

# Honey bee life spans are 50% shorter today than they were 50 years ago

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Despite improved standards for keeping honey bees in the lab, UMD research shows caged bees have shorter lifespans than they did 50 years ago, suggesting something other than environmental conditions could be causing higher rates of honey bee colony loss for commercial bee keepers. Credit: Anthony Nearman / UMD

A new study by University of Maryland entomologists shows that the lifespan for individual honey bees kept in a controlled, laboratory

environment is 50% shorter than it was in the 1970s. When scientists modeled the effect of today's shorter lifespans, the results corresponded with the increased colony loss and reduced honey production trends seen by U.S. beekeepers in recent decades.

Colony turnover is an accepted factor in the beekeeping business, as [bee colonies](#) naturally age and die off. But over the past decade, U.S. beekeepers have reported high loss rates, which has meant having to replace more colonies to keep operations viable. In an effort to understand why, researchers have focused on environmental stressors, diseases, parasites, pesticide exposure and nutrition.

This is the first study to show an overall decline in [honey bee lifespan](#) potentially independent of environmental stressors, hinting that genetics may be influencing the broader trends seen in the beekeeping industry. The study was published November 14, 2022, in the journal *Scientific Reports*.

"We're isolating bees from the [colony](#) life just before they emerge as adults, so whatever is reducing their lifespan is happening before that point," said Anthony Nearman, a Ph.D. student in the Department of Entomology and lead author of the study. "This introduces the idea of a genetic component. If this hypothesis is right, it also points to a possible solution. If we can isolate some [genetic factors](#), then maybe we can breed for longer-lived honey bees."

Nearman first noticed the decline in lifespan while conducting a study with entomology associate professor Dennis van Engelsdorp on standardized protocols for rearing adult bees in the laboratory. Replicating earlier studies, the researchers collected bee pupae from honey bee hives when the pupae were within 24 hours of emerging from the wax cells they are reared in. The collected bees finished growing in an incubator and were then kept as adults in special cages.

Nearman was evaluating the effect of supplementing the caged bees' sugar water diet with plain water to better mimic [natural conditions](#) when he noticed that, regardless of diet, the median lifespan of his caged bees was half that of caged bees in similar experiments in the 1970s. (17.7 days today versus 34.3 days in the 1970s.) This prompted a deeper review of published laboratory studies over the past 50 years.

"When I plotted the lifespans over time, I realized, wow, there's actually this huge time effect going on," Nearman said. "Standardized protocols for rearing honey bees in the lab weren't really formalized until the 2000s, so you would think that lifespans would be longer or unchanged, because we're getting better at this, right? Instead, we saw a doubling of mortality rate."

Although a laboratory environment is very different from a colony, historical records of lab-kept bees suggest a similar lifespan to colony bees, and scientists generally assume that isolated factors that reduce lifespan in one environment will also reduce it in another. Previous studies had also shown that in the real world, shorter honey bee lifespans corresponded to less foraging time and lower honey production. This is the first study to connect those factors to colony turnover rates.

When the team modeled the effect of a 50% reduction in lifespan on a beekeeping operation, where lost colonies are replaced annually, the resulting loss rates were around 33%. This is very similar to the average overwinter and annual loss rates of 30% and 40% reported by beekeepers over the past 14 years.

Nearman and vanEngelsdorp noted that their lab-kept bees could be experiencing some sort of low-level viral contamination or [pesticide exposure](#) during their larval stage, when they're brooding in the hive and worker bees are feeding them. But the bees have not shown overt symptoms of those exposures and a genetic component to longevity has

been shown in other insects such as [fruit flies](#).

The next steps for the researchers will be to compare trends in honey bee lifespans across the U.S. and in other countries. If they find differences in longevity, they can isolate and compare potential contributing factors such as genetics, pesticide use and presence of viruses in the local bee stocks.

**More information:** Water Provisioning Increases Caged Worker bee Lifespan and Caged Worker bees Living Half as Long as Observed 50 Years Ago, *Scientific Reports* (2022). [DOI: 10.1038/s41598-022-21401-2](#)

Provided by University of Maryland

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