DETERMINATION OF THE SEX AND AGE OF STARLINGS IN CANTERBURY, NEW ZEALAND

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ABSTRACT

The reliability of sexing and ageing Starlings in Canterbury from plumage characters was examined. Males were sexed without error and females almost so (98.7%). Birds in adult plumage were classified as first year or older, and all of known age fell into the correct group.

INTRODUCTION

The determination of sex and age is problematical for many bird species, and the Starling *Sturnus vulgaris* L. is no exception. Sex has been determined most accurately for this species by Parks (1962) and Schwab & Marsh (1967), who used a combination of the iris and mandibular rami colours; the latter authors being correct for 97.6% and 97.7% of males and females respectively. Age has been determined by Bullough (1942), Kessel (1951), and Davis (1959) from the length of the iridescent portion on the lower throat hackles of birds in adult plumage, two age classes being recognizable; birds of less than 12 months old, and those older. Both methods were used and critically examined by the author for Starlings in Canterbury, as a prerequisite for a concomitant study of the species' feeding ecology.

Approximately 40 birds were shot each month between April 1969 and March 1970. Carcasses were examined on the day of collection as the colour of some organs faded rapidly with refrigeration. Additional information was gathered from breeding birds taken live at nest sites.

Each carcass was checked for the colour of its irides, mandibular rami and general plumage, and the extent of its throat hackle feather iridescence. Predictions of both age and sex were checked using birds of known age and by autoptic studies of gonads and the bursa Fabricii; the latter a bulbous lymphoid sac opening into the upper cloaca. For hackle iridescence, four of the longest most attenuate hackles present on the birds forethroat were plucked from each Starling, and the iridescent portion of each (minus the white tip) measured to the nearest millimetre, using a stereoscopic microscope. Iridescence means calculated for each bird were analysed by the use of Harding's (1949) method of polymodal frequency distribution analysis as revised by Cassie (1950), and linear transformations obtained for the component groups of the size frequency distributions present. Such analyses permitted a ready detection of overlapping data for these component groups, the point of inflexion in each bimodal frequency distribution corresponding to the low point of a frequency diagram.

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RESULTS

Determination of sex

Eye colour in adult Starlings was dimorphic (Table 1). In females the iris was edged by a broad band which ranged in colour from light lemon to deep orange, and enabled ready identification in 96% of females examined. Conversely, most males (67.3%) possessed a uniform deep-liver-coloured iris. The remaining birds of both sexes possessed irides peripherally marked by a narrow faint yellow band, and determination of sex was difficult. All birds attained adult eye colour characteristics by the end of their first moult and retained them thereafter.

Bill colour was also dimorphic (Table 1) but varied seasonally. Birds of either sex had uniformly dark bills in mid and late summer (January-March), which changed to a bright lemon-yellow in early winter (April-May) over a period of 4 to 6 weeks (Table 2). Concurrently, the rami of the lower mandible turned blue to blue-black in all males examined and light pink in 97% of all females; the remaining females (two) had bills which were entirely lemon-yellow.

Table 1. THE RELIABILITY OF SECONDARY SEX CHARACTERISTICS IN STARLINGS OF ADULT PLUMAGE

	Males		Females	
	No. examined	Percent composition	No. examined	Percent composition
Iris colour				
Identification positive	76	67.3	72	96.0
Character indecisive	37	32.7	3	4.0
Bill ramus colour				
Identification positive	113	100.0	73	97.3
Character indecisive	Nil	Nil	2	2.7
Both characters combined				
* Identification positive	113	100.0	74	98.7

Note - * Ignores single indistinct character of any pair

Determination of age

Young Starlings retained a dull grey-brown plumage for approximately 12 weeks following fledging (Table 2) and had grey eyes and grey-black bills, the latter at first edged with bright yellow wattles. They moulted between January and the end of March, and

Table 2. SEASONAL VARIATION IN AGE AND SECONDARY SEX CHARACTERISTICS

Age/Sex character	Month of Collection											
	J	F	M	A	M	J	J	A	S	O	N	D
Juvenile plumage present	1	15	7	-	-	-	-	-	-	-	-	12
Bursa Fabricii present	1	15	6	-	-	-	-	-	-	-	-	12
Adult bill colour												
(a) Wholly black	17	15	18	35	10	1	-	-	-	-	-	2
(b) Intermediate but without secondary sex character	-	-	-	12	9	6	-	-	-	-	-	5
(c) Wholly yellow with secondary sex character present	-	-	-	-	4	41	35	39	36	37	12	16
No. of Starlings	18	30	25	47	23	48	35	39	36	37	12	35

attained a typical dark spangled adult plumage indistinguishable from that of older birds. Autoptic studies revealed that this moult was concomitant with the regression of the bursa Fabricii (Table 2).

In adult Starlings of either sex the length of the iridescent portion of hackle feathers was bimodally distributed (Fig. 1); the two component groups within each sex representing birds of less than 12 months of age and those older. Males and females respectively had mean iridescence values of 9.0 ± 0.18 (= S.E) and 5.6 ± 0.05 mm in the shorter hackle group, and 14.3 ± 0.12 and 9.5 ± 0.13 mm in the longer hackle group. Numbers in the first group were low, due largely to young birds in adult plumage being present in the population for little more than half of their first year.

The overlapping flanks of the frequency distributions of each component group within each sex were separated out (Table 3), thus dividing each sex into three possible classes. Starlings with iridescence values of 6-7 mm in females and 10-12 mm in males were considered to be of indefinite age (Group B, see Table 3) and the remainder of each component group fell into either group A or group C (Table 3). Proportionately more females than males fell into the indefinite category, as the two component groups of females were compacted into a smaller range.

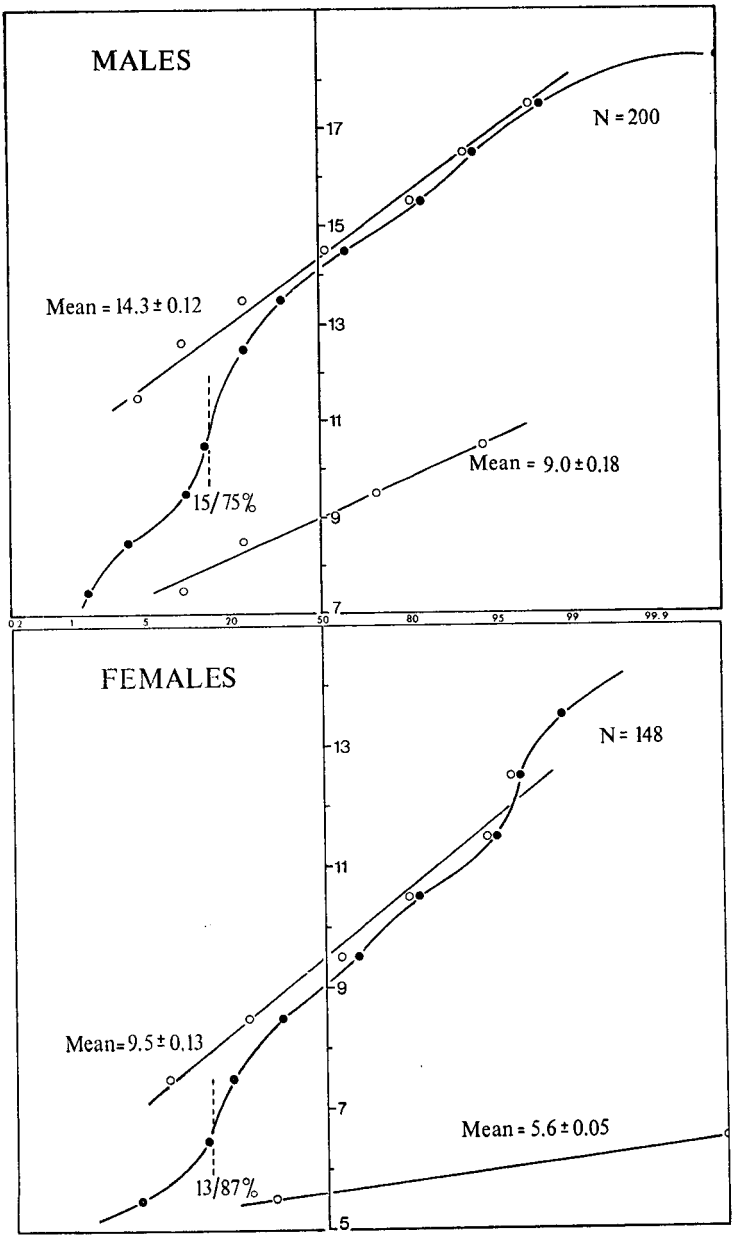

FIGURE 1 — The determination of the parameters of overlapping normally distributed component groups, indicated by hackle feather measurements (the Y coordinate). The X coordinate shows probability values. The second inflexion in the curve plotted for females has been ignored, as it concerns less than 5% of birds measured.

Table 3. THE COMPONENT GROUPS WITHIN THE SIZE FREQUENCY DISTRIBUTIONS OF HACKLE FEATHER IRIDESCENCE

Size Class	Females			Males		
	N	Percent Occurrence	Group Limits (mm)	N	Percent Occurrence	Group Limits (mm)
Group A	8	5.4	<6	22	11.0	<10
Group B	22	14.9	6-7	26	12.9	10-12
Group C	118	79.7	>7	153	76.1	>12

Groups A and B of both sexes included a few individuals less than 12 months old with adult or partially adult plumage and a distinct bursa Fabricii. Conversely, the hackle iridescence of 92 adults recaptured while breeding for the second year, and therefore at least two years old, all fell into group C. Likewise, two birds banded as nestlings and trapped two years later had hackles within the group C range.

CONCLUSIONS

Starlings can be sexed by the sexually dimorphic iris and mandibular rami colours. Iris colour is a less reliable criterion, especially for males (67% accuracy), than the colour of the bill rami (100% accuracy), but the latter can be used only from May to December. By using a combination, and ignoring single indistinct characters, the criteria distinguish males without error and females almost so (98.7%).

Following the moult of a distinctive juvenile plumage, all Starlings are superficially alike. However, the length of the iridescent portion of the lower throat hackles varies with age. Length frequency distributions of hackle iridescence show two groups within either sex representing birds in their first year, and those older. Using this criterion, the ages of a small proportion of Starlings (13% of males, 15% of females) cannot be determined, but all birds of known age fall into the correct group. Iridescence values show a partial separation with sex, but measurements for first year males and older females overlap, thus the character is unreliable for sex determination.

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