Journal of Coastal Research	10	3	747–751	Fort Lauderdale, Florida	Summer 1994

Seasonal Movements Between Habitats of Whitefronted Plovers *Charadrius marginatus* in a Coastal Dunefield

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ABSTRACT

VAN DER MERWE, D.; McLACHLAN, A., and DE RUYCK, A.M.C., 1994. Seasonal movements between habitats of Whitefronted Plovers *Charadrius marginatus* in a coastal dunefield. *Journal of Coastal Research*, 10(3), 747–751. Fort Lauderdale (Florida), ISSN 0749-0208.

After the breeding season, Whitefronted Plovers moved from territories in the Alexandria dunefield to feeding grounds in the Sundays River estuary. Topographic features and abundant small invertebrate prey make the estuary a favoured feeding habitat, but a poor breeding location. Plovers returned to the dunes to establish territories at the start of the breeding season in June. While occupying territories in the dunefield before the chicks hatch, adult plovers feed in the intertidal zone, rather than the dunes. Young chicks fed in the dunes with their parents until they were large enough to forage on the beach.

ADDITIONAL INDEX WORDS: *Whitefronted Plover, dunefield, estuary, foraging strategy.*

INTRODUCTION

The suborder Charadrii contains many species which breed in the Arctic and north temperate Palaearctic regions and spend the austral summer in South Africa. These species are termed "migrants", as opposed to the "resident" species, which may or may not migrate, but breed within southern Africa (SUMMERS *et al.*, 1977). Residents may, however, carry out short distance movements. This paper examines such movements in a common resident wader in southern Africa, the Whitefronted Plover *Charadrius marginatus*.

True seasonal migrations occur in some populations of Whitefronted Plovers. The inland race, *C. marginatus mechowi*, which breeds along sandy river banks in Zimbabwe, retreats to the east coast when the rivers are in flood and has been found as far south as Port Alfred (33°36'S; 26°53'E) (TREE, 1980).

Whitefronted Plovers maintain their territories throughout the year in the western Cape (SUMMERS and HOCKEY, 1980; CROWE, 1986) and at Cape Receife in the eastern Cape (SPEARPOINT *et al.*, 1988) and show little seasonal variation in population sizes. However, territory holders sometimes join flocks of non-territorial birds outside the breeding season (BLAKER, 1966; PRINGLE and COOPER, 1977; SUMMERS and HOCKEY, 1980). Maximum flock size recorded was 334 Whitefronted Plovers (FRAZER, 1985).

In the eastern Cape, MARTIN and BAIRD (1987) found that the numbers of Whitefronted Plovers around the Swartkops estuary increased during winter and decreased during summer when they left the estuary for adjacent sandy beaches.

This study tested the hypothesis that Whitefronted Plovers in the Alexandria dunefield shift their location after the breeding season and proposed a mechanism for this behavior.

STUDY AREA

The Alexandria dunefield, the largest coastal dunefield in South Africa, is situated along the northern margin of Algoa Bay (Figure 1) between the Sundays River mouth (33°44'S; 25°51'E) and Cape Padrone, 48 km to the east (ASCARAY, 1986; McLACHLAN *et al.*, 1987). Mostly unvegetated, the dunefield includes sparsely vegetated slacks (damp hollows between dune ridges where the water table is near the surface) which are used as breeding areas by the Whitefronted Plovers. The sandy beach adjoining the dunefield has fairly abundant intertidal invertebrate populations (1–50 $g \cdot m^{-2}$ dry flesh mass) (WENDT and McLACHLAN, 1985) with biomass dominated by large

91087 received 30 September 1991; accepted in revision 8 October 1993.

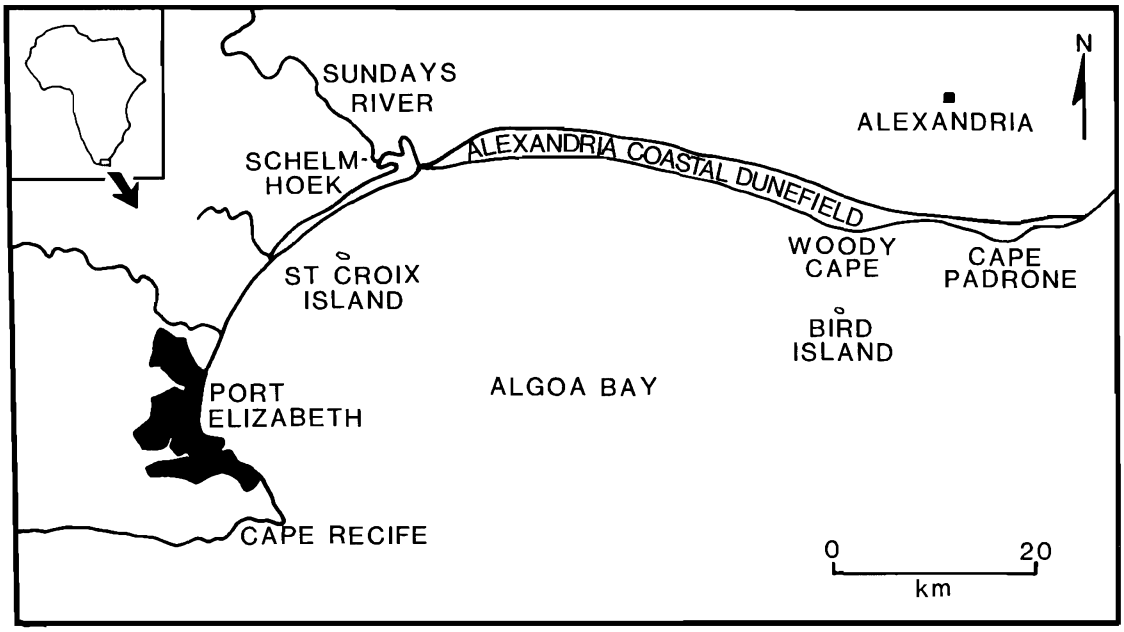

Figure 1. Map of Algoa Bay, showing Cape Receife and the Alexandria dunefield.

molluscs. The sand and mud flats in the Sundays River estuary also support a moderate biomass (1–4 $g \cdot m^{-2}$) including many small crustaceans (TOMALIN, *personal communication*), whereas the biomass of insects and crustaceans in the dune slacks (0.1 $g \cdot m^{-2}$, MCLACHLAN *et al.*, 1987) is considerably lower.

METHODS

Whitefronted Plovers were counted by visual sighting at low tide on sand and mud flats inside the mouth of the Sundays River estuary (a total area of about 1 km^2) monthly from April 1985 to June 1986. A section of dunefield (250 m × 1,100 m) where the birds usually establish territories was patrolled monthly on foot and all Whitefronted Plovers were counted by visual sighting from July 1984 to February 1986. They were also counted from a moving vehicle along a 5 km stretch of beach monthly from April 1984 to September 1985.

Surveys of intertidal invertebrate prey were conducted in the estuary and on the beach in late February, the time when plovers move from the one habitat to the other, to supplement limited data on prey of a suitable size range. For this, 28 × 0.1 m^2 quadrats were excavated along four transects; *i.e.*, samples at seven levels from low tide to high, at each locality. This was done to 2 cm depth, the sand or mud was passed through a sieve of 1 mm mesh and the fauna counted to an appropriate taxon.

RESULTS

The numbers of Whitefronted Plovers in the estuary mouth area remained low throughout the breeding season (June until January), when most birds were found on the beach and in the dunefield (Figure 2a). After the breeding season, birds moved to the estuary where numbers of birds started increasing from February and peaked between March and May, decreasing again in June. Most of the plovers in the estuary were in flocks.

The results of bird counts in the dunes showed the reverse pattern (Figure 2b). Numbers increased in June when territories were established, remained high throughout the breeding season, and decreased after the breeding season (February/March) when few birds remained in their territories.

Whitefronted Plover counts on the beach (Figure 2c) exhibited a similar pattern to those in the dunes. Numbers peaked in June when birds started moving back into the dunefield, dropped

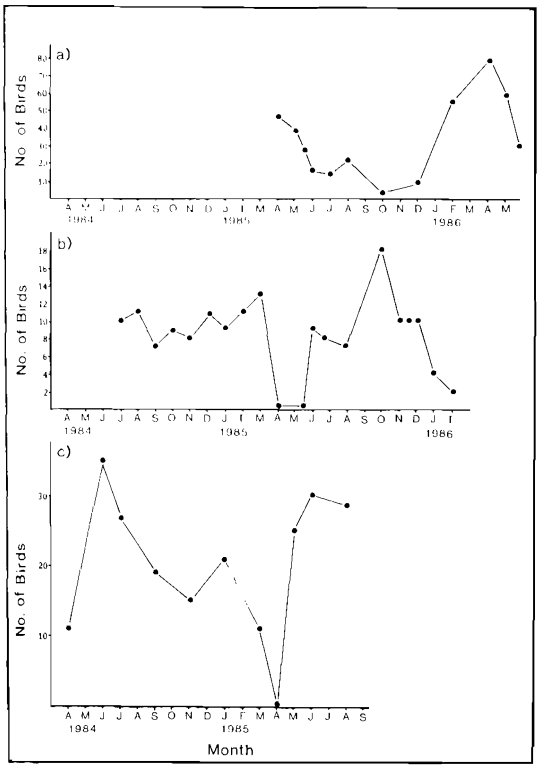

Figure 2. Seasonal changes in numbers of Whitefronted Plovers in three habitats: (a) the Sundays River estuary, (b) the dune/beach area and (c) a 5 km stretch of beach.

slightly when breeding started (August/September) and birds spent much time in the dunes, dropped steeply towards the end of the breeding season and were low during the non-breeding season (March–May). During the period when the birds were breeding in the dunefield, the adults used the beach as the main feeding habitat (VAN DER MERWE *et al.*, 1992). Juveniles began feeding in the intertidal zone in December/January when they were approximately one month old (VAN DER MERWE, 1987), resulting in a slight peak in numbers on the beach at that time (Figure 2c).

Plovers on the beach were usually single or in pairs when breeding, their territories extending down to the water (VAN DER MERWE, 1987). However, after the breeding season, they flocked in groups of 7–25 (April–May). In May 1985, there were two flocks: one of 20 birds, 25–30 km east of the Sundays River mouth and another of seven birds 10–15 km east of the mouth. In April 1986, there were two flocks, one of 25 and another of 16 birds, both within the first 10 km east of the mouth.

Table 1. *Mean density of invertebrates from 28 samples each.*

Taxon	Beach	Estuary
Polychaetes	0.3 ± 0.9	0.3 ± 0.8
Bivalves	10.6 ± 16.7	2.2 ± 6.2
Gastropods	0.3 ± 0.8	0.0
Hermit crabs	0.0	9.1 ± 25.6
Isopods	7.5 ± 6.6	56.0 ± 83.0
Amphipods	1.9 ± 2.9	205.7 ± 510
Insects	0.3 ± 0.9	5.9 ± 11.2
Crabs	0.0	3.5 ± 5.8
Total	20.9	282.4

There is a strong negative correlation between numbers of birds in the estuary *versus* numbers in beach/dune habitats (Spearman's $r = 0.77$, $p < 0.01$).

The benthic survey conducted in the estuary and on the beach (Table 1) revealed major differences between the two habitats. Gastropods were found only on the beach, hermit crabs only in the estuary, and all other taxa at both sites. Most animals collected were small, larger forms generally burrowing deeper and being unavailable to the plovers. Due to the variability of faunal abundance in samples taken across different intertidal zones (Table 1), the mean density for each taxon was calculated for each transect and the Chi-square test was used to determine differences between the estuarine and beach sites. Whereas bivalves were more abundant on the beach ($\chi^2 = 7.7$; $df = 1$; $p < 0.01$), isopods and amphipods were more abundant in the estuary ($\chi^2 = 265.4$; $df = 1$; $p < 0.01$), and polychaetes and insects showed no significant difference.

DISCUSSION

The seaward margin of the Alexandria dunefield provides ideal breeding areas for Whitefronted Plovers with adequate hiding places for the chicks in the form of hummocks, flotsam and rocks. As the invertebrate prey in the dunes is poor in winter (ASCARAY *et al.*, 1990), the birds feed mainly in the intertidal zone on the beach at this time. However, during extremely windy conditions, the birds seek shelter in the dunes and feed on insects. Only when the chicks are almost fully fledged and quite adept at running do they join adults feeding in the intertidal zone.

After the breeding season (February), the availability of insect prey in the dunes starts to decrease as winter approaches (ASCARAY *et al.*, 1990);

with chicks fledged, many pairs leave their territories and move to the nearby estuary where flocks form. However, in the western Cape (SUMMERS and HOCKEY, 1980; CROWE, 1986) and at Cape Receife, approximately 40 km southwest of the Alexandria dunefield (SPEARPOINT *et al.*, 1990), Whitefronted Plovers remain in their territories throughout the year.

During the non-breeding season, flocks of Whitefronted Plovers often visit the beach to feed, usually within 10 km of the Sundays River mouth. They are rarely seen in the dunefield at this time. Although both the beach and estuary may provide reliable feeding areas, suitable prey are far more abundant in the estuary than on the beach. A prey item not quantified in our benthic survey was siphons of large bivalves lying deeper in the sand on the beach. However, these are only available during low tide and occur in densities well below those of prey in the estuary. The estuary is, therefore, the preferred feeding habitat.

The fact that Whitefronted Plovers in the Alexandria dunefield breed in areas suboptimal for foraging implies that there is strong selection pressure operating for certain breeding requirements, most likely avoidance of predation of eggs, chicks or adults. The breeding success of Whitefronted Plovers in this study is 1.75 chicks/pair, higher than 0.08–0.14 chicks/pair found by SUMMERS and HOCKEY (1980) in the western Cape where plovers retain their territories throughout the year. Unfortunately, the breeding success of Whitefronted Plovers at Cape Receife is not known. Examples of "leapfrogging" between breeding and feeding sites were described locally in the African Black Oystercatcher, *Haematopus moquini*, which breed on offshore islands but have to fetch food for their chicks from mainland feeding sites (HOCKEY, 1984). MARTIN and RANDALL (1987) described several marine birds (like White-breasted cormorants *Phalacrocorax carbo*, Kelp gulls *Larus dominicanus*, Greyheaded gulls *L. cirrocephalus* and Caspian terns *Hydroprogne caspia*) breeding on islands in a commercial saltpan where they are protected from mammalian predators, whilst feeding from the ocean and nearby estuary. Jackass penquins *Spheniscus demersus* and Gannets *Sula capensis* both breed on Bird Island (33°15'S; 26°17'E) and make foraging trips of more than 100 km (HEATH, 1986; N. KLAGES, *personal communication*).

Whitefronted Plovers in the Alexandria dunefield move across the dune-beach interface, the beach-estuary interface and the dune-estuary interface, the former on a daily basis for feeding during the breeding season and the latter two on a seasonal basis coupled to the establishment and abandonment of breeding territories. The dunes appear to provide the most suitable and secure breeding areas, but the least favourable feeding sites. The beach and estuary, in contrast, constitute good foraging sites. The estuary is much richer in suitable prey, hence the movement there in the non-breeding season, as recorded for several other shore birds (BAIRD *et al.*, 1985).

Are the movements we describe here typical of this species or are they peculiar to this site? MARTIN and BAIRD (1987) found movement of Whitefronted Plovers out of the nearby Swartkops estuary in August as opposed to June. However, beaches and dunes around the Swartkops estuary are much less productive (MCLACHLAN, 1977) and more disturbed than our study area and the birds may, therefore, delay departure from the Swartkops estuary as long as possible. We propose that these movements between dune/beach and estuarine areas may be a common feature of this species in the eastern Cape, but local variations in timing may occur in response to varying local conditions. A comparative study between Whitefronted Plover populations at the Alexandria dunefield and Cape Receife may illucidate the differences in territoriality.

ACKNOWLEDGEMENTS

We thank Dave Ward, Phil Hockey and Tony Tree for constructive comments, Paul Martin for advice concerning field work, Ian Davidson and Pine Pienaar for their help in maintaining equipment and Leszek Karczmarski for assistance with benthic surveys. Financial support from the South African National Committee for Oceanographic Research (SANCOR) and the Department of Environment Affairs and Fisheries, through the Institute for Coastal Research at UPE, is gratefully acknowledged.

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