

Wild bee diversity in Austrian agricultural landscapes and the role of agri-environmental measures



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AIMS AND OVERVIEW

The wild bee workpackage in the project BINATS II focused on recording and evaluating wild bee diversity, abundance and species composition in Austrian arable areas. The habitats occurring in the agricultural landscape and their quality as habitat for wild bees, the effect of different land use systems and the possibility of promoting wild bees through selected measures of the Austrian agri-environmental programme (ÖPUL) were examined.

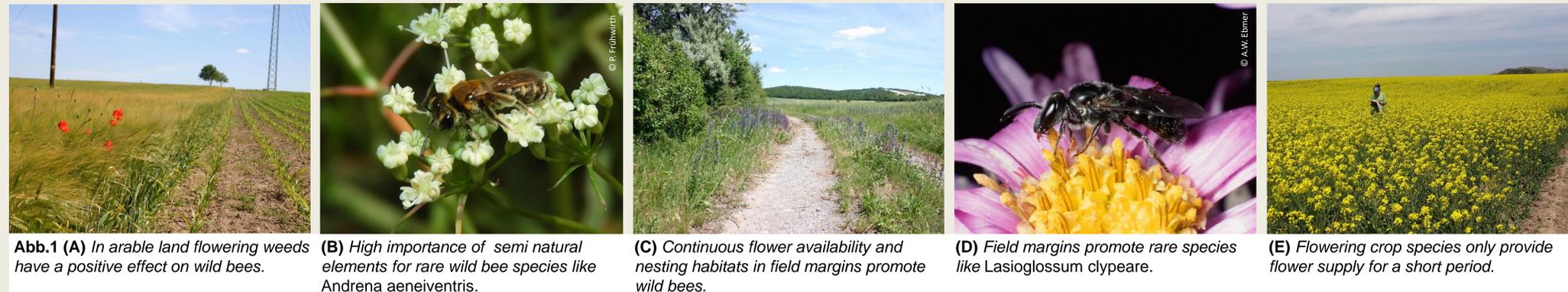


Abb.1 (A) In arable land flowering weeds have a positive effect on wild bees.

(B) High importance of semi natural elements for rare wild bee species like *Andrena aeneiventris*.

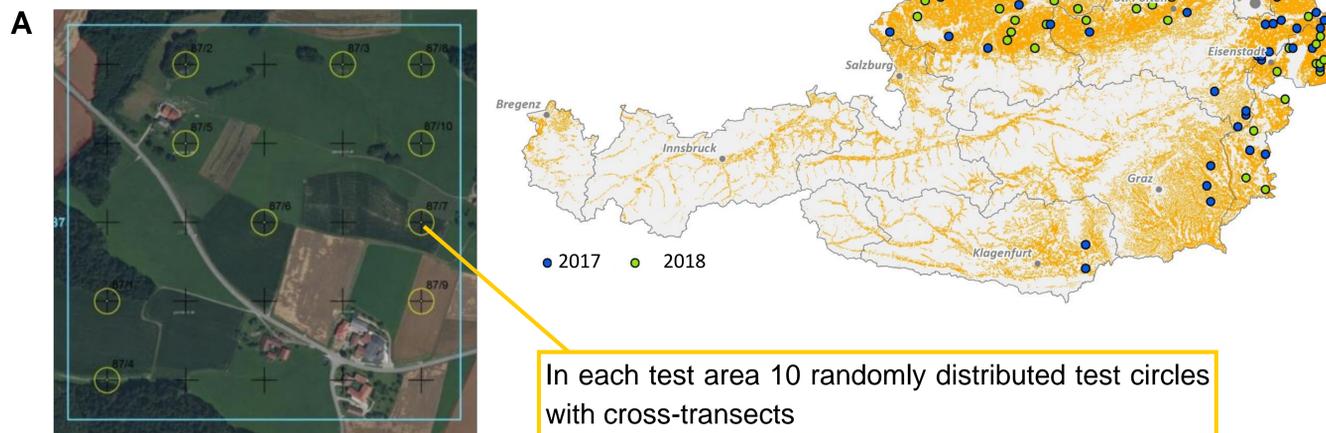
(C) Continuous flower availability and nesting habitats in field margins promote wild bees.

(D) Field margins promote rare species like *Lasioglossum clypeare*.

(E) Flowering crop species only provide flower supply for a short period.

LOCATION OF THE PROJECT AND METHODS

- 100 randomly selected test areas in the Austrian agricultural landscape (625x625m) (Pascher et al. 2011)
- Therein area-wide habitat mapping



In each test area 10 randomly distributed test circles with cross-transects

Wild bee sampling:

- Quantitative transect sampling method along the 80 m cross transects
- 20 minutes survey time per transect
- Four survey dates between April and August in 34 test areas, one survey date in the remaining 66 test areas
- Estimation of floral resource availability in five categories
- Documentation of pollen foraging plants

Abb. 2 (A) Example of a 625x625 m test area with 10 randomly selected test circles (Quelle: basemap.at) **(B)** Test areas: sampled 2017 (blue), 2018 (green) and agricultural areas (orange, CORINE Land Cover European seamless 100m Raster database V 18.5)

MAIN FINDINGS

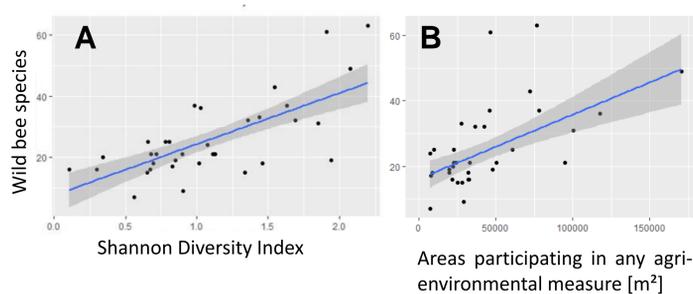


Abb. 3 (A) Correlation between Shannon Diversity Index ($p \leq 0,001$) and **(B)** Areas participating in any agri-environmental measure ($p \leq 0,001$) and wild bee species.

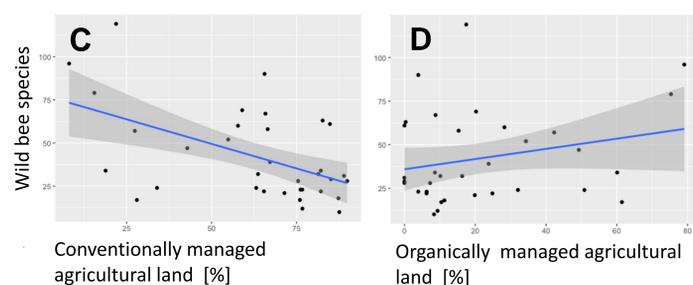


Abb. 3 (C) Correlation between proportion of conventionally farmed area ($p=0,002$) **(D)** proportion of organically farmed area in the test area ($p=0,15$) and wild bee species.

- A total of 245 wild bee species recorded.
- Significant negative effect of the proportion of arable land per test area on the number of wild bee species and individuals.
- Few wild bee species on flowering crops such as sunflower or rape (Fig. 1E & 4).
- High importance of semi-natural landscape elements such as field and path margins, ruderal sites or extensive grassland (Fig. 4). Rare species like *Andrena aeneiventris* or *Lasioglossum clypeare* (Fig. 1B & D) are often exclusively founded in these habitats.
- Significant positive relation of the proportion of areas participating in any measure of the Austrian agri-environmental programme (Fig. 3B). The highest amount thereby is comprised by organic farming. "Biodiversity areas" performed very differently, with the availability of flowers playing a significant role to promote wild bees.

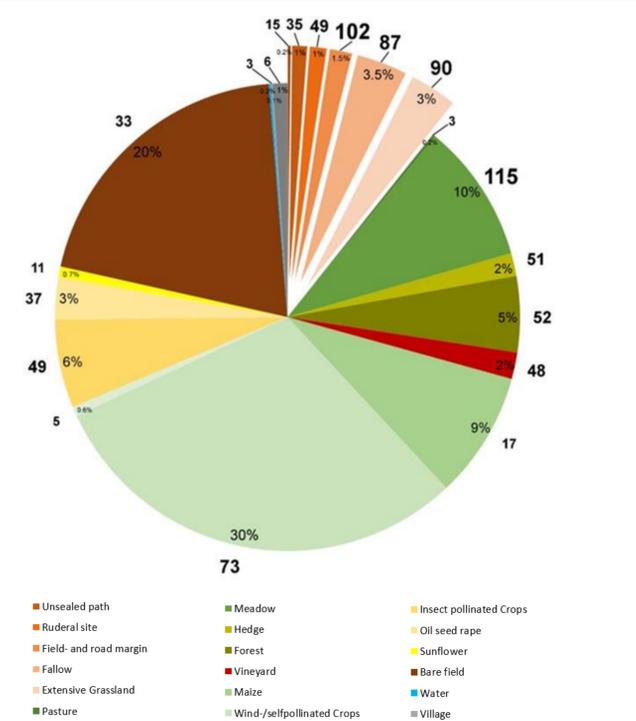


Abb. 4 Percentage in colored segments: proportion of habitat types of all transects (in orange semi-natural landscape elements), numbers outside: recorded wild bee species in the respective habitats.

TAKE HOME

Habitats such as field and path margins, ruderal site, fallows or extensive grassland house a high species diversity of wild bees in the Austrian arable farming area. For a sustainable protection of wild bees, the preservation and a positive value attitude towards such areas are essential. Although agri-environmental measures make a significant contribution to biodiversity in agricultural land, it would be desirable to optimize measures by promoting species-rich sowing mixtures and diversify management of biodiversity areas.

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