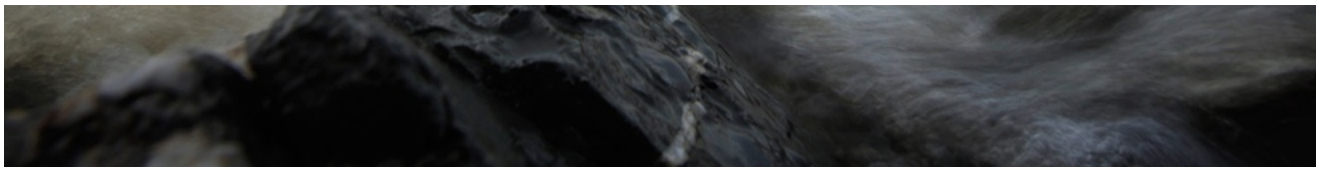
Gulf of Maine's cold-craving marine species forced to retreat to deeper waters

VEAZIE

Story by **Colin Woodard**/ Staff Writer
Photos by **Gregory Rec**/ Staff Photographer



Swollen from recent rains, the Penobscot River flows through the area of the river where the Veazie Dam once stood. The dam, along with the Great Works Dam farther downstream, was removed two years ago in an effort to allow salmon easier passage to spawning grounds upriver from the dam. The salmon face a new threat, though, with the increase in the water temperature in the Gulf of Maine. **Photo by Gregory Rec/Staff Photographer**

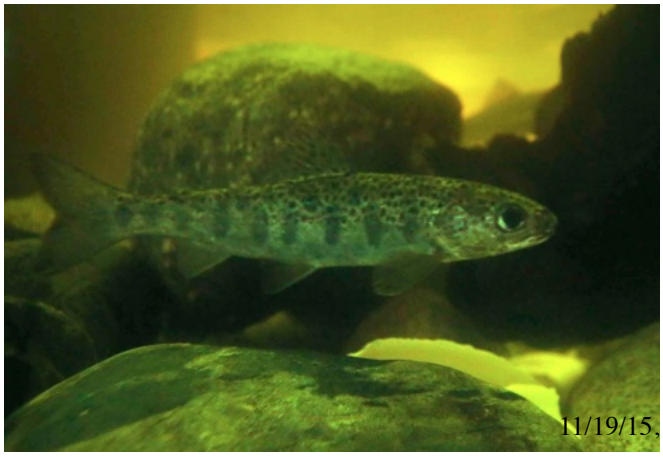
For 178 years, dams stood across the Penobscot River here, obstructing salmon and other river-run fish from reaching the watershed's vast spawning grounds, which extend all the way to the Quebec border.

Now, two years after the dam's removal, the salmon's proponents fear the fish face a more fearsome threat: a warming sea.

In recent years, the Gulf of Maine has been one of the fastest-warming parts of the world's oceans, and climate change models project average sea surface temperatures here to increase by another 5.5 degrees Fahrenheit by 2065, a development that could extirpate Atlantic salmon and other cold-loving species, many of which already find Maine at the southern edge of their ranges.

"We're all for taking down the dams and all the things that are going on to restore habitat, but how much are they looking at the evidence?" asks Gerhard Pohle of the Huntsman Marine Science Center in St. Andrews, New Brunswick, co-author of a study predicting how the changes are likely to affect 33 commercial species over the next 75 years. "Distribution of salmon in the Gulf of Maine would be such that there wouldn't be many left at all."

The warming gulf is already presenting challenges to many of its cold-loving denizens. Scientists at the National Marine Fisheries Services, or NMFS, have recorded the steady retreat of a range of commercially or ecologically important fish species away from the Maine coast and into deep water in the southwestern part of the gulf, where bottom water temperatures are cooler.



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A salmon parr, or juvenile, swims in a tank at the East Machias Aquatic Research Center. The hatchery is sited along the East Machias River and cycles river water through the hatchery in an attempt to imprint the river's characteristics upon the salmon as they are raised at the hatchery. **Photo by Gregory Rec/Staff Photographer**

The retreat, which intensified over the past decade, includes cod, pollock, plaice, and winter and yellowtail flounder. Other native species that once ranged south of Long Island – lobster, sand lance and red hake – have stopped doing so, presumably because the water there is now too warm.

"You can imagine that when you have species at the southern end of their ranges, they will be really sensitive to these changes," says Michael Fogarty, chief of the Ecosystem Assessment Program at the NMFS Northeast Fisheries Science Center in Woods Hole, Massachusetts. "They will either shift distribution or their survival rates might change."

American lobster have been doing just that, abandoning ever warmer conditions south of Cape Cod, where a report this August from the Atlantic States Marine Fisheries Commission found stocks that had "completely collapsed." The estimated population of adult lobsters in southern New England in 2013 was the lowest on record: 10 million, or about one-fifth the level of the 1990s.

"These declines are largely in response to adverse environmental conditions including increasing water temperatures over the last 15 years combined with sustained fishing mortality," the fisheries management group concluded, even though the lobster catch had fallen from 22 million to 3.3 million pounds since 1997. The commission is considering the results of the report, which recommends a near closure of the southern New England fishery, where hundreds of lobstermen have given up their licenses over the past 18 years.

Meanwhile, the lobster population in the colder Gulf of Maine has doubled to 250 million adult lobsters over the past two decades, even as Maine's lobster catch has tripled. As most other commercial fish populations have cratered, most Maine fishing communities now rely almost solely on lobster, which is far and away the state's most valuable fishery, at $457 million a year. (The figure for soft-shell clams, the closest competitor, is just $19 million.)

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Genevieive McDonald fills up her lobster boat with gas before heading out for a day of lobstering off the coast of Stonington. The best lobstering used to be in Casco Bay in the 1980s but has shifted east and is now considered to be in and around Stonington. **Photo by Gregory Rec/Staff Photographer**

Robert Steneck, a lobster expert at the University of Maine's Darling Marine Center, believes the lobster boom is largely the result of the destruction of the gulf's primary predator, the Atlantic cod, through centuries of intense fishing. Freed from predation and fished in a responsible manner, he says, the crustacean has been able to expand faster than lobstermen can catch them.

The warming gulf introduces potential perils, Steneck warns. Lobster larvae don't survive when the water is too cold or too warm, which is likely why lobster landings have actually been going down in York County, even as they've exploded in eastern Maine, where the water used to be too cold. Mainers of a certain age can recall that in the 1970s, the best lobstering was in Casco Bay but had shifted to the Boothbay region in the 1980s, the western entrance to Penobscot Bay in the late 1990s, and is in and around Stonington in Hancock County today.

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the 1970s, the best lobstering was in Casco Bay but had shifted to the Boothbay region in the 1980s, the western entrance to Penobscot Bay in the late 1990s, and is in and around Stonington in Hancock County today.

"We're definitely seeing this geographic shift and it's in keeping with the warming of the gulf," Steneck says. "Unless something changes in terms of ocean temperature trends, the Gulf of Maine will not likely remain a great place for high lobster abundance. How long this takes to play out, whether it's decades or centuries, nobody knows."

Cory McDonald pulls lobster out of a trap while fishing off the coast of Stonington. Over the past two decades, the lobster population in the Gulf of Maine has doubled to 250 million adult lobsters, even as the lobster catch has tripled. Robert Steneck, a lobster researcher at the University of Maine's Darling Marine Center, believes the lobster population has boomed because a primary predator of lobster – cod – has been decimated in the Gulf of Maine. **Photo by Gregory Rec/Staff Photographer**

The potential problems are manifold, Steneck observes. Warmer water holds less dissolved oxygen. It could cause lobster eggs to hatch too early in the season, while the parents their eggs were attached to are still migrating from deep water, where the newly hatched larvae are less likely to survive.

David Thomas, who fishes for lobster from Islesford, says he and his colleagues have been seeing surprisingly small lobsters bearing eggs, even ones too small to keep under Maine laws, suggesting the animals might be maturing faster in the warm water. "Mother Nature tends to have corrective actions, but what's the tipping point?" he asks. "You look down the other side of Cape Cod and the fishery is desolate. That's pretty scary."

Then there's shell disease, caused by bacteria that eat through the shell, weakening and sometimes killing the lobster. The disease exploded in southern New England since 1997, with roughly a third of all lobsters becoming afflicted with it, but the colder temperatures in the Gulf of Maine have kept it at bay. Still, the rate of infection grew sixfold between 2010 and 2012, to 0.3 percent, raising concerns about what may happen as average water temperatures climb.

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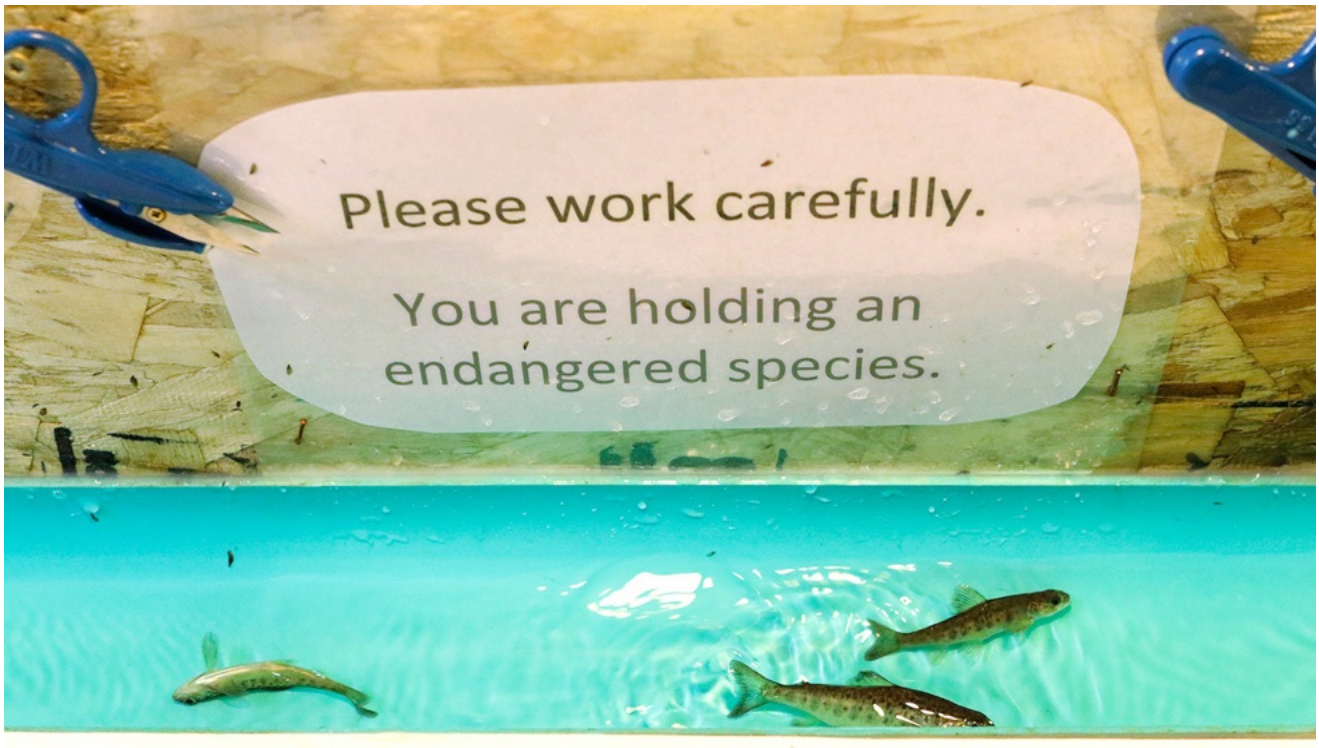
"Temperature has an impact, especially on how much the bacteria grow," says Michael Tlusty, director for ocean sustainability science at the New England Aquarium in Boston, who studies shell disease. "It also causes stress to the lobsters, especially if they don't get to bed down in cool temperatures for the winter to recover and recuperate."



Being accustomed to the water in the river where they are released might give salmon a better chance of survival. With warming temperatures in the Gulf of Maine disrupting their food supply, some think the best chance of helping salmon survive is to improve their river habitat so that they are as healthy as possible when they go out to sea.
Photo by Gregory Rec/Staff Photographer

Northern shrimp have already seen an apocalypse of sorts. During the "ocean heat wave" of 2012, all ages of shrimp took a nosedive that didn't appear to be driven by fishing pressure, says Anne Richards, a shrimp expert at the Northeast Fisheries Science Center. "Not only were no more babies coming into the population, but there was huge mortality for all sizes," she says. "We're still trying to figure out what that might be."

Among the culprits, according to the Atlantic States Marine Fisheries Commission: "increasing water temperatures and a decline in phytoplankton abundance (a food source for shrimp)" and a rise in predators, including dogfish and redfish. The gulf's shrimp fishery – prosecuted overwhelmingly by Maine-based boats – has been closed for two years running and was closed early in each of the three previous years.

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As for salmon, the prospects look uncertain, with runs in decline not just in the Penobscot but in the Saint Croix and the relatively wild Miramichi River in New Brunswick as well. "We're seeing declines over very large geographic areas, which points to some sort of factor out to sea, in the marine ecosystem," says fisheries ecologist Katherine Mills of the Gulf of Maine Research Institute in Portland. "We feel the impacts very strongly in Maine because we started with such low population numbers before the downturn."

Roger Collard unloads totes of shrimp from the hold of the Theresa Irene III after the boat tied up to the pier at Camp Ellis in Saco in this 2006 file photo.
Gregory Rec/Staff Photographer

The primary suspect: the decline of capelin off Greenland and Atlantic Canada, where Maine's salmon go to feed. "We think it's related to the warming temperatures shifting their prey base, the zooplankton," Mills says.

Andy Goode of the Atlantic Salmon Federation says the salmon's best hope lies in improving their riverine habitat, so the fish are as healthy as possible before they go to sea. The main stems of Maine's rivers may be getting warmer, but if fish have access to cooler, tree-shaded tributaries high beyond old dam sites like Veazie, they'll be better able to cope.

> "The warmer climate is also leading to more moisture and rainfall here in Maine, and that makes the rivers cooler," Goode notes. "So it's not completely doom and gloom."

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