AQUATIC CONSERVATION AT THE NATIONAL MISSISSIPPI RIVER MUSEUM & AQUARIUM

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Beneath the surface of even the smallest stream lies a whole ecosystem that most of us never get to experience. Even for those who bother to look, those ecosystems can be incredibly difficult to observe and study. Muddy water, nocturnal habits of many species, unsafe water conditions, private property, cold temperatures, and a number of other factors all provide obstacles. One option to learn what lies beneath the water's surface is to visit the nearest public aquarium facility. One of my favorites, though I admit to being a little biased, is the National Mississippi River Museum & Aquarium (River Museum herein for brevity).

The River Museum is a non-profit cultural center located on the banks of the Upper Mississippi River in historic Dubuque, Iowa, welcoming nearly 200,000 guests each year. Operated by the Dubuque County Historical Society, the River Museum is one of only a handful of facilities that is accredited by both the American Alliance of Museums (AAM) and the Association of Zoos & Aquariums (AZA). The AZA accreditation process must be undertaken every five years and is a rigorous test of an institution's entire operation, including animal welfare, veterinary care, conservation, education, guest services, physical facilities, safety, staffing, finance, and governance. Aquariums and zoos don't always receive the respect of animal rights activists. In some ways this is a positive development. Any facility that houses animals should be held to the highest of standards. Unfortunately, the current slate of national and state laws is insufficient to ensure ethical and responsible animal care practices, and too many facilities fall short. AZA accreditation gives people assurance that this facility employs best practices in all areas. Even federal agencies like OSHA and USDA reference AZA standards in their evaluations. The museum's mission is "to inspire stewardship by creating educational experiences where history and rivers come alive." One of the ways it accomplishes this goal is with more than 100,000 gallons of aquariums that bring hidden river ecosystems into public view. The naturalistic habitats provide homes to more than 200 species and 1,400 individual animals. The River Museum houses some of the largest aquariums in the Midwest, with a heavy focus on species of the Mississippi River Watershed; the most expansive watershed in North America, draining parts of 31 US states and 2 Canadian provinces. Some of the larger freshwater habitats include the diverse Backwater Marsh—with its dozens of native turtles, panfish, and diving ducks, the Flooded Forest—housing a pair of orphaned North American River Otters, the 35,000-gallon Main Channel, and the Bayou aquarium—complete with a full-grown, adult American Alligator *Alligator mississippiensis*. In the Rivers-to-the-Sea gallery guests will find saltwater aquariums that highlight connections between the rivers of America and the ocean. These aquariums are interspersed with historical and STEM-based exhibits in an attempt to tell the entire story of one of the world's largest artifacts, the Mississippi River (an artifact being an object that has been created or modified by human hands).

Aquariums and zoos serve valuable roles in their communities that cannot be overstated. Many engage in wildlife rescue efforts. Most provide homes for injured/orphaned animals that could not survive in the wild. The conservation and research efforts undertaken by aquariums and zoos are invaluable. Species like the California Condor and Przewalski's Horse would be extinct today if not for their efforts. Of all the large conservation-based organizations in the world, only aquariums and zoos are positioned to save species on the species-level; virtually all others focus almost entirely on habitat preservation and restoration. Habitat work is critical, but it can't happen in a vacuum; if the animals are lost before the habitat is corrected, there will be nothing left to recolonize. Education is also a cornerstone of every accredited aquarium and zoo. Senegalese conservationist Baba Dioum once said, "In the end we will conserve only what we love; we will love only what

Figure 1. The National Mississippi River Museum & Aquarium. (Photo by the River Museum)

Andy Allison is the Vice President of Living Collections & Education at the National Mississippi River Museum & Aquarium in Dubuque, Iowa. He has worked professionally with public aquariums since 1999, including the Living Planet Aquarium, the Albuquerque Aquarium, the Minnesota Zoo, Turtle Bay Exploration Park, and Cabela's Retail. He serves on the steering committees for AZA's Freshwater Fish and Aquatic Invertebrate Taxon Advisory Groups. Areas of expertise include aquatic animal husbandry, life support systems, water quality management, aquarium design, and team management.



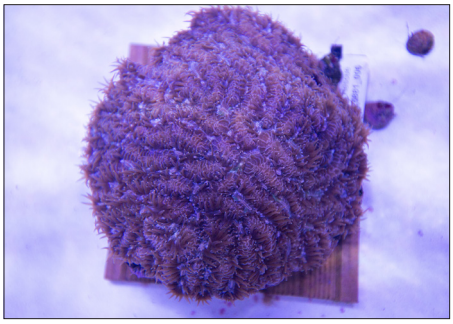

Figure 2. From left: young Wyoming Toad, mussels in the wetlab, coral colony. (Photos by the River Museum)

Figure 3. Male Barrens Topminnow. (Photo by the River Museum)

Figure 4. Shovelnose Sturgeon *Scaphirhynus platorhynchus* at the River Museum. (Photo by Olaf Nelson)

we understand; and we will understand only what we are taught."

Like all AZA-accredited facilities, the River Museum engages in several field conservation projects, part of its commitment to helping save species in the wild. One of the longest lasting of those is the Wyoming Toad SSP (Species Survival Plan). Wyoming Toad *Anaxyrus baxteri* historically lived in only a small area in the vicinity of Laramie, Wyoming. They experienced a severe population decline starting in the 1970s, probably caused by a number of factors including habitat alteration, insecticides, and chytrid fungus. The last ten toads known to exist were collected by the US Fish and Wildlife Service in 1989. The Wyoming Toad was declared extinct in the wild in 1991 by the International Union for Conservation of Nature (IUCN). Successful captive breeding occurred in 1994, and soon after that AZA facilities joined the efforts. The River Museum joined the propagation efforts in 2007. Since that time, nearly 50,000 tadpoles and toadlets have been sent back to Wyoming for release. Museum staff go to Wyoming every year to aid federal scientists with their toad-related conservation activities.

Another federal partnership focuses on work with freshwater mussels. Freshwater mussels, colloquially called "clams," are very different from the marine mussels and clams most of us are more familiar with. They are considered by many scientists to be the most imperiled group of animals in North America. Of the approximately 350 species found in North America, 70% are threatened, endangered, or are already presumed extinct. They have been decimated by a wide variety of threats including degraded water quality, siltation caused by erosion or dams, overexploitation by the button and pearl industries, loss of host fish, and competition with exotic, invasive mussel species. One such imperiled species is the federally endangered Higgins Eye *Lampsilis higginsii*. The US Fish and Wildlife Service and other agencies have worked to propagate this species for many years. One of the most successful propagation sites is on the River Museum campus in the Ice Harbor, an inlet of the Mississippi River. Staff assist with the culture programs and survey work. Perhaps most noteworthy, staff work with local schools and universities to get students involved with direct conservation work. Students test water quality and measure mussel growth while cleaning invasive Zebra Mussel *Dreissena polymorpha* off their shells and out of the culture systems. The students take the data back to their labs where they create graphs and tables that can be used by fisheries biologists to inform real science-based decisions about management strategies. This work with endangered species helps these students form a lifelong appreciation for the importance of all species, even these unassuming and mostly invisible riverine species. The River Museum also created a conservation lab to raise Logperch *Percina caprodes*. Logperch are not themselves rare, but they serve as an important host fish for another federally endangered mussel, the Snuffbox *Epioblasma triquetra*. The River Museum hopes to produce a source of cultured Logperch that can be utilized as hosts to raise greater numbers of Snuffbox mussels. The lessons learned by raising Logperch may one day translate into future work with rare species of darters as well.

The federally endangered Barrens Topminnow *Fundulus julisia,* is an imperiled fish species that is found naturally only on the Barrens Plateau of Tennessee. The River Museum recently joined the Tennessee Aquarium and their partners to advance propagation efforts for this species. Any progeny will be sent back to Tennessee for possible release into the wild.

Another initiative supported by the River Museum is Project Piaba. Project Piaba is a non-profit organization dedicated to supporting an artisanal fishery that supplies wild-caught fishes from the Rio Negro in South America to stock home aquariums all over the world. At first glance, purchasing wild-caught fishes from the Amazon Basin seems like a bad idea when farmed fishes are also available. However, things are not so simple. The people of Barcelos,

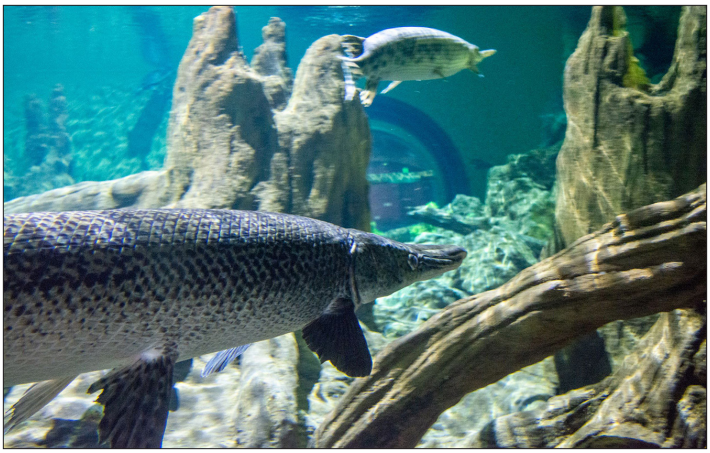

Figure 5. Alligator Gar *Atractosteus spatula* (foreground) and Longnose Gar *Lepisosteus osseus* at the River Museum. (Photo by Olaf Nelson)

Brazil, are so dependent on this fishery that they go to great lengths to protect the fishes and the water they live in. This protection extends to the entire rainforest, aiding jaguars, macaws, anacondas, and the entire ecosystem. While neighboring communities rely on economic drivers like cattle ranching, logging, and strip mining, which are all common practices that result in rainforest destruction, this community is protecting the rainforest and celebrating its diversity. Not only does the fishery provide an incredible socio-economic benefit to the region, the fishes in this region are superbly adapted to withstand and recover from a controlled harvest. During the wet season, fish like the Project Piaba mascot Cardinal Tetra *Paracheirodon axelrodi* breed exponentially, with fry filling every available wetland. During the dry season, those wetlands dry up and the available habitat disappears, resulting in the natural mortality of more than 90% of the fish every year. To recap, the local people collect fishes that are destined to die if they are not harvested, and ship them across the world where they have a chance to live long lives while raising awareness and instilling a love for nature in children of every nationality. This is a beautiful model of an artisanal fishery that provides socio-economic benefits to a region, while giving the local population a reason to support real conservation efforts.

The River Museum has even branched out to work with saltwater species as part of its effort to draw visible connections between the rivers of America and the rest of the world, especially our oceans. The Florida Reef Tract Rescue Project is a groundbreaking partnership among AZA facilities, state and federal agencies, universities, and non-profit organizations. Stony Coral Tissue Loss Disease was first discovered near Miami in 2014. The disease spreads rapidly and is characterized by incredibly high mortality (greater than 90% in some cases), and its ability to infect at least 20 of the 45 most important reef-building coral species in the region, makes it the most devastating coral disease on record anywhere in the world. Floridian authorities reached out to the AZA for help to create a network of nurseries to safeguard coral colonies collected ahead of the disease front, in an effort to preserve some of the valuable genetic diversity before it was totally lost. Outside of the AZA, no other group or partnership was capable of the quick response time needed, with knowledgeable staff and biosecure holding tanks ready to go. The River Museum is proud to have been selected as the first facility outside Florida to receive some of these irreplaceable colonies. The plan

Figure 6. Blue Sucker *Cycleptus elongatus* (top) and Quillback *Carpiodes cyprinus* at the River Museum. (Photos by Olaf Nelson)

is to use offspring from these corals to colonize the reef when the time is right.

As you can see, a visit to the National Mississippi River Museum & Aquarium is not just a visit to a cultural center. A portion of the revenue from every visit is used to fund these conservation projects and more like them. The next time you are in the area, consider stopping by and helping them save a species!

Figure 7. Father, daughter, and Longnose Gar. (Photo by Cyndie Nelson)