

## Insects Are In Serious Trouble

In western Germany, populations of flying insects have fallen by around 80 percent in the last three decades.



*Todd Korol / Reuters*

[Ed Yong](#), Oct 19, 2017

The bottles were getting emptier: That was the first sign that something awful was happening.

Since 1989, scientists from the Entomological Society Krefeld had been collecting insects in the nature reserves and protected areas of western Germany. They set up malaise traps—large tents that funnel any incoming insect upward through a cone of fabric and into a bottle of alcohol. These traps are used by entomologists to collect specimens of local insects, for research or education. “But over the years, [the Krefeld team] realized that the bottles were getting

emptier and emptier,” says Caspar Hallmann, from Radboud University.

By analyzing the Krefeld data—1,503 traps, and 27 years of work—Hallmann and his colleagues have shown that most of the flying insects in this part of Germany are flying no more. Between 1989 and 2016, the average weight of insects that were caught between May and October [fell by an astonishing 77 percent](#). Over the same period, the weight of insects caught in the height of summer, when these creatures should be at their buzziest, fell by 82 percent.

“We were expecting declines, but the extent of them was tremendous,” says Hans de Kroon, who was involved in analyzing the Krefeld data. “If this was in agricultural settings, we wouldn’t be quite so surprised. But it’s especially alarming that it happened in nature reserves.”

There have long been signs of such a decline. Studies have also shown that [populations of European butterflies](#) have halved since 1990, honeybee colonies have [fallen](#) by 59 percent in North America since World War II, and populations of [British moths](#) have dropped by 30 percent per decade. But most of these surveys focused on particular groups, whereas Hallmann’s group looked at the entire spectrum of flying insects. “It confirms the widespread, windscreen phenomenon,” he says. “Any truck driver in the developed world will tell you that they used to squash a lot of insects on the windscreen. Now the windscreens stay clean.”

“The study makes visible what otherwise has been an invisible decline in insect abundance,” says [Michelle Trautwein](#), from the California Academy of Sciences. “Our mistreatment of the planet has been recognizably bad for elephants and coral reefs, but it seems likely that it has also been just as bad for flies, moths, beetles.”

This is, to put it mildly, a huge problem.

Insects are the lynchpins of many ecosystems. Around 60 percent of birds rely on them for food. Around 80 percent of wild plants depend on them for pollination. If they disappear, ecosystems everywhere will collapse. But also, insects are the most diverse and numerous group of animals on the planet. If they’re in trouble, we’re *all* in trouble.

There’s a debate about whether the Earth is in the middle of a sixth extinction—an [exceptionally severe period of biological annihilation](#) of the kind that has only happened five times before. One of the talking points in this debate is that, [as](#)

[Peter Brannen recently wrote](#), “when mass extinctions hit, they don’t just take out big charismatic megafauna, like elephants ... They take out hardy and ubiquitous organisms as well—things like clams and plants and insects.”

And. Insects.

*“We can’t wait till we know exactly what’s leading to these losses. We have to act.”*

But remember that the German study only looked at one particular region. And it raises a question: If insects have disappeared by such a large degree, wouldn’t other species that depend on them be in much worse shape? Wouldn’t Germany’s flowers, birds, spiders, and reptiles also be plummeting? “We see great declines of insectivorous species—but not to this extent in most cases,” de Kroon acknowledges. “Some species could switch food sources, but we don’t really know what’s going on. We do know that we see declines in even common species, like blackbirds, starlings, and sparrows.”

Another unanswered question: Are all groups declining equally? “It would be interesting to see the list of species they collected, as Malaise traps are very good at collecting certain species and poor at collecting others, like dragonflies,” says [Jessica Ware](#), from Rutgers University. “If insect [groups] vary in their response to climate change, temperature, habitat change, or other factors,” that could change the implications of the study’s stark percentages. (Hallmann notes that identifying the thousands of individuals in a single trap, let alone all 1,503, would mean months of work for a team of specialists. That’s why they focused on total weight.)

Also, what’s behind the insect downfall? [Pollutants and pesticides](#) are likely to be a problem. Neonicotinoids—the world’s most popular insecticides—can mess with bees in



myriad ways, impairing their memory, befuddling their spatial skills, and preventing them from finding food.

More surprisingly, the German team couldn't find any evidence that the two usual suspects—habitat loss and climate change—were important culprits. The declines were similar in every kind of habitat, whether healthy grasslands or nutrient-poor wastelands. And although weather patterns in the region could explain the numbers of insects across a season, they couldn't account for the year-on-year decline.

But neither line of evidence is clear-cut. The team didn't look at larger-scale climate events, like prolonged droughts, and they couldn't measure the effect of habitat fragmentation—cutting up the land available to insects rather than merely reducing it. Indeed, the nature reserves in the German study are small, too distant from each other for insects to travel between, and locked in by agricultural land. Those are “hostile environments” for insects, de Kroon says, so species that thrive in the reserves could drain into the surrounding no-man's-land—and be lost.

Ware wonders if some of the vanished insects are simply migrating into other areas. “We know that certain dragonflies, for example, are changing their ranges in response to climate change,” she says. “So are neighboring countries experiencing a similar loss, or are specific species moving northward?”

That's why researchers need to do similar surveys in other countries, says [Crystal Maier](#), from Chicago's Field Museum. “We could actually do that. We have similar samples here at the museum, for similar ranges and time periods. You could spend a lot of time identifying species but they just weighed the samples. That's something we don't usually do but it's so simple, and it would be interesting.”

In the meantime, “we should use anything we have to enhance insect populations, like adding flower-rich areas around the margins [of agricultural land],” says Hallmann.

“We don't want people to get depressed,” says de Kroon. “Ecosystems are very resilient. They're still functioning quite well despite this loss. Let's make use of that resilience. We can't wait till we know exactly what's leading to these losses. We have to act.”

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