamilus amphichaenus (Frierson, 1898)
Texas heelsplitter

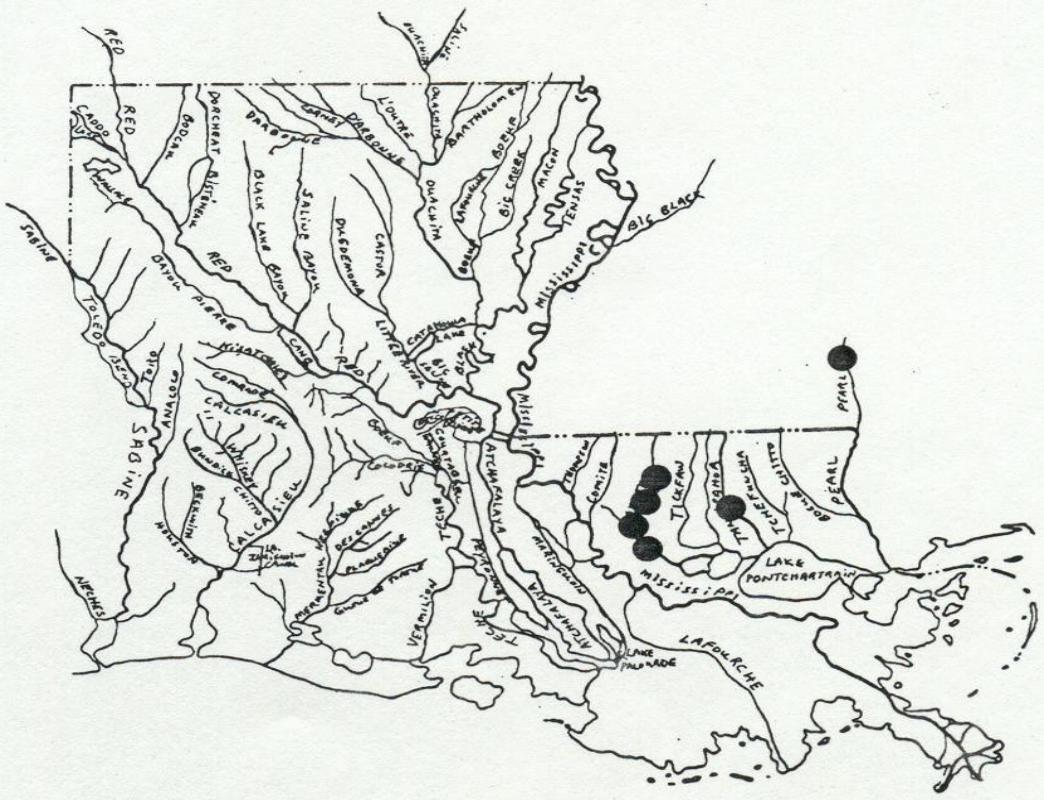
Figures M-O
Plate XV
Maps 102 and 103

Partial synonomy:
Potamilus amphichaenus (Frierson, 1898), Vidrine 1989b, Turgeon *et al*. 1988, Neck 1984, 1986, 1990
Proptera amphichaena (Frierson, 1898), Vidrine 1985, Stern 1976, Roback *et al*. 1980, Murray and Roy 1968, Strecker 1931, Frierson 1927 (p. 87)
Lampsilis amphichaena (Frierson 1898), Simpson 1914
Unio (Lampsilis) amphichaenus Frierson, 1898, Frierson 1899a, 1899b

Description: Shell large, long elliptical, subinflated, subsolid, with moderately full, but not high, beaks, whose sculpture has not been seen; with a long, narrow gape on the anterior base and a most decided one behind just above the posterior point; posterior ridge full, rounded; surface with irregular growth marks; epidermis dark brown to jet black, smooth and shining on the middle of the disk, somewhat roughened and lamellar on the rest of the shell, especially on the posterior slope; left valve with one rather feeble, subcompressed pseudocardinal and a vestigial second in front of and below it, with two short, very remote laterals; right valve with one



Map 104. Historical distribution of *Potamilus inflatus* in North America.



Map 105. Historical distribution of *Potamilus inflatus* in Louisiana.

pseudocardinal, sometimes with a smaller one above, and a remote lateral, whose inner edge is curved upward; beak cavities shallow, with an irregular row of large muscle scars running down towards the anterior base; anterior scars large, shallow; posterior scars small, somewhat elongated; pallial line wide, with a distinct sinus behind; nacre bluish and purplish, somewhat clouded. The female shell differs but slightly from that of the male, being a little fuller just behind the middle of the base and having the blunt posterior point a trifle higher (Simpson 1914 p. 186).

Type locality: Sabine River at Logansport, Texas.

General distribution: Western Gulf drainages.

Comments: Neck (1984, 1986 and 1990) reported it from several stations in Texas. The only specimens that I have collected are from the Neches River in Texas. These have an extraordinary siphonal structure. The siphons are elongate (as much as 1-2 inches in length) and can apparently extend through the substrate allowing the mussel to be deeply buried.

Potamilus inflatus (Lea, 1831)
inflated heelsplitter
Figures P-R
Plate XV
Maps 104 and 105

Partial synonomy:
Potamilus inflatus (Lea, 1831), Hartfield 1988, Turgeon *et al*. 1988
Proptera inflata (Lea, 1831), Stern 1976, Vidrine 1985, Frierson 1927 (p. 87)
Lampsilis inflata (Lea, 1831), Simpson 1914

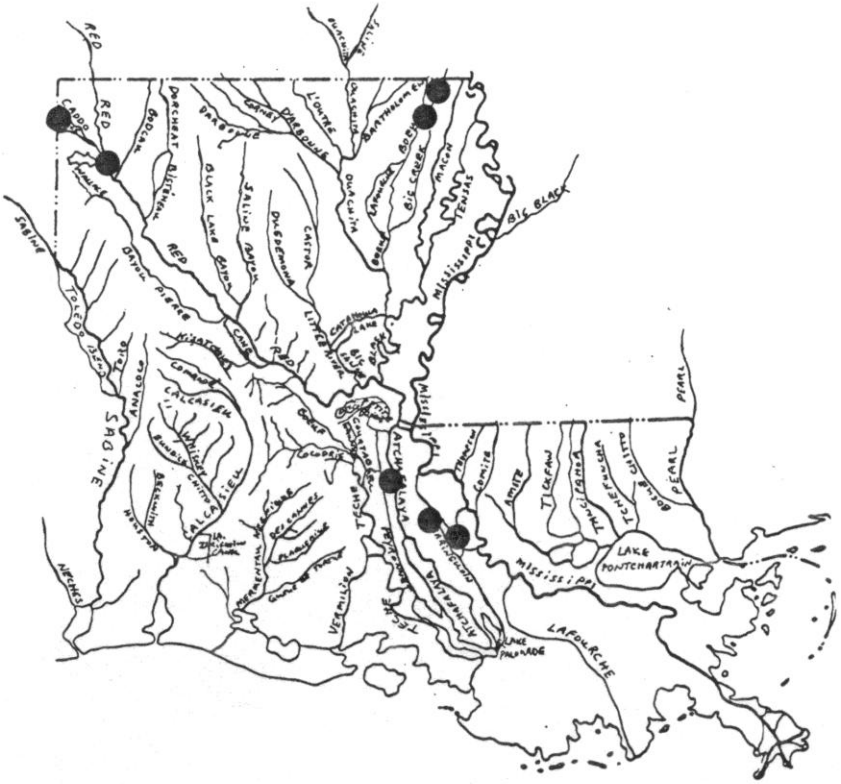
Description: Shell somewhat trapezoidal, truncate on the posterior slope and narrowed in front, thin, subinflated, having its greatest diameter just behind the center; dorsal wing probably high in young shells; posterior ridge high and widely rounded; beaks low and compressed, their sculpture not seen; epidermis greenish-olive to dark brownish, scarcely shining, nearly or quite rayless; in young shells there are often one or two faint, wide, dark rays on the posterior slope; left valve with a feebly developed, elongated pseudocardinal and two short, remote laterals; right valve with one faint, elongated pseudocardinal and one high, short, truncated lateral; beak cavity shallow, with a row of irregular, large scars; adductor scars shallow, the anterior ones large; nacre rich purple, iridescent behind. There seems to be but little difference between shells of the male and female (Simpson 1914, p. 184).

Type locality: Alabama River.

General distribution: Eastern Gulf drainages.

Comments: This is a federally protected, rare species. Hartfield (1988) surveyed its known range and re-evaluated the Amite River populations which Stern (1976) had reported.

Map 106. Historical distribution of *Potamilus ohiensis* in North America.



Map 107. Historical distribution of *Potamilus ohiensis* in Louisiana.

Potamilus ohiensis (Rafinesque, 1820)
pink papershell

Figures A-D
Plate XVI
Maps 106 and 107

Partial synonomy:
Potamilus ohiensis (Rafinesque, 1820), Turgeon *et al*. 1988,
Potamilus ohioensis (Rafinesque, 1820), Oesch 1984
Proptera laevissima (Lea, 1830), Stern 1976, Vidrine 1985, Strecker 1931, Frierson 1927 (p. 86)
Potamilus laevissimus (Lea, 1830), Vidrine 1989b
Lampsilis laevissima (Lea, 1830), Simpson 1914
Unio laevissimus Lea, 1830, Vaughan 1893, Frierson 1899a
Leptodea laevissima (Lea, 1830), Murray and Roy 1968

Description: Shell, without the wings, nearly evenly elliptical, a little wider behind with a decided posterior and anterior basal gap, thin , subcompressed, strongly alate, having a very high, triangular posterior wing that is often flexed at the top, and a small anterior wing; beaks subcompressed, not high, with a few nodulous, broken, slightly-looped ridges; surface with numerous irregular growth lines, sculptured in fine specimens with delicate radiating lirae, smoky-olive, lighter at the beaks, the rest bands dark, brilliantly polished; left valve with one or two feeble, compressed pseudocardinals and two remote, delicate laterals; right valve with one pseudocardinal, sometimes a faint one above it, and a high, truncated lateral; beak cavities shallow, with an irregular row of shallow scars; adductor scars large and shallow; nacre purplish. The male and female shells are so near alike that it is often difficult to separate them. The male shell is generally slightly rhomboid behind and the female is a very little fuller along the base (Simpson 1914, p. 183).

Type locality: Ohio.

General distribution: Mississippi Interior Basin and Western Gulf drainages.

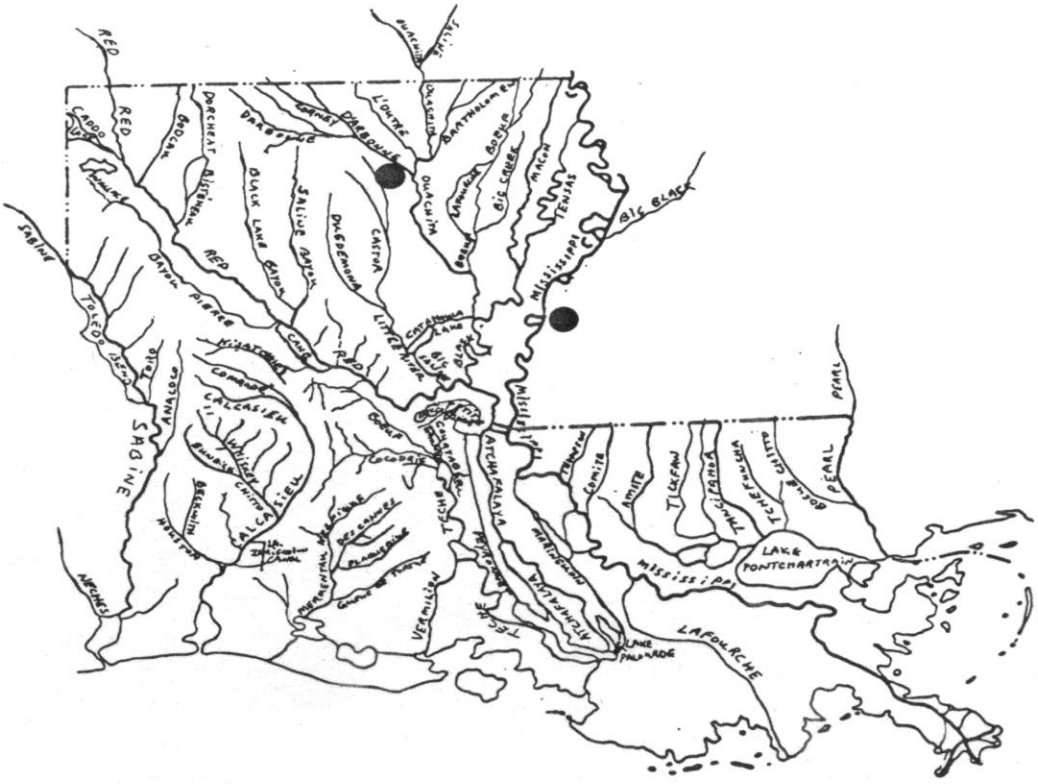
Comments: *Anodonta ohiensis* Rafinesque is considered to be this species (Oesch 1984). This species seems to do well in impoundments. *Potamilus inflatus*, *P. amphichaenus*, and this species form a complex across the Gulf coastal drainages. Frierson (1911) showed considerable interest in the seeming geographic isolation of these three species.

Potamilus capax (Green, 1832)
fat pocketbook

Figures E-F
Plate XVI
Maps 108 and 109

Partial synonomy:
Potamilus capax (Green, 1832), Turgeon *et al*. 1988, Oesch 1984
Proptera capax (Green, 1832), Vidrine 1985, Stern 1976, Gordon *et al*. 1980, Harris and Gordon 1987, Frierson 1927 (p. 87).
Lampsilis capax (Green, 1832), Simpson 1914
Unio globulus Lea, 1838, Featherman 1872

Map 108. Historical distribution of *Potamilus capax* in North America.



Map 109. Historical distribution of *Potamilus capax* in Louisiana.

Description: Shell greatly inflated, subsolid, obovate, with an excessively full, high, rounded umbonal region; the beak sculpture consists of very faint oblique ridges; surface generally smooth and somewhat shining, of a smoky olive color; rest marks distinct; ligament moderately long, passing forward under the beaks and appearing in front of them in a rather wide lunule; posterior ridge full and rounded; hinge line very strongly doubly curved; left valve with a single, sometimes a partially double pseudocardinal in front of the beak, generally ragged and considerably compressed; the hinge line is narrow and rounded behind, and has two small, compressed, distant laterals; right valve with two compressed, ragged pseudocardinals opposite each other, the upper extending back to the beak, and a single, high, thin, decidedly truncate lateral; beak cavities deep and very wide; muscle scars shallow, smooth; pallial line distinct; nacre bluish-white, pinkish or salmon-tinted. The shells are all full at the posterior base, those of the female but little more inflated in that region than are the males (Simpson 1914, p. 47).

Type locality: Falls of St. Anthony; Bayou Teche.

General distribution: Mississippi Interior Basin drainages.

Comments: This is a federally endangered species. A recent record in Jefferson Co., MS, is deposited in the Mississippi Museum of Natural Science (the plates in this report are made from these specimens). Branson (1966) reported one specimen from a strip-pit, 8.1 miles west of Monroe, Highway 80, Louisiana, collected 2 June 1963. Frierson (1927) considered the Bayou Teche record (one of the type localities) to represent *L. satura*. However, I have never encountered either species in the Bayou Teche system. This species could be confused with *L. satura*, but it has a lightly purplish nacre and the females lack the fish-like development on the postbasal mantle. A thorough search of northeastern Louisiana is necessary in order to ascertain the distribution of this species.

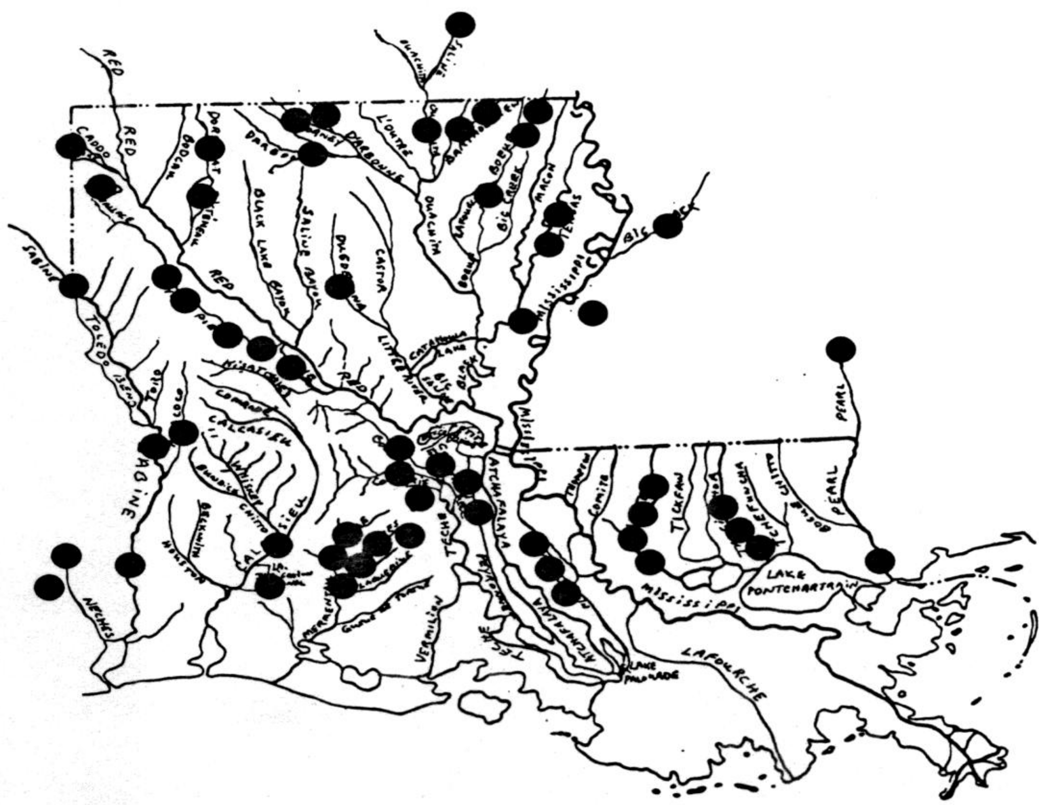
Potamilus purpuratus (Lamarck, 1819)
bleufer

Figures G-K
Plate XVI
Maps 110 and 111

Partial synonomy:
Potamilus purpuratus (Lamarck, 1819), Vidrine 1989b, Turgeon *et al.* 1988, Hartfield 1988, Neck 1986, 1990
Proptera purpurata (Lamarck, 1819), Vidrine 1985, Stern 1976, Strecker 1931, Gordon *et al.* 1980, Roback *et al.* 1980, Murray and Roy 1968, Frierson 1927 (p. 86)
Lampsilis purpurata (Lamarck, 1819), Simpson 1914, Vanatta 1910, Shira 1913, Coker 1915
Unio purpuratus Lamarck, 1819, Vaughan 1892, 1893, Frierson 1899a, 1899b

Description: Shell very large, somewhat obovate, inflated, with full, high beaks, having very faint, corrugated sculpture, scarcely winged in front, with a low, angular wing behind; there are two or sometimes three low, radiating ridges on the posterior slope; surface nearly smooth or somewhat sulcate, covered with a shining, blackish epidermis, ligament large and long, generally exposed in adult shells; left valve with two subcompressed to solid, ragged

Map 110. Historical distribution of *Potamilus purpuratus* in North America.



Map 111. Historical distribution of *Potamilus purpuratus* in Louisiana.

pseudocardinals and two strong, remote laterals, the hinge line rounded between the two sets of teeth; right valve with two pseudocardinals, the lower the larger, and one strong, truncated lateral; beak cavities rather deep, with a row of deep scars running towards the anterior base; muscle scars large, the anterior deep and smooth, the posterior scarcely impressed; nacre rich, dark purple, somewhat iridescent behind, much thicker in front. Male shell full at the posterior base, rounded and obtusely biangulate behind above the median line; the female shell has a wide, rounded, marsupial swelling far behind, and is decidedly truncate posteriorly (Simpson 1914, p. 166).

Type locality: "Africa"

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: This remarkable species can attain a huge size. I found a specimen ca. 8 inches in length in Bayou des Cannes in an old oxbow left by channelization. Its shell is highly prized for jewelry.

Genus *Ptychobranchus* Simpson, 1900

Animal characters: Branchial opening with papillae; anal separated from supra-anal by short mantle connection but never lacking; inner laminae of inner gills more or less free from visceral mass; palpi very small, connected about one-fourth of their length; color of soft parts mostly whitish with mantle edge black along the siphonal openings; marsupium occupying whole outer gill with a number of folds; ventral edge, when gravid, presents a beaded appearance; glochidia medium in size, subovate; conglutinates white, solid, subcylindrical.

Shell characters: Shell subelliptic, rather elongate, arched dorsad, disk smooth; beaks low, sculpturing indistinct, finely concentric; later bars, however, somewhat double-looped; epidermis yellowish to olivaceous, painted with capillarylike rays forming interrupted squarish spots; hinge teeth well formed; branchial impression of female shell very distinct; nacre white to pearl blue. Utterback (1915-16: 316).

Comments: A single species occurs in Louisiana.

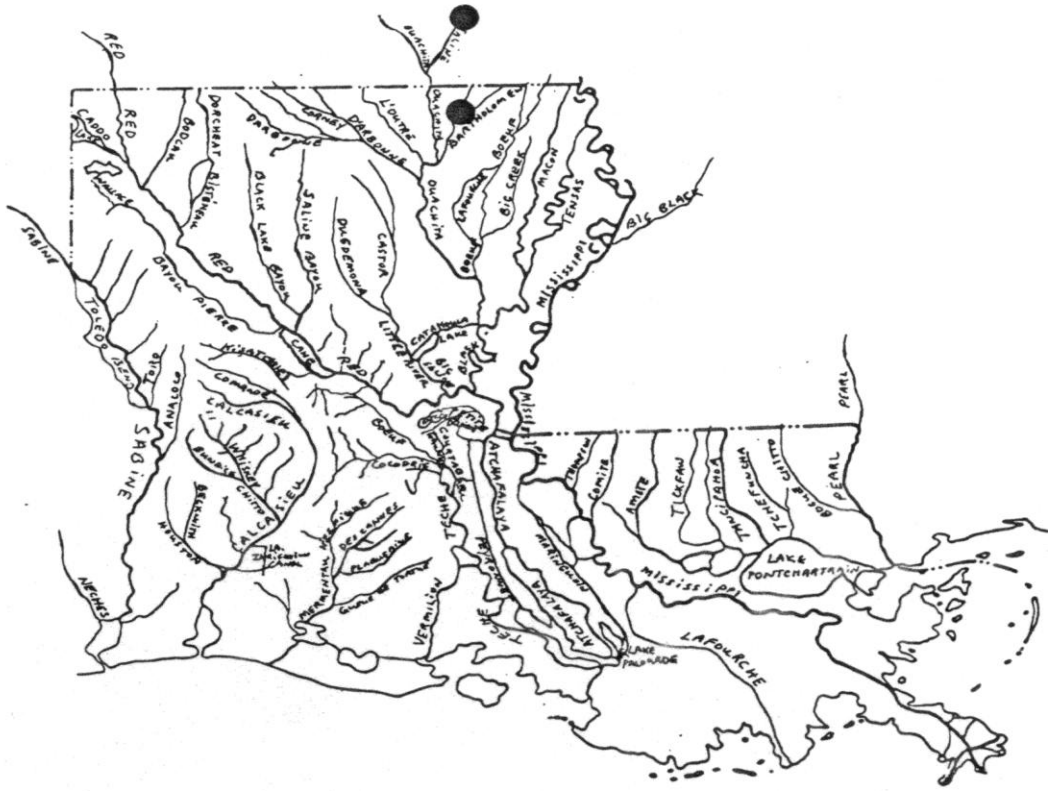
Ptychobranchus occidentalis (Conrad, 1836)
Ouachita kidneyshell

Figures L-M
Plate XVI
Maps 112 and 113

Partial synonomy:
Ptychobranchus occidentalis (Conrad, 1836), Vidrine 1989b, Turgeon *et al*. 1988, Gordon *et al*. 1980, Frierson 1927 (p. 65)
Lampsilis occidentalis (Conrad, 1836), Simpson 1914

Description: Shell obovate or subrhomboidal, convex, thin or subsolid, rounded in front, bluntly pointed or subbiangulate behind; posterior ridge scarcely developed; beaks slightly elevated, their sculpture not seen, but probably having fine, doubly-looped ridges; epidermis yellowish, yellowish-green or brownish, with numerous more or less distinct rays, mostly on the posterior part of the shell,

Map 112. Historical distribution of *Ptychobranchus occidentalis* in North America.



Map 113. Historical distribution of *Ptychobranchus occidentalis* in Louisiana.

slightly shining; left valve with two pseudocardinals, the anterior larger, and two delicate, nearly straight laterals; right valve with two pseudocardinals, the lower larger, and one lateral; nacre bluish-white, scarcely thickened in front. Male shell somewhat rhomboid, the posterior point nearest to the base; female with a long, rather full marsupial swelling, slightly biangulate behind, the biangulation midway up from the base or a little higher (Simpson 1914, p. 112).

Type locality: Current River, Arkansas.

General distribution: Ozark Province of the Mississippi Interior Basin drainages.

Comments: George and Vidrine (in prep.) report this species from Bayou Bartholomew. This species is characteristic of the Ozark fauna (van der Schalie and van der Schalie 1950), as is *Cyprogenia aberti* (Conrad, 1850) (Plate XIX, Figure N).

Genus *Toxolasmus* Rafinesque, 1831

Animal characters: Branchial opening small with rather large papillae; anal smooth, supra-anal large, closely connected to anal; inner laminae of inner gills free, more or less, from the visceral mass; palpi small, connected half of their length antero-dorsad; marsupia formed by a few large ovisacs occupying posterior part of the outer gills, reniform; branchial edge with a papillose caruncule; conglutinates solid, white, club-shaped; glochidia medium in size, semi-elliptic.

Shell characters: Shell very small, elliptic, rounded before, rather thick, disk smooth; beaks low, coarsely sculptured by regular concentric bars upcurved behind; epidermis dark, cloth-like. Utterback (1915-16: 395).

Comments: Two species occur in Louisiana.

Key to the species in Louisiana:

1a. Epidermis rough; female shell significantly produced post basally .....*T. texasensis*
1b. Epidermis smooth; female shell slightly produced.....*T. parvus*

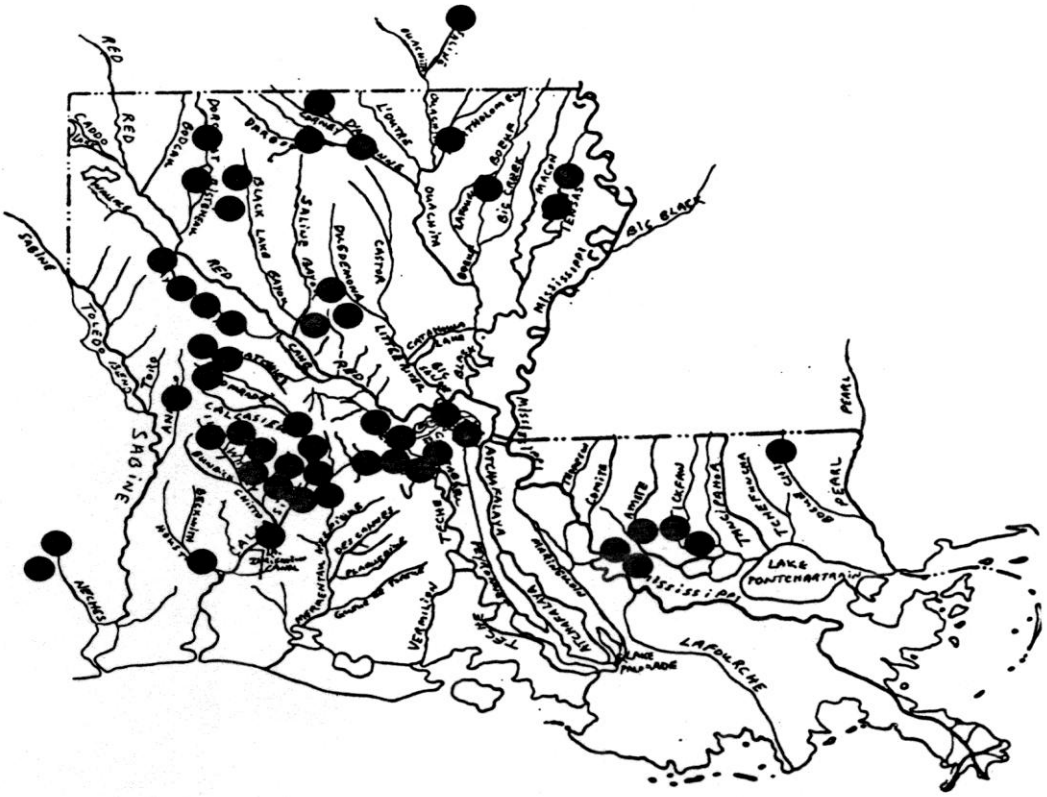
Toxolasmus parvus (Barnes, 1823)
lilliput

Figures A-E
Plate XVII
Maps 114 and 115

Partial synonomy:
Toxolasmus parvus (Barnes, 1823), Turgeon *et al.* 1988, Hartfield 1988, Neck 1986, 1990
Carunculina parva (Barnes, 1823), Vidrine 1985, 1989b, Stern 1976, Gordon *et al.* 1980, Roback *et al.* 1980, Frierson 1927 (p. 87)
Lampsilis parva (Barnes, 1823), Simpson 1914
Unio parvus Barnes, 1823, Vaughan 1893
Carunculina parva compressa Simpson, 1900, Murray and Roy 1968
Carunculina parva mearnsi Simpson, 1900, Murray and Roy 1968

Description: Shell long elliptical or subcylindrical, generally a

Map 114. Historical distribution of *Toxolasmus parvus* in North America.



Map 115. Historical distribution of *Toxolasmus parvus* in Louisiana.

very little wider behind, inflated, subsolid, with full, but not high beaks, which are turned forward over a narrow lunule, their sculpture consisting of seven or eight single-looped ridges, which are curved up more behind than in front, and return at the posterior end on converging lines to the nucleus; posterior ridge wanting; epidermis thick and clothlike, blackish or fuscous, often brownish in the umbonal region; left valve with two compressed, ragged, recurved pseudocardinals, and two delicate laterals; right valve with one pseudocardinal, a minute one above it, and a single lateral; beak cavities and muscle scars shallow; nacre bluish-white, silvery and somewhat iridescent behind, slightly thickened in front. The male and female shells are much alike, the latter being more inflated and a little fuller at the extreme post-basal region. The male shell is usually evenly rounded behind, that of the female is often a little truncate and sometimes has a blunt point above (Simpson 1914, p. 151).

Type locality: Fox River.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: Vidrine (1985 and 1989b) did not separate this species from the next. This is usually a creek species with very little sexual dimorphism and a relatively smooth periostracum.

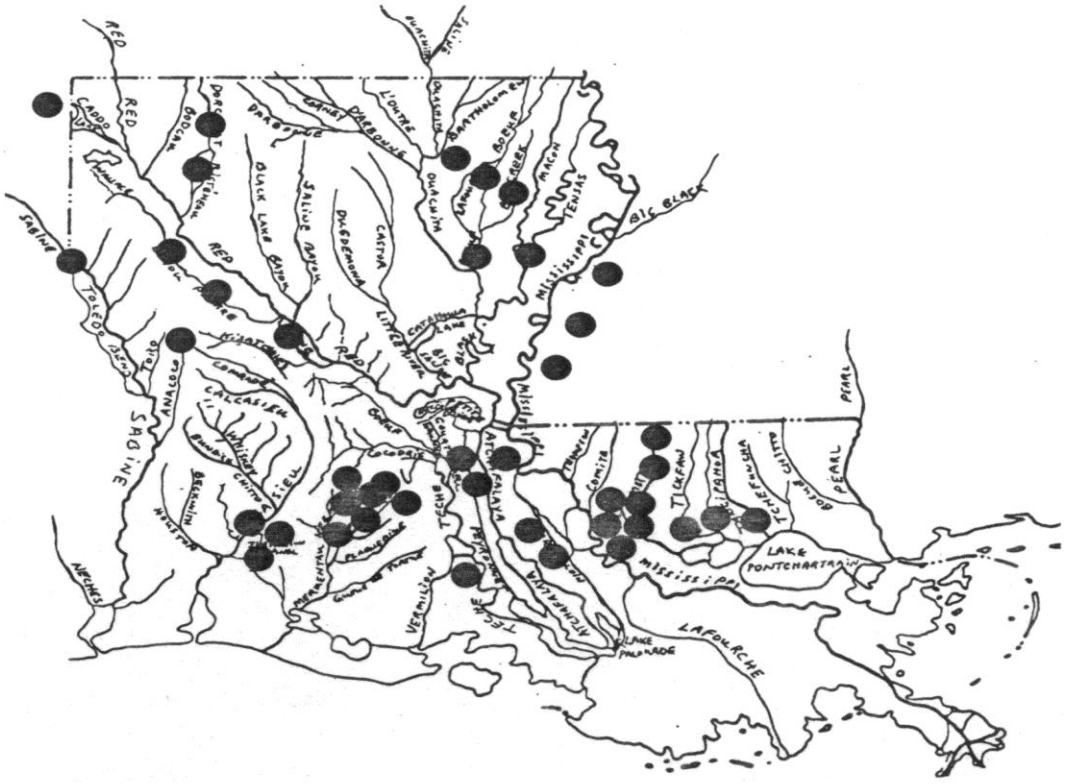
Toxolasmus texasensis (Lea, 1857)
Texas lilliput

Figures F-L
Plate XVII
Maps 116 and 117

Partial synonomy:
Toxolasmus texasensis (Lea, 1857), Turgeon *et al*. 1988, Neck 1986, 1990
Carunculina texasensis (Lea, 1857), Stern 1976, Gordon *et al*. 1980
Carunculina parva (Barnes, 1823), Vidrine 1985, 1989b (in part)
Lampsilis texasensis (Lea, 1857), Simpson 1914
Carunculina parva texasensis (Lea, 1857), Strecker 1931, Murray and Roy 1968, Frierson 1927 (p. 87)
Unio texasensis Lea, 1857, Vaughan 1892, 1893, Frierson 1899a
Unio bairdianus Lea, 1857, Vaughan 1893
Unio bealei Lea, 1862, Vaughan 1893

Description: Shell somewhat elliptical, subcompressed to inflated beaks low, but full in inflated specimens, sculptured with from seven to nine sharp ridges, which fall in a single loop and are curved upward rather suddenly behind to the posterior ridge, from which they return towards the nucleus in nearly convergent raised lines; posterior ridge well marked; surface covered with a thick, brownish or blackish epidermis, which is often chestnut tinted in the umbonal region; left valve with two compressed, ragged pseudocardinals, which are slightly reflexed and two curved laterals; right valve with one pseudocardinal and a vestige of another above it, with one lateral; beak cavities shallow, with a few rather large scars; anterior cicatrices separate; posterior cicatrices well impressed; nacre bluish-white to salmon, generally silvery iridescent and slightly thinner behind. The male shell is full and sometimes a little angular on the basal line just behind the center, and ends in a rounded or slightly biangulate point

Map 116. Historical distribution of *Toxolasmus texasensis* in North America.



Map 117. Historical distribution of *Toxolasmus texasensis* in Louisiana.

behind, midway up from the base. The female shell has a strongly developed, rather angular marsupial swelling at some distance from the posterior end; from the swelling to the elevated posterior point it is truncated. Female shell usually obviously smaller than the male shell (Simpson 1914, p 148).

Type locality: DeWitt Co., TX.

General distribution: Southern portion of Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: This species has male and female shells that are very sexually dimorphic and have very rough periostraca. It is common in larger rivers, lakes and ponds. An usual ecomorph (?) occurs in eastern Texas (Plate XVIII, Figure L).

Genus *Obliquaria* Rafinesque, 1820

Animal characters: Branchial opening large, with papillae; anal crenulated; supra-anal high with moderately short mantle connection to anal; inner laminae of inner gills free from the visceral mass except for a short distance anteriorly; palpi short and small; soft parts grayish; marsupium occupying only outer gills and consisting of five to seven ovisacs placed posterior to the center of the gill and when gravid extending far beyond the edge of sterile marsupium; glochidium medium in size, semicircular; hinge-line with a slight up-curve in center; conglutinates large, white, club-shaped; glochidia scattered all through the conglutinated mass.

Shell characters: She medium in size, thick, roundly trigonal, inflated; disk of one valve with row of large knoblike nodules running from beaks centrally ventrad and alternating with the knobs on the other valve; beaks sculptured with two or three concentric bars which, although heavy, are not well defined; epidermis greenish-yellow to brown with paintings of numerous interrupted rays; pseudocardinals prominent and ragged; laterals short, nearly straight; beak and branchial cavities not very deep; nacre white; female shell smaller and slightly inflated post-ventrad. Utterback (1915-16: 319).

Comments: A single species occurs in Louisiana.

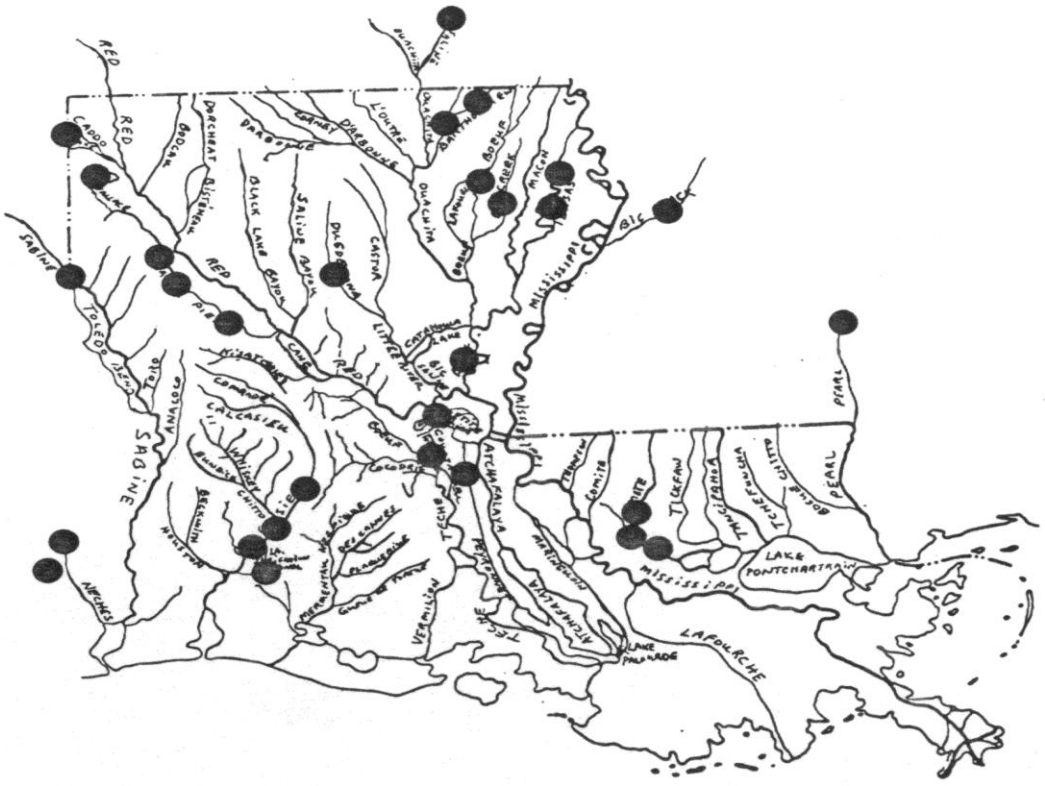
Obliquaria reflexa Rafinesque, 1820
threehorn wartyback

Figures M-R
Plate XVII
Maps 118 and 119

Partial synonomy:
Obliquaria reflexa (Rafinesque, 1820), Turgeon *et al*. 1988, Vidrine 1985, 1989b, 1990c, Simpson 1914, Vanatta 1910, Stern 1976, Shira 1913, Hartfield 1988, Strecker 1931, Gordon *et al*. 1980, Roback *et al*. 1980, Murray and Roy 1968, Frierson 1927 (p. 65)
Unio cornutus Barnes, 1823, Vaughan 1893, Frierson 1899a, 1899b

Description: Shell irregularly oval, inflated, solid, inequilateral, with rather high, full beaks, which are turned forward over a small lunule, their sculpture consisting of three or four coarse, oblique ridges; posterior ridge well developed; surface sculptured with a central radial row of four or five strong,

Map 118. Historical distribution of *Obliquaria reflexa* in North America.



Map 119. Historical distribution of *Obliquaria reflexa* in Louisiana.

longitudinally compressed knobs, occasional slight corrugations or wrinkles present; epidermis generallly smooth and subshining, yellowish-green, usually covered with delicate wavy more or less broken rays often uncolored. Sometimes rays consist of small dots and again of arrow-head markings; posterior end of shell obliquely truncate above; left valve with two ragged, radial, stumpy pseudocardinals and two slightly curved laterals; right valve with one triangular pseudocardinal, often with a vestigial tooth on each side of it, and one double lateral; muscle scars small, the anterior ones rough; beak cavities shallow; nacre white, straw-colored, salmon or reddish, much thicker in front. Male and female shells scarcely differing (Simpson 1914, p. 330).

Type locality: Kentucky River and Rapids of Letart.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: This striking species has knobs which appear alternately on one shell or the other as the individual grows, such that the two shells are not identical.

Genus *Obovaria* Rafinesque, 1820

Animal characters: Branchial and anal openings both papillose; supra-anal large, crenulated; mantle margin antero-ventrad to branchial opening slightly specialized with lamellae and crenulations; inner gills twice the width of outer, inner laminae entirely connected to visceral mass; palpi small, far removed from anterior end of outer gills; color of soft parts soiled white; marsupium consisting of many ovisacs originating from posterior half of outer gills and extending far below the ventral edge; conglutinates poorly developed, embryos held in rather loose masses; glochidia somewhat large, semielliptical, spineless, hinge line undulate.

Shell characters: Shell rounded to ovate, inflated; height greater than length; post-umbonal ridge not distinct, disk smooth; beaks prominent, sculptured with a few indistinct concentric, sinuate bars; epidermis brown with faint rays. Utterback (1915-16: 324).

Comments: Four species possibly occur in Louisiana. A fifth, *Obovaria* sp. cf. *jacksoniana*, may be made up of the populations occurring in the Mississippi River and west to Texas. However, all of these species are somewhat difficult to separate conchologically.

Key to the species of Louisiana:

1a. Shells nearly circular in outline.....2
1b. Shells decidely elliptical in outline.....3

2a. Epidermis yellowish.....*O. subrotunda*
2b. Epidermis greenish.....*O. unicolor*

3a. Umbos distinctly pointing anteriorly.....*O. olivaria*
3b. Umbos not pointing anteriorly.....*O. jacksoniana*

Obovaria jacksoniana (Frierson, 1912)
southern hickorynut

Figures S-Y
Plate XVII
Maps 120 and 121

Partial synonomy:
Obovaria jacksoniana (Frierson, 1912), Turgeon *et al*. 1988, Vidrine 1985, 1989b, Simpson 1914, Stern 1976, Hartfield 1988, Oesch 1984, Hoggarth 1981, Frierson 1927 (p. 91)
Obovaria castenea (Lea, 1831), Simpson 1914, Vidrine 1985, 1989b, Murray and Roy 1968, Roback *et al*. 1980, Strecker 1931, Vanatta 1910, Frierson 1927 (p. 91)
Unio casteneus Lea, 1831, Vaughan 1892, 1893, Frierson 1899a, 1899b

Description: Shell ovate, smooth, rounded before and below, nearly straight from the beak to post-point, which is about half way the height of the shell; umbonal ridge low, and the posterior area very narrow; beaks not high, sculpture not seen; nacre bluish-white, iridescent behind; teeth double in left, single in right valve; cardinals stout, erect; laterals not very large; muscle scars confluent behind, separate before; pallial line obsolete behind (Simpson 1914, p. 301). This species has not the female form of *castenea*, and the dorsal scars are in the bottom of the beaks in place of being on the teeth (Simpson 1914, p. 301).

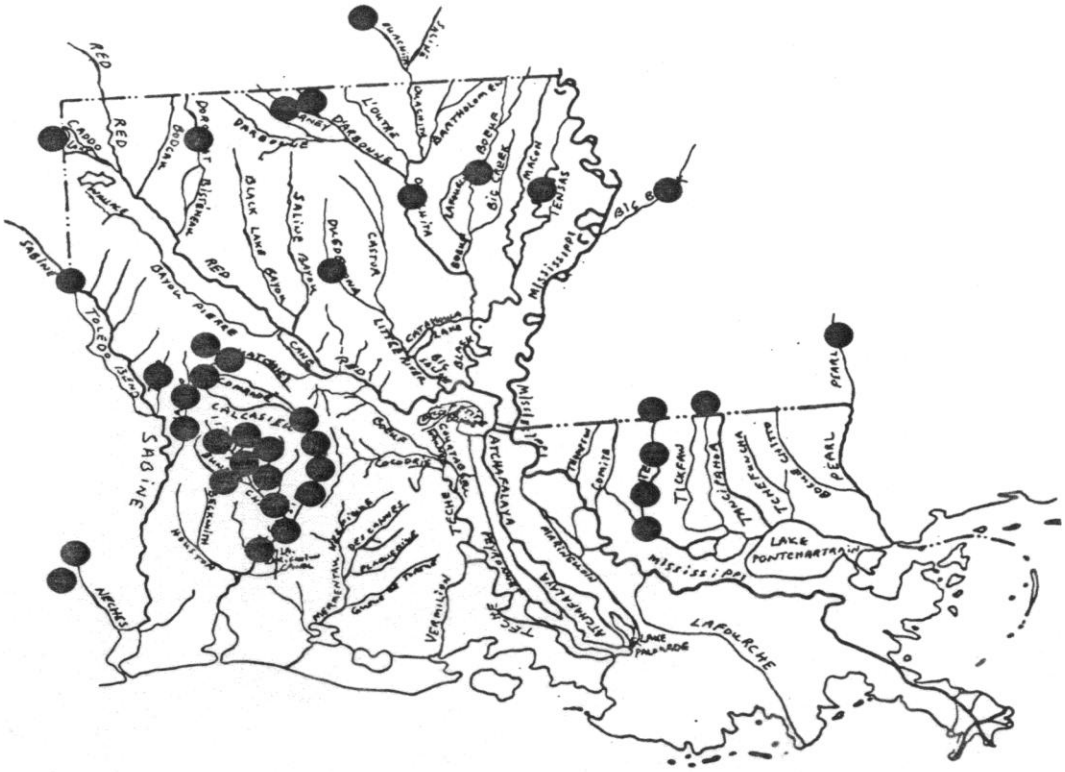
Type locality: Pearl River, Mississippi. Also in Yalabusha River, Mississippi.

General distribution: Missouri and southern portions of the Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages (Oesch 1984).

Comments: Recent authors, Valentine and Stansbery (1971), Stansbery (1976), and Oesch (1984) considered *O. castenea* and *O. jacksoniana* to be conspecific. *Obovaria castenea* (Lea, 1831), according to Stansbery (1976), is preoccupied by *Unio casteneus* Rafinesque, 1831, and *O. jacksoniana* is the acceptable name. He contended that the range of this species extends from the Mobile drainage west to Texas. Oesch (1984) reported it in Missouri. Hoggarth (1981) discussed differences between *O. jacksoniana* and *O. unicolor*. In this report, *Obovaria* sp. cf. *jacksoniana* is the western Louisiana form of this species, which is commonly treated as *O. castenea*. The description of *Obovaria castenea* (Lea, 1831) follows:

Shell rather small, that of the male ovate, that of the female elliptical, inflated, solid, blackish-chestnut or olive-green, sometimes with faint, concentric, lighter and darker bands, occasionally faintly rayed behind; beaks full and high, placed near the anterior end and marked with a few feeble, nearly parallel ridges; posterior ridge low; left valve with two pseudocardinals, the upper running nearly parallel with the two curved laterals; right valve with two pseudocardinals, with rarely a third posterior one, the anterior tooth compressed, and a double lateral; beak cavities shallow; muscle scars small, impressed; nacre whitish or bluish white, iridescent and slightly thinner behind. The male shell is ovate and pointed behind about midway up from the base; the female shell is ellitical, full at the post-base, scarcely pointed behind, and in all cases I have seen is much smaller that that of the male (Simpson 1914, p. 300). The name *casteneus* was applied to some *Unio*, which I am unable to determine, by Rafinesque in a

Map 120. Historical distribution of *Obovaria jacksoniana* in North America.



Map 121. Historical distribution of *Obovaria jacksoniana* in Louisiana.

Continuation of a Monograph on the Bivalve Shells of the River Ohio, etc., in October, 1831. According to Scudder, Lea's name was published the latter part of the same year, but I have no means of knowing which appeared first. Under the circumstances I use Lea's name (Simpson 1914). Type locality: Alabama River. The female shells of these two ecomorphs are quite different as Frierson indicated.

Obovaria olivaria (Rafinesque, 1820)
hickorynut

Figures A-B
Plate XVIII
Maps 122 and 123

Partial synonomy:
Obovaria olivaria (Rafinesque, 1820), Turgeon *et al*. 1988, George and Vidrine (in prep.), Gordon *et al*. 1980, Frierson 1927 (p. 91)
Obovaria ellipsis (Lea, 1828), Simpson 1914

Description: Shell usually evenly elliptical, sometimes rather ovate, inflated, solid, with high beaks placed close to the anterior end and turned forward over a small lunule, their sculpture consisting of a few somewhat doubly looped bars; posterior ridge scarcely developed; anterior end rounded or subtruncate; surface nearly smooth or having a few shallow, irregular sulcations; epidermis greenish or yellowish-brown, with faint, darker rays; left valve with two pseudocardinals, the posterior one nearly parallel with the stout, curved laterals; right valve usually with three pseudocardinals, the two outer ones small, the middle and upper ones in all shells parallel with the strong double lateral; beak cavities shallow, showing a row of dorsal scars; muscle scars small. impressed, the anterior ones rough; nacre silvery white, much thickened in front. The shells of the male and female differ but little, those of the latter being a very little more pronounced at the post-basal part than the former (Simpson 1914, p. 299).

Type locality: Ohio.

General distribution: Mississippi Interior Basin drainages.

Comments: George and Vidrine (in prep.) report this species from Bayou Bartholomew.

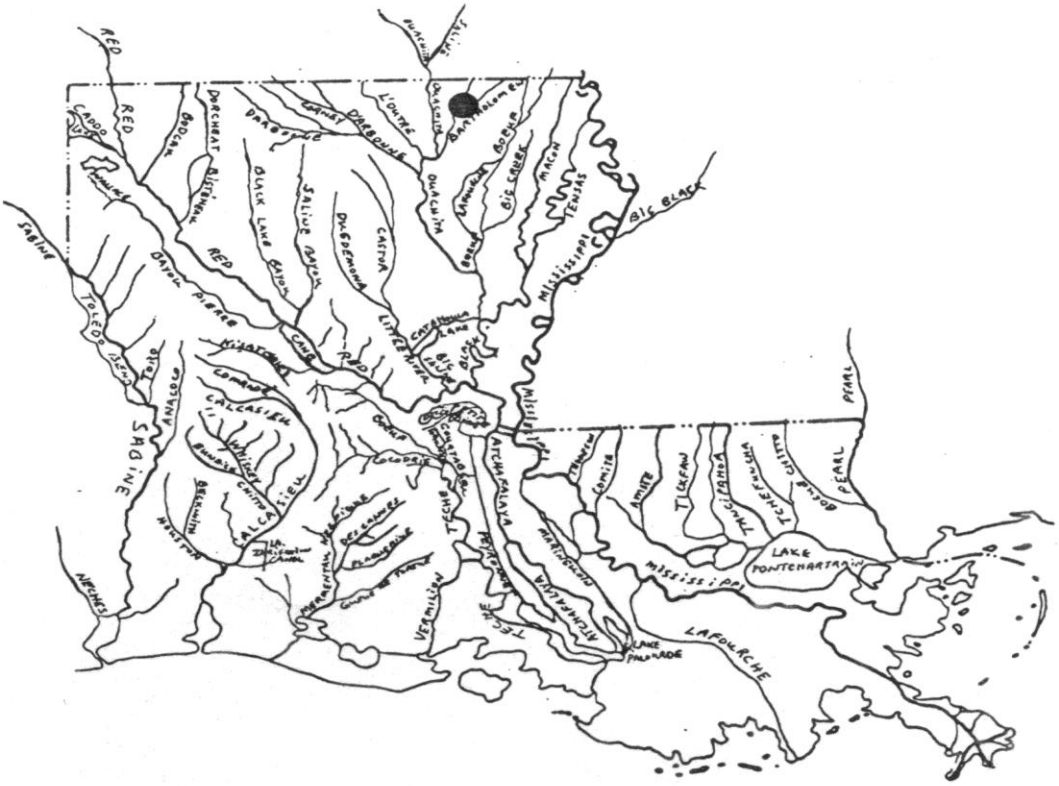
Obovaria subrotunda (Rafinesque, 1820)
round hickorynut

Figures C-F
Plate XVIII
Maps 124 and 125

Partial synonomy:
Obovaria subrotunda (Rafinesque, 1820), Turgeon *et al*. 1988, Hartfield and Rummel 1986, Hartfield and Ebert 1987, Frierson 1927 (p. 90)
Obovaria subrotundata (Rafinesque, 1820), Gordon *et al*. 1980
Obovaria circulus (Lea, 1829), Simpson 1914

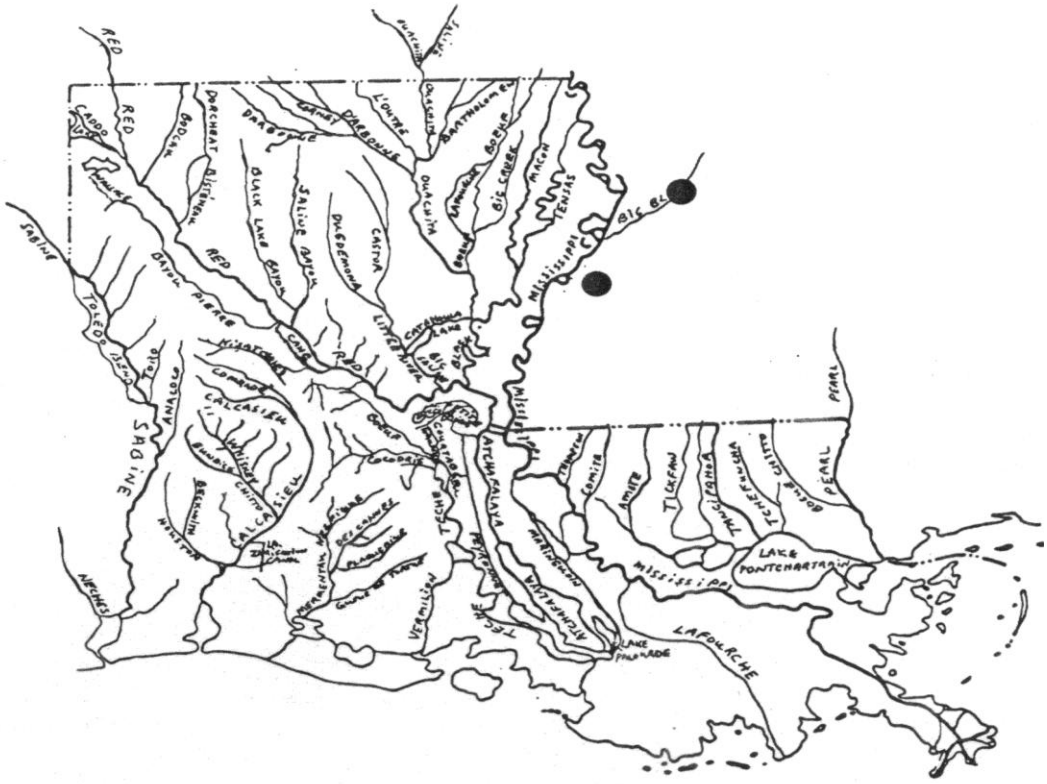
Description: Shell variable in outline, subtriangular, rounded or short elliptical, solid, inflated, with high beaks which are often

Map 122. Historical distribution of *Obovaria olivaria* in North America.



Map 123. Historical distribution of *Obovaria olivaria* in Louisiana.

Map 124. Historical distribution of *Obovaria subrotunda* in North America.



Map 125. Historical distribution of *Obovaria subrotunda* in Louisiana.

somewhat turned forward over a moderate lunule, sculpture consisting of a few rather feeble, slightly doubly-looped ridges; posterior ridge low, rather rounded; surface smooth or having few low, irregular, wide, concentric ridges, covered with a rayless, dusky brown, often cloth-like epidermis, which is much lighter colored on the posterior slope; left valve with two stout, radial pseudocardinals and two short, nearly straight laterals; right valve with three pseudocardinals, the middle one strong, the hinder faint and sometimes wanting; beak cavities shallow or only moderately deep, compressed; dorsal scars under the pseudocardinals; nacre silvery white, pink, salmon, rich purple (Simspon 1914, p. 291).

Type locality: The Ohio at Cincinnati, the Monongahela at Pittsburg and the Tennessee at Nashville.

General distribution: Mississippi Interior Basin drainages.

Comments: Hartfield and Rummel (1985) reported this species from Big Black River in Mississippi. Hartfield and Ebert (1986) reported it from Bayou Pierre in Mississippi. This species is a good candidate for occurring in northeastern Louisiana. No such records exist, but most of northeastern Louisiana has not been searched.

Obovaria unicolor (Lea, 1845)
Alabama hickorynut

Figures G-K
Plate XVIII
Maps 126 and 127

Partial synonomy:
Obovaria unicolor (Lea, 1845), Stern 1976, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Simpson 1914, Hartfield 1988, Hoggarth 1981
Obovaria subrotunda unicolor (Lea, 1845), Frierson 1927 (p. 90)

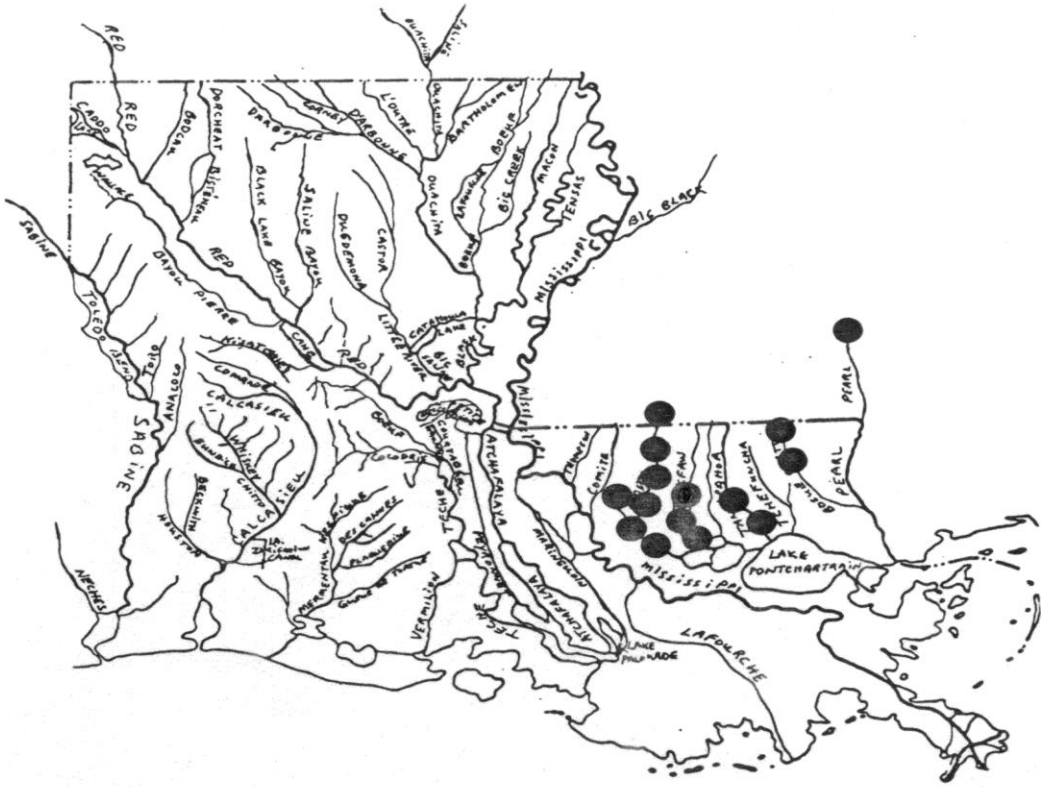
Description: Shell short elliptical or ovate, subinflated, rather solid, with a low, but distinctly marked, somewhat rounded posterior ridge; beaks rather full and high, in front of the middle, with feeble, imperfectly looped ridges; surface nearly smooth, somewhat sulcate on the anterior end; epidermis yellowish-brown or brownish, shining, often distinctly, though not brilliantly rayed, in the young shell greenish, lighter in front and having green rays; left valve with two radial pseudocardinals and two curved laterals; right valve with three pseudocardinals, the central one much the larger, and a somewhat double lateral; beak cavities not deep, rather compressed; muscle scars small impressed; nacre usually pinkish, but sometimes white or bluish. The female shell is a little more inflated at the posterior base than that of the male (Simpson 1914, p. 295).

Type locality: Tuscaloosa, Alabama.

General distribution: Eastern Gulf drainages.

Comments: Hoggarth (1981) compared this species and *O. jacksoniana*. *Obovaria unicolor* more closely resembles *O. subrotunda*.

Map 126. Historical distribution of *Obovaria unicolor* in North America.



Map 127. Historical distribution of *Obovaria unicolor* in Louisiana.

Genus *Truncilla* Rafinesque, 1820

Animal characters: Anal opening crenulated; supra-anal widely separated from anal; inner laminae of inner gills connected to visceral mass for a small posterior slit; palpi small; marsupia consisting of several ovisacs at posterior half of outer gill that acutely tapers; conglutinates white, undivided; glochidia smallest of all naiades.

Shell characters: Shell among the smallest; roundly triangular, inflated, flattened on post-dorsal slopes; post-umbonal ridge sharply angular; disk smooth; beak rather full, sculptured with a few ridges, the latter ones rather definitely double looped; epidermis greenish to yellowish with characteristic paintings of green arrow-marked rays; female shell slightly more inflated post-ventrad; hinge teeth delicate; nacre usually white. Utterback (1915-16: 346).

Comments: Two distinctive species occur in Louisiana.

Key to the species in Louisiana:

1a. Shell decidedly elongate.....*T. donaciformis*
1b. Shell more triangular and not elongated.....*T. truncata*

Truncilla donaciformis (Lea, 1828)
fawnsfoot

Figures L-O
Plate XVIII
Maps 128 and 129

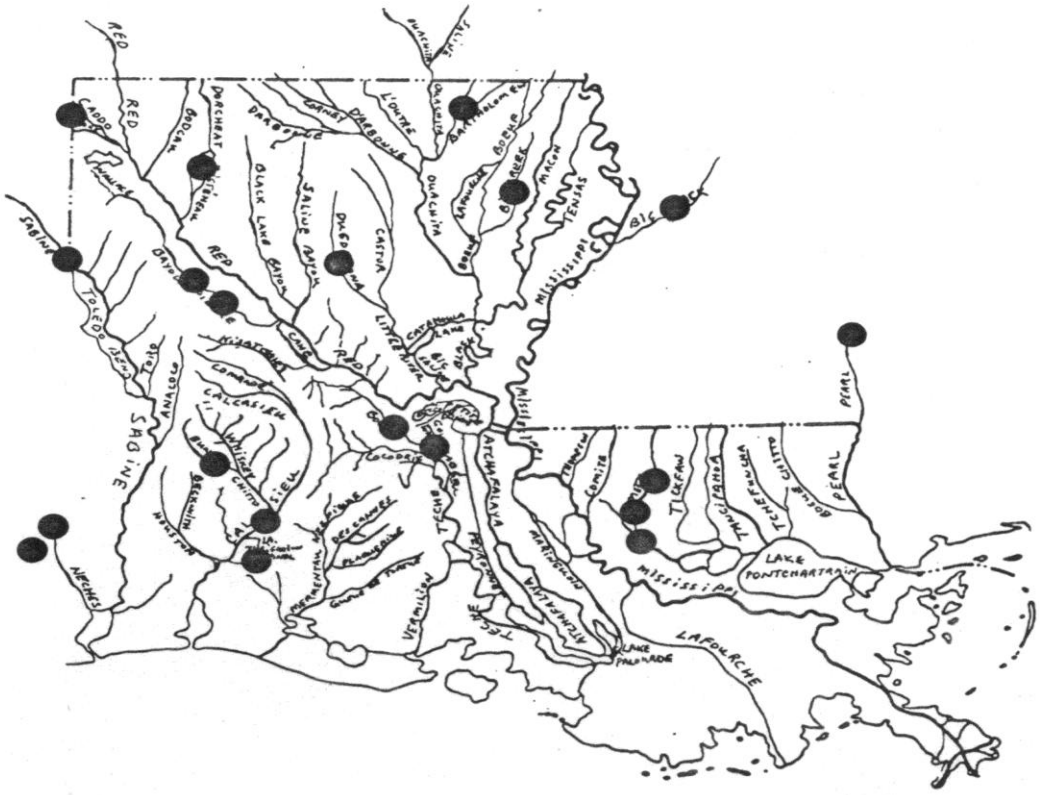
Partial synonomy:
Truncilla donaciformis (Lea, 1828), Vidrine 1985, 1989b, Turgeon *et al*. 1988, Gordon *et al*. 1980, Hartfield 1988, Stern 1976, Strecker 1931, Murray and Roy 1968, Neck 1984, Roback *et al*.1980
Truncilla donaciformis (Lea, 1827), Frierson 1927 (p. 89)
Plagiola donaciformis (Lea, 1828), Simpson, 1914, Shira 1913
Unio zigzag Lea, 1829, Vaughan 1892, Frierson 1899a
Unio donaciformis Lea, 1828, Vaughan 1893

Description: Shell rather small, subsolid, irregularly ovate, subinflated, inequilateral, with moderately high and full, though slightly flattened, beaks, whose sculpture consists of fine, doubly-looped ridges, the hinder loop being quite irregular on the sharp posterior ridge; surface with irregular growth lines, sometimes slightly plicate or corrugated on the posterior slope, generally shining, pale yellowish-green with a beautiful pattern of darker green rays. Rays are sometimes entire, but are generallly broken into arrow-head or zigzag markings; left valve with two compressed pseudocardinals and two laterals; right valve with one pseudocardinal and one lateral; beak cavities shallow; muscle scars impressed, the posterior ones round; nacre bluish-white. The female shell is apparently always smaller than that of the male and has a decided marsupial swelling, the sharp posterior point being a little more elevated than that of the male shell (Simpson 1914, p. 308).

Type locality: Ohio.

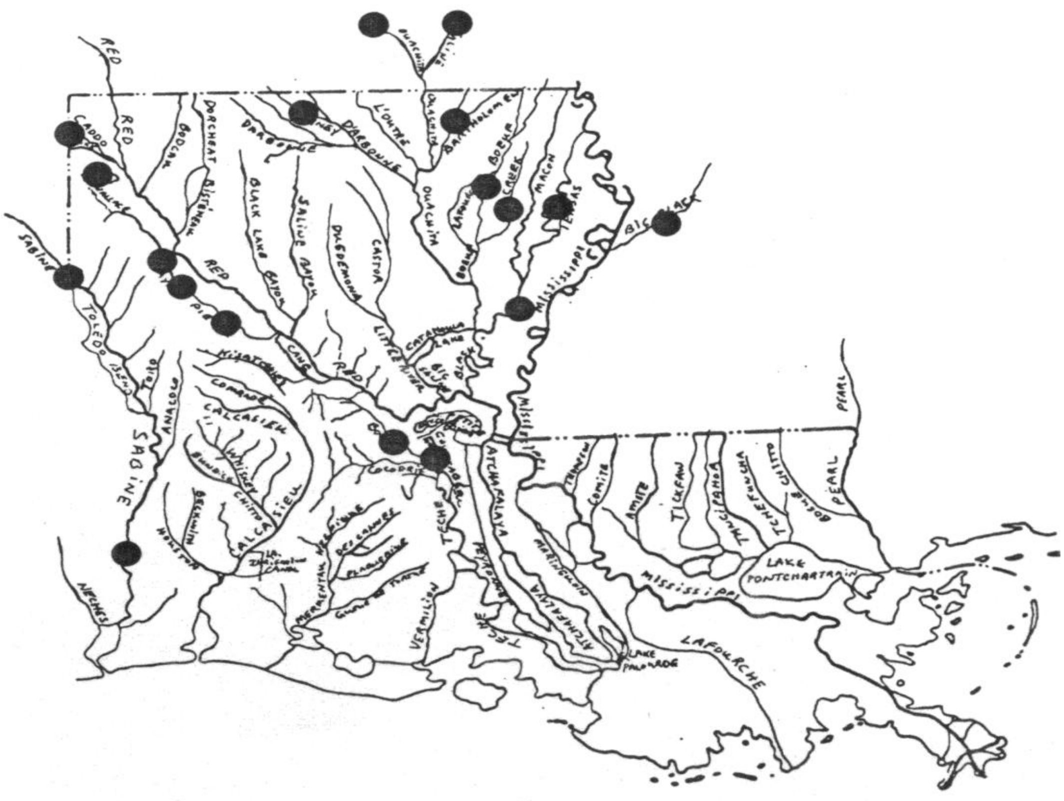
General distribution: Mississippi Interior Basin, Eastern Gulf (Pearl River) and Western Gulf drainages.

Map 128. Historical distribution of *Truncilla donaciformis* in North America.



Map 129. Historical distribution of *Truncilla donaciformis* in Louisiana.

Map 130. Historical distribution of *Truncilla truncata* in North America.



Map 131. Historical distribution of *Truncilla truncata* in Louisiana.

Comments: This is a small mussel with obvious zigzag green rays.

Truncilla truncata Rafinesque, 1820
deertoe

Figures P-Y
Plate XVIII
Maps 130 and 131

Partial synonomy:
Truncilla truncata Rafinesque, 1820, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Stern 1976, Strecker 1931, Neck 1990, Gordon *et al*. 1980, Roback *et al*. 1980, Murray and Roy 1968, Frierson 1927 (p. 89)
Plagiola elegans (Lea, 1831), Simpson 1914, Vanatta 1910, Shira 1913, Coker 1915
Unio elegans Lea, 1831, Vaughan 1893, Frierson 1899a, 1899b

Description: Shell subrhomboid, solid, inflated, with a very sharp posterior ridge behind which it is decidedly truncated; beaks high and full, turned forward over a small lunule; region of the beaks and upper part of the shell elevated considerably above the base; surface with irregular, subsulcate growth lines; epidermis dull or somewhat shining, often having wrinkled loops behind, yellowish-green with nurmerous wavy, often broken rays. Sometimes in addition to the rays there are numerous wavy or zigzag lines and occasionally the shell is tawny or reddish and rayless; hinge line curved; pseudocardinals ragged, two in the right valve and one in the left, sometimes they are much split; left valve with two laterals; right valve with one and sometimes a faint second below it; beak cavities not deep; muscle scars impressed; nacre bluish-white, white, salmon or reddish. The form of the shell is quite variable and those of the female and male differ but little from each other. The female shell is a little more produced at the central base (Simpson 1914, p. 307).

Type locality: Ohio River.

General distribution: Mississippi Interior Basin and Western Gulf drainages.

Comments: Vidrine and Quillman-Vidrine (1986) discussed the color variation and sexual dimporphism in the shells of this species from Bayou Wauksha, where it is unusually abundant.

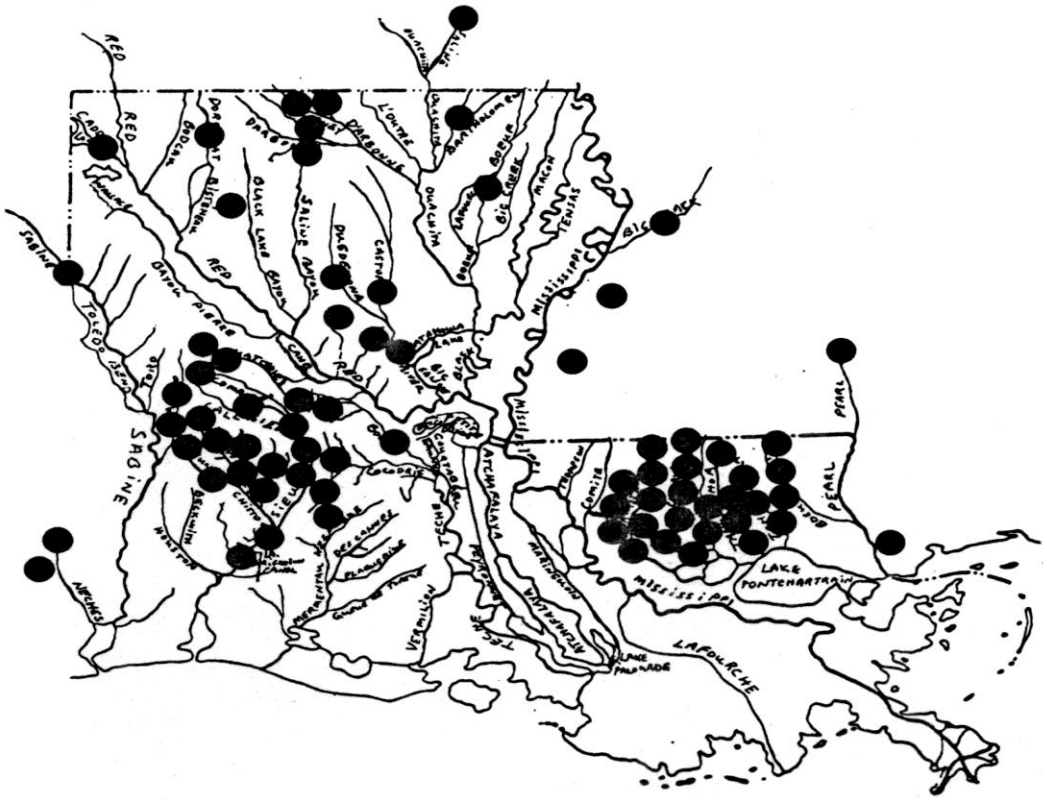
Genus *Villosa* Frierson, 1927

Animal characters: Mantle edge antero-ventrad to branchial opening specialized by papillae, both regular and irregular, arranged rather widely separated in a single row but never extending to the middle of the ventral margin; inner laminae of inner gills entirely connected, or more or less free.

Shell characters: Shell sub-elliptical, small or medium in size; beak sculpture rather double-looped or distinctly sinuate with the posterior sinuation rather open. Utterback (1915-16: 400).

Comments: Two distinctly different species occur in Louisiana.

Map 132. Historical distribution of *Villosa lienosa* in North America.



Map 133. Historical distribution of *Villosa lienosa* in Louisiana.

Key to the species in Louisiana:

1a. Nacre purplish; shell thickened; female shells obviously postbasally produced.....*V. lienosa*
1b. Nacre white; shell very thin; little sexual dimorphism....
.....*V. vibex*

Villosa lienosa (Conrad, 1834)
little spectaclecase

Figures A-I
Plate XIX
Maps 132 and 133

Partial synonomy:
Villosa lienosa (Conrad, 1834), Stern 1976, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Gordon *et al*. 1980, Roback *et al*. 1980, Hartfield 1988
Lampsilis lienosa (Conrad, 1834), Simpson 1914, Strecker 1931, Murray and Roy 1968, Frierson 1927 (p. 74)
Unio nigerrimus Lea, 1852, Vaughan 1892, 1893, Frierson 1899a, 1899b
Unio haleianus Lea, 1842, Vaughan 1893

Description: Shell long elliptical or slightly obovate, generally solid and inflated, with a faint posterior ridge; beaks moderate, the sculpture not seen; surface with irregular growth lines, often more or less sulcate, varying from dirty tawny to black, often faintly rayed behind; left valve with two granularly roughened pseudocardinals and two curved laterals; right valve with one pseudocardinal, a feeble lamellar tooth above, and one lateral with a vestige of another below it in old shells; laterals granular; muscle scars small, well impressed; nacre white, salmon or flesh-colored, sometimes deep purple, slightly thicker in front. The male is often nearly rounded or sub-biangular behind, the posterior end at or above the middle of the height; the female shell is considerably swollen at the posterior base, and its posterior end is more elevated than that of the male (Simpson 1914, p. 100).

Type locality: small streams in southern Alabama.

General distribution: Mississippi Interior Basin, Eastern Gulf and Western Gulf drainages.

Comments: This variable species is the second most abundant mussel in headwater creeks in both eastern and western Louisiana.

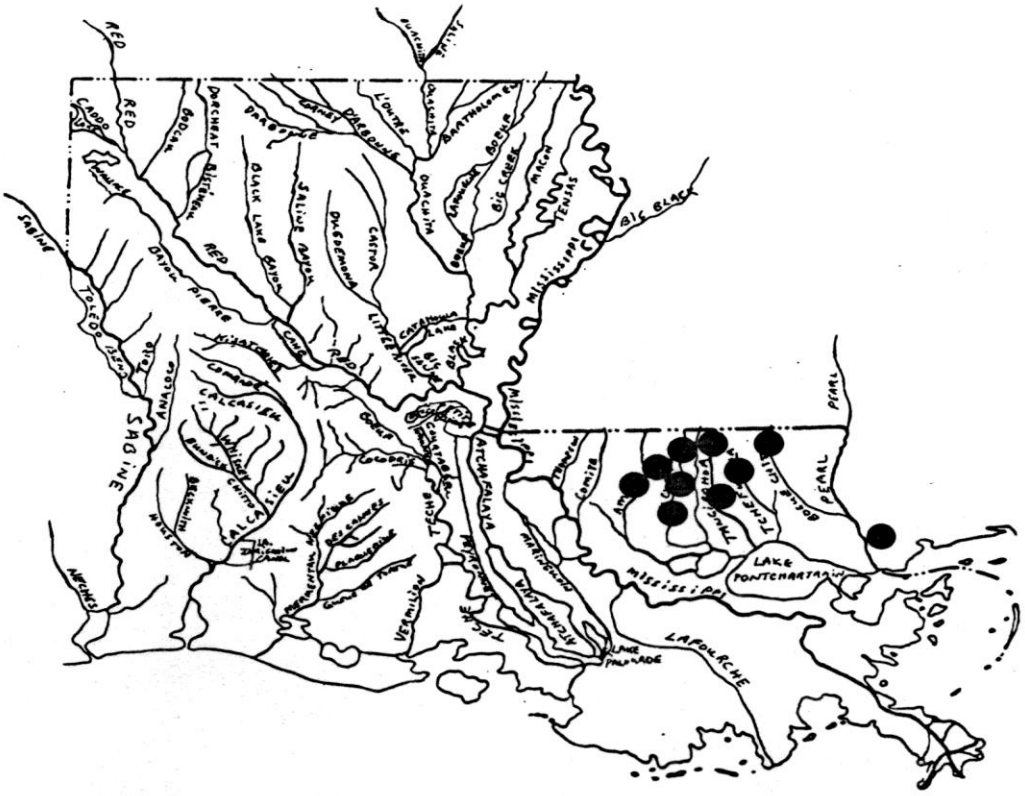
Villosa vibex (Conrad, 1834)
southern rainbow

Figures J-M
Plate XIX
Maps 134 and 135

Partial synonomy:
Villosa vibex (Conrad, 1834), Stern 1976, Vidrine 1985, 1989b, Turgeon *et al*. 1988, Hartfield 1988
Lampsilis vibex (Conrad, 1834), Simpson 1914, Frierson 1927 (p. 76)

Description: Shell varying from thin to subsolid, and from subcompressed to considerably inflated, long elliptical or long obovate; beaks scarcely inflated or elevated, sculptured with a few

Map 134. Historical distribution of *Villosa vibex* in North America.



Map 135. Historical distribution of *Villosa vibex* in Louisiana.

doubly-looped ridges; growth lines irregular, often slightly sulcate; surface smooth and shining, tawny or greenish-yellow, usually having wide, wavy rays, which may cover the entire shell or only the posterior part of it, occasionally nearly rayless; left valve with two somewhat compressed pseudocardinals, the anterior the higher and longer, and two delicate, rather short laterals; right valve with one pseudocardinal and a vestigial one above it, with one lateral; beak cavities not deep; muscle scars shallow; nacre bluish-white, slightly iridescent behind. Male shell sometimes subrhomboid, occasionally bluntly pointed behind about midway up from the base, often nearly evenly rounded posteriorly; female shell very slightly inflated at the post-basal part and evenly rounded behind (Simpson 1914, p. 136).

Type locality: Black Warrior River, south of Blount Springs, Alabama.

General distribution: Eastern Gulf drainages and South Atlantic slope (Clench and Turner 1956 and Johnson 1970).

Comments: Johnson (1980) commented on synonomizing several Arkansas and Texas species with this one. Apparently these have found little acceptance (Turgeon *et al*. 1988). A close relative, *Villosa iris* (Lea, 1830)(Back Cover, Figure 9 and Plate XIX, Figures O-P), occurs in Arkansas (Ouachita River drainage) (Vidrine 1989b and Gordon 1981). John Harris (Pers. comm.) suspects the illustrated shell to be *Lampsilis hydiana*, but it was originally identified by Daniel Bereza, who removed the soft anatomy for electrophoretic studies.

COMMENTS ON NON-UNIONACEAN CLAMS IN NON-MARINE WATER OF LOUISIANA

Corbicula fluminea (Muller)
Asiatic clam

Plate XIX
Figure U
Map 136

This species (or species complex) has dispersed throughout the southeastern U. S. since its introduction into the country in the 1930's. Dundee and Harman (1963) were first to report it in Louisiana. In 1976, disturbed waterways in western Louisiana often contained *Corbicula manilensis (=fluminea)*, though it was conspicuously absent from apparently undisturbed waterways. Disturbance includes three types of channel modifications: dredging, desnagging, and damming (impounding) (Vidrine, M. F., D. J. Bereza, and S. L. H. Fuller, unpublished manuscript dated July 1, 1976, reported at the 1976 American Malacological Union meeting and titled: *Corbicula manilensis* (Philippi) (Sphaeriacea: Corbiculidae) in western Louisiana). The map from this paper is reproduced here to show the known distribution of *Corbicula* in western Louisiana in 1976. Stern (1976) illustrated its distribution in eastern Louisiana, where it apparently was very common. During the last three years of revisiting stations, many of the revisited negative 1976 stations are now inhabited by *Corbicula*. Only smaller headwater streams, and not all of these by any means, lack this Asian alien. Hartfield and Cooper (1983) discussed the distribution of this species in Mississippi. Britton (1982) discussed the distribution of *Corbicula* in Texas. McMahon (1991) provided a rather detailed look at this species. Payne *et al.* (1989) discussed variation in size demography of lotic populations of *Corbicula fluminea* (Muller).

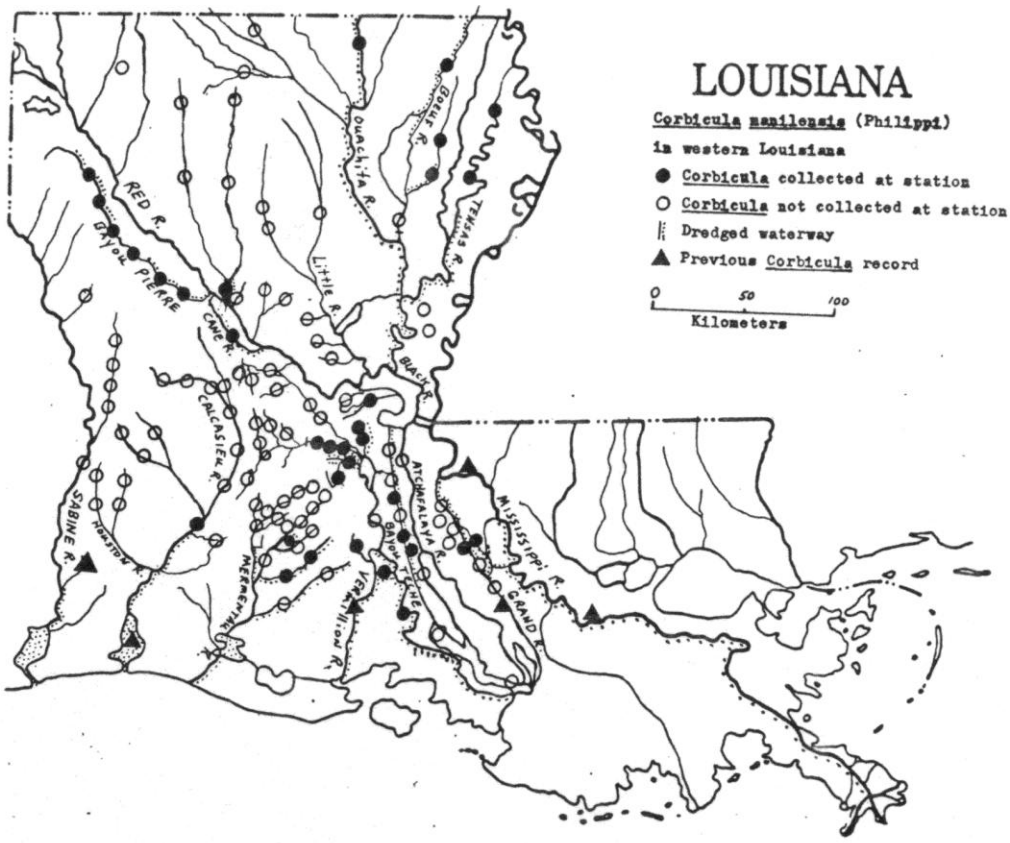
Musculium, *Sphaerium*, *Eupera*, and *Pisidium*
fingernail clams

These sphaeriacean clams were enumerated in Burch (1975a). Species of fingernail clams in four genera are known to occur in Louisiana. Populations are often extremely large, although the clams are extremely small. Stern (1976) briefly discussed these clams. Little is known of Louisiana fingernail clams, and they provide an excellent opportunity for research.

Dreissena polymorpha (Pallas)
zebra mussel

Plate XIX
Figure S

This exotic species, possibly of European origin, became established in the Great Lakes area around 1986. During 1992, it was found in Arkansas (John Harris, pers. comm., 1993) and later in the Mississippi River in Louisiana (Paul Hartfield, pers. comm., 1993). In 1993, it was found in the Old River area (Stephen Shively, pers. comm., 1993). McMahon (1991) provided a rather detailed look at this species. This mussel is probably the number one biological threat to native freshwater mussels because its byssal threads can effectively sew shut the valves and smother native mussels.



Map 136. Distribution of *Corbicula fluminea* in Louisiana. This map is reproduced from: Vidrine, M. F., D. J. Bereza, and S. L. H. Fuller, unpublished manuscript dated July 1, 1976 and titled: *Corbicula manilensis* (Philippi) (Sphaeriacea: Corbiculidae) in western Louisiana. The map showed the known distribution of *Corbicula* in western Louisiana in 1976.

Polymesoda caroliniana (Bosc)
Carolina marsh clam

Plate XIX
Figure T

This is a relatively common corbiculid clam in southern Louisiana and Mississippi saline marshes, and it may be initially confused with freshwater mussels (Duobinis-Gray and Hackney 1984). Stern (1976) reported this species in eastern Louisiana.

Rangia cuneata Gray
brackish water clam

Plate XIX
Figure R

This mactrid clam is commonly found in brackish water and occasionally in freshwater with freshwater mussels. I have seen such communities in both eastern and western Louisiana. This clam was common in Louisiana Irrigation Canal (Vidrine and Vidrine 1987). Apparently its larvae require some salinity to fully develop, and thus its range is usually restricted to fresh and brackish marshes (Hoese 1973 and Stern 1976).

Addendum

Tables 2, 3, and 4 are presented to fill gaps that are difficult to fill otherwise. Table 2 provides a rectification of Featherman's (1872) list of mussels with no annotation other than suggested name equivalencies. Table 3 does the same for Miller's (1936) list from the Baton Rouge area, with some annotation. Table 4 provides a list of shells from Indian middens mostly from Ouachita River drainages.
Collectively these tables and their data add to the completeness of the task at hand.

Table 2. Rectification of Featherman's (1872) list of mussels. His names are followed by currently accepted names.
~~~~~~

Unio trapezoides, Lea (=*Plectomerus dombeyanus*), Lake Pearl and Lake Concordia, Avoyelles Parish.
Unio nodulatus, Conrad (=*? Quadrula mortoni*), Lake Charles, Calcasieu Parish.
Unio apiculatus, Lea (=*Quadrula apiculata*), Teche, St. Mary Parish.
Unio pustulatus, Lea (=*Quadrula nodulata*), Lake Pearl, Avoyelles Parish.
Unio asper, Lea (=*Quadrula quadrula*), Teche, St. Mary Parish.
Unio plicatus, Lea (=*Amblema plicata*), Lake Pearl, Avoyelles Parish.
Unio calliginosus? (=*Villosa lienosa*), Falls Red River, Rapides Parish.
Unio cornutus (=*Obliquaria reflexa*), Bayou Cocodrie, ?Evangeline/Rapides Parishes.
Unio anodontoides, Lea (=*Lampsilis teres*), Lake Pearl, Avoyelles Parish.
Unio perplicatus, Conrad (=*Amblema plicata*), Lake Pearl, Avoyelles Parish.
Unio globulus, Say (=*Potamilus capax*), Teche, St. Mary Parish.
Unio purpuratus, Lamarck (=*Potamilus purpuratus*), Lake Pearl, Avoyelles Parish.
Unio parvus, Barnes (=*Toxolasmus parvus*), Nez Pique, Calcasieu Parish.
Unio hydianus, Lea (=*Lampsilis hydiana*), Lake Pearl, Avoyelles Parish.

Table 3. Rectification of Miller's (1936) list from the Baton Rouge area. His names are followed by currently accepted names if changed.
~~~~~~

Amblema costata	*(=Amblema plicata)*
Anodonta gigantea	*(=Pyganodon grandis)*
Carunculina texasensis	*(=Toxolasmus texasensis)*
Elliptio complanatus ?	*(an Atlantic coast entity)*
Elliptio crassidens	
Elliptio sp.	
Fusconaia askewi	
Fusconaia beadeliana	*(=Pleurobema beadleanum)*
Lampsilis approxima	*(=?Lampsilis hydiana)*
Lampsilis excavata	*(=Lampsilis ornata)*
Lampsilis fallaciosa	*(=Lampsilis teres)*
Lampsilis hydiana	
Lampsilis sp.	
Leptodea alata megaptera	*(=Leptodea fragilis)*
Obliquaria reflexa	
Obovaria unicolor	
Quadrula pustulosa	
Quadrula sphaerica	*(=Quadrula refulgens)*
Strophitus sp.	
Tritogonia verrucosa	

Table 4. List of mussels reported from Indian middens in northern Louisiana and southern Arkansas mainly from the Ouachita River drainage area (and sparingly from the Red River, Tensas River, Atchafalaya River and Mississippi River). This list is compiled from Moore (1909, 1912), Jon Gibson (pers. comm. 1975), Richard Franz (pers. comm. 1975), Mike Russo (pers. comm. 1992) and Saunders *et al*. (in prep.).

Pyganodon grandis (Say, 1829)
Strophitus undulatus (Say, 1817)
Amblema plicata (Say, 1817)
Megalonaias nervosa (Rafinesque, 1820)
Plectomerus dombeyanus (Valenciennes, 1827)
Quadrula cylindrica (Say, 1817)
Quadrula metanevra (Rafinesque, 1820)
Quadrula quadrula (Rafinesque, 1820)
Quadrula nodulata (Rafinesque, 1820)
Quadrula pustulosa (Lea, 1831)
Quadrula mortoni (Conrad, 1835)
Tritogonia verrucosa (Rafinesque, 1820)
Pleurobema pyramidatum (Lea, 1840)
Elliptio crassidens (Lamarck, 1819)
Elliptio dilatata (Rafinesque, 1820)
Fusconaia flava (Rafinesque, 1820)
Fusconaia ebena (Lea, 1831)
Actinonaias ligamentina (Lamarck, 1819)
Ellipsaria lineolata (Rafinesque, 1820)
Lampsilis cardium (Rafinesque, 1820)
Lampsilis satura (Lea, 1852)
Lampsilis hydiana (Lea, 1838)
Lampsilis teres (Rafinesque, 1820)
Leptodea fragilis (Rafinesque, 1820)
Ligumia recta (Lamarck, 1819)
Obliquaria reflexa Rafinesque, 1820
Obovaria jacksoniana (Frierson, 1912)
Glebula rotundata (Lamarck, 1819)
Potamilus purpuratus (Lamarck, 1819)
Toxolasmus parvus (Barnes, 1823)
Toxolasmus texasensis (Lea, 1857)
Truncilla truncata Rafinesque, 1820

PART III
BIOGEOGRAPHIC SUMMARY

Louisiana is a diverse state in relation to types of fauna and flora inspite of its lack of significant geological relief. Louisiana is not only culturely separable into distinct regions, but also biologically separable. Allen (1992) (grasses and other plants) and Douglas (1974) (freshwater fishes) illustrate just a few of the groups of organisms which display this separateness. Burch (1975b) provided little or no detail in the mapping of Louisiana and its mussel biogeography, and thus, Roback *et al*. (1980) constructed a map (adapted for this report as Map 1) which provided clues to the biogeography of freshwater mussels in Louisiana and adjacent waters. Neck (1982a) provided the mussel biogeographic provinces of Texas and subdivided the Western Gulf into a Sabine subprovince, a central Texas subprovince, and a Rio Grande subprovince. The upper Red River region of the Mississippi Interior Basin is named the Texoma subprovince. Neck (1984) used the name Austroriparian for the subregion of the Western Gulf represented by the streams in southeastern Texas and southwestern Louisiana. Felley (1992) discussed medium-low gradient streams of the Gulf Coastal plain, including the Calcasieu River in Louisiana; however, he omitted any discussion of the diverse mussel assemblage of this river.

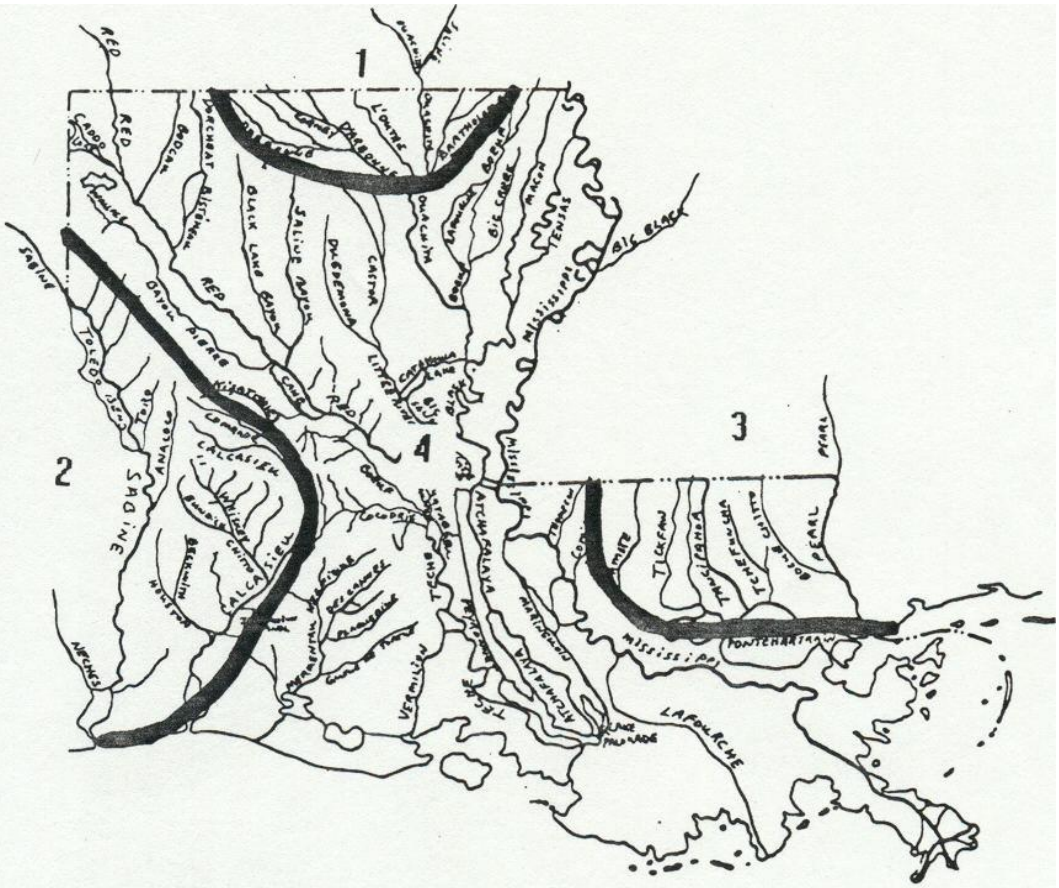
Gordon *et al*. (1980) separated Arkansas somewhat differently. Using physiographical regions, the Ozarkian subprovince is split into West Gulf Coastal plain, Ozark Plateaus, and Ouachita Mountains. Four distinct faunal affinities are noted: southern Interior Basin-Gulf drainage, northern Interior Basin, endemic Interior Highlands, and general Interior Basin. While this is used to treat individual species distributions, it is difficult to apply to assemblages. Here I treat the Arkansas mussels according to Roback *et al*. (1980).

Stern (1976) clearly illustrated the divergent assemblages of the streams east verses west of the Mississippi River. He defined the Central Gulf Coast mussel fauna. He dealt with geologic explanations for the origin of the fauna, which are not considered here, except to support his view. More recent work has further delineated the complexity of this fauna (Hartfield 1988, in press, Hartfield and Ebert 1986, and Hartfield and Rummel 1985).

Biogeographically, Louisiana can be divided into at least three major freshwater mussel provinces: Interior Basin, Western Gulf Coast, and Central Gulf Coast (Roback *et al*. 1980). The Central Gulf Coast may be a subprovince of what is generally termed the Eastern Gulf Coast (Isphording and Fitzpatrick 1992). Vidrine (1983) suggested four regions in Louisiana based upon the distribution of freshwater mussels (Map 2). Vidrine (1985) suggested four subregions which can be used to depict the freshwater mussel distributions in the state. These subregions include:

* southwestern Louisiana, which has affinities with southeastern Texas, the Sabine Subprovince (Neck 1982a)
* southeastern Louisiana, which has affinities with the Alabama River drainage, Central Gulf portion of the Eastern Gulf Coast
* north central Louisiana, which has affinities with the Ouachita River drainage in Arkansas (Ouachita subprovince of Ozark in the Mississippi Interior Basin), and
* the Mississippi and Red River floodways of the Mississippi Interior Basin. Isolated relict populations of endemic *Margaritifera hembeli* (Conrad) in the headwaters of Bayou Teche (Evangeline District of the Kisatchie National Forest) and the Red River (Catahoula Ranger District of the Kisatchie National Forest) may be considered an indication of a fifth subregion.

Map 1. Distribution of mussel-positive collecting localities, 1970-82. Solid dots represent mussels-positive localities sampled by the author and colleagues and localities represented in museum samples examined. Unionid faunal zones and provinces (according to Roback *et al.* 1980): 1. North Atlantic, 2. South Atlantic, 3. Peninsula Florida, 4. Apalachicolan, 5. Mobile Basin, 6. Central Gulf Coast, 7. Western Gulf Coast, 8. Interior Basin, 8A. Ozarkian Province, 8B. Cumberlandian Province, 9. Great Lakes-St. Lawrence, 10. Pacific, 11. Mexican Pacific, and 12. Mexican Gulf Coast. The Eastern Gulf drainages would include numbers 4, 5 and 6.



Map 2. Biogeographic regions based on the distributions of freshwater mussels in Louisiana.
1. north central Louisiana, which closely resembles the Ouachita River drainage in Arkansas (Ouachita subprovince of Ozark in the Mississippi Interior Basin),
2. southwestern Louisiana, which closely resembles southeastern Texas,
3. southeastern Louisiana, which closely resembles the Alabama River drainage system, Central Gulf portion of the Eastern Gulf Coast, and
4. the Mississippi and Red River floodways of the Mississippi Interior Basin.

Frierson (1911) compared the community structures of the Sabine and Pearl River systems and suggested that a number of species were the same masquerading under different names, however he later (Frierson 1927) retained specific status for most of these species that he had suggested might be the same in his 1911 paper. Since his work, many authors have divided the United States into faunal zones with respect to freshwater mussels and other biota. Freshwater mussels in Louisiana are apparently distributed with respect to the varied zoogeographic provinces. Table 5 compares the rivers here discussed with the reported species. The occurrences of the different species in the varied provinces are depicted in Table 6. The most obvious differences between the Eastern Gulf and Western Gulf assemblages in Louisiana mussels are apparent in the creek and medium size stream assemblages (Table 7). The individual drainages of Louisiana are divided into 25 separate river sections (see Table 5) for discussion and each is provided with a list of reported species.

1. The Pearl River in Louisiana is rather poorly surveyed as are most of the larger rivers as they approach the Gulf of Mexico. However, the list of species is long and presents a complex assemblage with components from the Eastern Gulf and the Mississippi Interior Basin. Hartfield (1988), Stern (1976), Vidrine (1985 and 1989b) and Frierson (1911) provided lists of species from which the following list is constructed.

Pyganodon grandis
Anodonta suborbiculata
Strophitus subvexus
Amblema plicata
Plectomerus dombeyanus
Quadrula refulgens
Pleurobema beadleanum
Elliptio arca
Fusconaia cerina
Lampsilis ornata
Lampsilis teres
Ligumia recta
Obovaria jacksoniana
Potamilus inflatus
Toxolasmus parvus
Villosa lienosa
Utterbackia imbecillis
Anodontoides radiatus
Lasmigona complanata
Megalonaias nervosa
Quadrula apiculata
Tritogonia verrucosa
Elliptio crassidens
Elliptio arctata
Fusconaia ebena
Lampsilis claibornensis
Leptodea fragilis
Obliquaria reflexa
Obovaria unicolor
Potamilus purpuratus
Truncilla donaciformis
Villosa vibex

2. The Tchefuncte is a small river drainage, which apparently lacks a diverse assemblage of mussels (Stern 1976).

Utterbackia imbecillis
Strophitus subvexus
Pleurobema beadleanum
Uniomerus declivus
Villosa lienosa
Anodontoides radiatus
Quadrula refulgens
Fusconaia cerina
Lampsilis claibornensis
Villosa vibex

3. The Tangipahoa River has received more attention, and it contains a diverse assemblage; however, it lacks some of the Mississippi Interior Basin and Eastern Gulf species that are found in the Pearl River. Miller *et al.* (1986) did a community structure study on this river in Mississippi; and Hartfield (1988) clarified the species names used in their study. An older record of *P. inflatus* by Carol Stein is discussed by Hartfield (1988). Stern (1976) provided an extended discussion on this faunal assemblage.

Pyganodon grandis
Anodontoides radiatus
Amblema plicata
Quadrula refulgens
Utterbackia imbecillis
Strophitus subvexus
Plectomerus dombeyanus
Tritogonia verrucosa

Pleurobema beadleanum
Fusconaia cerina
Lampsilis ornata
Lampsilis claibornensis
Leptodea fragilis
Obovaria jacksoniana
Potamilus inflatus
Toxolasmus parvus
Villosa lienosa
Elliptio crassidens
Uniomerus tetralasmus
Lampsilis hydiana
Lampsilis teres
Obliquaria reflexa
Obovaria unicolor
Potamilus purpuratus
Toxolasmus texasensis
Villosa vibex

4. The Tickfaw River is smaller than the Tangipahoa River, and its fauna is more limited. It contains a typical Eastern Gulf assemblage. *Anodonta suborbiculata* was found by the author in a borrow pit off of I-10. Twelve Mile Creek in St. Helena Parish contains a typical creek assemblage for this region.

Pyganodon grandis
Anodonta suborbiculata
Strophitus subvexus
Quadrula refulgens
Pleurobema beadleanum
Fusconaia cerina
Lampsilis ornata
Lampsilis teres
Obovaria jacksoniana
Toxolasmus parvus
Villosa lienosa
Utterbackia imbecillis
Anodontoides radiatus
Amblema plicata
Tritogonia verrucosa
Elliptio crassidens
Glebula rotundata
Lampsilis claibornensis
Ligumia subrostrata
Obovaria unicolor
Toxolasmus texasensis
Villosa vibex

5. The Amite River contains a mixture of faunal elements. Stern (1976) contended that the Bayou Manchac, which was once part of the lower Mississippi drainage was captured by the Amite drainage. This mixing of drainage assemblages seems apparent in the species components of the lower Amite River. Hartfield (1988 and in press) discussed the major changes that are occurring in this drainage. Hartfield (in press) lists *Elliptio arca* from this drainage, although the specimen that I examined from the Mississippi Museum of Natural Science appears to be a *E. crassidens*.

Pyganodon grandis
Anodontoides radiatus
Arcidens confragosus
Megalonaias nervosa
Quadrula quadrula
Tritogonia verrucosa
Elliptio crassidens
Uniomerus tetralasmus
Lampsilis ornata
Lampsilis claibornensis
Leptodea fragilis
Obliquaria reflexa
Obovaria unicolor
Potamilus purpuratus
Toxolasmus texasensis
Villosa lienosa
Utterbackia imbecillis
Strophitus subvexus
Amblema plicata
Plectomerus dombeyanus
Quadrula refulgens
Pleurobema beadleanum
Fusconaia cerina
Glebula rotundata
Lampsilis hydiana
Lampsilis teres
Ligumia subrostrata
Obovaria jacksoniana
Potamilus inflatus
Toxolasmus parvus
Truncilla donaciformis
Villosa vibex

6. The lower Mississippi is very poorly studied although it accounts for a rather large area. It extends from the northern edge of West Feliciana Parish south to the mouth of the river.

Pyganodon grandis
Quadrula mortoni
Toxolasmus parvus
Utterbackia imbecillis
Ligumia subrostrata
Toxolasmus texasensis

7. The upper Mississippi River in this study extends from the Louisiana/Arkansas border to the northern edge of West Feliciana Parish. Hartfield and Rummel (1985), Hartfield and Ebert (1986) and Hartfield (in press) provided the species lists for the Mississippi streams in this area. Recent collection of *P. capax* (MMNS specimens) provides a clue to the potential diversity as does Hartfield (in press) who suggests that potentially 41 species once occurred in this region. Grantham (1969) provided early lists of species in this portion of the study area. Cooper (1984) studied Chicot Lake in Arkansas, which is a major oxbow lake on the western side of the river. Fuller (1978b and 1985) described and illustrated the upper Mississippi River main channel fauna.

Pyganodon grandis	*Utterbackia imbecillis*
Arcidens confragosus	*Lasmigona complanata*
Amblema plicata	*Megalonaias nervosa*
Plectomerus dombeyanus	*Quadrula cylindrica*
Quadrula apiculata	*Quadrula nodulata*
Quadrula pustulosa	*Tritogonia verrucosa*
Pleurobema pyramidatum	*Elliptio crassidens*
Fusconaia flava	*Fusconaia ebena*
Uniomerus tetralasmus	*Ellipsaria lineolata*
Glebula rotundata	*Lampsilis cardium*
Lampsilis siliquoidea	*Lampsilis teres*
Leptodea fragilis	*Ligumia subrostrata*
Obliquaria reflexa	*Obovaria jacksoniana*
Obovaria subrotunda	*Potamilus capax*
Potamilus purpuratus	*Truncilla donaciformis*
Truncilla truncata	*Villosa lienosa*

8. The Atchafalaya River, once a small stream composed of connected lakes and swamps, is now a large river. The river is poorly studied; however, the Atchafalaya basin has been sampled in numerous sites. The basin appears to contain very patchily distributed beds with a rather large assemblage of species. The lower basin is changing so rapidly that it is difficult to assess mussel populations. Recent hurricane impact (Hurricane Andrew, August 1992) caused massive die-offs of mussels as numerous mussel bodies were seen floating with large clusters of dead fish following the direct hit of a hurricane. In the mid-1970's, I discovered large numbers of *A. suborbiculata* in Henderson Swamp, a western portion of the central basin. Both the eastern and western borrow canals, from which the soil was borrowed to build the flood-control levees on either side of the triangular basin, contain highly diverse assemblages with numbers of individuals large enough for harvesting by mussel fisheries.

Pyganodon grandis	*Utterbackia imbecillis*
Anodonta suborbiculata	*Arcidens confragosus*
Amblema plicata	*Megalonaias nervosa*
Plectomerus dombeyanus	*Quadrula quadrula*
Quadrula apiculata	*Quadrula nodulata*
Quadrula pustulosa	*Quadrula mortoni*
Tritogonia verrucosa	*Glebula rotundata*
Lampsilis hydiana	*Lampsilis teres*
Leptodea fragilis	*Potamilus ohiensis*
Potamilus purpuratus	*Toxolasmus texasensis*

9. The Tensas River and its drainages are in dire need of survey. The river apparently hosts an extremely diverse assemblage (Coker 1915 and Kuckyr and Vidrine 1975). Recently I have discovered in my 1978 shell collections specimens of *A. ligamentina, S. undulatus,* and *O. jacksoniana*. Also a pair of valves of a long dead specimen (*Lampsilis* sp.

=? *L. abrupta* or *L. siliquoidea*) was found.

Pyganodon grandis	*Utterbackia imbecillis*
Strophitus undulatus	*Arcidens confragosus*
Amblema plicata	*Megalonaias nervosa*
Plectomerus dombeyanus	*Quadrula quadrula*
Quadrula apiculata	*Quadrula nodulata*
Quadrula pustulosa	*Quadrula mortoni*
Tritogonia verrucosa	*Pleurobema pyramidatum*
Elliptio dilatata	*Fusconaia flava*
Fusconaia ebena	*Uniomerus declivus*
Actinonaias ligamentina	*Glebula rotundata*
Lampsilis abrupta?	*Lampsilis cardium*
Lampsilis satura	*Lampsilis hydiana*
Lampsilis teres	*Leptodea fragilis*
Ligumia subrostrata	*Obliquaria reflexa*
Obovaria jacksoniana	*Potamilus purpuratus*
Toxolasmus parvus	*Toxolasmus texasensis*
Truncilla truncata	*Lampsilis siliquoidea*?

10. The Boeuf River has suffered extreme changes, with massive channelization and rerouting of flow through Bayou Lafourche. The assemblage is very diverse (Vidrine *et al*. in press). It is the only location where *L. recta* has been found in western Louisiana.

Pyganodon grandis	*Utterbackia imbecillis*
Arcidens confragosus	*Amblema plicata*
Megalonaias nervosa	*Plectomerus dombeyanus*
Quadrula quadrula	*Quadrula nodulata*
Quadrula pustulosa	*Quadrula mortoni*
Tritogonia verrucosa	*Pleurobema pyramidatum*
Elliptio dilatata	*Fusconaia flava*
Fusconaia ebena	*Glebula rotundata*
Lampsilis satura	*Lampsilis hydiana*
Lampsilis teres	*Leptodea fragilis*
Ligumia recta	*Obliquaria reflexa*
Obovaria jacksoniana	*Potamilus ohiensis*
Potamilus purpuratus	*Toxolasmus parvus*
Toxolasmus texasensis	*Truncilla donaciformis*
Truncilla truncata	*Villosa lienosa*

11. Bayou Bartholomew and Bayou DiSiard have now been intricately connected by man's engineering, and thus, the two drainages are treated together. George and Vidrine (in prep.) report the assemblage of Bayou Bartholomew in Louisiana. Gordon *et al*. (1980) listed the species from this river in Arkansas. The diverse assemblage from this stream represents possibly the only extant large mussel beds which convincingly link northern Louisiana's mussel fauna to the upper Ouachita River and Arkansas River in Arkansas. The presence of *L. abrupta, P. occidentalis,* and *O. olivaria* clearly indicate that this region may be a southern extension of the Ozarkian (Ouachita) Province into northern Louisiana.

Pyganodon grandis	*Utterbackia imbecillis*
Anodonta suborbiculata	*Arcidens confragosus*
Amblema plicata	*Megalonaias nervosa*
Plectomerus dombeyanus	*Quadrula cylindrica*
Quadrula metanevra	*Quadrula quadrula*
Quadrula pustulosa	*Tritogonia verrucosa*
Pleurobema pyramidatum	*Elliptio dilatata*
Fusconaia flava	*Fusconaia ebena*
Ellipsaria lineolata	*Lampsilis abrupta*
Lampsilis cardium	*Lampsilis satura*

Lampsilis siliquoidea
Lampsilis hydiana
Lampsilis teres
Leptodea fragilis
Obliquaria reflexa
Obovaria olivaria
Potamilus purpuratus
Ptychobranchus occidentalis
Toxolasmus parvus
Toxolasmus texasensis
Truncilla donaciformis
Truncilla truncata
Villosa lienosa

12. The Ouachita River is a massive drainage, which has for the most part been poorly studied, especially in Louisiana. Most of the mussel records are quite old. Moore (1909) and Vanatta (1910) provided lists of mussels from this river in Louisiana. Gordon *et al.* (1980), Gordon (1981), Harris and Gordon (1987 and 1990) and Vidrine (1989b) listed species from this extremely diverse assemblage. Appended to the list of mussels provided are species presently only reported from Arkansas (*). Discussion elsewhere in this report strongly suggests that one or all of these may have historically been residents of Louisiana.

Pyganodon grandis
Utterbackia imbecillis
*Anodonta suborbiculata**
*Alasmidonta marginata**
Strophitus undulatus
*Lasmigona complanata**
Amblema plicata
Megalonaias nervosa
Plectomerus dombeyanus
Quadrula cylindrica
Quadrula metanevra
Quadrula quadrula
Quadrula pustulosa
Quadrula mortoni
Tritogonia verrucosa
Pleurobema pyramidatum
Elliptio dilatata
Fusconaia flava
Fusconaia ebena
Uniomerus tetralasmus
Actinonaias ligamentina
Ellipsaria lineolata
*Lampsilis abrupta**
Lampsilis cardium
Lampsilis satura
Lampsilis siliquoidea
Lampsilis hydiana
Lampsilis teres
*Ligumia recta**
Obliquaria reflexa
Obovaria jacksoniana
Potamilus capax
Potamilus purpuratus
Ptychobranchus occidentalis
Toxolasmus parvus
Truncilla donaciformis
Truncilla truncata
Villosa lienosa
*Arkansia wheeleri**
Lampsilis powelli (Lea, 1852)*
*Cyprogenia aberti**
*Lampsilis ornata**
*Villosa iris**
*Lasmigona costata**
*Leptodea leptodon**
Fusconaia ozarkensis (Call, 1887)*
Villosa arkansasensis (Lea, 1862)*
Cumberlandia monodonta (Say, 1829)*

13. The Black River is very short but very large and has been examined by Vanatta (1910).

Plectomerus dombeyanus
Lampsilis teres
Obliquaria reflexa

14. The Little River and its tributaries are heavily impacted by paper mill effluents and stream alteration. Sedimentation appears to have smothered many mussel populations in what should be an extremely diverse assemblage. Most of the mussels listed were found in Dugdemona River, a modest tributary.

Strophitus undulatus
Quadrula mortoni
Elliptio dilatata
Fusconaia flava
Lampsilis hydiana
Lampsilis teres
Ligumia subrostrata
Obliquaria reflexa
Obovaria jacksoniana
Potamilus purpuratus

Toxolasmus parvus *Truncilla donaciformis*
Villosa lienosa

15. Bayou D'Arbonne and Bayou L'Outre drain from the west into the Ouachita River in Louisiana. Bayou D'Arbonne was studied by Vaughan (1893), one of the earliest streams to be rather intensively studied. Branson (1966) reported *P. capax* from this drainage just west of Monroe. Both of these streams need much more study as they may contain species, which link these streams to the Ozarkian Province.

Pyganodon grandis *Strophitus undulatus*
Arcidens confragosus *Lasmigona complanata*
Amblema plicata *Plectomerus dombeyanus*
Quadrula quadrula *Quadrula apiculata*
Quadrula pustulosa *Tritogonia verrucosa*
Elliptio dilatata *Fusconaia flava*
Uniomerus declivus *Uniomerus tetralasmus*
Lampsilis hydiana *Lampsilis teres*
Ligumia subrostrata *Obovaria jacksoniana*
Potamilus capax *Potamilus purpuratus*
Toxolasmus parvus *Truncilla truncata*
Villosa lienosa

16. The Big Black and Saline River have received little attention. The species list here is from extremely modest collecting by the author.

Pyganodon grandis *Quadrula quadrula*
Quadrula mortoni *Fusconaia flava*
Uniomerus tetralasmus *Lampsilis hydiana*
Lampsilis teres *Ligumia subrostrata*
Toxolasmus parvus *Villosa lienosa*

17. Bayou Dorcheat and Lake Bisteneau were studied prior to the present century (Vaughan 1892). Little new information has surfaced on these streams.

Pyganodon grandis *Utterbackia imbecillis*
Strophitus undulatus *Arcidens confragosus*
Amblema plicata *Megalonaias nervosa*
Plectomerus dombeyanus *Quadrula quadrula*
Quadrula nodulata *Quadrula pustulosa*
Quadrula mortoni *Tritogonia verrucosa*
Pleurobema pyramidatum *Pleurobema riddelli*
Fusconaia flava *Lampsilis hydiana*
Lampsilis teres *Leptodea fragilis*
Ligumia subrostrata *Obovaria jacksoniana*
Potamilus purpuratus *Toxolasmus parvus*
Toxolasmus texasensis *Truncilla donaciformis*
Villosa lienosa

18. The Caddo River and Lake were studied by Shira (1913). I have not had the opportunity to work in this region except for a visit to Lake of the Pines in Texas, a good habitat with the three "Anodontas": *P. grandis*, *U. imbecillis*, and *A. suborbiculata*. Schafer *et al*. (1992) compiled a list of recently collected species in this drainage.

Pyganodon grandis *Utterbackia imbecillis*
Anodonta suborbiculata *Arcidens confragosus*
Amblema plicata *Megalonaias nervosa*
Plectomerus dombeyanus *Quadrula quadrula*
Quadrula nodulata *Quadrula pustulosa*
Tritogonia verrucosa *Fusconaia flava*
Uniomerus tetralasmus *Lampsilis hydiana*

Lampsilis teres
Obliquaria reflexa
Potamilus ohiensis
Toxolasmus texasensis
Truncilla truncata
Leptodea fragilis
Obovaria jacksoniana
Potamilus purpuratus
Truncilla donaciformis
Villosa lienosa

19. Bayou Pierre, the arm of the Red River, was Frierson's laboratory (Frierson 1899a). The bayou was dredged in the mid-1950's, Vidrine and Vidrine (1978) found most of the species listed by Frierson from this stream in 1974. We were unable to locate any of the mysterious *Strophitus*; however, what appear to be *F. askewi* and *P. riddelli*, which probably was Frierson's *Unio friersoni*, were collected.

Pyganodon grandis
Anodonta suborbiculata
Strophitus undulatus
Amblema plicata
Plectomerus dombeyanus
Quadrula nodulata
Tritogonia verrucosa
Fusconaia flava
Uniomerus declivus
Glebula rotundata
Lampsilis teres
Ligumia subrostrata
Potamilus purpuratus
Toxolasmus texasensis
Truncilla truncata
Utterbackia imbecillis
Strophitus subvexus
Arcidens confragosus
Megalonaias nervosa
Quadrula quadrula
Quadrula mortoni
Pleurobema riddelli
Fusconaia askewi
Uniomerus tetralasmus
Lampsilis hydiana
Leptodea fragilis
Obliquaria reflexa
Toxolasmus parvus
Truncilla donaciformis

20. The Red River in Louisiana has essentially not been studied for mussels. However in the Lake Texoma region of the Red River in Texas and Oklahoma, a rather diverse mussel fauna still exists. Valentine and Stansbery (1971) and White and White (1977) listed the species from Lake Texoma and the upper portions of the Red River in Texas and Oklahoma. Valentine and Stansbery (1971) found a single *F. askewi* and assumed that it might have been brought in. Frierson (1899a) listed species from DeSoto Parish in Louisiana, but most of his species may be repeats of the Bayou Pierre records.

Margaritifera hembeli
Potamilus ohiensis
Fusconaia ebena

21. The Cane River drains the eastern slope of Peason Ridge and has received almost no study. The author had the opportunity to sample it briefly in 1974. The Kisatchie Bayou, a major western tributary, has an extremely large and diverse fauna. This drainage needs a tremendous amount of study, as it seems to link the Western Gulf and the Mississippi Interior Basin by possible stream capture of Kisatchie Bayou's headwater creeks near Peason Ridge with Anacoco Bayou (Sabine River) and Comrade Creek (Calcasieu River). I found 2 specimens of what appears to be *F. askewi* in this river.

Pyganodon grandis
Plectomerus dombeyanus
Quadrula mortoni
Fusconaia askewi
Lampsilis hydiana
Leptodea fragilis
Toxolasmus parvus
Obovaria jacksoniana
Amblema plicata
Quadrula quadrula
Fusconaia flava
Uniomerus tetralasmus
Lampsilis teres
Potamilus purpuratus
Toxolasmus texasensis
Villosa lienosa

22. Bayou Teche contains an interesting mix of species from the Western

Gulf and the Mississippi Interior Basin. The presence of *M. hembeli* in headwater creeks indicates the unusual origin of its assemblage. With species such as *P. riddelli*, the headwaters of this drainage, especially Bayou Boeuf, may have undergone stream capture with the headwaters of the Calcasieu River. *P. capax* was reported from this stream (Featherman 1872). Frierson (1927) discounted this record and contended that the mussel had to be a *L. satura*. In my experience, neither of these mussels have been located in this drainage.

Margaritifera hembeli	*Pyganodon grandis*
Utterbackia imbecillis	*Anodonta suborbiculata*
Arcidens confragosus	*Amblema plicata*
Megalonaias nervosa	*Plectomerus dombeyanus*
Quadrula quadrula	*Quadrula apiculata*
Quadrula nodulata	*Quadrula pustulosa*
Quadrula mortoni	*Tritogonia verrucosa*
Pleurobema riddelli	*Fusconaia flava*
Uniomerus declivus	*Uniomerus tetralasmus*
Glebula rotundata	*Lampsilis satura*
Lampsilis hydiana	*Lampsilis teres*
Leptodea fragilis	*Ligumia subrostrata*
Obliquaria reflexa	*Potamilus capax*
Potamilus purpuratus	*Toxolasmus parvus*
Toxolasmus texasensis	*Truncilla donaciformis*
Truncilla truncata	*Villosa lienosa*

23. The Mermentau River represents the westernmost route of the Mississippi River. Its assemblage is characteristic of the lower Mississippi but quite impoverished. Most of the streams are mud bottomed, and the entire drainage has been channelized with only minor exceptions. Most of its fauna is essentially destroyed. Streams are sedimented heavily from erosion of nearby rice fields and construction, and the water is laden with agricultural runoff. Historically, unusually large mussels were found in this river drainage. Vidrine (1990b) reported the abundance and diversity in a seven mile stretch of undredged river bottom in Bayou des Cannes.

Pyganodon grandis	*Utterbackia imbecillis*
Plectomerus dombeyanus	*Quadrula quadrula*
Quadrula apiculata	*Quadrula pustulosa*
Quadrula mortoni	*Tritogonia verrucosa*
Fusconaia flava	*Uniomerus declivus*
Uniomerus tetralasmus	*Glebula rotundata*
Lampsilis hydiana	*Lampsilis teres*
Leptodea fragilis	*Ligumia subrostrata*
Potamilus purpuratus	*Toxolasmus parvus*
Toxolasmus texasensis	*Villosa lienosa*

24. The Calcasieu River remains for the most part in a near natural state. It has suffered in regions from paper mill wastes and sand mining, but it retains a diverse assemblage that is uniquely Western Gulf. The headwater streams have been studied in some detail (Vidrine 1988, 1989a, 1990a, 1991a, and 1992a), and large mussel populations of rather diverse communities exist. The headwaters drain hilly, pineland regions, and these sandy streams occasionally suffer from sedimentation. The general absence of agriculture and urbanization on this river has provided for some of the most productive sampling. The headwaters of this river may have been involved in stream capture with the Red River, Sabine River, and Bayou Teche headwaters.

Pyganodon grandis	*Utterbackia imbecillis*
Strophitus subvexus	*Arcidens confragosus*

Amblema plicata
Quadrula quadrula
Quadrula mortoni
Pleurobema riddelli
Uniomerus declivus
Glebula rotundata
Lampsilis hydiana
Leptodea fragilis
Obliquaria reflexa
Potamilus purpuratus
Toxolasmus texasensis
Villosa lienosa
Plectomerus dombeyanus
Quadrula apiculata
Tritogonia verrucosa
Fusconaia askewi
Uniomerus tetralasmus
Lampsilis satura
Lampsilis teres
Ligumia subrostrata
Obovaria jacksoniana
Toxolasmus parvus
Truncilla donaciformis

25. The Sabine and Neches River drain southeastern Texas and southwestern Louisiana and connect only at Sabine Lake prior to entering the Gulf of Mexico. However, their diverse faunal assemblages are very similar. Both rivers have suffered from impoundment. Many of their species-taxa remain poorly resolved. Few excellent sampling stations were found, although diversity was very high in such stations. Frierson (1898, 1899a, 1899b, and 1911), Strecker (1931), Vidrine (1990c), Roback *et al*. (1980), and Neck (1986 and 1990) presented data on mussel diversity and abundance in these streams. Divers who frequent Toledo Bend Lake have told me of large populations of mussels, but I have not sampled the lake.

Pyganodon grandis
Anodonta suborbiculata
Strophitus undulatus
Lasmigona complanata
Megalonaias nervosa
Quadrula quadrula
Quadrula nodulata
Quadrula mortoni
Pleurobema riddelli
Fusconaia askewi
Uniomerus declivus
Lampsilis cardium
Lampsilis hydiana
Leptodea fragilis
Obliquaria reflexa
Potamilus amphichaenus
Potamilus purpuratus
Toxolasmus texasensis
Truncilla truncata
Utterbackia imbecillis
Strophitus subvexus
Arcidens confragosus
Amblema plicata
Plectomerus dombeyanus
Quadrula apiculata
Quadrula pustulosa
Tritogonia verrucosa
Fusconaia flava
Fusconaia lananensis
Glebula rotundata
Lampsilis satura
Lampsilis teres
Ligumia subrostrata
Obovaria jacksoniana
Potamilus ohiensis
Toxolasmus parvus
Truncilla donaciformis
Villosa lienosa

This list of rivers is referred to in Table 5 which compares the varied river systems and the mussel species known to occur in each. The question marks (?) indicate a possible record or a published but unverified record.

1. Pearl River
2. Tchefuncte River
3. Tangipahoa River
4. Tickfaw River
5. Amite River
6. lower Mississippi River
7. upper Mississippi River
8. Atchafalaya River and Basin
9. Tensas River
10. Boeuf River
11. Bayou Bartholomew and Bayou DiSiard
12. Ouachita River
13. Black River
14. Little River and Dugdemona River
15. Bayou D'Arbonne and Bayou L'Outre
16. Big Black and Saline River
17. Bayou Dorcheat and Lake Bisteneau
18. Caddo River and Lake
19. Bayou Pierre, the arm of the Red River
20. Red River
21. Cane River and Kisatchie Bayou
22. Bayou Teche
23. Mermentau River
24. Calcasieu River
25. Sabine and Neches Rivers

Table 5. Tabular comparison of rivers verses mussel species for Louisiana mussels and species highly suspect of occurring in Louisiana. River numbers correspond with text listings.

Mussel species	Rivers																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
M. hembeli																				x		x			
P. grandis	x		x	x	x	x	x	x	x	x	x	x			x	x	x	x	x		x	x	x	x	x
U. imbecillis	x	x	x	x	x	x	x	x	x	x	x	x					x	x	x			x	x	x	x
A. suborbiculata	x			x				x			x	x						x	x			x			x?
A. marginata												?													
A. radiatus	x	x	x	x	x																				
S. subvexus	x	x	x	x	x														x?					x	x
S. undulatus									x			x?		x	x		x		x						?
A. confragosus					x		x	x	x	x	x				x		x	x	x			x		x	x
L. complanata	x						x					x?			x										?
A. plicata	x		x	x	x		x	x	x	x	x	x			x		x	x	x		x	x		x	x
M. hervosa	x				x		x	x	x	x	x	x					x	x	x			x			x
P. dombeyanus	x		x		x		x	x	x	x	x	x	x		x		x	x	x		x	x	x	x	x
Q. pustulosa							x	x	x	x	x	x			x		x	x				x	x		x?
Q. mortoni						x		x	x	x		x		x		x	x		x		x	x	x	x	x
Q. refulgens	x	x	x	x	x																				
Q. nodulata							x	x	x	x							x	x	x			x			x
Q. apiculata	x						x	x	x						x							x	x	x	x
Q. quadrula					x			x	x	x	x	x			x	x	x	x	x		x	x	x	x	x
Q. cylindrica							x				x	x													
Q. metanevra											x	x													
T. verrucosa	x		x	x	x		x	x	x	x	x	x			x		x	x	x			x	x	x	x
P. pyramidatum							x		x	x	x	x					x								
P. beadleanum	x	x	x	x	x																				
P. riddelli																	x		x			x		x	x
E. crassidens	x		x	x	x		x																		
E. dilatata									x	x	x	x		x	x										
E. arca	x?				x?																				
E. arctata	x?																								
F. askewi																			x		x			x	x
F. cerina	x	x	x	x	x																				
F. flava							x		x	x	x	x		x	x	x	x	x	x		x	x	x		?
F. ebena	x						x		x	x	x	x								x					
U. tetralasmus			x		x		x					x			x	x		x	x		x	x	x	x	
U. declivus		x							x						x				x			x	x	x	x
A. ligamentina									x			x													
E. lineolata							x				x	x													
G. rotundata				x	x		x	x	x	x									x			x	x	x	x
L. abrupta									?		x	?													
L. cardium							x		x?		x	x?													?
L. satura									x	x	x	x										?		x	x
L. ornata	x		x	x	x							?													
L. siliquoidea							x		?		x	x													
L. hydiana			x		x			x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x
L. claibornensis	x	x	x	x	x																				
L. teres	x		x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x
L. recta	x									x		x													
L. subrostrata				x	x	x	x		x					x	x	x	x		x			x	x	x	x
L. fragilis	x		x		x		x	x	x	x	x						x	x	x		x	x	x	x	x
P. amphichaenus																									x
P. inflatus	x		x		x																				
P. ohiensis								x		x								x		x					x?
P. capax							x?					x?			x							x?			
P. purpuratus	x		x		x		x	x	x	x	x	x		x	x		x	x	x		x	x	x	x	x
P. occidentalis											x	x?													
T. parvus	x		x	x	x	x			x	x	x	x		x	x	x	x		x		x	x	x	x	x
T. texasensis			x	x	x	x		x	x	x	x						x	x	x		x	x	x	x	x
O. reflexa	x		x		x		x		x	x	x	x	x	x				x	x			x		x	x
O. jacksoniana	x		x	x	x		x		x	x		x		x	x		x	x			x			x	x
O. olivaria											x														
O. subrotunda							x?																		
O. unicolor	x		x	x	x																				
T. donaciformis	x				x		x			x	x	x		x			x	x	x			x		x	x
T. truncata							x		x	x	x	x			x			x	x			x			x
V. lienosa	x	x	x	x	x		x			x	x	x		x	x	x	x	x			x	x	x	x	x
V. vibex	x	x	x	x	x																				

Table 6. Distribution of mussels in Louisiana streams in regards to provinces.

Species	W. Gulf	Ozark	MissBasin	E. Gulf
Margaritifera hembeli			x	
Pyganodon grandis	x	x	x	x
Utterbackia imbecillis	x	x	x	x
Anodonta suborbiculata	x	x	x	x
Alasmidonta marginata		x	x	
Anodontoides radiatus				x
Strophitus subvexus	x			x
Strophitus undulatus		x	x	
Arcidens confragosus	x	x	x	x
Lasmigona complanata			x	x
Amblema plicata	x	x	x	x
Megalonaias nervosa	x	x	x	x
Plectomerus dombeyanus	x		x	x
Quadrula cylindrica		x	x	
Quadrula metanevra		x	x	
Quadrula quadrula	x	x	x	x
Quadrula apiculata	x		x	x
Quadrula nodulata	x	x	x	
Quadrula pustulosa		x	x	
Quadrula mortoni	x		x	
Quadrula refulgens				x
Tritogonia verrucosa	x	x	x	x
Pleurobema beadleanum				x
Pleurobema pyramidatum		x	x	
Pleurobema riddelli	x	x		
Elliptio crassidens			x	x
Elliptio dilatata		x	x	
Elliptio arca				x
Elliptio arctata				x
Fusconaia flava		x	x	
Fusconaia askewi	x			
Fusconaia cerina				x
Fusconaia ebena		x	x	x
Uniomerus declivus	x	x	x	x
Uniomerus tetralasmus	x	x	x	x
Actinonaias ligamentina		x	x	
Ellipsaria lineolata		x	x	
Glebula rotundata	x	x	x	x
Lampsilis abrupta		x		
Lampsilis cardium		x	x	
Lampsilis ornata		x		x
Lampsilis satura	x	x	x	
Lampsilis siliquoidea		x	x	
Lampsilis hydiana	x	x	x	x
Lampsilis claibornensis				x
Lampsilis teres	x	x	x	x
Leptodea fragilis	x	x	x	x
Ligumia recta			x	x
Ligumia subrostrata	x	x	x	x
Obliquaria reflexa	x	x	x	x
Obovaria jacksoniana	x		x	x
Obovaria olivaria		x		
Obovaria subrotunda			x	
Obovaria unicolor				x

Table 6. Cont'd.

Species	W. Gulf	Ozark	MissBasin	E. Gulf
Potamilus amphichaenus	x			
Potamilus capax			x	
Potamilus inflatus				x
Potamilus ohiensis			x	
Potamilus purpuratus	x	x	x	x
Ptychobranchus occidentalis		x		
Toxolasmus parvus	x	x	x	x
Toxolasmus texasensis	x		x	x
Truncilla donaciformis	x	x	x	x
Truncilla truncata	x	x	x	
Villosa lienosa	x	x	x	x
Villosa vibex				x

Table 7. Distribution of mussels in Louisiana streams in regards to provinces as they commonly occur in headwater streams.

Species	W. Gulf	MissBasin	E. Gulf
Margaritifera hembeli		x	
Anodontoides radiatus			x
Strophitus subvexus	x		x
Strophitus undulatus		x	
Quadrula pustulosa		x	
Quadrula mortoni	x		
Quadrula refulgens			x
Tritogonia verrucosa	x	x	x
Pleurobema beadleanum			x
Pleurobema pyramidatum		x	
Pleurobema riddelli	x	x	
Elliptio crassidens			x
Elliptio dilatata		x	
Fusconaia flava		x	
Fusconaia askewi	x		
Fusconaia cerina			x
Uniomerus tetralasmus	x	x	
Lampsilis ornata			x
Lampsilis satura	x	x	
Lampsilis hydiana	x	x	
Lampsilis claibornensis			x
Lampsilis teres	x	x	x
Ligumia subrostrata	x	x	x
Obovaria jacksoniana	x	x	x
Obovaria unicolor			x
Potamilus purpuratus	x	x	x
Toxolasmus parvus	x	x	x
Toxolasmus texasensis	x	x	x
Truncilla donaciformis	x	x	
Truncilla truncata	x	x	
Villosa lienosa	x	x	x
Villosa vibex			x

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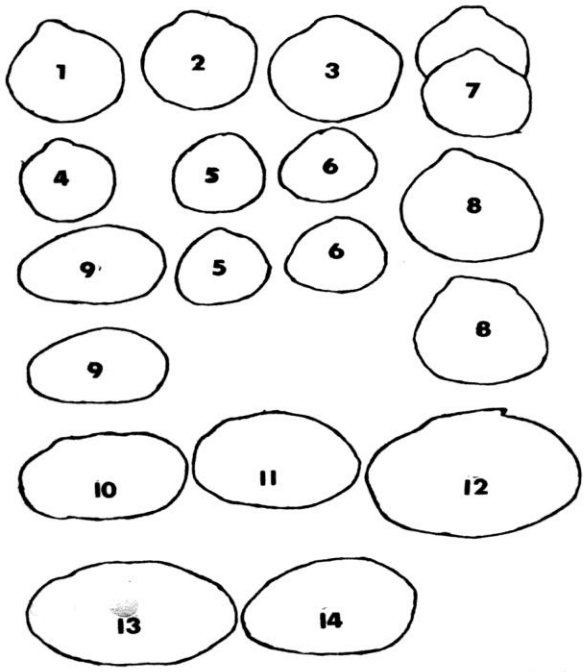
SYSTEMATIC INDEX

ABOUT THE AUTHOR

Malcolm F. Vidrine received his Ph.D. in Biology at the University of Southwestern Louisiana in 1980. His thesis was centered upon the water mites parasitizing freshwater mussels in eastern North America. In 1978, he was awarded a Jessup Fellowship by the Academy of Natural Sciences of Philadelphia, where he studied the Academy's mussel collections. He is currently an Associate Professor of Biology in the Division of Sciences at Lousiana State University at Eunice. He is the author and/or coauthor of more than 60 scientific and popular articles on a wide variety of topics including leprosy in armadillos, trematodes, leeches, mosquitoes, rotifers, butterflies, dragonflies, plants/wildflowers, mussels and mites. He is interested in the preservation of habitat and serves as Vice-President of the Cajun Prairie Habitat Preservation Society, through which he has been actively restoring a prairie in a 10 acre city park in Eunice. His hobbies include gardening for butterfly habitat and collecting Bowie knives. He has been married to Gail Quillman for 10 years, and they have two children, Daniel and Caroline. His older son, Macky, is a musician in Atlanta, Georgia.

BACK COVER
(All shells ca. actual size)



Quadrula mortoni (Conrad, 1835)

Figures 1, 2, and 3. Louisiana. St. Landry Parish. West Atchafalaya Basin borrow canal (Bayou Courtableu) ca. 0.5 miles north of Rte. U. S. 190. 18 August 1978. Bob Parker, Beverly Williams, and MFV.

Figure 4. *Quadrula nodifera* form. Texas. Hardin County. Village Creek at Rte. U. S. 96. 2 June 1978. Bill Bell, Mark LaSalle, Don Gowan, Darryl Clark, and MFV.

Pleurobema riddelli (Lea, 1861)

Figures 5 and 6. *Unio friersoni* (Wright, 1896), type. ANSP 68112. Louisiana. DeSoto Parish. Bayou Pierre.

Figure 7. Louisiana. Vernon Parish. Drake's Creek at Lookout Road. October 1989. MFV.

Figure 8. Louisiana. Natchitoches and Red River Parishes. Bayou Pierre at Rte. LA 174. 22 August 1974. Blake Vidrine and MFV.

Villosa iris (Lea, 1829)

Figure 9. (Female) Arkansas. Grant and Dallas Counties. Saline River at Rte. U. S. 167. 11 August 1978. Bill Bell, Darryl Clark, and MFV.

Lampsilis hydiana (Lea, 1838)

Figure 10. (Male). Louisiana. Vernon Parish. Drake's Creek ca. 0.5 miles below Lookout Road in Kisatchie National Forest. 8 August 1992. MFV.

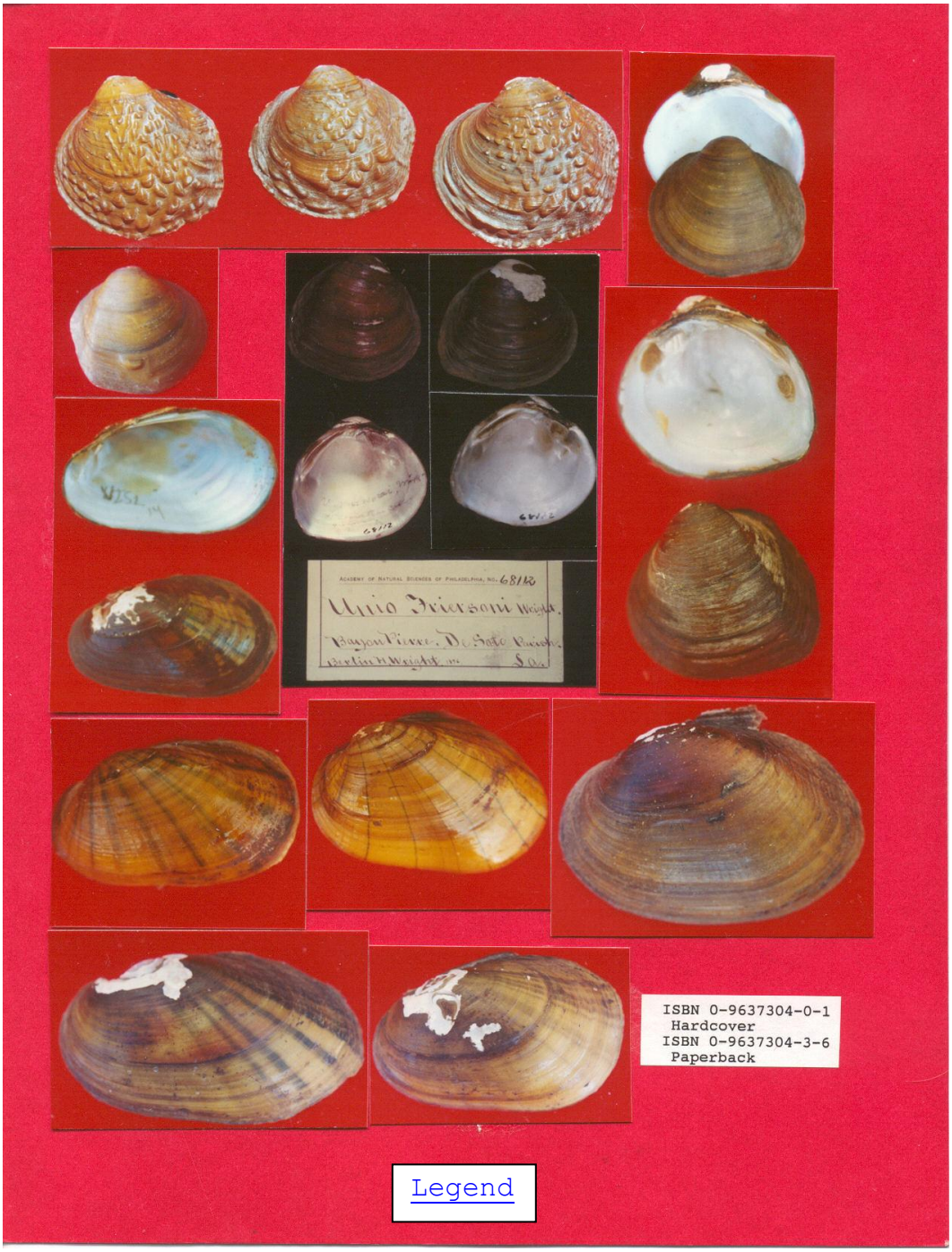
Figure 11. (Female). Louisiana. Acadia Parish. Mamou Irrigation Canal at intersection of Rtes. LA 368 and 97. 1 September 1973. Pat Vidrine, Numa Vidrine, and MFV.

Lampsilis claibornensis (Lea, 1838)

Figure 12. (Male). (MMNS 2506). Louisiana. St. Helena and East Feliciana Parishes. Amite Rive at Hwy. 63 to Magnolia. 6 November 1988. Hartfield and Majure.

Lampsilis siliquoidea (Barnes, 1823)

Figure 13 (Male) and 14 (Female). (MMNS 1913). Mississippi. Copiah County. Bayou Pierre, R7ET10N, Old Hazelhurst-Pt. Gibson road. 28 July 1983. Paul Hartfield.



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