

and birds, which form much of their prey (Heather & Robertson 1996). Little shag numbers have increased markedly in the Wellington region since the mid 1970s (Robertson 1992; Powlesland & Luke 2000), and so it seems that harrier predation of little shag eggs and young chicks has not affected the population level.

#### ACKNOWLEDGEMENTS

Our thanks to the Lindale Tourist Complex for access to the colony, to Angel Leach for access to mains power and a place to site the equipment in her home, to Mary Powlesland for assistance with various aspects of the study, to Andrew Vincent for changing the video tapes for a few days during Christmas 2000, to Mike Imber, Robin Fordham, and an anonymous reviewer for improvements to the manuscript, and to the national body of the Ornithological Society of New Zealand (OSNZ), the Wellington branch of OSNZ and the Balivean Trust for funds to purchase the time-lapse video equipment.

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**Keywords** little shag; *Phalacrocorax melanoleucos*; Australasian harrier; *Circus approximans*; predation; eggs



*Notornis*, 2002, Vol. 49: 268-270

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## SHORT NOTE

### Why were Providence petrels (*Pterodroma solandri*) nocturnal at Norfolk Island?

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There is no reason to believe that the Providence petrels (*Pterodroma solandri*) that formerly nested on Norfolk Island were any different taxonomically to the Providence petrels

that nest on Lord Howe Island. However, there is evidence for a significant difference in behaviour between the 2 populations.

At Lord Howe Island, Providence petrels come to the island and are active over their nesting grounds during the day in the breeding season. McCullough (1921) observed Providence petrels

Received 2 September 2001; accepted 31 January 2002

flying around the mountain tops in the afternoon, as they came in from the sea to their nests. According to the islanders, Providence petrels came to land from about mid-day onwards (Hindwood 1940). Again, Fullagar *et al.* (1974) reported that Providence petrels fly over the mountain tops during the day in autumn and early winter, and that activity increases from mid-morning with a peak in numbers of birds wheeling, chasing, and calling in the late afternoon and early evening. Warham (1988) observed some Providence petrels circling the tops of Mt. Lidgbird from c.1000 h onwards, but at lower elevations flying birds were only numerous in late afternoon.

In contrast, reports from the early 1790s of the behaviour of Providence petrels during their breeding season at Norfolk Island indicate that they came to the island and were active over their nesting grounds only as it became dark. For example, Hunter (in Bach 1968: 125) said "as soon as it is dark, they hover in vast flocks over the ground where their nests are." Clark (in Fidlon & Ryan 1981: 193, 292-293) went to Mount Pitt to "See the Birds come in at Sun Sett .... we got to the mount about five o'Clock we had not been there above ten Minutes before the Air was full of them." and "there never was a Bird Caught untill one hour after Sun Set .... they never came in .... until about Sun Set when the[y] generally hoverd about the mount for ane hour before the[y] came down." Paterson (1791-1793: vi) noted that they "return regularly when it becomes dark on the Island."

This difference in the time of arrival of Providence petrels at their breeding grounds on Lord Howe Island and Norfolk Island might be explained by the apparent absence of a resident species of diurnal raptor from Lord Howe Island before the 20th century, whereas on Norfolk Island there was at least 1 resident species of diurnal raptor when European settlement there began in 1788. No species of diurnal raptor is known to have been resident on Lord Howe Island until the Nankeen kestrel (*Falco cenchroides*) established itself there from about the 1940s (Hutton 1991), but there are several accounts of the abundance of "hawks" on Norfolk Island at the time European settlement began. When King (1788-1799: 21) wrote to Governor Phillip on 11 August 1788, he included "Hawks" among the birds he said were very plentiful. He went on to say: "The Hawks are large, and I fear will occasion great Losses when the Poultry begin to breed." In May 1788, he had written (King 1786-1790: 204) that "Hawkes are numerous & of two different kinds, the Grey & Blue, they are very destructive to the young Chicken & it is not an unusual sight to see them take up the Rats." Waterhouse (1789: 3) noted that at Norfolk Island in July 1788 "the Hawke is also

plenty here." Anon. (in Britton 1892: 401), writing in August 1790, included the "Hawk" among the birds to be met with on Norfolk Island, and said that it was quite common. They were not confined to the main island. King (1786-1790: 252) recorded "Hawkes" on nearby Phillip Island on 2 December 1788. These "hawks" apparently survived the 1st decade of European occupation of Norfolk Island. It is not possible to be sure of the identity of the birds to which Myers (1817: 218), who was at Norfolk Island for several months in 1800, referred when he said "The country is very hilly, one eminence in particular, called Mount Pitt, is very high, and resorted to by birds of the Eagle species", but it is likely they were the same *Accipiter* for which there is a fossil record (Meredith 1985).

Only 1 species of "hawk" may have been resident on Norfolk Island. Although King said the "hawks" were of 2 different kinds, he appears to have separated them on the basis of colour only which may have been nothing more than a character of age or sex. Meredith (1985) found a few fossils which he referred to the brown goshawk (*Accipiter fasciatus*), and thought it possible this species was a breeding resident in the past. Holdaway & Anderson (2001) also identified remains of a goshawk - which they referred to *Accipiter* cf. *A. fasciatus* - in the Emily Bay Polynesian site. Remains of the goshawk were rare, but most were clearly of birds that had been cooked and eaten.

It is not known when the resident "hawks" of the Norfolk group died out, or what caused them to do so, after the arrival of Europeans. However, their disappearance may well have been linked to the subsequent reduction of forest habitat, and to the rapid diminution or extinction of several of their principal prey items which no doubt included some or all of the petrels, parrots, parakeets, pigeons, doves, rails, and "quail" which resided there at the time European settlement of Norfolk Island began.

Predation is probably the principal factor promoting nocturnality at petrel breeding sites (Brooke & Prince 1991). Holmes (1977) observed black-winged petrels (*Pterodroma nigripennis*) and wedge-tailed shearwaters (*Puffinus pacificus*) returning to their colonies at Lord Howe Island during the afternoon, but noted that those species are strictly nocturnal at Muttonbird Island off New South Wales. He considered that the nocturnal behaviour of the birds at Muttonbird Island is apparently in response to predation by species such as the white-bellied sea-eagle (*Haliaeetus leucogaster*) and peregrine falcon (*Falco peregrinus*).

The arrival of Providence petrels at Norfolk Island at sunset would presumably have reduced the risk of predation by the numerous "hawks"

that resided there. The past absence of a resident species of diurnal raptor from Lord Howe Island would have allowed Providence petrels nesting on that island to visit their breeding grounds at any time without fear of predation by it. The nocturnal arrival of the Providence petrels which nested on Norfolk Island may reflect a behavioural adaptation by that population to predation by a resident species of diurnal raptor.

#### ACKNOWLEDGEMENTS

I am grateful to staff of the State Library of New South Wales, Sydney for providing access to unpublished manuscripts of Philip Gidley King, William Paterson, and Henry Waterhouse.

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**Keywords** Norfolk Island; Providence petrel; *Pterodroma solandri*; nocturnal habits; diurnal predators



## CORRIGENDA

There were two editorial errors in the Note added in proof to Flux, I.A. 2002. New Zealand white-capped mollymawk (*Diomedea cauta steadi*) chicks eaten by pigs (*Sus scrofa*). *Notornis* 49: 175-176. The author's name for the earlier reference to predation of mollymawk chicks at the Auckland Islands was consistently misspelled as Sorenson, and the reference was not cited.

The full reference is: Sorensen, J.H. 1951. *Wild life in the Subantarctic*. Christchurch, Whitcombe & Tombs.