



## Phenological response of three bird populations from Czech Republic to changing climate during 1961-2008

Lenka Bartosova (1,2), Miroslav Trnka (1,2), Zdeněk Bauer (1), Petr Štěpánek (3), Martin Možný (4), Zdeněk Žalud (1,2)

(1) Mendel University of Brno, Institute of Agrosystems and Bioclimatology, Brno, Czech Republic (bartolen@gmail.com),

(2) Institute of Systems Biology and Ecology, Academy of Sciences of the Czech Republic, Czech Republic, (3) Czech Hydrometeorological Institute, Brno, Czech Republic, (4) Czech Hydrometeorological Institute, Agrometeorological Observatory in Doksany, Czech Republic

In this work we present different phenological response of three bird populations: Nuthatch (*Sitta europaea*), Great Tit (*Parus major*) and Collared Flycatcher (*Ficedula albicollis*). Phenophases of these three passerine bird populations create gradual phenological sequence covering most of the spring period in the south eastern part of the Czech Republic within area representative for northern-most part of Pannonia lowland. Phenological data were collected at three locations, which are characterized by the same type of the vegetation cover and represent remnants of fully developed multi-aged canopy of flood plain forests. The two phenological phases were observed – First Laying Date (FLD) and Mean Laying Date (MLD) as precise as possible by only one observer during the whole time of observation (1961-2008).

The rate of the phenological shift of each bird species toward the year beginning were compared and phenological data were also analysed between each using coherence analysis and running regression.

As the phenological development of Nuthatch was observed since 1951 (till 2008) these long-time series were used to gain more detailed insight into relationship between timing of Nuthatch phenophases and key meteorological parameters. Meteorological and phenological data were also analysed for trends by software AnClim.

Results show different phenological response between three bird species. Increasing temperature led to an advanced timing of all three species but in different way. Nuthatch show shifting of MLD on average by 1.6 days per decade, Great Tit has advanced by 1.5 days per decade (in case of MLD) and finally Collared Flycatcher MLD has shifted more strongly by 1.9 days per decade. Trend analysis show also different reaction. High coherency correlation was noted between phenological trends of Nuthatch population and Great Tit population at all three experimental sites. Whereas results, which compared phenological trends of Nuthatch population with late species i.e. Collared Flycatcher show weaker correlation perhaps due to the Flycatcher being migrating species. Differences between phenological trends of early and later species prove also results for Great Tit population and Collared Flycatcher population. Coherency analysis implemented for these two species acknowledge almost same values of coefficients such as for Nuthatch and Collared Flycatcher.

Analyses for meteorological trends and Nuthatch phenological trend show strongest relationship between mean and maximum temperature trend during period MA (months May and April) and phenological trend. Coherency coefficient exceed the 99% confidence level at almost all frequencies and results also show high consistence between phenological series at all experimental locations.

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