SEX AND AGE DETERMINATION IN THE CLAY-COLORED SPARROW

By R. W. Knapton

The only method that Wood (1969) gives by which the sex of hand-held adult Clay-colored Sparrows (*Spizella pallida*) can be determined is the presence of an incubation patch in the female and a cloacal protuberance in the male. Sex identification of individuals showing neither of these characteristics is otherwise unknown. Furthermore, Wood (1969) adds that hatching-year birds cannot be aged between August and December as soon as the breast streakings that identify a juvenile are lost during the postjuvenal molt, although the plumage of immatures is reportedly more buffy than that of adults (Roberts, 1932; Bent, 1968). In this paper, morphological criteria are provided to separate male and female Clay-colored Sparrows in the spring, summer, and possibly the winter, and adults from immatures in the fall.

METHODS

From May to September, 1974, 1975 and 1976, I banded 834 Clay-colored Sparrows on two study areas in extreme southwestern Manitoba, near Lyleton. Of these, 296 (162♂, 134♀) were adults caught in May and June. These birds were initially sexed by the presence of an incubation patch or a cloacal protuberance and by behavioral differences: males sing, females do not, and the female undertakes most of the incubation (80%) and brooding (70%) of the young (Fox, 1961; Salt, 1964; Knapton, 1978).

In January 1976, 26 Clay-colored Sparrows were caught on two study plots in central Mexico, near Guadalajara (20°40′N, 103°20′W) and near Sanabria (19°30′N, 101°40′W). I also obtained 94 specimens (83 adults, 11 immatures) of known sex from the National Museums of Science, Ottawa, and the Royal Ontario Museum, Toronto.

The right wing chord (after Baldwin, Oberholser, and Worley, 1931) was measured in all birds. In 1974, I weighed to the nearest 0.1 g each wild-trapped bird, but abandoned this measurement in succeeding years because weight is too variable to be a satisfactory factor in sexing the birds. The tarsometatarsal length and exposed culmen length and depth were measured only on museum specimens.

In 1974 and 1975, I noticed that the head markings, especially the superciliary stripe, of females appeared more buff-colored than those of males. Consequently, I measured the color of the superciliary stripe, using Munsell soil color charts (Wood and Wood, 1972), on 70 adults caught in May and early June 1976, and on 80 adult museum specimens. In 1976, I also measured the color of the breast feathers of 13 immatures caught in August that were banded as nestlings on the study areas in Manitoba, and of 21 adults banded in the previous springs and recaptured in August following the postnuptial molt. The same measurements were taken on the 11 immature museum specimens.

The Munsell color chart used for all measurements was the hue 10YR, which shows the values 2 (black) to 8 (white) across a chromatic scale to dark yellowish-brown to yellow. The coloration of the superciliary stripe of all sparrows measured fell along a continuum from white (8/1 and 8/2) and light gray (7/1 and 7/2) through pale brown (8/3,8/4,7/3,7/4) to yellow (8/6,8/8,7/6,7/8).

RESULTS

A. Sex Differences

Wing chord length.—Figure 1A shows the distribution of wing chord lengths in adult male and female Clay-colored Sparrows on the Manitoba study areas. Lengths in females range from 56 to 62 mm, with a peak at 59 mm ($\bar{x}$ = 59.4 mm, SD = 1.2 mm), and lengths in males range from 60 to 66 mm, with a peak at 63 mm ($\bar{x}$ = 63.0 mm, SD = 1.4 mm). Figure 1B shows a similar distribution of wing chord lengths in the museum specimens, females peaking at 60 mm ($\bar{x}$ = 58.7 mm, SD = 1.6 mm), and males peaking at 63 mm ($\bar{x}$ = 62.2 mm, SD = 1.4 mm). Males therefore have longer wings than females, although an area of overlap occurs between 59 and 62 mm.

A similar bimodal distribution was obtained from the measurements of the wing chords of the Mexican sample (Fig. 1C), one peak at 59 mm and the other at 63 mm. Finally, for the nine immature museum specimens for which the sex is known, six males ranged from 61 to 63 mm ($\bar{x}$ = 62.2 mm) and females from 58 to 61 mm ($\bar{x}$ = 59.3 mm).

Superciliary stripe coloration.—Table 1 gives the hues of the superciliary stripe of the 70 adults measured on the Manitoba study area. On the average, males have whitish superciliary stripes, whereas that of the females is more pale-brown. For statistical analysis, categories were combined (8/1 and 8/2, 8/3 and 8/4), and the differences between males and females were found to be significant ($\chi^2 = 37.8, P < 0.001$).

Table 2 indicates the color measures for the museum specimens. Three out of the 83 adults could not be used because of damage to the eye area. In the remaining 80, a trend similar to the field data appears: superciliary white in males, browner in females. Again, when categories are combined, the differences between the sexes are significant ($\chi^2 = 21.1, P < 0.01$).

TABLE 1

Superciliary stripe color of adults measured on the Manitoba study areas (n = 70).

	Chart value/chroma			
	8/1	8/2	8/3	8/4
Males	28	13	1	0
Females	1	6	14	7

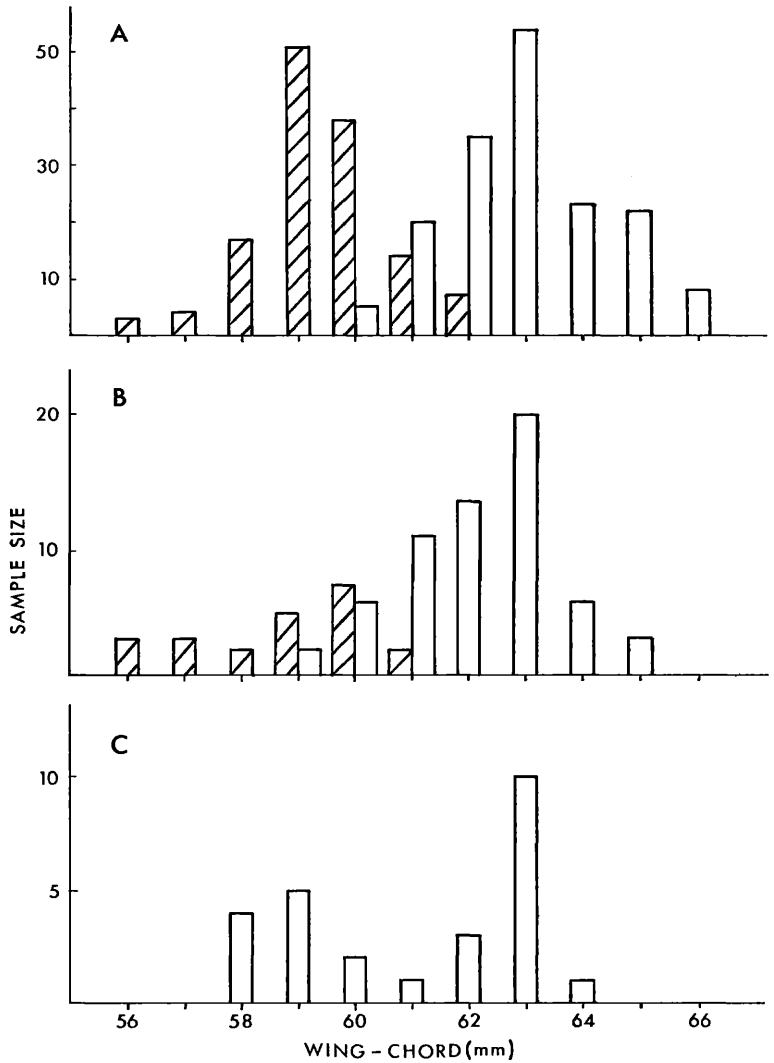

FIGURE 1. Measured wing chords for three samples of adult Clay-colored Sparrows. 1A shows the distribution of measurements for 134 females (hatched bars) and 162 males (open bars) live-trapped in Manitoba, 1B for 22 female (hatched bars) and 61 male (open bars) museum specimens, and 1C for 26 adults live-trapped in Mexico.

Other measurements.—Culmen length and depth and length of tarsometatarsus were measured on 83 museum specimens (61♂, 22♀). None of these measurements proved satisfactory in sexing the birds concerned because measurements for males and females almost completely overlapped, with no significant differences between the means (Knapton, 1978).

TABLE 2
Superciliary stripe color of adult museum specimens (n = 80).

A. Expressed as chart value/chroma	8/1	8/2	8/3	8/4	7/1	7/3	7/4	7/6
Males	8	27	18	4	1	0	0	0
Females	0	0	9	6	0	2	3	2

B. Expressed as chroma alone	1	2	3	4
Males	9	27	18	4
Females	0	0	11	11

B. *Age differences*

One of the most conspicuous features of immature Clay-colored Sparrows that have undergone the postjuvenal molt is the extensive area of pale brown feathers on the breast. This is particularly evident in hand-held birds in August. To compare breast feather color of adults and immatures, 34 birds were measured for this characteristic using the Munsell soil color chart 10YR: 13 immatures that had been banded as nestlings on the study areas and recaptured in August, and 21 adults that had been banded in previous springs and recaptured in August after the postnuptial molt. Also, the breast feather color of the 11 immature museum specimens was measured. All 24 immatures had breast feather coloration in the range 7/3 to 7/6, whereas the 21 adults ranged from 8/2 to 8/6. Hence, no overlap occurred in the hue of breast feather coloration between the two groups in August.

Culmen depth and length and length of tarsometatarsus of the 11 immature museum specimens were compared with the same measurements for the 83 adult specimens; none of these parameters proved useful in separating immatures from adults.

DISCUSSION

A hand-held Clay-colored Sparrow in reproductive condition can be sexed by the presence of an incubation patch or a cloacal protuberance. However, outside of the breeding season, individuals can be sexed with a high degree of accuracy by a combination of wing length and color of the superciliary stripe. A bird with a wing length between 56 and 58 mm and a pale brown superciliary stripe is a female, whereas one with a wing length greater than 62 mm and a white superciliary stripe is a male. Difficulties arise with those individuals whose wing lengths fall between 59 and 62 mm, and whose superciliary stripe is intermediate between white and pale brown.

Separating juveniles from adults is not a problem when dealing with birds that still retain the heavy breast streakings of the juvenal plumage,

but identification becomes more difficult after the postjuvenal molt when an essentially clear-breasted condition is attained. However, immatures can be distinguished from adults by the presence of a pale-brown breast band that often covers the whole breast, whereas adults in the fall have at most only the sides of the breast a light brown color.

SUMMARY

Clay-colored Sparrows can be sexed reliably by the reproductive condition of an individual during the breeding season and by behavioral differences. Wing chord length and superciliary stripe coloration taken together provide a high degree of accuracy in the sexing of individuals. Immatures that have undergone the postjuvenal molt can be clearly distinguished from fall adults by the color of the breast feathers.

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