



Biology and ecology of Mozambique tilapia (*Oreochromis mossambicus*)

Introduction: Mozambique tilapia, *Oreochromis mossambicus*, was thought to have been introduced illegally into Australian waterways during the 1970s. Since then the species has spread, with established populations now present in many water bodies in Queensland and Western Australia. It is continuing to expand its range and is likely to present a significant pest problem.

Synonyms and common names: *Chromis mossambicus* (Peters 1852), *Chromis dumerilii* (Steindachner 1864), *Chromis niloticus* var. *mossambicus* (Peters 1852), *Chromis vorax* (Pfeffer 1893), *Chromis natalensis* (Weber 1897), *Sarotherodon mossambicus* (Peters 1852), *Tilapia mossambica* (Peters 1852), *Oreochromis arnoldi* (Gilchrist and Thompson 1917), tilapia, Mozambique tilapia, Mozambique mouthbrooder.

“ Adult Mozambique tilapia can grow to over 40 cm and live for up to 10 years ”

Description: The Mozambique tilapia is a deep-bodied cichlid fish native to the eastward-flowing rivers of central and southern Africa¹. It varies in its appearance due to its ability to interbreed with related species of cichlids. It can also alter characteristics such as body size and age at sexual maturity in response to differing environmental conditions¹. Generally, both sexes have a long, continuous dorsal (upper) fin that starts from above the gills and continues along the majority of the upper body. The dorsal and anal fins are elongated towards the end of the fish and easily

reach to the tail fin when depressed against the body. The tail fin is rounded and often has a red margin in adult fish.

Sexually mature males differ from females in a number of ways. They have a slightly concave forehead, with a protruding jaw and thickened lips. Males can also display breeding colouration where the top two thirds of the fish is a dark grey or a deep purple-black, and the lower third is a light cream or a light grey colour – especially the lower cheeks and jaws.



Protruding jaw and thickened lips of male Mozambique tilapia. Image: Department of Employment, Economic Development and Innovation (DEEDI), Queensland

Sexually mature females and immature males display the same light cream or light grey underbelly that blends to a darker grey or silvery-olive colour on the upper half of the body. Juvenile and sub-adult fish are usually a much lighter, silvery-grey colour. Females and sexually immature males can have up to five dark coloured, circular blotches along the mid-section of their body. Fish that are less than 10 cm long often have dark vertical stripes along the sides of the body with a dark black spot present at the base of the dorsal fin. This spot is sometimes also ringed by a lighter grey margin and is often referred to as the ‘tilapia spot’.

Mozambique tilapia can live for up to ten years and reach a length of over 40 cm under optimal conditions, with males typically growing larger than females. For example, in Lake Tinaroo (a large impoundment in north Queensland), males have been captured as large as 46 cm and up to 2 kg². Females in this lake were slightly smaller, with a maximum length and weight of 43 cm and 1.8 kg respectively². However, where environmental conditions are poor, such as in disturbed habitats, Mozambique tilapia can 'stunt' their growth and mature at much smaller sizes. For example, fish collected from shallow urban drains in the Cairns region of north Queensland were found to be sexually mature as small as 7 cm in length².

Habitat: Mozambique tilapia generally prefer slow-moving water bodies such as lagoons, rivers and impoundments, but can also colonise faster-flowing creeks and streams. In addition to fresh waters, this type of tilapia can also live in habitats influenced by tides, such as the upper reaches of estuaries and coastal lagoons. Mozambique tilapia are often the most abundant species in disturbed habitats like urban drainages, since they can tolerate a broad range of conditions. Rehabilitation of these degraded areas (eg through tree planting and water quality management) can allow native fish to recolonise these systems and might reduce the number of pest fish present.



Mozambique tilapia are capable of surviving in a wide range of different habitat types, such as this example of a degraded urban drainage. Image: DEEDI, Queensland

Mozambique tilapia are thought to be one of the most salt-tolerant of all the tilapia species, tolerating salt concentrations of 0-120 parts per thousand (ppt; seawater is 35 ppt)³. In Western Australia, fish have been found living in small isolated pools at salinities of 95 ppt⁴. This tolerance of such high salinities suggests that Mozambique tilapia could live in marine areas, but their distribution within Africa and Australia indicates that they prefer fresh water.

The optimal temperature range needed by Mozambique tilapia for growth and reproduction is 22-30°C. The species can, however, survive at temperatures between 16 and 39°C. The distribution of Mozambique tilapia in southern Australia is likely to depend on how cold the water is. For example in 2007, large numbers of Mozambique tilapia died in southeast Queensland when water temperatures fell to 11°C⁵. Survival at low temperatures, however, can be increased where waters have a higher salt content than pure freshwater. In South Africa, Mozambique tilapia have been found to survive temperatures as low as 11°C in brackish waters³.

Nutrition: Mozambique tilapia are opportunistic omnivores and will eat algae, plant matter, organic particles, small invertebrates and fish¹. Such a broad diet enables them to colonise different environments, since they don't rely on any particular food source. In situations where there are many tilapia in one spot, adults sometimes cannibalise younger fish.

Reproduction: Mozambique tilapia are polygynous (ie males mate with multiple females) and brood embryos and young fry in their mouth – known as mouth brooding. They can reproduce under a variety of different ecological conditions. Due to their ability to stunt their own growth, Mozambique tilapia can also vary greatly between populations in their reproductive characteristics. For example, in an upland dam in north Queensland where conditions are fairly stable, males and females reach sexual maturity around three years of age at an average length of 38 cm¹. Females in this system produce an average of around 2300 eggs each spawning¹.



Mouthbrooding Mozambique tilapia. Image: DEEDI, Queensland

In disturbed urban drains in the Cairns area where conditions fluctuate widely, females and males reach sexual maturity as young as one year of age at lengths as small as 7-10 cm¹. Females in this system produce an average of 380 eggs each spawning¹.

Mozambique tilapia are also prolific spawners, having the ability to spawn and rear multiple broods of young during a season. For example, in South Africa, females have been seen spawning up to five times over a four-month period⁶. In northern Australia there is also evidence that Mozambique tilapia are serial spawners. In coastal areas near Cairns, individual fish are present in spawning condition for all or most of the year with a peak in spawning during late spring and summer in this region¹. In southeast Queensland and cooler upland areas of north Queensland, fish generally only spawn during the warmest months of the year when water temperatures go above 23°C⁷.

“ High levels of parental care give Mozambique tilapia a competitive advantage over Australian native fishes ”

During breeding, male Mozambique tilapia compete for females to spawn with by congregating together and forming dense mating territories known as ‘leks’. Here, each male builds a scooped-out nest (a hollow in the mud/sand) that he actively defends

against other males through displays and physical aggression. Generally, the largest male will win territorial contests and this is advertised to females and other males through particular sounds¹ and urinary odours⁸. Once a female has chosen a male, she will swim over his nest where courtship and spawning take place. Females lay their eggs into the males’ nest before picking them up in their mouth. The male then immediately releases milt (sperm) over the nest, which the female gulps at to fertilise her eggs. The female then abandons the male to set up her own territory where she broods the embryos in her mouth for a period of 20-22 days¹. Once the fry are free swimming, they will leave the female for brief periods but return to her mouth if threatened. Females aggressively defend eggs and fry from predators during this time.



'Stunted' female Mozambique tilapia (9 cm length) with mouth brood of eggs. Image: DEEDI, Queensland

Uses: In their natural range, Mozambique tilapia are extensively used as food by traditional fishers. The species has also been spread widely around the world as an aquaculture fish, as part of the ornamental fish trade and, to a limited extent, as a biological control agent⁹. Mozambique tilapia are attractive for aquaculture largely because they can be successfully farmed at high densities and in often poor quality water. They will also eat a wide variety of foods, including cheap plant-based feeds such as soy or corn. However, recently their popularity as a farm fish has fallen, with farmers preferring to culture tilapia hybrids that don't stunt at high densities like Mozambique tilapia do.

The use of Mozambique tilapia as a biological control agent has mainly been for the control of aquatic plants and mosquito larvae in the United States. This was done intentionally by state and federal agencies, but had mixed results^{9,10}. In Australia, Mozambique tilapia were originally imported from southeast Asia as an ornamental fish. This occurred despite the species being on the banned import list since the 1960s. Currently, there is no legal use for live Mozambique tilapia in Australia.

Further information:

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Adult Mozambique tilapia. Image: DEEDI, Queensland