A FIELD GUIDE TO THE FRESHWATER MUSSELS OF CHICAGO WILDERNESS

Chicago WILDERNESS

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www.fieldmuseum.org/chicagoguides

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All national range maps that appear in this guide with the exception of those for the creek heelsplitter and the ellipse are reproduced from Parmalee, Paul W. and Arthur E. Bogan. *The Freshwater Mussels of Tennessee*. 1998. University of Tennessee press. Knoxville. TN, with permission. National range maps for the creek heelsplitter and ellipse were made at Openlands using data from ESRI and NatureServe.

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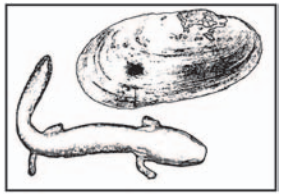
INTRODUCTION

Why This Guide?

By many people's standards freshwater mussels (also called clams or naiads) are homely creatures. They have no backbone, no eyes, they bury themselves in streambeds, and their reproduction includes hitchhiking rides from fish. Homely indeed! Many residents of the Chicago Wilderness region do not even realize that freshwater mussels live in our streams, rivers, lakes, and ponds, and that they are good indicators of water quality as well as fascinating creatures in their own right.

The purpose of this field guide and accompanying Web site is to raise awareness of our region's freshwater mussels, and encourage both aquatic stewards and environmental professionals to learn to identify mussel species in the Chicago Wilderness region and use them to estimate stream and river quality. North America has the most diverse freshwater mussel fauna in the world, but currently half of these species have been proposed for listing as endangered, threatened or of special concern. This reflects the fact that our stream communities have been substantially degraded, and there is a critical need to monitor their status.



We have selected a salamander mussel pictured with a mudpuppy as this guide's logo. The salamander mussel is the ideal visual representative for the guide for several reasons: most important, it is endangered in Illinois and a candidate for federal status as a threatened or endangered species. It is also unusual because it uses a salamander (the mudpuppy) as a host for its larvae (glochidia). It is of considerable local interest because this salamander host/mussel relationship was first confirmed at Hickory Creek, a stream in Will County, IL.

The numbers and variety of mussels present in a stream can be an excellent indicator of stream health, but mussels can be difficult to identify. The same species can vary in shape, coloration, and markings, and can look different at different ages. This variability can even be seen in one species within the same stream.

However, if you focus on species most likely to be found in your watershed, general shape, and some key characteristics presented in this guide, you will get better at identifying species of local interest.

Pictures are worth a thousand words. In order to help with the mussel identification process we have photographed typical, mature specimens like those you're likely to find in the field, and also included several photographs of each species, including close-up photographs of the distinguishing features along with brief but useful descriptions that highlight characteristics important for identification. By including multiple photos of each species, we hope to substantially ease the task of identifying freshwater mussels. The scale bar and the penny are included in photographs to give readers a general idea of the size of the valves; juveniles can be smaller than the pictured specimens and species can be quite variable in size.

How to Use This Guide

This Field Guide consists of introductory material, a glossary, a series of 39 detailed narrative species descriptions including range maps, and a bibliography. The species presented in the guide are currently in the Chicago Wilderness region, based on information from the Illinois Natural History Survey (INHS) Mollusk Database.

Getting Started

In order to become familiar with mussels and the terms used to describe them, study the anatomy section in this introductory material and the terms and photographs in the glossary.

Permits and Conducting Mussel Surveys

It is important to note that before conducting mussel surveys or collecting and keeping dead shells, a permit from the Department of Natural Resources must be obtained. In Illinois you can request a permit by writing to The Illinois Department of Natural Resources, Office of Resource Conservation, One Natural Resources Way, Springfield, IL 62702-1271.

The letter should contain information about who will be participating in the survey, what the survey will consist of, where and when it will take place, and why it is being done. If you are planning to start a collection of dead shells, be sure to state that only dead shells of non-protected species will be kept and that no living native mussel will be harmed during the surveys; all will be returned to appropriate habitat. Permits are good for a calendar year and a simple collecting report must be filed at the end of the year.

Collection of mussels in Indiana, Wisconsin or Michigan requires a scientific permit. Request a permit application from the Division of Fish and Game, Room 605, State Office Building, Indianapolis, IN, 46209 or from the Wisconsin Conservation Department, Box 150, Madison WI, 53701. The Wisconsin permit application can be found online at: http://www.DNR.state.wi.us/org/caer/cs/apps/9400379.pdf. Michigan Permits are available from the Fisheries Division, Michigan Department of Natural Resources, PO Box 30466, Lansing, MI 48909 or online at http://www.michigan.gov/documents/cultural_scientific_collector__permit_PR8114_25509_7.pdf.

Once you know what river, stream or lake you want to survey, it is advisable to check the Illinois Natural History Survey's Mollusk Database at http:/www.inhs.uiuc.edu/cbd/main/collections/mollusk.html to see what species are recorded as having been found there in the past. This can alert you to the species you are likely to find and substantially cut down on the time you spend trying to identify them.

Making Identifications

Species Description Pages

Once you are familiar with the anatomy and terms used in mussel identification and are ready to move to the species descriptions, compare your specimen to the pictures. Start with shape and then look at the beak sculpture. Next use ornamentation if present, then consider any color patterns. Always keep in mind that external shell color and nacre color can sometimes be helpful in distinguishing species, but that color can be extremely variable, and in old, weathered specimens the nacre and the external shell often have become eroded and bleached. Mussels also tend to darken as they age which can hide tips to identification such as green rays. You may also have a shell covered with algae, diatoms, mineral incrustations or fine sediment. A stiff plastic brush (or even an old toothbrush) can help to remove these things that make identification more difficult. Internally, the presence or absence of teeth is very helpful in making identifications, and the relative size and thickness of the teeth is secondarily helpful.

Title Banners

The species description title banners are color coded according to the subfamily to which the species belongs. Three separate subfamilies of native mussels exist in the Chicago Wilderness region: Ambleminae, Anodontinae and Lampsilinae. Species belonging to a given subfamily will display characteristics of that subfamily. For example, mussels in the subfamily Anodontinae have either no internal teeth or reduced internal teeth, while species belonging to the subfamily Lampsilinae may show differences in shell shape between males and females. Each species description page also has a tab with the banner color at the bottom of the page which allows you to flip through and quickly locate the descriptions for a subfamily. Illinois, Wisconsin and Indiana listing status for Endangered and Threatened species is also identified on the title banner.

Narrative Sections

The species descriptions include three sections: ID. Aids, Distinguishing Features and Environmental Profiles. Each of these sections is intended to help you in the process of species identification.

The **ID. Aids** section stresses the three or four most distinctive characteristics of the internal and external shell morphology. This usually includes shell shape because the shape of the shell can be a tip off for identification, or at least narrow your choices. Compare your shell to those in the guide that have a similar shape. The shape of a particular species, like every other feature, is variable, but that variability has its limits. If the species has ornamentation on its shell, this is also stressed in the ID. Aids section. Knobs, nodules, tubercles, corrugations and raised patterns can often be very helpful in making identifications. Shells that normally have these features usually stand out from less ornamented shells. The ornamentation can also be variable, even from the same locale for the same species, and can range from subtle to very distinct.

The **Distinguishing Features** section provides a detailed description of the species as well as comparisons with similar looking mussels. Both the ID. Aids and the Distinguishing Features may make reference to shell thickness. What constitutes a thick or a thin shell can be quite subjective, so a few guidelines are given below of how we classified our shells. This convention should be followed for this guide only. Shells can be thicker or thinner depending on where they are measured. Measurements for this guide are from the approximate center of the shell.

Very Thin	shells are less than 0.5 mm thick
Thin	shells are between 0.5 and one millimeter thick
Moderately Thick	shells are between one and two millimeters thick
Thick	shells are between two and five millimeters thick
Very Thick	shells are more than five mm thick

The **Environmental Profile** section flags the types of environments that may be reasonable for finding a particular species. For example, some mussels are found in ponds and lakes while others are confined to large rivers. It also includes information about whether the mussel is common or rare throughout its range. Mussel hosts include documented fish and salamander species to which the larva (glochidia) of the mussel attach, and from which they take nourishment as they develop adult structures. We have listed all the known hosts in the Chicago Wilderness region for each species, as well as probable hosts based on laboratory information. Identifying mussel hosts is a "work in progress" and you can check the host Web sites listed in the bibliography for the most current information at any given time. A map of the range of the species in the United States is included in the Environmental Profile section.

Dr. Clammy is a cartoon character created for this guide, who appears on many of the species description pages, giving interesting information and/or helpful tips for mussel identification.

Photographs

Several photographs are included on the species description pages. These include images of the characteristics of the external shell on the front of the page and photos of the characteristics of the internal shell on the back side.

Regional Distribution Maps

Records of the presence or absence of each native species in counties in the Chicago Wilderness region are illustrated on a regional distribution map on the back page of each species description. These records are from the Illinois Natural History Survey's (INHS) Mollusk Database. Presence or absence of the species is recorded for the period before 1975 and after 1975. The 1975 date was chosen because it approximates the date of implementation of the Clean Water Act. As of 1975, each state has an obligation to maintain the integrity of its aquatic systems, including the preservation of pollutant-sensitive species such as freshwater mussels. However, in practice, many streams have continued to degrade since the implementation of this act.

Counties where no records of the mussel have been reported are also identified. This does not always mean that the mussel species was (or is) not there, only that its presence was never formally recorded in the INHS Mollusk Database. A search of records of mussel distribution held by different agencies within the Chicago Wilderness Region was beyond the scope of this project; we relied instead on displaying the species for which verified records exist in the INHS collection. This may result in some species being displayed as "no record" when they are actually present in a county. This is more likely for counties outside of Illinois. It is also important to note when using these maps, that if the INHS has a record for a mussel species anywhere within a county, the whole county is shaded to show the mussel is (or was) present. More detailed distribution data can be found in the INHS Mollusk database referenced in the Web sites section. The distribution maps and the INHS database can aid in narrowing species identifications to locations with existing records but new finds which extend ranges are also possible....so are misidentifications. Therefore we encourage cautious use of the range maps.

The regional distribution maps that appear with each species description display only county boundaries, not county names. A key to county names appears here:

The Mussel Classification Index

One of the goals of this Field Guide is to introduce the Mussel Classification Index (MCI) for use in assessing mussel populations and communities. The guide was developed by Robert Szafoni of the Illinois Department of Natural Resources Division of Natural Heritage. The MCI and the calculated Mussel Resource Value (MRV) can provide a quantitative method for ranking mussel conservation priority needs, evaluating pre– and post-project impacts to mussel communities, and monitoring long-term changes to mussel communities. The MRV has not been correlated to actual stream disturbances or levels of degradation, so it cannot be used, at this time, to evaluate stream condition per se. The factors that go into the calculation of the MCI are:

1. Number of mussel species found (live + fresh shell; not relict)
2. Number of intolerant mussel species found (meaning state listed threatened or endangered species or the fluted-shell, monkeyface and ellipse)
3. Catch per unit effort (#live individuals/person-hours spent searching)
4. Percent of live species with individuals with 0-3 growth rings

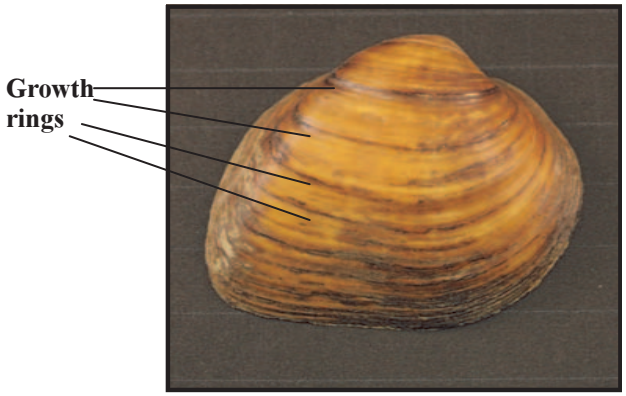
Data sheets and detailed information about how to calculate the MCI from these factors can be found on the Web site associated with this Field Guide at www.fieldmuseum.org/chicagoguides. In order to use the index you must be able to identify the mussels and recognize juveniles (mussels with 0-3 growth rings).

Juvenile Mussels

The species descriptions and photographs in this guide are focused on the identification of adult mussels. When identifying juvenile mussels, keep in mind that they are usually much more brightly colored than the adults, which tend to have their colored rays faded or missing. Juveniles are also smoother and more compressed than the adults, and have much thinner shells and more delicate teeth. While juvenile shells can be vexing to identify, they often have a very distinct umbo (beak) sculpture compared to an adult, which can be very helpful for identification.

Growth Rings

Growth rings on the shells of mussels have been used to estimate their age. Growth rings form dark bands on the mussel shell. While Current research suggests these bands are not necessarily laid down annually (like tree rings) they are reasonable guides for placing individuals in age groups. Erosion of the shell over time may obscure the early growth rings, but in very young shells (under five years of age) the dark lines are usually easy to discern and can be counted to determine whether the mussel appears to be three years old or younger. Thin shelled species grow faster than thick shelled species and may display 3 or fewer growth rings at a larger relative size.



Shell Anatomy

Freshwater mussels are soft bodied animals enclosed by two shells (valves) that are connected by a **hinge**, that is a tough organic ligament that runs along the dorsal junction.

Exterior

The top, or **dorsal surface**, of the mussel is where to find the hinge line. On the exterior surface of the valves, the dorsal surface has a raised knob that is referred to as the **umbo or beak**. The end opposite the dorsal, or the bottom end of the mussel, is referred to as the **ventral surface**.

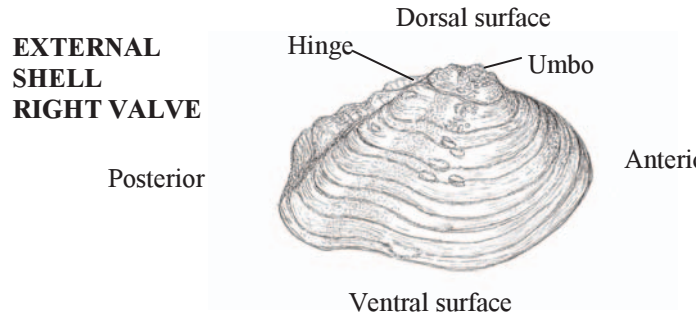
In addition to always being on the dorsal surface, the umbo is also always on the **anterior end** of the mussel. The end opposite the anterior is referred to as the **posterior**. Mussels spend their adult lives partially buried in the sediment of the stream, river, pond or lake that is their home. Their anterior end is buried in the sediment, while the posterior is exposed to the water, and this is the end from which they feed, breathe (with gills), and expel wastes.

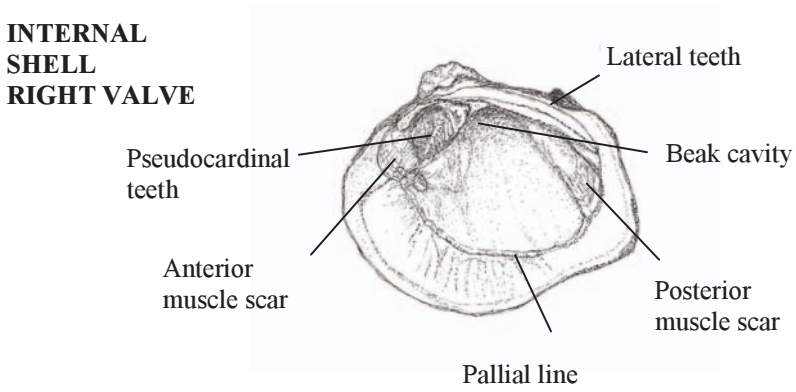
Interior

On the interior of the shell, just beneath the hinge line, are two sets of "teeth." Strictly speaking these are not teeth as found in mammals, reptiles, amphibians and fish, but rather parts of a hinge mechanism that keeps the left and right valves in alignment. Short, stubby triangular and/or serrated teeth at the anterior end of the mussel are called **pseudocardinal teeth**. **Lateral teeth** are typically more elongate; they can appear as a double row, they can be serrated or smooth, or they can be absent. The number of teeth in the left and right valves is not always the same. The size and shape of the lateral and pseudocardinal teeth can be important for identification.

Other structural features found on the inside of the shell include the **beak cavity**, the **pallial line**, anterior and posterior **muscle scars**, and the **interdentum**.

The beak cavity is underneath the lateral and pseudocardinal teeth, and can be shallow if the mussel is thin or very deep if the mussel is inflated or "fat." The interdentum is the space between the pseudocardinal teeth and the lateral teeth. The pallial line is a slight depression that runs around the inner circumference of the shell. It is prominent in some species but difficult to discern in others. It represents a remnant of the mantle (or pallium) which is one of the principal soft tissues found in the internal body of the mussel. This mantle or pallium secretes the shell or valves that make up the hard covering of the mussel. There are four sets of **muscles** in a living mussel. The two sets of muscles that open and close the shell are the **anterior** and **posterior adductor muscles**. They leave behind a roughened surface or scar on the inside of the valves and are distinctive in some species. The other muscles are retractors which are used for extending and retracting the mussel's foot, used for locomotion. It is the hard surfaces of shells or valves that you will use to identify species.





Web sites

NatureServe has a search feature that provides reliable information and maps for general mussel distribution, along with many other natural history facts:
http://www.natureserve.org/explorer/index.htm

The Ohio State University Museum of Biodiversity has an excellent host-mussel database and a wealth of other information:
http://www.biosci.ohio-state.edu/~molluscs/OSUM2/

The Illinois Natural History Survey site has a wonderful variety of information and an excellent database of Midwestern mussels:
http://www.inhs.uiuc.edu/cbd/collections/mollusk/molluskintro.html

The Illinois State Museum has helpful information and images on native mussels: http://www.museum.state.il.us/ismdepts/zoology/mussels/gallery.html?TopicID=Paleoheterodonta

Mussels of the Maumee has very good photos for identification help: http://www.farmertodd.com/musselguide/

The Unio Gallery from Missouri State University has a fascinating group of mussel reproduction photos at http://unionid.missouristate.edu/

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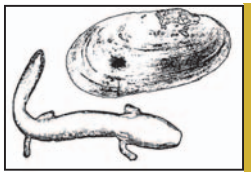


Elephant-ear *Elliptio crassidens* external views

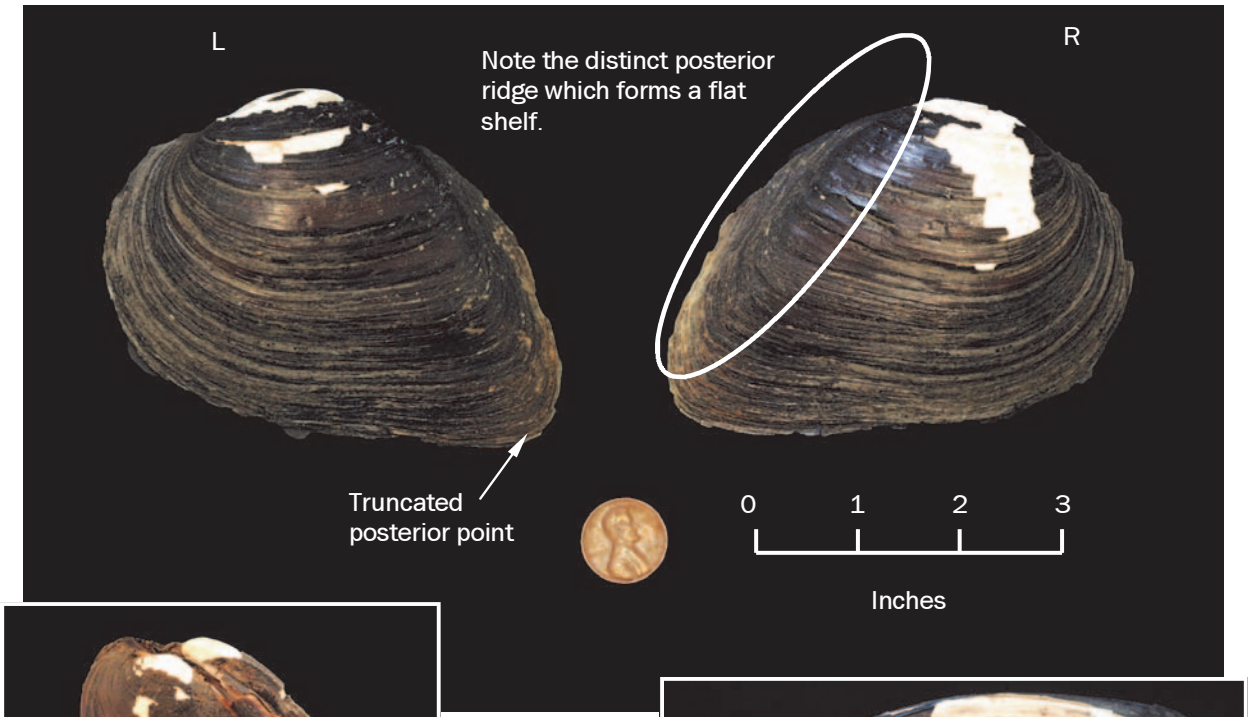
Subfamily Ambleminae

State Listed as Threatened: IL, as Endangered: WI

ID. Aids:
External Surface – A large, thick, somewhat triangular shell with relatively smooth periostracum; colored brown to almost black in older shells, with a distinct posterior ridge.
Internal Surface – Pseudocardinal teeth are large and nacre is often purple.

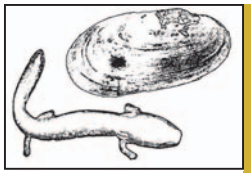
Distinguishing Features:
Similar Species – Spike, mucket.
Compared To – The spike often has a similarly colored shell, but the shell is thinner, more elongated, and compressed in shape when compared to the elephant-ear. The mucket may also be of similar color and thickness, but lacks the sharply angled posterior ridge of the elephant-ear. The elephant-ear also has a truncated posterior point that is at or below the longitudinal midline.
Beak Sculpture – Reported to be several indistinct raised, looped lines that are usually visible on only the youngest shells, and are indistinct even at that size. Most shells have eroded umbos. The beaks are slightly raised above the hinge line, but badly eroded beaks may appear to be even with the hinge line.
Beak Cavity – Shallow with a long interdentum.
Color – Somewhat smooth, dark brown to blackish. Young shells are usually yellowish green with many green rays.
Nacre – Often purple but can also be pinkish or almost white with a pink tinge near the umbos. Iridescent posteriorly.
Teeth/Hinge – Pseudocardinal teeth are large, peglike, and serrated with two in the left valve and one in the right. The right valve may have a second, smaller accessory tooth present anteriorly. Lateral teeth are large, heavily built, roughened, sharply angled, and short (about half the shell length).
Size/Thickness –To six inches. A 5.3-inch, (135 mm), long shell measured 6.7 mm thick in the middle.

Environmental Profile:
Habitat – In large rivers in mud, sand, or small gravel.
Hosts – The only known host is the skipjack herring.
Distribution /Status – Widespread but uncommon. Endangered in WI, not present in MI, threatened in IL and imperiled in more than half its range in the U.S. Present only in Grundy Co. IL in the Chicago Wilderness area.



Oblique view of articulated valves of an elephant ear mussel showing the posterior ridge and an eroded umbo.

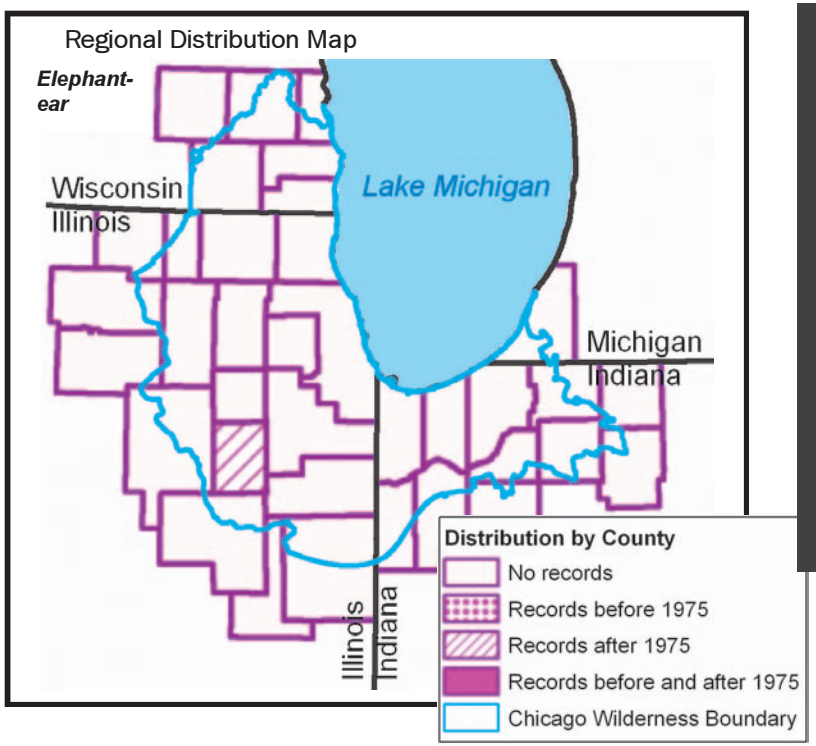
One of the characteristic features of the elephant-ear is an eroded umbo. Nearly every shell in the Field Museum collection had a badly eroded umbo. This umbo has eroded all the way to the organic layer that gives rise to the nacre, or the internal shell surface.

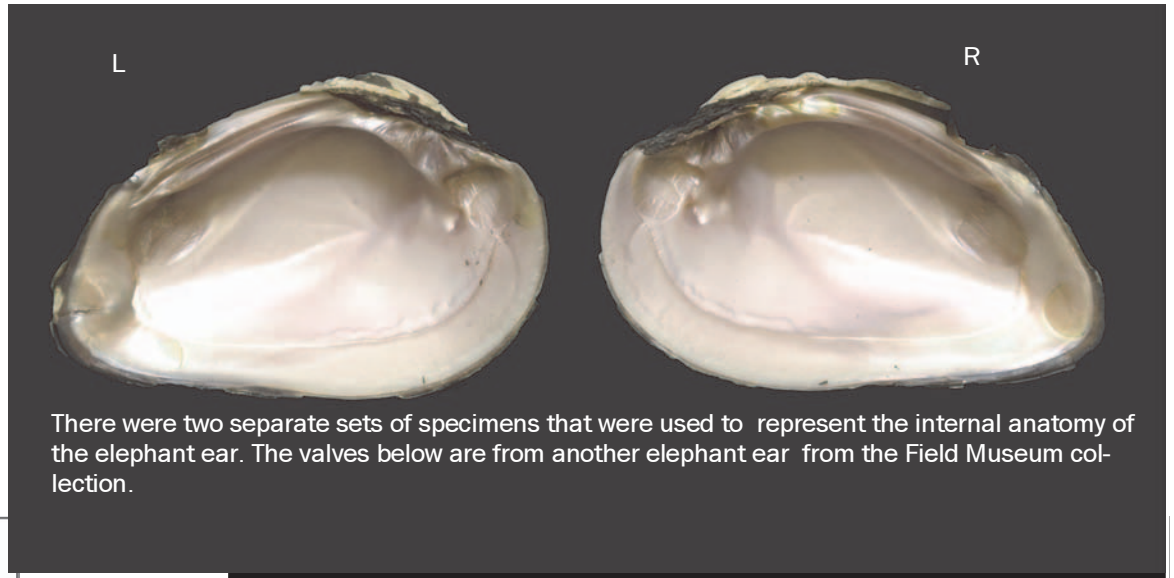


Elephant-ear *Elliptio crassidens* internal views

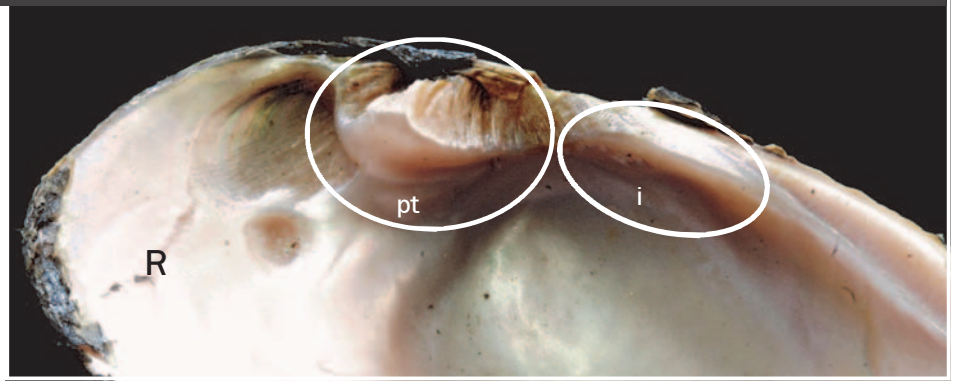
Subfamily Ambleminae

State Listed as Threatened: IL, as Endangered: WI

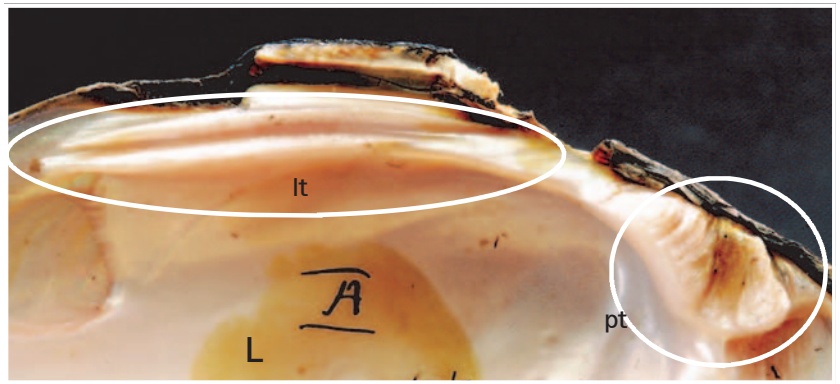




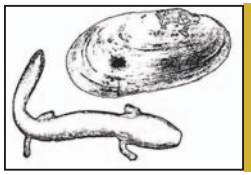
There were two separate sets of specimens that were used to represent the internal anatomy of the elephant ear. The valves below are from another elephant ear from the Field Museum collection.



Above is a photo of the right valve, and to the left is a close-up of the left valve. The pseudocardinal teeth are large, peglike, and serrated. There are two in the left valve, and one in the right. There are two lateral teeth in the left valve and a single lateral tooth with a shelf in the right valve. The interdentum (i) is prominent in this species and grades into the lateral teeth.



Left valve showing slightly curved lateral teeth and two stout, erect, serrated, and divergent pseudocardinal teeth.



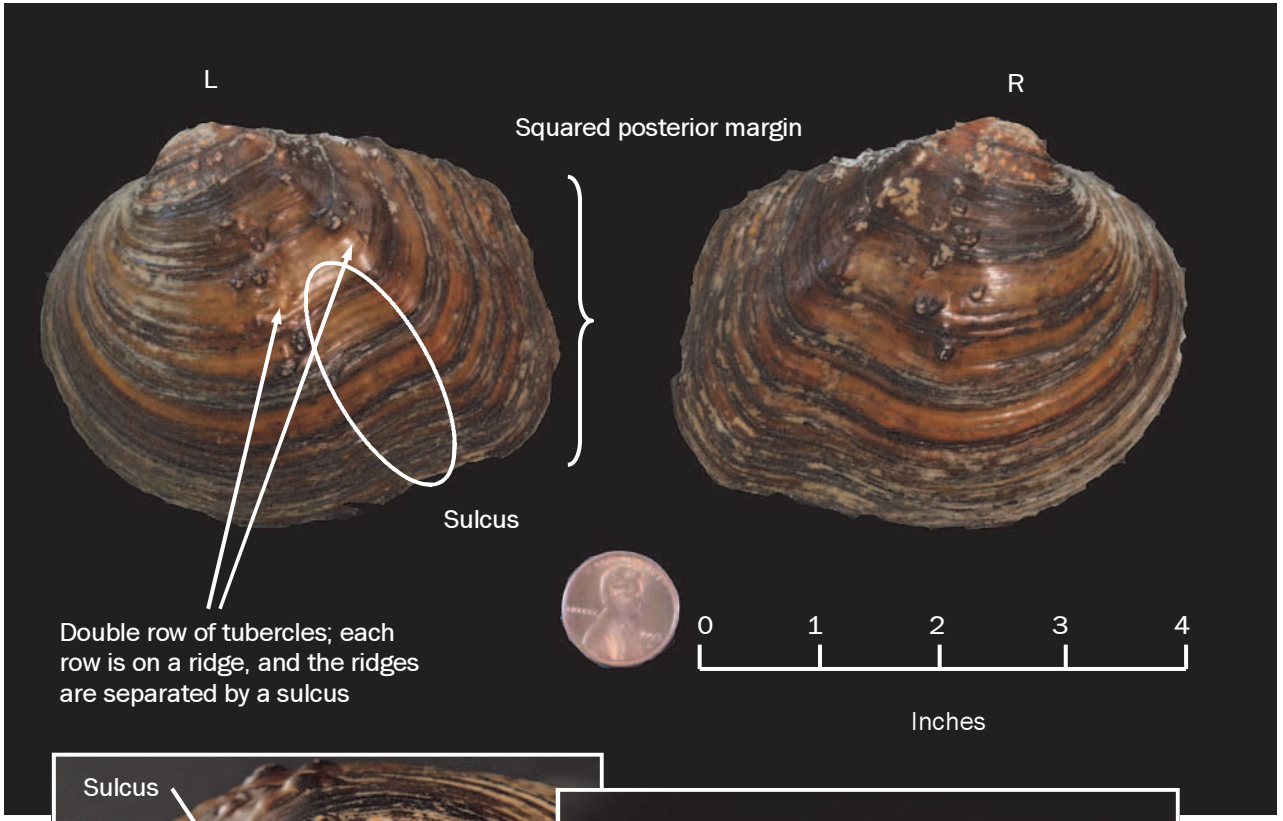
Mapleleaf *Quadrula quadrula*
Subfamily Ambleminae

external views

ID. Aids:
External Surface –Thick shell with a squared posterior edge and two rows of tubercles radiating down from the umbo and separated by a sulcus.
Internal Surface – Teeth heavy and well developed, nacre is white with iridescence.

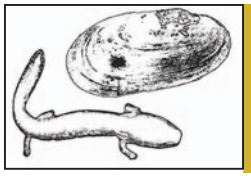
Distinguishing Features:
Similar Species – Pimpleback, monkeyface, and others outside of our range.
Compared To – The pimpleback has a more rounded shell while the mapleleaf is more elongated with a squared posterior edge. The monkeyface has less regular ornamentation, a prominent wing, and a more rounded posterior edge compared to the mapleleaf's smaller wing, two rows of tubercles as ornamentation, and squared posterior edge.
Beak Sculpture – Small tubercles radiate down from the tip of the umbo and this beak sculpture is continuous with the rest of the shell ornamentation.
Beak Cavity – Deep with a short but broad interdentum.
Color – Young shells are yellowish, often with green rays that can be fine to thick. Older shells are yellowish brown to reddish brown or dark brown and usually lack rays. All shells are smooth and somewhat glossy. Rarely, shells are found that have very few tubercles.
Nacre – Lustrous white with pronounced iridescence, especially on the posterior half.
Teeth/Hinge – Pseudocardinal teeth are large, deeply serrated, and peglike. The lateral teeth are moderately long and well developed.
Size/Thickness – To 4.5 inches. A four-inch specimen measures 5.5 mm thick in the middle.

Environmental Profile:
Habitat – Medium to large streams in compacted mud, sand, gravel and occasionally cobble.
Hosts – Channel catfish, speckled madtom, spotfin shiner, bigeye chub, sauger, flathead catfish, white crappie, largemouth bass, black crappie, black bullhead, brown bullhead, shovelnose sturgeon, yellow bullhead, green sunfish, bluegill.
Distribution /Status – Widespread and relatively common. Secure in IL, IN, and vulnerable in WI. Not present in MI.



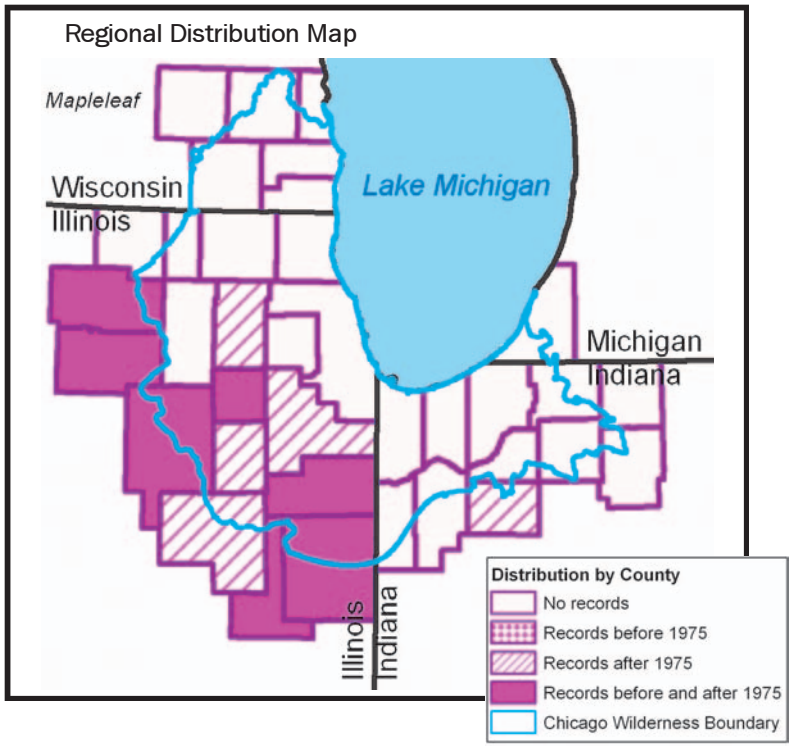
Close-up of umbo showing small tubercles which extend into a double row of tubercles, separated by a sulcus, that radiate down the shell.

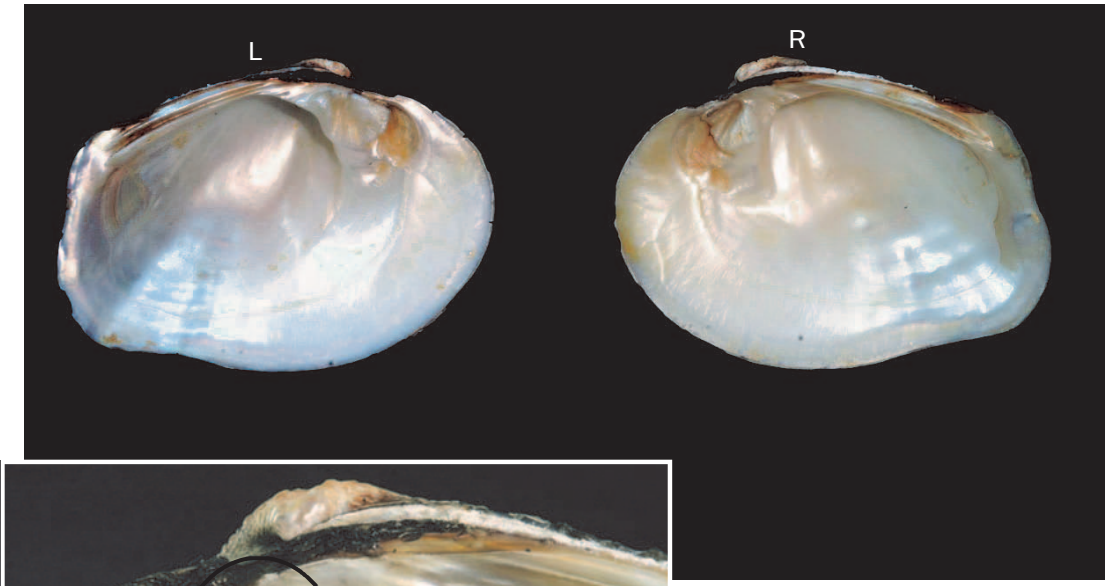
Close-up dorsal view of the left valve showing very large pseudocardinal teeth (pt).



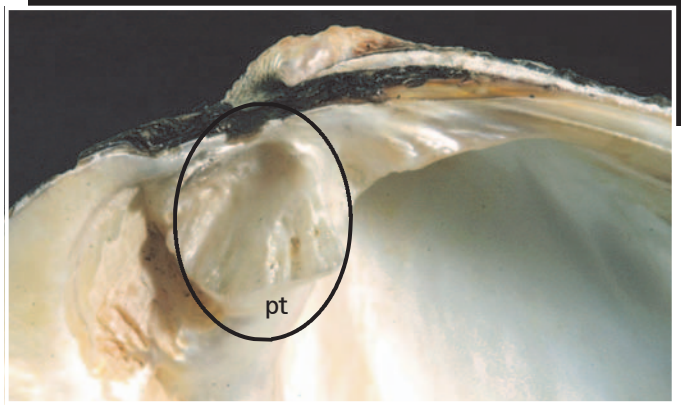
Mapleleaf *Quadrula quadrula*
Subfamily Ambleminae

internal views

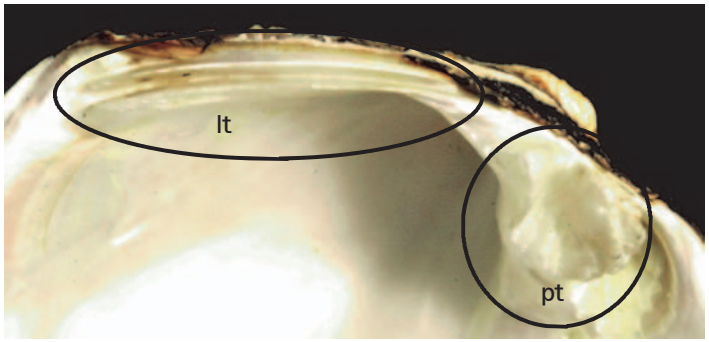




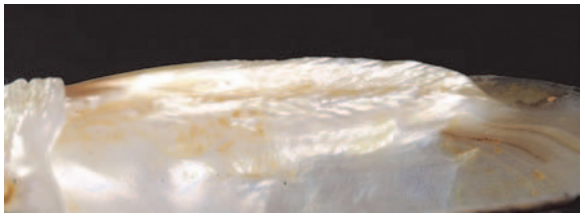
The nacre is lustrous white with pronounced iridescence, especially on the posterior half.



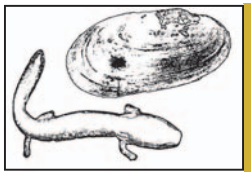
Right pseudocardinal tooth (pt). The pseudocardinal teeth are large, robust, and peglike.



Left valve showing two lateral teeth (lt) with a slight curvature and two distinct, deeply serrated pseudocardinal teeth (pt).



Close-up of right lateral tooth with striations across the long axis of the tooth. A shelf can also be present at the base of the tooth. The lateral teeth may be slightly curved to straight (Oesch, 1995).



Monkeyface *Quadrula metanevra* external views

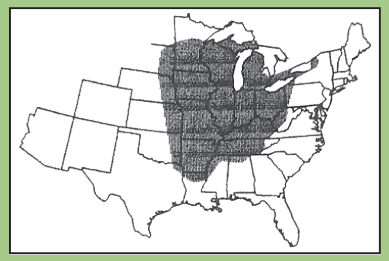
Subfamily Ambleminae

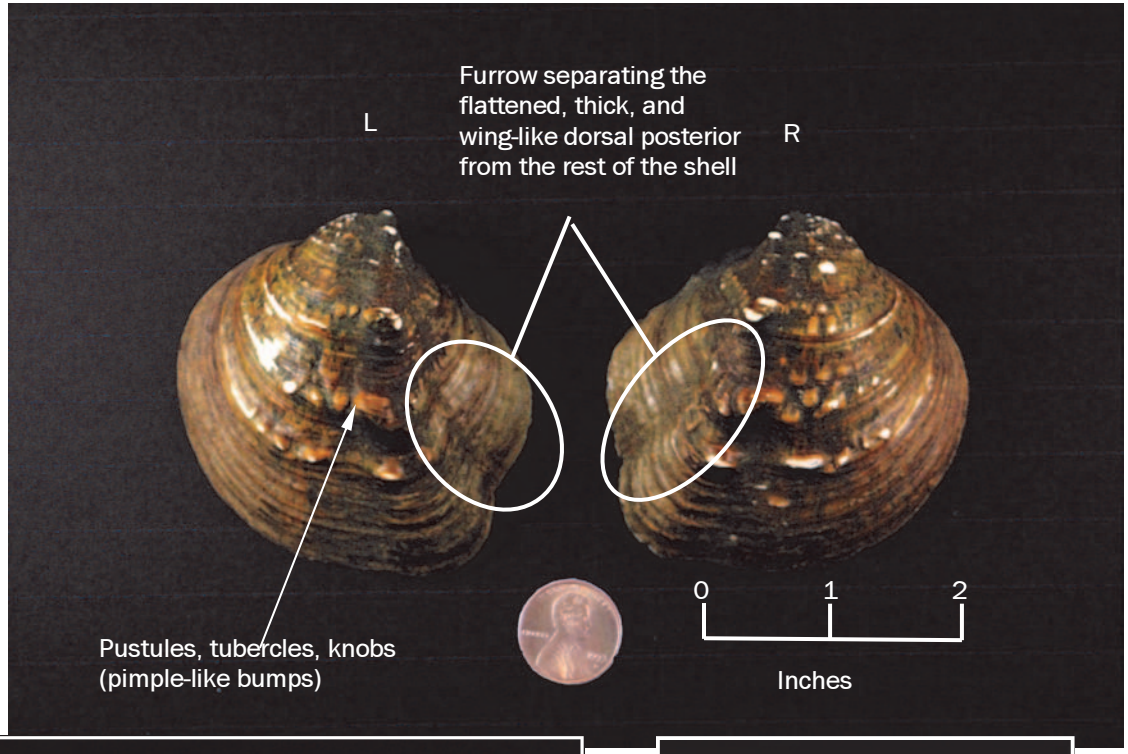
State Listed as Threatened: WI

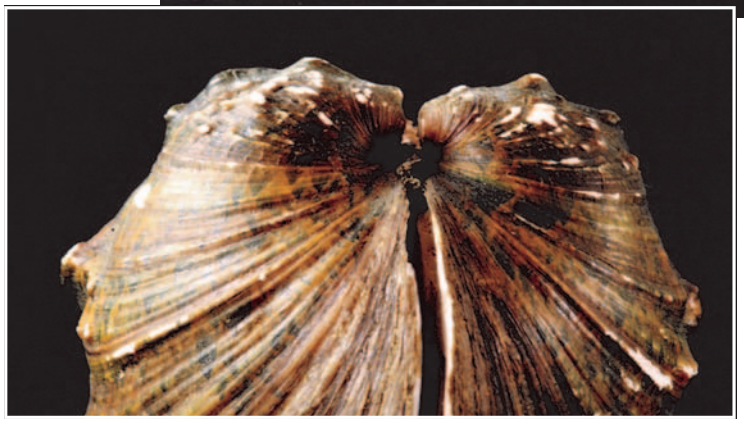
ID. Aids:
External Surface – Thick, inflated shell, somewhat rounded or rectangular in shape. The dorsal posterior region is flattened, thick and wing-like below the hinge line, and usually separated from the rest of the shell by a furrow. The surface of the shell is lightly to heavily covered with tubercles, and these are more plentiful centrally. One ridge extends from the umbo downwards just anterior to the furrow. This ridge may have knobs larger than those found on the rest of the shell.
Internal Surface – Large, stout, heavily grooved pseudocardinal teeth; nacre white.

Distinguishing Features:
Similar Species – Mapleleaf, pimpleback
Compared To – The monkeyface has one ridge on the dorsal surface of the shell, often with pustules and knobs. The mapleleaf has two ridges that are separated by a sulcus and that radiate from the umbo. These two ridges on the mapleleaf usually have pustules or, rarely, knobs. The pimpleback is rounded in shape and has pustules but no ridges.
Beak Sculpture – Several thick ridges close to the beak tip with pustules and sometimes knobs that originate at the umbo and continue down the posterior ridge, extending at least halfway down the shell.
Beak Cavity – Very deep.
Color – Yellowish tan to darker brown with green overtones, sometimes with darker small zigzag or chevron patterns.
Nacre – Nacre is pearly white and iridescent posteriorly.
Teeth/Hinge – Two pseudocardinal and two lateral teeth in the left valve, one in the right, with a small pseudocardinal tooth on either side of the primary on occasion. Pseudocardinals are large, serrated and striated. Lateral teeth are heavy, short and striated.
Size/Thickness – To four inches. A 3.5-inch (88mm) long shell measured 4.5 mm thick.

Environmental Profile:
Habitat – Medium to large rivers in sandy gravel or gravel.
Hosts – Green sunfish, bluegill, sauger.
Distribution /Status – Widespread but uncommon. Threatened in WI and of concern in IL and IN.

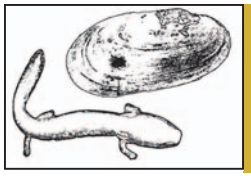






View of anterior dorsal surface of monkeyface. Note V- shaped green markings and strong ridges along periostracum surface. Umbo is elevated above the hinge line and pustules are present.

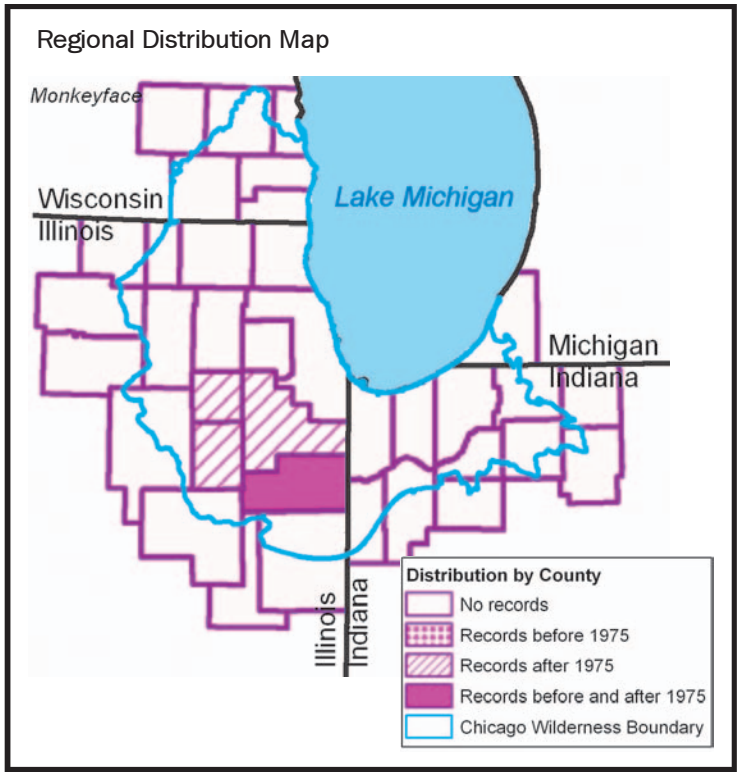
Dorsal surface of monkeyface showing concentric ridges which make up beak sculpturing. This is not the view for which the monkeyface is named but it does seem to resemble a face. Its name derives from a historic cartoon character with a face resembling a baboon.

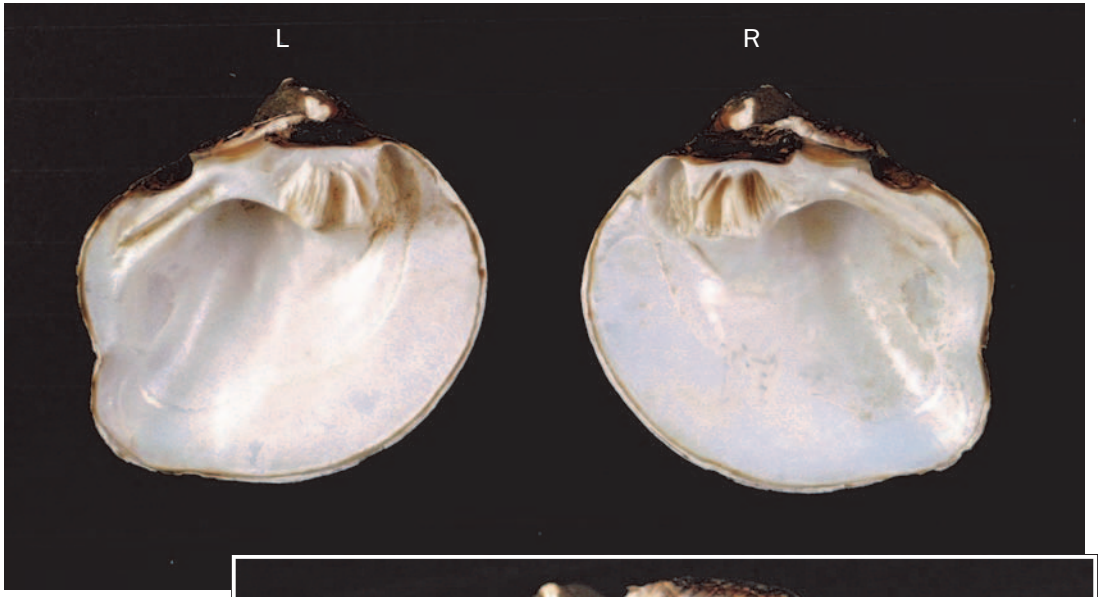


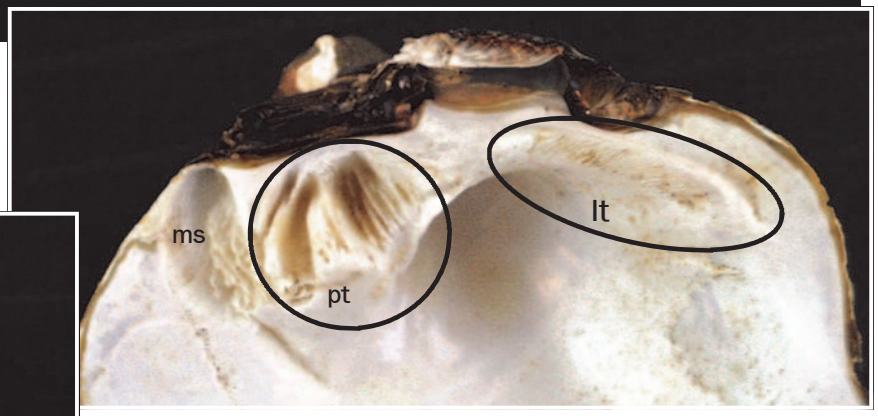
Monkeyface *Quadrula metanevra* internal views

Subfamily Ambleminae

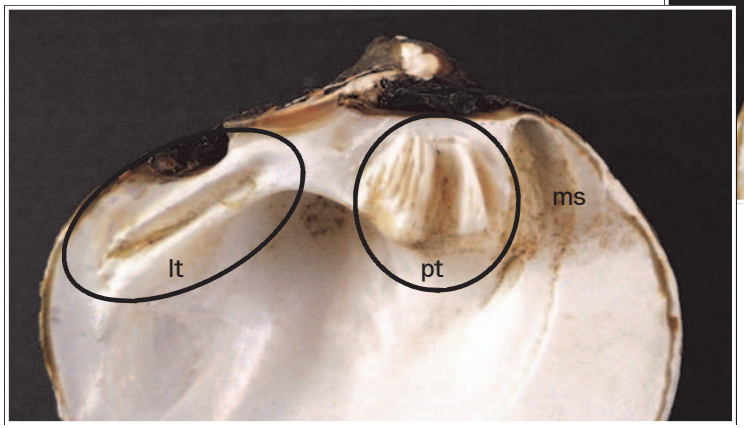
State Listed as Threatened: WI



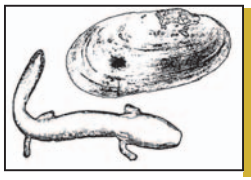




Close-up of the right valve. The pseudocardinal teeth (pt) are large, serrated, and striated. Occasionally there is a secondary pseudocardinal tooth on either side of the primary. Striations are visible on the lateral tooth which is heavy and short. Both valves are very thick. A deep muscle scar (ms) is present beside the pseudocardinal teeth.



Close-up of the left valve. There are two pseudocardinal teeth and two lateral teeth. Deeply incised muscle scars (ms) are also evident.



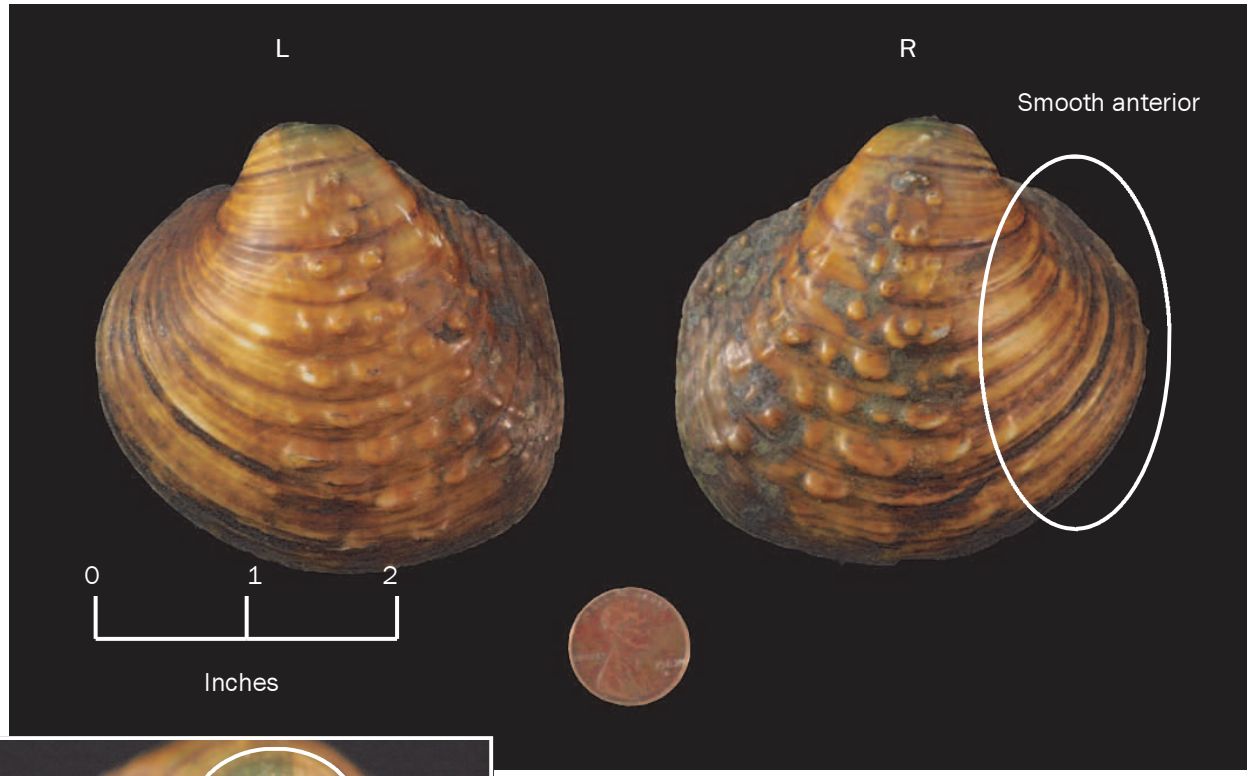
Pimpleback *Quadrula pustulosa*
Subfamily Ambleminae

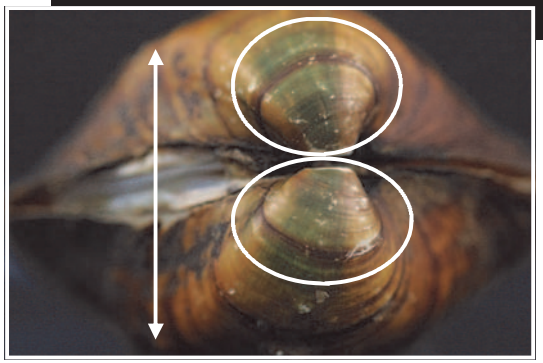
external views

ID. Aids:
External Surface – Shell is thick and rounded in general shape; the dorsal margin is straight while the ventral margin is curved; the anterior third of both valves is relatively smooth while the posterior two-thirds is covered by bumps or pustules. A broad green ray extending from the umbo is diagnostic.
Internal Surface – Pseudocardinal teeth are prominent and serrated and striated; beak cavity is deep. Nacre is white and iridescent posteriorly.

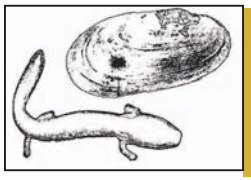
Distinguishing Features:
Similar Species – Mapleleaf, wartyback, purple wartyback.
Compared To – The mapleleaf has two rows of tubercles, a shallow sulcus, and a shell shape that can't be confused with the pimpleback. The wartyback has few tubercles arranged in one or two rows, and the tubercles are broad and often darker than the background shell color. The purple wartyback has a less inflated shell, a more distinctive wing, a nacre with a purple cast, and never has a broad green ray or rays on the umbo.
Beak Sculpture – Two or three small ridges or thick raised lines at the tip of the umbo, though these are often eroded and indistinct.
Beak Cavity – Deep.
Color – Yellowish brown to dark brown (especially in larger shells) with a green blotch or broad green ray(s) on the umbo. The green color may be subtle at times, especially in older shells.
Nacre – Lustrous white with iridescence posteriorly.
Teeth/Hinge – Pseudocardinal teeth heavy, serrated, and striated. Two in right valve one in the left. Lateral teeth are straight to moderately curved; two in the left valve one in the right.
Size/Thickness – To four inches but often much smaller. A 2.75" specimen was 7.0 mm thick in the center. The 2.5" specimen which is pictured is 3.0 mm at the ventral edge and 5.0 mm at the center.

Environmental Profile:
Habitat – Medium streams to large rivers in mud, sand, and gravel.
Hosts – Channel catfish.
Distribution /Status – Widespread, common, and locally abundant. Secure in IL, IN, WI, and under review in MI.



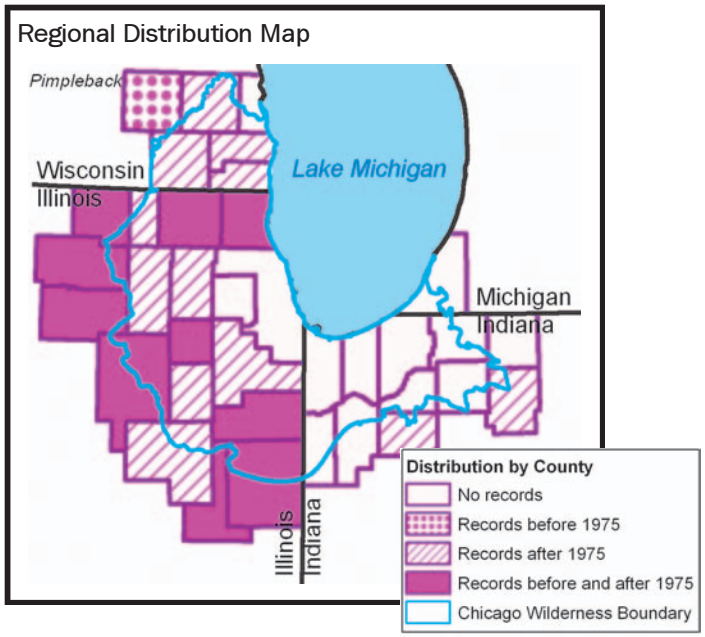


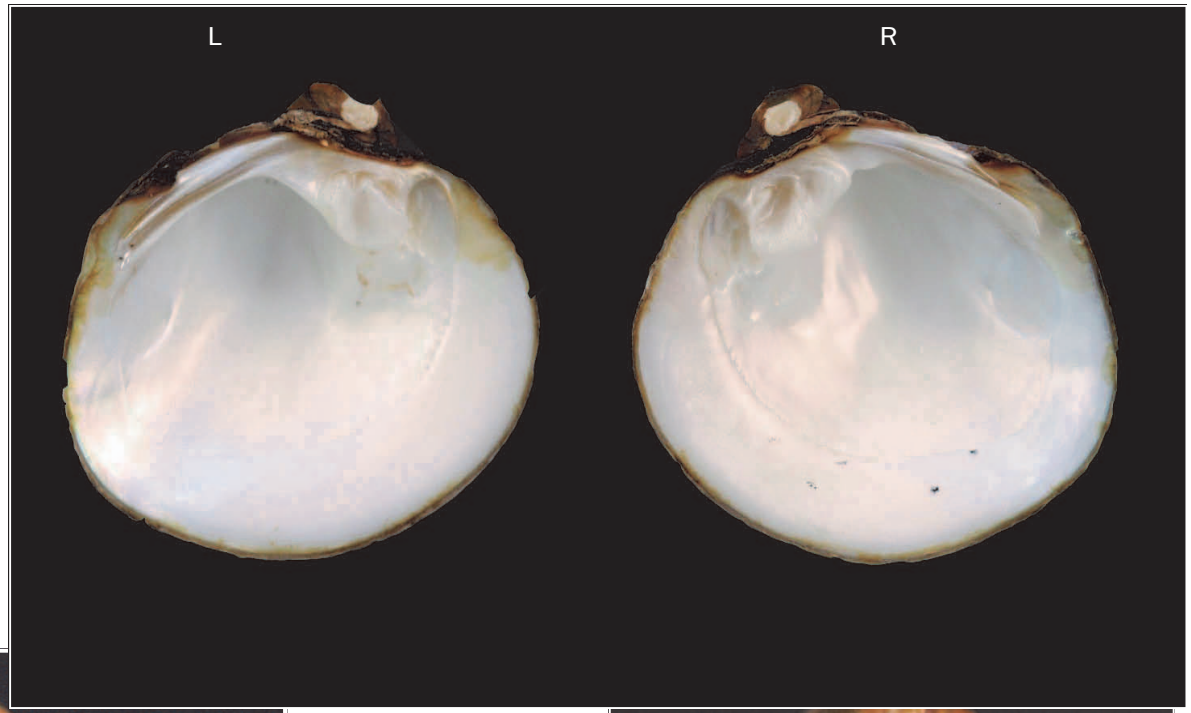
Broad green "ray" extends from umbo on both valves. This is a diagnostic characteristic but it is sometimes hard to discern. Notice the degree to which the shell is "inflated" (i.e. increased in size laterally or side to side as shown by the length of the double-sided arrow).

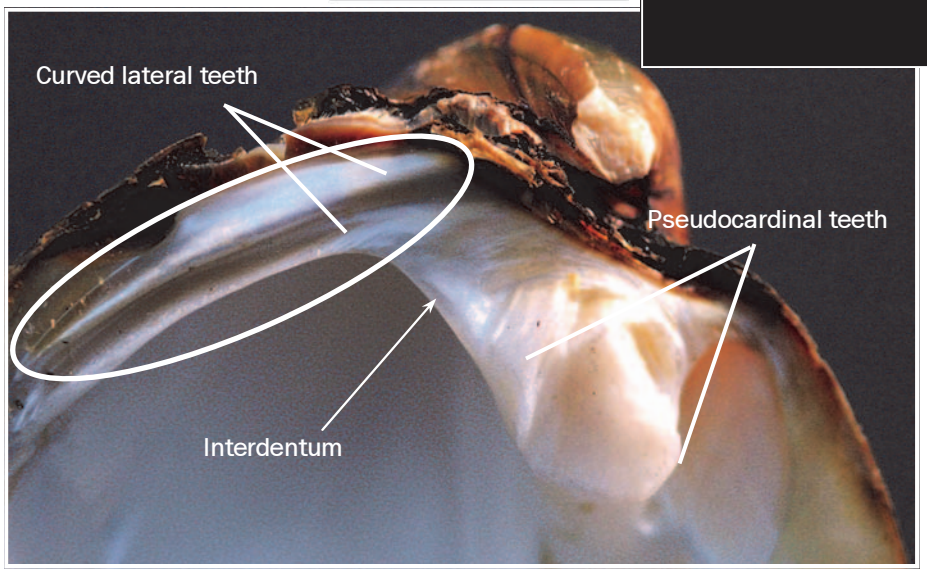


Pimpleback *Quadrula pustulosa*
Subfamily Ambleminae

internal views

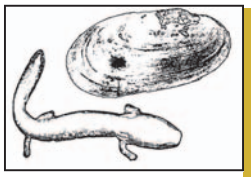






Left valve showing two slightly curved lateral teeth, an interdentum (space between lateral and pseudocardinal teeth) , and two pseudocardinal teeth. The species is described as having a single pseudocardinal tooth in the left valve "….occasionally with a small tooth on either side."

Right valve with close-up of the pseudocardinal tooth/teeth in shadow. Is this a single pseudocardinal tooth, two teeth with multiple lobes, or five separate pseudocardinal teeth? The species is normally characterized as having two pseudocardinal teeth in the right valve. This is one of many examples of the inherent variability associated with mussel morphology!



Pistolgrip *Tritogonia verrucosa* external views

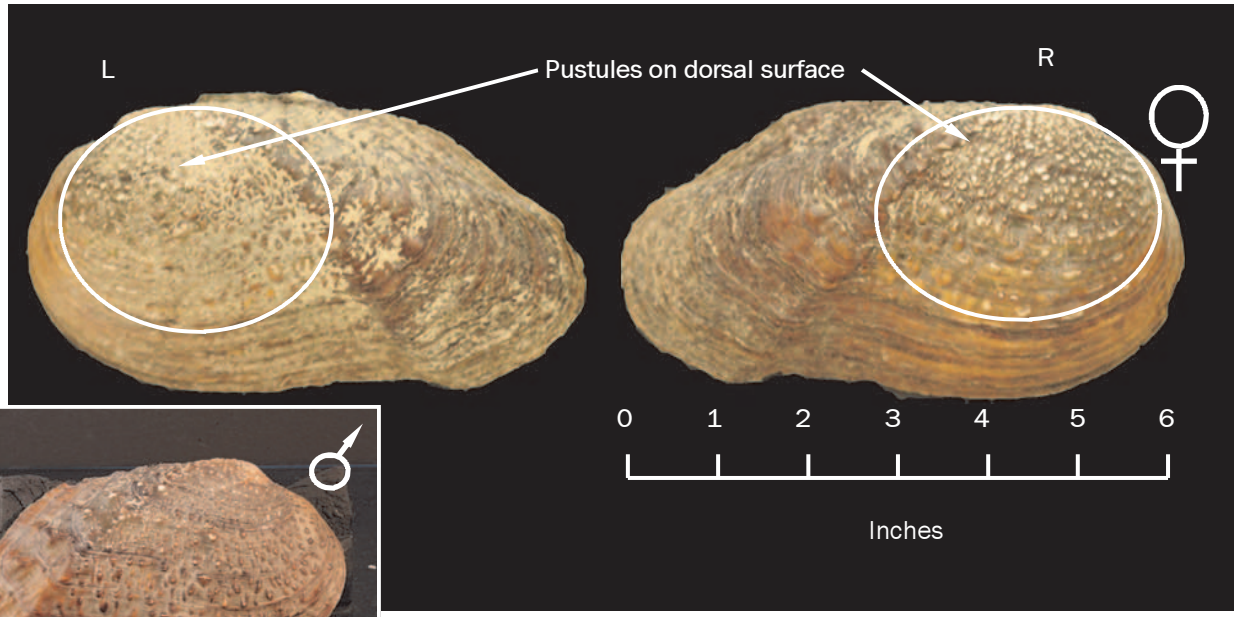
Subfamily Ambleminae

State Listed as Threatened: WI

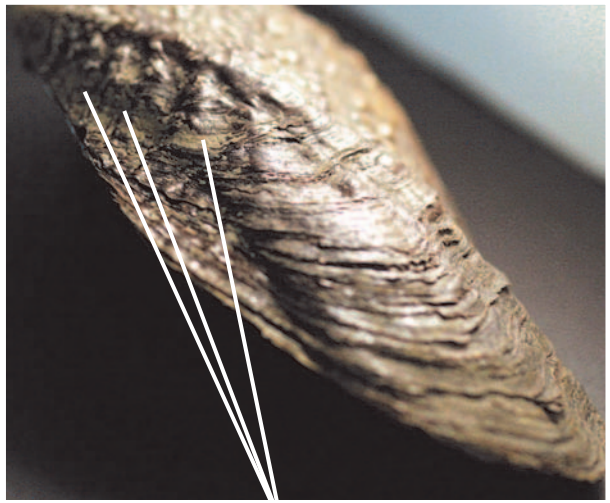
ID. Aids:
External Surface – Shell is thick, laterally compressed, and elongated. The shell is virtually covered with small, irregularly sized and spaced tubercles. The male's shell is shortened and squared off while the female's is elongated and rounded; one of the only Ambleminae in our area to show sexual dimorphism.
Internal Surface – Nacre is white and pseudocardinal teeth are stout.

Distinguishing Features:
Similar Species – Washboard, and rabbitsfoot (rabbitsfoot not found in Chicago Wilderness region).
Compared To – The washboard has tubercles and V- shaped markings on the shell nearer to the beak while the pistolgrip can be virtually covered with small tubercles. The pistolgrip is much more elongated in shape even when comparing young shells.
Beak Sculpture – The sculpture consists of small closely spaced tubercles that increase in size and become less closely packed as they progress down the side of the shell.
Beak Cavity – Deep.
Color – Periostracum is greenish to light brown. Older shells are dark brown to black in color. Young and medium sized shells may have indistinct, diffuse bands or random broad rays of a darker green color.
Nacre – Shiny white with iridescence posteriorly.
Teeth/Hinge – Two pseudocardinal and two lateral teeth in the left valve, one of each in the right. Pseudocardinal teeth are large, serrated and striated. Lateral teeth are long, straight and striated.
Size/Thickness – To eight inches. Variable thickness; 10 mm (anterior center) to 2 mm (ventral edge) for the specimen pictured.

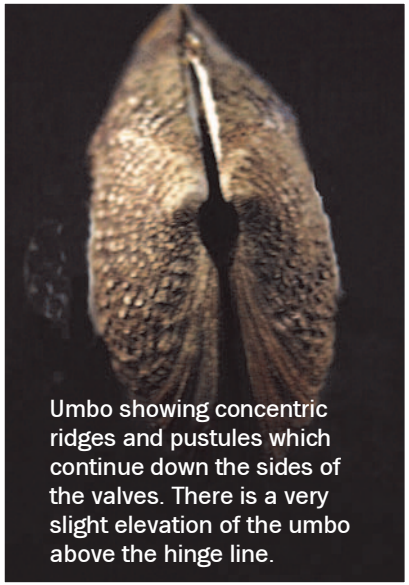
Environmental Profile:
Habitat – Medium to large rivers, in mud, sand and gravel.
Hosts – Yellow bullhead, brown bullhead, flathead catfish.
Distribution /Status – Widespread but uncommon throughout its range. Threatened in WI, secure in IL, IN, not present in MI.



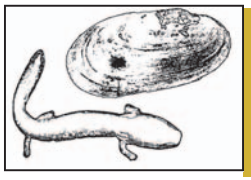
Pustules or "bumps" cover the anterior two-thirds of both valves. The posterior wing of the valves has folds across its surface.



Close-up photo of folds on posterior wing of right valve.



Umbo showing concentric ridges and pustules which continue down the sides of the valves. There is a very slight elevation of the umbo above the hinge line.

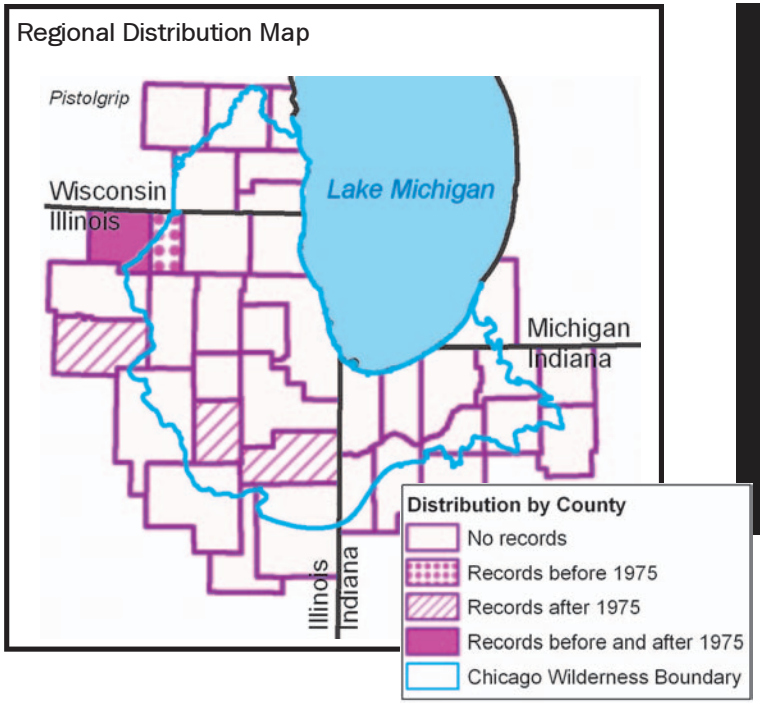


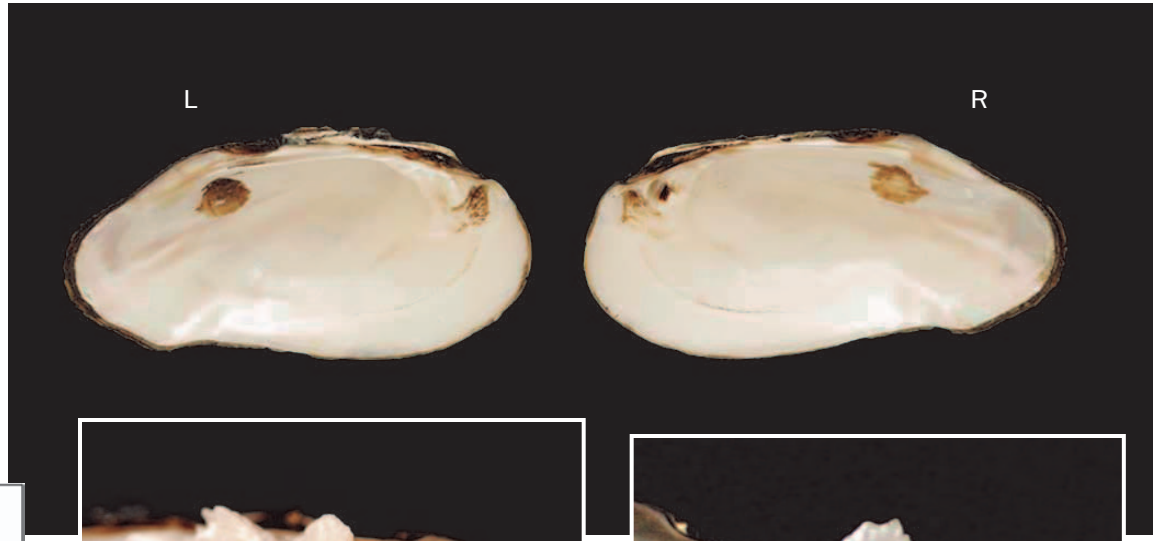
Pistolgrip *Tritogonia verrucosa* internal views

Subfamily Ambleminae

State Listed as Threatened: WI

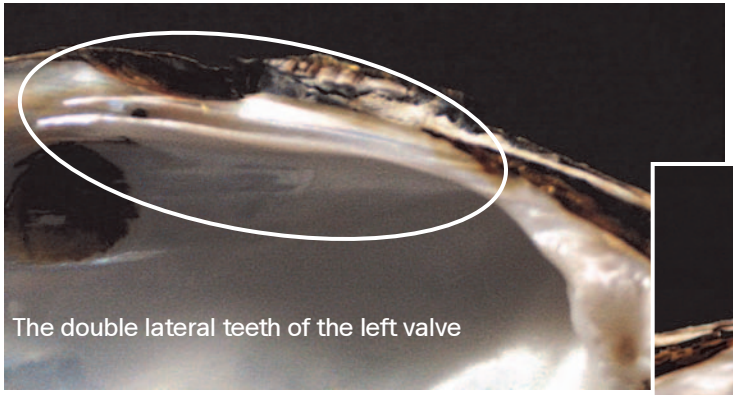
Regional Distribution Map



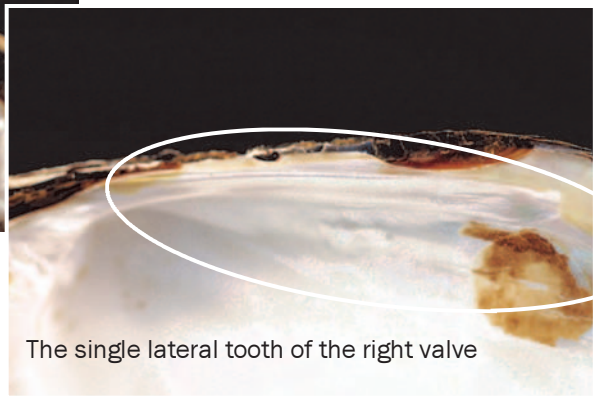


Close–up view of the double pseudocardinal teeth of the left valve. Note the grooves and striations on the pseudocardinal teeth of both valves.

Pseudocardinal tooth in the right valve

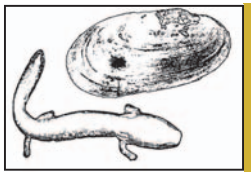


The double lateral teeth of the left valve



The single lateral tooth of the right valve

Serrate: Notched or toothed on an edge like the teeth of a saw.
Striation: marked with minute grooves or channels like the surface of a file
Iridescence: a play of colors producing rainbow effects (like a soap bubble). In mussels the multiple inorganic layers which create nacre often result in iridescence.



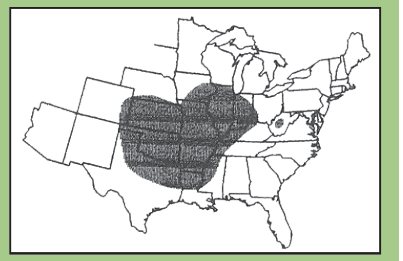
Pondhorn *Uniomerus tetralasmus* external views

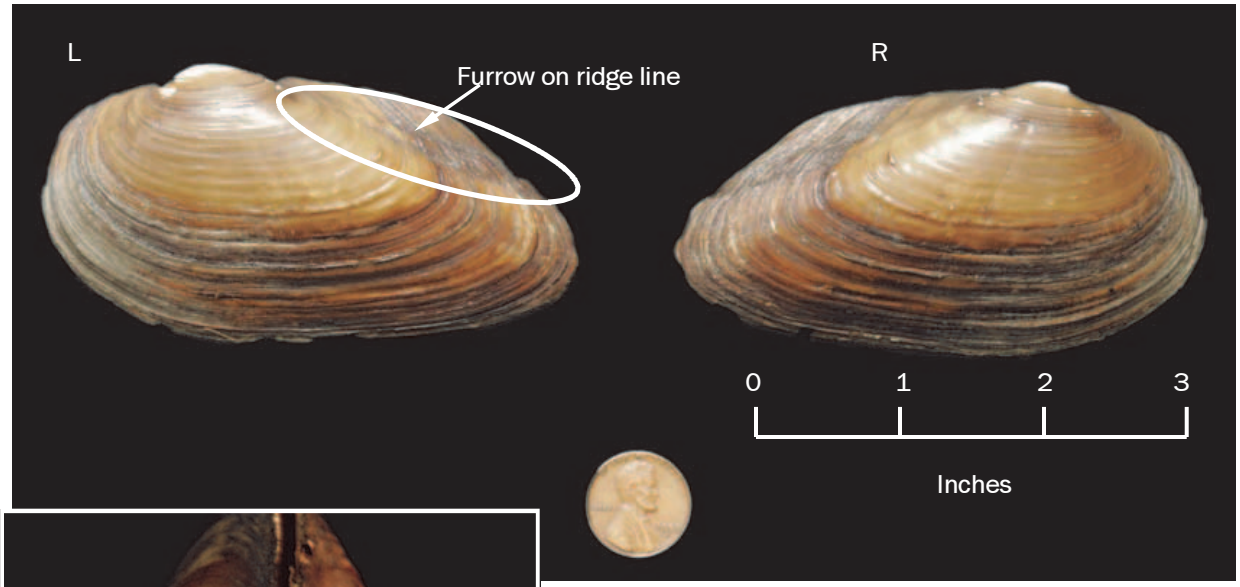
Subfamily Ambleminae

ID. Aids:
External Surface – A moderately thin but sturdy, elongated shell with a dorsal ridge that extends from the beak on the posterior surface. This ridge is formed by two shallow grooves on the compressed wing area. The beak sculpture consists of 4 to 6 thick raised lines radiating from an anterior point.
Internal Surface – White nacre, reduced teeth.

Distinguishing Features:
Similar Species – Giant floater, cylindrical papershell, creeper.
Compared To – The pondhorn has distinct beak ornamentation compared to other similar species and possesses weak but distinct pseudocardinal teeth, which the others lack. The others also lack the short ridge formed by double furrows on the pondhorn's wing.
Beak Sculpture – Four to six thick, raised lines swirl out from a point on the anterior umbo and become continuously farther apart posteriorly. The beaks are at, or barely protrude above, the hinge line.
Beak Cavity – Shallow
Color – Yellowish green to very dark brown in older shells. Younger shells are yellowish, smooth, and glossy, while older shells are somewhat rough and dull. Rayless.
Nacre – White, occasionally with a flush of orange near the umbo region. Posterior half iridescent. Juveniles have a bluish tinge to the nacre.
Teeth/Hinge – Pseudocardinal teeth are small, elongated, bladelike and serrated. There are two in the left valve and one in the right, sometimes also with a smaller accessory tooth in the right valve. Lateral teeth are short, less than half the length of the shell, well developed and slightly roughened.
Size/Thickness –To five inches. A 3.9-inch (99 mm) long shell measured 1.2 mm thick.

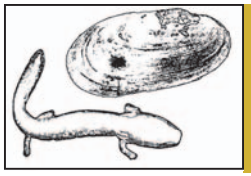
Environmental Profile:
Habitat – Ponds and small streams in mud and other fine substrates. This mussel is able to withstand long periods of stream drying, presumably by burrowing.
Hosts – Presently, the only known host is the golden shiner.
Distribution /Status – Widespread but uncommon. Extirpated in IN, vulnerable in IL, not present in WI, MI.





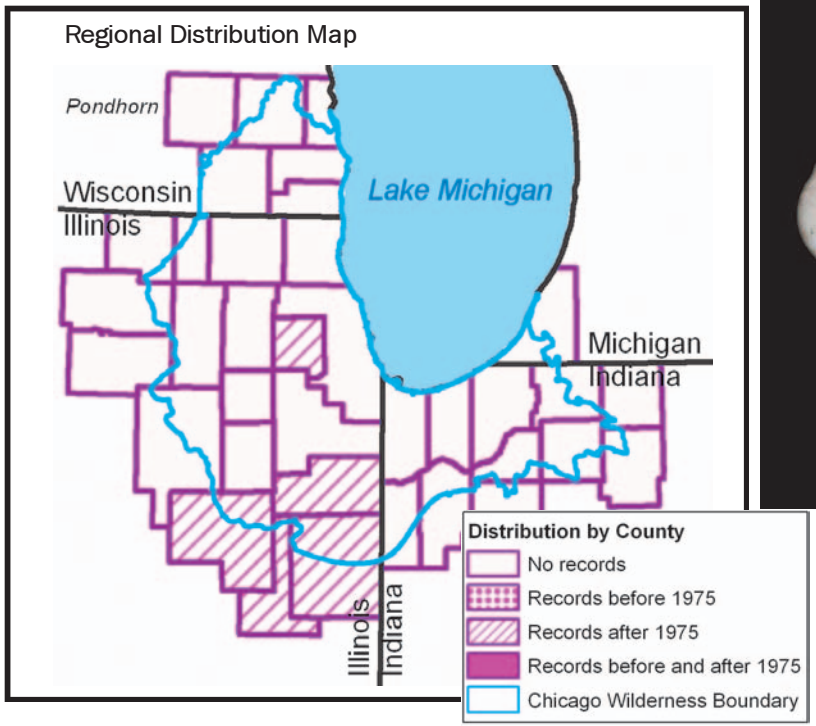
Close-up of the beak sculpture of the pondhorn. Notice that the umbo rises above the hinge line and that the raised ridges swirl outward from a point on the anterior of the umbo.

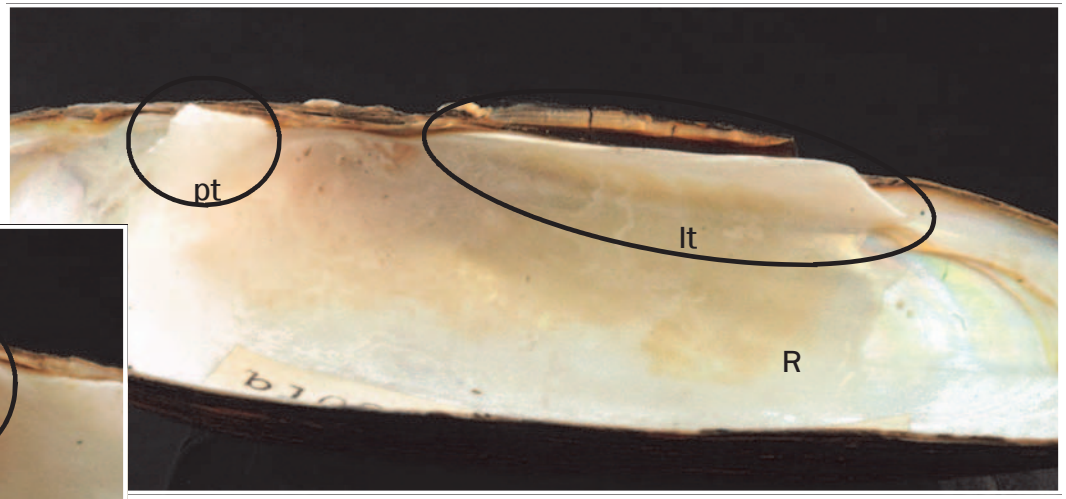
Close-up of the beak on the left valve of a pondhorn. Even though this umbo is badly eroded, the raised ridges of the beak sculpturing are distinct.



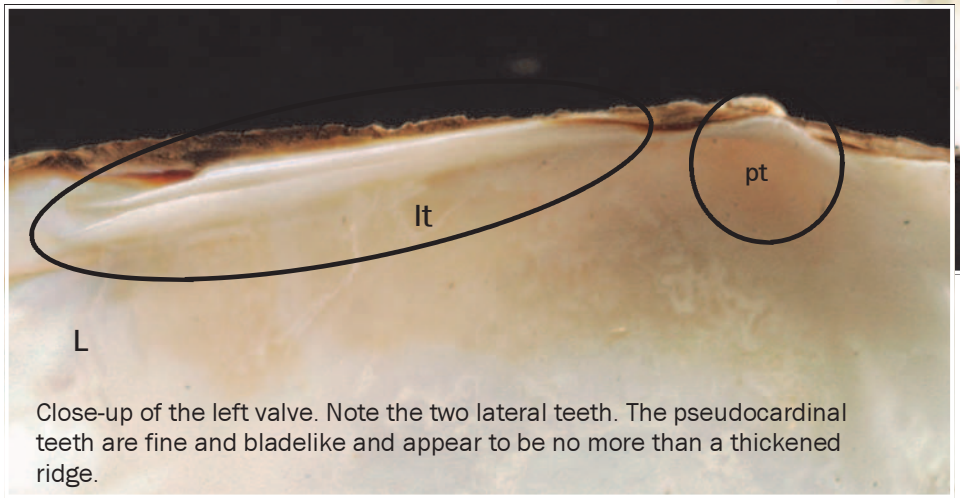
Pondhorn *Uniomerus tetralasmus* internal views

Subfamily Ambleminae

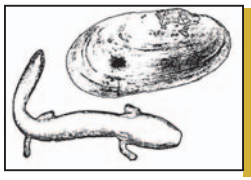




Close-up of the right valve of a pondhorn. The single pseudocardinal tooth (pt) is small, bladelike and serrated. The lateral tooth (lt) is short, less than half the length of the shell, well developed, and slightly roughened.



Close-up of the left valve. Note the two lateral teeth. The pseudocardinal teeth are fine and bladelike and appear to be no more than a thickened ridge.



Purple wartyback *Cyclonaias tuberculata* external views

Subfamily Ambleminae

State Listed as Threatened: IL, as Endangered: WI

ID. Aids:

External Surface – Thick and compressed shell covered with small rounded bumps or tubercles on the posterior half to three-quarters. Noticeable and distinct wing on upper posterior behind the umbo. Umbo sculpture of many wavy ridges and no green blotch on umbo. Parallel interrupted ridges on shell posterior are common.

Internal Surface – Heavy pseudocardinal teeth, nacre usually purple but can be white.

Distinguishing Features:

Similar Species – Pimpleback, mapleleaf.

Compared To – The mapleleaf has a truncated posterior and tubercles arranged in two rows. The pimpleback is more inflated at similar sizes, never has purple nacre, and usually has a green blotch, sometimes indistinct, on the umbo.

Beak Sculpture – Many, fine, wavy raised lines, often eroded in adults. Beaks are even with or protrude slightly above the hinge line.

Beak Cavity – Deep and covered by a large interdentum.

Color – Yellowish to greenish brown in younger shells. Older shells are darker brown to blackish.

Nacre – Glossy and usually varying shades of purple, but occasionally white with purple highlights.

Teeth/ Hinge – Pseudocardinal teeth are large, heavy and roughened by grooves and striations. Two in the left valve and one in the right. The right hand tooth often has a much smaller, smoother tooth on either side of it. Lateral teeth are heavy and straight to slightly curved, about half or less of the shell length. Two in the left valve one in the right. Fine longitudinal striations are present.

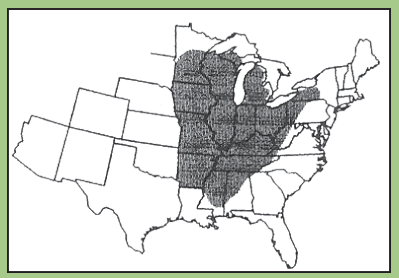
Size/Thickness – To five inches. A 115 mm (4.6 inches) shell is about 5.0 mm thick at the center.

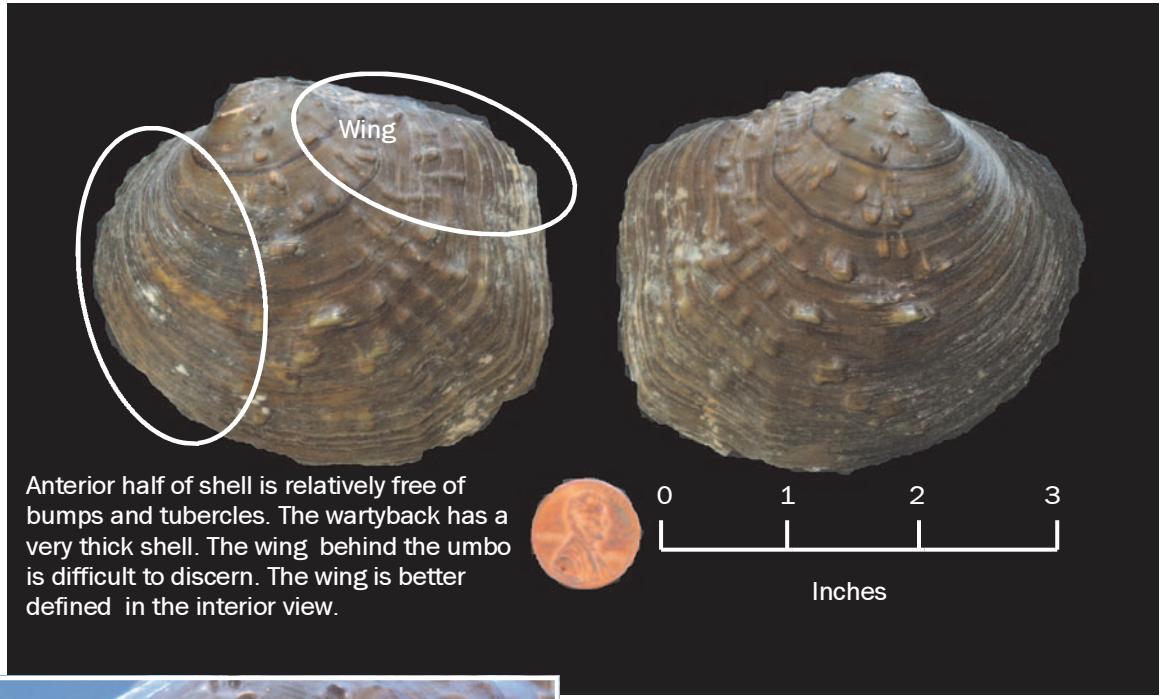
Environmental Profile:

Habitat – Medium sized streams to large rivers in substrates ranging from sandy gravel to gravel.

Hosts – Flathead catfish, channel catfish, yellow bullhead, black bullhead.

Distribution /Status – Widespread but scattered and always a small component of local fauna. Threatened in IL, endangered in WI, secure in IN, imperiled in MI.

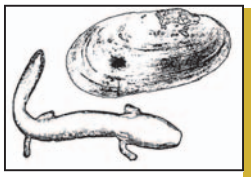




Anterior half of shell is relatively free of bumps and tubercles. The wartyback has a very thick shell. The wing behind the umbo is difficult to discern. The wing is better defined in the interior view.

Note the fine wavy raised lines of the umbo. When the umbo hasn't been eroded this is a diagnostic feature for the purple wartyback.

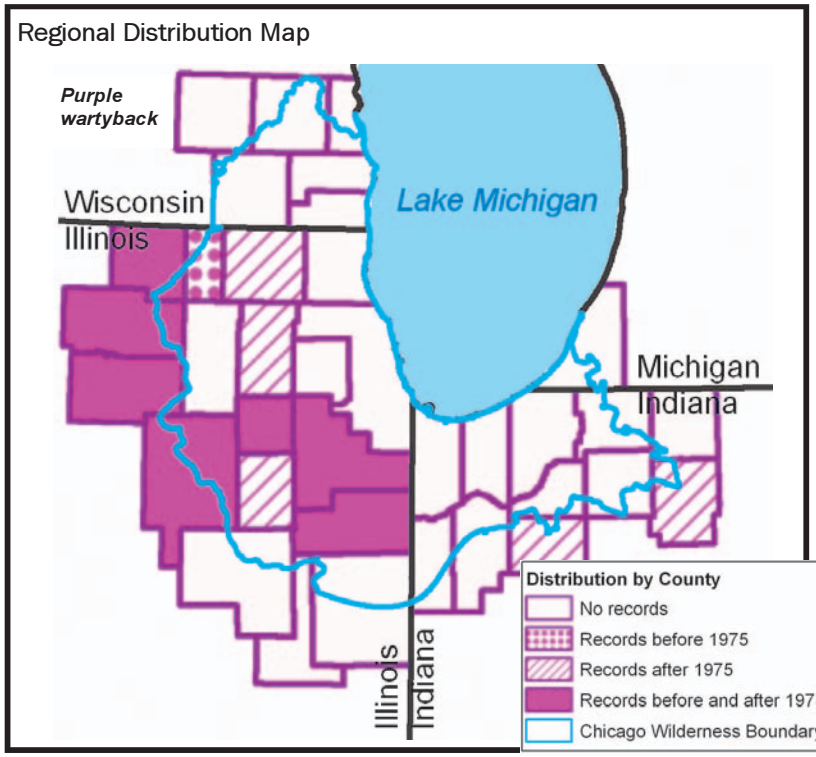
The color of a mussel specimen will sometimes appear to vary in different photographs of the same shell. This is mostly due to differences in lighting used for close-up photography. It also results from manipulations of contrast that have been done to bring out beak sculpturing and other mussel anatomical features. We've made an effort to insure that the colors of the principal external and internal photographs really reflect the color of the specimen pictured.

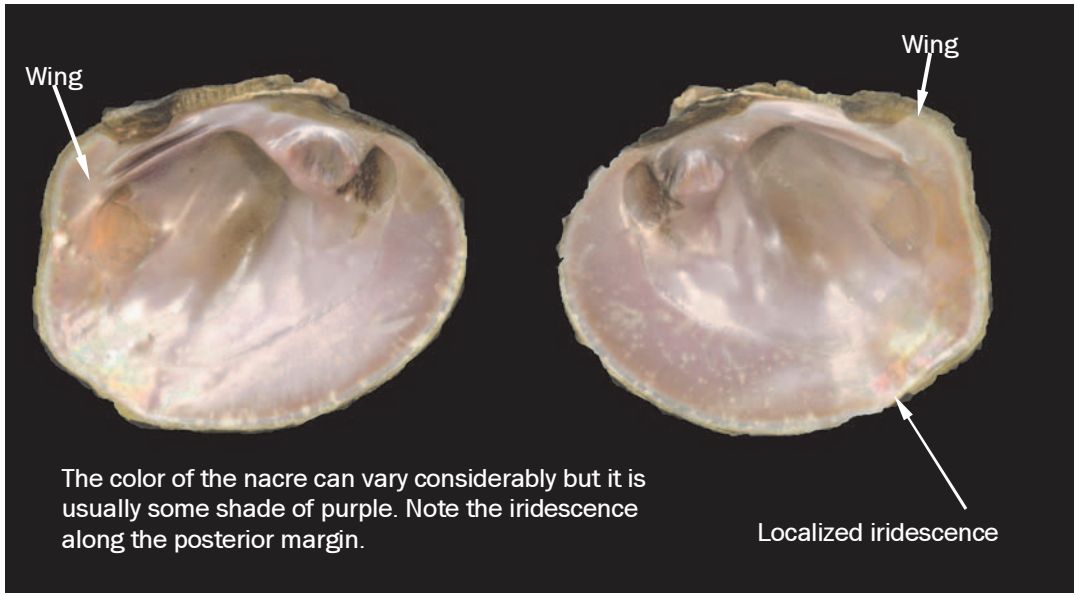


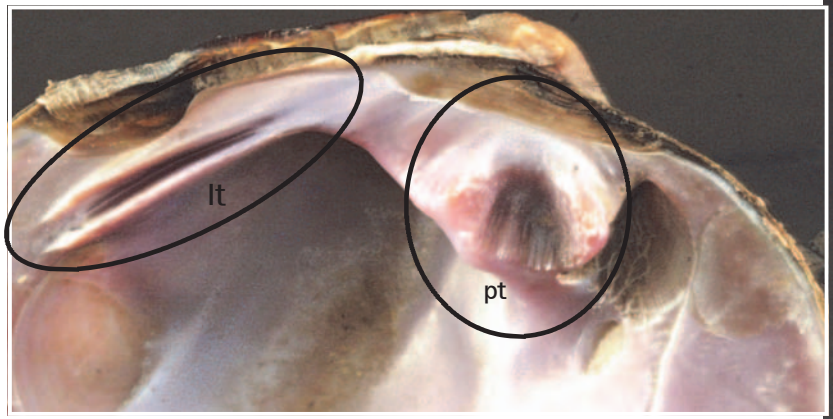
Purple wartyback *Cyclonaias tuberculata* internal views

Subfamily Ambleminae

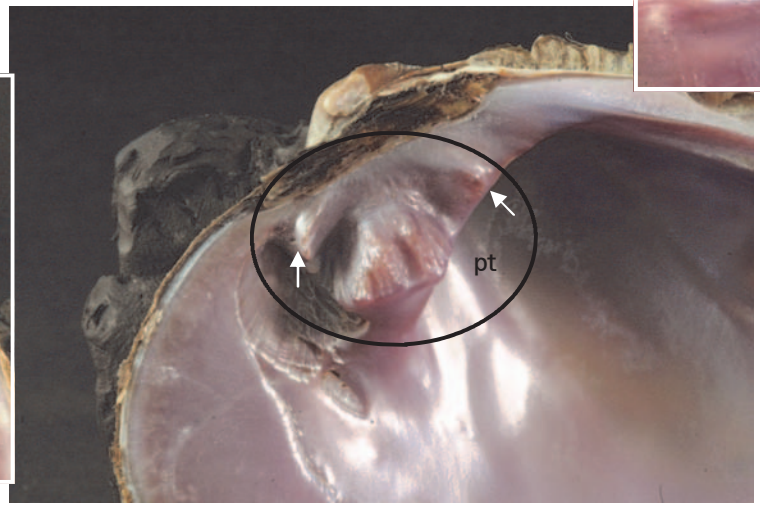
State Listed as Threatened: IL, as Endangered: WI



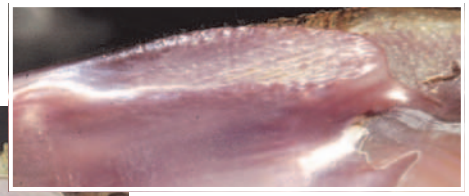




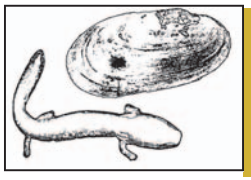
There are two divergent pseudocardinal teeth (pt) pictured. The pseudocardinal teeth are heavy and roughened by grooves and striations. The lateral teeth are heavy and straight to slightly curved.



There is a single large pseudocardinal tooth in the right valve with two smaller subsidiary teeth (indicated by arrows). This is common in the purple wartyback.



Serrations along the long axis of the right lateral tooth.



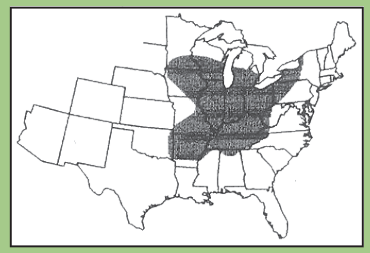
Round pigtoe *Pleurobema sintoxia* external views

Subfamily Ambleminae

ID. Aids:
External Surface – Several variations on shape. One form is roughly rounded with the posterior margin more elongated. Another form has a distinctly truncated posterior edge. Moderate size with **no sulcus**.
Internal Surface – Teeth prominent. Nacre often white, sometimes orange or pinkish.

Distinguishing Features:
Similar Species – Most mussels belonging the genus *Pleurobema* and the genus *Fusconaia* look similar to the round pigtoe.
Compared To – In the C.W. region the round pigtoe can be confused with the Wabash pigtoe. The Wabash pigtoe has a sulcus and the round pigtoe lacks one. The general shape of the round pigtoe varies from roughly circular to roughly trapezoidal while the Wabash pigtoe is somewhat triangular or rounded.
Beak Sculpture – Two to three raised concentric lines near umbo tip, often indistinct from wear.
Beak Cavity – The beak cavity is shallow in individuals living in medium sized rivers and moderately deep in individuals living in large rivers (Cummings and Mayer 1992)
Color – Relatively smooth periostracum, often a rich chestnut brown, sometimes reddish brown, and regularly darker brown. Faint and indistinct rays are sometimes seen in adults. Younger shells often have distinct and prominent rays. Annual growth lines are well–defined.
Nacre – Usually lustrous white, sometimes pink, orange -tinged, or rose colored.
Teeth/Hinge – Pseudocardinal teeth heavy and striated. Two in left valve and one in the right. Lateral teeth are well developed and straight, two in left valve and one in right.
Size/Thickness – Three to four inches. A 3.6 inch (91mm) shell measured 3.3mm in the center.

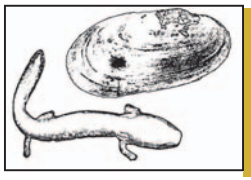
Environmental Profile:
Habitat – Small to large streams in mud, sand, and gravel.
Hosts – Spotfin shiner, northern redbelly dace, central stoneroller, bluntnose minnow, bluegill, southern redbelly dace.
Distribution /Status – Widespread but uncommon. Vulnerable in IN, MI, WI. Under review in IL and declining in northeastern IL.



Wabash pigtoe Round pigtoe

Note that the Wabash pigtoe is more inflated than the round pigtoe and the umbo is raised above the hinge line. The round pigtoe has a shallow beak cavity and the umbos are low and only slightly elevated above the hinge line.

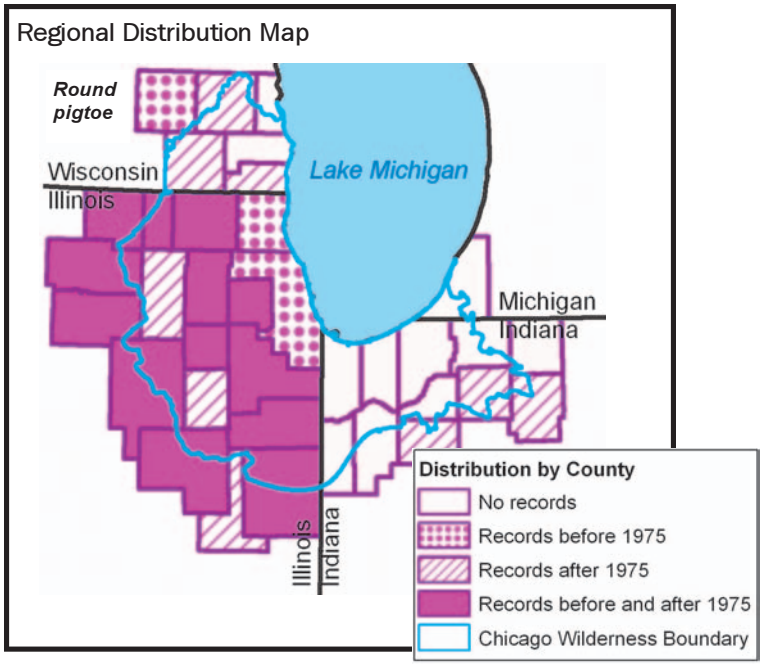
Umbo of round pigtoe. The beak sculpture is described as "two or three elevated ridges." None of the specimens that we could find however, had ridges which were distinct enough to discern.

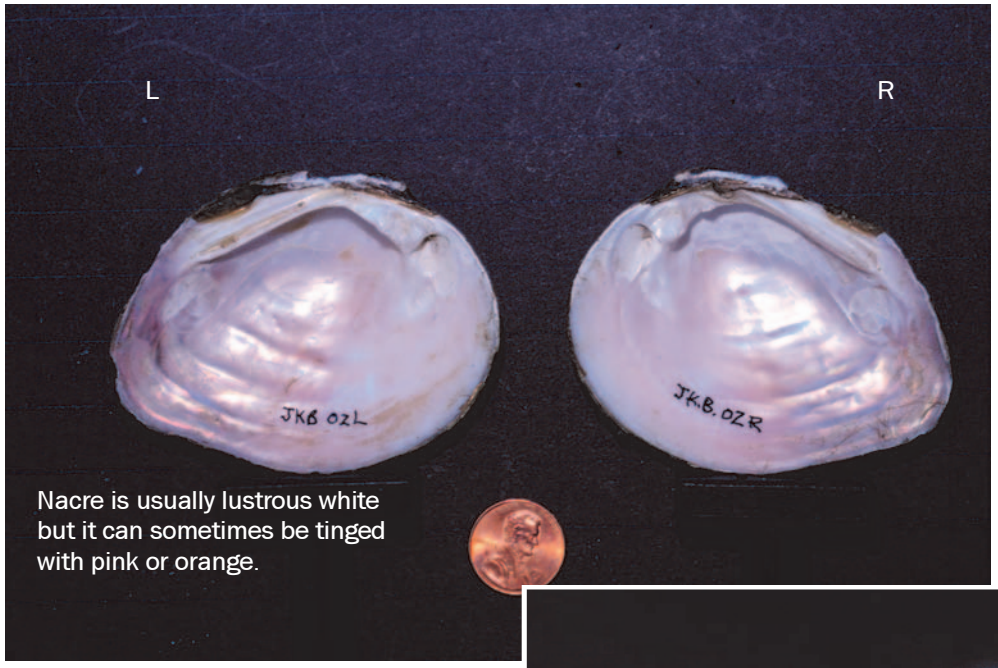


Round pigtoe *Pleurobema sintoxia* internal views

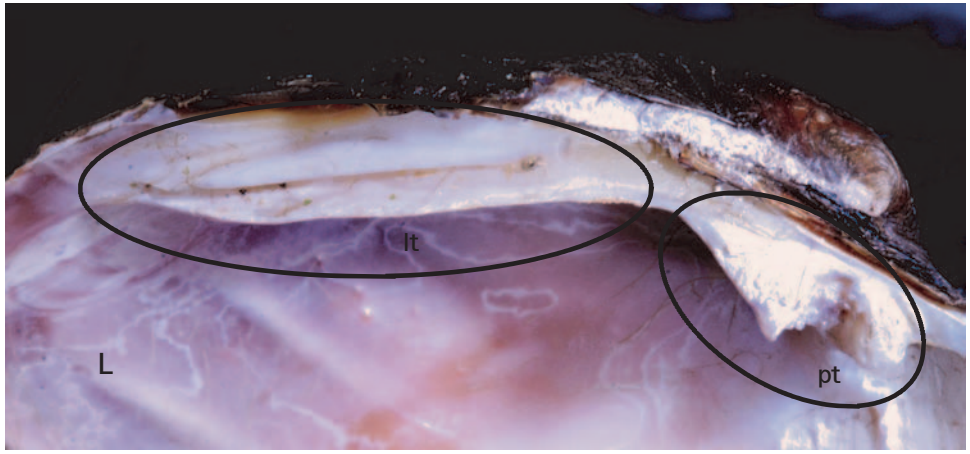
Subfamily Ambleminae

Regional Distribution Map

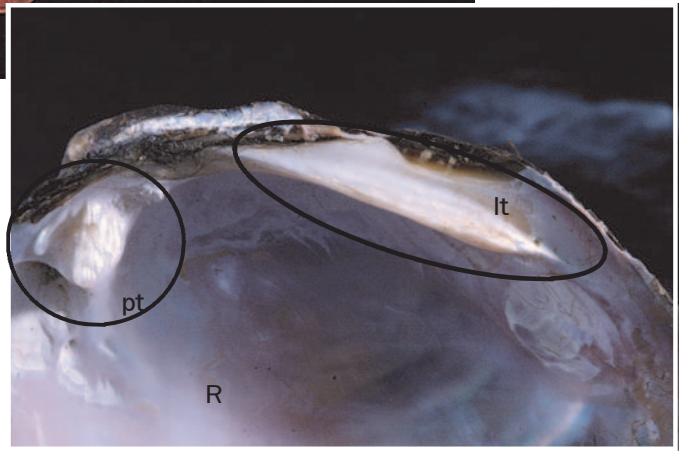




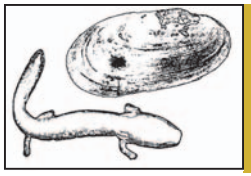
Nacre is usually lustrous white but it can sometimes be tinged with pink or orange.



Internal view of the left valve showing two pseudocardinal teeth (pt) and two, straight lateral teeth (lt). The beak cavity is shallow.



Internal view of the right valve. Note the single heavy pseudocardinal tooth and the small raised ridges which are lateral to the principal tooth. The lateral tooth is well developed and straight.



Sheepnose *Plethobasus cyphyus* external views

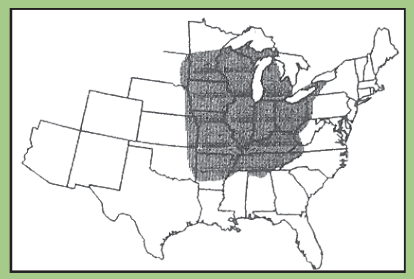
Subfamily Ambleminae

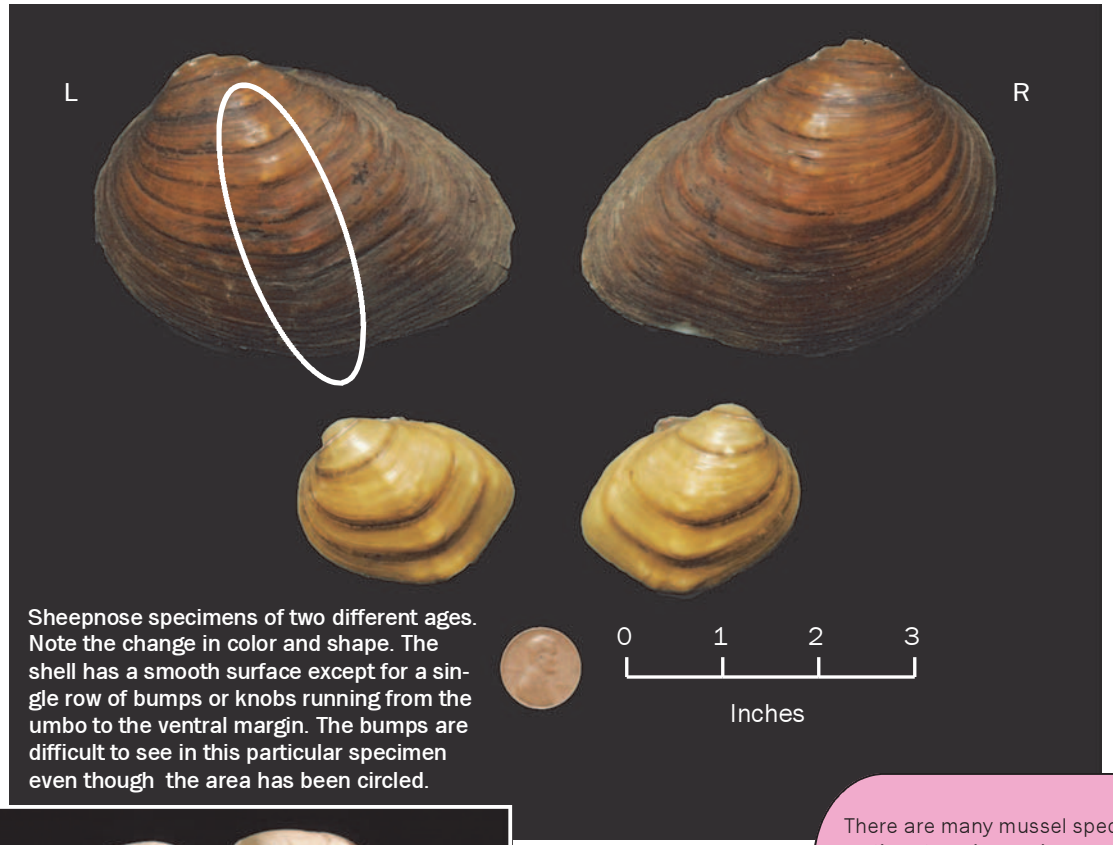
State Listed as Endangered: IL, WI, IN

ID. Aids:
External Surface – A thick elongated shell with distinct growth lines and a nodule visible on most growth lines running down the midline of the shell.
Internal Surface – White nacre, sometimes with pink or orange overtones. Stout teeth.

Distinguishing Features:
Similar Species – Threehorn wartyback (outside of Chicago Wilderness area).
Compared To – The threehorn wartyback is a smaller shell with very large knobs running down the middle of the shell from the umbo to every other growth line. The large knobs are produced alternately on the two valves.
Beak Sculpture – The beak sculpture consists of two very heavy, thickened ,concentric oval loops near the tip of the umbo. Most distinct in younger shells before the umbo is well eroded.
Beak Cavity – Ranges from moderately deep to shallow. The beaks are well raised above the hinge line.
Color – Adults are smooth and shiny, yellowish brown to dark brown and sometimes with green overtones. Younger shells are very shiny and smooth, appearing to be lacquered.
Nacre – Lustrous white, mildly iridescent posteriorly.
Teeth/Hinge – Pseudocardinals are well developed, peglike, triangular and roughened. Lateral teeth are prominent, moderately long, about half the shell length, and straight to slightly curved.
Size /Shell Thickness – To five inches. A three inch shell (75mm) measured 6.0mm thick at the center.

Environmental Profile:
Habitat – In medium to large rivers in silty gravel or sandy gravel.
Hosts – Walleye and central stoneroller.
Distribution /Status – Endangered in IL, IN, WI, not present in MI.

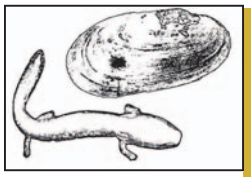




Sheepnose specimens of two different ages. Note the change in color and shape. The shell has a smooth surface except for a single row of bumps or knobs running from the umbo to the ventral margin. The bumps are difficult to see in this particular specimen even though the area has been circled.

The umbo of this specimen is eroded, but it is clear that the umbos extend well above the hinge line. The sheepnose is a relatively inflated species. Erosion of the umbo takes place in many different species of mussels and can make identification difficult.

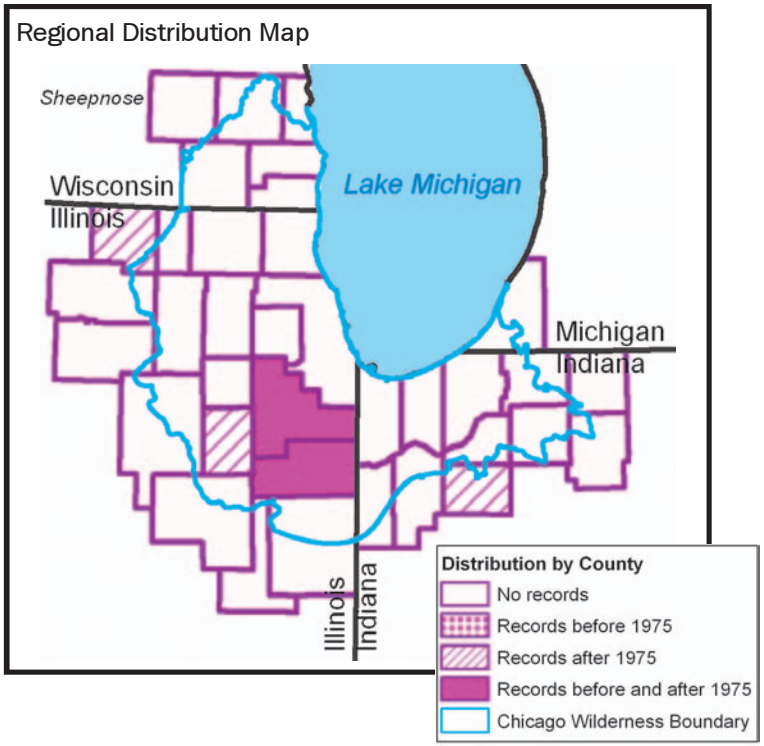
There are many mussel species listed as **threatened** or **endangered** by one or more states or by the federal government. The federal government defines a **threatened species** as one that is likely to become *endangered* within the foreseeable future throughout all or a significant part of its range, and an **endangered species** is one that is in danger of becoming *extinct* throughout all or a significant part of its range. A species becomes **extinct** when the last existing member of that species dies. Federal definitions apply to the status of the species within the United States, while state definitions apply to the status of the species within that state.

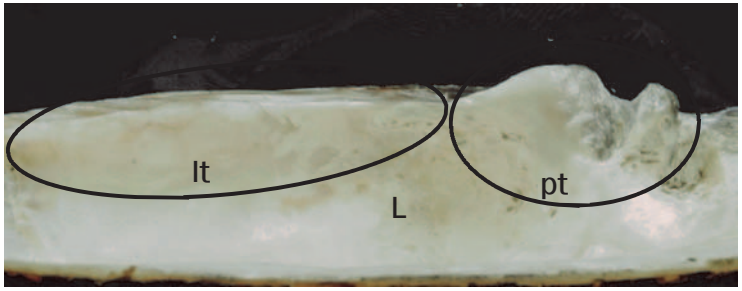


Sheepnose *Plethobasus cyphyus* internal views

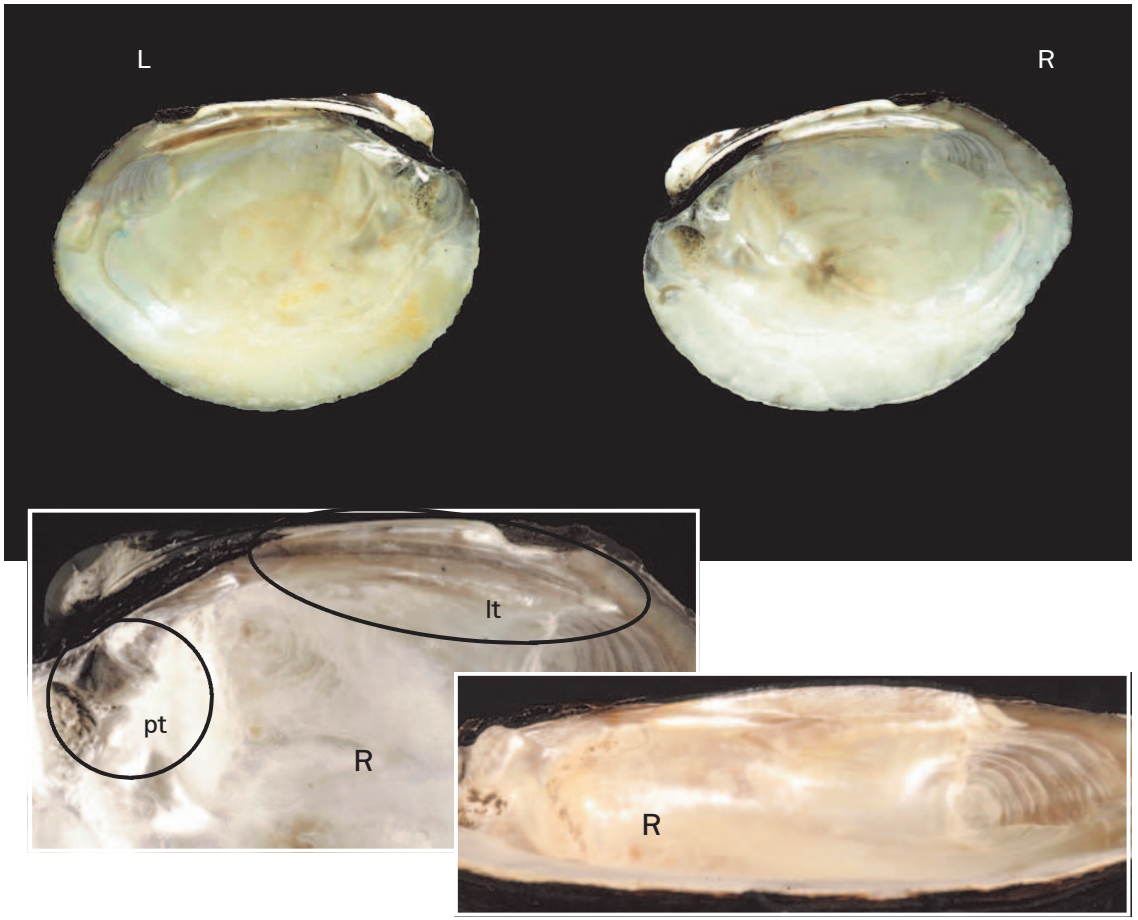
Subfamily Ambleminae

State Listed as Endangered: IL, WI, IN

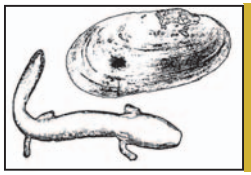




The lateral teeth (lt) are prominent, moderately long and straight to slightly curved. The pseudocardinal teeth are well developed, peglike, triangular and roughened. Two pseudocardinal teeth and two lateral teeth occur in the left valve.



Close-up views of the of the right valve. Notice that the lateral tooth (lt) has a “shelf” associated with it, and the nacre in the muscle scar is layered. Notice also that the lateral tooth is striated on the long axis.



Spike *Elliptio dilatata*

Subfamily Ambleminae

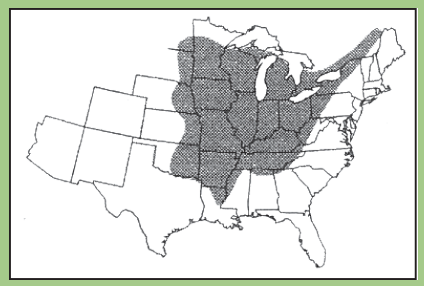
State Listed as Threatened: IL

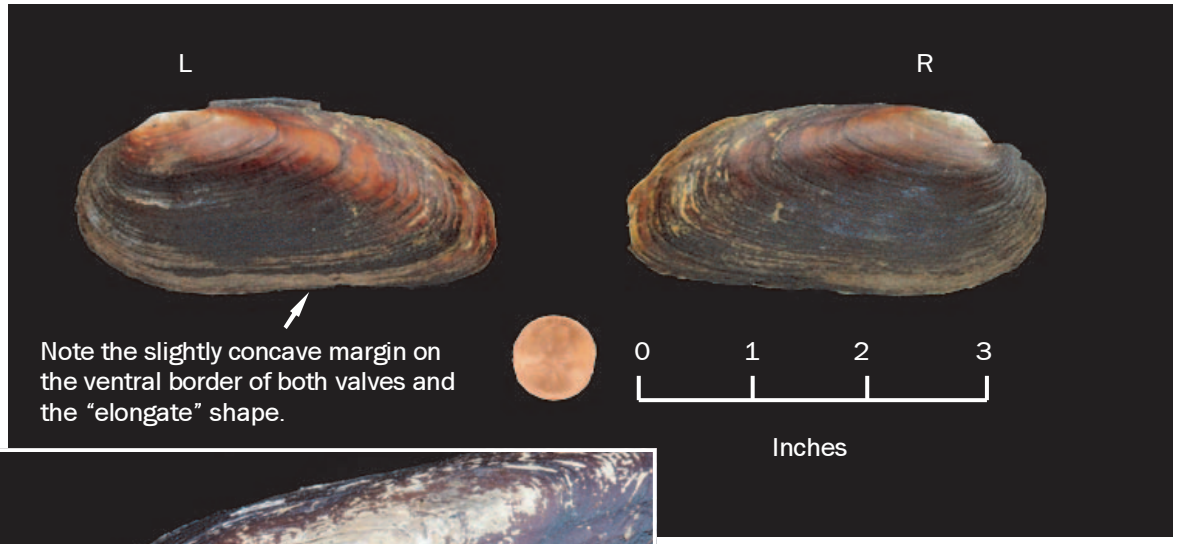
external views

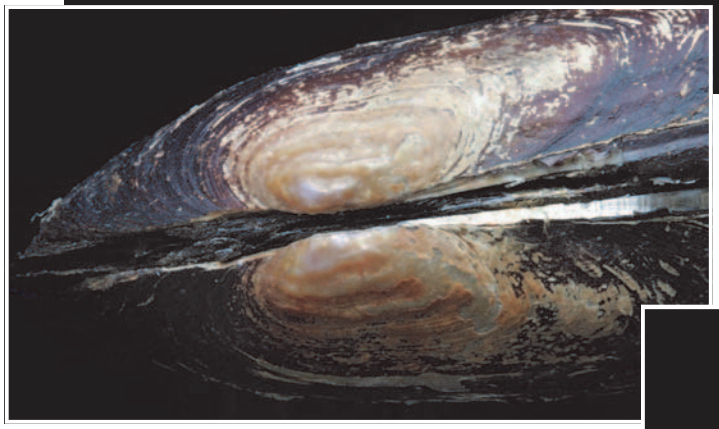
ID. Aids:
External Surface – A thin but strong,, moderately compressed, elongated shell. The posterior margin is usually rounded, but rarely is it truncated. The ventral margin is usually straight or slightly convex, but can become slightly concave in older shells. Very low profile beaks have sculpture of several heavy, rough loops when the sculpture is not eroded away.
Internal Surface – Nacre usually light to dark purple, occasionally white, and glossy. Teeth are well developed.

Distinguishing Features:
Similar Species – Black sandshell.
Compared To – The spike is more compressed laterally and is not as elongated as the black sandshell. The posterior pointed end of the spike is below the longitudinal midline of the shell, while it is above the midline in the black sandshell.
Beak Sculpture – Three or four heavy, raised, mildly double-looped bars; often eroded in adults. Beaks are even with, or protrude very slightly above, the hinge line.
Beak Cavity – Shallow.
Color – Smooth and greenish to greenish brown, sometimes with indistinct green rays in young shells. Older shells usually rayless and darker ruddy brown to black with a slightly rough periostracum.
Nacre – Usually varying shades of purple, but occasionally white or pink, and rarely light orange.
Teeth/Hinge – Pseudocardinal teeth are prominent and grooved. There are two in the left valve, and one in the right. Lateral teeth are moderately short, about half of the shell length, straight and roughened. There are two in left valve, and one in the right.
Size/Thickness – To 5.5 inches. A 5.5 inch (139mm) long shell measured 2.0mm thick at the center of the valve.

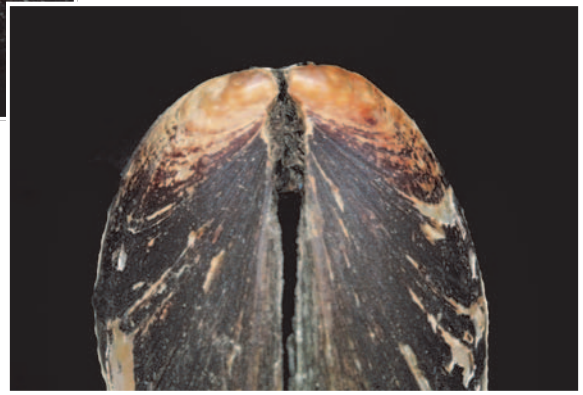
Environmental Profile:
Habitat – In small streams to large rivers and occasionally in lakes; in silt, sand and gravel.
Hosts – Gizzard shad, white crappie, black crappie, flathead catfish.
Distribution /Status – Threatened in IL. Formerly widespread and abundant but declining and imperiled in much of its range. Vulnerable in IN, WI, and under review in MI.



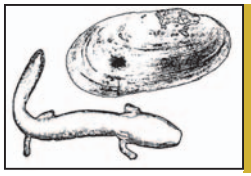




The periostracum on the umbo has been worn away but the beak sculpture is still distinct. Three to four heavy loops are characteristic.



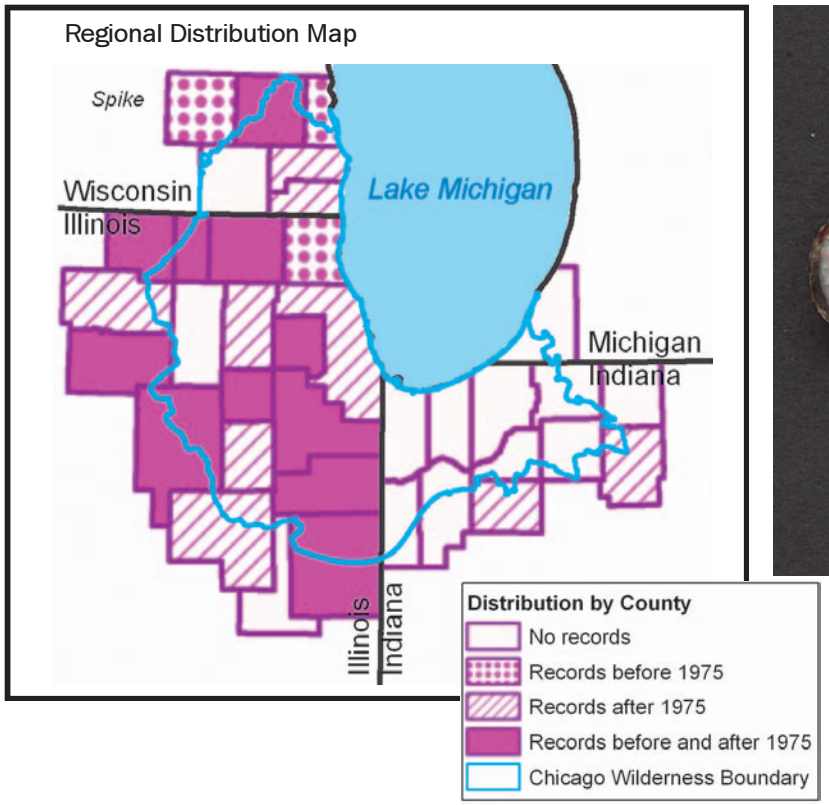
Another view of the umbo showing that it is even with the hinge line. Contrast this with other species like the Wabash pigtoe that have umbos that are elevated above the hinge line.



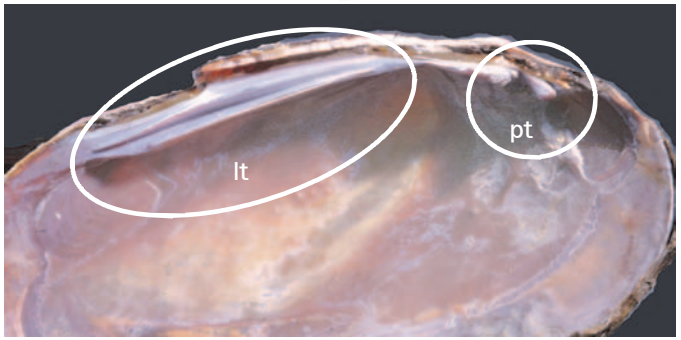
Spike *Elliptio dilatata* internal views

Subfamily Ambleminae

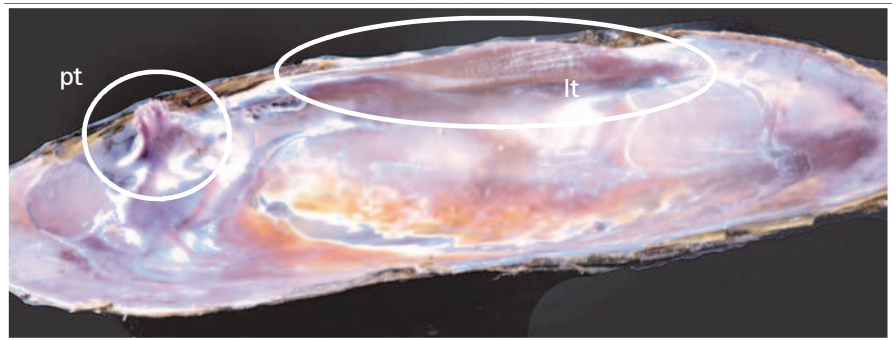
State Listed as Threatened: IL



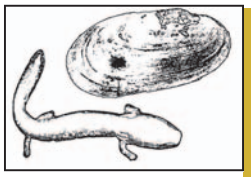
The spike's nacre color can be quite variable. Most often it is purple, but it can also be pink or white.



Both valves show intense nacre color. The left valve has two pseudocardinal teeth (pt) and two lateral teeth (lt).



A recurved, single pseudocardinal tooth (pt) in the right valve. The single lateral tooth (lt) is straight and striated along its long axis. The nacre of some species of freshwater mussels, including the spike, can be intensely colored.



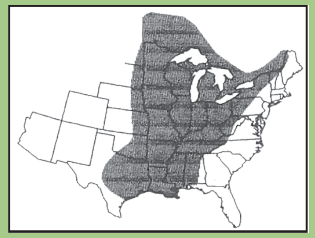
Threeridge *Amblema plicata* external views

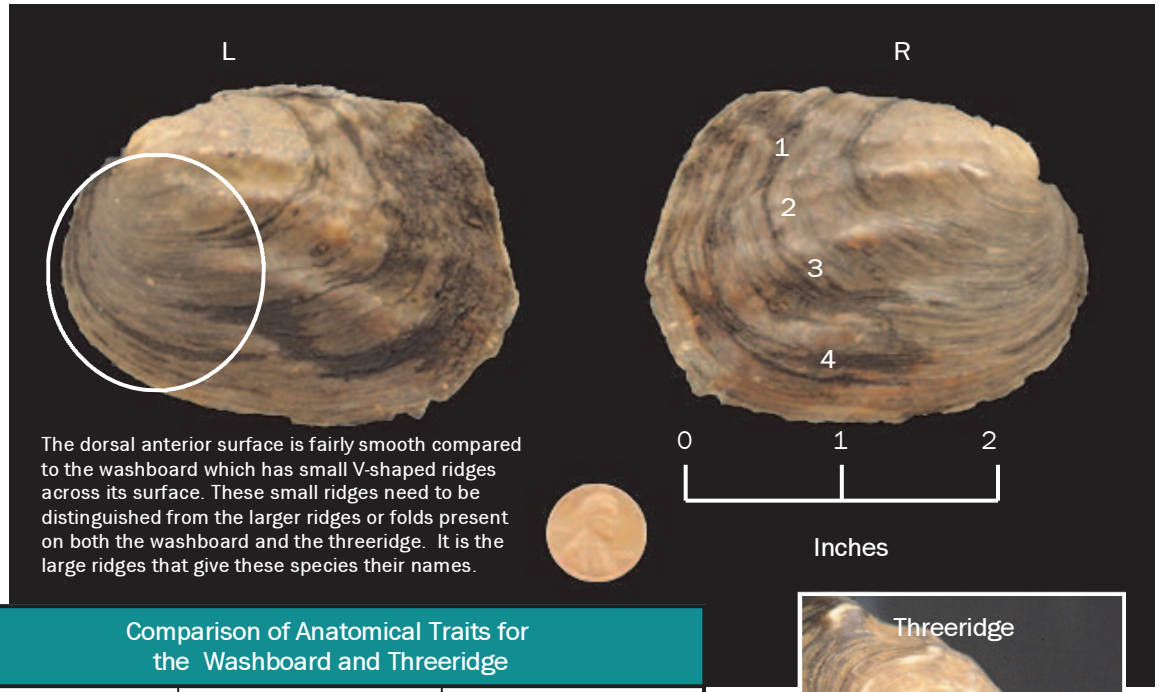
Subfamily Ambleminae

ID. Aids:
External Surface – Quadrate (square) in shape. Shell thick, usually with multiple large ridges on posterior half to three-quarters. Anterior part without ridges and area below beak without sculpturing. Shells from large rivers generally with fewer ridges. Beak sculpture is usually eroded. Color from tan to brown.
Internal Surface – Stout, grooved pseudocardinal teeth, and well developed lateral teeth. Nacre white, pearly, and usually iridescent near posterior edge.

Distinguishing Features:
Similar Species – Washboard, rock pocketbook.
Compared To – The washboard has many small, raised, V- shaped markings near the beak, which the threeridge lacks. The rock pocketbook has a nodular beak sculpture and more inflated shell with a lack of corrugated ridges.
Beak Sculpture – The beak protrudes above the hinge line and the sculpturing of several concentric thickened lines is visible only in young shells.
Beak Cavity – Deep with a small to large interdentum.
Color – Juveniles may be yellowish green through brown and greenish brown, while adults may be dark olive green through brown to black.
Nacre – White with a soft, pearly sheen, and usually tinged with a small area of iridescence on the posterior edge of the shell. Occasionally the posterior area may also be tinged with blue to purple, but more often in shells from larger rivers.
Teeth/Hinge – Pseudocardinal teeth stout, grooved, and serrated; two in the left valve, one in the right (with occasional small teeth on either side). Lateral teeth are large, relatively smooth and slightly curved; two in the left valve one in the right.
Size/Thickness – To eight inches with large shells being very thick, as expected. A 3.9-inch specimen was 5.7 mm thick.

Environmental Profile:
Habitat – Sometimes in compacted mud, often in sandy or gravel areas of smaller streams to large rivers.
Hosts – Rock bass, northern pike, shortnose gar, green sunfish, pumpkinseed, warmouth, bluegill, largemouth bass, white bass, yellow perch, white crappie, black crappie, flathead catfish, and sauger.
Distribution/Status – Widespread and secure in IL, and apparently secure in WI and IN; under review in MI.

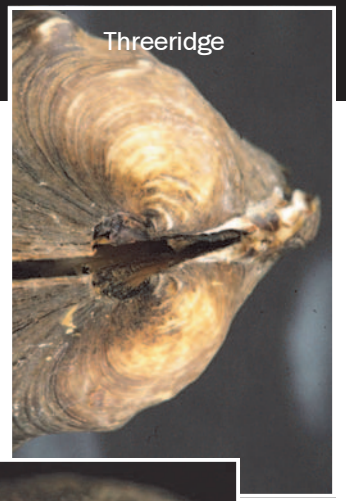




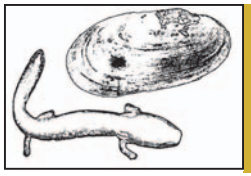
The dorsal anterior surface is fairly smooth compared to the washboard which has small V-shaped ridges across its surface. These small ridges need to be distinguished from the larger ridges or folds present on both the washboard and the threeridge. It is the large ridges that give these species their names.

Comparison of Anatomical Traits for the Washboard and Threeridge

Anatomical Trait	Washboard	Threeridge
Dorsal anterior surface	Fine V-shaped ridges (see washboard photo below right)	Smooth
Posterior two-thirds surface	Multiple large ridges	Usually three or more roughly parallel ridges
Umbo	Double-looped sculpture	Three or four concentric ridges
Size	To 11 inches	To eight inches

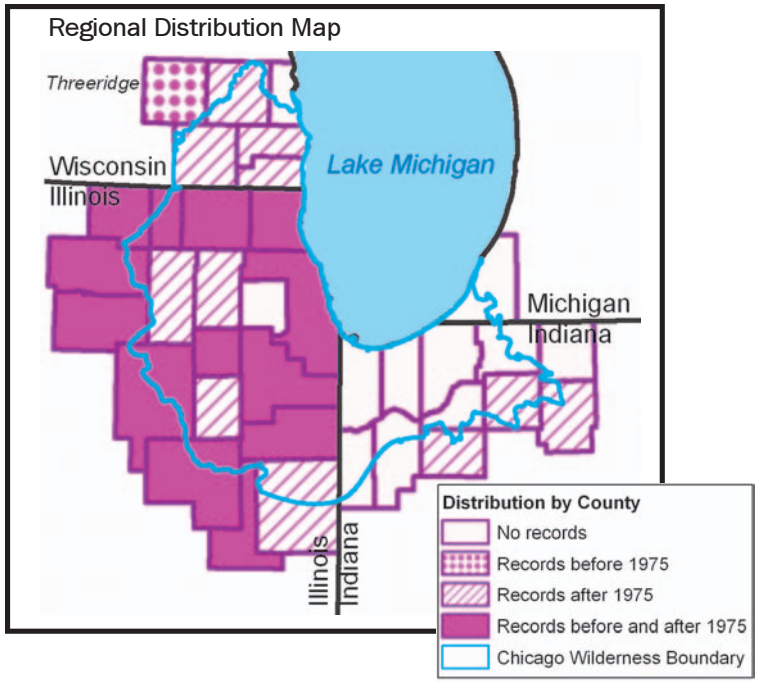


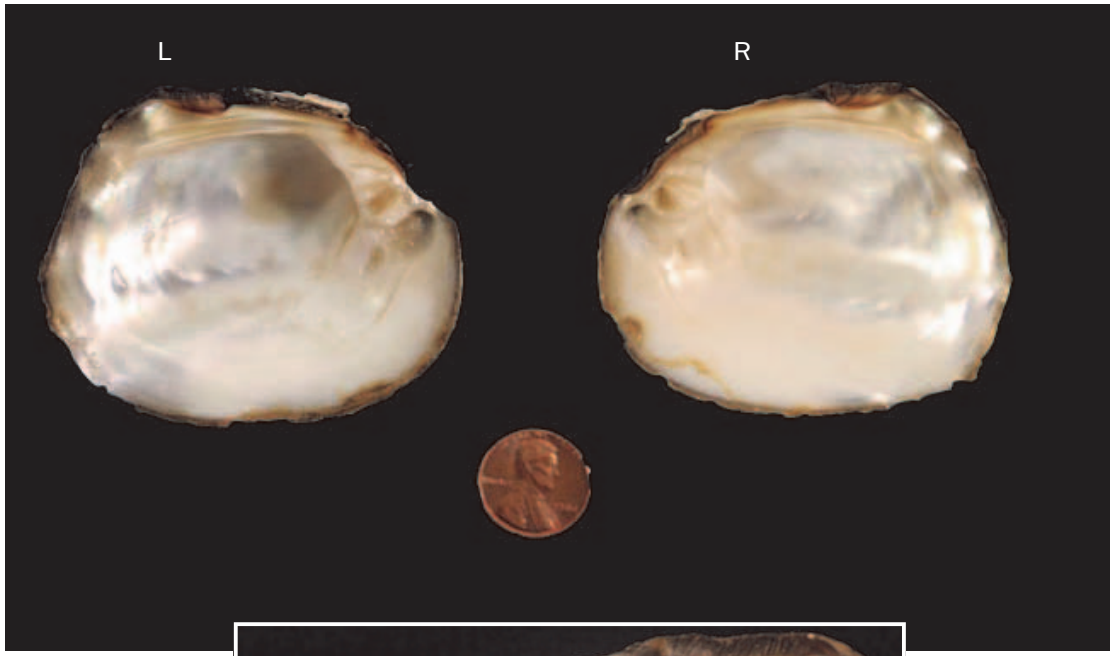
Umbos of the left and right valves of the threeridge (above). Notice the three to four concentric ridges on each valve. This contrasts with the double-looped sculpture of the washboard pictured to the left.

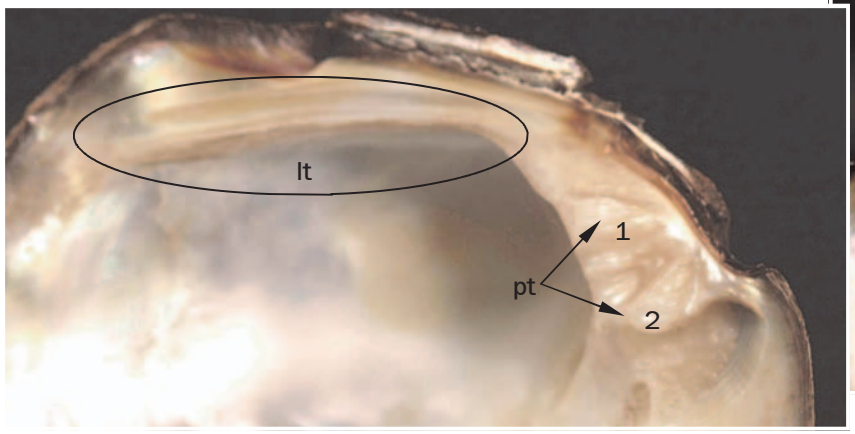


Threeridge *Amblema plicata* internal views

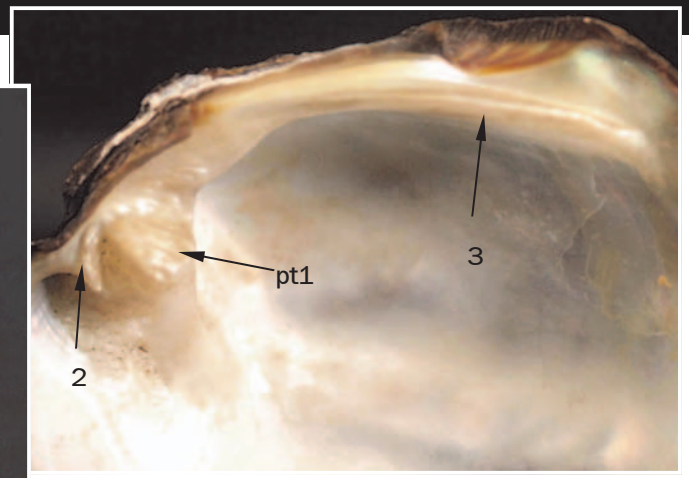
Subfamily Ambleminae



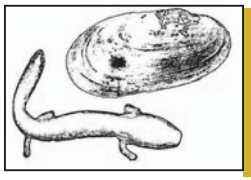




The left valve has two large, triangular, grooved pseudocardinal teeth (pt). Two lateral teeth are present which are long, slightly curved, and striated (lt). The nacre is white and is often tinged with purple. The nacre can be iridescent at the posterior edge of the shell.



The right valve has a stout, elevated, triangular, grooved pseudocardinal tooth (pt1) with an small denticle (2) anterior to it. The lateral tooth (3) is high, slightly curved and striated. Descriptions follow Oesch (1984).



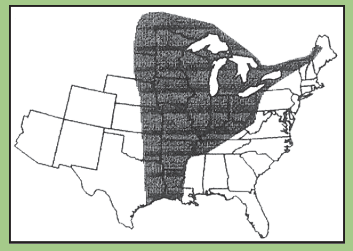
Wabash pigtoe *Fusconaia flava*
Subfamily Ambleminae

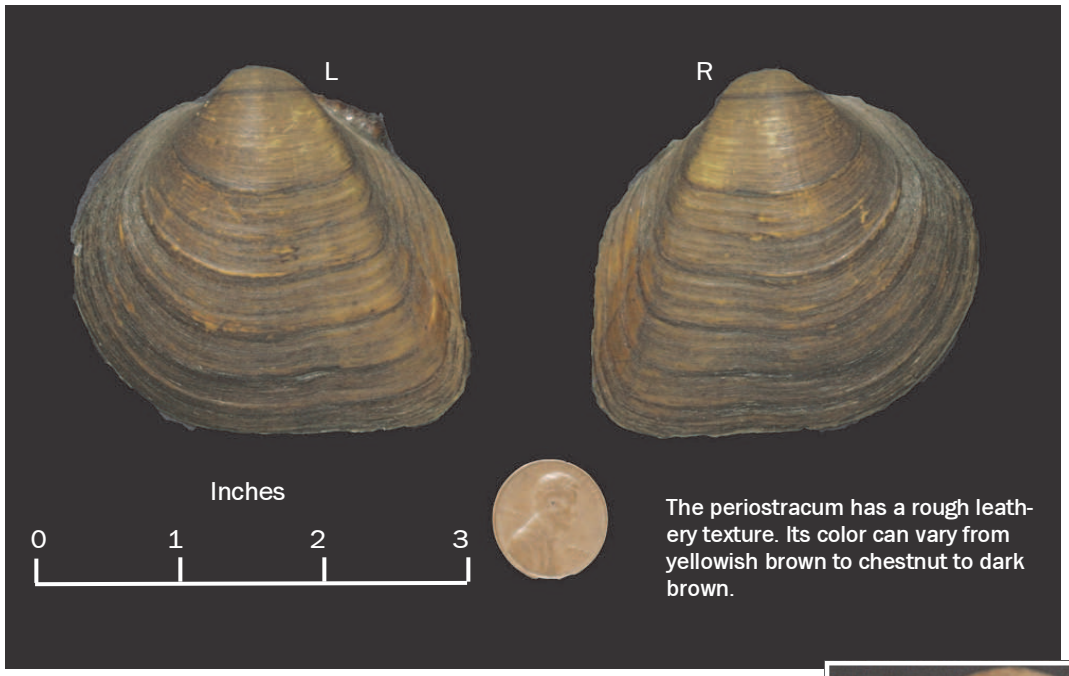
external views

ID. Aids:
External Surface – Small to medium sized, fairly thick shell, somewhat triangular in shape. Shallow sulcus (depression) on posterior half of shell. Periostracum rough.
Internal Surface – Prominent pseudocardinal teeth, nacre usually white.

Distinguishing Features:
Similar Species – All pigtoes in the genus *Fusconaia* and the genus *Pleurobema* look similar and can be difficult to identify even for experienced Mussel specialists.
Compared To – The Wabash pigtoe is more triangular in shape, and has a distinct to subtle sulcus on the posterior half of the shell compared to the round pigtoe. The Wabash pigtoe is also more inflated, and has a deeper beak than the round pigtoe when similar sized shells are compared.
Beak Sculpture – A few weak ridges, often thin and usually only seen in young shells.
Beak Cavity – Deep.
Shell Color – Yellowish tan, to dark brown, occasionally with faint rays, and the periostracum is somewhat rough in texture.
Nacre – Usually shiny white, but may have an orange tinge. Iridescent posteriorly in fresh shells.
Teeth & Hinge – Pseudocardinal teeth are heavy and roughened by striations and grooves. Two in the left valve and one in the right. Lateral teeth are heavy and straight to slightly curved. A few, subtle serrations are present especially at the posterior end of teeth.
Size/Thickness – To four inches. A 3.9-inch shell is about 4.0 mm thick in the center.

Environmental Profile:
Habitat – Creeks, small streams, and large rivers in mud, sand and gravel.
Hosts – Bluegill, white crappie, black crappie, creek chub and the silver shiner (outside our range).
Distribution/Status – Widespread, secure, and relatively common in IL, IN, WI, and under review in MI.

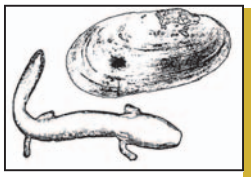




The periostracum has a rough leathery texture. Its color can vary from yellowish brown to chestnut to dark brown.

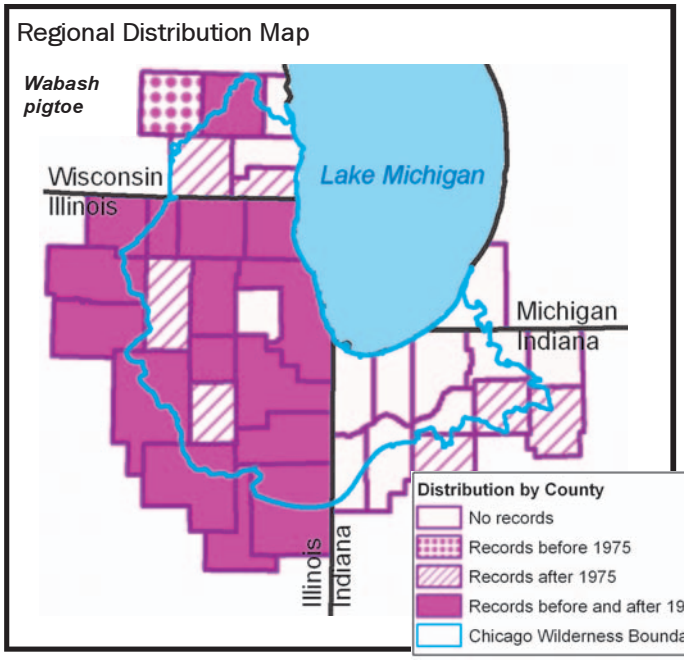
A view of the umbo demonstrating its height above the hinge line and poorly developed beak sculpture. Weak lines of the umbo are only apparent on very small valves with little or no erosion.

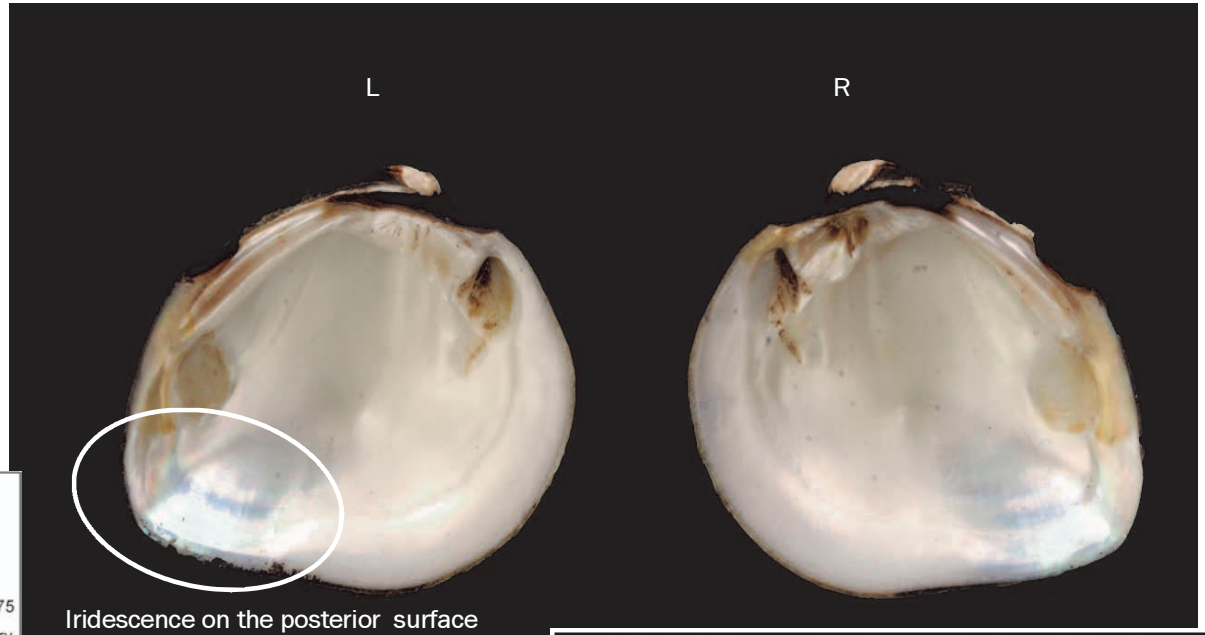
Sulcus on ventral margin of a Wabash pigtoe. The depression is very slight and the shell needs to be rotated to see it properly. Note the color differences in the different specimens.



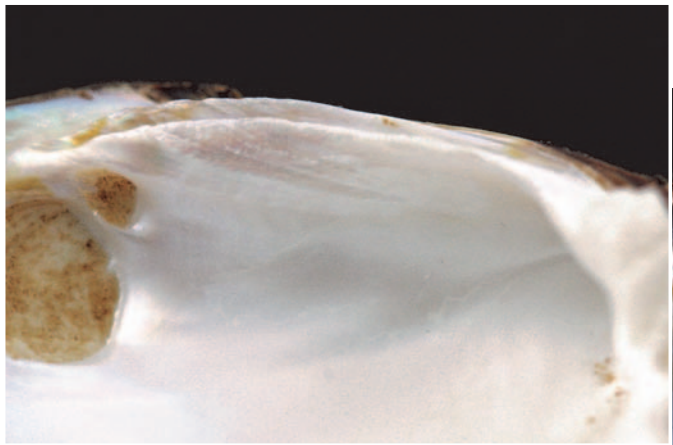
Wabash pigtoe *Fusconaia flava*
Subfamily Ambleminae

internal views

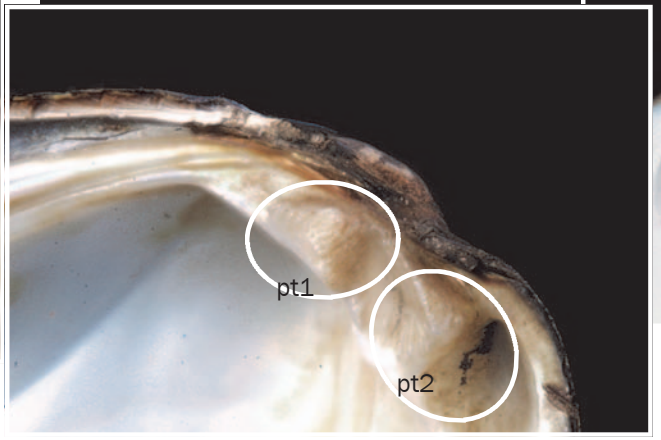




Iridescence on the posterior surface of the valve.

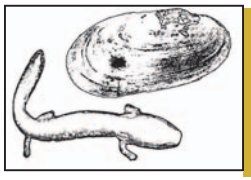


Close-up of lateral teeth on the left valve, showing striations on the long axis of the tooth. There are two lateral teeth in the left valve and a single one in the right valve.



The left valve has two elevated, serrated, divergent pseudocardinal teeth. The anterior tooth is thinner and elongate and the posterior tooth is heavy and triangular.

Close-up of the pseudocardinal tooth in the right valve showing characteristic grooves. Grooved surfaces of this kind are referred to as serrations.



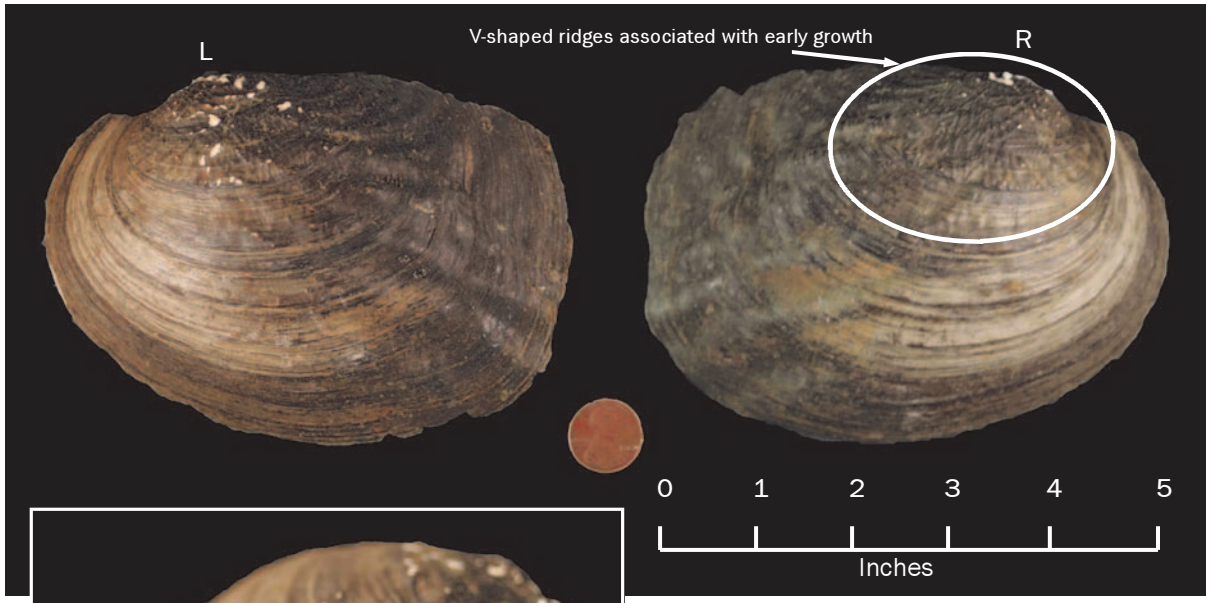
Washboard *Megalonaias nervosa* external views

Subfamily Ambleminae

ID. Aids:
External Surface – Large, dark, thick, elongated shell, roughly rectangular in shape with a small, flattened wing-like projection below the hinge line on the dorsal posterior. Several large ridges present on the posterior portion with a progression of many succeeding ridges running into the "wing." The beak sculpture is of thick, double-looped ridges progressing onto the shell and blending into raised V-shaped or chevron markings progressing down the central to anterior part of the shell.
Internal Surface – Large pseudocardinal teeth, similar to the threeridge mussel.

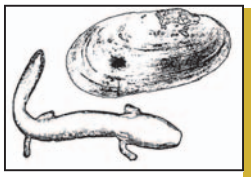
Distinguishing Features:
Similar Species – Threeridge, pistolgrip, rock-pocketbook (rock-pocketbook not found in the Chicago Wilderness region)
Compared To – The washboard has raised V-shaped markings on the beak which spread down onto the first few years of growth on the shell, while the threeridge does not. The presence of ridges on a distinctive posterior wing does not alone confirm the shell as a washboard. The pistolgrip has a more elongated shell than the washboard.
Beak Sculpture – Several thick double-looped bars close to the beak tip with raised pustules, lines, and V-shaped markings continuing on down the side of the shell for several major growth periods.
Beak Cavity – Deep with distinctive interdentum but comparable to the threeridge of similar size.
Color – Dark. Even young shells tend toward darker brown and adult shells tend to be black in color.
Nacre – Shiny white with posterior iridescence.
Teeth/Hinge – Two slightly curved, bladelike lateral teeth occur in the left valve. Two triangular, peglike pseudocardinal teeth in the left valve. Pseudocardinal teeth are incised with many grooves and striations. A single lateral tooth and a single pseudocardinal tooth exist in the right valve. Occasionally a smaller pseudocardinal tooth can be found.
Size/Thickness – To 11 inches. The largest and heaviest mussel in Illinois and North America. Thicker on anterior end; 4.0 mm in the center; 4.0 mm at the ventral edge; 10 mm below the anterior muscle scar for the specimen pictured.

Environmental Profile:
Habitat – Medium to large rivers in mud, sand, or gravel.
Hosts – Wide range of hosts including, but not limited to: flathead catfish, channel catfish, brown bullhead, tadpole madtom, black crappie, white crappie, bluegill, green sunfish, longear sunfish, warmouth, white bass, freshwater drum, gizzard shad, skipjack herring, tadpole madtom, longnose gar, logperch, yellow perch, sauger, central stoneroller, American eel, bowfin.
Distribution/Status – Widespread and common in large rivers. Secure in IL, IN, vulnerable in WI, not present in MI.



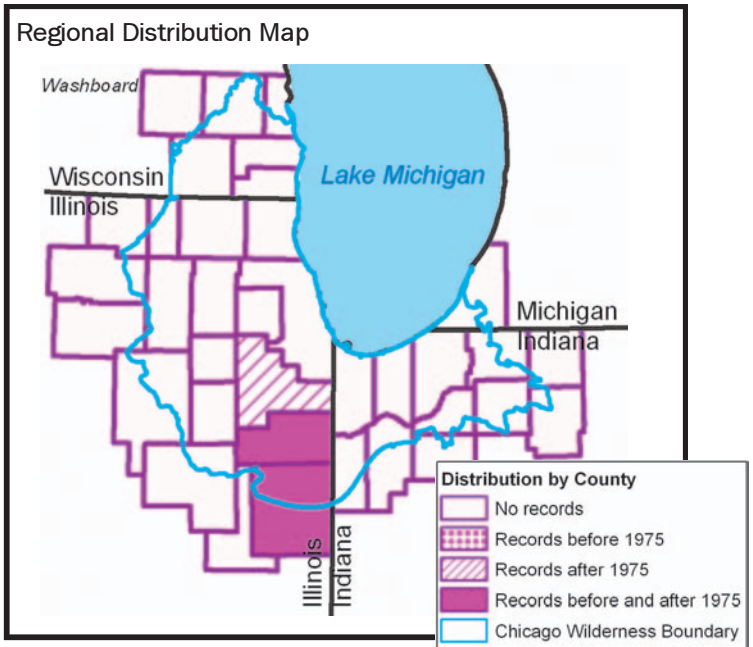
Surface of washboard showing large ridges for which it is named. Note the overall size (over five inches for specimen displayed).

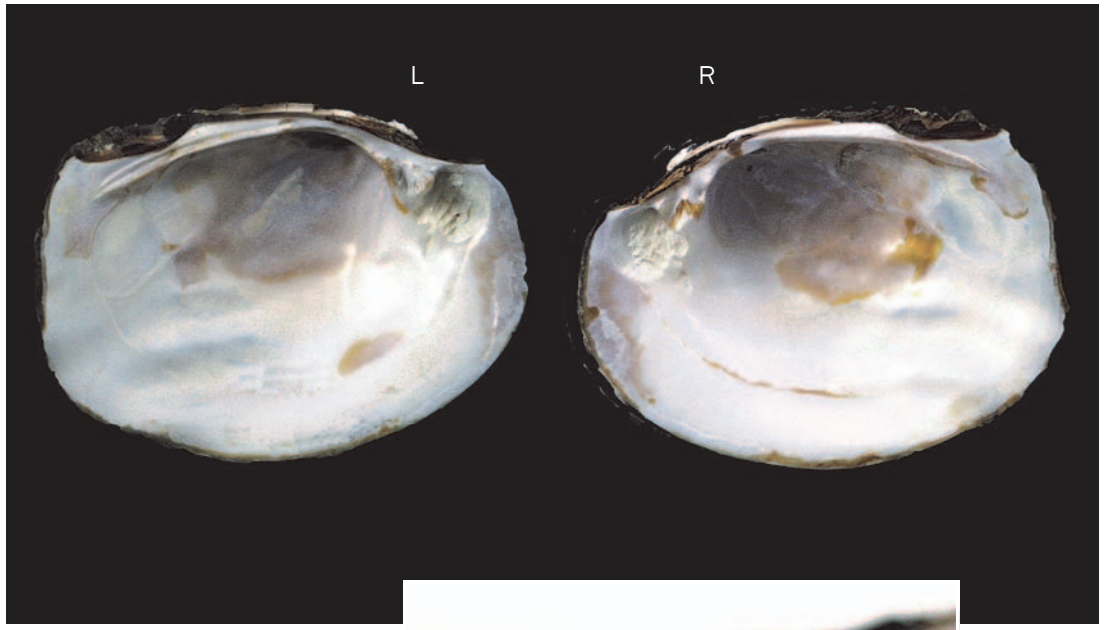
The umbo of this specimen is eroded; however, the double loop sculpturing can be plainly seen. While it is referred to as a "double loop" it visually resembles an "M" or a "W" depending on your orientation.

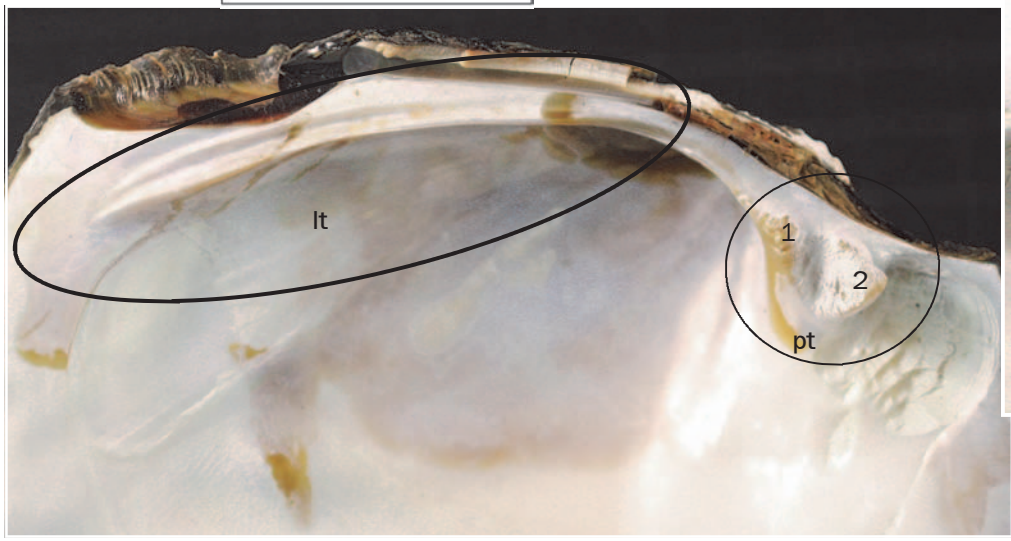


Washboard *Megalonaias nervosa* internal views

Subfamily Ambleminae

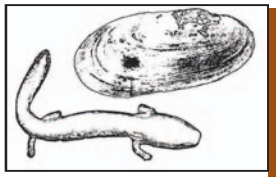






Left valve showing two curved lateral teeth (lt) and two peglike pseudocardinal teeth (pt). The beak cavity is comparatively deep. The pseudocardinal teeth have grooves and serrations on their surfaces. The nacre of this species often has copper or purple colored blotches.

Close-up of the pseudocardinal tooth for the right valve. The pseudocardinal teeth of mussels are not teeth in the traditional sense. Rather, they are projections which fit together to stabilize the hinge.



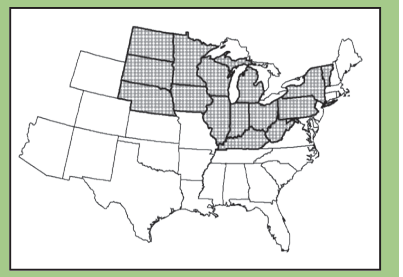
Creek heelsplitter *Lasmigona compressa* external views

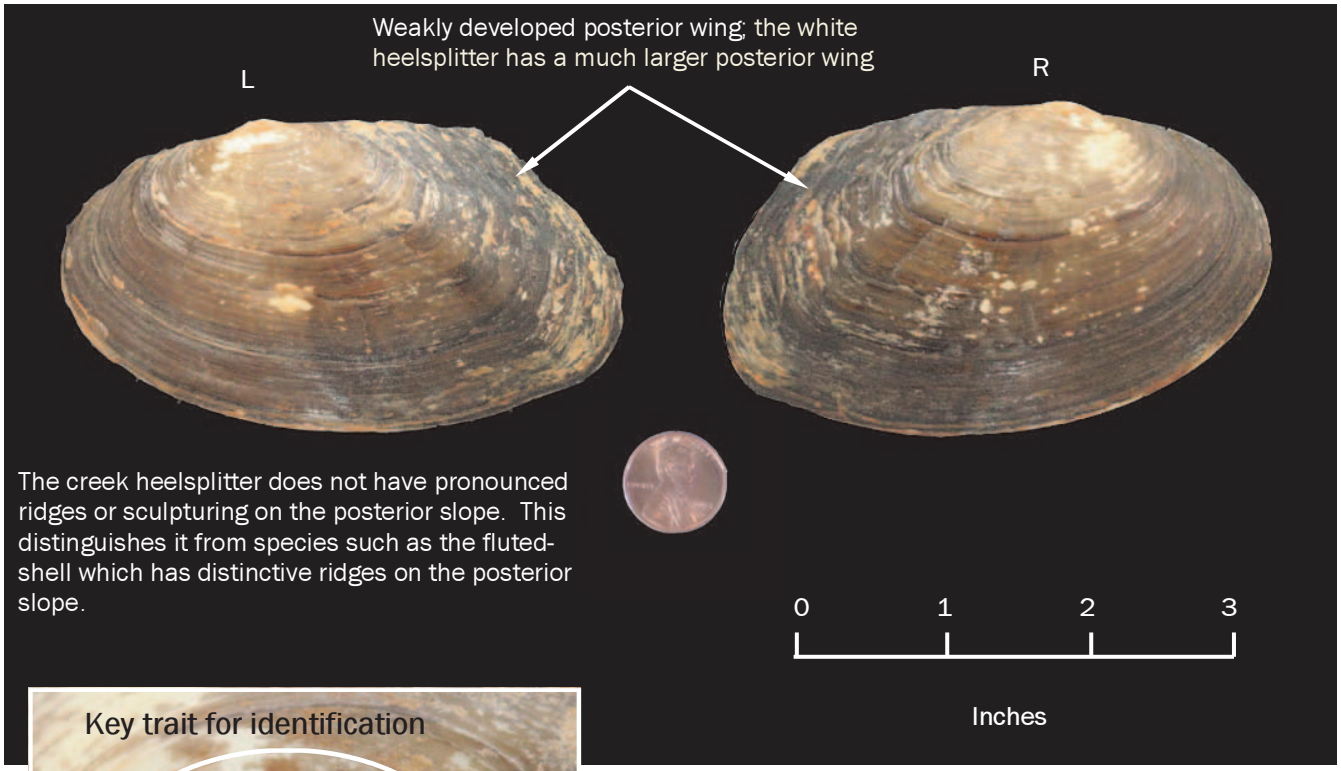
Subfamily Anodontinae

ID. Aids:
External Surface – Medium sized, compressed, moderately thin-shelled, with a low, flattened ridge that angles from the umbo to the posterior edge of the shell. The ridge may be subtle to prominent. Beaks with double-looped raised lines; beaks barely protrude above hinge line.
Internal Surface – Prominent lateral teeth, pseudocardinal teeth appear as thickened, flattened ridges. Nacre white, often with a light orange tinge that is more prominent near the beak.

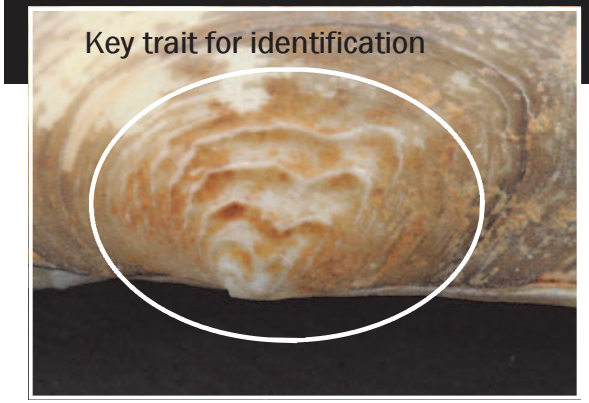
Distinguishing Features:
Similar Species – Fluted-shell, white heelsplitter, pondhorn.
Compared To – The creek heelsplitter has a distinct shape and distinct beak ornamentation compared to the fluted-shell, white heelsplitter and pondhorn. The white heelsplitter has a more circular shell and much larger posterior wing. The fluted shell has a thicker, more elongated shell with flutes on the posterior edge. The pondhorn has a posterior, rounded ridge and distinct wing while the creek heelsplitter has an angled ridge and a subtle wing. The creek heelsplitter has a more laterally compressed shell than the others.
Beak Sculpture – Five to eight double-looped ridges, with posterior loop pulled downward more than the anterior loop.
Beak Cavity – Extremely shallow.
Color – Yellowish tan, to dark brown, usually with green rays, especially on the posterior half of the shell, rays sometimes obscure. Younger shells are usually smooth and somewhat glossy, older shells can be somewhat roughened.
Nacre – Usually shiny white, but may have yellow, bluish, or orange tinge that is more prominent toward the beak.
Teeth/Hinge – Pseudocardinal teeth are somewhat bladelike, two in the left valve and one in the right. Lateral teeth appear short to moderately long and very slightly curved. A few subtle serrations are present.
Size /Thickness – To four inches. A three-inch shell is about 0.5 mm thick.

Environmental Profile:
Habitat – Creeks and small streams, in sand and fine gravel. Not common in large streams or rivers.
Hosts – Black bullhead, yellow bullhead, slimy sculpin, brook stickleback, gizzard shad, shortnose gar, green sunfish, orangespotted sunfish, bluegill, smallmouth bass, emerald shiner, mimic shiner, yellow perch, flathead catfish, longnose dace, black crappie, creek chub, spotfin shiner, brassy minnow, silver shiner (outside our range).
Distribution /Status – Widespread, relatively uncommon, and of concern in IL, WI, and IN. Not ranked in MI. Vulnerable or imperiled in much of its range.

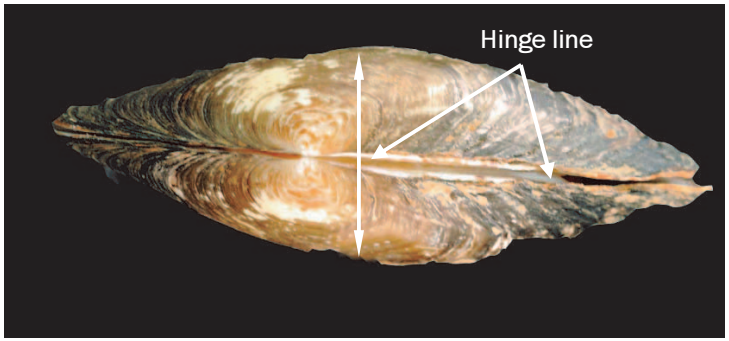




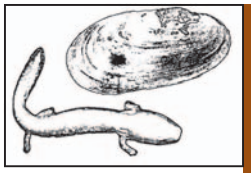
The creek heelsplitter does not have pronounced ridges or sculpturing on the posterior slope. This distinguishes it from species such as the fluted-shell which has distinctive ridges on the posterior slope.



Close-up of the umbo showing prominent double- looped ridges (five to eight) which are characteristic of the genus *Lasmigona* to which the creek heelspiltter belongs. Ridges on the creek heelsplitter are more defined and less subject to erosion than some other species in this genus, so the prominence of the ridges can be a characteristic used for identification.

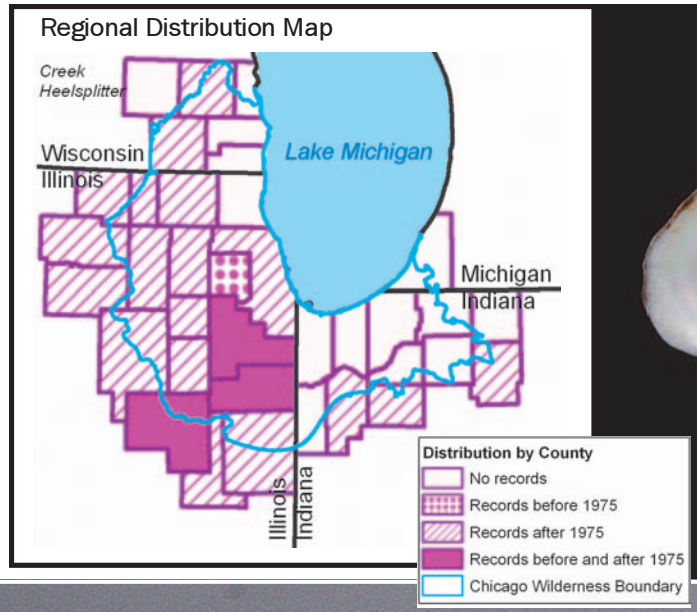


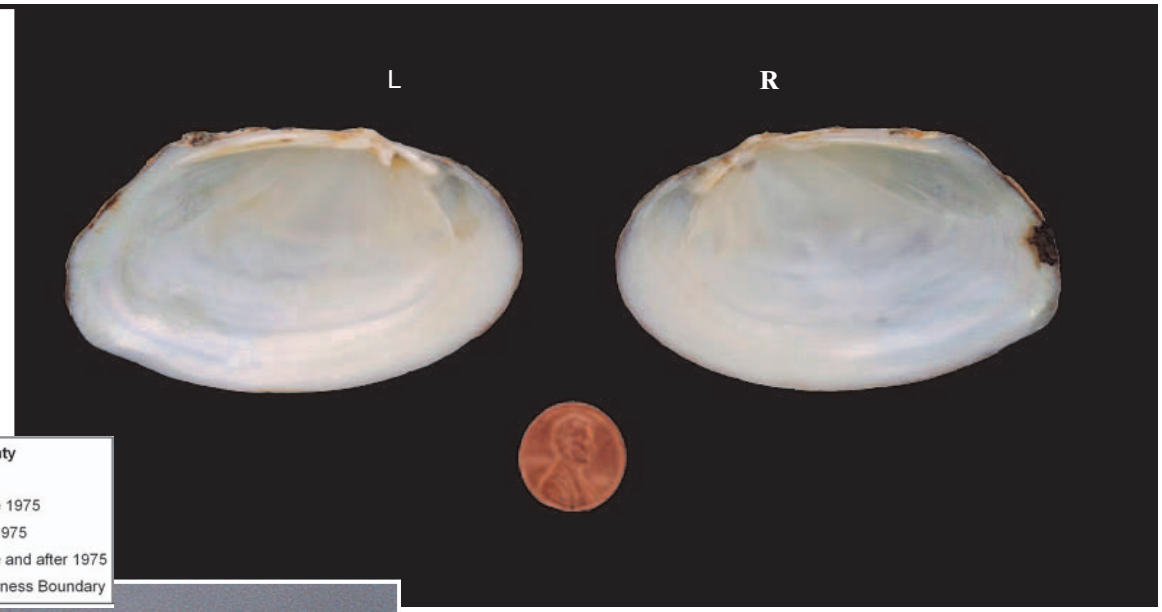
Dorsal view of the creek heelsplitter showing the hinge line and the umbo. The umbo is just slightly raised above the level of the hinge line. The beak sculpture for both valves is apparent. The shell is more laterally compressed (i.e. flatter) than similar species.



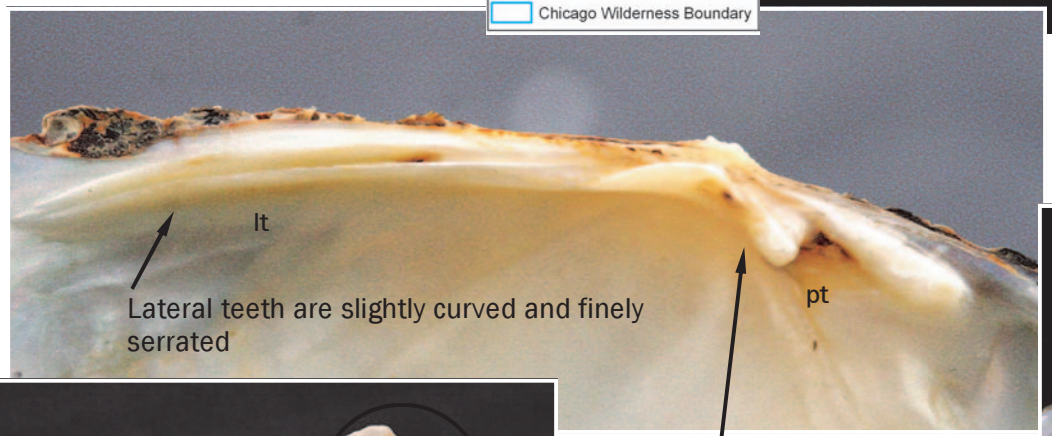
Creek heelsplitter *Lasmigona compressa* internal views

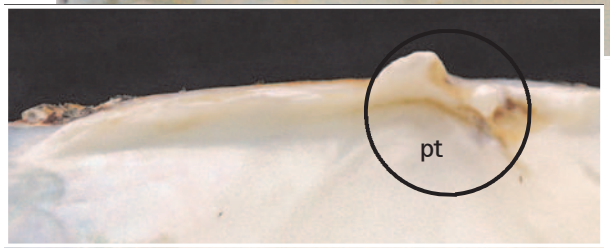
Subfamily Anodontinae





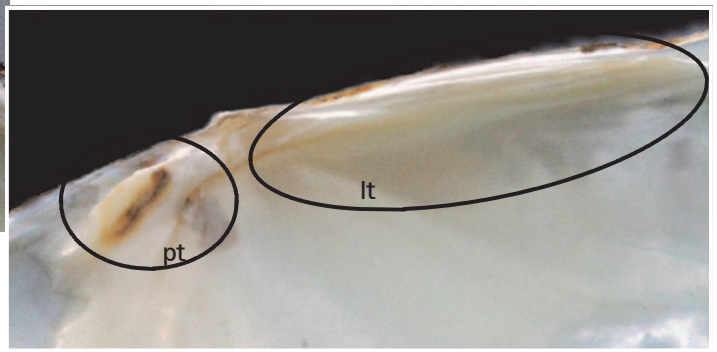
The anterior end of the creek heelsplitter is round. The posterior end has been described as "bluntly pointed and squared at the tip" (Cummings and Mayer, 1992).



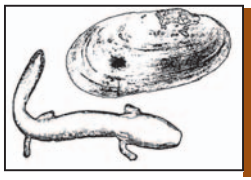


Pseudocardinal teeth are compressed and bladelike.

Two close-up views of the two left lateral teeth (lt) and the two left pseudocardinal teeth (pt). Lateral teeth on similar species (i.e. white heelsplitter and the fluted shell) are poorly developed and often look like thickenings of the hinge line.



Close-up view of right pseudocardinal and lateral teeth. Compare the different views of the left and right pseudocardinal teeth. Teeth can look quite different depending on the viewing angle.

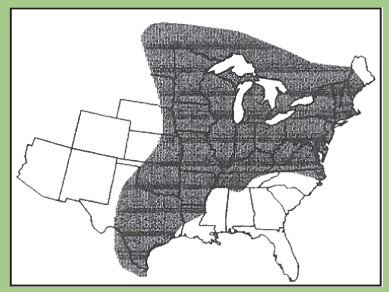


Creeper *Strophitus undulatus* external views
Subfamily Anodontinae

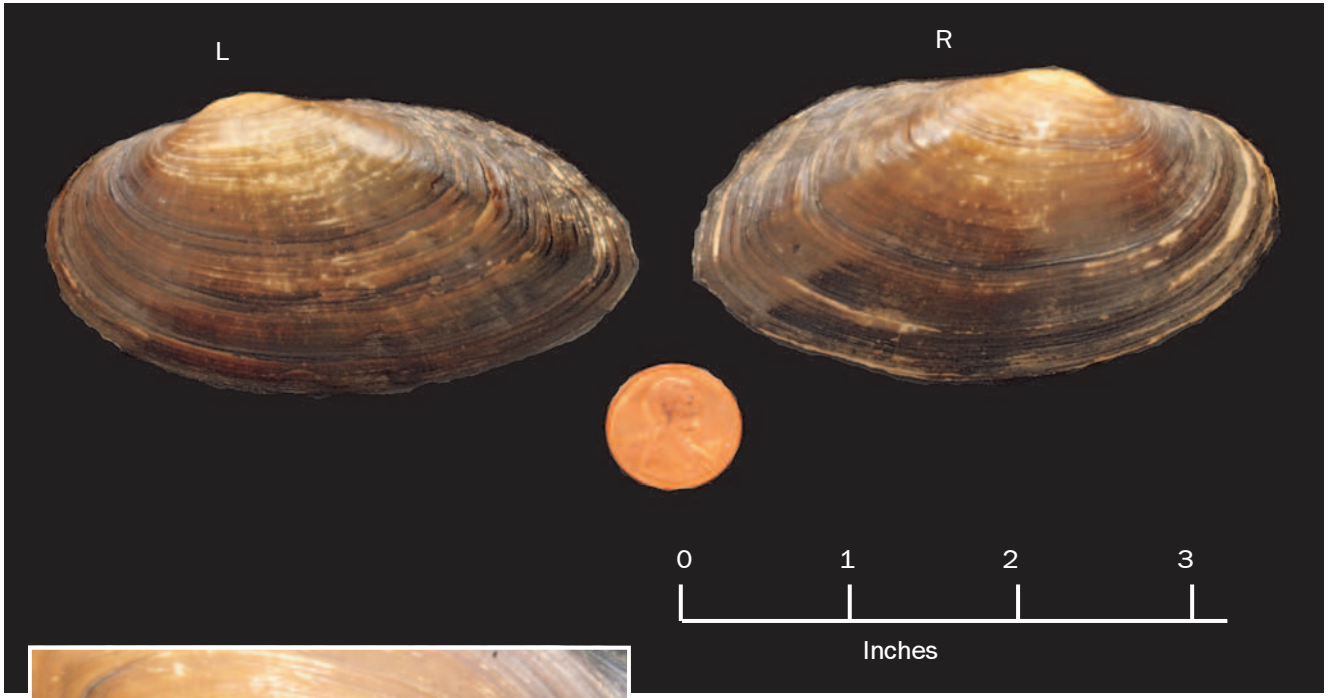
ID. Aids:
External Surface – Elliptical shape. Adults have medium sized, moderately inflated, thin to moderately thick shells. Beak sculpture consists of rough, thickened raised lines in a broad U- shaped pattern. The foot of live specimens is usually orange colored.
Internal Surface – Very weak teeth appear as indistinct swellings. Highly iridescent nacre, variable color.

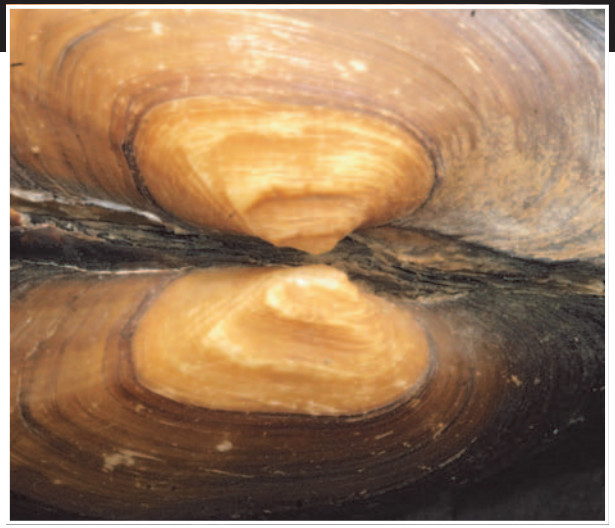
Distinguishing Features:
Similar Species – Paper pondshell, giant floater, cylindrical papershell.
Compared To – The creeper has a distinct beak sculpture compared to the others. The paper pondshell has a flat beak that is even with the hinge line, and has a thinner, more elongated shell. The cylindrical papershell is more elongated and more inflated than the creeper. The giant floater has a more inflated shell and a straight hinge line compared to the creeper.
Beak Sculpture – Several rough, thick, U- shaped, raised, concentric lines radiating from beak.
Beak Cavity – Shallow.
Color – Young have flat, glossy, smooth, yellowish brown shells with green rays. Older shells are brown to blackish with the rays becoming unnoticeable in the oldest shells.
Nacre – Often whitish blue, but may have yellow or orange tinge that may completely color the nacre or be more pronounced nearer the beak. Iridescent, especially the posterior half.
Teeth/Hinge – Pseudocardinal teeth may be hardly visible or can be smooth, elongated swellings near the beak. The hinge is relatively straight, but dips sharply downward just in front of the umbo.
Size/Thickness –To four inches. A 2.5-inch creeper was 0.6 mm thick at the center of the valve.

Environmental Profile:
Habitat – Creeks, small streams, and occasionally in large rivers in mud, sand and gravel.
Hosts – Rock bass, yellow bullhead, black bullhead, channel catfish, central stoneroller, brook stickleback, fantail darter, Iowa darter, rainbow darter, blackside darter, Johnny darter, logperch, green sunfish, pumpkinseed, bluegill, longear sunfish, white crappie, black crappie, creek chub, common shiner, spotfin shiner, sand shiner, bluntnose minnow, fathead minnow, blacknose dace, northern redbelly dace, longnose dace, central mudminnow, yellow perch, walleye, largemouth bass, smallmouth bass, burbot, and others outside of our range.



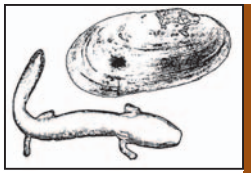
Distribution /Status – Widespread and fairly common in IL. Of concern in IN, and vulnerable in more than half its range.





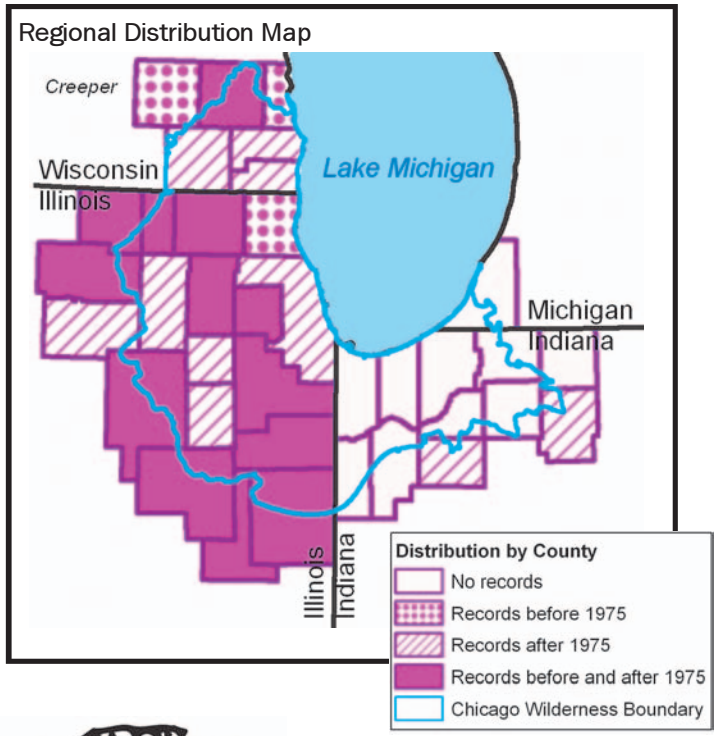
The beak sculpture consists of rough, thickened raised lines in a U-shaped pattern.

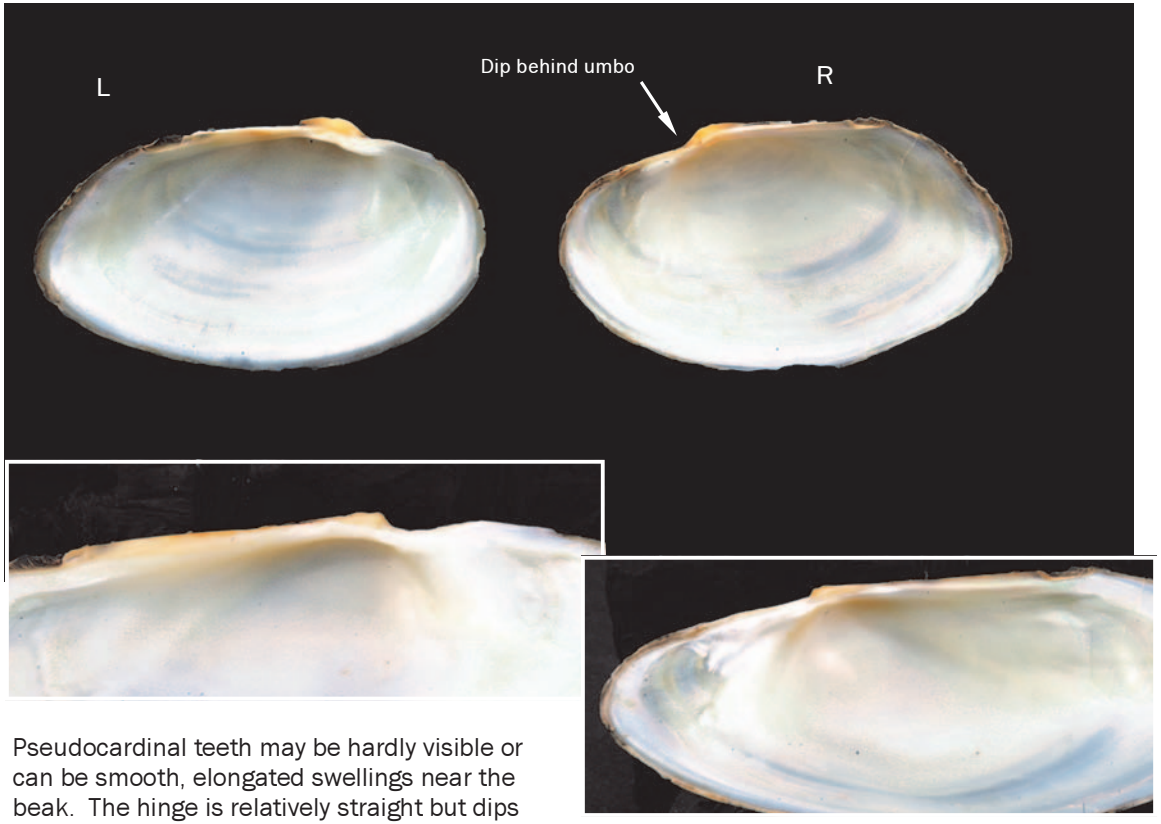
Dams have a negative effect on freshwater mussel diversity. Mussel species are most diverse in running water habitats, and dams create ponded conditions. Also, since fish act as hosts to mussel larvae, carrying them on their gills and aiding in their dispersal, dams that create barriers to fish migration also fragment mussel habitat. In addition, the silt that accumulates upstream of dams creates an environment in which only a limited number of silt tolerant mussel species can thrive. The damming of rivers and streams is an example of how human caused landscape changes can degrade mussel habitat.



Creeper *Strophitus undulatus* internal views

Subfamily Anodontinae

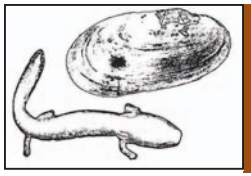




Pseudocardinal teeth may be hardly visible or can be smooth, elongated swellings near the beak. The hinge is relatively straight but dips sharply downward just in front of the umbo.

Oblique view of the right valve. Both the pseudocardinal teeth and the lateral teeth are greatly reduced. The nacre on this specimen is whitish blue. The posterior half of the shell is iridescent.

In the late 19th and early 20th centuries, freshwater mussel shells were used to make buttons for clothing. In 1891, the first mother-of-pearl (mussel shell) button factory opened in the Midwestern United States and in 1916, six billion mother-of-pearl buttons were produced! Eventually, zippers and plastic buttons began to replace the use of mother-of-pearl buttons and the market for buttons made from mussel shells declined. However, the harvesting of mussels for the button industry had taken a toll on mussel populations across the United States.

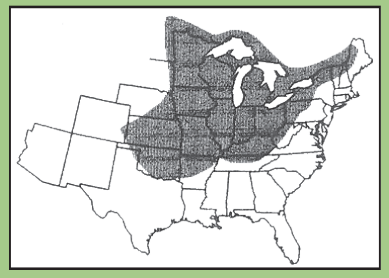


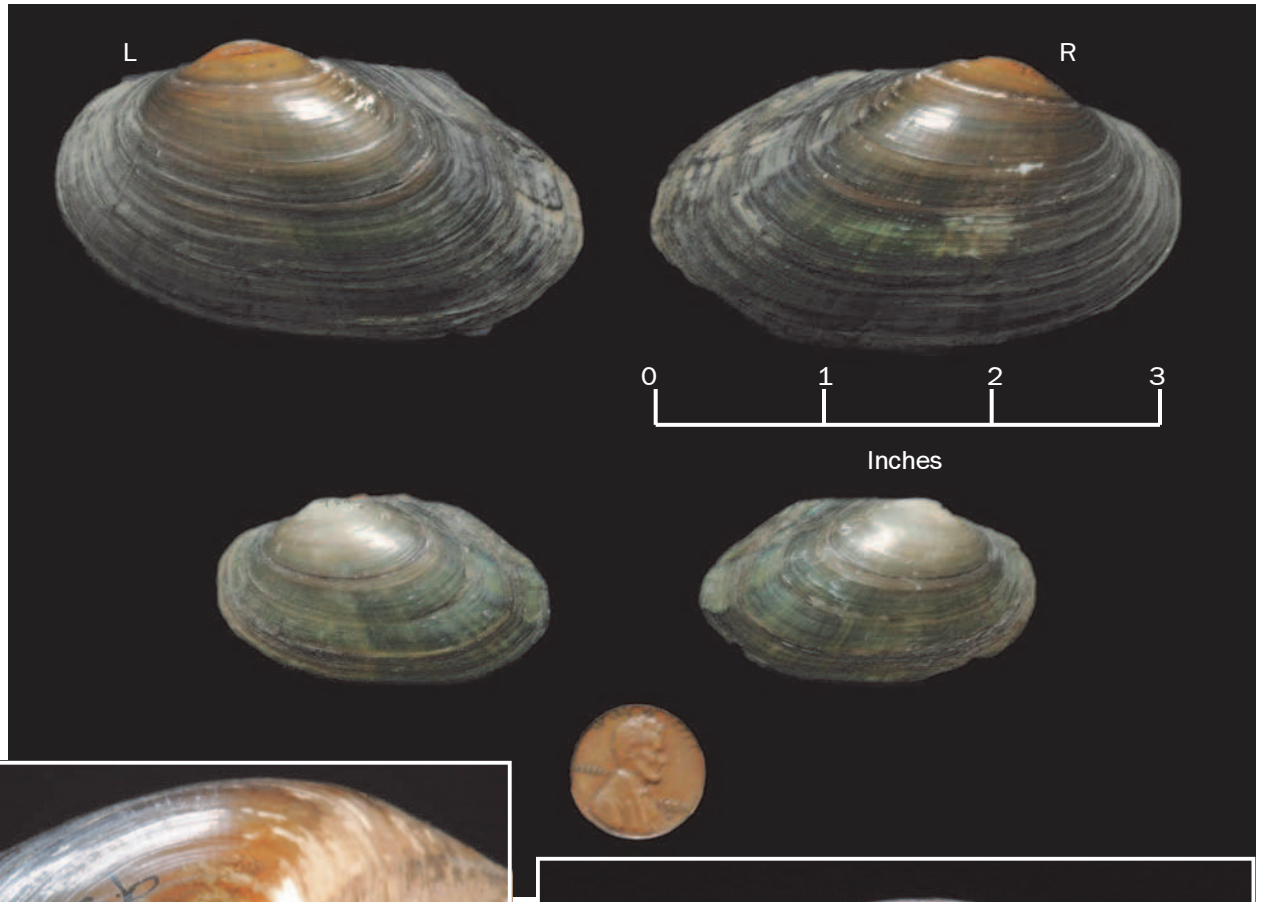
Cylindrical papershell *Anodontoides ferussacianus* external views
Subfamily Anodontinae

ID. Aids:
External Surface – Elongated oval shape with a very thin shell. Beaks slightly raised above hinge line with several concentric ridges. Beaks are often eroded.
Internal Surface – Teeth absent. Nacre silvery or white. Shell easy to break with fingers.

Distinguishing Features:
Similar Species – Giant floater, pondhorn, paper pondshell, creeper.
Compared To – The cylindrical papershell has a distinct beak sculpture compared to the giant floater, paper pondshell, pondhorn, and creeper. It has a thinner shell than all the similar species except the paper pondshell (for equal sized specimens). The pondhorn has a posterior wing that the cylindrical papershell lacks. The cylindrical papershell has a more prominent beak than the paper pondshell.
Beak Sculpture – Two to four fine, concentric, or V-shaped ridges.
Beak Cavity – Deep.
Color – Young shells smooth, often shiny yellowish tan, to dark brown, often with green rays, especially on the posterior half of the shell, although the rays are sometimes obscure. Old shells can look rayless and almost black, and can be somewhat roughened especially on the ventral half.
Nacre – Usually shiny white, or bluish white with iridescence posteriorly.
Teeth/Hinge – Lateral and pseudocardinal teeth absent. Hinge usually straight but occasionally slightly curved.
Size/Thickness – To 3.5 inches. A 3.25-inch shell is about 0.25 mm thick measured in the center.

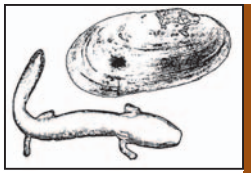
Environmental Profile:
Habitat – Creeks and small streams, in sand and mud. This is a common headwaters species that can also be found in Lake Michigan.
Hosts – White sucker, mottled sculpin, spotfin shiner, brook stickleback, Iowa darter, bluegill, common shiner, largemouth bass, blacknose shiner, sea lamprey, bluntnose minnow, fathead minnow, black crappie, and Tippecanoe darter (outside our range).
Distribution /Status – Secure in IL, vulnerable in WI and IN, and under review in MI.



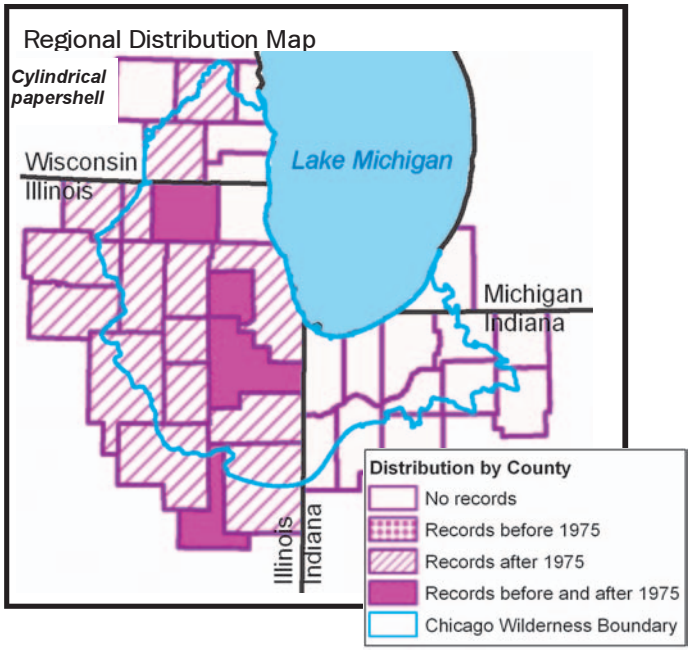


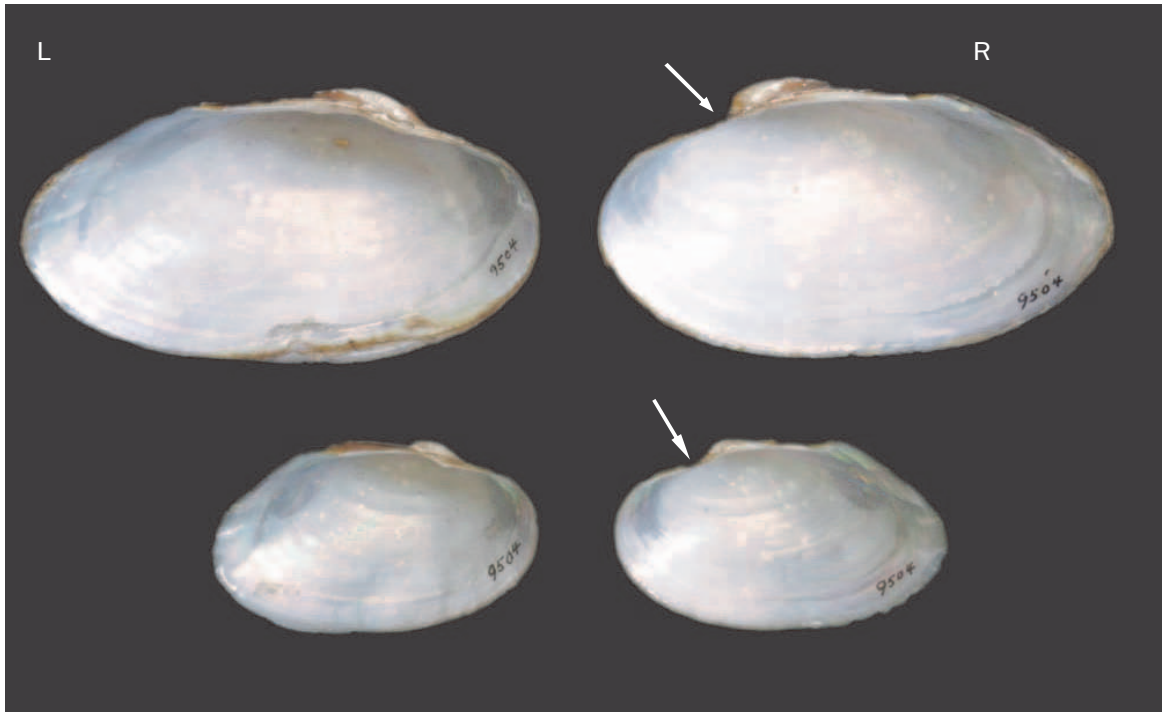
Close-up of the left valve beak sculpture.

Close-up of another left valve showing sculpturing on umbo surface.



Cylindrical papershell *Anodontoides ferussacianus* internal views
Subfamily Anodontinae

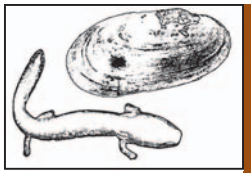




The teeth in the cylindrical papershell are absent; there are no pseudocardinal or lateral teeth present in either the left or right valve. Notice the slight indentation of the hinge line anterior to the umbo. This is diagnostic for the cylindrical papershell. The shell is comparatively thin. The nacre is usually shiny white or bluish white with iridescence posteriorly.

The iridescence of the cylindrical papershell is easier to see on this photograph as a consequence of slight changes in lighting.

In 2006, Chicago Wilderness published a report card of regional ecological health that gives an overall grade of C- to our streams. Most Chicago Wilderness streams suffer from impacts of urban and suburban development. However, there have been some significant efforts to improve stream ecosystems in the Chicago Wilderness region in recent years, including several dam removals. Some high quality streams still exist in areas where urbanization is less intense. Protecting these high quality streams into the future will be very important to survival of mussel species.



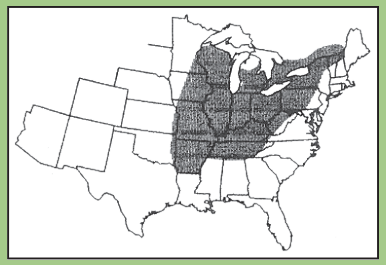
Elktoe *Alasmidonta marginata* external views

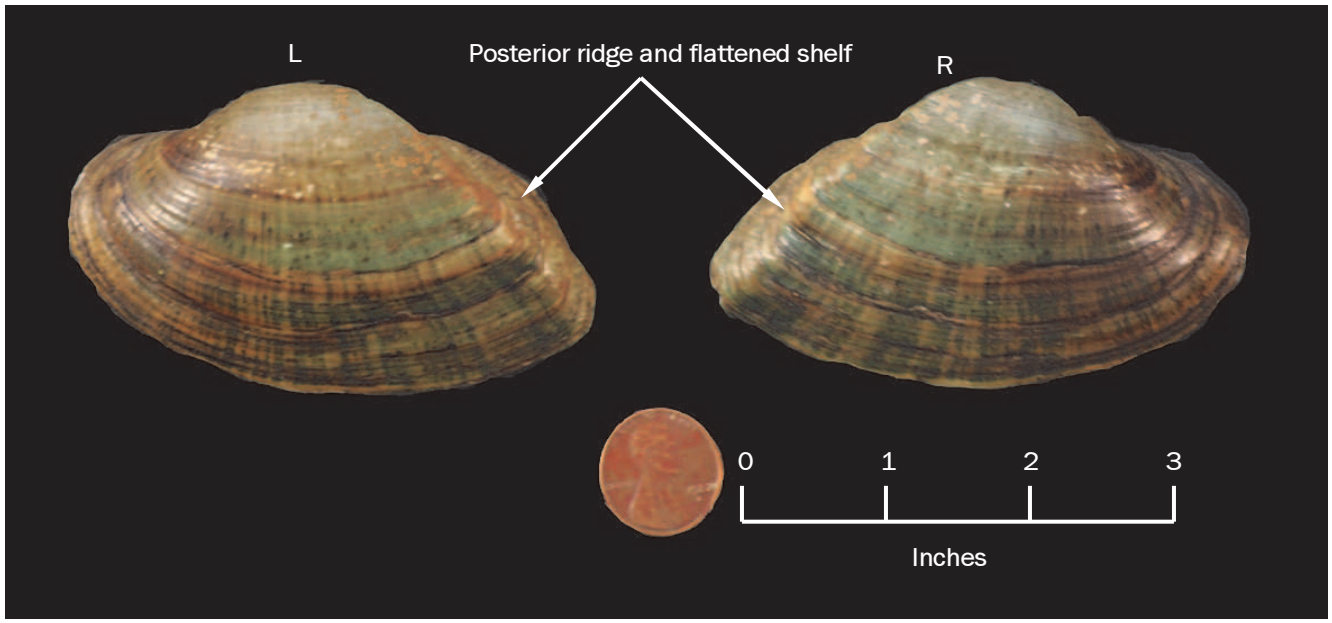
Subfamily Anodontinae

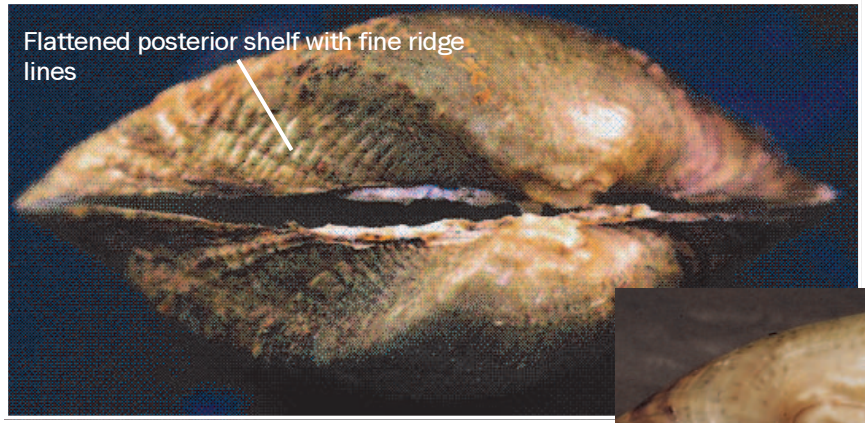
ID. Aids:
External Surface – Shell thin, greatly inflated, somewhat trapezoidal in shape, relatively smooth with a very prominent posterior ridge that sharply angles to form a flattened posterior surface. Shell can be bright green to brown usually with darker rays and dark speckles. Beaks have several very heavy double-looped bars. The foot is usually orange.
Internal Surface – Nacre has a subdued gloss and is bluish white.

Distinguishing Features:
Similar Species – Slippershell, deertoe, snuffbox.
Compared To – The slippershell is much smaller, has white nacre, is not as elongated, and is not as brightly colored. The deertoe has white nacre, is not as elongated as the elktoe, and has a different beak sculpture. The snuffbox is exceedingly rare, has white nacre, is not as elongated as the elktoe, has distinctive beak sculpture, and has a more substantial shell.
Beak Sculpture – Three or four heavy, raised, double-looped bars, though the looping can be very weak or absent. Beak barely protrudes above the hinge line.
Beak Cavity – Shallow
Color – The shell can range from bright green to tan to brown, and also have yellowish highlights. Darker green rays can be distinct to diffuse, and appear in one section or across the entire shell. Very dark small speckles or dots are often present.
Nacre – Usually a bluish white, but may have an orange tinge especially closer to the beak. The nacre is semi-glossy.
Teeth/Hinge – One bladelike and up-curved pseudocardinal tooth in the right valve and usually one, sometimes two, in the left. The lateral teeth are more or less reduced to thickenings of the shell.
Size/Thickness – To four inches. A 2.9-inch (75 mm) shell measured 0.7 mm thick in the center.

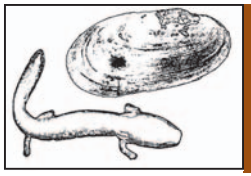
Environmental Profile:
Habitat – In medium to large rivers, in sand and gravel.
Hosts – Rock bass, white sucker, northern hog sucker, warmouth, shorthead redhorse.
Distribution/Status – Widespread but spotty distribution. Secure in IL, and WI, vulnerable in IN, and imperiled in MI.







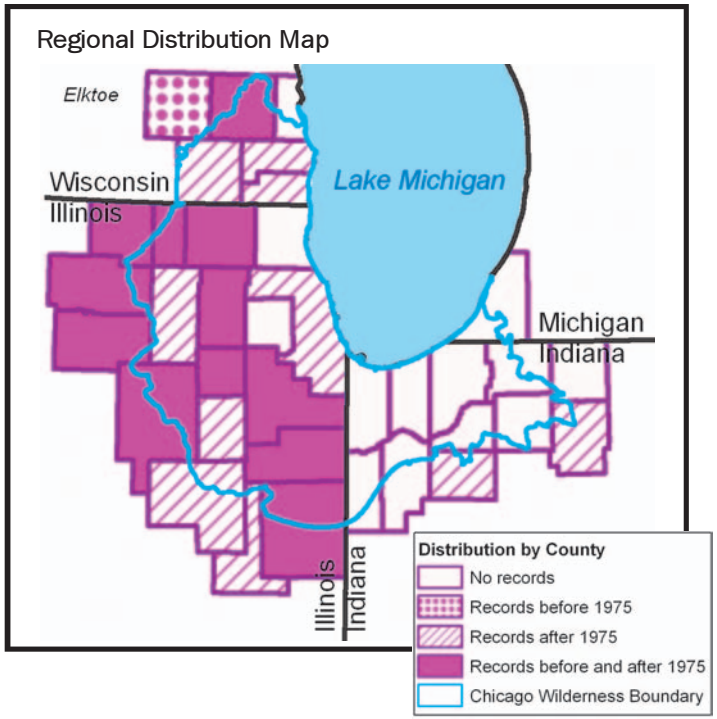
Close-up of the umbo which is slightly elevated above the hinge line. Beak sculpture consists of three or four heavy, double-looped ridges which are difficult to discern in this view. The posterior shelf has many fine ridge lines.

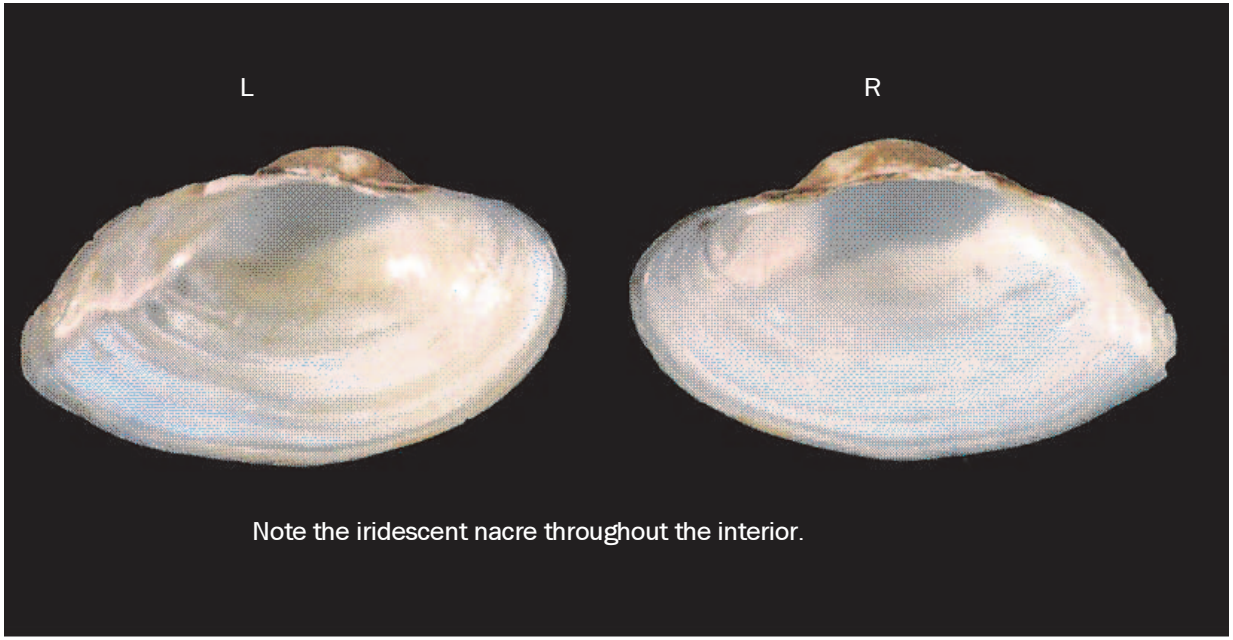


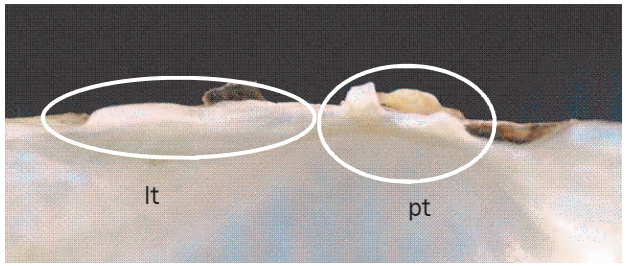
Elktoe *Alasmidonta marginata* internal views

Subfamily Anodontinae

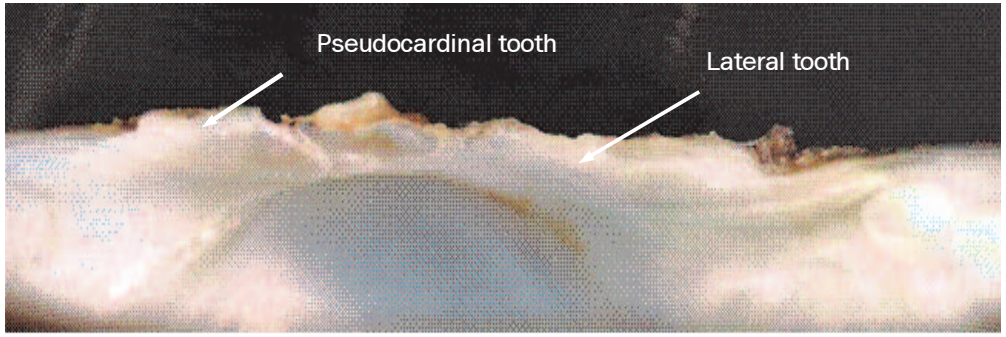
Regional Distribution Map



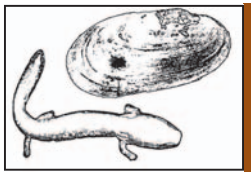




Left pseudocardinal tooth (pt) with two divergent peaks. The split pseudocardinal tooth is described in Oesch (1984). Some books describe this as two pseudocardinal teeth.The lateral tooth (lt) is greatly reduced and is little more than a thickening of the margin.



Close-up photo of the right valve. Both the lateral tooth and the pseudocardinal tooth are greatly reduced and represent little more than bladelike expansions of the dorsal margin of the shell.



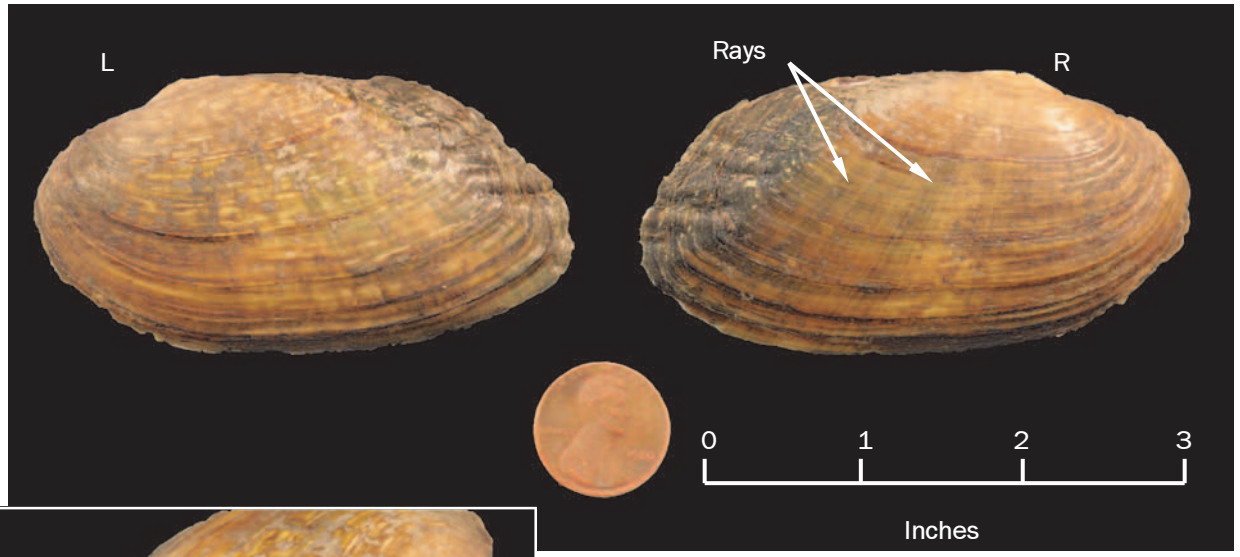
Fluted-shell *Lasmigona costata* external views

Subfamily Anodontinae

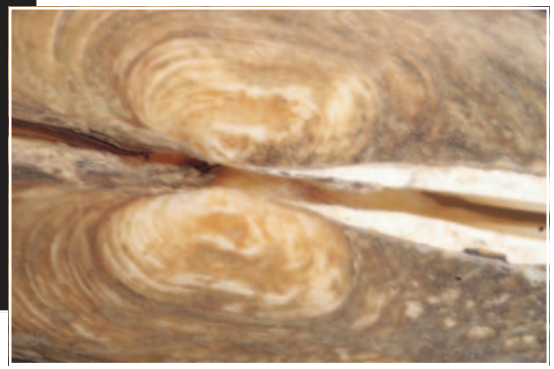
ID. Aids:
External Surface – Large, elongated, and somewhat compressed. Thick-shelled, with posterior edge having several to many flutes or scallops that often extend to the posterior third of the shell.
Internal Surface – Prominent, thin, serrated, bladelike teeth. Nacre whitish and sometimes tinged yellow or orange especially near beak cavity. Frequently has an orange foot.

Distinguishing Features:
Similar Species – Creek heelsplitter
Compared To – The creek heelsplitter has a roughly similar shaped shell, but has a smoother external surface. The fluted-shell has a series of small flutes or scallops on the posterior edge of the shell that often continue onto the posterior surface and extend across growth lines.
Beak Sculpture – Several thick, vaguely double-looped, raised lines, somewhat oblong in shape that radiate around the tip of the beak.
Beak Cavity – Shallow. Beak barely protrudes above the hinge line.
Color – Adults are yellowish brown to dark brown, and almost black in large shells, usually without noticeable rays. Small shells may be yellowish green with distinct green rays and most of the shells are smooth.
Nacre – Lustrous white or bluish white, often tinged with orange or yellow especially toward the beak cavity.
Teeth/Hinge – Pseudocardinal teeth thick, short, and serrated to somewhat bladelike. Lateral teeth are short, less than half the shell length, and may be somewhat indistinct.
Size/Thickness – To seven inches. A 3.5 inch (86 mm), shell is 1.5 mm thick in the center.

Environmental Profile:
Habitat – Medium sized streams to large rivers in mud, sand, and gravel. Occasionally in smaller streams.
Hosts – Banded darter, northern hogsucker, largemouth bass, pumpkinseed, longnose dace, central stoneroller, common carp, goldfish, bluegill, creek chub.
Distribution /Status – Widespread but is of concern in WI and declining in north-eastern IL. It is not found in MI.

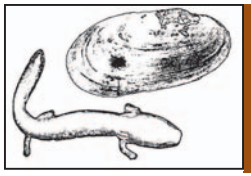


Close-up of the fluting on the posterior margin of the left valve.



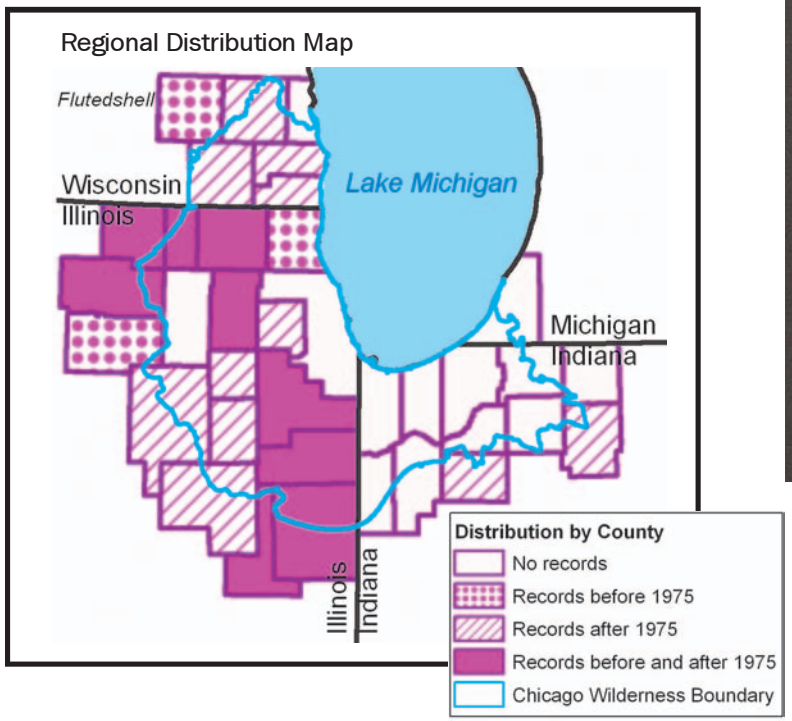
Close-up of the umbos of the left and right valves. The fluted-shell umbo is characterized by three to four heavy double-looped ridges.

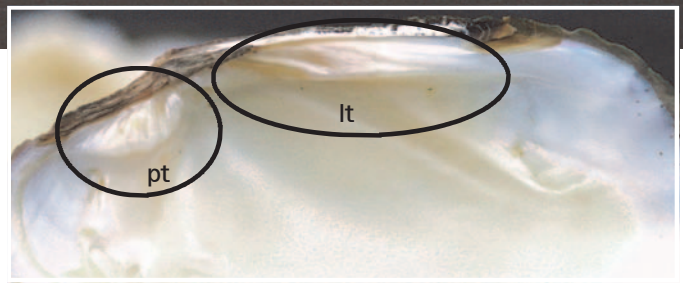
Common umbo configurations



Fluted-shell *Lasmigona costata* internal views

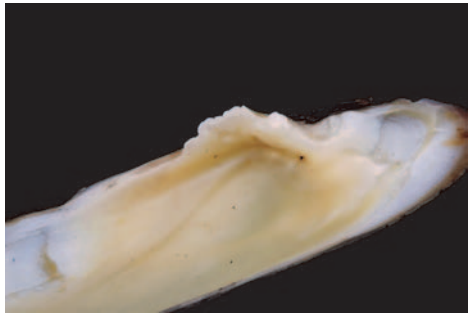
Subfamily Anodontinae





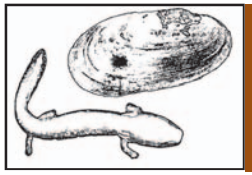
Close-up of the right valve showing a thick, short pseudocardinal tooth (pt) and an indistinct lateral tooth (lt). The lateral teeth are short, less than half the shell length, and may be somewhat indistinct.

Dorsal view of the left valve showing the pseudocardinal tooth as it is "fused" to the lateral tooth (following a description by Oesch, 1995). The lateral tooth is greatly reduced and is sometimes referred to as a thickening on the hinge line.



The contrast on this photo has been enhanced to emphasize the shape of the pseudocardinal tooth.The picture was taken from an oblique angle. The pseudocardinal teeth in these two photos are from the same mussel. Note how different the teeth can look just from a different camera angle.

The fluted-shell is one of the mussel species in Illinois that is considered to be an "intolerant" species, meaning it is intolerant of polluted and degraded habitat conditions. The concept of intolerant species is important in using biological indicators such as mussels, fish, and/or macroinvertebrates to estimate stream and river health. The presence of many intolerant species indicates a relatively healthy habitat while their absence (from areas where they previously occurred) may indicate a degraded habitat.



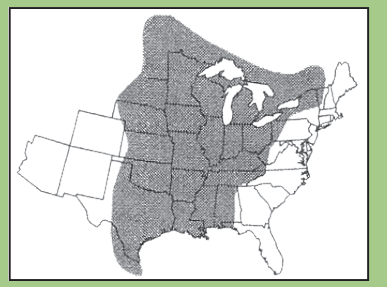
Giant floater *Pyganodon grandis* external views

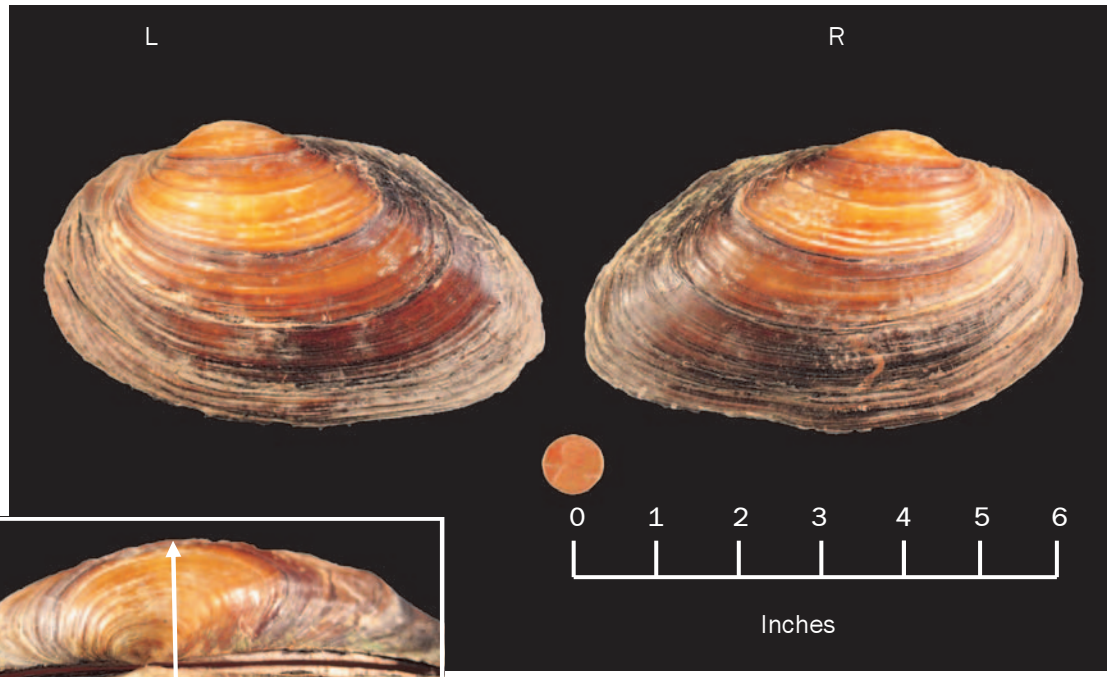
Subfamily Anodontinae

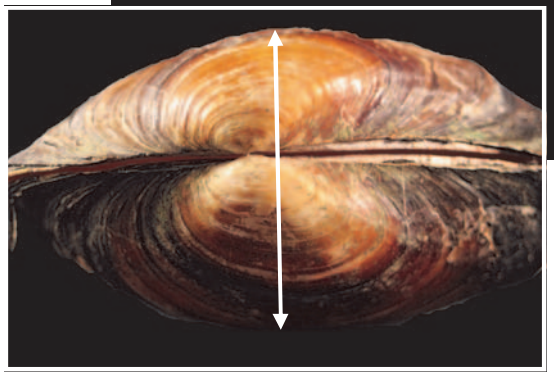
ID. Aids:
External Surface – Adults are large (to 10 inches), usually thin-shelled; beaks protrude above the hinge line; beaks with double-looped ridges.
Internal Surface – No teeth; highly iridescent nacre.

Distinguishing Features:
Similar Species – Paper pondshell, creeper, cylindrical papershell, pondhorn, flat floater (out of the Chicago Wilderness area).
Compared To – The giant floater has distinct beak (umbo) ornamentation compared to the paper pondshell, cylindrical papershell, pondhorn, and creeper. The paper pondshell has a flat beak, that is even with the hinge line, and has a thinner more elongated shell. The cylindrical papershell is more elongated and smaller than the giant floater. The pondhorn usually has a more pronounced beak, a more compressed shell, and a more pronounced wing, as well as weak teeth on the inside of the shell. See also the description of the creeper because these two species are often confused.
Beak Sculpture – Thick double-looped ridges, sometimes with extra thickening at the high point of the arc. Loops angle backward toward the posterior of the shell. If the umbo is very eroded, this sculpture may be difficult to see (as in photo number 4).
Beak Cavity – Broad and not deep.
Color – Tan to dark brown, sometimes with diffuse darker rays, especially in small shells. Sometimes light green with darker green rays that may be thin or broad, especially in smaller shells. Small shells may be smooth , older shells may be smooth to somewhat rough.
Nacre – Often silvery, but may have yellow, pink, purple, or orange tinge. Nacre is highly iridescent.
Teeth/Hinge – This mussel has no teeth. Hinge is generally straight to slightly curved.
Size/Thickness – Up to 10 inches. One of the largest freshwater mussels. The specimen pictured is 2.0 mm thick at the center.

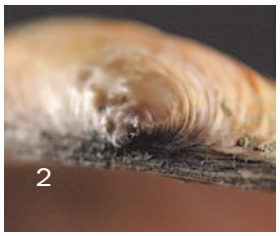
Environmental Profile:
Habitat – Small streams to large rivers, ponds to lakes including Lake Michigan. Found in silt, sand, and gravel. This may be the most adaptable and common mussel in the midwest because of its tolerance for turbidity and silty substrates.
Hosts – Many; approximately 35 different fish species in C.W. region.
Distribution /Status – Widespread and common. Secure in our area and most of its range.

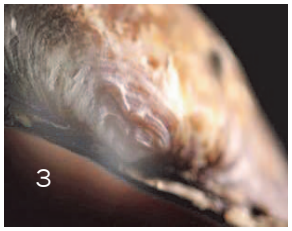


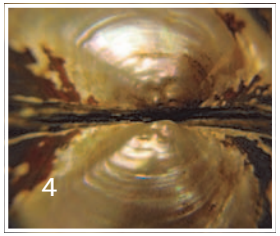




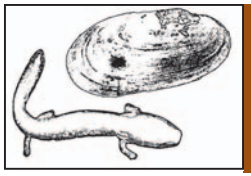
The term "inflated" refers to the expansion of shells laterally as shown by the arrow at left. When shells are inflated it is as if the mussel were a balloon that has been expanded because air has been pumped into it. Shells that are not inflated, but are flat like a pancake, are said to be compressed. The giant floater is a good example of a species which is typically "inflated."





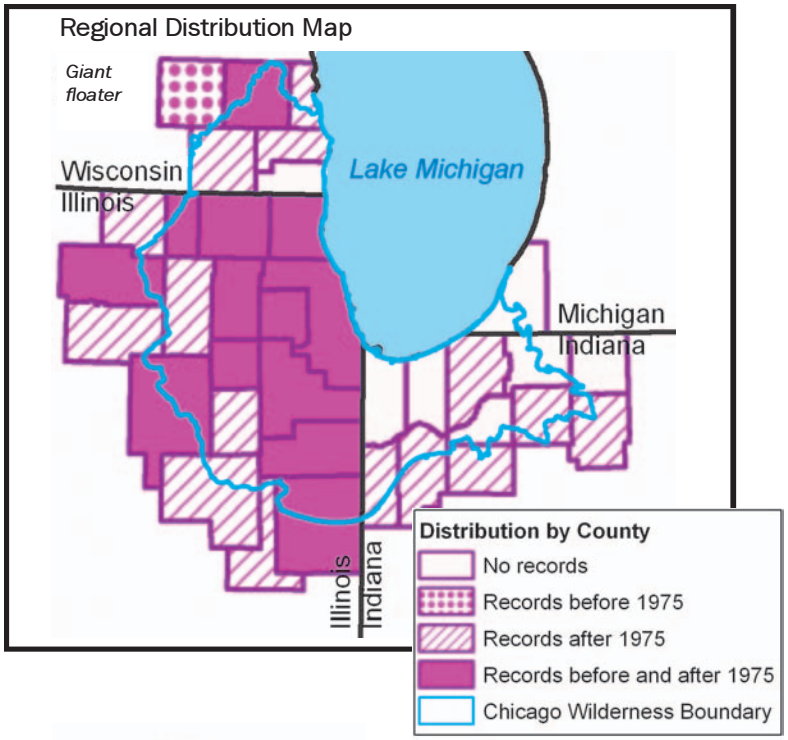


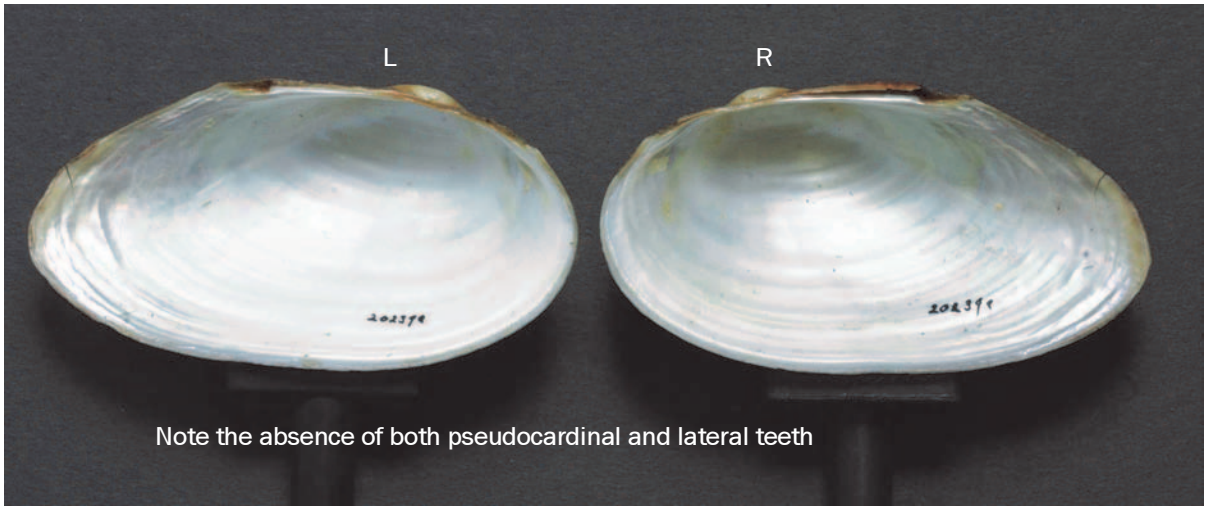
This set of close-up photographs shows the umbos from four separate giant floater valves. They are intended to give an idea of the range of beak sculpturing for a single species. Photograph 1 shows the typical beak sculpturing for a giant floater, a double loop with multiple loops slanted toward the posterior of the valve. Photos number 2, 3 and 4 all represent variations against the basic pattern. Many times the variations are due to erosion of the valve .



Giant floater *Pyganodon grandis* internal views

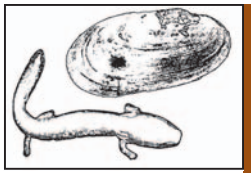
Subfamily Anodontinae





Giant floaters lack both pseudocardinal teeth and lateral teeth. The pondhorn, which is a similar species, usually has small, thin pseudocardinal teeth and thin, short lateral teeth. Several other species also have reduced teeth and the lack of well formed teeth can make identification difficult. Most giant floater shells are highly iridescent.

Freshwater mussels may inhabit a variety of aquatic environments including lakes, ponds, reservoirs, headwater streams, midsized streams, and large rivers. Some species are tolerant of a wide variety of conditions while others can be limited to specific habitats like fast-flowing riffles. The giant floater is one of the most common mussels found in lakes and ponds in Illinois. It is common in a variety of streams as well. Some malacologists (mollusk specialists) have noted that it is more common to find thin walled mussels associated with lakes and ponds and thick walled mussels associated with streams and rivers.

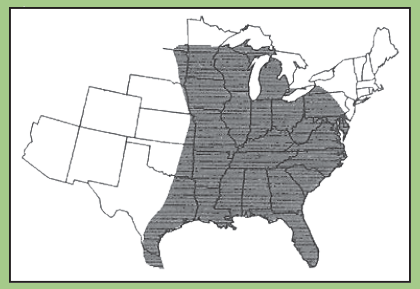


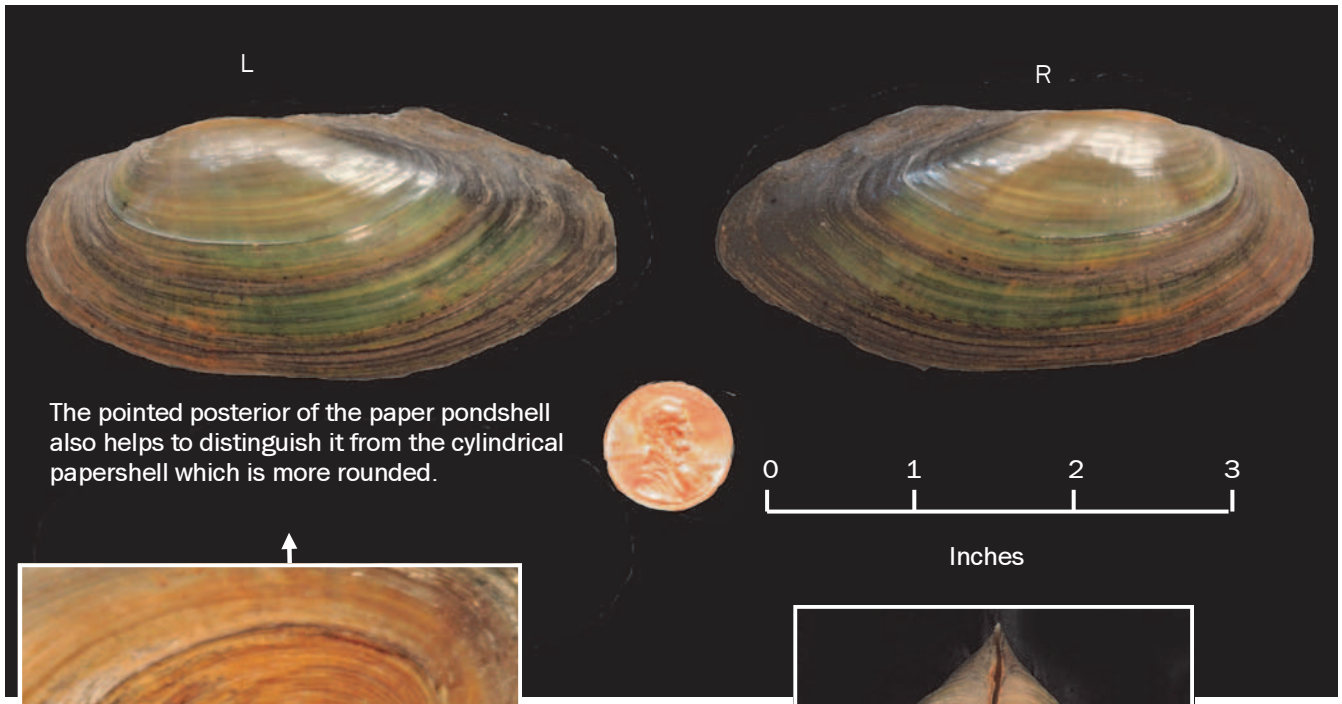
Paper pondshell *Utterbackia imbecillis* external views
Subfamily Anodontinae

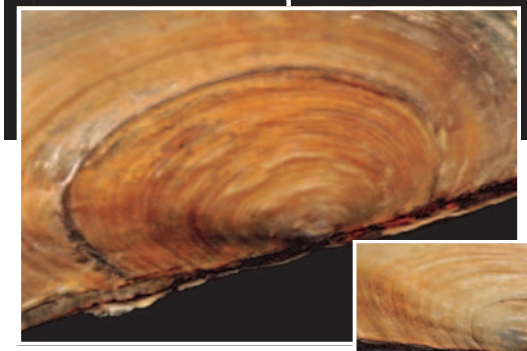
ID. Aids:
External Surface – Very flat beaks which do not protrude above hinge line. Very thin shell, easily broken between fingers. Beak with double - looped fine lines. Shell usually very smooth and shiny.
Internal Surface – No teeth, nacre often bluish white.

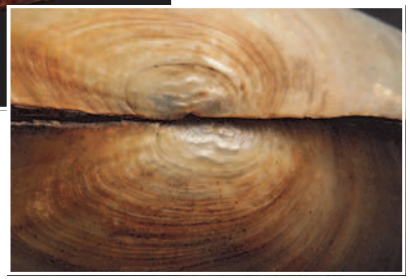
Distinguishing Features:
Similar Species – Giant floater, cylindrical papershell, creeper.
Compared To – The paper pondshell has a flat beak, that is even with the hinge line. The other similar species lack this characteristic, though the cylindrical papershell has a beak that protrudes above the hinge line only slightly. The beak ornamentation of the paper pondshell is different from the beak sculpture of the similar species, and the paper pondshell has a narrower shell than the others with the exception of the cylindrical papershell.
Beak Sculpture – Four to six fine, slightly raised, double-looped lines. The lines are sometimes thickened and can extend up to about one half inch, (1.3 cm), away from the tip of the umbo.
Beak Cavity – Virtually none.
Color – Greenish, yellowish, or brownish, usually darkening with age. Sometimes rayed with very thin green lines that join to form diffuse, broader rays. The umbo, which rarely erodes, is usually lighter in color than the rest of the shell.
Nacre – Very shiny and often bluish white, although sometimes it is white, and it is always iridescent posteriorly in fresh shells.
Teeth/Hinge – No Teeth. Hinge is straight or almost imperceptibly curved.
Size/Thickness – Small, usually three inches but may reach four inches in rare circumstances. A 3.5-inch shell is 0.2 mm thick.

Environmental Profile:
Habitat – Silt or fine-grained sediments in small streams, lakes, and large ponds. Very tolerant of fine silt, and/or still waters.
Hosts – Creek chub, green sunfish, longear sunfish, pumpkinseed, warmouth, bluegill, banded killifish, largemouth bass, spotfin shiner, black crappie, yellow perch, rock bass, northern leopard frog, bullfrog, tiger salamander and other species outside of the C.W. region.
Distribution /Status – Locally common in parts of IL, secure in WI, IN.



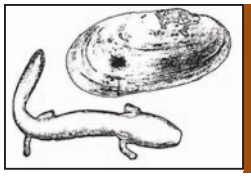






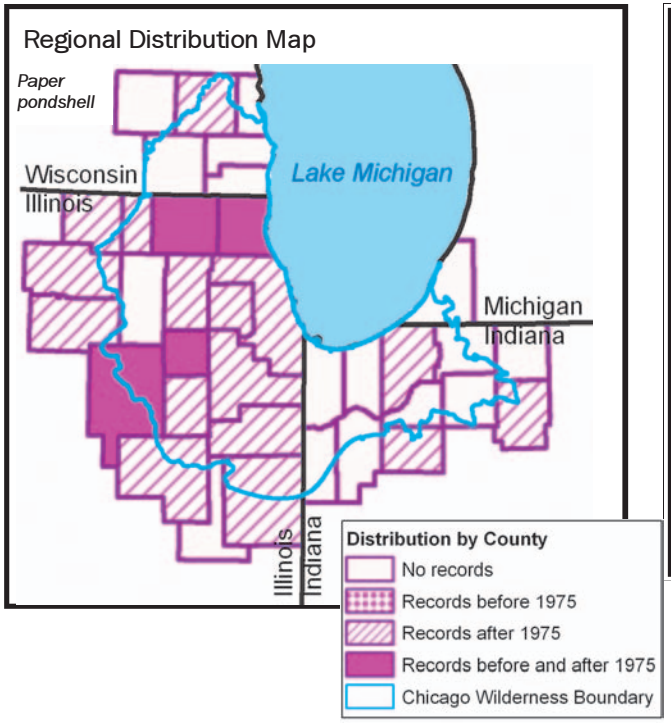
The beak sculpture is described as double-looped (Cummings and Mayer, 1992). The beak sculpture is fine lined and frequently difficult to discern. Two separate umbos are presented to demonstrate some of the variability that can be encountered.

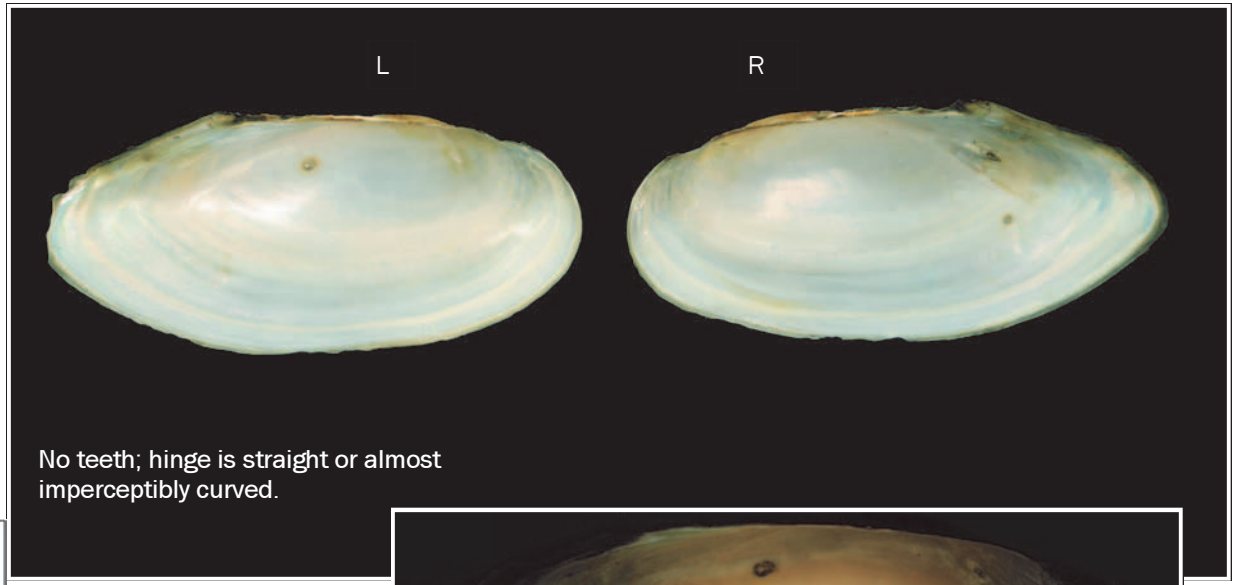
The paper pondshell has flat beaks, which are even with the hinge line. Other similar species lack this characteristic although the cylindrical papershell's is slightly elevated above the hinge line.



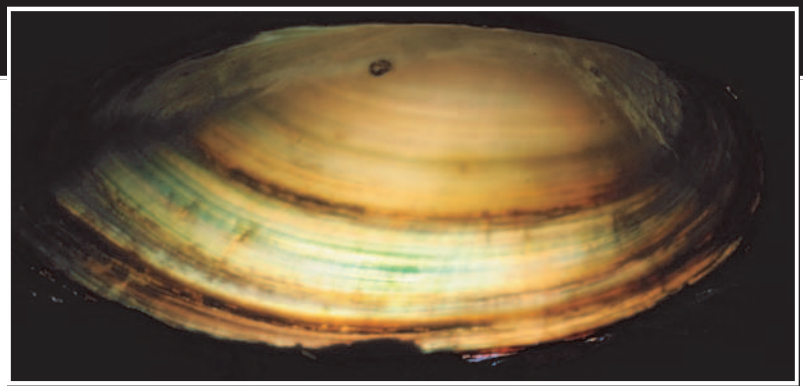
Paper pondshell *Utterbackia imbecillis* internal views

Subfamily Anodontinae

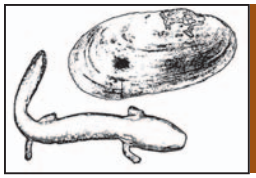




No teeth; hinge is straight or almost imperceptibly curved.



The name “paper pondshell” describes this species well. The shell of the individual pictured here is less than 1 mm thick! Young individuals are often described as “transparent.” Shining a light from the internal side (which has been done in the photograph just above and to the right) allows you to see the colors of the periostracum.



Salamander mussel *Simpsonaias ambigua* external views

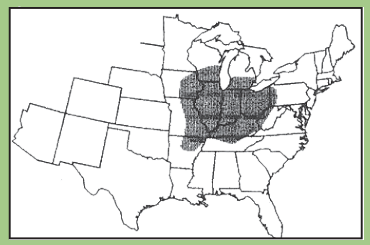
Subfamily Anodontinae

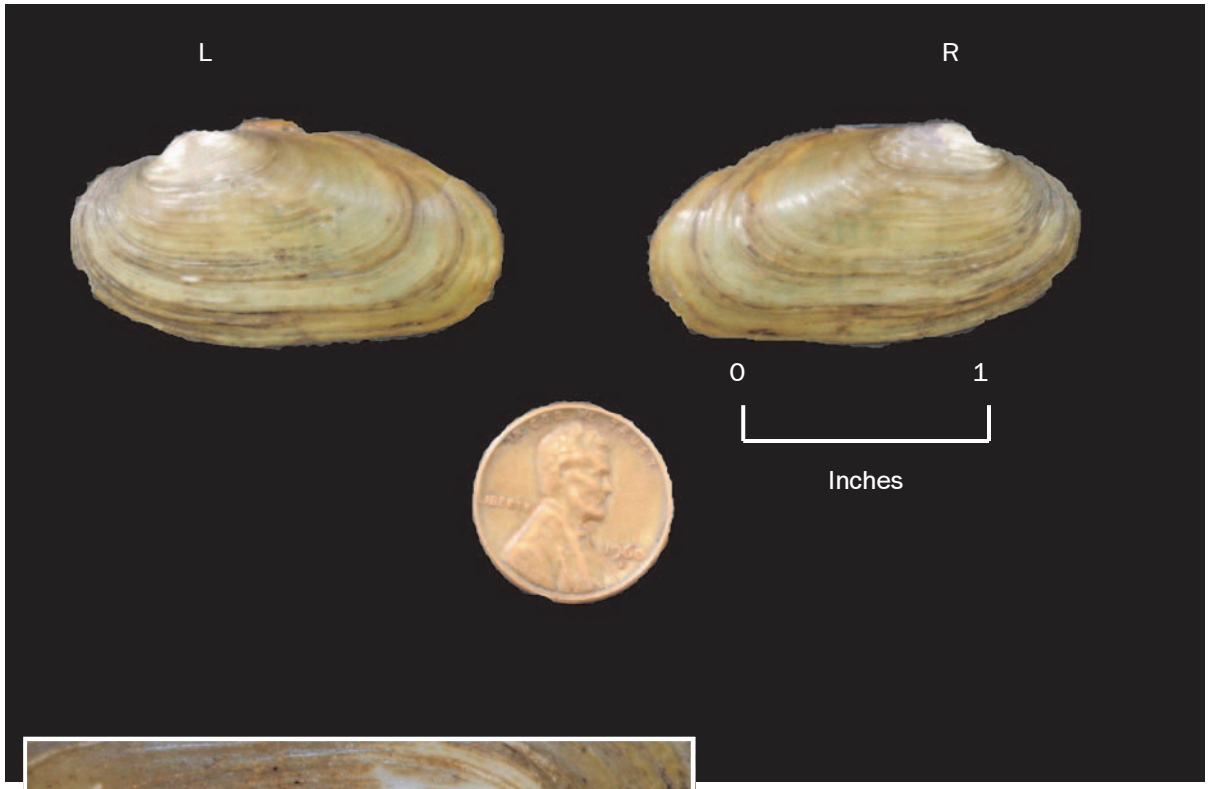
State Listed as Endangered: IL, MI, as Threatened: WI

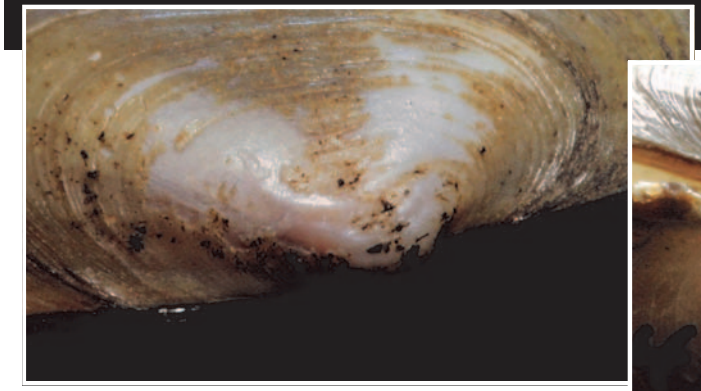
ID. Aids:
External Surface – Small, thin shelled, oval-shaped, mildly inflated, rayless shell with distinct growth lines on relatively smooth shell. Umbos with fine, double-looped raised lines.
Internal Surface – Nacre bluish white with occasional light orange flush to the umbo area. Tiny pseudocardinal teeth.

Distinguishing Features:
Similar Species – Lilliput, cylindrical papershell.
Compared To – The lilliput is of similar size (two inches or less) but has a very heavy ropelike umbo sculpture and dark periostracum color. The cylindrical papershell has a pointed posterior end, different beak sculpture, and is toothless.
Beak sculpture – Three to five fine, raised, weakly double-looped lines that are pulled up posteriorly. Beak barely protrudes above the hinge line.
Beak Cavity – Shallow.
Color – Adults are yellow to greenish brown and rayless. Shells are relatively smooth except that the major and minor growth rings are distinct to the eye.
Nacre – Bluish white and sometimes flushed with orange near the umbo. Iridescent posteriorly but iridescence not distinct on weathered shells.
Teeth/Hinge – Pseudocardinal teeth are tiny, and flattened, with one in each valve. The right valve may contain a bifurcated tooth giving the appearance of two teeth being present. The lateral teeth are indistinct and little more than swellings of the hinge line.
Size/Thickness – To two inches. A 1.6-inch (41 mm), shell measured 0.4 mm thick in the center.

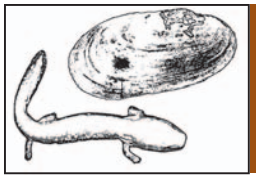
Environmental Profile:
Habitat – Medium sized streams to large rivers under large flat stone slabs that mudpuppies frequent.
Hosts – Mudpuppy.
Distribution/Status – Endangered in IL, MI, threatened in WI, and species of concern in IN. Threatened or endangered in the rest of its range.







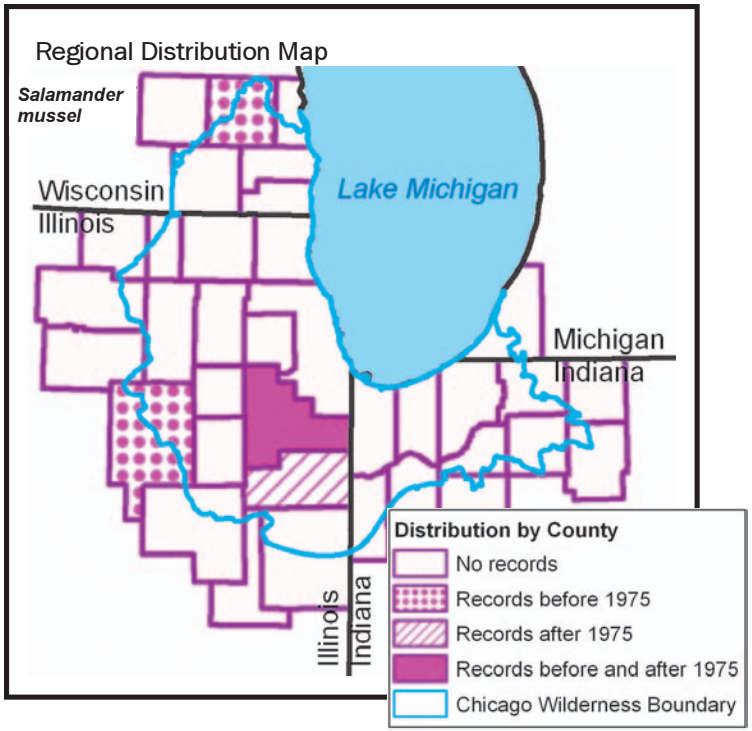
Two views of the beak sculpture of separate specimens. The beak sculpture consists of three to five double-looped bars. The bars extend upward slightly toward the posterior of the shell.

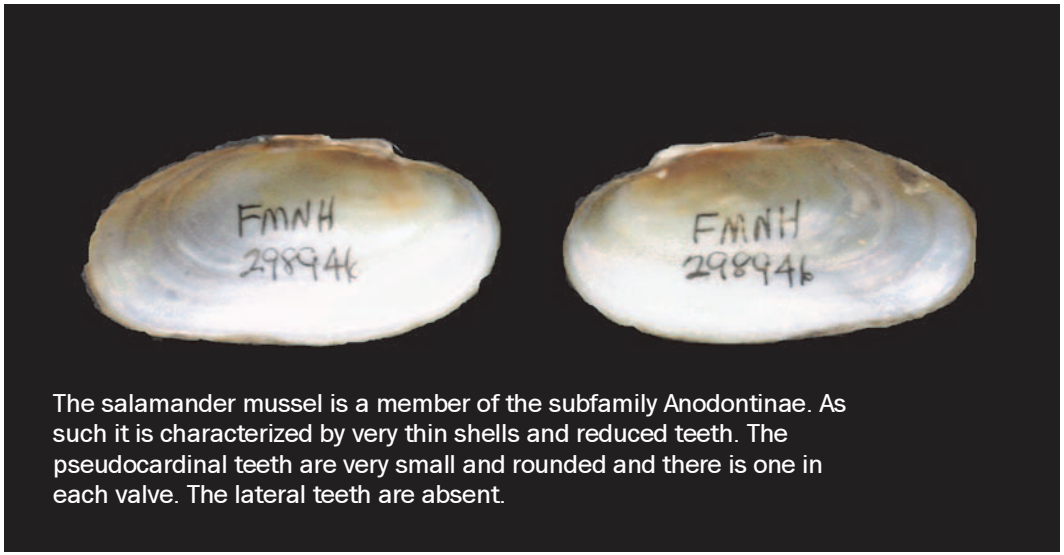


Salamander mussel *Simpsonaias ambigua* internal views

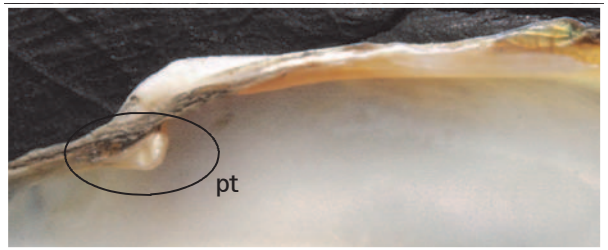
Subfamily Anodontinae

State Listed as Endangered: IL, MI as Threatened: WI





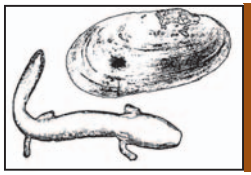
The salamander mussel is a member of the subfamily Anodontinae. As such it is characterized by very thin shells and reduced teeth. The pseudocardinal teeth are very small and rounded and there is one in each valve. The lateral teeth are absent.



Close-up of the pseudocardinal tooth (pt) in the right valve. Note the absence of any lateral teeth.

The salamander mussel is endangered in Illinois and is a candidate for federal status as a Threatened or Endangered species. It is one of the few North American mussels that uses a salamander (the mudpuppy) as a host for its larvae (glochidia). This host/mussel relationship was confirmed at Hickory Creek, a stream in northeastern Illinois, in Will County. Frank Collins Baker of the Chicago Academy of Sciences verified the relationship by matching salamander mussel glochidia that he collected from gravid (pregnant) mussels in Hickory Creek to glochidia that had been found in the lungs of a mud puppy salamander.

—based on an unpublished account by Joel Greenberg



Slippershell *Alasmidonta viridis* external views

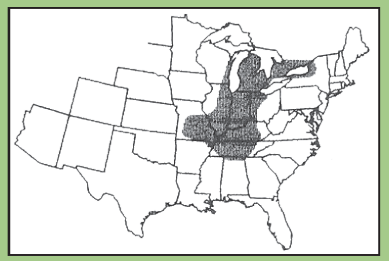
Subfamily Anodontinae

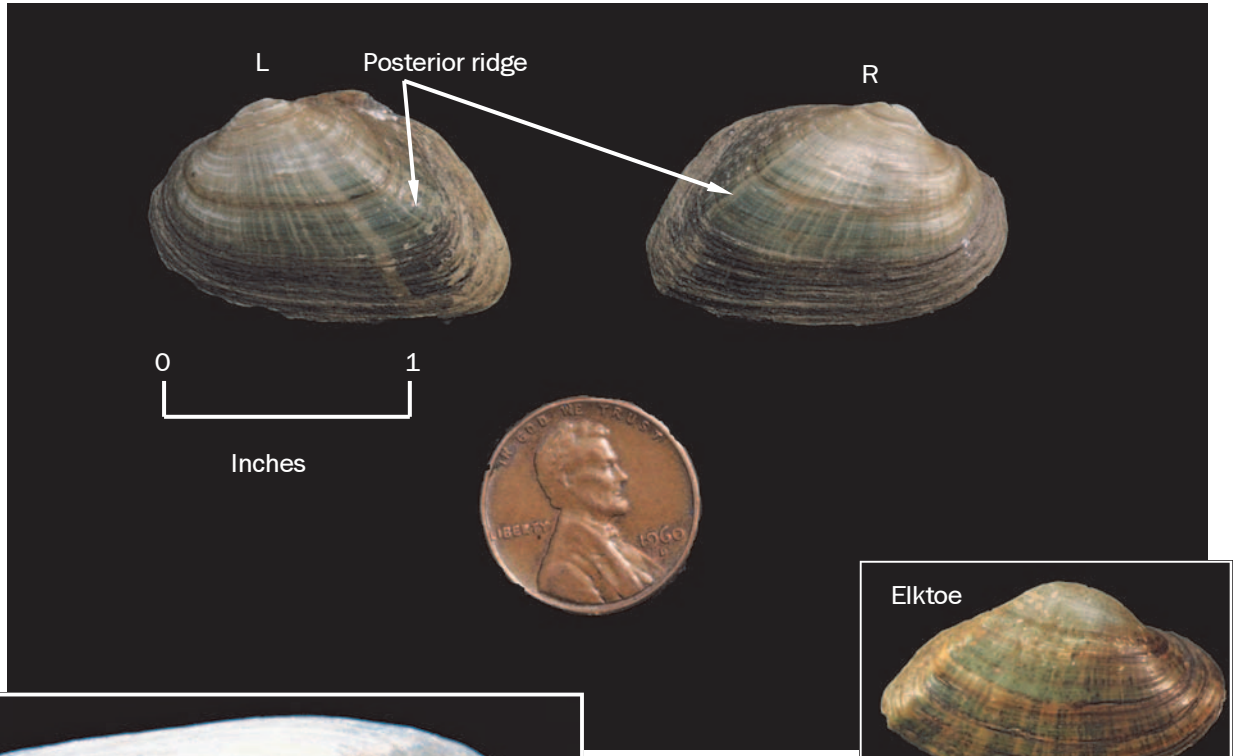
State Listed as Threatened: IL, WI

ID. Aids:
External Surface – Small, rhomboidal shell with a prominent posterior ridge angled from the beak to the lower posterior edge. Diffuse green or dark rays on the shell surface.
Internal Surface – Nacre white, lateral teeth indistinct, pseudocardinal teeth small.

Distinguishing Features:
Similar Species – Elktoe.
Compared To - The elktoe is much more elongated in shape, has a broader umbo, and is more brightly colored than the slippershell. The ventral edge of the elktoe is more rounded.
Beak Sculpture – Several thick and prominent raised lines radiating around the beak.
Beak Cavity – Moderately deep. Beak distinctly protrudes above the hinge line.
Color – Adults are very light yellowish brown (almost cream colored) to dark brown with few to many greenish rays on the posterior half of the shell. Small shells are lighter in color with more distinct rays. Shell can be somewhat rough in texture.
Nacre – White and iridescent posteriorly
Teeth/Hinge – Pseudocardinal teeth are triangular, bladelike and weakly serrated. Lateral teeth are short, less than half the shell length, fine, and somewhat indistinct.
Size/Thickness - To about 1.5 inches. A 1.4-inch (37 mm), shell is 0.5 mm thick in the center.

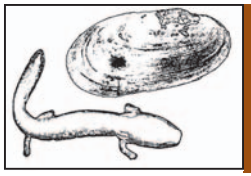
Environmental Profile:
Habitat – Creeks and headwater streams. In sand mud, or fine gravel.
Hosts – Johnny darter, mottled sculpin, and banded sculpin (outside of our range).
Distribution /Status – Widespread but imperiled in most of its range. Threatened in IL, WI and of concern in MI, IN.





The beak sculpture consists of several thick and prominent raised ridges radiating around the beak.

Note the green rays, small size (up to 1.5 inches) and general shape of the slippershell. The color of this species can vary dramatically across its life cycle. The young will look yellowish green. In older shells the rays will be less distinct and the colors will be darker. A photograph of an elktoe is presented as an insert for comparison.

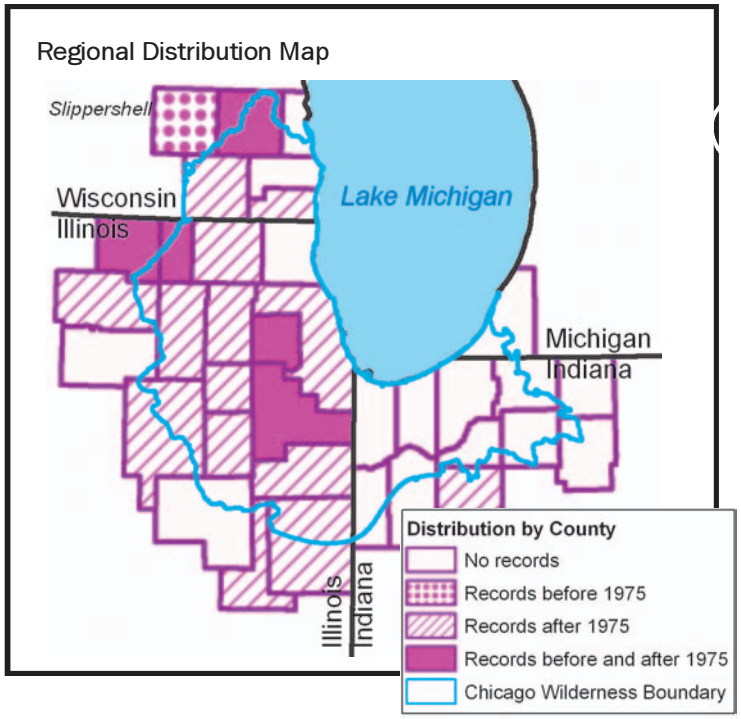


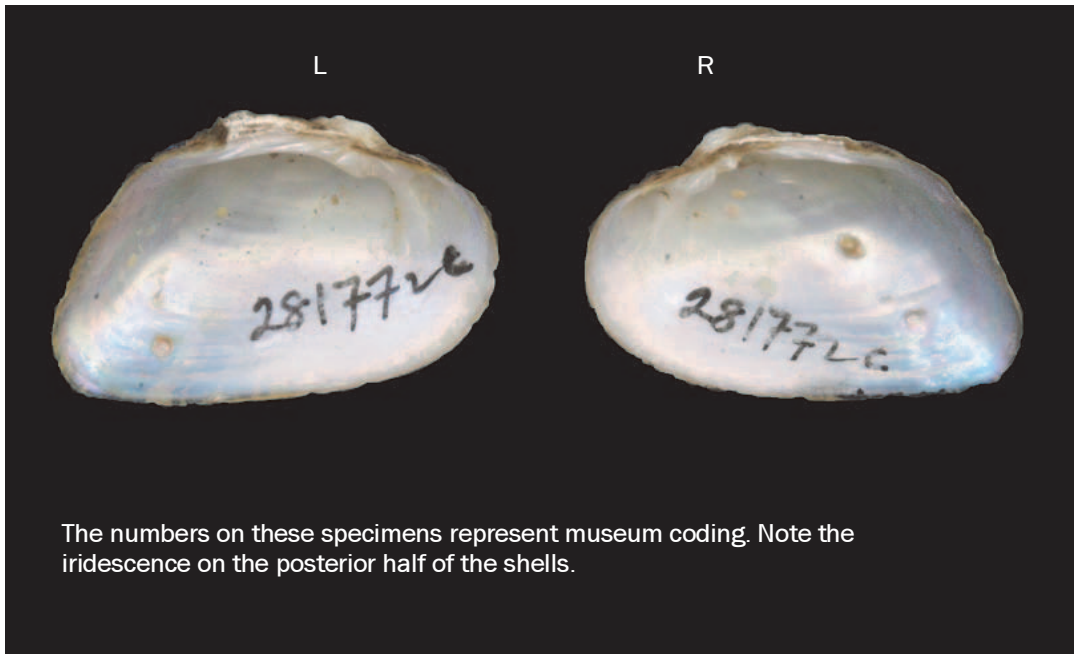
Slippershell *Alasmidonta viridis* internal views

Subfamily Anodontinae

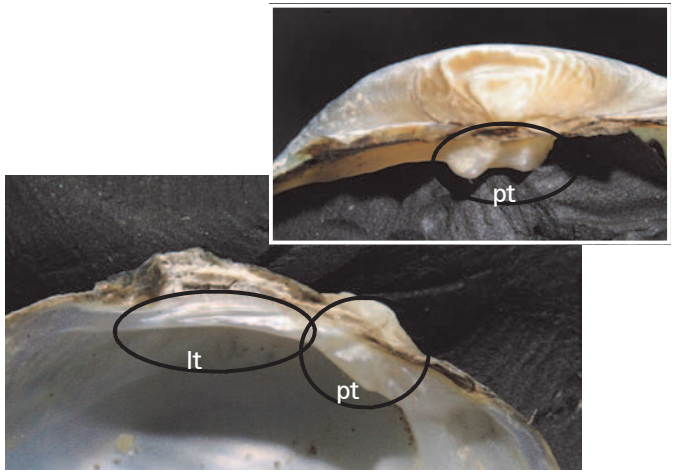
State Listed as Threatened: IL, WI

Regional Distribution Map

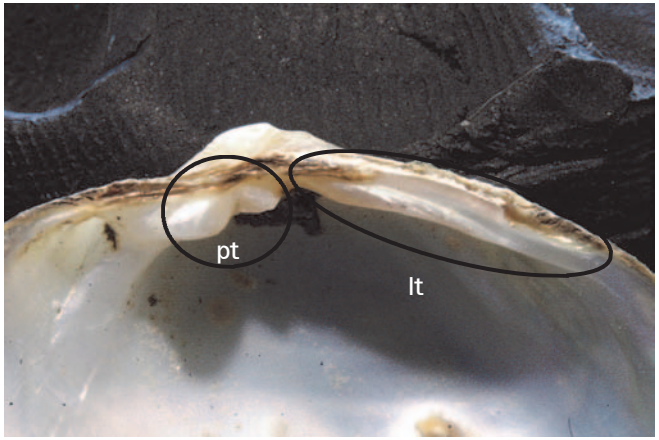




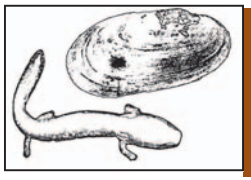
The numbers on these specimens represent museum coding. Note the iridescence on the posterior half of the shells.



Two views of the left valve. The two pseudocardinal teeth (pt) are stubby and triangular. The lateral teeth (lt) are poorly developed and appear as a swelling along the hinge line.



Close-up of the right valve showing two pseudocardinal teeth (pt). Normally there is a single pseudocardinal tooth in the right valve, and a weakly developed lateral tooth (lt).



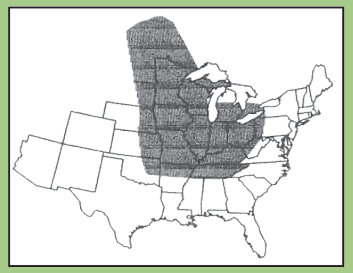
White heelsplitter *Lasmigona complanata*
Subfamily Anodontinae

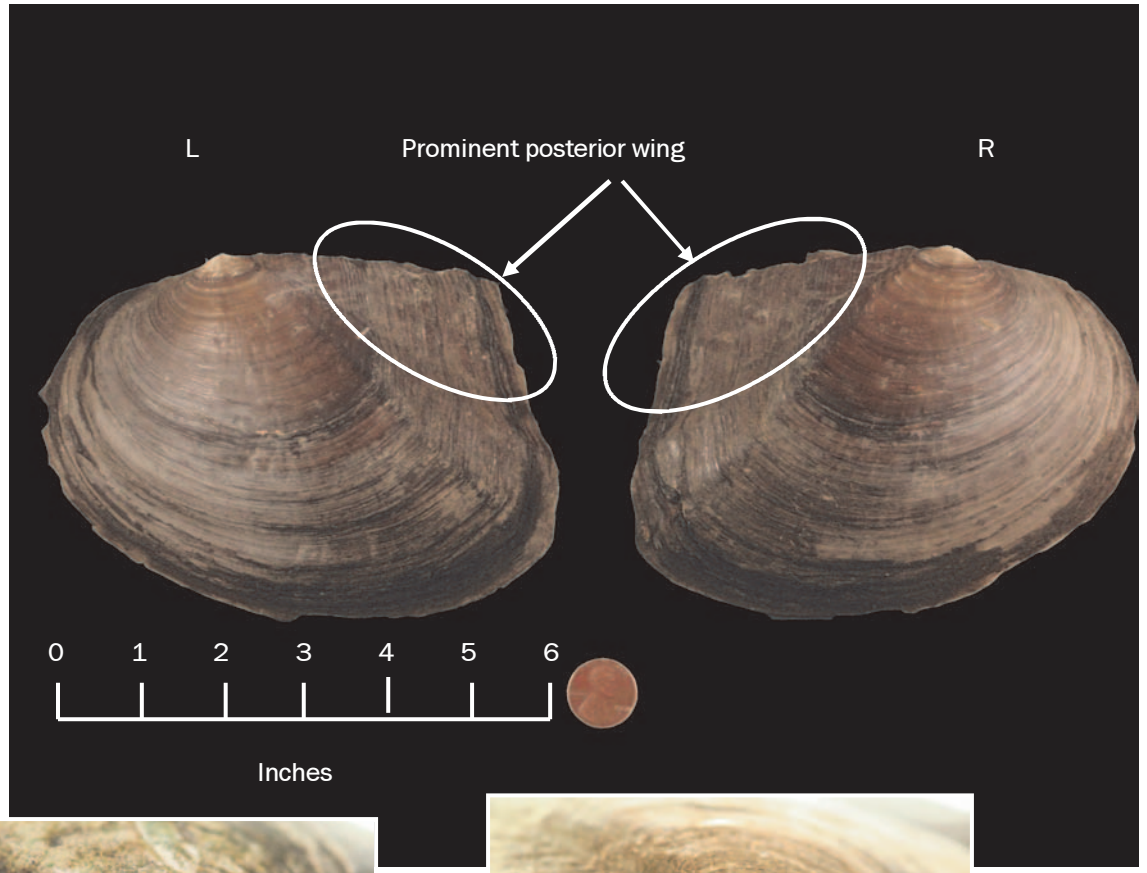
external views

ID. Aids:
External Surface – Shape resembling a hatchet. Adults are dark-colored, rounded, moderately thick, with a somewhat truncated posterior end and a well developed wing. Beak sculpture consists of prominent, double-looped raised lines.
Internal Surface – Well developed teeth and white nacre.

Distinguishing Features:
Similar Species – Pink heelsplitter and creek heelsplitter.
Compared To – The white heelsplitter has a distinctive beak sculpture compared to the others. The pink heelsplitter has a smoother shell and pink nacre while the white heelsplitter has a rougher texture and white nacre. The white heelsplitter has a more square shaped shell than the creek heelsplitter, which is more elongated. The wing of the white heelsplitter is larger than the wing of the creek heelsplitter.
Beak Sculpture – Three to six distinct, double-looped raised lines.
Beak Cavity – Shallow to moderately deep.
Color – Young shells are smooth, glossy, greenish brown and indistinctly rayed. Older shells are rayless, darker brown to black and are often more roughly textured.
Nacre – Lustrous white, sometimes bluish white with iridescence posteriorly
Teeth/Hinge – Pseudocardinal teeth are heavy, and very deeply serrated. Two in left valve, two in the right. Lateral teeth are poorly developed in both valves, appearing as one or two indistinct ridges along the hinge line. Interdentum is large.
Size/Thickness – To eight inches. A 5.6 inch, (143 mm), shell was 2.9 mm thick.

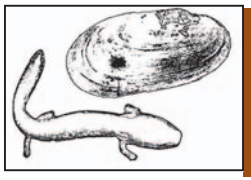
Environmental Profile:
Habitat – Small streams to large rivers in mud sand and gravel. Also in ponds and lakes and occasionally in Lake Michigan.
Hosts – Common carp, banded killifish, green sunfish, orange-spotted sunfish, largemouth bass, longnose gar, gizzard shad, river redhorse, walleye, white crappie.
Distribution /Status – Widespread and common in IL, IN, WI, unranked in MI. One of the most tolerant species to habitat destruction.





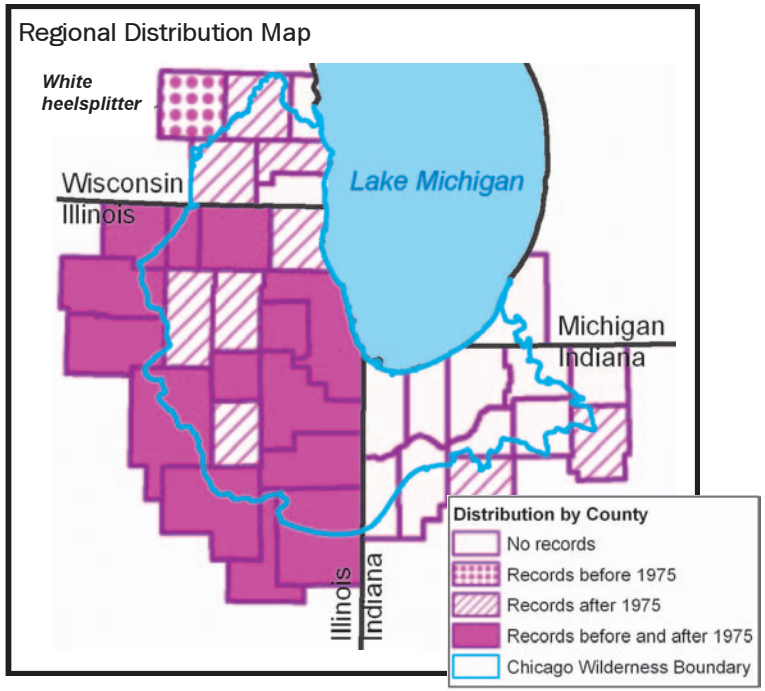
Umbo showing double-loop or "w" shaped sculpturing on a creek heelsplitter. Loops can number from four to eight and lines are more prominent than sculpture on other species.

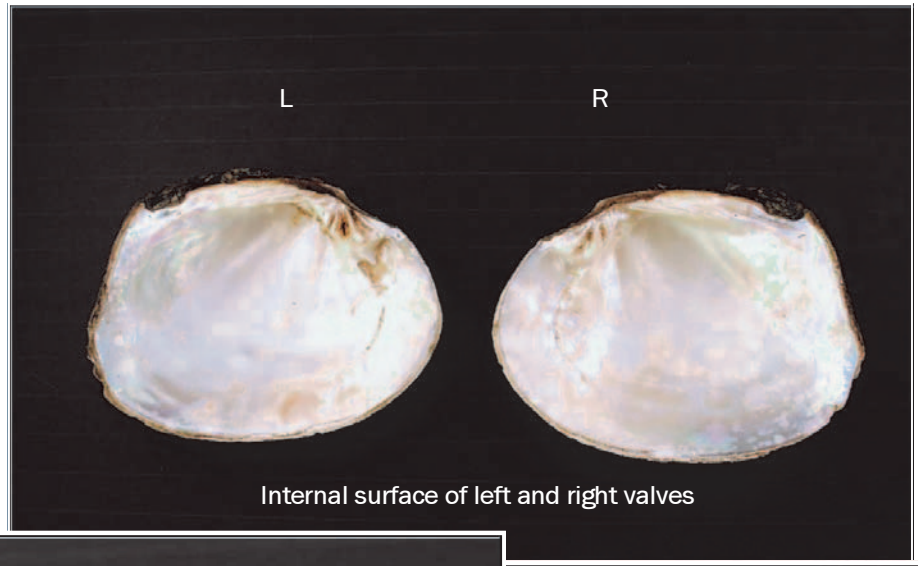
Umbo with double loop which is eroded and much less prominent on the white heelsplitter when compared to the creek heelsplitter. Erosion of the umbo sculpturing is common. Note that the white heelsplitter is "slimmer" or more compressed while the creek heelsplitter is "inflated" side to side.



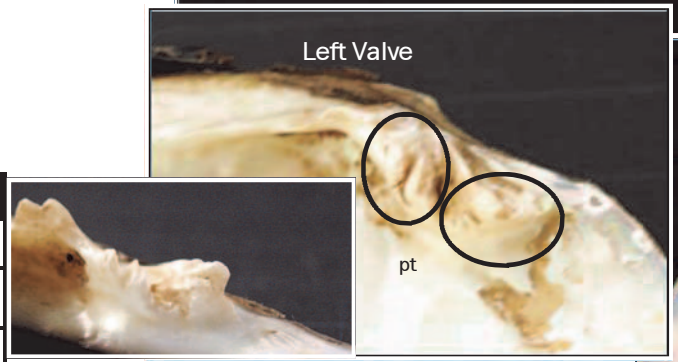
White Heelsplitter *Lasmigona complanata* internal views

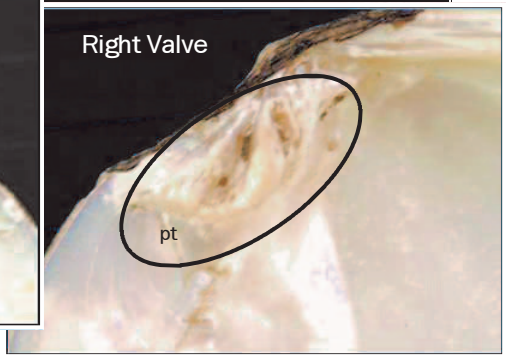
Subfamily Anodontinae





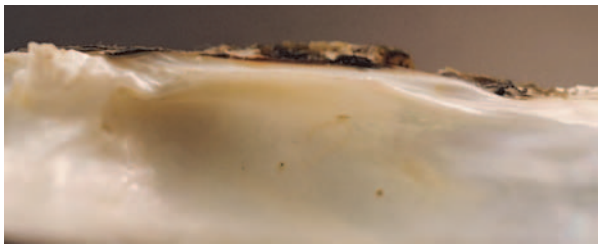
Anatomical Trait	White heelsplitter	Creek heelsplitter
Posterior wing	Prominent and distinct	Less prominent
Lateral sizing	Slimmer (compressed) side to side	More inflated; fatter side to side
Shape	Hatchet shaped; quadrate (square)	More elongate
Pseudocardinal teeth	Thick; two in left valve, one (sometimes two) in right	Bladelike, two in left valve, one in right
Lateral teeth	Poorly developed in both valves; represented as ridges or thickening of the hinge line	Thin and slightly curved
Nacre	White	Usually white but may have yellow, blue, or orange toward beak cavity
Umbo sculpture	Three to six double-loops; often eroded and indistinct	Four to eight double loops; prominent and distinct
Shell thickness	A millimeter or more in thickness	Thinner and lighter
Size	To eight inches	Four inches maximum



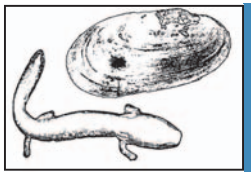


Divergent pseudocardinal tooth orientation.

Pseudocardinal teeth are robust in both the left and right valves. There are two pseudocardinal teeth (pt) in the left valve and usually one (but occasionally two) in the right valve.



Lateral teeth are poorly developed.



Black sandshell *Ligumia recta* external views

Subfamily Lampsilinae

State Listed as Threatened: IL

ID. Aids:

External Surface – Shell is thick, very elongated, smooth and moderately inflated in adults. Usually black, though occasionally dark green or dark brown. Beak barely protrudes above hinge line and beak sculpture of several double-looped raised bars is usually eroded away.

Internal Surface – Stout, peglike pseudocardinal teeth, and well developed lateral teeth. Nacre often white or purple, though can be tinged pink or orange.

Distinguishing Features:

Similar Species – Spike, spectaclecase, yellow sandshell.

Compared To – The spike has a beak sculpture of several heavy, rough loops when not eroded away. The black sandshell is more solid and inflated than a spike of similar size. It also has an upward sweeping point to the posterior profile compared to the downward sweep of the spike. This characteristic is less prominent in males. The yellow sandshell is yellow or light colored while the black sandshell is dark colored. The spectaclecase is very rare in IL and is thin shelled and virtually toothless.

Beak Sculpture – Low and barely protrudes above hinge line. Sculpture usually not visible in older shells but consists of several, fine, indistinct raised, double-looped bars.

Beak Cavity – Shallow.

Color – Shiny, normally smooth, and usually black though it can be dark green to dark brown, with dark green rays on some shells, especially the younger ones.

Nacre – Often white, but may be pink, orange, or purple, or partially tinged with these colors, even in shells from the same stream. Iridescent on the posterior part of the shell in fresh shells.

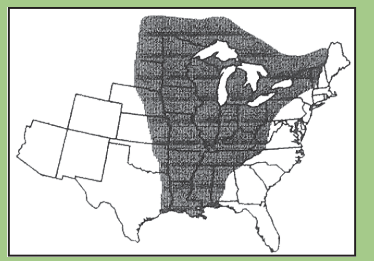
Teeth/Hinge –Two stout, bladelike, somewhat triangular and deeply striated pseudocardinal teeth in the left valve, with one, more peglike tooth in the right, often with a much smaller, bladelike accessory tooth anterior to it. Lateral teeth are heavy, long, straight to slightly curved; two in the left valve one in the right.

Size/Thickness – To 8.0 inches. A 143 mm, (5.6 inches), shell measured 4.0 mm thick in the middle.

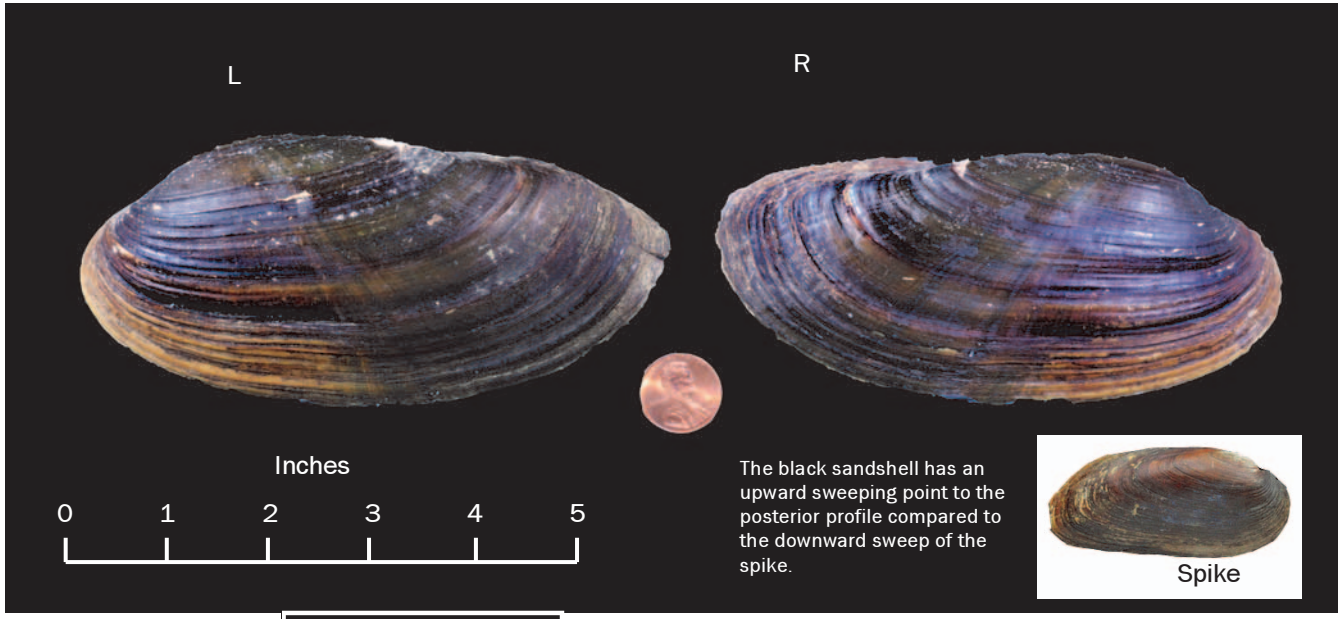
Environmental Profile:

Habitat – Large streams to large rivers in sand or small gravel.

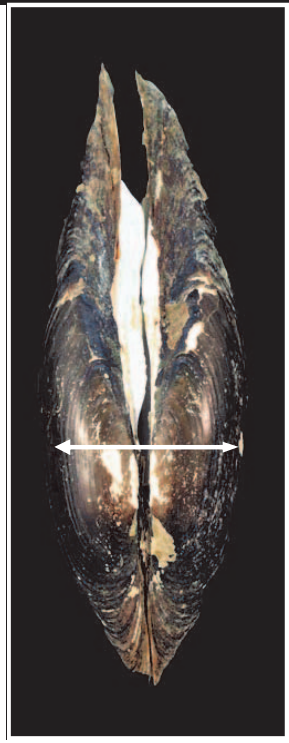
Hosts – Rock bass, American eel, central stoneroller, common carp, banded killifish, green sunfish, pumpkinseed, bluegill, orangespotted sunfish, longear sunfish, largemouth bass, white perch, white crappie, yellow perch, sauger, and walleye.



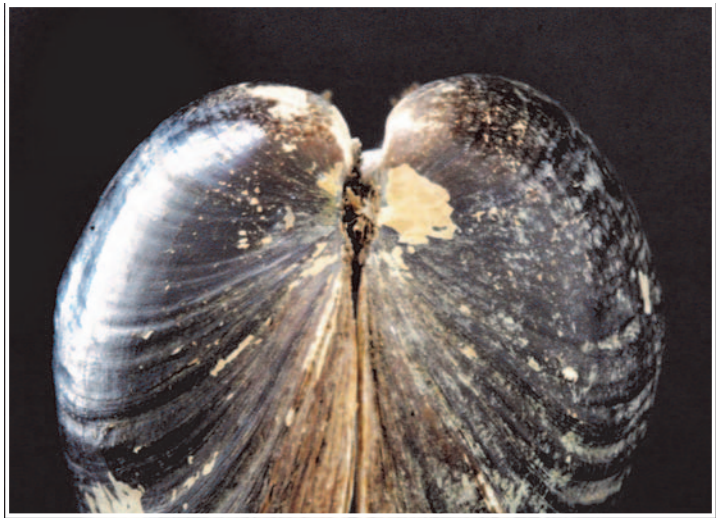
Distribution /Status – Threatened in IL and imperiled in IN, vulnerable in WI, not ranked in MI. In peril across most of its range.



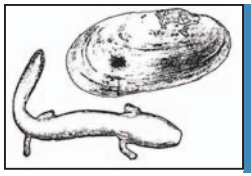
The black sandshell has an upward sweeping point to the posterior profile compared to the downward sweep of the spike.



Dorsal view of the black sandshell. Literature descriptions characterize it as being "moderately compressed." Compressed shells are flat like a pancake, while inflated shells have a rounder profile as if the mussel has been inflated like a balloon.



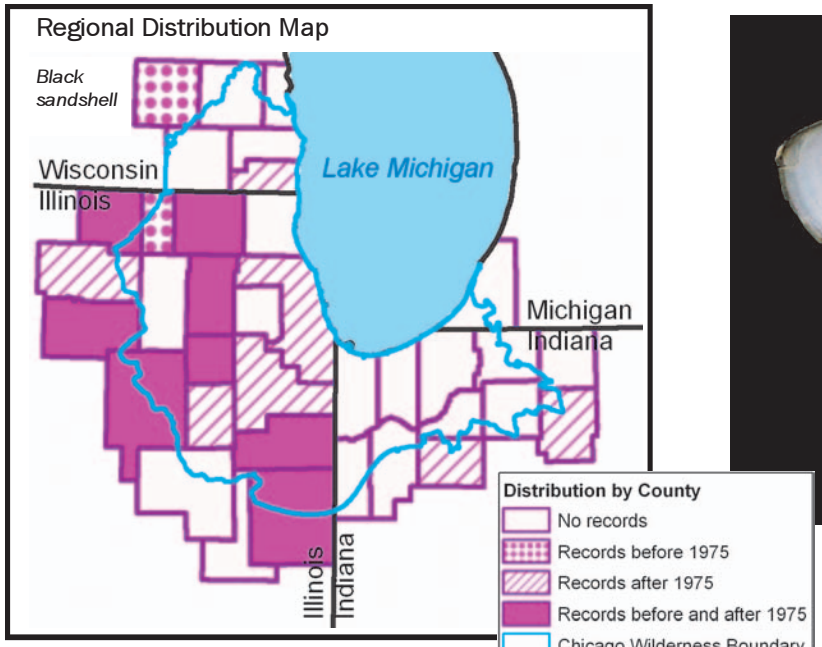
Anterior view of hinge line and umbo. Umbo is slightly elevated above the hinge line. The umbo is badly worn on this specimen.

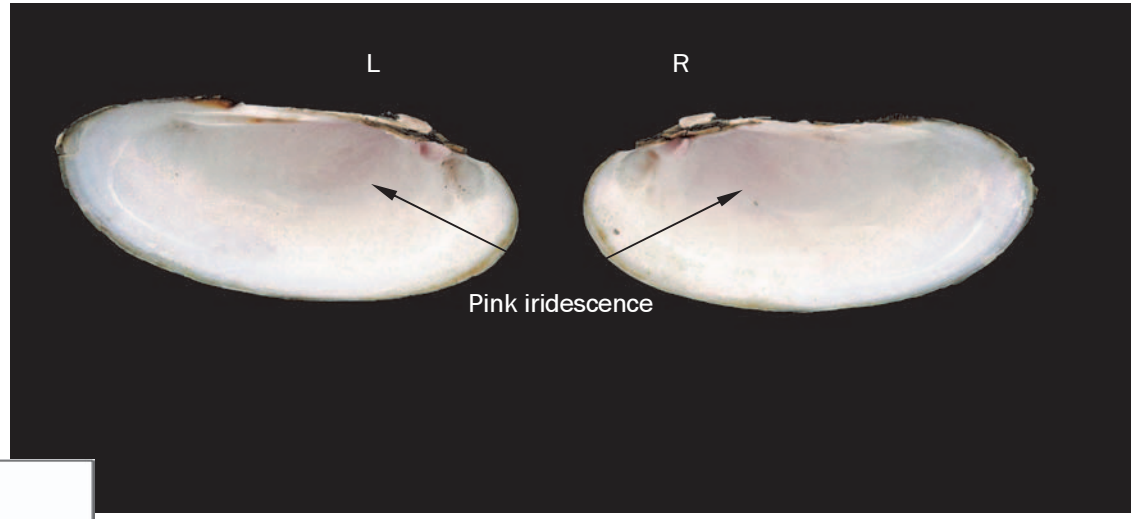


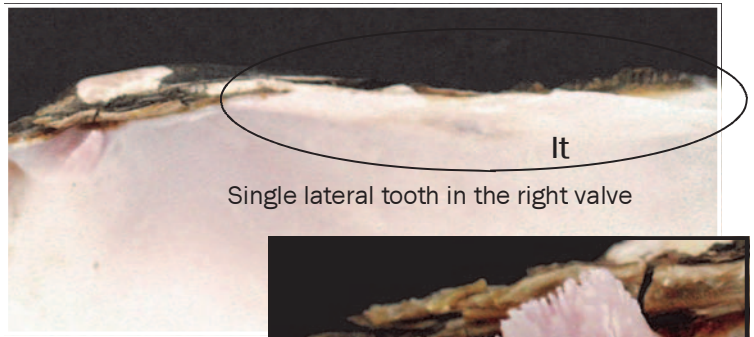
Black sandshell *Ligumia recta* internal views

Subfamily Lampsilinae

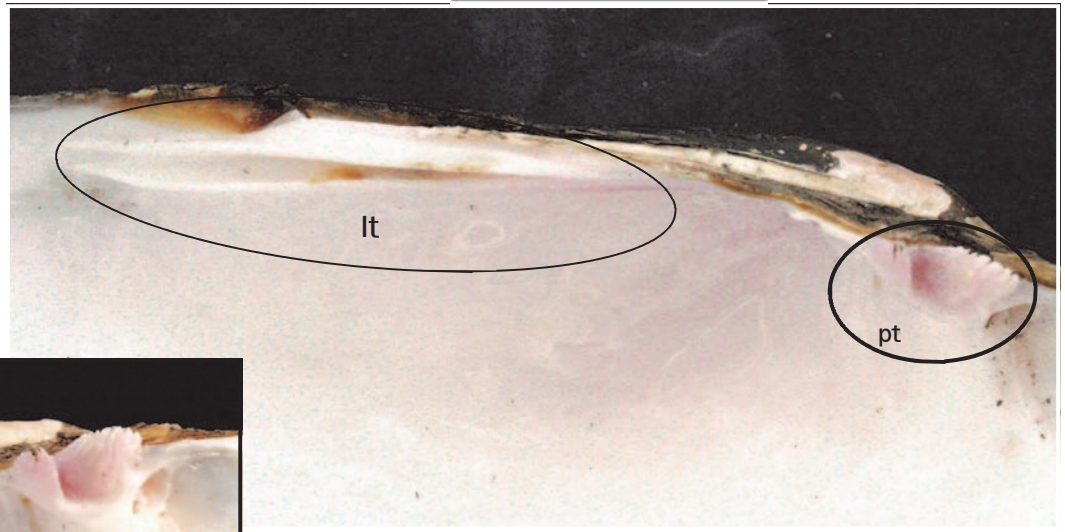
State Listed as Threatened: IL

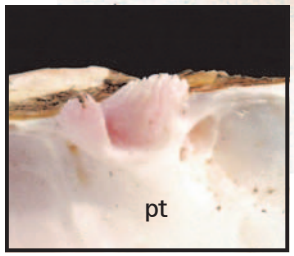




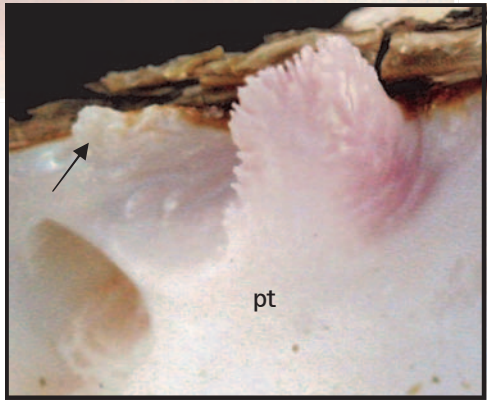


Single lateral tooth in the right valve

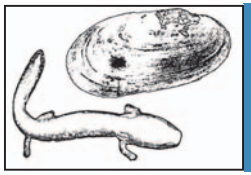




Close-up views of the left valve showing two stout, bladelike pseudo-cardinal teeth (pt). The pseudocardinal teeth are deeply serrated at the margins. The lateral teeth (lt) are heavy, long, and straight or slightly curved.



Close-up of right pseudocardinal teeth with deeply serrated margin. A second accessory tooth (shown above with an arrow) is anterior to the principal pseudocardinal tooth.



Butterfly *Ellipsaria lineolata*
Subfamily Lampsilinae

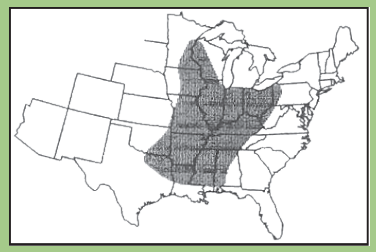
external views

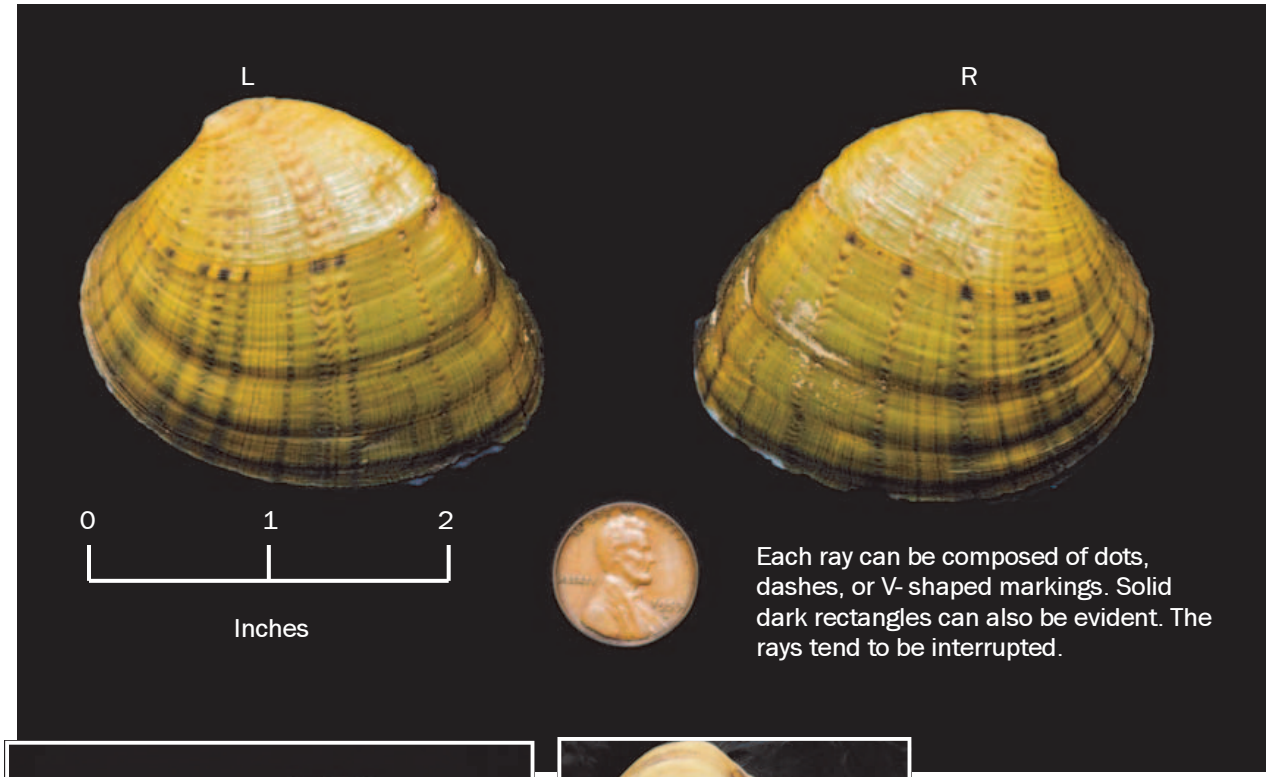
State Listed as Threatened: IL, as Endangered: WI

ID. Aids:
External Surface – Curved umbo. Heavy, triangular shell with flattened posterior edge. Few to many rays, each comprised of small dots, dashes, V-shaped markings, or lines.
Internal Surface – Heavy teeth, lustrous white nacre with iridescence posteriorly.

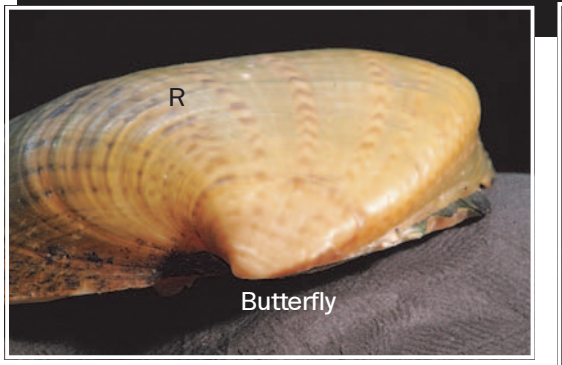
Distinguishing Features:
Similar Species – Deertoe.
Compared To –The butterfly has a roughly equilateral triangular shape with the posterior edge about equal to the ventral length. The deertoe has a squat triangular shape with the ventral length much longer than either side. The butterfly has a much thicker shell than a comparably sized deertoe, and is more laterally compressed than the deertoe.
Beak Sculpture – Several very fine, weakly double-looped lines, usually eroded on older shells.
Beak Cavity – Variable. Shallow to deep.
Color –Yellowish in younger shells, darker orange to brown in older shells. Rays can be few to many and tend to fade with age. Each ray may be comprised of dots, dashes, V-shaped markings, and even solid dark rectangles. Periostracum is smooth but well marked by growth lines.
Nacre – Lustrous white, iridescent posteriorly.
Teeth/Hinge – Pseudocardinal teeth are chunky, deeply incised, with two in left valve (sometimes with a smaller anterior accessory tooth). Lateral teeth are slightly curved and well striated. Always with a broad interdentum.
Size/Shell Thickness – To four inches. A 3.3-inch specimen is about 5.4 mm thick.

Environmental Profile:
Habitat: – Large rivers such as the Illinois River, in sand or gravel.
Hosts – Freshwater drum and green sunfish.
Distribution /Status – Widespread but uncommon. Threatened in IL, endangered in WI and of concern in IN.

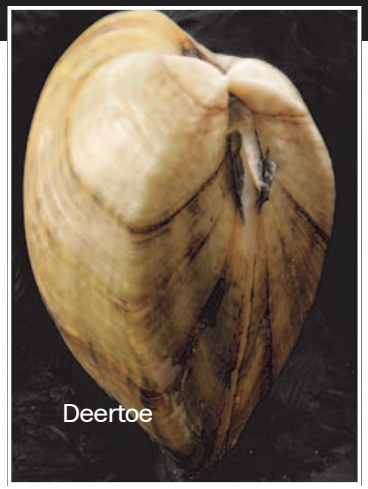




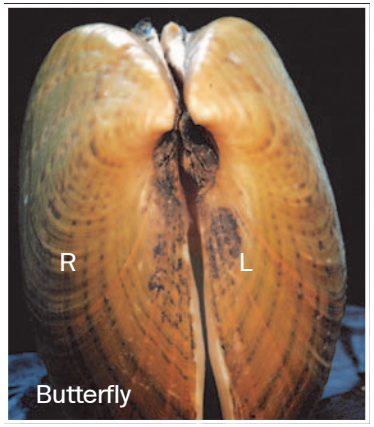
Each ray can be composed of dots, dashes, or V- shaped markings. Solid dark rectangles can also be evident. The rays tend to be interrupted.



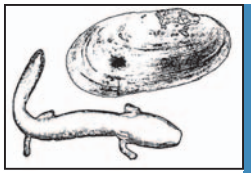
Note the dramatic pronounced sweep of the posterior margin of the shell. The curve is directed toward the anterior margin and the umbo is at the dorsal apex. The butterfly is also more compressed than deertoes of comparable size.



Note that the dorsal apex (umbo) of the shell is not curved and directed forward.



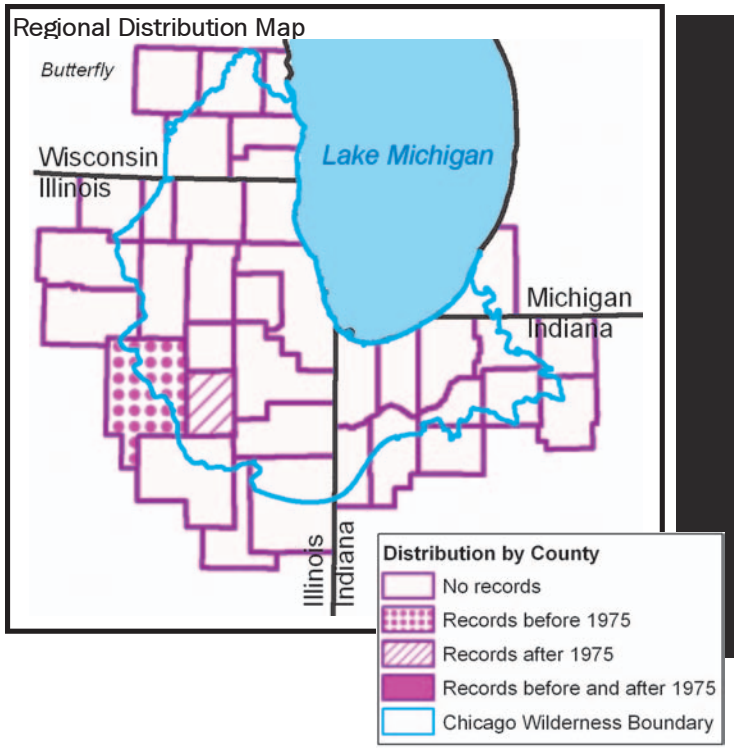
The butterfly has a fine beak sculpture of weakly double-looped lines that are difficult to discern.

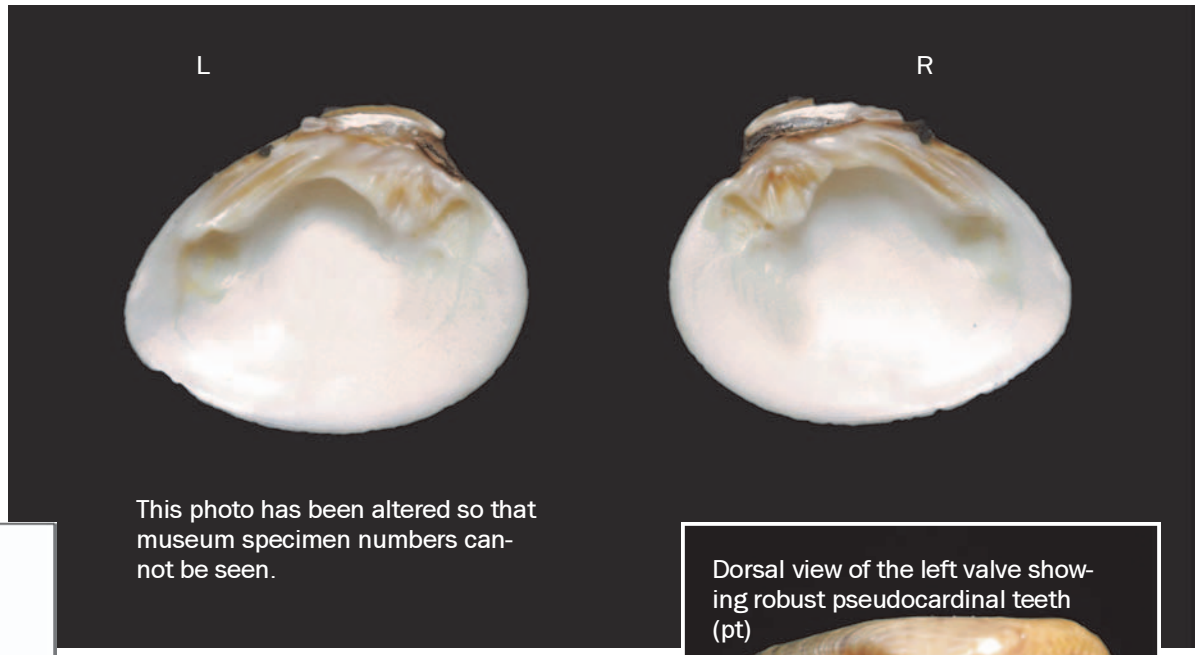


Butterfly *Ellipsaria lineolata*
Subfamily Lampsilinae

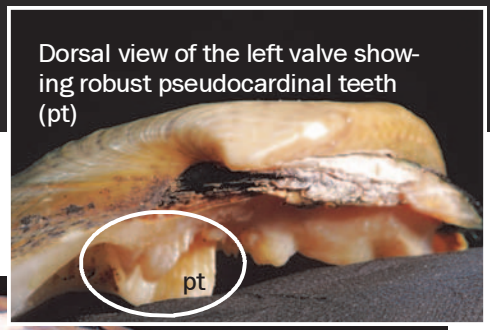
internal views

State Listed as Threatened: IL, as Endangered: WI

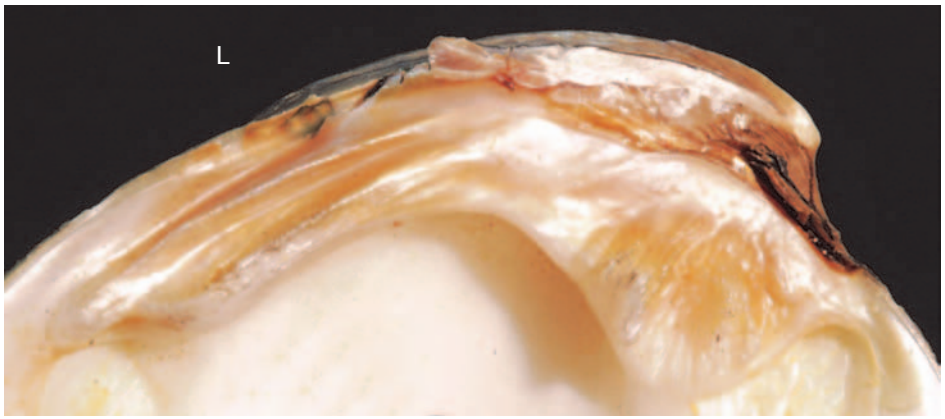




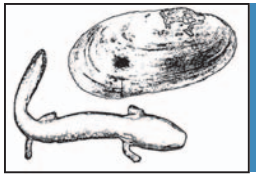
This photo has been altered so that museum specimen numbers cannot be seen.



Dorsal view of the left valve showing robust pseudocardinal teeth (pt)



Close-up views of the left and right valves. The lateral tooth of the right valve is "perched" on a raised shelf. The lateral teeth of both valves are slightly curved. There are two lateral teeth in the left valve. The pseudocardinal teeth are chunky and deeply incised. The interdentum (i) is distinct.



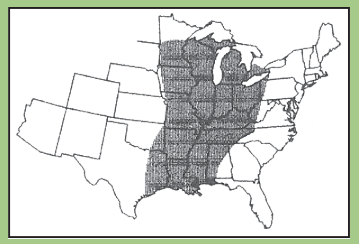
Deertoe *Truncilla truncata*
Subfamily Lampsilinae

external views

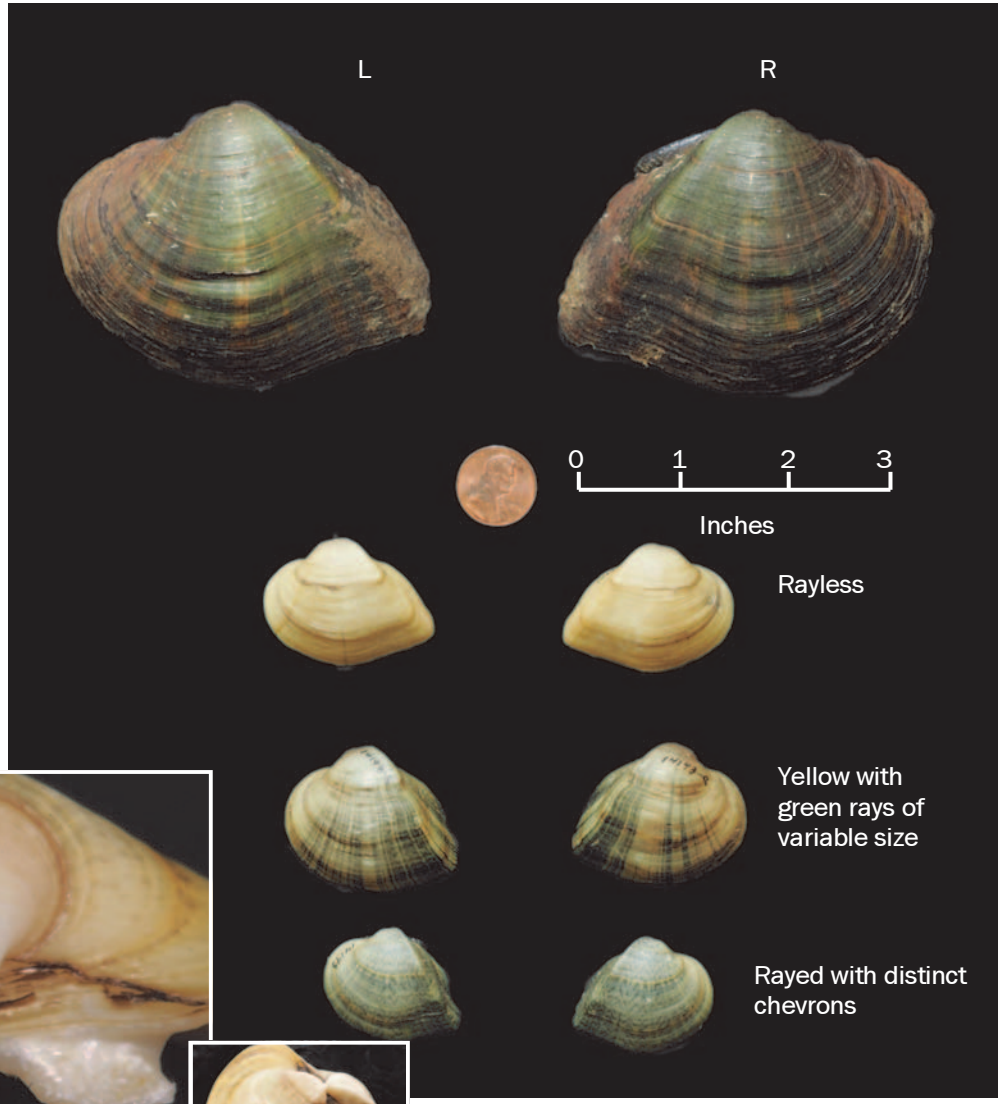
ID. Aids:
External – A small, smooth, shiny, stout, somewhat triangular shell with a posterior ridge that is sharply angled. Colored yellow, green to brown and often covered with green rays that are interrupted or discontinuous.
Internal – Pseudocardinal teeth are relatively large, grooved and peglike. Nacre is white

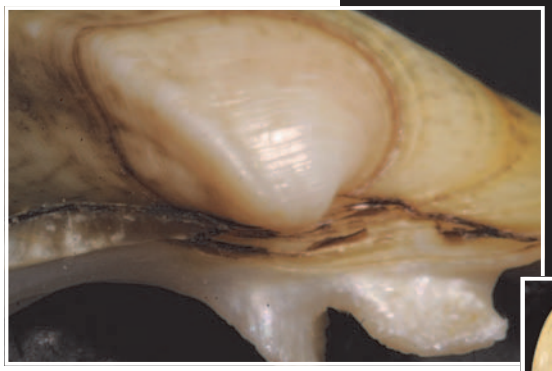
Distinguishing Features:
Similar Species – Elktoe, Wabash pigtoe, fawnsfoot
Compared To – The deertoe has a more distinct and more sharply angled posterior ridge starting at the umbo than the others. The elktoe can have similar markings, but has a distinctive, more elongated, shape than the deertoe. The fawnsfoot can have similar markings to the deertoe but lacks the sharp posterior ridge. The deertoe may have a similar shape to the Wabash pigtoe but lacks the pigtoe's pronounced sulcus, and usually has more markings than the pigtoe.
Beak Sculpture – The posterior ridge starts at the tip of the umbo and is very sharply angled here. Other mussel specialists describe a beak sculpture of three to five very fine raised lines that are double-looped and close to the tip of the umbo. Many shells lack any distinguishable beak sculpture, even those shells that are not eroded. The beaks are raised well above the hinge line.
Beak Cavity – Shallow to moderately deep.
Color – Smooth, glossy, and highly variable from yellow to green to reddish brown to brown with green rays that may be thick, thin, sparse or abundant. Rays can be made up of closely spaced V-shaped markings, sometimes in a zigzag pattern. Some shells may be rayless and monocolored.
Nacre – Sometimes pink, usually lustrous white, and iridescent, especially on the posterior part of the shell.
Teeth/Hinge – Pseudocardinal teeth are prominent, somewhat peglike, deeply grooved, and serrated with two in the left valve and one in the right. The smaller, posterior pseudocardinal tooth in the left valve can vary toward a bladelike shape. Lateral teeth are stout, striated or rough-textured, straight to very slightly curved, and short, about half of the shell length.
Size/Thickness – Usually to 2.0 inches but rarely to 3.5 inches. A 1.9-inch (48 mm) long shell measured 2.5 mm thick.

Environmental Profile:
Habitat – In midsize to large rivers in mud, sand or small gravel.
Hosts – Freshwater drum, sauger.
Distribution /Status – Apparently secure in IL, WI. Vulnerable in IN, not ranked in MI.



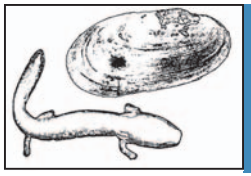
Mussel identification can be particularly difficult because of the diversity of sizes, shapes, and color patterns present within any given species. The deertoe specimens illustrated here demonstrate some of that variability. According to Cummings and Mayer (1992) the periostracum of the deertoe can be highly variable in color from yellow, green, yellowish brown to dark brown, with numerous green rays of variable widths and shapes...and occasionally there are no rays at all. The anterior of the deertoe is rounded but the posterior has an acute angled shelf that helps to give it its name. The deertoe usually measures up to two inches but the largest specimen that we found in the Field Museum collection was 3.5 inches.





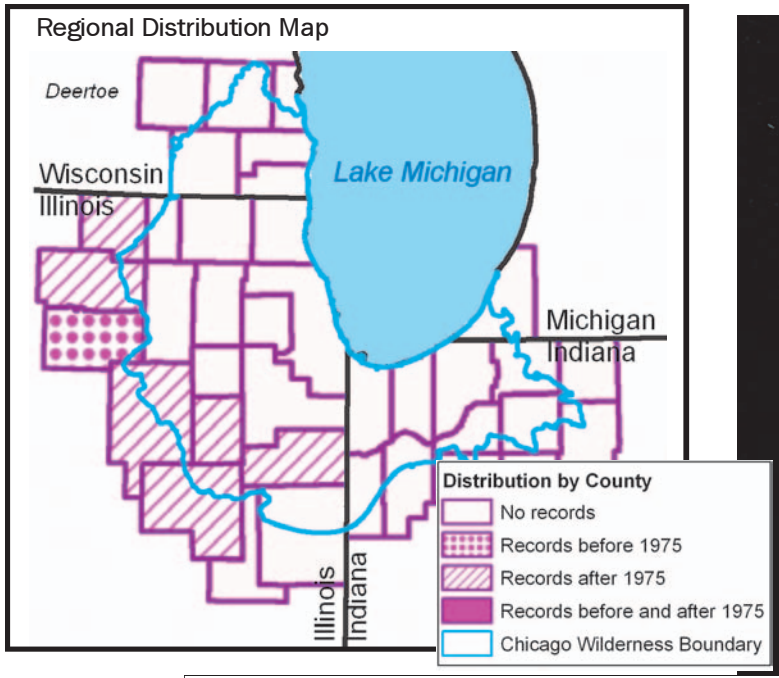
Umbo sculpturing on the left valve. Pseudocardinal teeth can be seen below the hinge line. The sculpturing of the umbo is often very difficult to discern.

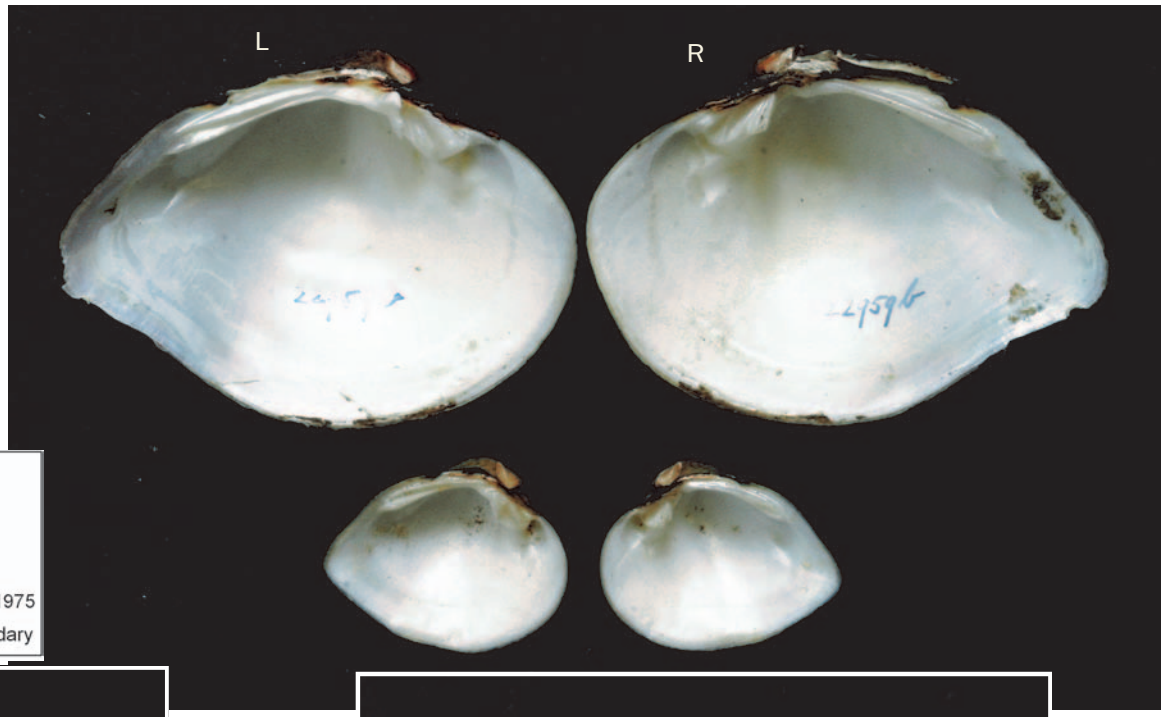
Posterior view showing acute angle and flattened appearance of the posterior shelf.

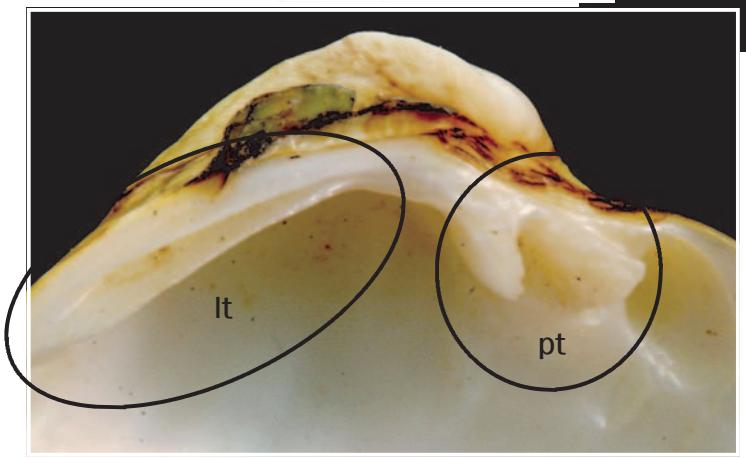


Deertoe *Truncilla truncata*
Subfamily Lampsilinae

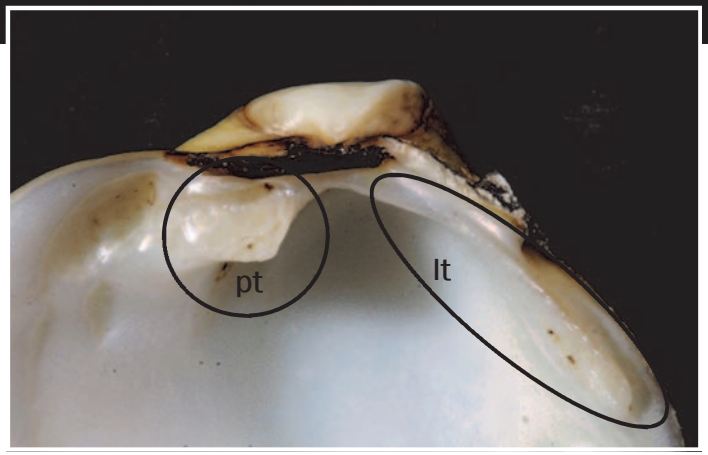
internal views



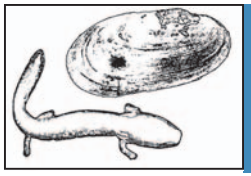




Close-up of the left valve showing two lateral teeth (lt) and two pseudocardinal teeth (pt). Note the divergent angle of the pseudocardinal teeth. The pseudocardinal teeth are peg-like to bladelike and are deeply grooved and serrated.



Right valve showing a single pseudocardinal tooth (pt) and a single lateral tooth (lt). The lateral teeth in both valves are short, about half the shell length. The lateral teeth are stout and striated or rough textured.



Ellipse *Venustaconcha ellipsiformis* external views

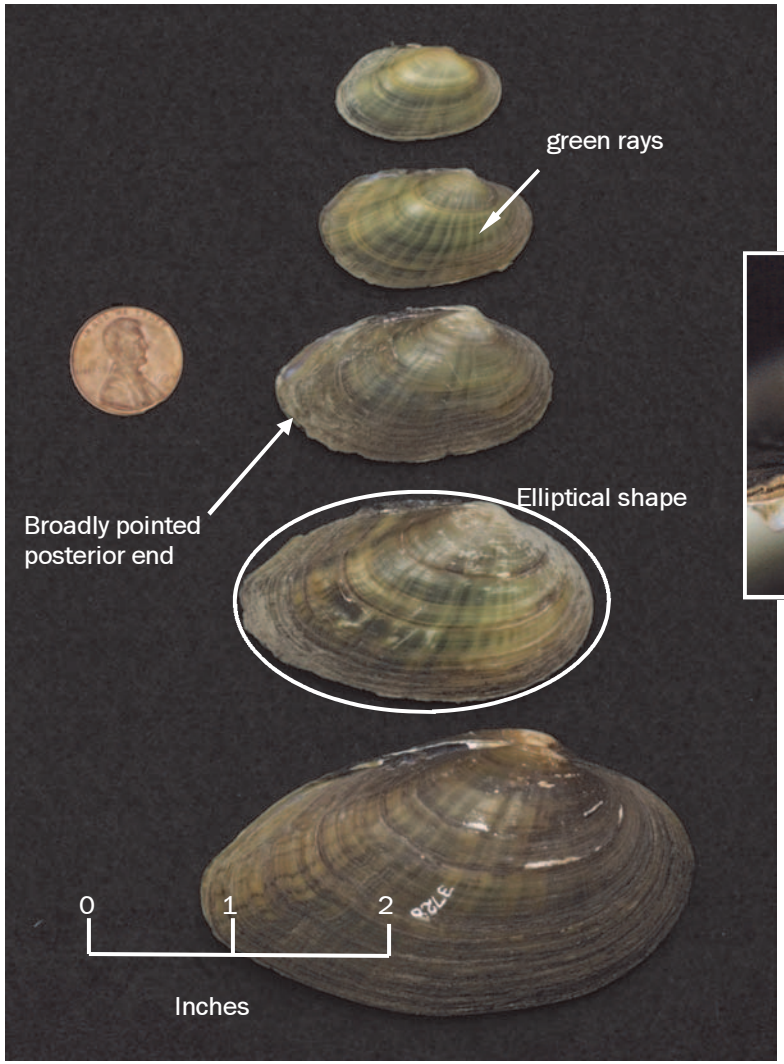
Subfamily Lampsilinae

State Listed as Threatened: WI

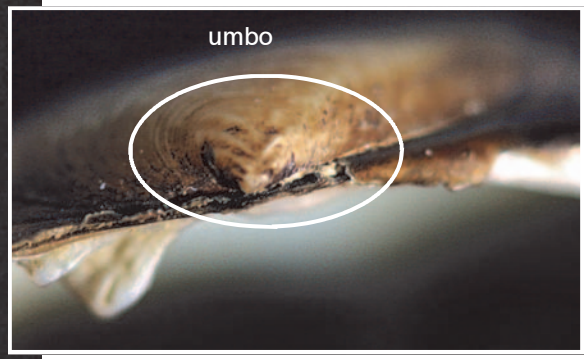
ID. Aids:
External Surface – Small, moderately thin shelled when younger, elongated with broadly pointed posterior end. Fine and indistinct beak sculpture. Many green rays cover yellow to brown younger shells. Oldest shells may be black, thick, and heavy. Periostracum has a cloth-like texture when dry. Moderately compressed. Beak very far forward.
Internal Surface – Pseudocardinal teeth small and bladelike to peglike. Lateral teeth well developed to very stout. Nacre white to bluish white.

Distinguishing Features:
Similar Species – Rainbow, mucket, spike.
Compared To – The ellipse has a different beak sculpture than the others, when sculpturing is visible. The rainbow has interrupted green rays on its shell. The young mucket is usually a more stout shell, at any particular size, with a green color, covered by broad green rays with a shiny shell surface. The spike is usually much more elongate, often with a purplish nacre.
Beak Sculpture – Two to four very fine, shallow double-looped lines that are often broken in the middle. The sculpture can be so fine that a hand lens is often needed to discern it, even with unworn shells. Older shells often have an eroded beak. Beak barely protrudes above the hinge line.
Beak Cavity – Shallow.
Color – Young and middle-aged shells often yellowish or greenish yellow, with green rays that may cover most of the shell. Older shells becoming darker brown with green rays, and oldest shells appear almost black and rayless. The periostracum is cloth-like especially ventrally.
Nacre – Shiny white to white with a bluish sheen. Weak to strong iridescence at the posterior end of the shell.
Teeth/Hinge – Pseudocardinal teeth small but distinct, somewhat bladelike and triangular, roughened by grooves and striations. Two in the left valve, one more peglike tooth, in the right. There is often a much smaller, secondary tooth anterior to the one peglike tooth in the right valve. Lateral teeth are well developed, relatively smooth, and are straight to slightly curved. Two in the left valve, one in the right.
Size/Thickness – To three inches. A 1.8-inch shell was 0.8 mm thick in the center.

Environmental Profile:
Habitat – Sand, gravel, and small cobble in small to large streams. May be found unburied and under rocks where the current has washed them.
Hosts – Mottled sculpin, slimy sculpin, brook stickleback, Iowa darter, johnny darter, fantail darter, greenside darter, rainbow darter, logperch, blackside darter, orangethroat darter, and others not found in IL .
Distribution /Status – Widespread but uncommon. Endangered in WI, imperiled in IN, MI, vulnerable and apparently declining in IL. Of concern in most of its range.

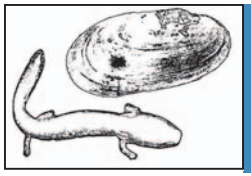


One of the themes of this identification guide is the diversity of forms that an individual species can have. In this photo there are five different individuals that range from very young (at the top) to mature (at the bottom). The valves at the top display green rays on the posterior half of the shell. This is a diagnostic characteristic. However, rays on older shells are less distinct and the posterior is more pointed in older individuals. Also notice the change in color of the periostracum for the older individuals. Shell shapes do resemble an ellipse but other mussels can also have an elliptical shape. The shell is noticeably thicker on the anterior margin.



Dorsal view. Pseudocardinal teeth and umbo on the right valve. Beak sculpture consists of two to four very fine, Double-looped ridges. This is a close-up of a very young individual. The umbo for older shells can be less distinct.

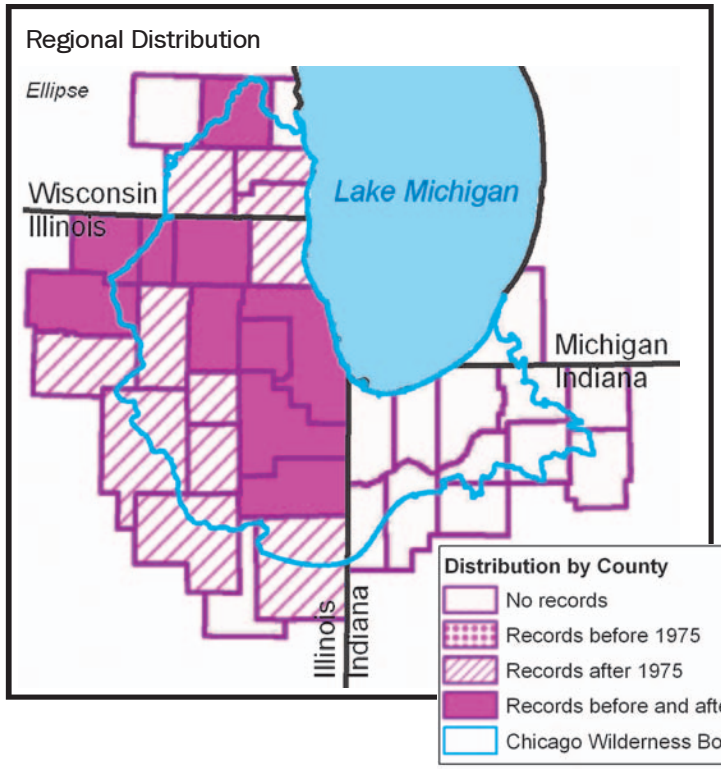
The shell above is an older ellipse that has undergone a color change as it has aged. Notice that the green rays are no longer visible and the base color of the periostracum has changed.



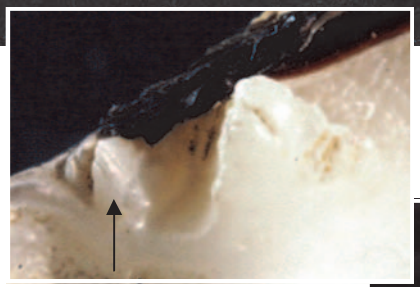
Ellipse *Venustaconcha ellipsiformis* internal views

Subfamily Lampsilinae

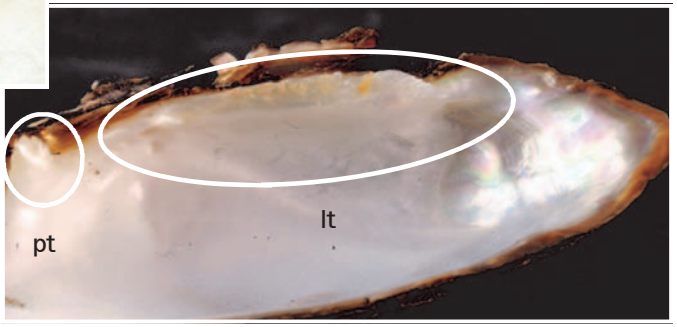
State Listed as Threatened: WI



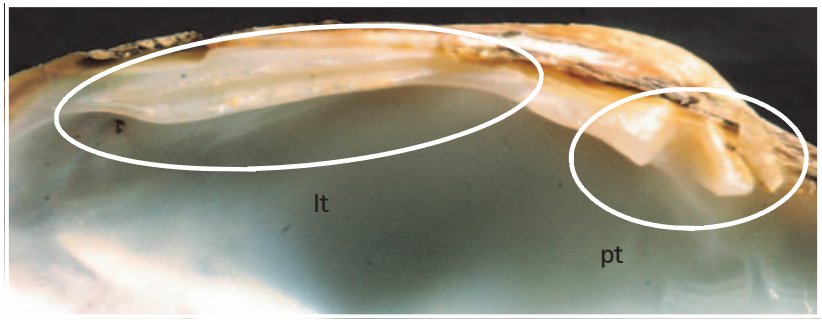
The nacre is white and iridescent on the posterior part of the shell.



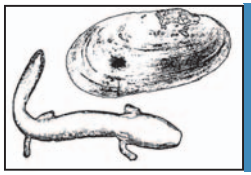
Another view of the right pseudocardinal tooth. The pseudocardinal tooth occasionally has a thin ridgelike tooth anterior to it (present in this specimen and pointed out by the arrow).



Close-up photo of the right valve. The right lateral tooth (lt) has serrations and a small shelf. The lateral tooth is bladelike and comparatively short but it gets higher as it goes from the anterior toward the posterior of the shell. The pseudocardinal tooth (pt) is triangular, serrated and grooved.



The left pseudocardinal teeth (pt) are triangular, heavy, roughened, and divergent (oriented in different directions). Lateral teeth (lt) are short, thick, and straight to slightly curved.

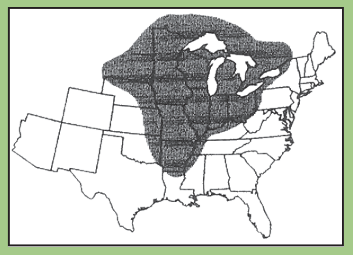


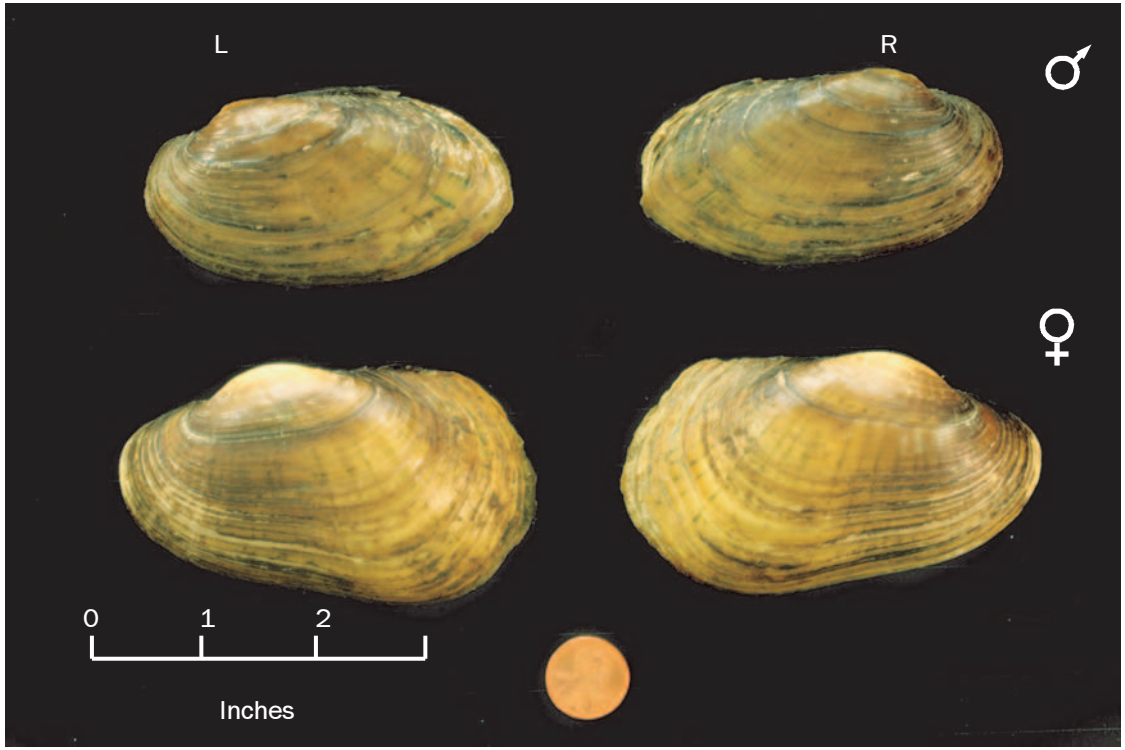
Fatmucket *Lampsilis siliquoidea* external views
Subfamily Lampsilinae

ID. Aids:
External Surface – Medium sized, moderately thick, moderately elongated shell with a beak sculpture of raised, double-looped lines. Color is yellowish to tan and dark brown.
Internal Surface – The pseudocardinal teeth are small, bladelike, but distinct and the nacre is white to bluish white.

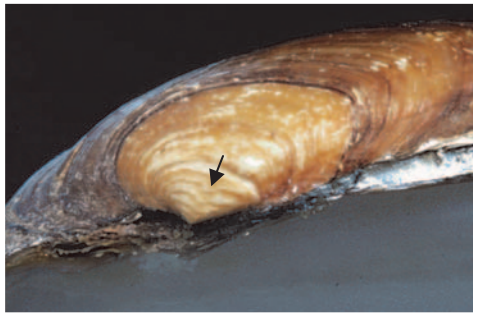
Distinguishing Features:
Similar Species – Creeper, mucket, plain pocketbook, rainbow, ellipse, yellow sandshell.
Compared To – The fatmucket has distinct beak ornamentation compared to the others. The yellow sandshell has four to seven double-looped lines, but is more elongated, smoother and distinctly yellowish. The creeper has a thinner shell and indistinct teeth. The plain pocketbook has a much wider shell with heavier teeth. The rainbow has similar beak sculpture but has a thinner, smaller, more compressed shell usually with broken rays. The ellipse has three or four fine double-looped lines as beak sculpture, but has a much thicker, smaller, more compressed shell.
Beak sculpture – Beak slightly raised above hinge line and sculpture is usually six to eight, fine double-looped raised lines. Sculpture often eroded away.
Beak Cavity – Moderately deep.
Color – Shell is usually smooth and shiny, especially when young. Young shells are yellowish with few to many thin to thick green rays. Older shells are rougher, yellowish to tan to dark brown, and have few to many green rays, usually less distinct; some older shells are rayless.
Nacre – White to bluish white and mildly iridescent posteriorly. Nacre rarely with pink tinge.
Teeth/Hinge – Lateral teeth thin, distinct, and slightly curved, two in left valve one in right. Pseudocardinal teeth are somewhat small but distinct, divergent, peglike to bladelike, two in left valve and one in right, occasionally with a smaller accessory tooth anteriorly.
Size /Thickness – To five inches. A 3.7 inch shell, (93 mm), measured 2.8 mm thick in the center.

Environmental Profile:
Habitat – Small streams to large rivers as well as ponds and lakes in silt, sand, and gravel. Once common in Lake Michigan.
Hosts – Smallmouth bass, largemouth bass, white bass, tadpole madtom, yellow perch, bluntnose minnow, white crappie, black crappie, sauger, walleye, bluegill, green sunfish, longear sunfish, sand shiner, rock bass, white sucker, pumpkinseed, warmouth, striped shiner, and common shiner.
Distribution /Status – Common and secure in IL, IN, WI, not reviewed in MI.



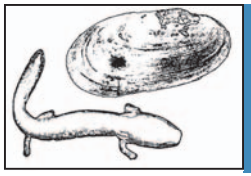


Just to complicate matters some species, like the fatmucket, have males and females that look somewhat different. Notice that the male has a shape which is approximately elliptical. The female, in contrast, has a moccasin shaped form which is broader on the posterior than the anterior. Formal descriptions of the female fatmucket describe the posterior margin as "truncated." Both males and females can have green rays but they may become indistinct as individuals age. The periostracum tends to be smooth and somewhat shiny.



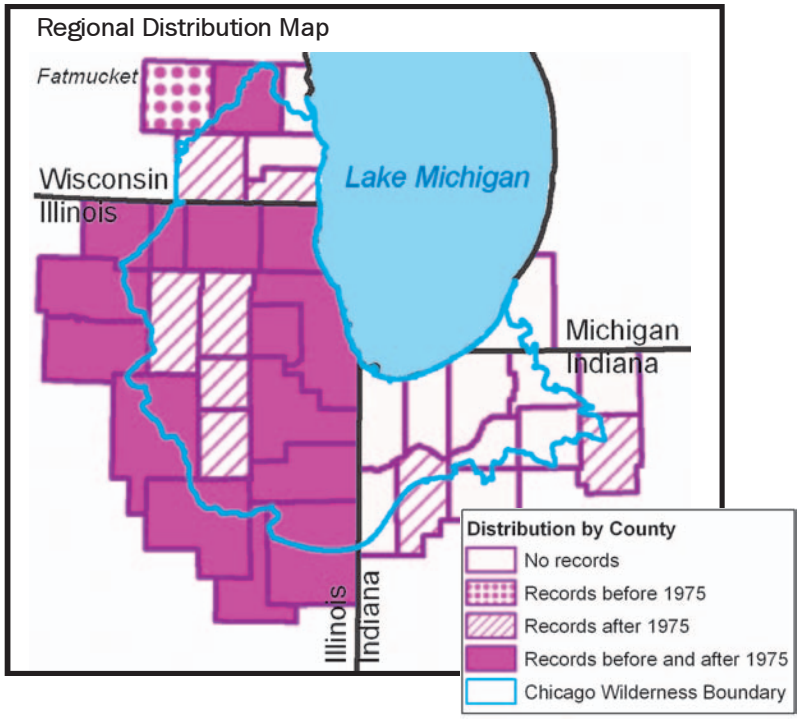
The umbo is only slightly elevated above the hinge line. The beak sculpture consists of six to eight double-looped bars. The bars are sharply drawn up in the middle. This is a significant feature for identification.

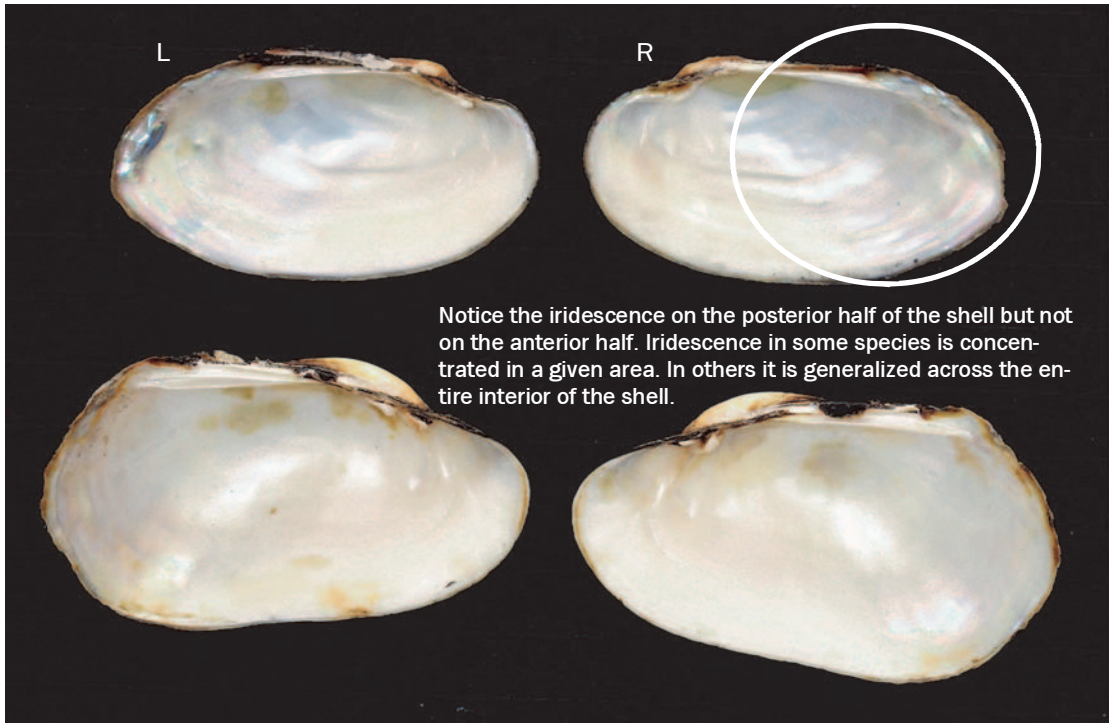
Many mussels in the subfamily Lampsilinae show sexual dimorphism with males and females having different shell shapes. Males often have a more pointed posterior shell, while females have a broadly rounded posterior shell. This rounded shape allows room for the females to hold developing larvae within their shell.



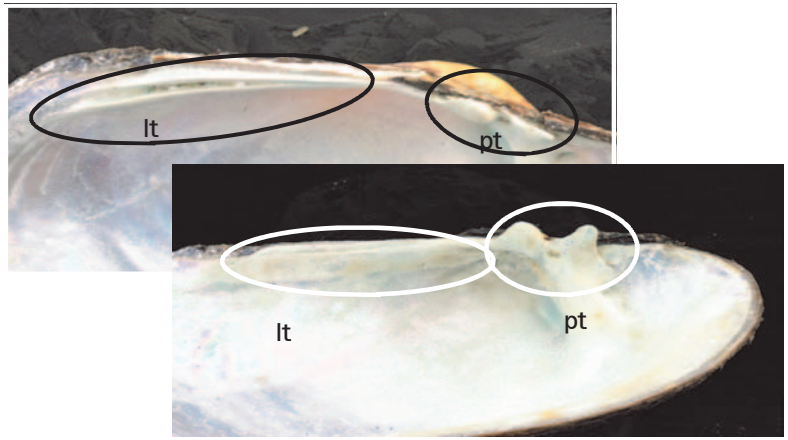
Fatmucket *Lampsilis siliquoidea* internal views

Subfamily Lampsilinae

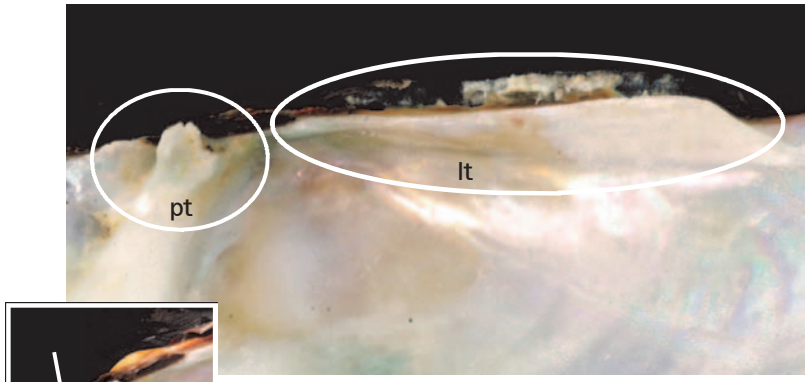




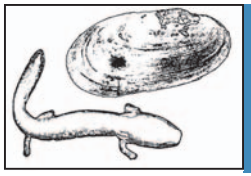
Notice the iridescence on the posterior half of the shell but not on the anterior half. Iridescence in some species is concentrated in a given area. In others it is generalized across the entire interior of the shell.



Two close-up views at slightly different angles of the left valve. Both the lateral teeth (lt) and the pseudocardinal teeth (pt) are bladelike. There are two lateral and two pseudocardinal teeth in the left valve. The lateral teeth are straight to slightly curved, long and thin. Many mussels have pseudocardinal teeth that are more robust and are pyramidal in shape.



Two close-up views of the right valve. The right valve typically has a single pseudocardinal tooth and lateral tooth. Occasionally there is a secondary ridgelike tooth (see inset arrow) in front.



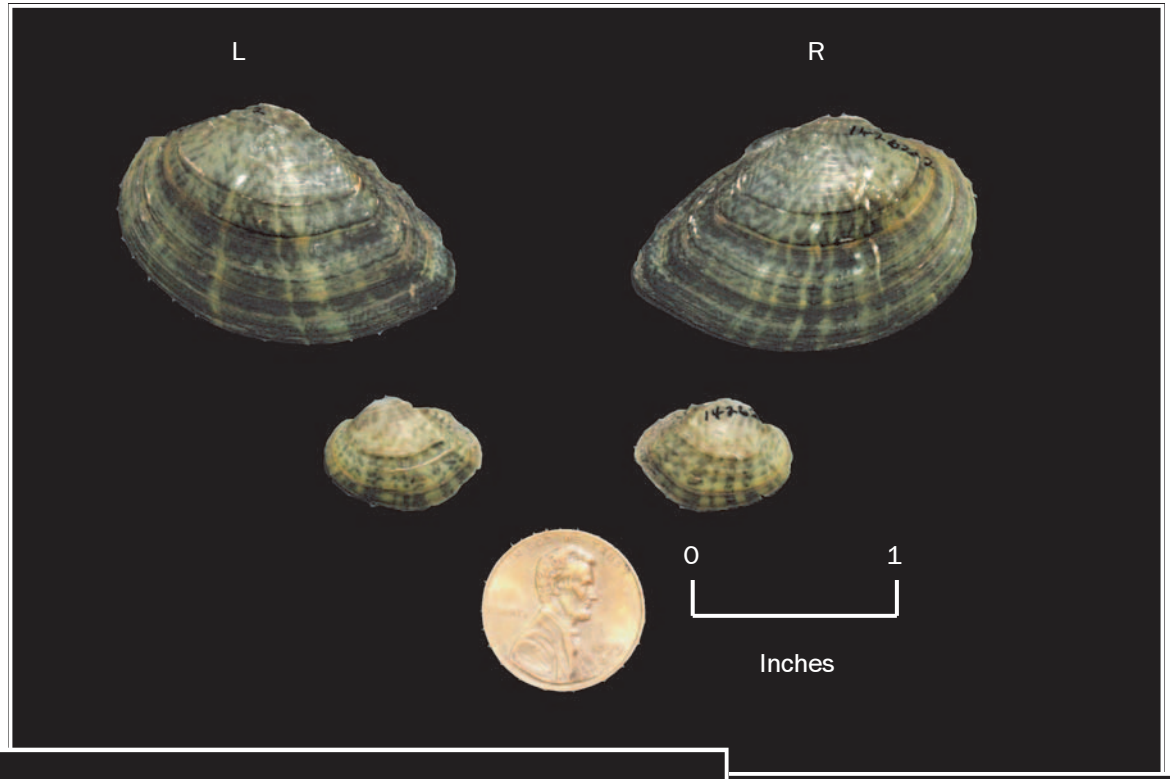
Fawnsfoot *Truncilla donaciformis*
Subfamily Lampsilinae

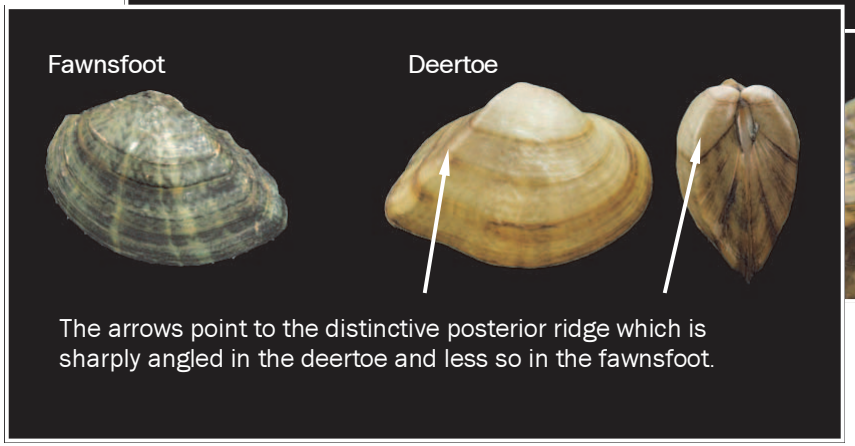
external views

ID. Aids:
External Surface – A small, stout, elongated shell with a pointed posterior end. The shell is yellowish to greenish with chevron or zigzag shaped markings and finely broken rays.
Internal Surface – White nacre, bladelike teeth.

Distinguishing Features:
Similar Species – Deertoe.
Compared To – While the chevron or zigzag markings may be common to both species, the deertoe is almost as broad as it is long, and has a distinct posterior ridge. These differences in shape alone can distinguish the species.
Beak Sculpture – Six or so fine, raised lines that are weakly double-looped and are very close to the tip of the umbo. The beaks are well raised above the hinge line.
Beak Cavity – Moderately deep.
Color – Smooth, yellowish to greenish brown. Chevron and/or zigzag markings can be prominent to diffuse and are usually more distinct on the posterior half of the shell. Broken and dotted rays may be green to brown and can be prominent or diffuse.
Nacre – Silvery white and iridescent on the posterior part of the shell.
Teeth/Hinge – Pseudocardinal teeth are well developed, bladelike, and roughened. Lateral teeth are relatively short, less than half the length of the shell, thick and striated. Two pseudocardinal and two lateral teeth are present in the left valve, one of each is present in the right. In the left valve the dorsal lateral tooth is much smaller than the ventral lateral tooth.
Size/Thickness – To two inches. A 1.5-inch (38 mm) long shell measured 2.3 mm thick.

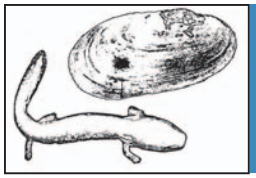
Environmental Profile:
Habitat – In large rivers, and at the confluence of large and medium rivers in sand or fine gravel.
Hosts – Freshwater drum and sauger.
Distribution /Status – Apparently secure in IL, but imperiled in more than half its range. Vulnerable in IN, critically imperiled in WI and under review in MI.





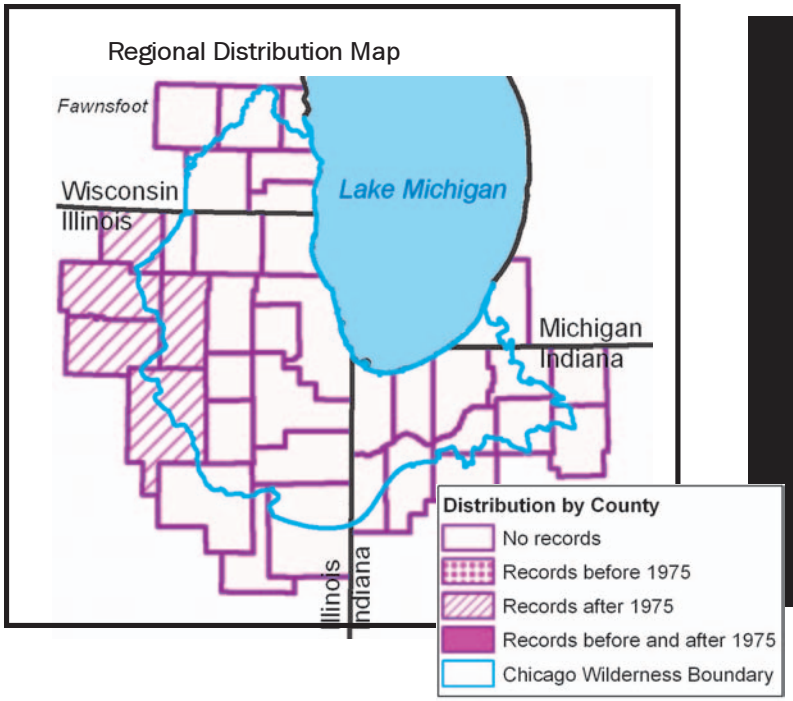
The arrows point to the distinctive posterior ridge which is sharply angled in the deertoe and less so in the fawnsfoot.

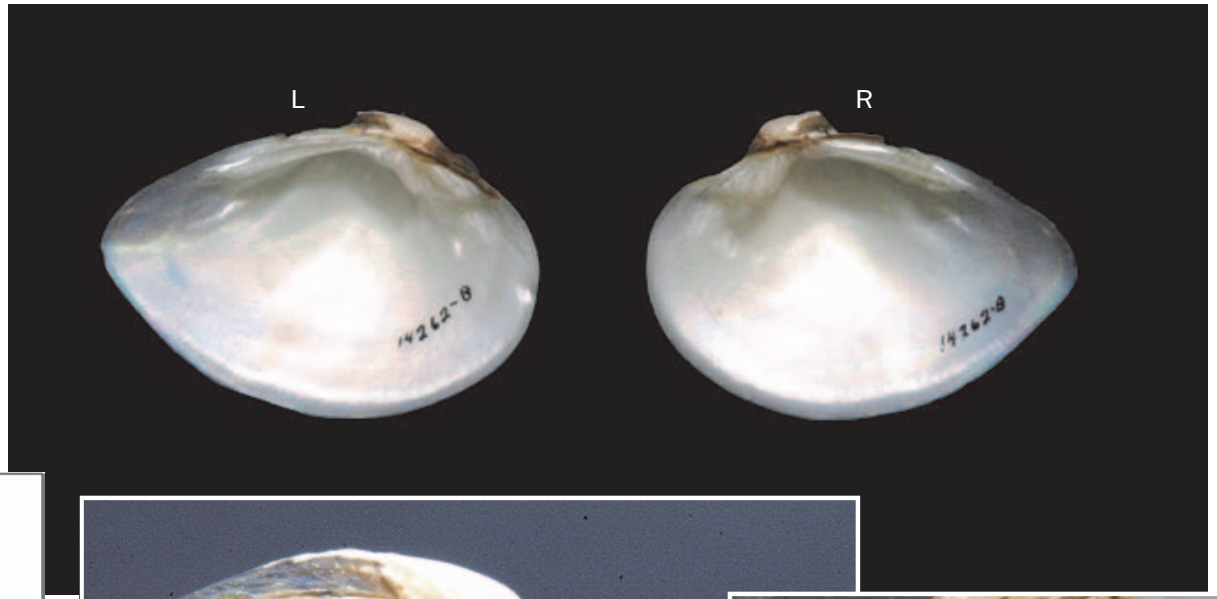
The beak sculpture of the fawnsfoot consists of up to six fine, raised lines that are weakly double-looped. Note that it also has a posterior ridge but it is not as pronounced as that of the deertoe.

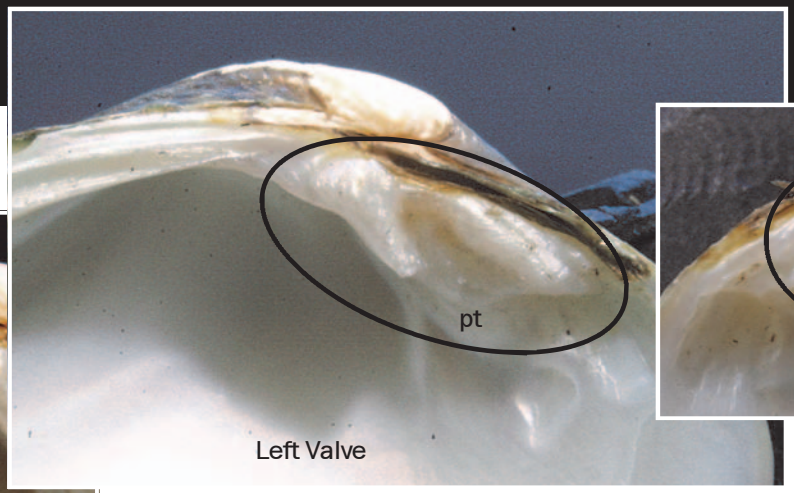


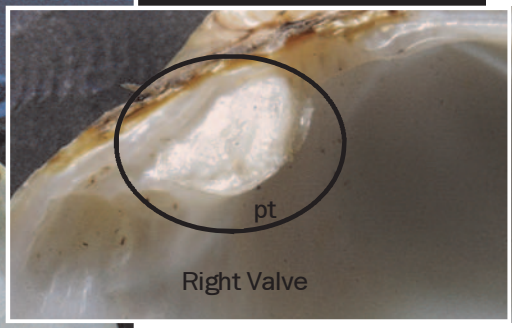
Fawnsfoot *Truncilla donaciformis* internal views

Subfamily Lampsilinae

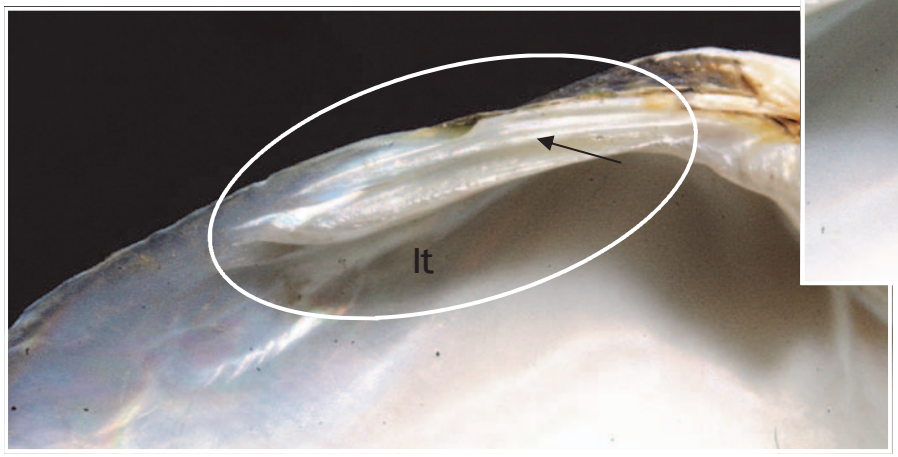




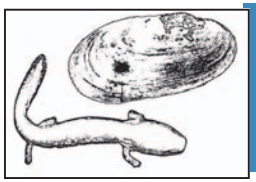




The two pseudocardinal teeth (pt) in the left valve are well developed, roughened, and bladelike. The teeth diverge at angles to one another. There are two pseudocardinal teeth in the left valve and a single pseudocardinal tooth in the right valve.



The lateral teeth are relatively short, less than half the length of the shell. The dorsal lateral tooth (indicated by the arrow) is much smaller than the ventral tooth.



Fragile papershell *Leptodea fragilis* external views

Subfamily Lampsilinae

ID. Aids:

External Surface – Very thin, somewhat smooth, laterally compressed shell can be broken with the fingers. Color is yellow or yellowish green. Small beaks are almost flush with the hinge line. Beaks have fine, slightly double-looped lines or a series of fine, concentric rings.

Internal Surface – Shell is usually white or white with pink highlights. Rarely pink throughout. All are highly iridescent. Pseudocardinal teeth are weakly developed.

Distinguishing Features:

Similar Species – Pink papershell, pink heelsplitter, and white heelsplitter.

Compared To –The white heelsplitter has a thick, usually rough, darker colored shell with a distinctive beak sculpture and heavy pseudocardinal teeth. The pink heelsplitter has a darker, smooth shell with a prominent wing, distinct to indistinct green rays, and pink or purple nacre. The pink papershell is very smooth and shiny externally, usually tan in color, and often rayless. The nacre is purple or pink and iridescent. The beak has three to four thickened ridges as sculpture.

Beak Sculpture – Three or four faint double-looped bars, *or* thin concentric rings close to the beak tip, without looping in some populations.

Beak Cavity – Very slight to totally absent.

Color – Yellow to yellowish tan, although in some populations, shells, especially older ones, are brownish with green tinges. Darker coloring marks many of the growth bands. Few to many green rays can be distinct in younger shells to diffuse in older shells with many populations in northern Illinois being rayless.

Nacre – The usual color is white, though some shells are white with pink highlights, especially near the umbo. Rarely shells can be pink throughout, making them difficult to separate from pink heelsplitters. Always highly iridescent.

Teeth/Hinge – Two pseudocardinal and two lateral teeth in the left valve, one of each in the right. Pseudocardinal teeth are small, often looking like only a thickened ridge or ridges, but sometimes they are small, smooth, triangular, and bladelike protuberances.

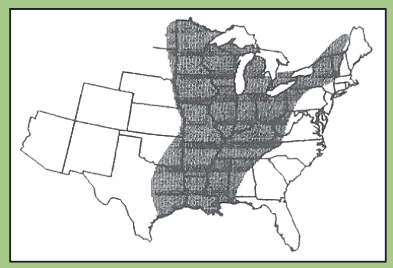
Size/Thickness – To six inches. A 4.75-inch long shell measured 1.0 mm thick.

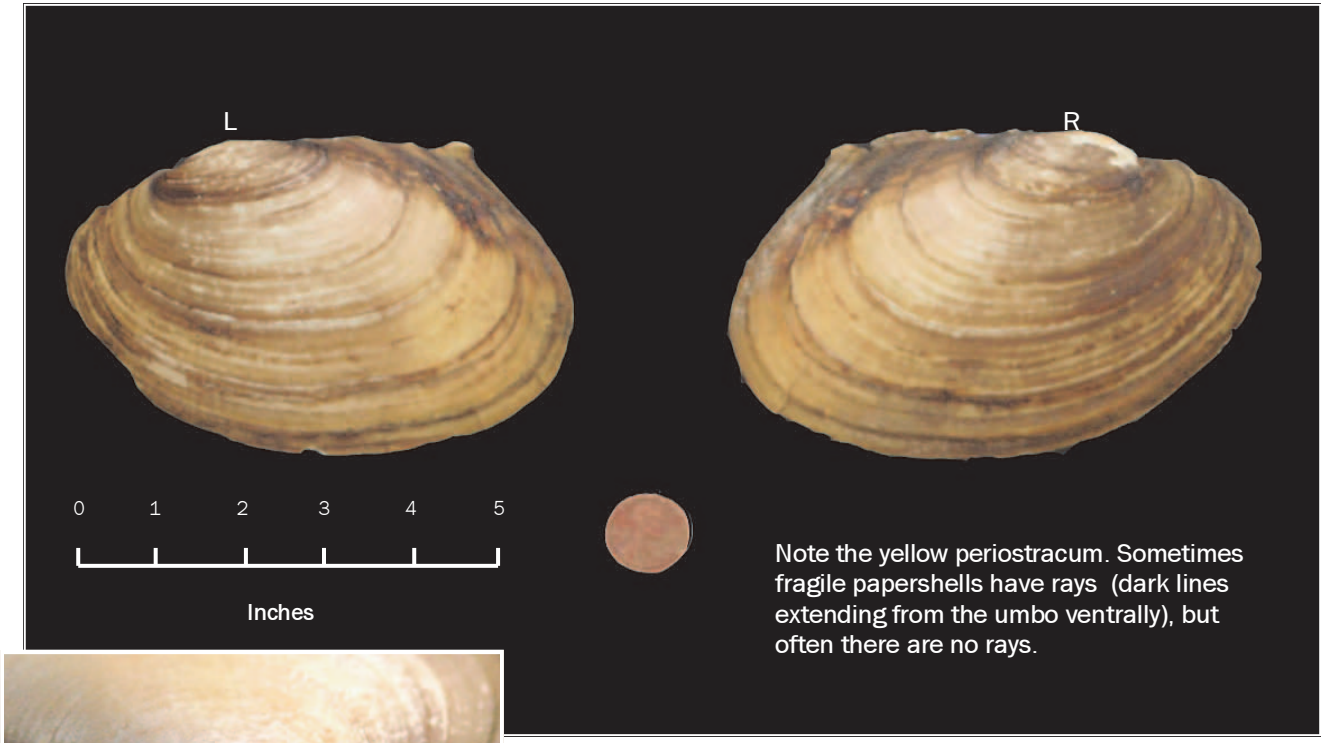
Environmental Profile:

Habitat – Small streams to large rivers, in silt, sand and gravel.

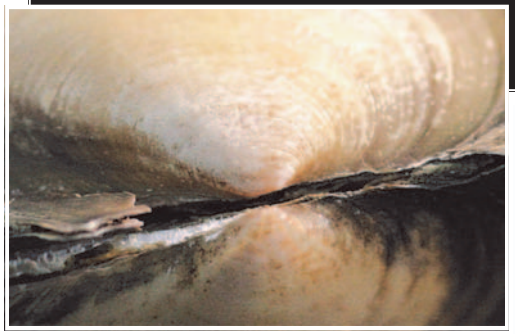
Hosts – Freshwater drum.

Distribution /Status – Abundant and common in IL and IN. Vulnerable in WI, not ranked in MI.



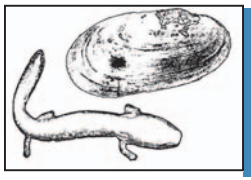


Note the yellow periostracum. Sometimes fragile papershells have rays (dark lines extending from the umbo ventrally), but often there are no rays.



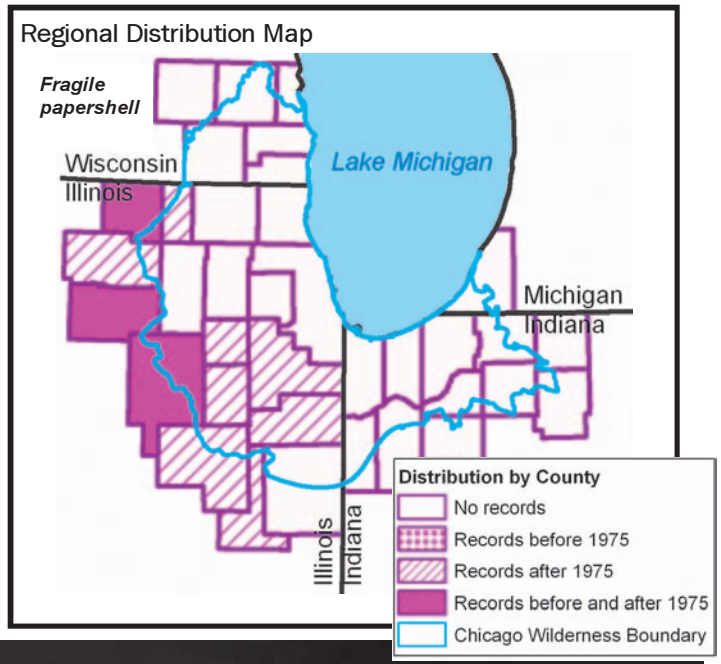
Close-up of the umbo of a fragile papershell. The umbo is very slightly elevated above the hinge line, and there are three to four concentric rings making up the beak sculpture, but these are often eroded in older specimens. This specimen is highly eroded and thus the beak sculpture is not very evident.

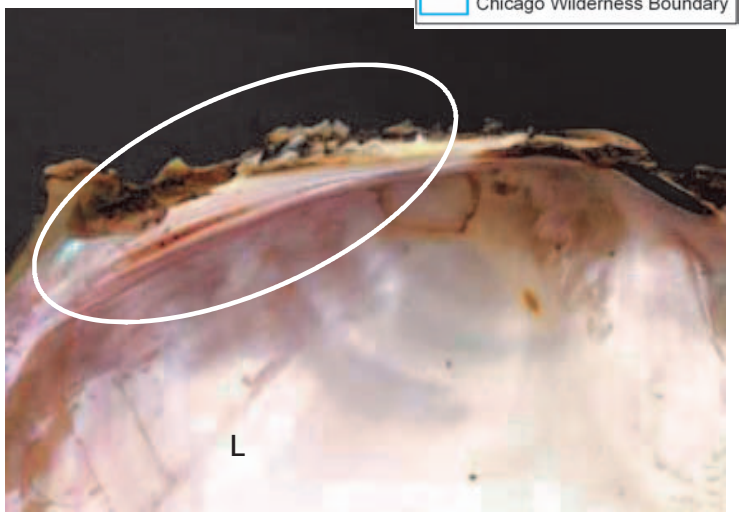
This is a species that is noteworthy for its variability. Some shells have rays, others will not; some shells can be dark brown, while others will be yellow; some valves have a pink nacre, but many have white nacre and some have white nacre tinged with pink. Fragile papershell identifications can be very fragile!



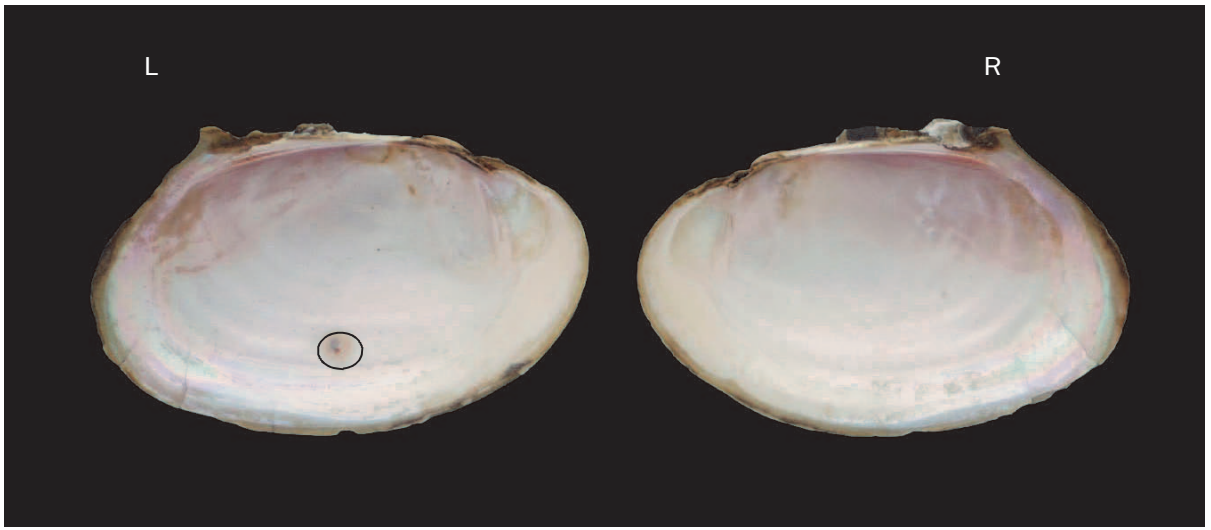
Fragile papershell *Leptodea fragilis* internal views

Subfamily Lampsilinae

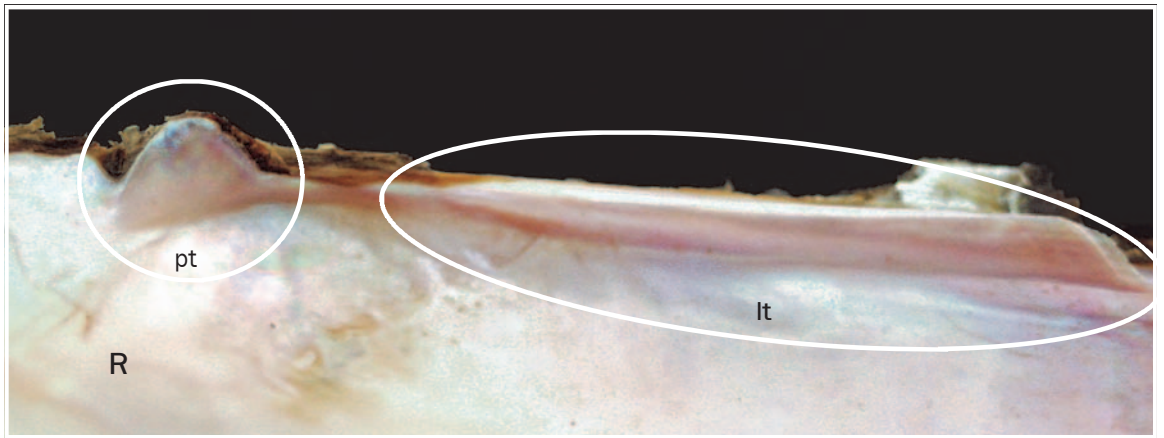




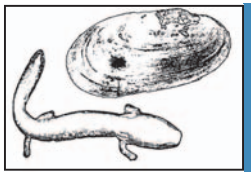
Left valve displaying a slightly curved set of lateral teeth. There is a single bladelike pseudocardinal tooth in this particular specimen. There are usually two separate pseudocardinal teeth in the left valve. This variation illustrates the diversity that may be encountered and the importance of weighing all the evidence when making an identification.



Note the pink tinge to the posterior half of the shell. A small flaw appears in the left valve towards the center. Flaws of this character sometimes result in the formation of freshwater pearls as the mussel grows and deposits nacre around the flaw. Salt water pearls are cultured with the help of freshwater mussels. A spherical nucleus made of freshwater mussel shell is embedded in the tissue of an oyster and a pearl is formed as the oyster deposits layers of its own nacre around this irritant.



Close-up view of the pseudocardinal tooth (pt) and lateral tooth (lt) for the right valve of a fragile papershell. The pseudocardinal tooth is smooth and bladelike in contrast to many other species. The lateral tooth is also smooth. Note the pink iridescence.

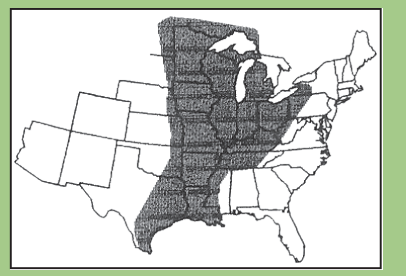


Lilliput *Toxolasma parvus* external and internal views
Subfamily Lampsilinae

ID. Aids:
External Surface – Small size (to 1.5 inches); dark green or brown color, rayless, inflated, five to six pronounced concentric ridges at umbo, moccasin shaped. The shell is "inflated" or increased in size laterally.
Internal Surface – Well developed pseudocardinal and lateral teeth despite its small size. Both lateral and pseudocardinal teeth have distinctive shape and orientation.

Distinguishing Features:
Similar Species – Purple lilliput *Toxolasma lividus*, Texas lilliput *Toxolasma texansensis*, little spectaclecase *Villosa lienosa*, but these are not found in the Chicago Wilderness area.
Compared To – The little spectaclecase reaches a larger maximum size, growing to up to 2.5 inches, and it has distinct double-looped umbo sculpture; other lilliputs occur in southern Illinois. None are found in the Chicago Wilderness area.
Beak Sculpture – Three to five heavy concentric ridges; the umbos are slightly elevated above the hinge line.
Beak Cavity – Moderately deep.
Color – Brown sometimes tinged with green; older shells can become dark brown or black.
Nacre – Bluish white; iridescent across the entire valve.
Teeth/Hinge – Left valve has two divergent (pointing in opposite directions) triangular pseudocardinal teeth and two slightly curved lateral teeth. Right valve has a single triangular, grooved, pseudocardinal tooth. Right lateral tooth has striations and a slight shelflike expansion at the distal end.
Size/Shell Thickness – To 1.5 inches; shells pictured average 1.0 mm or less in thickness.

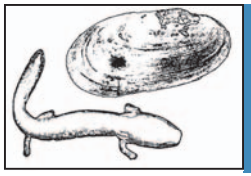
Environmental Profile:
Habitat – Common across a broad range of habitats including rivers, ponds, lakes. In mud, sand or gravel.
Hosts – Bluegill, green sunfish, orangespotted sunfish, warmouth, white crappie.
Distribution /Status – Apparently secure in IL, vulnerable in WI, imperiled in IN, not ranked in MI.



External and internal views of four specimens of lilliput. The lilliput is among the smallest species of our freshwater mussel fauna.

Dorsal view showing the heavy concentric ridges of the umbo and the inflated shell.

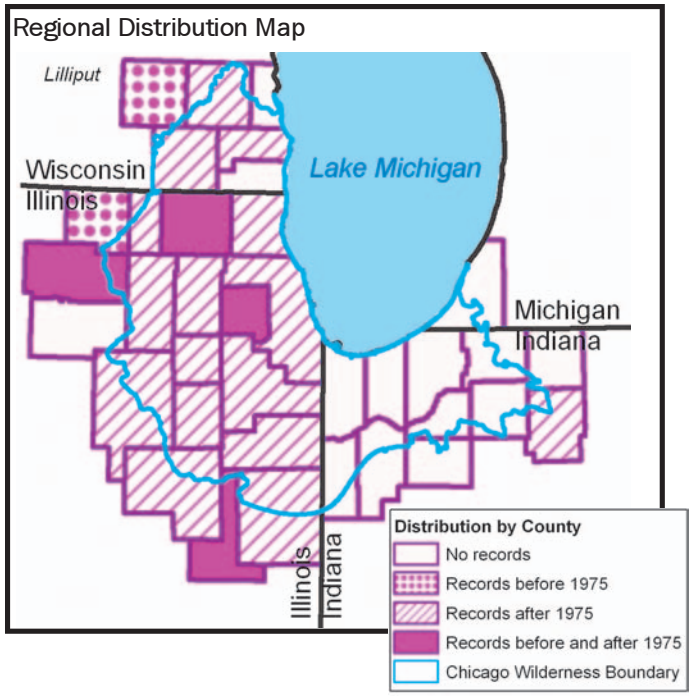
The internal surface of the mussel indicated by the white arrow above is stained with an organic accumulation of diatoms that would normally be washed off. Mussels are normally scrubbed clean before they are identified.

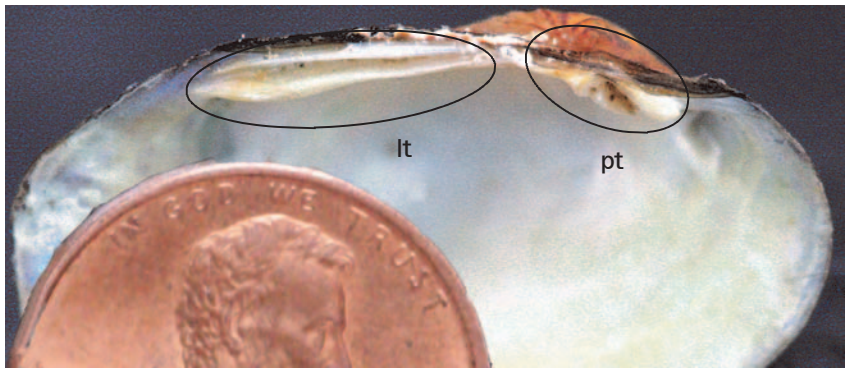


Lilliput *Toxolasma parvus*
Subfamily Lampsilinae

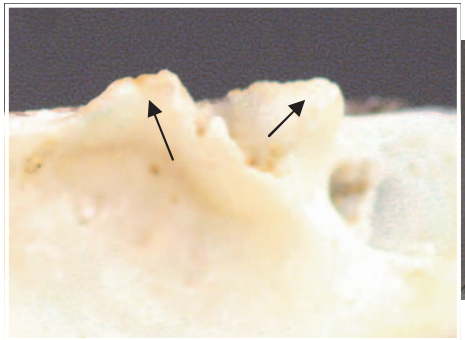
internal views

Regional Distribution Map

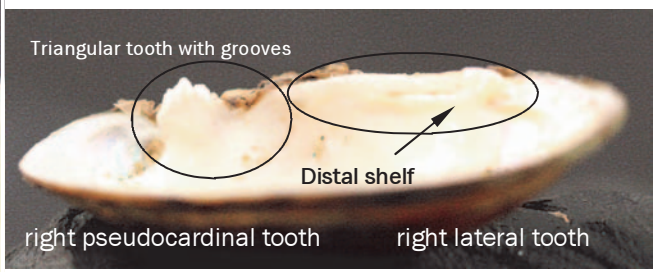


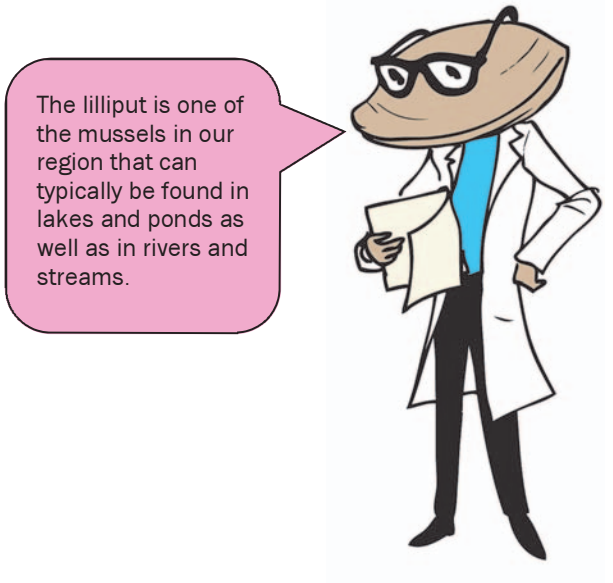


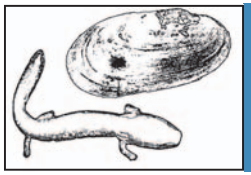
Despite being very small, lilliputs have well developed lateral and pseudocardinal teeth. Typically there are two lateral (lt) and two pseudocardinal (pt) teeth in the left valve and single pseudocardinal and lateral teeth in the right valve. The penny is shown for a size comparison on this close-up photo.



left pseudocardinal teeth; note the divergent angle of orientation (the teeth point in opposite directions, as shown by arrows).







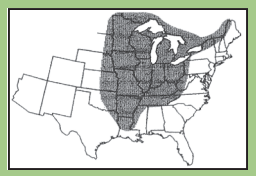
Mucket *Actinonaias ligamentina*
Subfamily Lampsilinae

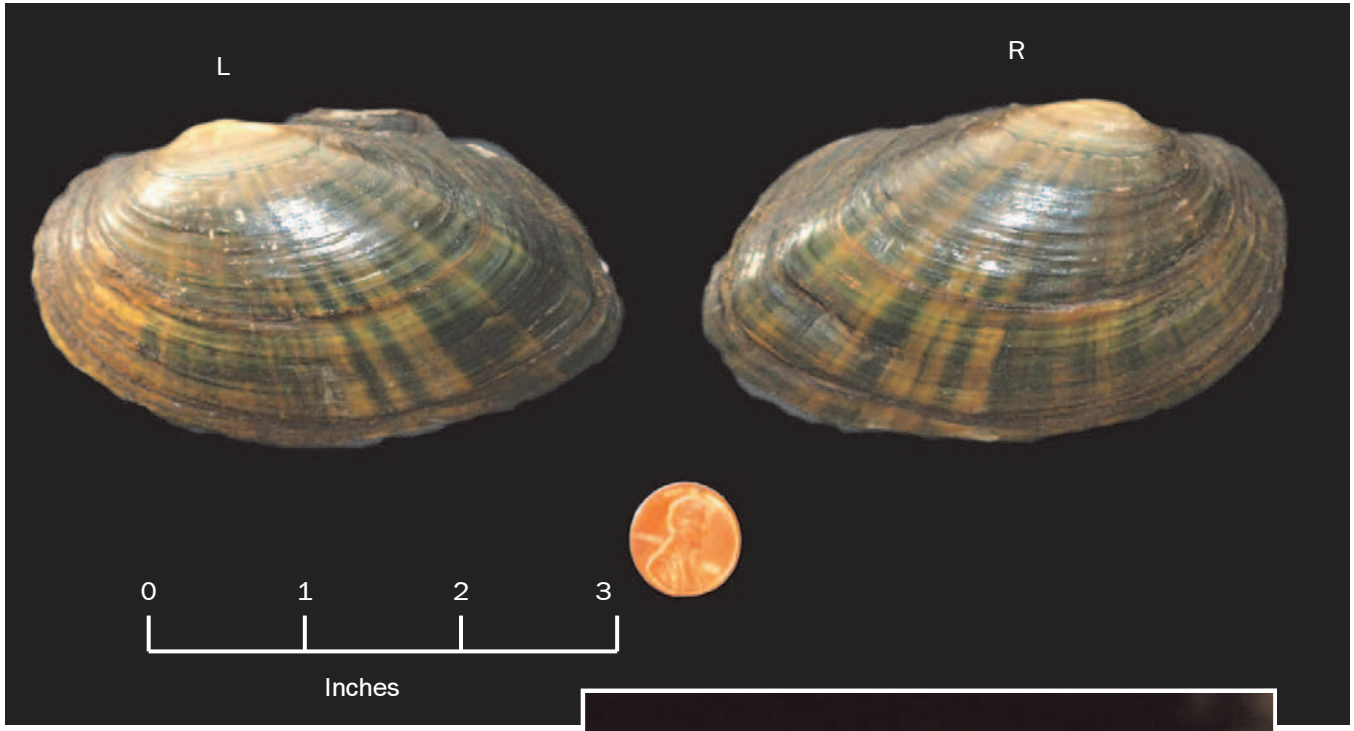
external views

ID. Aids:
External Surface – Young to middle-aged shells are moderately thin but solid, somewhat elongated, shiny and greenish, usually with many broad green rays. Beak sculpture, when visible, of several weakly double-looped raised lines. Old shells are thick, solid, often dark brown to black, rayless with robust teeth. Some shells are more ovoid and less elongated.
Internal Surface – Young to middle-aged shells with small but distinct triangular and divergent pseudocardinal teeth. Lateral teeth are stout. Older shells have robust teeth. Nacre is milky white to slightly bluish white and glossy when fresh.

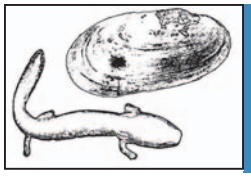
Distinguishing Features:
Similar Species – Ellipse, plain pocketbook, fatmucket.
Compared To – The plain pocketbook has a more inflated shell with less distinctive rays. The fat mucket male has a similar shape and teeth but is more elongated and has a sharply pointed posterior portion. The beak sculpture consists of six to eight double-looped bars in the fatmucket. The ellipse has a more yellow shell with a more roughened periostracum.
Beak Sculpture – Several weakly double-looped raised lines that are slightly thickened. Usually seen on younger shells, and often eroded in adults.
Beak Cavity – Shallow in young, fairly deep in old adults.
Color – The shell is shiny, yellowish green to green, usually with many broad green rays in young and middle-aged shells up to about four inches. The oldest shells appear brown to almost black with very faded rays or without rays. The shiny shell and green color help distinguish young muckets from ellipses of the same size.
Nacre – Shiny-white to slightly bluish-white with iridescence on the posterior region in fresh shells. The nacre appears milky-white without much iridescence in recently dead shells.
Teeth/Hinge – In young shells, the two pseudocardinal teeth in the left valve are somewhat bladelike, triangular, serrated and striated. The one in right valve is more peglike. There may be a smaller, accessory tooth anterior to the pseudocardinal tooth in the right valve. In old shells, teeth are more massive. Lateral teeth are well developed and are straight to slightly curved, with two in the left valve and one in the right.
Size/Shell Thickness – To seven inches. A 1.8 inch(45 mm) specimen measured 1.0 mm thick. A five inch shell, (125 mm), measured 2.8 mm. thick in the center.

Environmental Profile:
Habitat – Medium to large rivers in silty sand, sand and gravel, and occasionally in small cobble.
Hosts – Largemouth bass, smallmouth bass, bluegill, orangespotted sunfish, green sunfish, banded killifish, common carp, American eel, rock bass, silverjaw minnow, central stoneroller, and Tippecanoe darter.
Distribution /Status – Widespread and often abundant. Secure in IL, IN, WI, not ranked in MI. Of concern in more than half its range.



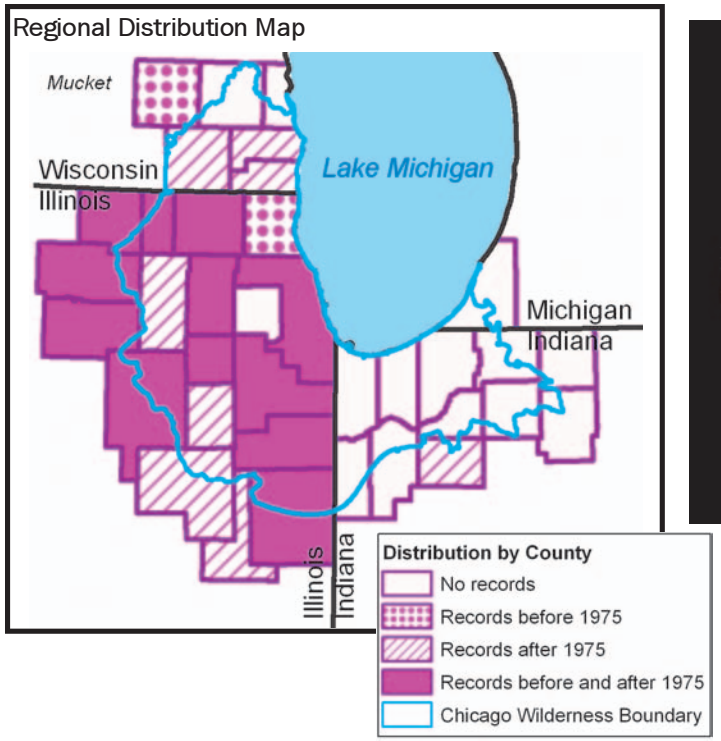


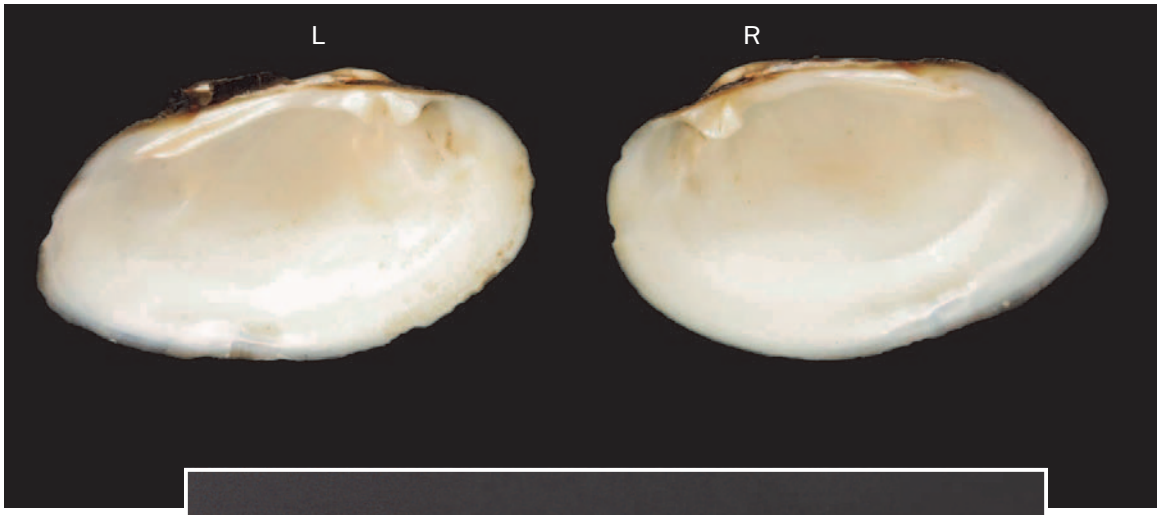
Raised lines which are weakly double-looped are present on this specimen. They are extremely difficult to see however, even with magnification. Ridges associated with beak sculpture are much less pronounced than for some other species. The pseudocardinal teeth for the left valve are prominent and robust.

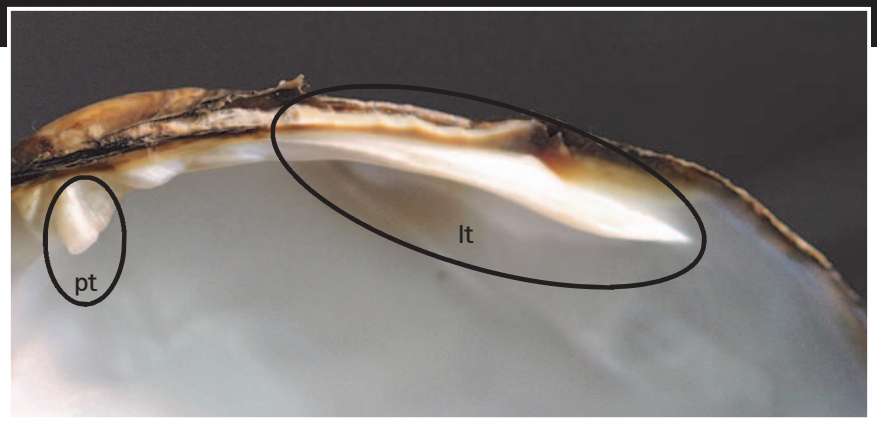


Mucket *Actinonaias ligamentina*
Subfamily Lampsilinae

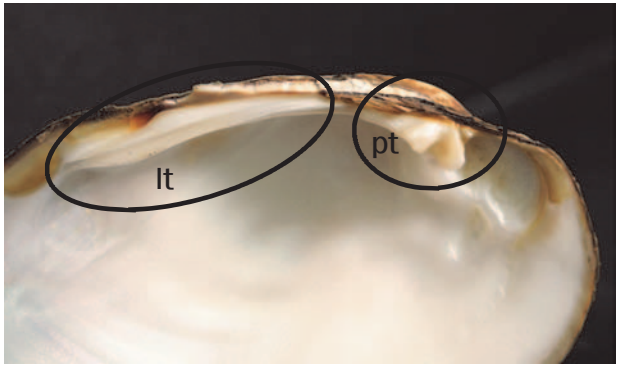
internal views



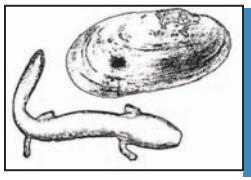




Close-up of the right valve showing a large erect, triangular, striated pseudocardinal tooth (pt). The smaller teeth which are anterior and posterior to the pseudocardinal tooth are referred to as "lamellar teeth." The lateral tooth (lt) is slightly curved and has fine striations. The striations are not apparent in this photo.



Close-up of the left valve . The left valve has "two stout, erect, divergent, triangular, striated pseudocardinal teeth." (Oesch, 1995). Divergent refers to the apices of the teeth pointing in different directions. The lateral teeth are short and slightly curved.



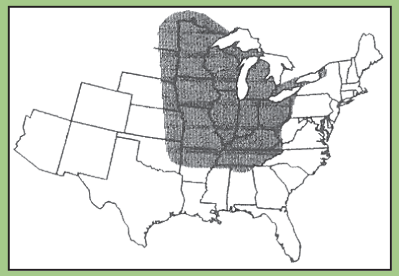
Pink heelsplitter *Potamilus alatus*
Subfamily Lampsilinae

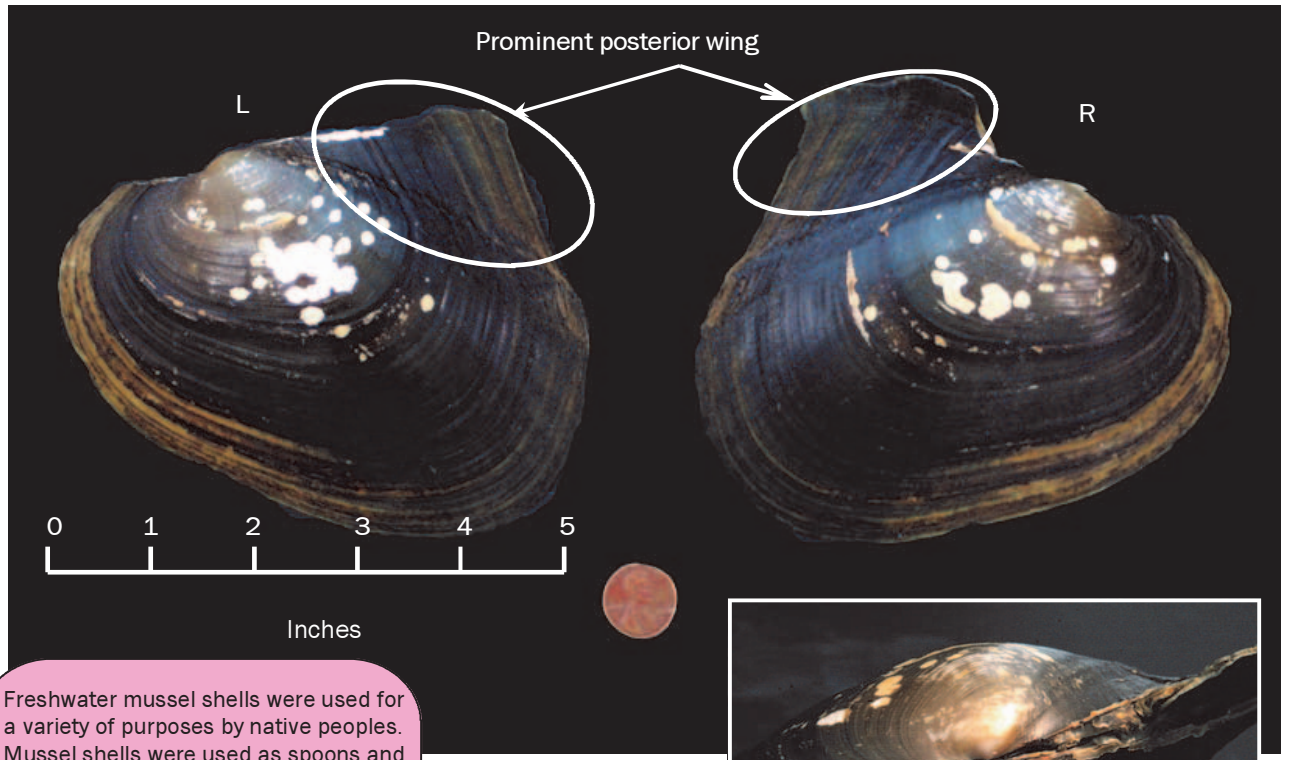
external views

ID. Aids:
External Surface – A thin shell, laterally compressed, relatively smooth with a very prominent posterior wing. Shell can be dark green through dark brown to almost black (in old shells), typically with dark green rays. Beaks (umbos) have very subtle concentric raised rings close to the apex, and young shells show more distinct sculpture.
Internal Surface – Pink to purple nacre.

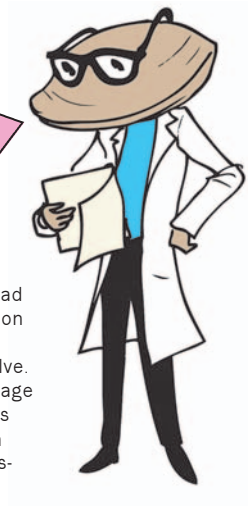
Distinguishing Features:
Similar Species – Pink papershell, fragile papershell, and white heelsplitter.
Compared To – The white heelsplitter has a thick, usually rough, dark colored shell with a distinctive beak sculpture and heavy pseudocardinal teeth. The fragile papershell usually has a lighter colored yellow to brown shell without a prominent wing. The pink papershell is very smooth and shiny externally. It is usually tan in color, and usually without rays. The nacre is purple or pink and the beak has three to four thickened ridges as sculpture.
Beak Sculpture – Three or four faint concentric raised lines close to the apex of the beak. These are much more distinctive in young shells.
Beak Cavity – Shallow.
Color –The shell can range from dark green to dark brown. Older shells appear almost black. Thick to thin darker green rays can be distinct to diffuse, and are more prominent on younger shells.
Nacre – Pink to purple in different shells and always highly iridescent.
Teeth/Hinge – Two pseudocardinal teeth and two lateral teeth in the left valve; one of each in the right. There may be another, smaller accessory pseudocardinal tooth in the right valve anterior to the main tooth in some shells. Pseudocardinal teeth are small, flattened, bladelike and serrated on the edges. Lateral teeth are thick, long, slightly curved and high.
Size/Thickness – To eight inches. The specimen pictured here is 3.0 mm thick toward the center and 1.0 mm thick toward the ventral edge.

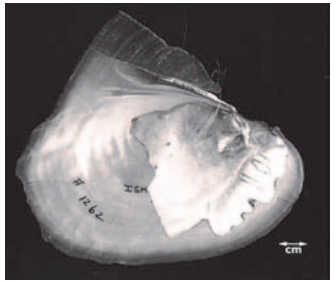
Environmental Profile:
Habitat – In medium to large rivers, in silt, sand and gravel.
Hosts – Freshwater drum.
Distribution/Status – Widespread and secure in IL, IN, WI. Unranked in MI.





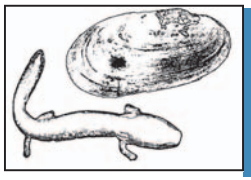
Freshwater mussel shells were used for a variety of purposes by native peoples. Mussel shells were used as spoons and also ground up and added to pottery to make it stronger. An engraved effigy of a profile of a human face carved from the shell of a pink heelsplitter was discovered during an archeological excavation at Cahokia Mounds, in southern Illinois. Cahokia Mounds was site of the largest city north of Mexico during the Mississippian period (900-1450 AD).





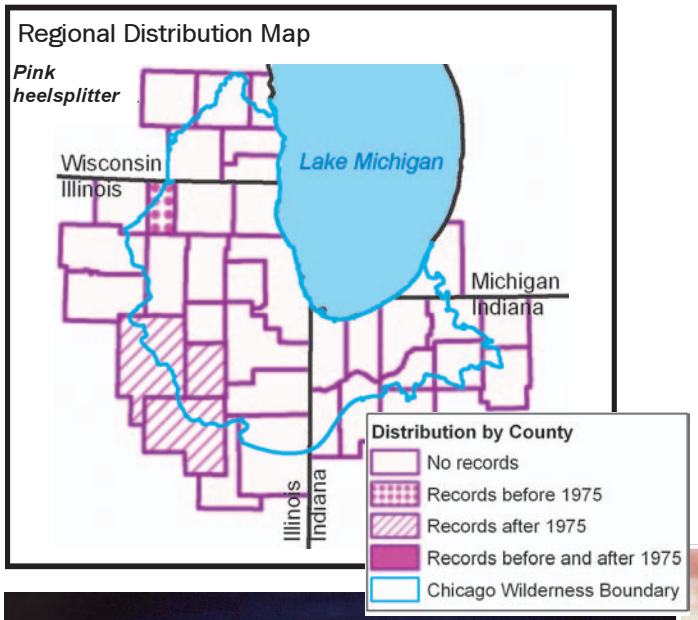
The human head effigy overlain on an intact pink heelsplitter valve. (Composite image courtesy Illinois State Museum and Carol Kussman)

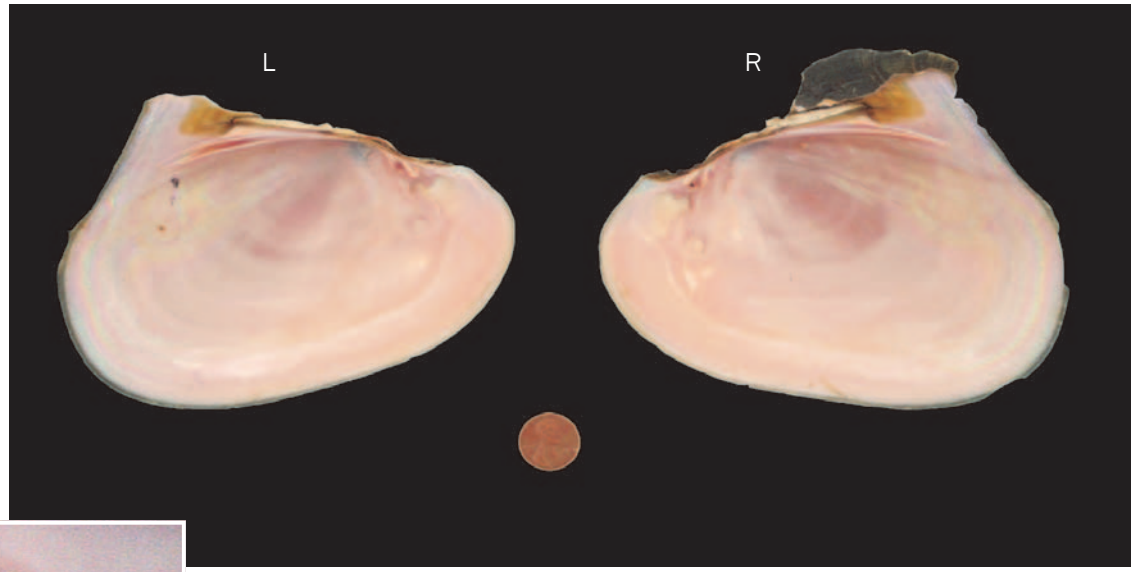
Close-up of the umbo of a pink heelsplitter. Umbo is flattened and only slightly elevated above the hinge line. Beak sculpturing of three or four concentric ridges is only apparent in young specimens that have not been eroded. Beak sculpture is not apparent in this specimen. Very fine concentric ridges extend down the surface of the valve and become more pronounced ventrally.

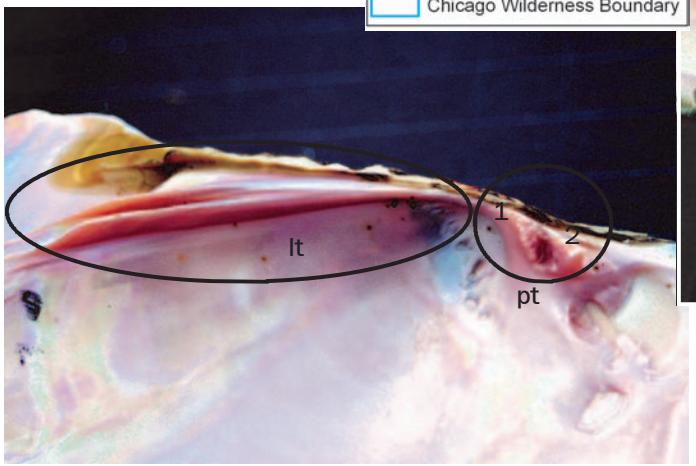


Pink heelsplitter *Potamilus alatus*
Subfamily Lampsilinae

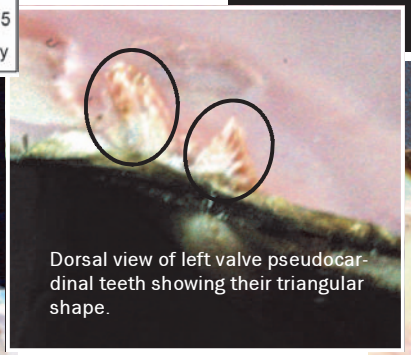
internal views



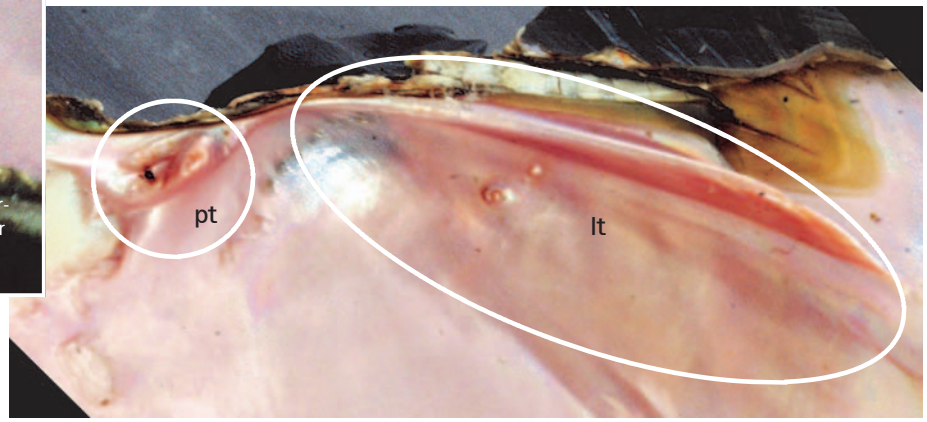




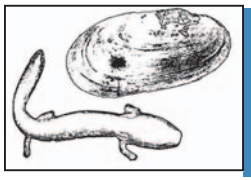
Left valve showing slight curvature of the two lateral teeth (lt) and the two triangular pseudocardinal teeth (pt), and pink iridescence.



Dorsal view of left valve pseudocardinal teeth showing their triangular shape.



Close-up of right valve showing a single bladelike lateral tooth (lt) and a peglike, triangular pseudocardinal tooth (pt).



Pink papershell *Potamilus ohiensis* external views

Subfamily Lampsilinae

ID. Aids:

External Surface – A thin shell, laterally compressed, very smooth and glossy, with a very prominent posterior wing. A small anterior wing is often present. Shell can be yellowish brown to olive green and typically does not have green rays. Beaks have very subtle concentric raised rings with nodules close to the apex, and young shells show more distinct sculpture.

Internal Surface – Often light purple, sometimes pink. Weak pseudocardinal teeth.

Distinguishing Features:

Similar Species – Pink heelsplitter, fragile papershell, and white heelsplitter.

Compared To – The adult white heelsplitter has a thick, usually rough, darker colored shell with a distinctive beak sculpture and heavy pseudocardinal teeth. The fragile papershell usually has a lighter colored yellow to brown shell often with rays, without a prominent wing, and has indistinct teeth. The pink heelsplitter has a heavier, rougher shell with larger pseudocardinal teeth.

Beak Sculpture – Two to four faint concentric raised lines with bumps or swellings on the lines close to the apex of the beak. Occasionally, the concentric lines are not visible and only the bumps are present, and even these may be subtle. The bumps may be somewhat elongated.

Beak Cavity – Shallow, with flat umbos either not protruding above the hinge line or just barely protruding.

Color – Adults are smooth and shiny, yellowish brown to dull green and usually without rays. Young shells are very shiny and smooth, appearing to be lacquered.

Nacre – Highly iridescent, usually light purple though pink specimens are encountered. The color may be uniform throughout or become more diffuse further from the umbo.

Teeth/Hinge – Pseudocardinal teeth are small, flattened, bladelike and serrated on the edges. Lateral teeth are thin, long, and slightly curved. Two pseudocardinal and two lateral teeth in the left valve, one each in the right.

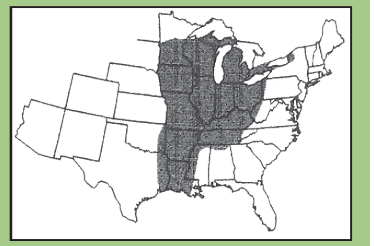
Size/Thickness – To seven inches. A 3.8 inch (96 mm) long shell measured 0.8 mm thick.

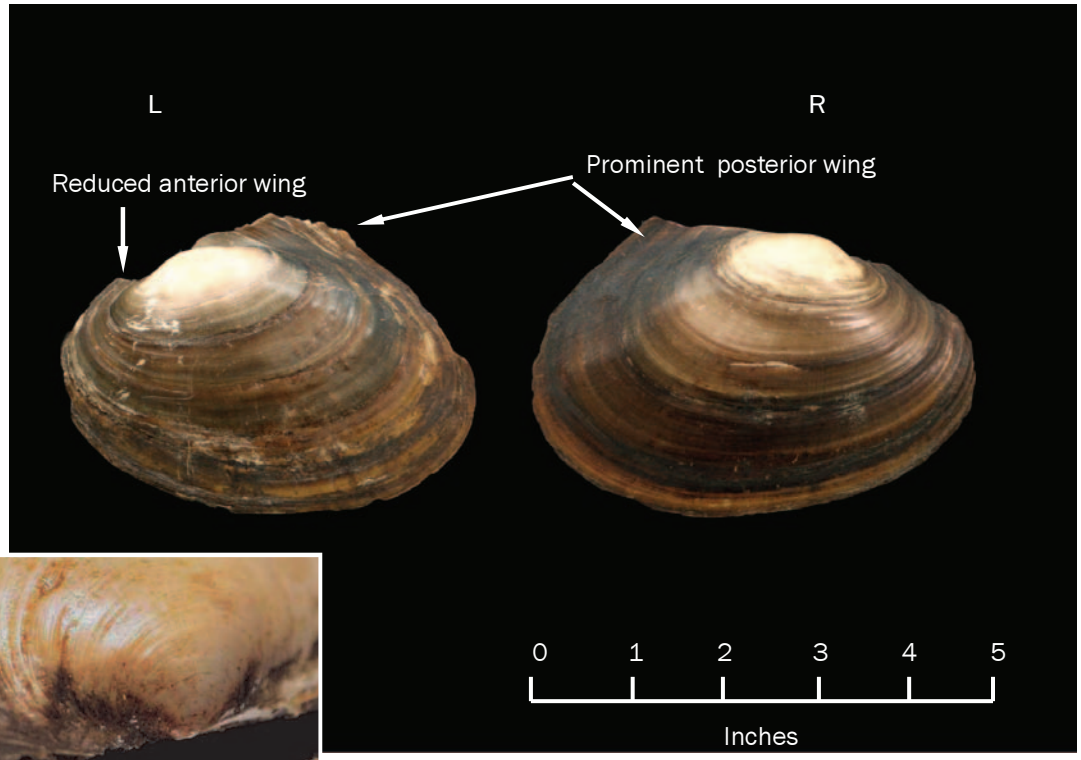
Environmental Profile:

Habitat – In medium to large rivers, in silt, sand and mud.

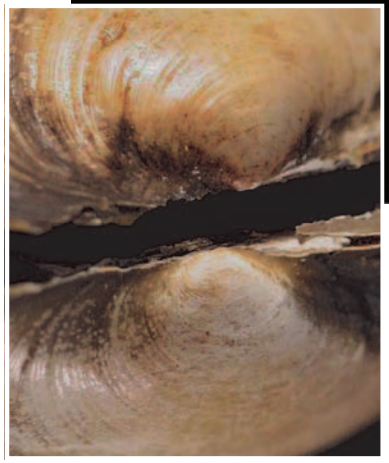
Hosts – Freshwater drum and white crappie.

Distribution /Status – Widespread and apparently secure in IL. Imperiled in WI, vulnerable in IN, not ranked in MI.

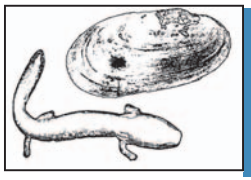




The periostracum (outside shell surface) is relatively shiny in the pink papershell. The ventral edge of the pink papershell is rounded whereas the pink heelsplitter is straighter.

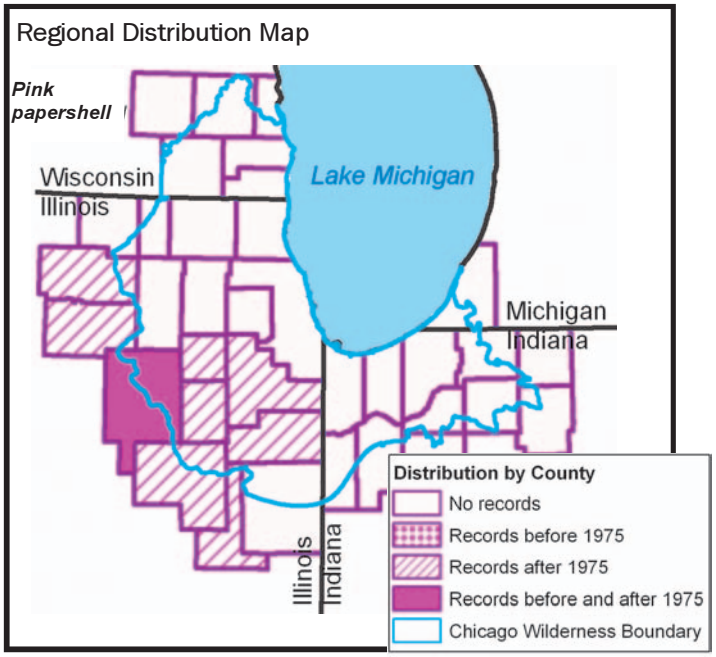


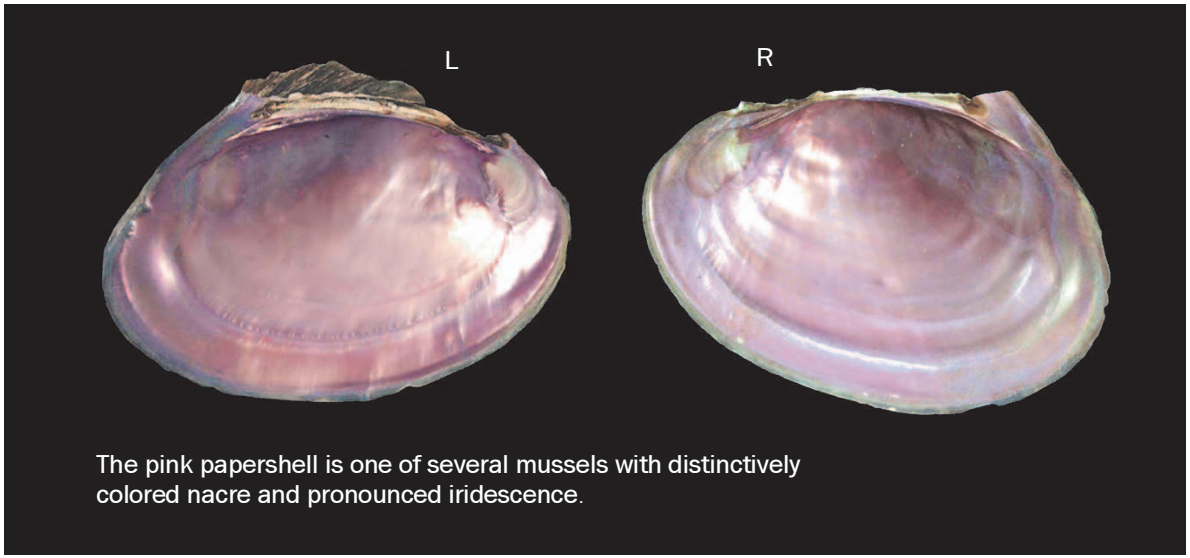
Close-up of the umbo. The umbo is very slightly elevated above the hinge line. Three to four concentric rings make up the beak sculpture but are often eroded in older specimens. This specimen is highly eroded and thus the beak sculpture is not very clear.



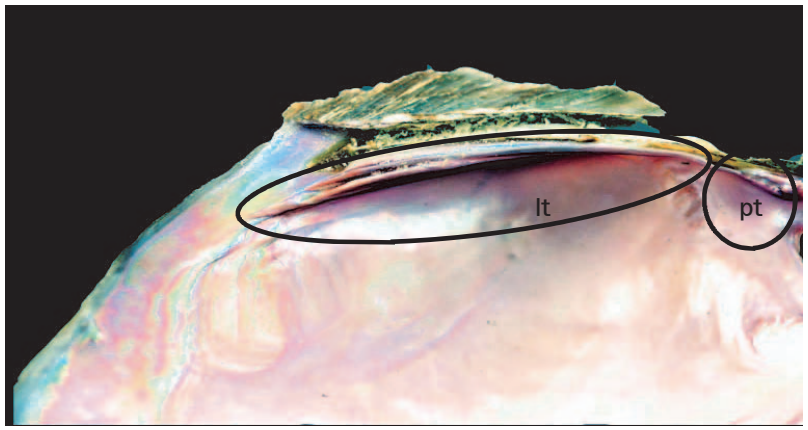
Pink papershell *Potamilus ohiensis*
Subfamily Lampsilinae

internal views

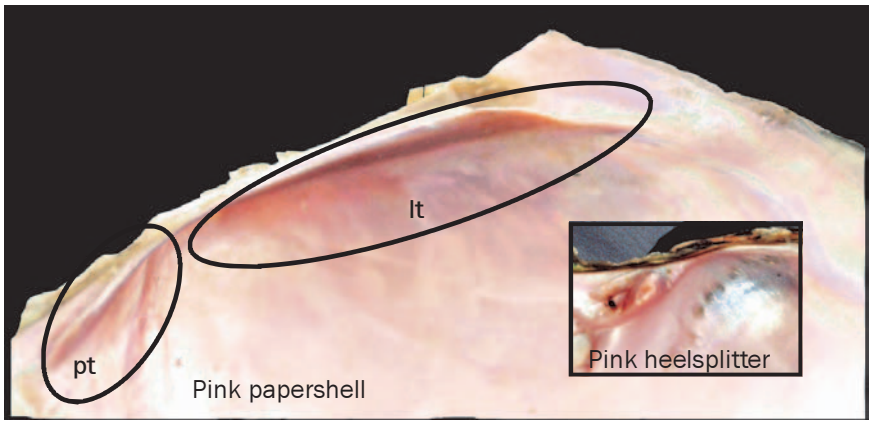




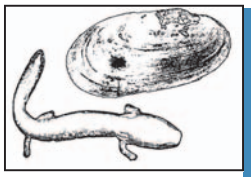
The pink papershell is one of several mussels with distinctively colored nacre and pronounced iridescence.



Close-up photo of the left valve showing the pronounced iridescence of the nacre. There are two small, thin, curved lateral teeth (lt) and an extremely shallow beak cavity. The pseudocardinal teeth (pt) are greatly reduced and are bladelike. There may be two or there may be only a single pseudocardinal tooth.



The right valve contains a single lateral tooth (lt) and a single pseudocardinal tooth (pt). Note the bladelike character of the pseudocardinal tooth. The thin shell and the bladelike character of the pseudocardinal tooth help to distinguish this species from the pink heelsplitter which looks very similar. The right pseudocardinal tooth from a pink heelsplitter is shown on the inset for comparison. Notice that it is more peglike.



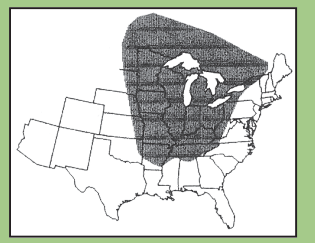
Plain pocketbook *Lampsilis cardium*
Subfamily Lampsilinae

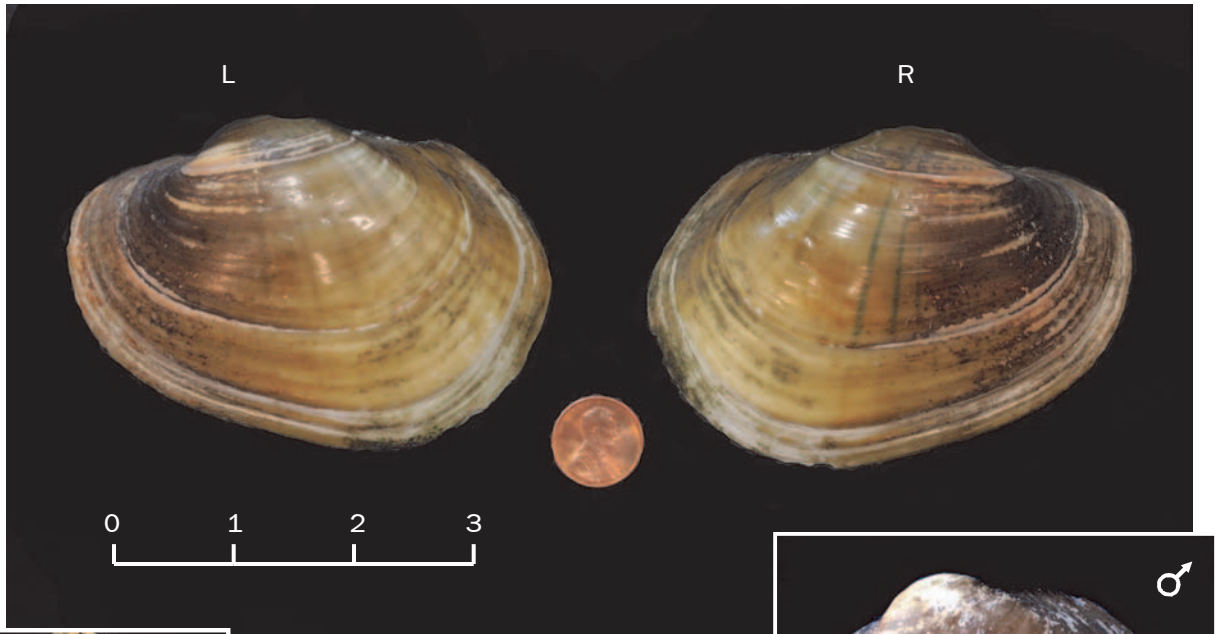
external views

ID. Aids:
External Surface – Large sized, moderately thick, inflated shell with a beak sculpture of three to five heavy, rough, raised lines. Beaks distinctly angled forward. Shell width is wide or inflated. Color ranges from yellow to brown, with or without green rays.
Internal Surface – The pseudocardinal teeth are somewhat small but distinct, divergent and bladelike in the left valve. The right valve has a single, peglike pseudocardinal tooth. The nacre is usually white and iridescent posteriorly.

Distinguishing Features:
Similar Species – Mucket, ellipse, fatmucket.
Compared To – The plain pocketbook has distinct beak ornamentation compared to similar species. The ellipse has three or four fine, double-looped lines as beak sculpture, and has a much smaller, more compressed shell. The mucket often has a much heavier, less inflated shell, a beak sculpture of double-looped lines, and a posterior edge that angles away more steeply. The fatmucket has a more elongated shell with double-looped lines as beak sculpture.
Beak Sculpture – Beak is distinctly raised above hinge line and turned forward. The sculpture is usually three to five thick, rough, concentric but elongated raised lines. The lines can appear to be slightly double-looped in some specimens. The sculpture is often eroded away, especially on older shells.
Beak Cavity – Deep.
Color – Shell is usually smooth and shiny, especially when young. Young shells are yellowish with few to many green rays that are often thin. Older shells are rougher, yellowish to tan, or dark brown and have few to many, thin to thick green rays that are usually less distinct than they are on juvenile shells. Many adults appear rayless.
Nacre – White to pale bluish white and iridescent posteriorly. Occasionally with tinges of orange or pink near the beak cavity.
Teeth/Hinge – Lateral teeth are well formed, slightly to moderately curved, and striated on the ends, with two in the left valve and one in the right. Two pseudocardinal teeth in the left valve are small but distinct, divergent, somewhat triangular and bladelike. One stout, roughened and serrated pseudocardinal tooth in the right valve, occasionally with a second, smaller tooth anterior to the main one.
Size/Thickness – To seven inches. A 2.4 inch, (60 mm) specimen was 1 mm thick. A 6.2 inch, (157 mm) shell was 7.0 mm thick in the center.

Environmental Profile:
Habitat – Small streams to large rivers in stable, compacted mud, through stable sand or gravel, most often in current. Occasional in impoundments.
Hosts –Tiger salamander, green sunfish, bluegill, smallmouth bass, largemouth bass, yellow perch, white crappie, sauger, and walleye.
Distribution /Status – Common but under review in IL, MI. Apparently secure in WI, IN.

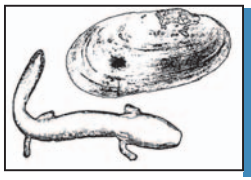




Plain pocketbooks are characteristically inflated.

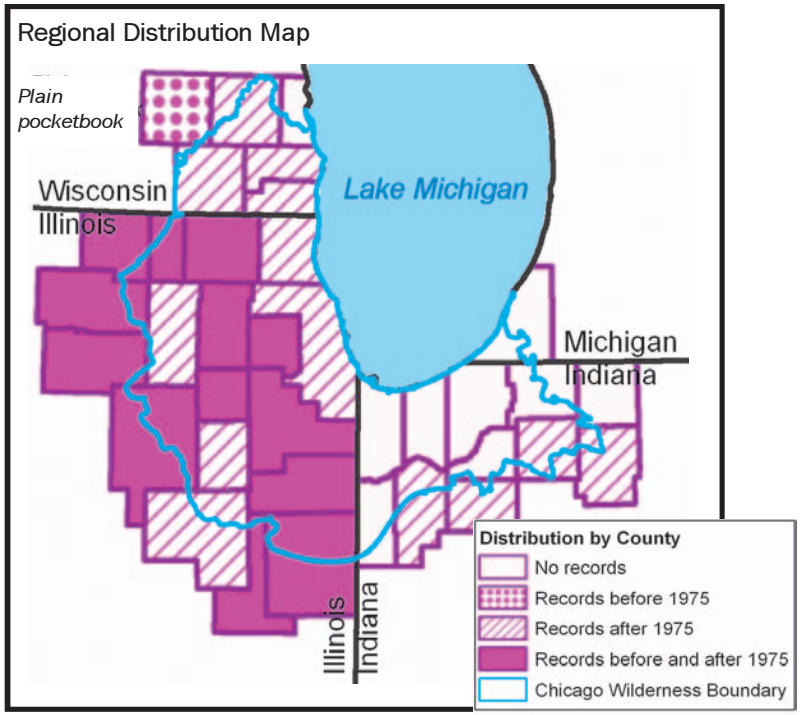
The beak sculpture is usually three to five thick, rough, concentric but elongated raised lines. The lines can appear to be slightly double-looped in some specimens. The sculpture is often eroded away, especially on older shells.

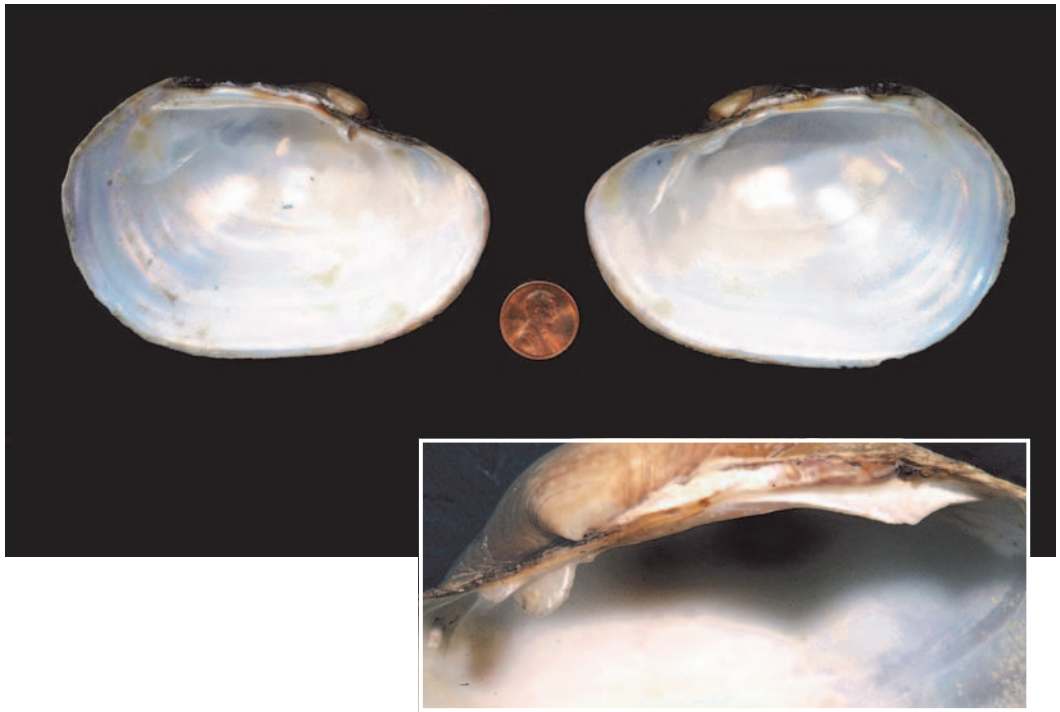
A male (top) and a female (bottom). Males are described as having the anterior end rounded and the posterior end "bluntly pointed." Females are described as having a "truncated" posterior margin. All mussels belonging to the subfamily Lampsilinae show sexual dimorphism.



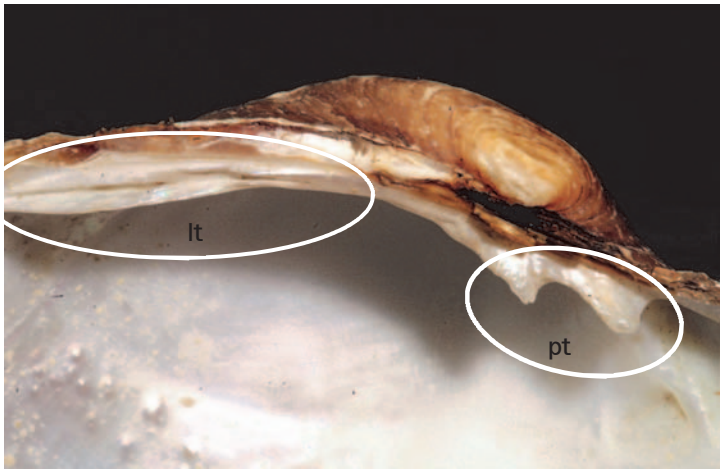
Plain pocketbook *Lampsilis cardium*
Subfamily Lampsilinae

internal views

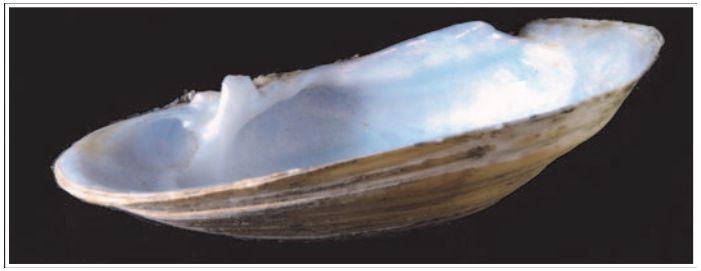




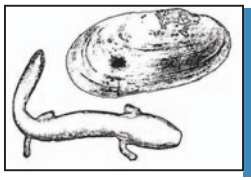
Dorsal view of right valve showing two bladelike pseudocardinal teeth and a single lateral tooth. This species usually has a single pseudocardinal tooth in the right valve, but occasionally has a second smaller one as seen here.



Close-up of left valve showing two triangular bladelike pseudocardinal teeth (pt) and two lateral teeth (lt).



Ventral view of right valve showing pseudocardinal and lateral teeth from a different angle.



Rainbow *Villosa iris*
Subfamily Lampsilinae

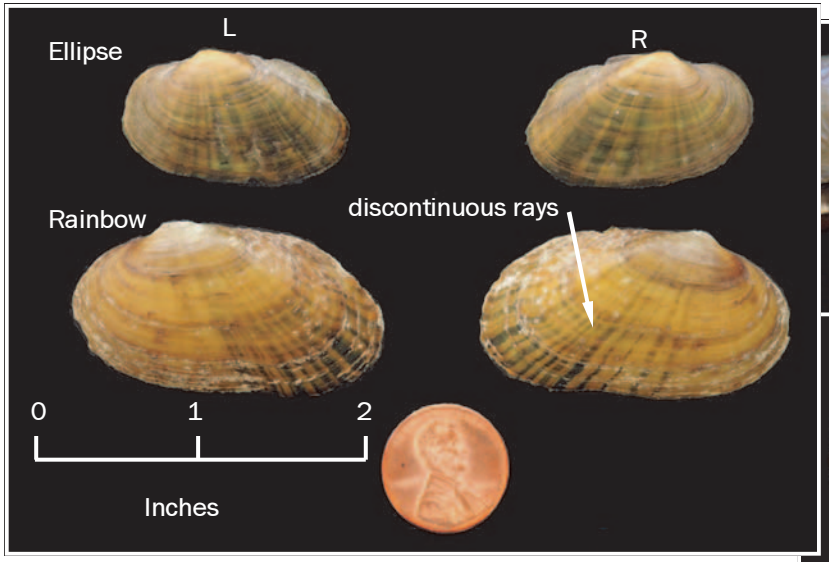
State Listed as Endangered: IL, WI

external views

ID. Aids:
External Surface – Small, elongate, thin-shelled, with double-looped beak sculpture and yellow to brown color with broken green rays.
Internal Surface – Bluish white, highly iridescent nacre. Small but distinct teeth.

Distinguishing Features:
Similar Species – Ellipse, fatmucket, mucket.
Compared To – The rainbow has broken green rays, is thinner shelled, and has a distinct beak sculpture, compared to the fatmucket, ellipse, and mucket of similar sizes.
Beak Sculpture – Usually three to six sharply defined raised, double-looped lines that are rounded at the top.
Beak Cavity – Shallow.
Color – Broken green rays on a yellowish to tan background color in younger shells. Some older shells may appear brown, with many broken, very dark green rays that can be indistinct.
Nacre – Very shiny, bluish to silvery white. Very iridescent especially on posterior half of shell. The iridescence is less noticeable on all but the freshest shells.
Teeth/Hinge – Pseudocardinal teeth small, but distinct. Somewhat triangular, elongated and heavily serrated and grooved, two in left valve, one in the right, often with a much smaller accessory tooth anteriorly. Lateral teeth long, thin, well developed and straight to slightly curved.
Size/Thickness – To three inches. A 2.4 inch, (60 mm), shell is 0.8 mm thick.

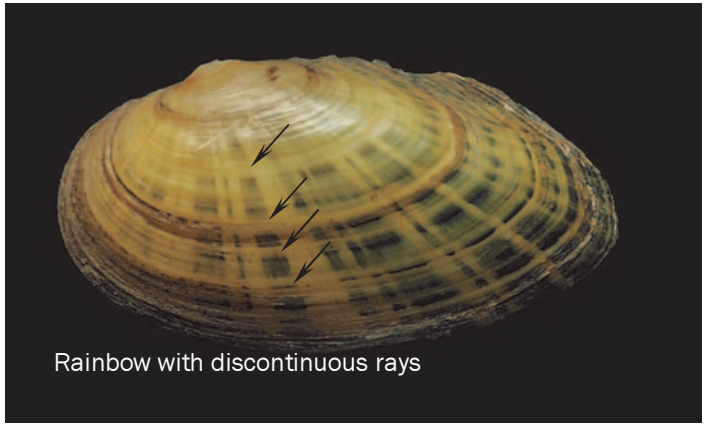
Environmental Profile:
Habitat – Small to medium sized rivers in silty sand, to gravel.
Hosts – Mottled sculpin, greenside darter, rainbow darter, green sunfish, largemouth bass, smallmouth bass, striped shiner, yellow perch, rock bass, and other species outside of the Chicago Wilderness region.
Distribution /Status – Endangered in IL and WI, of special concern in IN, imperiled in MI.

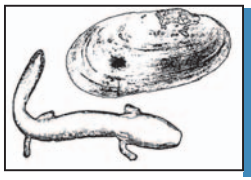



Rainbow Umbo


Young ellipse with continuous rays

The rays on the ellipse tend to be continuous, without a break. By contrast the rays on the rainbow mussel are often broken up by patches of background color; they are discontinuous. This can be difficult to discern even with the close-up photography being used here. A magnifier is useful when trying to distinguish these two species. Rays fade and become indistinguishable as the ellipse shell ages and becomes darker. The ellipse generally has a thicker shell than comparably sized rainbow specimens.


Rainbow with discontinuous rays

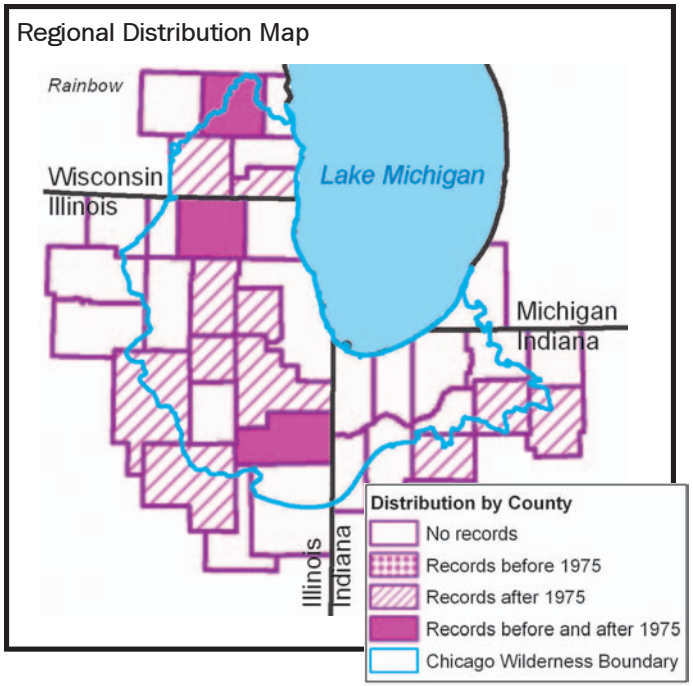


Rainbow *Villosa iris*
Subfamily Lampsilinae

State Listed as Endangered: IL, WI

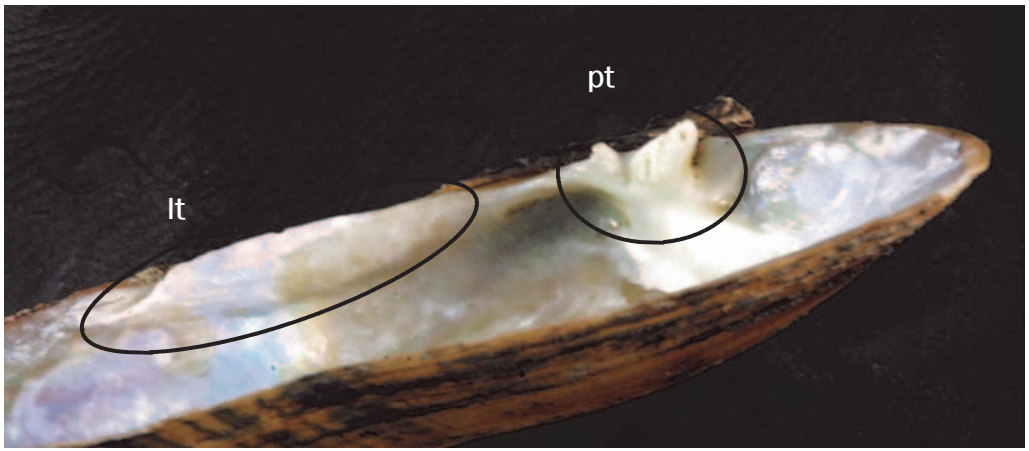
internal views

Regional Distribution Map

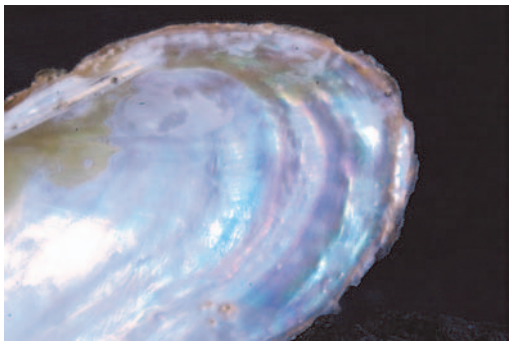


Left valve of the ellipse (back) and the rainbow (front). The pseudocardinal teeth of the ellipse have been described as “heavy , roughened and divergent.” The pseudocardinal teeth of the rainbow have been described as “small, triangular, and somewhat divergent.” Internal configurations of teeth are very similar in the rainbow and the ellipse.

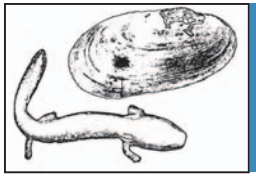
Right valves of the ellipse (back) and the rainbow (front). The shells of the ellipse are thicker for their relative size than those of the rainbow. It would be very difficult to distinguish the two species based on teeth alone.



Left valve of the rainbow showing two divergent pseudocardinal teeth (pt) and a single lateral tooth (lt). Remember this is NOT the usual condition for the left valve. Normally there are two lateral teeth in the left valve.



The rainbow is noted for its iridescence and this is probably how it got its name. Both the ellipse and rainbow can be iridescent. The thicker shell of the ellipse, however, tends to make it more opaque across the anterior half of the shell. Note that iridescence will change with the camera or viewing angle.



Snuffbox *Epioblasma triquetra*
Subfamily Lampsilinae

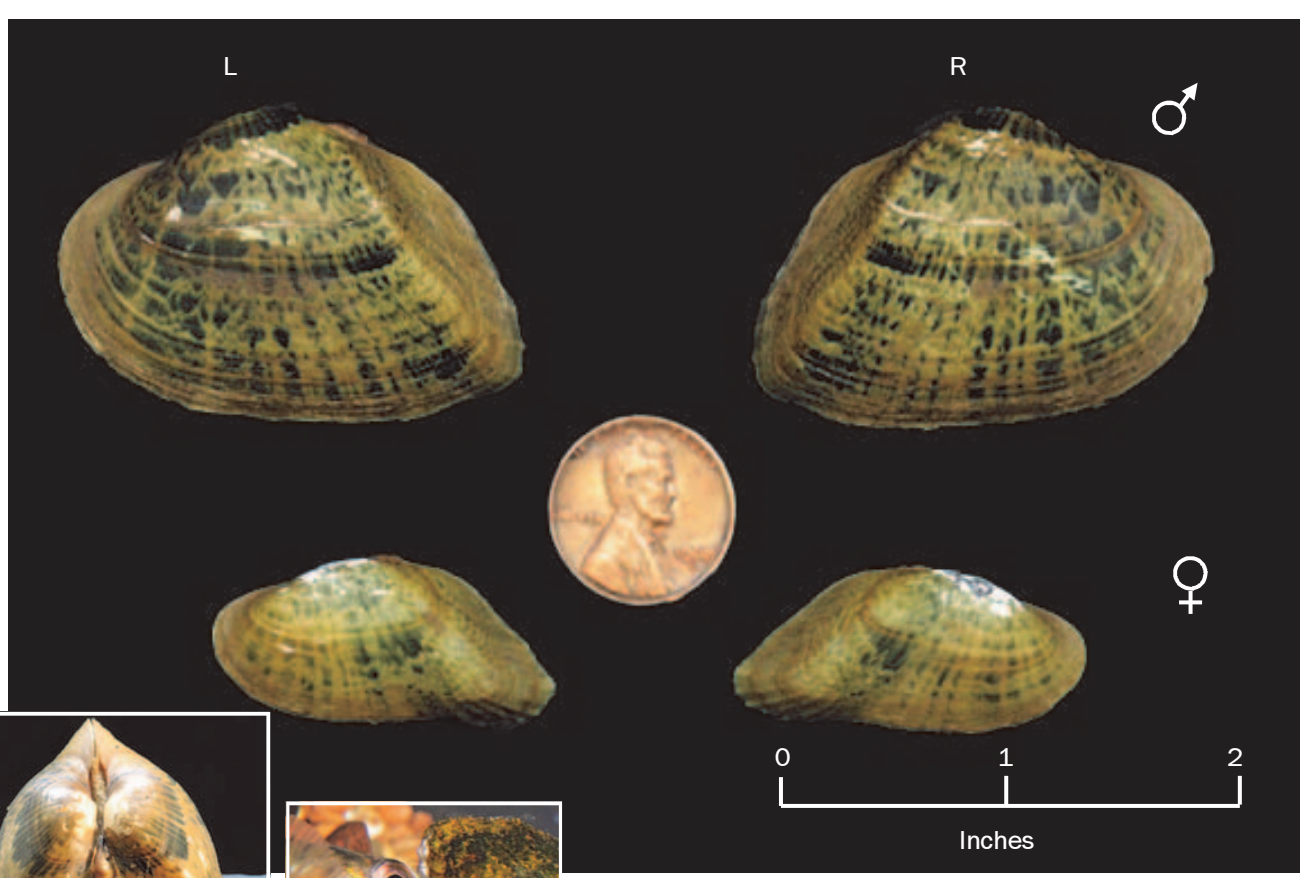
external views

State Listed as Endangered: IL, WI, IN, MI

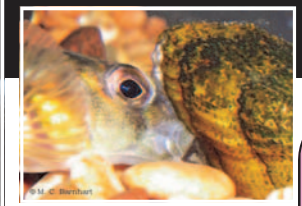
ID. Aids:
External Surface – A small, stout, elongated shell with pointed posterior end that is yellowish to greenish with broken green rays or blotches. The males are somewhat triangular in shape and the smaller females are more inflated and somewhat ventrally pinched posteriorly. Posterior shelf is ribbed and ribbing is more prominent in males.
Internal Surface – White nacre, bladelike pseudocardinal teeth

Distinguishing Features:
Similar Species – Elktoe, deertoe, fawnsfoot.
Compared To – The snuffbox has a broader umbo and distinct umbo sculpture from the rest. The elktoe can have similar markings but has a distinctive shape when compared to the snuffbox. The fawnsfoot has a similar shape to the male snuffbox, but has a narrower umbo. The deertoe may have similar markings but has a different shape to the ventral edge of the shell.
Beak Sculpture – Three to five very fine raised lines that are weakly double-looped. Most adults have eroded umbos. The beaks are broad and slightly to moderately raised above the hinge line.
Beak Cavity – Moderately deep to very deep.
Color – Smooth, yellow to yellowish brown with green blotches, and many broken green rays composed of green speckles. Occasionally small, green chevron shaped markings make up the rays.
Nacre – Lustrous white and posteriorly iridescent, especially along the posterior edge.
Teeth/Hinge – Pseudocardinal teeth are distinct, bladelike, serrated and roughened, with two in the left valve and two in the right. Lateral teeth are striated, curved, short and stout, extending about one third of the shell length.
Size/Thickness – To 2.5 inches. A 1.7 inch (43 mm) long shell measured 3.7 mm thick in the center.

Environmental Profile:
Habitat – In creeks to large rivers.
Hosts – Mottled sculpin, logperch, blackside darter.
Distribution /Status – Endangered in IL, WI, IN, MI and in most of the rest of its range.

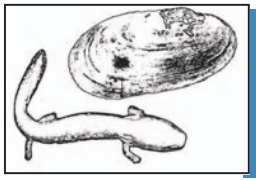


Dorsal surface from posterior view. Note that the umbo is slightly elevated above the hinge line and the posterior surface is ribbed. Ribbing is especially prominent in males.



A logperch with its nose caught by a snuffbox. (Courtesy of Chris Barnhart, Missouri State University)

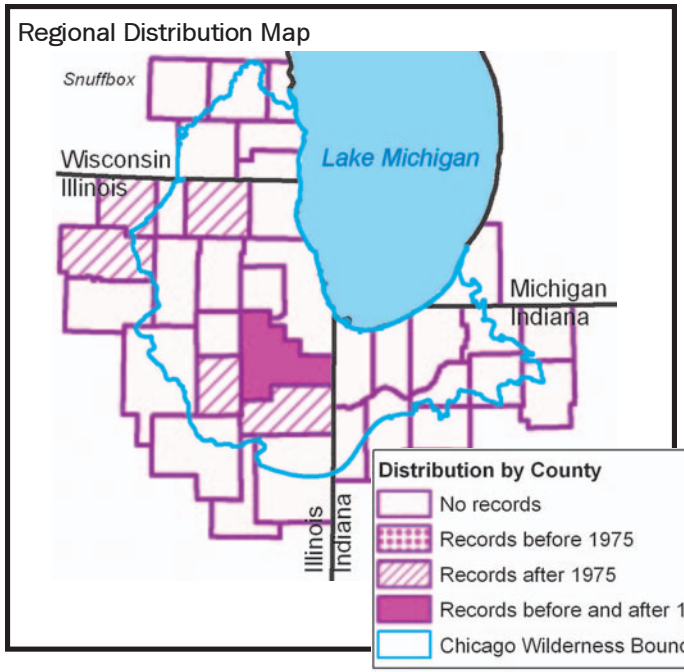
Many freshwater mussels need a host to carry their larvae or "glochidia." Hosts are usually fish, and the tiny glochidia hitchhike a ride by clamping onto their gills. This allows mussels to disperse throughout a stream. They eventually drop off and begin the sedentary life of an adult. The females of some species lure fish close to them so they can release their larva onto the fish. These species have soft mantle tissue that resembles small fish or worms. Hungry fish approach, and become a traveling boat for glochidia. The snuffbox actually clamps its shell down onto the snouts of fish that try to bite the lure, and holds them while releasing glochidia.

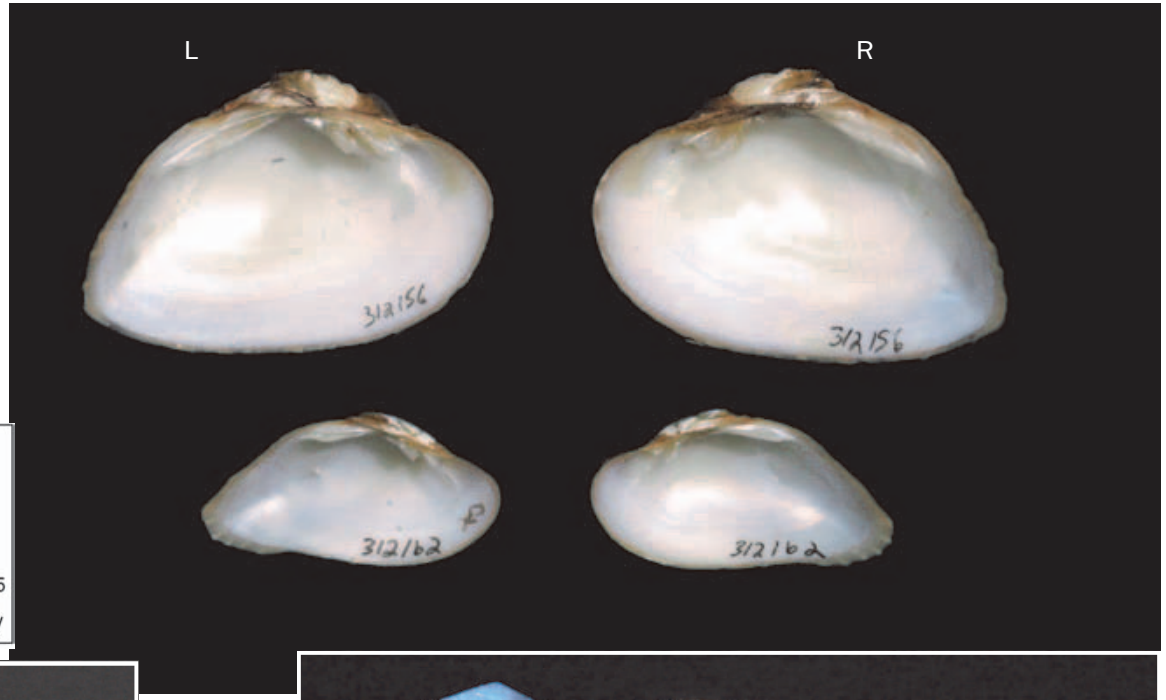


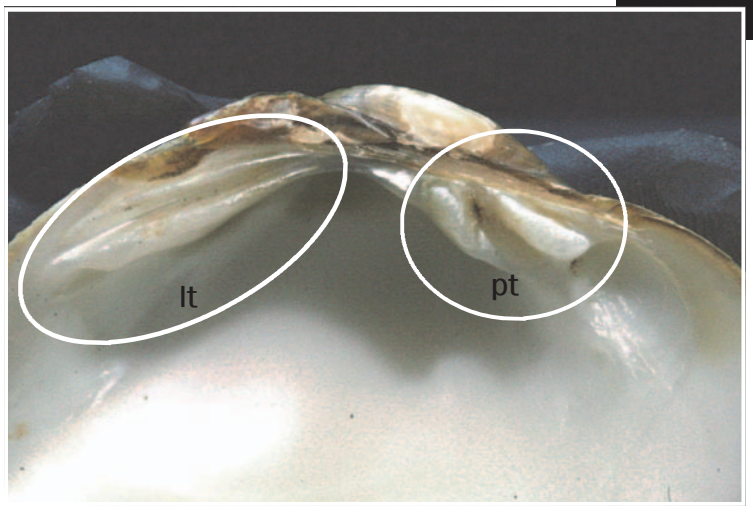
Snuffbox *Epioblasma triquetra* internal views

Subfamily Lampsilinae

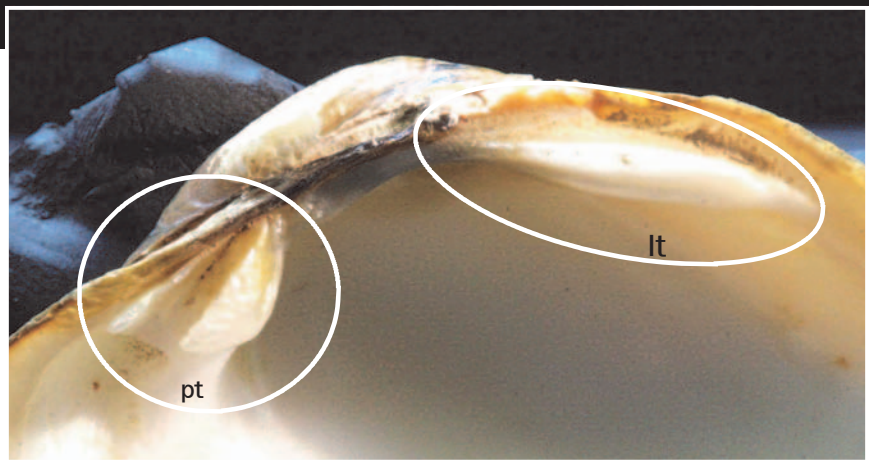
State Listed as Endangered: IL, WI, IN, MI



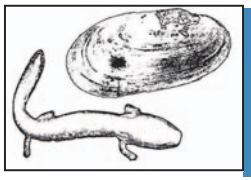




Close-up of the left valve showing two bladelike pseudocardinal teeth (pt) and two lateral teeth (lt). Notice that the pseudocardinal teeth are curved.



The right valve has two curved pseudocardinal teeth and two lateral teeth. The front lateral tooth is thinner and much smaller than the main lateral tooth.



Yellow sandshell *Lampsilis teres*
Subfamily Lampsilinae

State Listed as Endangered: WI

external views

ID. Aids

External Surface – Elliptical shape. A heavy, elongated shell with pointed posterior end. The shell is yellow and the beak sculpture is of fine loosely double-looped raised lines. Ventral portion of the shell is pinched slightly upward at the midline in many specimens. Male posteriorly pointed medially, female posteriorly pointed above the medial axis of the shell.

Internal Surface – Silvery white nacre, bladelike pseudocardinal teeth.

Distinguishing Features:

Similar Species – Fatmucket, black sandshell.

Compared To – While the shape of the black sandshell and yellow sandshell is very similar, the color of the black sandshell is much darker, even in juveniles, while the yellow sandshell keeps its yellowish hue. The fatmucket of both sexes is much broader and less elongated in shape than the yellow sandshell. The beak sculpture of the fatmucket is composed of thicker raised lines in a slightly different pattern. The upwardly pinched mid-ventral portion of the yellow sandshell is lacking in the fatmucket.

Beak Sculpture – Up to seven thin raised lines, weakly double-looped and appearing as if stretched out from each end.

Beak Cavity – Moderately deep. The beaks are low but raised above the hinge line.

Color – Younger shells are smooth, glossy, yellowish and often rayed with green. Older shells are smooth, dull, yellow to yellowish brown and are usually rayless

Nacre – Silvery white and posteriorly iridescent. Occasionally with light orange tinge, especially near the umbos.

Teeth/Hinge – Pseudocardinal teeth are small but distinct, bladelike, and roughened. Lateral teeth are strongly built, moderately long, about half the shell length and slightly roughened. Two pseudocardinal and two lateral teeth in the left valve, one each in the right, sometimes with a smaller anterior pseudocardinal tooth.

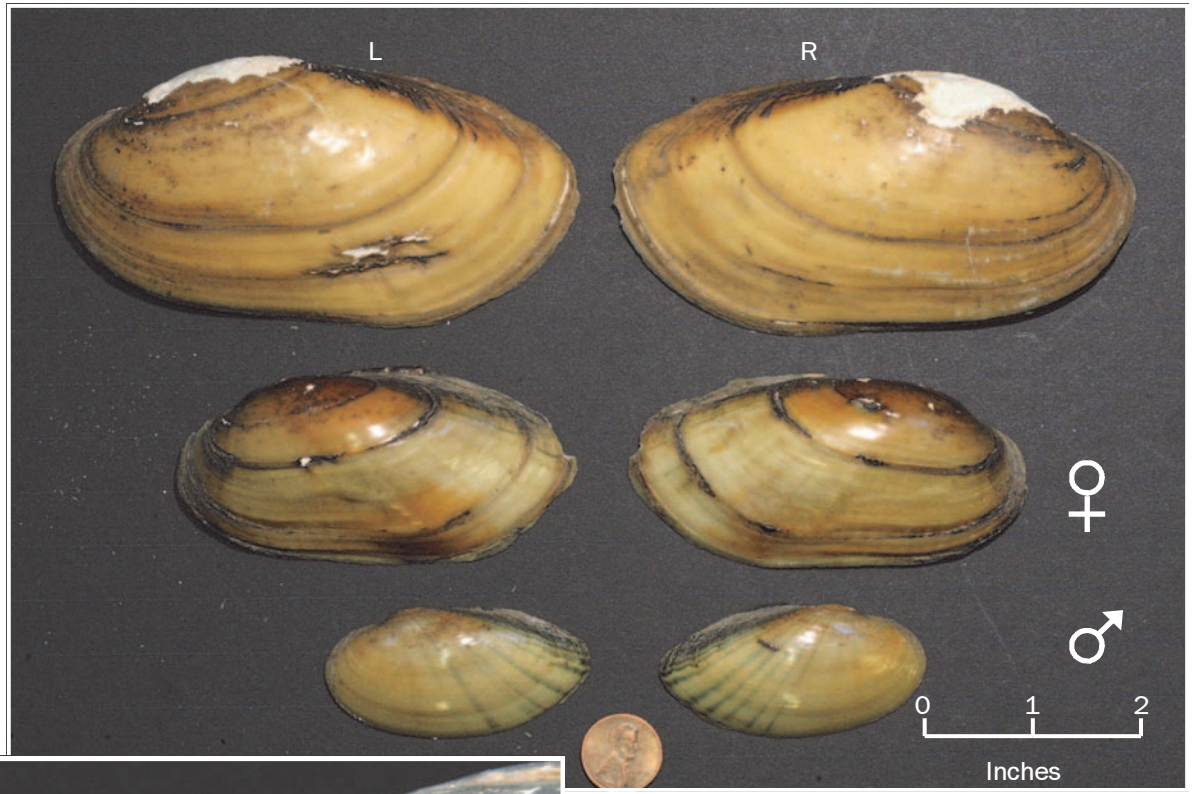
Size/Thickness – To six inches. A 4.3 -inch (108 mm) long shell measured 3.7 mm thick in the center.

Environmental Profile:

Habitat – In medium sized and large rivers in sand or small gravel.

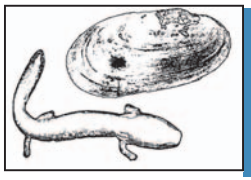
Hosts – Alligator gar, longnose gar, shortnose gar, green sunfish, warmouth, bluegill, orangespotted sunfish, and several other species outside of the Chicago Wilderness area.

Distribution /Status – Uncommon. Apparently secure in IL, endangered in WI, imperiled in IN, not present in MI. Imperiled in much of its northern range. The Chicago Wilderness region is on the northern edge of this mussel's range.



Sandshells of three different ages. Note the presence of rays on the youngest shell but the oldest shell is rayless. Also note the shiny appearance of the surface.

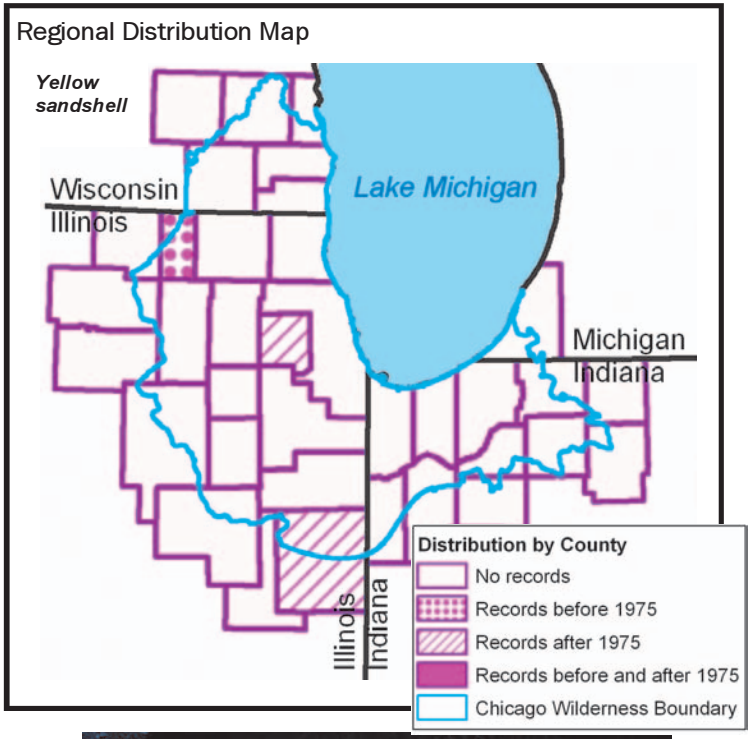
The beak sculpturing is distinctive in this specimen. It is made up of up to seven thin, raised lines which are double-looped. Note the pseudocardinal teeth which can be seen below the hinge line.

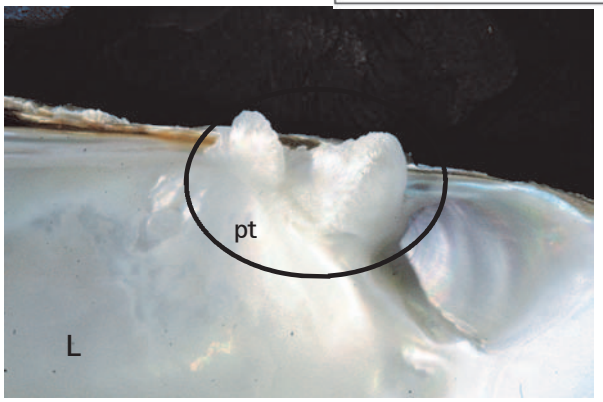


Yellow sandshell *Lampsilis teres*
Subfamily Lampsilinae

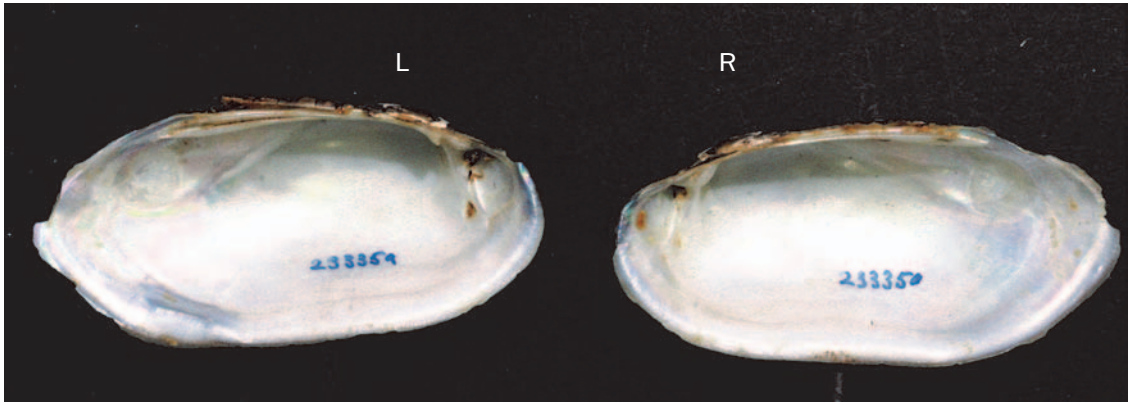
State Listed as Endangered: WI

internal views

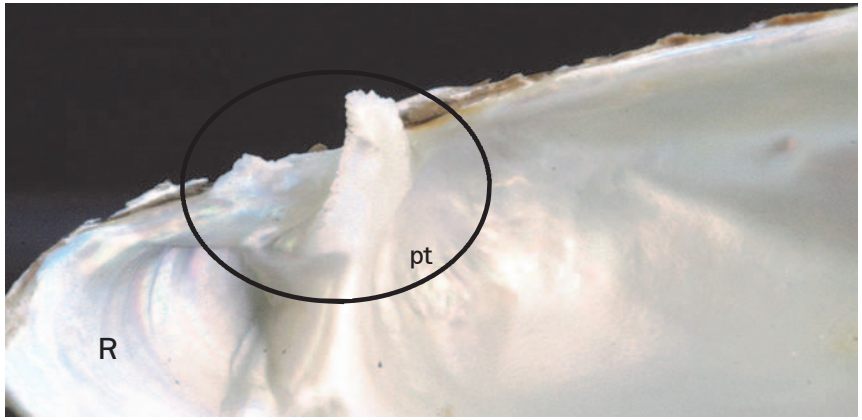




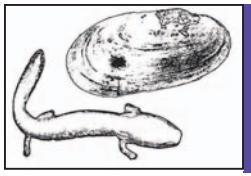
The left valve has two pseudocardinal teeth that are serrated and bladelike.



The yellow sandshell has an elongate shape. There are two pseudocardinal teeth and two lateral teeth in the left valve and single pseudocardinal tooth and lateral tooth in the right valve. The nacre is silvery white with iridescence on the posterior half of the valve. Many of the museum specimens that were examined had an orange cast in the beak cavity.



Right pseudocardinal teeth (pt). Note the curved bladelike appearance and the secondary anterior pseudocardinal tooth (lamellar tooth). The lateral tooth is long, quite thin and roughened.



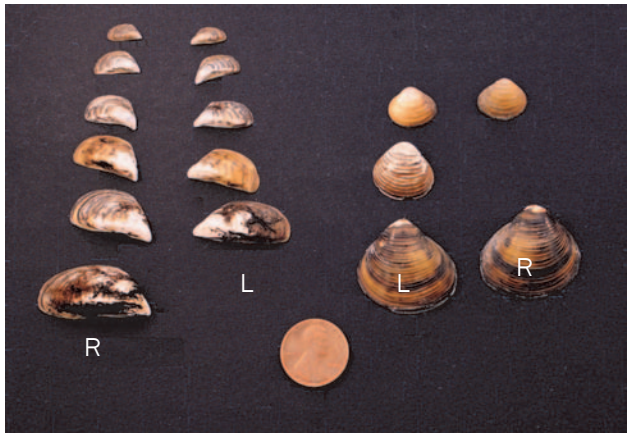
Zebra mussel *Dreissena polymorpha,* Quagga mussel *Dreissena bugensis,* Asian clam *Corbicula fluminea,*

Exotics external and internal views

Sphaeriidae fingernail clams

INVASIVE SPECIES

Zebra and quagga mussels are native to eastern Europe and western Asia. They were accidently introduced to North America in the 1980s, when seagoing ships dumped ballast water containing their larvae in Great Lakes ports. They have spread to many areas of North America. Their presence threatens the survival of native mussels. They are able to reproduce rapidly and they have fewer predators in North America. They don't need hosts to carry their larvae. A single zebra mussel can produce up to a million eggs a year. Larvae and adults can take over aquatic communities, filtering huge amounts of water and removing algae and plankton that would otherwise be available as food for native mussels, fish, and invertebrates.

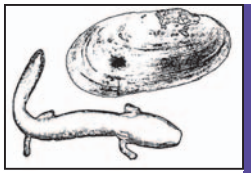


Zebra mussels (on the left) and Asian clams (on the right) are small as adults compared to most native mussels. Zebra mussels and Asian clams reach only about 1.5 inches in length. This photograph shows the sizes of various zebra mussel shells and Asian clam shells compared to a penny. The umbo on the Asian clam is displaced slightly in the direction of the anterior surface.

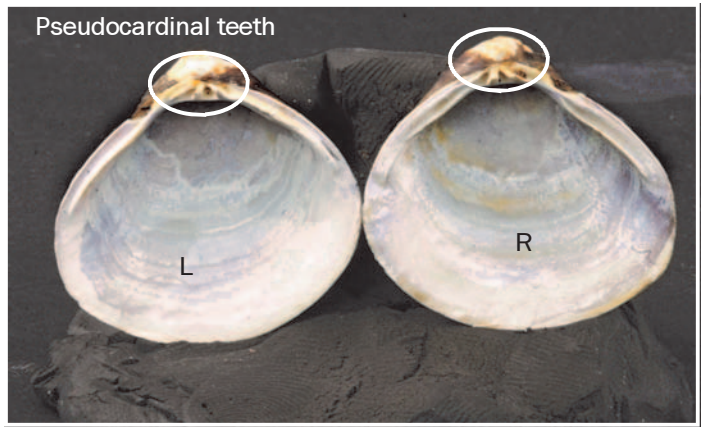
Internal and external views of zebra mussel valves. The zebra mussel's teeth are virtually absent but a distinctive shallow shelf (see arrows) is present. The mussel has a triangular shape and the surface is characterized by alternating dark and light bands, like the stripes of a zebra. Its name *polymorpha* (many forms) refers to the fact that it can be highly variable in color.

Quagga mussel and zebra mussel compared. Both the zebra mussel and the quagga mussel have dark stripes on a tan background. The quagga mussel (top) has a rounded angle on the ventral surface (V) which makes it topple over on a flat surface. The zebra mussel (lower specimen) will remain upright when placed in this position.

Zebra mussels are unusual freshwater mussels because they attach to hard, stable surfaces and are difficult to remove, a trait more common to saltwater species. Pictured here is a giant floater with a zebra mussel "horde" all over it. Becoming habitat for zebra mussels threatens the survival of a native mussel because it restricts the native mussel's ability to move, feed, reproduce and respire.



Close-up photograph of the external surface of an Asian clam. The shell can vary from yellow to dark brown. The periostracum has numerous concentric raised ridges.



The Asian clam has "paired" lateral teeth in each valve; two in the right valve and one in the left. The lateral teeth have fine serrations which are difficult to see unless a magnifier is used. Each valve has three pseudocardinal teeth just below the umbo. The nacre can be white or purple.

Asian clams are native to southeast Asia. They were first noted in North America in 1924 on the west coast of Canada. Asian clams have spread to rivers, streams, lakes and ponds throughout the United States. A single Asian clam can produce up to 70,000 juveniles per year.

Fingernail clams are a native species that superficially look like Asian clams. However, adult fingernail clams are smaller than adult Asian clams and the lateral teeth of the fingernail are smooth, not striated.

Ultra close-up of the pseudocardinal teeth and the lateral teeth of an Asian clam. Fingernail clams can look very much like the Asian clam. Asian clams are distinguished however, by the serrations on the lateral teeth (see arrow). Pseudocardinal teeth have been numbered for greater clarity.

GLOSSARY

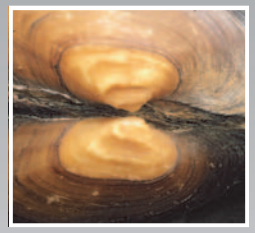
Anterior - The front portion of the shell. This is the portion that is buried in the substrate, and the single foot protrudes from here. The umbo is on the anterior surface.

Beak Sculpture - The thick or thin raised lines on the beak, often in repeating patterns. Together, these lines are called the sculpture, which is often helpful for identification of species. Other authors refer to these lines as bars or ridges.

Multiple wavy ridges

Double-looped ridges

Concentric Ridges



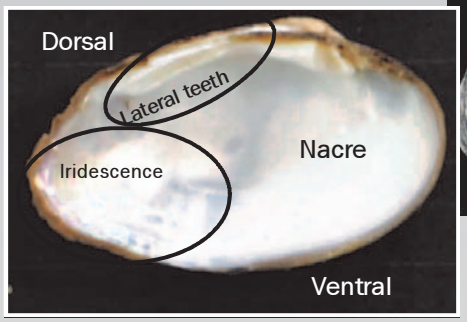
Elevated heavy ridges

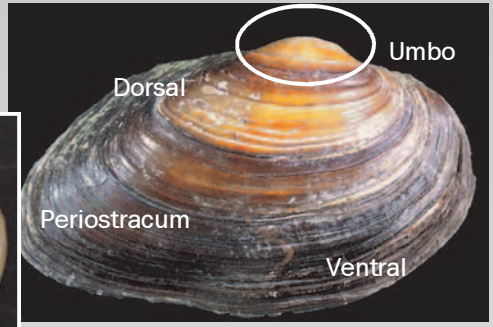
Concentric fine lines

Beak - Umbo. The raised area of the shell on the edge of the dorsal surface.
Compressed – Flattened or pressed together laterally.

Inflated - Swollen or expanded.

Concentric - Having a common center.





Dorsal - The top portion of the shell for anatomical discussion. This area of the mussel contains the hinge and the teeth. In life, the dorsal portion of the shell, as it is buried in the substrate, is more or less perpendicular to the substrate.

Interdentum - A small shelf of mother-of- pearl that connects the lateral teeth with the pseudocardinal tooth area. This is present in some mussels and absent in others.

Iridescent - Exhibiting rainbow colors.

Furrow - A distinct groove in the shell's surface that demarcates one section of the shell from another.

Grooves - Heavy lines in the teeth; or heavy lines in the shell that radiate from the beak region.

Host - The fish or salamander that carries larval mussels around for a short time and nourishes them.

Lateral teeth - Teeth are not really teeth in mussels. They are modifications of the shell for articulating the left and right valves (or shells). Lateral teeth are always posterior of pseudocardinal teeth and are generally long and thin.

Nacre - Mother-of-pearl that lines the interior of the shell and comprises the fabric of the shell. Mother of pearl in mussel shells is 3000 X stronger than inorganic crystals of the same material.

Periostracum - The tough, external "skin" containing the color and markings that cover the surface of the living shell. This thin skin eventually weathers away.

Posterior - The back or rear portion of the shell. The incurrent and excurrent siphons protrude from this area.

Pseudocardinal Teeth - Can be peglike, bladelike, or triangular but they are always anterior of lateral teeth.

Pustules - Bumps or small, raised rounded protuberances on the shell's surface.


Pustules on a pimpleback

Shell shapes -


Elongate


Round


Quadrate


Triangular


Elliptical

Shape - The shape of the shell is best described as how you picture it in your mind. What we might call "an elongated, cylindrical shell" might be called cigar shaped by some or banana shaped by others. Truncate refers to a posterior margin that is squared off. In the guide the fatmucket is described as "moccasin shaped". Shape can be diagnostic.

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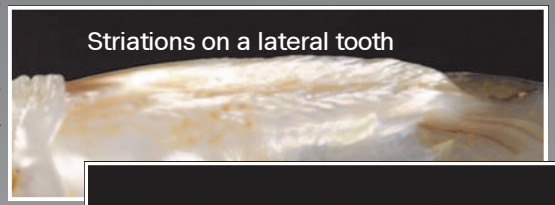
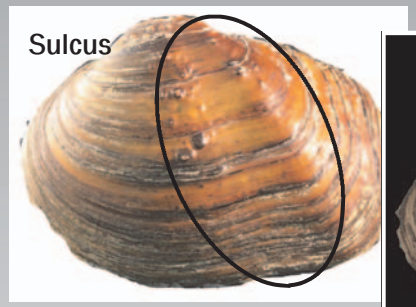
Striations - Light lines or shallow grooves.

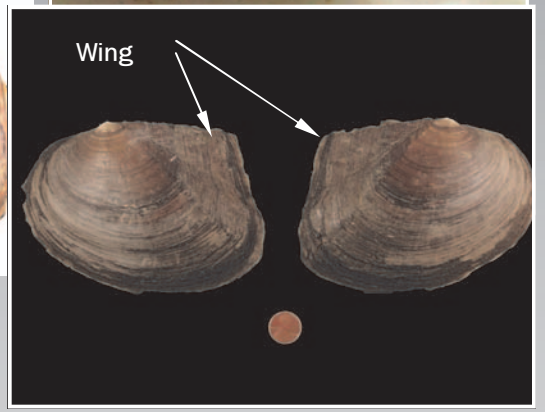
Serration - Notched or deeply grooved; defined and sometimes regular pattern similar to the edge of a steak knife.


Striations on a lateral tooth


Serrations on pseudocardinal teeth

Sulcus - A large but shallow and broad depression on the external shell surface. Its presence can be diagnostic in some species.


Sulcus


Wing

Tubercles - Pustules, or small, raised, rounded protuberances on the shell surface.

Umbo - Typically a raised section on the dorsal margin of the shell, it can be rounded or even triangular. Sometimes the umbo is flattened

Unionidae - The dominant family of freshwater mussels in North America
Unionid - the common way of referring to the freshwater mussel family Uniondiae

Valve - One of the two halves of the shell.

Wing - Flattened section of valve on the posterior or anterior perimeter of the dorsal surface

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