

# Insects in decline—on farmland, latecomers lose out

March 7 2019

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Credit: Michaela Hofmann

The pollination services provided by wild bees are indispensable, not only for ecological but also for eminently economic reasons. However, over half of the more than 500 wild bee species found in Germany are either at risk of extinction, or have already died out in certain areas. On the basis of an analysis of changes in the Red List status of threatened species, researchers led by Ludwig-Maximilians-Universität (LMU) biologist Susanne Renner (Professor of Systematic Biology and Mycology at Ludwig-Maximilians-Universität and Director of Munich's

Botanic Garden) have now investigated the factors responsible for this disturbing development. In a study that appears in the journal *Proceedings of the Royal Society B*, they identify a relative lack of food for late-emerging wild bees on land under intensive agricultural use as a major driver of species loss.

Like honeybees, wild bee [species](#) – which include [bumble bees](#) – collect nectar and pollen, and contribute significantly to the propagation of flowering plants. Depending on the type of flower, some species of wild bees perform this task more efficiently than their "domesticated" counterpart or even exclusively. Bumble bees, for example, visit three to five times more flowers than honeybees do. The German Association for Environmental Protection and Conservation (BUND) has estimated that the economic value of the pollination services provided annually by insects in Europe amounts to more than 14 billion euros. But insect populations worldwide are declining at alarming rates, as recent studies have shown – and bees are no exception to this trend. "Generally speaking, bee diversity appears to be diminishing as a result of intensive agriculture and the increased use of pesticides, both of which have a negative impact on the food sources and nesting opportunities available," says Renner. "We set out to identify the factors that make local populations of certain species particularly vulnerable to extinction."

Renner and her team first examined the data on wild bees compiled in Germany's Red List, which has monitored the status of wild species in the country for over 40 years. "On the basis of these data, we then asked which species-specific traits – such as [habitat selection](#), pollen specialization, body size, preferred nesting site, timing and level of foraging activity and time of emergence – show the highest correlation with the endangered status or best predict the extinction of individuals species," Renner explains.

The Munich researchers were able to survey the relevant species-specific

traits in 79% (445 out of 561) of the wild bee species known to nest in Germany. To their surprise, they found that variation in the trait 'pollen specialization' has little effect on extinction risk. "However, two other factors – habitat selection (i.e. a requirement for a particular habitat) and initiation of foraging activity in late summer – were very strongly correlated with endangered status," says Michaela Hofmann, a doctoral student in Renner's team and first author of the new publication. In contrast, both the diversity and status of wild bees in urban settings are relatively stable, and species such as the European orchard bee (*Osmia cornuta*) are not regarded as endangered. However, relatively narrow habitat preferences, coupled with emergence in late summer – and a correspondingly short foraging season – clearly increase extinction risk. "According to our analysis, late-emerging species – *Melitta tricincta*, for instance – are increasingly at risk in agricultural areas, because they can no longer find sufficient food. In regions where the land is intensively farmed, the fields are virtually devoid of flowers at that time of the year. Bees that emerge in the spring can at least count on the availability of plants such as oilseed rape and the presence of blooming orchards," says Renner. For the authors of the new study, this factor is likely to be the primary cause of the recent decline in the numbers of [wild bee species](#) in Germany.

The recent call for environmentally benign agricultural practices, formulated in a successful referendum on measures to protect and promote biodiversity in Bavaria, could help to conserve late-emerging [wild bees](#), Renner says. The researchers also suggest that a reduction in the frequency of mowing, the establishment of flower strips or the retention of field weeds on the edges of cropland could help preserve species diversity. The initiators of the campaign "Save the Bees" in Bavaria have now begun a series of roundtable discussions with their critics with a view to agreeing on a text for the envisaged amendment of the existing Nature Conservation Law. "But gardening fans can already do something valuable for bees by cultivating species-rich gardens and

dispensing with the use of pesticides and automatic lawnmowers," as Renner points out.

**More information:** Michaela M. Hofmann et al. Narrow habitat breadth and late-summer emergence increases extinction vulnerability in Central European bees, *Proceedings of the Royal Society B: Biological Sciences* (2019). [DOI: 10.1098/rspb.2019.0316](https://doi.org/10.1098/rspb.2019.0316)

Provided by Ludwig Maximilian University of Munich

Citation: Insects in decline—on farmland, latecomers lose out (2019, March 7) retrieved 27 April 2024 from <https://phys.org/news/2019-03-insects-declineon-farmland-latecomers.html>

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