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ZDRAVKO DOLENEC

PETRA DOLENEC

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Changes in spring migration of the wood pigeon (*Columba palumbus*) in northwestern Croatia

Zdravko DOLENEC[1,*], Petra DOLENEC[2]

[1]Department of Zoology, Faculty of Science, University of Zagreb, Rooseveltov trg 6, HR-10000 Zagreb - CROATIA

[2]Mokrice 132, HR-49243 Oroslavje - CROATIA

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Abstract: Several papers have shown the sensitivity of birds as monitors of climatic trends. We examined how a short-distance migrant bird, the wood pigeon, has responded to the recent climate change using data from a long-term study (1983-2007) in northwestern Croatia. The wood pigeon arrival dates have become 11.5 days earlier during the study period. This result suggests that the first arrival date of the wood pigeon is influenced by warm springs.

Key words: *Columba palumbus*, first arrival dates, spring temperatures, northwestern Croatia

The mean global temperature has increased between 0.3 and 0.6 °C over the last century (Houghton et al., 2001). Climate change over the past decades has led to advancing phenology of many organisms (e.g. Parmesan and Yohe, 2003). Some birds have started nesting earlier (e.g. Sergio, 2003) and some have earlier arrival dates (e.g. Both et al., 2004; Murphy-Klassen et al., 2005). The main aim of this research is to describe the change in the first arrival date of the wood pigeon and identify relationship between spring temperatures and spring migration. Many factors play an important role in predictions about spring phenological responses to climate warming. Among all meteorological parameters, we analyzed air temperature. According to Sokolov et al. (1998) and other authors, air temperature is the best predictor of weather and climate condition.

This study was conducted between 1983 and 2007 on a local breeding population, in a mixed agricultural landscape and small deciduous woods in a Mokrice area (lat 46°00´N, long 15°55´E) in northwestern Croatia. All observations during the whole research period were registered by authors (1983 – 2002: Z. Dolenec and 2003 – 2007: Z. Dolenec and P. Dolenec). To collect these observations, the study site was visited daily during February, March, and April. Mean monthly air temperatures (1983 – 2007) were obtained from the Meteorological Office in Zagreb (measured in the town of Maksimir – 20 km from Mokrice area) (February, mean = 2.3 °C, SD = 3.12, range = –3.6 to 6.9 °C; March, mean = 6.66 °C, SD = 2.23, range = 1.7 to 10.3 °C; April, mean = 11.4 °C, SD = 1.35, range = 8.2 to 14.2 °C). Correlation between mean spring temperatures (mean February – March – April) and year was significant (r = 0.401,

* E-mail: dolenec@zg.biol.pmf.hr

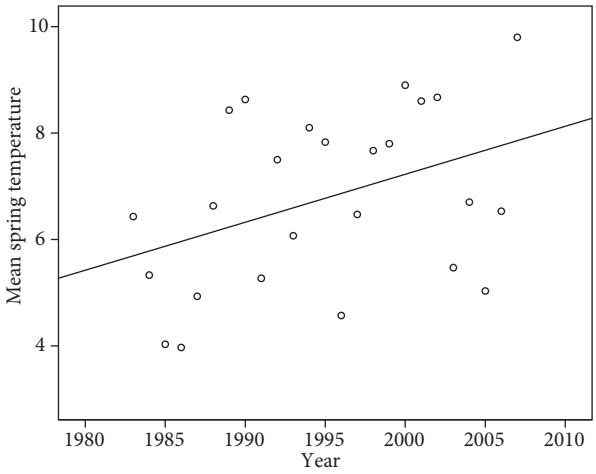

Figure 1. Relationship between spring temperature (°C) and year in the study area (1983 – 2007).

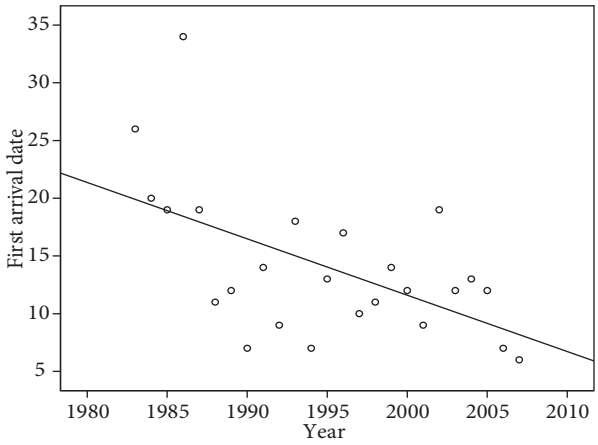

Figure 2. Relationship between first arrival date (1 March = 1) and year in the wood pigeon (1983 – 2007).

P = 0.047, N = 25; Figure 1). First arrival dates for each year was calculated as the mean of the first 3 arrivals recorded for that year. All statistics were calculated using SPSS 13.0. The threshold for statistical significance has been set at the P = 0.05 level.

The mean first arrival date of the wood pigeon (1983 – 2007) was 14 March (SD = 6.124; range = 7 March to 3 April). Correlation between first arrival date and the entire research period was significant (r = – 0.559, P = 0.004, N = 25; Figure 2). The relationship between the time of arrival and year can be expressed as y = 988.52 – 0.49x. The wood pigeon arrival dates have become 11.5 days earlier during the study period (1983 – 2007). Correlation between the mean air temperatures and mean first arrival date was also significant (r = – 0.599, P = 0.002, N = 25; Figure 3). The regression equation was y = 29.82 – 2.33x.

The results suggest that in years with warm springs, wood pigeon arrives at the Mokrice area markedly earlier than in years with colder springs. The prognosis of future characteristics of the spring migration in research area depends on the forecast of future climate warming. According to Tryjanowski et al. (2002), natural selection should favor rapid changes in time of arrival. For example, early breeding is considered to be advantageous, allowing longer development time for juveniles. The birds might be expected to migrate earlier in spring to take advantage

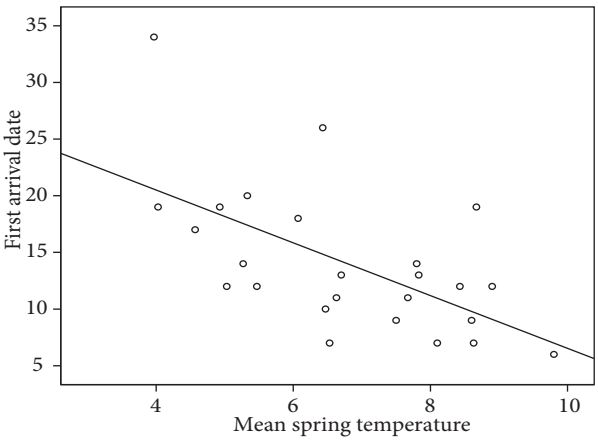

Figure 3. Relationship between first arrival date (1 March = 1) and spring temperature (°C) in the wood pigeon (1983 – 2007).

of this opportunity (e.g. Winkler et al., 2002; Mills, 2005). Ornithology has provided some of the best examples of the impacts of recent climate change on wildlife from around the world, but we have only begun to scratch the surface (Crick, 2004). According to Sokolov (2006), further changes in the dates of passerine bird arrival and breeding in the Palaearctic in subsequent years will largely depend on the dynamics of winter and spring air temperatures in the Northern Hemisphere, whereas the timing of autumn migrations will be determined mainly by the dates of their arrival and nesting.

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