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Vagrants and the paucity of land bird species at the Prince Edward islands

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ABSTRACT. The present avifauna of the sub-Antarctic Prince Edward islands consists of twenty-nine breeding species, including only one land bird. Vagrant land birds recorded during 64 months at these islands include twenty-eight individuals (twelve species of Palaearctic migrants, eleven individuals (five species) of resident African birds and four unidentified passerines. Cattle Egrets *Bubulcus ibis*, European Swallows *Hirundo rustica* and waders (Charadrii) were most frequently reported. Few of these birds were seen for more than a few days at these islands and none was seen for longer than 2 months. Although the remoteness of the islands precludes immigration by the less mobile birds, the apparent paucity of land bird species is largely atrributed to the failure of immigrants to colonize. Most species which arrived could not be considered to be potential colonists. The islands have a low ecological diversity and there appear to be few, if any, food resources which could be exploited at present by immigrant land birds. Climatic factors, predation and the lack of suitable vegetation cover may also exclude potential colonists.

Introduction

The arrival of a vagrant bird at a remote oceanic island may be an important event in the natural history of the island. Vagrants may colonize if the minimum requirements for their survival and breeding are met. We examine the frequency of occurrence and survival of vagrant land birds at the Prince Edward islands in the sub-Antarctic in an attempt to explain the apparent paucity of land birds at these islands.

The avifauna of the Prince Edward islands includes twenty-nine breeding species (Williams *et al.*, 1979). Only one species, the Lesser Sheathbill *Chionis minor* Hartlaub, is not a seabird. In this report, the term land bird is used broadly, to include all birds whose normal foraging habitat is not the open ocean.

The Prince Edward group comprises Marion (46° 54′ S, 37° 45′ E; area 290 km^2) and Prince Edward Island (46° 38′ S, 37° 57′ E; area 44 km^2), which are 22 km apart, and some small offshore stacks. The islands were formed about 276 000 years ago as the summits of a shield volcano rising from the ocean floor (Verwoerd, 1971). Islands in the Crozet archipelago, about 900 km to the east are the nearest land, and the nearest continent is Africa, 2300 km to the northwest with no islands in between (Fig. 1). Since their formation the islands have been subjected to periods of glaciation and further volcanic activity (Verwoerd, 1971). However, as palynological evidence suggests that the vegetation and climate have changed little over the past 10 000 years (Schalke & Van Zinderen Bakker, Sr, 1971), there has been ample time for land birds to colonize the islands.

The climate at the islands is typically sub-Antarctic: cool to cold and very windy with frequent precipitation (Schulze, 1971). The tundra-like vegetation is largely restricted to the coastal regions below 500 m a.s.l. and

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the dominant plants are bryophytes, ferns, grasses and low perennial angiosperms (Huntley, 1971). The recent formation of the islands, their isolation and the sub-Antarctic climate have led to a low ecological diversity and relatively simple food webs (Van Zinderen Bakker, Sr, 1971).

Results

We recorded the incidence of vagrant land birds from January 1974 to May 1979, a period of 64 months. Professional ornithologists lived on Marion Island for 43 months in this period and reported 93% of the vagrants. Other records came from photographs and sightings by interested meteorologists stationed on Marion Island. Probably only a small proportion of the vagrant land birds which reached the Prince Edward islands were seen by people. Most human activities were restricted to a small area on the leeward coast of Marion Island, forming about 10% of the island's coastal plain. Over 80% of all vagrants were reported from this area. Prince Edward Island was visited by biologists on only four occasions, totalling 20 days, during 1974–79.

The incidence of vagrant land birds at the Prince Edward islands is given in Table 1.

TABLE 1. Vagrant birds at the Prince Edward islands. All records are for Marion Island unless stated.

Species	Previous records*	Numbers of birds and dates (in parentheses) of records 1974–79
Palaearctic migrant land birds		
White Stork *Ciconia ciconia* (Linnaeus)	—	1 (21–24.x.77)
Turnstone *Arenaria interpres* (Linnaeus)	—	2 (at Pr. Ed., 25.iv.76), 2 (26.ii.77), 2 (18–20.i.79)
Ringed Plover *Charadrius hiaticula* Linnaeus	—	1 (24.iii.74)
Little Stint *Calidris minuta* (Leisler)	—	1 (17.i.79)
Stint sp. *Calidris (minuta?)*	—	1 (26.xi.76)
Common Sandpiper *Tringa hypoleucos* Linnaeus	—	1 (5.ii.75), 1 (1.xii.77), 1 (5.xi.78)
Wood Sandpiper *Tringa glareola* Linnaeus	—	1 (14.i.79)
Greenshank *Tringa nebularia* (Gunnerus)	—	1 (1.x.74–29.xi.74), 1 (1.xii.77)
European Swift *Apus apus* (Linnaeus)	—	2 (28.xi.77)
European Swallow *Hirundo rustica* Linnaeus	1 (VZB), 1 (DV)	1† (2.xi.74), 1† (12.iv.75), 3 (off Pr. Ed., 29.iv.76), 1† (11.iv.78), 1 (31.v.–4.vi.78)
Willow Warbler *Phylloscopus trochilus acredula* (Linnaeus)	—	1† (6.iii.75)
Yellow Wagtail *Motacilla flava* Linnaeus	—	1 (9.xi.78)
Flycatcher sp. *Muscicapa (striata?* (Pallas))	—	1 (21.i.75)
Resident African land birds		
Yellow-billed Egret *Egretta intermedia* (Wagler)	1 (LG)	1 (at Pr. Ed., 17.iv.76)
Cattle Egret *Bubulcus ibis* (Linnaeus)	1 (CR)	1 (19.ii.75), later 2 (5.iii.75–12.iii.75) then 1 (until 11.iv.75), 3 (10.iii.76), 1 (May 1977)
Three-banded Plover *Charadrius tricollaris* Vieillot	—	1 (September 1975)
Cape Turtle Dove *Streptopelia capicola* (Sundevall)	—	1 (3.xi.78)
Laughing Dove *Streptopelia senegalensis* (Linnaeus)	—	1 (10.iii.75)
Dove *Streptopelia* spp.	1 (VZB)	1 (*S. senagalensis?* 30.xi.76–1.xii.76)
House Sparrow *Passer domesticus* (Linnaeus)	—	3 (via a ship, 13.iv.76)
Unidentified passerines		
Unidentified Oriole-like birds	—	1 (18.i.74), 1 (26–28.xii.74)
Unidentified Warbler	—	1 (20.v.76)
Unidentified Pipit-like bird	—	1 (6.xi.78)

*CR = Crawford (1952); DV = De Villiers (pers. comm., specimen in Port Elizabeth Museum PEM 1519/64); LG = La Grange (1962); VZB = Van Zinderen Bakker, Jr (1971).

† Specimen collected.

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Three House Sparrows *Passer domesticus* which arrived on a ship are excluded from further considerations here. Ship assisted passages for the other birds are discounted as the islands are distant from any regular shipping routes. Forty-three birds of at least twenty species were recorded as vagrants during 1974–79: twenty-eight individuals (twelve species) of Palaearctic migrants; eleven individuals (five species) believed to be resident African birds and four unidentified passerines. Although some of the migrants reported have Holarctic distributions, they are all believed to be of Palaearctic and not Nearctic origin (see below). All of the Palaearctic migrants are species which spend the austral summer in southern Africa (McLachlan & Liversidge, 1978).

Migrant birds and those which frequently wander (e.g. Cattle Egrets, *Bubulcus ibis*) represent the bulk of the vagrants reported at the Prince Edward islands. The Turnstone, *Arenaria interpres,* Common Sandpiper *Tringa hypoleucos,* Greenshank *T. nebularia* and European Swallow *Hirundo rustica* have been recorded once or several times at other sub-Antarctic islands in the Indian Ocean (Watson, 1975). Similarly, egrets (*Egretta* and *Bubulcus*) have been recorded several times on remote sub-Antarctic islands (Watson, 1975). The habit of flying long distances to scattered, often temporary habitats is acknowledged to be an attribute pre-adapting some birds to be good colonizers (Mayr, 1965; MacArthur & Wilson, 1967).

The vagrants reported at the Prince Edward islands included ground-feeding predators and insectivores (waders, plovers, a wagtail, a stork and egrets), ground-feeding seed-eaters (doves and sparrows), aerial insectivores (swifts and swallows) and arboreal insectivores (warblers and a flycatcher). Apart from one Greenshank and two Cattle Egrets, none of these birds were seen for more than 1 or a few days (Table 1). A greenshank was present for almost 2 months, apparently feeding on organisms taken from mires and small ponds. One Cattle Egret was present for a week, and another for almost 4 weeks, but their feeding habits were not seen.

All vagrant birds recorded at the Prince Edward islands appear to have arrived from southern Africa, with the possible exception of a dove, tentatively identified as *Streptopelia picturata* from Madagascar (Van Zinderen Bakker, Jr, 1971). It is unlikely that any birds, including Nearctic migrants, arrived from South America, which is 7500 km from the Prince Edwards islands. Even if they were blown at the unlikely speed of 100 km/h for the entire distance, birds would have to fly for over 3 days to complete this trip. Most birds do not have energy reserves for flight over such a long period (Lack, 1959).

The incidence of vagrant land birds at the Prince Edward islands appears to be associated with certain weather conditions over southern Africa and the ocean south of Africa. Four examples are given in Fig. 1. In each case, a cold front moving from the west displaced a high pressure cell to the southeast of southern Africa. A day before the front reached southern Africa, there were strong off-shore winds. Farther south, strong anti-cylonic winds blowing from the north and northeast preceded the front. Birds blown off course at this time in southern Africa would have been blown southwards. As the cold front moved eastward (Fig. 1, c and d) anti-cyclonic and cyclonic winds preceding the front blew from the northwest, in the general direction of the Prince Edward islands.

Discussion

Sub-Antarctic and cold temperate islands of the southern hemisphere typically have few or no resident land bird species (Watson, 1975). Most of these islands are remote from source regions of land birds but vagrant land birds have been reported from most of them (Watson, 1975). Where detailed observations have been made, vagrant occurrence was similar in frequency to that at the Prince Edward islands (Keith & Hines, 1958; Warham, 1969). Few of these vagrants survived for long but during historical times three European passerine species, introduced to New Zealand, have colonized several sub-Antarctic islands to the south of New Zealand (Watson, 1975).

If the incidence of vagrants has remained constant then at least 80 000 land birds may have reached the Prince Edward islands during the past 10 000 years. One third of these birds

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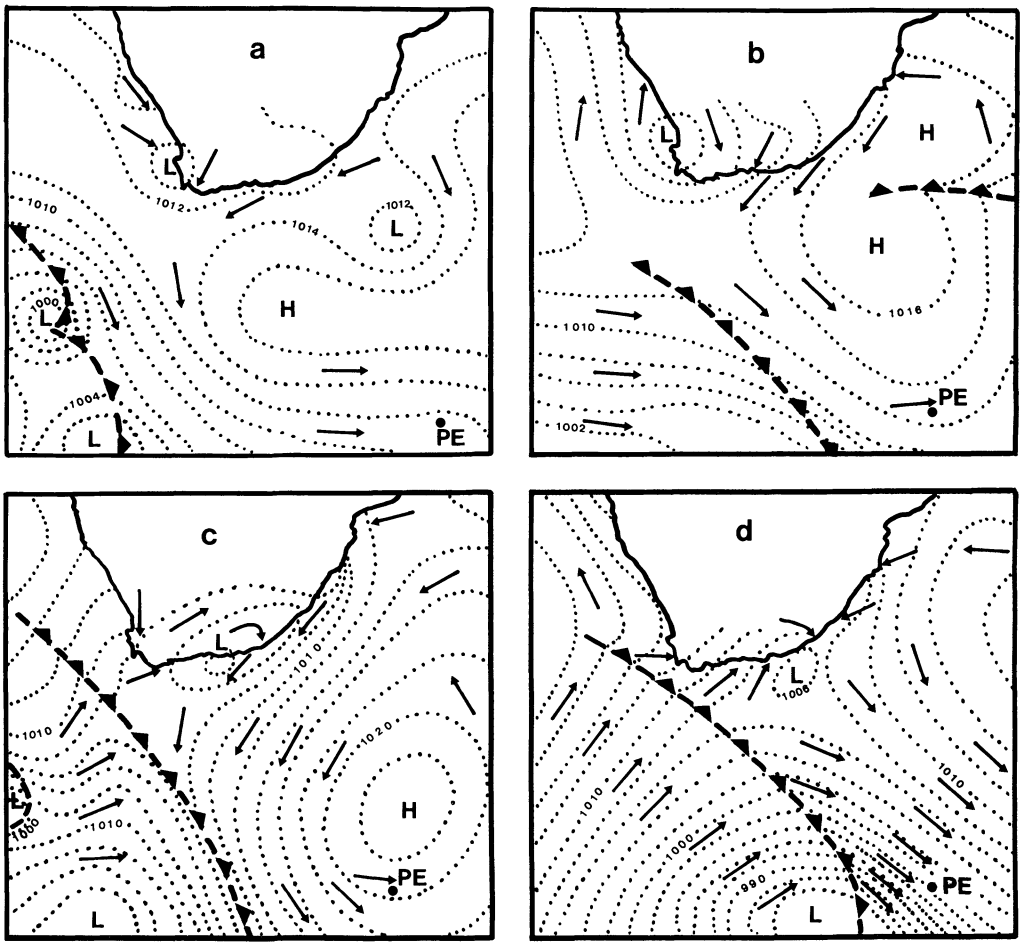

FIG. 1. Weather patterns on days preceding sightings of vagrant birds at the Prince Edward islands. A Ringed Plover was seen at the islands 2 days after 22 March 1974 (a), a Willow Warbler 2 days after 4 March 1975 (b), a Yellow-billed Egret a day after 16 April 1976 (c), and two European Swifts, a Greenshank and a Common Sandpiper within 4 days after 27 November 1977 (d). The position of the islands (PE), pressure isobars at 2 mbar intervals (dotted lines), cold fronts (dashed lines), wind direction (arrows) and the centres of low (L) and high (H) pressure are indicated. Data supplied by the South African Weather Bureau, Pretoria.

could be expected to have arrived in groups of two or more conspecifics (see Table 1) which would have greatly increased the probabilities of the establishment of a breeding population if conditions had been suitable. Although the remoteness of the islands precludes immigration by the less mobile species, we do not attribute the paucity of land birds at the Prince Edward islands to its isolation alone. Several other factors seem to be important.

(1) Most of the birds which arrived could not be considered to be potential colonists. Palaearctic migrants would be unlikely to attempt breeding in the southern hemisphere. The establishment of regular seasonal migration to and from these islands is also unlikely because of their small area, remoteness and paucity of suitable food (see below). There are no seasonal migrant land birds on any islands in the southern oceans, with the exception of the Wattled Sheathbill *Chionis alba*

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(Gmelin) on the islands of the Scotia Arc (Jones, 1963).

(2) There are few food resources which land birds could exploit. The success of immigrant land birds on oceanic islands depends ultimately on the availability of predictable resources. The available food resources at the Prince Edward islands are: eggs, chicks and carcasses from the penguins and other seabirds breeding on the islands (Siegfried *et al.*, 1980; Williams, Burger & Berruti, 1980); carcasses, placentae of seals (Condy, 1980); intertidal organisms (De Villiers, 1976); soil and litter invertebrates (Burger, 1980); and terrestrial plant matter (Huntley, 1971). Few of these resources are available in winter. The insect fauna at the islands is impoverished (Dreux, 1971) and predominantly fossorial. The only flying insects are tiny midges which are airborne only on rare calm days and probably have insufficient biomass to support aerial insectivores.

Exclusion of immigrants by diffuse competition, a feature of many oceanic islands (Diamond, 1975; Lack, 1976) might be operative. There are at present large populations of five predatory and scavenging species living off the penguins, seals, albatrosses and small petrels at the Prince Edward islands (Williams *et al.*, 1979) and it seems unlikely that additional bird species could exploit these resources. Similarly, immigrants which could eat intertidal organisms and terrestrial invertebrates would compete with 5000 Lesser Sheathbills and 900 Kelp Gulls *Larus dominicanus* Lichtenstein. At times when land-based food resources are less abundant, the seabirds now exploiting them turn to marine resources, whereas few land-based birds possess this ability. The Lesser Sheathbill survives by exploiting a very wide range of food items and by having flexible foraging behaviour (Burger, in prep.).

Seeds and other vegetable matter appear to be the only food items on these islands which are relatively unexploited by birds and have sufficient productivity (Smith, 1976) to support a population of land birds. Our present knowledge leads to the suggestion that only a generalized feeder, eating roots, seeds, leaves and possibly invertebrates could establish a resident population. Ducks, especially anatines, are possible candidates. There are resident anatine ducks on South Georgia, Macquarie, Auckland, Kerguelen and the Crozet islands in the sub-Antarctic (Watson, 1975). These ducks are generalized feeders, taking plant matter and intertidal, freshwater and terrestrial invertebrates (Paulian, 1953; Lack, 1970; Despin, Mougin & Segonzac, 1972; Weller, 1975a, b). The establishment of a population of ducks at the Prince Edward islands might be precluded, however, by the low species richness and low productivity of the freshwater habitats (Grobbelaar, 1975), the very narrow tidal range (De Villiers, 1976) and the paucity of sheltered bays and inlets, which are important to ducks on some sub-Antarctic islands (Weller, 1975a, b).

(3) The climate is generally severe. Vagrant land birds arrving at the Prince Edward islands could be expected to be in poor physical condition, having crossed 2000 km of open ocean, and would be vulnerable to death from exposure. Land birds from temperate Africa are probably ill-suited to survive the year-round inclement weather at these islands. Small birds do, however, survive at southern islands with equally inhospitable climates (Watson, 1975) but their survival seems to be linked to the availability of tall tussock-grass or other tall vegetation (Woods, 1970). There are no stands of tall vegetation which might shelter birds at the Prince Edward islands (Huntley, 1971).

(4) Many immigrants are killed by predators. Sub-Antarctic Skuas *Catharacta antarctica* (Lesson) attacked Cattle Egrets, House Sparrows, a Yellow Wagtail *Motacilla flava* and a Greenshank, and were seen to kill small birds, possibly passerines, out at sea. Lesser Sheathbills attacked a Three-banded Plover *Charadrius tricollaris*. The lack of tall vegetation at the Prince Edward islands makes land birds vulnerable to predators. Where tall tussock-grass is available, such as on South Georgia and Macquarie Island, small passerines can co-exist with skuas (Watson, 1975).

Although many land birds do reach the Prince Edward islands, environmental conditions prevent them from establishing breeding populations. It seems unlikely, under present conditions, that these islands will support many more than the present single resident species.

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