



The fishway at Leopard Creek, Kruger National Park, was recently upgraded.

## Spare a thought for our MIGRATING FISH

*The annual sardine run on the South African South Coast is not the only fish migration taking place around South Africa. Many freshwater species also require free passage, particularly from breeding spots in estuaries to habitats inland. Petro Kotzé reports on World Fish Migration Day held on 24 May to raise awareness of the need for fish to be free.*

**H**umans have manipulated rivers for their own use for thousands of years. Dams provide water for cities, irrigation to grow crops while generating power for industry and mining. In South Africa, we have been manipulating our waterways with artificial structures since the seventeenth century. Indeed, the country is one of the leading dam-builders in the world. South Africa's estimated 500 large dams hold back millions of litres of water, enabling activities that would otherwise have been near impossible in a semi-arid climate.

Dam construction started slowing down here in the 1970s, in part because there was a growing realisation that the benefits also came with a price – often to the river environment. One area of concern was,

and still is, our migratory fish and invertebrate species. Barriers to migration in rivers, such as bridges, weirs and dams, are considered a major factor responsible for the reduction in numbers and range of many such species throughout the country. Locally, we have about 100 indigenous freshwater fish species that undertake annual migrations to reach better feeding grounds, avoid unfavourable conditions and to improve breeding success.

If they are not able to do this, they could breed at the wrong time of the year, or not at all. This could leave the eggs and larvae in an unfavourable or unprotected environment, where they can become easy prey to predators. In turn, this could lead to a decrease in numbers or, eventually, to the species disappearing completely.

As the understanding of fish biology developed, countries started to react to environmental degradation and species loss. The challenge of river restoration, including the rehabilitation of our fish stocks, was launched. Since the 1970s and 1980s, there has been a worldwide increase and interest and research on promoting the free passage of aquatic organisms in river.

One of the most recent initiatives has been the launch of the world's first World Fish Migration Day, celebrated on 24 May.

## CREATING AWARENESS OF THE PLIGHT OF OUR MIGRATING FISH

The day aims to “promote greater awareness of the global importance of freshwater migratory fish and free flowing rivers.” The concept is the brainchild of Dutch aquatic ecologist, Dr Herman Wanningen and a number of international organisations, including the WWF in the Netherlands, the Nature Conservancy in the United States and the IUCN SSC/Wetlands International Freshwater Fish Specialist Group and Wanningen Water Consult with LINKit consult.

Aquatic Health specialist, Dr Kerry Brink, of the WFMD partnership, explains that it is the first of its kind worldwide. The idea to develop the day started in June last year, and momentum started to build after the website went live in October. “From there it just grew and grew.” Eventually, over 250 events across the globe took place to mark the occasion.

Brink explains that the main aim of the day is to create awareness, through a variety of events suitable for the whole family. Few people know what the impact of a dam really is to the aquatic environment,

**“For fish migration you need to have a connected river, which is free flowing without constructions blocking the way.”**

*Dr Andrew Deacon demonstrating a fish and its swimming capabilities to onlookers.*



Petro Kotzé



*A Tilapia found in a fishway in the Kruger National Park, its tail probably nipped off by a tigerfish.*

she notes. “There is a misconception that there are only benefits to dams, but there are, in fact, also many disadvantages. The debate surrounding the construction of dams is quite complicated, but you have to be aware that you cannot just build a dam and there will only be positive results.”

The crux of the day is captured in the theme, *Connecting fish, rivers and people*. “For fish migration you need to have a connected river, which is free flowing without constructions blocking the way,” says Brink. “The ideal is a river that is free-flowing from its source to the sea. Then we are trying to connect people to these ideas and concepts”, she says.

*The Lower Sabie gauging weir fish ladder. Here the pros and cons of a conventional fish ladder were explained by Drs Piet Kotze and Andrew Deacon.*

Another part of the aim is to let people know that there are other alternatives to restore the movement of fish, if the physical construction cannot be removed. These include fishways, fish ladders or



Petro Kórzé

fish passes – structures placed on or around constructed barriers such as dams or weirs to give the fish an opportunity to migrate.

With the help of over 150 organisations, celebrations and events was organised for World Fish Migration Day in the hundreds of participating locations worldwide, commencing in New Zealand and, following the sun, finishing as it set in Hawaii. Brink says the main event, held in Amsterdam, included a press conference and message from the Dutch minister of environmental affairs, and a tour of a fishway. Other international events included picnics next to rivers, a march in Ethiopia, workshops and presentations.

In Warsaw, a training conference with a political debate was organised with a number of satellite events that took place across the country and broadcast live. In Turn, WWF in Italy organised a conference to provide scientific information, techniques and encourage project proposals to address issues of hydrogeological management, minimising environmental impacts and requalifying the ecosystem. This event was preceded by the opening of the largest fish ladder in Europe.

It is hoped that the international day would bring global attention to the need to ensure that natural river networks remain connected and, where they are fragmented, to ensure that they are restored wherever possible, in order to achieve healthy fish populations and productive rivers.

In South Africa, the day was celebrated in the Kruger National Park, and focused on some of the fishways that have been constructed in this park’s rivers.

## A LOCAL LOOK AT FISHWAYS

For the occasion, consultant, Dr Andrew Deacon, who spent most of his career as the park’s freshwater ecologist, organised a tour of some of the park’s fishways, including the Leopard Creek fish ladder, the Lower Sabie gauging weir fishway, the Lower Sabie Dam bridge, which has a near-natural fishway, and the Kruger Gate gauging weir. Deacon says that there are currently around 13 fishways in this park, the first of which was constructed on the Engelhard Dam in 1971, providing the only migration route for aquatic organisms over the 667.7 m long dam wall with its 329 m long spillway.

## An innovative fishway design

**T**hrough the years, as fishway designs improved, a number of constraints have been identified. These include that many lack effectiveness because of poor placement of the entrance, that they cater mainly for large fish; that the fishway pools are often too short with excessive turbulence levels and a lack of maintenance.

An innovative fishway design, developed by hydraulics engineer, Dr Jan Rossouw with the support of the WRC, is the Twin Channel Vertical Slot. Very flat slopes are usually required for fishways, which have to accommodate a wide variety of fish. Flat, sloping fishways are expensive, and difficult to fit into a barrier.

These constraints can be overcome by placing two fishways in a barrier: one, with small drops between small pools, aimed at small fish; and the other aimed at larger fish, able to cope with larger drops and requiring larger pools. The large variation in water levels often experienced in South African rivers is adequately accommodated by adopting a vertical slot fishways design. The TwinChannel Vertical Slot Fishway allows the passage of fish of a wide range in size and swimming ability from very weak to very strong.


Some of the fishways were found to be blocked by debris, and in need of some maintenance – a reflection of the state of many fishways in the country. In 2008, for example, it was reported that there were about 57 fishways in South Africa, of which about 42 were functional to some degree.

South Africa has a long history with the development of fishways, improving designs as time went by. Initially, fishways were designed to cater for strong-swimming adult salmonids. This proved ineffective for passing juveniles or smaller fish species. When these limitations were noticed, it resulted in renewed research on the topic both locally and internationally, in order to develop designs that would allow for all necessary migratory fish to pass through. Today, there are improved fishway designs that successfully pass a wide variety of fish and other aquatic migratory species.

Locally, support took off after the then Department of Water Affairs and Forestry (DWAF) recognised the need to determine fishway requirements in South African conditions and species, and to develop optimal, cost-effective fishway design criteria for South African rivers. Performance evaluation and the know-how to maintain them correctly were also identified as of importance. This resulted in a series of research projects, funded by the Water Research Commission (WRC) to address such issues, resulting in comprehensive guidelines for the planning, design and operation of fishways in South Africa.

While the success of fishways is still hard to put into concrete figures, they are doing the job. According to Dr Deacon, when his team first started constructing fishways in Kruger, their biggest proof of success, like elsewhere in the country, was simply seeing the fish physically move through to their breeding grounds.

As for future plans for the international celebration, the goal-post has been moved further ahead. The partnership has come up with a letter of intent, says Brink, which they hope to get participants and organisations (most specialists and organisations in the areas of fish migration and conservation) to sign, in order to formalise their commitment to work towards collaborate and network to disseminate knowledge. The letter of intent will be used to cement the future of the international day. The first step is to tell people the facts, says Brink, and then the information can be disseminated to higher levels, hopefully to decision and policy makers.

- To stay up to date with any activities, visit <http://www.worldfishmigrationday.com/> and the 'World Fish Migration Day 2014' facebook page. 

**“Today, there are improved fishway designs that successfully pass a wide variety of fish and other aquatic migratory species.”**

*Fish sampled in the Kruger Gate fishway put in an aquarium temporarily as part of the World Fish Migration Day demonstration.*



Petro Kotzé