

First records of clock gene activity in *Calanus finmarchicus* – expression patterns during overwintering in a high Arctic fjord

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The copepod *Calanus finmarchicus* is a dominant zooplankton in the north Atlantic and is spreading northward into the Arctic due to ocean warming. The copepod's life is characterized by diel vertical migration as well as a seasonal cycle with overwintering in deep waters. Although both phenomena have been studied for more than a century, the exact factors controlling these rhythms are still unclear. Molecular techniques have precisely described genetic clockworks in several, mostly terrestrial species and there is clear evidence that clock genes are not only involved in the regulation of diel 24h rhythms, but can also play an important role in the synchronisation (entrainment) of the seasonal cycle. We present first records of clock gene expression in *Calanus finmarchicus* from Kongsfjorden, Svalbard and compare gene activity between specimens in the early and late phase of overwintering. Copepods were sampled from overwintering depth (>220 m) in September 2014 when day length was about 10 hours and during polar night in January 2015. The results show clear 24h oscillations in most genes for September, whereas gene expression is generally lower and almost completely arrhythmic during the polar night. The results strongly point towards the existence of a light-entrained genetic clock in *Calanus finmarchicus*. As the regulators of seasonal timing in this species are still unclear, understanding the mechanism of the clock could help assessing the adaptability of this boreal species to the strongly fluctuating light conditions at high latitudes. This could be crucial in predicting future seasonal mismatches and ecosystem consequences.

Keywords: *Calanus finmarchicus*, clock gene expression, overwintering, Kongsfjorden

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