

# FRESHWATER ECOSYSTEMS

## New movement aimed at saving region's freshwater fish

*Many migratory fish species are swimming upstream in the race for their survival. Jorisna Bonthuys reports about efforts underway to connect fish, rivers and people.*



Nowhere is the world's biodiversity crisis more acute than in freshwater ecosystems. Around a third of freshwater species are threatened with extinction. Only a third of the world's large rivers are still free-flowing and around 35% of wetlands have been lost in the past five decades.

This stark reality has been outlined in a recent report, *The World's Forgotten Fishes*. Scientists involved say populations of migratory fish have fallen by three-quarters in the last 50 years. Over the same time, populations of larger species, known as "megafish", have crashed by 94%.

In this report, scientists warned of a "catastrophic" decline in freshwater fish over recent decades. Approximately 80 species

were known to have gone extinct, 16 in the last year alone. Much of the decline is driven by the poor state of rivers, mostly due to pollution, dams and sewage ending up in waterways. The report also lists the introduction of invasive non-native species, overfishing and climate change as threats to aquatic biodiversity.

The report was produced by 16 conservation groups, including WWF, the London Zoological Society, the World Fish Migration Foundation, Conservation International and The Nature Conservancy.

Freshwater migratory fish travel throughout rivers to fulfil their lifecycles, some swimming thousands of kilometres during this journey. They navigate using the currents, magnetic fields

and even their sense of taste and smell. These fish cover vast distances from their place of birth to locations where they can find food or suitable habitats to reproduce. They often depend on free-flowing rivers to survive.

## Spotlight on African migratory fish

In Africa, there are many stressors on migratory fish and their habitats. Many migratory fish populations are under-reported, undervalued and under pressure. This was highlighted during a recent webinar organised by the Swimway Africa initiative. At this event, stakeholders in fish research and conservation discussed fish passage and river connectivity on the continent.

Participants in this initiative are creating and driving a network of people in Africa, providing free products and information, creating awareness to influence policy, and starting projects that open up rivers. This initiative is aimed to start a grassroots movement of people and organisations working together across Africa to save migratory fish and free-flowing rivers.

Swimway Africa flows from a partnership between Reaching Rivers, World Fish Migration Foundation, University of Mpumalanga, South African National Parks (SANParks), Oak Consultants and BOKU University (Austria). Participants in this initiative are busy setting up ambitious targets for 2050 to align with international laws and agreements to protect migratory fish and the people who depend on rivers for food and livelihoods.

In Africa, there is very limited data on freshwater migratory species and the effect of fishways or lack thereof on their movements, Dr Kerry Brink, an aquatic ecologist from Reaching Rivers and the World Fish Migration Foundation, pointed out. There is a clear and urgent need to increase the profile of migratory species given current pressures on fish species on the continent, she said.

“There are many gaps in our current understanding of Africa’s migratory fish species,” Brink said. “We are, for instance, working on a report and database to provide a clearer understanding of the migratory fish behaviour and their routes in sub-Saharan Africa. This information is critical if we are to strengthen measures to protect migratory fish, inspire people and encourage appropriate policy and legislation.”

Herman Wanningen



*According to Dr Gordon O'Brien of the University of Mpumalanga's School of Biology and Environmental Sciences, river connectivity and fish migration management is a shortcoming of the existing management approach for dealing with multiple freshwater stressors.*

Freshwater migratory fish do not only migrate upstream and downstream for their survival, but can also migrate laterally onto floodplains. In the Zambezi River, an impressive river flowing through nine countries in southern Africa, fish species that migrate laterally onto floodplains is a common sight.

Herman Wanningen from the World Fish Migration Foundation said removing old, obsolete and unsafe dams is the best restoration tool to ensure the ecological health of rivers. Many freshwater fish species need to migrate for their survival.

There are still many barriers in rivers that block the migration routes of many fish species. In Europe alone, there are more than a million such barriers. Many dams built in the last century are old and nearing the end of their concession. This means they must either be renewed or removed, Wanningen pointed out. Up to 25% of barriers no longer serve a function.

“The number of barriers worldwide is growing and is expected to continue growing due to climate change,” Wanningen said. “To keep our seas and rivers full of fish, we need open rivers.”

Where dams and weirs cannot be removed, fishways offer a useful tool to support fish migration. A fishway, also known as a fish ladder, is a structure on or around artificial and natural barriers (such as dams or weirs) to facilitate fish that migrate between the sea and freshwater to spawn or between different reaches within the river system. Most fishways enable fish to pass around the barriers by swimming and leaping up a series of relatively low steps into the waters on the other side. There are also many different types, including “nature-like” bypass fishways.

From as early as the eighteenth century, fishways have been implemented. Since then, knowledge, technology and experience have developed substantially, resulting in many different fishway designs specific for different regions or fish species.

The structures must, however, be properly maintained. Only about a third of all fishways in the Netherlands, for instance, currently work well, Wanningen pointed out.

Dr Mathew Ross, a consultant from EnviroRoss CC, said there are opportunities to provide provisions for fish migration measures in new infrastructure development related to hydropower. He said this offers opportunities to establish innovative fishways in key rivers to protect migratory species.

In his experience, engineers working on large-scale water and hydropower projects in Africa are increasingly open to adding fishways to their project designs. Given the current investment and interest in such projects in Africa, it is possible to motivate for an ecologically sustainable approach to fishways. This approach could, for instance, help to introduce fish-friendly hydropower turbines in such projects.

## Fish migrations in South Africa

In South Africa, many fishes with migratory behaviour between marine, estuarine and freshwater ecosystems are considered important to fish diversity. Although migratory fish are largely understudied in South Africa, it is estimated that more than 100



*The Kruger National Park has demolished 21 dam structures to improve the health of its ecosystems, including the Kanniedood Dam.*

species have requirements for migration to different degrees.

Many of these species are directly affected by water quality and habitat stressors and reduced river flows, affecting connectivity between the rivers and sea.

Robin Petersen, an aquatic ecologist from SANParks, says efforts are underway to protect migratory fish species in the Kruger National Park. He gave an overview of efforts underway to restore river connectivity in this park, considered one of South Africa's flagship conservation areas. Many rivers in the park are transboundary waterways that extend into neighbouring Mozambique, Botswana and Zimbabwe.

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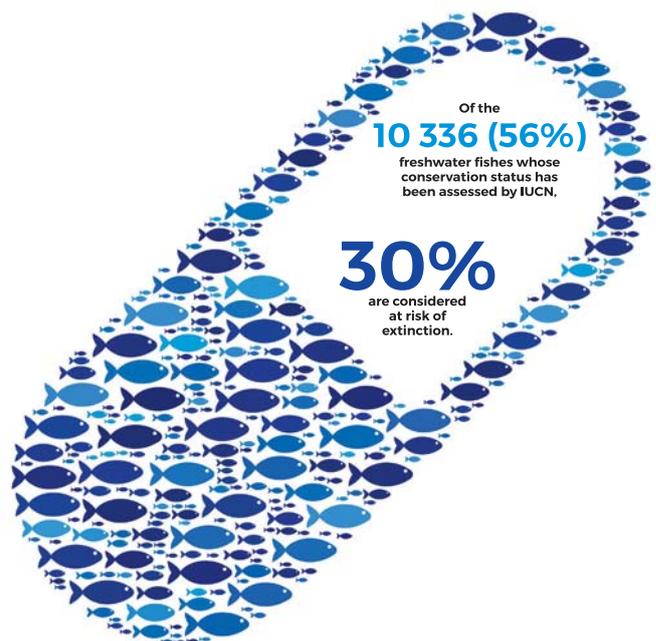
The park is considered a “hotspot” for aquatic biodiversity. It is home to 48 fish species (of 359 freshwater fish species in southern Africa), of which more than 20 are considered long-distance migratory species. This park has 600 km of perennial river systems and 30 000 km of seasonal and ephemeral streams (dry stream beds that flow as rivers or streams after rainfall periods).

Efforts are underway to eliminate selected redundant and obsolete dams and weirs in the park and establish completely free-flowing catchments in the area. “The park’s rivers are situated in a sea of (historic) dams,” Petersen pointed out.

In 1931, the first concrete dam was constructed in the park,

and since then, 53 concrete and earthen structures have been built along various watercourses. “With hindsight and significant scientific endeavour during the 1990s, it was realised that in many cases, this has led to numerous ecological problems and general degradation of the landscape in many parts of the park where water did not naturally occur previously,” Petersen indicated.

A total of 21 dam structures have already been demolished, including the Kanniedood Dam and the Mingerhout Dam, situated in the Shingwedzi and Letaba catchment area, respectively. These efforts are providing data that will inform



further river restoration efforts in the region, he indicated.

The Kanniedood Dam has, for instance, had major ecological and physical effects on the river system. “Fish species richness in the Shingwedzi River declined after it was built,” Petersen said. “In 1988, 11 years after the dam was completed, 19 fish species were no longer found downstream. A total of 13 species were absent upstream.

“When dam removals is not an option, fishways are a great alternative to improve river connectivity.”

After completing a fishway in 1992, some improvements were noted in the Shingwedzi. The number of fish species in the river at present is, however, still lower than before the dam was built. “This indicates that the construction of the dam possibly caused the irreversible local extinction of species,” Petersen said.

In South Africa, more than 60 fish passage facilities (fishways) exist, of which only about 20% are known to be functional and 33% are ineffective. The functionality of the rest has not been evaluated. This can be compared to more than 610 formal dams and more than 1 430 gauging weirs that act as human-made barriers to fish migrations.

There are now 16 fishways in the Kruger National Park, including the Engelhardt fishway along the Letaba River. These structures were built in the 1960s and 1970s. Many of them are not considered effective anymore, Petersen indicated.

Studies are underway to determine the ecological benefits of removing redundant dams and barriers on river connectivity, natural flow regimes, sediment and nutrient dynamics and the possible re-colonisation of locally extinct species in the park.

Meanwhile, the new natural water distribution work in the park yields multiple benefits not only for the ecosystem and abundant biodiversity it contains within the savanna landscape and its river systems.

“Clearly, this is only the beginning of understanding the long-term changes for the betterment of the the park’s ecosystem, the river system more broadly and for those that depend on them downstream,” Petersen said.



Herman Wanninger

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## Healthy rivers remain key

Healthy freshwater ecosystems are essential to sustain thriving populations of freshwater fishes in Africa. Dr Gordon O’Brien, an aquatic ecologist at the University of Mpumalanga’s School of Biology and Environmental Sciences, said river connectivity and fish migration management is a shortcoming of the existing management approach for dealing with multiple freshwater stressors.

River connectivity and fish migration management practices should be elevated to contribute to the sustainable use of water resources and ensure the resilience of fish populations in the region, O’Brien highlighted. More research is needed to ensure science-based decision-making and natural resource management. The Swimways Africa initiative can play a key role in this regard, he said.

Brink said the initiative provides a platform and network to exchange information and research across the continent and will help prioritise research to support migratory fish populations.

“By protecting and restoring natural flows, water quality and critical habitats while working to ensure swimways in rivers, we can make a decisive difference for migratory fish populations,” he said.

## Freshwater fish facts

### More fish are found in freshwater than in the ocean

Approximately 51% of all fish species are found in freshwater – that is more than 18 000 different species.

### Healthy freshwater fisheries equal healthy rivers, lakes, and wetlands

Healthy freshwater ecosystems are critical for thriving populations of freshwater fish and for human well-being. Rivers provide at least 2 billion people with their drinking water and support a quarter of the world’s food production.

### 60 million people rely on freshwater fish for their livelihoods

At least 200 million people rely on freshwater fish as their main source of protein. Today, 60 million people depend on freshwater fish for their livelihoods.

### Nearly one-third of all freshwater fish are threatened with extinction

Freshwater fish populations are collapsing. Nearly a third of all freshwater fish are threatened with extinction. In 2020, 16 freshwater fish species were declared extinct. Since 1970, megafish – those that weigh over 30 kg – have declined in number by 94%. Migratory freshwater fish saw a 76% decline during the same period.

*Source: The World’s Forgotten Fishes*