Bumblebees as potential indicators of landscape diversity

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Semi-natural habitats provide essential resources for pollinators within agricultural landscapes and may help maintain pollination services in agro-ecosystems. To counteract the decline of pollinators in Europe, conservation strategies focus on enhancing the local availability of semi-natural habitats, as supported by the European Union's agri-environment schemes. So measuring the effect of the heterogeneity of an agricultural landscape on the pollinators is very important for the maintaining of the pollinator capacity (as an important ecosystem service) of a habitat.

Aims of our study were to analyze the effect of (1) spatial heterogeneity of habitats, (2) the distance from cereal field edges and (3) the vegetation on the abundance and species richness of bumblebees.

Our research was conducted on 14 grassland patches, on the Mezőföld plain, Hungary, in June of 2012. We determined habitat types (arable lands, grasslands, forests, orchards, road sites, water surface) and the percentage of those at 7 spatial scales (radius 50-2000 m) around every study sites. Studied grassland patches were devided into'complex' and 'isolated' categories according to the proportion of semi-natural habitats within the surrounding landscape. Bumblebees were collected using lure-bated traps placed along two transects of each study site (in the middle and on the edge of the grasslands neighboured by arable land).

However, species richness and abundance of bumblebees didn't differ between 'complex' and 'isolated' grasslands our results show that landscape context significantly influences bumblebees diversity and abundance. Investigating the effects of elements of landscape structure and vegetation we found that species richness of the vegetation, size of the grassland patches, and the higher proportion of grasslands in a radius of 500 m had positive effect on bumblebee diversity. Whereas higher proportion of arable lands in a radius of 1000 m had negative effect on bumblebee diversity. The physiognomy of grasslands, height of vegetation and higher proportion of forests in a radius of 750 m had positive effect while the extent of weed-covered area and higher proportion of arable lands in a radius of 1000 m had negative effect on bumblebee abundance (1,3). Abundance of bumblebees was higher inside the grassland paths compared to the edge (2).

Home range of large bee species as bumblebees are essentially confined close to the nest especially if sufficient food resources are available. However thanks to their large dispersion ability bumblebees easily 'buffer' not optimal habitat patches. Therefore we conclude that effects of landscape structure can be detected at larger radius (>500 m).