
Concomitant decline in floral resources and wild bees in Belgium: insights from historical time series

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Abstract

Wild bees are essential for the maintenance of pollination service. One factor that could explain their decline is assumed to be the reduction of floral resources availability linked to land-use changes. However this hypothesis remains to be tested through a joint analysis of the long-term trend of bee and plant (functional) diversities.

We used a comprehensive country-wide dataset to analyze the time dynamics of plant-bee interactions. It contains observations of more than 30,000 specimens since about 1900 in Belgium and information about the floral species they visited at sampling time. We split it into three relevant time periods and applied network-based approach for each period. Next, we used information from our network analysis to infer community-level plant-bee interactions using a national database encompassing more than 60,000 plots. This allowed us to track community-level changes in pollination services at a biogeographical scale.

We found an effect of land-use intensification, notably a shift towards more generalist bees that tend to dominate the interaction networks. The overall area occupied by plant species of interest for bees decreased over time, especially in highly-managed areas. Further this translates into a shift in pollination service at the country-wide scale, with an increase in the area where the service is at risk.

Overall our results highlight the interest of compiling heterogeneous databases to assess the impact of land-use changes on plant-bee interactions, thanks to unique historical time series. Such initiative is a step forward in the perspective of ecosystem service mapping.

Keywords: wild bees, interaction, network analysis, pollination, ecosystem services

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