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On the use of rectrix shape and wing length to determine age and sex in the Cassin's Finch

Martha Hatch Balph

Recently, Samson (1974a) described several criteria for determining age and sex in the Cassin's Finch (*Carpodacus cassinii*). Two of the characters he found to be important were rectrix shape and wing length. While banding Cassin's Finches in Logan, Utah, I attempted (1) to assess the practicality of using rectrix shape as a criterion for determining age and (2) to make a further examination of wing length in relation to age and sex.

Methods

A total of 491 Cassin's Finches were banded between March 1976 and June 1977. The birds were captured using mist nets and ground traps. Each finch was individually marked with colored plastic leg bands and a USFWS band. Plumage coloration was recorded as either brown (corresponding to Sampson's, 1974a, "grey-brown") or red. Rectrix shape was determined using Samson's (1974a, 1974b) descriptions and figures. The unflattened wing cord was measured to the nearest 0.5 mm using a metric ruler with a "bend-of-the-wing" fixture. Finches captured during the spring and summer months were examined for the presence of a brood patch or cloacal protuberance. The extent of skull pneumatization was noted in brown-colored finches banded during the summer.

Age and rectrix shape

Samson (1974a) observed that, prior to the age of about 14 months, Cassin's Finches exhibit lanceolate "decks" (innermost pair of rectrices) and pointed tips on all rectrices. Following the first postnuptial molt at 14 months, when the remiges and rectrices are replaced for the first time, the rectrices appear more rounded. I found this distinction useful in my work with Cassin's Finches. However, the birds that I examined did exhibit varying degrees of pointedness or roundness in shape of the rectrices. Using Samson's (1974a, 1974b) figures and descriptions, I felt unable to categorize the tails of 73 (15%) of 491 birds; and of tails that I did classify, 25% were only slightly pointed or slightly rounded. In many such in-

stances, feather wear seemed not to be an influencing factor. Samson did not mention this problem, perhaps because his extensive experience with both live and dead specimens permitted him to discriminate more finely than I. However, I believe other banders might expect problems in classifying some finches with respect to rectrix shape.

To test the reliability of using rectrix shape as an aging criterion, I examined the occurrence of pointed and rounded rectrices in finches whose age could be independently ascertained. Of 128 finches classified as adult males on the basis of red plumage coloration, 92% exhibited rounded rectrices, 6% rectrices of intermediate shape, and 2% pointed rectrices. Of 64 finches banded during the breeding season (May to July) and classified as second-year males due to brown plumage coloration, absence of a brood patch, presence of a cloacal protuberance, and possession of a completely pneumatized skull, 3% showed rounded rectrices, 8% rectrices of intermediate shape, and 89% pointed rectrices. If my results are indeed representative, errors in determining age by rectrix shape should be relatively uncommon. The frequency of error can probably be reduced if a bander does not attempt to age finches whose rectrices appear intermediate in shape unless other criteria are available.

Wing length in relation to age and sex

Wing lengths of finches whose age and sex I determined by plumage coloration, rectrix shape, presence or absence of a brood patch during the breeding season, and/or the extent of skull pneumatization are summarized in Table 1. My averages are generally similar to those given by Samson (1974a): 93.1 mm for adult males (vs. 93.4 mm in Samson's study), 91.0 mm for subadult males in summer (vs. 91.9 mm), and 88.9 mm for all females in summer (vs. 88.3 mm).

Both in summer and in winter, the mean wing length of adult males was significantly greater than that of adult females ($t = 8.15$, $df = 66$, $P < 0.001$ in summer; $t = 9.03$, $df = 120$, $P < 0.001$ in winter). Summer and winter means did not differ

Table 1. Relationship between age, sex, and wing length in Cassin's Finches.

Age and sex	Season	Wing Length (mm)			
		n ¹	\bar{x}	SD	Range
Adult male	Summer	53	93.2	1.6	89.5-97.0
	Winter	75	93.0	2.2	88.5-97.5
Adult female	Summer	15	89.4	1.3	87.0-91.5
	Winter	47	89.3	2.2	85.5-94.5
Subadult ² male	Summer	64	91.0	1.9	86.0-95.0
Subadult ² female	Summer	9	87.6	1.3	86.5-90.5
Subadult ² sex unknown	Winter	160	90.3	2.1	84.0-95.5
Immature, sex unknown	Summer	5	90.0	1.4	88.0-91.5
Female, age unknown	Summer	2	90.5	2.1	89.0-92.0
Age and sex unknown	Winter	58	90.1	1.8	86.5-94.5

¹Excluded are three brown finches for which data were incomplete.

²"Subadult²" refers to second-year birds that have not yet undergone the first postnuptial molt. Also included are finches banded late in their hatching year.

significantly for either group ($t = 0.58$, $df = 126$, $P > 0.5$ for adult males; $t = 0.26$, $df = 60$, $P > 0.5$ for adult females). During the breeding season, when determination of sex was possible for second-year birds as well as for adults, mean wing length was greatest for adult males, followed by subadult males, adult females, and subadult females; these differences were statistically significant ($t = 6.47$, $df = 115$, $P < 0.001$ for adult vs. subadult males; $t = 3.16$, $df = 77$, $P < 0.01$ for subadult males vs. adult females; $t = 3.36$, $df = 22$, $P < 0.01$ for adult vs. subadult females).

Samson (1974a) suggested that wing length may be used to separate male and female brown finches in summer but not in winter, although in a later paper (Samson 1977) he did use wing length to determine the sex of wintering brown finches. Samson (1977) classified brown finches with wings < 90.0 mm in length as females and those with wings ≥ 90.0 mm in length as subadult males. If I apply this criterion to brown finches whose age and sex I ascertained independently, 41 of 135 birds are categorized incorrectly (47% of adult females in summer, 36% of adult females in winter, 25% of subadult males in summer, and 11% of subadult females in summer). As Samson did not separate adult and subadult females in his analysis, I cannot compare my results directly to his, although clearly he found less error than I did. My sample sizes are not as strong as those of Samson; however, because I consistently found somewhat smaller intersexual differences in mean wing length than he did, I would advise caution in the use of wing length alone to sex brown finches. Adult females can be identified by rectrix shape (Samson 1974b). I

believe it is reasonable to classify hatching-year and early second-year finches with wing lengths ≤ 88 mm as females and those with wing lengths ≥ 91 mm as males. This modification reduces error in sex determination from 23% to 4% when applied to my known-sex samples of subadult finches.

Samson (1974a) postulated that the wings of subadult Cassin's Finches may be shorter in length than those of adults, as has been shown for some other bird species (reviewed by Samson 1974a). He examined two individuals before and after the first postnuptial molt and noted an increase in wing length in both cases. I was able to measure the wing lengths in successive years of 11 finches that I banded between March and July 1976 and recaptured between December and June 1976-77. Four finches banded as subadults (all males) exhibited gains of at least 1.5 mm ($\bar{X} = 1.8$, $SD = 0.3$). In addition, six of seven birds that I banded as adults (four males and two of three females) showed increases in wing length ($\bar{X} = 1.1$ mm, $SD = 0.7$). Although my sample size is too small to permit a meaningful statistical analysis, I believe these results suggest that wing length does increase with age in Cassin's Finches, particularly at the time of the first postnuptial molt. Consistent with this conclusion are the significant differences I obtained between adults and subadults of each sex with respect to mean wing length at banding.

Summary

On the basis of data from 491 Cassin's Finches banded at Logan, Utah in 1976 and 1977, some minor modifications of F. Samson's criteria for determining age and sex are suggested: (1) age determination should not be attempted for a minority of brown finches exhibiting rectrices intermediate in shape between "pointed" and "rounded"; (2) wintering subadults may be classified as females if the wing chord is ≤ 88 mm and as males if the wing chord is ≥ 91 mm. Wing length appears to increase with age in this species.

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