

Age- and sex-related differences in head feather patterns of black stilts (*Himantopus novaezelandiae*)

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Abstract Patterns of white feathers on the heads of 10 female and 18 male wild and captive adult black stilts (*Himantopus novaezelandiae*) were quantified to determine whether the presence and location of white flecking was age- or sex-related. Eleven of the males, but none of the females had white flecking on their heads. Flecking occurred on 2-7 of 9 head regions described and an increased amount of flecking was positively correlated with increasing age. Males without white flecks were 2-7 years old, whereas males with flecks were aged 5-19 years. Most flecking was around the eyes, in the superciliary region and on the crown. We conclude that the presence of white flecking around the eyes or generally scattered on the head is a reliable indicator of a black stilt being old and male.

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INTRODUCTION

The black stilt (*Himantopus novaezelandiae*) is an endangered wading bird that breeds only in the Upper Waitaki Basin, South Island, New Zealand (Pierce 1996). As at February 2000 there were 31 adult black stilts in the wild, of which 9-10 were females. All black stilts have been intensively managed by the New Zealand Department of Conservation or the New Zealand Wildlife Service since 1980 (Reed *et al.* 1993; Pierce 1996; Reed 1998), and now more than 90% of all black stilts are individually colour-banded. Most of these birds have been managed by Department of Conservation staff since hatching, and so are of known age and sex.

Plumage patterns of chicks, juveniles, and sub-adults of black stilts, and the differences in plumage patterns of black, hybrid, and pied stilts (*H. h. leucocephalus*) have been well described by Pierce (1982, 1984), and males and females are regarded as having identical plumage. However, observations by one of us (SPE) over 13 years indicated that facial plumage of black stilts may change

from pure black, to black with white flecks in males, but not females, as they age.

Here, we describe the results of a quantitative study of black stilt facial plumage. The aim of this study was to assess differences in coloration of facial feathers in relation to ages and gender of adult black stilts.

METHODS

Facial plumage patterns were recorded from a sample of colour-banded adult black stilts located in the Upper Waitaki Basin, South Canterbury, from 9 April to 9 August 1999. Because black stilt under-feathers are grey at the base, light-coloured flecking may appear as a normal pattern during moult. Therefore, we quantified plumage patterns after the birds had finished moulting from summer into winter plumage, when plumage was generally in peak condition (Pierce 1984).

When a bird was located in the field, the band combination, date, and location of the bird were recorded, and the facial pattern scored. Only birds of known sex were sampled. Age was determined from hatching dates, or estimated as the minimum age when first banded as an adult. Gender was determined by blood sample, behaviour

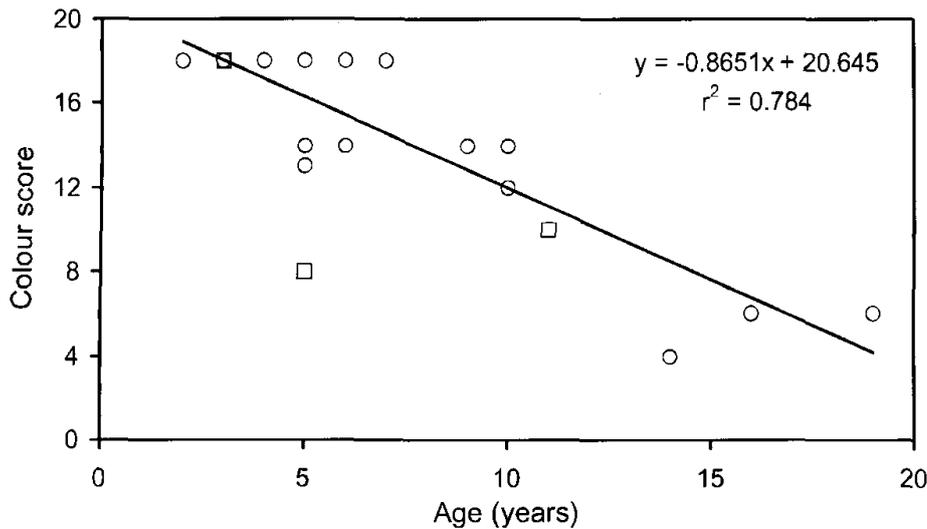


Fig. 1 Relationship between colour score and age in male black stilts (*Himantopus novaezelandiae*). Three points (squares) were excluded from the correlation analysis because the birds were of unknown age.

of adults during breeding, or pelvic width of adults caught on the nest (pelvic width is noticeably greater in females after egg laying, D. P. Murray pers. comm.). To score facial patterns, both lateral views of the head of each black stilt were accurately sketched and the presence and distribution of white, grey and black feathers in each of 9 regions of the head were described. The regions were the: lores, forehead, crown, nape, supercilium, cheek, throat, area immediately around the eye, and ear coverts. For each bird, the total number of regions that had any white feathers within that region was counted. Thus, birds could have 0 (black head) to 9 (each region with at least 1 white feather) regions with white feathering. A second score was used to quantify the extent of white feathering within each region, by scoring the amount of white within each head region. A score of 2 points was given for each region that was completely black, 1 for a mix of black and grey, 0 for any mix of black, grey and white, -1 for grey and white, and -2 for all white regions (minimum score was -18 for all white heads, and a maximum was 18 for all black heads). Grey feathers are present as underfeathers in black stilts, and are sometimes visible when feathers are damaged or worn.

RESULTS

Head patterns of 10 female and 18 male adult black stilts were sampled, which represented 50 – 55 % of all adult females and 50 % of all adult males, including captive birds. Ages of female stilts ranged from 3 to 14 years ($x = 8.5$, $SD = 3.37$), and of males from 2 to 19 years ($x = 7.78$, $SD = 4.76$). Three of the males were of uncertain age, but were at least 3, 5, and 11 years old, respectively.

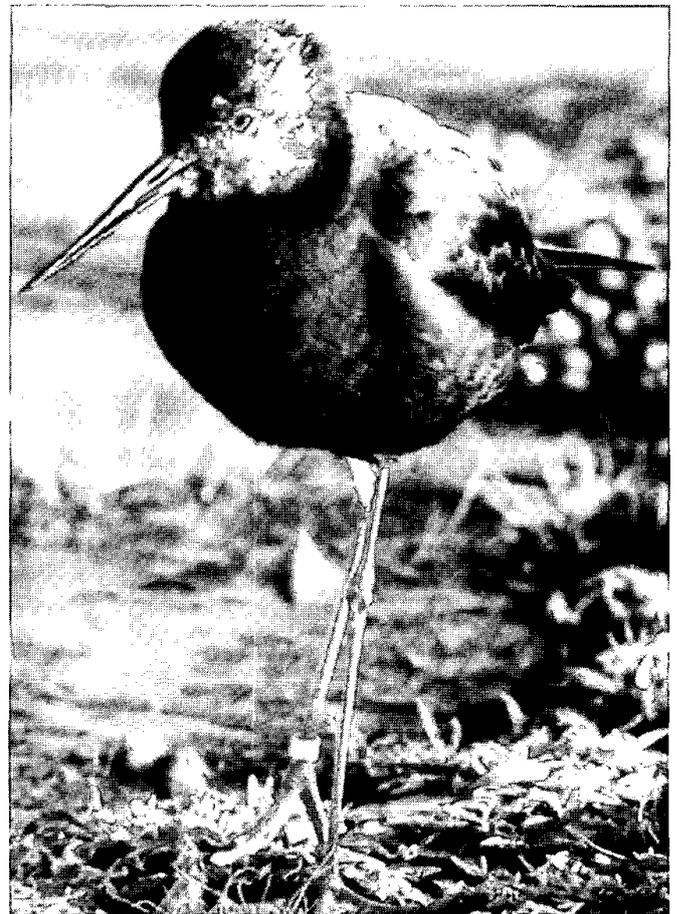


Figure 2: Adult male black stilts (*Himantopus novaezelandiae*) showing extensive white areas on lores, supercilium, ear coverts, and around the eye; and showing flecking on the cheek and crown, typical of very old male black stilts.

Sex and age of black stilts with white head feathers

None of the 10 females, and 11 of 18 (61 %) males had white feathers on their heads. No younger males and all older males had white head feathers. Males without white head feathers were aged 2 – 7 years ($n = 7$), whereas

Table 1 Location of white feathers on head regions of 11 individually colour-banded male black stilts (*Himantopus novaezelandiae*) of known age (years). Only black stilts that had white feathering on the head are included. Ages with + symbol represent the minimum ages of these birds which were banded as adults at their nest site. Colour score values are explained in the text: all-black heads score 18, and all-white heads would score -18.

Band	Age	Lores	Forehead	Crown	Super-cilaries	Ear coverts	Nape	Around eye	Cheek	Throat	Colour score
RY/GW	5				✓			✓			14
RY/WY	5		✓	✓			✓				13
RG/GG	5+			✓	✓	✓		✓	✓		8
WBK/YG	6		✓					✓			14
B/G	9							✓	✓		14
GR/G	10			✓			✓	✓			12
-/WBK	10							✓	✓		14
WW/RR	11+			✓	✓			✓			10
R/-	14	✓	✓	✓	✓	✓		✓	✓		4
-/G	16	✓	✓		✓	✓	✓	✓			6
-/Y	19	✓		✓	✓	✓		✓	✓		6
Total birds		3	4	6	6	4	3	10	5	0	

males with white head feathers were aged 5 – 19 years ($n = 11$, Fig. 1).

Relationship between age and proportion of head with white feathers

Scores for the proportion of white feathers in each head region of males ranged from 18 (heads that were completely black) to 4 (heads that were partially white). No black stilts had heads that were mostly or completely white (scores of 0 to -18). The proportion of the head that had white feathers increased with age, with old males having more white on their heads than young males ($r^2 = 0.784$, $P < 0.0001$, $n = 15$, 3 males of uncertain age excluded, Fig. 1).

Number of head regions with white feathers present

With 1 exception, white feathers were present on 2 head regions of birds aged 5 to 10, on 3 regions for 2 birds aged 10 and 11+ years old, 6 regions for 2 birds aged 16 and 19 years old, and 7 regions for a 14-year-old bird. The exception was male (RG/GG) who was 5+ years old, but had white on 5 head regions (suggesting that this bird was, in fact, probably 10+ years old).

Location on head

Location of white feathering varied among the 11 birds (Table 1, Fig. 2): it was most prevalent in the area

immediately around ($n = 10$ of 11 males) and above the eye ($n = 6$), and on the crown ($n = 6$) and cheek ($n = 5$) areas.

DISCUSSION

Our results show clear evidence for a sex- and age-related increase in white flecking on the heads of black stilts. Although numbers are limited, all male black stilts sampled that were older than 7 years exhibited feather flecking on the head, and flecking was evident in most birds older than 4 years. We have yet to record a female black stilt with white flecking, and so suggest that this type of feather patterning is found in males only.

Sexual variation in adult plumage colour occurs in other *Himantopus* species (e.g., black-necked stilt *H. h. mexicanus*, black-winged stilt *H. h. himantopus*), and in many other waders (e.g., black turnstone *Arenaria melanocephala*, stilt sandpiper *Micropalama himantopus*, spotted redshank *Tringa erythropus*, wrybill *Anarhynchus frontalis*, and most dotterels, *Charadrius* spp.), but adult plumage characteristics remain fixed with respect to age (Heather & Robertson 1996; Prater *et al.* 1977; Hayman *et al.* 1986; Marchant & Higgins 1993). Black-winged stilts in Portugal have a range of plumage patterns on their heads, napes and mantle, differing in the amount of black, dusky and white feathers. These patterns apparently relate to gender (Xeira 1987), with males having more extreme patterns (blacker or whiter) than females

(intermediate dusky patterns). It is unknown whether this pattern in this species change as the individual gets older.

Plumage patterns of stilts in New Zealand were very confusing to early observers because black and pied stilts exhibit a range of pied and mottled plumage between a succession of moults occurring from fledging to adulthood (Pierce 1984). In addition, hybrid offspring from black and pied stilt matings have a range of intermediary plumage patterns, some of which superficially resemble those of sub-adult black stilts. However, pied and light coloured hybrids (nodes A – E of Pierce 1984) have white faces. Darker hybrid adults (nodes F – I) conform to apparently fixed feather patterns on the head, with a white patch behind the bill, sometimes extending onto the forehead or chin and throat (Pierce 1984).

Three age classes of black stilts have white flecking on the head area. Juvenile and sub-adults have variable amounts of white flecking on their heads as they moult from pied juvenile stages to all black adult plumage. These birds invariably have white flecking on other parts of their bodies, particularly the flanks, breast and neck (Pierce 1982, 1984; pers. obs.). By comparison, the white flecking that we have described in adult black stilts only occurs on the head area, and nowhere else on their bodies. Thus, the occurrence of white flecking on heads of adult black stilts is a distinctive characteristic that, where present, will provide a reliable method of ageing and sexing black stilts that are 2-19 years old.

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