ID: W2608504860

TITLE: Intra-Specific Variation Reveals Potential for Adaptation to Ocean Acidification in a Cold-Water Coral from the Gulf of Mexico

AUTHOR: ['Melissa Kurman', 'Carlos E. Gómez', 'Samuel E. Georgian', 'Jay J. Lunden', 'Erik E. Cordes']

ABSTRACT:

Ocean acidification, the decrease in seawater pH due to the absorption of atmospheric CO2, profoundly threatens the survival of a large number of marine species. Cold-water corals are considered to be among the most vulnerable organisms to ocean acidification because they are already exposed to relatively low pH and corresponding low calcium carbonate saturation states (?). Lophelia pertusa is a globally distributed cold-water scleractinian coral that provides critical three-dimensional habitat for many ecologically and economically significant species. In this study, four different genotypes of L. pertusa were exposed to three pH treatments (pH=7.60, 7.75, and 7.90) over a short (two-week) experimental period, and six genotypes were exposed to two pH treatments (pH=7.60, and 7.90) over a long (six-month) experimental period. Their physiological response was measured as net calcification rate and the activity of carbonic anhydrase, a key enzyme in the calcification pathway. In the short-term experiment, net calcification rates did not significantly change with pH, although they were highly variable in the low pH treatment, including some genotypes that maintained positive net calcification in undersaturated conditions. In the six-month experiment, average net calcification was significantly reduced at low pH, with corals exhibiting net dissolution of skeleton. However, one of the same genotypes that maintained positive net calcification (+0.04% day-1) under the low pH treatment in the short-term experiment also maintained positive net calcification longer than the other genotypes in the long-term experiment, although none of the corals maintained positive calcification for the entire 6 months. Average carbonic anhydrase activity was not affected by pH, although some genotypes exhibited small, insignificant, increases in activity after the sixth month. Our results suggest that while net calcification in L. pertusa is adversely affected by ocean acidification in the long term, it is possible that some genotypes may prove to be more resilient than others, particularly to short perturbations of the carbonate system. These results provide evidence that populations of L. pertusa in the Gulf of Mexico may contain the genetic variability necessary to support an adaptive response to future ocean acidification.

SOURCE: Frontiers in marine science

PDF URL: https://www.frontiersin.org/articles/10.3389/fmars.2017.00111/pdf

CITED BY COUNT: 41

PUBLICATION YEAR: 2017

TYPE: article

CONCEPTS: ['Ocean acidification', 'Calcification', 'Coral', 'Seawater', 'Biology', 'Chemistry', 'Animal science', 'Ecology', 'Internal medicine', 'Medicine']