



Brazilian elodea

(*Egeria densa*)



Leslie J. Mehrhoff, University of Connecticut, bugwood.org



Where did it come from?

- Brazilian elodea came from South America, specifically Brazil, Uruguay and Argentina.
- It was brought to the United States through the aquarium trade because it helps keep water oxygenated for fish. As a popular aquarium plant, it was likely introduced into the wild after being discarded.

What does it look like?

- Brazilian elodea is a submersed aquatic plant that can be rooted or free floating.
- It has a bushy appearance, with leaves in whorls of four to six. It produces 0.7 to 1-inch-wide white flowers with three petals on short stalks that are visible above water.

Why is it a problem?

- Also known as Brazilian waterweed, it grows in very dense beds on the bottoms of lakes and rivers, eliminating habitat for native plants and animals. It can spread over 100 acres every year.
- Because it grows so thickly, it reduces water movement and quality.
- It clogs water intake pipes and makes boating, fishing and swimming difficult.

How do we control it?

- Cutting down Brazilian elodea doesn't work, because small pieces can grow into new plants, helping the population to spread more quickly.
- Herbicides or covering the plants with fabric to block sunlight can slow down the spread of Brazilian elodea.
- Remove any visible mud, plants, fish or animals before transporting your recreational water equipment.
- Drain water out of your boat, live well, bilge and other equipment before transporting.
- Clean and dry anything that comes in contact with water (boats, trailers, equipment, clothing, etc.).
- Brazilian elodea is still sold in some aquarium or water garden stores. Never release unwanted aquarium or water garden plants or animals into a natural water body.

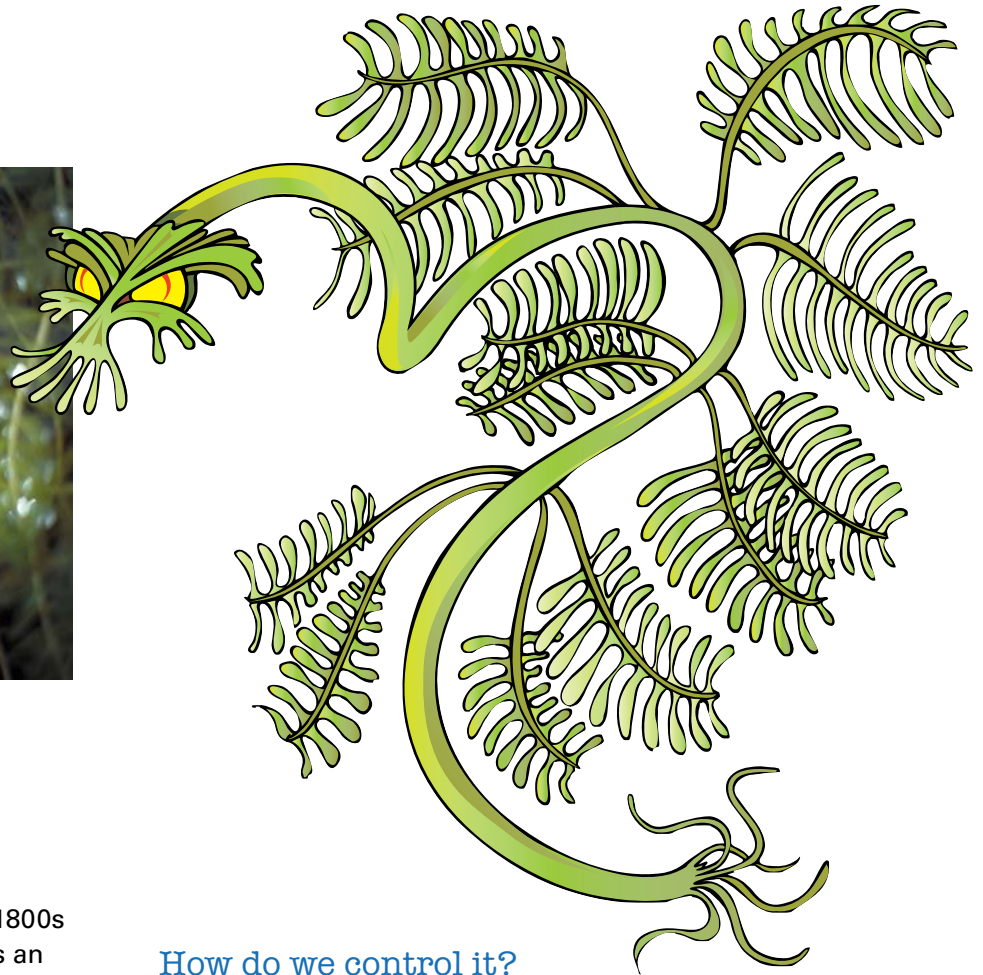


Eurasian Watermilfoil

(*Myriophyllum spicatum*)



Alison Fox, University of Florida, Bugwood.org



Where did it come from?

- Eurasian watermilfoil is native to Europe, Asia and North Africa.
- It was introduced to the United States between the late 1800s and the 1940s. It may have been brought intentionally as an aquarium decoration or as packing material for worms.

What does it look like?

- Eurasian watermilfoil has 12-21 leaflet pairs, while northern watermilfoil, a native plant, typically only has 5-10 leaflet pairs.
- When removed from the water, Eurasian watermilfoil is limp and soft, while northern watermilfoil is stiff and bristly.
- Eurasian watermilfoil sprouts small reddish flowers above water during mid-summer.

Why is it a problem?

- Eurasian watermilfoil grows to the surface so fast that it can reduce the amount of light in a lake or pond, shading out the native aquatic plants.
- Dense beds of Eurasian watermilfoil create more hiding spaces for small fish, so they are harder for larger fish to catch. When there are lots of little fish, they may not have enough to eat, so they stay small, a phenomenon called stunting.
- A broken stem fragment as small as two inches can produce a new Eurasian watermilfoil plant.

How do we control it?

- Herbicides can be used, but they will also kill native plants.
- It can be cut, but all of the plant must be removed from the water to prevent it from spreading.
- Prevent the spread of Eurasian watermilfoil to other bodies of water by removing it from recreational water equipment, draining water from all equipment and cleaning and drying anything that came in contact with water.
- Never release plants, fish or animals into a body of water.

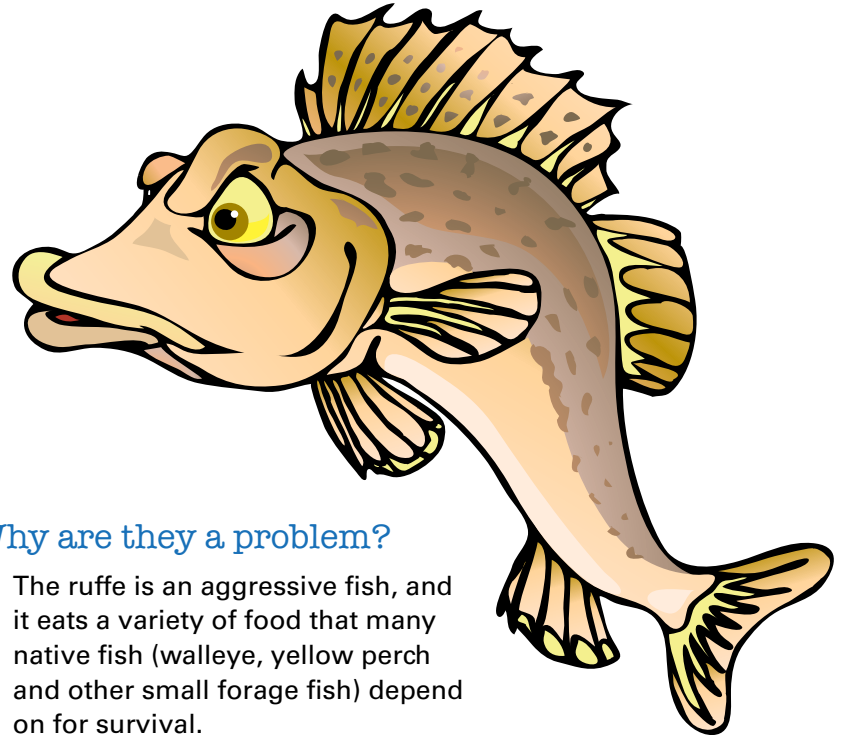


Eurasian Ruffe

(*Gymnocephalus cernuus*)



John Lyons/Wisconsin Dept. of Natural Resources



Where did they come from?

- The Eurasian ruffe is originally from fresh and brackish waters in portions of Europe and Asia.
- It likely came to Lake Superior in the ballast water of a trans-oceanic ship around 1985.

What do they look like?

- The adult ruffe is 4 to 6 inches long, and it is very slimy when handled.
- It is olive-brown to golden-brown on its back, and paler on the sides with yellowish undersides.
- It has a very large dorsal fin made up of two parts joined together. The front part is large and spiny with rows of dark spots. The back part is small and smooth.
- It is a relative of the perch, and its body shape resembles that of a yellow perch.
- It has special sensory organs that detect minute movements in the water to sense predators and prey.

Why are they a problem?

- The ruffe is an aggressive fish, and it eats a variety of food that many native fish (walleye, yellow perch and other small forage fish) depend on for survival.
- A population of ruffe can grow rapidly. In warm water, the ruffe can mature and reproduce in a single year. The average female can produce around 100,000 eggs per season.

How do we control them?

- Never use ruffe as bait.
- Remove any visible mud, plants, fish or animals before transporting your recreational water equipment.
- Drain water out of your boat, live well, bilge and other equipment before transporting.
- Clean and dry anything that came in contact with water (boats, trailers, equipment, clothing, etc.).
- Never release plants, fish or animals into a body of water.

Caricature graphic designed by David Brenner and used with permission from the Illinois-Indiana Sea Grant Program



Fishhook waterflea

(*Cercopagis pengoi*)

Spiny waterflea

(*Bythotrephes longimanus*)

Where did they come from?

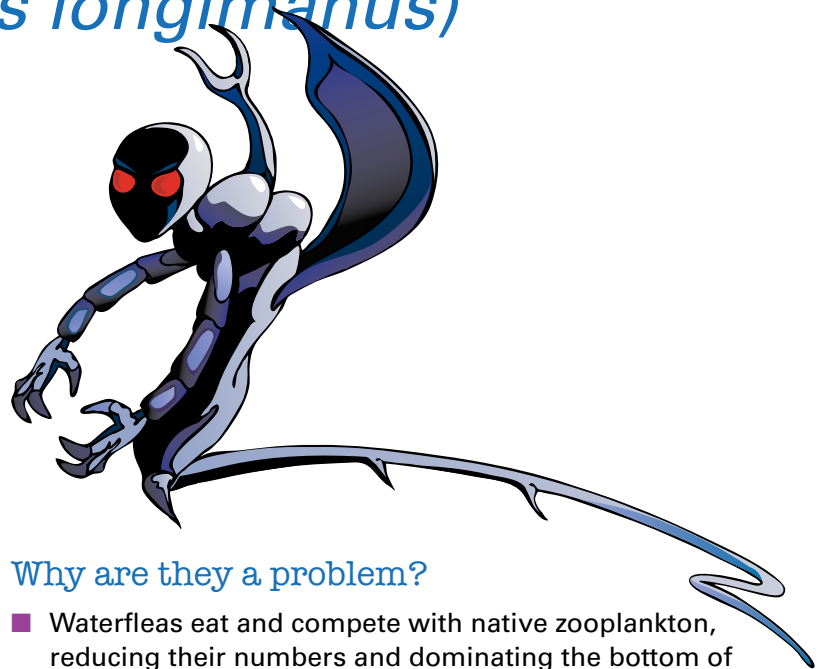
- Both the fishhook and spiny waterfleas came in ship ballast water from northeastern Europe.
- Fishhook waterfleas were first discovered in Lake Ontario in 1998, while spiny waterfleas were discovered there in 1982.

What do they look like?

- Waterfleas are small crustaceans.
- Both fishhook and spiny waterfleas are between $\frac{1}{4}$ and $\frac{5}{8}$ inches long, so it is difficult to distinguish them without magnification. Under a microscope, the fishhook waterflea has an angled tail with a loop near its end, while the spiny waterflea has a straighter tail and a bulbous egg pouch.
- Clumps of waterfleas look and feel like gelatin or cotton batting with tiny black spots.



Jeff Gunderson/Minnesota Sea Grant



Why are they a problem?

- Waterfleas eat and compete with native zooplankton, reducing their numbers and dominating the bottom of the food chain. Waterfleas aren't as nutritious as native zooplankton, and young fish can't digest them well.
- Waterfleas collect in masses on fishing lines and downrigger cables. These masses can clog the first eyelet of rods, damage a reel's drag system and prevent fish from being landed.
- Waterfleas can spread to inland waters when fishing gear is contaminated with egg-laden females. While females die out of water, under certain conditions they produce eggs that resist drying for half a day, remain viable, and can establish a new population.

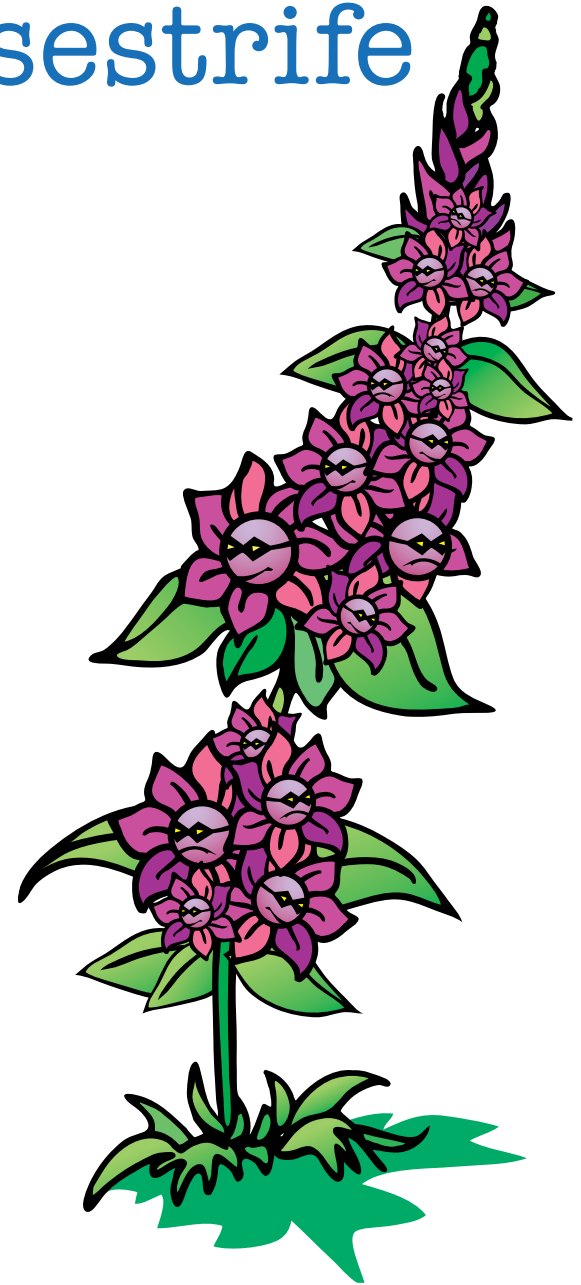
How do we control them?

- Inspect and remove gelatinous or cotton batting-like material from fishing lines. Waterfleas tend to collect where fishing lines meet a swivel, lure or downrigger ball connection (plucking like a guitar string helps).
- Drain water out of your boat, live well, bilge and other equipment before transporting.
- Clean and dry anything that came in contact with water (boats, trailers, equipment, clothing, etc.).
- Never release plants, fish or animals into a body of water.



Purple Loosestrife

(*Lythrum salicaria*)



Leslie J. Mehrhoff, University of Connecticut, Bugwood.org

Where did it come from?

- Purple loosestrife is native to Europe and Asia.
- It arrived in North America as early as the 1800s.
- Settlers brought it for their gardens, and it may also have come when ships used rocks for ballast.

What does it look like?

- Purple loosestrife can be 4-7 feet tall and have up to 30 flowered spikes. Each flower has 5-6 petals surrounding a small, yellow center.
- Each plant can produce over a million seeds a year.

Why is it a problem?

- Purple loosestrife is a very hardy and aggressive perennial plant.
- It crowds out native plants and provides very little food or habitat value for native animals.
- It invades wetlands and other moist soil areas. It also invades farmers' crops and pasture land.

How do we control it?

- Many people think purple loosestrife is beautiful, but don't transplant it into your garden.
- Avoid planting seed mixtures containing purple loosestrife.
- Small patches can be dug up by hand and then dried and burned. It's important to dig out as much of the roots as possible, because new plants can grow from broken root fragments.
- Herbicides can be used, but they will affect other plants and may kill desirable plants.
- Galerucella beetles feed only on purple loosestrife. These beetles can be released on the plants, but this method may take a year or more to bring an infestation under control.

Caricature graphic designed by David Brenner and used with permission from the Illinois-Indiana Sea Grant Program

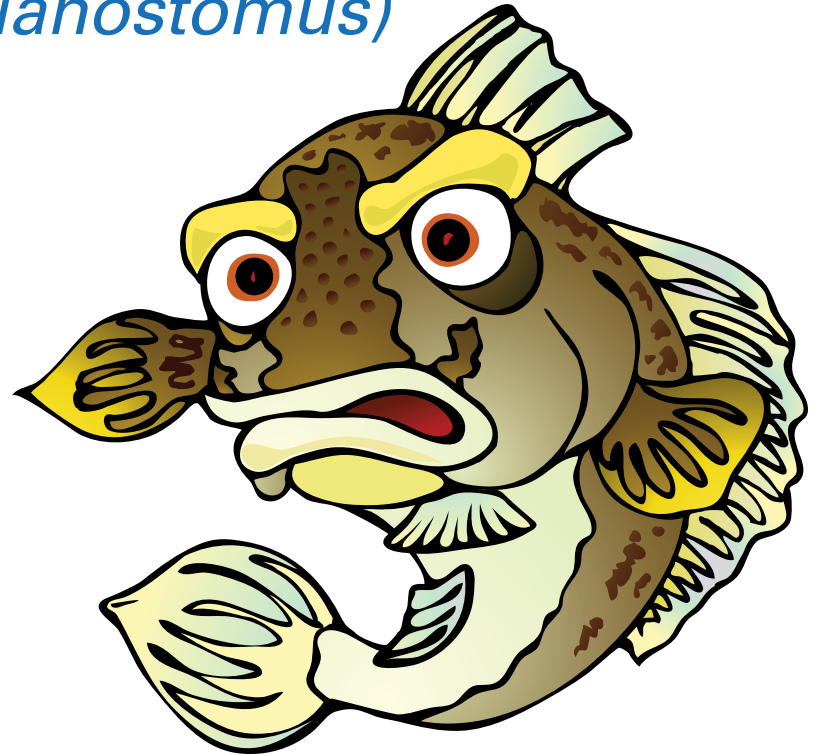


Round Goby

(*Apollonia melanostomus*)



John Lyons/Wisconsin Dept. of Natural Resources



Where did they come from?

- The round goby is native to the Black and Caspian seas in Europe.
- It came from European waters via ballast water.
- It was first discovered in the St. Clair River, the channel between Lake Huron and Lake St. Clair, in 1990 and spread to all of the Great Lakes by 1994.
- The electric barrier in the Chicago Sanitary and Shipping Canal was proposed to prevent gobies from entering the Mississippi River from the Great Lakes. However, gobies invaded the Mississippi River Basin before the barrier was completed.

What do they look like?

- Round gobies slightly resemble a large tadpole with a big head, narrower body, frog-like raised eyes and thick "lips."
- Young round gobies are solid slate gray while adults also have black to brown spots. Spawning males are nearly black.
- Adult gobies are usually 3 to 6 inches in length, although they may grow up to 12 inches long.
- They have a single suction cup-like pelvic fin.

Why are they a problem?

- Round gobies are very aggressive fish. They can displace native fish by eating up their food and taking over preferred habitat and spawning areas.
- Round goby populations can increase quickly because the fish reproduce up to six times in a summer.
- Gobies can survive in poor-quality water, which gives them an advantage over other fish. They also have a well-developed sensory system that allows them to detect small movements in the water. This allows them to feed in the dark, giving them another advantage over native fish.
- Round gobies are nuisances to fishermen because they steal bait off fishhooks, eat fish eggs and compete with small fish for food. However, round gobies like to eat another invasive animal: the zebra mussel.

How do we control them?

- Never use round gobies as bait.
- Remove any visible mud, plants, fish or animals before transporting your recreational water equipment.
- Drain water out of your boat, live well, bilge and other equipment before transporting.
- Clean and dry anything that came in contact with water (boats, trailers, equipment, clothing, etc.).
- Never release plants, fish or animals into a body of water.

Caricature graphic designed by David Brenner and used with permission from the Illinois-Indiana Sea Grant Program



Rusty crayfish

(Orconectes rusticus)

Where did they come from?

- Rusty crayfish are native to the Ohio River Valley in Ohio, Kentucky and Tennessee.
- They probably entered the Great Lakes and inland waters through use as bait trade.
- Rusty crayfish are sold as aquarium pets and supplied to schools.

What do they look like?

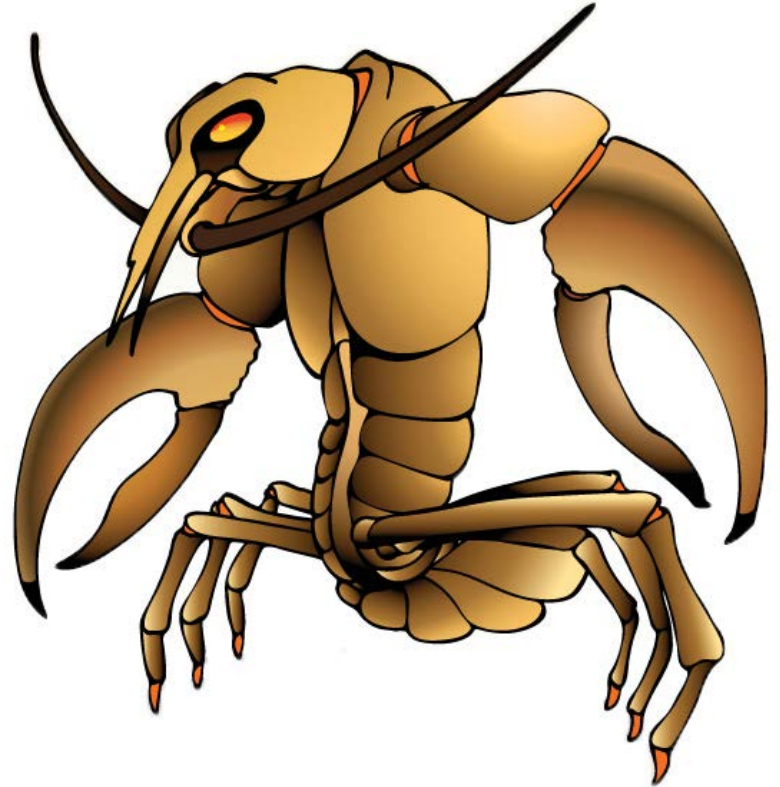
- Rusty crayfish have dark rusty-colored spots on each side of their backs, about where you would grab them to pick them up.
- They have large, smooth claws that vary in color from grayish-green to reddish brown.
- They also have black bands at the claw tips.

Why are they a problem?

- The rusty crayfish is a very aggressive species that often displaces native crayfish.
- They are opportunistic feeders, which means they eat almost anything, including plants, fish eggs and small fish.
- They also reduce aquatic plant abundance and diversity by destroying plants as they feed.

How do we control them?

- Remove any visible mud, plants, fish or animals before transporting your recreational water equipment.
- Never use rusty crayfish as bait.
- Drain water out of your boat, live well, bilge and other equipment before transporting.
- Clean and dry anything that came in contact with water (boats, trailers, equipment, clothing, etc.).
- Never release plants, fish or animals into a body of water.



Minnesota Sea Grant



Sea Lamprey

(*Petromyzon marinus*)



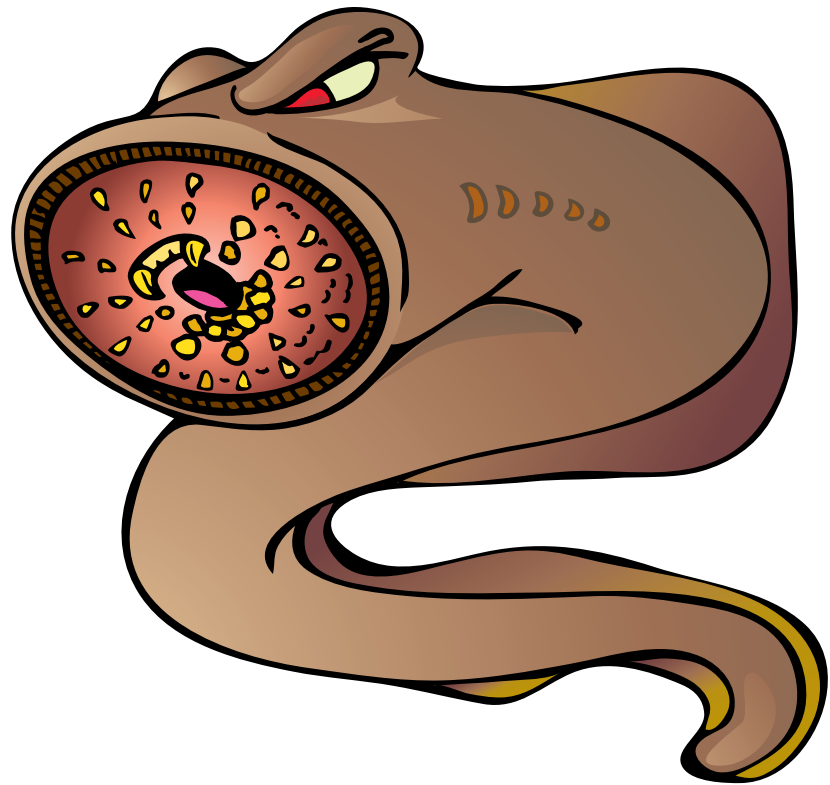
Wikimedia Commons

Where did they come from?

- Sea lampreys came from the Atlantic Ocean.
- They first invaded Lake Ontario through the St. Lawrence River in the 1800s. When the Welland Canal was modernized in 1919, the deeper channel between Lake Ontario and Lake Erie allowed lampreys to invade Lake Erie.

What do they look like?

- Sea lampreys are parasitic fish (in their adult form) that attach to other fish using their mouth that forms a sucking disk. Using rows of rasping teeth, they rasp through the victim's scales and skin, and then feed on its body fluids.
- Young lamprey (larvae) are small creatures that look like worms and feed on bottom debris and algae.
- Adult sea lampreys are 12-24 inches long and feed entirely on other fish.
- Lampreys are members of a family of ancient fishes that were around before the time of the dinosaurs.



Why are they a problem?

- Several types of native lamprey live in the Great Lakes region. Some are parasitic, but they rarely kill their host fish. In contrast, sea lamprey often kill their host, and a single sea lamprey can kill up to 40 lbs of fish in its lifetime.
- Sea lamprey feed on many commercially important native fish, such as lake trout. The lake trout harvest fell from about 15 million pounds to 300,000 pounds after sea lamprey invaded the Great Lakes.

How do we control them?

- The Great Lakes Fishery Commission works with Fisheries and Oceans Canada, the U.S. Fish and Wildlife Service, and the U.S. Army Corps of Engineers to control lamprey in the Great Lakes.
- The main method of control is applying a pesticide called TFM that kills lamprey larvae. Although it is successful, it is also expensive.
- Barriers have been constructed in streams to block the upstream migration of spawning sea lampreys. Most of these barriers allow other fish to pass through.
- Another method under investigation is to trick the lamprey and trap them by using a pheromone (chemical trigger) that male lampreys release to attract females during mating.

Caricature graphic designed by David Brenner and used with permission from the Illinois-Indiana Sea Grant Program



Silver carp

(*Hypophthalmichthys molitrix*)

Bighead carp

(*Hypophthalmichthys nobilis*)

Silver carp



Bighead carp



John Lyons/Wisconsin Dept. of Natural Resources



Where did they come from?

- Silver and bighead carp originated in Asia. There are actually several species of carp that are invasive species from Asia, including the well-known goldfish. Along with silver and bighead carp, black and grass carp are the latest to invade. They are collectively called "Asian carp."
- Silver and bighead carp were legally imported by the federal government and pond fish farmers in the 1960s and 1970s to control algae in ponds.
- Flooding in the 1990s caused many ponds to overflow their banks, allowing the carp to escape into the Mississippi River basin. They have been expanding their range ever since.

What do they look like?

- Both silver and bighead carp have low-set eyes and a large upturned mouth.
- Their heads have no scales, and their bodies have very small scales.
- They can weigh more than 60 lbs and grow to more than 4 feet long.
- Bighead carp have very large heads compared to their bodies, which is how they were named.

Why are they a problem?

- Silver and bighead carp are filter feeders that can eat up to 20% of their body weight daily and are likely to out-compete native species. Silver carp mostly eat phytoplankton (microscopic plants), while bighead carp mostly eat zooplankton (microscopic animals).
- When startled by the noise of boat and jet ski engines, silver carp leap from the water, sometimes as high as 15 feet. They have knocked boaters and jet skiers unconscious and broken noses and windshields.

How do we control them?

- Don't use small Asian carp as bait.
- Asian carp are now established in the Mississippi River basin, and government agencies are trying to keep them from invading the Great Lakes. One of the main efforts has been installing a series of electric barriers in the Chicago Sanitary and Shipping Canal, an artificial waterway that connects Lake Michigan to the Mississippi River basin.
- Asian carp are high in protein and healthy omega-3 fatty acids. Commercial fishermen catch Asian carp in the Illinois River and sell them to markets in China, where there is a large demand for them. Some people are trying to establish markets for Asian carp in the U.S. as well.

Caricature graphic designed by David Brenner and used with permission from the Illinois-Indiana Sea Grant Program



Zebra mussel

(Dreissena polymorpha)

Quagga mussel

(Dreissena bugensis)



Quagga mussel (left) and zebra mussel (right) / University of Wisconsin Sea Grant

Where did they come from?

- The two mussels are separate species but closely related. Zebra mussels are native to Eastern Europe and Western Russia. Quagga mussels are native to the Dneiper River drainage of Ukraine.
- Both mussels arrived several decades ago in the ballast water of ships.

What do they look like?

- Both mussels can be up to two inches long.
- Zebra mussels have striped shells that look like a zebra's stripes, which is how they get their name. Quagga mussels are named for a now-extinct subspecies of the zebra that had fainter stripes.
- Quagga mussels differ from zebra mussels in that they have an elliptical shape in cross section and don't have a flat ventral side.
- Zebra mussels have sticky byssal threads that they use to attach tightly to any hard surface. Quagga mussels are more versatile. They can stick to hard surfaces or live and thrive directly on a muddy or sandy lake bottom, and they can tolerate a wider range of extremes in temperature and water depth.

Why are they a problem?

- Both mussels are a problem because they filter water, up to a liter per day, to eat plankton. Because there are lots of them in the lakes and they can eat a lot of plankton, the mussels compete with small fish for food.
- They also accumulate contaminants in their tissues as they filter water. These contaminants can be passed up the food chain to any fish or bird that eats one of these mussels.
- Both mussels clog water intake pipes by forming colonies inside the pipes, preventing water from flowing easily.

How do we control them?

- With a permit, chemicals can be used to kill the larva on water intake pipes. If these chemicals were used in an open lake, they would also affect fish and native mussels.
- Remove any visible mud, plants, fish or animals before transporting your recreational water equipment.
- Drain water out of your boat, live well, bilge and other equipment before transporting.
- Clean and dry anything that came in contact with water (boats, trailers, equipment, clothing, etc.).
- Never release plants, fish or animals into a body of water.



Caricature graphic designed by David Brenner and used with permission from the Illinois-Indiana Sea Grant Program