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For people who care about the West

One Tough Sucker

by Hillary Rosner

Sometimes, when you glimpse an endangered species in its native habitat, it becomes a story you can't wait to tell everyone back home. A monkey swinging through the rainforest canopy, a sea turtle laying its eggs on the beach, a tundra flower blooming in a gravel field. But the pair of 10-inch-long razorback suckers I watched a group of biologists pull from nets in Lake Mohave one warm March morning -- and then gently measure, scan, and return to the water -- didn't make my heart skip. They just looked like a couple of slim brown fish.

The story I wanted to tell lay not in what I saw, but what I didn't. Within seven 300-foot-long nets strung in shallow coves, those two suckers were the only representatives of their dwindling species, outnumbered by dozens of corpulent, oily Asian carp.

Over five days of checking the nets morning and evening, Paul Marsh -- a former Arizona State University professor who now runs an independent native fish research lab -- and his crew netted 23 razorback suckers and 184 carp. Elsewhere on the lake, nets strung by teams from the U.S. Bureau of Reclamation, the U.S. Fish and Wildlife Service, and state wildlife agencies fared little better: They snagged a total of 129 razorback suckers and 282 carp, plus a smattering of other fishes not native to the Colorado.

The groups had gathered on Lake Mohave, a translucent stretch of dammed-up Colorado River on the Arizona-Nevada border north of Laughlin, for the annual weeklong ritual of the Razorback Roundup. Each year for the past two decades, fish biologists from around the Southwest have traveled here to monitor the sucker population, hoping to save it from oblivion.

In coves up and down the lake, more than 40 scientists had trucked in enough provisions to fuel their long days and often soggy work. At Marsh's camp, at the end of a long dirt road stretching west from Kingman, an elaborate kitchen was spread out around the base of a dead mesquite tree. Giant coolers held the ingredients for gourmet meals -- homemade pasta sauce, garlic bread, fresh-baked cookies -- and bottles of beer brewed by Tom Dowling, an ASU geneticist who studies the Mohave sucker population's diversity. Dowling had also packed a meat smoker for a midweek feast of pork and sweet potatoes.

The razorback sucker (Xyrauchen texanus), one of the four endangered fishes of the mainstem Colorado, is admittedly more fetching in its full-grown glory than the young specimens I met on the lake. Yellow-bellied and fleshy-lipped, the adults, which can grow to 13 pounds, have distinctive keel-like humps just behind their heads. Early Western settlers called them humpback suckers and buffalo fish. When the Colorado ran wild, the fish were abundant, their soft and bony flesh regularly consumed by Native Americans. In the late 1800s, settlers plucked them from the water with pitchforks and used them as livestock feed and fertilizer.

Razorbacks survived in Lake Mohave long after the Davis Dam filled the reservoir in the early 1950s. In fact, the lake once contained the largest population anywhere in the Colorado River Basin.

But by the mid-1980s, scientists had made a worrisome discovery: The Mohave population was still made up largely of the same fish originally trapped by the dam. The razorbacks had spawned year after year, but their hatchlings were snapped up by young green sunfish, channel catfish and other thriving non-native species. Meanwhile, the adult fish were inching closer to the end of their half-century life spans. The population was headed for a massive crash.

Today, after millions of dollars and decades of time spent trying to save the razorback, something is still going wrong. Next year marks 20 years since the fish was officially listed as endangered, but its numbers continue to drop.

"It's a challenge," said Marsh, a slim, graying aquatic ecologist who has devoted 30 years to native fish conservation. On the deck of his 21-foot motorboat, a Britney Spears tune -- not his choice -- rang out from a small boombox, his crew worked the nets, and he stood at the helm, pondering the future of the razorback sucker. "What do we do? How do we change our approach?"

One clear night, with the lake so flat you could see the Milky Way reflected on its surface, Marsh edged the boat close to a small rock overhang on the Nevada shoreline and cut the engine. He sank a small light into the water, and soon you could make out scores of tiny wiggling white creatures with little black dots for eyes. They were razorback sucker larvae, hatched just a few days earlier at this spawning ground, known as Tequila Cove.

Roundup participants had already captured several thousand of them here and delivered them to Willow Beach National Fish Hatchery, at Lake Mohave's north end, where they would spend two weeks in an aquarium dining on artificial plankton, spirulina

algae, powdered brine shrimp and other delicacies before moving on to indoor and then outdoor raceways. Each year, Roundup participants collect up to 30,000 larvae and ferry them upstream to the hatchery. They remain there for four years, reaching about 19 inches in length. At the end of that time, the surviving fish -- between 6,000 and 10,000 of them -- are tagged with tiny microchips (not much bigger than a staple and $5 apiece) and returned to the lake.

Watching the hatchlings swim in Tequila Cove was both thrilling and heartbreaking. In spite of the fact that humans have entirely transformed the river, adult razorbacks were clearly still doing what they've done for millions of years. And yet these larvae, if left on their own, had virtually no chance of survival. Unless they were caught and taken to the hatchery, they would be eaten by non-natives in a matter of days.

Year after year, biologists and hatchery workers go to the enormous trouble of capturing, transporting, raising and releasing the razorbacks for one simple reason: If the razorback has a future, these Mohave hatchlings carry it in their genes. In the Lower Colorado River Basin -- the section below Glen Canyon Dam -- razorback suckers continue to hang on in Lake Mead, to the north of Lake Mohave, and in Lake Havasu, to the south. Those populations, though, are genetic subsets of the Mohave razorbacks, meaning that the genomes found in the other two lakes -- and everywhere else on the river -- are also found in Mohave, but not necessarily vice versa. "As you go further upstream," said Marsh, "you get less and less genetic diversity, and each population that has been examined is a subset of the Mohave genetic template." Lake Mohave, in other words, is the motherlode of razorback DNA.

A small group of scientists started to issue warnings about the river's fishes in the 1940s, and several seminal research papers were published in the 1960s. But the alarm bell for Lake Mohave's razorback suckers rang out in 1983. W.L. Minckley, an ASU biologist, Marsh's mentor, and one of the godfathers of aquatic conservation on the lower Colorado, predicted that the lake's suckers were destined to vanish unless something could be done to help the hatchlings survive and grow.

He was right: In the mid-1980s, between 60,000 and 75,000 razorback suckers lived in the lake. By the turn of this century, there were fewer than 3,000. Today, scientists believe only about 50 of those wild fish and their lake-raised offspring survive. Despite more than two decades of research and conservation efforts, the population continues to dwindle. Up to 1,500 "repatriates," the fish raised at Willow Beach from wild larvae, are probably also swimming in Mohave's waters -- but those amount to less than 1 percent of the 150,000 hatchery-raised razorbacks that have been returned to the lake since 1992.

In spite of the unabated decline, Marsh perseveres. "I've spent a 30-year career watching the animals I love and work on go down the toilet despite my best efforts," he said. "I love these fish. I want my children, my grandchildren, to have an opportunity to love these fish the way I do. They were a remarkable creation of Mother Nature. For us, as a species, to allow these animals to be extinguished is fundamentally wrong. It's a philosophical thing."

It's an outlook shared by Tom Burke, the fishery group manager for the Lower Basin's multispecies conservation program at the Bureau of Reclamation, who has been a linchpin of razorback recovery efforts here for three decades. A large, bearded man famous for breaking out his harmonica at meetings, Burke has a tendency to wax poetic about the river, and he's smitten by the razorback's tenacity. "They evolved in a river of extremes," he said. "These fish are capable of withstanding 200-plus million metric tons of sediment a year coming out of Grand Canyon. That's --" he paused, trying to think of an apt comparison. "Well, it's a bunch."

Marsh and Burke began working on the Lower Colorado the same year, as field biologists. Their mentors were lifelong collaborators on endangered species conservation, and Marsh and Burke are close friends and colleagues. Their relationship is partly responsible for the continuing push to save Mohave's razorbacks. "We've had the same outlook," said Marsh. "We've had a lot of disagreements over the years, but we agree to disagree. His goal is the same as mine: to do the right thing for these critters."

The Colorado River was always, in Burke's words, "a tough neighborhood" for fish, not only because of its famous sediment load, but also because of its wide fluctuations in water volume, temperature and salt content. The razorback's 50-year-lifespan, he explained, gave it a fighting chance of producing at least one surviving offspring. But then humans made the neighborhood even tougher: We crisscrossed it with dams, and stocked it with voracious fish from far-off lands.

In the 1950s and early 1960s, government officials also routinely poisoned waterways, killing native species in order to stock sport fish like rainbow trout. Using money given to the states from taxes on recreational fishing products, government officials poisoned 2,500 miles of streams and 225,000 acres of lakes in 34 states, according to Anders Halversson, whose new book, *An Entirely Synthetic Fish*, chronicles America's love affair with rainbow trout.

In 1962, the Wyoming and Utah wildlife agencies orchestrated the *ne plus ultra* of fish genocide, a massive effort to poison native fish using a chemical called rotenone. The idea was to create a clean slate on the Green River -- a main Colorado tributary originating in Wyoming's Wind River Range -- above the soon-to-be-completed Flaming Gorge Dam, eradicating all life in the water and then filling it with millions of rainbow trout. Using a series of "drip stations" strung along 450 miles of river, as well as airboats and helicopters, officials killed off 450 tons of fish in three days. "As the rotenone front progressed downstream," writes Halversson, "it drove large schools of desperate fish in front of it, a sight that deeply impressed itself on those who saw them ‘thrashing about and struggling for air on the surface of the river.' "

Today, the idea of poisoning rivers and lakes is shocking -- unless it's to kill exotic species to protect native fish populations. But the second part of the Flaming Gorge strategy, stocking game fish, remains standard practice up and down the Colorado. In the Lower Basin alone, more than 100 non-native fish species have either become established in reproducing populations or are continually re-stocked. In the eight years following the Green River poisoning, according to Halversson, fish and game officials filled Flaming Gorge Reservoir with upwards of 20 million rainbow trout. The stocking continues today.

At Willow Beach, a short drive south of the Hoover Dam in Arizona, rainbow trout grow in raceways just yards away from the razorback suckers' pens. Every Friday, year-round, 2,000 rainbows are set free in Lake Mohave.

The rainbows are released away from razorback spawning grounds in an effort to limit predation, and at first it seemed that the rainbows wouldn't be too much of a problem -- as long as young razorbacks had a few safe havens in which to grow. "These fish evolved to spawn as the rivers started to rise from melting snow, and then rising waters would distribute the young into these slow eddy backwater areas," explained Burke. There, he said, the sediment would drop out, the sun would shine, and algae would grow, giving young fish a food source in a protected area.

The scientists established a series of backwater ponds, separated from the lake by man-made berms, designed to mimic the oxbow lakes that formed in the river's original floodplain. The fish grew relatively quickly, but they couldn't grow large enough to fend off predators before the ponds either dried out or reconnected to the lake. So the scientists turned to the hatchery. If wild larvae were collected and reared in safety for as long as possible, the thinking went, the young fish would have a better chance of surviving, and overall genetic diversity would be conserved. (In standard hatchery programs, larvae are produced at the hatchery by selectively breeding certain fish, which severely limits the gene pool.) Still, year after year, most of the fish died shortly after being returned to the lake.

Determined to find out exactly why, Abraham Karam, a young biologist working for Marsh, implanted acoustic transmitters in 20 hatchery fish and released them into the lake in 2006. The fish averaged 15 inches in length, the standard size they reach in one to two years at Willow Beach. Within less than six months, 16 of the transmitters had stopped moving, meaning the fish were dead. Another one of Marsh's biologists, Brian Kesner, recovered 13 transmitters by diving to the lake floor.

Karam's research fingers striped bass, the only fish whose mouths can open wide enough to munch 15-inch-long prey. (A subsequent study involving razorbacks 19 inches and longer found that the larger fish survive better.) He's convinced that the stripers, which were initially stocked in Lake Mead but spilled over the Hoover Dam during a high-water year in the early 1980s, are flourishing in Lake Mohave thanks to a nearly unlimited food supply: stocked rainbow trout. Well-fed, the bass have become formidable. Anglers regularly reel 40-pound stripers from the lake, and Nevada's record-setter, weighing 60 pounds, was caught on Mohave in 1998. Now, these colossal fish are devouring the hatchery-raised razorbacks -- along with bonytails, an even more perilously endangered native fish.

Karam is amassing additional evidence from Mohave fishermen. One angler found an acoustic transmitter -- one of those lost in Karam's study -- in the stomach of a striped bass caught just a couple of miles from where the tagged fish were released.

Others have noted the problem. On an online message board run by a popular lure company -- one striped bass model they sell is called "hatchery trout" -- a die-hard bass fisherman recently wrote, "For the green people who spend all of our tax money raising suckers, I have a word for them: The lake is full of predators and they are eating machines. When you stock suckers, the predators come from far and wide and go on a feeding spree. They eat all of your hard work raising suckers. Doesn't that register with you?"

An alphabet soup of conservation and recovery plans has been created to protect the razorback sucker. In the Lower Basin, the fish is part of a federal conservation plan, a $626 million, 50-year, 43-species effort launched in 2005. In the Upper Basin, more than $120 million in federal funds has already been spent on razorback sucker recovery efforts. According to some estimates, an additional $84 million could be spent by 2023.

On the upper river -- much of which still resembles a river -- the initial recovery projects focused mainly on improving and regenerating habitat: regulating flows, simulating floods, restoring gravel bars. Those efforts have been largely fruitless. "You'd like to see more fish in a bigger range," said Harold Tyus, a University of Colorado at Boulder professor who wrote the recovery plan for the razorback sucker while working for the U.S. Fish and Wildlife Service. "What are we seeing? Less fish and in a smaller range."

Some Upper Basin watchers see the story as one of missed opportunity, in which state officials continued to stock non-native fish long after they should have known better. The state of Colorado, for instance, stocked largemouth bass in the Elkhead Reservoir, near the town of Craig. Despite screens intended to prevent the fish from escaping, they've spilled over the dam and now dominate some stretches of the Yampa, a tributary that flows through the northwestern part of the state.

Which brings us to the built-in, largely intractable problem that looms over native fish recovery efforts: State wildlife agencies, which cooperate with the federal government on endangered species recovery, derive their revenue from recreational fishing. As Tyus put it, "The very agencies you're dependent on to recover the fish are the very agencies that are responsible for their plight."

Because sport fishing is big business -- for the agencies as well as local economies -- it's likely here to stay. People who enjoy

catching rainbow trout and striped bass and other species that didn't evolve in the Colorado River ecosystem are not about to give up their right to do so. (Marsh impishly pointed out that Burke likes to catch stripers on Lake Mohave, sometimes delivering filets to Marsh's camp during the Roundup.) Halversson, in his book, cites a 2005 Fish and Wildlife Service economic analysis of stocking programs: Every dollar spent growing and stocking rainbow trout led to $32 of economic activity.

Angela Kantola, assistant director of the Upper Colorado River Endangered Fish Recovery Program for the Fish and Wildlife Service, said the states have greatly improved their fish-stocking practices in recent decades. "The problem isn't stocking the fish," she said. "It's controlling the fish that are already in the system." In the Upper Basin, said Kantola, recovery agreements now prevent states from stocking sport fish where they'll be harmful to native fish, but she acknowledged that the states' dual roles "require some give and take, and some continued research."

So the turf wars continue -- and stretch far beyond feuds between sport-fishing advocates and native species conservationists. Within the conservation community, antagonism and lack of cooperation between the Upper and Lower basins shadows the future of the razorback sucker and its fellow endangered fishes. Lower Basin advocates are wont to complain that the Upper Basin has gotten most of the money -- oversight for native fish recovery on the entire Colorado lies with the Fish and Wildlife Service's Denver office -- and wasted it on habitat restoration when the real problem was non-natives.

Those focused on the Upper Basin, meanwhile, tend to dismiss the Lower Basin efforts as futile, given that nothing approaching ecosystem-scale recovery can ever take place in what is essentially a system of reservoirs. While some environmental groups have participated in the various Lower Basin conservation initiatives, none of them have given the razorback sustained support. "The river had been so transformed that it was a question of what could possibly be accomplished there," said Dan Luecke, a hydrologist and longtime participant in Upper Basin efforts, recalling a long-ago decision by the group Environmental Defense not to join an early Lower Basin recovery program.

But to the Lower Basin's champions, the fact that adult razorbacks survived for years in Mohave is proof that the efforts remain worthwhile -- even imperative. Just because there are dams on the river, they say, is no reason to give up on native species that evolved there. Tom Dowling, the geneticist, recalls a talk he gave at a fisheries conference several years ago, after which an audience member asked why Dowling was worried about biodiversity if the presence of non-natives meant there were now more species living in the river than ever before. "He asked, ‘Isn't that a good thing?' " Dowling said. "I was like, ‘You're missing the point completely!' As conservation biologists, it's important to understand what the different units are and try to preserve them. They co-evolved with the system."

Minckley, who died in 2001, laid out his own conservation plan for the razorback and other endangered fishes in the lower Colorado, in a scientific paper published posthumously and co-authored by Marsh, Dowling and others. He called for a more ambitious series of "protected, off-channel habitats," free of exotic species, where the razorbacks and other natives could breed and grow big enough to survive in the lake. The plan envisioned a series of "excavated habitats" resembling the river's original floodplain and constructed to keep non-native fish out. Hatchery-raised razorbacks would spend an additional year or two in these ponds before being netted and transferred into the lake (or elsewhere on the river). Though there has been wide support for the concept, it has yet to be implemented on a large scale. "The wheels turn slowly," said Marsh.

But even if Minckley's plan were carried out exactly as he envisioned, the razorback's survival would remain entirely dependent on sustained human intervention. That is not "recovery," nor is it the original intent of the Endangered Species Act. Yet it's a situation faced not just by razorback suckers but by most endangered species in the United States -- and likely around the world. There is no way they will survive without constant management. One recent study noted that "conservation-reliant" species now make up about 85 percent of those listed under the ESA.

So is it worth the effort? Does it make sense to set ourselves up as perpetual caretakers, indefinitely footing the bill and bearing ultimate responsibility for these creatures' presence or absence from the planet?

We work to save endangered species for many reasons. We do it for their genetic legacy, their place in the ecosystem, their commercial value, their moral right to exist. Sometimes it's simply for the love of a fascinating natural creation. Yet there is one overriding reason that binds us all, whatever our beliefs: Protecting endangered species is the law.

"There are some cases that seem perhaps less hopeful than others," said Sylvia M. Fallon, a wildlife conservation scientist with the Natural Resources Defense Council and an expert on the ESA. "But the law is designed to provide a legally enforceable way to make sure that we do what we can to identify threats and eliminate or mitigate those threats." Ultimately, said Fallon, the law is about "keeping all the pieces in place and not letting the whole web of life come apart."

But the pieces are countless, and budgets are finite. When it comes to some endangered species, law and economics may be on a collision course.

"I'm not sure I really truly believe in recovery for these fishes," Tom Burke told me one evening, as we sat on the upper deck of a houseboat the Bureau of Reclamation had rented for the Roundup. A waxing crescent moon glimmered just behind Burke's head, and the Big Dipper hung handle-side down, like a celestial question mark suspended over the lake.

It's not that Burke thinks razorback suckers on the lower Colorado should be abandoned to history. He's just a realist, looking out from the vantage of a long career. He's retiring in July, leaving Marsh and others worried about the fate of the program. "I believe we can do conservation, keep these species going for as long as we want to make a positive effort," he said. "But they have to be managed. I'm not saying these are zoo populations, but it's difficult for them to complete their life history without some outside help. And I don't see that ever changing."

Scientists who have spent their careers trying to save the native fish of the Colorado often wonder if their efforts will, ultimately, make any difference. "We're almost 30 years after the last amendments to the Endangered Species Act were passed in '73," said Marsh, "and no one would argue that native fishes of the Southwest are in better shape today than when the act was passed. We're actually losing ground." But he, for one, refuses to give up just yet. Politics might change, attitudes might change, some sort of breakthrough is always possible. "I guess I hope that if we knock on the door long enough that the door will open and things will move forward in a more meaningful way," he told me.

Before the crescent moon had risen that night, as the early spring sun fell toward Lake Mohave's Nevada coastline, Arizona's hills turned fiery pink. Bats shared the sky with seagulls and pelicans. A bald eagle, that ESA poster child, perched in a tree along what once was the edge of a canyon above a free-flowing Colorado River. As his staff worked nets for the second time that day, hoping to find more tagged razorbacks in order to unlock the mysteries of which fish were surviving, and why, Marsh looked out over the lake and tried to imagine its waters somehow cleansed of the species that don't belong here.

"It wouldn't be devoid of fish," he said. "The resources the natives need are all here. Fish are primitive and highly adaptive. So you give them a few elements -- water, food, shelter, real fundamental things -- they'll do OK."

Hillary Rosner has written about science and the environment for Mother Jones, The New York Times, Newsweek, OnEarth *and many other publications.*

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For more information, visit:

The Lower Colorado River Multi-Species Conservation Program

The Upper Colorado River Endangered Fish Recovery Program

Marsh and Associates Native Fish Lab