

**NOTE:**

**SPRING MIGRATION ECOLOGY OF CRETZSCHMAR'S BUNTING  
(*EMBERIZA CAESIA*) THROUGH ELAT, ISRAEL**

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Cretzschmar's bunting (*Emberiza caesia*) is a monotypic species with a very restricted distribution. It breeds only in the eastern Mediterranean warm-temperature zone of the western Palaearctic (Gillings and Hallmann, 1997). The species is migratory and winters in the subtropical zone in northeastern Africa and in the southern Arabian Peninsula. Migration is usually nocturnal, on a broad front, and staging stops can also be diurnal (Shirihai, 1996). Cretzschmar's bunting circumnavigates the Mediterranean Sea by flying along the eastern flyway that passes through the Middle East. In Israel, Cretzschmar's bunting is classified as a common autumn (mainly September) and very common spring (mainly March) passage migrant in most parts, and is also a fairly common breeding summer visitor in northern and central Israel. Shirihai (1996) reports that flocks of 500–1000 Cretzschmar's buntings have also been documented in the same areas in the 1980s. Hence, in order to enhance our understanding of the migration ecology of the different age and sex groups of Cretzschmar's bunting, we analyzed the data 1984–2000 for all individuals ringed at Eilat, Israel.

Data were obtained from the International Birding and Research Centre in Eilat (IBRCE). Just north of Eilat (29°33N, 34°57E), it is the only long-term ringing station in the Middle East. Ringing was initiated in 1984; however, owing to changes in agricultural practices and political pressures, the ringing location has changed three times (Morgan and Shirihai, 1997).

A total of 528 (range 3–161) Cretzschmar's buntings have been ringed at Eilat in the past 17 springs and none recovered or controlled elsewhere. We analyzed the data cumulatively for biometrics, and only data of springs 1984, 1990, and 2000 were further analyzed for phenology because only in these seasons was a large enough sample size caught and ringed. Arrival time is presented in Julian dates. Further, not all birds were sexed by the ringer, and data on wing chord length or body mass was not collected (methods Svensson, 1992) for all individuals, which has resulted in a large variation in sample sizes. We classified the birds into four age or sex classes—adult male, first calendar-year male, adult female, and first calendar-year female (cf. Small, 1992). Individuals not ascribed to one of these classes were not included in the biometric analyses.

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## PHENOLOGY

We found great differences in the migration phenology expressed as trapping time and pattern of the sexes ( $c^2 = 53.62$ ;  $df = 7$ ,  $p < 0.0001$ ; Fig. 1). During 1984, the median date of arrival for males and females was not significantly different (Mann–Whitney U-test,  $U = 874.5$ ,  $p = 0.172$ ; Table 1). However, during spring 1990, males arrived 6 days before females ( $U = 115.0$ ,  $p = 0.012$ ), and during spring 2000 males arrived 11 days earlier ( $U = 222.5$ ,  $p = 0.0001$ ). Cumulative analyses of the within-season samples showed that males arrived on average five days earlier than females ( $U = 3337.5$ ,  $p = 0.001$ ; Table 1).

We also obtained differences in the median date of passage when classified into the four age or sex classes—adult male, first calendar-year male, adult female, and first calendar-year female (median test,  $c^2 = 12.82$ ,  $df = 3$ ,  $p = 0.005$ ), but only differences between sexes were statistically significant.

DIFFERENCES IN MEASUREMENTS AND BODY MASS  
IN RELATION TO SEX AND AGE

Significant differences in wing chord length were found between the four sex and age classes (ANOVA,  $F_{3, 124} = 20.61$ ,  $p < 0.00001$ ; Table 2). However, post-hoc Student–Newman–Keuls test at  $p < 0.05$  showed that adult and first calendar-year males had

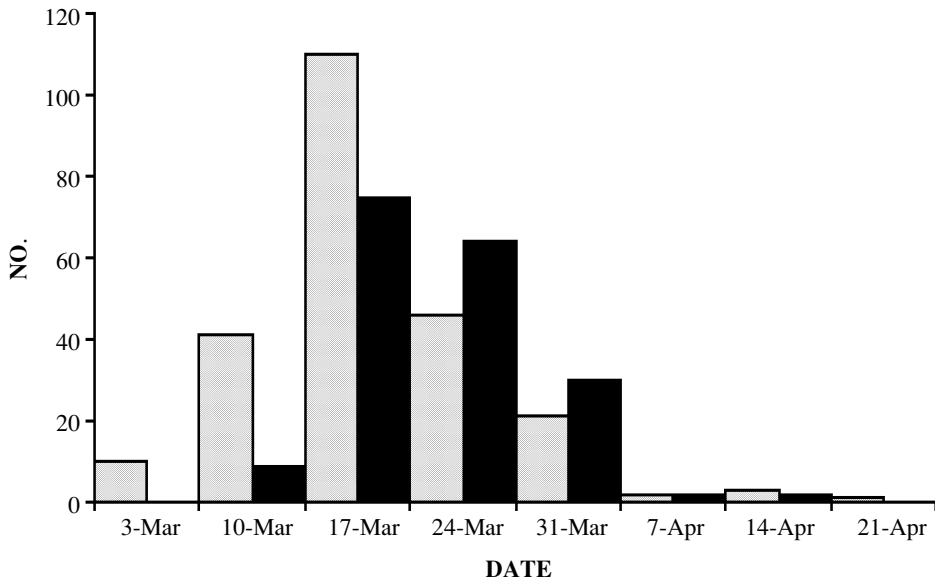


Fig. 1. Spring migration phenology of male (gray,  $N = 234$ ) and female (solid,  $N = 182$ ) Cretzschmar's buntings at Elat. Data from all years (1984–2000) pooled.

Table 1  
Spring passage (median, first, and last date ringed) of Cretzschmar's bunting at Elat, Israel

Year	Median		Range	
	Male	Female	Male	Female
1984	15 Mar	14 Mar	12 Mar – 18 Apr	13 Mar – 18 Mar
1990	15 Mar	21 Mar	8 Mar – 24 Mar	5 Mar – 4 Apr
2000	13 Mar	24 Mar	6 Mar – 28 Mar	8 Mar – 13 Apr
Avg. all years	15 Mar	20 Mar	26 Feb – 18 Apr	5 Mar – 13 Apr

Table 2  
Wing chord, tail length, and body mass of Cretzschmar's bunting on spring migration at Elat, Israel. All values presented as mean  $\pm$  SD (N)

	Wing (mm)	Tail (mm)	Body mass (g)
Male adult	86.0 $\pm$ 2.2 (32)	67.4 $\pm$ 3.3 (18)	18.9 $\pm$ 2.3 (32)
Male 1st yr	83.7 $\pm$ 2.8 (44)	66.8 $\pm$ 4.9 (13)	18.6 $\pm$ 1.7 (40)
Females adult	82.4 $\pm$ 2.5 (23)	64.6 $\pm$ 4.7 (11)	18.3 $\pm$ 2.2 (23)
Females 1st yr	81.5 $\pm$ 1.7 (29)	65.5 $\pm$ 4.2 (10)	18.9 $\pm$ 2.2 (28)

longer wings than adult and first calendar-year females, respectively. Further, adult males had longer wings than first calendar-year males.

We did not find significant differences in tail length (ANOVA,  $F_{3,48} = 1.28, p = 0.291$ ; Table 2) and body mass between the four age and sex classes (ANOVA,  $F_{3,119} = 0.51, p = 0.677$ ; Table 2).

#### WING CHORD LENGTH AND BODY MASS IN RELATION TO DATE OF PASSAGE

In males, wing chord length changed with the date of arrival (linear regression  $y = -0.065x + 0.026 - 0.24, t = -2.48, p = 0.014$ ) but was not significant for females ( $p = 0.667, N = 150$ ). However, in both sexes there was no significant change in body mass with the date of arrival at Elat (in both cases,  $p > 0.05$ ), also when residuals of body mass on wing length chord were used (in both cases,  $p > 0.1$ ).

The Cretzschmar's buntings in Elat start passage in March and arrive at their breeding places throughout April (Paz, 1987; Shirihai, 1996). Our results concur with Paz (1987), who suggested that males arrived about ten days before females. However, this did not occur during all the years of our study, and in spring 1984 there was no difference between the sexes. It is well-established that males of many bird species arrive on the breeding grounds before the females and that there is strong evolutionary pressure for a

fast northbound migration from the wintering grounds in the spring (e.g., Stolt and Fransson, 1995; Kokko, 1999).

The discrepancy of an average of 5 days between Paz (1987) and our results in the arrival time of both sexes (10 vs. 5 days) could be a result of the methodology applied. Paz (1987) presented his data based on detection of singing males during spring, which is easier than finding females in the field, and our study is based on ringing while on migration, which is random and hence more objective.

In our data the average wing chord, for both males and females, is about 2 mm longer than described in Cramp and Perrins (1994) and Glutz von Blotzhaim (1997). This is probably due to the fact that we measured live birds and Cramp and Perrins (1994) and Glutz von Blotzhaim (1997) based their biometric measurements almost exclusively on museum skins. The latter are less reliable because differences in measurements over time are known to occur due to shrinkage of skins in collections (e.g., Svensson, 1992). We obtained significant differences between sexes in wing chord. This phenomenon has been suggested, although not tested, by other authors (Cramp and Perrins, 1994; Svensson, 1994; Glutz von Blotzhaim, 1997) and is in accordance with the fact that among *Emberiza* buntings, males are larger than females (Olsson et al., 1995; Stolt and Fransson, 1995). Our results suggest that the earlier migrating individuals are larger males. In contrast, we did not find a similar relationship for females. In females, body mass is not only a function of the structural body size (especially wing length), but also fat, nutrients, and developing ovaries (Stolt and Fransson, 1995; Sandberg and Moore, 1996).

In conclusion, Cretzschmar's bunting exhibits a sex-related difference in phenology and body size while on passage through the Elat region. However, our study stresses the need for more detailed investigation in order to enhance our understanding of the migration strategies of the different sexes, age groups, and subspecies. No less important, our study also illustrates the almost complete lack of information about Cretzschmar's bunting in the breeding areas in Eurasia, their migration strategies, and the wintering grounds in Africa.

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