

Brown Teal (Pateke)
Anas chlorotis
Recovery Plan

THREATENED SPECIES RECOVERY PLAN NO. 19



Department of Conservation
Te Papa Atawhai

Brown Teal (Pateke) *Anas chlorotis* Recovery Plan

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ISSN 1170-3806
ISBN 0-478-01567-4

Cover photo: C.R. Veitch, Department of Conservation

Recovery Plans

This is one of a series of recovery plans published 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 Director-General of Conservation in February 1996. A review of this plan is due after five years, 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 brown teal and an interest in their conservation has been established 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 brown teal are welcome and should be directed to the recovery group via any office of the Department or to the Threatened Species Unit.

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1.0 Summary

This recovery plan briefly summarises the changing numerical status and distribution of brown teal over the past 150 years. It assesses the need for and the likely effectiveness of any conservation programme for the species based on the perception that habitat destruction and mammalian (especially mustelid) predation remain the principal threats to the species. Brown teal have a conservation status of "endangered" based on IUCN criteria.

Teal are presently restricted to Great Barrier Island (population stable at about 1200), Northland (rapidly declining, approx. 2-400), and Fiordland (on verge of extinction), and on Kapiti, Little Barrier and Tiritiri Matangi Islands (all <10 pairs).

The Fiordland population is considered beyond saving to situ but remaining birds represent a valuable genetic resource worthy of conservation to fuel future re-establishment programmes on southern islands and on mainland South Island. Wild birds in Northland can best be protected by concerted habitat and predator management at some, but not all, remaining population centres. The Great Barrier Island population offers no better than medium-term security for the species because of the island's vulnerability to colonisation by mustelids.

A recovery programme is outlined, the goal of which is to maintain teal in the wild state on islands and mainland of New Zealand in sufficient numbers and at sufficient secure locations so that it has the conservation status of "non-threatened". Seven conservation objectives for the 10-year period from 1995 are outlined which seek to ensure retention of wild birds on Great Barrier Island and in Northland, establishment of new populations on islands and on mainland North Island, consolidation of existing captive breeding programmes, and development of a broader public constituency of support for teal conservation.

2.0 Introduction

The brown teal *Anas chlorotis* is a small dabbling duck endemic to mainland New Zealand and Chatham Island. It is one of several similar-looking teals in the Indo-Australasian area (collectively called "Austral Teals"; Delacour 1956), others in the New Zealand region being grey teal *A. gracilis*, Campbell Island teal *A. nesiotis*, and Auckland Island teal *A. aucklandica*.

Although once widespread throughout New Zealand's three main islands and Chatham Island where they occupied more diverse habitats than today (Worthy & Holdaway 1994), brown teal are now largely restricted to Great Barrier Island and some coastal valleys of eastern Northland, between Whananaki and Russell. A remnant population persists in part of Fiordland and isolated birds occur in other parts of Northland and, possibly, in Waikato and Bay of Plenty. Little Barrier, Tiritiri Matangi and Kapiti Islands contain small resident populations of about ten breeding pairs, the latter two the result of deliberate introduction.

The decline of brown teal, in both numbers and range, has been continuous since the late 19th century, and has been attributed to predation, habitat loss, over-exploitation and disease (McKenzie 1971, Williams 1962, Hayes & Williams 1982). Brown teal disappeared from Chatham Island about 1915 (Fleming 1939), from Stewart Island about 1972 (Hayes & Williams 1982) and for most of this century their South Island presence has been restricted to Southland (now extinct) and Fiordland. By 1950, brown teal in the North Island were essentially unknown or extremely rare beyond Northland and Great Barrier Island. Although the Great Barrier population has remained more or less stable over the past 10-20 years and presently (1995) numbers approximately 1200 birds, the Northland population has continued a slow but steady contraction of range and numerical decline to approximately 2-400 birds (Appendix 1).

The widespread obliteration or modification of New Zealand's lowland wetlands and swamp forests, and other land-use changes over the past 150 years has forced the retreat of brown teal to small and widely separated wetlands in a predominantly pastoral environment. Leaving aside the threat posed by introduced small predatory mammals, the maintenance of habitat and population integrity in this pastoral environment presents a particular conservation challenge. The retreat has also left brown teal on lands where no other of New Zealand's threatened avifauna are so concentrated - land in private ownership on which there are few regulatory constraints on use.

This historic and ongoing decline in numbers and range led Bell (1986) to accord the species the conservation status of "vulnerable" (= threatened) using the then IUCN conservation criteria (King 1981). Under present IUCN criteria (e.g. version 2.2, Mace & Stuart 1994; version 2.3, Anon 1994), the species is classified as "endangered" (Green, in press). The Department of Conservation's working document which ranks all New Zealand biota for conservation action (Molloy & Davis 1994) lists brown teal as a "Category C" species - the third highest priority for conservation.

Brown Teal occupy an ecological niche which is almost unique amongst the world's waterfowl. Evolving in the absence of small ground-dwelling or wetland mammals, it

has adopted the ecological characteristics akin to a wetland rodent by inhabiting areas of dense vegetation in the seral transition from open water to dry land. In addition, a more terrestrial than aquatic habit, an omnivorous diet, and a restricted annual range both at the individual and population level describes a lifestyle unmatched by almost all other waterfowl save for its close relatives on the New Zealand sub-antarctic islands. In this respect brown teal is a classic - and still extant - example of the influence of selective forces which operated on the avifauna of pre-human New Zealand.

The concern for brown teal centres on their impending extinction in Fiordland and Northland and their likely medium term persistence solely on Great Barrier Island. This document seeks to summarise relevant knowledge of brown teal, appraise the reality for expecting and/or attempting any recovery process and outline approaches to facilitate the long term survival of the species.

NOTES TO SECTION I

The taxonomy of some Austral teals is confusing (see Dumbell 1986). Two recent authorities treat the three New Zealand teals differently. Marchant & Higgins (1990) accords each of them species status whereas Turbott et al.(1990) considers them as three subspecies of *Anas aucklandica*. Recent unpublished genetic work supports the approach of Marchant & Higgins (see Williams et al. 1991) and separate species status has been adopted in the recovery plan for subantarctic teal (McClelland 1993).

3.0 Status, Distribution and Decline of Brown Teal

3.1 PAST DISTRIBUTION

Historically, this species may have been widespread throughout lowland North, South and Stewart Islands where, in wetland and damp forest locations, it was a common member of the aquatic and forest floor insectivorous guild (Atkinson & Millener 1991; Worthy & Holdaway 1994). Brown Teal also occurred on Chatham Island where they differentiated into a somewhat smaller and shorter-winged form (P Millener, pers. comm.).

At the time of European settlement brown teal were probably widely distributed throughout North Island (Hayes & Williams 1982, Fig. 1) with highest densities in the large lowland freshwater wetlands of Manawatu, Wairarapa, Waikato, Hauraki and Bay of Plenty regions, while in South Island they were probably less common and located principally in Canterbury, Fiordland and Southland (Hayes & Williams 1982). Their range then also included Stewart Island and Chatham Island. Other records (see Dumbell 1986) show teal to have persisted in parts of the South Island high country, central North Island, Te Urewera, and Hunua Ranges, and onto many of the smaller inshore islands where populations often persisted for several decades. In fact, Buller (1882) wrote "...this elegant little duck is distributed all over the country, being met with in every inland lake and often in the deep freshwater streams which run into them, where the overhanging vegetation affords ready shelter and concealment".

3.2 PRESENT DISTRIBUTION AND STATUS

Today the largest numbers of brown teal are found on Great Barrier Island and on the east coast of Northland (Hayes & Williams 1982, Fig. 2). On Great Barrier Island systematic and repeated surveys between 1984 and 1987 indicated 1300 - 1500 birds were present (Dumbell 1987). More recent assessments estimate something similar (Appendix 1). In Northland, a 1988 survey detected 520 birds at flock sites but regular counts since then confirm a steady decline of most summer aggregations (see Appendix 1) and suggest that less than 300 now remain. However, not all birds attend flock sites in all years and the extent of this variation remains unknown.

Several small populations occur on islands. A natural population has persisted on Little Barrier Island since the 1940s (Blanshard 1964, C. Smuts-Kennedy pers.comm.), a possible breeding population exists on Arid (Rakitu) Island adjacent to Great Barrier (Bellingham et al. 1982), while released birds remain and have bred on Kapiti Island, Tiritiri Matangi Island, and Moturoa Island in the Bay of Islands.

Isolated sightings are still recorded at many former Northland haunts, such as the Hokianga and Kaipara Harbours and nearby coastal lakes, in the Auckland and

Waikato areas, Coromandel (a former stronghold) and Fiordland (Bull et al. 1985). There have been no authenticated records within the last ten years from former remnant haunts in the Whangamarino wetlands and the headwaters of the Whaeo and Rangitaiki Rivers in Bay of Plenty. Captive-reared teal released during the 1970s at Matakana Island near Tauranga, at coastal lakes in Manawatu and at Kaihoka Lakes near Farewell Spit, no longer persist.

Thus fewer than 2,000 brown teal are presently living in a wild state in New Zealand.

3.3 POSSIBLE REASONS FOR DECLINE

Two previous reviews of the historical information concerning the decline of brown teal (Hayes and Williams 1982, Dumbell 1986) suggested that, while the traditional causal factors of predation, habitat loss, over-exploitation and disease can all be implicated, their relative importance at various times and localities remains unclear. Hayes and Williams (1982) reported the bird's decline was largely in two phases, the first in the last quarter of the 19th century, and the second during the 1920s and 1930s. They suggested that, in both phases, intensive land clearance and wetland drainage were major causal factors throughout the bird's range, and were supplemented by the other factors, particularly hunting and mammalian predation.

Several authors (e.g. Potts 1869, Buller 1898) reported on the impact of hunting on brown teal during the early period of European settlement. While this may have been reduced by the bird's protection in 1921, it was not eliminated (Myers 1923), and continued hunting finally eliminated brown teal in Manawatu at least (M. Wilson pers. comm.).

The timing of the second decline phase was also coincidental with the widespread disappearance of weka *Gallirallus australis*. McKenzie (1971) postulated this was due to the effects of an introduced poultry disease - a possibility, but not sufficient to explain the brown teal's demise either in areas where weka remained common, or nationally.

The impact of introduced mammalian predators is hard to judge objectively. Hayes and Williams (1982) considered cats *Felis catus* were responsible for the disappearance of brown teal from Stewart Island since that predator was widespread in a feral state on the island. Wilson (1959) suggested that stoats *Mustela erminea* were a major predator, due to their ability to track teal onto their nests, whereas Ogle (1981) attributed the persistence of brown teal on Great Barrier Island to the absence of both mustelids and Norway rats *Rattus norvegicus*. The potential impacts of predators has been clearly demonstrated at sites where captive-bred birds have been released e.g. Mimiwhangata in 1991 when nine of 12 radio transmitted birds were preyed upon by ferrets *M. furo* (R Pierce pers. comm.), and in 1995 at Tawharanui Regional Park where all eight released birds were killed by cats and stoats (B. Green, pers. comm.). Dogs have also been reported and observed catching and killing teal at flock sites (M. Williams pers. obs.).

While all the traditional decline factors can be implicated in the historic decline of brown teal, an examination of more recent localised declines may assist the process of appraisal (see Table 1). Since 1960, brown teal have become extinct on Stewart

Island, in Coromandel, have almost disappeared from Fiordland, and their range within Northland has contracted significantly. Meanwhile, they have remained in stable numbers on Great Barrier Island, persisted on Little Barrier and established on Kapiti and Tiritiri Matangi Islands.

An interpretation of Table 1 is that both land change and biological factors together have more impact on brown teal than either does alone, except for intensive land modification that obliterates rather than modifies wetland habitat. By this analysis further decline in Northland appears inevitable because of widespread hunting, ongoing habitat degradation and the presence of numerous predator species. It also suggests that mainland re-establishment and conservation efforts will need to be at locations which combine habitat security with ongoing predator control.

TABLE 1: PRESENCE/ABSENCE OF FACTORS IMPLICATED IN DECLINE OF BROWN TEAL.

	NTHL	CRMNDL	FIORDL	STEW IS	LIT BAR	GRT BAR	KAPITI	TIRITIRI
PREDATORS								
Cat	+	+	-	+	+/-	-	-	
Mustelid	+	+	+	-	-	-	-	-
Hedgehog	+	+	-	+	-	-	-	-
Norway rat+	+	-	+	-	-	+	-	
Ship rat	+	+	+	+	-	+	-	-
Possum	+	+	+	+	-	-	+/-	-
Avian	+	+	+	+	+	+	+	+
LAND CHANGE								
Extensive	+	.	-	-	-	-	-	
Minor	-	+	+	+	-	+	-	
None	-	-	+	+	+	-	+	
HUNTING	+	+	-	+	-	-	.	-
POPULATION TREND	Decline	Extinct	Decline	Extinct	Stable	Stable	Stable	Expand

Abbreviations: *Nthl* = Northland, *Crmndl* = Coromandel, *Piordl* = 1st Fiordland, *Stew Is* = Stewart Island, *Lit Bar* = Little Barrier Island, *Grt Bar* = Great Barrier Island, *Tiritiri* = Tiritiri Matangi Island

Symbols: + = present, - = absent, * = restored landscape

4.0 Past Conservation Efforts

Modern efforts to assist brown teal conservation date back to 1973 when several waterfowl enthusiasts holding brown teal in captivity were approached by the Wildlife Service to supply captive-bred birds for release. To facilitate this programme and provide new captive stock, 20 birds were captured on Great Barrier Island and distributed to aviculturalists. These birds took some time to settle down, and the considerable diversity of facilities and avicultural techniques then practised by the participants resulted in half of the new stock being lost within two years. This fledgling conservation programme coincided with the formation of a New Zealand chapter of Ducks Unlimited (DU) to which many waterfowl aviculturalists soon belonged. The brown teal captive breeding programme was then developed further and coordinated by DU as "Operation Pateke". A further 22 teal from Great Barrier Island were brought into captivity in 1976 and distributed to the expanding number of breeders, aviary standards were developed, husbandry techniques improved and information shared. A very successful "Brown Teal Management Seminar" was organised by DU in 1980 and funded by a Mobil Environmental Grant, the resulting handbook (Hayes 1980) summarising captive management procedures and providing an overview of the then status of the species in the wild. Ducks Unlimited has continued its "Operation Pateke" as a captive breeding programme ever since and, during the past 15 years, has extended it to include releases, of birds (especially in Northland, see below) and post-release monitoring.

4.1 RELEASES OF CAPTIVE-REARED BIRDS

In 1968, ten teal were released on Kapiti Island (Williams 1969). These included captive-reared birds and some wild birds from Great Barrier Island that had spent several years in captivity. Descendants of that release still persist on the island' and during the intervening years teal from there have dispersed to the nearby mainland (Hayes & Williams 1982, PMcKenzie pers. comm.).

Between 1977 and 1983, 320 captive-reared teal were liberated on four lakes near Himatangi in Manawatu. Despite breeding being confirmed, and the birds dispersing to other nearby Manawatu wetlands, the population failed to establish (Hayes & Williams 1982). The same lack of success greeted the release of 20 teal on Kaihoka Lakes, Nelson, in 1978 (Williams 1978) and 64 teal on Matakana Island in 1982 (Hayes & Williams 1982).

Most recent releases of birds raised by members of Ducks Unlimited have been in Northland. From 1984 to 1995, almost 1000 teal were released at mainland sites in Northland, from Matapouri Estuary to Purerua Peninsula (near Kerikeri), Hokianga Hbr, and on three islands: Tiritiri Matangi Island (1987, 1990), Moturoa (1985, 1986, 1994), and Urupukapuka Island (1988, 1990, 1992, 1994) (Appendix 2).

Kapiti and Tiritiri Matangi Island releases have established breeding populations, and breeding occurred in 1994 and 1995 on Moturoa Island following rat and mustelid removal. To date, none of the mainland releases have established new populations although some of the teal released at Mimiwhangata were recruited into the local wild population.

4.2 PROTECTION OF FLOCK SITES

The pattern of decline of teal in the Waipu and Hokianga areas of Northland was thought to involve, initially, the destruction of traditional summer flock sites, followed by the slow disappearance of birds from the affected catchments (C.A. Fleming pers comm to M.Williams, D.V Merton unpubl. Wildlife Service files). In the mid-1970s, efforts were made to locate existing summer flocks sites in Northland. Where landholders agreed, fences to exclude stock were erected and limited planting (mostly of flax) was undertaken so as to improve the visual seclusion of the sites. Similar protection work was undertaken at three sites during 1982-4. However, this work has neither slowed nor stopped the decline of these teal populations.

4.3 CRITIQUE OF PAST CONSERVATION EFFORTS

Twenty years of captive breeding and release of brown teal has failed to stem the decline of the species on the New Zealand mainland. The absence of predator control and other field initiatives to support the release programmes throughout this period and the apparent lack of institutional support for these conservation efforts has drawn recent criticism (Hayes 1994). The reader is referred to Hayes' publication for a perspective on past conservation efforts and suggestions for the future.

NOTES TO SECTION 4

A survey of Kapiti Island, October 1995, using a dog, located only one pair of brown teal (R.Empson pers. comm.).

5.0 Ecology of Brown Teal

Only two dedicated studies of brown teal ecology are available to draw upon - that of Dumbell (1987) conducted on Great Barrier Island during 1984 - 1987, and by Williams (1994a,b.) in Northland 1993-4. Results of Dumbell's study and other anecdotal records are summarised in Marchant & Higgins (1990).

5.1 FLOCK SITES AND THE SUMMER FLOCKING HABIT

Brown teal form large seasonal flocks at traditional sites. The number of birds at each of these sites oscillates annually, from a peak (on Gt. Barrier Is.) between December and March to a low between July and September. In Northland, high numbers are present from November and birds begin dispersing away at the onset of autumn rains.

Present day flock sites are mostly on quiet tidal coastal streams fringed by a mosaic of bankside vegetation that includes a mixture of tall and dense cover for shelter, shade, and escape, and open areas of grassy bank used for loafing in the sun. The site is generally located at the interface of salt/freshwater as indicated by the extent of salt adapted vegetation. Favourite perching sites include ledges and undercuts on stream banks and overhanging branches.

Initially, the summer flocks seem to comprise mostly unpaired birds, presumably juveniles. However, as peak numbers are reached, many birds are obviously paired clearing indicating the presence of adults. During the autumn, many new pairings are formed and the proportion of paired birds in the flock increases. The pairs disperse into the surrounding catchment during autumn and winter to make their breeding attempt.

On Great Barrier island, some flock sites are completely abandoned during the winter, but others retain a small group of birds which do not make a breeding attempt. It is not yet clear whether those birds remaining are late young of the previous year or whether they are prevented from breeding by their, inability to secure breeding habitat. Some flock sites also have sharply defined periods of use and these may be acting either as satellites to a main site, or may be used for a specific purpose, such as providing access to summer feeding sites. Thus, not all summer flocks of brown teal act in a similar manner.

There is still more to learn about the reasons for and the function of summer flocking, including the age and sex composition of flocks and social behaviour within the flock. That flocks have some important social significance is suggested by the observation that destruction of a traditional flock site (at Waipu and Kaeo in Northland) was followed by local population local decline and eventual extinction (C.Fleming in Oliver 1955, Bell 1959, Anderson 1983). On the other hand, Williams (1994b, unpubl.) has interpreted declines at two Northland flock sites as being caused by prolonged poor juvenile survival and the gradual loss of adults which breed in seasonally dry habitats.

5.2 FEEDING HABITAT AND BEHAVIOUR

Little is known about the diet of brown teal except that they are omnivorous and feed on invertebrates and plant detritus. Outside the nesting period most feeding occurs immediately adjacent to the flock site. Favoured feeding areas are often short, grazed vegetation with extensive areas of surface water available in which the birds dabble. Although numerous clumps of *Juncus* and *Cyperus* may be present, uniformly thick cover is not preferred as a feeding site. They feed at night throughout the year, but in summer also in late afternoon. During summer brown teal move into intertidal areas and feed during each low tide period (Weller 1974, 1975, Dumbell 1987). Diurnal flock feeding on pasture areas adjacent to the flock sites also occurs at this time and coincides with the bird's lowest seasonal body weight and their pre-nuptial moult.

During daylight feeding, flock birds feed close together with only 1-2 m between individuals. When feeding at night, individuals are much more dispersed with at least 10 m between individuals when the birds are not paired. Similar separations also occur when the birds are paired, however, during this time the members of the pair feed together with large distances existing between pairs.

An analysis of the location of flock sites on Great Barrier Island showed that the single most important habitat feature was the presence of adjacent grazed land. However, in Northland, remaining associations are more with estuarine vegetation and the close proximity of estuarine feeding areas. These associations emphasise the importance of considering flock site habitat in conjunction with associated feeding habitat when managing brown teal.

5.3 BREEDING HABITAT AND BEHAVIOUR

Breeding pairs occupy and defend small and exclusive breeding territories. On Great Barrier Island, breeding habitat is difficult to describe because the nature and extent of the bird's territoriality is largely unknown there. Nest sites are associated with thick cover and are generally close to water. Recorded nest sites include *Cyperus* clumps, *Juncus* clumps, under fallen ponga fronds, in rank grass and blackberry tangles. In all cases the nest is covered from view overhead.

In Northland, pairs may be found year-round in some dense swamps and on ponds with extensive marginal vegetation. However, a significant proportion of pairs establish territories on streams, using the streamside vegetation as daytime cover, and venturing out onto damp areas of pasture to feed at night. In contrast to the year-round swamp and pond-dwellers, most stream pairs have feeding areas that are well separated from their daytime loafing sites. These pairs are forced to abandon their breeding ranges when, in late spring and summer, their feeding areas dry up.

Nests are frequently close to the daytime loafing sites. The female leaves and enters the nest by walking and forms a track through the surrounding heavy cover. The male appears to maintain a presence within 10 m or so of the nest, from where he guards the nesting area and joins the female during her nest relief periods.

The birds' nesting association with water and their territoriality means it is uncommon to find two pairs breeding on a small pond. In linear habitats, such as

streams and drains, each pair may maintain up to 100 m of breeding habitat as their own. This is vigorously defended by the male who investigates all intrusions and will evict any other brown teal.

The male brown teal is actively involved in brood rearing. Brood rearing habitat is not clearly known except that heavy cover is used during the day. Broods feed with their parents at night and can be found some distance from suitable cover. The nest site is sometimes used to brood ducklings indicating that brood-rearing habitat may simply be the same as that occupied by the pairs prior to breeding.

5.4 DISPERSAL AND POPULATION STRUCTURE

Brown teal population structure may be conceived as a series of 'local populations' comprising those birds using each roost site, which can then be grouped into 'geographical populations' to include all the birds at all the roost sites within each major catchment. On Gt. Barrier Islands, few birds move distances of up to 20 km and only 5% of resighted birds have been found outside the catchment in which they were banded. However, up to 15% of resightings were made at flock sites other than the site of banding, but within the same catchment. In Northland, movement between catchments has yet to be recorded.

Within each local population's range, some brown teal do exhibit daily and seasonal movements of several kilometres.

5.5 POPULATION DYNAMICS

The mean annual survival of all birds banded on Great Barrier Island for the years 1985-87 was 63%, indicating a mean life expectancy of 2.2 years from independence. No differentiation has been made between juveniles and adults or male and female; first-year birds would have a lower annual survival than older birds, and females probably a little lower than males.

The average clutch size was 5.5 eggs; 30% of eggs on Great Barrier Island were deserted, 7% were destroyed by predators, the other 63% successfully hatched. Egg remnants suggested that both cats and rats had destroyed eggs. The causes of nest desertion were unknown.

Overall duckling survival was 26%. Mean brood size at fledging (of surviving broods) was the same as the mean brood size at hatching suggesting the complete elimination of some broods, and the successful fledging of others without loss.

Combining these data, each breeding pair on Great Barrier Island in 1985-87 produced an average of 0.9 ducklings per breeding attempt with a total lifetime productivity for each bird of just 1.0 duckling. This suggests that population size is tenuously stable.

Data from two summers in Northland (Williams 1994a,b) contrast with those from Gt. Barrier Island. Mean clutch size (n= 14) was 6.5, and the mean number of ducklings raised by each breeding pair (n=63) was 1.7 with only 20% of pairs failing to raise some young. However, approx. 55% of the fledglings failed to survive the

period (4-5 -months) from fledging to the establishment of the conspicuous summer flocks and almost all of the remainder died during the dry summer/autumn period preceding the onset of breeding. Adult survival was high during the breeding season (none of 126 breeders lost during nesting and brood rearing) and thought to be likewise during the period of the post-breeding moult (which takes place on the breeding territories). However, summer/autumn survival was low with only 19% of adults returning to breed in one predominantly pastoral study site and 57% returning to territories on streams. These data can be interpreted as evidence of total recruitment failure in both Northland populations studied, and of particularly high adult mortality in pastoral areas during the driest period of the year.

The considerable difference in breeding and survival data from Northland and Great Barrier Island, and between the two Northland study sites, is a warning not to base management decisions on "general" models of productivity and survival. These data indicate that productivity and survival may be very site-specific.

6.0 Can Brown Teal Recover?

Habitat destruction or modification, disease, predation and exploitation are perceived to be the principal agents of the brown teal's demise. This is largely an assumption, for cause and effect relationships have not been established with rigour, and they are never likely to be. Rather it is a case of interpreting knowledge of the species' biology in concert with present understanding of the perceived and known agents of decline of other native birds.

There are two fundamental questions that will guide the conservation of this species:

1. Can brown teal persist within their present range?

This is a consideration of the factors presently impacting upon the species in Fiordland, Northland and on Great Barrier Island and whether they are mitigable.

2. Can brown teal populations be established and survive in areas beyond their present range?

This is a consideration of whether there are alternative localities, both within or beyond their former range, where successful establishment of self-sustaining populations is likely and where those populations are likely to persist over the medium to long term.

6.1 SURVIVAL WITHIN THE PRESENT RANGE

Northland

There has been a progressive decline in the Northland population since a 1963 survey (D.Merton, Wildlife Service files). However, the decline clearly pre-dates this for Oliver (1955) refers to C A Fleming's description of the duck's disappearance from various catchments back in 1936.

Recent counts (Appendix 1) show clearly that the decline continues. Table 1 suggests that the decline on the Northland mainland is neither easily halted nor reversed; the suite of predators in Northland is extensive and expanding with ferrets and possums the most recent arrivals, and habitat alienation (especially the impact of cattle farming on coastal lowland wetlands on the east of the peninsula, all of which are in private ownership), shows no sign of abating. In response to this there are three principal conservation options:

- i attempt to slow the rate of decline of the remaining populations by low intensity management at all locations where birds presently occur. This management would include attempts to limit the impact of cattle on some breeding habitat, temporary or seasonal lowering of predator density in some areas, providing temporary or medium term physical protection of flock sites and attempts at creating or securing summer feeding areas;
- ii undertake intensive and on-going management to support all existing teal populations in Northland, where "population" is defined as an interacting group of five breeding pairs or more.

- iii undertake intensive and on-going management to support a limited number of carefully selected and localised populations and accept the extinction of all other Northland populations.

All options are demanding of continuous human input and considerable funding. Option (i) is ultimately self defeating because not all populations are likely to receive an intensity of management effort at critical times and the ultimate extinction of brown teal in Northland will not be prevented. Option (ii) is the "ideal" and makes a clear statement about how this species is perceived in its last mainland stronghold. It is very demanding of resources and calls for an intensity of management akin to that presently provided to critical avian species such as Black Stilt, Takahe and Kokako. Option (iii), while undoubtedly controversial in that some populations will be "abandoned", permits a concentration of mind and resources. However, it is dependant upon enduring support of the affected landowners and an unwavering physical and \$ \$ commitment from conservation managers.

Great Barrier Island

Absence of waterfowl hunting, the slow pace of land modification, and the absence of mustelids, possums and norway rat are factors that favour the persistence of brown teal on Great Barrier Island at least in the medium term. However, the various teal populations on the island all appear particularly vulnerable to the accidental or deliberate introduction of mustelids to the island, impacts arising from increased human settlement close to existing key breeding areas and flock sites, and the concomitant increase in human camp followers (especially cats and dogs). In addition, there may be some population processes presently at work which could heighten the vulnerability of some of the island's populations. For example:

- i Dumbell (1987) suggested that productivity on Great Barrier Island is constrained by poor duckling survival and concluded (i) that the (then) population may be below the island's carrying capacity, and (ii) additional impacts upon duckling survival may promote a population decline. If Dumbell's analysis is correct (and it is too important not to warrant confirmation), specifically targeting an increase in productivity by removing present constraints (in addition to ensuring the long term security of flock and feeding sites) offers a realistic approach to holding the birds on the island.
- ii Recent fieldwork on Okiwi Station (Williams & Barker 1995) has raised the possibility that, in this pastoral landscape, farming activity may be directly affecting breeding habitat. The local population may be constrained by lack of breeding sites and the estuarine margins may hold a significant number of birds of breeding age who, for want of a suitable site, are unable to breed. This, too, is worthy of further testing and, if found correct, responded to by a change in farming regime on the DoC-owned property so as to add additional security to the island's population.

Although teal numbers on Great Barrier are high (by comparison to those anywhere else), and a series of past assessments have concluded numbers to be stable, there is an inherent vulnerability which demands close and constant monitoring. However, if the mustelid and possum-free status of the island is maintained, and patterns of landuse and human settlement do not alter significantly, the future of teal on Great Barrier Island seems assured.

Fiordland

The status of this population is unknown. Most recent sightings have been limited to the Breaksea and Doubtful Sounds areas (especially the Seaforth catchment and Gairloch; I. Southey per. com.) in contrast to their more widespread distribution of say 20 years ago (e.g. Murchison and Stuart Mountains, J.Mills pers. comm.). Sightings are usually of single birds or (perhaps) family groups; summer aggregations typical of the two northern populations are unknown from Fiordland.

Of the four factors implicated in the national decline of brown teal, it is likely that predation (especially that caused by stoats, given their reputed high numbers in Fiordland and their known effects on other native species) is the most serious. Predator control to support a diffuse and poorly-known population of teal is simply impractical, and there is little likelihood of this population surviving unaided. The demise of this population is imminent.

Given the above conclusion, it is worth emphasising that the remaining Fiordland teal represent the last of "southern" brown teal. They represent a significant genetic resource, especially for any re-establishment programmes on southern islands.

Small islands

Whether small teal populations such as those on Kapiti, Tiritiri Matangi, Arid, and Little Barrier can persist long term without constant/occasional immigration from nearby larger populations is uncertain. The apparent slow decline of the Kapiti population over 25 years to possibly only one pair in 1995 (R.Empton, pers. com.) is not cause for optimism. Teal are no longer present on Mayor, Great Mercury and Kawau Islands, as well as Ruapuke, Ulva and Codfish islands near Stewart Island (Dell 1950, Oliver 1955), all islands whose adjacent "mainland" populations have disappeared. Unfortunately, there is little useful information about former teal numbers and extent of habitat on the islands from which they disappeared to serve as a guide to determine the likely role of small islands in brown teal conservation. The extent that teal can and have been established on some small islands using captive-bred stock shows that small islands can provide at least a short term conservation option.

6.2 ESTABLISHMENT AND SURVIVAL BEYOND PRESENT RANGE

Given that brown teal have been bred in captivity in considerable numbers (up to 100 young produced annually) for almost two decades, and that captive-reared birds have established new populations in favourable circumstances on two small islands, the possibility of creating further new populations using captive-reared birds is a real conservation option. So too is the (as yet untried) establishment of populations by direct translocation of wild birds sourced from Great Barrier Island.

Are there locations where this could be done? Any such assessment will require a careful appraisal of the immediate and medium-term suitability and security of the site and the extent to which it can be, or needs to be, supported with predator-control programmes. Failure of the extensive mainland releases (Northland and Manawatu) and two island releases (Matakana, Urupukapuka) provides a clear

warning: to attempt population re-establishment or to supplement existing ones in the face of the known threats and in the absence of ongoing support and monitoring is a most unrealistic conservation approach.

1 *Islands*

One obvious approach, and one already proven, is to establish further self-sustaining populations on islands. The list of island candidates for appraisal could be extensive, particularly if cognisance is given to the diversity of habitats teal occupied on the mainland prior to human settlement. Likewise, candidate islands need not be limited, in the first instance, to those with evidence of past teal presence, nor to those within the historic breeding range of the species. Provided teal habitats on the island are not under threat of significant modification, that the risks from disease, predation or exploitation are absent or preventable, and that the release of teal would not conflict with existing or future plans for the site or island, the island's further appraisal is warranted. Examples of potentially suitable islands include "rehabilitated" islands, such as Red Mercury and others of the Mercury group, Waiheke and other islands of the inner Hauraki Gulf, Breaksea and other stoat-free islands in Fiordland, Ulva, Codfish and other Foveaux Strait islands, former haunts within the Chatham group, and more distant locations such as Raoul and Lord Howe Islands.

The establishment of some significant island populations would provide the much-needed and essential fallback position for teal should Great Barrier Island be colonised by mustelids and possums.

2 *Mainland sites*

Are there sites on the New Zealand mainland worthy of consideration? The histories of mainland releases, and the ongoing declines in Northland and Fiordland, suggests that without intensive and on-going predator management, mainland releases are futile. But what about sites where significant wetland habitat is protected from (especially) the impact of grazing animals and where there is a commitment to ongoing predator control? Are releases of birds into these mainland "islands" warranted?

Re-establishment of viable mainland populations, maintained without intensive management would represent the ultimate success of brown teal conservation initiatives. But such an ambition will require a good deal of trial and error along the way. It will involve, for example, exploiting advances in predator management, refining and broadening perceptions of what comprises teal habitat, trialling different sources (wild, captive) and different methods of release of pioneer birds and developing effective post-release management strategies, and it will demand good monitoring and evaluation. Should such initiatives be undertaken during the timeframe of this plan, then all releases at mainland sites need to be considered and conducted as carefully-planned trials, and subjected to an overall experimental design. The over-riding purpose is that all trial releases should contribute new knowledge so that they act as stepping stones to the ultimate conservation goal.

Already there are many mainland sites, within and beyond the present relict range, where teal releases could be trialled. Lowland forest "islands" where intensive predator management on behalf of other rare avian species is being undertaken by Department of Conservation present several such opportunities. So too do lands under regional authority ownership where "game keeper" management of wildlife is

practised e.g. Tawharanui Regional Park (Auckland Regional Council). There are also significant wetlands on private land "suitable" for teal and where there is confessed or active support for brown teal conservation from the landowner. In the latter case, there is already one useful example of a "safe haven" near Russell in the Bay of Islands producing birds which seek to settle in wetlands beyond. Given that these opportunities and models exist, trial releases of captive-reared and wild-translocated birds are definitely warranted.

6.3 COMMUNITY OF SUPPORT FOR BROWN TEAL CONSERVATION

Unlike many of New Zealand's threatened wildlife species, brown teal enjoy a practical constituency of support that extends well beyond the Department of Conservation. As an organisation, Ducks Unlimited New Zealand has a 20-year history and interest in brown teal conservation, best expressed by its captive breeding programme "Operation Pateke". There are also many individuals both within and outside of DU's programme that have an even longer history of involvement in the aviculture of the species and in its conservation.

The relative ease with which brown teal have been bred in captivity has created a climate of interest amongst many individuals and some territorial authorities in many parts of New Zealand who see their own site-based conservation programmes as being capable of contributing to teal conservation. This constituency is keen to obtain birds for introduction to their lands for the purpose of establishing a breeding population there. Similarly, the success of the "safe haven" concept on private land in the Bay of Islands has promoted interest amongst neighbouring landholders, thus extending both the community of support and conservation opportunities.

This community of support, much of it expressed in overtly practical terms represents one of the greatest assets for any brown teal conservation programme and one of the keys to its ultimate success. An important task and responsibility of the co-ordinators of this recovery programme is to make full use of this community of support, to focus, encourage and involve that community fully in the programme, and create a widespread partnership and ownership of the programme.

6.4 CONCLUSIONS

Brown teal have the potential, and the community support, to survive over the long term.

Existing wild populations are, however, under considerable threat. The Fiordland population appears beyond saving in situ. Throughout Northland the rate of decline can be slowed only with concerted effort and if retention of a wild population is to be achieved, it is likely to demand an initial concentration of effort at a few selected sites. Further decline in range in Northland seems inevitable. The Great Barrier population may be secure in the medium term but it remains particularly vulnerable to mustelid colonisation of the island - and thus cannot be viewed as providing long

term security for the species. At present there are no secure fallback positions other than the captive population.

Captive breeding for release remains an option for the establishment of new populations, while the potential of direct translocation (so successful for many avian species) has yet to be trialled. There are a range of islands within and beyond the historic range of the species on which small self-sustaining populations may be established. There are also an increasing number of locations on the mainland where existing conservation programmes (involving habitat protection and predator control) offer a real opportunity for the establishment of new teal populations. In addition, there is a strong community of support for brown teal conservation - individuals and organisations ready and willing to contribute their time, labour and money on behalf of the bird.

7.0 Options for Brown Teal Recovery

7.1 DO NOTHING

The consequences of this approach are that the species will become extinct on the New Zealand mainland in the short term (perhaps within ten years) but will persist on Great Barrier Island until such time as land use changes or mustelids and possums reach the island. There is uncertainty about the persistence of all existing small island populations.

7.2 MAINTAIN SOLELY AS A CAPTIVE POPULATION

A corollary is to attempt no preservation of the wild populations but seek to maintain a population in captivity both within and beyond New Zealand. This is feasible over the short and medium term (perhaps up to 50 years) by which time the species may well be extinct in the wild. Once the source of additional captive stock is removed, the gene pool is permanently restricted and the future of the species sails on the unknown currents of long term captive management. The persistence of the species under these circumstances is unlikely.

7.3 MONITOR AND ATTEMPT TO MAINTAIN EXISTING DISTRIBUTION AND NUMBERS

On its own, this approach is ultimately self-defeating for it does not address the present biological realities. The threats posed by predators and habitat modification or destruction may be constrained in Northland by concerted effort at a few sites but remain at risk to a change in management or funding priority, or human-induced events over which the wildlife manager has no control. The Great Barrier population remains vulnerable to mustelid and possum introductions. To solely monitor and maintain existing distribution represents a "holding" approach and has value if used in concert with attempts to find a more lasting conservation solution.

7.4 EXPAND EXISTING RANGE AND NUMBER OF POPULATIONS

Implementation of this option focuses on finding locations which have few predators and little habitat modification, and provide an opportunity for the establishment of a population sourced from either translocated wild birds or captive-reared birds. If it is from the latter source it requires formalising the existing captive breeding programme.

This option would not limit population establishment to within the former range of the species.

The conservation strategy outlined in the remainder of this document rejects the "do nothing" and "solely captive maintenance" options, and seeks to combine the "monitoring and maintain" option with a search for more permanent conservation solutions as offered by a programme which seeks to establish brown teal at many more secure locations both on islands and mainland New Zealand.

8.0 National Conservation goals for Brown Teal

PROGRAMME GOAL

To maintain brown teal in the wild state on the mainland and islands of the New Zealand region in sufficient numbers and at sufficient secure locations so that it has a conservation status of "non-threatened" based on IUCN criteria.

OBJECTIVES FOR THE DURATION OF THIS 10-YEAR PLAN

1. To maintain the current numbers and distribution of brown teal on Great Barrier Island.
2. To maintain a viable breeding population of brown teal (based on existing wild birds) at a minimum of two locations on the mainland of Northland.
3. To establish new breeding populations (of ten or more pairs) of brown teal on at least five further islands.
4. To initiate, by a variety of means, the establishment of new brown teal populations at a minimum of five locations on the New Zealand mainland.
5. To determine the taxonomic and genetic status of teal in Fiordland relative to teal on Great Barrier island, and if distinctive, to capture sufficient to establish a captive breeding programme capable of producing 20 pairs by 2005.
6. To maintain the existing captive breeding programme operating under a captive management plan which is capable of supplying birds for release annually.
7. To broaden the public constituency of support for brown teal conservation and to involve all elements of that constituency fully in the recovery programme for brown teal.

9.0 Interpretation of Conservation Objectives for Brown Teal

9.1 MAINTAIN THE GREAT BARRIER ISLAND POPULATION

The integrity of this population is paramount! Given the present distribution and status of other teal populations, it is clear that any decline in teal on Great Barrier Island will place the species at significantly greater risk of extinction.

There are two fundamental elements to maintaining this teal population: (i) preventing mustelids, possums, norway rats and hedgehogs colonising the island; and (ii) managing the teal. The former is part of a general advocacy of the indigenous floral and faunal values of the island and which emphasises the uniqueness of Great Barrier Island in not having this suite of introduced mammals. The latter focuses on the population ecology of teal and the general interaction of teal with their environment.

Past research (Dumbell 1987) suggested that teal on the island comprised several local populations, movements between which were generally uncommon. If this demographic structure still persists (and it should be assumed to do so until demonstrated otherwise), then teal management should be structured likewise i.e. each local population should be monitored and managed as a separate entity. Because of the significance of the Great Barrier Island population, all local populations on the island are viewed as equally important and equally worthy of monitoring and management effort.

Detailed knowledge of brown teal biology upon which to base management of local populations is still slender, being derived in the main from Dumbell's 1984-87 study (Dumbell 1987a) which focussed on the Awana population. While subsequent annual monitoring and local knowledge has contributed much useful information, there is an apparent limit in understanding to permit teal responses to environmental modifications (e.g., farming activities, riparian fencing) to be predicted. Improving this deficiency is seen as a priority task.

9.2 MAINTAIN SOME OF NORTHLAND'S WILD POPULATIONS

Brown teal still occur over a wide area of Northland. Most of the local populations which contributed to particular summer flocks at known traditional sites appear to have declined (Appendix 1) to the extent that flocks no longer assemble. They are now represented by scattered pairs which inhabit relatively unmodified wetlands year-round and it is probably their progeny which disperse out over the farmland to give rise to the regular and widespread reports of teal. Slowly, these scattered pairs expire, or their habitats are modified, and the teal's range in Northland declines further. For already-relict populations, this process seems, physically and financially, beyond reversal.

However, an opportunity exists to retain the few substantial local populations which remain. The causes of decline in eastern Northland have been identified (recruitment failure induced by predation of juveniles, high adult mortality, loss of breeding habitat, loss of summer refuge) and techniques to combat them exist.

The Department of Conservation has committed itself (1995) to maintaining a population of teal on its land at Mimiwhangata. Birds resident on this land may be part of a more extensive local population that extends northward and over private land at least to Teal Bay. Habitat creation and protection, and continual predator control are to be part of this conservation effort. But there are several other populations in eastern Northland worthy of the same intensity of effort e.g. Tutaematai-Whangaruru, Parekura Bay, Okiato-Orongo Bay, Takou Bay. That they occur on privately-owned farmland rather than public estate makes them no less worthy of conservation.

These remnant populations comprise wild birds which, over many generations, have lived in wetlands and streams within a predominantly pastoral environment. As such, they are facing selection pressures that have the potential to instill in teal behavioural traits that improve their adaptation to pastoral New Zealand.

The purpose of this objective is to direct substantive conservation effort and resources to at least one (preferably more) population beyond Mimiwhangata.

9.3 ESTABLISH ISLAND POPULATIONS

Establishment of additional populations on islands has been identified as a supporting conservation measure over the short term. The viability of small island populations over the medium to long term is questionable mainly because evidence of their persistence has not been investigated and neither has been their possible dependency on large source populations nearby. This is clearly a necessary task.

Island evaluation and selection can draw upon an appraisal of characteristics of present Northland/Great Barrier Island habitats as well as those of the islands presently or formerly occupied. However, in the absence of mammalian predators and browsers, brown teal are likely to be able to exploit a much wider range of habitats than present or immediate past distribution would indicate.

Large islands, such as Stewart Island, Chatham and Pitt Island should be included in any analyses. Brown Teal disappeared from Chatham Islands about 1915 (Fleming 1939), and from Stewart island about 1972 (Hayes & Williams 1982). It is possible that many of the factors implicated in the demise of teal on these larger islands may still be present today. However, there may be locations where they are absent or controllable to the extent that a re-introduction attempt has a good prospect of success.

Releases of teal onto islands using wild translocated birds from Great Barrier Island or captive-reared birds derived from GBI-sourced captive stock should be restricted to islands north of Cook Strait, or to the Chatham group. Until the genetic status of Fiordland teal is appraised (see 9.5 below), no releases onto southern islands should take place.

9.4 ESTABLISH MAINLAND POPULATIONS

For the purpose of this objective, a new population will have been established when, after releases have ceased, a minimum of 10 breeding pairs persist, most individuals of which are the result of local breeding.

Establishment of viable mainland populations, maintained without intensive management would represent the ultimate success of brown teal conservation initiatives. But such an ambition will require a good deal of trial and error along the way. The purpose of this objective is to foster a programme of releases at mainland sites wherein each release is well monitored and contributes understanding to the process of mainland population establishment (see 6.2.(ii))

Under this objective, releases by a wide variety of methods (e.g. ranging from the annual dispersal of progeny from pens containing captive breeding pairs through to the unsupported bulk releases of juveniles and adults), using both captive-bred and wild translocated birds singly or in combination, and at sites differing widely in habitat composition and geographic location are encouraged.

This encouragement of lateral thinking and trialling should not be interpreted as *carte blanche* encouragement for releases into any "wetland" environment. Release sites should conform to agreed criteria (established by the Recovery Group - see section 10) pertaining particularly to the quality of habitat at the release site, the existence of a predator control regime, and the availability of suitable habitat beyond the release area in which a population nucleus could be expected to establish and survive. Provision for follow-up releases and monitoring of all releases would form part of the release protocol.

Releases of teal at mainland sites using wild translocated birds from Great Barrier Island or captive-reared birds derived from GBI-sourced captive stock should be restricted to the North Island. Until the genetic status of Fiordland teal is appraised (see 9.5 below), no releases in South Island should take place.

9.5 GENETIC STATUS OF FIORDLAND BROWN TEAL

Because teal in Fiordland are geographically so distant from those inhabiting Great Barrier Island and Northland, they may be sufficiently distinctive genetically as to warrant conserving for that reason alone. To meet this objective requires appropriate research to be undertaken as a matter of urgency, requires field appraisals to locate remnant nuclei of teal in Fiordland, and promotes the capture of some of those birds.

Should Fiordland teal prove genetically or phenotypically distinctive, a captive breeding programme is warranted so that these birds can provide the nucleus for all repopulation attempts in the South Island and on islands south of Cook Strait.

9.6 CAPTIVE BREEDING PROGRAMME

The existing captive breeding programme undertaken by members of Ducks Unlimited New Zealand and centrally co-ordinated by that organisation as "Operation Pateke" is the most successful and longest-running of any captive

breeding programme for a threatened New Zealand bird. Its importance as a source of birds to fuel trial releases on islands and the mainland over the next 10 years cannot be overstated.

To ensure the existing DU captive breeding programme, and contributions made by people or organisations not allied to DU, are conducted in the most successful way, and conform to Department of Conservation requirements governing captive management of New Zealand fauna, a captive management plan is required under this objective. Production and management of this plan is the responsibility of the Recovery Group. Annual production targets under this plan should be set 24 months in advance by the Recovery Group. Implicit to the successful operation of the captive breeding programme is close and frequent and direct liaison between the Recovery Group and brown teal breeders.

9.7 BROADENING THE PUBLIC CONSTITUENCY OF SUPPORT FOR BROWN TEAL

A broad constituency of support for brown teal and its conservation has been identified (see section 6.3). It is an important contributory and political asset to any brown teal recovery programme and the existing constituency appears capable of considerable expansion.

To date considerable difficulty has been experienced in trying to secure funds and labour for conservation initiatives on private land. A public constituency of support, capable of providing that labour and capable of soliciting supporting funds in its own name, would be a particularly positive development and the Recovery Group should foster and promote it.

Cultivating and broadening a public constituency of support carries with it the requirement for that constituency to have a full role in the recovery programme for brown teal and for it to have a justifiable sense of ownership of the programme.

10.0 Role of the Brown Teal Recovery Group

The implementation of this plan will be facilitated by a "Recovery Group" appointed by the Director of Protected Species Policy Division, Department of Conservation. Membership of this group will be drawn from within the full constituency of interest in brown teal conservation.

The primary function of the Recovery Group is to prescribe tasks needed to be done in order to achieve the objectives of this plan, and to facilitate the implementation of those tasks. The Recovery Group is not provided with any financial resources and cannot commission work.

As necessary throughout the duration of this plan, the Recovery Group should prepare such plans and protocols as are required under Department of Conservation policies to guide the plan's implementation. Examples of these include a captive breeding plan, criteria for selection of release sites on islands and mainland, transport and release methodologies, and research plans.

Annually, the Recovery Group shall

- i Review the outcomes of tasks prescribed for and performed in the previous year;
- ii Identify and prioritise tasks under each objective to be undertaken in the forthcoming year and define appropriate performance measures for those tasks;
- iii Convey to appropriate agencies and individuals (e.g. Department of Conservation Conservancies, DU, brown teal breeders) details of tasks that support the recovery programme;
- iv Develop funding applications to support research and management programmes and forward them to appropriate agencies and individuals with recommendations for submission;
- v Review its own performance as a co-ordinating and liaison body and modify its operations as necessary;
- vi Prepare an annual report of progress of the brown teal recovery programme which shall include, at least, the record of Recovery Group meeting(s), reports of all significant research and management activities undertaken, and an outline of tasks planned for the year ahead. This report is to be submitted to Director (Protected Species Policy Division), Department of Conservation and made available to all agencies and individuals contributing to the recovery programme.

Nothing in the list above is intended to limit the operation and initiative of the Recovery Group. The operational philosophy that underpins this recovery plan is one of encouraging contributions to the conservation of brown teal from all interested agencies and individuals, and the creation of widespread ownership of the recovery programme.

11.0 Acknowledgements

This plan has arisen from an initial version prepared by GSD and guided through several subsequent drafts by MW. Throughout the preparation of drafts of this plan, many helpful thoughts, comments and criticisms were received from people with experience and interest in brown teal conservation. The authors acknowledge this sharing of expertise.

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Appendix 1: Location of Extant Brown Teal Flock sites in Northland and on Great Barrier Island and Records of Recent Censuses

NORTHLAND

SITE	1988	1990	1991	1992		1993		1994	
Clendon Cove	55	66	80	39	54	0	4	19	0
Gordans Dam	32	0	-	0	-	0	0	-	-
Bentzens Pond	16	8	17	14	9	15	9	2	-
Parekura Bay (Bentzens)	87	80	57	40	43	14	16	6	0
Kydd's (Wairoa Stream)	3	31	30	25	12	13	15	1	4
Ngaiotonga Pond	12	0	0	0	0	0	0	-	-
Ngaiotonga Stream	0	19	0	2	8	0	4	2	0
Tutaematai Stream	c100	63	103	146	130	141	133	113	58
Punaruku Stream	6	8	23	14	6	2	0	2	0
Teal Bay	32	24	28	25	28	7	6	30	18
Ngahau Bay	10	3	12	13	11	8	8	2	0
Mimiwhangata	43	25	11	20	17	21	15	14	8
Rockells Bay (Otamure Bay)	15	0	7	0	3	2	0	-	2
Whananaki River	82	78	c70	44	41	51	25	39	20
Whananaki South	2	0	-	-	-	2	2	0	-
Hailes Road (Whananaki)	19	0	0	0	0	0	0	0	-
Matapouri Bay	3	2	2	0	0	-	-	-	-
Kowharewa Bay	3	1	0	0	2	0	0	-	-
TOTALS	520	408	440	380	364	276	233	230	110

GREAT BARRIER ISLAND

SITE	1986	1987	1992'
Awana	242	192	75
Max Burrill's Drain	100	100	162
Mabey's	162	198	178
Okiwi	284	304	160
Whangapoua	84	10	101
Saltwater	51	34	6
Blackwell's	49	45	13
Karaka Bay	55	38	37
Kaitoke	56	0	39
Sugarloaf	2	3	35
Harataonga	26	40	43
Motairehe	22	11	27
Pa Beach	17	9	10
Port Fitzroy	12	12	8
Whangaparapara	11	7	3
Shoal Bay	8	13	0
TOTALS	1186	1016	897+

* Incomplete count. Total 1992 estimate is 1150.

Appendix 2: Brown Teal Releases in Northland, 1984-1994

DATE	PLACE	#MALES	#FEMALES	TOTAL
4.8.84	Matapouri Estuary	29	25	54
4.8.84	Mimiwhangata	22	20	42
9.4.85	Matapouri Estuary	15	15	30
22.6.85	Takau Bay	28	17	45
-.11.85	Moturoa Island	3	3	6
-.07.86	Moturoa Island	6	0	6
26.7.86	Mimiwhangata	-	-	90
-.8.86	Kaeo River	-	-	21
26.9.87	Mimiwhangata	31	14	45
8.10.87	Mimiwhangata	-	-	11
30.7.88	Mimiwhangata	15	24	39
30.7.88	Urupukapuka Island	2	4	6
15.10.88	Mimiwhangata	9	14	23
29.10.88	Mimiwhangata	11	13	24
18.1.89	Purerua Peninsula	36	34	70
22.10.89	Purerua Peninsula	-	-	25
2.4.90	Purerua Peninsula	35	32	67
2.4.90	Urupukapuka Island	-	-	6
15.1.91	Purerua Peninsula	17	22	39
8.6.91	Mimiwhangata	18	15	33
31.10.91	Purerua Peninsula	5	14	19
14.2.92	Purerua Peninsula	30	34	64

17.8.92	Purerua Peninsula	16	30	46
18.8.92	Urupukapuka Island	3	3	6
14.10.93	Hokianga Harbour	19	32	54
5.8.94	Moturoa Island	5	5	10
5.8.94	Hokianga Harbour	20	36	56
5.8.94	Waikino	15	15	30
5.8.94	Urupukapuka Island	3	4	7
Total		383+	425+	974

*The taxonomy of some Austral teals is confusing (see Dumbell 1986). Two recent authorities treat the three New Zealand teals differently. Marchant & Higgins (1990) accords each of them species status whereas Turbott et al. (1990) considers them as three subspecies of *Anas aucklandica*. Recent unpublished genetic work supports the approach of Marchant & Higgins (see Williams et al. 1991) and separate species status has been adopted in the recovery plan for subantarctic teal (McClelland 1993)*

A survey of Kapiti Island, October 1995, using a dog located only one pair of brown teal (R.Lmpson pers. comm.).

Appendix 3: Published Recovery Plans

Stitchbird	(\$15)	Approved 1996
Brown teal	(\$15)	Approved 1996
Native frogs	(\$15)	Approved 1996
Dactylanthus taylorii	(\$15)	Approved 1995
Bat (Peka peka)	(\$15)	Approved 1995
Otago and grand skinks	(\$15)	Approved 1995
Giant land snail	(\$15)	Approved 1995
South Island saddleback	(\$15)	Approved 1994
Takahe	(\$15)	Approved 1994
New Zealand Dotterel	(\$15)	Approved 1993
Tuatara	(\$15)	Approved 1993
Mohua (yellowhead)	(\$15)	Approved 1993
Subantarctic teal	(\$15)	Approved 1993
Kowhai ngutukaka	(\$15)	Approved 1993
Chevron skink	(\$15)	Approved 1993
Black stilt	(\$15)	Approved 1993
Whitaker's and robust skinks	(\$15)	Approved 1992
North Island kokako	(\$15)	Approved 1991
Kiwi	(\$15)	Approved 1991
Yellow-eyed penguin*	-	Approved 1991
Blue duck **	(\$10)	Approved 1991
Kakapo	Out of print	Approved 1989

* Available: from Otago Conservancy, Department of Conservation, Dunedin

** Available: Science & Research Internal Report No.30,
Science & Research Division, Department of Conservation, Wellington

Copies may be ordered from:

DOC Science Publications
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