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Competition between honey bees and wild bees? Effects of increased honey bee densities on foraging and reproduction of wild bees and other pollinators

Michael Glück[1], Manuel Treder[1], Raghdan Alkattea[1], Karsten Schweikert[2], Ulrich Ernst[1], Vera Joedecke[3]
Martin Dieterich[4], Peter Rosenkranz[1], Kirsten Traynor[1]
[1]State Institute of Bee Research, University of Hohenheim, Stuttgart, Germany
[2]Core Facility Hohenheim, University of Hohenheim, Stuttgart, Germany
[3]Botany Department, State Museum of Natural History Stuttgart, Stuttgart, Germany
[4]Institute of Landscape and Plant Ecology, University of Hohenheim, Stuttgart, Germany

Wild bees have experienced alarming declines over the last decades, with many species critically endangered or already extinct. Besides important drivers of decline like habitat loss, intensification of agriculture, urbanization, and climate change, some postulate that the increasing density of honey bee colonies can potentially have negative effects on wild bees, as they might compete for floral resources. Currently, there are only a few experimental studies analyzing the effects of increased honey bee densities under field conditions, and so it is still unclear to what extent competition might affect the foraging behavior of wild bees and other pollinators, and if this has any impact on the reproductive success of wild bees.

To help answer these questions, we experimentally varied honey bee density in flower-rich meadows by moving five colonies into and out of our study sites every two weeks. While doing so, we documented the flower visitation rates of honey bees, wild bees, and other pollinators from May to August 2022, to see if there were any effects on foraging behavior. Simultaneously, we used the red mason bee Osmia bicornis to investigate if increased honey bee density reduced brood cell construction and cell provisioning, while also analyzing the pollen collected by Osmia to identify potential nutritional overlaps with the honey bees.

Our results showed a significant reduction in the flower visitation rates over all wild pollinators when honey bee densities were increased. We didn't find any effects on the reproductive rates of O. bicornis, despite a substantial overlap in the pollen collected by mason and honey bees.

Our study provides important data-based evidence for the current discussions on potential nutritional competition and emphasizes the complexity of the topic. Further studies are needed to understand the impacts on more specialized wild bee species.

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