Reducing numbers of one carnivore species indirectly leads to extinction of others

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Previous studies have shown that carnivores can have indirect positive effects on each other, which means that when one species is lost, others could soon follow. A team from the University of Exeter and the University of Bern has now found that reducing the numbers of one species of carnivore can lead to the extinction of others.

Published online today (28 February 2013) in the journal Ecology Letters, the study shows that simply reducing the population size of one carnivore can indirectly cause another similar species to become extinct. The research shows that changes in population size, as well as extinction, can create ripple effects across sensitive food webs with far-reaching consequences for many other animals.

The research shows that species could suffer just as much from harm to another species as from being under direct threat themselves. This adds weight to growing evidence that a 'single species' approach to conservation, for example in fisheries management, is misguided. Instead the focus needs to be holistic, encompassing species across an entire ecosystem.

The researchers assembled experimental ecosystems with three species of parasitic wasps, along with the three types of aphids on which each wasp exclusively feeds. They set up four sets of tanks each containing the three aphid and three wasp species and allowed the populations to establish for eight weeks. Over the next 14 weeks (seven insect generations) the researchers removed a proportion of the wasps from

three of the sets of tanks every day - one species from each set. The fourth set had no wasps removed.

The team found that the partial removal of one wasp species led indirectly to the extinction of other wasp species. In the absence of one wasp species, the aphid it preyed upon grew in numbers. All three species of aphid feed on the same plant so increased competition for food led to changes in sizes of the aphid populations. However no aphid species went extinct and so the indirect extinctions of the wasps were not the result of extinction of their prey. Rather, it is likely that the wasps that went extinct had difficulty searching for suitable prey among large numbers of unsuitable ones.

Lead researcher Dr Frank van Veen of the University of Exeter's Centre for Ecology and Conservation said: "We have shown that the complex ripple effect of a change in population size across food webs is more sensitive than previously thought and that a reduction in the numbers of one carnivore can lead to the extinction of another carnivore species. We also found evidence that the initial indirect extinction can itself trigger further ones, potentially leading to a cascade of extinctions, like dominoes toppling over."

"The insect system is handy for experimentation but the same principles apply to any ecosystem, from mammals in the Serengeti to the fish in our seas. It clearly shows that we should have an ecosystem-based approach to conservation and to the management of fish stocks and other natural resources."

The research team has recently been awarded a £470K grant by the Natural Environment Research Council (NERC) to extend this research at a larger scale.

Provided by University of Exeter