Missouri mussel invaders

Two exotic freshwater mussels, the Asian clam (Corbicula fluminea) and the zebra mussel (Dreissena polymorpha), have found their way to Missouri. The Asian clam was introduced into the western U.S. from Asia in the 1930s and quickly spread eastward. Since 1968 it has spread rapidly throughout Missouri and is most abundant in streams south of the Missouri River. Asian clam and zebra mussel larvae have an advantage here because they don’t require a fish host to reach a juvenile stage and can reproduce at a much faster rate than native mussels. Zebra mussels attach to any solid surface, including industrial pipes, native mussels and snails and other zebra mussels. They form dense clumps that suffocate and kill native mussels by restricting feeding, breathing and other life functions. You can help stop the spread of these mussels by not moving bait or boat well water from one stream to another; dump and drain on the ground before leaving. Check all surface of your boat and trailer for zebra mussels and destroy them, along with vegetation caught on the boat or trailer. Wash with hot (104°F) water at a carwash and allow all surfaces to dry in the sun for at least five days before boating again.

Asian clam and zebra mussel larvae have an advantage here because they don’t require a fish host to reach a juvenile stage and can reproduce at a much faster rate than native mussels. Zebra mussels attach to any solid surface, including industrial pipes, native mussels and snails and other zebra mussels. They form dense clumps that suffocate and kill native mussels by restricting feeding, breathing and other life functions. You can help stop the spread of these mussels by not moving bait or boat well water from one stream to another; dump and drain on the ground before leaving. Check all surface of your boat and trailer for zebra mussels and destroy them, along with vegetation caught on the boat or trailer. Wash with hot (104°F) water at a carwash and allow all surfaces to dry in the sun for at least five days before boating again.

Resources


Missouri Naiades: A Guide to the Mussels of Missouri. Ronald D. Drisch, Missouri Department of Conservation, 1995. A guide with drawings and detailed descriptions of all Missouri mussels. Note that many of the scientific names have changed since it was updated, but common names used in the book are noted here. (Available from Nature Shop, Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180 for $6, plus $2 for shipping and handling. Missouri residents add 6.225 percent sales tax.)

courses.umass.edu/mcb095f/gallery/

The Unio Gallery at Southwest Missouri State University contains some of Dr. Chris Barnhart’s fascinating photos and videos of the life cycle of mussels.

www.inhs.uiuc.edu/cbd/musselmanual/cover.html


equal opportunity to participate in and benefit from programs of the Missouri Department of Conservation is available to all individuals without regard to their race, color, national origin, age, sex or disability. Complaints of discrimination should be sent to the Department of Conservation, P.O. Box 180, Jefferson City, MO 65102. OR U.S. Fish & Wildlife Service, 28th and “C” Streets NW, Washington D.C. 20240, Missouri Relay Center 1-800-735-2966 (TDD).

Copyright © 2002 by the Conservation Commission of the State of Missouri. E 000129

SUE BRUENDERMAN, JANET STERNBURG AND CHRIS BARNHART
Freshwater mussels occur throughout Missouri in a variety of habitats. Some species, like the fatmucket, are widespread and likely to be found in most Missouri rivers. Other species, like the purple warby, may live in several regions but are found in greatest numbers in areas with particular physiographic characteristics.

What good are mussels, you ask?

Freshwater mussels are an important food for raccoons, mink, otters and some waterfowl and fish. Mussels may subsist on freshwater mussels during winter months, leaving piles of shells on the river bottom, requiring a tough muscular foot. Plus, a mussel can live longer than most humans. They tell us if our water is clean enough for people and livestock to drink. They can live longer than most humans.

Feeding and reproduction

A freshwater mussel's body is mostly a long muscular foot that contracts and withdraws into the shell if pulled from the stream bottom. On either side of the foot is a pair of specialized gills that allow the mussel to breathe and filter-feed. Water is drawn into the body or mantle cavity through the incumbent siphon and passes over the gills that extract oxygen and food (algae and fine particles of decaying organic matter). While food travels to the mussel's stomach, sediment and undigested wastes (called pseudofeces) quickly exit through its excurrent siphon, becoming food for other aquatic animals. Freshwater mussels have a complex life cycle. The larval stage is parasitic on a host, typically a fish. During the breeding season, males release sperm into the water and they enter the female via her incumbent siphon to fertilize the eggs. If modified gills are a brooding chamber for embryos that mature into microscopic larvae, called glochidia (glo-kid-ee-ah). Mussels feed food into carrying their larvae. Some mussels release their larvae in packages that resemble the host fish's food while other mussels have special lures to draw a fish in close. For example, the mantle flap of a female pocketbook mimics a minnow to lure in bass. The bass attempts to eat the “minnow,” and it gets a mouthful of glochidia. Glochidia clamp shut on the gills or fins of the host fish (which usually doesn't harm the fish). If the fish is the correct host, the glochidia are attached for days or weeks, develop into juveniles and drop to the stream bottom. If they land in a suitable habitat, they grow to adults and repeat the cycle. If glochidia don't find a suitable host fish or they land in poor habitat, they will die.

Mussels are biological indicators of water quality because they are long-lived and relatively immobile, accumulating contaminants present in water and sediment that can be scientifically analyzed. They are nature's "vacuum cleaners," filtering and cleansing polluted waters.

Can you eat freshwater mussels?

You can eat freshwater mussels, but their meat is tough and unpalatable compared to the saltwater mussels commonly eaten. Most freshwater mussels live on rocky coastlines and attach themselves to rocks by strong filaments called byssal threads, so their meat is tender. Freshwater mussels burrow and move about on the river bottom, requiring a tough muscular foot. Plus, a freshwater mussel's foot and soft tissues are storehouses for contaminants, metals and other pollutants.

Feeding and reproduction

A freshwater mussel's body is mostly a long muscular foot that contracts and withdraws into the shell if pulled from the stream bottom. On either side of the foot is a pair of specialized gills that allow the mussel to breathe and filter-feed. Water is drawn into the body or mantle cavity through the incumbent siphon and passes over the gills that extract oxygen and food (algae and fine particles of decaying organic matter). While food travels to the mussel's stomach, sediment and undigested wastes (called pseudofeces) quickly exit through its excurrent siphon, becoming food for other aquatic animals. Freshwater mussels have a complex life cycle. The larval stage is parasitic on a host, typically a fish. During the breeding season, males release sperm into the water and they enter the female via her incumbent siphon to fertilize the eggs. If modified gills are a brooding chamber for embryos that mature into microscopic larvae, called glochidia (glo-kid-ee-ah). Mussels feed food into carrying their larvae. Some mussels release their larvae in packages that resemble the host fish's food while other mussels have special lures to draw a fish in close. For example, the mantle flap of a female pocketbook mimics a minnow to lure in bass. The bass attempts to eat the “minnow,” and it gets a mouthful of glochidia. Glochidia clamp shut on the gills or fins of the host fish (which usually doesn't harm the fish). If the fish is the correct host, the glochidia are attached for days or weeks, develop into juveniles and drop to the stream bottom. If they land in a suitable habitat, they grow to adults and repeat the cycle. If glochidia don't find a suitable host fish or they land in poor habitat, they will die.

Mussels are biological indicators of water quality because they are long-lived and relatively immobile, accumulating contaminants present in water and sediment that can be scientifically analyzed. They are nature's "vacuum cleaners," filtering and cleansing polluted waters.
Disappearing freshwater mussels

Freshwater mussels are disappearing at an alarming rate throughout North America. Nearly half of M. isauri’s 65 freshwater mussel species are of conservation concern. Ten of these species are listed as Endangered at either the federal or state level, and additional species are under consideration for listing.

Many M. isauri watersheds have been destabilized and water quality has been degraded from poor land-use practices and urbanization. Freshwater mussels cannot tolerate a shifting, unstable stream bottom. They need a stable habitat of rocks, sand, cobble or boulders for securing themselves in an otherwise turbulent environment.

Excessive silt and gravel in streams follow excessive land disturbance. High silt loads interfere with the filtering and feeding of adults and smother young mussels. Mussels close their shells to avoid temporary slugs of pollutants coming downstream, but eventually they have to open up to breathe and feed, so long-term water quality problems in a watershed will eventually kill them.

The survival of these mussels in the state is uncertain. Habitat alteration and loss, competition from exotic species (Asian clam and zebra mussel) and over-harvesting of shells are the primary reasons for decline. Some species that are dwindling have never been abundant here, a natural rarity that makes them even more susceptible to habitat degradation than a species that is common with a large range.

To help reverse the decline of mussels, the M. isauri Department of Conservation, U.S. Fish and Wildlife Service and Southwest Missouri State University are working together to artificially propagate and restock populations of endangered mussels. The goal is to boost populations that are no longer reproducing on their own.

Habitat restoration is the key element needed to bring Missouri's mussel populations back to healthy, self-sustaining levels. Restoration of streams is a slow process, so mussel breeding in captivity may save some of our rarest mussel species.

For an updated list of endangered and rare mussels, visit Missouri’s Endangered Species Checklist at www.conservation.state.mo.us/nathiis/endangered/.
Step 1: During the breeding season, males release sperm into the water and the females filter the sperm into their gill chambers. The female's gills incubate the fertilized eggs until they develop into tiny larvae, called glochidia.

Step 2: Glochidia must attach to the gills or fins of a specific fish species. Mussels have unusual tricks to attract their host. Pocketbooks have a lure that looks like a small fish, while other mussels release their glochidia in packets disguised as insects or tiny fish. Host fish are fooled and try to eat the lures, taking glochidia into their mouths and gills. They develop for several days or weeks before becoming juveniles and leaving the fish.

Step 3: When mature, the juvenile mussels release from the host and drop onto the stream floor. Unlike other parasites, glochidia usually do not harm the host.

Step 4: If the juvenile mussels drop into good habitat, they grow into adults and the cycle is repeated. Some mussels live less than 10 years, while others live 20 to 40 or as many as 100.
**Missouri musel regions**

M isou is divided into four main areas, or aquatic regions, with physiological characteristics important to mussel distribution with habitats for the host fishes used in mussel reproduction.

**DISTRIBUTION**

Missouri’s mussel resource of the Mississippi River has changed in the last century due to commercial harvest and river modifications to improve navigation. Common species today include threeridge, butterfly, three-horned wartyback, fragile papershell, mapleleaf, lilliput, pimpleback and giant floater.

**HABITAT**

Common mussels of the firm sand, mud and clay bottom include the round pigtoe, Wabash pigtoe, mucket, plain pocketbook, threeridge, ellipse, purple wartyback, ellipse, brekernay and many others living in stable stream bottoms of sand, gravel, cobble and boulders.

**SIMILAR SPECIES**

Missouri’s mussel regions

- **DEERTOE** 
  Truncilla truncata
  - A common mussel in some areas, deertoe has distinctive markings.
  - **SHELL** solid, thick, inflated, mostly triangular; prominent posterior ridgeline drawn to a rounded point at the posterior end.
  - **UMBO** wide and raised above hinge line.
  - **EPIDERMIS** yellowish-brown to brown; numerous green rays vary in width with spots, zigzags or often V-shapes (chevrons); sometimes without rays.
  - **INSIDE SHELL** beige cavity moderately deep; pseudocardinal teeth triangular, grooved and well-developed; lateral teeth short, thin, grooved and straight to slightly curved; nacre (lining) white; rarely pinkish-salmon.
  - **DISTRIBUTION** spotty, may be locally common where found.
  - **HABITAT** medium to large rivers with moderate to swift current in gravel mixed with sand and mud.
  - **SIMILAR SPECIES** Butterfly has a flattened appearance and less developed rays. Fawnfoot (not shown) is easily confused with deertoe, but is longer with a less prominent dorsal ridge and well-developed rays. Curved foot is an example of a second species that may be confused with deertoe. The deertoe, but is longer with a less prominent dorsal ridge and well-developed rays. Fawnsfoot (not shown) is easily confused with deertoe, but is longer with a less prominent dorsal ridge and well-developed rays.
  - **ADULT SIZE** up to 3".

- **FRAGILE PAPERSHELL** 
  Leptodea fragilis
  - A widespread mussel that relies on freshwater drum as host fish for the developing young. Shell thin, fragile or brittle, oblong to oval; dorsal wing on young, often eroding with age.
  - **UMBO** flattened and barely above hinge line.
  - **EPIDERMIS** light yellowish-tan to dirty yellow-brown in adults; faint, narrow green rays may cover shell.
  - **INSIDE SHELL** beige cavity shallow; pseudocardinal teeth small, thin and reduced; lateral teeth smooth, moderate length, very thin, blade-like and high; nacre (lining) bluish-white, iridescent throughout and may be pinkish dorsally.
  - **DISTRIBUTION** widespread and locally common where found; absent from south-flowing streams in south-central Ozarks.
  - **HABITAT** streams of all sizes in reduced current in firm sand and mud.
  - **SIMILAR SPECIES** Pink papershell has darker epidermis and purple to purplish-bronze nacre.
  - **ADULT SIZE** 3-6".

- **PINK HEELSPITTER** 
  Potamilus alatus
  - A large dorsal wing and purple lining make identification easy.
  - **SHELL** large, inflated, laterally compressed, elongate to rectangular with a large dorsal wing; anterior and sharply rounded, posterior and broadly rounded.
  - **UMBO** flattened and only slightly raised above hinge line.
  - **EPIDERMIS** brown to greenish-brown, becomes darker with age; juveniles often with faint green rays, later fading.
  - **INSIDE SHELL** beige cavity shallow; pseudocardinal teeth relatively small, thin and rough; lateral teeth high and moderately long, blade-like and straight to slightly curved; nacre (lining) purple to pinkish-purple.
  - **DISTRIBUTION** widespread; most common in O Sau, M erman, and Salt river basins.
  - **HABITAT** margins of medium to large streams with mixed sand and mud or sand, gravel and cobble.
  - **SIMILAR SPECIES** W hite heelspitter is compressed and rounded with a white nacre. Pink papershell has a thinner shell, is less inflated, is not rounded posteriorly and has reduced teeth. Blufter is more inflated with a deeper beige cavity and a squared posterior end.
  - **ADULT SIZE** 3-6".

**A mussel hunt**

- Snorkeling and scuba diving are the most common ways to search for live freshwater mussels. Water scooping is also used when the water is cold or polluted. You can make your own water scope by cutting out the bottom of a plastic five-gallon bucket and replacing it with clear Plexiglas.

- With your face or bucket close to the stream bottom, watch for the slightest of movements. Perhaps you’ll see a puff of sand or silt. If it’s a freshwater mussel, the first things you’ll notice are the two siphons extending from between shell halves. If you reach out and touch it, a live mussel will think you are a predator and quickly clamp shut. They are sensitive to shadows. You can pick up a live mussel without hurting it if you treat it with care. Note the shell patterns and long foot as you pull the mussel from the stream bottom. When replacing the mussel, the part of the shell where the foot is should go down. Mussels do not actually have a head; instead they have a long muscular foot that protrudes from their protective house-of-shell. The mussel walks through the substrate with its foot. The siphons are located at the rear (posterior) end.

- Rebury the foot end into the streambed. If you accidentally rebury the siphon end, the mussel may suffocate. If unsure, leave the mussel close by in the same habitat, on its side, behind a boulder or in quiet water to rebury itself. Left unburied in swift current, a mussel can easily be swept away – take care to always put mussels back where you found them.
Common Mussels

Many of Missouri's mussels are hard to identify, but with a little practice you can learn some of the ones in rivers and streams near your home. Shells of freshly eaten mussels, discarded on a streambank by a muskrat or raccoon are good for learning characteristics. Look at the shell's shape, thickness and color on the outside (epidermis) and inside. Note bumps or other outside features and the shape and size of inside teeth.

Descriptions of 29 of Missouri's colorful and fascinating mussels are included here, along with some technical terms, so you can use the diagrams to help you understand. Additional mussels are listed in references on page 16.

Additional mussels are described in references on page 16.

Use the diagrams to help you understand.

**Mussel Shell Terms**

**SPECTACLECASE**

**Cumberlandia monodonta**

Spectaclecase live in large groups with as many as 100 mussels per square yard. The mussels can live to be 60 years or older. M. monodonta may have the largest number of spectaclecase mussels left in the world.

**SHELL**

Elongate and compressed with rounded ends; somewhat pinched in the middle becomes thicker with age.

**UMBO**

Slightly elevated above hinge line.

**EPIDERMIS**

Dark brown to black, becomes brittle with age.

**INSIDE SHELL**

Beak cavity shallow; pseudocardinal teeth prong-like; lateral teeth poorly developed; nacre (lining) white, iridescent posteriorly.

**DISTRIBUTION**

Tributaries of the Mississippi and Missouri rivers.

**HABITAT**

Medium to large rivers in reduced current adjacent to swift water, among boulders or in patches of gravel, sand and cobbles.

**SIMILAR SPECIES**

Black sandshell (not shown) has a sharply pointed posterior and lacks the flaky epidermis. Adult spike can appear as a small spectaclecase, but it is neither as elongate nor pinched in shape.

**ADULT SIZE**

5-8".

**GIANT FloATER**

**Pyganodon grandis**

When a floater dies, the large mussel with thin shell will actually rise to the water surface and float as it decays. M. grandis, named by the fisherman who harvested button shells in the early 1900s, may have the largest number of giant floaters left in the world.

**SHELL**

Large, thin, elongate to suboval and very inflated.

**UMBO**

Slightly elevated above hinge line.

**EPIDERMIS**

Shiny, light tan to light green or brown, becomes black to greenish-black with age, then white with faint green rays.

**INSIDE SHELL**

Beak cavity broad; teeth absent; nacre (lining) iridescent and variable, often silvery-white; tinge of pink or salmon.

**DISTRIBUTION**

Widespread.

**HABITAT**

Most common in sluggish sections of ponds, reservoirs, creeks and rivers in mud or silt.

**SIMILAR SPECIES**

Flat floater is more circular and its umbo is almost flush to the hinge line. Paper pondshell has a thinner shell and a flatter umbo.

**ADULT SIZE**

3-8”.

**THREEHORN WartyBACK**

**Obliquaria reflexa**

As with many other mussels, the fish host of this widespread mussel is unknown.

**SHELL**

Small, moderately thick and rounded with 3 to 4 large knobs or horns on each valve (shell half), alternating with those on the opposite valve distinct depressions above each knob.

**UMBO**

Raised above hinge line.

**EPIDERMIS**

Light tan to green, darker with age often with fine green rays.

**INSIDE SHELL**

Beak cavity shallow to moderately deep; pseudocardinal teeth heavy, serrate and well developed; lateral teeth grooved, relatively long and straight to slightly curved; nacre (lining) white.

**DISTRIBUTION**

North-flowing streams south of the Mississippi River; also on the east side of the Missouri River.

**HABITAT**

Large streams and rivers with moderate current in gravel, sand and mud; also in reservoirs.

**SIMILAR SPECIES**

Pimpleback and wartback are similar, but neither has the fine green rays of the threethorn wartback, nor such large, distinct knobs with associated depressions.

**ADULT SIZE**

2-3”.

**MUCKET**

**Actinonaias ligamentina**

One of the most widespread and numerous mussels in southern Missouri.

**SHELL**

Thin, heavy, oblong and moderately inflated.

**UMBO**

Low and slightly above hinge line.

**EPIDERMIS**

Yellowish-brown, becomes darker with age, green rays may be present.

**INSIDE SHELL**

Beak cavity shallow; large pseudocardinal teeth, serrate and slightly elevated; lateral teeth blade-like, straight to slightly curved, moderately short and serrate; nacre (lining) white, rarely pink-tinged.

**DISTRIBUTION**

Widespread and abundant in southern Missouri; also Salt River.

**HABITAT**

Medium to large rivers in relatively swift water with a stable mix of gravel, sand and cobbles.

**SIMILAR SPECIES**

The plain pocketbook's shell is more inflated, less stout, thinner, more square (females) or rounded (males) and has a higher umbo.

**ADULT SIZE**

3-7”.

**BUTTERFLY**

**Ellipsaria lineolata**

The butterfly is one of the most beautiful of Missouri's mussels.

**SHELL**

Solid, thick, noticeably flattened and triangular with a prominent and sharply angled posterior ridge.

**UMBO**

Flattened on the sides, directed forward and slightly raised above hinge line.

**EPIDERMIS**

Yellowish-brown with interrupted but distinct brown rays that appear as spots, bars, wavy patterns or V-shapes (chevrons).

**INSIDE SHELL**

Beak cavity shallow; pseudocardinal teeth large, grooved and triangular; lateral teeth serrate; short and straight; nacre (lining) black.

**DISTRIBUTION**

Most common in north-flowing tributaries of the Mississippi River in several Missouri and Mississippi River tributaries.

**HABITAT**

Large rivers with strong current in coarse gravel and sand.

**SIMILAR SPECIES**

The dwarf has a similar color pattern, but the shell is much more inflated and has a deeper beak cavity.

**ADULT SIZE**

3-5”.

---

**SIMILAR SPECIES**

**Ellipsaria lineolata**

The butterfly is one of the most beautiful of Missouri's mussels.

**SHELL**

Solid, thick, noticeably flattened and triangular with a prominent and sharply angled posterior ridge.

**UMBO**

Flattened on the sides, directed forward and slightly raised above hinge line.

**EPIDERMIS**

Yellowish-brown with interrupted but distinct brown rays that appear as spots, bars, wavy patterns or V-shapes (chevrons).

**INSIDE SHELL**

Beak cavity shallow; pseudocardinal teeth large, grooved and triangular; lateral teeth serrate; short and straight; nacre (lining) black.

**DISTRIBUTION**

Most common in north-flowing tributaries of the Mississippi River in several Missouri and Mississippi River tributaries.

**HABITAT**

Large rivers with strong current in coarse gravel and sand.

**SIMILAR SPECIES**

The dwarf has a similar color pattern, but the shell is much more inflated and has a deeper beak cavity.

**ADULT SIZE**

3-5”.

---

**SIMILAR SPECIES**

**Ellipsaria lineolata**

The butterfly is one of the most beautiful of Missouri's mussels.

**SHELL**

Solid, thick, noticeably flattened and triangular with a prominent and sharply angled posterior ridge.

**UMBO**

Flattened on the sides, directed forward and slightly raised above hinge line.

**EPIDERMIS**

Yellowish-brown with interrupted but distinct brown rays that appear as spots, bars, wavy patterns or V-shapes (chevrons).

**INSIDE SHELL**

Beak cavity shallow; pseudocardinal teeth large, grooved and triangular; lateral teeth serrate; short and straight; nacre (lining) white.

**DISTRIBUTION**

Most common in north-flowing tributaries of the Mississippi River in several Missouri and Mississippi River tributaries.

**HABITAT**

Large rivers with strong current in coarse gravel and sand.

**SIMILAR SPECIES**

The dwarf has a similar color pattern, but the shell is much more inflated and has a deeper beak cavity.

**ADULT SIZE**

3-5”.

---

**SIMILAR SPECIES**

**Ellipsaria lineolata**

The butterfly is one of the most beautiful of Missouri's mussels.

**SHELL**

Solid, thick, noticeably flattened and triangular with a prominent and sharply angled posterior ridge.

**UMBO**

Flattened on the sides, directed forward and slightly raised above hinge line.

**EPIDERMIS**

Yellowish-brown with interrupted but distinct brown rays that appear as spots, bars, wavy patterns or V-shapes (chevrons).

**INSIDE SHELL**

Beak cavity shallow; pseudocardinal teeth large, grooved and triangular; lateral teeth serrate; short and straight; nacre (lining) white.

**DISTRIBUTION**

Most common in north-flowing tributaries of the Mississippi River in several Missouri and Mississippi River tributaries.

**HABITAT**

Large rivers with strong current in coarse gravel and sand.

**SIMILAR SPECIES**

The dwarf has a similar color pattern, but the shell is much more inflated and has a deeper beak cavity.

**ADULT SIZE**

3-5”.

---

**SIMILAR SPECIES**

**Ellipsaria lineolata**

The butterfly is one of the most beautiful of Missouri's mussels.

**SHELL**

Solid, thick, noticeably flattened and triangular with a prominent and sharply angled posterior ridge.

**UMBO**

Flattened on the sides, directed forward and slightly raised above hinge line.

**EPIDERMIS**

Yellowish-brown with interrupted but distinct brown rays that appear as spots, bars, wavy patterns or V-shapes (chevrons).

**INSIDE SHELL**

Beak cavity shallow; pseudocardinal teeth large, grooved and triangular; lateral teeth serrate; short and straight; nacre (lining) white.

**DISTRIBUTION**

Most common in north-flowing tributaries of the Mississippi River in several Missouri and Mississippi River tributaries.

**HABITAT**

Large rivers with strong current in coarse gravel and sand.

**SIMILAR SPECIES**

The dwarf has a similar color pattern, but the shell is much more inflated and has a deeper beak cavity.

**ADULT SIZE**

3-5’’.
A coppery-purple shell was not in fashion with the button industry – only white was used.

Nacre color varies from purple to pink to white. In smaller rivers, the shell is much thinner.

Round pigtoes are more rounded than Wabash pigtoes. Rare individuals have a bright pink nacre.

The paper pondshell is oddball – a single mussel can be both male and female. The larvae of glochidia have hooks and attach to the fins of a host fish. Young mussels can be a beautiful bright green, with thin glossy shells.

The pistol grip is shaped like a cheeked gunstock, pistol grips are easy to identify. Young or small spectaclecase could be confused with the spike, but they appear pinched. The black sandshell (not shown) is longer and thicker with a more prominent posterior ridge and a shiny exterior that is usually darker.

The paper pondshell is an oddball – a single mussel can be both male and female. The larva of glochidia have hooks and attach to the fins of a host fish. Young mussels can be a beautiful bright green, with thin glossy shells.
**MONKEYFACE**  *Quadrula metanevra*

Finding the monkey face in the shell is left up to the imagination.

**SHELL** thick, rounded or squared and inflated, with very prominent posterior ridge and lobed posterior margin; pustules (bumps) extend from umbo to posterior ventral margin, increasing in size.

**UMBO** narrow, slightly raised above hinge line.

**EPIDERMIS** yellowish-green, becomes brown with age; may have randomly scattered dark green chevron marks.

**INSIDE SHELL** beak cavity deep; pseudocardinal teeth large, grooved and triangular; lateral teeth short, streaked and straight; nacre (lining) white, iridescent posteriorly.

**DISTRIBUTION** rivers flowing off the Salem and Springfield plateaus (except for south-flowing streams in the central lower Ozarks); Missouri and Salt rivers.

**HABITAT** quiet sections of medium to large rivers and reservoirs in sand, mud and fine gravel.

**SIMILAR SPECIES** *One* The prominent posterior ridge, pustules and knobs make this species easy to identify.

**ADULT SIZE** 2-4".

---

**WARTYBACK**  *Quadrula nodulata*

The bumps on the shell of the wartyback may help to anchor it in the river bottom.

**SHELL** thick anteriorly to thin posteriorly; rounded to squared-off moderately inflated shell with two poorly defined rows of elongated knobs diverging from the umbo to the ventral margin.

**UMBO** rounded and raised high above the hinge line.

**EPIDERMIS** generally yellowish to light brown, becomes darker with age.

**INSIDE SHELL** beak cavity deep; pseudocardinal teeth large, grooved and roughened; lateral teeth moderately long, grooved and slightly curved; nacre (lining) white, iridescent posteriorly.

**DISTRIBUTION** most often found in rivers of the Lowland Region, northeast Missouri and Mississippi River; may be locally abundant.

**HABITAT** most common in large streams or rivers in firm sand and mud.

**SIMILAR SPECIES** Pimplebacks are similar, but have randomly distributed small knobs and may have a green ray from umbo to halfway down shell. Monkeyface has a distinct groove.

**ADULT SIZE** 2-3".

---

**PIMPLEBACK**  *Quadrula pustulosa*

The pimpleback is usually bumpy, but some individuals are perfectly smooth.

**SHELL** thick, rounded to squared, moderately inflated and covered with few to many pustules (bumps) in no discernable pattern; smooth anterior third.

**UMBO** elevated above hinge line and turned forward.

**EPIDERMIS** yellowish-green to light brown in juveniles, becomes chestnut to brown with age. May have a broad green ray on the umbo.

**INSIDE SHELL** beak cavity deep; pseudocardinal teeth well-developed and serrate; lateral teeth moderately short, heavy, serrate and straight to slightly curved; nacre (lining) white, iridescent posteriorly.

**DISTRIBUTION** widespread.

**HABITAT** small to large rivers in coarse gravel and sand or mud.

**SIMILAR SPECIES** Pimpleback has knobs arranged in two weakly defined rows and the green umbo ray is not present. Purple wartyback is more compressed with a purple nacre.

**ADULT SIZE** 2-3".

---

**MAPLELEAF**  *Quadrula quadrula*

The mapleleaf spawns in the summer, using catfish as a host.

**SHELL** thick, squared to rounded and slightly inflated with two rows of pustules (bumps) radiating from the umbo to shell margin and separated by a sulcus (smooth depression); anterior portion usually smooth.

**UMBO** small, slightly raised above hinge line.

**EPIDERMIS** yellowish-green with faint rays in juveniles; darkens with age to medium to dark greenish-brown or brown.

**INSIDE SHELL** beak cavity deep; pseudocardinal teeth serrate and well-developed; lateral teeth long and straight; nacre (lining) white, iridescent posteriorly.

**DISTRIBUTION** widespread except for south-central Ozarks.

**HABITAT** quiet sections of medium to large rivers and reservoirs in sand, mud and fine gravel.

**SIMILAR SPECIES** Wartyback and pimpleback do not have a depression and are more rounded. Purple wartyback is generally more compressed and has purple nacre. Monkeyface has a row of knobs instead of a depression.

**ADULT SIZE** 3-5".

---

**THREETRIDGE**  *Ambela plicata*

Sometimes called blue point, this mussel species is widely distributed in Missouri and is occasionally found along reservoir margins.

**SHELL** thick, heavy to rounded, occasionally inflated and covered with three or more posterior folds or ridges.

**UMBO** raised above hinge line.

**EPIDERMIS** yellowish-green to light brown in juveniles, becomes dark green, brown or black with age.

**INSIDE SHELL** beak cavity medium to deep; pseudocardinal teeth large and thick; lateral teeth serrate, straight to slightly curved; nacre (lining) white and frequently stained.

**DISTRIBUTION** one of the most widespread mussels; absent from north-central Missouri.

**HABITAT** small streams to large rivers in mud, sand and gravel.

**SIMILAR SPECIES** Washboard is larger with more complex folding and has bumps on the anterior third of shell.

**ADULT SIZE** 3-7".

---

**WABASH PIGTOE**  *Fusconaia flava*

A widespread mussel that releases its larvae in tiny red packets to attract fish hosts.

**SHELL** variable, usually thick, square to triangular, somewhat compressed (creaks and small rivers) to inflated (large rivers); a broad sulcus (smooth depression) extends from umbo to ventral margin.

**UMBO** elevated above hinge line and turned forward.

**INSIDE SHELL** beak cavity deep; pseudocardinal teeth well-developed and serrate; lateral teeth moderately short, heavy, serrate and straight to slightly curved; nacre (lining) white, iridescent posteriorly.

**DISTRIBUTION** widespread.

**HABITAT** quiet sections of medium to large rivers and reservoirs in sand, mud and fine gravel.

**SIMILAR SPECIES** Wartyback and pimpleback do not have a depression and are more rounded. Purple wartyback is generally more compressed and has purple nacre. Monkeyface has a row of knobs instead of a depression.

**ADULT SIZE** 2-4".
Cliff White

Adulthood Size

Similar Species

Habitat

Epidermis

Umbon

Pimpleback

Quadrula pustulosa

The pimpleback is usually bumpy, but some individuals are perfectly smooth.

Shell thick, rounded or squared and inflated, with very prominent posterior ridge and lobed posterior margin; pustules (bumps) extend from umbo to posterior ventral margin, increasing in size.

Umbon narrow, slightly raised above hinge line.

Epidermis yellowish-green, becomes brown with age; may have randomly scattered dark green chevron marks.

Inside Shell highly toothed, pseudocardinal teeth large, grooved and triangular; lateral teeth short, streaked and straight; nacre (lining) white, iridescent posteriorly.

Distribution rivers flowing off the Salem and Springfield plateau (except for south-flowing streams in the central lower Ozarks); Misssippi and Salt rivers.

Habitat medium to large rivers in relatively swift current in a stable clean-swept mix of coarse sand and gravel.

Similar Species Mississipi mudshell; most purple wartyback does not have a depression and are more rounded. Purple wartyback is generally more compressed and has purple nacre. Monkeyface has a row of knobs instead of a depression.

Adult Size 2-3"
**Purple Wartyback** *Cydonialas tuberculata* (also Purple Pimpleback)

A coppery-purple shell was not in fashion with the button industry - only white was used.  
*SHELL* thick, heavy, nearly round, compressed (small rivers) to inflated (large rivers) and covered with many bumps anterior end rounded, posterior end squared off.  
*UMBRO* slightly raised above hinge line.  
*EPIDERMIS* yellowish-brown to greenish-brown, becomes darker with age; greenish rays may be present in juveniles.  
*INSIDE SHELL* beak cavity deep and wide, massive pseudocardinal teeth, widely spaced and deeply grooved; lateral teeth short and straight or slightly curved; nacre (lining) deep copper-purple.  
*DISTRIBUTION* mainly in the Ozarks, but also Salt and Fabius rivers.  
*HABITAT* medium to large rivers with moderate current in sand, gravel and cobble.  
*SIMILAR SPECIES* Pimpleback and wartyback are less massive and less compressed, have white nacre and smaller pseudocardinal teeth.  
ADULT SIZE 2-4".

**Round Pigtoe** *Pleurobema sintoxia*

Round pigtoes are more rounded than Wabash pigtoes. Rare individuals have a bright pink nacre.  
*SHELL* relatively thick, heavy, compressed and rounded (small streams) or inflated and mostly triangular (big rivers).  
*UMBRO* low, slightly raised above hinge line and tilted forward.  
*EPIDERMIS* greenish- to reddish-brown or light brown in juveniles and chestnut or dark brown in adults; usually without rays.  
*INSIDE SHELL* beak cavity shallow (medium streams) to moderately deep (large rivers); pseudocardinal teeth and lateral teeth well developed, with the lateral primarily straight; nacre (lining) white, occasionally pitted.  
*DISTRIBUTION* widespread in the Ozarks, but also Salt and lowland rivers.  
*HABITAT* medium-sized rivers in moderate current with stable gravel, sand and cobbles.  
*SIMILAR SPECIES* See comparisons for Wabash pigtoes, page 9.  
ADULT SIZE 2-4".

**Spike** *Elliptio dilatata* (also Ladyfinger)

Nacre color varies from purple to pink to white. In smaller rivers, the shell is much thinner.  
*SHELL* thick, slightly inflated to compressed and elongate generally twice as long as width; ventral margin either straight or slightly curved in juveniles.  
*UMBRO* low and rarely raised above hinge line.  
*EPIDERMIS* greenish-brown with faint green rays; dark brown to black with age.  
*INSIDE SHELL* beak cavity shallow to absent; pseudocardinal teeth triangular and stranded; lateral teeth short and straight; nacre (lining) purple, occasionally pink or white.  
*DISTRIBUTION* common and locally abundant south of the Missouri River; also in northeast Missouri.  
*HABITAT* medium to large rivers with moderate current in stable gravel and sand.  
*SIMILAR SPECIES* Young or small specimens could be confused with the spike, but they appear pinched. The black sandshell (not shown) is longer and thicker with a more prominent posterior ridge and a shiny exterior that is usually darker.  
ADULT SIZE 3-5".

**Paper Pondshell** *Utterbackia imbecillis* (also Paper Floater)

The paper pondshell is an oddball - a single mussel can be both male and female. The larva of *galloida* has hooks and attach to the fins of a host fish. Young mussels can be a beautiful bright green, with thin glossy shells.  
*SHELL* very thin, elongate, oblong and inflated in adults.  
*UMBRO* not raised above the very flat hinge line.  
*EPIDERMIS* shiny, yellow to green with faint yellow to green rays.  
*INSIDE SHELL* beak cavity shallow to absent; teeth absent; nacre (lining) iridescent white to bluish-white.  
*DISTRIBUTION* sporadic; sometimes locally abundant.  
*HABITAT* quiet water in ponds, reservoirs, sloughs and streams in silt or a mix of silt and fine sand.  
*SIMILAR SPECIES* Small giant floaters are distinguished by umbro distinctly raised above the hinge line.  
ADULT SIZE 1-4".

**White Heelsplitter** *Lasmigona complanata*

The shell is large and impressive in overall size. Although fairly flat, it can be more than 8 inches long. A large wing on the heelsplitter can be painful if you step on it.  
*SHELL* large, very compressed and rounded with a large wing above the hinge line.  
*UMBRO* flattened, small and not raised above hinge line.  
*EPIDERMIS* green or greenish-brown, often with faint rays, becomes dark brown to black with age.  
*INSIDE SHELL* beak cavity shallow; pseudocardinal teeth large; lateral teeth blade-like and poorly developed; nacre (lining) bluish-white to white, iridescent posteriorly.  
*DISTRIBUTION* widespread, except for south-central Ozarks.  
*HABITAT* slow current in firm mud and sand or fine gravel; also in lakes and ponds.  
*SIMILAR SPECIES* Pink heelsplitter is more inflated with a pinkish-purple nacre. Pink papershell is generally smaller with a thinner shell and purple nacre.  
ADULT SIZE 4-8".

**Pistolgrasp** *Tritogonia verrucosa* (also Buckhorn)

Shaped like a chiseled gunstock, pistolgraps are easy to identify.  
*SHELL* heavy, compressed and elongate covered with pustules (knobs); pronounced, knobby posterior ridge with flutings and folds extending to margin.  
*UMBRO* slightly elevated above hinge line, turned forward.  
*EPIDERMIS* light green to brown in juveniles and brown or black in adults.  
*INSIDE SHELL* beak cavity moderately deep; pseudocardinal teeth large and serrate; lateral teeth long, straight and heavy; nacre (lining) usually white, iridescent posteriorly.  
*DISTRIBUTION* widespread, sometimes locally common.  
*HABITAT* medium to large rivers with moderate current in stable gravel and sand or mud.  
*SIMILAR SPECIES* None due to the distinct shape of its knobby shell.  
ADULT SIZE 4-7".
**Common Mussels**

Many of Missouri's mussels are hard to identify, but with a little practice you can learn some of the ones in rivers and streams near your home. Shells of freshly eaten mussels, discarded on a streambank by a muskrat or raccoon are good for learning characteristics. Look at the shell's shape, thickness and color on the outside (epidermis) and inside. Note bumps or depressions above each knob.

Descriptions of 29 of Missouri's colorful mussels are included here, and fascinating mussels are included here, along with some technical terms, so you can use the diagrams to help you understand. Additional mussel names are listed in references on page 16.

---

**Mussel Shell Terms**

- **SHELL**
- **UMBO**
- **EPIDERMIS**
- **INSIDE SHELL**
- **HABITAT**
- **DISTRIBUTION**
- **ADULT SIZE**
- **SIMILAR SPECIES**

---

**THREEHORN WARTYBACK**

*Obliquaria reflexa*

As with many Missouri mussels, the fish host of this widespread mussel is unknown.

- **SHELL** small, moderately thick and rounded with 3 to 4 large knobs or horns on each valve (shell half), alternating with those on the opposite valve. Distinct depressions above each knob.
- **UMBO** raised above hinge line.
- **EPIDERMIS** light tan to green, darker with age often with fine green rays.
- **INSIDE SHELL** beak cavity shallow to moderately deep; pseudocardinal teeth heavy, serrated and well developed; lateral teeth grooved, relatively long and straight to slightly curved; nacre (lining) white.
- **DISTRIBUTION** north-flowing streams south of the M isauri River; also southeastern Ozarks and Salt River.
- **HABITAT** larger streams and rivers with moderate current in gravel, sand and mud; also in reservoirs.

**SIMILAR SPECIES** Wartyback and warthog are similar, but neither has the fine green rays of the threehorn warthog, nor such large, distinct knobs with associated depressions.

**ADULT SIZE** 2.3".

---

**MUCKET**

*Actinonaias ligamentina*

One of the most widespread and numerous mussels in southern Missouri.

- **SHELL** thick, heavy, oblong and moderately inflated.
- **UMBO** low and slightly above hinge line.
- **EPIDERMIS** yellowish-brown, becomes darker with age; green rays may be present.
- **INSIDE SHELL** beak cavity shallow; large pseudocardinal teeth, serrate and slightly elevated; lateral teeth blade-like, straight to slightly curved, moderately short and serrate; nacre (lining) white, rarely pink-tinted.
- **DISTRIBUTION** widespread and abundant in southern Missouri; also Salt River.
- **HABITAT** medium to large rivers in relatively swift water with a stable mix of gravel, sand and cobble.

**SIMILAR SPECIES** Pimpleback and wartyback are similar, but neither has the fine green rays of the butterfly.

**ADULT SIZE** 2.75".

---

**BUTTERFLY**

*Ellipsaria lineolata*

The butterfly is one of the most beautiful of Missouri’s mussels.

- **SHELL** solid, thick, noticeably flattened and triangular with a prominent and sharply angled posterior ridge.
- **UMBO** flattened on the sides, directed forward and slightly raised above hinge line.
- **EPIDERMIS** yellowish-brown with interrupted but distinct brown rays that appear as spots, bars, wavy patterns or V-shapes (chevrons).
- **INSIDE SHELL** beak cavity shallow; pseudocardinal teeth large, grooved and triangular; lateral teeth serrate; short and straight; nacre (lining) white.
- **DISTRIBUTION** most common in north-flowing tributaries of the M isauri River and in several M issipppi River tributaries.
- **HABITAT** large rivers with strong current in coarse gravel and sand.

**SIMILAR SPECIES** Dace has a similar color pattern, but the shell is much more inflated and has a deeper beak cavity.

**ADULT SIZE** 3.5".

---

**Giant Floater**

*Pygadon grandis*

When a floater dies, the large mussel with thin shell will actually rise to the water surface and float as it decays.

- **SHELL** large, thin, elongate to suboval and very inflated.
- **UMBO** swollen and elevated above hinge line.
- **EPIDERMIS** shiny, light tan to light green or brown, becomes black to greenish-black with age; young often with faint green rays.
- **INSIDE SHELL** beak cavity broad; teeth absent; nacre (lining) iridescent and variable, often silvery-white, tinged with pink or salmon.
- **DISTRIBUTION** widespread.
- **HABITAT** most common in sluggish sections of ponds, reservoirs, creeks and rivers in mud or silt.

**SIMILAR SPECIES** Flat floater is more circular and its umbo is almost flush to the hinge line. Paper pondshell has a thinner shell and a flatter umbo.

**ADULT SIZE** 3-8".

---

**Spectaclecase**

*Cumberlandia monodonta*

Spectaclecase live in large groups with as many as 100 mussels per square yard. The mussels can live to be 60 years or older. M isauri may have the largest number of spectaclecase mussels left in the world.

- **SHELL** elongate and compressed with rounded ends; somewhat pinched in the middle becomes thicker with age.
- **UMBO** slightly elevated above hinge line.
- **EPIDERMIS** dark brown to black; becomes brittle with age.
- **INSIDE SHELL** beak cavity shallow; pseudocardinal teeth prong-like; lateral teeth poorly developed; nacre (lining) white, iridescent posteriorly.
- **DISTRIBUTION** tributaries of the M isauri and M issipppi rivers, also Salt River.
- **HABITAT** medium to large rivers in reduced current adjacent to swift water, among boulders or in patches of gravel, sand and cobble.

**SIMILAR SPECIES** Black sandshell (not shown) has a sharply pointed posterior and lacks the flaky epidermis. Adult spike can appear as a small spectaclecase, but it is neither as elongate nor pinched in shape.

**ADULT SIZE** 5-8".

---

**Threehorn Wartyback**

*Obliquaria reflexa*

As with many Missouri mussels, the fish host of this widespread mussel is unknown.

- **SHELL** small, moderately thick and rounded with 3 to 4 large knobs or horns on each valve (shell half), alternating with those on the opposite valve. Distinct depressions above each knob.
- **UMBO** raised above hinge line.
- **EPIDERMIS** light tan to green, darker with age often with fine green rays.
- **INSIDE SHELL** beak cavity shallow to moderately deep; pseudocardinal teeth heavy, serrated and well developed; lateral teeth grooved, relatively long and straight to slightly curved; nacre (lining) white.
- **DISTRIBUTION** north-flowing streams south of the M isauri River; also southeastern Ozarks and Salt River.
- **HABITAT** larger streams and rivers with moderate current in gravel, sand and mud; also in reservoirs.

**SIMILAR SPECIES** Pimpleback and wartyback are similar, but neither has the fine green rays of the butterfly.

**ADULT SIZE** 2.3".

---

**Mucket**

*Actinonaias ligamentina*

One of the most widespread and numerous mussels in southern Missouri.

- **SHELL** thick, heavy, oblong and moderately inflated.
- **UMBO** low and slightly above hinge line.
- **EPIDERMIS** yellowish-brown, becomes darker with age; green rays may be present.
- **INSIDE SHELL** beak cavity shallow; large pseudocardinal teeth, serrate and slightly elevated; lateral teeth blade-like, straight to slightly curved, moderately short and serrate; nacre (lining) white, rarely pink-tinted.
- **DISTRIBUTION** widespread and abundant in southern Missouri; also Salt River.
- **HABITAT** medium to large rivers in relatively swift water with a stable mix of gravel, sand and cobble.

**SIMILAR SPECIES** Pimpleback and wartyback are similar, but neither has the fine green rays of the butterfly.

**ADULT SIZE** 2.75".

---

**Giant Floater**

*Pygadon grandis*

When a floater dies, the large mussel with thin shell will actually rise to the water surface and float as it decays. M isauri mussels, by the way, have originated from the fishermen who harvested button shells in the early 1900s.

- **SHELL** large, thin, elongate to suboval and very inflated.
- **UMBO** swollen and elevated above hinge line.
- **EPIDERMIS** shiny, light tan to light green or brown, becomes black to greenish-black with age; young often with faint green rays.
- **INSIDE SHELL** beak cavity shallow; pseudocardinal teeth large, grooved and triangular; lateral teeth serrate; short and straight; nacre (lining) white.
- **DISTRIBUTION** widespread.
- **HABITAT** most common in north-flowing tributaries of the M isauri River and in several M issipppi River tributaries.
- **HABITAT** large rivers with strong current in coarse gravel and sand.

**SIMILAR SPECIES** Pimpleback and wartyback are similar, but neither has the fine green rays of the butterfly.

**ADULT SIZE** 2.3".

---

**Spectaclecase**

*Cumberlandia monodonta*

Spectaclecase live in large groups with as many as 100 mussels per square yard. The mussels can live to be 60 years or older. M isauri may have the largest number of spectaclecase mussels left in the world.

- **SHELL** elongate and compressed with rounded ends; somewhat pinched in the middle becomes thicker with age.
- **UMBO** slightly elevated above hinge line.
- **EPIDERMIS** dark brown to black; becomes brittle with age.
- **INSIDE SHELL** beak cavity shallow; pseudocardinal teeth prong-like; lateral teeth poorly developed; nacre (lining) white, iridescent posteriorly.
- **DISTRIBUTION** tributaries of the M isauri and M issipppi rivers, also Salt River.
- **HABITAT** medium to large rivers in reduced current adjacent to swift water, among boulders or in patches of gravel, sand and cobble.

**SIMILAR SPECIES** Black sandshell (not shown) has a sharply pointed posterior and lacks the flaky epidermis. Adult spike can appear as a small spectaclecase, but it is neither as elongate nor pinched in shape.

**ADULT SIZE** 5-8".

---

**Threehorn Wartyback**

*Obliquaria reflexa*

As with many Missouri mussels, the fish host of this widespread mussel is unknown.

- **SHELL** small, moderately thick and rounded with 3 to 4 large knobs or horns on each valve (shell half), alternating with those on the opposite valve. Distinct depressions above each knob.
- **UMBO** raised above hinge line.
- **EPIDERMIS** light tan to green, darker with age often with fine green rays.
- **INSIDE SHELL** beak cavity shallow to moderately deep; pseudocardinal teeth heavy, serrated and well developed; lateral teeth grooved, relatively long and straight to slightly curved; nacre (lining) white.
- **DISTRIBUTION** north-flowing streams south of the M isauri River; also southeastern Ozarks and Salt River.
- **HABITAT** larger streams and rivers with moderate current in gravel, sand and mud; also in reservoirs.

**SIMILAR SPECIES** Pimpleback and wartyback are similar, but neither has the fine green rays of the butterfly.

**ADULT SIZE** 2.3".
**Deertoe**  *Truncilla truncata*

A common mussel in some areas, deertoe have decorative green markings.

**Shell** solid, thick, inflated, mostly triangular; prominent posterior ridgeline drawn to a rounded point at the posterior end.

**Umbo** wide and raised above hinge line.

**Epidermis** yellowish-brown to brown; numerous green rays vary in width with spots, zigzags or most often V-shapes (chevrons); sometimes without rays.

**Inside shell** beak cavity moderately deep; pseudocardinal teeth triangular, grooved and well developed; lateral teeth short, thin, grooved and straight to slightly curved; nacre (lining) white; rarely pinkish-salmon.

**Distribution** sporadic, may be locally common where found.

**Habitat** medium to large rivers with moderate to swift current in gravel mixed with sand and mud.

**Similar species** Butterfly has a flattened appearance and less developed rays. Fawnsfoot (not shown) is easily confused with deertoe, but is longer with a less prominent dorsal ridge and more distinct zigzag marks covering the shell.

**Adult size** up to 3".

**Fragile Pappershell**  *Leptodea fragilis*

A widespread mussel that relies on freshwater drum as host fish for the developing young.

**Shell** thin, fragile or brittle, oblong or oval; dorsal wing on young, often eroding with age.

**Umbo** flattened and barely above hinge line.

**Epidermis** light yellowish-tan to dirty yellow-brown in adults; faint, narrow green rays may cover shell.

**Inside shell** beak cavity shallow; pseudocardinal teeth small, thin and reduced; nacre (lining) bluish-white, indistinct throughout and may be pinkish dorsally.

**Distribution** widespread and locally common where found; absent from south-flowing streams in south-central Ozarks.

**Habitat** streams of all sizes in reduced current in firm sand and mud.

**Similar species** Pink papershell have darker epidermis and green rays may cover shell.

**Adult size** 3-6".

**Pink Heelsplitter**  *Potamilus alatus*

A large dorsal wing and purple lining make identification easy.

**Shell** large, inflated, laterally compressed, elongate to rectangular with a large dorsal wing, anterior and sharply rounded, posterior and broadly rounded.

**Umbo** flattened and only slightly raised above hinge line.

**Epidermis** brown to greenish-brown; pseudocardinal teeth small, thin and reduced; lateral teeth smooth, moderate length, very thin, blade-like and high; nacre (lining) bluish-white, indistinct throughout and may be pinkish dorsally.

**Distribution** widespread and locally common where found; absent from south-flowing streams in south-central Ozarks.

**Habitat** streams of all sizes in reduced current in firm sand and mud.

**Similar species** Pink papershell have darker epidermis and purple to purplish-bronze nacre.

**Adult size** 3-6".

**Missouri mussel regions**

* M issouri is divided into four main areas, or aquatic regions, with physiological characteristics important to mussel distribution with habitats for the host fishes used in mussel reproduction.

* M ussel diversity is greatest in Missouri’s clear, swift-flowing rocky streams of the south-central Ozark Region. M ussels here include the round pigtoe, Wabash pigtoe, mucket, plain pocketbook, threeridge, spike, purple wartyback, ellipse, brokenray and many others living in stable stream bottoms of sand, gravel, cobble and boulders.

* T he Prairie Region in northern and eastern Missouri has fewer mussels, but numbers can be large where found. Common mussels of the firm sand, mud and clay bottom include the yellow sandshell, pink papershell, fragile papershell and giant floater. In ponds and lakes, watch for paper pondshell and lilliput.

* T he Lowland Region of southeast Missouri has changed dramatically from swampland to manmade drainage ditches in the last 100 years, but an amazing array of mussel species survive. M ussels living in the ditches with sand, clay and silt include the bluffer, wartyback, three-horned wartyback, fragile papershell, mapleleaf, lilliput, pimplesback and giant floater.

* T he Big River Region is the Missouri and Mississippi rivers.

* F ew mussels live in the Missouri River’s swift current, shifting stream bottom and heavy silt load, although the fragile and pink papershell have adapted to the muddy waters. T he once diverse mussel resource of the Mississippi River has changed in the last century due to commercial harvest and river modifications to improve navigation. Common species today include threeridge mapleleaf, butterfly and washboard, in a mix of mud, sand and gravel.

* M ussels do not actually have a head, instead they have a long muscular foot that protrudes from their protective house-off-shell. T he mussel walks through the substrate with its foot. T he siphons are located at the rear (posterior) end. Dry the foot end into the streambed. If you accidentally rebury the siphon end, the mussel may suffocate. If unsure, leave the mussel close by in the same habitat, on its side, behind a boulder or in quiet water to rebury itself. Left unburied in swift current, a mussel can easily be swept away – take care to always put mussels back where you found them.

**Mussels do not actually have a head, instead they have a long muscular foot that protrudes from their protective house-off-shell. The mussel walks through the substrate with its foot. The siphons are located at the rear (posterior) end.**

**A mussel hunt**

Snorkeling and scuba diving are the most common ways to search for live freshwater mussels. Water scoping is also used when the water is cold or polluted. You can make your own water scope by cutting out the bottom of a plastic five-gallon bucket and replacing it with clear Plexiglas.

With your face or bucket close to the stream bottom, watch for the slightest of movements. Perhaps you’ll see a puff of sand or silt. If it’s a freshwater mussel, the first things you’ll notice are the two siphons extending from between shell halves. If you reach out and touch it, a live mussel will think you are a predator and quickly clamp shut. T hey are sensitive to shadows.

You can pick up a live mussel without hurting it if you treat it with care. Note the shell patterns and long foot as you pull the mussel from the stream bottom. When replacing the mussel, the part of the shell where the foot is should go down. M ussels do not actually have a head, instead they have a long muscular foot that protrudes from their protective house-off-shell. T he mussel walks through the substrate with its foot. T he siphons are located at the rear (posterior) end. Dry the foot end into the streambed. If you accidentally rebury the siphon end, the mussel may suffocate. If unsure, leave the mussel close by in the same habitat, on its side, behind a boulder or in quiet water to rebury itself. Left unburied in swift current, a mussel can easily be swept away - take care to always put mussels back where you found them.

**A mussel hunt**

Snorkeling and scuba diving are the most common ways to search for live freshwater mussels. Water scoping is also used when the water is cold or polluted. You can make your own water scope by cutting out the bottom of a plastic five-gallon bucket and replacing it with clear Plexiglas.

With your face or bucket close to the stream bottom, watch for the slightest of movements. Perhaps you’ll see a puff of sand or silt. If it’s a freshwater mussel, the first things you’ll notice are the two siphons extending from between shell halves. If you reach out and touch it, a live mussel will think you are a predator and quickly clamp shut. T hey are sensitive to shadows.

You can pick up a live mussel without hurting it if you treat it with care. Note the shell patterns and long foot as you pull the mussel from the stream bottom. When replacing the mussel, the part of the shell where the foot is should go down. M ussels do not actually have a head, instead they have a long muscular foot that protrudes from their protective house-off-shell. T he mussel walks through the substrate with its foot. T he siphons are located at the rear (posterior) end. Dry the foot end into the streambed. If you accidentally rebury the siphon end, the mussel may suffocate. If unsure, leave the mussel close by in the same habitat, on its side, behind a boulder or in quiet water to rebury itself. Left unburied in swift current, a mussel can easily be swept away - take care to always put mussels back where you found them.

**A mussel hunt**

Snorkeling and scuba diving are the most common ways to search for live freshwater mussels. Water scoping is also used when the water is cold or polluted. You can make your own water scope by cutting out the bottom of a plastic five-gallon bucket and replacing it with clear Plexiglas.

With your face or bucket close to the stream bottom, watch for the slightest of movements. Perhaps you’ll see a puff of sand or silt. If it’s a freshwater mussel, the first things you’ll notice are the two siphons extending from between shell halves. If you reach out and touch it, a live mussel will think you are a predator and quickly clamp shut. T hey are sensitive to shadows.

You can pick up a live mussel without hurting it if you treat it with care. Note the shell patterns and long foot as you pull the mussel from the stream bottom. When replacing the mussel, the part of the shell where the foot is should go down. M ussels do not actually have a head, instead they have a long muscular foot that protrudes from their protective house-off-shell. T he mussel walks through the substrate with its foot. T he siphons are located at the rear (posterior) end. Dry the foot end into the streambed. If you accidentally rebury the siphon end, the mussel may suffocate. If unsure, leave the mussel close by in the same habitat, on its side, behind a boulder or in quiet water to rebury itself. Left unburied in swift current, a mussel can easily be swept away - take care to always put mussels back where you found them.
Disappearing freshwater mussels

Freshwater mussels are disappearing at an alarming rate throughout North America. Nearly half of M. isauri’s 63 freshwater mussel species are of conservation concern. Ten of these species are listed as Endangered at either the federal or state level, and additional species are under consideration for listing.

Many M. isauri watersheds have been destabilized and water quality has been degraded from poor land-use practices and urbanization. Freshwater mussels cannot tolerate a shifting, unstable stream bottom. They need a stable habitat of rocks, sand, cobble or boulders for securing themselves in an otherwise turbulent environment.

Excessive silt and gravel in streams follow excessive land disturbance. High silt loads interfere with the filtering and feeding of adults and smother young mussels. Mussels can close their shells to avoid temporary slugs of pollutants coming downstream, but eventually they have to open up to breathe and feed, so long-term water quality problems in a watershed will eventually kill them.

The survival of these mussels in the state is uncertain. Habitat alteration and loss, competition from exotic species (Asian clam and zebra mussel) and over-harvesting of shells are the primary reasons for decline. Some species that are dwindling have never been abundant here, a natural rarity that makes them even more susceptible to habitat degradation than a species that is common with a large range.

To help reverse the decline of mussels, the M. isauri Department of Conservation, U.S. Fish and Wildlife Service and Southwest M. isauri State University are working together to artificially propagate and restock populations of endangered mussels. The goal is to boost populations that are no longer reproducing on their own.

Habitat restoration is the key element needed to bring M. isauri’s mussel populations back to healthy, self-sustaining levels. Restoration of streams is a slow process, so mussel breeding in captivity may save some of our rarest mussel species.

For an updated list of endangered and rare mussels, visit Missouri’s Endangered Species Checklist at www.conservation.state.mo.us/nathis/endangered/.

Elktoe

Although not listed as Endangered, the elktoe is one of many M. isauri spads with a declining population.

Snuffbox

Four mussels are listed as Endangered in M. isauri only, including the snuffbox, elephantear, storyshell and lampshell.

Scaleshell (above)

and pink mucket

The pink mucket and scale shell mussels are listed as Endangered both in M. isauri and nationwide, along with the Curtis-pearlymussel. H. ligata’s eye fat pocketbook and winged mapleleaf (thought to be eradicated or no longer found in M. isauri).

www.conservation.state.mo.us/nathis/endangered/.

Pink PAPERSHELL • Potamilus ohiensis

The dorsal wing connects the shell halves and covers the hinge.

**SHELL** thin, compressed, oval to rectangular with a large dorsoal wing.

**UMBO** not raised above hinge line.

**EPIDERMIS** light tan to olive-brown, becomes darker brown with age. Light tan juveniles may have a greenish cast; without rays.

**INSIDE SHELL** back cavity shallow; pseudocardinal teeth thin, small and erect; lateral teeth thin, blade-like and slightly curved; nacre (lining) light purple.

**DISTRIBUTION** relatively widespread; most common in Gasconade, Osage, Grand, Chariton, Lamine, North Fabius and Salt rivers; uncommon where found.

**HABITAT** shallow areas of medium to large rivers with slow current in silt, mud or sand.

**SIMILAR SPECIES** Pink heelsplitter has a darker, thicker shell with a deep purple nacre and large pseudocardinal teeth. Fragile papershell is light yellow with a darker area near the umbo and whitish to whitish-blue nacre, possibly with a pink tinge.

**ADULT SIZE** 3-6".

Bluefer • Potamilus purpuratus (also Pfeiffer shell)

The bluefer, pink heelsplitter and fragile and pink paper shells use freshwater drum as a host.

**SHELL** stout, inflated, oval to rectangular and thick with a posterior wing round anterior end and broadly rounded posterior ridge; posterior and bluntly squared (males) to sharply rounded (females).

**UMBO** broad and raised above hinge line.

**EPIDERMIS** smooth and glossy, dark brown, becomes black with age; dark green rays on young, later fading.

**INSIDE SHELL** back cavity broad and deep; pseudocardinal teeth relatively small, roughened and pointed; lateral teeth prominent, blade-like and slightly curved; nacre (lining) pinkish-purple to deep purple.

**DISTRIBUTION** restricted to the Lowland Region in flood control ditches and White, Black, St. Francis and Mississippi river tributaries.

**HABITAT** medium to large rivers with reduced current in a stable mix of mud and silt and mud and gravel.

**SIMILAR SPECIES** Pink heelsplitter is lighter in color and less inflated or stout and its nacre is lighter in color.

**ADULT SIZE** 3-8".

Lilliput • Toxolasma parvus

The smallest of Missouri’s freshwater mussels.

**SHELL** small, stout, thick, elliptical and inflated.

**UMBO** moderately broad and low.

**EPIDERMIS** light brown to grayish-brown, becomes dark brown to black with age.

**INSIDE SHELL** back cavity shallow to moderately deep; pseudocardinal teeth thin, high, triangular and roughened; lateral teeth also thin but well developed, long, high and blade-like; nacre (lining) bluish-white, sometimes with salmon tinged, iridescent posteriorly.

**DISTRIBUTION** endemic, but more common than the other two lilliput species.

**HABITAT** large rivers with slow to no current in silt, sand and fine gravel; also in ponds, lakes and overflow waters.

**SIMILAR SPECIES** Purple lilliputs (not shown) have larger, more rounded shells with distinctive purple nacre and are found in the southern Ozarks. Texas lilliputs (not shown), newly known in M. isauri, have a satiny sheen to their shells.

**ADULT SIZE** 1-2".
Step 1:
During the breeding season, males release sperm into the water and the females filter the sperm into their gill chambers. The female’s gills incubate the fertilized eggs until they develop into tiny larvae, called glochidia.

Step 2:
Glochidia must attach to the gills or fins of a specific fish species. Mussels have unusual tricks to attract their host. Pocketbooks have a lure that looks like a small fish, while other mussels release their glochidia in packets disguised as insects or tiny fish. Host fish are fooled and try to eat the lures, taking glochidia into their mouths and gills. They develop for several days or weeks before becoming juveniles and leaving the fish.

Step 3:
When mature, the juvenile mussels release from the host and drop onto the stream floor. Unlike other parasites, glochidia usually do not harm the host.

Step 4:
If the juvenile mussels drop into good habitat, they grow into adults and the cycle is repeated. Some mussels live less than 10 years, while others live 20 to 40 or as many as 100.

Life Cycle of a Mussel
Freshwater mussels rely on specific host fish for their larvae to develop into young mussels. For some species, finding the right host involves deception with intricate lures.
Mussels sit quietly in the water and never utter a sound. They require oxygen, food, and water to thrive. They are relatively immobile but can extend their feet to reach the bottom or surface of a stream. They can live longer than most other animals.

Nearly 300 species of freshwater mussels occur in North America, and approximately 65 of them live in Missouri waters. The iridescent whites, brilliant purples, and beautiful pinks of freshwater mussel shells are as colorful as their namesake—kaleidoscope, rainbow, and glitter, just to name a few.

Mussels are biological indicators of water quality because they are long-lived and relatively immobile, accumulating contaminants present in water and sediment that can be scientifically analyzed. They are nature's "vacuum cleaners," filtering and cleaning polluted water.

**What good are mussels, you ask?**

Mussel shells are an important food for raccoons, muskrats, otters, and some waterfowl and fish. Mussels may also be eaten by humans. Mussel shells or middens on stream banks—the husks of a tasty meal—are harvested. Plastics came into widespread use, and the long-lived, bottom-dwelling mussels declined rapidly and the long-lived, thick-shelled animals couldn't reproduce as quickly as they were harvested. Plastic debris has become a serious threat to mussels, as it can entangle or strangle them. In the early 1990s, fashionable buttons were purchased from shells of freshwater mussels. The button industry originated right here in the Midwest because the Mississippi River was rich in these shells or middens on stream banks—the husks of a tasty meal. Mussel resources were harvested. Plastics came into wide use, and the long-lived, bottom-dwelling mussels declined rapidly and the long-lived, thick-shelled animals couldn't reproduce as quickly as they were harvested. Plastic debris has become a serious threat to mussels, as it can entangle or strangle them.

**Feeding and reproduction**

A freshwater mussel's body is mostly a long muscular foot that contracts and withdraws into the shell if pulled from the stream bottom. On either side of the foot is a pair of thin, specialized gills that allow the mussel to breathe and filter-feed. Water is drawn into the body or mantle cavity through the incurrent siphon and passes over the gills that extract oxygen and food (algae and fine particles of decaying organic matter). While food travels to the mussel's stomach, sediment and undigested wastes (called pseudofeces) quickly exit through its excurrent siphon, becoming food for other aquatic animals. Waste products include undigested wastes (called pseudofeces) that are quickly excreted through the excurrent siphon. In this mussel and other freshwater mussels, the adult's mantle is modified into a brood chamber for embryos that mature into microscopic larvae, called glochidia (glo-kid-ee-ah). If glochidia don't attach for days or weeks, develop into juveniles and drop to the stream bottom. If they land in a suitable habitat, they grow to adults and repeat the cycle. If glochidia don't find a suitable host fish or they land in poor habitat, they will die.

**Can you eat freshwater mussels?**

You can eat freshwater mussels, but their meat is tough and unpalatable compared to the saltwater mussels commonly eaten. Mollusks live on rocky coasts and attach themselves to rocks by strong filaments called byssal threads, so their meat is tender. Freshwater mussels burrow and move about on the river bottom, requiring a tough muscular foot. Plus, a freshwater mussel's foot and soft tissues are food for other aquatic animals. In the early 1900s, fashionable buttons were purchased from shells of freshwater mussels. The button industry originated right here in the Midwest because the Mississippi River was rich in these shells or middens on stream banks—the husks of a tasty meal.
**Missouri mussel invaders**

Two exotic freshwater mussels, the Asian clam (*Corbicula fluminea*) and the zebra mussel (*Dreissena polymorpha*), have found their way to Missouri. The Asian clam was introduced into the western U.S. from Asia in the mid-1930s and spread westward, eventually reaching Missouri in the early 1990s. Since then, it has moved into the Mississippi River basin and is most abundant in streams south of the Missouri River. In the mid-1990s, zebra mussels hitched a ride in the ballast waters of freighter ships traveling from Asia to the Great Lakes. They have rapidly moved into the Mississippi River basin and westward to Oklahoma. Asian clam and zebra mussel larvae have an advantage here because they don’t require a fish host to reach a juvenile stage and can reproduce at a much faster rate than native mussels. Zebra mussels attach to any solid surface, including industrial pipes, native mussels and snails and other zebra mussels. They form dense clumps that suffocate and kill native mussels by restricting feeding, breathing and other life functions.

You can help stop the spread of these mussels by not moving bait or boat well water from one stream to another; dump and drain on the ground before leaving. Check all surfaces of your boat and trailer for zebra mussels and destroy them, along with vegetation caught on the boat or trailer. Wash with hot (104°F) water at a carwash and allow all surfaces to dry in the sun for at least five days before boating again.

**Resources**

*Field Guide to Freshwater Mussels of the Midwest.*

Ronald D. Desch, Missouri Department of Conservation, 1995. A guide with drawings and detailed descriptions of all Missouri mussels. Note that many of the scientific names have changed since it was updated, but common names used in the book are noted here. (Available from Nature Shop, Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180 for $6, plus $2 for shipping and handling. Missouri residents add 6.225 percent sales tax.)

*The Unio Gallery at Southwest Missouri State University contains some of Dr. Chris Barnhart’s fascinating photos and videos of the life cycle of mussels.*

Website for the *Field Guide to Freshwater Mussels of the Midwest,* by Kevin S. Cummings and Christine A. Mayer of the Illinois Natural History Survey. The book is online.

---

**ZEBRA MUSSEL**

A female can produce more than a million larvae at one time, several times per year.

**SHELL** Slightly elongate, triangular and D-shaped. **EPIDERMIS** Very distinctive with alternating bands of light and dark colors. **Threat** Attach to any solid surface in dense clusters, including industrial pipes and native mussels if enough attach to a native mussel, it cannot open its shell and soon dies.

**ADULT SIZE 1”**

**ASIAN CLAM**

Shells are very common statewide in rivers, ponds and reservoirs and are often found on banks and gravel bars. **SHELL** Thick, rounded to somewhat triangular and inflated. **EPIDERMIS** Greenish-yellow to black with heavy, concentric ridges, originating from the umbo. **INSIDE SHELL** Deep interior beak cavity; prominent teeth; white to dark purple nacre (lining). **Threat** Believed to compete with native mussels for food and habitat.

**ADULT SIZE 1.5”**

---

**Mussel builders**

Freshwater mussels need clean water and stable rivers and streams. The Missouri Stream Team program is a network of citizens concerned about Missouri streams who get involved in river conservation. Joining a Stream Team is a good way to help our streams, from water quality and litter control to creating wildlife habitat. For more information:

Stream Team Coordinator,
Missouri Department of Conservation,
P.O. Box 180, Jefferson City, MO 65102-0180,
call 1-800-781-1989 or visit
www.mostreamteam.org.

---

**Web sites**

[www.mostreamteam.org](http://www.mostreamteam.org)

[www.inhs.uiuc.edu/cbd/musselmanual/cover.html](http://www.inhs.uiuc.edu/cbd/musselmanual/cover.html)

[www.mosummuseum.org](http://www.mosummuseum.org)

[www.inhs.uiuc.edu/cbd/musselmanual/cover.html](http://www.inhs.uiuc.edu/cbd/musselmanual/cover.html)