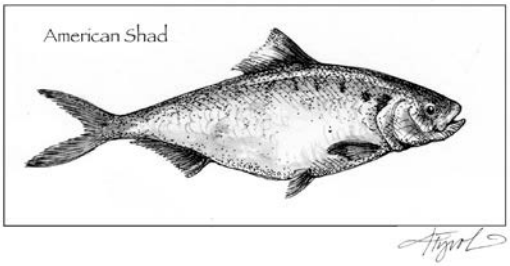
The Outside Story



With Cooler Water, Better Prospects for Shad Migration?

By: Michael J. Caduto

There was a time in the waters known by the Abenaki peoples as *Kwenitegok*, "Long River," when migratory fish moved in such multitudes that their backs appeared as a living bridge from shore-to-shore. After the glacier melted, shad and alewives returned to migrate up our rivers for 10,000 years, and salmon for some 8,000 years. But free passage in the Connecticut River ended in 1798 when the first major dam was built near Turners Falls, Massachusetts. Thirteen dams eventually blocked the river's main channel — including those in Holyoke, Vernon and Bellow Falls — sealing the fate of the great fish runs.

It wasn't until 1980, when fish passage was constructed at Turners Falls, and later at the other dams, that migrating fish trickled back to some of their former spawning grounds. In 1992, 720,000 American shad passed the Holyoke dam — impressive but still a fraction of historic numbers.

Not every impediment to fish passage, however, is built of concrete and stone. Migratory fish are highly responsive to temperature. American shad, which can grow to two feet and weigh five pounds, spawn from May through July. Shad migrate upriver to spawn in water ranging from 41 to 73 degrees, but in the Connecticut River, they tend to stop migrating upriver once the water exceeds 68 degrees. About half of the shad that survive spawning return to the sea, and some return two or three times during their lifetime.

Between 1978 and 1992, the Vermont Yankee nuclear power plant in Vernon received permits for discharging warm water into the Connecticut River, allowing for an increase in the river temperature by up to five degrees between May and October, and 13 degrees from October to May. A 2003 permit added another degree to the upper limit. During peak operation, Vermont Yankee released more than half a billion gallons of water daily which sometimes measured 105 degrees as it entered the river. This heated plume reached 55 miles downstream to Holyoke, and appears to have been a major factor in a steep decline of shad in the river (in 2005, the annual run of shad passing the Holyoke dam was approximately 143,000 fish, a decline of 80% from 1992). This decline may have been exacerbated by over-fishing of shad in the mid-Atlantic and predation from a growing population of striped bass at that time.

Warm water drains the energy reserves needed to spawn and swim back to the sea. Ken Cox, Fisheries Biologist with the Vermont Agency of Natural Resources (ANR), explained that, “fish migrating upriver are racing against time, against increasing temperature and date, so the window of opportunity is shrinking all the time. Artificial discharges shrink the window all the more.”

“The rate of maturation of eggs growing inside females is also impacted by water temperature,” he said. “The cooler the water, the slower the eggs mature, so fish can get further upriver before spawning. A warm slug of water can cause an increase in the maturation rate and eggs will mature lower down the river than they would normally.”

In late summer, juvenile shad start moving downriver when the water temperature drops to around 65 degrees, slowly undergoing physiological changes that will enable them to survive in saltwater. Cox observed that plumes of warm water can delay their migration to such an extent that they may be trapped until they move downstream too late, when the water has become so cold that it may increase mortality.

When studying the impacts of warm water on migrating shad, Cox’s agency worked with an advisory committee from New Hampshire, Massachusetts and the US Fish and Wildlife Service. Said Cox, “based on literature and our observations, we concluded that there was ample reason to be suspicious that there may be thermal impacts negatively impacting shad in the upper Connecticut River.”

David Deen, River Steward for the Connecticut River Watershed Council, has observed the greatest drop-off in the numbers of migrating fish between Vernon and Turners Falls. “That’s where the impact of the thermal heating raised the water temperature high enough to trigger spawning activity unnaturally, and too quickly,” said Deen.

On December 31 2014, Vermont Yankee stopped producing power and ceased discharging high volumes of heated water into the Connecticut River. In 2015 nearly 40,000 shad passed above the Vernon Dam.

But the dams themselves continue to impede fish passage. In 2015 only 14% of the shad that passed the Holyoke dam made it above the Turners Falls dam. Until mechanisms are devised that enable healthy numbers of migratory fish to navigate past these barriers, the journeys of these intrepid piscines will be dammed.

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