

## Acid-base physiology of Antarctic and Sub-antarctic sea urchins and their resilience to ocean acidification

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Increasing atmospheric carbon dioxide concentration alters the chemistry of the oceans towards more acidic conditions. Polar oceans are particularly affected due to their low temperature, low carbonate content and mixing patterns, for instance upwellings. Echinodermata were hypothesized to be at risk due to their high-magnesium calcite skeleton. However, tolerance to ocean acidification (OA) in metazoans is first linked to acid-base regulation capacities of the extracellular fluids. No information on this was available for Antarctic echinoderms and inference from temperate and tropical studies needed support. We investigated the acid-base status of 9 species of sea urchins (3 cidaroids, 2 regular euechinoids and 5 irregular brooding euechinoids) collected in the frame of the ANTXXIX/3 Polarstern campaign, the vERSO BELSPO project and the REVOLTA and PROTEKER IPEV projects. It appears that Antarctic regular euechinoids are equipped with similar acid-base regulation systems as tropical and temperate regular euechinoids and are able to compensate their extracellular pH (pHe) when facing OA by increasing the extracellular bicarbonate concentration. Cidaroids have an acid-base status similar to that of tropical cidaroids, characterized by very low pHe. Therefore, Antarctic cidaroids will most probably not be affected by decreasing seawater pH, the pH drop linked to OA being negligible in comparison with their naturally low pHe. Irregular euechinoids regulate their pHe when facing OA through an unknown mechanism. The pH of sea water in the brooding chambers depends on the pH of the surrounding sea water and is further reduced in presence of calcified juveniles. This suggests that these juveniles will endure worse acidification conditions and might be possibly at risk. Combining these results with the resilience of Antarctic euechinoid larvae suggests that most of these organisms might not be the expected victims of ocean acidification although the impact on brooded juveniles of irregular euechinoids should be further investigated