

FRESHWATER BIODIVERSITY

High mountain minnow lives on, 20 years after dam rescue mission

The massive Lesotho Highlands Water Project was still in the planning phase when scientists predicted a major threat to a very rare fish species. Racing against the clock, they used off-road motorbikes, horses and mobile fish tanks to move hundreds of the fish out of harm's way. Thanks to their dedication, the Maloti Minnow lives on. Tony Carnie reports.

James McCafferty



Much like tossing a pebble into a pond, the ripple effects of building massive dams and water engineering projects can spread out far and wide. The power of those ripples can be devastating to certain life forms, especially when the project involves storage dams that are big enough to supply the vast Gauteng industrial area, and an artificial channel to link two separate river systems.

That was the situation several decades ago when group of fish scientists saw trouble on the horizon for a very small and rare species of freshwater fish due to the imminent construction of the Lesotho Highlands Water Scheme.

The original scheme involved building five large dams and several tunnel systems to provide electricity for Lesotho and to transfer billions of cubic metres of water to South Africa. Good

news for people and industry . . . but the potential death knell for the largest population of the Maloti Minnow (*Pseudobarbus quathlambae*), a critically endangered fish species that had adapted to living in several freezing, high mountain river systems in Lesotho.

Dr Johann Rall was one of the South African fish scientists who helped to translocate hundreds of these fish to other rivers as an insurance policy for their survival. He was so worried about their future that he began a captive breeding project to multiply their numbers. As a further safeguard, he also initiated a cryopreservation project to store fish sperm at very low temperatures.

At the time, Rall was a young zoology student at Rand Afrikaans University, where he later completed both his MSc and PhD

degrees on the ecology and conservation of this globally-unique minnow.

Why was this fish in trouble?

The Maloti minnow (prior to a more recent re-discovery in KwaZulu-Natal) was endemic to Lesotho. On average, the adults grow to a length of about 8 cm – slightly longer than a torch battery – and the majority of the population lived in mountain streams protected by the towering Semonkoangeng Falls.

For millennia, this giant 192 m barrier of vertical stone had prevented alien trout, yellowfish and other indigenous predatory fish from migrating upstream to eat or displace the rare minnows that had evolved over many, many centuries in a unique natural river sanctuary.

While the minnows also faced other threats due to human impacts, the Lesotho Highlands Water Scheme would involve flooding large sections of critical river habitat following construction of the Mohale and Katse dams. Another very significant threat was the new artificial tunnel that would link the Katse and Mohale. This tunnel would effectively bypass the Semonkoaneng Falls and allow predatory fish to eat the upstream minnows once protected naturally by the waterfall.

Freshwater fish expert, Prof Paul Skelton, noted that this inter-basin transfer scheme would allow smallmouth yellowfish (*Labeobarbus aeneus*), Orange River mudfish (*Labeo capensis*), rock catfish (*Austroglanis sclateri*) and exotic trout species to migrate upstream. “The Maloti minnow is now a really small fish

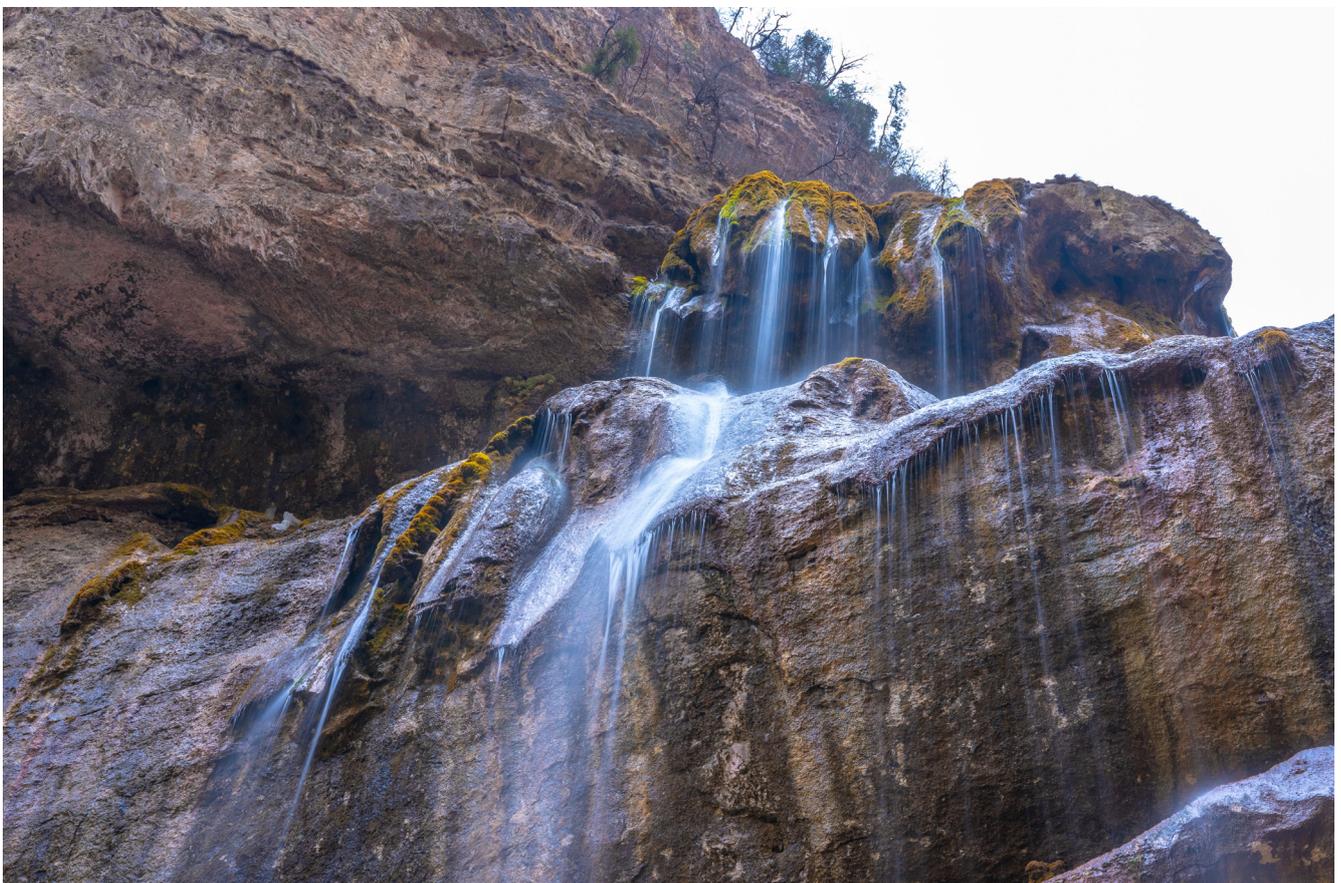
in a big pond, with other larger, more aggressive fish,” he warned at the time.

“My intuition is that that the yellowfish will prey on small minnows, and compete with adults for food and habitat. The mudfish may also compete with the minnows, and could also change the stream habitat by suspending benthic sediments while feeding,” he said.

While some minnows were found in other rivers within Lesotho, Rall noted that the Mohale population was a separate, evolutionary significant unit (ESU) compared to minnows in the eastern part of the country. Rall estimated that the Mohale ESU also made up 77% of the total extent of occurrence of the Maloti Minnow and the new Mohale Dam was expected to affect 97% of the Mohale ESU from the introduction of trout and yellowfish if no mitigation measures were put in place.

“Thanks to the efforts of conservationists in the early 2000s – and their foresight – the future is not all that bleak.”

So, during 2002/03 Rall and his colleagues sprung into action to translocate insurance populations to at least three distant river systems. Time was tight, the terrain was remote and roads



Lesotho's secluded rivers, fed from mountain streams, have provided a perfect habitat for the Maloti minnow.

James McCafferty



Nthabiseng Morokole collects fish samples from the Senqunyane River.

rudimentary in many places. But over a period of several months, the team managed to capture and move nearly 1 700 of the tiny fish.

"We collected from the three main rivers (Senqunyane, Bokong and Jorodane) to ensure maximum genetic diversity. We had a 1 000 ℓ water trailer equipped with oxygen cylinders, zeolite and a water pump."

The cylinders were needed to ensure that the fish had enough oxygen to survive a long trip, while the zeolite mineral additives were used to purify ammonia and other organic waste from the temporary fish holding tanks (as captured fish often vomit and defecate due to the collection stress).

The captured minnows were then kept for 24 hours in a "fresh out tank" to ensure the best quality water for the journey to their new homes – trips that could take up to 48 hours.

This was largely due to cold weather and poor terrain, forcing the team to use off-road motorbikes and horses at some points, recalls Rall, who now works in New Zealand as a consultant. Incredibly, none of the captured fish died during the journeys.

A future ensured

Twenty years down the road, the wisdom of translocation has been confirmed by a recent research project led by Dr Jim

McCafferty an ichthyologist and freshwater fish consultant with Advance Africa Management Services. Speaking at the annual Conservation Symposium hosted by Ezemvelo KZN Wildlife and other nature conservation groups, McCafferty noted that the minnows still face an "uphill battle for survival".

"But thanks to the efforts of conservationists in the early 2000s – and their foresight – the future is not all that bleak," he said.



Refiloe Ntsohi, Nthabiseng Morokole, Mpho Baholo and Tseou Terai on a biodiversity unit survey along the Makhaleng River.

James McCafferty

During a recent (2017 - 2019) survey McCafferty and his colleagues revisited the remote rivers to monitor the current status of the translocated fish in the Jorodane, Makhalleng, Maletsunyane, and Quthing Rivers.

A previous survey in 2006 showed that the fish had survived in only three of the four rivers to which they were translocated near 20 years ago. As no follow-up surveys had been undertaken since 2006 it was critical to assess the status of the translocated populations (potentially representing the last remnants of the Mohale ESU).

More recent surveys suggested that while the minnows had disappeared from the Makhalleng and Quthing rivers, they were still alive in parts of the Jorodane and Maletsunyane.

The Maletsuyane population was also at high risk because of its proximity to a recreational trout fishing area. Alien brown trout were currently isolated from the minnows by a small weir, but there were serious risks if trout were to be released above the weir.

As a result, the Lesotho Highlands Development Association has

developed a conservation action plan which includes proposals for a new zonation plan for those rivers which still host the minnows.

"It is critical that these minnow populations, and activities in the catchment areas, are routinely monitored and managed to prevent the introduction of non-native fishes and to limit poor land-use practices," McCafferty told the symposium.

More recently, however, further research has indicated that minnows are still present in the Quthing and Makhalleng rivers, suggesting that relocations to each of the four rivers may have worked. The conservation project has also been supported by staff from the Lesotho Highlands Development Authority Biodiversity Management Unit survey team.

"They are an incredible group of ladies that I mentored and who have been involved in the surveys throughout," says McCafferty. "They are now responsible for ongoing monitoring of the minnow populations and are immensely passionate about conserving them."



The Katse Dam. While the Lesotho Highlands Water Project has brought much needed water resources to South Africa and income for Lesotho it has not been without its environmental impacts.