
PEST FISH THROUGHOUT NEW ZEALAND

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Natasha has worked on aquatic biosecurity issues for the last 16 years. She has been involved in all aspects of aquatic biosecurity management - legal, policy, operational, technical and research. She co-edited the New Zealand Invasive Fish Management Handbook published in 2015 and has a good grasp of pest fish issues in New Zealand.

TRANSCRIPT

Kia ora koutou. I have been asked to give a general overview of pest fish in New Zealand. Introduced fish are highly adaptable, frequently invasive and often cause problems. They are difficult to detect and notoriously hard to eradicate. For that reason it is no surprise that a group of goldfish is known as troubling. But it is not all doom and gloom. I will talk about what species are pests, who has a role in managing them, what problems they cause, what has been done about them and what we still need to work on.

| Year | Sanctioned | Illegal |
|-----------|----------------------------------------------------------|-----------------------------------------|
| 1861-1880 | brown trout, perch, tench, goldfish, brook char, catfish | |
| 1881-1900 | rainbow trout | |
| 1901-1920 | salmon (3 spp.), mackinaw, | guppy |
| 1921-1940 | gambusia | |
| 1961-1980 | (grass carp, silver carp) | rudd |
| 1981-2000 | | koi carp, golden orfe, caudo, swordtail |
| 2001-2005 | | [gudgeon][marron] |

I will start with fish introductions to New Zealand. We have 19 species of naturalised fish and two species - grass and silver carp, not thought to be able to breed here. Most introductions were planned to establish fisheries with the exception of catfish. Nobody really knows why catfish were introduced to New Zealand and it is possible that the wrong species of catfish was introduced. Gambusia were introduced as a mosquito controller and a forage food for valued species like trout. All the introductions after the 1960s have been done illegally or accidentally with the exception of grass and silver carp.

Legal status of introduced freshwater fish

| Freshwater Fisheries Regulations 1983 | | Biosecurity Act 1993 | Conservation Act 1987 | HSNO 1997 | No Legal Status |
|---------------------------------------|-------------------|----------------------|------------------------------------|--------------------------------------|------------------------------|
| Sports Fish | Noxious Fish | Unwanted organisms | Restricted Fish | Prohibited Organisms | |
| Trout (2spp) | Koi carp | Koi carp | Grass carp' | Stickleback | Brown bullhead catfish+ |
| Salmon (3spp) | Rudd (except A/W) | Gambusia | Silver carp' | Pike family | Golden orfe |
| Brook char | Piranha | [Gudgeon] | | Any venomous fish | Naturalised - aquarium fish* |
| Mackinaw | Pike | [Marron] | | | Aquarium fish in captivity |
| Tench | Walking catfish | Channel catfish | | | |
| Perch | Tilapia spp. | | Green - naturalised | Grey – only in captivity | Blue – not in NZ at all |
| Rudd (AW Fish & Game Region only) | | | Pink – possibly eradicated from NZ | Orange – can only breed in captivity | |



+ Must kill on capture (Fisheries Regs)
 *goldfish, guppy, swordtail, sailfin molly, caudo
 * Animal Welfare Act 'pest'

Not all introduced fish are considered pests. There are various different legal designations for introduced freshwater species - sports fish and noxious fish fall under the Freshwater Fisheries Regulations. Unwanted organisms are designated under the Biosecurity Act and restricted fish fall under the Conservation Act. Prohibited organisms come under the Hazardous Substances and New Organisms Act. Then we have a bunch of fish that have no legal status at all.

Take away sports fish that are highly valued, and fish not thought to be present in New Zealand, and fish only in captivity, and fish we think we have eradicated and cannot breed here, the species left are considered pests in New Zealand.

There are also a number of other classifications done through regional pest management plans which are made under the Biosecurity Act and administered by regional councils. These vary between species and regions throughout New Zealand.

- Exclusion
- Eradication
- Containment
- Suppression
- Restricted
- Progressive control
- Total control
- Surveillance
- Site led

So what! Isn't it good that we have lots of fish species in New Zealand? The trouble is pest species cause problems on multiple levels. They adversely affect our native species,

our freshwater ecosystems, whether it be re-suspension of sediments, excretion of nutrients, browsing or uprooting of macrophytes, causing changes to food webs and leading to algal domination of lakes.

**Dictionary Definition of
Pest fish vs invasive fish**

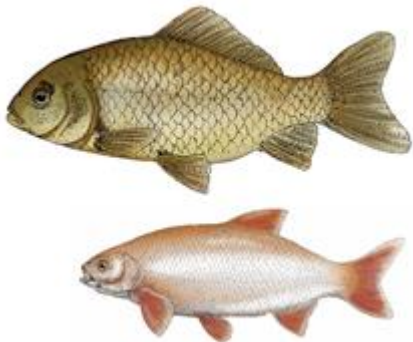
Pest species

- *Destructive animal that attacks crops, food, livestock, etc.*

Invasive species

- *Tending to spread very quickly and undesirably or harmful*

Many of our introduced fish species like trout are highly valued despite the impacts they have had on native species or the damage they have done to freshwater ecosystems. The terms pest fish and invasive fish are often used interchangeably in New Zealand and the dictionary definitions are not that different with the invasive definition probably highlighting the movement more than pest. In New Zealand the term pest fish is used to describe those species that have some classification in the legislation, and invasive is a more general term. So in my mind all our pest species are invasive but not all our invasive species are classified as pest fish.

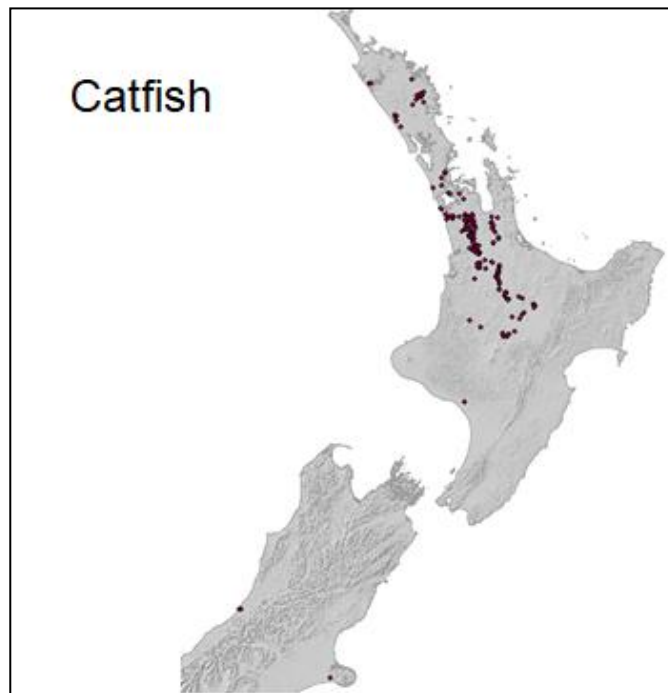


Feral goldfish and orfe

In the Waikato region rudd are classified as sports fish but are a noxious species in the rest of the country. Feral goldfish are well spread throughout the North Island and there is a debate about the effect that they have in some places and quite benign in others. They probably cause damage similar to what Koi carp do but in some places they are highly valued. Orfe or golden orfe were introduced into ponds in private property around Auckland. They have not been seen by a fisheries ecologist or scientist for about 20 years so we do not know if they are still present in New Zealand. The aquarium species that are found naturalised in some geothermal streams around the Central North Island are mainly aquarium escapees or releases. But I am not going to talk about these fish.

This morning I will focus on four fish all classified under the legislation.

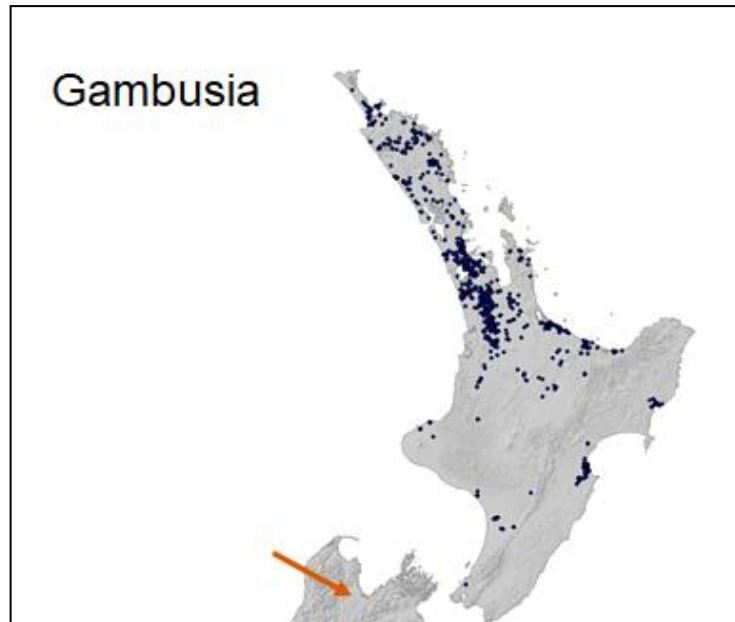
Catfish – 300 mm, prefer a wide range of habitats and slow flowing waters where they can use their chemosensory organs to hunt prey. They are very resilient and can survive long periods out of the water if their skin is kept moist. They can handle heavy metals and poor water quality. They are very opportunistic feeders and have a taste for our macro invertebrates, particularly kōura. They are known to modify invertebrate communities, ecosystem processes and nutrient statuses. They probably also compete with our native tuna or native eels. Their distribution is known to be from the Central North Island, the Waikato catchment and also spread up into Northland. We have two populations in the South Island which have been there since the 1800s, Lake Mahinapua on the West Coast and Lake Ellesmere on the east. We do not know why they have not spread and there are very low densities. It took us many, many years to find catfish in Mahinapua in our surveys.



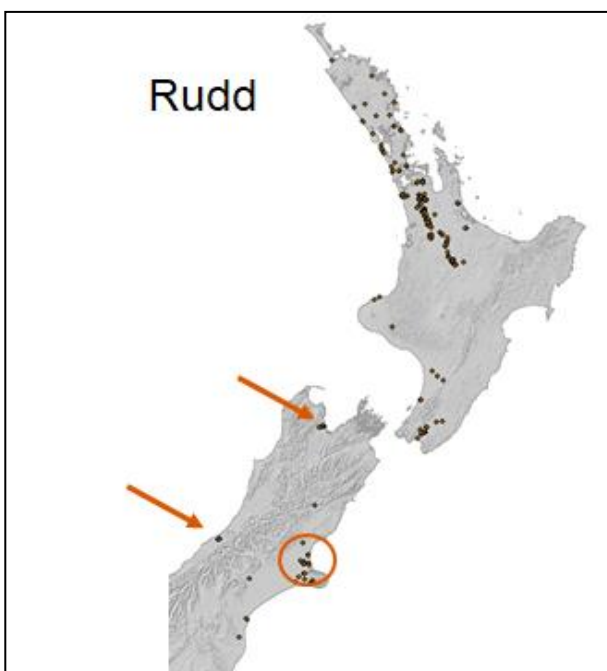
Gambusia – 30-60 mm, small fish, live bearers. The female is the larger animal. They have a very wide environmental tolerance managing to cope from ice cover through to water temperatures of 40 degrees. They handle oxygen depletion and very high salinities. They are known for their ability to gang up and nibble on native fish, eat their eggs, nibble their fins, eat their eyes. Their magnitude of problems is highly variable but probably their ecosystem effects have been underreported and through their selective removal of invertebrate grazers they can alter food webs. They are in the top half of the North Island



and in the last 20 years have spread east and south in the North Island and in 2000/2001 there was an incursion of gambusia into the South Island that has been subject to an eradication programme. We eradicated them from 68 sites and have 11 to go. We hope that eradication is still possible but they have been found in more natural systems in the Nelson region which makes getting rid of them a little harder.



Rudd – 250-300 mm, unfortunately prefer lakes, ponds, wetlands and margins of rivers and streams. They prefer native macrophytes and have been implicated in their collapse and reduction of water quality and excrete phosphorus. They do not digest all their plant material so it is returned to the water column contributing to algal



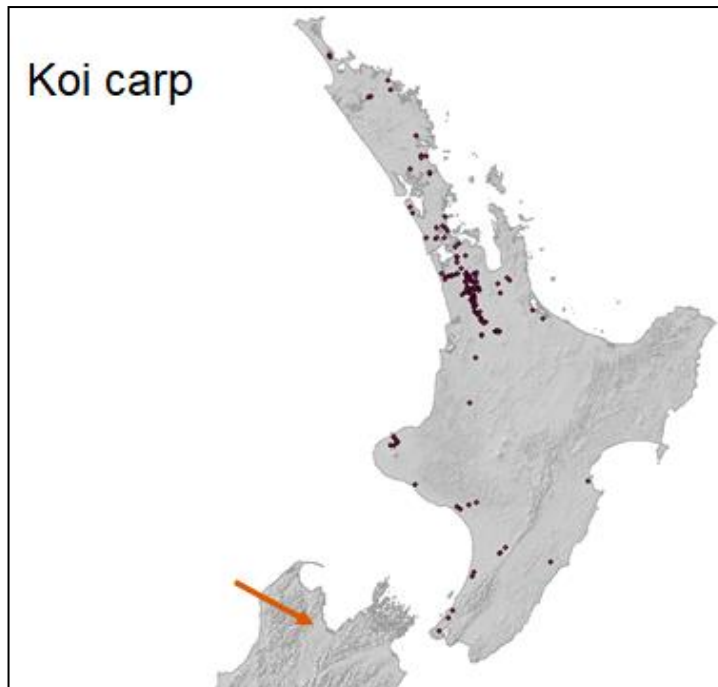
domination. Their diet overlaps with our native species of kōaro and dwarf īnanga and there is probably direct competition. They are found in the Waikato catchment and the lower North Island.

The distribution maps have been taken out of the New Zealand Freshwater Fish database and do not show the sites in the lower North Island that have been eradicated as have the sites in the South Island that are not within that orange circle. The rudd fishery around Canterbury is highly managed between the course fishers and the Department of Conservation and they are restricted mostly to ponds and sites outside of eradication programmes.

Associated with that gambusia incursion I spoke about, rudd were also detected

and we still have a handful of sites in Nelson to be eradicated. Unfortunately we had a recent invasion in Lake Lanthe; obviously a long way from other known populations so human induced spread.

Koi carp – 600 mm, our most common pest fish species built up to large numbers and highly visible. They suck up sediments and sift out organic material leaving distinctive pock marks. They then re-suspend the benthic sediments and nutrients leading to increase in turbidity. They also dislodge macrophytes and destabilise the banks. They are also in the Waikato catchment and spreading into Northland and the lower North Island. Some of those sites have been eradicated. Unfortunately, koi carp were picked up in that incursion in Nelson in the early 2000s but we think we have now eradicated koi carp from the South Island, probably about 5 sites.



Koi carp are a little different in that they have a containment area. (Slide next page) Within the containment area is a control/management approach to their numbers where a recreation and commercial harvest is allowed. The commercial harvest is a restricted fishery that is controlled and outside the containment area our preference is still for eradication. This is slightly at odds with its unwanted organism designation.

Koi carp Containment Area



Within CA

- Control/management
- Recreational & commercial harvest

Outside Containment Area

- Eradication

Who is responsible for pest fish?

Before things get to the border the Environmental Protection Agency are responsible through the Hazardous Substances and New Organisms Act. At the border, and with a pre-border role as well, we have the Ministry for Primary Industries. Once into New Zealand, if there is a new incursion of pest fish the Ministry for Primary Industries



is the lead agency. They would lead the response if we had an incursion of pike or largemouth bass.



For established pest fish species in New Zealand the Department of Conservation has a leading role under the Freshwater Fisheries Regulations and the Conservation Act but there are a lot of other players including regional councils, Fish & Game, Iwi. The legislation is driven within New Zealand by the Biosecurity Act and the Freshwater Fisheries Regulations under the Conservation Act.

Pest fish management principles –

- Prevent establishment into New Zealand. Once here prevent them getting into new places
- Once they are here, contain them where they are
- Eradicating priority pest populations
- Manage pest fish at high priority sites

This shows the distinction between a pest focus, which is targeting the organism or managing high value sites. It is an important thing when planning the management response.



A good pest fish programme

- Such a programme needs to be underpinned by public awareness and advocacy. Rivers and lakes can be like island catchments but if people are moving these fish around we will not get anywhere.
- It needs an inventory and surveillance programme, a detection programme that is manageable. Fish are notoriously hard to detect at low numbers and often by the time we detect them they are well established.
- It is important to have good local relationships and partnerships and ensure the programme meets all needs.
- Having a plan means knowing how to respond.
- It is vital to be backed up by compliance and law enforcement.

Success Stories

It is not all doom and gloom. The response to the South Island incursion of koi carp and gambusia went well because of the collaborations between agencies and stakeholders. One tool in our toolbox is the piscicide rotenone approved for use in New Zealand and we have done some eradications. As well as Nelson, in South and North Canterbury and the Lower North Island we have some control programmes. In Lake Rotopiko (Serpentine) Lake in the Waikato we actively control rudd and have managed to keep a native macrophyte community intact over the last 16 years.

There is a greater awareness of pest fish issues in New Zealand, some research and good surveys and awareness campaigns all supported by local initiatives. The Aquarium

Species Import Health Standard has been tightened up. When I first started working in this field there were thousands of fish that could be introduced into New Zealand. Whole genera were introduced but that list has been tightened up to include individual species, a much smaller list.

A whole lot of resources have been developed from survey guidelines determining eradication criteria, diving bird protocols to prevent by catch, cleaning your gear to prevent inadvertent spread of other pests.

Issues, Gaps and Challenges

There are no clear procedures or funding for response to important incursions and we lack some tools and the expertise and ability to respond as well. Management is fragmented with this overlapping jurisdiction and roles between agencies. Fish continue to spread but often at a regional level. If we act quickly then eradication is still feasible.

What do we need to focus on?

Pest fish work is hard. It is easy to ignore what happens under the water and hard to detect until they have established. To counteract that we need clear national direction that compels action. I am hopeful that the Freshwater Biosecurity Partnership will give leadership around the country. This group has grown out of the long-term Didymo response group, which has now widened to a Freshwater Biosecurity Partnership including people from industry, Iwi groups, regional councils and central government and Fish & Game.

We need clear funding priorities to make the case for increased investment or management. This work is often an easy area to cut funding from.

We need clarity on how to prioritise site or species incursions over other priority biodiversity work.

Collaboration is key, we need to work together to achieve pest fish control or eradication. We just need to get on and do it.

Thank you.