Impact of ocean acidification and warming on sub-polar shelled pteropods (BIOACID subproject 3.2.1)

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Increasing global CO_2 concentrations and temperatures impact biogeochemical processes in the world's oceans. Rising CO_2 concentrations make the water corrosive for $CaCO_3$ shells and skeletons thereby negatively affecting a variety of marine calcified organisms. Most pronounced effects are expected for the Arctic Ocean. The thecosome pteropod *Limacina helicina* has a key function in the Arctic epipelagic food web. Due to their aragonitic shell, pteropods are expected to be among the first major group of calcifying organisms to be adversely effected by undersaturation in $CaCO_3$.

We investigated ocean acidification and warming effects on physiological aspects of different life stages of *L. helicina*. During three expeditions to Ny-Ålesund, Spitsbergen, we focused on pre-winter juveniles in Sept/Oct 2009, on overwintering juveniles in Jan/Feb 2010 and on adults in June/July 2010. Laboratory experiments were carried out at three different temperatures (3–8°C) and four pCO_2 concentrations (180–1150ppm). Principally, we investigated, growth, calcification/dissolution, shell preservation, lipid content, respiration and mortality.

First results from a 29 days experiment in Sept/Oct 2009 revealed a clear temperature and pCO_2 effect on mortality, but temperature was the overriding factor. Shell diameter, shell increment and shell preservation were significantly impacted by pCO_2 but not by temperature. More detailed, mortality was 46% higher at 8°C compared to 3°C (*in situ*), and 14% higher at 1150 ppm CO_2 as compared to 180 ppm CO_2. Shell diameter and increment were by 10% and 12% reduced at 1150 ppm CO_2 as compared to 180 ppm CO_2, respectively, and shell preservation was 41% lower.