Influence of environmental conditions on trophic niche partitioning among sea stars assemblages

Le Bourg Baptiste[1], Alice Blanchard[1], Bruno Danis[2], Quentin Jossart[2], Gilles Lepoint[1], Camille Moreau[2] and Loïc N. Michel[1]

[1] Laboratory of Oceanology, MARE Centre, University of Liège, 4000 Liège (Sart-Tilman), Belgium E-mail: baptiste.lebourg@doct.ulg.ac.be
[2] Marine Biology Laboratory, Université Libre de Bruxelles (ULB), 1050 Brussels, Belgium

The Southern Ocean undergoes intense and contrasted impacts linked to climate change. The Western Antarctic Peninsula is one of the most rapidly warming regions of the world (Meredith and King, 2005), resulting in sharp sea ice cover decrease (Parkinson and Cavalieri, 2012). In contrast, surface temperature and sea ice cover remain stable in other regions such as the Weddell Sea. Sea stars (Echinodermata: Asteroidea) are a key group of the Southern Ocean benthos, considered to be quite resistant to seawater temperature changes (Peck et al., 2008). However, other more indirect environmental changes, might induce important shifts in food web structure and functioning, that may affect sea stars trophic ecology.

In this context, the aim of this study was to use stable isotopes ratios of C, N and S to study sea stars trophic ecology to characterise their trophic diversity and plasticity regarding food web changes. Sea stars were sampled during the austral summer in the South Georgia (sub-Antarctic) in 2011 and in the South Shetland (2006) and South Orkney Islands (2016), as well as in the Weddell Sea (2015-2016). Trophic diversity, i.e. differences of trophic ecology between sea star species, and variability, i.e. differences of trophic ecology between individuals of the same species, were investigated in each region by investigating isotopic dispersion and isotopic niche (proxy of the trophic niche) areas and overlap.

Difference in niche width and overlap between the regions may be the result of different environmental conditions, including sea ice coverage and dynamics. For example, in the South Shetland, sea stars had small and poorly differentiated isotopic niches. This result indicate that they may exploit the same benthic communities relying on few common food sources such as organic matter released during sea ice melting (Isla et al., 2006) or sinking phytoplankton (Mincks et al., 2008). Whether this situation leads to competition or not depends on the resources availability. In contrast, isotopic niches were larger and better separated for sea stars from South Georgia. South Georgia is an oligotrophic environment with no sea ice (Korb et al., 2008). As available food items are more limited but, perhaps, more diversified, a higher trophic segregation may appear between species. Ultimately, this project will help delineating processes determining trophic ecology of Southern Ocean sea stars.

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