

**THREATENED SPECIES RECOVERY PLAN SERIES NO.10**

**NEW ZEALAND DOTTEREL RECOVERY PLAN**  
*(Charadrius obscurus)*

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## Abbreviations

DoC = Department of Conservation  
OSNZ = Ornithological Society of New Zealand  
RF&BPS = Royal Forest & Bird Protection Society  
TSU = Threatened Species Unit, Department of Conservation

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## 1. SUMMARY

The New Zealand dotterel is a threatened, endemic shorebird with a total population estimated at 1400 birds. It has a restricted distribution, with two populations separated by about 1000 km. The northern population numbers about 1350 and breeds on the coast of the North Island, north of 39°S; the southern population numbers no more than 74 individuals and breeds on the open mountain tops of Stewart Island. In the 19th century, the species was widespread in the South Island and also occurred in the southern half of the North Island. Decline to the present range was probably brought about by a combination of degradation of breeding habitat, introduced predators and possibly shooting. The two present populations appear to be facing different problems and in most parts of this plan they are considered separately.

The northern population breeds largely on sandy beaches, where it is threatened by predation, destruction of habitat due to development and dune stabilisation, and by disturbance during the breeding season from recreational use. Breeding success is usually low, but in the past few years protection of breeding birds at a few sites has resulted in increased numbers of chicks fledging. This strategy should be continued at those sites and extended to others. The key objective for the northern population during the next 5 years is to increase its size and encourage expansion of its breeding range in the North Island. Some research is needed, particularly on survival and recruitment of juvenile birds and on the impact of predation. The NZ dotterel breeds in many areas that have high recreational use in summer and there is scope for advocacy to increase public awareness of the species. Greater public participation in the conservation of the NZ dotterel, particularly involvement of local communities in protection programmes, is vital for the future of the species.

Monitoring of numbers at selected breeding and flocking sites should be carried out annually and a complete census should be undertaken after five years of management. Towards the end of the period covered by this plan, it is important that the effectiveness of the protection programmes in increasing productivity is critically assessed.

Little is known about the Stewart Island birds but there are physical and behavioural differences between birds of the northern and southern populations. Recent surveys show that the southern population has declined rapidly in the past 30-40 years. In the next five years, the *highest priority* should be to try and reverse this decline. Flocks on Stewart Island and in Southland should be monitored annually. Captive breeding may be an option if the decline continues; a contingency programme should be prepared and actioned if necessary.

Management options which should not be required during the period covered by this plan are discussed briefly; these include translocation, provision of artificial breeding sites and intensive management during breeding.

## 2. INTRODUCTION

### 2.1 General

The NZ dotterel (*Charadrius obscurus* Gmelin) is an endemic shorebird belonging to the family Charadriidae (lapwings and plovers), sub-family Charadriinae (plovers and dotterels). There has been some debate about which genus the species belongs in, and for a time it was placed in a genus of its own, *Pluviorhynchus*. Current opinion suggests however that the NZ dotterel is a typical *Charadrius* plover. The first specimen was collected at Dusky Sound in April 1773, on Cook's second expedition. Other common names used at different times include Red-breasted dotterel or plover, Dusky plover, mountain plover, big dott(e)rel and the Maori name tuturiwhatu-pukunui.

Once widespread in New Zealand, the species is now restricted to two areas, one population found on the coast of the North Island, the other breeding on the mountains of Stewart Island. Details of past and present distribution are given in Section 3. Outlines of breeding biology, feeding, habitat use, movement patterns and comments on longevity are given in Section 4.

### 2.2 Description

The NZ dotterel is a thickset plover with a large-looking head, large dark-brown eyes and a heavy black bill. It is the largest member of the genus *Charadrius*, with adults typically weighing 130-170g. The sexes are similar in appearance. In eclipse plumage birds are mid-brown on the crown, back and upper wings and off-white below; in early winter adults develop a variable amount of red on the throat, breast, belly and flanks. In some cases this colour may extend to the face, nape and upper wings. First-winter birds can often be recognised by their pure-white underparts. Birds of the Stewart Island population are nearly always darker brown on the upperparts and become darker red in breeding plumage. All birds have a dull black bill and pale grey legs and feet. A detailed description is given by Hayman et al. (1986). No conclusive means of distinguishing the sexes has been established, although recent findings suggest that some morphometric differences may exist between males and females (Dowding, in prep). In most cases, males probably show deeper and more extensive red colouration than females in breeding plumage, but this has not yet been unequivocally demonstrated.

Birds are well camouflaged and may be surprisingly difficult to see on sandy beaches; they are often heard (the commonest call is a repeated "chip") before being seen. When not breeding, the NZ dotterel is usually very confiding - birds normally allow a close approach and commonly run away, flying only if pressed.

There are a number of physical and behavioural differences between birds of the northern and southern populations (Dowding & Murphy, 1993); these are summarised in Table 2.1.

Table 2.1: Differences between northern and southern NZ dotterels

	northern	southern
measurements	some significantly smaller	some significantly larger
weight	significantly lighter	significantly heavier
breeding plumage	usually paler	usually darker
breeding habitat	coastal	mountain tops
flocks	post-breeding	post-breeding and winter

RA Falla suggested that the two groups might be different sub-species (RB Sibson, ML Barlow, pers comms) but to date this question has not been resolved.

### 3. DISTRIBUTION AND CAUSES OF DECLINE

#### 3.1 Past distribution

In the late 19th century, the NZ dotterel was still widespread in New Zealand but may not have been particularly common in many areas. Potts (1869) described it as being "met with on hill and plain, yet nowhere in very considerable numbers." Similarly, Buller (1882) recorded that "This fine species, although nowhere very plentiful, is dispersed along the whole of our shores, frequenting the ocean-beaches and the sand flats at the mouths of all our tidal rivers."

Although the species was recorded from both coastal and a few inland localities in the North Island, the majority of available historical records are from the South Island (Cumming 1991, Dowding unpublished). In particular, it appears that the mountains and foothills of the South Island and the Canterbury Plains were breeding strongholds. The species was probably still in good numbers in many parts of the South Island in the mid-19th century but seems to have declined quite rapidly there by early in the 20th century. It was described by Hutton & Drummond (1904) as "another bird that has had to beat a retreat before civilisation".

#### 3.2 Present distribution

The species is now found in two discrete populations. More than 90% of the present population is found on suitable coastline of the North Island, north of 39°S. Most of these northern birds frequent sandy beaches and tidal estuaries year-round and breed only on the coast. Although the majority live on the mainland, there are a few pairs on some of the smaller islands that have suitable habitat off the east coast of the North Island. There is also a group of about 35 birds on the east coast of Great Barrier Island (Dowding 1991). Recently a natural southward expansion of the range of the species may have begun to take place on the east coast of the North Island (Foreman 1991).

The remaining birds (about 74 in April 1993) breed on the mountain tops of Stewart Island at about 47°S; a list of the known breeding localities is given in Dowding and Murphy 1993. Some of these birds form a winter flock in Southland, and the decline

of this flock has been documented by Barlow (1993). A few birds are also found each autumn and winter on the Nelson coast, particularly on Farewell Spit; recent band recoveries indicate that these are wandering juveniles from the Stewart Island population (Dowding, unpublished).

There are occasional reports of single birds from the coast of the southern North Island and from the northern and eastern coasts of the South Island; in most cases these are also probably juveniles wandering away from the usual breeding range of the species.

To date, there are no records of birds from one population reaching the other. There are no records of the NZ dotterel on any of the outlying island groups.

### **3.3 Causes of decline**

#### **3.3.1 General**

As with many bird species that have declined dramatically since the arrival of people in New Zealand, it is difficult to be specific about the relative importance of different factors. Why the species has essentially disappeared from the South Island, but not the coast of the North Island, is not obvious.

The NZ dotterel was probably taken by Maoris occasionally but there is no evidence from middens that it was a major (or even regular) food item. Some 19th century records suggest that the species was considered a delicacy by European settlers and it was apparently shot for market at flock sites on the east coast of the South Island (and probably elsewhere). As the NZ dotterel is particularly confiding (and could therefore be easily shot), this may have caused a very rapid reduction in numbers in some areas. Some birds were also shot for museum collections in the 19th century, particularly in the South Island, but this activity probably played a relatively small part in the overall decline.

Introduced mammalian predators (particularly cats, dogs, mustelids and European rats) probably had a significant effect, as they did on many ground-nesting birds in New Zealand. However, the past impact of individual predator species is now impossible to assess. The extended incubation time and fledging period of the species probably played a part, making eggs, chicks and adults particularly vulnerable during the breeding season.

#### **3.3.2 Northern population**

It is very difficult to judge the extent of the decline in the North Island as historical records are few and vague. The species no longer breeds in the mountains of the central North Island but there is little surviving information on whether many birds were ever present there. Falla (1940) recorded that "There seem also to be a few breeding records from the central plateau of the North Island, south of Lake Taupo" but the source of the records was not stated. Edgar (1969) recorded that NZ dotterels frequented the area between Karioi and Waiouru from 1914 to 1925 but it is not clear whether the birds were breeding there.

Recent overall trends in the northern population are difficult to gauge accurately. A superficial comparison of Edgar's (1969) findings with the 1989-90 census (Dowding, in preparation) suggests little difference in total numbers during the past 20-25 years. Coverage in the earlier population estimate was incomplete however, and the total was known to be an underestimate. It is clear that there has been a decline in numbers in some areas during this time and there is also evidence of some change in breeding distribution. This has probably been caused largely by both destruction and degradation of breeding habitat. There has been extensive development (e.g. housing projects and pine plantations) of dune areas and beaches in northern New Zealand in the past 30 years. In addition, stabilisation of foredunes and sandspits with marram grass has degraded nesting habitat considerably in some localities (Cumming 1991). Disturbance by people, their vehicles, dogs and stock has also increased and undoubtedly results in low productivity in many areas in most years. This is caused both directly (by repeated disturbance causing desertion, by people, vehicles and stock crushing nests) and indirectly (disturbance increases the chance of egg and chick predation, particularly by gulls). Introduced predators almost certainly take eggs and chicks, but little detailed information is available. Recent findings in the Omaha-Mangawhai area show that there is also some predation of adults and suggest that there may be a sex bias in mortality, with lower survival of males than females (Dowding & Chamberlin, in prep). It is not known whether this is contributing significantly to the decline of the species. Natural factors, mainly high winds and big tides, result in some loss of nests.

### 3.3.3 Southern population

Some of the factors operating on birds of the northern population (and previously on those in the South Island) are not present on Stewart Island. There is virtually no development or destruction of breeding habitat and very little disturbance by people, vehicles or dogs. Adult mortality is high and it seems likely that predation is a major problem. As there are no mustelids on the island, feral cats and European rats present the main threats (Dowding & Murphy 1993). Recent work shows that there is a severe gender bias in the population, with females outnumbering males by 2 or 3 to 1.

## 3.4 Status

The species has a restricted distribution and a total population of about 1400 birds. It has declined to virtual local extinction in the South Island and the southern part of the North Island in the past 100-150 years. The main factors that are assumed to have brought about this decline (notably introduced predators and degradation of breeding habitat) continue to operate, and overall the species is therefore classified as threatened (= IUCN vulnerable) (Bell 1986). The Stewart Island population has declined rapidly in the past 40 years and is believed to contain no more than 74 birds at present (Dowding 1993a). The species should therefore be considered in serious danger of local extinction on Stewart Island.

## 4. ECOLOGY OF THE NZ DOTTEREL

### 4.1 Past research

Banding of the species began in 1950 as an OSNZ project, co-ordinated initially by Ross McKenzie and later by Sylvia Reed. Summaries of some of the findings from this project were published by McKenzie (1978) and Reed (1981). Phillips (1980) described some aspects of breeding behaviour in New Zealand plovers but his account of the NZ dotterel was based on limited observations and some of it was second-hand. More recently, Dowding and co-workers have studied a group of birds of the northern population and gathered data on annual movement patterns, breeding-site fidelity, pair-bond retention and survival. (Dowding 1989; Dowding & Chamberlin 1991; Dowding & Chamberlin, in prep). Cumming (1991) examined breeding habitat requirements, considered some of the factors affecting breeding success (particularly human disturbance) and discussed loss of breeding habitat caused by dune stabilisation and development.

There has been little research on birds of the southern population but numbers have been monitored periodically by Maida Barlow and others (OSNZ) at Awarua Bay, Southland (Barlow 1993). Dowding & Murphy (1991) undertook a preliminary study of the status and distribution of the Stewart Island population. This study was continued by Dowding (1992a, b), and the decline of the population was described in detail by Dowding & Murphy (1993).

## **4.2 Habitat use and movement patterns**

### **4.2.1 Northern population**

NZ dotterels of the northern population typically nest, roost and form post-breeding flocks on sandspits and beaches, particularly at the mouths of tidal estuaries and at stream and river outlets. Nesting also occurs on shell-banks and occasionally on gravel areas. Small numbers breed at highly-modified sites, notably on grass at several airports and at Marsden Point oil refinery (R Parrish, pers comm). Pairs are highly territorial for a variable period before and during the breeding season, defending territories vigorously against other NZ dotterels. Breeding territories vary considerably in size; those on some favoured sandspits or shellbanks may be as small as 20m x 20m at high water, while some of those on beaches may be the width of the beach and 500m long (Dowding, unpublished).

A recent analysis of breeding habitat requirements (Cumming 1991) suggests that favoured areas are low, flat, and have little or no vegetation. On beaches and sandspits, such areas are produced and maintained by wind and water erosion of mobile dune systems. Cumming (1991) demonstrated that loss of these areas due to dune stabilisation and housing developments was correlated with local declines in the number of breeding NZ dotterels. Most observations of habitat requirement are from sandy east coast areas and there could be minor differences in habitat use by west coast birds. Favoured nest sites may differ because of factors such as iron sand (which becomes very hot in summer), bigger tides, and strong westerly winds.

Most adults of the northern population move annually a short distance along the coast from their breeding site to a post-breeding flock site and back (Sibson 1967, Dowding & Chamberlin 1991). Movement patterns of a group of birds on the east coast of Northland were described by Dowding & Chamberlin (1991). The flock began to form

in January each year and was at peak numbers in February and March. Birds began returning to breeding grounds in late March, and two-thirds of those that bred away from the flock site had left by the end of April. Birds showed a high degree of fidelity to both breeding site and flock site. The timing of formation and dispersal of northern post-breeding flocks varies slightly from year to year and may vary also with locality. Post-breeding flock sites are commonly at or close to tidal estuaries.

#### 4.2.2 Southern population

On Stewart Island, breeding sites are inland on the open mountain-tops, usually in areas where vegetation is sparse or it is very low (Dowding & Murphy, in prep). Until recently, a few pairs also bred in the sand dunes at Mason Bay (Guthrie-Smith 1914, Dawson 1951). Southern birds spend the winter in three coastal flocks, two on Stewart Island and one at Awarua Bay in Southland (Dowding & Murphy 1993).

### 4.3 Breeding

There has been no detailed study of the breeding biology of the NZ dotterel and our knowledge is based largely on accounts of relatively few nesting attempts (e.g. McKenzie 1952, McKenzie et al. 1977). Research is needed in this area for both populations, mainly to determine the relative impacts of predation and disturbance and to find which stages of the breeding cycle are most vulnerable.

In the northern population, the nest is usually a simple scrape in the sand, occasionally lined with a few shells or pieces of sea-weed. It is often adjacent to an obvious marker, such as a piece of driftwood, a clump of vegetation or a stone. The usual clutch size is three and incubation lasts about 30 days. First clutches are normally laid between early September and early October. If a clutch fails there may be up to three re-nesting attempts per season, but it is unusual to find eggs after the end of January. Adults have well-developed injury-feigning displays which are used to divert attention from nests or chicks. Fledging takes 6 - 7 weeks. There are no documented cases of birds attempting to raise a second brood after the successful fledging of an early brood. Some juvenile NZ dotterels leave their natal site shortly after fledging, while others remain there for much of their first winter. Juveniles are known to wander widely during their first 18 months - 2 years; they probably follow the coast for the most part, stopping for variable periods where they find other NZ dotterels and/or suitable feeding grounds. Most birds probably first breed when two years old.

Virtually nothing is known about the breeding biology of the southern population, although it seems likely that the main features will be similar.

### 4.4 Longevity

The species is undoubtedly long-lived. Unfortunately, much of the early banding undertaken by McKenzie and Reed has yielded little useful data on survival and longevity, as the colour bands used for much of the study deteriorated quickly and were lost. There is one outstanding record, often quoted, that deserves comment. In 1976, a bird bearing a very worn metal band was captured and re-banded. Part of the number on the old band was legible and it was deduced that the bird was one banded as a chick in 1950. There is now some doubt however, as the bird is still alive at an apparent age

of more than 40 years. While this seems highly improbable, there are a number of well-documented cases of individuals 14-20 years old. Recent results from the Omaha-Mangawhai area suggest that adult survival may be partly sex-dependant, with males showing higher annual mortality than females (Dowding & Chamberlin, in prep).

#### **4.5 Feeding**

There have been no detailed feeding studies. In the North Island, records collected by Latham (1987) and Cumming (1991) and observations by Dowding (unpublished) suggest that NZ dotterels are opportunistic feeders, eating a wide variety of suitably-sized animals. These are mainly invertebrates but there are several records of small fish being taken (Latham 1979, Habraken 1980). On tidal estuaries and at river mouths, small crabs often constitute a large part of the diet, while on beaches and sandspits, sandhoppers (*Talorchestia* sp.) are a common prey item. Although estuaries and beaches are the most common feeding grounds, NZ dotterels occasionally feed on short-cropped pasture and on inter-tidal rock platforms.

There are few records of foods or feeding from the Stewart Island population. Preliminary observations suggest that for much of the year, most adult birds also feed on tidal flats, taking a similar range of invertebrates, particularly crabs (Dowding & Murphy, in prep). Chicks, however, must feed in the rocky areas and wet herbfields on mountain tops until they fledge. Crabs and small flounders were recorded as prey items by Barlow (1993).

#### **4.6 Known and potential predators**

A number of animals, introduced and native, are known predators or suspected of taking eggs, chicks or adult NZ dotterels. There is, however, virtually no information on their relative importance, or on the overall importance of predation on productivity and survival. The commoner known or suspected predators of northern birds include:

- Cats - these are present on or near many breeding sites and are capable of taking eggs, chicks and adult birds. They are thought to be the main predator of adult birds on Stewart Island (Dowding & Murphy 1993).
- Mustelids - stoats are known to be present on some breeding sites and could also take eggs, chicks and adults. Not present on Stewart Island.
- Dogs - common on many breeding sites and known to kill chicks.
- Rodents - rats and mice are present on many breeding areas. Both could take eggs, rats may also take chicks and possibly adults.
- Hedgehogs - common on many beaches and sandspits and may take eggs.
- Black-backed gulls - these are known to take eggs and chicks. Predation by gulls may be a greater problem in high-disturbance areas, where adults are likely to be distracted from nests and chicks more often and for longer periods.
- Red-billed gulls - these are known to take eggs.
- Harriers - present in many areas and could take eggs and chicks, particularly where disturbance levels are high. One took an adult dotterel at Matakana Island (Wills 1993)
- Possums - reported to take eggs on Matakana Island (Wills 1993).

## **5. SPECIES RECOVERY TO DATE**

### **5.1 Northern population**

The first attempt to assess the size of the NZ dotterel population was published by Edgar (1969). Since then, there have also been a number of regional surveys by OSNZ branches. Together with the results of the comprehensive census undertaken in 1989-90 by DoC, OSNZ and RF&BPS (Dowding, in prep), these surveys have provided a baseline for future counts, as well as providing detailed information on habitat use and the location of important breeding and flock sites.

In the past seven years, efforts to increase productivity have been made by protecting breeding birds from disturbance at a number of sites, most of them on the east coast. Protection has been initiated and/or undertaken by a number of organisations, particularly Wildlife Service/DoC and RF&BPS. Support for these programmes has come from various groups, including RF&BPS, OSNZ, local schools and other organisations, and from many individuals. At most of these sites, volunteers or paid wardens have roped off nesting areas and provided interpretation for the public; at some, breeding success has also been monitored. These sites have generally fledged higher numbers of NZ dotterels than unprotected sites (Cumming 1991) but more information on the effectiveness of protection programmes is required. Little is known of the post-fledging survival or recruitment of juvenile birds. At a number of other unmanned sites, nesting areas have also been roped or fenced off, either by DoC staff or interested individuals or groups; because these are visited less frequently it is difficult to assess whether productivity has been increased.

### **5.2 Southern population**

Research on the distribution and size of the Stewart Island population has recently been published; comparison with the available historical data shows that it has declined rapidly in the past two years (Dowding & Murphy, 1993). Adult mortality is known to be high and it seems likely that the major cause is predation by feral cats during the breeding season (Dowding 1992a). The cat control programme outlined in Appendix H was undertaken during the 1992-93 season. The results were very encouraging, with a rise in the total southern dotterel population for the first time since accurate census figures have been available (Dowding 1993a, b).

## **6. OPTIONS FOR RECOVERY**

This plan treats the options and strategies for recovery of the northern and southern populations separately. There are physical differences between birds of the two populations and their present breeding habitats are very different. It also seems very likely that the main problems facing the northern and southern populations are different.

### **6.1 Northern population**

Option 1. Do nothing. The population would almost certainly continue to decline slowly in numbers. Breeding range would probably also shrink as the species retreated to areas with lower levels of disturbance and less habitat degradation.

Option 2. Do nothing on the mainland; ensure survival of the species on refuge islands free of predators and with minimal disturbance. There appear to be relatively few suitable islands with sufficient breeding habitat to support a large population; the long-term survival of the species therefore relies on its conservation on the mainland.

Option 3. Increase the total population by protecting breeding birds at selected mainland sites. Reduce disturbance and predation to increase productivity and enhance survival of adults and chicks. Monitor to assess post-fledging survival and recruitment of juveniles and survival of adults. Enhance colonisation attempts in new breeding areas.

Option 4. As option 3, but also attempt translocations to re-introduce the species to parts of its former range.

For the duration of this plan, the preferred option is option 3. The number of birds in the northern population is still relatively high and is not declining rapidly. Translocations (option 4) are therefore not considered necessary within the time frame of the present plan. They may not succeed without some experimentation, as we know little about (a) the factors that caused local extinctions or (b) the likely outcome of attempting to translocate NZ dotterels. A translocation plan should be devised however; experiments should be carried out and the plan implemented at a later date if option 3 does not result in a natural expansion of the breeding range.

#### Ability to recover

There is every reason to believe that the decline of the northern population can be reversed. We have no idea how many pairs need to be protected during breeding to bring about overall population growth, but the present decline is slow, suggesting that a modest increase in productivity should be sufficient.

## 6.2 Southern population

Option 1. Do nothing. If the southern population continues to decline at the present rate, it will probably be extinct within 10 years, but the point from which recovery might reasonably be expected will be reached much sooner, probably in as little as two years (Dowding 1992a).

Option 2. Begin a programme to control predators (particularly cats) in the important breeding areas on Stewart Island; monitor the effect of this on survival of adult dotterels and on productivity. Continue research on the reason(s) for the decline and modify management strategies if appropriate. Locate as many breeding sites on Stewart Island as possible. Prepare a contingency captive-breeding plan.

Option 1 (to allow the southern population to become extinct) is not considered a justifiable option. It is highly likely that the small southern population contains a disproportionate amount (up to half) of the variation, both genetic and behavioural, remaining in the species. The recovery option chosen should aim to preserve the *maximum diversity possible* within the species, whether the origin of that diversity is

known to be genetic or not. It is clearly also desirable to preserve a threatened species in as large a part of its existing range as possible. Attempts are currently being made, for example, to preserve a number of species (such as yellowhead and yellow-eyed penguin) in particular parts of their range, even though populations exist elsewhere. If the NZ dotterel were allowed to become extinct on Stewart Island, the species would be confined to the coast of the northern part of the North Island.

Further research is needed, but the limited information available suggests that predation of adult birds by cats on the Stewart Island breeding grounds is the major factor responsible for the population decline (Dowding 1992a). The preferred option is therefore option 2.

Preservation of the southern population may be desirable for another reason. If, in the long term, re-introductions to the South Island high country are contemplated, it is possible that they may be more successful with birds from the Stewart Island population. Being inland breeders, these birds may establish more readily than North Island birds, which could be imprinted with coastal breeding.

#### Ability to recover

Unless action is taken within the next few years, it seems certain that the Stewart Island population will be unable to recover (Dowding 1992a). Numbers are low (no more than 65 individuals in April 1993) and there are few adult males remaining (Dowding 1993a).

## **7. RECOVERY STRATEGY**

### **7.1 Key objectives**

In the long term, the recovery programme should aim to increase the total population of the NZ dotterel, expand its breeding range and protect important habitat. Within the five-year period covered by this plan, the key objectives for the two populations should be:

- 7.1.1 To increase the size of the northern population and encourage expansion of its breeding range in the North Island.
- 7.1.2 To reverse the decline of the Stewart Island population.

These objectives should be achieved by the following actions:

### **7.2 Recovery group**

A recovery group should be set up to advise the Director of Protected Species Policy Division, DoC, and to oversee the implementation of the recovery plan.

1. The group should meet annually to review the achievements of the recovery programme to date and recommend any in-course corrections that are considered necessary.
2. It should maintain a file of reports and data collected from protected sites and monitoring programmes (see Appendix E).

3. It should act as a central source of information and expertise on the NZ dotterel for other DoC staff and conservation organisations.
4. Towards the end of the period covered by this plan, the recovery options and strategy should be reviewed and the group should initiate preparation of the next recovery plan.
5. The group should number no more than eight people and should include:
  - one or more scientists with experience in research on the species,
  - one or more DoC staff with experience in management of the species from North Island conservancies,
  - one DoC staff member from Southland Conservancy,
  - one member of DoC TSU,
  - representatives of OSNZ and/or RF&BPS (these organisations may be represented by other members of the group if mutually agreed).
6. The group should choose a leader from its members; he or she should be responsible for co-ordinating the activities of the group and arranging the annual meetings.

### **7.3 Advocacy**

The broad aim of advocacy should be to increase public awareness and knowledge of the NZ dotterel and its problems. This includes increasing awareness of the need for habitat protection. On the North Island coast, the NZ dotterel is widespread but not numerous and protection of more than a small fraction of the population is probably beyond the resources of the Department of Conservation. Involvement of local communities in the management of the species is therefore vital. Wherever possible, advocacy should increase public knowledge of the NZ dotterel, with the specific aim of creating opportunities for greater public participation in its conservation. Advocacy may involve any or all of the following:

#### **7.3.1 Northern population**

- Wardens at protected sites are the main interface between the public and the protection programme. They must have a good basic knowledge of the species, be able to explain clearly why NZ dotterels are threatened and why protective measures are necessary. This will probably require briefing by local DoC staff and/or supply of an information kit to prospective wardens before the start of the season.
- Permanent interpretative signs should be erected at all protected sites. These should be attractive, conspicuous and located at strategic access points, such as in car-parks. Signs should be well illustrated, give information on the NZ dotterel and other species in the area and explain the protection programme. Signs should be maintained and preferably be constructed so that information can be up-dated as necessary.
- Explanatory pamphlets should be produced and made available at DoC offices and at protected sites to assist wardens. These should outline the problems facing the species and what is being done to assist it nationally (same information for all areas) and give some local detail, including a map showing fenced areas and public accessways.
- DoC staff and others involved in conservation of NZ dotterels should address schools, special interest groups and community meetings and

should conduct field trips to protected sites. These actions should aim to increase local involvement in existing protection programmes and/or initiate new ones.

- DoC conservancy staff and the Recovery Group should maintain links with organisations (particularly OSNZ and RF&BPS) involved or interested in NZ dotterel conservation.
- There should be regular use of the media, both print and broadcast. This would include central press releases on protection and research programmes (prepared by DoC Advocacy, in consultation with others) and encouraging local media to write articles of regional interest. Such articles have been written about a number of sites (e.g. Ohope, Waipu, Omaha) and commonly describe protection efforts by local school groups, individuals and conservation organisations. Articles in local newspapers appear to be particularly effective in raising local awareness and understanding of the need for protection; this in turn increases the amount of unsolicited policing of breeding sites by local people.

#### 7.3.2 Southern population

Research and management of the Stewart Island population seems unlikely to cause conflict with the public in the short term. Advocacy should therefore be directed chiefly at increasing public awareness of the plight of the southern population, mainly through use of the media.

### 7.4 Management of the northern population

One DoC staff member in each conservancy should have overall responsibility for co-ordinating and supervising all NZ dotterel protection and monitoring programmes. This includes organising protection programmes and habitat management each season (Section 7.4.1.1 and Appendix D) and habitat protection (Section 7.4.1.2). Where possible, the same individual should be responsible for liaison with the Recovery Group.

#### 7.4.1 Protection at breeding sites.

This includes species protection, as well as practical and statutory protection of habitat.

##### 7.4.1.1 *Species protection*

Two broad levels of species protection can be distinguished, although it is recognised that in many cases the distinction will be blurred, particularly where conservation groups or private individuals contribute to protection programmes.

- (a) **full protection** - the actions to be undertaken and the personnel involved will differ from site to site but at a minimum there should be roped areas, signs, a full-time or resident warden, and interpretation, both static and by the warden/minders/local DoC staff. This level of protection is appropriate for the most important sites, i.e. those with many birds and high levels of disturbance. The principal tasks at fully-protected sites are:
- Setting up barriers and signs in September, removing them after breeding.
  - Maintenance of barriers and signs against weather and vandalism.

- Public interaction (includes interpretation/advocacy and policing activities).
- Monitoring and recording details of breeding success.
- Compiling a report on the season's activities.
- Predator control, where appropriate (see Appendix D).
- Modification and/or management of breeding habitat, where appropriate.

These tasks will be undertaken by a variety of people, including DoC staff, paid or voluntary wardens, members of RF&BPS, OSNZ and other organisations and local people. Detailed and accurate record-keeping is essential, as some of the value of protection programmes is lost if records are inadequate (see Appendix E). Timing of protection is particularly important (see Appendix D). Details of some of the methods that may be used in providing protection, including management of breeding habitat, are listed in Appendix D.

- (b) **partial protection** - this covers a wider range of activities, and exact procedure will depend on factors such as number of birds, local topography, and the resources available. It may involve DoC staff, conservation groups or private individuals. At a minimum it should involve roped areas, periodic checks and at least some interpretation/advocacy. This level is appropriate for smaller groups of birds (e.g. 4 pairs or less) and less-disturbed areas, as it saves time and money which wardening or regular checking entails; it is currently in operation at a number of sites but little is known about the effectiveness of this type of protection. Records should be kept wherever possible.

The protection programmes described in this plan contain a significant research-by-management (RbM) element. A considerable part of the value of the programmes will be lost if records are incomplete or inaccurate. The standard of reports currently produced by wardens varies considerably. Before the start of the season wardens/minders at each site should be instructed by local DoC conservancy staff on (a) what information is required and (b) how to collect it (see Appendix E). The Recovery Group should compile a standard form for completion at all protected sites each season.

#### 7.4.1.2 *Habitat protection*

Our current knowledge of the species and its problems suggests that breeding areas are the most important habitat to protect. It is also important however to ensure that major flocking and feeding sites are not developed or degraded. Habitat protection may include a wide range of practical and/or legal actions and will usually assist other species, particularly other shorebirds such as terns and oystercatchers.

- (a) **Practical actions** - These will vary from site to site and may include:

- Work with planning authorities to inform them of the location of dotterel sites and habitat protection requirements; where need be objecting to planning applications which will affect these sites.
- Considering legal action to halt unauthorised modification of habitat.
- Devising effective methods of keeping animals (particularly dogs and stock) and vehicles off beaches, sandspits and estuaries wherever possible. This may involve erecting or repairing fences and gates and will often require the co-operation of land-owners with properties adjacent to important sites.

- Advocacy, particularly aimed at increasing local awareness of the species and its status and participation of local people in protection programmes (see section 7.3).
- Preventing stabilisation (particularly by planting) of dunes at breeding sites. Favoured nesting areas are open and flat and are produced by wind and water erosion of *mobile* dune systems (Cumming 1991). These dynamic systems must be preserved if suitable breeding areas are to be maintained.

(b) **Statutory protection** - A number of different types of legal status are available to protect dotterel habitat, particularly breeding areas. Factors which will influence the type of status appropriate for any particular site will include cost, the ownership of the land involved and whether permanent or temporary protection is required. The summary below is necessarily brief and the relevant Acts should be consulted for further details. Statutory protection may include:

- Reserve status under the Reserves Act 1977. This is permanent (and therefore appropriate only for important, stable sites), offers a high level of protection but can be expensive, as it may require purchase of the land at market price. The two classifications most likely to be appropriate for protection of NZ dotterel breeding sites are Government Purpose Wildlife Management Reserve (under which public entry cannot be prohibited) or Scientific Reserve (under which entry may be prohibited).
- Conservation Covenants under the Reserves Act 1977 and the Conservation Act 1987. Covenants are permanent, they overlie title and bind the owner's successors. They offer a high level of protection but may be expensive if compensation is required (but not if there is a Gift of Covenant). They are flexible, as the contents are subject to negotiation and agreement with the landowner.
- Management Agreements under the Conservation Act 1987. These may contain any conditions agreed, they overlie title but are not permanent, as they do not bind the owner's successors. They are not normally expensive and may be a useful temporary measure in some circumstances, e.g. while a higher level of protection is negotiated.
- It may be possible to protect certain dotterel breeding sites with Heritage Orders under Part VIII of the recent Resource Management Act 1991, although at the time of writing this has not been tested. Under this Act, Heritage Orders may apply to any place of "special cultural, architectural, historical, *scientific, ecological*, or other interest".
- Proclamations under the Wildlife Act 1953, although technically still available, are now rarely used. The two relevant designations are Wildlife Sanctuary (a high level of protection under which entry can be prohibited or restricted) and Wildlife Refuge (under which entry cannot be prohibited).

#### 7.4.2 Selection of breeding sites for protection

Full protection is currently in operation each season at a number of appropriate sites; during the period covered by this plan, these sites should continue to be protected and a few others should be added. These sites are listed in the Work Plan (Table 8.1). In the longer term however, there should clearly be flexibility in choosing which sites to protect. Criteria to be considered are listed in Appendix C. If the number of pairs breeding at a site falls below a certain level, the expense of protection may no longer be warranted and partial (or no) protection may be appropriate. Conversely, if numbers increase sufficiently at an unprotected or partially-protected site, consideration should be given to instituting full protection. Such changes may be brought about, for example, by decrease or increase in size of a breeding site (particularly by erosion or accretion of sandspits). Experience suggests that in such circumstances NZ dotterels readily move to a new breeding site nearby.

#### 7.4.3 Breeding site monitoring

As a local index of the status of NZ dotterels, monitoring (to record the number of pairs attempting to breed) should be carried out at a number of breeding sites each season. In order to avoid bias, information should be gathered at some unprotected or partially-protected sites as well as at all fully-protected sites. This is important because adult survival at protected sites may be different from that elsewhere.

Colonisation of parts of the northern Hawke's Bay coast may currently be under way (Foreman 1991). This area should be surveyed annually in October or November, as monitoring a natural colonisation may assist in the design of translocation strategies.

Sites to be monitored are listed in the Work Plan (Table 8.2) and monitoring and recording procedures are detailed in Appendix E. Monitoring will be undertaken by a variety of people, including DoC staff, paid wardens and members of OSNZ and RF&BPS, co-ordinated by the DoC conservancy officer responsible for NZ dotterel programmes. It is clearly very important that monitoring is undertaken by people with good identification and survey skills. If assistance is required, contact the local Regional Representative of OSNZ.

#### 7.4.4 Flock site monitoring

During the period covered by this plan, monitoring should be carried out annually at the post-breeding flock sites listed in the Work Plan (Table 8.3). These are spread throughout the range of the northern population and together they constitute a significant proportion of it (about 45%). Monitoring of flocks will thus provide an accurate annual assessment of the status of the entire northern population. Procedures are detailed in Appendix E (see also comments in 7.4.3 above).

#### 7.4.5 Complete Census

A census of the whole northern population should be carried out at the end of the period covered by this plan. This should be undertaken in the same way as the census of 1989-90. It will enable evaluation of the effectiveness of the protection programme in (a) increasing the size of the northern population and (b) expanding the usual breeding range of the species. The DoC officer responsible for NZ dotterel programmes in each

conservancy should co-ordinate the planning and execution of the census in his/her conservancy, assisted by volunteers from OSNZ, RF&BPS and others skilled in bird identification and surveying.

#### 7.4.6 Experimental management - chick shelters

Black-backed gulls are known to take NZ dotterel chicks but whether this is an important threat to the species overall has not been determined. Some sites (e.g. Matakana Island, Bay of Plenty) have good numbers of NZ dotterels but their breeding success is believed to be very low; this may be because of the many black-backed gulls in the area, as suggested by Chudleigh (1988). It may be possible to increase productivity at such sites by providing shelters for chicks. The rationale behind chick shelters and an outline of a programme to test their effectiveness are given in Appendix F.

#### 7.4.7 Extra-limital breeding

Occasionally, birds may be found breeding outside the normal present range of the species, i.e. south of Taharoa on the west coast, south of Hick's Bay on the east coast. In these circumstances, birds should be given as much protection as possible from disturbance and predation, in the hope that they will act as a nucleus and attract others to form a larger breeding group.

Experience at Omaha (Dowding & Chamberlin 1991) indicates that birds will not normally change their breeding site because of low breeding success or disturbance, but if one bird of a pair dies, the survivor will seek a new mate elsewhere. This suggests that ensuring survival of the adult breeding birds should be a priority when birds are found breeding outside the usual range of the species. This may include (a) the establishment of vegetation-free buffer zones around nesting sites to allow earlier detection of predators by sitting birds and/or (b) predator control, particularly targeted at cats and mustelids if these are known or suspected to be present (see Appendix D) and/or (c) a rope fence and signs (see Appendix D).

### **7.5 Research - northern population**

The following research should be completed within the period covered by this plan.

1. Research is required on predation. Very little is known about the relative importance of predation on eggs, chicks or adults during breeding, or which predators are important. This research should be undertaken during the period covered by this plan, as it could have considerable impact on the subsequent direction of the recovery programme. The project would involve full-time study at several sites, through at least two breeding seasons, to allow for natural differences between years (high priority).
2. Continuation of research under way on survival, dispersal and recruitment of juveniles. While the existing management regime is resulting in more chicks fledging, we know relatively little about survival and recruitment of these birds. Preliminary results suggest that survival is probably good but in the longer term the strategy of protecting breeding sites to raise productivity may have to be supplemented with other management techniques (high priority).

3. Research on breeding biology. This should relate breeding biology to problems of predation (see 7.5.1), disturbance and habitat use (medium priority).
4. Collect relevant information and devise a programme to test translocation techniques. Factors that will need to be considered are outlined in Section 9.1 (medium priority).
5. Continue research on survival, pair-retention, productivity and site-fidelity of the Omaha-Mangawhai population (JE Dowding & SP Chamberlin) (medium priority).

**- Evaluation (northern population)**

It is essential that the Recovery Group ensures that the effectiveness of protection programmes is assessed towards the end of the period covered by this plan. The national census will reveal (a) whether total population size has risen and (b) whether the increased number of juveniles expected has resulted in any natural expansion of the present breeding range. If either or both occur, continue the programme; if neither occurs, consider other options, bearing in mind the results of research that may have been completed by then.

**7.6 Management of the southern population**

Currently the only breeding area on Stewart Island known to contain more than two pairs is the Table Hill study area, which contained 9-10 pairs during the 1991-92 season. This is the only area in which cat control is worthwhile at present. Consideration should be given in future to control programmes in any other areas that might be found containing three or more pairs. Control should begin in August or early September, shortly before breeding begins, and continue until the end of January. A programme to control cats in the Table Hill area during the 1992-93 season was proposed by Dowding (1992a) and is reproduced as Appendix H. This was undertaken (Dowding 1993) and is scheduled to be repeated in 1993-94.

Monitoring of winter flocks provides the only practical way of checking the status of the southern population. As this population is already very low in numbers, monitoring is crucial and must be undertaken annually. Monitoring procedures are given in Appendix E.

**7.7 Research - southern population**

The preferred option for the southern population (Section 6.2) requires some research to be undertaken. In order of priority, this research should include:

- 7.7.1 A continuation of the current study, which aims (a) to identify the factor(s) responsible for the decline on Stewart Island, (b) to identify any further important breeding areas so that management can be effectively targeted and (c) to determine the medium-term effectiveness of cat control (planned to continue during the 1993-94 season) in enhancing adult survival (very high priority).
- 7.7.2 Preparation of a captive-breeding programme in case this becomes necessary. (Otorohanga Zoo would be prepared to undertake this.) Collect relevant information from institutions that hold or have held NZ dotterels and those breeding other shorebirds, identify appropriate facility/site(s), personnel and source of funding. Captive breeding is an expensive option and should not be

undertaken unless the ultimate goal of the programme has been clearly identified (high priority).

- 7.7.3 DNA analysis to determine the extent of genetic differences between the northern and southern populations. This research is currently designated medium priority; however, if at any time funding for management becomes dependent on the demonstration of genetic differences between the two populations, this task should become very high priority.

• ***Evaluation (southern population)***

If the management and research outlined in 7.6 and 7.7 fail to halt the decline of the Stewart Island population in 5 years, or if the population is found to have fallen to 40 birds or below at any time, consider actioning the captive-breeding programme. If the population is stable or has increased in numbers after 5 years, continue management and monitoring. If numbers on Stewart Island rise in the longer term, the species may begin breeding in coastal areas again, particularly at Mason Bay but possibly also at other sites such as Smoky Beach, Doughboy Bay or The Neck. If this occurs, predator control and some management of vegetation may be necessary in these areas.

## **8. WORK PLAN**

### **8.1 Management of the northern population**

Task 8.1.1 - to provide protection for NZ dotterels at selected breeding sites each season from 1992-93 until 1996-97.

*Comments* - See Section 7.4.1 and Appendix D for details of requirements, methods and timing. A list of sites at which NZ dotterels should receive full protection (i.e. where a full-time warden is required) is given in Table 8.1. Most of these are currently receiving some level of protection, but Omaha is a notable exception. Instituting full protection at this locality should have very high priority.

There should be flexibility in which sites are protected (see Section 7.4.2). Changes should be discussed by DoC conservancy staff and the Recovery Group. Suggested criteria for site selection are given in Appendix C.

Task 8.1.2 - to monitor number of pairs breeding at unprotected or partially-protected sites each season from 1992-93 until 1996-97.

*Comments* - Sites to be monitored are shown in Table 8.2.

TABLE 8.1 Breeding sites at which NZ dotterels should receive full protection.

Conservancy	site	approximate number of breeding pairs
Northland	Waipu	15
	Ruakaka	5
	Mimiwhangata	4
	Mangawhai Island	7
Auckland	Omaha*	9-10
	Papakanui6	
Waikato	Opoutere	7
Bay of Plenty	Ohope Spit	8

\* Not currently protected. There are 9-10 pairs breeding in a confined space, giving Omaha Spit one of the largest concentrations of NZ dotterels breeding in a small area in the country. The level of disturbance in summer is very high and productivity is very low.

TABLE 8.2 Unprotected or partially-protected sites to be monitored annually.

Conservancy	site	approximate number of breeding pairs
Northland	Kauri Mountain/Ocean Beach	14
	Ngunguru	6
	Whananaki	4
	Bay of Islands (part)*	4
	Mangawhai Spit	10
Auckland	Wade River	5
Waikato	Waikato Heads	4
	Colville	5-10
	Whangamata	4
Bay of Plenty	Maketu	7
	Matakana Island (part)	14
East Coast	Waiotahi Spit	5-7
	See Task 8.1.3 below	

\* includes Urupukapuka, Motuarohia and Motukiekie

Task 8.1.3 - to record numbers and localities of NZ dotterels breeding on the Hick's Bay to Hawke's Bay coastline annually, and to assist colonisation attempts in this area.

*Comments* - Monitoring is currently being undertaken jointly by OSNZ and DoC, East Coast Conservancy; the Recovery Group to ensure that monitoring continues in future. Colonisation should be assisted where possible (see 7.4.7 and Appendix D).

Task 8.1.4 - to monitor post-breeding flock sites annually in autumn from 1992 until 1996.

*Comments* - Post-breeding flocks that should be counted annually are listed in Table 8.3. In 1992 and 1993, there should be 3 counts each year to allow for annual variation and locality differences (see Appendix E). Depending on the results of these counts, it should be possible to reduce them to one or two per year in 1994-96.

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TABLE 8.3 Post-breeding flocks that should be counted annually.

Conservancy	flock site	approx. number of birds
Northland	Kowhai Beach	35
	Whananaki	37
	Ngunguru	30
	Whangarei Harbour	35
	Waipu Spit	40
	Mangawhai (Spit & Island)	75
Auckland	Omaha	55
	Wade River	20
	Tapora	40?
	Te Matuku, Waiheke I	35
Waikato	Matarangi	55
	Opoutere	20
	Colville	30?
Bay of Plenty	Tauranga Hbr/Matakana I	30
	Ohope Spit	55
	Pukehina/Maketu	35

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Task 8.1.5 - to undertake proposed 'chick shelter' RbM programme.

*Comments* - For details of this programme, see 7.4.6 and Appendix F. The Recovery Group to consider selection of a suitable site and discuss with local conservancy staff.

Task 8.1.6 - to collect records from all sites and maintain a database.

*Comments* - this includes all data (and reports) from protected sites (Task 8.1.1), counts from other breeding sites (Tasks 8.1.2 and 8.1.3) and flock counts (Task 8.1.4). To be organised by the Recovery Group.

Task 8.1.7 - to census the entire northern population at the end of the period covered by this plan, i.e. in October 1996 and March-April 1997.

## **8.2 Research on the northern population**

Task 8.2.1 - to carry out research on the impact of predation on breeding NZ dotterels.

*Comments* - Little is known about the impact of predation; this project should be undertaken during the 1992-93 and 1993-94 breeding seasons if possible, but in any case it must be completed before the end of the period covered by this plan. The research must be closely related to management goals (high priority).

Task 8.2.2 - to continue research on survival, dispersal and recruitment of juveniles.

*Comments* - This is currently being undertaken by JE Dowding, with assistance in banding chicks from DoC staff and others. This programme should continue for the next 3-4 seasons or until sufficient data has been collected to assist in the evaluation of the recovery strategy (high priority).

Task 8.2.3 - to undertake research on the breeding biology of NZ dotterels.

*Comments* - This should be an intensive study, full-time during the breeding season, undertaken during at least two seasons; it could overlap considerably with task 8.2.1 (medium priority).

Task 8.2.4 - to devise a programme to test translocation techniques.

*Comments* - The Recovery Group, in consultation with TSU, should initially be responsible for undertaking this task. Some of the factors that should be considered are listed in Section 9.1 (medium priority).

Task 8.2.5 - to continue research on the Omaha-Mangawhai population.

*Comments* - This is currently undertaken by JE Dowding & SP Chamberlin. This project will continue, at least for the 1993-94 season. This recovery plan identifies Omaha Spit as an important breeding site which should receive full protection. There are now 6 years data on productivity and breeding-site fidelity at Omaha and all of the resident breeding birds are banded. The continuation of the project after protection is begun will therefore result in much useful information on (a) the effectiveness of protection in raising productivity and (b) whether birds will move breeding territory to nest inside a protected area (medium priority).

### **8.3 Southern population**

Task 8.3.1 - to attempt to reverse the decline of the Stewart Island population by controlling cats around important breeding areas each season.

*Comments* - A proposal to control cats in the Table Hill area (Dowding 1992a) is reproduced as Appendix H. DoC Southland Conservancy/Stewart Island Field Centre should be responsible for this task (high priority). This task should be undertaken each season for the duration of the period covered by this recovery plan (see Dowding 1993a).

Task 8.3.2 - to study the effect on dotterel survival and productivity of the cat control described in 8.3.1.

*Comments* - This was carried out in 1992-93 (Dowding 1993a) and is scheduled to occur again in 1993-94 (S&R contract to J.E. Dowding).

Task 8.3.3 - to monitor the southern population annually by counting numbers in autumn flocks and recording colour-banded birds.

*Comments* - The Recovery Group to ensure that this task is undertaken each year. Current monitoring procedures are outlined in Appendix E; details are given in Dowding (1992a) (high priority). [In 1993-94, this task overlaps entirely with Task 8.3.2.]

Task 8.3.4 - to prepare a contingency captive-breeding plan.

*Comments* - This should initially be the responsibility of the Recovery Group, in consultation with DoC TSU. The plan should be prepared as soon as possible in case numbers fall below 30 in the near future. The Recovery Group to discuss captive-rearing trials (using birds of the northern population) with suitable institutions (medium priority).

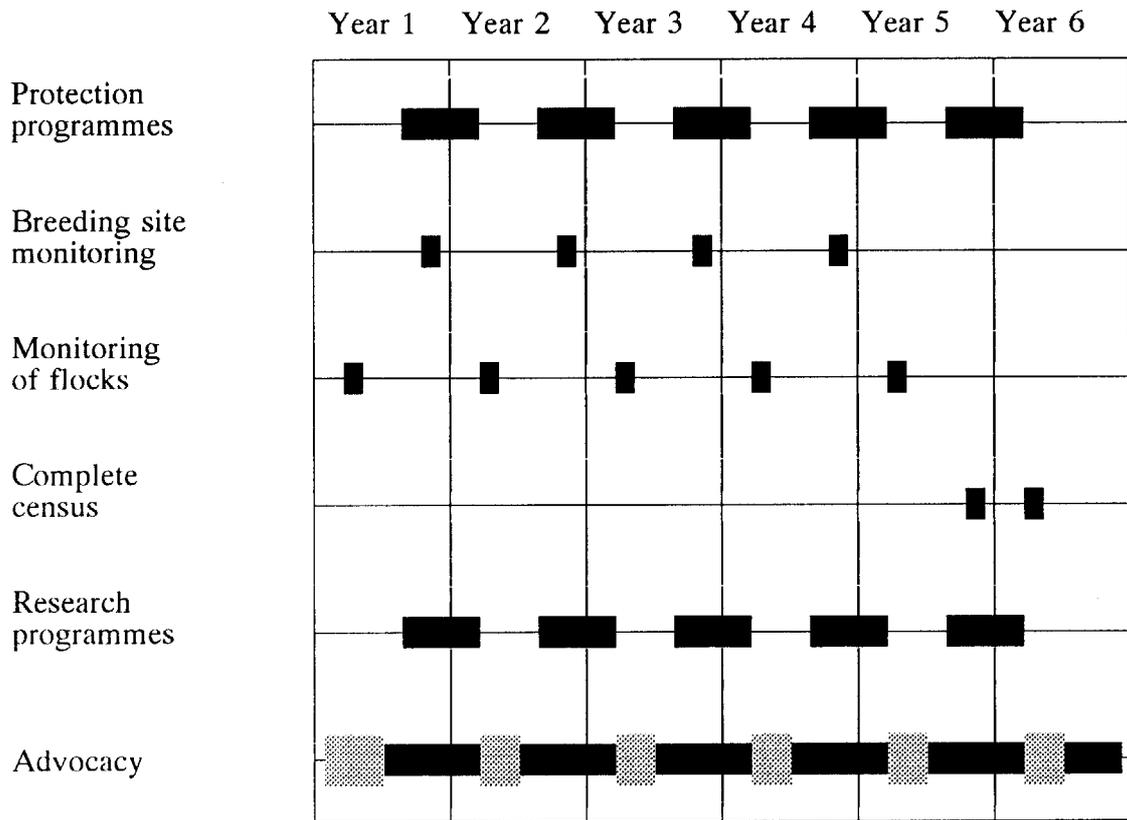
Task 8.3.5 - to determine the extent of genetic differences between the northern and southern populations by analysis of DNA.

*Comments* - This might make a suitable project for a University student, in consultation with the Recovery Group. As the population is very small, no losses are acceptable and the techniques used must not put birds at risk (currently medium priority but could become very high priority - see section 7.7.3).

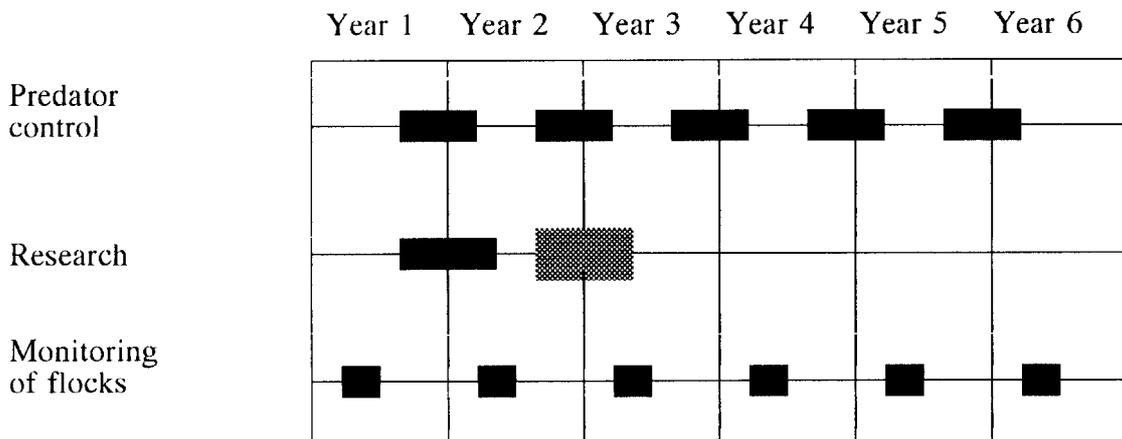
### **8.4 Critical Path**

The major actions described in the Recovery Strategy and Work Plan are summarised below. Periods of intensive effort are shown black, those of less-intensive effort are cross-hatched.

### NORTHERN POPULATION



### SOUTHERN POPULATION



## **9. FUTURE OPTIONS**

### **9.1 Translocations**

One of the recommendations for research in this recovery plan is that a programme be designed to test re-location techniques for the species. Some of the factors which need to be considered in any attempt to translocate NZ dotterels are outlined below.

1. Adults show high breeding-site and flock-site fidelity (Dowding & Chamberlin, 1991) and may attempt to return to their capture site. NZ dotterels are capable of covering large distances quickly; one banded juvenile is known to have travelled a minimum of 835 km in a maximum of 13 days (Dowding, unpublished).
2. Juveniles are known to wander widely and there is no reason to believe that they would remain at or near their release site for long.
3. The species very rarely breeds on the coast of the southern North Island and apparently no longer breeds in the South Island. We do not know exactly what caused the species to die out in these areas; re-introductions may therefore be unsuccessful until any adverse factors involved are identified and can be controlled or circumvented.
4. North Island birds may be less suitable than those from Stewart Island, if attempts are ever made to re-introduce the species to the South Island high country. We know nothing about breeding-site selection in the NZ dotterel, but it is possible that existing North Island birds will be imprinted with coastal breeding.
5. The little evidence available so far suggests that NZ dotterels are not particularly faithful to their natal site. There will therefore be no automatic increase in the number of birds at a new breeding site, even if breeding is successful.
6. Monitoring the colonisation which appears to be occurring in parts of northern Hawke's Bay may provide useful information, e.g. on selection of release sites.

### **9.2 Artificial breeding sites**

Some sites may continue to hold significant groups of breeding birds for many years but, in spite of protection, productivity may remain low because of very high levels of disturbance and/or predation. An option for the medium/long term at these and other sites might be the provision of alternative artificial breeding sites (such as man-made islands of sand or shell), located so as to minimise disturbance and predation. Experience at Omaha and Mangere suggests that NZ dotterels would readily adopt such sites. Artificial breeding sites may also be a useful tool in translocation experiments.

### **9.3 Intensive management techniques**

Intensive management during breeding, especially by egg manipulation, may be an option if other techniques are found to be unsuccessful in raising productivity sufficiently. Eggs are known to be particularly vulnerable, with many clutches disappearing within a few days of being laid.

- The simplest technique is to reduce the risk to eggs by removing them, substituting dummy eggs and incubating the real eggs artificially. They are then returned to the nest immediately before hatching. This technique has the advantages that it does not set up a chain reaction which may become difficult to manage (see below), and that disruptions are minimal - the chicks are raised by their real parents at their natal site and in a normal time frame. This technique

should not unduly jeopardise further breeding - NZ dotterels will re-lay if chicks are lost when small (Dowding, unpublished). The technique does not, however, increase egg output.

- A second technique is to remove eggs and incubate them artificially, thereby inducing the birds to lay a replacement clutch. The first clutch is replaced just before hatching and the second removed for artificial incubation. Before hatching the second clutch may be donated to another suitable pair with a nest, and so on. When there are no potential foster parents with eggs available, the last clutch is captive-reared to fledging and then released. This technique increases egg output but there may be problems of co-ordination. No information is available on survival of captive-bred NZ dotterels in the wild.

In the near future, these techniques are likely to be necessary only for use with the southern population; it would be simpler however, to trial them first with birds of the northern population. It should be borne in mind that there will be considerable logistical difficulties (and expense) in moving eggs between the Stewart Island breeding grounds and a suitable artificial incubation facility.

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## APPENDIX A. Cost estimates

Estimated costs (where available) of the principal management tasks in this plan are given below (figures provided by DoC conservancies - N=Northland, A=Auckland, W=Waikato, B=Bay of Plenty)

### *Northern population*

	1992-93	1993-94	1994-95	1995-96	1996-97
<b>Protection &amp; monitoring at breeding sites</b>	N 14,500	N 15,000	N15,500	N 16,000	N 16,500
	A 5000	A 5000	A 5000	A 5000	A 5000
	W 12,400	W 12,400	W12,400	W 12,400	W 12,400
	B 7750	B 2500	B 2500	B 2500	B 2500
<b>Monitoring of flocks</b>	N 2000	N 2060	N 2122	N 2188	N2254
	A 1000	A 1000	A 1000	A 1000	A1000
	W 200	W 200	W 200	W 200	W 200
	B 1000	B 1000	B 1000	B 1000	B1000
<b>Census</b>					N10,000 W 400
<b>Advocacy</b>	N 1000	N 1030	N 1061	N 1093	N1126
<b>Research</b>	500				
	300				

### *Southern population*

A cat control programme for the Table Hill area has been proposed and is estimated to cost approximately \$6000 (see Appendix H). Costs of annual monitoring (Task 8.3.1) and evaluation of cat control (Task 8.3.3) are estimated at an additional \$9000.

## **APPENDIX B. Key contacts**

The following is a list of some of the people recently involved in NZ dotterel work.

### **Northern population**

Research

John Dowding

Simon Chamberlin

Andrew Cumming

Ray Pierce

Experience in management of protected breeding sites

Richard Parrish (Northland)

Phil Thomson (Waikato)

Keith Owen (Bay of Plenty)

Chris Smuts-Kennedy (Little Barrier Island)

Wayne Todd (Waikawau)

Peter Carter (Thames)

Wardens and `minders'

Rachel Houlbrooke (Opoutere)

Suzy O'Neill (Opoutere)

Geoff Stone (Opoutere)

Mairie Fromont (Mangawhai)

Adrian and Helen Harrison (Ohope)

Jason Roxburgh (Waipu/Ruakaka)

Tim Shaw (Waipu/Ruakaka)

Noel Henry (Waipu/Ruakaka)

Bruce Mackereth (Whitianga)

Dave Wills (Matakana Island)

OSNZ

OSNZ Regional Representatives in each area have information on NZ dotterel distribution and numbers. Society members should be able to assist with monitoring and surveying. Contact addresses for Regional Representatives are given in each issue of *Notornis*.

RF&BPS

Basil & Ann Graeme (Bay of Plenty)

### **Southern population**

John Dowding (research on status and distribution, monitoring, cat control)

Elaine Murphy (research on status and distribution, monitoring)

Sandy King (Stewart Island)

Paul Johnston (Stewart Island)

Maida Barlow (numbers and distribution in Southland)

## **APPENDIX C. Selection of breeding sites for protection**

The following factors should be considered when assessing breeding sites for protection.

1. The single most important consideration is the number of breeding birds. In general, a site is considered of international importance if it holds 1% of the total population of a species; in the case of the NZ dotterel, this is equivalent to about 6 breeding pairs. Any site that contains 10 pairs or more in a relatively confined area is of major importance and must receive some level of protection, preferably full protection.
2. Density and spacing of birds. Are they concentrated in a relatively small area that can be effectively roped or fenced? There are a number of sites (such as Pakiri River mouth, North Auckland) where there are 5-6 pairs of NZ dotterels and high levels of disturbance, but the birds are widely scattered and fencing them all is impractical. At such sites, it may be possible to rope off an area containing one or two pairs, in the hope that nearby pairs will move inside the rope in subsequent years.
3. Is the number of NZ dotterels attempting to breed at the site increasing/decreasing/stable? Is it a new breeding site, outside the usual breeding range of the species? If so, it is of particular importance and should receive protection.
4. Does the area have any existing form of statutory protection (e.g. reserve or refuge status) or is there a likelihood of such protection by these or other means, such as covenant or management agreement (see Section 7.4.1.2)?
5. Does the area to be roped/fenced provide for the needs of the birds? Chicks need walking access to feeding grounds and places to hide, particularly from gulls (see Appendix F).
6. Is predation known to be (or likely to be) a problem? Common predators of NZ dotterels are listed in section 4.6. Can predator numbers be reduced? Factors that should be considered and an outline of a suitable trapping regime are given in Appendix D, paragraph 6.
7. What is the level of disturbance and/or recreational use in the area? Can effective protection be achieved with minimum disruption to recreational users? It is clearly important to minimise public antagonism to protection programmes.
8. What level of assistance (practical and financial) is available from interested local individuals and local or national groups?
9. Are there benefits to other species breeding (or roosting) in the area, which may be protected simultaneously, e.g. variable oystercatcher, caspian tern, fairy tern?

## **APPENDIX D. Guidelines for protection at breeding sites**

This appendix outlines some of the practical actions that may be part of the protection effort at breeding sites. These can only be broad guidelines, as each site presents different problems.

1. The single most important action is probably the erection (and maintenance) of a rope or wire fence around the breeding birds. This is usually constructed of simple metal standards (similar to those used for electric fences) and old rope (experience shows that new rope is more likely to disappear). Such fences are relatively unobtrusive and do not attract undue attention. Some of the standards should carry signs indicating the purpose of the fence. At a minimum these should be small plates bearing the words 'Birds Nesting - Please Keep Out'. At Northland sites a standard sign printed on corrugated plastic is stapled to wooden stakes. The sign measures approximately 340 x 410 mm and is reproduced as Appendix G.
2. Where it does not compromise protection of the birds, fences should be sited so as to allow public access to frequently-used areas. In practice this may involve fencing two or more adjacent areas to leave a corridor for pedestrians and marking paths. Where a number of breeding pairs are sufficiently close, it is easier and preferable to erect one fence around the whole group. At some localities where disturbance is high however, very small enclosures (some only 3-4 m in diameter) around individual nests have apparently been sufficient to allow hatching. The shape and size of the protected area should remain flexible throughout the season - if birds lay (first or subsequent clutches) outside the fenced area, it is often a simple matter to move part of the fence to include the nest. In some situations, it may not be possible to predict where birds will lay and fences should be erected immediately after laying.
3. Timing of protection is important. Most present wardening starts in November; birds usually begin laying in September (and sometimes as early as the last week of August) and this is when wardening should ideally begin. In practice, this may involve using volunteer wardens part-time for the period September-November, with a paid or full-time warden for the period of higher disturbance (November-February). In any case, fences and signs should be in place by late August. Birds which succeed in raising their first clutches have them fledged before the period of highest disturbance (late December and January). Fences should be removed when all chicks have fledged or all pairs present have abandoned breeding attempts for the season. This may be anywhere between late January and early April. Fences should not be removed just because nesting has finished; unfledged chicks also receive protection from the fenced areas.
4. If nests are sited where they are obviously vulnerable to flooding, they can be moved, although the potential gain must be balanced against the very real risks of (a) desertion and (b) attracting predators to the disturbed area around the nest. Little information is available on what will succeed, so detailed records should be kept of any attempts made, successful or otherwise. Ideally, nests should probably be moved

about one-two metres every second day. In urgent situations distance and/or frequency may have to be increased; successful single shifts of 5-10 m have been achieved. Many NZ dotterels lay next to a prominent marker; such as a piece of driftwood or seaweed, a clump of vegetation or rock. It is important to move any such markers with the nest; if no marker is obvious, one should be provided to assist the birds. Obviously nests should not be re-sited too close to existing nests of other pairs.

5. The need and opportunities for management of vegetation at protected sites will vary. Establishment of a buffer zone cleared of vegetation near the roped area or at the base of a sandspit, may discourage some mammalian predators. Thinning (or removal) of vegetation on breeding areas may reduce predation by allowing incubating birds to detect threats earlier. This may conflict with other requirements, particularly dune and beach-front stabilisation. In some cases, management of NZ dotterels may have to be assigned higher priority than establishment of native dune plants. In such circumstances, consider the use of rock groynes and/or fences to stabilise the area; at Omaha Spit, a series of fences has accumulated sand and created a network of sheltered depressions that are favoured as nesting sites by both NZ dotterels and variable oystercatchers. At certain sites it may be possible to increase the area of breeding habitat. Cumming (1991) found that favoured breeding areas are low, flat and have little or no vegetation. In some situations it may be possible to rehabilitate stabilised dunes or other heavily-vegetated areas to increase the amount of open, flat habitat.

6. Predator control. The common predators of NZ dotterels, known and suspected, are listed in section 4.6. It should be stressed that there is very little well-documented information on the overall impact of predation on the species or on the relative importance of different predators. Control should not be undertaken at breeding sites without at least some understanding of the predator-prey web in the area, as removal of some predators might allow access to others which may have greater impact and/or be more difficult to control. In particular, control that removes only one potential predator should be avoided; if only rats are removed, for example, cats and stoats may switch their diet and eat more birds. Probably the most important animals to control in most situations are cats, mustelids (particularly stoats and ferrets), rats and possibly hedgehogs. A suitable trapping regime includes two types of trap (a) Mk IV Fenn traps, which will catch rats, stoats, hedgehogs and small ferrets, and (b) larger traps to catch cats and large ferrets (these may be Mk VI Fenn traps, soft-jawed leg-hold traps or cage traps). Kill-traps must be in tunnels or otherwise covered (to avoid capture of non-target species) and are generally more efficient when baited (e.g. hen eggs for rats, stoats and hedgehogs). Traps must be located where they do not endanger chicks, which can range widely and may seek shelter under trap covers. In some localities where they are very numerous, removal of black-backed gulls may also have to be considered. At most breeding sites however, reduction of disturbance should increase the ability of parent birds to guard chicks and thereby reduce losses to native predators such as gulls or harriers.

## **APPENDIX E. Recording and monitoring procedures**

As pointed out in Section 7.4.1.1, there is a RbM component in protection programmes, particularly at fully-protected sites. Some of the value of the programmes is lost if record-keeping is inadequate. The minimum information that should be recorded is listed below and monitoring procedures for both breeding and flocking sites are outlined.

### **Breeding sites**

Fully-protected/wardened sites

Record as many of the following as possible:

1. Dates that wardening started/finished.
2. How many pairs of NZ dotterels attempted to breed at the site?
  - a) inside the fenced area?
  - b) nearby but outside the fenced area?  
(draw a sketch map)
3. Record the cause(s) of nesting failures, *if these can be determined with certainty*.
4. How many chicks fledged? Details (if relevant) of:
  - a) band combinations of banded chicks,
  - b) approximate dates of fledgingWere any other banded NZ dotterels seen at the site during the season?
6. Record other species which nested inside the fenced area. How many pairs of each?
7. Record results of any predator control undertaken (species and numbers).

Currently, full-time wardens are usually employed from mid-November. It should be remembered that many NZ dotterels will be on second clutches by this time (having lost the first); some may even be about to lay their third clutches. This is frequently not taken into account when reports are compiled. Where possible, arrangements should be made (e.g. with local volunteers) to keep records from mid-September until the time wardening begins.

Unprotected/ partially-protected breeding sites

These should be checked in October, if possible on two occasions 2-3 weeks apart.

When a pair is between clutches, one bird may not always be present and there may be no obvious indication of breeding. Record (a) total number of NZ dotterels present, (b) estimate of number of breeding pairs, (c) band combinations of any banded birds (see 'Recording colour-band combinations' below). Maximum numbers are obtained if counts are carried out within 1hr of high water. At other times, off-duty birds may visit nearby estuaries or stream-mouths to feed.

### **Post-breeding flocks (northern)**

1. Always count within 1hr of HW. At other times, some birds may be absent feeding.
2. In 1992 and 1993, count flocks on three occasions each year (a) in late February, (b) in late March and (c) in late April. Time of maximum flock size varies within this period from year to year and possibly also from place to place.

3. Look carefully for colour-banded birds (see 'Recording colour-band combinations' below). Checks of post-breeding flocks provide the best way of finding banded juveniles.

### **Post-breeding/winter flocks (southern)**

Only three southern flocks are known and each poses different monitoring problems. It is particularly important to record sightings of all banded birds in these flocks, as this yields information on annual adult survival (see 'Recording colour-band combinations' below). For details of timing and precise locality of these flocks, see Appendix A of Dowding (1992a).

#### **Awarua Bay, Southland**

Monitoring birds in Awarua Bay is difficult and a reliable routine is only slowly being established. The birds may be in a very loose flock, spread out over a large area; the most consistent counts seem to be obtained by searching in the vicinity of Cow Island, one hour either side of a 2.6m tide. Single visits to this flock can be misleading and at least three counts should be made between April and July. Check for banded birds.

#### **Central flock, Stewart Island**

This is the only large flock remaining and must be monitored annually, as it provides the best single index of the status of the southern population. It commutes between feeding grounds and different high-tide roosts, depending on the time of day. Monitoring should be carried out at Mason Bay within one hour of HW Paterson inlet, on three successive days when high water is in the middle of the day. Record banded birds seen.

#### **Cooks Arm flock, Stewart Island**

The flock at the head of Cooks Arm is difficult of access and very small; it may not exist for much longer and the resources required to check it may not be justified.

### **Recording colour-band combinations**

*Always remember to record place and date.* Possible colours are O=orange, R=red, B=blue, Y=yellow, G=green, W=white. Note that all birds have a metal band; this may be quite hard to see in some circumstances but it is an integral part of the combination and its position is important. Band combinations should be recorded from the bird's left leg first and top to bottom e.g. M-WYG is metal on the bird's left leg, white over yellow over green on its right; BR-OM is blue above red on the bird's left leg, orange above metal on its right.

## **APPENDIX F. Chick shelters - a RbM proposal**

In the North Island, black-backed gulls are known to take NZ dotterel chicks and in some areas predation may be heavy. We have no idea, however, whether chick predation by gulls is a major factor in keeping productivity low in the northern population as a whole.

### Rationale

At the approach of danger, NZ dotterel chicks normally run to the nearest cover and hide. Nesting commonly occurs on low, flat areas devoid of vegetation (Cumming 1991); this presumably allows earlier detection of predators and other threats by adults but means that chicks can be stranded a long way from suitable cover. At such sites it would be a simple matter to provide small shelters, scattered around the roped-off breeding area, for chicks to use when danger threatens. This would combine the benefits of cover (for chicks) with the advantages to adults of breeding in open areas. Shelters could consist of piles of rocks (chicks at Omaha routinely hide in the crevices between rocks making up the groynes on the spit) or simple wooden tunnels. They may also provide shelter from threats other than gulls, such as dogs and adverse weather conditions.

### Method

1. Rope off two groups of breeding pairs, in an area where black-backed gulls are breeding and where disturbance from people, vehicles and animals will be minimal. There should preferably be four or more pairs in each group.
2. If necessary, a buffer zone of vegetation should be cleared around the roped areas to discourage mammalian predators.
3. Provide sites for chicks to hide from gulls at one site but not at the other. The shelters should be alternated between the sites each season to remove the effect of any differences between the sites.
5. Employ a warden to minimise disturbance, provide interpretation, monitor breeding success (number of chicks fledged), record and report each season. There should also be observation of chick reaction to the shelters.
6. Monitor number of pairs using the areas each season for five years, expanding the protected zone if necessary during this time.

### Evaluation

At the end of the period covered by the recovery plan, the results of any 'chick-shelter' programme should be assessed by the Recovery Group. Productivity should be compared between 'shelter' and 'no shelter' regimes each season and overall after 5 seasons.

**APPENDIX G. A proposal to control cats around Table Hill, Stewart Island, to enhance survival and productivity of NZ dotterels**

**Method**

Preliminary tests in December 1991 showed that cat density in the Table Hill area was very low, suggesting that a few animals, possibly visiting the open tops periodically from forest and scrub areas lower down, are doing most of the damage. The proposed control is therefore based on the use of long-life polymer-1080 baits (developed by Eason et al. under contract to DoC S&R), placed in a ring around Table Hill to intercept cats entering the dotterel breeding area. This ring would roughly follow the scrub line and, depending on its exact route, would be a line about 10 km in length. Bait stations would be installed at 50-100 m intervals along this line; baits might also be spread between them by hand. The 1991 tests showed that neither NZ dotterels nor kiwis took non-toxic versions of the baits.

Installation of the stations and baiting of the ring would be undertaken in August-September 1992. The initial application is designed primarily to remove any resident cats from the area before the birds begin breeding in October. Stations would be checked and baits renewed once a month (Oct 1992-Jan 1993 inclusive) to try and intercept cats moving into the area.

**Evaluation**

The entire population will be monitored (by checking the three flocks) in March-April 1993. Survival of banded adult birds which bred in the Table Hill area (protected sample) will be compared with that of birds which bred in all other areas (unprotected sample). It may also be possible to get an indication of any change in productivity on Table Hill, by comparing numbers of nests and/or chicks per pair found in December 1991 and December 1992.

**Approximate costing**

Materials for 200 'plastic bucket' bait stations @ \$2.00		\$400
Approximately 150 kg baits, loaded by FRI, Christchurch (estimate 0.5 kg per season per station = 50-100 kg, plus possible line applications)		?\$1500
Helicopter time for transport of baits, stations, food supplies and 2 people from Halfmoon Bay to Table Hill, Aug-Sep 1992.		
30 min if helicopter is already on the island	\$600	
90 min if helicopter not already on the island		or \$1650
Wage-worker time @ \$500 per week		
2 weeks set-up Aug-Sep 1992	= \$1000	
4 days check/replace baits Oct 1992		=\$400
4 days check/replace baits Nov 1992		=\$400
4 days check/replace baits Dec 1992		=\$400
4 days check/replace baits Jan 1993		=\$400
	\$2600	\$5100/\$6150

## Notes

1. If the control operation is successful and is repeated in subsequent years, costs will obviously differ. In particular:
  - (a) bait stations are durable and designed to be left in position for the foreseeable future - they are therefore a one-off cost,
  - (b) baits for 1992-93 would be provided at a reduced cost by FRI; they will probably have to be purchased at a commercial rate in subsequent years,
  - (c) set-up time would be approximately one week (rather than two) in future years.
  
2. Aerial application of the bait was considered but rejected for the following reasons:
  - (a) baits are presently at the field-trial stage and it is unlikely that the quantities needed for an aerial drop would be available this season,
  - (b) exposed baits (particularly the lure component) will deteriorate more rapidly than bait in stations; repeated applications in a season would be expensive in both bait and flying time.
  
3. At the time of writing, it is not clear whether baits should be broadcast between stations; because baits are currently surface-loaded, 1080 concentration in exposed baits may fall fairly quickly, increasing the risk that cats could ingest sub-lethal doses and become bait-shy. This situation is under discussion with FRI staff. Improved loading methods (such as incorporation of the 1080 in the bait formulation) should overcome this problem in future.
  
4. Some operating costs on Stewart Island, particularly boat transport in Paterson Inlet, are not included. Accommodation (in the form of a bivouac) is already installed on Table Hill.
  
5. The cost of monitoring and evaluating the effectiveness of the programme is not included in the estimate above (see Task 8.3.3).
  
6. If this programme is successful in improving survival and productivity on Table Hill, it could easily be extended to include the adjacent Blaikies Hill area at a later date, at very little extra cost. If NZ dotterels attempt to re-colonise Mt Rakeahua (see Dowding 1992a), this would be an obvious site at which to attempt control - access is good and the area of open breeding habitat is relatively small.

### **Postscript (August 1993):**

**The control system outlined here was undertaken during the 1992-93 season, and the results were described by Dowding (1993a). The programme is scheduled to be repeated with minor improvements during the 1993-94 season.**