Some insects are declining, but what's happening to the other 99%?

April 3 2025

Earwigs are among the poorly studied insect species globally. Credit: Charles J. Sharp CC BY-SA 4.0

Insects are the dominant form of animal life on our planet, providing humans and wildlife with pollination, food, and recycling services but,

despite concerns about population declines, little is known about how 99% of species globally are faring.

A new approach is needed to better monitor species and protect them from the impacts of climate and land use change, pollution and invasive non-native species as soon as possible, according to a study led by the UK Center for Ecology & Hydrology (UKCEH) and ZSL (Zoological Society of London).

The researchers, whose work has been published in the journal *Science*, point out that there are one million known insect species globally but there have been IUCN assessments for just 1%—12,100 species, with around 20% of these considered threatened.

Monitoring is largely confined to butterflies, bumblebees and dragonflies in parts of Europe and North America, with little known about insects in parts of Asia and South America and virtually no data on species in Africa.

Incomplete picture

Despite reports of catastrophic insect declines, the study authors say the global state of insect biodiversity remains unclear due to the sheer complexity of insects' lifestyles and fluctuating population trends, as well as a massive lack of data.

In their study, they propose a new framework for monitoring populations and analyzing the impact of threats that integrates all available methods for studying insects. These are: comparing diversity and abundance over time and across different habitats, and through gathering expert opinion and carrying out experiments.

Dr. Rob Cooke, an ecological modeler at UKCEH and joint lead author

of the study, explained, "We need to find out whether insect declines are widespread and what's causing them. The challenge is like a giant jigsaw puzzle where there are thousands of missing pieces, but we do not have decades to wait to fill these gaps and then act.

"There is a lot of interest in monitoring charismatic species such as bees and butterflies, but few people care about the supposedly unpleasant insects, even though they too provide benefits for us. For example, earwigs feed on aphids and other garden pests while cockroaches eat decaying material and keep soils healthy."

Undervalued and understudied

Dr. Charlotte Outhwaite of ZSL's Institute of Zoology, joint lead author of the study, added, "Insects are an incredibly important part of our ecosystems, pollinating around 80% of flowering plant species and vital for 35% of global food production, yet they are undervalued and understudied.

"With a million described species, it would take too long to figure out what works best for each species. Instead, we want to find large-scale actions that benefit the most insects. For this, we need to use all the available information we have."

The study authors explain this means that, when there is a lack of data, experts would make judgments about how climate, land use, pollution or invasive non-native species are affecting certain species based on the known impacts on similar types of insects. Their proposed framework would integrate four types of research methods:

- Time series trends, for example a decline in the number of butterflies over a 10-year period.
- Spatial comparisons, such as looking at differences in species

numbers or abundance across different habitats or regions.
- Experiments to investigate the response of insects to different threats, such as comparing a field sprayed with pesticides to one without, or removing invasive non-native species from one area but not another.
- Expert opinion on the response of insects to threats, for example, a scientist pointing out that butterfly counts tend to be higher in warmer rather than colder forests.

By combining data from a range of sources, scientists can gain a more complete picture of how insects respond to drivers of change while allowing transparency in uncertainty and data gaps.

The next step for the researchers is to implement their approach by using a range of research methods to model insect responses to key threats. Consolidating all available data will provide an updated overview of the state of the world's insect populations.

The Global Insect Threat-Response Synthesis (GLiTRS) project involves UKCEH, the Natural History Museum, University College London, the Zoological Society of London, the University of Cambridge, Queen Mary University of London, the University of Stellenbosch, the University of Reading, the University of Exeter and Imperial College London.

More information: Rob Cooke et al, Integrating multiple evidence streams to understand insect biodiversity change, *Science* (2025). DOI: 10.1126/science.adq2110.
www.science.org/doi/10.1126/science.adq2110

Provided by UK Centre for Ecology & Hydrology