Fatty acid profiling of copepods to meet SDG 2, 13 and 14: Comparing temperature responses in a tropical and temperate estuary

Wellens Siel[1], Mensens Christoph[1], Boyen Jens[1], Guifarro Zara[1], Vlaeminck Bruno[1], Dominguez Luis[2] and De Troch Marleen[1]

[1] University of Gent, Department of Biology, Research group Marine Biology, Campus Sterre, Krijgslaan 281/S8, 9000 Ghent, Belgium
E-mail: siel.wellens@ugent.be
[2] Escuela Superior Politécnica del Litoral (ESPOL), Centro del Agua y Desarrollo Sustentable (CADS) Vía Perimetral 5, Guayaquil, Ecuador

Climate change is a focal point in the UN sustainable development goals (SDG 13: *take urgent action to combat climate change and its impacts*). Predicted temperature changes will have a disproportionally higher impact on coastal ecosystems, such as estuaries. In these estuaries, benthic harpacticoid copepods (Crustacea, Copepoda) play a pivotal role at the base of the food web as they are the main consumers of primary producers such as diatoms and serve as a food source for higher trophic levels like fish. Their high levels of fatty acids (e.g. omega-3, omega-6), are essential for the maintenance of physiological functions in many organisms in this food web, including humans. In view of their role in the marine food web, balanced fatty acid profiles in these copepods are indicators for a healthy and stable ecosystem and any change in these profiles is expected to cascade through the food web and to have implications on the use of marine resources as a food source for humans (SDG 14: *conserve and sustainably use the oceans, seas and marine resources*).

In this study, responses to increased temperatures were studied and compared between two benthic copepods: *Platychelipus littoralis*, from the Westerschelde estuary and *Canthocamptus sp.* from the Guayas estuary in Ecuador. With increased temperatures, the fatty acid profile of these copepods will change in order to adapt to the environment. These changes in fatty acid profile are expected to be more pronounced in tropical species which are naturally less subjected to daily and seasonal temperature variability, in contrast, temperate species are expected to be able to adapt better in changing environments.

In controlled lab experiments, the copepod species were subjected to different elevated temperature treatments. We found that with increased temperatures, concentrations of essential fatty acids such as EPA and DHA (omega-3) tend to decrease. Although this decrease is less pronounced than expected, it can induce unfavorable effects on the higher trophic levels, which need these primary consumers for the majority of their fatty acid uptake.

Also humans rely on marine resources for the uptake of certain essential fatty acids that cannot be obtained through other food sources. In Ecuador, coastal communities largely depend on marine resources for their daily nutrition. When the essential fatty acid content in marine organisms is decreasing due to climate change, this can result in malnutrition in these vulnerable communities (SDG 2: *end hunger, achieve food security and improved nutrition and promote sustainable agriculture)*.

Keywords: Climate change; Copepods; Lipids; Westerschelde; Guayas