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# Phenological shifts of flowering plants and their pollinators along an urbanisation gradient

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## Abstract

Urbanisation is one of the main drivers of landscape modification, as vegetation and open lands are replaced by paved surfaces, roads and buildings. These changes imply the phenomenon of urban heat islands – urban and suburban areas show increased temperatures compared to their rural surroundings. However, its influences on flowering period and pollinator activity remains poorly investigated.

We surveyed 12 meadows managed by local practitioners with standardised native seed mixes in the Métropole Européenne de Lille (northern France). Sites were selected according to an urban gradient (three urbanisation levels, based on the proportion of impervious areas within a 500m radius), and were visited bi-weekly from April 4th to June 29th 2017. We estimated the flowering abundance at all sites at any given observation period. At the same time, we sampled pollinators (bees and hoverflies) using pan traps and hand net. We estimated the effects of sampling day and urbanisation level on flower cover and pollinator activity using GLMMs.

Urbanisation had a strong effect on average flowering phenology of the whole plant community. In medium and high urbanisation sites, flowering peak occurred respectively 7 and 30 days earlier, compared to rural areas. Similar patterns were found for the most common flowering species. Our results also suggest that flowering duration has increased in urban areas. We observed phenological shifts of pollinators as urbanisation increased. Bumblebees experienced a similar advance of activity in moderately and highly urbanised sites, compared to rural sites. Likewise, we observed an advancement of the activity of some solitary bees (Halictidae) in urban areas. We are currently analysing data regarding the other bee and hoverfly taxa found during the study. We will discuss the possible effects of phenology shifts on plants and pollinators, and their consequences in relation to temporal mismatches among species.

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