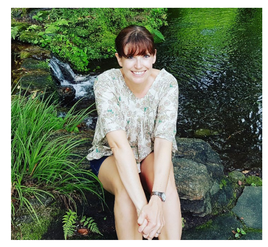
Plankton on the move: implications for global biodiversity goals



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ICEGRAPH Increasing Confidence Evaluating GES for Regional Assessments of Pelagic Habitats
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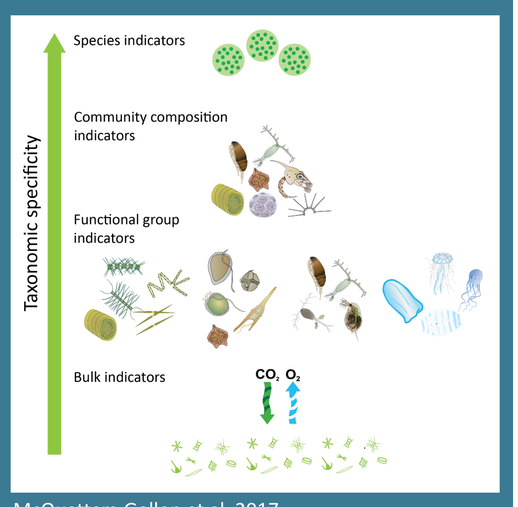
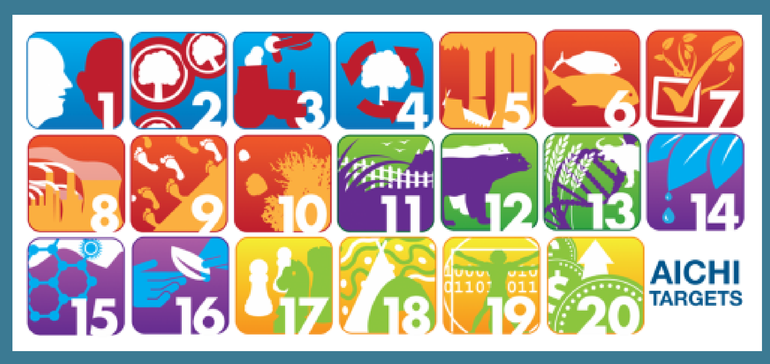
Why plankton?

- Plankton communities are the key biological feature of pelagic habitats.
- Plankton produce 50% of global oxygen.
- Plankton comprise the base of the marine food web and are sensitive to changes in their environment, making them good indicators.



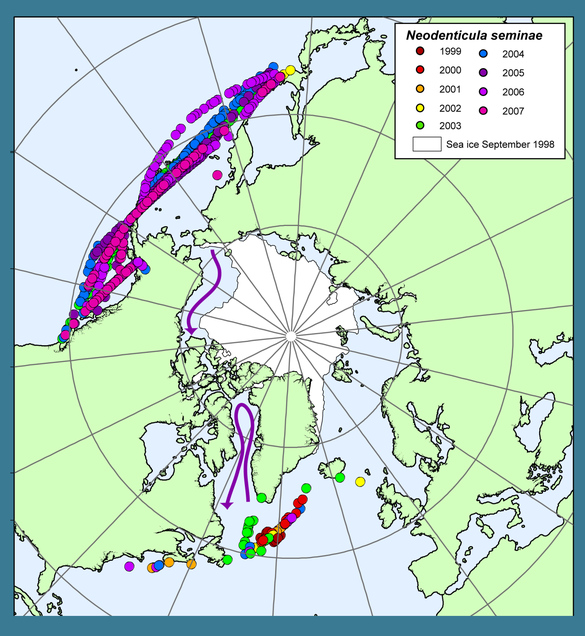
McQuatters-Gollop et al. 2017

Achieving global biodiversity goals depends on healthy plankton communities

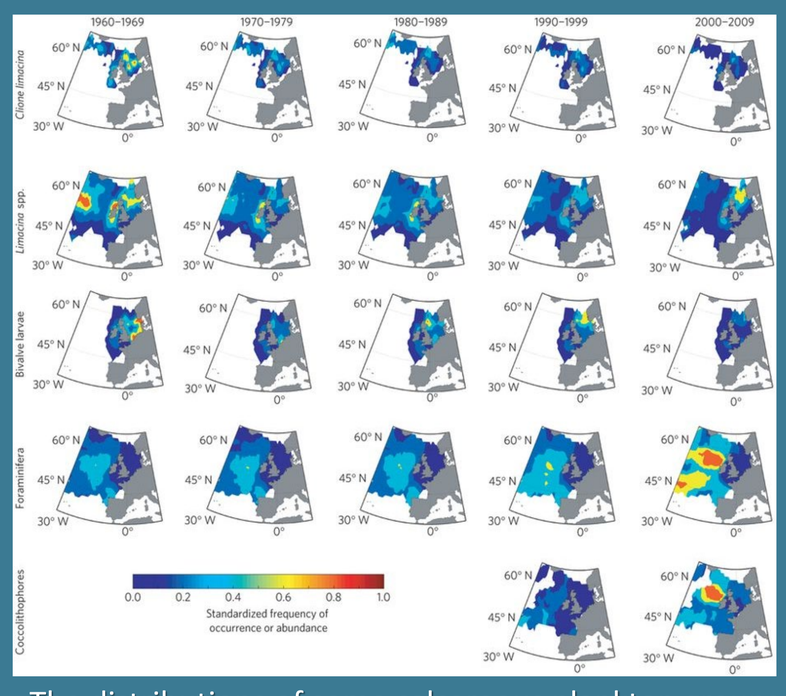


Climate change is reorganising plankton communities

NE Atlantic copepod community composition is shifting as temperatures increase (updated from Beaugrand et al. 2002).

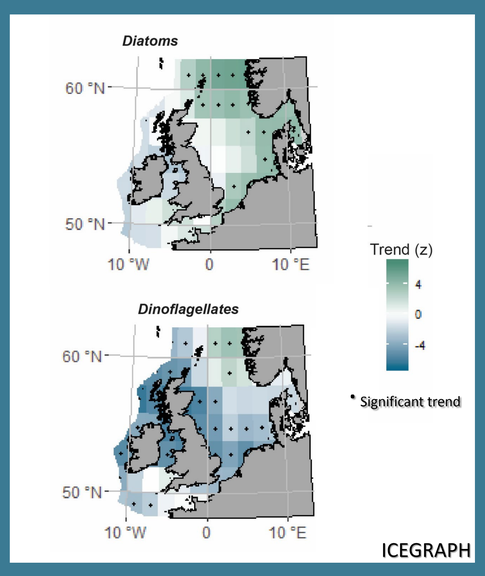


An ice-free channel through the Arctic has allowed a Pacific diatom, *Neodenticula seminae*, to establish in the North Atlantic (Reid et al. 2007).



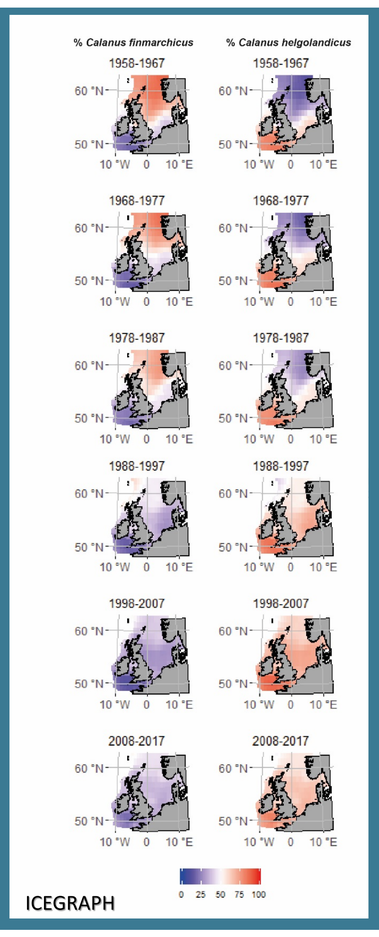
The distributions of some calcareous plankton groups have altered during the past five decades, although links to decreasing pH are unclear (Beaugrand et al. 2013).

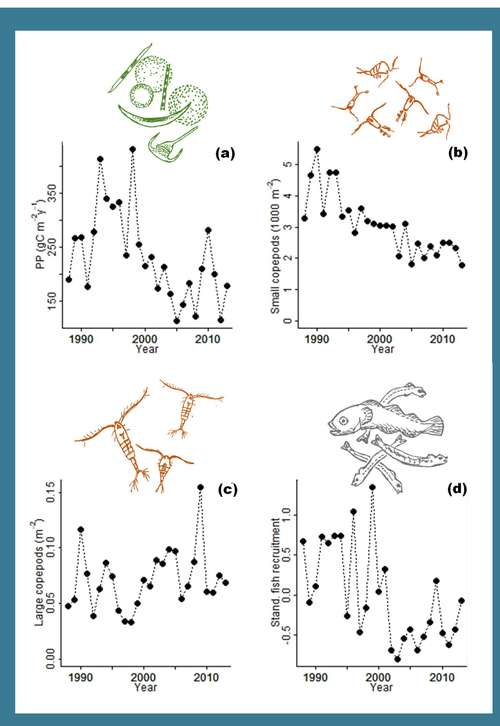
Shifting plankton, shifting food webs



At the base of the North Sea food web, diatom and dinoflagellate abundances have increased and decreased, respectively, since 1958, changes associated with temperature (Bedford et al. in prep).

Rising temperatures have caused dominance of the North Sea copepod community to switch from the cold-water, lipid-rich *C. finmarchicus* to the warm-water, less nutritious *C. helgolandicus*, resulting in a poorer food source for larval fish (updated from Beaugrand et al. 2002).





Warming-driven declines in North Sea primary production are strongly correlated with decreases in small copepods and fish recruitment (Capuzzo et al. 2017).

What do these plankton changes mean for global biodiversity goals?

- Indicators created from multi-decadal plankton datasets can help assess progress against biodiversity goals.
- Plankton change can act as an early warning signal for wider ecosystem alterations.
- Understanding how climate change is impacting plankton can reveal insights into food web changes.
- Decision-makers require this information to prepare for and adapt to climate-driven changes in the marine environment.

References: Beaugrand, G., et al., (2002). Reorganization of North Atlantic Marine Copepod Biodiversity and Climate. *Science*, 296: 1692-1694. • Beaugrand, G., McQuatters-Gollop, A., et al., (2013). Long-term responses of North Atlantic calcifying plankton to climate change. *Nature Climate Change*, 3: 263-267. • Capuzzo, E., McQuatters-Gollop, A., et al., (2018). A decline in primary production in the North Sea over 25 years, associated with reductions in zooplankton abundance and fish stock recruitment. *Global Change Biology*, 24: e352-e364. • McQuatters-Gollop, A., et al., (2017). From microscope to management: the critical value of plankton taxonomy to marine policy and biodiversity conservation. *Marine Policy*, 83: 1-10. • Reid, P.C., et al., (2007). A biological consequence of reducing Arctic ice cover: arrival of the Pacific *diatom Neodenticula seminae* in the North Atlantic for the first time in 800,000 years. *Global Change Biology*, 13: 1910-1921.