The sky is the limit... How high can zooplankton go?

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The effects of global warming spread to all trophic levels in the marine environment. Consequently, the reaction of zooplankton to increasing temperatures and heatwaves is extra important, as this might induce cascade effects that enhance effects for higher trophic levels. As main transferers of nutrients from primary producers to secondary consumers, copepods play a key role in the connection between low and high trophic levels in marine food webs. Therefore, it is highly important to investigate how the nutritional value of copepods, aka the fatty acid profiles, change with rising temperatures. During our research, the nutritional value of copepods changed drastically after several generations of high temperature exposure. In parallel, DNA methylation patterns were monitored to link stress levels and epigenetic changes to different temperature treatments. Interestingly, when temperature increased slowly over the course of four generations, mimicking future global temperature rise, methylation patterns deviated strongly from control conditions, while the fatty acid profiles remained similar to those of the control. This shows that a slow increase in temperature allowed the copepods to properly adapt to climate change, in strong contrast with their response to rapid temperature increase. The outcome of this research highlights the importance of short, local variations and heatwaves, in comparison to the mean global temperature increase.

Keywords
Copepoda; Climate Change; Temperature Stress; Fatty Acid; Epigenetics