



The northern brook lamprey is one of five lamprey species native to Minnesota's streams. Unlike the more familiar exotic sea lamprey, this species does not prey on other fish.

The obscure existence of native lampreys has left

GOOD LAMPREYS Are Hard to Find

researchers in the dark —until recently.

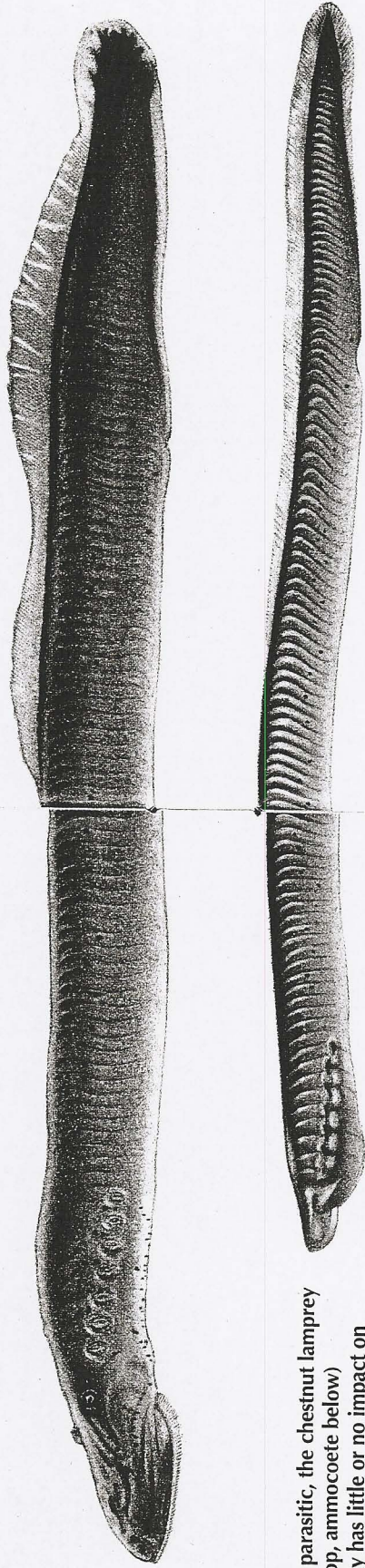
MOST MINNESOTANS WHO know anything about lampreys seem to hate them. But should we? Yes, I realize that the sea lamprey has wreaked havoc with fish in Lake Superior. And yes, we've spent lots of money trying to control it and

deal with the consequences of its parasitic lifestyle. But what about Minnesota's "other" lampreys, our native species? Are they just as bad? Six species of lampreys live in Minnesota. Our five native lampreys are much smaller and far less destructive than their distant non-

native cousin. Only two native species—the silver and the chestnut lamprey—share the sea lamprey's behavior of preying on other fish, and they seldom have a noticeable effect on their prey populations. Our three other natives—American brook, north-

By NEAL D. MUNDAHL

GARY MESZAROS, DEMBINSKI PHOTO ASSOCIATES



Though parasitic, the chestnut lamprey (adult top, ammocoete below) generally has little or no impact on native fish populations.

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ern brook, and southern brook lamprey—are non-parasitic, meaning they do not attack and feed on other fish.

During the past few years, I did field work on two lamprey projects for the Department of Natural Resources' Natural Heritage and Nongame Research Program to determine lamprey range and abundance and to collect specimens for DNA analysis in the laboratory. I rarely encountered anyone who had seen one of our native lampreys or knew anything about them. Having learned a great deal about these lampreys, I now find them to be some of our state's most interesting fish species.

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CLANDESTINE LIFE. All of Minnesota's lampreys have similar life cycles. Adult lampreys ascend streams to spawn from late April to mid-June, depending on locale and species. Awaiting the onset of spawning, lampreys hide beneath rocks or other objects in fast riffles. I once found an American brook lamprey under a discarded oven door in the South Fork of the Zumbro River near Rochester.

Adults move out of riffles and just upstream to spawning areas in loose groups. I've watched as many as a dozen lampreys move out of hiding within a few minutes and begin to spawn. What stimulates them to begin their spawning activities together remains a mystery.

Although a single lamprey can construct a spawning nest, several lampreys often construct a nest

together in beds of coarse sand, gravel, or cobble. To clear a spot for nesting, a lamprey picks up stones with its suction-cup mouth and laboriously pushes or drags them away. It also attaches its mouth to a rock and thrashes its body vigorously within the nest, stirring up sediment, which the current carries away. This thrashing digs out a depression an inch or two deep and about the size of a dinner plate, similar to the spawning nests created by sunfish in the shallows of many of our lakes.

Several nests often are clustered together. Most nests are visible, but some are obscured by submerged logs, rocks, or other objects, such as the Smurf-blue chunk of plastic that shielded most of a large nest I found in Rupprecht Creek.

To spawn, the female attaches her mouth to a rock on the upstream

edge of the nest and the male attaches his mouth to her head. The intertwined pair undulates feverishly, releasing and fertilizing the eggs. The process lasts only a few seconds, and they repeat it every few minutes. I have observed what appeared to be the same individuals spawning repeatedly in the same nest for more than an hour.

Most active nests of American brook lampreys that I've observed contained four to six lampreys, but some had up to a dozen. While spawning, the lampreys seem oblivious to almost everything around them. I've stood above spawning American brook lampreys and taken pictures, measured nests, and even touched the lampreys without disturbing them. On several occasions I scooped up all the lampreys within a nest, counted them, and returned

Native Fish

them to the nest; they behaved as if nothing had happened.

WRIGGLING AMMOCOETES.

Female sea lampreys are known to lay more than 100,000 eggs, but native lampreys lay far fewer. Just as salmon do, lampreys die when they finish spawning.

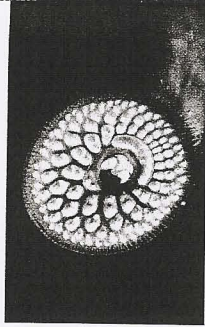
After hatching, microscopic juvenile lampreys—called larvae or ammocoetes—drift downstream, then burrow into stream bottoms of fine sand and silt, beginning a hidden existence that will last three to seven years, depending on the species. Juveniles resemble adults, but they lack eyes and broad fins and have a folded, hoodlike mouth instead of a sucking disk. Unless

disturbed, the ammocoetes remain buried in sediment, growing to nightcrawler size while filtering bacteria, algae, and other microscopic food particles.

Researchers rely on electrofishing units to coax ammocoetes from their muddy homes. Before the advent of electrofishing, researchers scooped buckets of mud from likely habitat and spread the mud on the stream bank, hoping to spot ammocoetes wriggling through the goo.

My students at Winona State University and I usually have the best luck finding ammocoetes around submerged woody debris, where sluggish eddies apparently concentrate lamprey foods. We have collected as many as 20 ammocoetes

The sea lamprey decimated Great Lakes lake trout populations, which had little defense against this invader from the Atlantic. The sea lamprey, which reaches a length of more than 2 feet, attaches to a fish and rasps a hole in its skin with its many teeth (right). It secretes an anticoagulant to keep blood flowing from the wound.



near a single submerged log.

In late summer the largest, oldest ammocoetes begin the gradual changes that transform them into adults. Most obviously, they develop eyes, broader fins, and suction-cup mouths. Parasitic lampreys go in search of fish prey and spend the next 12 to 18 months growing and maturing. Non-parasitic brook lampreys do not feed after becoming adults; they live off their body reserves for seven to nine months before spawning.

As spawning season approaches, lampreys move into faster waters. Were it not for the one to two weeks when they spawn en masse, lampreys—especially the brook species—would remain virtually invisible.

GREAT LAKES SCOURGE. The only non-native Minnesota lamprey, the sea lamprey (*Petromyzon marinus*) traveled here from its native waters in the Atlantic Ocean and coastal streams of eastern North America. Following construction of the Erie and Welland canals, sea lampreys took more than 100 years to make their way through the Great Lakes to Lake Superior, appearing there in 1938.

Preying on lake trout, whitefish, and other commercial and sport fish, the adult sea lamprey attaches its mouth, rasps wounds with sharp teeth and filelike tongue, and feeds on fish tissue, blood, and other body fluids. During its parasitic adult life,

it feeds on several individuals. A large fish usually survives a lamprey attack, but it bears scars. A small fish is usually killed outright or dies later from massive infections from the wounds.

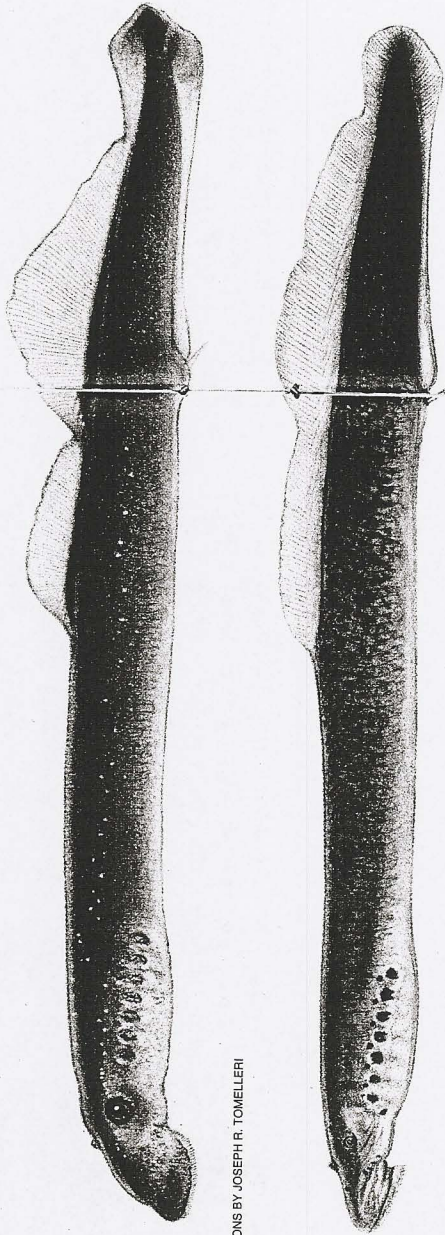
In lakes Huron and Michigan, sea lampreys and overfishing drove lake trout to extinction. The same nearly happened in Lake Superior. Fortunately, selective chemical toxicants, or lampricides, were developed to control sea lampreys in tributary streams during their larval stage. Lake Superior trout numbers are now recovering. Control programs for the Great Lakes cost several million dollars each year, but they protect multibillion-dollar sport and commercial fisheries.

NATIVE LAMPREYS. Smaller size, different fin shape, and unique form and pattern of teeth distinguish native lamprey species from the sea lamprey.

The **silver lamprey** (*Ichthyomyzon unicuspis*) grows to a length of 12 inches. It is most common in the Mississippi, Minnesota, St. Croix, Red, and Rainy rivers and Lake of the Woods. When I collected silver lampreys in the Mississippi, they were usually attached to common carp, but they also parasitized a wide range of large fish, including catfish, walleyes, northern pike, suckers, sturgeons, and paddlefish.

The **chestnut lamprey** (*I. castaneus*), similar in size to the silver, lives in

GREAT LAKES FISHERY COMMISSION



ILLUSTRATIONS BY JOSEPH R. TOMELLERI

The breeding male American brook lamprey (top) is one of Minnesota's most common non-parasitic lampreys. The southern brook lamprey (bottom) was recently discovered to inhabit St. Croix River tributaries in eastern Minnesota.

smaller streams, such as tributaries of the Rainy, Big Fork, and upper St. Croix rivers. Adults can parasitize large catfish and sturgeon, but most go for smaller suckers and trout.

In general, neither silver nor chestnut lampreys have had the same severe impacts on prey fish populations that the sea lamprey has produced, although silver lampreys have caused some problems in Lake of the Woods. Biologists have speculated that long-term coexistence of native lampreys and their prey has allowed them to adapt to one another.

The American brook lamprey (*Lampetra appendix*) is the most common of Minnesota's three non-parasitic lampreys. However, its

relatively small size—usually 6 to 8 inches long—and secretive lifestyle make it difficult to observe. Its natural range extends from Minnesota's southeastern corner—where it has been reported in about 50 different streams—south to northern Alabama and east to the Atlantic Coast.

Apparently even more secretive than the American brook lamprey, the northern brook lamprey (*L. flosor*) and southern brook lamprey (*L. gagei*) have escaped mention in recent popular books on Minnesota fishes. The northern brook is our smallest species, usually less than 5 inches long. It has been collected from streams in St. Louis, Carlton, and Koochiching coun-

ty in others. Human activities that add chemicals and eroded soils to streams are the likely cause of these declines. Because of their intolerance to many forms of disturbance, lampreys are being used as biological indicators of healthy stream systems.

Recent surveys in Minnesota have revealed that lampreys are still present at the majority of stream sites where they were reported in the past. We know for certain that some populations are smaller than they used to be, because we don't see as many spawners as we saw before. We lack good historical data for most stream populations, so we don't know if these small populations have always been small.

Projects aimed at improving stream habitats for game fish appear to benefit lampreys as well. As people focus on better land management practices in watersheds throughout Minnesota, and as more people learn about native lampreys, I hope the outlook for the survival of these obscure but intriguing creatures will improve. □

The Nongame Wildlife Program check-off and sales from the State Parks Nature Store provided \$3,000 to fund the research on lamprey population status and habitat requirements. The Nongame Wildlife checkoff and RIM Critical Habitat Match fund provided \$2,000 to collect specimens for identification through DNA analysis.

ties. The southern brook is slightly larger—5 to 7 inches long—and was only recently discovered in St. Croix River tributaries in St. Croix State Park—a curious find considering that the nearest known populations occur in southern Missouri.

BIOLOGICAL INDICATORS. No native lampreys are listed as threatened or endangered species in Minnesota. Northern and southern brook lampreys are listed as species of special concern, primarily due to lack of information on their distribution and population status. Likewise, researchers know little about the ecology and population biology of chestnut and silver lampreys.

Large aggregations of spawning American brook lampreys have declined in many streams and disap-