PHYSIOLOGICAL AND BEHAVIORAL EFFECTS OF OFFSHORE WIND FARM SOUNDS ON THE COPEPOD *Calanus finmarchicus*

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Anthropogenic underwater sound is increasing and can negatively impact the physiology and behavior of marine populations (Duarte et al., 2021). In many parts of the world, the number of offshore wind farms is increasing to meet the development goals towards sustainable renewable energy. However, offshore wind farms often produce continuous low-frequency chronic sounds, which modify the global marine soundscape. Many studies investigating the effect of underwater sound focus on high trophic levels (e.g., mammals and fish) while the effects of sound pollution on lower trophic levels such as zooplankton remain understudied.

Copepods such as *Calanus finmarchicus* play a key role in the marine food web by assuring carbon transfer from primary producers to higher trophic levels. Copepods perceive water velocities through mechanoreception, which is crucial for feeding, mating, and predator avoidance. The few studies investigating the noise effect on copepods have shown physical damage in sensing organs, potentially impairing their ability to detect water movement and altering swimming behavior (Vereide and Kühn, 2023). These findings are often species- and life-stage-specific and conducted under laboratory conditions; natural field conditions remain understudied.

To address this knowledge gap, we investigated the impacts of sound from offshore wind farms on adult female *C. finmarchicus* in an in situ mesocosm setup in Norway during summer 2024. Specifically, we examined the physiological and behavioral response of copepods exposed to continuous sound. Copepods were exposed to playback of offshore wind farm operational sounds in the mesocosms for two weeks, allowing for an ecologically relevant study under controlled conditions. We measured survival and metabolic rates throughout the exposure period. We hypothesized that the effects of sound exposure on copepods will become more pronounced over time, with lower survival and higher metabolic rates increasing as exposure progresses. We will also investigate gene expression related to oxidative responses, expecting increasing antioxidant expressions in sound-exposed copepods over the two-week period. As part of the behavioral response experiments, copepods were placed in a swimming arena after sound exposure, where we recorded escape and swimming behaviors. We hypothesized that sound-exposed copepods will become increasingly disoriented over time and show a progressively weaker response to predator cues.

Duarte C, et al. (2021) The soundscape of the Anthropocene Ocean. Science, 371(6529). eaba4658

Vereide E, Kühn S (2023) Effects of Anthropogenic Noise on Marine Zooplankton. The Effects of Noise on Aquatic Life, pp. 1–24. Springer