

The responses of marine biodiversity and ecosystems to global environmental change and other impacts – a century-long perspective from the English Channel

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Global environmental change (ocean warming, sea level rise and stormier seas, ocean acidification, non-native invasive species) interacts with regional (e.g., bottom-fishing, eutrophication) and local impacts (e.g., pollution, habitat loss due to coastal development) to alter marine biodiversity and ecosystems. Long-term research is essential to distinguish the signal of climate change from the noise of natural fluctuations and to understand interactions of global change with regional and local scale impacts. Generally, climate change makes regional and local scale impacts worse. Using examples from work in the English Channel and the wider British Isles and Ireland – led from the Marine Biological Association of the UK – a case is made for a long-term view of global change in the oceans. Firstly 100 years of observations help segregate the influence of climate and over-exploitation on bottom fish stocks in the English Channel. Secondly, changes on rocky shores drawing on time-series stretching back 70 years are considered including interactions with pollution and coastal development. The mechanisms driving changes in distribution of species are then briefly discussed with in-parallel experiments and modelling, before briefly considering consequences for community structure, dynamics and ecosystem functioning. In the medium-term (next 25 years) scientific focus and societal actions should concentrate on better understanding and management of the interactions between global change and those regional and local impacts that can be regulated – whilst hopefully de-carbonisation of society proceeds apace.