Body mass, wing length and spring arrival of the Ortolan Bunting *Emberiza hortulana*

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In this study, individual and sexual differences that may affect the time for spring arrival of Ortolan Buntings in southern Sweden are analysed. The median arrival date was, on average, about one week earlier in males than in females. We found that males with longer wings arrived before males with shorter wings. This applied in normal weather conditions as well as in a spring with prevailing cold northerly head-winds. In females, we found no correlation between wing length and time of arrival. In head-wind conditions the arrival of both sexes was delayed, and the first males arrived with lower body masses. Females arrived with a larger body mass in relation to wing length than males. It is briefly discussed what are the functional factors connected to wing length that may be of importance for the time of spring arrival. In males, body size, age, and flight performance are possible factors. In females, the individual date of spring arrival is evidently determined by other factors than those correlated to wing length.

1. Introduction

By comparing bird species, it has been shown that several aspects of wing morphology, such as length and pointedness, are related to migratory distance (e.g. Kipp 1958, Winkler and Leisler 1992). These morphological characteristics are thought to influence flight performance, such as flight speed (Pennycuick 1989). If an early arrival to the breeding grounds is important for the individual bird, we can expect that birds with relatively longer and more pointed wings should arrive, on average, before those with shorter and blunter wings. If there is an intra-sexual competition for an early arrival to breeding territories, we should expect to find the same relationship between individual wing morphology and date of arrival in females, as in males. Considering these statements, the present study set out to test if the time for the spring arrival of individual Ortolan Buntings in southern Sweden is related to their absolute wing length and body mass, and to compare the results observed for females with those for males.

The wintering areas of North European Ortolan Buntings are most probably situated in tropical West Africa. This is indicated from observations at Mount Nimba (Brosset 1984) and by the direction of autumn migration (Stolt 1977, 1987). The distance from the wintering area to southern Sweden is about 5800 km.

Recently, Claessens (1992) showed that the spring migration period through France is short, with a duration of only about three weeks. During the spring passage at Camargue, Isenmann (1992) found larger wing length and body mass for males than for females. It is also known that in spring, males arrive before females in northern Europe (Stolt 1977).

2. Material and methods

During the period 1950–1991 a total of 691 Ortolan Buntings were ringed at bird observatories in southern Sweden (south of 61°N) between April 29 and June 15 (Table 1). Sex was noted for 90 % of the birds. Data on wing length and body mass were available only for the years 1984–1991. Body mass was noted for 59 males and 45 females. Wing length (maximum length according to Svensson 1984) was noted for 63 males and 46 females.

The Ortolan Bunting is not known to breed in the neighbourhood of any of the ringing stations included, and this fact, together with ringing recoveries, indicates that the Ortolan Buntings trapped at these stations are migrating birds. Therefore, the trapping dates can be expected to show the time for the passage of birds on spring migration, shortly before the arrival at their northern breeding area.

During May 1991, the weather situation was extremely unfavourable for the arrival in Scandinavia of spring migrants. In a large part of northern Europe the spring weather of 1991 was characterized by prevailing northern winds and repeated cold-spells from the north (SMHI 1991). This was also evident from the wind observations made for the month of May at the southernmost point of Öland, during the period 1984–1991. Northerly winds (WNW–ENE) during the night were more frequent in 1991, than in the other years (data from the Swedish Meteorological and Hydrological Institute). Therefore, in our analyses, data from 1991 are treated separately.

In many passerines, juvenile birds are known to have shorter wings than adults (e. g. Alatalo et al. 1984). By ageing and measuring the Ortolan Bunting skins in the collection of the Swedish Museum of Natural History, we found that in male Ortolan Buntings the mean difference in wing length between the two age groups was about 1 mm. The older males had longer wings, but the difference was not significant (86.9 mm, $n = 15$ and 85.9 mm, $n = 17$, $t = 1.54$, $P = 0.13$). For females, the number of skins was not large enough to give a useful measure.

3. Results

3.1. Phenology

During 1950–1990, males (md = 11 May) arrived about a week earlier than females (md = 18 May). Corresponding values for 1991 were, 22 May for males and 28 May for females. The time difference between the sexes was almost identical with normal years, but in 1991, males passed 11 days and females 10 days later than normal (Table 2).

Table 1. Numbers of Ortolan Buntings *Emberiza hortulana* ringed during spring passage in 1991 and during the period 1950–1990, at trapping sites in southern Sweden (south of 61°N). M = male, F = female, U = unsexed.

	Year 1991				Period 1950–1990			
Trapping site	M	F	U	Total	M	F	U	Total
Falsterbo	1	–	–	1	19	13	4	36
Torhamn	9	8	2	19	64	97	15	176
Ottenby	8	8	1	17	183	152	37	372
S Gotland	–	–	–	–	2	1	1	4
Nidingen, Getterön	–	–	–	–	16	15	6	37
Hammarön	–	–	–	–	2	1	–	3
Landsort	2	3	1	6	2	2	1	5
Eggegrund	2	3	–	5	6	3	1	10
Total	22	22	4	48	294	284	65	643

3.2. Wing length in relation to date of passage

Males had longer wings than females (Table 3, t = 9.76, $P < 0.001$). The mean difference was about 5 mm. During the period 1984–1990, as well as in 1991, males with longer wings arrived, on average, before those with shorter wings. According to the regression model, the first males to arrive had, on average, 4–5 mm longer wings than the later arrivals (Fig. 1A and C).

For females, wing length did not change with the date of arrival (Fig. 1B and D).

3.3. Body mass in relation to date of passage

In 1991, there was a strong tendency that males arriving first had a lower body mass than those arriving later ($r^2 = 0.42$, b = 0.37, t = 2.0, P = 0.06, n = 21). This occurred despite males with longer wings arriving first, and despite the fact that during the years 1984–1990, there was a strong correlation between wing length and body mass in males ($r = 0.51$, $P < 0.001$, n = 39).

No significant difference in mean body mass

Table 2. Spring passage of Ortolan Buntings *Emberiza hortulana* in southern Sweden. Only birds ringed at trapping sites south of 61°N are included. Numbers of birds ringed are given according to ringing date in 1991 and during the period 1950–1990. M = male, F = female, U = unsexed.

Date	Year 1991				Period 1950–1990			
	M	F	U	Total	M	F	U	Total
Apr 26–30	–	–	–	–	1	1	1	3
May 1–5	–	–	–	–	50	4	3	57
May 6–10	1	–	–	1	92	31	12	135
May 11–15	3	–	–	3	72	58	17	147
May 16–20	6	1	1	8	54	86	10	150
May 21–25	8	5	1	14	12	54	13	79
May 26–30	4	13	1	18	11	32	6	49
May 31–4 June	–	1	1	2	–	14	3	17
June 5–9	–	–	–	–	2	3	–	5
June 10–14	–	2	–	2	–	1	–	1
Total	22	22	4	48	294	284	65	643
Md	22 May	28 May	27 May	25 May	11 May	18 May	20 May	15 May

Table 3. Wing length (mm) and body mass (g) of Ortolan Buntings *Emberiza hortulana* on spring migration at trapping sites in southern Sweden in 1991, and during the period 1984–1990.

	Spring 1991			Period 1984–1990		
	Mean ± SD	Range	n	Mean ± SD	Range	n
Wing						
Males	89.3 ± 2.7	83–95	21	88.5 ± 2.8	83–94	42
Females	84.4 ± 1.8	81–88	22	84.0 ± 1.9	81–89	24
Body mass						
Males	23.9 ± 2.2	20–27	20	24.3 ± 2.2	20–32	39
Females	24.0 ± 1.5	21–27	22	24.1 ± 1.9	20–27	23

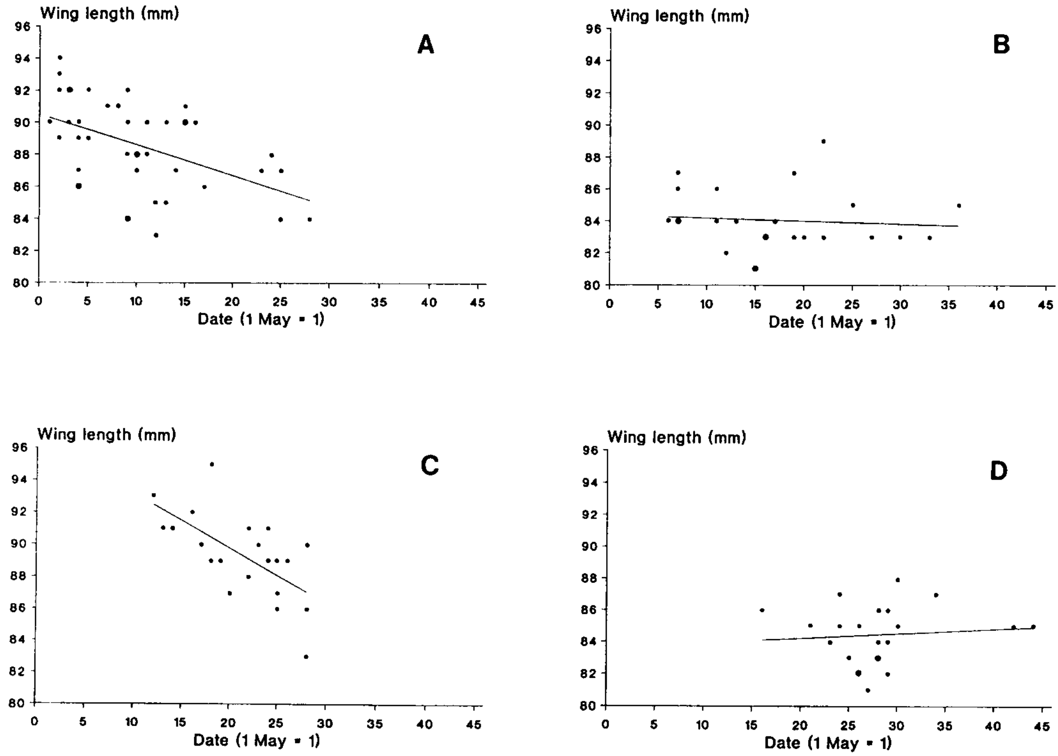

Fig. 1. Wing length in male and female Ortolan Buntings *Emberiza hortulana* in relation to date of passage during spring migration in southern Sweden. Smaller and larger dots refer to 1 and 2 birds, respectively. A = males during the period 1984–1990 ($r^2 = 0.23$, $b = -0.19$, $t = 3.5$, $P < 0.01$, $n = 42$). B = females, 1984–1990 ($r^2 = 0.01$, $b = -0.02$, $t = 0.4$, NS, $n = 24$). C = males in 1991 ($r^2 = 0.41$, $b = -0.34$, $t = 3.6$, $P < 0.01$, $n = 21$). D = females in 1991 ($r^2 = 0.01$, $b = 0.03$, $t = 0.4$, NS, $n = 22$).

was found between males and females when they arrived in Scandinavia, despite males having longer wings (Table 3).

4. Discussion

4.1. Why do males with longer wings arrive before males with shorter wings?

It is a common opinion among ornithologists at Swedish bird observatories that in several species experienced adults arrive in spring before inexperienced second-year birds. This is, for instance, known in the Pied Flycatcher *Ficedula hypoleuca* (Lundberg & Alatalo 1991). In the Ortolan Bunting, the range of variation in wing length in males was 12 mm. Nonetheless, the measurements of museum skins showed that the difference in mean wing length between the two age groups was only about 1 mm. Thus, if the difference in wing length between those arriving first and last was an effect only of age, we think it should not amount to more than about 1 mm. However, the mean difference was about 5 mm. This result indicates that in the Ortolan Bunting, age can explain only a part of the earlier arrival of males with longer wings.

It is obvious that an early arrival may give reproductive advantages, especially in competition for breeding territories. An early arrival may also mean disadvantages, and fat reserves may, for example, be exhausted if the bird arrives in a bad weather situation. The lower body mass for males arriving in 1991 seems to indicate this.

Since there are no indications that the average wing length should differ within the breeding area in Fennoscandia (Cramp & Perrins 1994), to which these birds are heading, the observed decrease in wing length cannot be explained by different populations passing through southern Sweden at different times. In a number of species a positive correlation has been demonstrated between wing length and the lean body mass of the birds (e.g. Rogers & Odum 1964, Ellegren 1989, Ellegren & Fransson 1992). Therefore, we can assume that Ortolan Buntings with longer wings are also the larger ones. Whether they also have a longer wing in relation to body size, we do not know. Larger birds may have a number of advantages. They may, for example, be dominant in competition for food at stopover sites, and, therefore, have shorter stopover periods and, hence, a higher overall migration speed (e.g. Lindström et al. 1990).

Thus, our results suggest that in male Ortolan Buntings wing length is a factor of importance for an early arrival in spring. However, whether this earlier arrival of long-winged individuals is caused by improved flight performance, age or body size, or by a combination of different factors remains to be shown.

4.2. Why is time of arrival not correlated to wing length in females?

The absence of a positive correlation between wing length and arrival may imply that in females the balance between arriving early and arriving in good condition is more in favour of good condition than in males. Arriving females also have a larger body mass in relation to wing length than males. In late spring, growing ovaries can be another factor increasing the body mass in females. In the Mediterranean area, Isenmann (1992) noted a mean body weight of 23.4 g (n = 15) for females and 24.4 g (n = 19) for males. In comparison with our data (Table 3), there is a small difference that may indicate an increase in weight on arrival in Scandinavia in females, but not in males.

Evidently, in females there seem to be other factors than the individual differences in wing length that are of decisive importance for the date of spring arrival.

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