

# Dispersal of South Island Pied Oystercatchers (*Haematopus ostralegus finschi*) from an inland breeding area of New Zealand

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## ABSTRACT

Dispersal of colour-banded South Island Pied Oystercatchers *Haematopus ostralegus finschi* from a breeding area on farmland in mid-Canterbury, New Zealand, was investigated from December 1987 to September 1997. Most moved north and were away from the breeding area from late December to mid-July. All birds spent this time at coastal sites, which ranged from 97 to 834 km from their breeding area. Distances travelled by males and females and birds of all ages were similar. Birds had high fidelity to wintering sites within and between years. Pair bonds were not maintained in winter and there was no evidence that fledglings accompanied their parents to wintering sites.

**KEYWORDS:** Charadrii, wintering areas, migration, site fidelity

## INTRODUCTION

South Island Pied Oystercatchers *Haematopus ostralegus finschi* (hereafter referred to as Pied Oystercatchers) breed mainly inland east of the Southern Alps, from Marlborough to Southland, on shingle riverbeds and farmland (Turbott 1990). Birds may occur sporadically in their breeding area as early as the first week in June (D. Geddes, unpubl. data; P. Howden, pers. comm.), but movement back to the breeding areas usually commences in July and continues to September (Baker 1974a). Following the completion of breeding, which is usually by late December, the birds migrate to coastal sites within New Zealand (Baker 1974a), with greatest numbers occurring at northern harbours and at Farewell Spit (Higgins & Davies 1996, Sagar *et al.* 1999). Birds from southern populations moving north for the winter may travel distances as great as 1300 km (Baker 1974a). The average fat reserves of adults in spring were considered sufficient for an approximate flight range of 2140 km, well in excess of the need (Baker 1975a).

Sightings of adults colour-banded at wintering areas suggested that they usually return to the same wintering areas year after year (Baker 1974a), but no data were presented to substantiate this statement. Since September 1987, we have banded Pied Oystercatchers at an inland breeding area as part of a long-term study of population dynamics. Many of these birds have been observed on their coastal wintering grounds. The objectives of this study are to determine whether: (1) males and females and birds of differing age varied in their choice of wintering areas; (2) the pair-bond was maintained outside the breeding season; and (3) juveniles accompanied their parents to coastal wintering sites.

### STUDY AREAS & METHODS

During the period 1987 to 1996 a total of 176 adult (99 females and 77 males) and 231 pullus or juvenile Pied Oystercatchers were colour-banded at a breeding area (43°46'S, 171°30'E) about 20 km inland from Ashburton, in mid-Canterbury. All birds in this study area nested on pasture or cultivated land. Each year, we visited the study area at about weekly intervals from early August to early December. However, in 1988 and 1989, DG made daily records from early June of the return of birds over about half of the study area. Adult birds were trapped on the nest and fitted with unique colour-band combinations of three colour bands and a numbered stainless steel band. The sex of each adult was determined by a combination of bill measurements, following criteria reported by Baker (1974b), and subsequent observations of behaviour. Pulli (aged 21-28 days) and recently fledged juveniles were fitted with a cohort colour-band combination and numbered stainless steel band which identified the year in which the birds fledged. As these birds could not be identified individually, sightings of them reported here represent the minimum number observed at any coastal site. For example, we report one bird where one bird of a particular cohort was observed on several dates at a coastal site; we do not report the total number of observations. Birds in our study population may breed for the first time at an age of four years (PMS & DG unpubl. data); therefore, for the purposes of this paper, we analysed dispersal separately for three age classes – <1 year (= juvenile), 1-3 years (= immature), and >4 years (= adult). There were insufficient reports of 4-year-olds to analyse here.

Searches for these birds were conducted by Ornithological Society of New Zealand (OSNZ) members throughout the country, with some coastal sites being visited as frequently as once a month throughout the year. In New Zealand, coastal sites where Pied Oystercatchers congregate are well known through the OSNZ national wader counts (Sagar *et al.* 1999), and so observers living near potential sites were asked to check high tide roosts for colour-banded birds. In addition, the project featured in several articles in newsletters distributed to OSNZ members nationwide. In all instances, observers were asked to report whether or not colour-banded birds had been observed at sites visited. Cumulatively, this resulted in 95% of all sites where >200 Pied Oystercatchers congregated during winter being covered at least once annually during the period January-June inclusive in the 10 years 1988-1997. In addition, all coastal sites on the east coast of the South Island between Otago Harbour and the Ashley Estuary (i.e. sites closest to the breeding area, Fig. 1) where Pied Oystercatchers have been reported were each checked for colour-banded birds at least five times each during the period 1988 to 1997.

### RESULTS

During the study there were 307 reports of colour-banded adults, representing 84 different birds. These comprised 49.4% (38/77) of adult males and 46.5% (46/99) of adult females colour-banded in mid-Canterbury, and so the detection rate of both sexes was similar ( $\chi^2 = 0.076$ , d.f. = 1,  $P = 0.95$ ). Of these 307

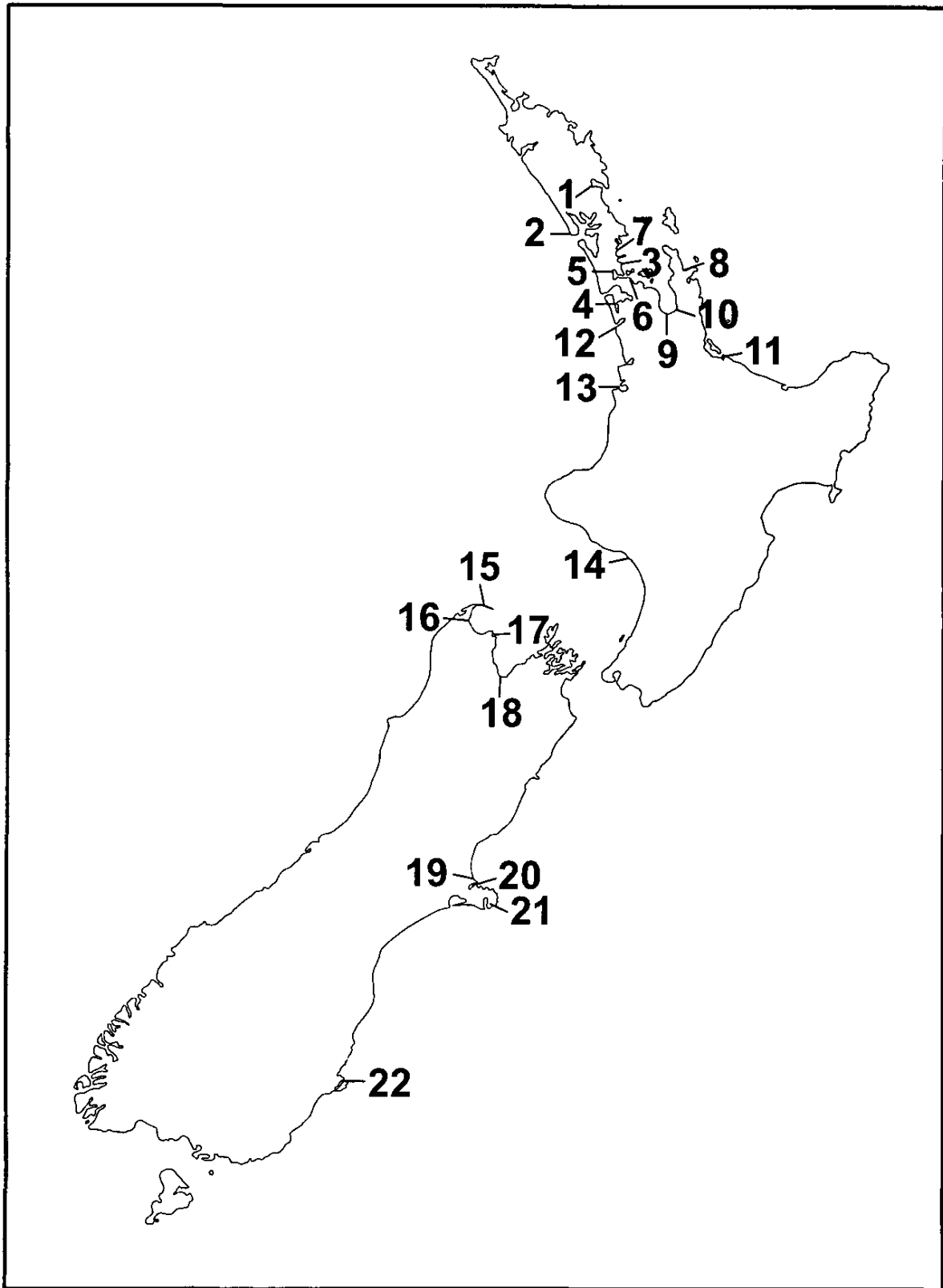


FIGURE 1 - New Zealand, showing the locations of roosting sites where colour-banded Pied Oystercatchers were reported. 1 - Whangarei Harbour; 2 - Kaipara Harbour; 3 - Wade River; 4 - Manukau Harbour; 5 - Waitemata Harbour; 6 - Tamaki Estuary; 7 - Orewa Rivermouth; 8 - Matarangi, Coromandel Peninsula; 9 - Firth of Thames; 10 - Thames; 11 - Tauranga Harbour; 12 - Port Waikato; 13 - Kawhia Harbour; 14 - Wanganui Rivermouth; 15 - Farewell Spit; 16 - Pakawau; 17 - Motueka Estuary; 18 - Waimea Estuary; 19 - Avon-Heathcote Estuary; 20 - Lyttelton Harbour; 21 - Akaroa Harbour; 22 - Otago Harbour.

TABLE 1 – Median distance (km) between mid-Canterbury banding site and recovery sites (during December - July) of South Island Pied Oystercatchers.

Age/gender	Median	Range	Sample size
Juvenile(<1 year)	726	98-834	36
Immature (1-3 years)	727	98-781	35
Adult male	727	98-834	38
Adult female	727	97-834	46

reports, 306 were sight recoveries of live birds and one was of a bird found dead. There were 163 reports of birds which had been banded as pulli or juveniles, but because these could be identified only to the year in which they were banded and because of the potential confounding effect of fledgling survival rates, it was not possible to calculate detection rates. Of these 163 reports of birds colour-banded as pulli or juveniles, 147 were sight recoveries, two were recaptures, nine were identified by reading the band numbers through telescopes, and five were found dead (four of these were <1 year old).

The range of dates during which colour-banded adult Pied Oystercatchers were observed at coastal sites was 26 December to 12 August. There was no indication of a sequential occurrence of colour-banded birds with increasing distance from the breeding area; the earliest a bird was recorded at the Avon-Heathcote Estuary, a straight line distance of 98 km, was 27 December and at Kaipara Harbour, a straight line distance of 780 km, was 26 December. With the exception of one observation on 12 August (at Manukau Harbour), there were no reports of colour-banded adults at coastal sites from the second week of July to 26 December. The timing of sightings of adults also indicates that both sexes behave similarly, with reports of both males and females ending after the second week in July. Juveniles (<1 year old) have been reported ( $n = 45$ ) at coastal sites in every month except July and October, immatures (1-3 years old,  $n = 61$  reports), in every month except September, 4-year-olds ( $n = 20$  reports) in every month except August, October and December, and birds >4 years old ( $n = 37$ ) in every month from December to July.

Colour-banded Pied Oystercatchers were reported from 22 coastal sites (Fig. 1). With the exception of an adult male and an 8-year old bird of unknown gender which wintered at Otago Harbour ( $45^{\circ}49'S$ ,  $170^{\circ}40'E$ ) 232 km to the south, all birds wintered north of the breeding area (Fig. 2 & 3). Whangarei Harbour ( $35^{\circ}47'S$ ,  $174^{\circ}24'E$ ), 834 km from the breeding area, was the most northerly wintering site recorded for each age and gender. Of six juveniles identified individually (by reading the band number or being found dead), three aged 3-4 months were found during January 726 km (2 birds) and 780 km (1 bird) from their natal area; the other three juveniles were found during April or May (when 6-8 months old) 731 km (1 bird) and 767 km (2 birds) from their natal area. The median distance between banding and recovery site was similar for birds of each age and gender (Table 1) and the straight line distances between breeding and wintering

TABLE 2 – Fidelity to coastal roosting sites shown by adult oystercatchers. N is the sum of the number of times individual birds were reported at estuaries at intervals of >1 month (within years) or >1 year (between years).

	Males		Females	
	N	%	N	%
<i>Within years</i>				
Same	61	100	65	97.0
Changed	0	0	2	3.0
<i>Between years</i>				
Same	57	94.7	66	100
Changed	3	5.3	0	0

sites did not differ with age or gender (Kruskal-Wallis Test Statistic = 3.810,  $P = 0.283$ ). The highest numbers of colour-banded birds were reported from northern harbours known for large concentrations of wintering oystercatchers; for example, Manukau Harbour (19 adults, 17 juveniles and immatures), Kaipara Harbour (13 adults, 6 juveniles and immatures), Firth of Thames (7 adults, 10 juveniles and immatures), and Whangarei Harbour (7 adults, 3 juveniles). However, 15.4% (13/84) of all adults reported wintered at the Avon-Heathcote Estuary, just 98 km from the breeding area.

Insufficient observers reported both the number of birds checked and the number of colour-banded birds recorded. Therefore, we were unable to determine whether proportionally more colour-banded birds occurred at specific wintering sites, particularly when distance from the breeding area was taken into account.

Observations of colour-banded Pied Oystercatchers within and between years showed that wintering site fidelity of adults was high (Table 2), with birds remaining at their chosen site throughout their time away from the breeding area, and returning to the same wintering sites year after year. For example, at the Avon-Heathcote Estuary (one of the wintering sites checked most consistently by observers) the same adults have been reported present from December to the first week in July within a year, and three birds have been observed there in each of eight consecutive years. No adult male was reported from more than one coastal site within a year (Table 2). Two adult females were reported from different roosting sites within a season (Table 2): one was observed at Puhinui, Manukau Harbour, on 26 March 1994 and then at Miranda, Firth of Thames, on 22 May 1994, a distance of about 60 km; the other was observed at the Wade River, north of Auckland, on five occasions between 24 January 1995 and 24 May 1995, and then 669 km away at the Avon-Heathcote Estuary on 22 June 1995, when it was probably migrating back to the breeding area. Between years, three of 18 adult males observed in more than one year (a total of 57 bird-years) were roosting at different coastal sites (Table 2): one was observed at Kaipara Harbour in 1991 and then at the Firth of Thames in 1995 and 1996, a distance of about 100 km; one was observed at Kawhia Harbour in 1993 and 1994, and then twice at Manukau Harbour, about 50 km away, in 1995; one was observed on five occasions during 1995 and once during

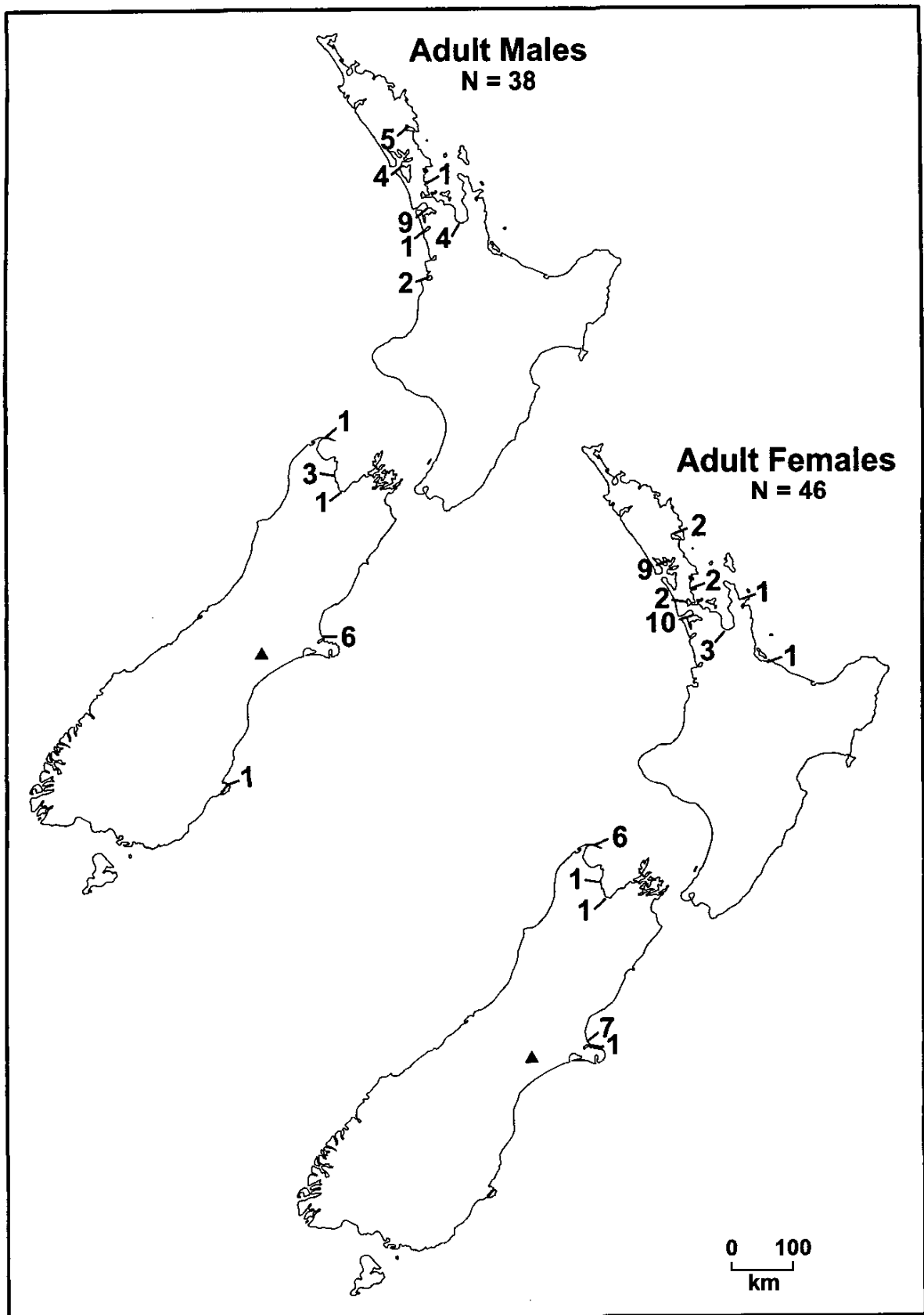


FIGURE 2 - Wintering sites of male and female Pied Oystercatchers banded as breeding adults at an inland study site. Numbers refer to the number of individual birds identified at each site. The triangle shows the location of the inland banding site.

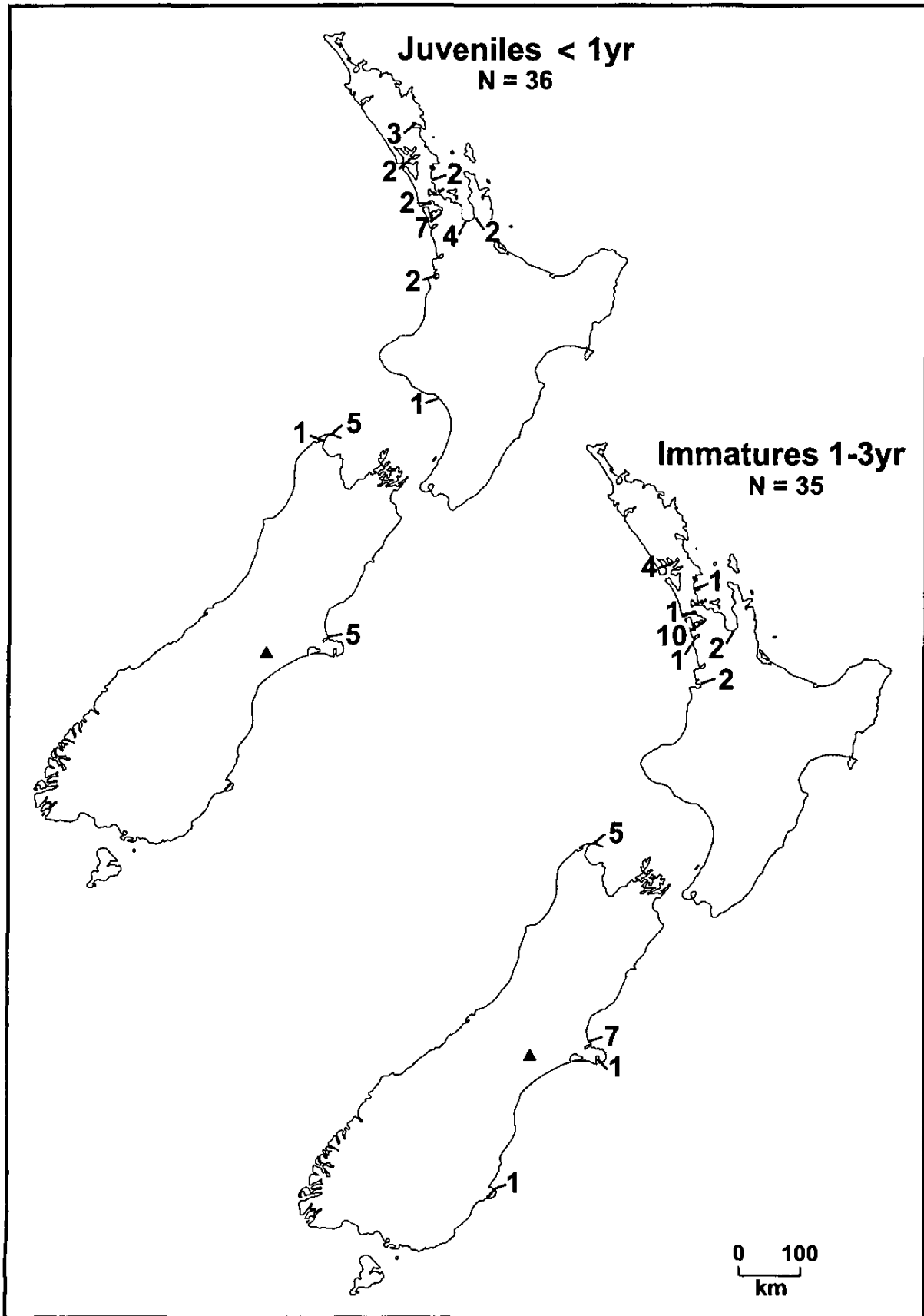


FIGURE 3 - Wintering sites of juvenile and immature Pied Oystercatchers banded as pulli or recently fledged juveniles at an inland study site. Numbers refer to the minimum number of individual birds identified at each site. The triangle shows the location of the inland banding site.

1996 at the Wade River, but then moved 1.5 km south to Dacre Beach where it was observed once in 1997. The flock which this latter bird was associated with moved back and forth between high tide roosts at the Wade River and Dacre Beach, depending upon weather, tide height, and disturbance (J. Dowding, pers. comm.). None of the 26 adult females observed in more than 1 year (a total of 66 bird-years) was seen at different coastal sites in different years (Table 2). Among juveniles and immatures the band number of one bird was read through a telescope in successive years. This bird was banded as pullus on 26 September 1993 and was reported roosting at the Wade River on 7 April 1994 and then four times between 10 March 1995 and 24 April 1995; it then moved 5.8 km to the Orewa Rivermouth, where it was observed roosting on 7 & 9 February 1996.

Of 18 instances where wintering sites of both members of established pairs were known, 16 were at separate sites, the birds of one pair were at different roosts within the same harbour, and both birds of one pair were at the same roost. Wintering sites of ten individually identified (by reading band numbers through telescopes, recaptures, or being found dead) juvenile or immature oystercatchers were reported. The wintering sites of both parents for three of these birds was known and none occurred at the same site as their offspring. Likewise, the wintering sites of one parent of another four juveniles/immatures was known and none of these co-occurred with their offspring. The wintering sites of the parents of the other three juveniles were not known.

## DISCUSSION

We found that Pied Oystercatchers from a breeding area in inland mid-Canterbury disperse widely to coastal sites from Whangarei Harbour in the north to Otago Harbour in the south. Within this range there was no evidence of any differences in dispersal distances of adult males and adult females. Likewise, dispersal distance was not affected by age of the birds. The timing of the occurrence of these birds at wintering sites supports evidence of bird movements obtained by monitoring programmes at coastal sites. For example, at the Avon-Heathcote Estuary monthly average numbers of Pied Oystercatchers during the period 1987-1990 were about 1000 from August to November, rising to 2000 in December and then 3700 to 5000 from January to April, before declining to 3000-4000 from May to July (Crossland 1993). Our study birds were at the inland breeding area from July to December and then at coastal sites from late December to the second week of July, although there was individual variation in the timing of movements within these months.

In Europe, adult oystercatchers leave the breeding grounds before the juveniles, and so traditional migration routes must be passed on from adults to juveniles genetically (Hulscher *et al.* 1996). In New Zealand, oystercatcher fledglings become independent of their parents before post-breeding migration of adults commences (Baker 1969). In our study, no juveniles occurred at the same coastal site as either of their parents, indicating that they did not disperse from the breeding area with their parents. Juveniles were identifiable only to cohort in our study, and so it was not possible to determine whether they moved from one coastal site



to another before settling. However, sightings of juveniles aged 3-4 months at distances of >700 km from their natal site showed that they dispersed to the most distant coastal sites in about the same time as adults. The months of sightings of birds of known age indicated that juveniles remained at coastal sites throughout their first year, but then were absent from these sites for increasing periods during the breeding season until they were over four years old, when their pattern of occurrence was the same as that of known breeders. This evidence supports the findings of Baker (1975a), who reported significant increases, from winter to spring, in the fat reserves of adults and second-year immatures, but not of juveniles, indicating that the latter birds did not undertake spring migration to the breeding grounds. In addition, in a study of the age structure and sex ratio of live-trapped birds at coastal sites in the South Island, Baker (1975b) concluded that second-year birds and some subadults moved inland during the breeding season. In this respect, *H.o. finschi* behaviour is similar to that of the nominate race, where birds in their first year remained throughout the summer at a coastal estuary, but perhaps moved to inland areas for an increasing period in their third, fourth and fifth summers, by which time they were absent for as long as the adults (Goss-Custard *et al.* 1982).

Fidelity to their coastal wintering site appears to be widespread in Pied Oystercatchers, with individual adults generally being very site faithful. In Britain, many birds colour-banded as adults at their coastal wintering sites were observed at the same sites in subsequent years (Dare 1970, Goss-Custard *et al.* 1982) and there are no records of movements of banded birds between wintering sites in Europe (Hulscher *et al.* 1996). Studies of colour-banded birds in New Zealand (Baker 1974a, this study) show similar behaviour in our race of Pied Oystercatcher. The process by which juvenile oystercatchers choose a particular wintering site is not known (Hulscher *et al.* 1996); however, many oystercatchers remain faithful to the wintering site that they used during their first year (Goss-Custard *et al.* 1982).

Of the 307 sightings of colour-banded adult Pied Oystercatchers reported in this study, only one can be definitely attributable to a bird on passage; this is the female which was previously observed at the Wade River from January to May and then at the Avon-Heathcote Estuary in late June of the same year. Despite concluding that in spring, fat reserves of Pied Oystercatchers were sufficient for an approximate flight range of 2140 km, well in excess of their needs, Baker (1975a) considered that the more usual mode of migration of Pied Oystercatchers was a series of short journeys punctuated by brief pauses for feeding and resting. This was based on a large number of sight records (which unfortunately he did not document) of migrant birds between major breeding grounds and wintering areas. However, large intertidal areas, such as those favoured by Pied Oystercatchers as wintering sites, occur only in the northern half of the North Island and in the Nelson region of the South Island. Therefore, it is unlikely that many of the >57 000 Pied Oystercatchers which winter in the North Island (Sagar *et al.* 1999) would find sufficient suitable habitat in which to stop and feed and to remain unobserved

between breeding and wintering areas. Also, despite extensive observer coverage, in our study there was only one report of a colour-banded adult obviously on passage. Therefore, contrary to Baker (1975a) our data suggest that the return migration may be done in one long journey.

Baker (1974a) reported that pair formation in this species is usually effected while the birds are still in winter flocks. This perception was based on observations of copulations at wintering areas, the frequency with which pairs were seen to feed and roost together, and observations of pairs on migration in the MacKenzie Basin and Canterbury riverbeds; however, some pairs formed on arrival at the breeding grounds (Baker 1975a). None of those observations were of individually identifiable birds of known status. Our study shows that established pairs usually do not spend the winter at the same coastal sites, therefore, the breeding area itself is probably the main site for the re-establishment of pair bonds.

Coastal sites in New Zealand, particularly those near the larger estuarine towns and cities, are under increasing human-induced stress by way of development and disturbance (Taylor & Smith 1997). Despite such disturbance, the population of Pied Oystercatchers has increased markedly since shooting of the birds was made illegal in 1940 (Baker 1973). By 1969 the total population was estimated at 49 000 birds and birds were exploiting new breeding habitats in agricultural land adjacent to shingle riverbeds, their traditional nesting habitat (Baker 1973). Subsequent counts at coastal wintering sites showed that by the early 1990s numbers had risen to an estimated 112 000 birds (Sagar *et al.* 1999). Fidelity of Pied Oystercatcher to coastal wintering sites suggests that the birds are currently obtaining sufficient food at their coastal sites for their return migration to the breeding area in spring and for the onset of breeding. As our long-term study of Pied Oystercatchers continues it may soon be possible to model population dynamics with respect to their breeding and wintering sites, and so determine any effects of increased population density or disturbance at coastal sites.

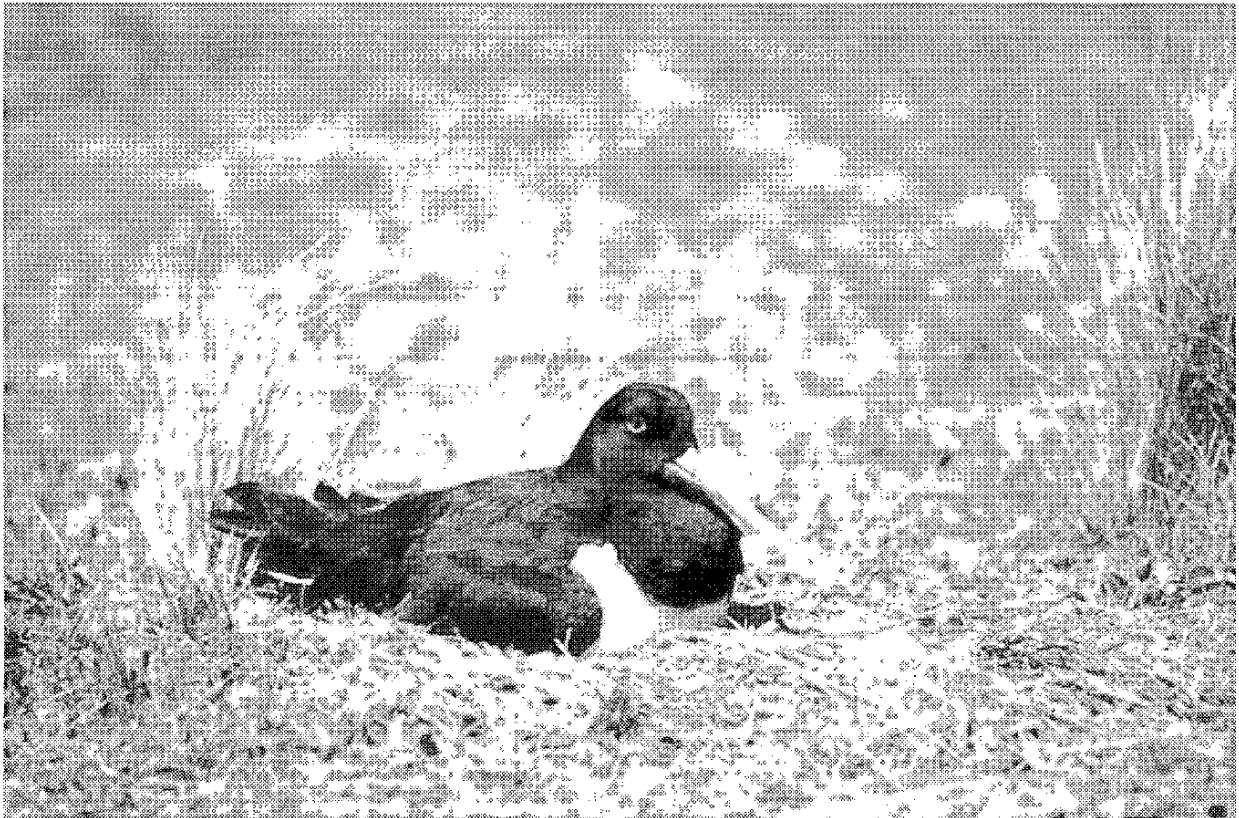
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