photo courtesy of Gunther Schmida

Module 1:
Introducing tilapia

Objectives

- Participants will gain an understanding of why pest fish are a problem and what the main species are, with particular emphasis on Mozambique tilapia
- Participants will gain a broad knowledge of tilapia including their characteristics, biology, distribution, why they have become a problem and how they spread

Intended participants

- All stakeholder groups

Key messages

- Pest fish are a major threat to your local waterways
- Pest fish spread very quickly
- Pest fish are believed to be mainly spread by human activities
- Tilapia are threatening to invade the Murray–Darling Basin

Learning resources

- PowerPoint
- Case studies
- Learning activities

What makes an animal a pest?

Despite the best efforts of humans to eradicate them, many pest animals continue to thrive. But what is it that makes these animals so persistently invasive? Aside from the inconsistent attitudes of people to pests, explanations can be found in the special characteristics of a pest. A pest's success in Australia can mostly be attributed to specific aspects of its biology, combined with habitat disturbance that provides favourable conditions and a lack of predators and diseases that might otherwise limit its numbers and distribution.

What is a pest fish?

The term 'pest fish' refers to fish species that are not native to an area and that have potential negative social, economic or environmental impacts. Populations of pest fish have successfully established in many of our local waterways and are a major threat to the high diversity of native freshwater fish in Queensland and New South Wales.

The presence of pest fish in natural waterways can have some serious impacts such as:

Habitat

- decreased water quality
- increased water turbidity and siltation
- increased nutrient loads

Native fauna and flora

- introduction of diseases and parasites
- decreased biomass and diversity of rooted water plants
- reduced numbers and diversity of native aquatic fauna (through direct competition for food or space, or predation)
- decreased numbers and diversity of aquatic insects
- altered food chains and other ecological processes
- increased dominance of waterbodies by pest fish

Economic and recreational

- increased pressure on recreationally significant species through competition, etc.
- reduced environmental and conservation value of infested waterbodies
- diminished recreational value of infested waterbodies
- reduced value of recreational and/or commercial fisheries.

Furthermore, pest fish such as tilapia and gambusia often exhibit aggressive behaviour, resulting in reduced condition, increased risk of infection from wounds and a higher mortality of native fish.

Although the presence of pest fish can potentially have some devastating results, their impacts on a particular area will depend on the specific case; it is important to note that pest fish are often a symptom of a degraded habitat, not a cause.

There are four particular pest fish species that are having serious negative impacts on waterways in New South Wales and southern Queensland: carp (*Cyprinus carpio*), Mozambique tilapia (*Oreochromis mossambicus*), redfin (*Perca fluviatilis*) and eastern gambusia (*Gambusia holbrooki*). Of these species, the Mozambique tilapia (also known as the Mozambique mouth-brooder) is the only one currently not present in the Murray–Darling Basin (MDB). This pest fish has been listed in the top 100 of the world's worst introduced species and is regarded as one of the greatest threats to Australia's native biodiversity. Tilapia were first introduced into Australia in the 1960s as ornamental fish and now dominate many Queensland waterways. The species' success as an invader can be attributed to its ability to easily and rapidly breed, general hardiness, rapid growth rate and environmental plasticity.

***Figure 1.1** Carp (*Cyprinus carpio*)*

***Figure 1.2** Eastern gambusia (*Gambusia holbrooki*)*

***Figure 1.3** Redfin (*Perca fluviatilis*)*
photo courtesy of NSW DPI

***Figure 1.4** Mozambique tilapia (*Oreochromis mossambicus*)*

Things to know about tilapia

Breeding

The Mozambique tilapia is a mouth-brooder, which means that eggs and larvae are reared and protected in the adult's mouth. The female collects the fertilised eggs into her mouth from a circular pit or nest built (and aggressively defended) by the male. This technique ensures a high juvenile survival rate of 50–90 per cent. Furthermore, tilapia can often reproduce year-round, adding to their ability to quickly establish large populations in a waterway.
In poor environmental conditions, tilapia can use a breeding strategy called stunting, where earlier maturation at a smaller size enables the fish to concentrate their energy on reproduction instead of growth.

Figure 1.5 Mozambique tilapia nests

Figure 1.6 Female Mozambique tilapia carrying eggs in her mouth

Figure 1.7 Female Mozambique tilapia carrying juveniles in her mouth

Figure 1.8 Female Mozambique tilapia with juveniles

Habitat preference

Tilapia are habitat generalists, meaning they can adapt to many environments, including disturbed environments where they often flourish. Tilapia can prey shift allowing them to utilise available food sources under a wide range of environmental conditions. The stunting mechanism allows tilapia to exist in extremely high densities and to outcompete natives for food and space. They can survive in conditions too poor to support native fish species, as they can tolerate polluted and turbid waters. In environments with low levels of dissolved oxygen, tilapia can supplement their oxygen requirements by gulping air at the water's surface.

Tilapia are hardy fish, tolerant of a broad range of environmental conditions such as poor water quality, high salinity and high temperatures. They are reportedly able to survive and grow in seawater. They can also survive in water temperatures ranging from 8 °C to 42 °C,

giving them the potential to live in habitats covering a large portion of Australia. The lower temperature range, however, can be a limiting factor as they require temperatures greater than 16 °C to remain active and feed; temperatures greater than 20 °C are generally required for them to breed.

Generally speaking, tilapia inhabit mud-bottomed, well-vegetated areas in slow-flowing rivers and streams or still-water habitats. Tilapia also thrive in habitats that consist of the invasive wetland weed para grass (*Urochloa mutica*).

*Figure 1.9 An area infested by para grass (*Urochloa mutica*)*

*Figure 1.10 Para grass (*Urochloa mutica*)*

Diet

Although tilapia prefer a diet of organic material such as algae, animal waste and microscopic organisms, they are known to be flexible in their food choices and can adapt to alternative food sources available in their environment. Reports have shown that tilapia range from being herbivorous to totally carnivorous. Despite what some people believe, tilapia also prey on other fish; they have even been known to resort to cannibalism.

Distribution

Tilapia have established populations worldwide and pose severe ecological threats in most countries. In Australia, populations currently exist in a number of locations in tropical and subtropical areas, including both northern and southern Queensland. Tilapia are established in Western Australian rivers that closely resemble systems in the semi-arid north-west of the MDB. Although there are currently no reports of tilapia in the MDB, established populations are known to exist in waterways only a short distance away, such as Boondooma Dam in the Upper Burnett River system.

Many populations of tilapia also exist in the greater Brisbane area, including:

- the Pine Rivers catchment (including North Pine Dam and Lake Kurwongbah)
- the Caboolture River
- drains near Deception Bay
- the Brisbane River (including Lakes Wivenhoe and Somerset)
- the Bremer River near Ipswich
- the Tingalpa Reservoir
- parts of the Lockyer Valley
- the lower Albert and Logan rivers
- drainages near the Gold Coast.

In order to best use the resources available to tackle pest fish incursions, Queensland has refocused its activities to give priority to vulnerable catchments and 'hot spots' within those catchments. The focus is also on increasing community awareness, which, in combination with surveillance by fisheries teams, will increase the chances of early detection. The MDB has been identified as one of these vulnerable catchments.

To prevent the introduction of tilapia into the MDB, specific areas are currently targeted for community education, pest fish monitoring and surveillance, and control and eradication where necessary. These areas (listed opposite) are targets because of their direct links with the MDB, as well as demographic and geographic factors that put them at risk of an incursion. Some of these sites already contain established populations of tilapia and are regularly monitored for changes in the population dynamics that could increase the chance of tilapia spreading further.

Tilapia hot spots in and around the MDB

Caboolture River
Dalby
Kingaroy
Lake Kurwongbah, Petrie
Maroon Dam, Boonah
Moogerah Dam (near Aratula)
Oakey
Roma
Toowoomba
Upper Burnett River
Upper Stanley River
Warwick
Wivenhoe Dam

Figure 1.11 Oreochromis mossambicus *distribution throughout Queensland, as at April 2011*

How pest fish spread

The term 'new incursion' is used when a pest fish species is reported or sighted in an area where it has not previously been recorded. New incursions often occur as a result of the deliberate or accidental actions of members of the community. However, pest fish can also move up and down a river and its tributaries due to flooding or natural migration, resulting in expansion of existing populations or a new incursion in an area.

Examples of human-mediated new incursions include:

- people moving pest fish from one waterbody to another, either inadvertently or on purpose
- people dumping exotic aquarium fish into creeks and rivers
- people using pest fish as bait
- pest fish escaping from ornamental ponds or farm dams where they are cultured for consumption
- water transfers between river basins for irrigation and drinking purposes.

New incursions of tilapia can result from incidents such as those listed above, even if the fish involved are dead. This is because juvenile tilapia can survive for a considerable time in the female's mouth after the female dies. When a dead female is thrown back into a stream, any juveniles in her mouth can survive and breed.

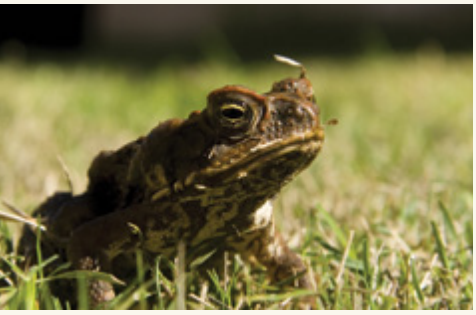
The spread of tilapia is alarming, with new incursions (mostly in Queensland) being confirmed at a steady rate since the 1970s. Particularly notable was the spread of tilapia throughout the Burdekin River system, which began in 2004. Within four years, tilapia had invaded 3000 km of the waterway. The list opposite is a chronology of tilapia spread throughout Australia from 1977 to 2009.

1977	Tingalpa Reserve, Qld (drinking water dams)
1978	Ross River, Townsville, Qld (botanic gardens)
1978	Cairns, Qld (urban creeks)
1979	North Pine Dam, Qld
1981	Carnarvon region, WA (farm dams)
1980s	Port Douglas, Qld (resort ponds)—eradicated
1986–2005	Upper Barron catchment, Qld (farm dams)
1996	Tinaroo Dam, Barron River catchment, Qld
2000	Boondooma Dam, Burnett River, Qld
2001	Brisbane River, Qld
2003	Ross Dam, Townsville (from farm dam) and upper Herbert (drinking water dam), Qld
2004	Burdekin, Qld (farm dams)
2005	Burdekin, Qld (different location)
2004, 2007	Endeavour River, Cooktown, Qld (farm dams)
2008	Eureka Creek, Mitchell catchment, Gulf of Carpentaria, Qld—eradicated
2009	Bullyard Creek, Kolan River catchment, Qld
2009	Burrum Heads, Burrum River catchment, Qld

Case studies

Cane toads

The classic example of a tropical Australian pest species is the cane toad (*Bufo marinus*), which was first introduced to far north Queensland in 1935. Soon after their introduction, cane toads rapidly spread throughout most of the eastern and northern parts of Queensland and northern New South Wales. Most recently, cane toads have started to colonise the Northern Territory at an estimated speed of approximately 30–50 km per year. In the near future, they are predicted to become established in the northern parts of Western Australia.



The cane toad (*Bufo marinus*)

Cane toads have become such successful invaders in tropical Australia because of unlimited food supply, suitable environment and low rates of predation. These factors have allowed dynamic reproduction and spread. Their continued spread is only limited by environmental factors, such as the availability of water for breeding, tolerable temperatures, suitable shelter and an abundance of food.

Tilapia in Lake Nicaragua

Lake Nicaragua is the largest tropical lake outside of Africa. It is a dominant feature of the geography of Central America and contains at least 16 species of native fish from the cichlid family. These fish are a large component of the native fishery and a vital resource in one of the New World's poorest countries.

In the early 1980s, an attempt was made to increase catchable fish by introducing tilapia as part of an extensive stocking program. In just a few years, local fishers saw a dramatic shift in the fish composition of the lake. The tilapia quickly adapted to their new habitat and grew rapidly, feeding on local plants and fish. They formed large feeding schools, moving through the lake system over long distances. By 1990, in some places, exotic tilapia constituted as much as 54 per cent of the fish being caught, while the biomass of native cichlids had declined by as much as 80 per cent. As a result, a considerable number of native cichlids are now declining.

The ability of tilapia to adapt to saltwater conditions poses a serious threat to Nicaragua's coast zone. Lake Nicaragua is connected by a major waterway, the Rio San Juan, to the Caribbean Sea. This is a large river in which fish, including such large species as the Caribbean bull shark (*Carcharhinus leucas*), move up and down; thus the river itself poses no barrier to migration. It is likely that tilapia will eventually move down the San Juan and out into the fertile coastal areas of the Caribbean, where they will colonise the shallows along the eastern coastline of Nicaragua. If populations of tilapia establish here, they may seriously affect the productive marine fisheries and vital nursery areas for millions of Caribbean marine fish.

Learning activities

Successful invaders

Purpose: To reinforce the specific biological traits that have enabled tilapia to become such successful invaders of aquatic ecosystems.

Since being introduced into Australia in the 1970s, tilapia have colonised and become the dominant fish species in many waterways. Their success as invaders can be attributed to which of the following? (Discuss with those around you and circle the appropriate answers.)

Tilapia can easily and rapidly breed

Tilapia have versatile feeding habits

Tilapia have a rapid growth rate

Tilapia feed only on a particular species of aquatic plant, which is found throughout Australia

Tilapia often have striking colouration, which scares off Australian native freshwater fish

Tilapia can withstand very low water temperatures (i.e. 5 °C and under)

Tilapia can tolerate harsh environmental conditions

Tilapia are larger than Australian native freshwater fish

Answer

Tilapia can easily and rapidly breed

Tilapia have versatile feeding habits

Tilapia have a rapid growth rate

Tilapia feed only on a particular species of aquatic plant, which is found throughout Australia

Tilapia often have striking colouration, which scares off Australian native freshwater fish

Tilapia can withstand very low water temperatures (i.e. 5 °C and under)

Tilapia can tolerate harsh environmental conditions

Tilapia are larger than Australian native freshwater fish

How pest fish spread

Purpose: To prompt participants to think about ways in which tilapia can spread between waterways and encourage them to have pest fish in mind when carrying out activities near waterways.

In small groups, discuss the ways in which pest fish, such as tilapia, can spread from one area to another. Can you think of specific examples of situations that might result in new tilapia incursions? Make a list of those you think might be most significant in your local area.

Impacts of tilapia

Purpose: To provide an understanding of how the specific behaviour and ecology of tilapia directly impacts aspects of natural habitats, native fauna, native flora, society and the economy.

Think about what you've just learnt about the Mozambique tilapia's behaviour and ecology (breeding, habitat preference and diet). Consider how these specific characteristics could impact on:

- the habitat
- native fauna
- native flora
- society
- the economy.

Use a whiteboard or butcher paper to list the impacts under each of these headings. For example, the nests built by male tilapia could potentially impact on a habitat by increasing turbidity; altering natural erosion patterns causing bank instability; and changing the physical structure of the habitat. It is important to note, however, that these are only possible impacts and that the actual impact of a tilapia incursion would depend on the specific case.

Biology overlap

Purpose: To demonstrate how the biology of tilapia can overlap with the biology of native fish fauna and the implications this may have.

As a group, discuss the information provided in the following table. Which aspects of the species' biology overlap and, therefore, how might the presence of tilapia impact on the native species listed? Use the information in the comments column to prompt discussion.

Comparison of the biology of tilapia (*O. mossambicus*) and the biology of fish species native to the Murray–Darling Basin
(compiled from various scientific sources)

Species	Spawning habitat	Spawning season	General habitat preferences	Diet	Temperature range	Maximum size	Comments
Tilapia *Oreochromis mossambicus*	Builds lekking nests on sloping banks, among aquatic vegetation. Mouth brooder	Spring to autumn when water is above 18–20 °C	Plastic in habitat preferences. Prefers slow-flowing waters, tolerates wide range of salinities	Omnivore. Includes macrophytes, phytoplankton, detritus, zooplankton, aquatic insects and small fish. Plastic behaviour. More likely to be a predator in environments with low productivity	8–39 °C	45 cm	Can dominate dry season pools. Can aestivate in sandy river beds. Has plastic breeding behaviour switching to altricial reproductive strategy under harsh conditions
Olive perchlet *Ambassis agassizii*	Lays adhesive eggs on aquatic macrophytes and rocks. May actively migrate to lagoons	Spring to autumn	Pools of low velocity and moderate depth. Often associated with macrophytes and filamentous algae	Small planktonic organisms and macroinvertebrates	Recorded between 11 °C and 33.6 °C	6 cm	This species has declined across the MDB. Spawning habitat could be vulnerable to tilapia
Silver perch *Bidyanus bidyanus*	Pelagic spawners, often migrate upstream to spawn	Spring and summer when temperature exceeds 23 °C	Slow pools often near woody debris or reeds	Omnivorous. Juveniles feed on filamentous algae and plankton. Adults feed primarily on macroinvertebrates and algae	Recorded between 2 °C and 36 °C	At least 50 cm	This species has declined across the MDB. Could compete with tilapia for food resources
Bony bream *Nematalosa erebi*	Still waters. Scatter buoyant eggs	October to February	Lowland and foothill rivers, larger streams and floodplain wetlands. Often in open water	Detritivore, consuming detritus, algae, microalgae, microcrustaceans, and small amounts of aquatic insects, terrestrial insects, molluscs and macrophytes	9–38 °C Low temperatures are thought to depress the immune response	47 cm Commonly to 20 cm	Diet may overlap that of tilapia leading to competition. Tilapia may predate on juvenile bony bream. However bony bream remain common in impoundments with tilapia. Could be greater impacts in ephemeral waterholes

Species	Spawning habitat	Spawning season	General habitat preferences	Diet	Temperature range	Maximum size	Comments
Unspecked hardyhead *Craterocephalus stercusmuscarum fulvus*	Adhesive eggs are scattered in the vicinity of cover (aquatic vegetation)	October to February when temperature exceeds 24 °C	Rivers, streams, and floodplain wetlands. Most common in pools of the foothill zone in the northern basin. Prefers slow-flowing or still habitats with aquatic vegetation	Aquatic insects, microcrustaceans	The coastal subspecies has been recorded between 12.4 °C and 30.9 °C. No data for Murray–Darling subspecies	7.8 cm	Lower Murray populations could be impacted by tilapia, through disruption of macrophyte habitats, predation of fry and some competition for food
Murray hardyhead *Craterocephalus fluviatilis*	Possibly similar to unspecked hardyhead	September to April	Margins of lakes, billabongs and wetlands. Some deeper areas with aquatic vegetation. Does well in ephemeral deflation basin lakes and tolerates saline environments	Microcrustaceans, aquatic insects and algae	No data	7.6 cm	This is a threatened species. Lower Murray populations could be impacted by tilapia through disruption of macrophytes and competition for food resources. Tilapia prefer similar habitats and also tolerate saline environments, where this hardyhead may currently have few competitors
Eel-tailed catfish *Tandanus tandanus*	Substrate spawner, constructing nests of pebbles and gravel. Eggs laid in nest among gravel. Male guards and tends eggs in the nest	Spring and summer when water temperatures are 20–24 °C	Slow-flowing streams, lakes and billabongs. Favours cover including snags, undercut banks and aquatic vegetation	Aquatic macroinvertebrates, including aquatic insects, macrocrustaceans and molluscs. Some fish are also consumed	8.4–33.6 °C (based on field records for South East Queensland populations)	90 cm, usually less than 50 cm	Tilapia may compete for nesting sites or disrupt catfish spawning sites
Hyrtl's tandan *Neosilurus hyrtlii*	Eggs scattered over sand and gravel substrates (Ross River). Non-adhesive eggs sink into spaces between rocks and gravel	Summer	Benthic species occurring in floodplain lagoons, waterholes, river pools and flowing areas	Benthic carnivore. Small macroinvertebrates, molluscs, detritus	Lower limits 8–12 °C Recorded in waters up to 36 °C	40 cm, usually under 28 cm	May compete for food. Tilapia may disrupt spawning substrate

Species	Spawning habitat	Spawning season	General habitat preferences	Diet	Temperature range	Maximum size	Comments
Rendahl's tandan *Porochilus rendahli*	Alligator River populations migrate to lagoons to spawn	Summer	In MDB recorded from lagoons, impoundments, river pools, anabranches and tributary streams in forested catchments. In Alligator Rivers Region prefers areas with dense aquatic vegetation	Benthic feeder. Microcrustaceans, aquatic insects, molluscs, detritus	Lower temperature unknown Up to 38 °C	24 cm	Tilapia may compete for food species. This species is restricted and not very abundant in the MDB. Tilapia could be a threat
Purple-spotted gudgeon *Mogurnda adspersa*	Rocks, logs and aquatic plants are used as spawning substrates. Males guard and care for eggs	Summer, when water temperatures are over 20 °C	Benthic species preferring cover such as rocks, cobble and aquatic vegetation. Found in slow-moving and still waters of creeks rivers and wetlands	Small fish, tadpoles, macroinvertebrates	In South East Queensland recorded between 11.9 °C and 31.7 °C	15 cm	Invasion by tilapia could threaten reintroduction of purple-spotted gudgeon in South Australia, through predation of juveniles and disruption of aquatic macrophyte habitat. Upper catchment populations unlikely to overlap with tilapia
Flathead gudgeon *Philypnodon grandiceps*	Eggs laid on wood and rocks and guarded by male	Spring and summer when temperatures are between 18 °C and 27 °C	Slow-flowing areas of lowland streams and lakes	Ambush predator of small fish, molluscs, tadpoles, macroinvertebrates	Likely to tolerate broad range of temperatures based on distribution. 11–31 °C in South East Queensland	11.5 cm	Juveniles could be prey for tilapia. Potential range of tilapia only overlaps with this species in Darling and lower Murray

Species	Spawning habitat	Spawning season	General habitat preferences	Diet	Temperature range	Maximum size	Comments
Dwarf flathead gudgeon *Philypnodon macrostomus*	Unknown	Recorded breeding between 19 °C and 22 °C in aquariums	Still waters over muddy substrates, also over rocky substrates and near weedy areas	Benthic carnivore, feeding mainly on aquatic insects	8.4–31.7 °C in South East Queensland	6.5 cm, usually under 4 cm	Potential overlap of range with tilapia in Condamine and lower Murray catchments. Predation by tilapia could reduce abundance of this already restricted (in the basin) and not very abundant species
Western blue-spot goby *Pseudogobius olorum*	Aquatic vegetation in brackish and freshwater. Male guards and fans eggs	Spring	Estuaries, lower reaches of freshwater streams and lakes. Benthic over mud or rocky bottoms and in weedy areas	Benthic crustaceans, algae	No data	6 cm	Tilapia could impact on this species if it colonises the lower lakes. Tilapia have adversely impacted gobies in Fiji
Lagoon goby *Tasmanogobius lasti*	Estuarine and freshwater habitats	No data	Still and slow-flowing habitats over sand, silt and mud substrates	No data	No data	5 cm	Tilapia have adversely impacted gobies in Fiji
Flat-headed galaxias *Galaxias rostratus*	Benthic spawner	August–September when temperatures exceed 10.5 °C	Slow-flowing waters, billabongs, lakes, swamps and rivers	Aquatic insects and microcrustaceans	No data	14.6 cm	Range of this species and tilapia only likely to have limited overlap. Tilapia could potentially impact lower Murray populations, where this species is already rare
Common galaxias *Galaxias maculatus*	Brackish areas. Landlocked populations spawn in tributary streams on rising flows, laying eggs on terrestrial vegetation	Autumn	Slow-flowing streams, margins of lagoons and lakes. Juveniles occupy shoreline vegetation	Microcrustaceans, insect larvae, terrestrial insects	No data but has temperate distribution	19 cm	Tilapia could interact with lower lake populations. May compete for juvenile habitat or could be potential predator of fry

Species	Spawning habitat	Spawning season	General habitat preferences	Diet	Temperature range	Maximum size	Comments
Desert rainbowfish *Melanotaenia splendida taetei*	Aquatic vegetation or roots of riparian vegetation	When temperatures exceed 20 °C	Slow-flowing and still habitats, including waterholes and ephemeral rivers	Omnivorous. Small aquatic invertebrates and filamentous algae	Likely to tolerate high temperatures	9 cm	Tilapia could dominate and compete for food in drought refugia. Tilapia may prey on juvenile rainbowfish
Murray–Darling rainbowfish *Melanotaenia fluviatilis*	Spawn among aquatic plants	Spring summer when temperatures exceed 20 °C	Slow-flowing rivers, wetlands and billabongs	Aquatic and terrestrial invertebrates and some filamentous algae	Fairly wide range of temperatures tolerated, but tends to be absent from colder areas	9 cm	Tilapia could dominate and compete for food in drought refugia in northern basin. Tilapia may prey on juvenile rainbowfish or graze on spawning habitat
Southern pygmy perch *Nannoperca australis*	Non-adhesive eggs scattered over the bottom substrate or among aquatic vegetation	September–January when temperatures exceed 16 °C	Slow or still waters with dense aquatic vegetation and cover	Microcrustaceans, small insect larvae and aquatic insects	No data	8.5 cm	Tilapia could threaten reintroduction and management efforts of this species in South Australian lower lakes. Impacts could include predation and disturbance of preferred habitat type
Yarra pygmy perch *Nannoperca obscura*	Unknown—suspected to have breeding behaviour similar to the southern pygmy perch *Nannoperca australis* (above)	Spring, when temperatures are between 16 °C and 24 °C	Slow-flowing or still waters with abundant cover and aquatic vegetation	Insect larvae and microcrustaceans	No data	7.5 cm	This species is already rare in the lower lakes. Tilapia could be a further threat through predation of fry, destruction of habitat and competition for food

Quiz

1. The definition of a pest fish is:
   a) A native fish species that has significantly increased in population size
   b) A fish species that has been introduced to control insect pests
   c) A fish species that is not native to an area and can potentially have negative social, economic or environmental impacts
   d) A species of fish that dominates a waterway

2. Which four main pest fish species are having serious negative impacts in New South Wales and Queensland?
   a) Carp, Mozambique tilapia, redfin and gambusia
   b) Carp, Nile tilapia, red devil and gambusia
   c) Carp, goldfish, Mozambique tilapia and gambusia
   d) Carp, Mozambique tilapia, redfin and goldfish

3. Which fact about the Mozambique tilapia is false?
   a) It is a mouth-brooder
   b) The males build nests for breeding purposes
   c) They can often reproduce year-round
   d) Females give birth to live young

4. Stunting is:
   a) When pest fish exist in small populations but still have negative impacts on the ecosystem
   b) A phenomenon where fish can mature earlier and concentrate their energy on reproduction instead of growth
   c) A fish disease resulting in the production of smaller eggs and juveniles
   d) When pest fish put pressure on native fish, resulting in native fish maturing earlier and at smaller sizes

5. Which statement is true?
   a) Tilapia can survive in water temperatures as low as 4 °C.
   b) Tilapia can survive for a long time outside of water, allowing them to migrate between unconnected waterways
   c) Tilapia cannot survive in water with low levels of dissolved oxygen
   d) Tilapia can survive in seawater

6. Mozambique tilapia mainly eat:
   a) Native fish such as gudgeons and bream
   b) Organic material such as algae, animal waste and microscopic organisms
   c) The roots of large aquatic plants
   d) Juvenile tilapia

7. In Australia, populations of Mozambique tilapia are currently known to exist in:
   a) Queensland, New South Wales and Western Australia
   b) Western Australia and Queensland
   c) Queensland and New South Wales
   d) Queensland and the Northern Territory

Answers

1. c) A fish species that is not native to an area and can potentially have negative social, economic or environmental impacts

2. a) Carp, Mozambique tilapia, redfin and gambusia

3. d) Females give birth to live young

4. b) A phenomenon where fish can mature earlier and concentrate their energy on reproduction instead of growth

5. d) Tilapia can survive in seawater

6. b) Organic material such as algae, animal waste and microscopic organisms

7. b) Western Australia and Queensland

FAQs

Do people eat tilapia?

Tilapia is a popular food fish in Asia, Africa and the South Pacific. However, the use of tilapia for consumption in Queensland is illegal.

Are there other species of tilapia in the wild in Australia (other than Mozambique tilapia)? Where?

The spotted tilapia (*Tilapia mariae*) is another species of tilapia that has established breeding populations in Australian waters. It is found in northern Queensland waters around the Cairns region and also in the heated waters of the Hazelwood Power Station pondage near Morwell in Victoria. An outbreak of redbelly tilapia (*Tilapia zilii*) occurred near Perth, Western Australia, in 1975, but was eradicated by the state fisheries department. There are currently no reported outbreaks of any tilapia species in New South Wales waters.

How big do tilapia grow?

Mozambique tilapia usually grow to a maximum of 40 cm in length. However, much larger individuals have been reported in estuarine creeks in South East Queensland.

There are already large populations of carp in my local area. Will tilapia still be a problem if they are introduced as well?

Yes, tilapia and carp fill different niches, meaning they have different roles and effects in the aquatic community. Therefore, the combined impact of both of these pest species will be greater than the impact of one of the species alone.

Can recreational anglers target tilapia?

Tilapia may be captured during recreational fishing; however, their possession in Queensland is illegal. Therefore, any tilapia captured must be euthanised and disposed of straightaway. The most humane way to euthanise tilapia is to stun the fish with a sharp blow to the head just above the eyes, causing brain destruction. It can be disposed of in an appropriate rubbish bin or buried well away from the water. The most important things for recreational anglers to remember are not to use tilapia as bait, alive or dead, and not to release tilapia back into a waterway.

What do I do if I already have tilapia in my farm dam?

Phone the DEEDI Customer Service Centre on 13 25 23 or NSW DPI on (02) 4916 3877 and speak to a pest fish officer who will provide appropriate recommendations and may organise an inspection of the waterbody if necessary.