

# Report reveals seasonal iron depletion in U.K. coastal waters

December 21 2018, by Alan Williams

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Scientists from the University of Plymouth have found that a lack of summertime iron could be having a major impact on the overall health of our coastal waters and shelf seas.

Shelf seas are the regions of shallow water less than 200m in depth between our coasts and the open ocean. They comprise only around 7 percent of the global ocean yet are highly productive, supporting more than 90 percent of global fisheries and providing invaluable resources in terms of biodiversity, carbon cycling and storage, waste disposal, [nutrient cycling](#), recreation and renewable energy.

Working as part of the UK Shelf Sea Biogeochemistry (SSB) research programme, Plymouth scientists discovered that lowered summer concentrations of iron in the shallow seas overlying our continental shelf could be having a detrimental effect on the growth of phytoplankton, the living 'canopy' of the [marine environment](#) and the base of the marine food web.

This shows that human activities such as atmospheric and water-borne pollution and dredging can affect essential iron and nutrient availability. This causes a direct knock-on effect for the marine food web in general, causing significant change to the overall marine ecosystem and the many and varied species it supports.

The £10.5 million SSB programme was co-funded by the Natural Environment Research Council (NERC) and the Department for

Environment, Food and Rural Affairs (Defra).

The project synthesis report – Shelf Seas: The Engine of Productivity – says it has provided a much-improved understanding of the role of shelf seas in removing and storing carbon, and the lessons for policy in monitoring, managing and valuing these precious habitats.

The key findings will be used to provide evidence for Defra, the devolved administrations and other stakeholders to help ensure the sustainable use of the UK marine environment.

The Plymouth element of the research was led by Dr. Simon Ussher, Associate Professor of Marine and Analytical Chemistry, and Visiting Professor Maeve Lohan, working with Lecturer in Environmental Science Dr. Angela Milne and former Ph.D. student Dr. Anthony Birchill.

They took part in a number of research cruises around 50-200 miles off the coast of Cornwall, collecting samples of the [water](#) column before analysing them both on ship and in the lab back in Plymouth.

Their specific findings were presented in a research paper – "Seasonal iron depletion in temperate shelf seas" – published in *Geophysical Research Letters*, and now are incorporated into the NERC/Defra synthesis report.

Dr. Ussher and Dr. Milne said:

"The novel element of this study was that it provided the first year-round assessment of iron and nutrient concentrations in UK coastal and shelf waters. And what we found was very surprising. The summer iron concentrations were similar to those found in iron-limited Southern Ocean waters despite the fact our samples were collected in relatively

shallow seas that lie directly above sediments. We never expected to see such depleted levels of iron here.

"This is important as future climate predictions suggest that summer stratification of coastal waters will intensify as global temperatures increase. This means that the sunlit surface waters where phytoplankton live and grow will become more cut off from deeper waters that are rich in iron and nutrients. This physical separation of nutrient-poor surface waters from nutrient-rich deeper waters can limit the ability of phytoplankton to grow and reproduce and therefore impact on the overall productivity of our [shelf seas](#). These results show that we need to continue monitoring [iron](#) and nutrient concentrations to ensure there is no lasting detrimental effect on our coastal waters and fisheries."

The SSB programme brought together more than 100 researchers from 15 universities and research centres, and involved research cruises on RRS Discovery and RV Cefas Endeavour, mostly in the Celtic Sea.

Dr. Phil Williamson, the Science Coordinator of the SSB programme said:

"The seas around Britain are amongst the best-studied in the world. Yet we are only just finding out how the many complex processes occurring there fit together. Whilst this research programme was aimed at a better understanding of the big picture, the team also discovered many new facts on what is actually going on, and how our nearest part of the ocean might be vulnerable to future change."

**More information:** Antony J. Birchill et al. Seasonal iron depletion in temperate shelf seas, *Geophysical Research Letters* (2017). [DOI: 10.1002/2017GL073881](https://doi.org/10.1002/2017GL073881)

Provided by University of Plymouth

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