



## **Climate change and the response of phenology of Great Tit, Summer Oak and herbivorous caterpillars on flood plain forest ecosystem during 1961-2007**

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In this study are presented the phenophases of three animal and plant species, which were observed on research plot Vranovice during 1961 – 2007 (47 years). The observation took place at typical flood plain forest of southern Moravia. These are one common bird Great Tit (*Parus major*), tree Summer Oak (*Quercus robur*) and caterpillars Tortrix moth (*Tortrix viridana*) and Winter Moth (*Operophtera brumata*). These species are dependent on each other during their development and together create trophic chain.

In case of Summer Oak the phenophases were observed since the bud break to full foliage on the same specimen during the whole 47 years. During the same period were observed nesting of 843 nesting pairs of Great Tit. We determined the first laying date (FLD), which was defined as the date when the first clutch in a given year was initiated and mean laying date (MLD), which was defined as the mean initiation date of the all first clutches in the population. The activity of caterpillars was observed indirectly using data on the intensity of caterpillars' frass fall-down that was systematically recorded throughout the study period. As the beginning of peak of excrement fall-down was taken the first day when this event was first observable. The conclusion phase was accompanied by migration of Winter Moth (*Operophtera brumata*) caterpillars to lower levels of the forest before the cocooning. Tortrix Moth (*Tortrix viridana*) caterpillars are cocooning (encapsulated) in folds of leaves.

The phenophases of all three species has shifted to the earlier time during whole period of observation. The date of full foliage has advanced by 1.9 days per decade. FLD of Great Tit has shifted to the earlier time by 1.6 days and MLD has advanced by 1.5 days per decade. In both cases, the trends are statistically significant at  $p = 0.01$ . The dates of activity of caterpillars has shifted at the beginning by 2.02 and at the end by 2.06 days per decade. This trend is statistically highly significant at  $p = 0.001$ .

The temperature and subsequent shifting of phenophases could caused the mistiming of all parts of food chain. But in our case the phenological stages of bird populations and caterpillars are diverge in some years but trophic (food) chain is never negatively affected.

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