

Meta-analysis reveals complex marine biological responses to the interactive effects of ocean acidification and warming

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Methodology

- Meta-analysis was performed on peer-reviewed articles published between Jan 1990 and Jan 2012 that explicitly investigated: ocean acidification, elevated temperature, or elevated temperature and acidification (for conditions predicted by the year 2100)
- Analyses were carried out using a log response ratio (lnRR) with a weighted random-effects model
- Interaction between ocean acidification and warming was carried out using a factorial meta-analysis

Major Findings

- Biological responses varied across taxonomic groups, life-history stages, and trophic levels
- Multiple stressors generally exhibited a stronger biological effect than experienced in isolation
- Four of five biological responses measured interacted synergistically when warming and acidification were combined, suggesting that predicting ecosystem responses to multiple stressors may be difficult to predict.
- Marine ecosystems are subject to multiple stressors, this research highlights that care must be made in making inferences from single-stressor studies.