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# Could losing a sense of smell explain why crab populations are declining?

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By Responsible Seafood Advocate

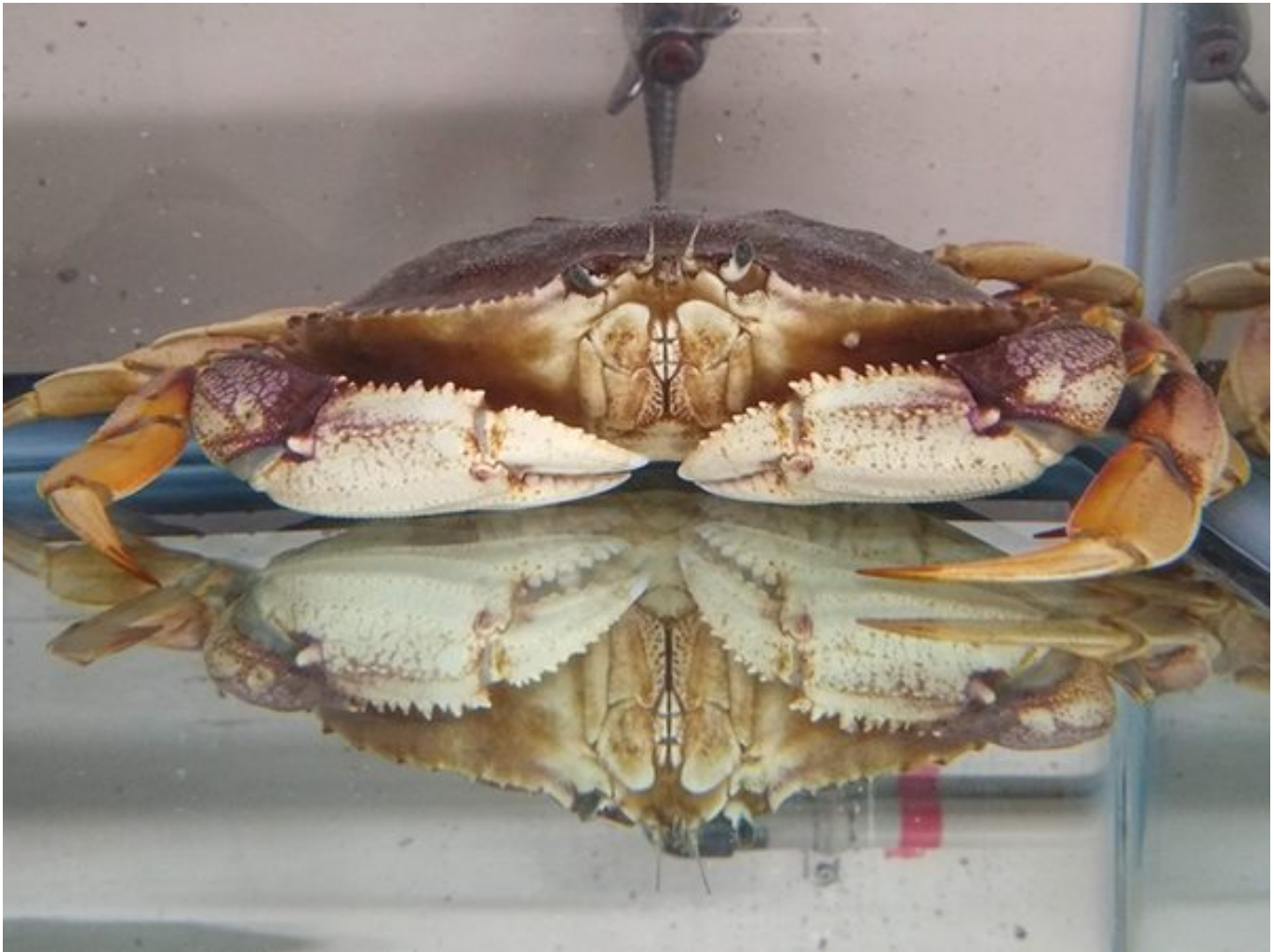
## Ocean acidification causes Dungeness crabs to sniff less, which may contribute to crab population collapse

A new University of Toronto study has found that climate change is causing a commercially significant marine crab to lose its sense of smell, which could partially explain why crab populations are thinning.

The research, which was published in *Global Change Biology* (<https://onlinelibrary.wiley.com/doi/10.1111/gcb.16738>), was done on Dungeness crabs and found that ocean acidification causes them to physically sniff less, impacts their ability to detect food odors and even decreases activity in the sensory nerves responsible for smell.

“This is the first study to look at the physiological effects of ocean acidification on the sense of smell in crabs,” said Cosima Porteus, an assistant professor at the University of Toronto (UofT) Scarborough and co-author of the study along with the postdoctoral student Andrea Durant.

Like most crabs, they have poor vision, so their sense of smell is crucial in finding food, mates, suitable habitats and avoiding predators, explained Porteus. They sniff through a process known as flicking, where they flick their antennules (small antennae) through the water to detect odors. Tiny neurons are responsible for smell are located inside these antennules, which send electrical signals to the brain.



Recent research conducted at the University of Toronto Scarborough found that ocean acidification is causing Dungeness crabs to sniff less, affecting their ability to detect food odors. Photo by Cosima Porteus.



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The researchers discovered two things when the crabs were exposed to ocean acidification: They were flicking less and their sensory neurons were 50 percent less responsive to odors.

“Crabs increase their flicking rate when they detect an odor they are interested in, but in crabs that were exposed to ocean acidification, the odor had to be 10 times more concentrated before we saw an increase in flicking,” said Porteus.

There are a few potential reasons why ocean acidification seems to be impacting the sense of smell in crabs. Porteus points to other research done at the University of Hull that showed ocean acidification disrupts odor molecules, which can impact how they bind to smell receptors in marine animals such as crabs.



## Study: Pyridine is ‘highly toxic’ to crabs and caused 2021 die-off

A Newcastle University study found that pyridine is ‘highly toxic’ to crabs and is the chemical responsible for crab and lobster die-offs in the United Kingdom.



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For this study, the researchers were able to test the electrical activity in the crabs’ sensory neurons to determine whether they were less responsive to odors. They also discovered that they had fewer receptors and their sensory neurons were physically shrinking by as much as 25 percent in volume.

“These are active cells and if they aren’t detecting odors as much, they might be shrinking to conserve energy,” she said. “It’s like a muscle that will shrink if you don’t use it.”

Porteus said reduced food detection could have implications for other economically important species such as Alaskan king and snow crabs because their sense of smell functions the same way.

“Losing their sense of smell seems to be climate-related, so this might partially explain some of the decline in their numbers,” said Porteus. “If crabs are having trouble finding food, it stands to reason females won’t have as much energy to produce eggs.”

Dungeness crabs are an economically important species found along the Pacific coast, stretching from California to Alaska. They are one of the most popular crabs to eat and their fishery was valued at more than \$250 million in 2019.

**Read the full study here (<https://onlinelibrary.wiley.com/doi/10.1111/gcb.16738>).**

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