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The short and long-term implications of warming and increased sea water pCO₂ on the physiological response of a temperate neogastropod species

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Abstract:

Global average temperatures and seawater pCO₂ have rapidly increased due to the oceanic uptake of atmospheric carbon dioxide producing severe consequences for a broad range of species. The impacts on marine ectotherms have been largely reported at short-term scales (i.e. from days to weeks); however, the prolonged effects on long-term processes such as reproduction have received little attention. The gastropod *Ocenebra erinaceus* is a key predator structuring communities on rocky shores of the French and UK coasts. Even though rocky shore species are regarded as being very tolerant to changes in temperature and pH, many of them are living near their upper tolerance limits, making them susceptible to rapid environmental changes. Here, we report that future mean seawater conditions (RCP8.5, + 3 °C and ~900 μatm CO₂) do not significantly affect the physiology and molecular response of *O. erinaceus* adults after 132 days. During the first 50 days, there was a slight impact on oxygen consumption rates and body weight; however, after 95 days of exposure, gastropods fully acclimated to the experimental condition. Despite this, reproduction in females exposed to these future seawater conditions ceased after long-term exposure (~ 10 months). Therefore, in the short-term, *O. erinaceus* appear to be capable of full compensation; however, in the long-term, they fail to invest in reproduction. We conclude studies should be based on combined results from both short- and long-term effects, to present realistic projections of the ecological consequences of climate warming.

Keywords: warming, pCO₂, neogastropod, short-term, long-term