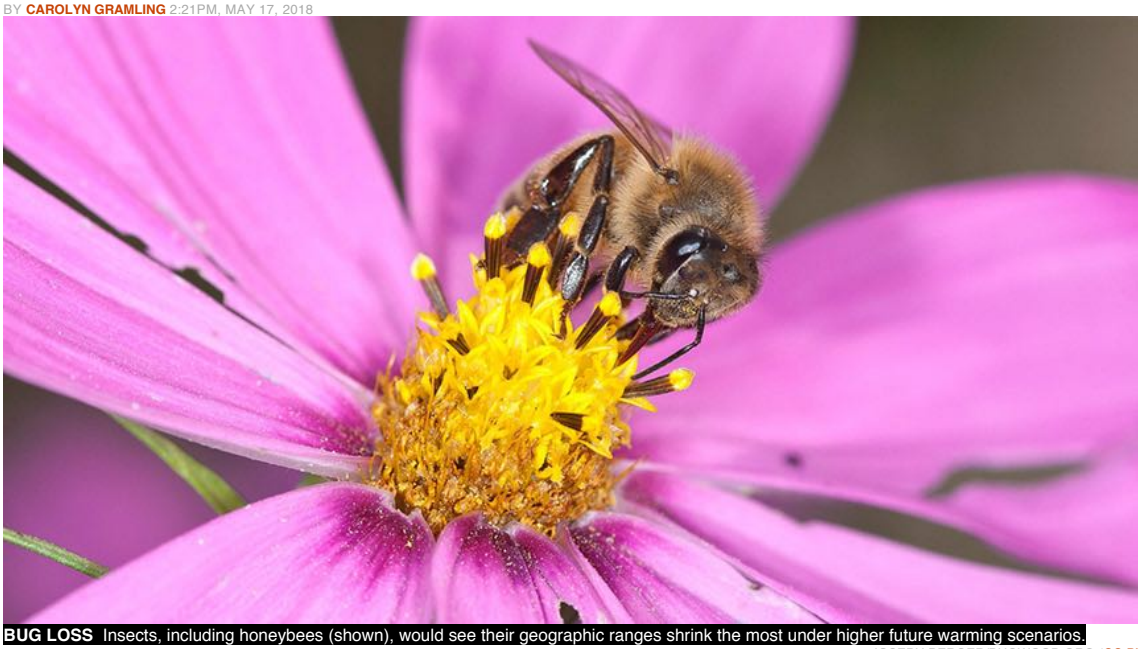
Keeping global warming to 1.5 degrees C helps most species hold their ground

Just a half-degree beyond that would at least double the range loss for plants and animals

BY **CAROLYN GRAMLING** 2:21PM, MAY 17, 2018



BUG LOSS Insects, including honeybees (shown), would see their geographic ranges shrink the most under higher future warming scenarios.

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Limiting global warming this century to just 1.5 degrees Celsius above preindustrial temperatures would be a boon to the planet's biodiversity. This lower warming threshold, compared with warming of 2 degrees C, will preserve much larger swaths of the geographic ranges of tens of thousands of land-based species of plants, vertebrates and insects living on the planet, a new study suggests.

Using a combination of climate simulations and data on the distribution of more than 115,000 terrestrial species worldwide, scientists saw distinct differences in future biodiversity depending on how much warming the planet experiences. At 2 degrees C of warming by 2100, 18 percent of insect species, 16 percent of plant species and 8 percent of vertebrate species saw their geographic ranges shrink by more than half. Under 1.5 degrees C of warming, those numbers fell to 6 percent of insects, 8 percent of plants and 4 percent of vertebrates, the team reports in the May 18 *Science*.

"Losing half the range is a pretty big impact, because that means [the organisms] stop contributing as much to the ecosystem," says study coauthor Rachel Warren, an environmental scientist at the University of East Anglia in Britain. These ecosystem contributions include air and water purification, plant pollination and nutrient cycling.

Until a few years ago, 2 degrees was the magic number. If the planet's nations could limit global warming to just 2 degrees C , scientists thought, the world would be relatively "safe" — with little change to sea levels, species habitats or climate conditions. But over time, concerns began to arise that that target would still incur too great a cost, Warren says.

Many small island nations and less-developed countries, which are likely to be hit hardest by the effects of climate change, have lobbied for a more stringent reduction in greenhouse gas emissions to hold global warming to just 1.5 degrees C by 2100. The Paris Agreement on climate change reached in 2015 reflected that concern, as delegates agreed to limit warming to "well below" 2 degrees C (*SN: 1/9/16, p. 6*).

But the scientific literature contained little information about the effects of a lower warming target, Warren says. "The scientific community has really been playing catch-up since the agreement." As part of the Paris agreement, the United Nations' Intergovernmental Panel on Climate Change is expected in late 2018 to finalize a special report on the impacts of 1.5 degrees C

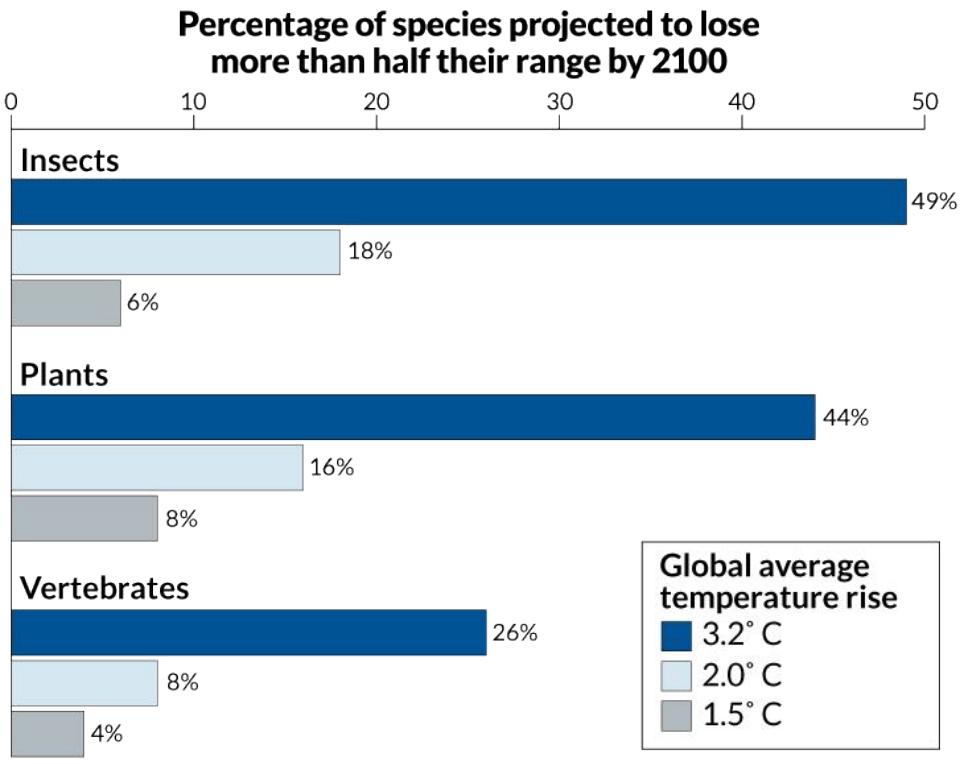
of warming.

For their study, Warren and her colleagues used species distributions from the international Global Biodiversity Information Facility database. The inclusion of insects — a first for such a study, Warren says — is particularly important because they are at the base of many food chains and because of their contributions to ecosystems, including cycling nutrients in soils and pollinating plants.

Based on the current geographic range of each species, the team determined statistically what climatic niche each species preferred. Then the researchers projected how climatic conditions would change globally under three warming scenarios: 1.5 degrees, 2 degrees and 3.2 degrees C, which represents the amount of warming expected by 2100 under nations' current pledges to limit greenhouse gas emissions. The final step was to track the movement of those niches around the globe in response to climate change, and measure by how much they grew or shrank.

Losing ground

Different global warming scenarios — of 1.5 degrees Celsius, 2 degrees Celsius or 3.2 degrees Celsius — will have very different impacts on the geographic ranges of terrestrial insects and other invertebrates, plants and vertebrate animals.



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Overall, as the warmer the planet got, most species' ranges got smaller. That's for three basic reasons, Warren says. Some climatic niches migrated right into the sea and vanished. Others crept up mountain slopes until they could go no higher. And for some species — such as many plants — the pace of climate change was too rapid for the species themselves to migrate.

So, how much of an improvement is the lower warming target? "It's very much the right question to be asking," says Lauren Buckley, an ecologist from the University of Washington in Seattle.

The study "is a great first approximation of the difference in these warming scenarios," Buckley says. However, she notes, the work's broad-brush approach means it can't take into account the physiology of these species or how each might respond to changing climates.

"Some organisms will be winners and some losers with climate change," she says. "Hopefully, a lot of biologists will start to ask this question, too."

Citations

R. Warren *et al.* The projected effect on insects, vertebrates, and plants of limiting global warming to 1.5°C rather than 2°C. *Science.* Vol. 360, May 17, 2018, p. 791. doi:10.1126/science.aar3646.

Further Reading

C. Gramling. Globetrotting tourists are leaving a giant carbon footprint on the Earth. Science News Online, May 7, 2018.

C. Gramling. Cargo ships must cut their emissions in half by 2050. Science News Online, April 13, 2018.

M. Temming. U.S. will withdraw from climate pact, Trump announces. Science News Online, June 1, 2017.

T. Sumner. 195 nations approve historic climate accord. *Science News*. Vol. 189, January 9, 2016, p. 6.