

Arctic study shows key marine food web species at risk from increasing carbon dioxide

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This is the researchers in the Arctic. Credit: Credit: Martin Hartley-Catlin Arctic Survey

A research expedition to the Arctic, as part of the Catlin Arctic Survey, has revealed that tiny crustaceans, known as copepods, that live just beneath the ocean surface are likely to battle for survival if ocean acidity continues to rise. The study found that copepods that move large

distances, migrating vertically across a wide range of pH conditions, have a better chance of surviving.

The increasing level of carbon dioxide in our atmosphere is changing [ocean](#) chemistry leading to seawater moving down the pH scale towards acidity. Some areas of the Arctic Ocean are already experiencing the fastest rates of acidification on the planet and, combined with sea-ice loss and warming temperatures, the impacts of climate change are likely to hit Arctic [marine life](#) first.

The study is published in the journal *Proceedings of the National Academy of Sciences (PNAS)* and was carried out by the University of Exeter and the Plymouth Marine Laboratory. The scientists observed that the natural range of temperature and acidity under the ice that copepods experience on a day-to-day basis corresponded to their responses to the ocean acidification conditions predicted for 100 years' time.

Dr Ceri Lewis from the University of Exeter said: "Our study found that some marine animals may not be able to survive the impact of [ocean acidification](#), particularly the early-life stages. This unique insight into how marine life will respond to future changes in the oceans has implications that reach far beyond the Arctic regions."

Found across the globe, copepods are one of the most abundant marine animals and are a vital food source for a wide variety of other marine life. Copepods can also act as bio-indicators, providing an early warning system for the health of the environment.

Until recently, it has been difficult to document what copepods and other marine life do when the Arctic Ocean is covered by sea ice, and more specifically what conditions they experience. The researchers, working alongside polar explorers as part of the Catlin Arctic Survey, camped in

winter conditions on the Arctic ice at temperatures of -40°C , risking frost bitten fingers, in order to collect this novel data.



This is Dr. Ceri Lewis from the University of Exeter with sample bottles. Credit: Al Humphries-Catlin Arctic Survey

Dr Helen Findlay from Plymouth Marine Laboratory said: "Our work has shown that life experience matters when it comes to surviving stressors. More studies are needed that link the natural environmental conditions to laboratory experiments. Ceri and I are planning to continue this line of work through a PhD studentship next year."

An estimated 30% of carbon dioxide released by humans into the atmosphere dissolves into oceans. With carbon emissions set to increase, the world's oceans are likely to suffer from increased acidification in the coming years. This study reveals how these changes are likely to impact globally important species like [copepods](#).

The study demonstrates that organisms with a limited natural habitat range are likely to suffer the most under changing climatic and oceanic conditions. Organisms with a wide natural range are likely to cope better.

Future studies will consider whether the type of habitat can be used to predict the vulnerability of different species to climate change.

More information: Sensitivity to ocean acidification parallels natural pCO₂ gradients experienced by Arctic copepods under winter sea ice, *PNAS*, www.pnas.org/cgi/doi/10.1073/pnas.1315162110

Provided by University of Exeter

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