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Climate change impacts on cold-water coral thermal range: a paleoceanographic perspective

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Reef-building scleractinian cold-water corals (CWC) are engineer species that create 3D structures providing shelter for many organisms in the mostly barren seafloor landscape, making them important hotspots of biodiversity in the deep sea. Natural climatic cycles change CWC living conditions, affecting their habitat suitability through the ages. As human-induced global warming intensifies, understanding the impact of these changes on deep-sea environments and biological ecosystems becomes increasingly important. During the biomineralization process, corals incorporate elements into their aragonite skeletons in different proportions depending on the environmental conditions. Thus, the chemical composition of modern and fossil coral skeletons can be indicative of the seawater conditions during their formation. The ratios of several major and trace elements, as well as some stable isotopic systems, can be used as proxies. The combination of CWCs' long lifespan, well-preserved aragonite skeleton, and ability to record environmental conditions make them a powerful tool for reconstructing past ocean conditions. *Lophelia pertusa* (LP) is the most commonly used species for paleo reconstructions due to its global distribution and distinctive morphology that facilitates identification. While LP's live temperature range is typically cited as being between 4-12°C, the source of this information is elusive [1]. Concomitantly, recent studies (based on Li/Mg-thermometry) suggest that LP may have survived below 4°C during the Last Glacial Maximum (LGM) [2,3], indicating a possible regional thermal adaptation across millennia. To better define the current and past temperature range of LP, additional research efforts are required. The objective of this study is to investigate temporal changes of LP thermal amplitude in the Atlantic. For that, we will, on one hand, revise (and better constrain) the species' present-day thermal amplitude using data from oceanographic surveys and sampling expeditions, including CTD measurements. And, on the other hand, improve the reconstruction of LP’s temperature range (and its variation) since the LGM by extending the available LP Li/Mg-thermometry record.

1. Rogers (1999), https://doi.org/10.1002/iroh.199900032
2. Lausecker et al. (2021), https://doi.org/10.5194/egusphere-egu22-9308
3. Cuny-Guirriec (2020), https://theses.hal.science/tel-02971509