

Climate change will upset vital ocean chemical cycles

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New research from the University of East Anglia shows that rising ocean temperatures will upset natural cycles of carbon dioxide, nitrogen and phosphorous.

Plankton plays an important role in the ocean's carbon cycle by removing half of all CO₂ from the atmosphere during photosynthesis and storing it deep under the sea – isolated from the atmosphere for centuries.

Findings published today in the journal *Nature Climate Change* reveal that water temperature has a direct impact on maintaining the delicate plankton ecosystem of our oceans.

The new research means that ocean warming will impact plankton, and in turn drive a vicious cycle of [climate change](#).

Researchers from UEA's School of Environmental Sciences and the School of Computing Sciences investigated phytoplankton – microscopic plant-like organisms that rely on photosynthesis to reproduce and grow.

Lead researcher Dr Thomas Mock, said: "Phytoplankton, including micro-algae, are

responsible for half of the carbon dioxide that is naturally removed from the atmosphere. As well as being vital to climate control, it also creates enough oxygen for every other breath we take, and forms the base of the food chain for fisheries so it is incredibly important for food security.

"Previous studies have shown that phytoplankton communities respond to global warming by changes in diversity and productivity. But with our study we show that warmer temperatures directly impact the chemical cycles in plankton, which has not been shown before."

Collaborators from the University of Exeter, who are co-authors of this study, developed computer generated models to create a [global ecosystem model](#) that took into account world [ocean temperatures](#), 1.5 million plankton DNA sequences taken from samples, and biochemical data.

"We found that temperature plays a critical role in driving the cycling of chemicals in marine micro-algae. It affects these reactions as much as nutrients and light, which was not known before," said Dr Mock.

"Under warmer temperatures, marine micro-algae do not seem to produce as many ribosomes as under lower temperatures. Ribosomes join up the building blocks of proteins in cells. They are rich in phosphorous and if they are being reduced, this will produce higher ratios of nitrogen compared to phosphorous, increasing the demand for nitrogen in the oceans.

"This will eventually lead to a greater prevalence of blue-green algae called cyanobacteria which fix atmospheric nitrogen," he added.

More information: 'The impact of temperature on marine phytoplankton resource allocation and metabolism' by A Toseland, SJ Daines, JR Clark, A Kirkham, J Strauss, C Uhlig, TM Lenton, K

Valentin, GA Pearson, V Moulton and T Mock is
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