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GREAT LAKES FISHERY COMMISSION FUNDS INNOVATIVE APPROACH TO RESTORE ATLANTIC SALMON IN LAKE CHAMPLAIN

BURLINGTON, VERMONT—Scientists and fisheries managers are testing a novel breeding strategy to help Atlantic salmon overcome a persistent and potentially fatal nutritional problem in Lake Champlain, with funding from the Great Lakes Fishery Commission (Commission). The work brings together researchers and hatchery managers from the U.S. Fish and Wildlife Service, Vermont Fish and Wildlife Department, New York Department of Environmental Conservation, U.S. Geological Survey, SUNY Brockport, and several national fish hatcheries and research laboratories.

The problem is thiamine deficiency complex (TDC). Thiamine (vitamin B1) is an essential nutrient for fish development. In Lake Champlain, Atlantic salmon feed heavily on invasive alewife, a small fish that contains thiaminase, an enzyme that breaks down thiamine in the body. Female salmon accumulate too little thiamine to pass adequate amounts into their eggs, and many offspring die before they are old enough to feed on their own. Since alewife became established in the lake, 75% of salmon eggs tested have fallen below the thiamine levels needed to survive to the next life stage.

Not all salmon respond to TDC equally. Researchers noticed that some fish survived the thiamine problem far better than others—and they are now testing whether those differences can be put to work. The approach, called assisted evolution, involves identifying salmon that tolerate thiamine deficiency and breeding them selectively to form an experimental broodstock. The goal is to increase the frequency of survival-linked traits in fish stocked into Lake Champlain. To date, researchers have released approximately 1.6 million salmon from two experimental broodstocks into the lake. Researchers are monitoring those fish to determine whether this strategy produces salmon that survive and reproduce more successfully than fish from standard broodstock practices.

There are trade-offs. Selecting only the most resilient individuals for breeding reduces the genetic diversity of the stocked population—and diversity is what gives a population the flexibility to adapt to future threats. Researchers are still working to determine whether assisted evolution can improve TDC survival without causing longer-term genetic harm. The

outcomes of this work may also offer lessons for managing other fish and wildlife populations facing mounting pressures from invasive species, disease, and environmental change.

"Atlantic salmon face a gauntlet of challenges in Lake Champlain, and thiamine deficiency is one of the most difficult to address because it is driven by an invasive species we can't simply remove. This research asks whether the salmon themselves can be part of the solution—and that is exactly the kind of forward-thinking science the Commission was built to support," said Dr. Marc Gaden, Executive Secretary of the Commission.

The U.S. section of the Commission, at the request of Congress, supports Lake Champlain and Lake Memphremagog programs that fund leading-edge fisheries research, yielding discoveries and solutions that address emerging threats to fish populations and inform adaptive management strategies.

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The Great Lakes Fishery Commission (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 promote measures that protect and improve the multi-billion-dollar Great Lakes fishery. Visit online at www.glfc.org