Predicting the impact of wild habitat loss

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Habitat loss is one of the greatest threats many species face, but scientists have struggled to predict the effects of, for example, rainforest loss, due to the sheer numbers of species involved.

Researchers have now focused on a single self-contained ecosystem – comprised simply of a carnivorous plant and the species that inhabit it – and used this to create a model that could apply to much larger systems.

The study is the first wild experiment to test how the interactions of predators and prey can drive decline when habitats contract, the researchers claim. "To actively manipulate an entire food web is pretty difficult outside the laboratory," explains Nicholas Gotelli, at the University of Vermont in Burlington, US.

To overcome that problem, Gotelli and colleague Aaron Ellison turned to the northern pitcher plant (Sarracenia purpurea), a carnivorous species found in the bogs of southern Canada and the eastern US. The plant produces up to 12 fat, tubular shaped leaves each year that fill with water and support an aquatic community.

Food webs
The pitcher plants use nectar, and bright colouration to attract ants and flies into the leaves, which fall into the water and drown. They form the basis of a complex food web, involving water-bound midge and fly larvae that eat them. Other tiny species, such as bacteria, protozoa, and rotifers, eat the leftovers – and also serve as food for the larvae.

The complexity of this food web is comparable to that of food webs of much larger species, says Gotelli.

Working with 50 pitcher plants in a Vermont bog, the researchers reduced or added water, to stimulate habitat loss, and in some cases removed the midge and fly larvae which act as "top predators" in these miniature ecosystems. Top predators are often the first to vanish when habitats contract, as they need the largest areas to survive.

Complex interactions
Gotelli and Ellison compared a range of computer models of how species are predicted to decline after habitat loss with the pair's actual results of how species had declined. Models that took into account the complex interactions of species were much better at predicting actual declines, than those that made predictions based on habitat size alone, they confirmed.

"If we're going to understand the effects of habitat loss on natural communities, we're going to have to do more than study a single species at a time," says Gotelli.

He plans to use his model to study the effects of climate change on the ecosystem, first varying the amounts of precipitation.

Looking at the total interactions of predators and prey is important in formulating methods to save species from decline, he adds.

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