

Mussels of the Flint River Basin:

Descriptions, Life History, and Habitat



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We dedicate this guide to the memory of Carson Stringfellow,
the original mussel hugger.

About

This guide is an educational resource intended to grow awareness and affection for the freshwater mussels of the Flint River basin in Georgia. Taxonomy is relevant as of January 2024.

We compiled range, habitat, brooding, and shell descriptions from *Freshwater Mussels of Alabama and the Mobile Basin in Georgia, Mississippi, and Tennessee* by James D. Williams, Arthur E. Bogan, and Jeffrey T. Garner; observations by the Georgia Department of Natural Resources Wildlife Resources Division; and observations by the Jones Center at Ichauway Aquatic Biology Laboratory. Additional resources are cited throughout the document and listed at the end. Unless otherwise specified, photos were provided by the Jones Center at Ichauway Aquatic Biology Laboratory.

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A pair of dragonflies fly over *Elliptio nigella*.

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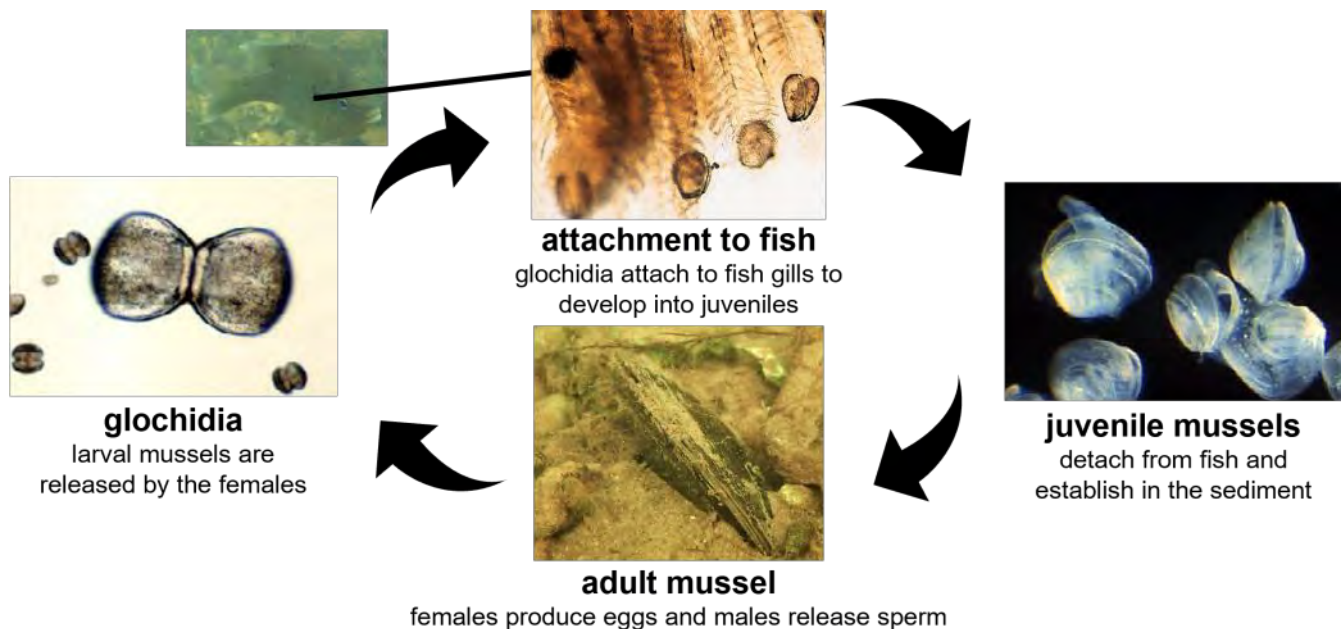
A Quick Introduction to Freshwater Mussels

What are they and what do they do?

Freshwater mussels are molluscs in the order Unionida. They live burrowed in the sediments of lakes, rivers, and streams. Habitat preference differs among species. Once burrowed in the sediment, they can relax muscles to slightly open their shells and filter feed. Their filtering significantly improves the water quality around them by removing particles, making it a better environment for other animals and humans to utilize.

A unique method of reproduction

Female mussels produce eggs and males release sperm into the water. After the eggs are fertilized, brooding occurs within the female mussel's shell as the eggs develop into the larval stage known as glochidia. The glochidia must attach to the gills of fish hosts to develop into juvenile mussels. Some mussels are generalists and may utilize many fish types, while others use specific species of fish. Attaching the glochidia to the fish gills may be achieved in various ways. Some mussels may simply release their glochidia into the water column to attach to fish gills, while mussels attracting more specific fish may have more specialized techniques. Some mussels can make lures called conglutinates. These conglutinates look like the prey of host fishes, but upon biting, they release glochidia. Others can place the lures on long mucus tubes called superconglutinates. Once the glochidia have developed into juveniles, they can detach from the gills, settle to the sediment surface, and burrow in their new location.



The life cycle of a mussel, credit for photos of glochidia and juveniles: M.C. Barnhart, Unio Gallery, <http://unionid.missouristate.edu>.

Conservation

Over 70% of North American freshwater mussel species are considered imperiled, threatened, endangered, or extinct (Williams et al 1992). The causes include flow alteration and separation from host fishes by dam construction, reduced water quality, reduced flow due to human use, invasive species, and more.

Internal Anatomy

Basic Terms

- **Mantle**– a layer of tissue that separates the mussel body from the shell
- **Dorsal and pallial muscles**– attach the mantle to the shell
- **Foot**– organ used to anchor in or move through the substrate
- **Adductor muscles**– used to close the shell
- **Gills**– used for respiration, feeding, and storing eggs (typically outer gills)
- **Labial palps**– help transfer food from the gills towards the mouth
- **Incurrent, excurrent, and supra-anal apertures**– openings that bring resources (e.g., water and food) or expel resources (e.g., waste and sperm) to and from the mussel
- **Papillae**– rows of tissue along the apertures

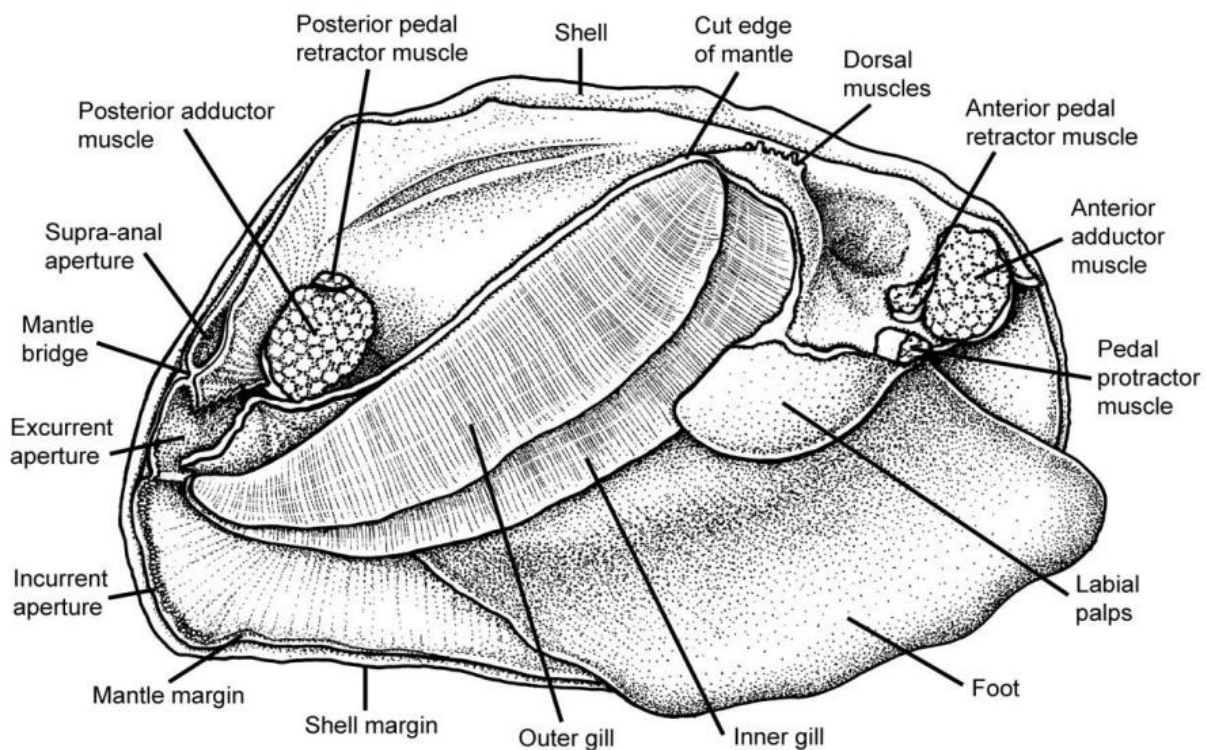
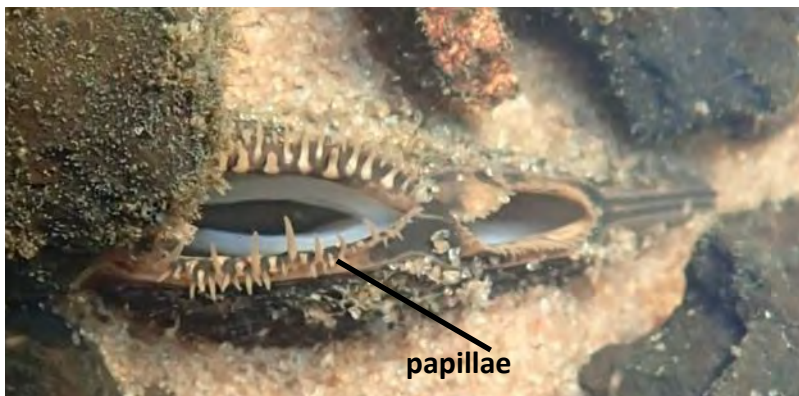


Illustration of mussel interior with the mantle cut away, credit: illustrated by S. Trammel, Williams 2008.

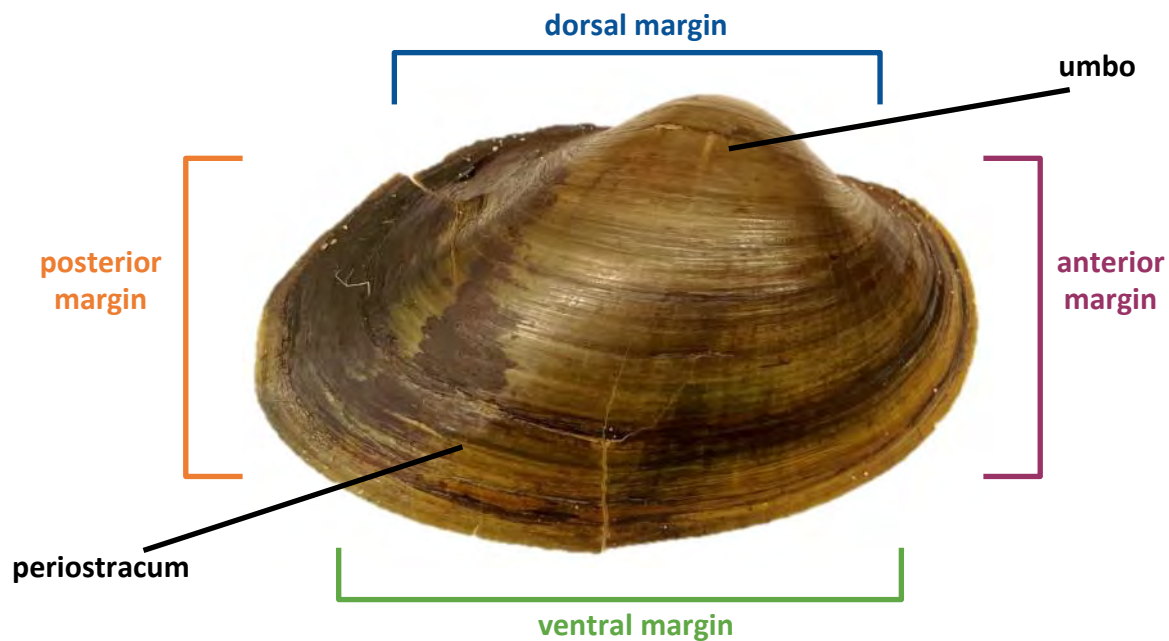


A mussel in substrate; the adductor muscles are relaxed so the shell is open.

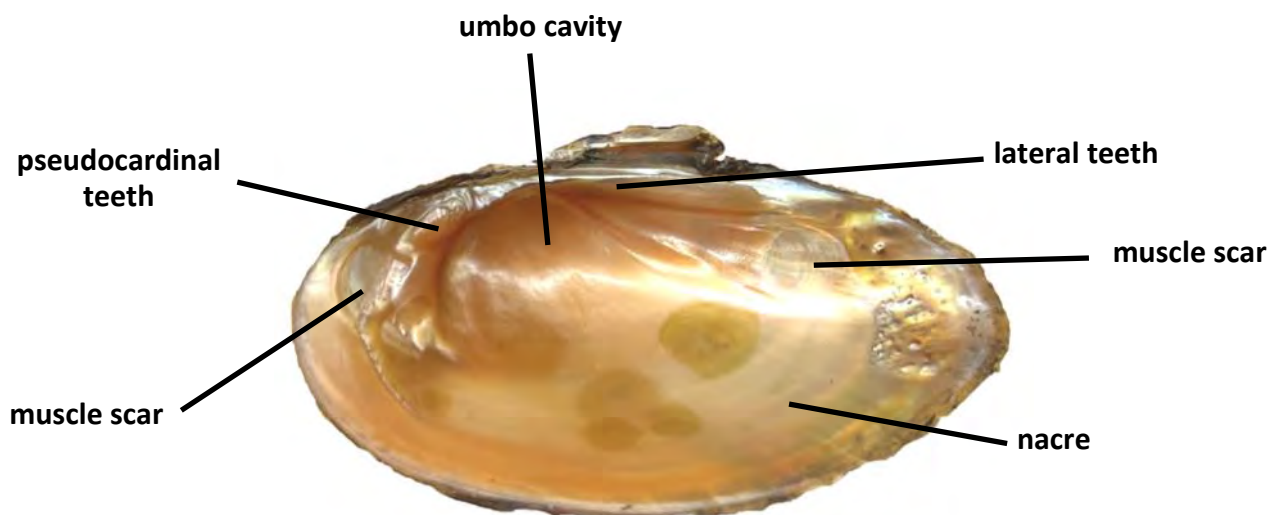
Shell Morphology

Basic Terms

- **Periostracum**- the uncalcified outer layer of the shell; color and texture varies among species
- **Umbo**- oldest part of the shell; located near the hinge; inflation and sculpturing varies among species
- **Nacre**- inner shell layer composed of calcium carbonate; visible once shell is opened; color varies among species
- **Teeth**- includes pseudocardinal (anterior of the umbo) and lateral (posterior to the umbo) teeth; function is to aid in alignment while closing; presence varies among species
- **Muscle scar**- scar in the shell left by the presence of muscles



External shell morphology.



Internal shell morphology.

Umbo Sculpturing

The umbo sculpturing varies among mussel species. Three major types of sculpturing can be found in the Flint basin: barred, single-looped, and double-looped. As mussels age or live in tough environments, the sculpturing can erode away.

Barred Sculpturing

Barred sculpturing is considered to look like a swish mark. Examples of species include *Elliptio pullata* and *Elliptio fumata*.



Single-looped Sculpturing

Single-looped sculpturing consists of concentric rings. Examples of species include *Toxolasma paulum* and *Unio merus columbensis*.



Double-looped Sculpturing

Double-looped sculpturing resembles the letter "w." Examples include *Villosa vibex*, *Villosa villosa*, and *Leunio lienosus*.



The Flint River Basin

The Flint River

The headwaters of the Flint River are buried in pipes under the Hartsfield-Jackson Atlanta International Airport. The Flint flows unimpeded by dams for its first 220 miles, making it one of only 40 rivers left in the United States to flow over 200 miles without a dam. Then, the river has a series of three run-of-the-river reservoirs created by dams. The final reservoir, Lake Seminole, is formed by the Flint's convergence with the Chattahoochee River and marks the end of the Flint. The outflow of Lake Seminole is the start of the Apalachicola River, which eventually flows into the Gulf of Mexico. Along this journey, the Flint runs 349 miles.



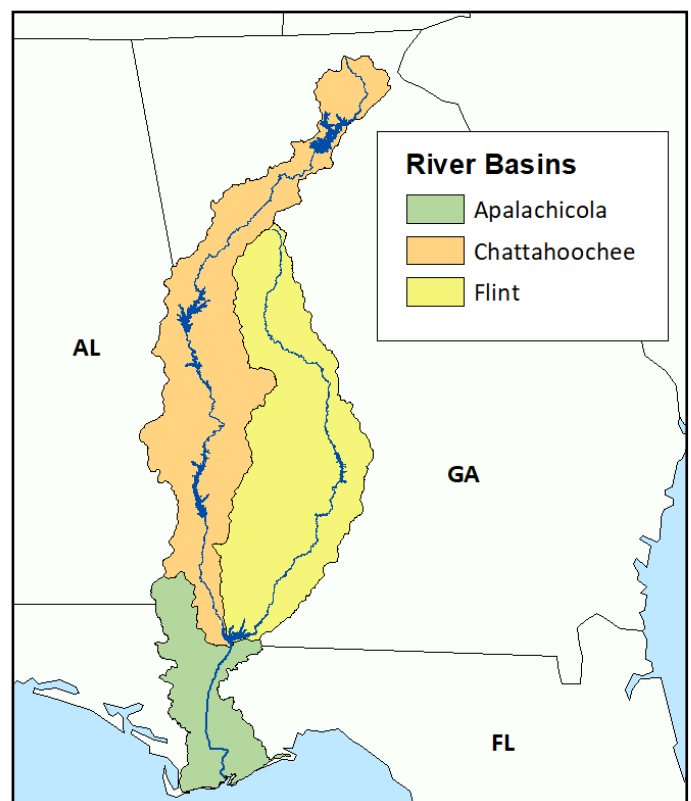
The Flint River, credit: Richard T. Bryant.

Habitat Diversity and Biodiversity

The Flint and its tributaries flow through many different physiographic districts, meaning there is a large diversity of habitats. The basin begins in the Greenville Slope and Pine Mountain districts, which offer habitats including Piedmont swamps, Pine Mountain ridges, and megashoals. After crossing the fall line of the Piedmont and Coastal Plain physiographic provinces, the waters flow through the Fall Line Hills district. Habitats here include blackwater swamps and riparian forests. Finally, the waters reach the Dougherty Plain, a region known for its karst landscape. Here, the Ocala limestone on the banks and underlying the river create habitats like limestone shoals and blue hole springs. This abundance of habitats combined with the Flint's old geologic age and isolation make high biodiversity of fish, amphibians, and mussels possible.

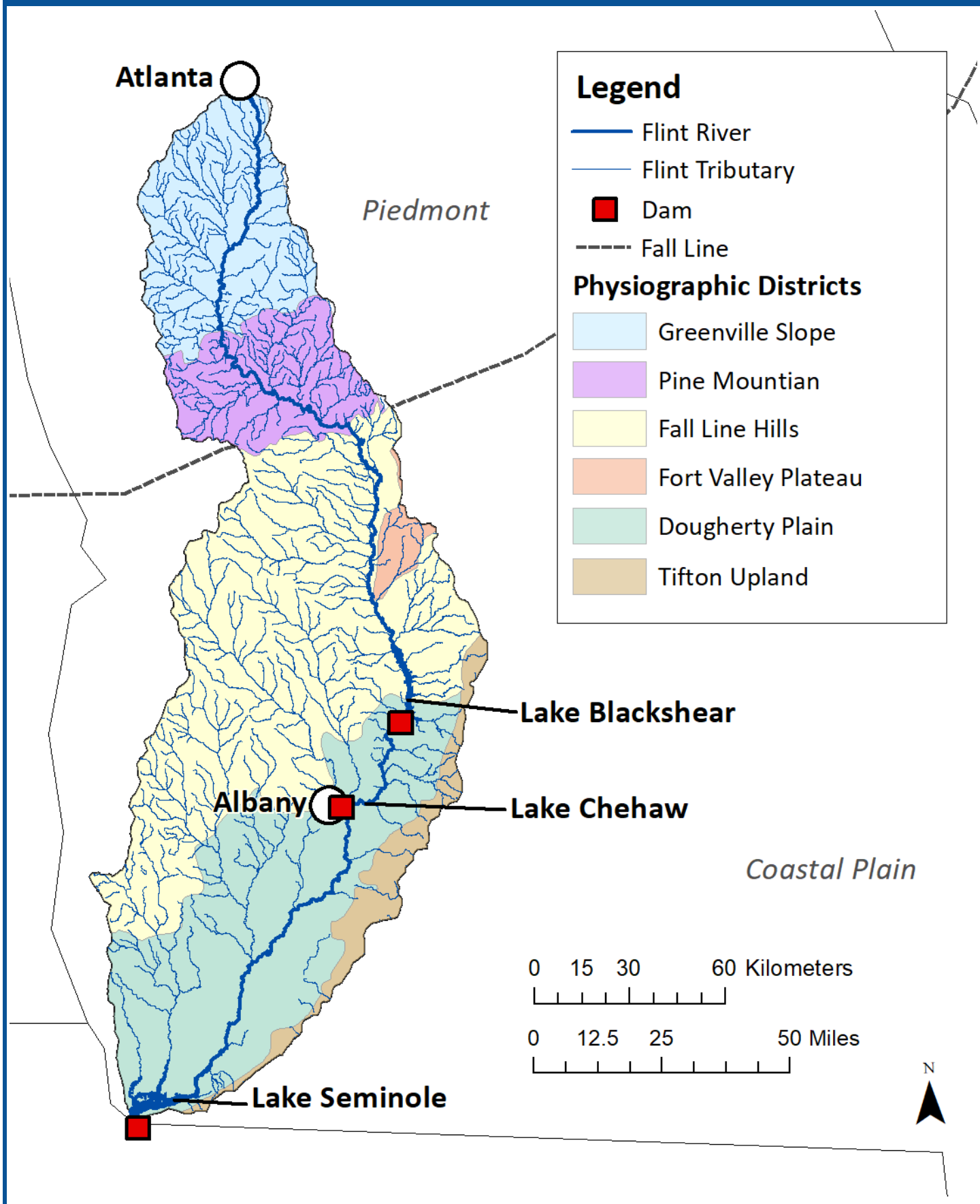
The Apalachicola-Chattahoochee-Flint (ACF) Basin

The Flint River basin is part of the Apalachicola-Chattahoochee-Flint River basin. Together, this basin includes parts of Alabama, Georgia, and Florida and drains over 19,000 square miles. Although rainfall is typically abundant, land development, long growing seasons, warming temperatures, and human demand can reduce flows and result in water scarcity. Water usage and regulation in the ACF Basin is contentious due to the demands for human supply, irrigation for crops, and meeting the needs of aquatic wildlife. Building more resilient water management plans is an important aspect of mussel conservation.



The ACF Basin.

Flint River Basin Map



Amblema neislerii, Fat Threeridge

Status: Federally endangered

Range: Flint River downstream to Apalachicola and Chipola Rivers

Typical Habitat: Small to large rivers with stable sandy to silty substrate; Smit and Kaeser (2016) noted their preference for gently sloping banks with low shear stress

Life History: Females brood from May to June and release a sticky white mass of glochidia that wrap around fish (O'Brien and Williams 2002).

Fish Host: *A. neislerii* have demonstrated success with Etheostominae (darters) and Cyprinidae (minnows) in laboratory studies (Fritts and Bringolf 2014).



89 mm



Description

- **Shell:** thick with 7-9 horizontal and parallel ridges, scalloped posterior, larger specimens are highly inflated
- **Size:** maximum length ~115 mm



47 mm

A smaller *A. neislerii* shell.



A. neislerii in the Flint River.

Subfamily: Ambleminae, Tribe: Amblemini

Hamiota subangulata, Shinyrayed Pocketbook

Status: Federally endangered

Range: Flint River and its tributaries with some populations in the Ochlockonee River (FL) and tributaries of the Chattahoochee River

Typical Habitat: Medium sized streams to large rivers in sandy to muddy substrate

Life History: Females have been found brooding throughout the year, and superconglutinates that look like small fish have been observed April through September. A mantle fluttering display has also been observed and is thought to be a strategy in periods of lower flow (Fritts and Bringolf 2014).

Fish Host: *H. subangulata* utilizes *Micropterus* (bass) species for transformation.

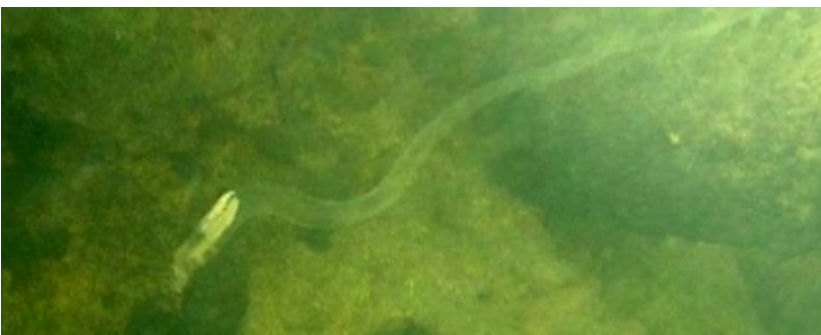


55 mm



Description

- **Shell:** bluntly pointed with round ventral margin and high umbo
- **Periostracum:** waxy, yellow-brown, and has dark rays over the entire length; older individuals are darker with obscured rays
- **Nacre:** white or salmon tinted
- **Sexually dimorphic**
- **Size:** maximum length ~85 mm



A superconglutinate of *H. subangulata* moves through the water to attract bass.



A variety of sizes and staining in Spring Creek.

Subfamily: Ambleminae, Tribe: Lampsilini

Lampsilis floridensis, Florida Sandshell

Status: Not listed federally or in Georgia

Range: Gulf Coast basins from Escambia River (~Pensacola, FL) to Hillsborough River (~Tampa Bay, FL)

Typical Habitat: Small creeks to large rivers in sand, gravel, and mud substrates; commonly found on sloping sandy banks and sometimes in reservoirs

Life History: Females brood from late summer to the following spring or summer. Nocturnal displays of a dark and unornamented mantle flap have been observed in the Apalachicola and Suwannee Rivers (Brim Box and Williams 2000).

Fish Host: *L. floridensis* utilize Centrarchidae (sunfishes) and Lepisosteidae (gar) species for transformation (Roe 2010).



81 mm



Description

- **Shell:** elongate and bluntly pointed with a round ventral margin
- **Periostracum:** ivory to pale yellow, may have faint rays, has dark posterior ridge, and feels waxy
- **Sexually dimorphic**
- **Size:** maximum length ~120 mm



L. floridensis in the Flint River; a small portion of its foot is visible.



Top: female, bottom: male.

Subfamily: Ambleminae, Tribe: Lampsilini

Lampsilis straminea, Rough Fatmucket

Status: Not listed federally or in Georgia

Range: Suwanee River Basin (GA and FL) west to Lake Pontchartrain (~New Orleans, LA)

Typical Habitat: Small creeks to large rivers in sand, gravel, and mud substrates; sometimes found in reservoirs (Williams et al. 2014)

Life History: Females are believed to brood from spring to late summer. They produce large and elaborate mantle lures.

Fish Host: *L. straminea* are considered generalists. Laboratory studies have shown successful transformation on Centrarchidae (sunfishes), Cyprinidae (carps and minnows), and other groups. The size of its lure suggests it may target larger fish (GA DNR).



91 mm



Description

- **Shell:** oval outline, very inflated, thick, and heavy
- **Periostracum:** yellow or brown with faint or absent rays
- **Sexually dimorphic**
- **Size:** maximum length ~119 mm



L. straminea in the Flint River.



Top: female, bottom: male.

Subfamily: Ambleminae, Tribe: Lampsilini

Leunio lienosus, Little Spectaclecase

Status: Not listed federally or in Georgia

Range: Suwannee River basin (GA and FL) west to Texas and north to the Illinois and Ohio River basins

Typical Habitat: Small creeks to large rivers in sand, gravel, and mud substrates; can be found in reservoirs

Life History: Females brood in late summer or autumn to the following summer. They can create large club shaped conglutinates (Utterback 1916).

Fish Host: Successful transformations have occurred on Centrarchidae (sunfish) and Ictaluridae (catfish) (Keller and Ruessler 1997).



Description

- **Shell:** rounded on posterior end with biangulate posterior margin
- **Periostracum:** brown with fine rays present or absent
- **Internal anatomy:** can usually be opened slightly; ACF specimens have a peppery charcoal pigmentation that is only present on the posteroventral portion of the mantle
- **Sexually dimorphic**
- **Size:** maximum length ~84 mm

Similar Flint Species

- Small specimens can look like *Toxolasma paulum*
- *Villosa vibex*
- *Villosa villosa*



A male *L. lienosus* in Brantley Creek.



Top: female, bottom: male.

Subfamily: Ambleminae, Tribe: Lampsilini

Medionidus penicillatus, Gulf Moccasinshell

Status: Federally endangered

Range: Chattahoochee (Kirkland and Sawhatchee Creeks) and Flint (Ichawaynochaway, Chickasawhatchee, Whitewater, Swift, and Chokey Creeks) basins, Econfinia Creek (~Florida Panhandle)

Typical Habitat: Usually smaller creeks but can occupy larger rivers with moderate flow; sand, gravel, or cobble substrates

Life History: Gravid females have been found from October through mid-summer. Females with mature glochidia have been observed out of the substrate lying on their umbos. They flap dark mantles and push their white gills to the edge of their shells (O'Brien and Williams 2002).

Fish Host: *M. penicillatus* primarily utilize Percidae (darters). Evidence of successful transformation has been found on *Percina nigrofasciata* (Blackbanded Darter), *P. crypta* (Halloween Darter), and *Etheostoma swaini* (Gulf Darter) (Fritts and Bringolf 2014).



M. penicillatus in Chokey Creek.



The corrugations of older specimens may be eroded away.

Description

- **Shell:** elongated and pointed, generally small, inflated, and posterior slope always has corrugations present
- **Periostracum:** generally yellowish to amber with rays in broken chevron pattern sometimes present; older specimens may be darker
- **Size:** maximum length ~55 mm

Subfamily: Ambleminae, Tribe: Lampsilini

Toxolasma paulum, Iridescent Lilliput

Status: Not listed federally or in Georgia

Range: ACF Basin, Econfina Creek (~Florida Panhandle) east to Lake Okeechobee

Typical Habitat: Small creeks to large rivers and reservoirs in sand, gravel, and mud substrates; often found close to the bank in fine and silty sediment

Life History: *T. paulum* may migrate vertically along stream slopes in response to shifts in water level (Clench and Turner 1956). Females brood from late summer until late spring. They rotate small knob-like papillae called caruncles to attract fish.

Fish Host: Hosts are largely unknown but Centrarchidae (sunfishes) have been confirmed.



21 mm



Description

- **Shell:** small with single looped umbo sculpturing
- **Periostracum:** usually very dark brown; old specimens are still small but tend to have eroded umbo
- **Sexually dimorphic**
- **Size:** maximum length ~49 mm

Similar Flint Species

- Can look like small *Leunio lienosus*



Left top: female, bottom: male. Right: *T. paulum* displays caruncles.

T. paulum in Keel Creek.

Subfamily: Ambleminae, Tribe: Lampsilini

Villosa vibex, Southern Rainbow

Status: Not listed federally or in Georgia

Range: Coastal drainages from North Carolina to Mississippi

Typical Habitat: Small creeks to large rivers and reservoirs in sand, gravel, and mud substrates

Life History: Females brood from late summer until early July. They have been observed pulsating ~15 pairs of tentacle like papillae to attract hosts. The papillae are inky-black to rusty-orange with little black spots, and they taper to a fine point (Haag et al. 1999).

Fish Host: *V. vibex* has had successful transformation on Centrarchidae (sunfishes), Ictaluridae (catfishes), Fundulidae (topminnows and killfishes), and Esocidae (pikes, pickerels, and mudminnows). Haag et al. (1999) reported transformation on *Micropterus punctulatus* (Spotted Bass) and *M. salmoides* (Largemouth Bass).



Description

- **Shell:** thin, smooth, and moderately inflated with double looped umbo sculpturing
- **Periostracum:** prominent dark rays on posterior
- **Internal anatomy:** ACF specimens have peppery charcoal pigment that extends entire length of central mantle margin
- **Sexually dimorphic**
- **Size:** maximum length ~88 mm

Similar Flint Species

- *Villosa villosa*
- *Leunio lienosus*



A display of papillae, credit: Haag et al. 1999.



Top: female, bottom: male; credit: Tara Muenz.

Subfamily: Ambleminae, Tribe: Lampsilini

Villosa villosa, Downy Rainbow

Status: Not listed federally or in Georgia

Range: St. Mary's River basin (GA and FL) west to Escambia River basin (~Pensacola, FL)

Typical Habitat: Small creeks and sloughs to large rivers and reservoirs in sand, gravel, and mud substrates

Life History: Females brood from late summer until the following summer. They use a mantle lure or a simple brood lure to attract fish hosts (Hewitt et al. 2021).

Fish Host: The hosts of *V. villosa* are largely unknown, but they include Centrarchidae (sunfishes).



57 mm



Description

- **Shell:** elliptical, moderately thin, and inflated with double looped umbo sculpturing
- **Periostracum:** feels clothlike; usually dark brown and may have broad rays
- **Internal anatomy:** ACF specimens have peppery charcoal pigment that extends entire length of central mantle margin
- **Nacre:** often silvery-blue
- **Sexually dimorphic**
- **Size:** maximum length ~90 mm

Similar Flint Species

- *Villosa vibex*
- *Leaunio lienosus*



V. villosa in Mill Creek.



Top: female, bottom: male.

Subfamily: Ambleminae, Tribe: Lampsilini

Elliptio arctata, Delicate Spike

Status: Endangered in Georgia

Range: Historically spanned from ACF Basin west to Pearl River (MS) but now seems restricted to Flint River and its tributaries in the ACF Basin; specimens in Mobile River basin are rare or extirpated

Typical Habitat: Creeks and rivers with moderate currents; most commonly found around large cobble, limestone boulders, and bedrock cracks in cavities and crevices

Life History: Females are believed to have a short brooding duration (Archambault et al. 2018) from February to May. Not much else is known.

Fish Host: *E. arctata* is likely a specialist species but the host is unknown. Learning more about life history is a priority for species recovery.



Description

- **Shell:** arcuate, thin for *Elliptios*, and often heavily eroded
- **Nacre:** often bluish-white
- **Internal anatomy:** teeth are small, has whitish papillae, and has large supra-anal opening
- **Size:** maximum length ~100 mm

Similar Flint Species

- Old specimens may lose their arc and look like *Elliptio pullata* and *E. fumata*
- *E. purpurella*



E. arctata are often heavily eroded.



E. arctata in the Flint River.

Subfamily: Ambleminae, Tribe: Pleurobemini

Elliptio crassidens, Elephant Ear

Status: Not listed federally or in Georgia

Range: Mississippi River basin (PA west to WI and south to MO), Alabama River basin, and ACF basin

Typical Habitat: Rivers in sand, gravel, or cobble substrates

Life History: Females are short term brooders that brood from early spring to late spring. They produce conglomerates that have been described as “simple and non-elastic” (Watters et al. 2009) and as “a mass” that “does not appear to be mimicking a particular food source” but could be a grub or worm (Hauswald 2010).

Fish Host: *E. crassidens* utilize *Alosa* species including *A. chrysochloris* (Skipjack Herring) and *A. alabamiae* (Alabama Shad) (Hart et al. 2018).



71 mm



Description

- **Shell:** round to oval when young and elongated to arcuate when older, thick, heavy, inflated, and usually with corrugations on posterior slope that can erode with age
- **Periostracum:** usually brownish-amber to very dark brown; may have rays
- **Size:** maximum length ~125 mm



E. crassidens in the Flint River.



An old specimen that became arcuate and developed into a “Gonzo nose.”

Subfamily: Ambleminae, Tribe: Pleurobemini

Elliptio nigella, Winged Spike

Status: Not listed federally or in Georgia; was believed to be globally extinct until rediscovery in 2010 (Wisniewski et al. 2013)

Range: Currently known from lower Flint River in Albany to Lake Seminole

Typical Habitat: Large rivers around large cobble and limestone boulders in cavities and crevices

Life History: Females brood from spring to late summer and fall. Not much else is known.

Fish Host: More information is needed. Fish hosts could be similar to *E. chipolaensis*, which inhabits the Chipola River and utilizes Centrarchidae (sunfishes). Learning more about life history is a priority for species recovery.

Description

- **Shell:** wedge-shaped with a distinct notch anterior to the umbo, thin for an *Elliptio* species, biangulated posterior margin, and prominent wing
- **Nacre:** white, blue-white, or peach
- **Size:** maximum length ~106 mm



A young relic from the Flint River.



Similar Flint Species

- *Elliptio pullata* and *E. fumata*



E. nigella in Ichawaynochaway Creek.

Elliptio pullata, Gulf Spike + *Elliptio fumata*, Gulf Slabshell

E. pullata and *E. fumata* are extremely difficult to tell apart. Surveys often group these species together.

E. pullata

Status: Not listed federally or in Georgia

Range: Escambia River basin (~Pensacola, FL) east to ACF basin

Typical Habitat: Small creeks to large rivers in nearly all substrates

Life History: *E. pullata* is the most abundant mussel in the ACF basin. Females brood from May to August. Not much else is known.

Fish Host: Hosts are largely unknown, but studies have successfully used *Lepomis macrochirus* (Bluegill) and *Micropterus salmoides* (Largemouth Bass) (Keller and Ruessler 1997).



67 mm



Descriptions

- **Shell:** both species are elliptical and moderately thick with barred sculpturing on the umbo. *E. pullata* tends to be more elongated. *E. fumata* tends to be narrower and more rectangular.
- **Size:** maximum length ~110 mm (*E. pullata*) and ~145 mm (*E. fumata*).

E. fumata

Status: Not listed federally or in Georgia

Range: ACF basin

Typical Habitat: Small creeks to large rivers in nearly all substrates

Life History: Females brood from May to August. Not much else is known.

Fish Host: Hosts are unknown.



65 mm



Subfamily: Ambleminae, Tribe: Pleurobemini

Similar Flint Species

- *Elliptio arctata*
- *E. pupurella*
- *E. nigella*



E. pullata relic.



E. fumata relic.



Young specimens.



Specimen in the Flint River.



Specimen in Mill Creek.



Specimen filtering in Ichawaynochaway Creek.

Subfamily: Ambleminae, Tribe: Pleurobemini

Elliptio purpurella, Inflated Spike

Status: Threatened in Georgia

Range: ACF and Ochlockonee (FL) basins

Typical Habitat: Clay-bottomed streams, sand and limestone shoals in medium creeks to large rivers, and sometimes sand-bottomed runs with slow and steady current

Life History: Prior observation suggests females brood from mid-spring until May. Not much else is known.

Fish Host: More information is needed. Learning about life history is a priority for species recovery.



52 mm



Description

- **Shell:** usually small, arcuate in shape, and inflated
- **Periostracum:** dark brown or yellow with broad rays when young
- **Nacre:** usually purple or white
- **Size:** maximum length ~90 mm

Similar Flint Species

- *Elliptio pullata* and *E. fumata*
- *E. arctata*



E. purpurella in the Flint River.



E. purpurella in Big Abrams Creek.

Subfamily: Ambleminae, Tribe: Pleurobemini

Elliptoideus sloatianus, Purple Bankclimber

Status: Federally Threatened

Range: ACF and Ochlockonee River (FL) basins

Typical Habitat: Medium to large rivers in sand, gravel, and mud substrates

Life History: Females brood from February to May. They release white lanceolate shaped (tapered at each end) conglutinates of 10-15 mm length. Some can form pairs and create a V-shape (O'Brien and Williams 2002).

Fish Host: Acipenseridae (sturgeon) including the native *Acipenser oxyrinchus desotoi* (Gulf Sturgeon) are believed to be the primary hosts due to high transformation rates. Studies have shown *E. sloatianus* can also have success with Percidae (darters) (O'Brien and Williams 2002, Fritts et al. 2012).



147 mm



Description

- **Shell:** large, heavy, thick, inflated, and sculptured with straight posterior margin, prominent posterior ridge, and shallow umbo pocket
- **Nacre:** purple nacre along margins of shell
- **Size:** maximum length ~215 mm

Similar Flint Species

- *Megalonaias nervosa*



E. sloatianus in the Flint River.



Top: Purple nacre along margins of the shell, credit: Andrea Crownhart.
Bottom: A small *E. sloatianus* in the Flint River.

Subfamily: Ambleminae, Tribe: Pleurobemini

Pleurobema pyriforme, Oval Pigtoe

Status: Federally endangered

Range: Econfina Creek to Hillsborough River in Florida; Sawhatchee Creek, Flint River, and Flint River tributaries in Georgia

Typical Habitat: Most common in small creeks but can occur in large rivers in sand, gravel, and mud substrates in pool, run, and riffle habitats

Life History: Females brood from May to early July. They release conglomerates that are white-pink in color and ~5 mm in length with a rounded end (O'Brien and Williams 2002).

Fish Host: *P. pyriforme* has successfully transformed on Cyprinidae (minnows) species including *Pteronotropis hypselopterus* (Sailfin Shiner) (O'Brien and Williams 2002).



42 mm



Description

- **Shell:** small, thick, moderately inflated, and oval to subtriangular in shape
- **Umbo:** elevated above the hingeline and angled toward anterior
- **Periostracum:** usually yellow but can darken with age; may have faint rays
- **Nacre:** usually white to salmon
- **Size:** maximum length ~60 mm

Similar Flint Species

- *Leunio lienosus*
- *Villosa villosa*



Some *P. pyriforme* have rays.



P. pyriforme.

Subfamily: Ambleminae, Tribe: Pleurobemini

Cyclonaias infucata, Sculptured Pigtoe

Status: Not listed federally or in Georgia

Range: ACF and Ochlockonee River (FL) basins

Typical Habitat: Small streams to large rivers in sand, gravel, and clay substrates; usually found in deeper areas away from stream margins

Life History: Females brood from spring until summer.

Fish Host: Hosts are unknown, but catfish, bullheads, and madtoms are suspected.

Taxonomy: The scientific name of *C. infucata* may soon change to *Pustulosa infucata* (Neemuchwala et al. 2023).



48 mm



Description

- **Shell:** small, subcircular, heavy, thick, and inflated; umbo often eroded
- **Sculpturing:** highly variable; some have chevron-like ridges that extend across shell
- **Size:** maximum length ~68 mm



C. infucata in the Flint River.



The umbo is often heavily eroded.

Subfamily: Ambleminae, Tribe: Quadrulini

Megalonaias nervosa, Washboard

Status: Not listed federally or in Georgia

Range: Ochlockonee River (FL) west to the Rio Grand (TX) and north to Upper Mississippi and Ohio Rivers

Typical Habitat: Typically large rivers in the ACF basin but may also be found in small creeks or reservoirs in sand, gravel, and mud substrates

Life History: It takes 8 years for *M. nervosa* to sexually mature (Woody and Holland-Bartels 1993). They are host generalists and release glochidia.

Fish Host: Many!

Description

- **Shell:** large, heavy, thick, and heavily sculptured; has prominent dorsal wing and scalloped posterior
- **Interior:** deep umbo cavities and rough textured anterior abductor scar
- **Nacre:** white to bluish-white
- **Size:** maximum length ~280 mm, the largest freshwater mussel in North America



161 mm



Similar Flint Species

- *Elliptoideus sloatianus*



30 mm



55 mm

Young *M. nervosa*.



M. nervosa in the Flint River.

Subfamily: Ambleminae, Tribe: Quadrulini

Uniomerus columbensis, Apalachicola Pondhorn

Status: Not listed federally or in Georgia

Range: Gulf Coast basins from Ochlockonee River (FL) west to Choctawatchee River basin (AL)

Typical Habitat: Small creeks to large rivers in sand, gravel, and mud substrates; commonly found in swampy areas and ephemeral floodplain tributaries

Life History: *U. columbensis* can remain alive in dry conditions for months at a time. Females are assumed to brood from late summer or autumn to following summer (Williams 2008) or late spring to early summer (GA DNR).

Fish Host: Hosts are unknown.



64 mm



Description

- **Shell:** typically large with “axe head” shape, has prominent wing, has biangulated posterior slope, and umbo has single looped rings
- **Periostracum:** clothly feel and typically dark without rays; younger specimens can have yellow-brown periostracum
- **Size:** maximum length ~125 mm



U. columbensis in Chickasawatchee Creek.



Young *U. columbensis* are lighter in color and thin.

Subfamily: Ambleminae, Tribe: Quadrulini

Alasmidonta triangulata, Southern Elktoe

Status: Endangered in Georgia, proposed federally endangered

Range: Flint River, Ichawaynochaway Creek, Chickasawhatchee Creek, Patsiliga Creek, Uchee Creek, and Apalachicola River

Typical Habitat: Slower flowing reaches of creeks and rivers with gently sloping banks and soft substrate

Life History: *A. triangulata* has historically been considered rare in distribution (Clench and Turner 1956). Females brood from mid-October until early spring.

Fish Host: Catostomidae (suckers) are presumed hosts based on trials with *Alasmidonta arcula* on the Atlantic Slope. Learning more about life history is a priority for species recovery.



47 mm



Description

- **Shell:** subtriangular, thin, and highly inflated with slight crenulations along posterior slope; young individuals have large knobby ridges
- **Umbo:** high
- **Teeth:** lacks a well developed lateral tooth
- **Size:** maximum length ~70 mm



A. triangulata in the Flint River.

Subfamily: Unioninae, Tribe: Anodontini

Pyganodon grandis, Giant Floater

Status: Not listed federally or in Georgia

Range: Lives in most of the eastern United States except on the Atlantic slope

Typical Habitat: Usually in slackwater areas and reservoirs but may live in other areas

Life History: *P. grandis* is usually reported as a long-term brooder but timing varies depending on location. They are a generalist species that discharge glochidia.

Fish Host: Many!

Description

- **Shell:** oval to triangular, thin, and greatly inflated
- **Umbo:** elevated highly above the hingeline
- **Teeth:** lacks pseudocardinal and lateral teeth
- **Size:** maximum length ~250 mm



127 mm



36 mm



94 mm

Relics of different ages.



P. grandis in Mill Creek.

Subfamily: Unioninae, Tribe: Anodontini

Strophitus radiatus, Rayed Creekshell

Status: Threatened in Georgia

Range: Endemic to the ACF Basin

Typical Habitat: Small creeks to large rivers in sand, gravel, and mud substrates

Life History: Not much is known, but gravid females have been collected in September and December in the ACF.

Fish Host: More information is needed. Learning more about life history is a priority for species recovery.



41 mm



Description

- **Shell:** thin and moderately inflated; posterior margin is bluntly pointed to rounded
- **Umbo:** slightly elevated above hingeline and positioned anteriorly
- **Nacre:** dark green or amber; sometimes has rays
- **Teeth:** has rudimentary pseudocardinal tooth but lacks lateral teeth
- **Size:** maximum length ~75 mm

Similar Flint Species

- *Villosa vibex*



S. radiatus in Ichawaynochaway Creek.



S. radiatus in Kinchafoonee Creek.

Subfamily: Unioninae, Tribe: Anodontini

Utterbackia imbecillis, Paper Pondshell

Status: Not listed federally or in Georgia

Range: Rio Grand (TX) east to Ochlockonee River (FL) and north to St. Lawrence River in Canada

Typical Habitat: All aquatic habitats with slow or no flow and soft substrate; common in reservoirs

Life History: Females are reported to be long-term brooders and may be gravid year-round. They are generalists. It is believed *U. imbecillis* may be able to bypass the parasitic stage and transform into juveniles on the parent (Dickinson and Sietman 2008, Howard 1914).

Fish Host: Many!



76 mm



Description

- **Shell:** elliptical and elongate shape, very thin
- **Umbo:** typically not elevated above hingeline
- **Periostracum:** green or brown, lacks rays on the ventral margin of shell
- **Teeth:** lacks pseudocardinal and lateral teeth
- **Size:** maximum length ~120 mm

Similar Flint Species

- *Utterbackia peggyae*



A young *U. imbecillis* in Little Spring Creek.



U. imbecillis in Market Branch.

Subfamily: Unioninae, Tribe: Anodontini

Utterbackia peggyae, Florida Floater

Status: Not listed federally or in Georgia

Range: Escambia River (~Pensacola, FL) east to St. Mark's River

Typical Habitat: Small creeks to large rivers in soft substrates with little to no flow

Life History: Females brood from late summer or autumn to the following summer. They are suspected to be generalist.

Fish Host: Hosts are unknown, but likely include many species.



62 mm

Description

- **Shell:** subelliptical shape, very thin, moderately inflated, broadly rounded posterior margin, and wing that creates an angle with the hingeline
- **Umbo:** not elevated above hingeline
- **Periostracum:** green or brown, usually has numerous rays, and is darker on posterior slope
- **Teeth:** lacks pseudocardinal and lateral teeth
- **Size:** maximum length ~87 mm



Similar Flint Species

- *Utterbackia imbecillis*



Young *U. peggyae* in Spring Creek.



U. peggyae in Spring Creek.

Subfamily: Unioninae, Tribe: Anodontini

Other Noteworthy Bivalves

Utterbackiana heardi, Apalachicola Floater

U. heardi is a species endemic to the ACF and Ochlockonee basins. It is protected in Georgia through its Rare status. Their usual habitat is muddy substrates in backwaters and lakes. *U. heardi* look similar to *Utterbackia imbecillis* and *Pyganadon grandis*, but they can be differentiated by the umbo height. The umbo of *U. heardi* should be more elevated above the hingeline than *Utterbackia imbecillis* and less elevated above the hingeline than *Pyganadon grandis*. Not much is known about their life history.



58 mm



Lampsilis binominata, Lined Pocketbook

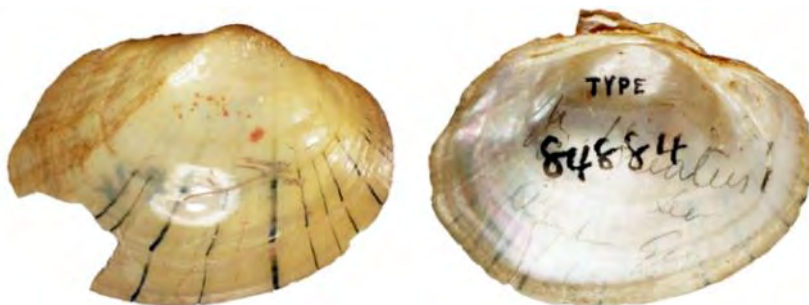
L. binominata was endemic to the Flint and Chattahoochee Rivers. It was considered rare but is now believed to be extinct. Prior specimens were found living around the Fall Line. The last live specimens were seen in 1967, and the last dead specimen was found in 1976 (Brim Box and Williams 2000, Williams 2008).



55 mm



Credit: Georgia DNR.



Credit: Williams et al. 2011.

Other Noteworthy Bivalves

Corbicula fluminea, Chinese Basket Clam

C. fluminea is invasive to the Flint River basin. It can be identified by its triangular shape and concentric rings. Specimens are often less than 25 mm, but it may grow up to 60 mm. The impacts of its presence are not fully known but may include nutrient pulses from mass die offs (McDowell and Sousa 2019), the changing of substrate from abundance of shells (Linares et al. 2022), and competition with native mussel species.



24 mm

The spread of invasive mussel species is a serious concern. Preventative measures include inspecting boats, draining bilge water, and removing any plant materials before taking your boat into another water body. *Dreissena polymorpha* (zebra mussel) and *Dreissena bugensis* (quagga mussel) have not yet invaded the Flint River Basin.



Distinguishing Between Similar Species

Leaunio lienosus* vs. *Toxolasma paulum

- *T. paulum* are more inflated for their size
- *T. paulum* have concentric single loop umbo sculpture, while *L. lienosus* have “W” shaped double loop umbo sculpture
- Live *L. lienosus* have papillate mantle folds, while *T. paulum* have caruncles (rudimentary in males)
- *T. paulum* have thicker pseudocardinal teeth

Leaunio lienosus* vs. *Villosa vibex

- *L. lienosus* have a biangulated posterior margin
- *V. vibex* have a thinner shell with a more broadly rounded posterior margin
- *V. vibex* typically have more prominent darker rays
- *V. vibex* have thinner and more bladelike pseudocardinal teeth
- *V. vibex* typically have bluish-white nacre, while *L. lienosus* typically have dark purple or salmon nacre
- The shell of *L. lienosus* can often be gently opened; specimens east of the Mobile Basin have dark pigmentation on the mantle margin that stops anterior of the mantle fold, while *V. vibex* will have pigmentation along entire mantle margin

Leaunio lienosus* vs. *Villosa villosa

- *L. lienosus* are less elongate and have thicker pseudocardinal teeth
- *V. villosa* typically have bluish-white nacre, while *L. lienosus* typically have dark purple or salmon nacre
- The shell of *L. lienosus* can often be gently opened; specimens east of the Mobile Basin have dark pigmentation on the mantle margin that stops anterior of the mantle fold, while *V. villosa* will have pigmentation along entire mantle margin
- *V. villosa* have a clothly periostracum

Villosa vibex* vs. *Strophitus radiatus

- *V. vibex* have well developed pseudocardinal and lateral teeth
- *S. radiatus* have a narrower umbo that elevates higher above the hingeline
- *S. radiatus* will lack pigmentation on the mantle margin

Villosa vibex* vs. *Villosa villosa

- *V. vibex* usually have a thinner shell with a more broadly rounded posterior margin
- *V. vibex* usually have more prominent rays
- *V. villosa* have a clothly periostracum
- *V. vibex* have more bladelike pseudocardinal teeth
- *V. villosa* have bluish pearly nacre

Elliptio arctata* vs. *Elliptio pullata* and *Elliptio fumata

- Old *E. arctata* may lose arc when older, but the shell is usually not as thick as *E. p/f*

Elliptio arctata* vs. *Elliptio purpurella

- *E. purpurella* are usually more inflated
- *E. purpurella* commonly have purple nacre, while *E. arctata* nacre is more commonly bluish-white

Elliptio nigella* vs. *Elliptio pullata* and *Elliptio fumata

- *E. p/f* are usually more compressed
- *Elliptio nigella* have a notch anterior to the umbo

Elliptio purpurella* vs. *Elliptio pullata* and *Elliptio fumata

- *E. purpurella* should be more inflated

Elliptioideus sloatianus* vs. *Megaloniais nervosa

- *E. sloatianus* are usually more elongated
- *M. nervosa* are usually more sculptured including sculpturing on the anterior portion of the shell; posterior is more scalloped than *E. sloatianus*
- *E. sloatianus* have a shallow umbo cavity and *M. nervosa* have a deep umbo cavity
- *E. sloatianus* typically have purple nacre and *M. nervosa* typically have white nacre
- *M. nervosa* have a rough anterior abductor muscle attachment scar, while *E. sloatianus* have a moderately smooth one

Pleurobema pyriforme* vs. *Leunio lienosus

- *P. pyriforme* tend to have concentric rings on the umbo, while *L. lienosus* have double-looped sculpturing

Pleurobema pyriforme* vs. *Villosa villosa

- The posterior terminus of *P. pyriforme* is below the midline of the shell and bluntly pointed, while *V. villosa* tends to be at the midline
- *V. villosa* have a clothly periostracum

Utterbackia peggyae* vs. *Utterbackia imbecillis

- *U. peggyae* have a prominent wing that forms an angle with the hingeline
- *U. peggyae* are less elongated
- *U. peggyae* are higher posteriorly
- *U. peggyae* have more prominent fine green rays
- *U. peggyae* have peppered pigment along the mantle margin

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Lampsilis floridensis in the Flint River.

