Acclimatisation of key physiological processes in the cold-water corals *Lophelia pertusa* and *Madrepora oculata* over their ambient temperature range

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**Introduction**

- *L. pertusa* & *M. oculata*: Key cold-water coral (CWC) reef-builders
- Both species thrive at ambient water temperatures of 4 – 14 °C
- Effects of temperature on distribution patterns still in question
- Maintain *L. pertusa* and *M. oculata* over natural temperature range
- Investigate influence of ambient temperature on CWC physiology
- Evaluate temperature effects on key CWC physiological processes

**Methods**

*Lophelia pertusa* & *Madrepora oculata*

- Cosmopolitan species, occur in Med at up to 14 °C
- *L. pertusa*: depth range: 39–2775 m, size: \(\leq 1.5\) m
- *M. oculata*: depth range: 55–1950 m, size: \(\leq 0.75\) m
- Laboratory incubations: After each monthly treatment period
- Replication: \(n = 5\) species\(^{-1}\) period\(^{-1}\)
- Colony sizes: *L. pertusa*: \(3 \pm 2\) and *M. oculata*: \(65 \pm 22\) polyps
- Closed cell incubation: 6 h duration
- Parameters measured:
  - Calcification (via total alkalinity)
  - Respiration (via O\(_2\) electrodes)
  - DOC (dissolved organic carbon) net flux (via HTCO)

**Physiological measurements**

**Results**

- *L. pertusa* key physiological processes show effective acclimatisation to persistently modified ambient temperature
- Species-specific response to lowered temperature is indicated by decline in *M. oculata* calcification and respiration rates

**Summary**

- Thermal acclimatisation in CWC indicates species-specificity
- *L. pertusa* metabolism and growth show thermal acclimatisation
- *M. oculata* physiological rates decrease with lowered temperature
- CWC DOC fluxes appear uncoupled from ambient temperature

**Conclusions**

Species-specific thermal acclimatisation capacity may likely affect the regional occurrence and distribution patterns of key CWC reef-builders. Thermal acclimatisation may further represent an essential physiological feature to withstand climate change related temperature anomalies importantly affecting overall deep-sea reef functioning by sustaining continuous CWC ecosystem engineering capacity.

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