

Scientists have been debating the conclusions of a recently published research on insects that reportedly found alarming declines.

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Results of a study of insects in protected areas across Germany earned dramatic headlines warning of "ecological Armageddon". Insects are vital to humans as well as the birds and mammals that eat them, controlling pests, pollinating crops and recycling organic matter. [The study](#), published in science journal PLOS One, found an estimated seasonal decline of 76 percent, and mid-summer decline of 82 percent in flying insect biomass over 27 years.

Large taxa

According to the researchers, the decline was apparent regardless of habitat type, and changes in weather, land use, and habitat could not explain the trend. However, the conclusions of the researchers were more nuanced than media coverage implied, according to other insect specialists. Importantly, the study did not measure insect populations, as most articles claimed, but insect biomass. In other words, the researchers measured the insects caught in traps by weight, not by number, nor species. This is a subtle, but important distinction, according to Chris Shortall, an entomologist at Rothamsted Research, which has been surveying insects since 1964. "This decline could very well have been driven by a decline in one or two relatively large taxa (such as bumblebees and dragonflies) as was demonstrated in our study at Hereford which found one species of (relatively) large fly had declined, while other taxa showed no significant change," he said.

Recovered then declined

Professor Alexandra Klein, head of nature conservation and landscape ecology at the University of Freiburg in Germany, pointed out that many of the sites were surveyed only once over the 27-year period of the study, and that the areas of land surveyed, despite being designated as protected, were small and degraded. However, Klein acknowledged that the loss of insect biomass found by the study was extremely high. One conclusion, she said, could be that the areas of land surveyed were not high quality enough to sustain flying insects, and that high-quality habitats need to be brought back to agricultural landscapes. "If we do not react, this might bring us to an 'ecological armageddon' meaning having almost no insects or that insect biomass will be dominated by pest and alien species," Klein said. Other research on insect populations have drawn mixed conclusions. [A study](#) published in the journal Global Change Biology in 2015 looked at the impact of extreme weather, climate and pesticide use on invertebrates in Sussex cereal fields over 42 years. It found that populations of 12 insect species declined and two increased. Of the remainder, some recovered then declined. However, overall it identified a 35 percent decline in the total number of insects. Of four insect traps studied by the scientists at Rothamsted Research, three showed downward trends in insect biomass over 30 years to 2002, but the decline was only significant in one area.

Agricultural chemicals

"So we are really none the wiser; the two studies that focus on a wider range of insect groups do not give us a clear indication of insect decline. "On the other hand, both studies are limited in their geographic coverage; we do not know how representative the results are of the whole country," according to Simon Leather, professor of entomology at Harper Adams University, in [a blog](#). Leather said that more research on insect populations was needed. Use of pesticides should be examined "very closely", and there should be more emphasis on conservation biological control, where the environment is managed to encourage the presence of natural enemies of pests, he said. [In a blog](#) on the German study, Dr Manu Saunders, an ecologist at the Charles Stuart University in Australia, pointed out similar issues with the research as Professor Klein, and said it was misleading to link the study with collapses in pollinators, or declines in butterflies, as much media coverage had done. However, she wrote that the study was still an important scientific story: "Yes, insects are in trouble. We know that overuse of agricultural chemicals, particularly [pesticides](#), and [intensification of agricultural landscapes](#) have negative effects on non-target insects. "I hope the story gives much-needed attention to the fact that entomologists and insect ecologists all over the world need more support and funding to answer similar questions in other environments. The only way to identify 'ecological Armageddon' is to show that these patterns of decline exist across multiple scales," she added.