Unravelling transgenerational plasticity on marine invertebrates in a changing ocean

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Climate change and pollution are happening concomitantly, especially in coastal areas which are subjected to various human activities. Among pollutants, heavy metals, pesticides and detergents are very concerning not only due to their toxicity but also their persistence in the environment. Such factors are known to affect the metabolism and condition of ectotherms, with downstream effects on growth, reproduction, and mortality. Consequently, both climate change and pollution can induce shifts in biodiversity, species distribution and fitness. To date, most global change studies focus on short-term experiments using a single generation, limiting our understanding of global change impacts in the marine environment. In this study we analyzed the impact of ocean warming and copper pollution in life-history traits and proteome of marine polychaetes over two generations in order to identify the pathways underpinning transgenerational responses and fitness consequences. Marine polychaetes are keystone species in many trophic webs of coastal areas, and are easily reared in captivity. These features make them suitable models for transgenerational studies. If acclimation over multiple generations takes place, populations may be able to survive in changing oceans, as previously shown in laboratory studies using other marine invertebrates as models. Preliminary data indicate an increase in fecundity from F1 to F2 in the warming scenario and an increase in average reproductive body size under copper pollution and the combined scenario (copper pollution and warming). Egg developmental rate also tends to increase in the warming scenario. Molecular analyses are currently under development and we hypothesize that differences in protein networks (related with cytoprotective proteins, anti-oxidant defense, mitochondrial enzymes) may dictate life history responses over the generations, potentially allowing for better performance.