

# research snapshot

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## Falling calcium levels are harming freshwater animals.

### What is this research about?

Over the past two decades, calcium levels have been falling in the freshwater lakes of eastern North America. Too much logging and acid rain have reduced the amount of calcium in forest soils. This has brought about a loss of calcium in nearby waters. As a result, there is a growing concern that the falling levels will have an impact on the various crustaceans that inhabit these waters. Because of their thick exoskeletons and regular moult cycles, freshwater crustaceans have high calcium needs; this restricts them to only those waters that have substantial amounts of calcium. When calcium levels drop, their exoskeletons become weaker. Their ability to reproduce and survive is threatened. Low levels of calcium can also reduce the abundance, size, and weight of these crustaceans. A reduction in size can slow the onset of sexual maturity, making them more vulnerable to predators. This, in turn, may further impact the size of their population. Finally, affected crustaceans may become less tolerant of other factors such as temperature, toxic metals, and UV radiation.

Three groups of crustaceans in particular – daphniids, crayfish, and gammarids – are especially important. Because of the water in which they reside, they are useful for studying the decline in calcium concentration. But they

### What you need to know:

Crayfish are especially vulnerable to falling levels of calcium in eastern North American lakes. This poses a threat to the ecosystems in which crayfish and other crustaceans reside.

are important on an ecological level, as well. Daphniids, which can be found in North America, Europe, and north Asia, are important filter feeders of phytoplankton. They also serve as food for planktivorous fish. Crayfish and gammarids are key prey for a variety of animals including waterfowl, fish, amphibians, and terrestrial animals. Given their importance to their ecological systems, there is an urgent need to understand the impact of declining calcium levels on these and other species.

### What did the researchers do?

Researchers at York University reviewed existing research to analyze the impact of falling levels of calcium on several types of crustaceans in eastern North America. They also looked at the gaps in some of this research, which may be preventing researchers from being able to assess the risks these animals face.

### What did the researcher find?

Because of falling levels of calcium in the freshwater lakes of eastern North America, daphniids, gammarids, and crayfish are likely living under chronic metabolic stress. This would make them more vulnerable to predators and would weaken their populations. Of the three crustaceans looked at in this study, daphniids make the best candidates for studying calcium concentrations. Gammarids, on the other hand, may be able to adapt to water that is poor in calcium, which is an encouraging sign. However, crayfish are the most vulnerable to declining levels of calcium.

### How can you use this research?

To date, only seven species of animals, living in areas that are experiencing calcium decline, have been studied by researchers. In order to fully understand and predict the impact of falling levels of calcium on different types of crustaceans, more research is needed. Researchers should study animals that come from – and have adapted to – water that is poor in calcium. Experiments in laboratories should replicate the conditions of calcium-poor waters. They should also draw on larger samples. Research on animals such as molluscs, which have a high need for calcium, is urgently needed.

### About the Researchers

Norman Yan is a Professor in the Department of Biology at York University. Allegra Cairns is a graduate student at York University. This Research Snapshot is from their paper, “A review of the influence of low ambient calcium concentrations on freshwater daphniids, gammarids, and crayfish.”

[nyan@yorku.ca](mailto:nyan@yorku.ca)

### Keywords

*Acid rain, calcium, crayfish, crustaceans, daphniids, exoskeleton, gammarids, lakes, logging, North America, water.*

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[kmunit@yorku.ca](mailto:kmunit@yorku.ca)

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