TECHNICAL BRIEF

November 2016
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

Monitoring the efficacy of alien fish eradication

A newly-completed Water Research Commission (WRC) study explored the efficacy of alien fish eradication in the Rondegar River, Western Cape.

Background

Fish invasions have been cited as a primary threat to imperilled South African fishes and other aquatic fauna. As a result, the management and control of alien invasive species is a legislated priority in South Africa. from a river rehabilitation perspective, eradicating alien fish allows for the rehabilitation of several kilometres of river, with very significant benefits for the endangered fish species present and for the associated aquatic biota.

In South Africa, the piscicide rotenone is one of the preferred methods for achieving eradication.

While alien fish removal by rotenone has been demonstrated to be an effective management tool, it has been surrounded by controversy in recent years due to its known and unknown collateral effects on non-target aquatic organisms. As a result, monitoring is an essential component of eradication projects.

The primary objective of this research project was to assess the efficacy of South Africa's first alien fish eradication project and to provide information of how the ecosystem in a river recovers following treatment with rotenone.

The study site

The Rondegat River is typical of many invaded streams in the Cape Floristic Region. The 28 km-long single-channel river is shallow (less than a meter deep) and relatively narrow (2-4 m wide).

The river receives most of its flow in winter and early spring (May to September), and the groundwater-dependent summer discharge is very low (0.07-0.08 m^3/s). The river flows into a 1 124-ha warm-water impoundment, Clanwilliam Dam, where alien black bass populations have been established since 1948.

The Rondegat River, Western Cape.

Historically, these fish had invaded the lower Rondegat River up to a waterfall located 5 km upstream of the dam. The subsequent construction of a weir some 4 km below the waterfall (sometime in the 1960s) effectively isolated the smallmouth bass in the 4 km stretch of river between the waterfall and the weir.

This section of river was treated using rotenone in February 2012 and March 2013 based on the assumption that the removal of smallmouth bass from the bounded section of the river would result in the recovery of the native fish.

Monitoring methods

River surveys were conducted to document the short-term impact and efficacy of the first rotenone and second rotenone treatments and assessing recovery rates of native fishes and invertebrates following treatment.

Fish populations were monitored at 42 sites between February 2011 and March 2015. Fish abundance at each site was estimated using two independent methods: underwater video analysis (UWVA) and snorkel surveys.

To assess for size structure, all fishes that died during the rotenone operations were collected and measured. For comparisons in the control area and in the treatment area during the recovery period (2014 and 2015), fish were sampled using seine nets and fyke nets. All fish that were caught were identified to species level, measures to the nearest millimetre fork length (FL) and released at the site of collection.

Invertebrate monitoring was conducted seasonally at three monitoring sites within the treatment area, three monitoring sites in the control area upstream of the treatment section, as well as at a monitoring site downstream of the treatment area.

Monitoring comprised a total of 13 sampling events between May 2010 and February 2015. The sampling techniques included drift, stone and kick sampling.

Rondegat River monitoring results

Monitoring of fish and invertebrate communities in the Rondegat River demonstrated that:

- The treatment was successful with no alien smallmouth bass Micropterus dolomieu detected in the rehabilitated reach of river following treatment.
- Native fishes rapidly re-colonised the reach where smallmouth bass had been eradicated with fish densities approximating those in control sites after three years.
- Assessments of invertebrate communities demonstrated that communities quickly recovered following the short-term impacts of rotenone treatment, including 'catastrophic drift' and decrease in abundance of EPT taxa (Ephemeroptera, Plecoptera and Tricoptera).
- In the long term, ecosystem health as estimated by the SASS 5 scoring system was not significantly altered by the rotenone treatment and densities of EPT taxa recovered to pre-treatment levels within one year following treatment.

Guidelines for future monitoring projects

Guidelines for future monitoring projects to assess for the efficacy of rotenone treatments with regard to removing alien fish, and for monitoring the responses by macro-invertebrates and fish to these treatments.

In summary, recommendations include:
Sampling recommendations including: appropriate sampling periods, site selection and number of sampling sites, water quality parameters and site descriptions.
Recommendations for assessing fish communities using multiple sampling methods (snorkel survey, underwater video and electrofishing) to assess fish diversity and abundance.

Invertebrate sampling methods, including the use of the SASS 5 scoring system and stone samples to provide the best quantitative data for monitoring.
Choice of appropriate taxa, which in the case of the Rondegat River project the mostuseful were EPT taxa.

Further reading:

To obtain the report, *Monitoring of invertebrate and fish recovery following river rehabilitation using rotenone in the Rondegat River* (**WRC Report No. 2261/1/16**), contact Publications at Tel: (012) 761-9300; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.