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# Do microplastics influence the toxicity of crude oil to Arctic copepods?

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**Requested session: 5 Impact of plastic pollution in the Arctic. Ecotoxicology, toxicology, and socioeconomics**

## ABSTRACT

Microplastics have already reached the world's most remote marine environments, such as the Arctic. There, they constitute a new stressor alongside multiple other human-induced stressors including ocean warming, changing salinity and chemical pollution. The aim of this study was to analyse sublethal effects of crude oil in combination with microplastics and a chemical dispersant on three Arctic copepod species: *Metridia longa*, *Calanus finmarchicus* and *Calanus glacialis*. The chosen species are among the most important herbivores of the pelagic food web in the Arctic in terms of biomass and are a major source of lipids for fish, birds and marine mammals. Copepods were exposed to either crude oil (1  $\mu\text{L L}^{-1}$ , Light Louisiana Sweet oil, dispersed droplets) alone, crude oil with microplastics (20  $\text{mL}^{-1}$ , 20  $\mu\text{m}$  polystyrene beads) or with microplastics and a chemical dispersant (0.05  $\mu\text{L L}^{-1}$ , Corexit® 9500A) for 5 days. The exposure suspensions were renewed daily and the number of produced fecal pellets and eggs were counted. Eggs were furthermore collected to monitor the hatching success within 10 days.

Exposure to crude oil significantly reduced the fecal pellet production rate of all three species by 34 to 58%, demonstrating a negative effect of the oil on the feeding activity of the copepods. We observed the presence of both crude oil droplets and microplastics in fecal pellets of the three species. Additional exposure to microplastics or microplastics plus a chemical dispersant did not change this observed negative effect of crude oil on the egestion rates. None of the investigated exposure combinations significantly affected copepod egg production and hatching success at the used concentrations. The reduction in feeding (reduced energy acquisition) at an unchanged reproduction cost caused by crude oil exposure could result in a depletion of the lipid storage, with potential implications for over-wintering success. This effect was not altered by the presence of microplastics despite using a concentration, which clearly exceeds measured levels in the Arctic. To conclude, this study demonstrates that in combination, crude oil is a pollutant of higher concern to Arctic copepods than microplastics.