AMAZING AMERICAN EELS

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My first encounter with American Eels *Anguilla rostrata* was in June 1976 on the Mississippi River at US Lock and Dam 1 (Ramsey County, MN, Figure 1). I was an avid angler who fished the tailwaters of the dam with my high school buddies almost every day. The swift and swirling waters made the best fishing hole we had ever known for Smallmouth Bass *Micropterus dolomieu* and White Bass *Morone chrysops*. Almost every cast with spoon or spinner was rewarded with a scrappy and thrilling battle!

The first half of 1976 had been far behind in precipitation, and streams and rivers were unseasonably low. Weather forecasters were ominously predicting the worst drought since the Dust Bowl of the 1930s. Nevertheless, the water flowing over the dam's spillway was still too deep and swift to ever consider wading, and we fished safely from an island just a short distance downstream (Figure 1). That day, several barges locked through the dam. We never kept track of them but knew by the horn blasts that another barge was exiting a lock. Shortly after one horn blast, we noticed water coming over the spillway was rapidly diminishing and then ceased entirely. We hesitated, wondering how long this may last. One impatient buddy just couldn't wait: he waded chest deep in the now calm waters and walked triumphantly on the spillway. He immediately started holding up stranded fishes like trophies. The largest was our first-ever Muskellunge *Esox masquinongy*, weighing about 20 pounds. The temptation was too great for the rest of us to stay behind and we canoed over to the spillway. We fanned out, thrilled at what we might find next. Then someone stepped out of the powerhouse and we feared are adventure was over. Instead, he smiled and waved us on. This was a different time, and I still marvel at what I used to do without concern of reprimand or arrest. We found more and more fishes. Of course, our original quarry of Smallmouth Bass and White Bass were everywhere, but there were also hog Common Carp *Cyprinus carpio* and Bigmouth Buffalo *Ictiobus cyprinellus*. I found my first Shortnose Gar *Lepisosteus platostomus* and was fascinated with its tooth-studded bill. Most of the fishes were able to escape on their own, flipping and flopping through a dense carpet of algae that covered the entire spillway. As the water continued to drain from the sponge-like algae, we noticed the concrete spillway was in very bad shape with extensive cracks everywhere. From one nearby crack, a slithering creature emerged and then another and another. It took us a little time to realize what they were. I think we all yelled in unison, "EELS!!!" We all charged in different directions trying to grab the one to two-foot "snakes." We all had aquariums and wanted to bring some home. Easier said than done! They could not outrun us, but the slimy devils could not be held or restrained. Like a pig greased with lard, we couldn't get any until finally realizing they could be aimed and "shot" short distances by squeezing them in our hands. I positioned the canoe where we had several corralled near the lip of the spillway. The first couple of tries didn't land any in the canoe, but after a little practice, we scored seven. We would have kept going, but the guy at the powerhouse yelled the water level had risen to the top of the dam and we should leave now. Sure enough, after we paddled back to the island, the spillway turned white again with raging waters. We did keep the eels and were

Photos by the author unless otherwise indicated.

Figure 1. Smallmouth Bass angler fishing from an island in the tailwaters of US. Lock and Dam 1 at Saint Paul, MN.

Figure 2. Corey Geving (Roughfish.com) struggles with a writhing American Eel for an almost perfect shot. The fish was caught in the Mississippi River at Hastings, MN on 16 August 2012. (Photo by Aaron Bye)

thrilled watching them burrow into the aquarium gravel to lay in wait when fed minnows. We also soon discovered these escape artists required full aquarium hoods weighted down with bricks!

I never saw American Eels in these numbers again but did catch them occasionally while fishing for Channel Catfish *Ictalurus punctatus* and Flathead Catfish *Pylodictis olivaris* at night (Figure 2). Sitting around campfires telling tall tales or nodding off, we were spooked countless times by what lurked in the dark depths when the bells erupted on our rod tips or when we heard the high-pitched squeal of line zinging out on old baitcaster reels. Once, my pole flew from its rod holder and splashed in the river. Leaping in after it, I groped in the darkness, found it, and set the hook with a hard yank. Fleeing eels always felt like whopper catfish until they turned around. Then in an instant, nothing, and I assumed the fish was lost. However, while reeling in the rest of the line, our flashlights revealed the fish was still on and zipping toward shore. I could not reel fast enough to keep the slack out! Finally, the lights exposed the eel writhing in the shallows. These catches always got the adrenaline pumping and kept us wide-eyed and alert anticipating more thrills to come.

I always credit my formative years of fishing and keeping native fishes as to why I chose a career as a fish biologist. However, my pursuit "evolved" from catching fish to studying species' distributions. Many Minnesota fishes have fascinating distributions, which are often attributed to Minnesota's most recent glacial history (Underhill 1989). However, American Eels in North America's interior waters, including Minnesota, are unique in being all females, and they are not permanent residents of the waters they occupy. They may live here for several years, but they are catadromous spawners that will eventually return to their natal Sargasso Sea in the North Atlantic to reproduce (Dybas 1990). The adults are assumed to all perish after spawning, but a new and incredible life cycle begins anew. The eel offspring ride ocean currents, which disperse them to river mouths from Greenland to Brazil. During the migration, American Eels undergo multiple metamorphoses. The early life stages include such striking transformations that early researchers believed they were different species. When the eels finally reach the end of their journey, whether it is a coastal water (males) or the upper reaches of a river or stream (females), American Eels remain there from three to sometimes more than 40 years before their return migration to the Sargasso Sea (USFWS 2011).

Minnesota lies on the periphery of the American Eel's range. This requires travel here by one of two routes: from the Gulf of Mexico up the Mississippi River to southeast Minnesota or from the Gulf of St. Lawrence through the Great Lakes to western Lake Superior. Both routes are long and arduous, but American Eels possess some legendary abilities that are vastly superior to those of most of their peers. Eels can survive at least 24 hours out of water without injury and will travel overland to bypass dams and falls (Eddy and Underhill 1976). There are also accounts of eels using tunnels and underground streams to reach their destinations. One closely related European Eel *A. anguilla* traveled 31 miles underground to reach a pond in Italy (Buffler and Dickson 1990). These super-fish feats may explain four very odd occurrences in Minnesota (numbers 1–4 in Figure 3), each of which are discussed in detail below.

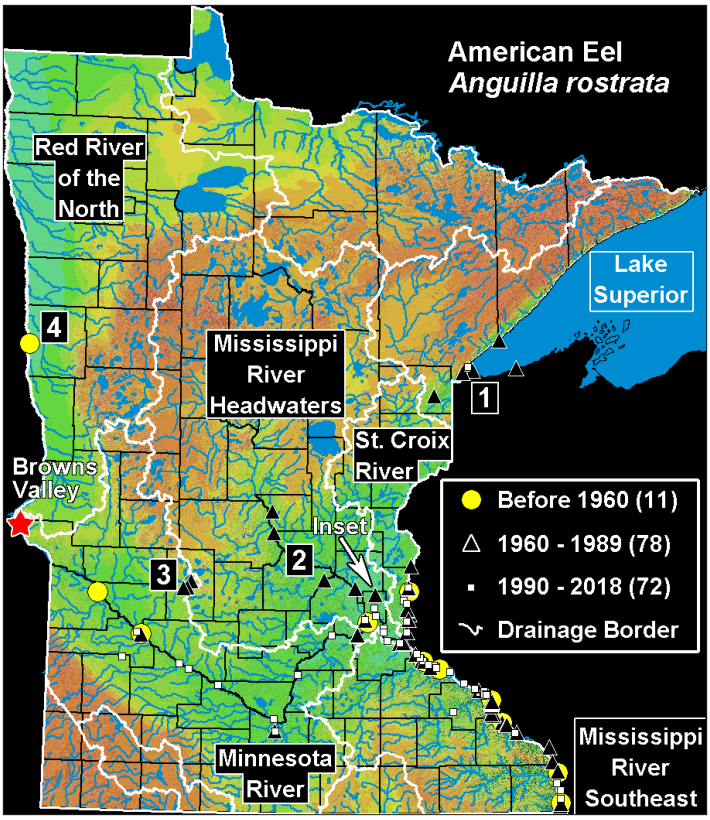

Figure 3. Distribution of American Eel in Minnesota major drainages. Numbers 1–4 are unusual occurrences reported in the following accounts. Figure 5 contains the inset map referenced above.

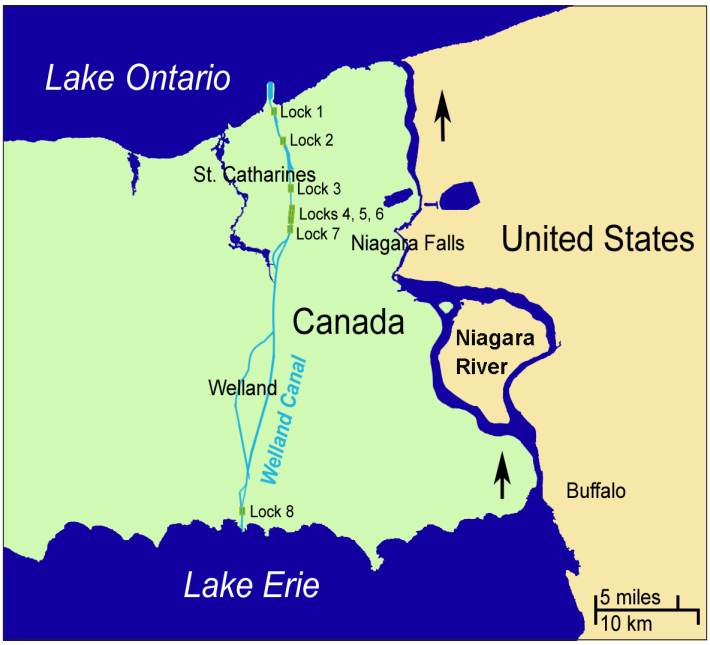

Figure 4. The Welland Canal that bypasses Niagara Falls. Arrows show direction of flow. Image released into the public domain.

LAKE SUPERIOR DRAINAGE - FIGURE 3, NO. 1.

American Eels are not indigenous to the Great Lakes above Niagara Falls. However, the first known occurrence of American Eel from the Minnesota waters of Lake Superior was in 1966 (Eddy

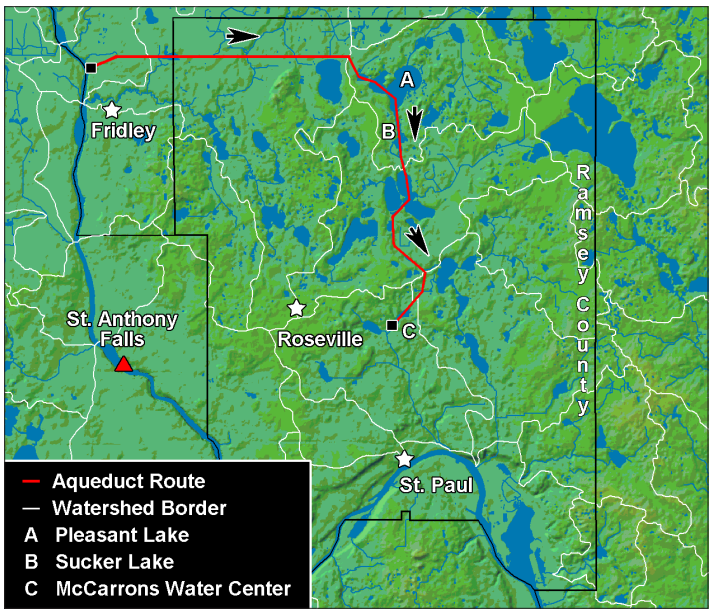

Figure 5. Left: NANFA member Jenny Kruckenberg at outfall of eight-mile aqueduct from the Mississippi River. Right: Detailed inset from Figure 3 of Saint Paul's water supply route from the Mississippi River.

and Underhill 1976). Most of the records reported since are clustered in the Duluth-Superior Harbor and St. Louis Bay, but also include single reports from the Bois Brule River mouth (Douglas County, WI) and the Knife River mouth (St. Louis County, MN). The late, great NANFA member Phil Cochran holds the record for finding the species furthest inland from Lake Superior (i.e., 24 air miles) in the Blackhoof River (Carlton County, MN). He was studying Northern Brook Lampreys *Ichthyomyzon fossor* in the Nemadji River system and assumed he had preserved only lamprey ammocoetes. He got a big surprise when he examined the collection back in the lab and found a small American Eel in the lot. One very good reason to preserve specimens! All these American Eels likely gained access through the Welland Canal, which was completed in 1829 but has since undergone several renovations and route changes (Wikipedia contributors). The current canal is 27 miles long and connects Lake Ontario and Lake Erie through a series of eight locks, allowing ships to bypass the 167-ft high Niagara Falls (Figure 4).

MISSISSIPPI RIVER HEADWATERS DRAINAGE - FIGURE 3, NO. 2.

For several millennia, a falls (later named St. Anthony after a missionary priest) posed a barrier to upstream fish migration on the Mississippi River at present-day Minneapolis. The differences in the historical fish faunas above and below the falls were striking before navigation locks were completed in 1963, with 64 species present above and 123 below the falls (Eddy et al. 1963). However, in 1960 at least one American Eel surmounted this ages-old (albeit human-altered) barrier and reached the northernmost extent ever reported in the Mississippi River at the outlet of Little Rock Lake (Benton County). This locality is 66 air miles north of the upper St. Anthony Falls Dam and required the fish to circumvent or scale four mainstem dams without locks or fish passage.

There are even more impressive accounts of at least three American Eels traveling through the plumbing of Saint Paul's water supply. The city's water source is a pumping station on the Mississippi River near Fridley, and the water flows through an eight-mile underground aqueduct (Figure 5). In 1984, an American Eel was collected in Pleasant Lake (Ramsey County). This lake has no natural inlets or outlets but lies in a lake chain (i.e., Charley, Pleasant, Sucker, and Vadnais) along the route to Saint Paul's McCarrons Water Center. In 1997, a dead eel was found in a malfunctioning pump that diverted water from Sucker Lake. This fish would have had to journey through another half-mile aqueduct from Pleasant Lake. However, the gold medal should be awarded (posthumously) to a fish (Figure 6) that made it all the way to the McCarrons Water Center. This marathon swimmer would have to pass through another pumping station on Vadnais Lake and travel through four miles of aqueduct to the water treatment plant. All in all, the eel covered 16 linear miles from the Mississippi River.

MINNESOTA RIVER DRAINAGE - FIGURE 3, NO. 3.

In Minnesota, American Eels generally have not been found in small tributaries great distances upstream of their confluences with large rivers. One exception is a chain of lakes near Willmar in Kandiyohi County. In 1988, a Minnesota Department of Natural Resources (MDNR) lake survey crew collected one American Eel in Eagle Lake which is the headwaters of Hawk Creek and 37 air miles from the Minnesota River. MDNR also reported additional eels were collected in the late 1980s downstream of Eagle Lake in Willmar and Foot lakes for county fair exhibit aquaria.

RED RIVER OF THE NORTH DRAINAGE - FIGURE 3, NO. 4.

This occurrence, if true, would be the only record from the Hudson Bay basin. There are no photos or extant specimens. Dr. John Pterka (retired professor North Dakota State University) reported this occurrence with reservation since it was based on an interview he had with an angler about the angler's strange catch from the Red River at Fargo, ND in the 1950s. It would be difficult, but not impossible, to confuse American Eels with other species. Nevertheless, this fish would have had to ascend the Minnesota River

Figure 6. American Eels. Top: from Sucker Lake, MN (20 May 1997). Bottom: from McCarrons Water Center, Saint Paul, MN (28 May 2008). (Photo credit N/A)

Figure 7. Fish passable road culvert at the head of Lake Traverse on the continental divide near Browns Valley, MN. Left side of road is in the headwaters of the Red River of the North which flows to Hudson Bay; right side is in the headwaters of the Minnesota River which flows to the Gulf of Mexico.

and cross the Laurentian continental divide near Browns Valley, MN, to access the headwaters of Red River. This feat is not impossible since water can flow to either the Red River or the Minnesota River drainages through a road culvert depending which drainage has a higher water level (Figure 7). White Bass *Morone chrysops* and Orangespotted Sunfish *Lepomis humilis*, which are not indigenous to the Red River of North drainage and were first reported in Lake Traverse, likely crossed at this point.

EPILOGUE

The MDNR has designated the American Eel a species of Special Concern because Minnesota is on the periphery of its range and appears to be declining regionally in abundance and distribution. USFWS recently reviewed the species and found it does not warrant protection at this time under the Endangered Species Act. My hope is this evolutionary marvel and cunning creature will continue to "visit" Minnesota for a very long time to come.

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