Response to ocean acidification varies by genotype in the deep-sea coral *Lophelia pertusa*

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Cordes et al. in press, UNWOA (updated from Freiwald et al. 2005, UNEP)
22 sampling stations
Depth range: 2–2500 m
2010–2014 (Spring – Fall)

Lunden et al. 2013, L&O; Georgian et al., in prep
CTD data providing the first estimates of $\Omega_{\text{ar}}$ at depth in the Gulf of Mexico

Lunden et al. 2013, L&O; Georgian et al., in prep
Low $\Omega_{ar}$ at deep-water reefs

Lunden et al. 2013, L&O; Georgian et al., in prep
Short-term decline in growth in response to low pH and $\Omega_{ar}$ treatments

Lunden et al. 2014, Frontiers Mar Sci
Variable response by genotype in short term experiments

Average response to pH

Genotype-specific response to pH

Net Calcification (% d⁻¹)

pH treatment

7.6  7.75  7.9

Net Calcification (% d⁻¹)

pH Treatment

7.6  7.75  7.9
Long-term decline in growth in response to low pH and $\Omega_{ar}$ treatments
Variable response by genotype in long term experiments
Variable response by population: genetic isolation

Lunden et al. 2014, Frontiers Mar Sci
Variable response by population: growth rate

Georgian et al., submitted
Variable response by population: respiration rate

Georgian et al., submitted
Variable response by population: feeding rate

Georgian et al., submitted
Gulf of Mexico *Lophelia* occurs close to lower bounds of dissolved oxygen tolerance.

Survivorship in laboratory experiments

Lunden et al. 2014, Frontiers Mar Sci
Gulf of Mexico *Lophelia* occurs close to upper bounds of temperature tolerance.

Survivorship in laboratory experiments

Colors represent different genotypes |

Lunden et al. 2014, Frontiers Mar Sci
The complex response of *Lophelia* to ocean change

Low saturation states near deep reefs
Growth occurs above $\Omega_{ar} = 1$ in lab experiments
Variability in response
  some genotypes can calcify at $\Omega_{ar} < 1$
  different physiological strategies in populations
Gulf of Mexico populations may be more sensitive due to multiple stressors in natural environment
Thanks to my lab for the data: Sam Georgian, Carlos Gomez, Melissa Kurman, Jay Lunden, Conall McNicholl, Chris Sears, Jeff Turner
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