# Wiping out top predators messes up the climate

- 18:00 17 February 2013 by **Fred Pearce**

- For similar stories, visit the **Endangered Species** and **Climate Change** Topic Guides

Wiping out top predators like lions, wolves and sharks is tragic, bad for ecosystems – and can make climate change worse. Mass extinctions of the big beasts of the jungles, grasslands and oceans could already be adding to greenhouse gases in the atmosphere.

Trisha Atwood of the University of British Columbia in Vancouver, Canada, studied the effect of removing predator fish from ponds and rivers in Canada and Costa Rica. Across a range of ecosystems, climates and predators, she found a consistent pattern: carbon dioxide emissions typically increased more than tenfold after the predators were removed.

"It looks like predators in many types of ecosystems – marine and terrestrial as well as freshwater – can play a very big role in global climate change," she told *New Scientist*.

The widespread and dramatic ecological impacts of the loss of top predators are well known. In the ensuing "trophic cascade", the vanished top predator's prey proliferate, which in turn puts pressure on the species that the prey eats, and so on down the food chain. In this way, changes at the top of a food chain destabilise the balance of populations right the way down.

But the geochemical impacts of trophic cascades, including any impact on emissions from ecosystems, are much less well known. Atwood's study of freshwater ecosystems showed how changes to species at the bottom of the food chain, such as photosynthesising algae, following the removal of a top predator dramatically increased the flow of $CO_2$ from the ecosystem to the atmosphere.

The effect will not always be to increase $CO_2$ emissions, however – sometimes the loss of top predators could decrease emissions, she says. "But we show that something so seemingly

unrelated, like fishing all the trout from a pond or removing sharks from the ocean, could have big consequences for greenhouse-gas dynamics."

## Help from kelp

Other recent studies have hinted at similar effects. Last October, Christopher Wilmers of the University of California, Santa Cruz, reported how the disappearance of sea otters is linked with increased $CO_2$ emissions from North American coastlines (Frontiers in Ecology and the Environment, doi.org/khz). With no otters eating them, sea urchins thrive and eat out kelp forests – often known as the "rainforests of the oceans" – resulting in major $CO_2$ releases.

Global climate models do not take such impacts into account yet. Atwood says they could be major, as freshwater emissions may be on a par with the influence of deforestation, which is thought responsible for around 15 per cent of human-caused $CO_2$ emissions.

Environmentalists will herald the findings as further evidence that it is vital to protect pristine habitats and the charismatic species at the top of their food chains. But there is a dark side. A recent study found that some island ecosystems around New Zealand store 40 per cent more carbon than others because of their top predators – invading rats that are wiping out seabird colonies. Rats, it seems, are good for the climate (*Biology Letters*, doi.org/bbmtw9).

Journal reference: *Nature Geoscience*, DOI: 10.1038/NGEO1734