

The BEHAVIOURAL ECOLOGY
and MANAGEMENT of
NEW ZEALAND
SHORE PLOVER

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ABSTRACT

The behavioural ecology of the New Zealand shore plover (*Thinornis novaeseelandiae*) is examined to provide information for its management.

The shore plover species is confined to a small single sedentary population that is a remnant of a population that was much larger and widespread. Predation by rodents and feral cats is thought to be the main cause of shore plover decline from its former range.

The entire population was studied from November 1984 to December 1986 on South East Island in the Chatham Islands. Almost all individuals in the population were colour-banded prior to the start of the study and population numbers had been regularly monitored since 1961.

Trends in the population are investigated from 15 years banding records. The population has between 43 and 44 pairs, and about 130 birds. There is no migration and dispersal from South East Island. The population has been stable at least since 1969, but has the capacity to increase by 8% per annum. There is a high proportion of non-breeding adults in the population.

A number of aspects of shore plover behavioural ecology are presented and possible factors accounting for these are discussed. Relatively constant environment (food, climate), large difference in the habitat quality within the shore plover habitat, and a mammalian predator free environment are possible factors that account for the patterns of shore plover breeding biology, spatial organisation, habitat use, microhabitat (resource) use, activity budgets, parental care, and chick growth and behaviour.

Environmental factors influencing habitat quality and breeding success are identified.

The southern shore is a lower quality habitat for shore plover, chicks had slower growth rates and higher mortality than on the northern shore. The breeding success on the northern shore was twice that of the southern shore.

Early habitat imprinting of shore plover may influence the non-dispersive behaviour and may constrain their flexibility in habitat use and spatial patterns.

Although shore plover appear to be a stable population at present and in no danger of immediate extinction, a single population of a species (especially as low as ≈ 130 birds) is always threatened with extinction. Regarding this, a number of management options are proposed to safeguard the shore plover population on South East Island and to establish new populations.

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CHAPTER 9

SUMMARY

This study shows the importance of research to the effective management of an endangered species. The broad objective was to define the habitat features and biology of shore plover significant to their survival and their management.

Shore plover were chosen for study as they are a small single sedentary population that is a remnant of a population that was much larger and widespread. As the population is stable this provided a special opportunity to study the management of a stable but endangered species.

The aims of the research were therefore broad and covered the following topics:

- 1) Historical distribution and cause of decline
- 2) Population trends
- 3) Breeding biology
- 4) Spatial organisation
- 5) Habitat, microhabitat (resources) and prey use
- 6) Activity budgets and parental care
- 7) Chick growth and behaviour.

The main findings from these topics were:

Shore plover were once widespread in coastal habitats in the lower North Island, South Island and possibly the upper North Island but had

declined to a single population on South East Island in the Chatham Islands by about 1900. This species has been confined to a single population for the past 85 years. The cause of shore plover decline is thought to be predation by rats (especially norway rats) and feral cats. No rodents, cats or mustelids have reached South East Island.

The population on South East Island has been small (120 - 140 birds) but stable since at least since 1969. Today there are between 43 and 44 breeding pairs and about 130 birds in total. However, the population has the capacity to increase by 8% per annum.

Shore plover are a longlived species with age-dependent survival and fertility. Mortality was highest in juveniles and in winter. Mortality was low and fertility high in adult shore plover compared to other shorebirds.

Shore plover have the following breeding characteristics in common with other plover species - monogamous pair bonds, pairs establish separate home ranges, mostly lay three egg clutches, incubation span of 28 days, both sexes incubate, synchronously hatch precocial chicks, and male and female share parental care (chick care).

These breeding characteristics of shore plover are not common in other plover species - sedentary throughout the year (non-migratory), high fidelity to mates and breeding sites, long breeding season, a high mean clutch mass as a percentage of female body weight, long and irregular laying intervals between eggs in a clutch, long interval to last laid egg to start of incubation, sometimes a delay in hatching of

the last chick in a clutch, delay in chicks leaving the nest once they are hatched, often don't reneest and there was usually a long delay to reneesting, highly variable fledging time, a long period from fledging to independence in some fledglings, and high hatching success but low success in chicks fledging.

With a constant food supply and relatively settled climatic conditions throughout the year, shore plover don't need to migrate from South East Island in the non-breeding season. The high survival of breeding birds and their sedentary nature results in high fidelity to mates and breeding sites. Also the number and location of breeding home ranges change little between breeding season.

With a lack of mammalian predators there is high hatching success and an overall high breeding success in shore plover. Nesting under cover be a response to skua predation. Nesting under cover, long laying intervals, delay in starting incubation from the last laid egg, delay in the last chick hatching, delay in chicks leaving the nest once they have hatched, long fledging period in some chicks and poor anti-predator behaviour would increase shore plover vulnerability to predation in the presence of rodents, cats or mustelids.

Predators of shore plover on South East Island include red-billed gulls and black-backed gulls, and probably skuas, harrier hawks and white-faced herons. Causes of chick mortality include predation from these species, starvation and drowning from swell wash.

In the breeding season pairs had separate home ranges. Home range

spacing ensured sufficient chick raising areas and feeding areas close to nest sites. Exclusive use of nesting and chick raising areas was maintained by defense. Feeding areas were less exclusive and not always defended. Unpaired adults and juveniles had less discrete home ranges that overlapped with each other, and to a small extent with breeding pairs.

In the non-breeding season, some breeding pairs remained in their home ranges while others abandoned their home ranges to flock with unpaired adults and juveniles. A period of high mobility within South East Island was followed by settlement near or in breeding home ranges for the rest of the non-breeding season.

In the breeding season pairs on the northern shore had compact home ranges where all activities of a pair occurred within a contiguous area, while pairs on the southern shore had dispersed home ranges where activities occurred over a number of separate areas. Microhabitats used by shore plover were in contiguous areas on the northern shore but on the southern shore were usually separated.

Shore plover occupy rocky shore, saltmeadow and tussockland and until the mid 1960's used grazed pasture on South East Island. They occupied a range of coastal habitats in their historical distribution.

A wide range of rocky shore microhabitats and some vegetated microhabitats were used by shore plover; among which wet-algae covered rock platform, freshwater seeps, wet bare rock platform saltmeadow turf were the commonest. The difference in microhabitat use between

birds of different age, breeding status, and sex is a result of the different activities of these birds while the difference in birds between shores reflects the availability of the microhabitats on each shore.

Shore plover on South East Island show a habitat preference by their selection of microhabitats, as their use of microhabitats does not match the microhabitat availability.

Shore plover feed on a wide range of small-sized and locally abundant, marine and terrestrial invertebrates. The most abundant prey types were copepods, insect larvae and amphipods. The commonest microhabitats used for feeding did not have the highest prey densities, nor were they the most available. Overall prey density was slightly lower on the southern shore. Prey densities did not fluctuate greatly over the breeding season.

Chicks were more restricted in their prey types. This probably limited their feeding sites to freshwater seeps where abundant small sized prey was found. Poor feeding skills and a small-sized bill meant not all prey was available to chicks on the Clears.

Activity budgets differed between breeding and non-breeding birds because the time used by breeding birds to incubate and care for chicks was available to non-breeding birds for other activities. Males and females spent about an equal time caring for chicks, but females did most of the active care. Activity budgets of breeding birds changed over the breeding season as a response to different breeding

activities. The relative proportions of time spent feeding and roosting also changed over the breeding season.

Energy acquisition did not appear to be a problem for breeding or non-breeding adults as they had time for roosting when they could have been feeding. Although females had time to roost during incubation and chick care, long irregular laying intervals, long interval to nest once the last egg is laid, low incidence of reneating and long delay to reneating indicated females do have a problem in obtaining enough energy or nutrients for egg laying. Incubation and chick care but probably required less energy than egg laying. Female activities compared to male activities during incubation and chick care may also be less energy demanding.

Breeding birds on the southern shore did not spend longer feeding than those on the northern shore. This is despite higher energy demands expected in both maintaining body temperature in a cooler climate and moving from nesting and/or chick raising areas to feeding areas. However, females on the southern shore had longer laying intervals which suggests energy acquisition is a problem for southern shore females at this time.

Breeding birds on the southern shore spent less time in chick care than birds on the northern shore. In the dispersed home ranges on the southern shore parents could not always attend chicks at the same time as feeding as they often needed to move to feed at distant areas. This may have led to higher predation on chicks and could partly explain the lower breeding success on the southern shore.

Shore plover chick growth rates varied with the habitat. The variation in growth rates was reflected in the fledging but not the independence period. Factors within the habitat that affected growth rates were probably prey supply, climatic conditions, exposure to swell and density of predators. With higher prey availability than on the Clears, but with the harsh southern shore conditions, chicks raised on the southern coast grew faster than on the Clears, but slower than on the northern shore.

The high proportion of non-breeding adults of breeding age in the population along with the more or less constant number of breeding pairs suggests that South East Island is supporting the maximum number of breeding pairs possible. Unpaired birds probably make use of the space available after paired birds have established breeding home ranges. Defense of home ranges is limiting the number of breeding pairs that can establish on South East Island but probably not the number of unpaired birds in the population whose numbers fluctuate.

Breeding success was highest on the northern shore and lowest on the southern shore, which indicated that the southern shore is a lower quality habitat for shore plover. This difference in habitat quality explains the variable fledging time and laying intervals. The southern shore has a harsher climate, higher density of predators, greater swell wash, and on the Clears a lower food supply. Breeding success was also highest in compact home ranges and lowest in dispersed home ranges. Although compact home ranges were on the northern shore and dispersed home ranges on the southern shore, it may also be the

differences in the amount of chick care in these types of home ranges that effects breeding success.

Environmental factors that may influence habitat quality and breeding success include microhabitat (resource) availability and distribution, aspect (through the influence of climate), exposure to swell and quality of chick raising areas. Behavioural and genetical factors probably influence breeding success but the effect of these were not examined.

Imprinting on habitat type and/or habitat location may occur in chicks before they become independent. This could explain the non-dispersive behaviour of juveniles and unpaired adults. Shore plover do not disperse from South East Island except on very rare occasions. This would mean lack of expansion of their range even if suitable habitats were nearby. If non-dispersive behaviour is heredity then shore plover will always have internal recruitment. Although the population showed flexibility in habitat use on South East Island, habitat choice by individuals may be constrained by habitat imprinting. The breeding population also shows flexibility in spatial patterns of feeding areas and less so of nesting and chick raising areas.

A detailed research base has been established and the cause of endangerment identified so management of shore plover can now be considered. Management aspects are discussed in Chapter 10.