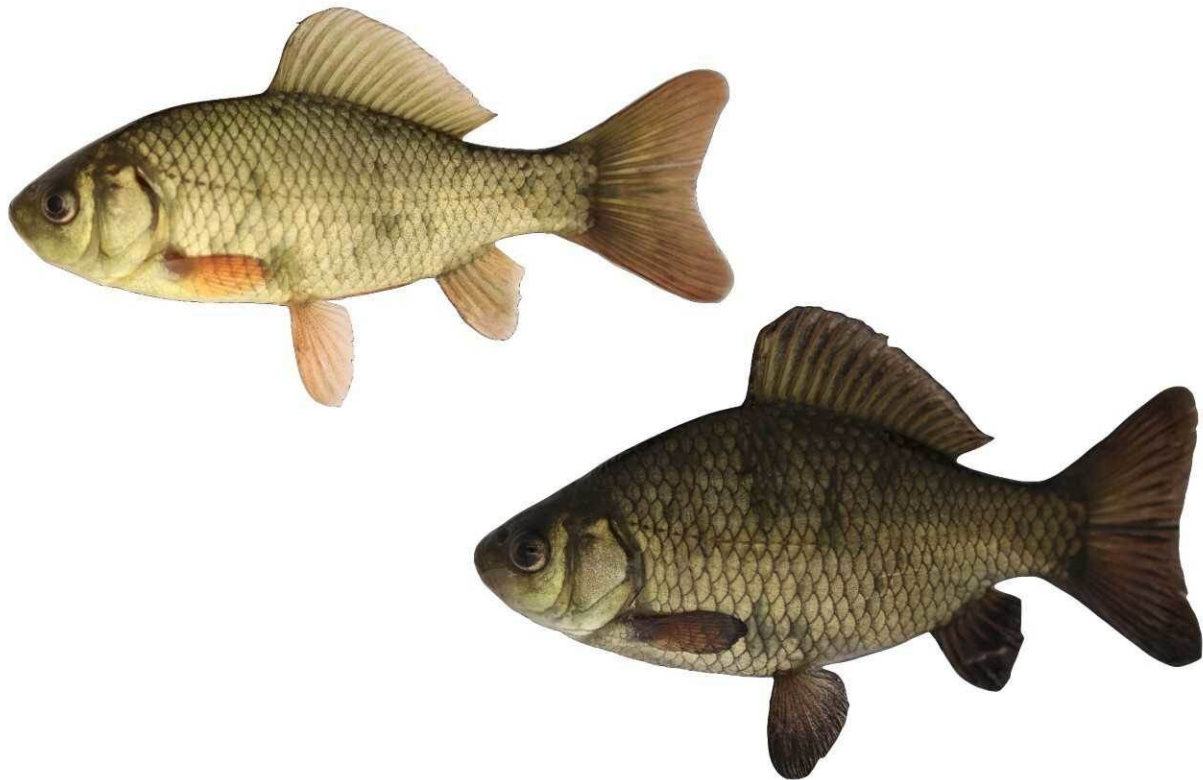


Fear of predators increases risk of illness in prey species

July 9 2019



The crucian carp on the bottom has lived near predators, and is therefore bigger (in height). Credit: Jerker Vinterstare

Predators are not only a deadly threat to many animals, they also affect potential prey negatively simply by being nearby. Researchers at Lund University in Sweden have studied what happens to the prey's immune

system when they are forced to expend a large amount of their energy on avoiding being eaten.

To protect themselves, certain [animals](#) switch colour, while others change their body shape. An example of the latter is the [fish species](#) crucian carp, which changes shape when coexisting with their natural [predator](#), the northern pike. Instead of its normal oblong body shape, the crucian carp increases in height and resembles a discus. This makes it considerably more difficult for the pike to eat it, and increases the carp's chances of survival.

The researchers in Lund studied whether this type of body change for protection against predators affects the prey's immune system. The results are clear: animals at risk of being attacked by predators generally have an weaker immune system compared with animals that are not threatened.

The presence of predators can thus have hidden but potentially important effects on the prey's chances of survival.

"They are potentially more susceptible to viruses and bacteria, and have an increased risk of illness," says Jerker Vinterstare, [doctoral student](#) at the Department of Biology at Lund University.

The reason for the impairment of central parts of the immune system is unclear, but the researchers think that stress is likely to be a contributory factor. Previous research has shown that [chronic stress](#) can result in an impaired immune system, and the presence of predators nearby probably entails a high level of stress.

The research team used crucian carp as its model animal, but think that predators can have a similar effect on the immune system of other prey.

A surprising result was that the individuals that increased in height the most displayed a better immune system than individuals whose height did not increase as much, and therefore had a weaker defence against predatory fish.

According to the researchers, it would have been less surprising if the opposite effect had been observed, as changing [body shape](#) is expected to incur energetic costs. An individual that increases more in height should quite simply have less energy to devote to its immune system.

"It's surprising, but I think it may be linked to the personality of different individuals. We knew previously that bold crucian carp protect themselves more against pike attacks by increasing in [height](#) to a greater extent than their more cautious conspecifics," says Jerker Vinterstare, who continues:

"Having a bold personality is synonymous with having an exploratory nature. A bold crucian carp that moves over large areas is at greater risk of running into danger, both in the form of hungry predatory fish and microorganisms that cause disease. Such individuals have a greater need to invest in an effective defence," he concludes.

More information: Jerker Vinterstare et al. Defence versus defence: Are crucian carp trading off immune function against predator-induced morphology?, *Journal of Animal Ecology* (2019). [DOI: 10.1111/1365-2656.13047](#)

Provided by Lund University

Citation: Fear of predators increases risk of illness in prey species (2019, July 9) retrieved 23 April 2024 from <https://phys.org/news/2019-07-predators-illness-prey-species.html>

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