



# Pāteke survival guide

September 2011





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SEPTEMBER 2011

Published by:  
Department of Conservation  
Northland Conservancy  
P.O. Box 842  
Whangarei 0140

This document will guide landowners, community groups and other parties interested in the recovery of pāteke. It provides an overview of our current understanding of the ecology of pāteke and our associated best advice on management approaches for pāteke recovery.

Cover photo: Peter Russell.

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ISBN 978-0-478-14892-3 (printed copy)

ISBN 978-0-478-14893-0 (web PDF)

In the interest of forest conservation, we support paperless electronic publishing.

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# 1. Pāteke—some key facts



Female pāteke and brood. Photo: Joanna Sim.

The pāteke or brown teal (*Anas chlorotis*) is a relatively small, little-known duck found only in New Zealand.

Its closest relatives are the Auckland Island teal and Campbell Island teal of subantarctic New Zealand and the chestnut teal of Australia.

Pāteke are mottled brown in colour, with a white ring around the eye. Males are easily distinguishable from females in their breeding plumage (during the autumn and winter months) with their iridescent green heads and chestnut-coloured breasts.

Originally birds of a variety of forest and wetland habitats, pāteke now occur mainly on lowland floodplains typically where there are combinations of pastoral land, forest remnants, wetlands, and estuaries.

Pāteke are winter-spring nesters and defend territories around their nests and brood-rearing sites. During the day these territorial birds hide in dense vegetation, often close to open water. Most females lay 1-2 clutches per season, each containing about 6 eggs which are incubated for about 4 weeks.

A characteristic of pāteke is their congregation at regular flock sites on and at the edges of permanent water bodies. These are most heavily frequented during the non-breeding (summer) months and particularly by young birds.



Pāteke flocking on a tidally influenced section of stream above an estuary. Photo: Tiff Browne.

Pāteke do most of their feeding at night in permanent seeps, swamps, damp pasture and the shallows of drains, streams, ponds and estuaries. They are omnivorous, consuming a variety of grasses, seeds, insects, molluscs, worms and many other invertebrates.

**Once widespread throughout New Zealand, they are now very rare due to habitat loss and predators.**

## 2. Where are all the pāteke ?

Currently there are three concentrations of wild pāteke in northern New Zealand, and many small populations mainly on islands. The key populations are:

- Great Barrier Island (Aotea)—throughout the island, with highest numbers in the Okiwi-Whangapoua catchment.
- Northland—currently extending between Bay of Islands and Ngunguru, with highest numbers in the Teal Bay-Mimiwhangata-Whananaki area.
- Coromandel Peninsula—recently reintroduced population in the Port Charles-Waikawau Bay area.

Over 400 birds occur in each of these populations, but precise numbers are difficult to determine because of their secretive nature. Minimum counts completed in 2011 (and very approximate total estimates in parentheses) are: Northland 408 (600), Great Barrier Island 803 (1000), Coromandel 321 (400).

Other much smaller island populations occur on the following islands: Hauturu (Little Barrier Island), Tiritiri Matangi, Kawau, Tuhua (Mayor Island), Mana and Kapiti; and also at Karori Wildlife Sanctuary in Wellington.



Map of current pāteke distribution.



An important captive breeding population is being maintained by breeders around the country from Dargaville to Invercargill. Birds bred in captivity are being used to re-establish populations around New Zealand, including Coromandel Peninsula, Cape Kidnappers, Tawharanui Regional Park, Tutukaka Coast and Arthur River in Fiordland.

Aviary at Peacock Springs, Christchurch.  
Photo: Joanna Sim.

### 3. Can pāteke recover?

Studies within the surviving populations indicate that the further recovery of this species is feasible, but it requires large areas of suitable habitat and very high quality predator control or exclusion. The growing number of ecological restoration projects operated by the community and agencies throughout the country offer many opportunities for recovering pāteke. Captive breeding and releases are important tools in these recovery initiatives.

### 4. Seasons of the pāteke

#### Summer

Pāteke are most obvious during the summer non-breeding period, when large numbers can congregate during the day at permanent water bodies. These summer “flock sites” are commonly located at the head of estuaries and at stream pools, livestock ponds and drains. Typically these sites have easily accessible banks, tree roots or partially submerged logs on which the birds roost and from which they can drop onto the water if danger threatens. Flock sites often have overhead cover such as trees and vines which give some protection from predatory birds, in combination with surrounding open areas which afford some view of approaching threats.



Pāteke flocking on a grazed stream bank. Photo: DOC.



Pāteke flocking at Whangapoua estuary. Photo: Joanna Sim.



Pāteke readily roost on artificial structures, such as this custom built raft. Floating structures keeps them safe from most predators as they allow birds a good view of approaching danger and easy access into deep water. Photo: Joanna Sim.

Pre-breeding body moult occurs at the flock sites in January–February. Not all birds are present at the flock site, with many adults staying in their breeding territory year round, particularly in wet years. Consequently, sub-adults frequently comprise the bulk of the flocking birds.

## Autumn

In the early autumn, most birds are still using flock sites for diurnal (daytime) roosts. However, during the autumn birds increasingly move to and fro between the flock sites and prospective breeding grounds, particularly after significant rain.

## Winter-Spring

Pāteke breed mainly in winter and spring, although nests can occur in any month. Each pair defends a territory of variable size against other pāteke. The ideal territory provides for several needs:

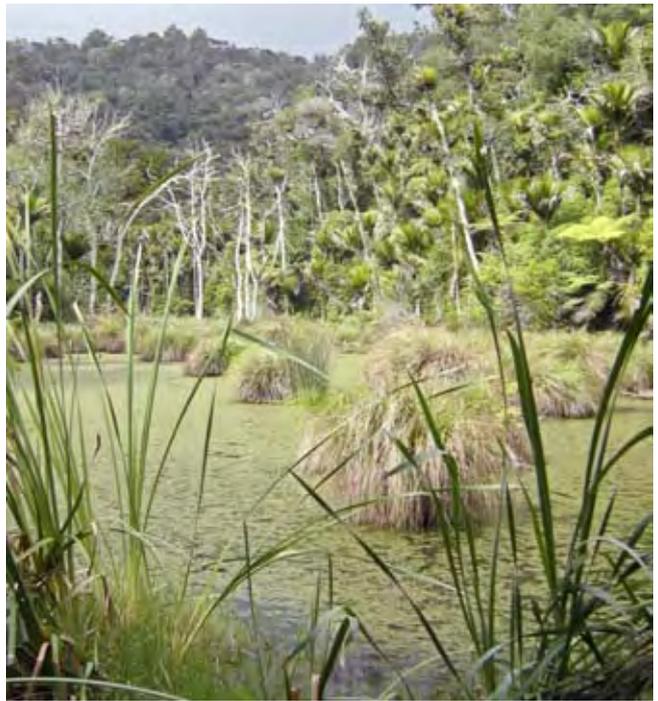
- Ground-cover for nests which are nearly always on the ground, e.g. sedges (*Cyperus*, *Carex*, etc), long grass, undercut/overhanging banks, logs.
- A water body for rearing ducklings—stream, scoop pond, drain etc. Ideal sites are those which provide dense cover on the banks close to the water onto which ducklings can escape if a predator arrives. Often nests are found close to these water bodies and pairs take their broods to them soon after hatching, staying close to water during daylight.
- Good feeding for adults and ducklings, either in the territory or close by. Optimal feeding conditions for pāteke are poorly known, but anywhere with lots of invertebrates, seeds and fruits are likely to be good. Adults with broods are often found beside seepage areas, swamps, drains and shallow margins of ponds and streams. Slow moving waterways provide some feeding, including drains, seeps, estuaries, mudflats, muddy backwashes and associated wetlands, and they can provide valuable daytime refugia if sufficient cover is available.
- Pasture—closely cropped (short) pasture is used extensively during winter and in damp conditions where they glean invertebrates from the grass and they sometimes also eat clover.



Pāteke feeding on pasture at night during winter. Photo: Joanna Sim.



Nest in sedge. Photo: Ian Hogarth.



Brood rearing pond. Photo: DOC.



Ideal pāteke brood rearing site: open water with associated feeding areas in wetlands. Photo: Tiff Browne.

Adults undergo a complete body moult beginning in late spring when birds are often still at breeding grounds. Birds are flightless during the height of this moult and therefore even more vulnerable to predators.

## 5. Dramatic decline

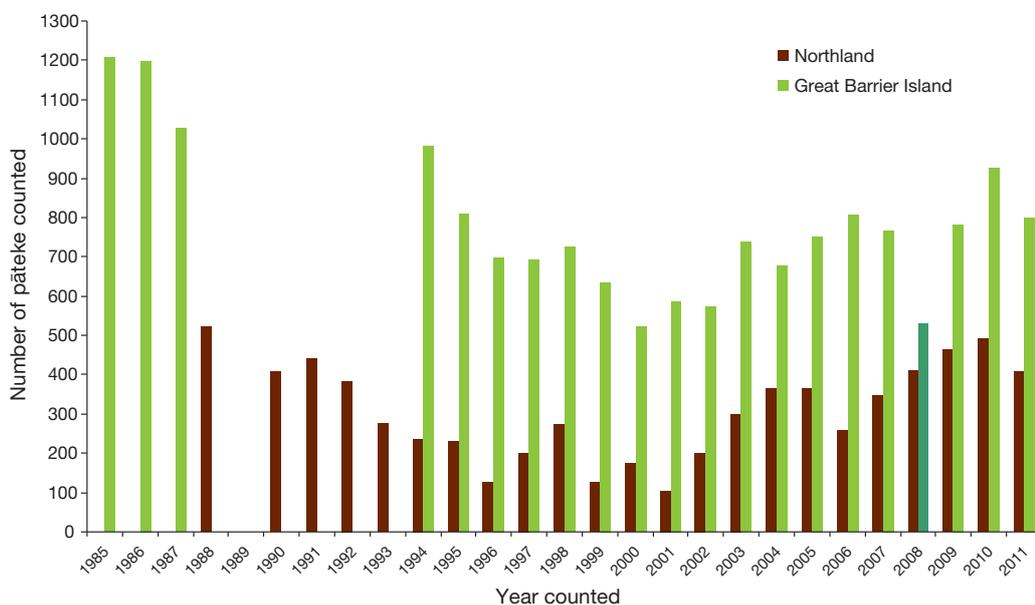
Originally pāteke were widespread and abundant in wetlands and forests of the three main islands and were possibly the most common waterfowl species in New Zealand. Reports of birds being abundant were frequent, e.g. in 1925–30 at Whangarei “a stretch of about a third of a mile (500 m) upstream of Mangere Falls carried about 500 teal and old-timers said there had been more.” (*Notornis* 18 [1971]: p 283.

Since the 19th and early 20th centuries, the population has declined dramatically due to habitat loss, predation and probably excessive hunting in some areas. Disease has also been suggested as a contributing factor. Pāteke disappeared from the eastern South Island soon after European settlement, but held on in Fiordland until recently, where a few birds may still persist. They disappeared from Stewart Island in the 1970s.

In the North Island the decline was more protracted with populations holding on in the 1960s throughout most of Northland between the Whangarei Harbour-Waipu area and Cape Reinga. Many birds were also seen in the Waikato and Coromandel during this period. By the late 1980s the range of the Northland population had contracted to the area from Whananaki to Russell Peninsula, and by the late 1990s the Russell Peninsula population had been decimated. Currently (2011) the bulk of the Northland population is restricted to the Teal Bay-Mimiwhangata-Whananaki area with a few birds occurring south to the Ngunguru area and north to Russell Peninsula. Current flock counts are reaching those seen in the early 1990s, due to predator control and management in the Teal Bay-Mimiwhangata-Whananaki area.

The population on Coromandel Peninsula is recovering due to predator control and reintroductions of captive-reared birds. Elsewhere in the North Island, small numbers of birds are seen in many areas, e.g. Manawatu-Horowhenua, probably stemming from past releases and/or dispersal from islands.

On Great Barrier Island there was an apparent initial increase in pāteke numbers during the 20th century, possibly stemming from clearing of forest for pasture in low-lying areas, which created suitable habitat for pāteke. However, this was followed by a population decline in the 1990s apparently as a result of predation pressure and a change in habitat management. In the early 2000s, this decline was arrested by intensive predator control and the population now appears to be relatively stable.



Annual census counts showing number of pāteke counted at all known flock sites at Northland (1988, 1990–2011) and on Great Barrier Island (1985–1987 and 1994–2011).

## 6. Threats

The main and immediate threat to pāteke is from introduced mammalian predators, particularly mustelids (stoats, ferrets and weasels), cats and dogs. As a result of excessive predation, pāteke have vanished from many areas where the habitat is otherwise suitable for them. These and other localised threats are discussed below.

### Mustelids—stoats, ferrets and weasels

On the mainland, mustelids are responsible for the majority of pāteke deaths. Ferrets are large (up to 1.5 kg) mustelids, usually with a dark facial mask and creamy-coloured body with dark guard hairs giving an overall darker appearance from a distance. Stoats and weasels are cinnamon-coloured with a white underbelly, with stoats being larger and with a black-tipped tail. Ferrets are strictly nocturnal but stoats and weasels often also hunt during the day.



Pāteke killed by a mustelid. Photo: Nigel Miller.



Weasel. Photo: DOC.



Ferret. Photo: Rod Morris.



Stoat. Photo: DOC.

Stoats are the most widespread and common mustelid in pāteke country and account for most pāteke deaths, even in some of the comprehensive trapping regimes. Stoats are especially good climbers and swimmers. Young stoats disperse many kilometres from their birth site, beginning in early summer. Those that survive can have a huge impact on pāteke in the autumn. Autumn is a particularly vulnerable time for pāteke when adults (including some one-year olds) are increasingly moving between habitats as they prospect for nest sites. **Unlike some other New Zealand birds (e.g. brown kiwi) pāteke are vulnerable to stoats throughout their lifetime, and predation can occur at any time of year.**

## Cats

Cats are one of the main predators of pāteke on Great Barrier Island, and they are also a threat at many mainland sites. As with mustelids they can kill pāteke at all life stages. Cats are active hunters during the day and night, and can cover long distances quickly.

Pāteke are at risk not only from feral cats, but also domestic cats around human settlements and/or where traps are limited to live-capture types.



Feral cat. Photo: Rod Morris.

## Dogs

Pāteke try to use camouflage (i.e. “freezing” instead of flying) to avoid predators. **As a result, wandering and unsupervised dogs can have significant impacts on pāteke by catching and killing birds on nests and running them down and killing them in feeding areas.** Single dogs have been responsible for multiple deaths in some areas.

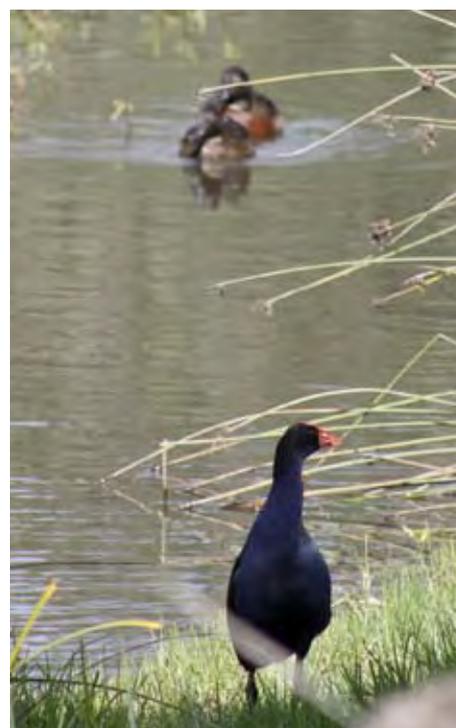
## Other mammals

Pigs, possums, rats and hedgehogs can destroy nests, and potentially compete with pāteke for food.

## Bird competitors and predators

Several birds can impact on pāteke to various (usually small scale) degrees, including:

- Pukeko can prey on eggs and especially ducklings—this can be significant in areas where pukeko are common.
- Harriers (kahu) can prey on ducklings and adult pāteke, particularly weak or starving birds.
- Paradise shelduck and mallards can compete for nesting habitat, and paradise ducks can evict broods and resident pairs from ponds and other refuge areas.
- Mallards and grey duck which can hybridise with pāteke .
- Eels predate on ducklings, and other predators, such as morepork, possibly kill pāteke from time to time. However, their impacts are unlikely to be as significant as those of carnivorous mammals.



Pukeko and a pair of pāteke at a flock site. Photo: Tiff Browne.

## Habitat loss and degradation

The most chronic habitat loss has been the loss of lowland wetlands, e.g. swamps, slow-flowing streams and kahikatea forests, and their conversion to agricultural land and other development. Surviving wetlands have often been modified by the following:

- Excavation of deep, steep-sided channels and the loss of backwashes and seepage areas causing the chronic drying out of lowlands in summer months and during droughts.
- The loss of riparian vegetation along margins of wetlands, ponds and streams which provide important areas in which to hide and nest.
- In poorly managed areas, kikuyu and other exotic grasses have proliferated, resulting in dense impenetrable swards of vegetation.
- The presence of rodents results in increased competition with pāteke for seeds, invertebrates and other foods.



Grazed stream with no suitable cover for pāteke.  
Photo: Tiff Browne.

## Vehicles

**Vehicles kill many pāteke; for example, in some locations 5–10% of birds can be killed on local roads annually, similar to mortality rates from predators.** These sites are often where the flock site is slightly upstream of a preferred feeding area, e.g. intertidal pāteke often feed in drains and puddles at the edge of the road and are scared into the path of moving vehicles. At other sites, blocked culverts and artificial waterfalls force birds to cross roads rather than go under them. Fences and wires also account for some bird deaths.



Road sign urging drivers to look out for pāteke at night on the roads. Photo: Joanna Sim.

## Fishing nets

Nets set for eels and mullet in streams and tidal areas are a risk to pāteke as they can become entangled and drown. These nets are especially dangerous when they extend above the surface of the water and are left unattended.



Pāteke drowned in a set net. Photo: Leon Candy.

## 7. What you can do for pāteke

Pāteke can adapt very well to the New Zealand rural landscape. A self-sustaining pāteke population requires a large area (usually several hundred hectares) and this may span several properties. Consequently, landowners and groups often need to consider management issues beyond their immediate properties.

There are six critical requirements:

- Foraging habitat is diverse, including all or most of the following habitats:
  - areas of low-lying fertile floodplains with many permanent and ephemeral wetlands
  - seasonally damp, grazed, fertile pasture (rank grass is impenetrable and provides less food)
  - ability to retain moisture levels in dry periods
  - floodplain forest, e.g. stands of podocarps and other tree and shrub species (*Coprosma* etc) along valley floors, all providing fruit for pāteke
  - proximity to estuaries
- Suitable nesting and roosting cover (e.g. riparian areas of sedges, rushes and other dense ground vegetation) near the open water, wetland brood-rearing areas, and wetland feeding areas
- Potential flocking sites at permanent, undisturbed, water bodies containing marginal cover and safe resting areas
- Effective control of mammalian predators, such as where community groups and DOC are protecting kiwi, kākā and other threatened fauna, but management may need to be more intensive for pāteke
- Effective control of pets and working dogs as occurs in well-managed kiwi zones
- Road deaths and disturbance issues are minimal



Pāteke habitat at Mimiwhangata Coastal Park: open water for flocking, refuge and brood rearing with associated feeding areas. Photo: Pete Graham.

Each of these six requirements, and ways of achieving or improving them, are discussed in detail in the Appendix.

## 8. Case studies of effective pāteke management

### 1. A community initiative

#### Background

The Tutukaka Landcare Coalition (TLC) comprises a group of landowners spanning a growing area (currently c.3000 ha) of eastern Northland forest, wetlands and farmland. Originally established to manage the local kiwi population, the TLC engaged hunters to decrease pig numbers and set up sustainable control of mustelids, cats, dogs, possums and a core area of rat control, and enhanced wetland habitat. They networked well with agencies, including the NZ Landcare Trust, WWF, DOC, the pāteke captive breeding programme and Northland Regional Council, all of which assisted with advice and resources. Funding has also been secured from businesses such as Transpower and Banrock Station Wines, while local restaurant Schnappa Rock hosted a fundraising dinner which raised \$7,000 for the project. As well as detecting a positive response from kiwi, the TLC began to notice other birds arriving, including kākāriki, kākā, bellbird and pāteke. They approached the Pāteke Recovery Group for advice and the PRG recommended and facilitated the release of captive-reared birds in the heart of the TLC in May 2007, 2008 and 2011.



Jane Camm and pupils from Ngunguru School releasing pāteke into the TLC protected area. Photo: Tiff Browne.

#### Tasks completed for pāteke

Specific tasks that TLC completed for pāteke were:

- Establishment of a large pond and planning is underway for additional ponds
- More intense and diverse predator control, including switching to alternative bait types for mustelids, pulsing of fresh rabbit bait etc.
- Raising the awareness of locals on the impacts of dogs and cats
- Erecting signs and writing fliers to raise local awareness about pāteke
- Securing of funds to carry out radio telemetry monitoring of released birds.

#### Significance of pāteke to TLC initiative

The return of the pāteke is significant due to:

- The local suite of wetland bird species is in recovery mode with bittern, grey duck, fernbird, banded rail and spotless crake also present.
- Pāteke represent a returning element of the lowland forest ecosystem.

**Latest news:** *Increasing numbers of pāteke are being seen in areas both within and adjacent to the TLC area of predator control. Sixty-four birds were released in May 2011 to boost the population.*

## 2. A farming perspective

### Background

Colin Caldwell owns c.700 ha of coastal property at Port Charles, Coromandel Peninsula. Approximately half of this area is grazed, mostly with dry stock and sheep and the rest of the property is mainly bush. To the north is the extensive Moehau complex where kiwi and other fauna are increasing in response to predator control. The Caldwells developed a close interest in pāteke, particularly as captive-released birds and their progeny spread along the streams and wetlands of their property. The property is already ideal for pāteke because it comprises a mosaic of short pasture, streams, wetland, shrubland and other rough cover, and there is an estuary nearby. Colin wanted to further improve the habitat and security of the pāteke and implemented several management tasks following advice from the Pāteke Recovery Group and funding from the Regional Council, Banrock Station, the pāteke captive breeding programme and the Environment Fund.



Newly revegetated pond on the Coromandel Peninsula. Photo: Rebekah Caldwell.

### Tasks that the Caldwell's completed for pāteke

- Predator control—targeting mustelids and cats
- Dog control—was already in place
- Erection of road signs and roadside fencing, and enlarging culverts to help minimize road deaths
- Excavation of scoop ponds
- Landscaping drains to provide better access for ducks
- Continuation of grazing of pasture and experimenting with grain crops
- Currently assessing sites where better riparian protection can be implemented along the streams.

### Implications for farm management

Impacts on the farm have been (or are anticipated to be) mainly positive and include the following:

- Improved water quality (and therefore livestock health) from fenced streams.
- Pāteke prompted a new look at pasture management for focus, further research on pasture bugs
- Presence of an endangered species increasing the profile of the property.

**Latest news:** *The pāteke population is growing; the estimated current population is approximately 450 birds.*

### 3. Property development

#### Background

Wayne Mitchell is a property developer working for Maxus Group Ltd. The company wished to subdivide an area of coastal hills and a small coastal valley at Rockell's Bay within the Northland stronghold of pāteke . Small numbers of birds had been observed on the development site. The proposal attracted significant local interest and was heard at an Environment Court hearing.



Developed wetlands at Rockell's Bay, Northland. Photo: Tiff Browne.

#### Tasks completed for pāteke

Wayne sought expert advice from the PRG and other wetland advisors and implemented the following management:

- Excavation of brood ponds
- Planting of nesting cover
- Provided logs as resting areas in ponds
- Grazing of pasture
- Targeted weed control
- Pet exclusion
- Predator control
- Code of conduct for residents.

#### Outcome for development

Wayne achieved the following subdivision outcomes:

- Successful Environment Court outcome with all subdivision lots applied for being approved
- Presence of endangered species increased the profile of the property, renamed Rockell Shores Wildlife Sanctuary
- Environmental profile of Company was enhanced through its approach towards sustainable management of an endangered species.

**Latest news:** Pāteke numbers have increased. (A record 23 were present in February 2011).

## 9. Monitoring

Pāteke are most conspicuous at flock sites in the summer months. Although not all birds in the catchment area will be present at flock sites, they do provide an opportunity to index the local population with the objective of determining long-term trends in the total population. Flock site monitoring should comprise:

- Three counts in late summer (e.g. February) preferably at least a week apart and in the middle of the day. If a flock site is tidal, restrict counts to one specific tidal time—carry out pilot counts to determine which part of tidal cycle (usually high tide) gives the highest counts and with low variability between counts.

Other monitoring can include:

- Determining how many ducklings fledge (productivity) if one or more pairs are easily observed.
- Recording monthly rainfall, grazing regimes (livestock, number, sward level)
- Predator captures and sightings of live dogs, mustelids and cats, all of which help answer questions of how the birds are doing in different years and different environmental conditions and enable trapping regimes to be modified.
- More intensive monitoring at release sites (via telemetry and trained dogs—refer to DOC).

## 10. Captive breeding and releases

The national pāteke captive breeding programme consists of private breeders, zoos and wildlife parks who breed pāteke for release each year. This programme has enabled the re-establishment of secure pāteke populations in parts of their former range. The captive breeding program is managed by the captive & reintroductions coordinator, who manages twenty generous volunteer pāteke breeders nationwide. The programme collectively produces between 150 and 200 birds for release per annum; 197 pāteke were bred for release in 2010 alone. Pāteke destined for release are disease screened and sent to Peacock Springs in Christchurch where they undergo pre-release conditioning, are banded and radio-tagged in preparation for release around New Zealand. Release sites are selected through a rigorous assessment process which ensures pāteke are released into areas with adequate protection and habitat to support self-sustaining populations. The release of captive-reared birds is essential for the establishment of pāteke in new locations and the Pāteke Recovery Group is extremely grateful for the ongoing voluntary support and in-kind donations for the programme.



Arthur River release site. Photo: DOC.

# 11. Specialist advice and support

Pāteke information available on the DOC website <http://www.doc.govt.nz/>

Kiwi Survival Guide, third edition 2003. Department of Conservation, Wellington (useful predator control guidelines). Available at <https://www.savethekiwi.org.nz>

Funding and support: the New Zealand Landcare Trust, WWF, the Community Environment Fund, the Biodiversity Condition Fund and the Biodiversity Advice Fund, Ducks Unlimited New Zealand.

For information on humane kill traps targeting cats, rats and mustelids see <http://www.predatortraps.com/about.htm>. This website contains information on the target predators, trapping techniques and instructions, stockists and latest news.

DOC offices managing pāteke populations can provide local advice: Whangarei Area office (09 4703304), Great Barrier Island Field Centre (09 4290044), Hauraki Area office (07 8679180 and Tauranga Area Office (07 5787677).

The Pāteke Recovery Group can provide specialist advice. Please contact Recovery Group leader Andrea Booth at DOC Northland Conservancy Office (09 4703300).

Field trials of fresh and long-life baits for stoats in Northland. *Research and Development Series*, Department of Conservation. 2007.

The New Zealand Landcare Trust trapping guidelines 2009: <http://www.landcare.org.nz/user-content/2469-pest-control-guidelines.pdf>

The New Zealand Landcare Trust biodiversity restoration guidelines: <http://www.landcare.org.nz/user-content/1215-restoring-the-balance.pdf>

# Appendix 1:

## Six critical requirements for pāteke and ways to achieve them

### 1. Foraging habitat

The precise feeding preferences of pāteke are poorly known but they will feed in the following habitats:

- Fertile swamps that contain shallow open water and muddy areas that the birds can gain ready access to. They avoid areas choked with Mercer grass, kikuyu and other impenetrable vegetation.
- Sluggish streams with backwashes, interconnecting other wetlands, streams with *Potamopyrgus* snails and high densities of insect larvae.
- Wide drains and ditches that are accessible to pāteke and which have varying water levels, including much shallow water and muddy areas with sluggish flows. No dense vegetation within drains, but overhead and bankside cover is ideal. Easy access (gentle, unobstructed slopes) to surrounding feeding and loafing areas is beneficial.
- Ponds containing some gentle-sloping, bare banks and offering some feeding opportunities at their edges and on peninsulas and islands. Overhead cover is also ideal for at least part of the ponds.
- Improved, closely cropped, fertile pasture grazed by sheep or cattle, and supporting abundant invertebrates; permanently damp areas can be maintained through irrigation.
- Estuaries—possibly frequented throughout wherever invertebrates are common, but are particularly seen feeding in areas with cockles, mudsnails, and other small bivalves and gastropods.
- Swamp forest characterised by kahikatea, cabbage trees, *Coprosma* spp., kiekie, flax and raupō, with sluggish streams and muddy areas.

### Common problems associated with feeding habitat and ways of overcoming them

#### *Problem 1—rank grass*

Issue—rank grass such as kikuyu and Mercer grass can form dense impenetrable mats within former feeding areas, e.g. swamps, drains, pasture.

- Interim solutions—grazing, spraying and replanting densely to outcompete fast-growing grasses, using weed matting around plants to keep grasses down. When spraying grasses on or near waterways use water-safe Glyphosate 510, Aquakynde penetrant and red marker dye at label rates.
- Long term solutions—light grazing and/or shade trees:
  - Mānuka and fruit trees (e.g. puriri, *Coprosma*) which provide the dual role of shading out grasses and providing food for ducks. Plant mānuka at 1 metre intervals or closer (one of few trees ideal for shading grass in permanently wet areas); can also include local fruiting species, e.g. *Coprosma* and large leafy trees;
- Weed control guides:

- Restoring the Balance: the Northland Biodiversity Enhancement Group biodiversity self-help kit (<http://www.landcare.org.nz/user-content/1215-restoring-the-balance.pdf>)
- Weedbusters ([http://weedbusters.co.nz/about\\_weedbusters/index.asp](http://weedbusters.co.nz/about_weedbusters/index.asp))
- DOC guidelines (<http://www.doc.govt.nz/conservation/threats-and-impacts/weeds/>)
- Council guidelines



Paddock on Great Barrier Island/Aotea before (left) and after modification using a dam wall to hold back water. Photo: Joanna Sim.

### ***Problem 2—unproductive pasture due to drying out and/or infertility***

Issue—during prolonged dry periods, the food available in pasture and lawns may be limited and birds have to rely on wet areas.

- Interim solutions—supplementary feeding, e.g. grains from feeders, irrigation, slow-release fertiliser.
- Long-term solutions—retaining moisture levels, e.g. adjustable weirs on drains with native fish access; restoration planting of upper catchments to ensure increased moisture retention and slower release in dry periods. Pasture fertility—seek advice regarding pasture management, e.g. fertilizer rates, re-seeding, grazing regime altered to avoid over-grazing in dry periods and excessive pugging in wet periods, alternative pasture species.

## **2. Nesting habitat**

Pāteke nest in dense ground-cover, generally close to feeding areas and areas of open water where the brood is relatively safe. The nest site can be within quite open areas, often up to 100 metres from water, e.g. clumps of *Cyperus* or *Carex* (including Australian sedge) in grazed areas, or in denser vegetation, e.g. edges of dense kikuyu, rushes, beneath banks, fallen tree trunks, etc. Broods are found in swamps, drains, ponds and sections of streams where the ducklings are secreted away in dense vegetation (usually adjoining open water) during the day and the family emerges to feed in those areas or adjacent wet areas at night.

### **Common problems associated with nesting habitat and ways of overcoming them**

#### ***Problem 1—lack of nest site cover***

Issue—pasture management may have resulted in natural nest-site cover such as *Cyperus* being removed or Australian sedge and other weeds sprayed.

- Solutions—fence livestock out of small areas (lower hill slopes) or habitat strips (e.g. stream banks) and leave to regenerate, or plant with sedges, *Cyperus* etc, or prop up mānuka slash to shade weeds and provide cover for pāteke .

### ***Problem 2—livestock ponds lack cover for broods***

Issue—many livestock ponds would make ideal brood-rearing ponds, but livestock access has removed all cover.

- Interim solutions—circle fence one corner or end of a pond and plant with rushes and sedges and shrubs.
- Long-term solution—Provide alternative stock water and retire pond for restoration. Also plant one or two large leafy trees, e.g. pohutukawa or puriri that will provide better protection from harriers in the long-term.



Fenced and replanted pond and wetland. Photo: Tiff Browne.

## **3. Flock sites**

Pāteke flock sites are extremely varied and can occur in the following situations:

- Estuaries—both in mature mangroves and in areas just upstream of the salt water wedge. Birds prefer to roost beneath overhead cover, e.g., mature mangroves, pohutukawa, mānuka/kānuka, exotics such as willow and *Elaeagnus*, and sometimes dense ground-cover such as kikuyu overhanging undercut banks (c.f. rank kikuyu being unsuitable for foraging—see above).
- Streams—areas where there are deep open areas of water, also generally with overhanging trees, tree roots and on relatively gentle-sloping banks, usually at the bottom of a catchment.
- Ponds—usually large ponds of 50 m or more in length, but smaller ponds can have small flocks or families of pāteke .

Key requirements for viable flock sites:

- Sites not disturbed by people, vehicles, pets. Consider formal protection, e.g. covenants.

- Larger sites better and permanently deep-water areas of 1 metre or more.
- Access to and from roosting banks which are not overgrown with vegetation—an alternative is to provide artificial roosts, e.g. floating rafts.
- Predator control essential—see below.
- Overhead cover is a benefit from aerial predators.
- Creating artificial ponds is a viable option for pāteke if there is a shortage of good flock sites. However, avoid making ponds above wetland feeding areas as this may effectively dry out the wetlands below—ponds at the bottom of catchments allow the wetland hydrology to remain intact and also provide a settlement area to improve water quality.



Pāteke using artificial raft as a roost. Photo: Joanna Sim.

## 4. Predator control

For pāteke to survive, mustelids, cats and dogs need to be eliminated or controlled to very low levels. Contact the Pāteke Recovery Group for further information.

### Key advice for mustelid control

- Combinations of Fenn traps and DOC 200 (stoats) and 250 traps (ferrets and stoats) are recommended, using single or preferably double sets set in DOC best practice wooden boxes. For more information on DOC 200 and DOC 250 best practice sets see <http://www.predatortraps.com/about.htm>.
- Note the entrance hole for DOC 200 traps should be no larger than 60mm x 60mm otherwise cats, possums (and other non-targets) can enter the tunnel. Galvanised mesh with 60 mm holes is ideal. The entrance hole for a DOC 250 is 80mm x 80mm to allow ferrets access to the traps.
- Wooden tunnels with larger mesh ends are likely to allow more air movement through them therefore increasing the volume of scent for predators to be able to find traps
- Trapping density needs to be adjusted to the local situation, e.g. more traps will be needed where there is a lot of cover available to predators. As a starting point, 1 trap to 10 ha has been effective for pāteke recovery in several sites, e.g. a trap site every 100–200 m.

- Trap site selection should reflect the distribution of pāteke and likely hunting areas of predators, e.g. stream edges, bush edges, fence lines, roadsides, beneath canopy, converging features, etc.
- Mammalian predators prefer to hunt beneath overhead cover.
- Maintain access to and around trap sites e.g. clearing grass, dig ground as fresh digging can attract mustelids.
- Consider setting additional traps at a trapping “hot spot”, or in response to a predator sighting.
- Traps should be set and checked year-round to protect pāteke .
- Optimal bait is rabbit (egg is less attractive to mustelids)—fresh bait is best (replaced twice a week), but salted rabbit replaced weekly or fortnightly is also effective. Pāteke are more susceptible to mustelids than kiwi and require more frequent re-baiting.
- Keep baits off the ground by attaching them to a nail in the trap box.
- Consider changing the types of traps and baits if trap-shy predators are suspected to be present.
- Remove old (unpalatable) baits and carcasses from the site.
- Maintain traps and follow health and safety guidelines; refer to the NZ Landcare Trust trapping guidelines (2009) for these and more detailed updates, bait preparation, and monitoring recommendations.



Double set DOC 200 trap box. Photos: Tiff Browne.

### Key advice for cat control

- Kill traps, e.g. modified SA Conibear cat traps, are ideal, but must be set 70+ cm off the ground on ramp ideally < 35 degrees angle and less than 10 cm wide.
- Traps should be set every 100-200 metres.
- Traps should be set and checked year-round to protect pāteke .
- Fresh rabbit (minced) is ideal for SA Conibear traps (requires “sloppy” bait such as minced meat), not salted or preserved bait.
- Try different baits; where possible, baits should consist of local food sources used by cats. Effective baits include meat—fresh and salted rabbit, hare, and possum and fish (fresh/frozen/salted).
- Timms traps—like SA Conibear traps these must be set above the ground.



Steve Allen-modified Conibear trap. Photo: Tiff Browne.

- Belisle Super X 220 kill traps are designed to take solid baits such as salted rabbit pieces. These traps are set in a ‘chimney’ trap cover or cubby.
- Cage traps—cages need to be stable; also block off rear end of cage to stop pawing. Bait with fresh or salted rabbit.
- Leg-hold traps need to be set in elevated areas away from pāteke , but note that pāteke can also climb sloping trunks to nest sites in *Astelia* etc. Live capture traps must be checked daily.
- Remove old baits and carcasses from the trap site.
- Refer to The NZ Landcare Trust trapping guidelines (2009) for more detailed information.

*For more information on DOC best practice for feral cat control, contact DOC.*

## 5. Control of dogs and cats

- If pāteke are in your area make sure your dogs are under control and watch out for other dogs in the area.
- Contact DOC regarding pāteke aversion training for any dogs likely to come into contact with pāteke .
- Work closely with the local community and dog control officers.
- Maintain good signage of pāteke needs, dog restrictions, and that wandering dogs will be shot, poison laid, cats caught, etc. Sign templates are available from DOC.
- Dogs may be shot if they are worrying stock or threatening wildlife on your land. Follow legal and safety requirements of the Arms Code.
- Dog traps are a good advocacy tool and can be effective in catching dogs—different types are available (liaise with DOC).



Example of advocacy signs available from DOC.

Some other potential problem species may need to be controlled:

- Is pukeko control needed? Where pukeko are common they can impact on pāteke , especially on those with young broods. Consult with DOC about the need to manage pukeko and paradise shelduck if their numbers are high, and determine permit requirements and appropriate methodology with them.
- Is harrier control needed? Some pāteke populations have recovered without harriers being controlled, but there is a potential impact on pāteke , especially young (and potentially weak) birds. Controlling harriers is complex and needs to be discussed with local DOC staff.
- Providing culverts and dense vegetation in pāteke areas probably helps reduce predation by harriers.
- Discourage and preferably exclude mallards from the management area.
- Monitor potential ripple effects, e.g. increases in rabbit and rodent numbers that could be associated with the predator control. Implement control, particularly if there are other animals present that are sensitive to these pests. See DOC regarding best practice for control of other pests.

## 6. Minimising road kills

Methods of minimising road kills include the following:

- Evaluate sites—risks, history of past deaths and potential for future deaths.
- Place signage leading up to these sites indicating that pāteke may be on the roads particularly at dusk and during the night.
- Provide better access for pāteke beneath bridges and through culverts to reduce numbers on roads.
- Provide roadside screening across regular flight paths (e.g. streams between flock site and estuary) to elevate the heights of flying birds.
- Drain puddles at the side of roads in death-prone areas to reduce site attractiveness to pāteke .
- Encourage locals to care about their pāteke .



Screening to prevent pāteke road deaths. Photo: Joanna Sim.

## 7. Minimising deaths in fishing nets

It is best to avoid setting nets in pāteke areas as the risk of entanglement is high. If nets are set they should be attended at all times and submerged to avoid catching pāteke . Set nets must comply with Ministry of Fisheries regulations:

- Any net or nets used either individually or jointly must not extend more than a quarter of the way across any bay, channel, river, stream or sound.
- Nets must not be set in a way that causes fish to be stranded by the falling tide.
- The use of stakes to secure nets is prohibited.
- Each end of a net must have a surface buoy permanently and legibly marked with the fisher's initials and surname.
- Set nets must not exceed 60 metres in length.
- Nets must not be set within 60 metres of another net.