The Native Fish Strategy and Demonstration Reaches

Jim Barrett
Murray-Darling Basin Commission
GPO Box 409, Canberra City ACT 2601

jim.barrett@mdbc.gov.au

Abstract

The Native Fish Strategy for the Murray-Darling Basin 2003–2013 (NFS) is a response to the key threats to native fish management in the Basin, including habitat degradation, decreased water quality, impediments to fish passage, lack of environmental flows, and the presence of alien species such as carp. As a result of these threats, current populations of native fish communities across the whole Basin are estimated to be at about 10 per cent of their pre-European settlement levels.

The NFS seeks to rehabilitate native fish communities in the Basin back to 60 per cent of their estimated pre-European settlement levels within the next 50 years. The Strategy was approved by the Murray-Darling Basin Ministerial Council in May 2003 after a six month public consultation period.

Demonstration reaches are a core feature of the NFS. A demonstration reach is a section of river where a number of management actions, such as provision of fish passage, resnagging and management of alien species, are carried out. The purpose of such a reach is to demonstrate to the community the benefits from rehabilitating native fish habitat and populations using an adaptive management framework.

A number of management actions have been undertaken and are planned for the Hume to Yarrawonga reach of the River Murray. The Murray-Darling Basin Commission (MDBC) believes this reach could have potential as the NFS's first demonstration reach. The Hume to Yarrawonga reach has a number of features that make it ideal as a demonstration reach. For example, its native fish population is subject to a variety of threats; it is degraded, but fixable; it is close to significant regional population centres; and it is typical of other sites in the Basin, meaning solutions may be transferable to other river reaches.

Introduction

Numerous factors have contributed to the deterioration of fish habitat and native fish populations in Australia (Maitland 1995; Kearney *et al.* 1999). Many rivers within the Murray-Darling Basin are threatened by multiple factors acting in concert and largely arising from the detrimental impacts of human activities (**Table 1**). Across the Basin, changed river flows continue to increase the problems of salinity, reduced water quality, alien fish species and blue-green algal blooms; all of which affect declining native fish populations.

Table 1. Threats to native fish in the Murray-Darling Basin (MDBC 2004)

Threat	Threatening process
Flow regulation	Loss of water to other uses, critical low flows, loss of flow variation, loss of flow seasonality
Habitat degradation	Destruction of riparian zones, removal of in-stream habitats, sedimentation
Lowered water quality	Artificial changes in water temperature, increased nutrients, increased turbidity, salinity, pesticides, and other contaminants
Barriers	Impediments to fish passage caused by dams, weirs, culverts, etc., and non-physical barriers such as increased velocities, reduced habitats, water quality and temperature
Introduced species	Predation by and/or competition from trout, redfin, gambusia, carp, weatherloach
Exploitation	Commercial and recreational fishing pressure on depleted stocks and illegal fishing
Translocations/stockings	The loss of genetic integrity and fitness caused by inappropriate translocation and stocking of native species
Diseases	Outbreak and spread of EHNV and other viruses, diseases and parasites

For example, the construction of dams, weirs and other structures has changed the natural flows and flooding patterns of waterways, benefiting Carp (*Cyprinus carpio*) and other alien species at the expense of native fish (Koehn *et al*. 2000). Such structures and lack of flooding also present a barrier to fish migration. Many species, such as short-headed lamprey (*Mordacia mordax*) and congolli (*Pseudaphritis urvillii*), need to move between ocean and river habitats to successfully complete their life cycle and breed.

Murray-Darling Basin fish are generally 'warm water' species, meaning the release of cold water from dams affects their spawning, growth and survival (Koehn 2001). River snags (logs, branches, fallen trees) important for native fish breeding, feeding and protection have been extensively removed from many of the Basin's rivers (Nicol *et al*. 2002). Other threats include over-fishing and inappropriate or poorly managed re-stocking of waterways with native and alien fish that can lead to the inadvertent spread of diseases (see **Table 1**).

Many of the threats to native fish communities are associated with a lack of adequate knowledge about native fish, their status, importance and threats. Fish are hidden under water, meaning the general public has less awareness or understanding of issues confronting native fish species, compared to more visible terrestrial animals. The general public has a limited awareness of the status and ecological role of the Basin's smaller native fish that are not targeted by recreational fishers.

The Native Fish Strategy

A 10-year **Native Fish Strategy** (NFS) for the Murray-Darling Basin (MDB) was approved by the MDB Ministerial Council in May 2003. The Strategy aims at 'rehabilitating aquatic habitats and ecological processes in the MDB through management actions designed to restore healthy native fish communities'. The Strategy is based on a number of key principles:

- the decline of native fish populations in the Basin has been caused by eight generic threatening processes, not just one;

- a number of management actions need to be implemented simultaneously so that rehabilitation of populations is done in an integrated and holistic manner;

- rehabilitation of native fish populations needs to consider the recovery of the whole ecological community (rather than a single fish species or population); and

- demonstration reaches provide a positive means for engaging the public and educating them with practical examples of rehabilitation.

The Strategy's aims and objectives

The 'big picture' vision of this Strategy is to ensure that the Basin sustains viable fish populations and communities throughout its rivers. The 50-year goal of the Strategy is to rehabilitate all native fish species in the Basin back to 60 per cent or better of their estimated pre-European settlement population levels.

Through consultation, the Strategy established 13 objectives to address the threats and improve the status of native fish populations in the Basin (MDBC 2004). These have been condensed into six driving actions, which are designed to promote both government and community awareness of and investment in the Strategy:

- rehabilitating fish habitat;

- protecting fish habitat;

- managing riverine structures;

- controlling alien fish species;

- protecting threatened native fish species; and

- managing fish translocation and stocking.

Several important prerequisites need to be implemented to accomplish the six driving actions. For example, managing riverine structures requires the design of effective fishways through or over major barriers and finding engineering and operational solutions to address thermal pollution. Alien fish species need to be managed through 'integrated pest management approaches' that combine several actions to reduce the impact of pest species and stop their spread. The Strategy also urges immediate investment in the development and implementation of 'species recovery plans' for threatened native fish species.

The implementation of the driving actions will not produce immediate responses (Phillips 2003). While the rehabilitation of fish habitat and the management of riverine structures should result in changes to native fish communities within the next 10 to 15 years (**Figure 1**), it is likely to be considerably longer before benefits are obvious from the other driving actions.

However, if this investment is delayed it will prove more costly to rehabilitate the Basin's native fish communities in the future.

The demonstration reach concept

A demonstration reach is intended to show by example the need for river rehabilitation to address the full range of issues threatening native fish communities. It demonstrates the benefits achieved by integrated programs. The successful rehabilitation of a reach improves community awareness and support, provides visible examples, focuses the attention of funding agencies and boosts scientific knowledge of rivers and fish (Barrett & Ansell 2003). These key outcomes will underpin the success of the NFS.
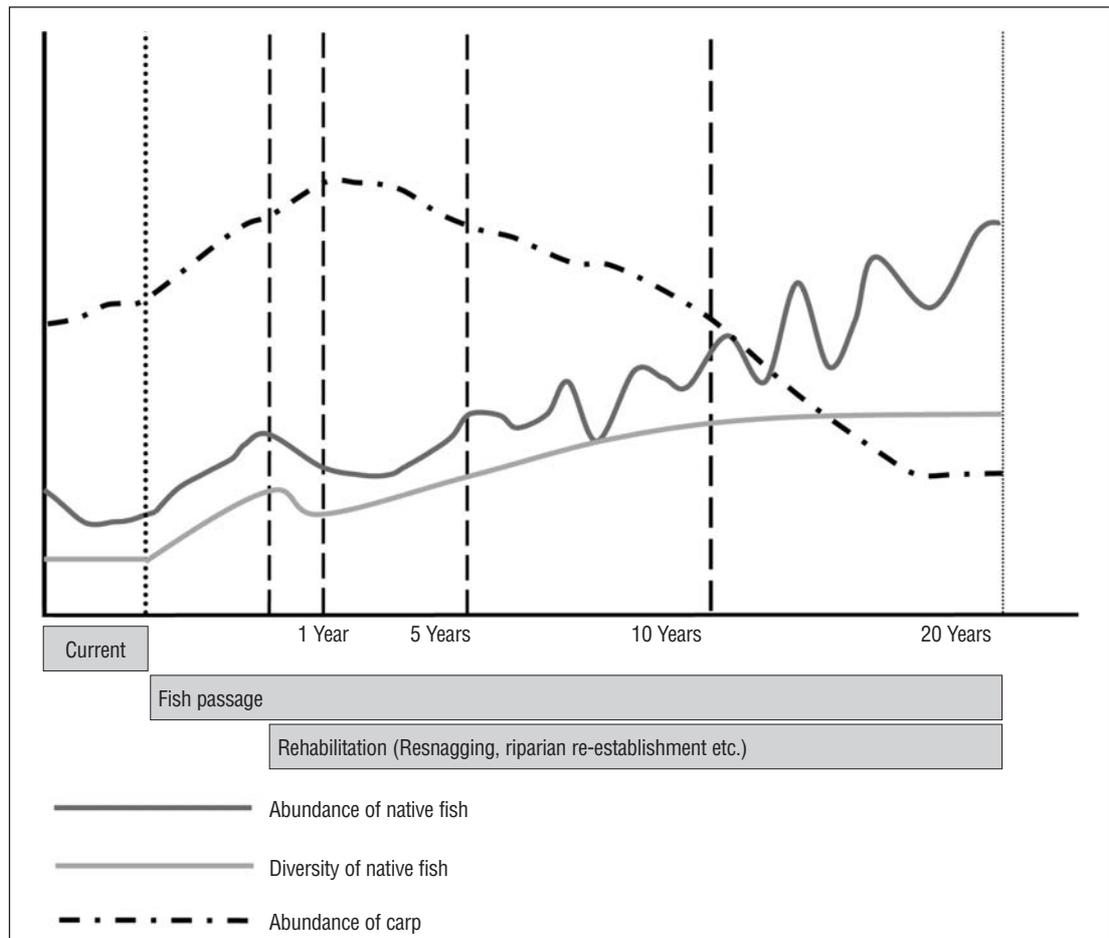

Figure 1. Hypothetical changes in the abundance and diversity of fish through time within a demonstration reach

A demonstration reach provides a coordinated attempt to concurrently address the major fish community and environmental degradation issues of an individual reach. Many rehabilitation programs are already underway across the Basin, and others are imminent or proposed. These programs include actions addressing the issues of:

- environmental flows;
- riparian revegetation;
- fishway construction and the removal of some barriers to fish migration;
- alleviation of cold-water pollution below dams;
- diversion of saline water;
- resnagging; and
- control of alien species such as carp.

However, current rehabilitation programs are spread thinly across the Basin and often only address a single problem, and progress to date has been slow. A recent panel study showed that the full range of factors preventing native fish community recovery in an area must be addressed for substantial rehabilitation to succeed. For example, there is little value in providing environmental flows if cold-water pollution prevents native fish from breeding, growing and migrating. Carp control will be of limited value if dams and weirs continue to prevent native fish from recolonising habitats.

Furthermore, the scale of the interventions must be appropriate. Fish communities respond over large spatial and temporal scales. Demonstration reaches need to be of substantial size with rehabilitation actions occurring over at least a 10-year period. A key target of the NFS is the successful establishment and rehabilitation of one demonstration reach in each of the Basin's five jurisdictions by 2010.

Demonstration reaches have three main components. Firstly, a number of management actions, such as the reinstatement of environmental flows, restoration of riparian revegetation, fishway construction, alleviation of cold-water pollution, diversion of saline water, resnagging, and control of alien species, should be run in concert, under an adaptive management framework. Such multiple actions should demonstrate the cumulative way that native fish communities respond to management interventions (Phillips 2003).

Secondly, demonstration reaches will focus rehabilitation projects on shorter sections of river

to optimise the effectiveness of limited resources. However, care needs to be taken to ensure that (i) the length of a demonstration reach covers a large enough area (e.g. 20–100 km) to be both visible and measurable, and (ii) it is treated over a sufficient time period (e.g. 7–10 years).

The third component of demonstration reaches will involve engaging the public through compelling examples of river and fish community rehabilitation. This will often involve collaboration between a number of different groups, agencies and individuals. Demonstration reaches should focus the attention of funding agencies on the serious problems occurring in rivers and, under an adaptive management approach, boost scientific knowledge of rivers and fish.

Who do we need to consult with?

It will be important to integrate the demonstration reach management framework with existing land and water programs. Such integration will provide a means of demonstrating the ability to rehabilitate fish communities, while allowing sustainable levels of resource use to continue. Local steering committees and project officers will be instrumental in forming linkages with community groups representing a range of interests: Landcare, catchment management, local government, indigenous people, angling and conservation. Links will also need to be made with industry groups representing agriculture, irrigation, commercial fishing and tourism interests.

Hume-Yarrawonga

The Hume-Yarrawonga reach of the River Murray in southeastern Australia has been identified as a potentially suitable site for a demonstration reach because:

- it complies with all of the criteria for a demonstration reach (see below);
- it has already benefited from a number of programs (e.g. Hume-Yarrawonga Waterway Management, Living Murray Regional Evaluation Group B); and
- significant actions are either underway, or planned for this area, including: an overall waterway management strategy, improved fish passage at Yarrawonga, monitoring of fish populations, purchasing of easements for flow regulation, addressing water quality issues at Hume Dam, resnagging, carp management, and threatened species recovery.

In addition, The Living Murray project's Implementation Program has significant investment earmarked for habitat restoration in the Hume-Yarrawonga reach. The proposal to fast-track a demonstration site will help to extend principles and outcomes to the wider community in this reach.

Why the Hume-Yarrawonga section?

The Hume Dam to Yarrawonga section of the river complies with all of the criteria of a demonstration reach in that it is:

- degraded but able to demonstrate results from rehabilitation actions;
- in close proximity to the significant population centre of Albury-Wodonga;

and restoration works there will be:

- likely to gain strong community support;
- substantial, accessible and visible to the public;
- suitable for trialling rehabilitation techniques and approaches;
- suitable as examples of solutions to problems;
- likely to develop solutions that are transferable to other similar sites;
- affected by several different threats or ecological issues;
- suitable for testing scientific hypotheses and measuring and monitoring results;
- near an adjoining downstream river reach that can be used as a reference.

This reach has a low species composition and abundance of native fish and a predominance of alien species, such as carp, as documented in *Fish and Rivers in Stress: The NSW Rivers Survey* (Harris and Gehrke 1997). 'The Aquatic Community of the Lower Murray River Drainage', which includes this river reach, has been listed as endangered under Part 7A of the NSW *Fisheries Management Act 1994.*

The Advisory Group on Hume to Yarrawonga Waterway Management was formed in May 2000 as a result of the outcomes of the Hume to Dartmouth Dams Operations Review. By agreeing to the establishment of this Group, which contains many of the stakeholders that will need to be engaged if a demonstration reach in this area is to be successful, the Commission signalled its intent to identify and implement a sustainable management strategy for the Hume

Dam to Yarrawonga reach of the River Murray, which would deal with the impact of full regulated flow (25,000 ML/day) on riparian land as well as on the ecology of the river and its environs.

The Living Murray's 'Proposal for Investment', section 10.3 states that:

> Demonstration sites will be considered for the various aspects of this program. Demonstration sites will be established to provide tangible examples of the nature and benefits of the interventions planned. The concept of demonstrations sites will be tailored to the program from similar ideas described in the Ministerial Council's Native Fish Strategy. They will contribute to the creation of a climate of ongoing improvement in the environmental management of the River Murray. Fast-tracking implementation at these demonstration sites will occur where it can be reasonably established that such actions will be consistent with the overall program template of prioritisation.

The results of The Living Murray Regional Evaluation Group B (Hume Dam to Yarrawonga Weir) will be integral to the planning of this exercise.

What are the risks associated with this project?

- Viable solutions may not be found to mitigate cold water pollution at Hume Dam.
- There may be community/political perception that too many resources are being devoted to one section of the river.
- There may be a lack of commitment to long-term monitoring and other follow-up actions.

How can we best progress the establishment and implementation of this demonstration reach?

This needs to be determined through internal discussions within the MDBC office, and will eventually need to gain the imprimatur of the MDBC and Council. A dedicated Project Steering Committee needs to be established to include both community and industry members. There also needs to be a dedicated effort to bring together the current natural resource management-related projects in the reach. These projects need to be integrated as far as possible to maximise benefits for the whole river system, including its native fish. Baseline monitoring requirements need to be established at an early stage.

Other tools that may be of assistance include:

- the Adaptive Experimental Assessment and Management (AEAM) process – see *Ranking Areas for Action: A Guide for Carp Management Groups*;

- CRC for Freshwater Ecology project 'Adaptive Management in Restoration Ecology';

- outcomes of the July 2003 'OzAM' adaptive management exercise;

- The Living Murray public consultation process;

- *Summary Report Scoping Study — Waterway Management Plan* for the Hume to Yarrawonga Reach;

- Lake Mulwala Draft Land and On-water Management Plan;

- Murray Flows Assessment Tool and the Regional Evaluation Group B report;

- National Carp and Pest Fish Task Force action plan;

- local catchment management plans;

- the Arthur Rylah Institute resnagging report (Yarrawonga-Tocumwal); and

- the NFS Communication Strategy.

This initiative complements The Living Murray initiative and is likely to provide tangible benefits in the short term.

Conclusions

Demonstration reaches are designed to show the benefits for native fish (and other aquatic and riparian biota) when all the necessary river-rehabilitation works are integrated and focused in one place. The major environmental and native fish issues affecting the reach are documented in a community-inclusive process. A program is implemented to coordinate and boost rehabilitation, working on all the problems concurrently. A thorough scientific investigation assesses the ecological and native fish responses to actions, and results are widely publicised amongst the Basin community throughout the program.

Broader communication of the results achieved through demonstration reaches will be linked to the NFS's Communication Strategy. On-ground progress and results from rigorous scientific monitoring of the responses of the river and its fish community to management actions will be publicised frequently.

Community ownership of the NFS and river rehabilitation through practical on-ground examples are at the centre of the NFS's Investment Plan. A successful demonstration reach supported by the Commission is likely to kick-start the process in other rivers and jurisdictions.

It will be critical to integrate the demonstration reach management framework with existing land and water programs. Given the objective of demonstration reaches to convey to communities the potential to rehabilitate fish habitat and populations while allowing sustainable levels of resource use to continue, local steering committees and project officers need to link with various community and industry sectors.

Demonstration reaches are attractive propositions. They involve the community, integrate regional planning and resources, and are very likely to demonstrate positive results that can be applied elsewhere. Agencies should waste no time in embracing these concepts and developing and implementing integrated programs for establishing their own demonstration reaches.

Acknowledgements

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