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The clams before the storms: the fate of bivalve diversity during times of crisis

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Of all the macrofossil groups, bivalves (clams, scallops, oysters and mussels) have perhaps the best global record. Known from the Cambrian, bivalves have survived every mass extinction and climate perturbation the planet has suffered. Many of the ~90 living families of bivalves with a fossil record have roots that stretch back to the Paleozoic.

This lineage longevity makes bivalves an ideal model group for studying biodiversity responses to changing climate – families have been separate for a long time, and their varied ecological roles and habitats means that the effects of climate on different biogeographic regions and ways of making a living can be teased apart. The abundance of bivalves in marine and freshwater deposits provides large specimen-level datasets for analysing survivorship across climate-event boundaries, such as the Paleocene-Eocene Thermal Maximum, a major warming event, or the end-Pliocene cooling. Bivalves have been shown to be a good proxy for much of marine benthic biodiversity, and they can give us insights into questions such as: is biodiversity response to climate perturbation predictable? What species and lineages are at risk, and can we identify them?

Not only can bivalves help us track effects of climate changes of the past thanks to their rich fossil record; they may also be a major player in human efforts towards our own future climate resilience. Bivalves today provide food for many millions of people worldwide, both in artisanal and commercial fisheries, and perform vital ecosystems services, such as water filtration, sequestration of carbon, and as both food and habitat for many other animals of all sizes. Increased aquaculture of molluscs has been postulated as a way to take more of the burden of feeding the world's population off the terrestrial realm, and without the adverse effects of finfish farming.

This talk will discuss patterns and fluctuations of bivalve diversity through time, focusing on predictive models for survivorship across major climate transitions in the Cenozoic, and using the past behaviour of species and clades to look ahead to potential marine diversity responses to projected climate scenarios.