

## ACKNOWLEDGEMENTS

My thanks to Terry Greene, Andrew Grant, and 2 anonymous reviewers who improved earlier drafts.

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**Keywords** orange-fronted parakeet; *Cyanoramphus malherbi*; yellow-crowned parakeet; *Cyanoramphus auriceps*; nest site; *Nothofagus*



*Notornis*, 2002, Vol. 49: 263-265

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## SHORT NOTE

## Delayed plumage maturation in the male North Island robin (*Petroica longipes*)

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Both sexes or just males of some passerines can breed before the adult plumage is attained (Goodwin 1986; Snow 1982), which Lyons & Montgomerie (1986) called delayed plumage maturation. As an extreme example, both male and female kakerori, or Rarotonga flycatcher (*Pomarea dimidiata*) do not attain the adult plumage until their 4th year (Robertson *et al.* 1993).

The New Zealand robins (*Petroica* spp.) are small (c. 35 g), forest-dwelling, endemic passerines. Each is restricted to one of the 2 main islands of New Zealand and its associated offshore islands; North Island robin (*P. longipes*), and South Island robin (*P. australis*) (Holdaway *et al.* 2001). The Stewart Island robin (*P. a. rakiura*) is a race of the South Island species. In his revision of the New Zealand robins, Fleming (1950) described in detail the plumages of adult males, adult females, and fledglings of each form from museum specimens and observations of live birds. In general, for each

form of what he regarded as subspecies he described adult males as having darker plumage on the back and upper breast than adult females, the difference being most evident when a pair was seen together in the field. However, he made 2 further comments on this general statement. For *P. australis*, he noted that there were several skins labelled "female" that could not be distinguished from others labelled "male", and that he was not confident of the sexing of several skins. For *P. longipes*, he commented that from a consideration of skins, that plumage faded during the year, masking the gender differences, but that in pairs of live birds the male was distinguishable from the female.

Since Fleming's descriptions and comments there have been 3 field studies of *P. australis* involving the use of unique colour-band combinations on each bird, and the monitoring of individuals over 2 or more consecutive nesting seasons (Flack 1979; Powlesland 1983a; Maloney 1991). In none of these studies were males reported to breed in other than the adult plumage (almost black to black upperparts and upper breast). At Kowhai Bush, Kaikoura (Hunt & Gill 1979), all juvenile males attained black feathering over the head, upperparts and upper breast during January–April when 2–3 months old (Powlesland unpubl. data). However, K.P. Brown, B.D. Lloyd, and I.G. McLean (pers. comm.) considered that such 1st-year males of *P. australis* may have a slightly paler plumage than that of older males, so that the situation for this taxon needs further investigation.

Three studies of North Island robins involving uniquely colour-banded birds began in the 1990s: on Tiritiri Matangi Island (to assess the effect of familiarity on post-translocation survival and behaviour following release in 1992) (Armstrong 1995; Armstrong *et al.* 2000); on Kapiti Island from 1994 (to quantify mortality during a rat eradication in 1996) (Empson & Miskelly 1999); and in Pureora Forest Park from 1995 (to quantify mortality during aerial possum poison operations) (Powlesland *et al.* 1999). It was noticed on Kapiti Island (P.J. Reese pers. comm.), in northern Te Urewera National Park (B. Beaven pers. comm.), and in Pureora (pers. obs.) that both members of some pairs were grey, like adult females, and that such pairs bred successfully. Likewise, Armstrong *et al.* (2000) stated that males acquired the characteristic black adult plumage only after their 1st breeding season when 12–16 months old, but did not give details.

At Pureora Forest Park, I subjectively assessed the plumage of colour-banded male robins each September at the start of each nesting season (Powlesland *et al.* 2000) from 1995 to 2000. The colour of the plumage over the head, back and

**Table 1** Plumage changes of 28 male North Island robins (*Petroica longipes*) banded as nestlings and fledging between successive Septembers at Pureora Forest Park September 1995 to September 2000.

Plumage	September of observation				
	1st	2nd	3rd	4th	5th
Light grey	18	0	0	0	0
Dark grey	10	14	2	1	1
Black	0	14	15	5	0

upper breast of each male was assessed to be either light grey, dark grey, or black, and was done without reference to each bird's age and previous colouration. The number of males available to monitor declined with time as a result of mortality, and perhaps because an occasional bird moved outside the study area (Powlesland *et al.* 2000).

The gender of each robin was determined from its behaviour: only males gave full song (Powlesland 1983b) and courtship-fed their mates, and only females built nests, incubated eggs, and brooded chicks (Powlesland 1983a). The establishment and defence of a territory was not solely a male activity, and so was not an indication of gender. While most 1st-year females paired with unpaired males within 2 months of becoming independent, 6 (18%,  $n = 34$ ) remained unpaired, and established territories and defended them against intruders during autumn and winter. This happened even though there were unpaired males in the study area, sometimes on an adjacent territory. These 1st-year females abandoned their territories in late July–August, and paired with previously unpaired males.

The 25 males of unknown age and banded when in black plumage, all retained this plumage colouration throughout the study. Eight of these birds were monitored through 4 breeding seasons. In contrast, none of the 28 1st-year males that were banded as nestlings or fledglings, had black plumage by their 1st September, when 7–10 months old. Eighteen (64.3%) were assessed as light grey, and 10 (35.7%) dark grey (Table 1). By their 2nd September, none was light grey, 14 had dark grey plumage, and 14 were black (Table 1). Of the 14 black-plumaged robins, 5 had gone from light grey to black, the remainder from dark grey to black. Of the 17 males that survived to their 3rd September, 2 were dark grey and the rest black. By the 4th September, 5 of the 6 surviving males were black. Overall, 22 (92%) of the 24 males had moulted into black plumage by their 3rd September. These data demonstrate that males did not attain black plumage by their 1st breeding season, half attained it by their 2nd breeding season, and most of the rest by their 3rd.

From his examination of museum skins of North Island robins, Fleming (1950) commented that "the plumage ... fades during the year, masking the sex differences." I did not assess male robin plumage colour at intervals through winter and the subsequent breeding season (September–March). However, from casual observations, male robin plumage did not obviously fade – such as a male's plumage going from black to dark grey – between moults. Given that some male North Island robins breed in light grey plumage in their 1st breeding season, the same plumage as that of females, which Fleming (1950) was unaware of, it is understandable that he suspected that plumage faded, and that the labelling of sex on some skins was incorrect.

The function of delayed plumage maturation is unclear, and several hypotheses have been proposed for its existence (Lyons & Montgomerie 1986; Rohwer & Butcher 1988; Cuadrado 1995; Thompson & Leu 1995). The hypotheses that could potentially apply to New Zealand robins (*Petroica* spp.) were given in Armstrong *et al.* (2000), and are: (1) that young males use their resemblance to females to gain access to other males' mates for cuckoldry; (2) that the cryptic plumage offers protection from predation to young males and their offspring; (3) that young males that resemble females are less likely to be attacked and therefore can obtain territories more easily; (4) and that the dull plumage of young males signals subordinate status, both to rival males and potential mates. The results of this study do not indicate the possible selective advantage of delayed plumage maturation in the North Island robin. However, a study is underway to determine whether it enhances the success of territory acquisition and survival of robins on Tiritiri Matangi Island (D.P. Armstrong pers. comm.).

#### ACKNOWLEDGEMENTS

My thanks to Fiona Bancroft, Brent Beaven, Jaap Knegtmans, Ian Marshall, Hazel Speed, and Andrew Styche for assistance with monitoring and banding of the robins; and to Doug Armstrong, Don Franklin, Rod Hay, Richard Holdaway, and an anonymous referee for helpful comments on drafts of this note.

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**Keywords** *Petroica longipes*; Petroicidae; delayed plumage maturation