A Vampire Story

. . . Or how I learned to stop worrying and love the lamprey

By Ted Williams

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Sea lampreys suck. Striking fast as cobras, these primitive, jawless, boneless fish latch onto their prey with tooth-studded disks, bore holes with raspy tongues, then imbibe body fluids. They can suck their way over wet dams and through rocky rapids. They hitch rides by sucking onto boats and humans. In the Great Lakes, Finger Lakes, and Lake Champlain a sea lamprey may kill 40 pounds of salmonids during its 18-month adult phase. When one or several finish with a trout or salmon it looks like Swiss cheese soaked in raspberry jam.

You can suppress sea lampreys by poisoning their mud-dwelling larvae, blocking their access to streams, and disrupting spawning with release of sterile males. But you'll never get them all; and if you don't keep at it, they'll bounce right back. The only sure way to protect game fish is to equip each with a wooden crucifix, at least according to columnist Dave Barry.

Consult most any credible source and you'll learn that sea lampreys are "alien invaders" from the Atlantic that gained access to Lake Ontario and the Finger Lakes through the Erie Canal and to Lake Champlain through the Champlain-Hudson canal. Now two comprehensive studies, still unpublished at this writing, provide compelling evidence that this is not so, that sea lampreys are just as native to these waters as are landlocked salmon to Maine's West Grand, Green, Sebec, and Sebago lakes.

Dr. Kim Scribner, a fisheries professor at Michigan State University, supervised a project that compared the DNA of sea lampreys from Lake Champlain and Cayuga Lake with that of specimens from the Atlantic. "The genetics of the lake fish indicate long isolation," Scribner told me. "If colonization were a human-mediated event, there should be certain genetic affinities between populations." There aren't.

Concurrently, independently and looking at different genetic markers, researchers at the Hudson River Foundation for Science and Environmental Research have reached the same conclusion. "We found tremendous differences in mitochondrial DNA," declares the foundation's Dr. John Waldman. And he adds that because Champlain lampreys don't share DNA with Lake Ontario fish, they probably had a separate history of colonization. Certainly, there is nothing that would have prevented sea lampreys from entering Lake Ontario through the St. Lawrence River and Lake Champlain through the Richelieu River.

The notion that sea lampreys negotiated the Erie and Champlain-Hudson canals is a major stretch. Like other anadromous fish, lampreys require clean, well-oxygenated water, and the canals were filthy and stagnant. They were also choked with locks, and ripe lampreys need to spawn quickly because, like Pacific salmon, they undergo rapid decay. What's more, the sea lamprey (at least in freshwater) is one anadromous fish that doesn't home in on its natal river. Instead, it follows pheromones released by larval lampreys-the presence of larvae means there must be spawning habitat. If sea lampreys arrived from the Atlantic via man-made canals, there wouldn't have been larvae to attract them.

But why and how did sea lampreys negotiate the Welland Canal (which bypasses Niagara Falls) and enter the upper Great Lakes, where they are definitely not endemic? Slowly and in exceedingly small numbers. This relatively short (26-mile) canal was finished in 1829, but it wasn't until 1921 that sea lampreys showed up in Lake Erie. And apparently, not many lampreys made it through because Waldman and his colleagues found far less genetic diversity in Lake Superior specimens.

As recently as last fall the Atlantic Salmon Journal ran a piece in which a misinformed fish writer (one Ted Williams) reported that sea lampreys were probably not native to Lake Champlain and Lake Ontario because "not one of the historical accounts of salmon or lake trout catches mentions a fish bearing a circular wound." But native silver lampreys had been present in both drainages and would have wounded fish, an indication that lack of public commentary on scarring doesn't mean much.

How could Atlantic salmon and lake trout have thrived in the Finger Lakes, and Lakes Champlain and Ontario if sea lampreys had been present? Other documents (such as my master's thesis) contend that lampreys wiped out lake trout in Lake Ontario. But a newly released 15-year study by federal agencies and North American universities, offers convincing evidence that by the 1940's the lake was sufficiently contaminated with dioxin to kill virtually all young trout. Lake Ontario's prolific Atlantic salmon were extirpated in the late 19th century by dams, which also would have knocked down sea lampreys. But a few lampreys survived, and the species exploded when the dams fell into disrepair and when humans replenished the lake with lamprey prey.

Could it have been that the extinct native races of lake trout and Atlantic salmon in Lakes Ontario and Champlain had adapted to sea lampreys? If this were the case, you'd expect the extant native trout from Seneca Lake (one of the Finger Lakes) to be resistant to lamprey attack. Indeed they are-so resistant, in fact, that managers stock them in the Great Lakes where they survive much better than the Lake Superior strain. Perhaps it's a behavioral thing or perhaps, because Seneca Lake is very deep, its lake trout prefer water too deep for lampreys.

So all this means that we should desist from controlling freshwater sea lampreys and kiss them Jimmy Houston style, right? Well, no. First, if it were possible to extirpate them from habitat they seem to have evolved in, we shouldn't; but it's not possible. Second, they aren't native to the upper Great Lakes; and, although it's not possible to extirpate them there either, it would be nice to. And third, the lamprey problem in lakes Ontario and Champlain is indeed the result of alien introductions-but the aliens are stocked salmonids, not (apparently) the sea lampreys with which they can't cope. The only solution is aggressive lamprey control.

Before the lamprey invasion the United States and Canada annually harvested about 15 million pounds of lake trout from the upper Great Lakes. Then, between 1937 and 1947 the Lake Huron catch dropped from 3.4 million pounds to about nothing. Between 1946 and 1953 the Lake Michigan catch fell from 5.5 million pounds to 402.

Managers started work on the problem in 1946 when a team led by Michigan DNR biologist Vernon Applegate began interdicting lampreys with barriers. But the researchers quickly realized they'd also need a selective poison, and there'd never been such a thing for any pest, let alone fish. Still, three years later Applegate and his colleagues began what he called "a six-year sentence of unmitigated boredom," testing about 6,000 chemicals by dumping them into 10-liter glass battery jars that contained a rainbow trout, a bluegill and a larval lamprey.

Finally in 1955 lab chief John Howell found one jar in which the lamprey was dead and the trout and bluegill "alive and happy." At first he thought something had gone wrong. But when he tried again he got the same result. Unfortunately, the chemical-3-bromo-4 nitrophenol-was expensive and almost impossible to synthesize. So Applegate turned to Dow Chemical Co. for help. Dow suggested testing close chemical relatives, then concocted some soluble formulations. The winner was 3-trifluoromethyl-4-nitrophenol (TFM), still used today and as close to a silver bullet as chemical pesticides get. Non-target mortality is almost nil. Occasionally, when dosages are off, young mudpuppies (large aquatic salamanders) are killed. But numbers swiftly rebound, and in roughly 3,000 TFM treatments over the last 40 years not one population is known to have been lost.

No lamprey control was more effective than water pollution. For example, the St. Marys River, which runs from Lake Superior into Lake Huron, produced few lampreys before it was brought back to life by the Clean Water Act. At 25 times the size of the biggest river ever treated with TFM, there had been nothing managers could do but watch the cleaned-up St. Marys pump vampires back into Lake Huron.

But in 1998 the Great Lakes Fishery Commission tried a new selective lampricide called granular Bayluscide. Grains of sand are coated with the poison, then coated again with a time-release substance. Applied to hot spots by helicopter, the lampricide sinks and spreads over the bottom, allowing non-target fish to swim up or away. After Bayluscide treatments on the St. Marys, and release of sterile males that tie up multiple females in unproductive spawning, scarring of Huron lake trout declined by 50 percent. There are still problem areas in the Great Lakes (upper Lake Michigan, for instance), but the sea lamprey is the one alien invader (out of 165) that managers have learned how to control. Today Great Lakes sea lampreys are down 90 percent from their 1961 peak. The control program costs about $12 million a year and produces income-from sportfishing-of between $4 and $6 billion a year.

Lamprey control is forever. But without it, says the commission's Marc Gaden, "Endangered species would be wiped out, and we'd have no fishery to speak of, just a cesspool of exotic organisms that have infested our waters." In Europe, where sea lampreys fetch as much as $25 per pound, they've traditionally been relished as gourmet food. Crazed with gluttony, King Henry I of England is said to have killed himself with a "surfeit of lamprey." We plunder our dogfish for the Brits; why not plunder our lampreys for them and get paid for it? But when I put the question to Gaden he said the commission needs every male lamprey it can get its hands on for its sterile-release program. "The last thing we want is to be competing with commercial fishermen." The commission traps lampreys, kills the females (which are fat with eggs and lack the spinal ridge), then runs the males through a machine that weighs them, figures out the right dosage of sterilant, shoots it into them, then dumps them into a holding tank.

In 1990 Vermont, New York, and the US Fish and Wildlife Service (having finished a five-year, 997-page Environmental Impact Statement (EIS) that restudied everything the lake states and Canada had learned about TFM since the 1950's) finally got around to using TFM in Lake Champlain's tributaries. The results on the Atlantic(?) salmon fishery were spectacular. "Some of the guys were fishing the Ausable, Boquet and Saranac instead of going up to the Gaspe," reports Larry Nashett of the New York Department of Environmental Conservation. "Up there they might spend a lot of time and money and catch one fish. Here, on good days, they were taking three-fish limits." The better salmon were seven or eight pounds. There was even some natural reproduction.

But when the EIS expired in 1997, it seemed as if Vermonters had never heard of TFM; the stuff terrified them. At this point Vermont, New York and the US Fish and Wildlife Service undertook a two-year, 579-page "comprehensive evaluation" of the eight-year program and-when this was hatched-a two-year, 562-page supplemental EIS, in which they restudied everything they'd restudied in the first EIS.

Since the end of all the studies in 2001, New York has been knocking the bejesus out of lampreys on its side of the lake. But because of low water in 2001 along with public chemophobia and ongoing timidity among health officials, there has been only one TFM treatment in Vermont-on Lewis Creek in 2002. Meanwhile, the salmon fishing in 2003 was the worst in recent memory, according to district fisheries biologist Brian Chipman.

On the Poultney River-one of three large Vermont streams that desperately require TFM treatments-The Nature Conservancy has talked the state and feds into a five-year moratorium while everyone chats about non-chemical "alternatives" that don't exist. In the March FR&R, the editor described TNC as "arguably the world's most effective environmental organization." This is correct, and that's why I was so surprised and distressed to read TNC's commentary on the supplemental EIS. It was pure gobbledygook, rambling on about lampriciding being ill-advised because, having no "endpoint," it didn't contribute "toward the goal of having the system 'manage itself,'" as if this were ever anyone's goal or even a possible goal. By this logic we should write off 80 percent of the Yellowstone cutts on earth and forget about perpetual alien-lake-trout control in Yellowstone Lake; and we should abandon perpetual lamprey control in Lake Superior, a program that has allowed native lake trout, the top predators in that vast ecosystem, to recover to the point that they're self-sustaining. The supplemental EIS ignores the "likely detriment" to existing fish that would result from stocking salmon and lake trout "strains of a different origin and different genetics than the populations that were lost," continued TNC. By this logic the United States should never have introduced tundra and Canadian anatum peregrine falcons after our eastern peregrine was lost.

Such statements provide ordnance to a minority of hothead sportsmen/property-rights types who, at least in Vermont, seem to make a majority of the noise. I scarcely dare imagine what else they're saying about TNC after reading their comments on our internet bulletin board (http://bbs.flyrodreel.com) regarding a column in which I'd merely mentioned TNC's role in land preservation. For example: "Dear Ted Williams . . . TNC appears to delight in crushing the will of local people. . . . Where is your article on the need for lamprey control in Lake Champlain? Your buddies are interested in protecting the sea lamprey, mudpuppy, etc. . . . These organizations are sucking blood money out of the restoration effort. . . . Go ahead change the name to Sea Lamprey & Mudpuppy Magazine and see how well it is received by fly fishermen!"

To its credit, TNC chose to respond calmly and rationally to this and other tantrums and to engage the state and feds in dialogue rather than court action. The Vermont Public Interest Research Group (VPIRG) and Audubon Vermont, on the other hand, sued.

What I find so frustrating about the environmental community, not just in Vermont but nationwide, is its frequent inability to see native fish as part of ecosystems, even when these natives are apex predators. In announcing its lawsuit, VPIRG advanced the argument that Atlantic salmon and lake trout recovery was "strictly for sport fishing." It then proclaimed that TFM has "potentially far-ranging and largely unknown effects on non-target organisms." This is an untruth. There are no "far-ranging" effects; no piscicide is safer for non-targets; and no pesticide, with the possible exception of rotenone, has been better studied. During the 2002 treatment of Lewis Creek managers placed mudpuppies in wire cages to see what would happen to them. Not one was harmed.

The supplemental EIS commentary of VPIRG and Vermont Audubon, whose lawsuit failed, made no more sense than TNC's: "The benefit of catching fish without visible scars accrues to a tiny segment of the population while the potential damage to the environment from lampricide treatments must be borne by all Vermonters," declared VPIRG, as if scarring were the issue or had something to do with rebuilding Lake Champlain's native ecosystem or as if Vermonters were in any way threatened by quick, localized, EPA-approved applications of TFM at less than five parts per million. "The intent of the program is to produce more and larger individuals of three species of game fish," remarked Audubon Vermont, as if Atlantic salmon, lake trout and walleyes were of no value in and for themselves and played no role in the lake's native ecosystem.

If Vermont finally commits to aggressive chemical control, Champlain's sea lampreys will probably be reduced to something like their natural level back when native salmonids had the ability to avoid them. But what role should the saltwater race of sea lampreys be allowed to play in the Atlantic Ocean and in the rivers it collects? With one hand Vermont and the feds are killing lampreys that are apparently native to Lake Champlain and, with the other-a few miles away, over a low mountain range-they're rehabilitating native lampreys in the Connecticut River.

In the spring of 2003 the feds and the watershed states passed 8,063 lampreys over the fishway at Vernon, Vermont. Downstream, at Holoyoke, Massachusetts, they passed 53,030. Isn't this schizoid, not to mention dangerous and irresponsible? Yes, according to some fish pundits. For example, The Lawrence (Massachusetts) Eagle-Tribune's respected outdoor columnist, Roger Aziz scolds managers for allowing sea "lamprey eels [which] literally suck the life out of their host fish" through fish-passage facilities: "The fish ladders ought to be used to diminish the lamprey and prevent it from entering into the lakes and streams of New Hampshire."

But in the marine ecosystem saltwater lampreys limit no species; they are incapable of feeding when they enter freshwater; and they all die after spawning. The danger to freshwater fish is "zero to none," to quote Fred Kircheis, former director of Maine's Atlantic Salmon Commission who, contracted by the National Fish and Wildlife Foundation, has just finished a white paper recommending policy for saltwater sea-lamprey management. When you try to acclimate a saltwater lamprey to freshwater it dies, he explains.

With their carcasses, feces, eggs, milt, and young, saltwater lampreys bring a feast of nutrients to sterile, glaciated feeder streams. Spawners clear sediments and pebbles with their sucker mouths, creating clean areas that attract spawning salmon. Lamprey carcasses are gorged on by the caddis larvae that trout and young salmon eat. Larval lampreys bury in the bottom, thereby preventing a prime impediment to successful salmonid reproduction-

stream embeddedness. Lampreys feed eagles, ospreys, herons, vultures, turtles, minks, otters, crayfish and dozens of other native predators and scavengers. "It wasn't until I started talking to some birders that I realized owls prey heavily on lampreys when they come up in the shallows at night," says Steve Gephard, Connecticut's anadromous-fish chief. "Sea lampreys have played a very important role in this watershed for a lot longer than any other species. We don't begin to recognize the benefits."

It's hard to blame sportsmen and outdoor writers for not grasping the value of native saltwater lampreys when some managers are just as ignorant. In Maine the Department of Inland Fisheries and Wildlife and the Division of Marine Resources interdict spawning lampreys west of the Penobscot River and let them go to the east (where there are essentially no dams for interdiction). "Why?" Gephard keeps asking.

When I repeated the question to Fred Kircheis he said: "Uninformed bias." The superstition that saltwater lampreys are somehow "bad" started in the 1960's when a few "transformers" (newly metamorphosed larvae trying to get to sea) left scars on landlocked salmon in Sheepscot Lake. Usually transformers are just hitchhiking, but if they do feed (because low water temporarily blocks seaward migration), they're so small they apparently don't kill their hosts.

Because Maine Atlantic salmon and other native anadromous fish evolved with sea lampreys and need them, the state's anti-lamprey bias has long infuriated TU's New England conservation director, Jeff Reardon. Currently, he's trying to remove a useless dam on the Sheepscot River. "I thought we were ready to move on this a year ago," he told me. "Then there was a huge blowup about lampreys. The Maine agencies wanted to use the dam as a lamprey barrier. The National Fish and Wildlife Foundation and NOAA (National Oceanographic and Atmospheric Agency(?)) , which would be providing funding to remove the dam or build a fishway, have been telling the state agencies, 'Look, if there's a reason to exclude lampreys, tell us what it is.'" They can't because there isn't.

Thoughtful anglers who notice and appreciate the natural world need to carefully consider sea lampreys in all waters, fresh and salt. Lampreys may suck. But, then, so do bonefish, humming birds, butterflies, and human infants. Sea lampreys everywhere teach us that, in nature, "ugliness" is a word that applies only to ecological messes-messes that, without exception, are made by humans when they destroy beautiful and complex machinery or toss parts where they don't belong.