



# Managing invasive freshwater fish in New Zealand

PROCEEDINGS OF A WORKSHOP HOSTED BY DEPARTMENT OF  
CONSERVATION, 10–12 MAY 2001, HAMILTON



Department of Conservation  
*Te Papa Atawhai*

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Published by  
Department of Conservation  
P.O. Box 10-420  
Wellington, New Zealand

This work may be cited as:

Department of Conservation 2003: Managing invasive freshwater fish in New Zealand. Proceedings of a workshop hosted by Department of Conservation, 10-12 May 2001, Hamilton. xiv + 174 p.

This report was prepared for publication by DOC Science Publishing, Science & Research Unit; editing and layout by Ruth Munro. Publication was approved by the Manager, Science & Research Unit, Science Technology and Information Services, Department of Conservation, Wellington.

All DOC Science publications are listed in the catalogue which can be found on the departmental web site <http://www.doc.govt.nz>

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ISBN 0-478-22423-0

**National Library of New Zealand Cataloguing-in-Publication Data**

Managing invasive freshwater fish in New Zealand : proceedings of a workshop hosted by Department of Conservation, 10-12 May, 2001, Hamilton.

Includes bibliographical references.

ISBN 0-478-22423-0

1. Freshwater fishes—New Zealand—Congresses. 2. Introduced fishes—Control—New Zealand—Congresses. 3. Nonindigenous aquatic pests—Control—New Zealand—Congresses. I. New Zealand.—Dept. of Conservation.—Science and Research Unit. 363.780993—dc 21

In the interest of forest conservation, DOC Science Publishing supports paperless electronic publishing. When printing, recycled paper is used wherever possible. This book is printed on recycled paper by Pronto Print Solutions, Wellington, New Zealand.

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# Introduction

Freshwater ecosystems are important components of New Zealand's environment, supporting a diversity of indigenous aquatic species, providing valuable ecosystem services to communities, and are of considerable cultural and spiritual significance to Maori. They are also subject to a wide range of pressures—including hydrological modification and drainage, pollution and sedimentation, nutrient enrichment, deforestation, abstraction, and invasion. These pressures have had considerable consequences for freshwater ecosystems and biodiversity, with one-third of the 37 described indigenous fish species threatened, and most freshwater environments significantly modified and dominated by introduced plant and fish species (Anon. 2000).

The New Zealand Biodiversity Strategy was launched in February 2000 in response to the ongoing decline of indigenous biodiversity. The Strategy established a strategic framework for the management and protection of indigenous biodiversity, and for conserving genetic resources of valued introduced species. It sets an ambitious goal to 'Halt the decline in New Zealand's indigenous biodiversity' and sets out a programme of action for terrestrial, freshwater, and marine environments. For freshwater environments these include objectives to protect the full range of the remaining natural freshwater ecosystems and habitats, and the prevention, control, and management of plant and animal pests that threaten indigenous biodiversity (Anon. 2000).

Historically, freshwater conservation in New Zealand has focused upon individual aspects of habitat protection including spawning site protection, riparian management, fish passage restoration, avoiding and remedying point source pollution, harvest management, and flow maintenance. However, protecting and conserving New Zealand's indigenous freshwater biodiversity requires integrated programmes of action that will also include the management of plant and animal pests.

In 1994, Collier estimated that more than 228 species of aquatic plants and animals had been introduced to New Zealand. Introduced species pose considerable management challenges in freshwater ecosystems. They are often highly invasive, and new incursions are difficult to detect. They are therefore likely to become widespread before they are discovered, and this makes them difficult to control or eradicate. In addition, effective control technologies are often not available, or it is impossible to eradicate these pests without high collateral damage or excessive costs. As a result, invasive freshwater pests are perceived to pose a significant, and often irreversible, threat to freshwater ecosystems.

Invasive freshwater fish are a key issue for the protection and management of indigenous freshwater biodiversity. A total of 19 species of introduced freshwater fish have naturalised in New Zealand—some are highly valued but many pose a considerable threat. The process is also unfortunately ongoing. Since 1960, at least four introduced fish species have naturalised in New Zealand following illegal importation, and these are being actively spread (see Dean present volume).

Range expansion of introduced freshwater fish has occurred, mostly in association with human activity. To date, this spread has received little attention from management agencies although the first reports of *Gambusia* and koi carp from the South Island have brought the issue sharply into focus. This increased awareness, coupled with a growing drive to protect important freshwater ecosystems and freshwater biodiversity, provided the impetus for agencies to progress the management of invasive freshwater fish.

A three-day workshop on 'Managing invasive freshwater fish in New Zealand' was convened in May 2001 by the Department of Conservation (DOC) to assist it to develop a strategic approach to invasive freshwater fish management and research. The workshop was attended by representatives of central and local government agencies, fisheries managers, tangata whenua, and freshwater scientists.

A series of invited speakers from New Zealand and Australia presented papers to develop a common level of understanding of the issues, inform participants of recent initiatives in this work area, and generate debate about priority management and research needs.

The first day of the workshop focused on management issues. These included presentations of the current (multi-agency) framework for managing invasive freshwater fish in New Zealand, and an overview of the current situation. DOC's strategic approach to weed management (Owen 1998) was presented to the workshop as a successful pest management model with principles that may be transferable to invasive freshwater fish management. A recurring theme was the opportunity to learn from terrestrial pest managers, and the importance of applying pest management principles to invasive freshwater fish.

The Australian management approach was also presented, including examples of state and federal initiatives to control and manage invasive freshwater fish (see Barrett present volume). Three further presentations provided more detail on Australian initiatives and the lessons that have been learnt—including papers on prioritising sites for management action, undertaking control operations, and assessing the effectiveness of management operations.

The second day of the workshop was dedicated to research, where New Zealand and Australian scientists presented the results of their research on invasive freshwater fish—focusing on assessing the biology and impacts of introduced freshwater fish species, and control and eradication methodologies. At the end of the day, participants were asked to identify the introduced freshwater fish that posed the greatest risks to freshwater ecosystems and biodiversity. While the process was subjective, there was a remarkable level of consensus amongst participants, and the same six introduced fish species (koi carp, catfish, rudd, perch, brown trout and *Gambusia*) were consistently identified as the highest priority for management action (see Appendix 1).

The final day of the workshop was spent identifying and prioritising research and management actions for the six invasive fish species that were identified the previous day.

These proceedings contain the research papers that were presented at the workshop, as well as selected management papers. They provide an overview of invasive freshwater fish research and management issues within New Zealand

and Australia, and summarise the current state of knowledge. As much of this information resides outside of the published literature, it is hoped that these proceedings will be a valuable reference resource and useful building block for future pest fish research and management in New Zealand.

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# Opening address

Welcome everybody and thank you all for coming here for what I hope will be a productive discussion and information exchange on pest fish management and research.

I know that there has been a lot of discussion about what this workshop should be called, and realise that some people are not happy with the connotation that 'pest' has, and are not clear about the species that it applies to. To clarify, we are talking about freshwater fish species that pose a problem to aquatic species or habitats in a particular situation. This may be native species where they have been introduced into a system where they have not previously occurred, or it may be sports fish if they are affecting freshwater habitats or species. In my mind, it is about assessing a place (i.e. catchment), establishing management objectives for that place (based on information about its values and inhabitants), and determining whether the introduction of an exotic species into that place is consistent with those objectives.

The Department does not intend, or have the resources, to undertake wholesale control and eradication of introduced species simply for the sake of removing them. The Department must make its decisions on a site-by-site basis, using systems to prioritise the sites.

I am aware of several examples of pest fish management that the Department is involved in at present. One of the most significant of these projects is the removal of trout from a stream in Otago. Here, DOC and Fish & Game New Zealand are working with NIWA to monitor the consequences of trout removal on a population of a threatened Otago galaxiid. The trout do not reach a large size in this stream, and so do not contribute to a valued trout fishery—their removal is therefore not of significant concern to the local fish and game council. It is a good example of a situation where two different management agencies can reach an agreed outcome at a site, resulting in positive spin-offs for indigenous biodiversity.

## PEST FISH MANAGEMENT AND RESEARCH

The Department has undertaken a delimitation survey of the Nelson/Marlborough area, and will extend its survey into other parts of the South Island next financial year. The results to date from Nelson look promising for control of koi carp and *Gambusia*, and eradication has been attempted at the small number of known locations. Of concern though are the number of other species that have been detected during the surveys, that have been illegally transferred into new waters. Most of these species have been coarse fish, which are also sports fish, although they have included rudd, a noxious species.

The illegal transfers of fish signal a number of things to me. There is:

- clearly a perception that government agencies will not catch or prosecute offenders

- a lack of knowledge about the impacts of the species that are being introduced
- a lack of ownership or knowledge of management objectives that have been set for water bodies
- also an element of hooliganism in some situations.

It is clear to me that the development and implementation of the Department's Pest Fish Management Framework will need to incorporate education, compliance, law enforcement, and surveillance. Somehow, the illegal introduction of new species to freshwater ecosystems needs to become socially unacceptable in New Zealand. After all, the majority of freshwater fish introductions (whether inadvertent or intentional) are being undertaken by people—freshwater fish can't move between catchments on their own. The containment of species therefore relies on education.

It is important to recognise that the introductions of freshwater fish have a number of potential impacts—effects on indigenous aquatic species and their habitats; impacts upon sports fish and game habitats; effects on water quality; contribution to the destabilisation of macrophytes in shallow lakes; and the potential to transfer disease. They therefore traverse the boundaries of DOC, Fish & Game New Zealand, Ministry of Fisheries, and regional councils. I think that it will be important for all of these agencies to engage and coordinate their activities in relation to this issue, in order to be effective.

## FRESHWATER CONSERVATION

Most of you will be aware that the government launched its Biodiversity Strategy in February 2000. This document sets ambitious goals for freshwater biodiversity management and conservation. In order to achieve holistic freshwater ecosystem management and the desired outcomes articulated in the Biodiversity Strategy, the Department needs to coordinate its management actions with those of other agencies, in order to manage threats at a site and catchment level.

I hope that you will all have an enjoyable day today and engage in some healthy debate and discussion. I see it as a positive opportunity for the Department's freshwater staff to interact with each other and with people from other agencies, and hope that you will all find your time here well spent.

Peter Lawless

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