Immediate, science-based community action can stop insect decline

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For every mammal species in the tropics there are about 300 insect species. Researchers often know very little about the role insects play in the tropical forest. Sharon Martinson works in Hannah ter Hofstede's lab at Dartmouth University to understand katydid communication. Here, she shares her katydids with visitors to the Smithsonian Tropical Research Institute's lab in Gamboa, Panama. Credit: Jorge Aleman

This year, German environmentalists collected 1.75 million signatures for a 'save the bees' law requiring an immediate transition toward organic farming. But to create healthy ecosystems worldwide, people in communities across the globe will need to take similar action based on empathy for insects—and not only for bees and butterflies—according to entomologists Yves Basset from the Smithsonian Tropical Research Institute and Greg Lamarre from the University of South Bohemia, writing in *Science*. The authors present immediate, science-based actions to mitigate insect decline.

"What is new is the clear call to present our research in ways that everyone can understand it be-cause communities need specific information to justify local political initiatives," said Basset, who coordinates a project to monitor insects in nine countries as part of the ForestGEO research program at the Smithsonian.

"It takes specific legislation to preserve the amazing variety of insects in the world and the critical services they provide by stopping the destruction of natural habitats, limiting road building in parks and reserves and producing food without the use of pesticides," Basset said, "Conserving insects is not the same as conserving big mammals or rare frogs. You can't keep millions of insects in a zoo."

A recent article in *Entomology Today* suggests that successful programs to save insects have a clear and simple objective and a strategically chosen audience. By focusing on bees and butterflies and other beautiful, familiar insects, it is possible to enact legislation to protect the habitat of lesser known, less attractive, but equally important species.

But there are still huge gaps in information about how different species of insects are doing, especially in the tropics. Even in temperate areas, where insect declines are reasonably well documented, some pest species are on the rise.

"It is next to useless to weigh insects collected in an area and say that insect communities are in-creasing or declining." Basset said. "We need much more specific information. That is expensive and we are also hindered by the effort that it takes just to identify the species, especially in the tropics. What we are doing now is to group insects by their main function: pollinators, decomposers, predators on other insect species, and then to determine how each group is doing in a specific area of the world."

For example, some of the top predators of insects are other insects. When we eliminate these species it may result in a population explosion of smaller insects, some of which carry dangerous diseases: more insect biomass does not necessarily mean that we are protecting insect diversity.

Basset published a paper in 2017 showing that the response of butterflies to environmental change was very different from the response of termites. This illustrates the need to study insects as distinct entities, each with different ecological requirements and exposed to different threats.

When people refer to global insect declines, there is very limited information from the tropics where the majority of all insect species live. And much of the data is from reserves far from pesticide use and habitat destruction. The article calls for more research on tropical insects.

"Barro Colorado Island, the Smithsonian research station in Panama's tropical forest, is only about 15km^2 and there are more than 600 butterfly species," Basset said. "We can only tell you if about 100 of them are declining. For the rest, we simply have no data. In the tropics, insects outnumber mammals 300 to one. High-ranking scientific journals would publish a graph of jaguar decline, but not 300 graphs showing

declines of obscure insect species."

Basset points out the window at a patch of trees in the courtyard of STRI headquarters in Panama. "There are probably thousands of species in that little grove of trees. I'm not kidding."

"The creation of sustainable systems for environmental protection, transportation and agriculture will depend on biologically literate, empathetic people who join together to create knowledge-based legislation as they did in Germany," Basset said.

More information: "Toward a world that values insects" *Science* (2019). science.sciencemag.org/cgi/doi … 1126/science.aaw7071

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