TECHNICAL BRIEF

Water & the environment

Saving threatened fish species – A guide

This WRC-funded study developed a guide towards the development of threatened fish species in southern Africa

Southern African fish species under threat

The conservation of biodiversity in southern Africa's freshwater ecosystems is an important, but often neglected, conservation management priority. A recent assessment of southern Africa's freshwater biodiversity resources concluded that freshwater aquatic systems support a high diversity of aquatic species, with high levels of endemism. Many of these species provide direct and indirect benefits to people.

Levels of threat to these species are estimated to be very high (more so than in other countries). The main threats to freshwater biodiversity, often associated with water resources development, are resource over-exploitation, water pollution, loss or contamination of food supply, flow modification, destruction or degradation of habitat and invasion by exotic species. Serious, and sometimes irreversible, changes in water quality in river systems have already been caused by the effluent and seepage from mines, industries, agricultural enterprises and human settlements. In addition to such pollution, the presence of dams, weirs and alien fish also pose a major threat to the survival of freshwater fish species.

The current protected area network for water resources is not designed for the protection of freshwater species, with many species falling outside of any protected area. Future protected areas thus need to be designed for the effective conservation of freshwater species.

A challenge to be overcome, however, is that very limited species information is available in many parts of the region. While a substantial number of fresh water fish species from southern Africa are listed in the IUCN Red Data List, it is probable that many other fish species in southern Africa might be threatened.

The need for conservation planning tools

It is important that conservation organisations have the necessary tools to assist in effective conservation management and, thereby, to ensure survival of threatened fish species. The lack of a clearly-defined methodology for conservation planning and management has hitherto been detrimental to fish conservation.

To fill this gap, a serious effort has been made to develop a generic conservation framework for threatened fish species, applicable to southern African conditions, which would lead to an effective conservation strategy. The framework has been developed using the Southern Barred Minnow, *Opsaridium peringueyi* as test species, selected on account of its sensitivity rating and current conservation status. The selection of this species also presented the opportunity to develop a conservation plan (the Biodiversity Management Plan for Species or BMP-S) specifically for *Opsaridium peringueyi*. Before the latter could be done, however, it was necessary to gather and integrate extensive information relating to the distribution, biology and ecology of *Opsaridium peringueyi*.

A generic framework for developing conservation plans for threatened fish species

The framework sets out steps to be taken and methods to be used in developing conservation plans for threatened fish species.

- *Identification of threatened species.* Information on the conservation status and therefore the risk of extinction of fish species are obtainable from the IUCN Red

Data List for Southern African Fish, whilst other recent publications are able to provide information on the sensitivity ratings as well as the frequency of occurrence of the species. Following the identification of a threatened species, the next step would be to assemble a planning team incorporating a conservation planner, a GIS specialist and specialist scientists that are able to deal with the biology and ecology of the fish species as well as with the limnology, geomorphology and physical and chemical in-stream aspects of the relevant river reaches or water bodies.

- **Technical advisory team.** The complexity of managing a river system or fish species necessitates a technical advisory team with a wide representation of specialists to assist the planning team through the sharing of relevant expertise and experiences.

- **Literature survey.** This survey should cover both published and unpublished data and literature on the historic occurrence, ecology and biology of the candidate species, as well as information on aquatic systems within the known distribution range of the species.

- **Current species status: specialist input.** The best approach would be to conduct workshops with various regional role players to determine the current status of the species under consideration. Rivers may traverse more than one province or country, in which case differences in the applicable legislation as well as questions regarding the responsibility for strategy implementation, sampling and transportation of material would have to be considered. The main aim of the workshop, however, would be to discuss the current distribution of the species and to gather and collate anecdotal information with regard to aspects such as the best possible sampling sites, who to contact to get access to certain restricted areas, when to sample and any other relevant information.

- **Research and fieldwork.** The gathering of necessary background information on the species necessitates a certain amount of research and fieldwork, focusing on:
  - *Species distribution*: Useful approaches would be to survey each of the historic sites to determine whether a candidate species is still present and to collect additional data and, in addition, to make use of GIS-based niche modelling systems.
  - *Species biology*: In any conservation planning exercise knowledge of the reproductive biology, feeding biology, migratory patterns, and habitat selection of the candidate species is imperative. Field studies

to fill gaps would need to be undertaken whenever available literature does not contain the required knowledge.
  - *Population genetics*: A detailed genetic analysis of the species under investigation is necessary to screen for genetic variants and to establish the levels of genetic diversity in geographically isolated populations and also to throw light on relationships with other species within the genus.
  - *Aquatic system information*: Information is needed on causes of pollution and habitat modification, and on the current status of water quality in the total distribution range, in order to give direction to future needs for monitoring and the putting in place of measures for the protection of the endangered species under investigation.
  - *Artificial breeding*: As little is known about the reproduction of many threatened species, research is needed to develop and standardise techniques for captive breeding, a conservation strategy widely used for the recovery and reintroduction of endangered fish species.

- **Background report.** A report needs to be compiled to serve not only as a record of all work done and all data and information gathered, but also as background reading material for participants in a) a forthcoming stakeholder workshop to discuss and develop an initial conservation plan and b) the species re-evaluation process for updating of the IUCN Red List, if necessary.

- **Stakeholder workshop.** The objective of the stakeholder workshop is to develop a vision, key result areas and goals for the conservation plan (BMP-S) and decide on actions and responsibilities necessary for reaching the set goals. If justified, the relevant findings of the workshop should be in a format to allow changes to be made to IUCN Red List for fish species.

- **BMP-S development and implementation.** The National Environmental Management: Biodiversity Act of 2004 (NEMBA) provides the legislative support for the development of Biodiversity Management Plans for Indigenous Species (BMP-S). Such a conservation plan for a fish species has the potential to ensure the long-term survival not only of the candidate species, but also of several other aquatic species, as well as facilitating the sustainability of ecological processes, river types and ecosystem goods and services. The BMP-S process makes provision for the conservation plan to be endorsed by the Minister and thus formally incorporated into legislation.

The BMP-S for *Opsaridium peringueyi*

It was originally envisaged that a species-specific conservation plan for *Opsaridium peringueyi* would be a key outcome of using *O. peringueyi* as the chosen test species in designing the generic framework for conservation plans for endangered fish species. From the outset it was also regarded as important that the development of the framework be integrated with current national and provincial biodiversity conservation initiatives, the most notable being the development of Biodiversity Management Plans for Indigenous Species (BMP-S).

The steps taken in developing the conservation plan for *O. Peringueyi* (i.e., extensive research on the distribution, ecology and biology of the species; compilation of a background report to facilitate stakeholder participation; re-evaluation of *O. peringueyi* in terms of the IUCN Red Listing procedure; the stakeholder participation workshop where the initial BMP-S for *O. peringueyi* was developed) were meant to effect this necessary integration.

The way forward

The *O. peringuyeyi* biodiversity management plan, developed in accordance with the generic framework for conservation plans for threatened species, is the first BMP-S for a fish species. Future pilot implementation and further stakeholder consultation will be followed by submission of the BMP-S for approval by implementing agents, as prescribed in the BMP-S Norms and Standards. Implementation would contribute to the long term survival not only of *O. peringuyeyi*, but also of several other associated aquatic species.

The plan's implementation also promises to contribute to the sustainability of ecological processes, river types and ecological goods and services in the current species distribution range.

The BMP-S development process provides for the conservation plan ultimately to be endorsed by the Minister and incorporated into legislation. This could prove beneficial for the successful implementation of the plan. It is thus recommended that the *O. peringueyi* BMP-S be taken through this formalisation process in order to give it legal status.

In developing the generic conservation plan for threatened fish species, several factors (financial, political and social) that could influence the successful implementation of species conservation plans were kept in mind. This imparts the flexibility needed for conservation planners and managers to fit the generic plan to their unique circumstances, species and aquatic systems.

Where necessary, provision should be made for refinement of species conservation plans through ongoing research. In the case of the BMP-S for *O. peringuyeyi*, further research needs to be encouraged to satisfy a critical need relating to the genetic status of the different populations of the species.