

NEW ZEALAND MUDFISHES



A GUIDE

Nicholas Ling

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New Zealand mudfishes: a guide

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Introduction

New Zealand's mudfishes are unusual fish by any standards. When their wetland habitats dry out in summer, they burrow into the soil and remain there, motionless, breathing air, until the first decent flood of autumn refills the wetland and washes them from their refuge. Few fish species worldwide have such ability to survive for extended periods out of water. Early settlers in New Zealand were surprised to find live fish when digging vegetables from the earth. This ability to survive prolonged periods of drought allows them to colonise habitats that would be unsuitable for conventional fishes, which cannot survive out of water.

These cryptic, nocturnal fish were probably once the most abundant freshwater fish in New Zealand. However, the loss of more than 90% of our wetlands over the past two centuries has confined them to a few refuge habitats still threatened by development of adjacent land. Although mudfish are sometimes encountered by farmers when digging or clearing drains, their existence is not widely known to the general public due to their cryptic or reclusive nature. They are all quite small, averaging around 100 mm in length, and dirty brown or black in colour. This makes them hard to spot in their swampland habitats even when they are active during the day.

Mudfishes are our most specialised group of freshwater fish and a unique component of our natural heritage. Urgent and careful management of their remaining habitat is essential to ensure that they remain with us throughout the twenty-first century.

What are mudfish?

Four species of mudfishes are recognised in New Zealand, with a further species occurring in Tasmania (the Tasmanian mudfish, *Neochanna cleaveri*). Apart from the recently discovered Northland mudfish, whose distribution overlaps with that of the black mudfish, the species have quite disjunct distributions throughout the North and South Islands.

Mudfish belong to the genus *Neochanna* in the family Galaxiidae, our most numerous group of freshwater fish. Including the mudfishes, there are twenty-one galaxiid species represented in New Zealand; more than fifty percent of our native freshwater fish fauna. This ancient family of fishes originated on the prehistoric super-continent of Gondwana and is found throughout the temperate Southern Hemisphere.

Like all galaxiids, mudfish are elongate fish lacking scales, and have a thick leathery skin with a coating of mucus that protects the fish against infection, and also reduces desiccation when out of water. However, mudfish differ from other galaxiids in a number of ways. They have either very reduced or absent pelvic fins and are more eel-like in form. They also have characteristic differences in the bones of the head and in the teeth.

Some of the galaxiid species are diadromous, meaning that their life cycle involves both marine and freshwater stages. Adults migrate down rivers in the spawning season to lay eggs. The hatching young are washed out to sea and subsequently return to freshwater as whitebait. By contrast, mudfish have abandoned the sea and spend their entire life cycle in freshwater.

Mudfish habitats and ecology

Mudfish generally occupy habitats that dry out over summer months, forcing the fish to aestivate during this period (see page 7). This relieves competition, and even predation, from other fish species since these cannot survive such prolonged periods of drought. However, the common name mudfish is somewhat incorrect in that all species actually prefer clear, non-turbid water rather than muddy habitats.

The black mudfish and its relative, the Northland mudfish, seem to have the most specialised habitat requirements of all mudfish species. They are obligate swamp dwellers, mostly confined to infertile or oligotrophic bogs on acidic peaty soils that are dominated by reeds such as *Baumea* or *Schoenus*. They prefer clear rather than turbid water, and are not generally found in eutrophic wetlands characterised by vegetation such as *Typha orientalis* (raupo or bulrush).



Figure 1 Black mudfish habitat - the Kaimaumau wetland near Kaitaia.

The close relationship between the two northern mudfish species and substrate type is illustrated in Figure 2. Mudfish have only been recorded in Northland from wetlands associated with acidic soils. Unfortunately, very little original mudfish habitat remains and what is left is rapidly disappearing. Many sites are such small remnants that their future seems very uncertain, since water levels in small wetlands can be very unstable.

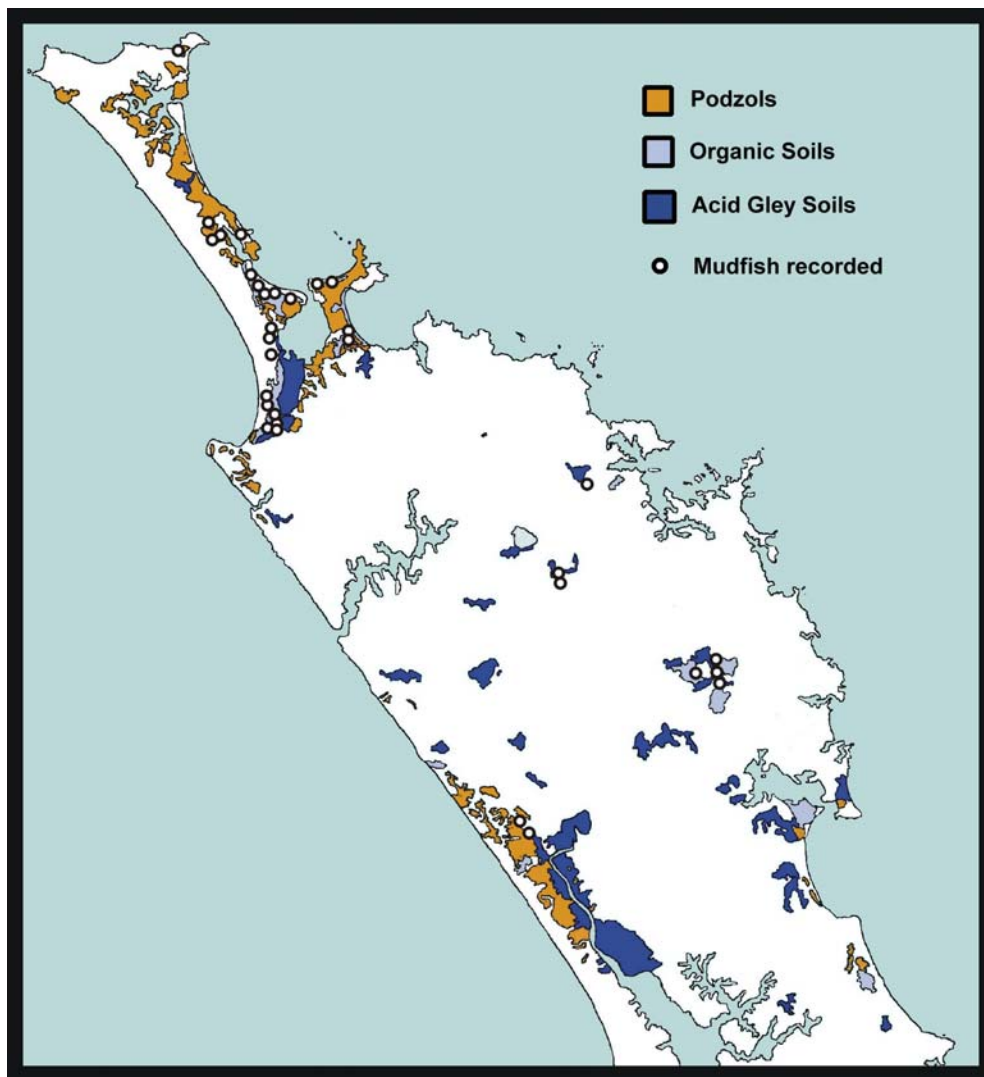


Figure 2 The recorded distribution of the two mudfish species occurring in Northland closely matches wetlands associated with acidic soils.

Unlike both the northern species, brown mudfish tolerate a wide range of habitats from the peaty pakihi bogs of the West Coast, to eutrophic raupo swamps, swampy lake margins, forest pools, and even spring-fed swampy streams.



Figure 3 Brown mudfish habitat – a sphagnum bog (pakihi) in podocarp forest on the West Coast of the South Island.

Brown mudfish, like the other species, become sexually mature during the summer aestivation so that spawning can occur as soon as enough water is available. This gives the offspring the greatest possible time to grow before they, in turn, are forced to undergo their first aestivation the following summer. Because the metabolic rate of animals is inversely related to their size, the bigger a fish is, the longer it is likely to survive these extended periods without feeding.

Canterbury mudfish are seriously threatened by habitat destruction. Although extensive areas of true wetland may once have existed on the Canterbury Plains, these have all but disappeared due to land development and agriculture. Canterbury mudfish are now mostly found in overgrown ephemeral streams, often fed by seasonal springs. These are often gravel-bedded; fish burrow into banks or under vegetation to aestivate.



Figure 4 Canterbury mudfish habitat – a seasonal, spring-fed, gravel-bedded stream on the Canterbury Plains.

All species including the Canterbury mudfish are generalised opportunistic carnivores that will eat almost anything of appropriate size. The tiny newly hatched fry, only 5 to 7 mm long, are active by day, feeding in mid-water on any small aquatic zooplankton. After two months, when they have reached a length of about 35 mm, they become nocturnal like the adults and feed mostly on small crustaceans, earthworms, the larvae of aquatic insects, and forage for trapped insects at the water surface.

Aestivation – a fish out of water

Many galaxiids, including some of our more common species such as the banded kokopu, can survive out of water for short periods, perhaps several days. However, mudfish regularly survive periods of emersion lasting for several months each summer. This process is called aestivation and is the summer equivalent of hibernation. Their survival depends on finding a suitable refuge that provides adequate access to air yet also remains damp to prevent dehydration. Suitable locations include burrows in damp mud, or under dense clumps of vegetation, logs or other litter.

Studies on the black mudfish show that they reduce their metabolic rate by around 60% and remain mostly inactive throughout the period of aestivation. The lungfishes of Africa and South America also undergo aestivation by burrowing into damp mud and can remain in a state of truly suspended animation, or torpor, for a year or more. However, mudfish do not undergo torpor and remain alert throughout the aestivating period. If an aestivating mudfish is returned to water, it will become active immediately.



Figure 5 Black mudfish aestivating in damp mud in a Waikato farm drain.