

Summary of doctoral thesis:  
**„Characteristics of the autumn migration of warblers of the *Sylvia* genus  
in the Beskid Niski (S Poland)”**

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Bird migrations are the subject of many scientific studies, the aim of which is not only to understand the mechanisms of migration, but also protection of species in the context of habitat and climate changes around the globe. The migration season is usually divided into the stages of active passage and the periods of stopover. Breaks in migration allow the birds to rest and rebuild their energy reserves, especially before flying over vast geographical barriers. Bird migration studies often concern small species from passerines group, which in the area of permanent and long-term research are caught in specialized nets with the aim of ringing and make the necessary biometric measurements. Warblers of the *Sylvia* genus are the subject of many studies characterizing the dynamics of migrations of *Passeriformes* on the migration route from Europe to Africa. For the purposes of this study, the results of ringing four species of warblers were used: Eurasian Blackcap *Sylvia atricapilla*, Garden Warbler *Sylvia borin*, Common Whitethroat *Sylvia communis* and Lesser Whitethroat *Sylvia curruca*. Of the above-mentioned species, Blackcap represents the preferences of the medium-distance migrations (the Mediterranean Basin, northern Africa). The remaining species belong to long-distance migrants.

In case of the European continent, relatively little is known about the migrations of autumn birds along the eastern migration routes, including the region of the Carpathians. Due to the morphological diversity of the terrain, this area may affect both the greater concentration of bird migration along the depressions of the terrain like river valleys and may also constitute certain ecological barrier forcing the birds to stay longer and prepare for a flight over the mountain range.

The aim of the study was to characterize the autumn migration of warblers through the mountain range of the Beskid Niski, which is part of the Outer Western Carpathians. The detailed goals of the work included:

- ❖ characteristics of the flight dynamics of the studied species of warblers and determination of long-term trends in numbers,

- ❖ determination and comparison of the seasonal migration dynamics of the studied species of warblers along with the characteristics of the age and sex structure during the autumn migration,
- ❖ analysis of the influence of atmospheric conditions on the autumn flight,
- ❖ the characteristics of the stopover phenomenon during the passage through the Beskid Niski region.

The research area was located in Myscowa village, in the upper section of the Wisłoka River, where for 20 years (1998-2017) there was a ringing station of autumn birds migrations. It was one of the easternmost multi-annual points of bird ringing in central Europe. The study of migration was carried out by catching in specialized ornithological nets. Birds were ringed and marked according to species, age and sex, as well as biometric measurements of wings, tail, body weight and body fat. Recapture of the previously ringed birds made it possible to determine the minimum duration of the stopover period (MSL) as well as to evaluate changes in body weight and body fat (MDR, FDR). The results from ringing were standardized for a fixed number of nets (analysis of multi-year dynamics) and compilation in the form of average daily dynamics of migration (analysis of seasonal dynamics of flight). Spearman's rank correlations, linear GML models, chi-square as well as t-Student and U-Mann Whitey tests were used for further statistical analyzes. The meteorological data used for the analyzes were obtained on the basis of the results of temperature, precipitation and wind speed measurements by the nearest meteorological station (Krosno).

The dynamics of many years of migration of the studied species of warblers showed a decrease in the number of captured birds throughout the entire study period. For the Garden Warbler, Common Whitethroat and Lesser Whitethroat numbers of migratory birds may reflect the trends in the number of breeding populations in Poland and Europe. Despite the trend in numbers during the flight of Eurasian Blackcap through the Beskid Niski, in Poland and Europe the breeding population of these species was noticeably increasing, however moderate decline in numbers of Blackcap has also been observed in recent years. Young individuals were clearly dominant during migration. There were no significant differences in the flight numbers of males and females of Eurasian Blackcap.

The studied species of warblers showed different dynamics of seasonal migration. Eurasian Blackcap as a middle-distance species presented a stretched migration curve over the migration period, with a median dates of passage later in the season. The migration of the remaining species, referred to as long-distance, was characterized by an earlier and faster flight to wintering grounds.

The Eurasian Blackcap was characterized by a significant delay in flight dates throughout the entire research period. This is typical of species with short distance migration conditions, indicating the possible impact of climate change on the earlier return of birds from wintering grounds and shortening the migration routes. Apart from the Eurasian Blackcap, only in the case of the Common Whitethroat the migration dates were delayed, which referred only to young birds.

There was a relationship between migration of the Eurasian Blackcap and Garden Warbler, and the age and sex groups of the Eurasian Blackcap, in terms of the medians dates of passage. Shifts in flight dates depended on a given research year. In the case of the remaining pairs of the studied species or groups, a weaker relationship of the median dates of passage was demonstrated or there was no relationship. When analyzing the dynamics of the migration of sex groups, the later migration of females versus males was noticeable.

The maximum temperature recorded in a given pentad had a positive effect on passage of the studied species of warblers. No influence of other weather conditions on the number of warblers migration was found. On the basis of the literature data, the speed and direction of the wind and, to a lesser extent, precipitation have a particular influence on the number and dynamics of bird migration.

Eurasian Blackcap uses the area of the Beskid Niski (in the conditions of the surroundings of the Wisłoka river valley) as a zone of stopover during migration, where about half of the specimens may gain weight before continuing their passage. A longer stopover in the passage of the adult birds is noticeable, as opposed to young ones. There were no differences in the duration of the stopover period for the sex groups. The studied area provides the birds with the opportunity to accumulate energy reserves and rest before further migration, including the flight over the Carpathian area. The Carpathian chain probably does not constitute a significant ecological barrier for migrating birds, however, due to the topographic diversity of the region, there may be an increased concentration of migratory birds in the area of the Wisłoka river valley (diverse in terms of ecological niches).