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NEW METHODS DEVELOPED TO ESTIMATE SEA LAMPREY DAMAGE

Unique "signatures" in sea lamprey blood indicate specific fish species upon which lampreys have preyed

ANN ARBOR, MI—A research team has developed new methods for estimating the diets of the sea lamprey, one of the most devastating species to have invaded the Great Lakes. Measuring the diets of sea lamprey will give scientists and managers a better picture of how much ecological and economic damage each sea lamprey causes over its life cycle. While the findings support the long-held belief that sea lamprey prefer to feed on large fish like lake trout, they also indicate that sea lamprey affect many other species, and that those effects differ from time to time and place to place.

In a study funded by the Great Lakes Fishery Commission, a group of federal, tribal and university researchers teamed with agencies, commercial fisheries and anglers to capture sea lamprey throughout Lake Superior, mainly from 2002 to 2004. The researchers examined the chemistry of sea lamprey tissues because certain types of carbon and nitrogen atoms, known as isotopes, yield clues about which fish species the sea lamprey feed upon. "A fish like a lake trout from Lake Superior has a fairly predictable 'signature' of carbon and nitrogen isotopes in its blood," said Dr. Chris Harvey, a biologist with the National Oceanic and Atmospheric Administration and one of the study's lead researchers. "When a sea lamprey feeds on lake trout, we start to see the lake trout's isotopic signature appear in the lamprey tissues. If it feeds on other species as well, the lamprey's tissue chemistry looks more like a blend of signatures."

Sea lamprey invaded the upper Great Lakes after moving through the Welland Canal, probably in the early 20th Century. Reviled for their impacts on lake trout, salmon, and other fish populations, sea lamprey feed by rasping through the sides of fish and consuming blood and fluids. Although their numbers were reduced dramatically starting in the 1960s, sea lamprey continue to kill large numbers of lake trout and other valuable species.

Using the stable isotope data and simulation models, the researchers found that sea lamprey throughout most of Lake Superior fed mainly on large, predatory fish during the study period. Between 60% and 90% of their diet was blood from predators like lake trout and possibly burbot. They also found that sea lamprey in western waters of the lake had more diverse diets than in eastern waters, with substantial feeding on lake whitefish and suckers. In Black Bay, a large bay in northwestern Lake Superior, over 50% of the sea lamprey diet was whitefish blood.

The research team is now using the new diet information to update computer simulations that describe the feeding behavior of individual sea lamprey. Justin Fox, who recently completed graduate studies with Dr. James F. Kitchell at the University of Wisconsin-Madison, developed simulations in which sea lamprey can feed on up to six different host species during their parasitic stage. The simulations are adjusted in order to match sea lamprey growth trends and stable isotope signatures observed in different areas of the lake. The simulations also predict how many of the hosts are actually killed due to blood lost during to a sea lamprey attack.

Preliminary feeding model outputs suggest that sea lamprey impacts are felt by many species throughout the fish community besides lake trout. Some economically valuable species like lake herring and lake whitefish experience significant mortality, while some species that are less valuable, such as the deep-water siscowet, act as "buffer" species, absorbing sea lamprey impacts that might have otherwise affected fish with more commercial or recreational importance.

The research confirmed that sea lampreys prefer to feed on large fish like lake trout, though it also indicated sea lampreys affect many other species, and that those effects differ from time to time and place to place. "This refined view of who sea lamprey feed on at different times and in different areas is a big step," Harvey said. "Many of the pioneering impact models were forced to guess which species sea lamprey were killing. Our study removes some of that guesswork, and we hope it will lead to better accounting of the actual damage that sea lamprey do."

Information about this and other research completion reports is available online at www.glfc.org/pubs_out/communi.php.

The Great Lakes Fishery Commission is an international organization established by the United States and Canada through the 1954 Convention on Great Lakes Fisheries. The commission has the responsibility to support fisheries research, control the invasive sea lamprey in the Great Lakes, and facilitate implementation of A Joint Strategic Plan for Management of Great Lakes Fisheries, a provincial, state, and tribal fisheries management agreement. WWW.GLFC.ORG

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