Six decades of plankton decline sparks call to protect the foundation of the marine food web

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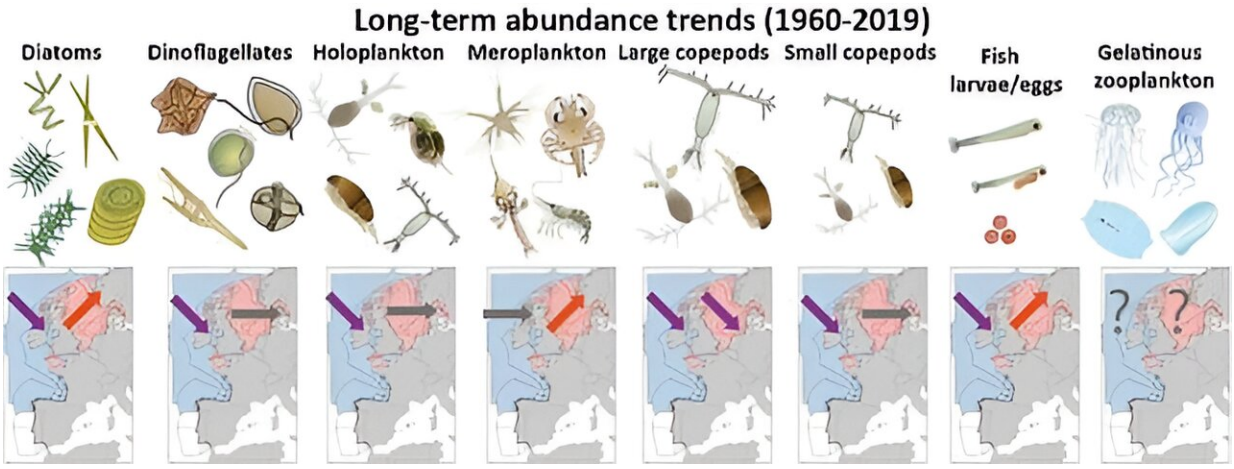

Credit: University of Plymouth

The decline in plankton abundance in the North East Atlantic over the past six decades should serve as a red flag to policy makers about the need to protect some of the planet's most critical forms of life, a new study has warned.

Scientists from across western Europe carried out the most comprehensive assessment to date of long-term changes in the region's plankton communities.

They analyzed 24 phytoplankton and zooplankton datasets generated by 15 research institutions to map the 60-year abundance trends for eight planktonic lifeforms.

This included data collected by the Continuous Plankton Recorder (CPR) Survey, which has been operating since 1931 and represents the most geographically extensive marine monitoring program in the world. The findings are published in the journal *Science of The Total Environment*.

The research has also been featured in OSPAR's Quality Status Report 2023. Published in September 2023, it is the culmination of years of work by more than 200 scientists across Europe, detailing the current status of marine biodiversity as well as the specific human activities exerting pressures on the marine environment, with a particular emphasis on climate change.

The assessment of pelagic habitats highlighted in the report was coordinated by Dr Abigail McQuatters-Gollop and Dr Matt Holland, working alongside colleagues at Plymouth Marine Laboratory (PML) and the Marine Biological Association (MBA). The findings of this report will be used by governments across Europe to inform their marine policy and how they manage human activities to protect our shared marine environment.

Across the open oceans of the North East Atlantic, where temperatures have increased gradually during the past six decades, most of the lifeforms assessed showed a decrease in abundance.

Dinoflagellates (an important type of phytoplankton), for example, have decreased by around 5% per decade since the 1960s while the quantities of holoplankton (zooplankton that spend their entire lives in the water column) fell by 7% per decade.

By contrast, similar populations in the North Sea—which has undergone major warming, changes in nutrients, and disruption from fisheries—have remained far more stable. Some plankton populations there, and particular in more coastal regions, have even increased in abundance.

In the *Science of the Total Environment* article, the study's authors say the reasons behind the variation in impacts from the North East Atlantic to the North Sea are not wholly clear, but align with a rise in human use of the oceans and an acceleration in changes to the global climate.

They also say that with plankton playing such an integral role in the food chain—and phytoplankton, in particular, generating up to 50% of the planet's oxygen—the decline represents a cause of major concern.

"Plankton form the base of marine food webs, making them important indicators of ecosystem status. Changes in the abundance of plankton functional groups, or lifeforms, can affect higher food web levels and indicate important shifts in ecosystem functioning. With our study highlighting major changes over a prolonged period of time, it should provide a red flag to politicians and policymakers about the prioritization of future management and adaptation measures required to ensure future sustainable use of the ocean," says Matt Holland, postdoctoral research fellow, Marine Conservation Research Group.

"This study highlights the value of collaborative research at the science policy interface. Research institutes across Europe contributed data for the recent OSPAR assessment of the North-East Atlantic to meet their reporting obligations. Most of this data had never been examined in a combined analysis before. By combining previously separate datasets, we were able to detect important trends and patterns consistent across multiple institutions and territorial waters, which provided the inspiration for this paper," says McQuatters-Gollop.

The study's authors include representatives from Marine Research Plymouth—a partnership between the University, Plymouth Marine Laboratory (PML) and the Marine Biological Association—who have collaborated over many years to assess changes in Europe's plankton populations.

They also worked to create the Plankton Lifeform Extraction Tool (PLET), which brings together separate plankton datasets into one central database to give a more accurate picture of the spatial and temporal location of ocean plankton.

"This study is based on a network of time series from multiple laboratories across the U.K. and the rest of Europe. It shows worrying declines in some of the key plankton groups, and while the scale of the decline points to large scale climatic warming as the ultimate cause, we still need to understand why some species and regions are changing faster than others," says Dr. Angus Atkinson, from Plymouth Marine Laboratory (PML).

"One of the key messages here is that warming is impacting the plankton. The trends are showing declines in most areas, however some areas are showing increases in certain plankton groups. This demonstrates the importance of having large-scale coverage when monitoring the plankton and combining with a range of different time-series," says Dr. Clare Ostle, continuous plankton recorder research fellow.

More information: Matthew M. Holland et al, Major declines in NE Atlantic plankton contrast with more stable populations in the rapidly warming North Sea, *Science of The Total Environment* (2023). DOI: 10.1016/j.scitotenv.2023.165505

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