Do copepods love hot tubs? About how invertebrates deal with climate change

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More than ever, global change is threatening the planet. Marine ecosystems are particularly under threat, as seawater temperatures are rising faster and faster all over the world. Increasing ocean temperatures might induce shifts in the distribution of nutrients throughout the food web. Consequently, copepods play a key role in these changing environments as they are situated at the interface between primary producers and secondary consumers. From this position, copepods transfer poly unsaturated fatty acids (PUFA's), to higher trophic levels. Among these PUFA's are DHA and EPA, two important omega-3 fatty acids that are essential for organisms higher up the food web. DHA and EPA are essential fatty acids because organisms cannot produce them themselves, yet these fatty acids need to be absorbed through foods for the organism to live a healthy life. This research focusses on how fatty acid profiles and epigenetic profiles of copepods change with rising temperatures over short and long-term scenarios. Fatty acid profiles can be used as a proxy for food quality, and epigenetic profiles can indicate whether organisms are able to adapt to changing environments in a faster way than evolution. A transgenerational experiment was conducted with *Acartia tonsa*, a pelagic copepod species. The copepods were exposed to different temperature treatments over the course of several generations, to observe potential interactions between the fatty acid metabolism and epigenetic mechanisms. Here we used DNA methylation levels as a tool to investigate the epigenetic profile. DNA methylation has also been shown to play an important role in stress response, which provides us with extra information about *Acartia tonsa's* reaction to climate change across multiple generations. Fatty acid profiles were characterized with GC-MS (gas chromatography – mass spectrometry) and relative abundances of fatty acids were compared between different treatments and replicates. In conclusion, these multigenerational experiments aim to provide new insights into effects of global warming on PUFAs and DNA methylation levels in invertebrates at the basis of marine food webs. These results illustrate the advantage of the unique combination of food web ecology, stress ecology, biochemical profiling and epigenetics.

Keywords
Climate Change; Copepods; Fatty Acids; Epigenetics