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Phenology, duration and site fidelity of wintering bluethroat (*Luscinia svecica*) at Eilat, Israel

M. Markovets, R. Yosef*

International Birding and Research Centre in Eilat, P.O. Box 774, Eilat 88000, Israel

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Abstract

Between 1984 and 2002, a total of 7643 Bluethroats were ringed and 1054 of these were recaptured at the International Birding and Research Center (IBRCE) in Eilat, Israel (29°33'N, 34°57'E). The autumn migration of Bluethroat begins in September and ends in early December (median 01-Nov). The spring migration starts in early March and continues till May (median 21-Mar). Wintering Bluethroats arrive during October and November and stay in Eilat until March and April. The Bluethroats remain at the winter quarters for up to 4 months, though some individuals could linger for as long as more than 5 months. The majority of the wintering population was males (65.3%) and adult birds (66.1%), the sex ratio during winter (65:35) did not differ significantly from the sex ratio during autumn migration (60:40). The ratio between young and adult birds at Eilat during winter (66:34) differed significantly from the autumn migration (75:25). Wintering site fidelity for six seasons (consecutive autumn through spring) from 1996 to 2001 was 1.8%. Wintering site fidelity of Bluethroats when compared between birds that winter for the second and third season shows a recovery rate of 37.1%.

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*Corresponding author.

E-mail address: ryosef@eilatcity.co.il (R. Yosef).

1. Introduction

Ever-increasing understanding of the processes that govern migration is being achieved owing to direct observations of migratory flyways, studies of stopover ecology and behavior, and research of orientation and navigational abilities (Alerstam, 1990; Berthold, 1996). The component of the annual migration cycle that has been least studied is the over-wintering ecology of migrants, especially of the long-distance species, at the wintering sites (Salewski, 1999; Salewski et al., 2000). Winter site fidelity has been reported for a limited number of species (e.g. Blackcaps, *Sylvia atricapilla*, Eurasian Robin, *Erithacus rubecula*; Cuadrado, 1992) but most of the Palearctic migratory species remain to be studied at their wintering quarters in the Mediterranean Basin, Middle East and Africa.

The Bluethroat (*Luscinia svecica*) is a polytypic species, widespread from the northern Palearctic from Scandinavia to Alaska and from the Siberian arctic tundra to the Himalayan Mountains. There is limited knowledge of the winter quarters of the different subspecies of Bluethroats, and no information is available about their wintering ecology and behavior (Cramp and Perrins, 1994). Ellegren (1991) reported that Bluethroats spend their winter in Iberia, the southern Mediterranean region, in Africa, the Middle East and India.

In Israel, the wintering areas of the Bluethroat are well known (Shirihai, 1996). The Bluethroat winter in low-lying areas in damp habitat near water in the northern valleys and along the Jordan River, in the desert near sewage plant and in oases. This paper examines the phenology and duration of wintering Bluethroats in the Eilat region. This is of special interest because of the extreme conditions with which this temperate zone breeding species has to contend with at the wintering quarters in Eilat that is in the desert.

2. Material and methods

Trapping and ringing of birds has been conducted at the International Birding and Research Center (IBRCE) in Eilat, Israel (29°33'N, 34°57'E) for the past 19 years. Eilat is located at the southernmost tip of Israel and lies within the Saharo-Arabian desert, characterized by extreme temperatures and a very low precipitation (avg. Annual rainfall 17 mm).

Between 1984 and 2002, a total of 7643 Bluethroats were ringed. Of these, 1054 (14.0%) individuals were re-captured. Certain individuals were re-captured several times each year, or between seasons and years, such that there were a total of 2247 recaptures.

The trapping stations were changed three times during the course of this 19-year study (Morgan and Shirihai, 1997). Since the spring of 1996 to the present, birds have been trapped in a 68-hectare Bird Sanctuary (IBRCE) that is positioned equidistant from the two earlier study areas that were used from 1984 to 1995. In all of the study years, Bluethroats were captured in large numbers. Hence, we assumed

that the precise location of the trapping station was not a factor that influenced this study.

The data analysed in this study were collected in the normal process of the work conducted at the IBRCE ringing station and no special efforts were made to trap the study species. Hence, the data are random and we consider it to be representative of the migration and over-wintering at Eilat, Israel.

For the purposes of this study, an overwintering Bluethroat was defined in one of two categories: ones that were trapped for the first time between 1 December and 1 March; and individuals that were trapped prior to 1 December but were re-trapped at least 60 days after their first capture in Eilat. All captured Bluethroats were ringed with numbered aluminium rings, and aged and sexed (see Svensson, 1992) based on the coloration of the tips of the greater coverts—juveniles having light brown edges and adults dark edges. We measured minimum wing chord and tail length to the nearest mm, and registered body mass, for each individual.

3. Results

Migration: A total 7643 Bluethroat were ringed between 1984 and 2002. Of these a total of 950 (12.4%) were during the spring migration and 6693 (87.6%) in the autumn. We aged 7296 of the birds and they comprised 1830 (25.1) adults and 5466 juveniles (74.9); and 7174 were sexed and 4296 (59.9%) were males and 2878 (40.1%) females.

Wintering period: We compared 5-day (pentade) dynamics of first captured Bluethroats during spring and autumn migration in Eilat from 1984 to 2002. During autumn migration the number of Bluethroats recaptured begins to exceed the number of first captures by the first pentade of December (Fig. 1). In spring, the number of the first captures of Bluethroats exceeds the number of recaptures until approximately mid-March (Fig. 2). Analysis of pentade dynamics indicates that at Eilat, autumn migration ends by 1 December, and spring migration does not begin before 1 March (Table 1).

Duration of wintering: It is possible to determine the duration of Bluethroats wintering period in three ways: (1) extreme dates of presence at a wintering place that totals 191 days (Table 1); (2) median terms of arrival and departure from a wintering place that totals 126 days (Table 1); (3) maximal duration from life-history of birds in Eilat that totals 165 days (Table 2).

Analysis of 102 retrapped Bluethroats in Eilat for at least 90 days from December through February shows that the duration of wintering of adult birds ($N = 30$, mean 116 days) is less than the duration of wintering first-year Bluethroats ($N = 72$, mean 122 days) but this difference is not statistically significant (Mann–Whitney U -test, $U = 856.5$, $Z = 1.641$, $p = 0.101$). Thirty-seven females spent on average less wintering time than 65 males (118 days vs. 121 days) in Eilat; this difference is also not statistically significant (Mann–Whitney U -test, $U = 1027.5$, $Z = -1.01$, $p = 0.307$).

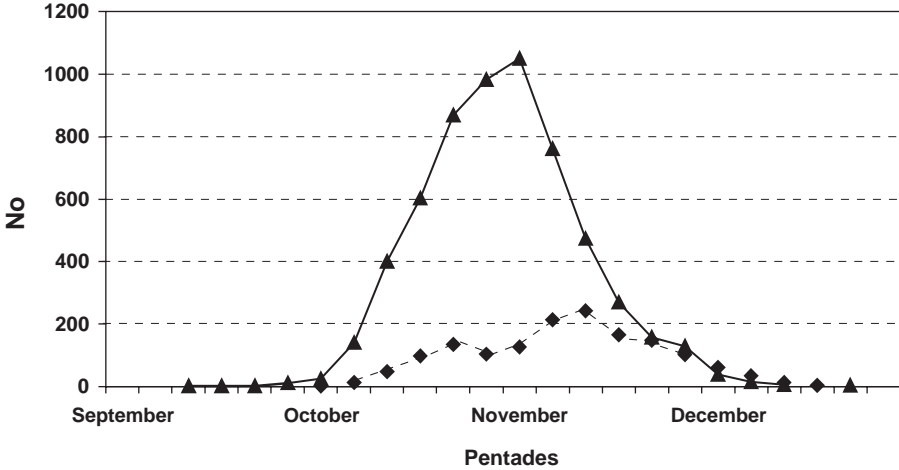


Fig. 1. Distribution of Bluethroats caught at Eilat, Israel, during autumns 1984–2002. Triangles and solid line denote first trapped birds, and quadrates and dotted line the retraps.

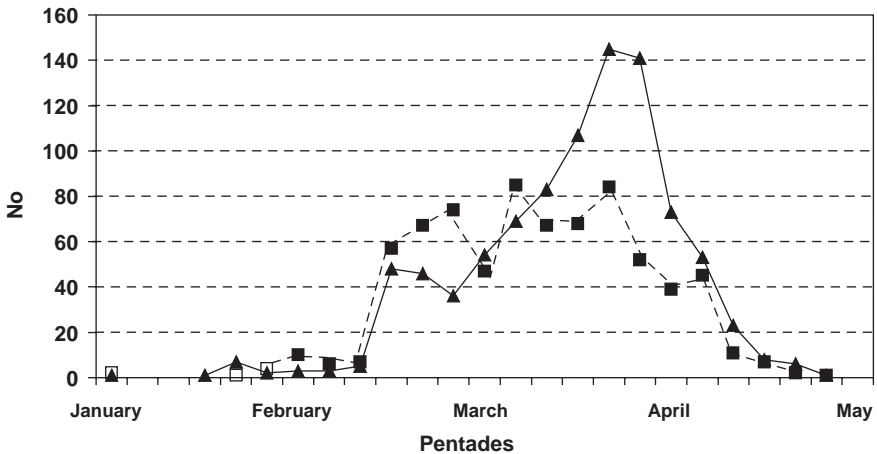


Fig. 2. Distribution of Bluethroats caught at Eilat, Israel during springs 1984–2002. Triangles and solid line denote first trapped birds, and quadrates and dotted line the retraps.

Sex and age wintering birds: The sex and age of recaptured Bluethroats ($N = 178$) present in Eilat for at least 60 days were analysed. The majority of the wintering population was males (65%). The sex ratio was significantly different from 50:50 ($df = 1, \chi^2 = 6.12, p = 0.013$). However, the sex ratio during winter (65:35) did not differ significantly ($df = 1, \chi^2 = 1.66, p = 0.197$) from the sex ratio during autumn migration (60:40). In contrast, the ratio between young ($N = 124$) and adult birds ($N = 65$) at Eilat during winter (66:34) differed significantly ($df = 1, \chi^2 = 9.35, p = 0.002$) from the autumn migration (75:25).

Table 1
Median and mean capture dates of Bluethroats (*Luscinia svecica*) at Eilat for the years 1984–2001

	Season	First catch	Last catch	Median	Mean
First catch	Spring	01-Jan	08-Mai	21-Mar	17-Mar
	Autumn	13-Sep	26-Dec	01-Nov	01-Nov
Retraps	Spring	05-Jan	29-Apr	12-Mar	11-Mar
	Autumn	05-Oct	22-Dec	12-Nov	11-Nov
Retraps > 60 day	Spring	01-Mar	19-Apr	16-Mar	17-Mar
	Autumn	10-Oct	01-Dec	10-Nov	10-Nov

Table 2
Length of stay of over-wintering Bluethroat based on maximal life-history during one season at Eilat

Ring number	Sex	Age	First catch	Last catch	Days
T 56315	F	5	16-Nov	16-Apr	151
A 122601	F	5	2-Nov	3-Apr	152
X 64521	M	6	8-Nov	10-Apr	153
X 24452	M	5	10-Oct	14-Mar	155
X 86613	M	6	19-Oct	23-Mar	156
X 97811	M	5	22-Oct	4-Apr	165

Wintering site fidelity: For six seasons (consecutive autumn through spring) from 1996 to 2001, a total of 1916 Bluethroats were ringed (1577 in autumn and 339 in spring). Of these, 35 (1.8%) individuals were re-trapped in the following season. An additional 13 (0.7%) Bluethroats were re-trapped for three consecutive seasons; two (0.1%) individuals were re-trapped in each of four consecutive seasons; and one (0.05%) bird was captured during five consecutive seasons. The highest percentage of re-trapped individuals in consecutive seasons occurred in 1998–99 when 270 birds were ringed and 21 (12.8%) were re-trapped in 1999–2000. Higher wintering site fidelity of 37.1% is evident if we compare between birds that winter for the second and third season.

4. Discussion

The Bluethroat is obviously a species that conducts a loop migration, i.e., that they migrate south in autumn via Eilat in large numbers (Fig. 1) but return north in the spring via an as yet unknown flyway resulting in very low numbers in Eilat in the spring (Fig. 2). The majority of the Bluethroats migrating through Eilat belong to the more eastern subspecies: *volgae* and *pallidogularis* which also explains the rather late autumn migration (median 01-Nov). The birds stop in the autumn in Eilat on the path to their assumed wintering areas in East Africa. In the spring they return bypassing Eilat, probably by following the Red Sea shore, cross over to the Arabian

Peninsula and the Persian Gulf in a direct flight path to their breeding grounds. Lack of ringing recoveries of birds ringed at Eilat prevents our understanding of their migratory routes and wintering grounds. However, to date only two Bluethroats ringed in Israel have been controlled in Russia and the Ukraine (Bear and Nitzan, 1999). It is logical to assume, that these birds belong to subspecies *volgae*.

Data collected at Eilat, from 1984 to 2002 indicate that the wintering population of Bluethroats arrives during October and November. Autumn migration ends by the first pentad of December and disagrees with Shirihai (1996) who postulated that Bluethroat migration ends by mid-December. Bluethroats remain at the winter quarters for up to 4 months, though some individuals could linger for as long as more than 5 months (Table 2). The first wave of spring (north bound) migrants appears in Eilat in the first decade of March and contradicts Shirihai (1996) who stated that the spring migration of the Bluethroats begins in mid-February. We suggest that the differences in timing postulated by Shirihai and the dates determined in the present study arise due to the differences in the number of seasons included in the studies. Data used by Shirihai (1996) is limited to the years 1984–1993, i.e., 10 years, as compared to our 19 years of data. Further, during the 1990s ringing was also conducted during parts of winter, larger numbers were trapped at the Bird Sanctuary of the IBRCE, and subsequently larger numbers were re-trapped resulting in the discrepancy observed. We believe that we are able to determine more precisely the first wave of spring migrants upon their arrival in Eilat.

The lack of a significant difference in duration in Eilat between age and sex groups is most likely related to the small sample size and could be the result of the fact that wintering birds learn the locations of the mist-nets in their territories and avoid them. We believe that if more time and effort are directed to the trapping of Bluethroats, we may find significant differences in the overwintering population of adults and juveniles, and males and females.

The predominance of males in the wintering population of Bluethroats in Eilat suggests that the species has the strategy of males wintering further north than females as has been reported for other species (e.g. Møller, 1994; Stolt and Fransson, 1995; Kokko, 1999). It has been suggested that males should winter closer to the breeding grounds because early arrival in the spring is at premium among territorial species, with first arriving males occupying the best territories. Also, our data show that males predominate as migrants at Eilat and probably also influences the proportion of overwintering individuals at Eilat. The finding that there are more adult than juvenile birds overwintering at Eilat, and this differs from the ratio of adult vs. juvenile birds migrating through Eilat, suggests that there are age and/or sex related differences in the migration strategies in the Bluethroats. However, the lack of information from other wintering sites prevents us from making any comparisons as to whether indeed males winter closer to the breeding grounds or if experienced adults have an advantage over the first-year migrants.

Data collected in this study at Eilat shows that wintering Bluethroat have high site fidelity between years. Breeding populations of long-distance migrant passerines often have recovery rates of less than 1.8% (Sokolov, 1997). Salewski et al. (2000) found site fidelity of 39% for a long-distance migrant passerine, the Pied Flycatcher

(*Ficedula hypoleuca*), in Africa. The recovery rate of 37.1% for the Bluethroats at Eilat is more than the 13.6% reported for Reed Warblers (*Acrocephalus scirpaceus*) in Uganda (Pearson, 1972; Dowstt-Lamaire and Dowsett, 1987). Such (37.1%) winter site fidelity is comparable with breeding philopatry found for many long-distant migrants in populations with good controls (Sokolov, 1997). This recovery rate shows that local survival of Bluethroat between two consecutive winters is comparable to that of the survival of long-distance migrants on the breeding grounds (Payevsky, 1985).

We think that the attraction of the IBRCE Bird sanctuary can be explained in the following sequence of events in the annual migration cycle of an individual: A young Bluethroat flying south for the first time in autumn randomly arrives in the Eilat-Aqaba area and finds a suitable habitat which is near fresh water (pers. obs.). The following autumn, these birds return to winter in the same area and form the nucleus of the adults, along with a new cohort of juvenile birds. Shirihai (1996) estimated the size of the overwintering population to be 110 individuals. We consider the relatively limited fresh water habitats in the Eilat area to be a limiting factor and the reason that a relatively small number of Bluethroats over winter in the region.

Winter is frequently implicated as the period when populations of migratory populations are most limited (Sherry and Holmes, 1996). Baillie and Peach (1992) showed that prolonged drought in the sub-Saharan regions of Africa negatively affected certain European-African migrant populations, and supported the winter limitation hypothesis (Robbins et al., 1989). Similarly, the evidence presented in this paper of wintering site fidelity for the Bluethroat has important conservation implications. This is especially true for species with narrow habitat requirements, such as the Bluethroat and other temperate migrants, and that need aquatic, especially fresh water, habitats. Hence, it is important that an effort be made to conserve the few remaining habitats in the region for the over-wintering and migratory populations that avail of the Eilat flyway.

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