

Bees in the city – The role of relict populations and connectivity for wild bees in urban green spaces

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Introduction

While wild bees decline in agricultural landscapes, rare species persist in urban areas and generalists often perform better, despite suitable habitats usually being small and fragmented.

Hypothesis: Persistence of relict wild bee communities in urban areas benefits from flowering resource availability, management and habitat connectivity.



Fig. 1 Male *Megachile willughbiella* „Willughby's Leafcutter“ a common species within the city of Karlsruhe

Methods

We compared a baseline dataset of 14 extensively managed urban meadows in Karlsruhe, Germany, from 2002 (961 bees in 92 species) with data collected at the same sites in 2017 to investigate the historical signal in community composition after 15 years. Urban meadows were paired with intensively managed sites in 2017 (31 sites: 1761 bees in 117 species; 14 sites: 806 bees 91 species) to analyse the role of connectivity and management in potential changes.

Results

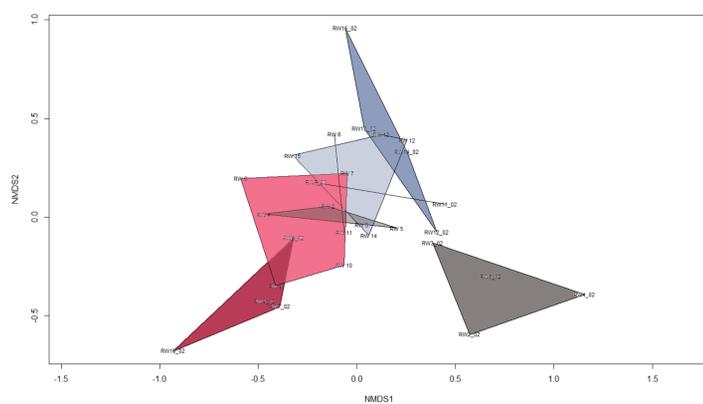


Fig. 2: NMDS Ordination of 14 study sites from 2002 (dark red, dark blue and dark gray) and 2017 (light red, light blue and light gray).

In 2002, community structure differed between three restricted regions, suggesting local relicts (Mantel-test; $r=0.286$, $p=0.008$). In 2017, previously rare species recorded more frequently diminished this distinction. (NMDS; stress=0,15; 3 dimensions)

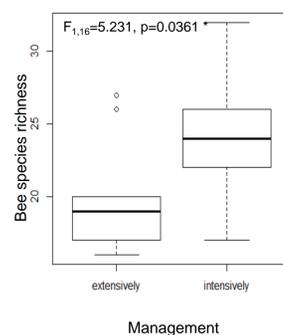


Fig. 3: Bee species richness on 18 extensively and intensively managed sites

Management intensity had a positive effect on species richness (Fig.3), but extensively managed sites (Fig.4 gray polygon) added more rare species to the local species pool. (NMDS; stress=0,18; 3 dimensions)

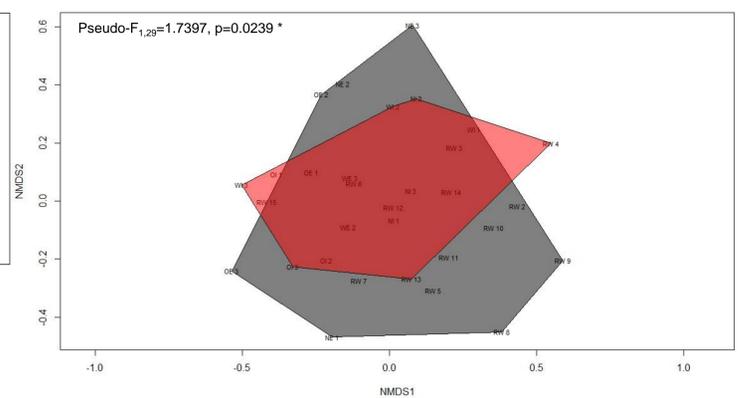


Fig. 4: NMDS Ordination of 31 study sites from 2017. Gray polygon=extensively managed sites; red polygon=intensively managed sites

Conclusion

Connectivity between relict populations in restricted urban areas facilitates species exchange and thus persistence. Suitable management of green spaces supports urban wild bee conservation for a broad range of specialized species.