Geophysical Research Abstracts
Vol. 20, EGU2018-17843, 2018
EGU General Assembly 2018

Ocean acidification increases herring larvae survival via food web alteration

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Ocean acidification, the decrease in seawater pH by increasing CO_2 concentrations, was shown to directly affect a wide range of marine organisms. These direct effects may in turn influence other species indirectly via food web interactions. These combined direct and indirect effects of ocean acidification were assessed in two mesocosm studies, where pelagic communities up to fish larvae were enclosed for several weeks and manipulated with CO_2 concentrations projected within the next hundred years.
The first experiment was performed in the Gullmarsfjord, Sweden. From January to June 2013, five of ten mesocosms were set to CO_2 levels of $\sim$760 μatm pCO_2, while the other five served as untreated controls. In this study, an enhancement of primary production under elevated CO_2 was mirrored by an increase in zooplankton abundance, which served as prey organisms for the herring larvae. After six weeks, herring larvae survival was significantly higher in the elevated CO_2 mesocosms.
The second mesocosm experiment was performed from May to July 2015 in the Raunefjorden, Norway. Here, four of eight mesocosms served as untreated control, while the other four were set to CO_2 levels of $\sim$2200 μatm pCO_2. This study confirmed the higher herring larvae survival at elevated CO_2, although overall survival rates were much lower than in the previous study. This time, however, no CO_2-induced enhancement of primary and secondary production was observed. Possible explanations for the higher herring larvae survival under elevated CO_2 in this experiment could be lower competition with and predation by gelatinous zooplankton.
Results of herring larval survival from both studies will be discussed in the context of food web effects of ocean acidification and will be used as "food for thought" to highlight knowledge gaps regarding species interactions in ocean acidification research.