

# New Zealand mudfish (*Neochanna* spp.) recovery plan 2003–13

Northland, black, brown, Canterbury and  
Chatham Island mudfish

THREATENED SPECIES RECOVERY PLAN 51



Department of Conservation  
*Te Papa Atawhai*

# New Zealand mudfish (*Neochanna* spp.) recovery plan 2003-13

Northland, black, brown, Canterbury and Chatham  
Island mudfish

THREATENED SPECIES RECOVERY PLAN 51

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Above, left: Northland mudfish (*Neobanna beletos*). Photo: Nicholas Ling.

Above, right: Black mudfish (*N. diversus*). Photo: Nicholas Ling.

Below, left: Brown mudfish (*N. apoda*). Photo: Nicholas Ling.

Below, right: Canterbury mudfish (*N. burrowsius*). Photo: Tony Eldon.

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# Abstract

A significant decline in the numbers and distribution of mudfish (*Neobanna* spp.) has led to the preparation of a recovery plan covering the Canterbury mudfish (*Neobanna burrowsius*), brown mudfish (*Neobanna apoda*), black mudfish (*Neobanna diversus*), Northland mudfish (*Neobanna beleios*) and the recently discovered Chatham Island mudfish. Historically the loss of wetlands has severely impacted on the habitat and distribution of all the mudfish species. The long-term goal of this recovery plan is to maintain and improve the geographic range, habitat and genetic diversity of all the species. It sets in place actions for managing listed key mudfish sites (selected to include large populations, key scientific sites and sites to cover the full geographic range of each species). This plan also recognises that advocacy under the Resource Management Act (RMA) and working proactively with the community will be essential actions to achieve protective measures for mudfish habitat.

# 1. Introduction

The endemic non-migratory Canterbury mudfish (*Neochanna burrowsius*), brown mudfish (*Neochanna apoda*), black mudfish (*Neochanna diversus*), Northland mudfish (*Neochanna beletos*) and the recently discovered Chatham Island mudfish (McDowall in press), are distributed throughout New Zealand in isolated relict populations. The species generally occur in geographically distinct ranges, although some overlap occurs between the black and Northland mudfish. Landuse intensification in New Zealand has resulted in severe degradation, fragmentation and loss of mudfish habitat.

These fish species are descendants of tangaroa (nga uri o tangaroa) and as such are nga taonga tuku iho o nga tupuna matua (treasures handed down to us from our ancestors). The Ngai Tahu Claims Settlement Act 1998 requires the Department of Conservation to consult and have particular regard to the views of Ngai Tahu when making decisions regarding the management of taonga species, such as Canterbury mudfish.

Under the New Zealand 'threat of extinction' classification system (Hitchmough 2002; Molloy et al. 2002) the Canterbury and Northland mudfish are ranked as acutely threatened species that are Nationally Endangered, and the brown and black mudfish as chronically threatened species in Gradual Decline. A Data Poor qualifier applies to the Northland mudfish reflecting the absence of information on ecology and life-history of this species. The Chatham Island mudfish has not yet been ranked, but is likely to have a similar ranking to Northland and Canterbury mudfish, given its very limited distribution.

The intention of this recovery plan is to provide strategic guidance to Department of Conservation freshwater fish conservation management in order to achieve greater coordination nationally and to ensure the highest priority recovery work is undertaken. This recovery plan is intended to sit alongside Conservancy Conservation Management Strategies as a means to assist with Conservancy and Area business planning. This plan sets out the recovery programme for threatened mudfish species over the next 10 years (2003-13). It has been produced in tandem with a large galaxiid recovery plan, and non-migratory galaxiid recovery plan with the aim of guiding the conservation management of New Zealand's threatened freshwater fish species over the next 10 years. These plans have been produced under the overarching guidance of the DOC statement of intent (DOC 2002), and will be linked to the strategic action plan for freshwater (FreshSAP) which is currently being produced.

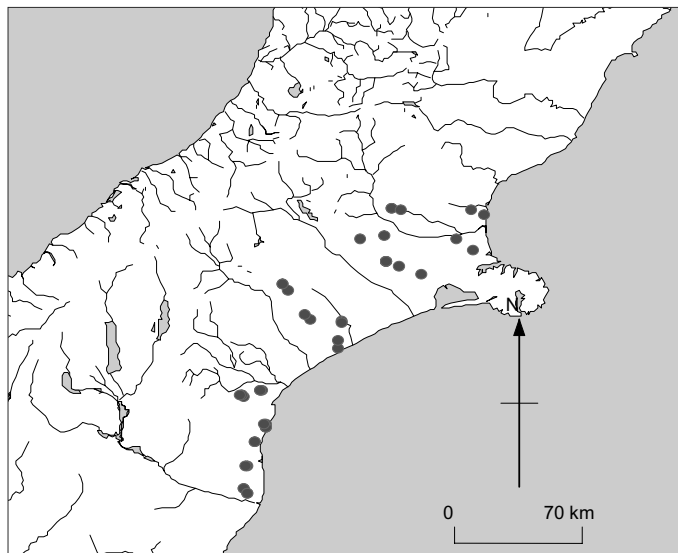
## 2. Past/present distribution and population

The following mudfish distribution maps were obtained from the New Zealand Freshwater Fish Database.

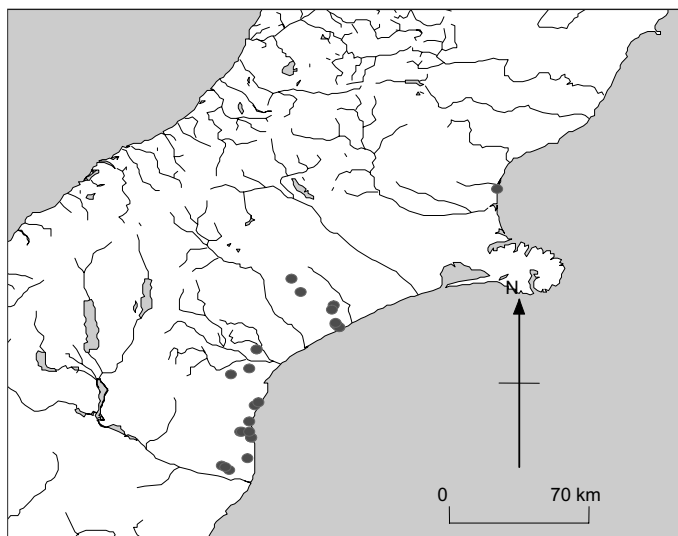
### *Canterbury mudfish*

Canterbury mudfish occur at low elevations in Canterbury, from about Oxford south to the southern banks of the Waitaki River. Historically it was more widespread throughout the Canterbury Plains in wetlands that are now drained. The species is now restricted to small relict populations in fragile wetland remnants (Harraway 2000; McDowall 2000). Population size fluctuations and local extinction/colonisation events appear to be quite common.

Canterbury mudfish records prior to 1991.



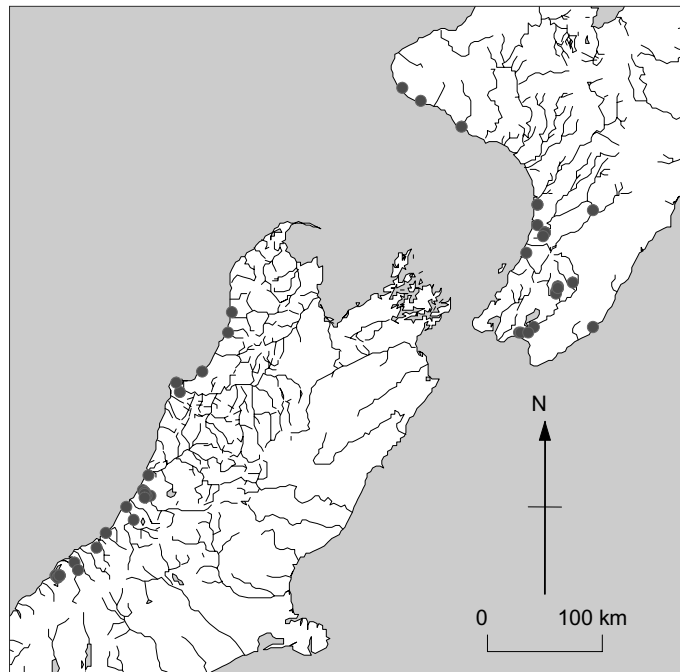
Canterbury mudfish records 1991 to present day.



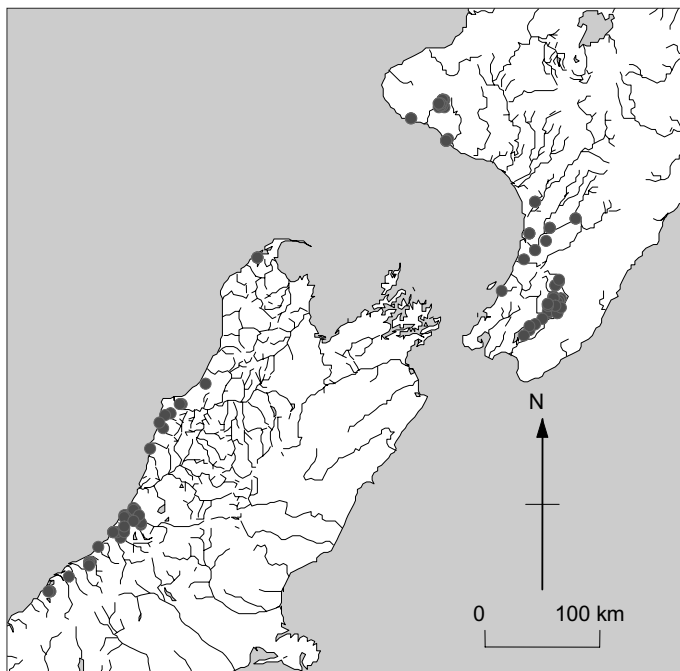
### ***Brown mudfish***

Brown mudfish are widespread in the southern North Island from Opunake southwards in the west (Caskey 2000), and around Pahiataua southwards in the east (Rebergen 1997) with isolated populations around the Manawatu (Francis 2000). In the South Island this species is distributed along the West Coast from north of Karamea south to Okarito, mostly at low altitudes (Butler 1999). Like the other mudfish species, the loss of 85-90% of New Zealand's wetlands (Ministry for the Environment 1997) has affected distribution (McDowall 2000).

Brown mudfish prior to 1991.



Brown mudfish records 1991 to present day.

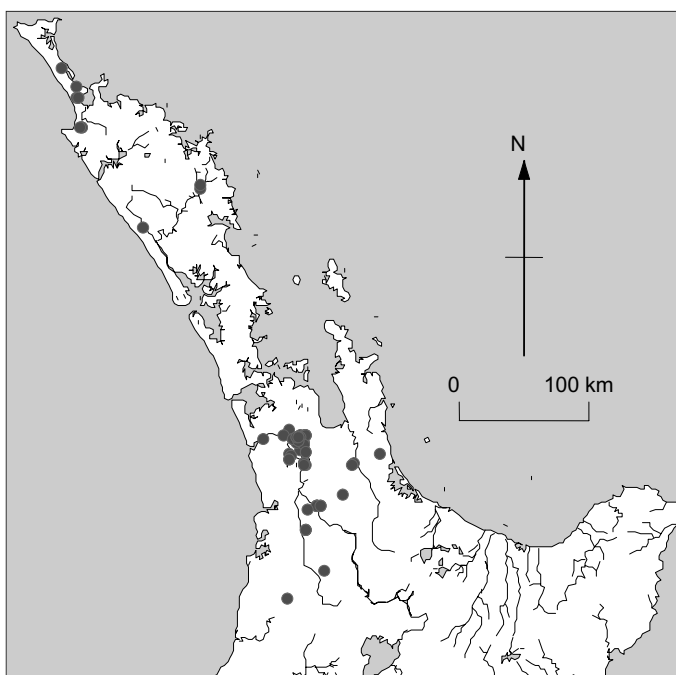




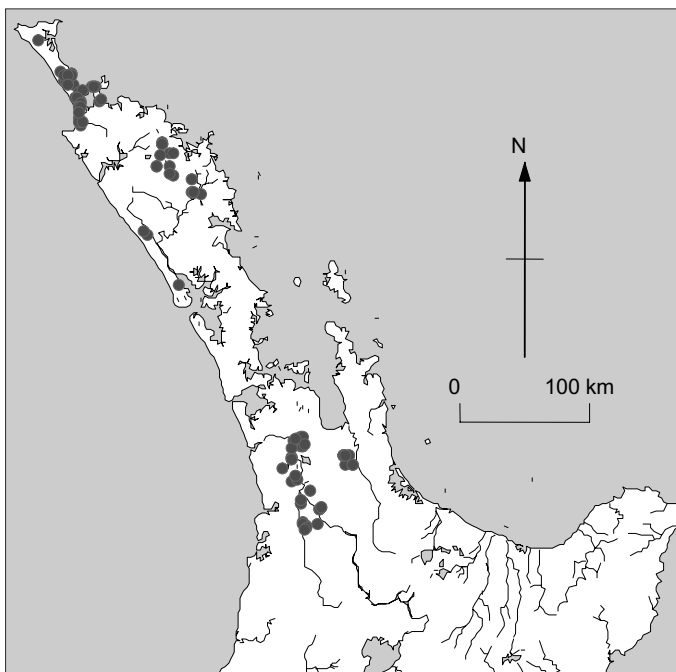
### ***Black mudfish***

Black mudfish are widespread in northern North Island, from north of Kaitaia (Kerr & McGlynn 2001) to as far south as Mokau in the west, and the Hauraki Plains in the east. Widespread habitat loss has also occurred for this species, with the fish having disappeared from many areas in the lower Waikato, Hauraki Plains, and Hikurangi swamplands. Large populations of black mudfish remain in two of New Zealand's largest freshwater wetlands: Kopuatai Peat Dome and Whangamarino Wetland (Barrier 1993). Ling et al. (2001) identify three evolutionarily significant units: northern Northland, southern Northland and Waikato.

Black mudfish prior to 1991.



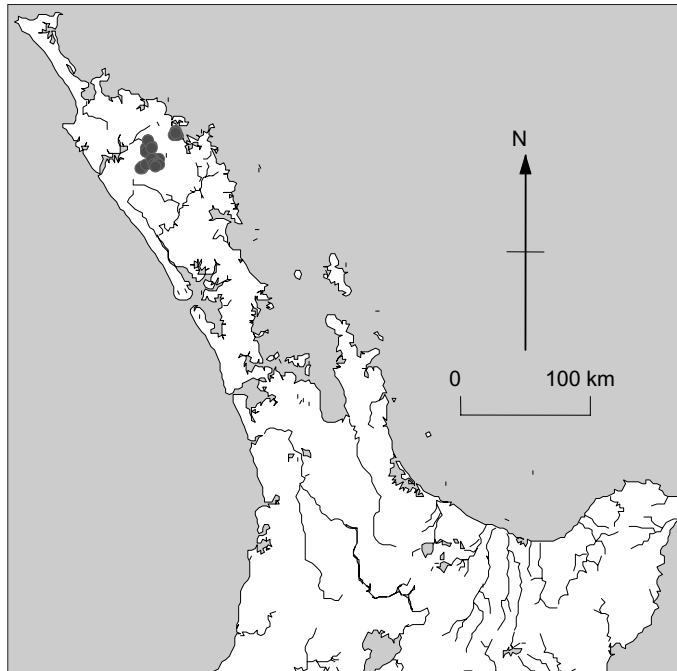
Black mudfish records 1991 to present day.



### ***Northland mudfish***

The Northland mudfish is presently known from only a handful of populations in the Northland region from Kaikohe to Kerikeri (Kerr & McGlynn 2001). Extensive survey work documenting the present distribution has indicated that this species may be one of New Zealand's rarest mudfish species (Kerr & McGlynn 2001; McGlynn & Booth 2002). The species has only recently been described (Ling & Gleeson 2001).

Northland mudfish records  
(no records prior to 1991).



### ***Chatham Island mudfish***

The Chatham Island mudfish was collected from Lake Rakeinui on Chatham Island. This mudfish species appears closely related to Canterbury mudfish (McDowall in press).

### 3. Cause of decline and present-day threats

Historically the loss of approximately 85–90% of New Zealand’s wetlands has severely impacted on the habitat and distribution of all the mudfish species. For instance between 1954 and 1976, the former wildlife service found that 263,000 ha of wetlands had been lost (Ministry for the Environment 1997). Key stronghold regions for mudfish such as Northland, Waikato, Wairarapa, Canterbury, and to some extent North Westland, were all affected. Loss and degradation of habitat through activities such as drainage schemes, irrigation and land development were, and still are, the biggest agent of decline for these species. New threats, the significance of which have yet to be established, include the potential effect of invasive fish species such as *Gambusia affinis* on these species (Willis & Ling 2000).

### 4. Species ecology and biology

Knowledge regarding species’ biology and ecology is reasonably extensive (Cadwallader 1975; Eldon 1971, 1978, 1979a & 1979b; Meredith 1985; Barrier 1993; Dean 1995; Grainger 2000; Harraway 2000; Davey et al. 2003; Ling 2001). All mudfish species have a non-migratory life-history and are restricted to wetlands, swampy streams and drains. Black and Northland mudfish appear to prefer acidic soil types and clearer waters, while brown and Canterbury mudfish are found in a wider range of habitat types. Virtually nothing is known regarding the habitat of the Chatham Island mudfish. All mudfish species can occupy habitats that become seasonally dry during the summer, during which individuals often undergo an aestivation period of varying duration from weeks to months. This ability to aestivate (Dean 1995) relieves competition, and even predation, due to the inability of other fish species to survive such prolonged periods of drought (Ling 2001). Although fry are readily seen during the day, adults of all species are largely nocturnal. Spawning can occur from autumn through to spring (Eldon 1971, 1978, 1979b).

Data regarding longevity is scarce, though mudfish species are thought to live until around 8 years old. All species have a fairly general diet consisting primarily of aquatic insects and crustaceans, including midge larvae, copepods, cladocerans, and amphipods; some terrestrial species are also taken (Eldon 1979a).

## 5. Past conservation efforts

Past conservation efforts for all species included in this recovery plan have been in two main areas: advocacy (RMA, land purchase cases, land status changes) and improving knowledge of the species biology and ecology. Translocation work has been undertaken on the Canterbury mudfish (Eldon 1993) and brown mudfish (D. Caskey pers. comm.). While a few of New Zealand's larger wetlands such as the Whangamarino have been legally protected, to date advocacy has not been very successful in preserving smaller wetlands and the mudfish populations they hold. A few exceptions are in the Stratford area and Canterbury (e.g. Dog Kennel Creek).

## 6. Long-term recovery goal

The long-term recovery goal is that the geographic range, habitat, and genetic diversity of all mudfish species are maintained and improved.

## 7. Options for recovery

### 7.1 OPTION 1 — DO NOTHING

This would involve relying on existing protected areas to protect mudfish populations. This option is not recommended as many populations occur outside of the protected areas.

### 7.2 OPTION 2 — UNDERTAKE NATIONAL PRIORITY WORK

Undertake national priority work using threatened fish recovery plans as a tool for co-ordination of required management work and research needs, and to identify funding requirements. This is the preferred option because recovery plans give effect to programmes set out in DOC's draft Freshwater Strategic Action Plan (in prep.), and the Department's statement of intent 2002-05 (DOC 2002).

## 8. Objectives for the term of the plan

- Objective 1.** Protect and manage habitats with *key* mudfish populations.
- Objective 2.** Monitor *key* mudfish population trends.
- Objective 3.** Identify and advocate for the protection and sustainable management of *all* mudfish habitat.
- Objective 4.** Maintain and increase populations of *all* mudfish species.
- Objective 5.** Involve Iwi in the implementation of this recovery plan.

## 9. Work plan

To assist prioritisation of recovery plan actions, each action has been given a level I (secure from extinction), level II (maintain genetic diversity), or level III (increase security further) priority ranking. These priority rankings have been derived from recent DOC national policy work on Natural Heritage Concepts and Principles (in prep.). Under the highest priority level I ranking, a taxon will be considered 'secure' if, in the face of reasonably likely events (including interruptions in management programmes) the taxon is unlikely to become extinct within the next 20 years. This category captures work associated with identifying agents of decline in some instances. Under level II second priority ranking, 'maintain genetic diversity' is defined as preventing major range contraction or the extinction of genetically distinct local populations. Level III third priority actions capture all proposed work not covered by the first two priority level actions, provided the work contributes in some way to further increasing species security.

### ***Objective 1: Protect and manage habitats with key mudfish populations.***

#### **Performance measure**

Threats will be identified and protective measures initiated for 40 key mudfish populations by 2004, resulting in the endangered species classification being reduced to a less threatened status for each mudfish species by 2013.

#### ***Explanation***

Habitat loss and degradation is resulting in a decline of New Zealand mudfish populations. Canterbury and Northland mudfish are both currently ranked as Nationally Endangered, black and brown mudfish are ranked as in Gradual Decline. The Chatham Island mudfish has not been ranked, but given its very

limited distribution, it is likely to have a similar ranking to Northland and Canterbury mudfish. Key populations have been identified (see Appendix 1) and these sites will be prioritised for protection in order to secure sufficient populations to reduce the threatened status of each species. Many areas of wetland habitat are located within private land, potentially subject to future development. To date, advocacy under the Resource Management Act has been the main tool to address threats to these habitats. However, a more targeted effort using other tools such as purchase/covenanting is also required for identified key mudfish sites.

#### *Action 1.1*

Identify land tenure of key mudfish sites by 2004.

**Responsibility:** Freshwater Technical Support Officer, Programme Manager

**Priority:** Level I

#### *Action 1.2*

Complete national register information for each key mudfish site by 2004. (A link to the register may be gained via DOC's internal document manager: dme:\\WANCO-5).

**Responsibility:** Freshwater Technical Support Officer, Programme Manager

**Priority:** Level I

#### *Action 1.3*

Liaise annually with landowners of key mudfish sites, and keep a record of visit discussions where appropriate.

**Responsibility:** Programme Manager

**Priority:** Level I (Canterbury/Northland/Chatham Island sp.)  
Level II (brown/black sp.)

#### *Action 1.4*

Seek protection of those key mudfish sites on private land by 2005.

**Responsibility:** Programme Manager, Freshwater Technical Support Officer

**Priority:** Level I (Canterbury/Northland/Chatham Island sp.)  
Level II (brown/black sp.)

#### *Action 1.5*

Manage key sites for mudfish habitat including such tasks as managing vegetation, securing sites from new pest fish invasion and managing water levels. Review management annually.

**Responsibility:** Programme Manager

**Priority:** Level I

### *Action 1.6*

Undertake annual identification/review of key site list.

**Responsibility:** Recovery Group

**Priority:** Level II

### ***Objective 2: Monitor key mudfish population trends.***

#### **Performance measures**

For each species, at least three key mudfish populations within each evolutionarily significant unit (ESU) (Appendix 1) will be annually monitored by 2006 using a standardised monitoring approach. Data, updated annually, will be accessible on the national register.

#### *Explanation*

At present there is no standardised methodology for measuring mudfish population structure and density at sites, or standard techniques for assessing presence/density of mudfish larvae within New Zealand. A publication incorporating standardised methods needs to be produced before commencing national monitoring of New Zealand mudfish populations. Annual monitoring of at least three populations within each species ESU will provide an accurate assessment of how 'secure' each species is.

### *Action 2.1*

Produce and publish a standard methodology for mudfish survey and population monitoring by June 2004.

**Responsibility:** Biodiversity Recovery Unit (liaise with Nick Ling)

**Priority:** Level I

### *Action 2.2*

Establish annual monitoring for a minimum of three key populations within each ESU by 2006. Monitoring to include population structure/density and ecosystem health (refer standard survey and monitoring SOP developed through action 2.1).

**Responsibility:** Freshwater Technical Support Officer, Programme Manager

**Priority:** Level II

### *Action 2.3*

Re-survey key mudfish sites, where full survey has not occurred in the last 5 years.

**Responsibility:** Programme Manager

**Priority:** Level II (Northland/Canterbury sp.)  
Level III (brown/black sp.)

***Objective 3: Identify and advocate for the protection and sustainable management of all mudfish habitat.***

**Performance measure**

Protective measures are achieved for wetland ecosystems containing mudfish through plan or resource consent hearings, and non-statutory initiatives such as a code of practice for dairy farming or drainage by 2013.

*Explanation*

Loss and degradation of habitat is resulting in a decline of mudfish populations around New Zealand. There is a lack of awareness by local authorities and the public on the state of New Zealand fish species. This needs to be addressed through a public awareness campaign that will involve working with communities (e.g. 'Adopt a mudfish site'), and producing information such as fact sheets for distribution to targeted audiences. Many areas of wetland habitat are located within private land, potentially subject to future development. The most effective tools to address threats to mudfish habitat include working directly with surrounding landowners, general public awareness raising activities, advocacy under the RMA, and protection through covenanting or land purchase deals. Developing good relationships with landowners will be imperative to the success of these tools. Those undertaking planning advocacy actions should be aware of any non-statutory initiatives with landowners, and take care to safeguard those relationships.

*Action 3.1*

Identify new mudfish populations through full survey of diverse habitat types throughout the species' range, where full survey has not occurred in the last 5 years according to the standard methodology developed in action 2.1.

**Responsibility:** Programme Manager, Freshwater Technical Support Officer

**Priority:** Level I (Northland/Canterbury/Chatham Island sp.)  
Level II (black/brown sp.)

*Action 3.2*

Advocate through Regional Plans and resource consents the protection of mudfish habitat from water level manipulation such as drainage or water level raising, and the use of buffers to protect wetland sites from the effects of land use.

**Responsibility:** Community Relations Officer, Freshwater Technical Support Officer

**Priority:** Level I (Northland/Canterbury/Chatham Island sp.)  
Level II (black/brown sp.)



### *Action 3.3*

Advocate for the restoration of mudfish sites through Regional Plans.

**Responsibility:** Community Relations Officer, Freshwater Technical Support Officer

**Priority:** Level II

### *Action 3.4*

Advocate for 'mudfish friendly' drain maintenance methods through Regional Plans, resource consents or through developing appropriate voluntary codes of practice.

**Responsibility:** Community Relations Officer, Freshwater Technical Support Officer

**Priority:** Level I (Northland/Canterbury/Chatham Island sp.)  
Level II (black/brown sp.)

### *Action 3.5*

Advocate through District Plans the protection of mudfish habitat from vegetation clearance.

**Responsibility:** Community Relations Officer, Freshwater Technical Support Officer

**Priority:** Level II

### *Action 3.6*

Work with local communities to protect mudfish habitat.

**Responsibility:** Community Relations Officer, Freshwater Technical Support Officer

**Priority:** Level II

### *Action 3.7*

Nominate private landowner/managers who demonstrate 'mudfish friendly' land management practices for environmental awards.

**Responsibility:** Programme Manager

**Priority:** Level III

### *Action 3.8*

Develop and undertake a community relations campaign on the importance of mudfish, by 2004. This may be part of a freshwater community relations campaign.

**Responsibility:** Recovery Group, Community Relations Officers, Programme Managers

**Priority:** Level II

***Objective 4: Maintain and increase populations of all mudfish species.***

**Performance measure**

By 2013, endangered species classifications are reduced to Serious Decline or a less threatened status for Canterbury and Northland mudfish, and remain at Gradual Decline or a less threatened status for brown and black mudfish.

*Explanation*

Canterbury and Northland mudfish are currently ranked as Nationally Endangered, and require urgent targeted conservation action to improve this conservation status. Black and brown mudfish are ranked as Gradual Decline and are therefore of lower priority for conservation action. Species weighted priorities reflect this difference. The Chatham Island mudfish has not been ranked, but given its very limited distribution, it is likely to have a similar ranking to Northland and Canterbury mudfish.

*Action 4.1*

Produce and publish a standard methodology for captive rearing and choosing and creating new habitat for mudfish introductions.

**Responsibility:** Biodiversity Recovery Unit, Recovery Group

**Priority:** Level II (Chatham Island sp.)  
Level III (black/brown sp.)

*Action 4.2*

Undertake captive rearing of mudfish.

**Responsibility:** Freshwater Technical Support Officer, Programme Manager

**Priority:** Level I (Chatham Island sp.)  
Level II (Northland/Canterbury sp.)  
Level III (black/brown sp.)

*Action 4.3*

Undertake and monitor introductions of mudfish to suitable urban and rural habitat (refer to standard methodology developed through action 4.1).

**Responsibility:** Freshwater Technical Support Officer, Programme Manager

**Priority:** Level II (Northland/Canterbury/Chatham Island sp.)  
Level III (black/brown sp.)

*Action 4.4*

Create new wetlands to extend the available habitat for all mudfish species within New Zealand (refer standard methodology developed through action 4.1).

**Responsibility:** Freshwater Technical Support Officer, Programme Manager

**Priority:** Level II (Northland/Canterbury sp.)  
Level III (black/brown/Chatham Island sp.)

*Action 4.5*

Monitor newly created wetlands and restoration projects.

**Responsibility:** Freshwater Technical Support Officer, Programme Manager

**Priority:** Level II (Northland/Canterbury sp.)  
Level III (black/brown/Chatham Island sp.)

***Objective 5: Involve Iwi in the implementation of this recovery plan.***

**Performance measure**

Copies of the annual report on implementation of recovery plan including all actions undertaken with Iwi will be provided to all Kaupapa Atawhai Managers and interested Iwi groups.

*Explanation*

The Recovery Leaders' Annual Report gives a yearly update on implementation of recovery plans, including any Iwi involvement with plan action implementation over the reporting year. This provides an efficient mechanism by which to keep Tangata whenua informed of progress. Furthermore, the open invitation for any of the Kaupapa Atawhai Managers or interested Iwi groups to sit on annual recovery group meetings provides a mechanism for Iwi feedback to recovery group, and facility for plan change if required.

*Action 5.1*

Engage local Tangata whenua on a project by project basis.

**Responsibility:** Programme Manager, Freshwater Technical Support Officer (Kaupapa Atawhai Manager to assist)

**Priority:** Level II

*Action 5.2*

Report regularly, through mutually agreed means, to Tangata whenua.

**Responsibility:** Programme Manager, Freshwater Technical Support Officer (Kaupapa Atawhai Managers to assist)

**Priority:** Level II

*Action 5.3*

Incorporate actions arising out of all Treaty settlements.

**Responsibility:** Recovery Group (Kaupapa Atawhai Manager to assist)

**Priority:** Level II

#### *Action 5.4*

Co-operate with mutually agreed Tangata whenua led initiatives relating to implementation of this plan.

**Responsibility:** Programme Manager, Freshwater Technical Support Officer  
(Kaupapa Atawhai Managers to assist)

**Priority:** Level II

## 10. Research priorities

A considerable amount of information is available about the various mudfish species, although there are still information gaps that need to be addressed in order to achieve the objectives of this plan. In the past much research has been undertaken by university students. Maintaining a good relationship with universities and other external agencies will be important in addressing these information gaps. The priorities for research are as follows:

1. Determine evolutionary significant units for all mudfish species, and identify three key populations within each unit.
2. Investigate the effect of hydrological regime on mudfish populations and determine how this relates to the 'patchy' distribution of mudfish within larger wetland systems, and the effects of water manipulation such as drainage and water level raising.
3. Investigate the impact of *Gambusia affinis* on mudfish population structure and long-term health through controlled field trials, and monitoring current invasion areas such as sites in the Whangamarino Wetland.
4. Develop *Gambusia* exclusion and eradication techniques.
5. Investigate the toxicity of fire fighting foams and additives to mudfish in concentrations likely to be encountered post fire fighting, and assess long-term fate/effect of these chemicals in wetland ecosystems.
6. Investigate water quality and habitat preferences for all mudfish species.
7. Investigate and quantify inter-specific relationships with other fish species.
8. Assess the impacts and risks associated with chytrid fungus.
9. Investigate factors affecting recruitment into small mudfish populations.

## 11. Review date

This plan will be reviewed after 10 years or sooner if new information leads to proposals for a significant change in direction. The plan will remain operative until a reviewed plan is in place. The date that is proposed for review of this recovery plan is 2013.

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# Appendix 1: Defining key mudfish populations

The recovery plan seeks to maintain and improve the geographic range, habitat and genetic diversity of all mudfish species. One way of measuring success with this goal will be if those species currently classified as Nationally Endangered are re-classified as being in Gradual Decline by the end of the 10-year period. To be classified as being in Gradual Decline, a species must have 15 secure populations. To achieve this with some confidence, 15 or more key populations are required to be identified for each species. The recovery plan sets out objectives and actions to be undertaken with key mudfish populations in order to guide management. The key populations are to be selected to preserve large populations or habitats, key scientific sites and to maintain the geographic range of species and the genetic and biological diversity within each mudfish species. More than 15 key sites will be identified where necessary to secure the full range of populations across the species' range.

## CRITERIA FOR KEY MUDFISH POPULATIONS

The key mudfish populations have been selected according to the following criteria, to be used in future reviews of the list of key sites:

1. The three largest populations of mudfish within any evolutionary significant unit (ESU). Population size will be determined either from monitoring data or on its surrogate, the area of habitat available.
2. The type locality of each species (or the nearest present-day population that is thought to be within the same ESU).
3. Populations that are geographic outliers and are remnants of the historic range of the species and populations that maintain the geographic range ESUs.
4. Long-term research sites.
5. Populations in unusual habitats for the species.
6. Protected sites being actively managed under an integrated management programme.
7. If fewer than 15 sites have been designated using criteria 1-6, other sites selected in consultation with wetland owners and DOC Area Managers are to be included as key sites, until at least 15 key sites have been designated—taking into account other factors such as the presence of other rare species, the degree of modification and the degree of control the Department has over outside influences on the mudfish habitat.

KEY MUDFISH POPULATIONS (AS AT OCTOBER 2003).

SITE NAME	KEY VALUE
<b>Northland mudfish</b>	
1 Ngawha wetland complex	Population in ESU
2 Lake Omapere wetland complex	Large population
3 Northland college farm	Population in ESU
4 Waitangi forest complex	Population in ESU
5 Kaipaha swamp complex	Isolated population
6 Wairoa conservation area	Type locality
7 Rakautao forest complex	Population in ESU
8 Tautautoro	Geographic outlier
9 Ra Tau	Population in ESU
10 Aratora reserve	Population in ESU
<b>Black mudfish</b>	
1 Arapai swamp	Most southerly population, geographic outlier
2 Awanui River Swamp	Type locality
3 Whangamarino Swamp	Large population, long-term science
4 Kopuatai Peat Dome, Hauraki Plains	Large population
5 Otakairangi	Population in ESU
6 Jordan Valley	Population in ESU
7 Parengarenga	Geographic outlier
8 Opuatia Swamp	Unusual habitat—abundant population under flax cover
9 Lake Whangape margin	Unusual lake margin wetland—periodically flooded by lake
10 Waiparera	Population in ESU
11 Waihuahua	Population in ESU
12 Ohia	Population in ESU
13 Maitahi	Geographic outlier
14 Pouto	To be re-surveyed
<b>Brown mudfish</b>	
1 Eltham	Population in Taranaki ESU
2 Ngaere 1	Population in Taranaki ESU
3 Kakaramea	Population in Taranaki ESU
4 Warea	Geographic outlier
5 Ngaere 2	Population in Taranaki ESU
6 Round Bush	Population in Manawatu/Wairarapa ESU
7 Ashhurst Domain	Population in Manawatu/Wairarapa ESU
8 Parewanui Rd	Population in Manawatu/Wairarapa ESU
9 Un-named swamp Waimoana, east coast of Wairarapa	Geographic outlier (site record needs re-confirmation)
10 Lowes Bush Wairarapa	Good population
11 Fensham Reserve, Wairarapa	Good population
12 Koputoroa Scientific reserve	Good population
13 Lake Wairarapa wetlands	Needs to be re-surveyed
14 Mangarakau Swamp, Northwest Nelson	Geographic outlier
15 Okarito River/Jenkins Creek Wetland	Southern extreme of range
16 Saltwater forest	Population in West Coast ESU
17 Ianthe forest	Population in West Coast ESU
18 Mahinapua scenic reserve, Hokitika	Population in West Coast ESU
19 Virgin flats/terraces, Westport	Population in West Coast ESU
20 German terrace, Westport	Population in West Coast ESU



SITE NAME	KEY VALUE
21 Nikau Scenic Reserve	Isolated population
22 Stockton plateaux - Repo valley	Unusual habitat
23 Awakiri Pakihi	Unusual habitat (high altitude)
<b>Canterbury mudfish</b>	
1 Burrows (Oxford)	Type locality
2 Dog Kennel Stream	Restoration site
3 Wainono lagoon	Population in ESU
4 Mid Canterbury Plains stockwater irrigation network	Unusual habitat
5 Taiko Stream Wetland	Translocation site
6 Willowby Local purpose Reserve	Translocation site
7 Te Roto Repo o Tawera (Mounseys)	Population in ESU
8 Hororata Stream	Science study site
9 St Andrews Stream	Population in ESU
10 Te Puna (Hook R tributary)	Population in ESU
11 South bank of Waitaki River	Most southerly population
12 Wainiwaniwa River (Melvern Hills)	Population in ESU
13 Tutaeatu Lagoon (Ashley River)	Northern most population
<b>Chatham Island mudfish</b>	
1 Lake Rakenui	Only population

# Recovery plans

This is one of a series of recovery plans produced by the Department of Conservation. Recovery plans are statements of the Department's intentions for the conservation of particular plants and animals for a defined period. In focusing on goals and objectives for management, recovery plans serve to guide the Department in its allocation of resources and to promote discussion amongst a wider section of the interested public.

After preparing a technical report which was refined by scientists and managers both within and outside the Department, a draft of this plan was sent to the New Zealand Conservation Authority and relevant Conservation Boards for comment. After further refinement, this plan was formally approved by the Regional General Manager (Northern) in May 2003. A review of this plan is due after ten years (2013), or sooner if new information leads to proposals for a significant change in direction. This plan will remain operative until a reviewed plan is in place.

The Department acknowledges the need to take account of the views of the tangata whenua and the application of their values in the conservation of natural resources. While the expression of these values may vary, the recovery planning process provides opportunities for consultation between the Department and the tangata whenua. Departmental Conservancy Kaupapa Atawhai Managers are available to facilitate this dialogue.

A recovery group consisting of people with knowledge of mudfish, and with an interest in their conservation has been established. The purpose of the Mudfish Recovery Group is to review progress in the implementation of this plan and to recommend to the Department any changes which may be required as management proceeds. Comments and suggestions relating to the conservation of mudfish are welcome and should be directed to the recovery group via any office of the Department or to the Biodiversity Recovery Unit.

# Published recovery plans

No.	SPECIES	YEAR APPROVED
50	Kiwi ( <i>Apteryx</i> spp.)	2003
49	<i>Powelliphanta</i> land snails	2003
48	North Island <i>Oligosoma</i> spp. skink	2002
47	Tuatara	2001
46	Chatham Island fantail, Chatham Island tomtit and Chatham Island warbler	2001
45	Forbes' parakeet and Chatham Island red-crowned parakeet	2001
44	New Zealand shore plover	2001
43	Chatham Island shag and Pitt Island shag	2001
42	Chatham Island mollymawk, northern royal albatross, Pacific mollymawk	2001
41	Chatham Island tui	2001
40	Black robin	2001
39	Parea	2001
38	Chatham Island oystercatcher	2001
37	Chatham Island petrel	2001
36	Chatham Island taiko	2001
35	Hoiho	2001
34	Pygmy button daisy	2001
33	<i>Hebe cupressoides</i>	2000
32*	Inland <i>Lepidium</i>	2000
31	<i>Muehlenbeckia astonii</i>	2000
30	North Island kokako	1999
29*	Weka	1999
28*	<i>Pittosporum patulum</i>	1999
27	<i>Cyclodina</i> skinks	1999
26	Coastal cresses	1999
25	Threatened weta	1998
24	Striped skink	1998
23*	Fairy tern	1997
22*	Blue duck	1997
21	Kakapo	1996
20	Stitchbird	1996
19*	Brown teal	1996
18*	Native frogs	1996
17*	New Zealand (Hooker's) sea lion	1995
16*	<i>Dactylanthus taylorii</i>	1995
15*	Bat (peka peka)	1995
14	Otago and grand skinks	1995
13*	Giant land snail	1995
12*	Takahe	1994
11*	South Island saddleback	1994
10*	New Zealand dotterel	1993
9*	Tuatara	1993
8*	Kowhai ngutukaka	1993
7*	Subantarctic teal	1993
6*	Mohua (yellowhead)	1993
5	Chevron skink	1993
4	Black stilt	1993
3*	Whitaker's and robust skinks	1992
2	Kiwi	1991
1*	North Island kokako	1991
—*	Yellow-eyed penguin	1991

\* Out of print.

In-print issues are available free of charge from DOC Science Publishing, Science & Research Unit, P.O. Box 10-420, Wellington. All recovery plans from No.25 (1998 and later) are available on the DOC website: [www.doc.govt.nz](http://www.doc.govt.nz) > Publications > Science and Research > Biodiversity Recovery Unit