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AGE AND SEX DIFFERENCES IN THE SIZE OF NORTHERN HARRIERS

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Despite an extensive study of morphological differentiation in the genus *Circus* (Nieboer 1973), seasonal shifts in the weight of Northern Harriers (*C. cyaneus*) are previously unreported. Here, we show that (1) each sex and age class experiences a seasonal weight decline during spring migration through Wisconsin, (2) in each sex juveniles have shorter wings than adults, and (3) although juvenile males have slightly shorter tails than adult males, adult and juvenile females show no difference in tail length.

STUDY AREA AND METHODS

We trapped 182 breeding and 127 migrating harriers in the springs and summers of 1959 through 1978 on the Buena Vista Marsh in central Wisconsin (see Hamerstrom 1969, for a description of the area). Migrants were usually trapped with Bal-chatries and breeding birds with Dho-gazas near their nests (Hamerstrom 1963). Harriers were aged and sexed using Hamerstrom's (1968) criteria. Weighing and measuring techniques used are given in Hamerstrom and Hamerstrom (1978). A few birds were not processed completely, so sample sizes vary.

We used, t-tests and approximate t-tests to determine levels of significance.

RESULTS AND DISCUSSION

Both adult and juvenile spring migrants had slightly longer wings and tails than did breeding harriers (Table 1). We believe these differences are due either to feather wear or the fact that members of the central Wisconsin population were slightly smaller than those passing through on migration (Scharf and Hamerstrom 1975). Because these differences were not significant ($P > .50$) we grouped our size data ignoring season and examined them for age-specific differences.

Juveniles of both sexes had significantly shorter wing chord measurements than adults (Fig. 1). Juvenile males had shorter tails than adult males but the difference was not significant. Juvenile and adult females showed no difference in tail length (Fig. 2).

Migrating adult male harriers weighed significantly more than migrating juvenile males ($P < .01$), and more than both adult ($P < .001$) and juvenile ($P < .001$) breeding males (Fig. 3). Similarly, migrating adult females weighed significantly more than migrating juveniles ($P < .01$), breeding adults ($P < .01$), and breeding juveniles ($P < .01$). However, in both sexes adults preceded juveniles on migration, and in all four age-sex classes a decline in weight was found through spring migration (Table 2). This decline is significant for both adult ($P < .01$) and juvenile ($P < .05$) females but not for adult ($P > .50$) and juvenile

TABLE 1.

Northern Harrier wing chord and tail length measurements.

	n	Spring migrants	n	Breeders
Adult females				
Tail length	50	235.8 ± 8.40 (210–258)[1]	79	234.6 ± 6.93 (217–246)
Wing chord	52	383.3 ± 7.84 (372–406)		381.9 ± 9.98 (361–410)
Juvenile females				
Tail length	23	235.7 ± 7.85 (221–251)	25	235.6 ± 8.45 (194–249)
Wing chord	23	377.4 ± 9.52 (350–394)	24	375.4 ± 10.67 (368–403)
Adult males				
Tail length	29	210.3 ± 7.41 (193–224)	53	208.0 ± 7.75 (196–238)
Wing chord	29	344.5 ± 7.90 (325–362)	52	342.5 ± 8.25 (325–356)
Juvenile males				
Tail length	20	206.4 ± 7.06 (190–218)	5	204.8 ± 6.26 (197–213)
Wing chord	21	336.3 ± 7.71 (322–347)	6	333.3 ± 7.23 (325–342)

[1] Mean ± SD (range), in mm.

($P > .05$) males. To determine whether the weight differences we found between adults and juveniles were due to differences in the timing of migration, we compared the weight of adults and juveniles caught during the time of greatest migratory overlap (5–25 April for females, 2–12 April for males). In both sexes the magnitude of the weight difference decreased substantially (68% for females, 34% for males) and in neither comparison was the difference significant ($P > .20$ for females, $P > .05$ for males). That adults of both sexes were slightly, but not significantly heavier than juveniles probably reflects the fact that even during these periods of maximum overlap, adults still tended to occur earlier than juveniles. Breeding adults and juveniles of both sexes show no age specific differences in weight ($P > .10$; Fig. 3).

The seasonal decrease in harrier weights probably reflects either a loss of migratory fat and/or increased metabolic needs in the breeding season. It does not appear to be a function of weight differences between the central Wisconsin population and harriers breeding farther north. Three harriers (2 adult males, 1 adult female) were processed twice during a single year, first as migrants and later as breeders. All three

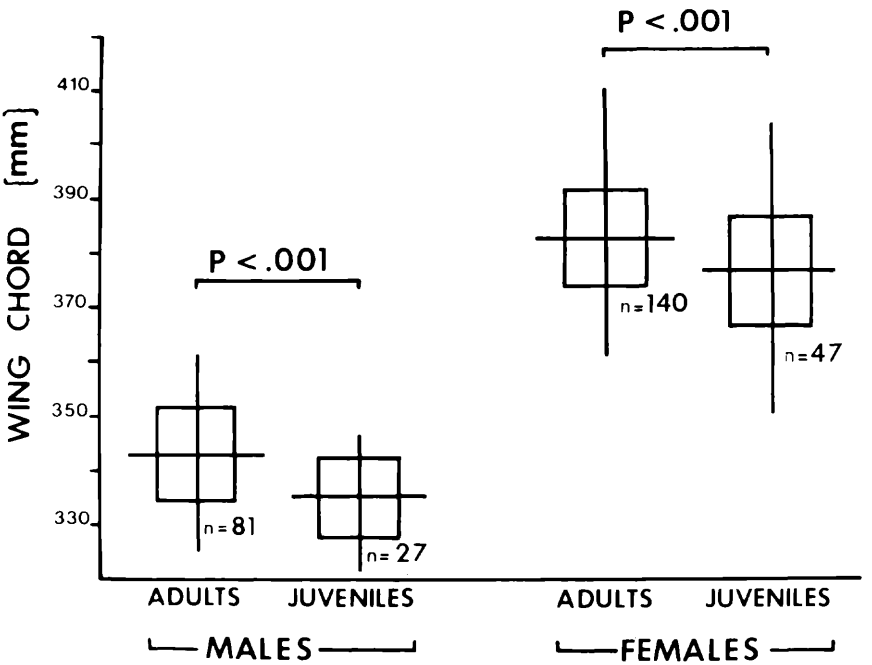

FIGURE 1. Mean (horizontal line), ± 1 SD (vertical bar) and range (vertical line) of Northern Harrier wing chords.

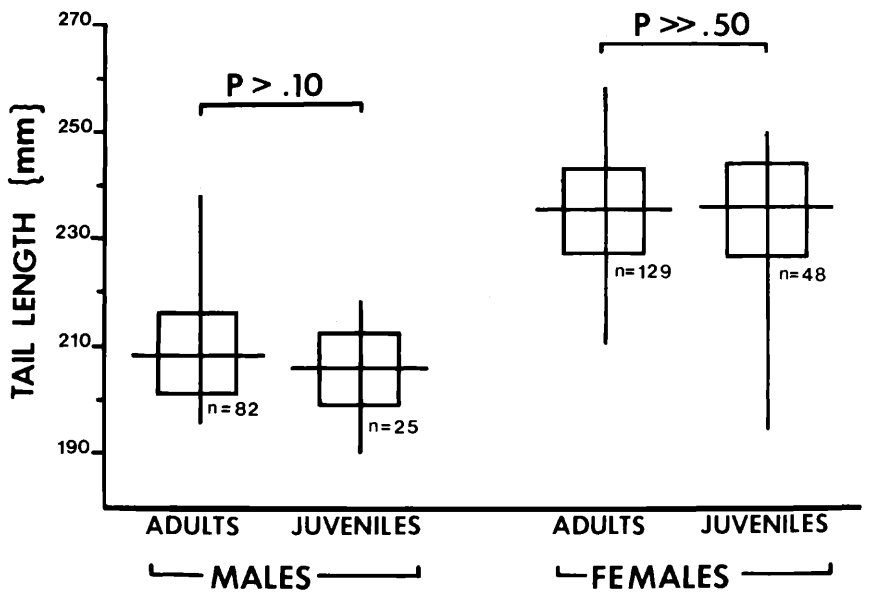

FIGURE 2. Mean (horizontal line), ± 1 SD (vertical bar) and range (vertical line) of Northern Harrier tail lengths.

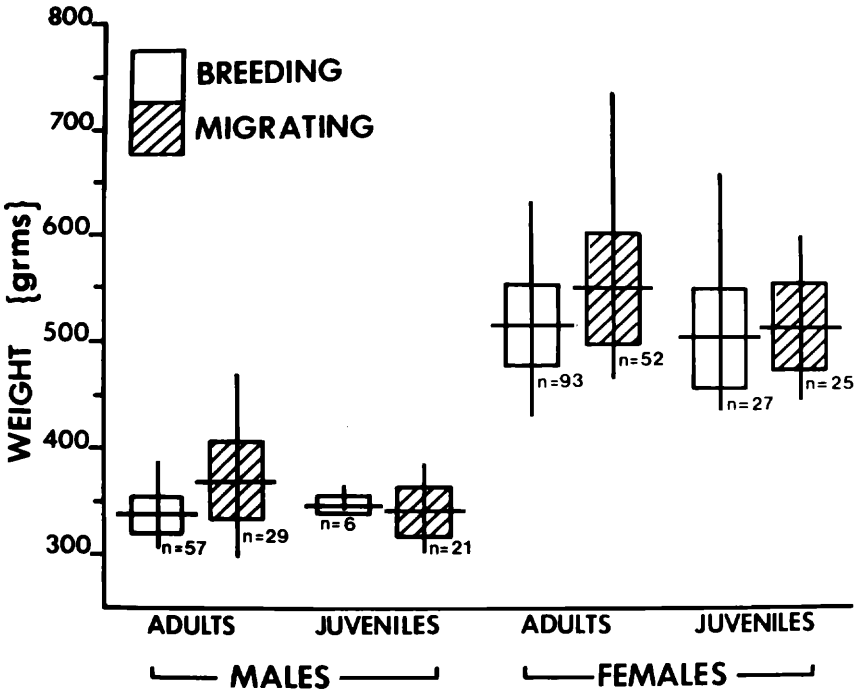

FIGURE 3. Mean (horizontal line), ± 1 SD (vertical bar) and range (vertical line) of Northern Harrier weights.

showed weight losses similar to the average seasonal weight loss for adults of their sex.

Mueller et al. reported similar increases in wing chord with age in Goshawks (*Accipiter gentilis*; 1976) and Sharp-shinned Hawks (*A. striatus*; 1979). They also reported age-dependent decreases in tail length in

TABLE 2.

Slopes and correlation coefficients for the regression lines indicating seasonal declines in the weight of adult and juvenile harriers and median trap dates.

	Slope of regression line[1]	r	Median date trapped
Adult females	−1.75	0.43[2]	13 April
Juvenile females	−1.86	0.45[3]	21 April
Adult males	−0.84	0.35	1 April
Juvenile males	−0.10	0.07	18 April

[1] Weight = (slope) × (day of year captured) + (constant).
[2] Significant at the $P < .05$ level.
[3] Significant at the $P < .01$ level.

those species. They mention that this "generalization of shorter wings and longer tails in juveniles" appears to hold for most Circininae "except possibly for the Marsh Harrier (*C. aeruginosus*) . . . ." However their sample sizes are small (Mueller, pers. comm.) and our data fail to reveal age-dependent shifts in tail length. In fact our juvenile males had slightly, but not significantly, *shorter* tails than adult males. Mueller et al. (1979) go on to note that several raptors, including Red Kites (*Milvus milvus*), Honey Buzzards (*Pernis apivorus*) and some falcons, have both longer tails and wings as adults. Why these species differences occur is unknown and more study is needed.

SUMMARY

The weight of adult and juvenile harriers of both sexes declines during spring migration in Wisconsin. As in both Goshawks and Sharp-shinned Hawks juvenile harriers have shorter wings than adults. But unlike these accipiters, juvenile harriers do not have significantly shorter tails than adults. The reason for these differences is unknown.

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