Native bee populations can bounce back after honey bees move out

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A native bee sits on a purple flower on the left, while a honey bee sits on a yellow flower on the right. Credit: Margarita López-Uribe

Managed honey bees have the potential to affect native bee populations when they are introduced to a new area, but a study led by researchers at Penn State suggests that under certain conditions, the native bees can bounce back if the apiaries are moved away.

The research, published in the *Journal of Insect Science*, examined the effects of migratory beekeeping—the practice of moving honey bee colonies to a different location for part of the year—on native bee populations.

The researchers found that when managed honey bees were moved into an area, the population of native bees decreased in abundance and diversity. However, in places where apiaries were kept for years and then removed, the native bee populations once again increased in both total numbers and species diversity.

Margarita López-Uribe, the Lorenzo L. Langstroth Early Career Professor of Entomology in the College of Agricultural Sciences and co-author of the paper, said the findings suggest that while migratory beekeeping can be a disturbance to native bees, it may also be possible for those populations to recover.

"Because these sites rebounded only one year after the apiaries were removed, it suggests that the populations temporarily decreased due to native bees being displaced and not because they died out," she said. "These bees were also likely able to rebound because the landscape had an abundance of flowers and minimal agriculture and pesticide use."

However, she added that results might be different in areas where floral diversity and space for bees are lower and if there's a higher density of managed honey bee colonies.

According to the researchers, insect populations are declining across the

globe, which can be attributed to many human activities including changes to insect habitats and the introduction of non-native species. While these exotic species can sometimes have a positive effect on crop plants, they can also compete with native species for resources, such as honey bees vying with native bees for flowers.

Because honey bees are so widespread, the researchers said it can be difficult to design studies that examine this competition between honey bees and other bee species. For this study, they traveled to the Qinghai-Tibet Plateau in China, an area in which honey bees don't live in the wild and are only present due to migratory managed apiaries, which include about 60 to 100 colonies each.

"The bees are primarily kept in the lowlands in Sichuan, but in the summer, it gets too hot," López-Uribe said. "So, for the past four decades, beekeepers have been trucking their colonies to a higher elevation where it's significantly cooler and there are plenty of floral resources. There is also low pesticide exposure, because there's no agriculture out there."

Bees are often kept in one area, like this apiary in Sichuan, China, but moved to avoid the heat of summer. Credit: Margarita López-Uribe

Originally, the researchers planned to analyze bee populations at two types of sites: one in which honey bees were currently being kept and one in which they never were. An unforeseen third type was added when a music festival took place in one of the areas that previously housed migratory apiaries. This allowed the team to study areas in which honey bees were previously kept for decades before being removed the year before.

The researchers chose two spots in each type of site to gather samples,

collecting bees at each plot on three separate days. The bees were then sorted and identified as either a honey bee or native bee species.

After analyzing the data, they found that native bee numbers were the lowest at sites that currently included honey bees and higher at sites that either previously or never had honey bees.

These reductions particularly affected the dominant native bee species in the area: Andrena sp. 3, a mining bee. While total native bee numbers rebounded at sites where honey bee colonies were removed the previous year, the abundance of Andrena sp. 3 remained low.

The researchers also found that native bee phylogenetic diversity—a measure of the amount of evolutionary history among a group of species—was higher in areas that currently included honey bees and higher still in areas that previously included them. This increase in phylogenetic diversity could be because lower numbers of Andrena sp. 3 allowed other species to have access to limited foraging or nesting areas.

While the study was set in China, López-Uribe said the findings could likely be applicable to many other areas in the world.

"In our study, we were talking about up to 100 colonies per apiary being moved, which is very small compared to, for example, the 1.5 million colonies in total that are trucked to California each year," she said. "But in areas where a smaller number of colonies are being moved, results could be similar."

Overall, the researchers said the findings suggest that while the introduction of managed honey bees lowers the abundance of native bees, the long-term effects likely depend on how many honey bee colonies are introduced and how long they are present. Future studies could examine the effects of these honey bee densities and durations on native

bee abundance, community composition and pollination services over multiple seasons.

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More information: Anthony D Vaudo et al, Low-density migratory beekeeping induces intermediate disturbance effects on native bee communities in Tibetan Plateau alpine meadows, *Journal of Insect Science* (2024). DOI: 10.1093/jisesa/ieae108

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