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BODY CONDITION AND FAT SCORE IN LOCAL AND PASSAGE POPULATIONS OF THE GREAT REED WARBLER (*Acrocephalus arundinaceus*) DURING THE SPRING MIGRATION IN NE BULGARIA

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ABSTRACT

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The fat level and the body mass of local Great Reed Warblers in the Kalimok Field Station, NE Bulgaria (41°00'N, 26°26'E) were compared with those of passing birds. During the springs of 1998-2004, 591 individuals of this species were mist-netted and handled according to the guidelines in the Manual of Field Methods (ESF project) and to the South-East European Bird Migration Network (SEEN) standards. As local birds we identified 60 individuals caught at least twice in different seasons. The means of the fat score and the body mass calculated for the local birds and for the passing Great Reed Warblers were similar. Also, the time of the local birds arrival and the passage of the species in the region studied coincided. Therefore, we suggest that the southern and northern populations have equal potentials for realization of their migratory state and birds from southern populations could spread in spring to the north, being an important interregional gene flow in Great Reed Warblers.

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INTRODUCTION

The goal of the spring migration in the Palaearctic-African Migration System is to reach breeding sites in the temperate zone. The navigation of birds is very precise (Wiltschko and Wiltschko 1978, 1998). The physiology of migratory birds, storing fat for long sustained flights, is well known (Berthold 1975, Blem 1990). The higher body weight and the fat scores are indicators of migratory disposition that may be measured in the field (Busse 1970, Blyumenthal 1971, Dolnik 1975). However, only

few studies concerning the spring arrival along with the body weight and the fat score are available (Busse 1976, Lapshin 1978, Sandberg 1996, Fransson and Jakobsson 1998, Potti 1998). There is only one publication (Chernetsov 1999) presenting data on the arrival together with the pattern of the transit migration and the physiological condition of arriving and passing Reed Warblers (*Acrocephalus scirpaceus*). The available data show that some long-distance migrants arrive at their breeding grounds with considerable reserves of energy compared with the reserves of their conspecifics on migration (Sandberg 1996, Fransson and Jakobsson 1998). The high fat stores of the arriving migrants might be an adaptation for unpredictable weather conditions and limited food availability at stopover sites along the migration route and at the arrival sites in high latitudes (Sandberg 1996). Most of these publications are addressed to the western part of the migratory divide and nothing is known about the eastern part of the Palaearctic-African Migration System.

The aim of the present study is to examine how migrants of one species terminate their spring passage, *i.e.* how they synchronize the precise navigation and the end of the migratory disposition. Do migrants from the southern parts of the breeding area have a time advantage compared to those from northern areas, or the migratory state is an inside program of the same duration determined by basic environmental factors for both groups?

In order to answer this question, the fat level and the body mass of local Great Reed Warblers in NE Bulgaria were compared with those of passing birds.

MATERIAL AND METHODS

The spring migration of the Great Reed Warbler in eastern part of the Balkan Peninsula was studied using mist-netting data from the Kalimok Field Station (NE Bulgaria). The station is located in the central part of the Lower Danube Plain (41°00'N, 26°26'E) and has been operating as a constant ringing site since 1995. The Great Reed Warbler breeds in great numbers in the trapping area and nearby. During the springs of 1998-2004, 591 Great Reed Warblers were mist-netted and ringed according the protocols of ESF project (Bairlein 1995) and the SEEN (South East European Bird Migration Network) standards (Busse 2000). The ringing in spring of 2000 was constrained to only few days resulting in lack of data (Table 1). Fat was scored after Kaiser (1993).

Table 1
Numbers of ringed Great Reed Warblers during the period of study

Spring seasons	1998	1999	2000	2001	2002	2003	2004	Total
Ringed birds	87	30	2	252	79	73	68	591
Controls	12	8	1	19	13	4	3	60

As local birds, we recognised 60 individuals caught at least twice in different seasons. Over 60% (n = 47) of these individuals were repeatedly controlled over several years.

RESULTS

From 0 to 26 days elapsed between the first capture of a Great Reed Warbler and the capture of first local individual in the spring (Table 2). The patterns of arrival and passage of the species seem to coincide (Fig. 1).

Table 2
Time of arrival of local breeders and passing northern birds

Year	Date of first capture	Date of first capture of a local bird	Elapsed time in days
1998	29 Apr.	1 May	2
1999	24 Apr.	24 Apr.	0
2001	6 Apr.	24 Apr.	18
2002	30 Apr.	1 May	1
2003	16 Apr.	12 May	26
2004	6 Apr.	12 Apr.	6

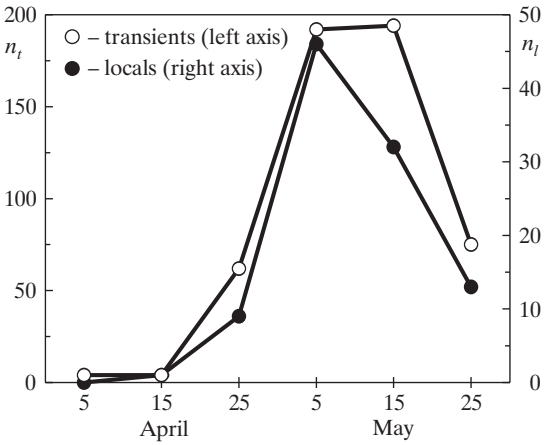

Fig. 1. Patterns of transit passage and arrivals of local birds

The means of body mass calculated for the local birds and for the passing Great Reed Warblers were similar (Table 3). There were no significant differences between the two samples (t = 0.24). However, distributions of mean body mass for local birds and for passing individuals as presented in Figure 2 show some differentiation that cannot be further discussed on the basis of available data.

No significant difference in the fat scores of passing birds and the fat scores of local birds at the arrival was registered (Table 4). The distributions of fat score are

Table 3
Comparison of body mass of passing birds and first arrivals of local birds

	Transient birds	Local birds
Mean ± 1.96 *SE*	30.76 ± 0.25	30.67 ± 0.66
Number of observations (*N*)	444	59
Standard deviation (*SD*)	2.70	2.56
t-test between means	$p = 0.40$	

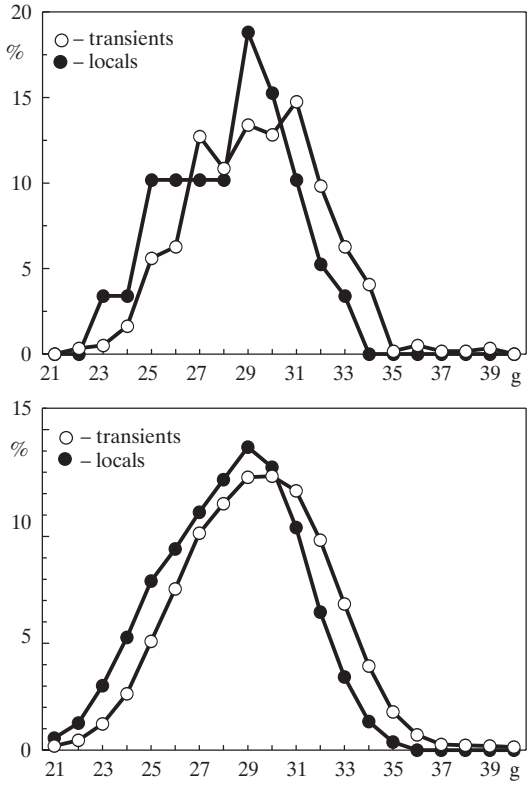

Fig. 2 . Distributions of body mass of transient and local individuals. Upper panel – raw data, lower panel – data smoothed by moving average.

Table 4
Comparison of fat level of passing birds and first arrivals of local birds

	Passing birds	Local birds
Mean ± 1.96 *SE*	2.00 ± 0.15	2.28 ± 0.42
Number of observations (*N*)	437	60
Standard deviation (*SD*)	1.57	1.66
t-test between means	$p = 0.11$	

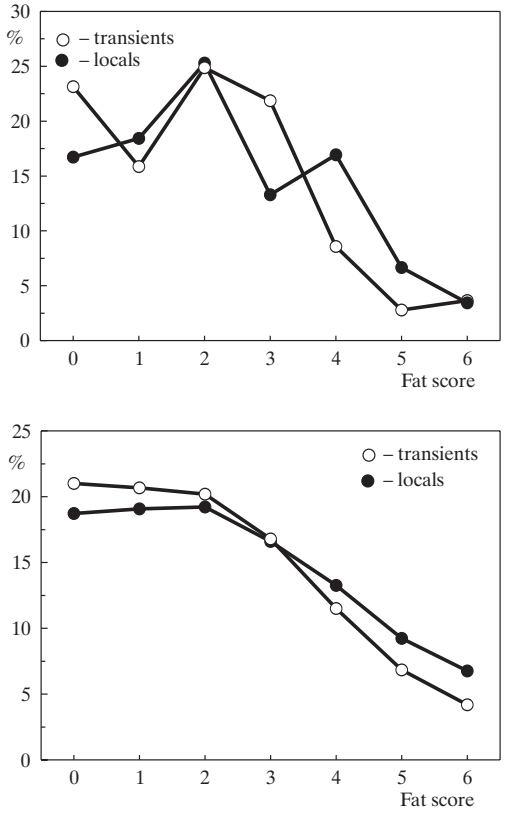

Fig. 3 . Distributions of fat scores of transient and local individuals. Upper panel – raw data, lower panel – data smoothed by moving average.

presented in Figure 3 and they show suspicious distributions similar to these in Figure 2.

DISCUSSION

The means of the fat score and the body mass calculated for the local and for the passing Great Reed Warblers in NE Bulgaria were similar, but note slight differences in patterns. In Willow Warblers (*Philoscopus trochilus*) arriving at breeding sites in Gotland and Swedish Lapland, higher fat scores were recorded compared to the fat stores of passing individuals (Sandberg 1996, Fransson and Jakobsson 1998). On the contrary, on the Curonian Spit, the body mass, body condition and proportion of fat individuals among local Reed Warblers having completed migration were significantly lower than in their passage conspecifics (Chernetsov 1999). The results from Swedish Lapland suggest the relation between the species-specific migratory habits and foraging modes, and the amount of fat reserves carried upon the arrival on the breeding grounds (Sandberg 1996). Recent findings in the study of energy deposition of passerine birds along the migration route suggest that free-living mi-

grants modify deposition rates in response to factors other than food availability alone (Schaub and Jenni 2000). There is also evidence for the fat deposition response of long-distance migrants to the magnetic field along the migratory road (Fransson *et al*. 2001). The physiology of migratory birds is genetically determined and under the control of basic environmental factors (Berthold 2001).

In addition, the periods of the arrivals of the local Great Reed Warblers and the passage of this species in the Balkan region coincide. The phenology of arriving birds and of passing birds in spring is similar for the Reed Warblers in the Curonian Spit (Chernetsov 1999). These smilarities suggest equal durations of the period of endogenous program governing spring migration of southern and northern populations of long-distance migrants. A question arises whether birds from southern populations have time advantage in spring and what is the role of philopatry and juvenile dispersal in the population structure of long-distance migrants such as the Great Reed Warbler. Dispersion is of prime importance for many evolutionary processes and has been studied for decades. Lifetime fitness of short- and long-distance dispersing individuals has been studied in Great Reed Warblers at a Swedish study site revealing relatively high proportion of long-distance dispersers (Hansson *et al*. 2004). A new approach to studying dispersal in the Great Reed Warbler reviled significant role of few dispersing females in interregional gene flow of Swedish population (Hansson *et al*. 2003). Obviously, there are no clear parameters of the migratory disposition (fat level and body weight) we can use for identification of southern and northern populations of the Great Reed Warbler in spring migration. Therefore, we suggest that the southern and northern populations have equal potentials for realization of their migratory state, *i.e.* birds from southern populations could spread in spring to the north and this may be an important interregional gene flow in Great Reed Warblers.

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