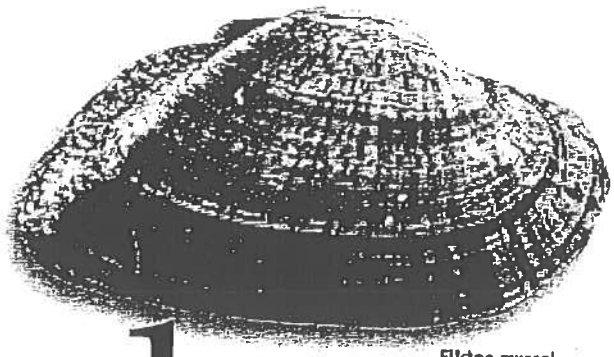
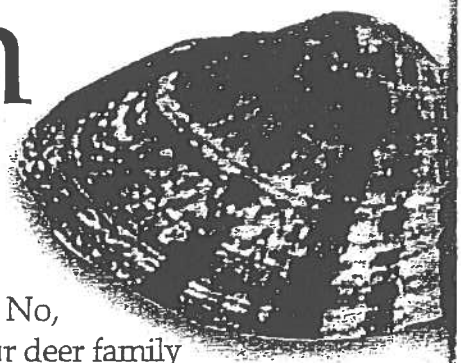
Saving native mussels reach by reach

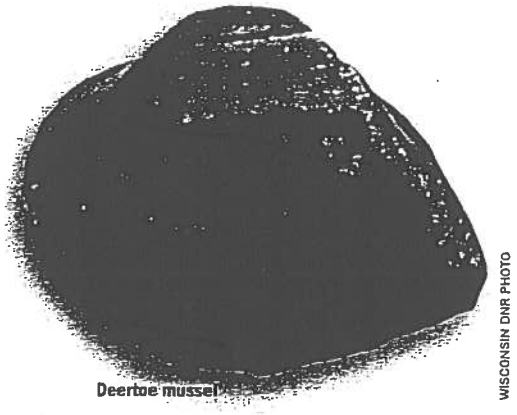


Elktoe mussel



Fawnsfoot mussel

TWO PHOTOS BY ILLINOIS NATURAL HISTORY SURVEY



Deertoe mussel

WISCONSIN DNR PHOTO

Heather Kaarakka

Deertoe, elktoe, fawnsfoot. No, these terms do not track our deer family friends; they are common names of animals struggling to maintain a toehold in Wisconsin, the freshwater mussels. Exploitation, changing water quality and invasive species all threaten these invertebrates that have fascinating life histories and employ innovative ways to expand their range.

Half of Wisconsin's 51 mussel species are endangered, threatened, or are species of special concern due to overharvesting, stream degradation and displacement by hitchhikers from Europe, the zebra and quagga mussels.

Glochidia on fish gills.

CHRIS BARNHART

Freshwater mussels can spread their young by mimicking small fish and hitching a ride to new territory.

Historically, the most serious threat to mussel populations came from people. In the mid-1800s, a pearl button industry blossomed on the Mississippi River. Mussels were dredged and removed by the ton to be punched into buttons and used in mother-of-pearl inlays. More recently small plugs of mussel shells were used as cores for the overseas cultured pearl industry. All these businesses and damming of waters where mussels traditionally ranged have contributed to their demise.

MUSCATINE HISTORICAL SOCIETY

It's not the pearls or the buttons that make mussels so intriguing; it is the amazing way these animals grow and spread their population. Mussels reproduce like many other water-dwelling creatures: males release sperm into the water and females filter it out to fertilize their eggs, but the mussels' reproductive cycle only gets more exciting thereafter. Female mussels raise their young on their gills from the time they are eggs until they are im-

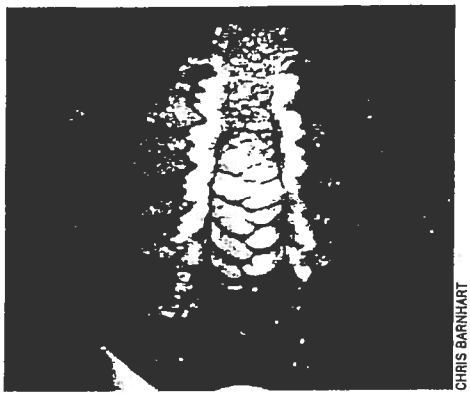
mature mussels called **glochidia**.

From this point in their development, the mussels employ an intricate dance of deception and intrigue. In order for the glochidia to survive, grow and disperse they must attach to the gills of a fish and obtain nutrients from blood serum. The mussels need the host fish to carry the glochidia through the waterways; otherwise the slow-moving mussels would get swept downstream by currents.

Survival is too important to leave to a chance encounter, and the mussel mothers have evolved elaborate ways to entice fish and increase the probability of attaching glochidia to their hosts' gills. Some mussels have developed fleshy appendages that mimic fish prey to such a degree that some even sport "eyes." Depending on their host fish, mussels will tailor their "lures" to look like the tastiest snack the fish can find. The Higgins' eye mussel, for example, has a lure that looks like a delectable minnow that its hosts, bass and walleye, can hardly resist. It undulates like wriggling baitfish. As the fish comes down to investigate, the mussel releases its glochidia in the fish's face and mouth. The baby mussels are free to attach themselves to gills, eyes and other membranes.

CHRIS BARNHART

Sacs of glochidia (conglutinates) lure fish, such as this darter, into eating them. The glochidia then form cysts on the fish's gills and drop off into new territory.



CHRIS BARNHART

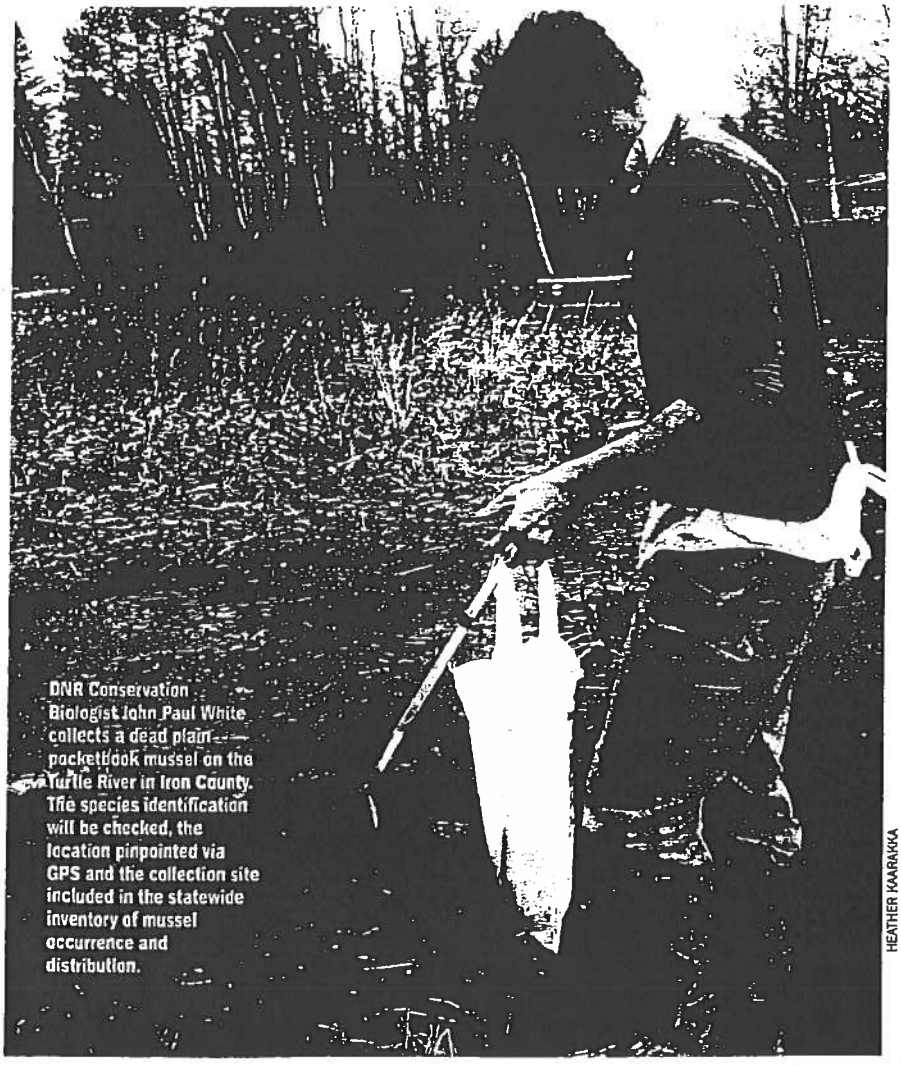
The snuffbox contains marsupial gills that enclose the immature mussels. When a logperch is lured in, the mussel clamps shut and expels the glochidia that stick to the fish's face and mouth.

One mussel, the snuffbox, has such a unique way of transferring its glochidia that it has only one species of host fish, the logperch. As the logperch pokes its nose into the mussel looking for the lure, the mussel clamps shut on the fish's head and billows glochidia into the fish's face and mouth. The snuffbox is so strong that it has been known to crush the heads of other fish species investigating the lure. Other mussels have smaller non-predatory hosts and have to attract them by different means. They release sacs of glochidia called **conglutinates**. These little morsels look like perfect snacks to fish, which get a mouth-full of glochidia when they bite the sacs.

After the glochidia take at least a two- to three-week ride on the fish host as a benign parasite, they drop off and land in the bed of a new stretch of a stream, river or lake where they may grow and stay for more than half a century. Mussels are so long-lived in fact, that live mussels can be found in areas that have been dammed off leaving behind populations, which are functionally extinct. When researchers find a mussel whose fish host has been extirpated from the river for 40 years, we know that particular mussel must be at least that old.

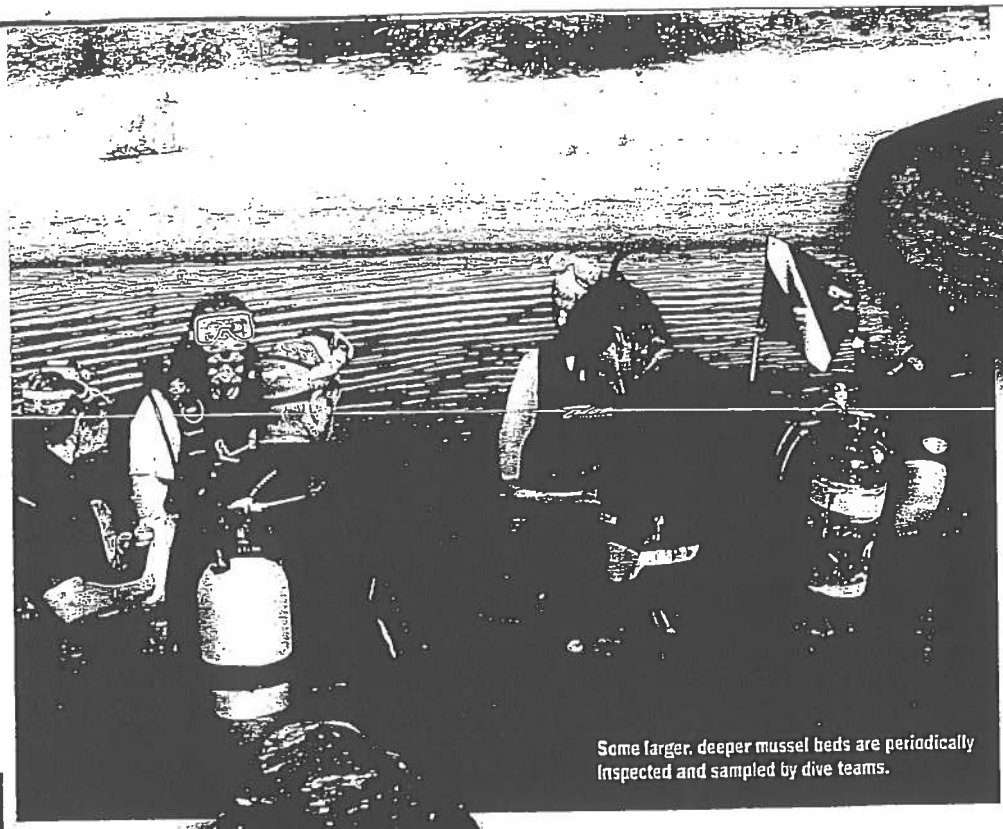
Much like a canary in a coal mine, mussels are viewed as important, sensitive indicators of changing environmental conditions. Most species of freshwater mussels prefer clean running water with high oxygen content, and all species are susceptible to pollution including pesticides, heavy metals, ammonia and algal toxins. The presence or absence of a particular mussel species provides information about long-term water health. In general, having healthy diverse populations of mussels means the water quality is good.

Some juvenile forms of mussels are more susceptible to pollution than the



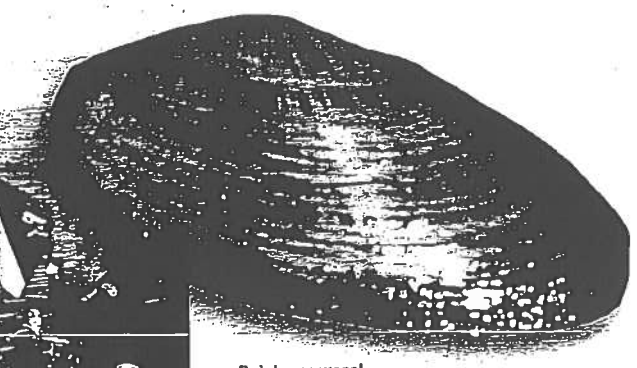
HEATHER KAARAKKA

DNR Conservation Biologist John Paul White collects a dead plain pocketbook mussel on the Turtle River in Iron County. The species identification will be checked, the location pinpointed via GPS and the collection site included in the statewide inventory of mussel occurrence and distribution.



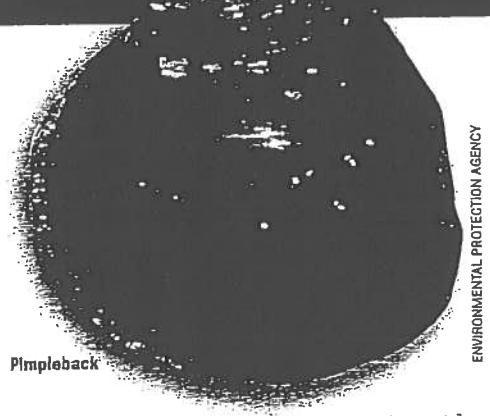
Some larger, deeper mussel beds are periodically inspected and sampled by dive teams.

US FISH & WILDLIFE SERVICE



Rainbow mussel

WISCONSIN DNR PHOTO



Pimpleback

ENVIRONMENTAL PROTECTION AGENCY

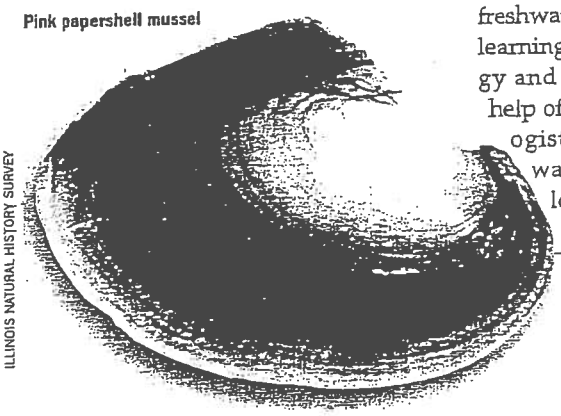
adult forms, so finding juveniles with few adults nearby may indicate a newly colonized area. Since mussels are long-lived, they can be used to document changes in water quality over long periods of time. Growth rings on mussel shells determine their age. During a time of rest, the shell accumulates a defined line indicating a period of no growth. These lines can be used to glean information about historical water quality and disturbance. Mussel shells also accumulate metals from both water and sediment. Testing heavy metal concentrations in shells can tell researchers when water in a given area was first contaminated.

Currently, it is illegal to harvest any live mussels in Wisconsin, but mussel shells can be collected statewide unless they are endangered or were found on the St. Croix or Namekagon rivers. Examining these shells provides mussel researchers with an excellent tool to tally the species composition in a given stream at a point in time.

In 1973-1977, Harold A. Mathiak took samples from 251 rivers and streams across Wisconsin. He summarized his findings in *A River Survey of the Unionid Mussels of Wisconsin 1973-1977*, published in 1979. The survey detailed species, listed dates when specimens were collected and pinpointed survey locations. This was the last systematic mussel survey in the state.

DNR's Bureau of Endangered Resources is working with citizen scientists to create a new mussel monitoring program to update the data on mussel distribution statewide. Researchers are enlisting the help of volunteers by contacting schools, nature centers and interested individuals to provide people who enjoy being outside with the training to conduct stream surveys. Volunteers wade the water and walk stream banks looking for live and dead mussels. Live mussels are identified and photographed before they are returned to the stream. Empty shells and dead specimens are collected along with information and photos that are sent to the mussel monitoring program at DNR's central office.

Pink papershell mussel



ILLINOIS NATURAL HISTORY SURVEY

Identifying mussels can sometimes be tricky. Basic shape, color, size and beak structure are all used to determine the species. As with most invertebrates, there is some overlap between species description and even sexual dimorphism. It takes a keen eye to distinguish species. To get started on differentiating the species and mussel monitoring, check out the DNR citizen monitoring program online at wiatri.net/inventory/mussels.

Even if you are not ready to participate in mussel surveys, you can help protect them in several ways:

- If you own waterfront property, protect it for mussels by keeping it as natural as possible.
- If you see freshwater clams in the nearshore area where you plan to put in a pier or boat lift, contact the DNR to ask what can be done to reduce impacts on mussels.
- Follow advice to prevent the spread of the invasive zebra mussel.

The future remains uncertain for freshwater mussels, but researchers are learning new aspects of mussel ecology and biology every day. With the help of citizen scientists, mussel ecologists may be able to learn new ways to protect and prevent the loss of these amazing invertebrates.

Heather Kaarakka works on the citizen-based mussel monitoring program for DNR's Bureau of Endangered Resources.