

CLUES TO THE HISTORY OF BEES

The future of bees may depend on understanding their past.

Bees are in trouble, any entomologist will tell you.

Honeybee colonies in the United States have suffered devastating losses in recent years. But colony collapse disorder, as it's called, affects only the species kept in beehives — the European honeybee, *Apis mellifera*. There are almost 20,000 species of wild bees, and they aren't faring well, either.

Nearly a third of bumblebee species in the United States are declining. In the Netherlands, more than half of the country's 357 species of wild bees are endangered. Many species of plants, including crops, depend on wild bees to spread their pollen. When they lose their pollinators, they may suffer, too.

"It's essential to know what is causing those declines," said Jeroen Scheper, a graduate student at Alterra, a research institution at Wageningen University in the Netherlands.

But it is not enough to consider the many challenges — from pesticides to parasites — that wild bees face right now. "We need to go back in time," said Mr. Scheper.

Mr. Scheper and other scientists have tried to solve this puzzle by taking advantage of the patient — some might say obsessive — work of naturalists over the past 140 years. Through much of North America and Europe, these unsung heroes carefully tallied sightings of bees year after year. They caught bees, stuck them on pins, and stored their desiccated little bodies by the thousands in museum cabinets. Those impaled bees have been resting in their darkened drawers, waiting for scientists to pay them a visit. And now they have.

Recently, Ignasi Bartomeus, then a post-doctoral researcher at Rutgers University, and his colleagues tapped this vast supply to reconstruct the history of bees in the Northeast. They searched the bee collections at the American Museum of Natural History, the New York State Museum, and a number of university collections.

All told, they examined more than 40,000 wild bees. They whittled their survey down to just 30,000 specimens for which there was clear information about when and where they had been caught.

Studying the 438 species in their database, they found that the diversity of wild bumblebee species in the region declined by 30 percent between 1872 to 2011. (The diversity of the bees overall declined by a more moderate 15 percent.)

As scientists gain a better understanding of the history of bees, they are also starting to gather clues about what has been driving the changes they are documenting. In their new study, published this week in *Proceedings of the National Academy of Sciences*, Mr. Scheper and his colleagues analyzed detailed records about bees in the Netherlands to determine how their populations changed during the twentieth century.

Then the scientists looked for what the declining species had in common. They examined a number of possible factors — how common bee species were at the beginning of the century, for example, and how far they typically flew to find food, and how big they grew.

The scientists were even able to study what bees ate all those decades ago. Mr. Scheper and his colleagues visited seven Dutch museums, where they inspected the bee collections. When they peered closely at the insects, they could see pollen grains stuck to the legs of some them.

Placing the pollen grains under a microscope, the scientists identified the

plants that the bees had visited.

As it turned out, the fate of the bees often was tied to that of the plants they depended on.

The growing intensity of farming in the Netherlands since the 1950s hit many wild plant species hard. “There were a lot more flowers in the landscape before,” said Mr. Scheper.

Dutch farmers cleared more land, used more toxic herbicides, and blanketed their farms with fertilizers.

Some wild plants were able to survive these challenges, but others became scarce. Mr. Scheper and his colleagues found that the bees that preferred declining plants also declined.

This link held true even for bees that collect pollen from dozens of plant species. The results suggest that without the preferred kind of pollen, the bee larvae suffered.

Mr. Scheper and his colleagues also found that big bees were at greater risk than small ones. He suspects that is because big bees need to eat more. If the plants they depend on get harder to find, they are more likely to suffer than smaller bees.

“The results are compelling and make a lot of sense,” said Dr. Bartomeus, who was not involved in the Dutch study. “If your food source is declining, your populations will suffer.”

Laura A. Burkle, an ecologist at Montana State University who also was not involved in the new study, cautioned that food might not be the only explanation for the results. The changes

in landscape that stripped away pollen might also have ruined bee nesting sites.

“We don’t have a solid understanding of which of these main resources is most limiting to bees,” said Dr. Burkle.

Mr. Scheper said that policies for restoring bees will have to take their preferred plants into account.

“If you want to slow down or reverse the decline of a species, you can’t suffice with general measures,” he said. “Bee species that need red clover are not helped with dandelions. I know that policy makers prefer a simple and quick answer — ‘Just do this and you’ll get this.’ — but it’s not that simple.”



Bombus sylvarum is a species of bee found across Europe.

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NEW YORK TIMES



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