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Effect of Ocean acidification on growth, calcification and reproduction of calcifying and non-calcifying epibionts of brown algae

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Anthropogenic emissions of CO_2 are leading to an acidification of the oceans of 0.4 pH units in the course of this century according to the more severe model scenarios. The excess of CO_2 could notably affect the benthic communities of calcifiers and macrophytes in different aspects (photosynthesis, respiration and calcification). Seaweeds are one of the key species of nearshore benthic ecosystems of the Baltic Sea. They are the substratum of several fouling epibionts like bryozoans and tubeworms. Most of those species are bearing calcified structures and could therefore be potentially impacted by the seawater pCO_2. On the other hand, the biological activity of the host may substantially modulate the pH and pCO_2 conditions in the boundary layer where the epibionts live. The aim of the present study was to test the sensitivity of seaweed macrofouling communities to higher pCO_2 concentration. Fragments of macroalgae Fucus serratus bearing the calcifiers Spirorbis spirorbis (Annelida) and Electra pilosa (Bryozoa) and the non-calcifier Alcyonidium gelatinosum (Bryozoa) were maintained for 30 days under three pCO_2: natural 460 $\pm$ 59 μatm and enriched 1193 $\pm$ 166 μatm and 3150 $\pm$ 446 μatm. Our study showed a significant reduction of growth rates and reproduction of Spirorbis individuals at the highest pCO_2. Tubeworms Juveniles exhibited enhanced calcification of 40 % when in the light compare to dark, presumably due to effect of photosynthetic and respiratory activities of the host alga. Electra colonies showed significantly improved growth rates at 1193 μatm. The overall net dissolution of the communities was significantly higher at 3150 μatm. No effect on Alcyonidium colonies growth rates was observed. Those results suggest a remarkable resistance of the algal macro-epibiontic communities to the most elevated pCO_2 predicted for 2100 for open ocean ($\sim$1000 μatm) conditions. Concerns remains with regards to higher pCO_2 possibly found in the future Baltic Sea.