Impacts of introduced tilapia – Australia and overseas

Introduction: The black mangrove cichlid or ‘spotted tilapia’ (*Tilapia mariae*) and the Mozambique tilapia (*Oreochromis mossambicus*) were illegally introduced into Australian waterways during the 1970s. Both species have become well established in the relatively short time since their introduction. At first they were probably released as unwanted aquarium fish, and Mozambique tilapia are now established in catchments in tropical and subtropical Australia while black mangrove cichlids are mostly restricted to northeast Queensland. Both tilapia species are declared invasive pests in most Australian states. The rapid rate at which both species are spreading, together with evidence from overseas studies, suggests that they will have harmful impacts in Australia.

Impacts of Mozambique tilapia reported from overseas include:
- declines and localised extinctions of native fish species in central America, Sri Lanka, India, Mexico and Venezuela
- the collapse of milkfish aquaculture (*Chanos chanos*) on the Pacific Island of Nauru, due to tilapia overcrowding ponds and aggressively out-competing milkfish for food and space
- habitat damage through nest-building activities, including increased water turbidity, uprooting of aquatic vegetation, altered erosion patterns, and increased bank instability.

Reported impacts of black mangrove cichlids in the United States include:
- aggressive behaviour towards native fishes (eg Sunfish *Lepomis* spp.)
- declines in abundance of other native and exotic fishes
- outnumbering of local fish communities, in some cases making up more than half of the total fish biomass
- the potential to reduce the quality of spawning habitat available for native species.

In Australia, recent detailed studies of the biology of both species have identified potential impacts including:
- large areas of disturbed substrate (pond/river bottom) due to nest building
- damage to aquatic plants from nest-building activities
- disruption of spawning in native fishes.

Environmental impacts

Competition: Both species of tilapia introduced to Australia are highly aggressive when breeding and actively defend their territories and young from potential predators. Aggressive behaviour towards Australian native fish has been well documented, with tank trials showing the mere presence of Mozambique tilapia significantly disrupts the breeding success of the Australian eastern rainbow fish. Mozambique tilapia also have the ability to limit their physical size (‘stunt’) and mature at an early age. This means they can build up their population faster than native fish that can’t reproduce at the same rate. This rapid reproduction strategy, together with their aggressive behaviour, explains how tilapia can quickly exclude native fishes and become the most dominant fish species where they are introduced.

Habitat degradation: Tilapia can cause changes and damage to aquatic habitats. Black mangrove cichlids and Mozambique tilapia both dig out hollows or ‘nests’ in the river bed during breeding. When there are a lot of tilapia, large amounts of nest-building activities can cause damage to the bottom of waterways and harm aquatic plants. The damage caused by tilapia might not be as obvious as the damage caused to river bottoms by
the feeding activities of introduced carp, but scientific research has shown that Mozambique tilapia can reduce the population density of some Australian native aquatic plants.

**Disease:** There is potential for introduced fish to bring new types of pathogens and parasites with them. These infectious agents can be harmful to the health of native fish that have not previously been exposed to them. To date, there have been no confirmed cases of either species of tilapia introducing exotic diseases or parasites to Australian waters. However, it’s possible that the non-native external parasite *Trichodina heterodentata* was introduced to Australia with tilapia. This species of parasite has been recorded from cichlids (and Mozambique tilapia in particular) cultured in the Philippines.

**Economic impacts**

**Water quality:** The introduction of tilapia can decrease water quality in warm-water lakes and reservoirs. Evidence of this impact occurring overseas is from a different tilapia than those we have here; however, Australian water managers might face similar problems where tilapia have multiplied to huge numbers. During a dry year, managers might be reluctant to draw down dams to low levels if reservoirs contain large quantities of tilapia, for fear of mass tilapia deaths fouling the water. Other events resulting in large numbers of fish dying, such as cold weather (which has happened in southeast Queensland), also have the potential to foul domestic water supplies. Such events could have substantial economic flow-on effects if towns/cities are forced to buy water from alternative sources, and/or spend money on reducing the number of tilapia in the waterbody.

**Commercial and recreational fisheries:** The effect of introduced tilapia on fisheries resources has not been studied in detail in Australia. Competition for food, aggressive behaviour, habitat degradation and disease transfer are all potential impacts of tilapia on recreational and commercial fisheries. Despite this, in some countries Mozambique tilapia and similar species have been deliberately introduced to try and enhance local fisheries. One study on fish catch rates in a reservoir in Brazil where the closely related Nile tilapia (*Oreochromis niloticus*) had been introduced showed that fisheries were not actually enhanced. The catch rates of local fishers over a 30-year period were significantly reduced for commercially important native species, but increased for introduced Nile tilapia — giving no overall increase in the productivity of the fishery as a whole.

In Australia, commercial fisheries are mainly coastal and estuarine, but some of the target species such as barramundi need freshwater systems during parts of their lifecycle. So, any adverse impacts on freshwater systems caused by pest fish such as tilapia could impact on the productivity of associated fisheries.

Similarly, invasive tilapia populations have the potential to affect recreational fisheries by increasing the amount of ‘trash’ fish caught by anglers. This might have flow-on economic impacts on related industries such as tourism, especially if recreational fishing is a draw card for the affected area. The impacts might be felt more sharply in some rural and regional areas where recreational fisheries are an important part of the local economy.

**Social impacts:** People are less likely to use and enjoy public reservoirs and waterways if they contain too many pest species such as tilapia. For example, water bodies fouled by nest-building activities, the presence of dead fish, or even changes in what types of fish are caught, can all change the way the community perceives and uses the resource.

**Further information:**