

Action Statement

Flora and Fauna Guarantee Act 1988

No. 190

Introduction of live fish into waters within Victorian river catchments

Preamble

The preparation of this Action Statement follows the listing of the 'Deliberate or accidental introduction of live fish into public or private waters within a Victorian river catchment in which the taxon to which the fish belongs cannot reliably be inferred to have been present prior to the year 1770 AD' as a Potentially Threatening Process (SAC 1992) under the **Flora and Fauna Guarantee Act 1988**, and outlines the actions to be taken to ameliorate the adverse effects of this process.

The following definitions are used for the purposes of this Action Statement:

Fish are those major groups belonging to the Phylum *Chordata* which as adults breathe through gills and are free swimming but whose locomotory appendages have not advanced beyond primary fins (Gomon, Glover and Kuitert 1994).

Waters include those public and private waters within Victorian catchments. They can vary in salinity from fresh to saline in inland salt affected streams, or in estuaries. They can also be held in the dams, and natural lakes and wild rivers, lakes and estuaries and artificial structures such as aquarium tanks and holding pens.

An *introduction* is the human assisted movement of all stages of fish's lifecycle and any derived, viable genetic material and associated transport media. Movements vary in their complexity. They can range from infrequent movements of limited species between limited locations, such as provision of brood stock for fish aquaculture trade, to frequent movements of many fish species between many locations, such as the supply of fish for the home aquarium.

Victorian river catchments are areas which, through run-off or percolation, contribute to the water in a

stream or stream system. They include the area from the headwaters of the catchment to point of entry to the Murray River or to the sea in Bass Strait. All Victorians live in a catchment and for administrative purposes all of Victoria is divided into 10 catchment management areas.

Ecologically Sustainable Development is 'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased' (Commonwealth of Australia 1992).

Description And Distribution

The introduction of 'fish' has the potential to provide social, economic and environmental benefits (Australian Bureau of Statistics 2001). Historically, benefits have been given prominence. Introductions, however, can equally have irreversible and adverse consequences (Prime Minister's Science Engineering and Innovation Council 2002). To ensure introductions are ecologically sustainable the potential threats, associated with them must be carefully and systematically considered.

Sala *et al.*(2000), in predicting scenarios for changes in biodiversity to 2010, concluded that biological exchange was a relatively more important threat to the biodiversity of aquatic ecosystems than to other ecosystems because of the intentional and unintentional release of organisms. The magnitude of this problem is increasing (Lodge 1993) and the integrity of aquatic ecosystems is being challenged worldwide by invasive species (Moyle & Light 1996).

The introduction of 'fish' into Victorian catchments may threaten the biodiversity and ecological services provided by Victoria's aquatic ecosystems, may pose risks to human health, and may threaten the social and economic benefits derived from the aquatic environment, including aquaculture, recreational and commercial fishing of native and already-introduced species.

Once a fish has been introduced, it may or may not establish a viable breeding population. When established in an aquatic system, it may be extremely difficult, if not impossible, to control or eliminate with current knowledge.

From the international and Australian literature it is clear that while the risks vary with the species, the vulnerability of a water body to the establishment of a pest species can also be compounded by habitat and other environmental changes (Arthington *et al.* 1990, Moyle and Light 1996). Because of the risks they pose in the event that they establish wild populations fish, or stocks of particular concern to Victoria, are likely to be those that have one or more of the following characteristics:

- Species which can dominate space and competitively exclude native species, eg. Carp (Williamson 1996)
- Species which are predators, eg. Trout species are known to prey on native fishes, especially *Galaxias* species, causing population declines and fragmentation (Wager and Jackson 1993; Cadwallader 1996; Raadik *et al.* 1998). Trout species are also known to predate on tadpoles and young frogs, and have been implicated in the decline of the spotted tree frog *Litoria spenceri* (Watson *et al.* 1991, Gillespie 2001).
- Species with the potential to have adverse impacts on aquatic habitat and associated communities, eg. the collapse of the North American Great Lakes community structure and fishery as a result of the entry to the Lakes of the Sea Lamprey *Petromyzon marinus*, via the Welland Canal, in particular the impact on the Lake Trout *Salvelinus namaycush* (Mills *et al.* 1993), and the collapse of community structure in Lake Victoria following the introduction of Nile perch *Lates nilotica* (Barel *et al.* 1985).
- Species or stocks that may act as vectors for disease causing organisms such as viruses, protozoa and bacteria that pose risks to human health, or threaten indigenous species, aquaculture and wild fish stocks (Langdon 1990).

In the 1970s, for example, an atypical strain of the bacterium *Aeromonas salmonicida* was introduced to Victoria with goldfish from Japan, giving rise to Goldfish Ulcer Disease in wild and cultured goldfish and carp populations. Subsequently, the bacterium was demonstrated to be transmissible to, and pathogenic for salmonid

fishes (Whittington and Cullis 1988). Infected roach have also been recorded from Lake Burrumbeet, near Ballarat.

Epizootic Haematopoietic Necrosis virus is of unknown origin which affects English perch (redfin) in the wild. The virus spread to cultured rainbow trout in 1986 and has now been shown to be highly pathogenic for a wide range of native freshwater species, including silver perch, Macquarie perch, and mountain galaxias and to a lesser extent Murray cod, and to the introduced mosquitofish (Langdon 1989).

- Stocks that may affect gene pools. The mixing of different stocks through human activities may compromise genetic diversity and impact on the distribution of unique genes in both the donor and receiving populations (Blankenship & Leber 1995, Keenan *et al.* 1996).

Historical perspective

Deliberate introductions to Victoria of freshwater fish species date from the second half of the nineteenth century, and eight self-maintaining species occur in Victorian river catchments as a result (Cadwallader and Backhouse 1983). These are brown trout *Salmo trutta*, rainbow trout *Oncorhynchus mykiss*, European carp *Cyprinus carpio*, goldfish *Carassius auratus*, tench *Tinca tinca*, roach *Rutilus rutilus*, English perch *Perca fluviatilis*, and Gambusia *Gambusia holbrooki*. The North American chinook salmon *Oncorhynchus tshawytscha* and the Atlantic salmon, *Salmo salar*, persists in selected public waters through continued stocking of hatchery reared fish. Of these species, all but Gambusia was introduced to Victoria to create a new fishery. Gambusia was introduced to south-east Australia in the 1920s for the purpose of biological insect control (Lloyd 1986).

The most recent additions to Victoria's freshwater/estuarine species are a result of the disposal of ships' ballast water (Hewitt *et al.* 1999), and from the escape or disposal of aquarium species (Lintermans *et al.* 1990). The yellow-fin goby *Acanthogobius flavimanus*, was probably introduced to Victoria in ballast water (Pollard 1980) and the Oriental weatherloach *Misgurnus anquillicaudatus*, the convict cichlid *Heros nigrofasciata*, Jack Dempsey cichlid *Cichlasoma octofasciatum*, and black mangrove cichlid, *Tilapia mariae*, as a result of the escape or disposal of aquarium fishes (Cadwallader *et al.* 1980). These tropical cichlid species have been recorded from the artificially heated waters of the Hazelwood Power Station cooling pondage (see: <http://www.asfb.org.au/research/es/cichlida.htm>).

Since European settlement, the more favoured native fish species have been extensively introduced to public waters within drainage basins in which they did not naturally occur (Harris & Battaglene 1990). Such deliberate artificial extensions of species'

range have occurred in Victoria for the Freshwater Catfish *Tandanus tandanus*; Murray cod *Maccullochella peelii peelii*; Trout Cod *Maccullochella macquariensis*; Macquarie perch *Macquaria australasica*; Golden Perch *Macquaria ambigua* and Silver Perch *Bidyanus bidyanus*.

Management Status

Current Status

The introduction of live fish into waters within a Victorian river catchment is a potentially threatening process. It is listed under the **Flora and Fauna Guarantee Act 1988** as the 'Deliberate or accidental introduction of live fish into public or private waters within a Victorian river catchment in which the taxon to which the fish belongs cannot reliably be inferred to have been present prior to the year 1770 AD'.

It forms part of a broad policy framework to help manage the social, economic and environmental risks and benefits arising from the introduction of plants and animals to Victoria. The framework includes this Action Statement, the Action Statement for the potentially threatening process 'Introduction of exotic organisms into Victorian marine waters', Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria (Victorian Government 2003). It also includes other Victorian legislation, such as the **Fisheries Act 1995**, and Commonwealth legislation, such as the **Environment Protection and Biodiversity Conservation Act 1999**.

Reasons for Listing as a Potentially Threatening Process

In its final recommendations, the Scientific Advisory Committee (SAC 1992) determined that the introduction of live fish into public or private waters was a potentially threatening process as in the absence of appropriate management it:

- poses or has the potential to pose a significant threat to the survival of a range of fauna, and
- poses or has the potential to pose a significant threat to the evolutionary development of a range of fauna.

Major Management Objective

Recognition of the importance of conserving and preserving biodiversity is reflected in a number of international and national agreements and arrangements including the Convention on Wetlands of International Importance (1971) (Ramsar Convention), National Strategy for the Conservation of Australia's Biodiversity (Commonwealth of Australia 1996), National Strategy for Ecologically Sustainable Development (Commonwealth of Australia 1992) and the

Intergovernmental Agreement on the Environment (1992).

Within Victoria, Victoria's Biodiversity (Victorian Government 1997), Regional Catchment Strategies, and the Victorian River Health Strategy (Victorian Government 2002), for example, reinforce this commitment, along with the broader commitment to ecologically sustainable development (ESD). The application of ESD principles will help ensure that, as a society, we are not running down our natural assets and building up an 'environmental debt', such as occurs through the establishment of introduced organisms that become pests.

Accordingly, the major management objectives of this Action Statement are:

- to minimise the risk that fish species new to Victoria will establish self-maintaining populations in the wild
- to minimise the risk that species that are already present within Victoria will establish self-maintaining populations outside their current range
- to prevent the further spread of undesirable populations of non-indigenous species in Victorian public waters, and where practical eliminate them.

In prioritising these management objectives, it is recognised that an approach which focuses on ongoing minimisation of the risk of new species establishing in the wild, is more effective in environmental and economic terms, than attempting to eradicate or manage species once they have become established. Consistent with the above, risk-based assessments will also be used to assess short and long term priorities. Relevant criteria for assessing risk include the nature of the species, characteristics of the introduction process, vulnerability of the area to the establishment of wild populations of introduced species, and values of the waters or activities that may be affected. The risk assessment is outlined in the *Guidelines for Assessing Translocations of Live Aquatic Organisms in Victoria* (Victorian Government 2003).

Management Issues

The fish species, waters, and organisational circumstances in which fish introductions are considered and undertaken are quite varied, as is the potential and direct and indirect risks for the establishment of self-maintaining wild populations. Some activities can involve relatively few individuals, relatively few fish-movements and limited locations such as aquaculture ventures. Some activities, where species are introduced to relatively few locations in the wild can lead to the establishment of species across entire river basins,

including when species move through water distribution systems that cross catchment boundaries. By contrast, fish-movements by aquarium enthusiasts can be numerous, and involve large numbers of individuals and locations. Fish may be introduced for a variety of purposes, including those outlined below. Fish, and associated diseases and parasites, can also be introduced incidentally as result of other activities such as the discharge of ballast water in the freshwater areas of ports, or deliberately as part of an illegal activity.

Stocking of lakes and rivers

The Department of Sustainability and Environment (DSE) and the Department of Primary Industries (DPI), or organisations under permit from DSE & DPI, stock selected waters to provide for recreational fishing and to conserve native fish stocks. Species include Rainbow Trout, Brown Trout, Chinook Salmon, Atlantic Salmon, Murray Cod, Golden Perch, Macquarie Perch, Silver Perch, Freshwater Catfish, River Blackfish, Australian Bass and Trout Cod. In 2000 807,000 salmonids, mainly Brown Trout and Rainbow Trout were stocked in public waters, principally impoundments. In 2000/01 1,200,000 native species, mainly Golden Perch and Murray Cod were stocked in public waters.

Stocking of farm dams

This is undertaken by individuals who acquire fish for stocking into their private farm dams. Under the **Fisheries Act 1995**, approval to stock a farm dam or to import fish from outside Victoria is required from Fisheries Victoria.

Aquaculture

Commercial fish farms produce mainly Rainbow Trout and Atlantic Salmon, as well as some Brown Trout for the local and export food trade. Trout, Murray cod, Golden Perch, Silver Perch, Freshwater Catfish, Australian Bass and occasionally estuary Perch are also produced for stocking private and public waters. Fish Culture Permits are also provided to goldfish farms that produce fish primarily for the aquarium trade, and for the culture of native finfish..

Live fish as bait

In inland waters, the Common Galaxias *Galaxias maculatus*, and the Big- or Flat-headed Gudgeon *Philypnodon grandiceps*, are the most commonly and widely used live bait species of fish. Introductions to inland waters may arise from the use of live fish for bait either through the baitfish coming off the hook, or through unused bait being liberated at the fishing site.

Aquaria

A wide variety of species from throughout the world have been introduced to Victorian homes to stock hobby aquaria and to a lesser extent research and commercial aquaria. Introductions to inland waters may arise as a result of aquaria related activities when unwanted aquarium species are disposed of either directly to rivers and streams, or via the stormwater/sewer system.

Previous Management Action

As outlined above the initial focus was on the perceived benefits of the introductions, and much of the management action was directed to culture of stock and their introduction to Victorian waters. However, over the last decade or so there has been increasing recognition of the impact degraded aquatic habitats have on fish populations, and the vulnerability of waters to fish introductions. For example, through the **Flora and Fauna Guarantee Act 1988** various human activities have been identified that require attention because of the potential to threaten fish habitats, including: changes to the natural temperature regimes, increased sediment input, and the input of toxic substances into Victorian waters. The **Fisheries Act 1995** also provides powers to specifically protect fish habitat. There has also been increasing recognition that not all introductions are beneficial and the social, economic and environmental impacts of some introductions can be severe and difficult if not impossible to reverse, such as those that lead to the introduction of diseases. It was also recognised that nationally, assessment of proposals to introduce fish, and aquatic organisms more generally, have been treated in an adhoc manner and assessed without common guidelines.

To address these issues, Australian Governments agreed in 1999 to a *National Policy for the Translocation of Live Aquatic Organisms - Issues, Principle and Guidelines for Implementation* (Ministerial Council on Forestry, Fisheries and Aquaculture 1999). In agreeing, Victoria committed itself to using the national policy as the basis for arrangements applying to Victoria. These arrangements will build on previous management actions outlined below.

Guidelines

- *Trout Stocking Guidelines* (NRE 1998) outlines general criteria for considering trout stocking proposals in public waters. Priorities for waters considered for stocking are determined according to habitat suitability criteria, existing or potential population levels and needs of the angling public. Trout are not stocked in waters: where the released fish may constitute a threat

to a population of a species of special concern or where a unique faunal assemblage exists; where natural reproduction adequately supports a fishery; waters east of the Snowy River catchment; and waters identified as unsuitable habitat.

- *Native Fish Stocking Guidelines* (NRE 1998) outlines the general criteria for considering native fish stockings in inland waters for conservation and recreational purposes. Stocking is confined to public waters except where special management or research needs exist or arise.
- *Fish in Farm Dams* (NRE 2000) outlines the applications arrangements for permits to stock fish in farm dams and offers suggestions on the species and their management, consistent with the above guidelines.
- The annual *DPI Victorian Recreational Fishing Guide* outlines arrangements for the use of *bait* in Victorian waters. Bait restrictions are covered by Reg. 532 of the Fisheries Regulations 1998.

Legislative arrangements

- *Requirement for permit to stock fish.* The **Fisheries Act 1995** requires that all persons wishing to stock fish in Victorian waters must first have written permission from DPI . Permits are required to ensure that species are not released into areas where they are likely to cause environmental or economic damage. Permits also facilitate the locating of infected fish in the event of an outbreak of a fish disease, thereby assisting in the detection and control of the source of the disease.
- *Noxious Fish.* Under the **Fisheries Act 1995** a variety of species are listed as noxious. They include carp, mosquitofish and penalties apply for possession or control of live specimens.

Management plans and action statements

- *National Management Strategy for Carp Control 2000-2005* (Carp Control Coordinating Group 2000) Its goals are to: prevent the spread of carp; reduce the impacts of carp to acceptable levels; promote environmentally and socially acceptable application of carp eradication and control programs; improve community understanding of the impacts of carp and the management strategies to counteract those impacts; and promote the cost efficient use of public resources in carp eradication and control programs.
- *Goulburn Eildon Fisheries Management Plan* (NRE 2002) set out the strategies and actions for managing the fishery for the next five years.

- *Bendigo Region Fisheries Management Plan* (NRE 2002) outlines actions to address key issue for fisheries in the Bendigo region, including: angler education; carp and roach control; FFG listed, threatened or vulnerable native fish species and communities; fisheries compliance; habitat, in particular water quality and quantity; and introduced fish species.
- *Action Statements* prepared under the Flora and Fauna Guarantee Act, outline the reasons for the listing and describe what has been done and what can be done by Government in partnership with the community to recover the species or community, or the reducing the impact of potentially threatening processes. Action Statements, and accepted nominations under this Act, related to fish species or communities include: Silver Perch (No. 350), Dwarf Galaxias (No. 141), Australian Mudfish (No. 142), Yarra Pygmy Perch (No. 125) Barred Galaxias, *Galaxias olidus var. fuscus*, (No. 65), Trout Cod, *Maccullochella macquariensis* (No. 38), Variegated (Ewen's) Pygmy Perch, *Nannoperca variegata* (No. 42), and *Lowland riverine fish community of the southern Murray-Darling basin* (No. 459). Action Statements or accepted nominations for relevant potentially threatening processes include: altered fish regimes (No. 197), altered temperate regimes (No. 230), loss of riparian vegetation (No. 354), prevention of passage of aquatic biota as a result of the presence of instream structures (No. 292), increased sediment input into Victorian streams (No. 181), the removal of woody debris from streams (No. 118), and altered flow regimes (No. 197).
- *Fisheries Notes* are a series of fact sheets outlining DSE & DPI 's approach to various fish management issues. They include the stocking of various species and the management of noxious aquatic species.

Intended Management Action

In implementing the actions listed below, it is recognised that the risks associated with fish introductions, and aquatic introductions more generally, are also a national issue especially for waters within the Murray Darling Basin. As outlined previously the issue of fish introductions has already been given significant attention within Victoria and nationally. Consequently, the actions outlined here are intended to build on this existing work and provide improved consistency and effectiveness in the approach to fish introductions.

Assessment of the risk of fish introductions into Victorian river catchments

1. Assess introductions in accordance with the *Guidelines for Assessing Translocations of Live*

Aquatic Organisms in Victoria (Victorian Government 2003). A staged approach will be taken to the introduction of the Guidelines with a review of their effectiveness, including reducing risks to the values of waters in Victoria's river catchments, is scheduled for year four of their operation. Guideline implementation will also be supported by DPI and DSE through extension and enforcement programs.

Responsibility: DPI, DSE

Emergency response to unwanted fish populations

Early intervention, prior to a population of an unwanted fish species becoming established, provides the best chance of eradication, such as the response to the February 2001 discovery of carp in the Glenelg River Basin, which was previously free of this noxious species.

2. Undertake emergency responses to new introductions of unwanted fish. The decision to respond will be based on the risk, eg a new species or introduction to a new river basin of water body previously free of species, and the probability of success. In mounting emergency response DPI and DSE will seek the support of local stakeholders.

Responsibility: DPI, DSE

3. Periodically evaluate and update the list of designated Noxious Aquatic Species (Fisheries Act 1995). Promote this list, via the web, to alert the community and to ensure that legal controls can be put in place in the event of an emergency response to a new introduction.

Responsibility: DPI, DSE

Management of established pest fish populations

Carp are currently the focus of control efforts aimed at preventing its continued spread and to reducing its impact in areas where it is established.

4. Continue to work through the *National Management Strategy for Carp Control 2000-2005*.

Responsibility: DPI, DSE

5. Develop approved control plans for other established pest populations or for areas that they affect, where action is warranted.

Responsibility: DPI, DSE

Improved integration of decision making processes

A range of decisions taken by land, water and fisheries managers can affect the threat to Victoria's aquatic flora and fauna posed by

deliberate and accidental introductions. These decisions can often be taken in isolation from each other, and the implications of individual decisions may not be evident for some time. The development and implementation of regional catchment management plans, fisheries management plans and the River Health Strategy provide important ways to improve decisions that have implications for introduced fish populations or new introductions.

6. Where relevant, consolidate various policies related to fish introductions in Victoria's catchments.

Responsibility: DPI, DSE

7. Continue to work with and encourage relevant stakeholders to progressively improve decision making processes affecting fish introductions and introduced fish and to integrate decisions about fish introductions with progressively evolving arrangements dealing with biosecurity.

Responsibility: DPI, DSE

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Further information can be obtained from Department of Sustainability and Environment Customer Service Centre on 136 186.

Flora and Fauna Guarantee Action Statements are available from the Department of Sustainability and Environment website: <http://www.dse.vic.gov.au>

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