Preliminary results: Deep sea oil spill in the Arctic – effects of pyrene on overwintering Calanus copepods

Toxværd, Kirstine Underbjerg; Dinh, Khuong Van; Hjorth, Morten; Nielsen, Torkel Gissel

Published in:
Book of Abstracts Sustain 2017

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

Preliminary results: Deep sea oil spill in the Arctic – effects of pyrene on overwintering *Calanus* copepods

Kirstine Toxværd[1, 2], Khuong Van Dihn[2], Morten Hjorth[2], Torkel Gissel Nielsen*[2]

1: COWI, Department of Water & Nature, Parallelvej 2, 2800 Kgs Lynby, 2: National Institute of Aquatic Resources, Technical University of Denmark, Kemitorvet Building 201, 2800 Kgs Lyngby, Denmark
*Corresponding author email: tgin@aqua.dtu.dk

Picture: Calanus hyperboreus after long-term exposure to pyrene. Credits: Kirstine Toxværd

Polar Oceans are some of the least impacted by human activities due to seasonal or permanent sea ice that limits human access. Projections of future polar ice loss suggest that the impact will increase substantially because of changing environmental conditions and pollution. Arctic Oceans hold a substantial amount of the world's remaining oil and gas reserves, but exploration is extremely technically challenging. To enable proper risk assessment, it is crucial to understand how oil spills can impact Arctic marine ecosystems. During polar night, biological processes in Arctic marine ecosystems are conventionally believed to slow down or cease. Indeed, several marine species have overwintering strategies, such as the *Calanus* copepods that overwinters for 8-10 months at depths of 200-2000 m and migrate to the productive surface layers to feed on the short Arctic bloom.

We conducted a winter experiment with two species of Artic copepod to study the impact of long term exposure to oil during polar night. We used the ecological important *Calanus hyperboreus* (winter breeder) and *C. glacialis* (spring breeder) as tests species, and quantified effects on the fitness-related traits mortality, egg production, grazing and egg hatching. Females were incubated in bottles with seawater and the oil compound pyrene (in concentrations of 0.1, 1, 10, 100 and 100+ nM) from December to March. They were transferred to clean seawater and fed in excess for 2-3 weeks until termination of the experiment. Mortality was checked daily, and egg and fecal pellets were collected within 24 h of production. Egg hatching success was determined at the beginning, middle and end of the experiment. Preliminary results indicate that *C. hyperboreus* exhibit a delayed response to pyrene through reduced feeding after transfer to clean seawater. Effects diminish over time, and feeding rate is recovered after 14 days without exposure to oil. Both egg production and feeding rate of *C. glacialis* is impacted by exposure in a concentration dependent manner after transfer to clean seawater. These findings suggest, that long term oil exposure during overwintering does indeed impact both *Calanus* species, and that *C. hyperboreus* seem to be more robust than the smaller *C. glacialis*. While effects on *C. glacialis* may have implications for stock recruitment within the season, potential effects on *C. hyperboreus* are likely delayed until next season. Negative effects on copepods may potentially affect the entire food chain and have severe ecosystem effects.