# **Supplementary material**

# **Title of Article:**

Light-mediated temperature susceptibility of kelp species (*Agarum clathratum*, *Saccharina latissima*) in an Arctic summer heatwave scenario

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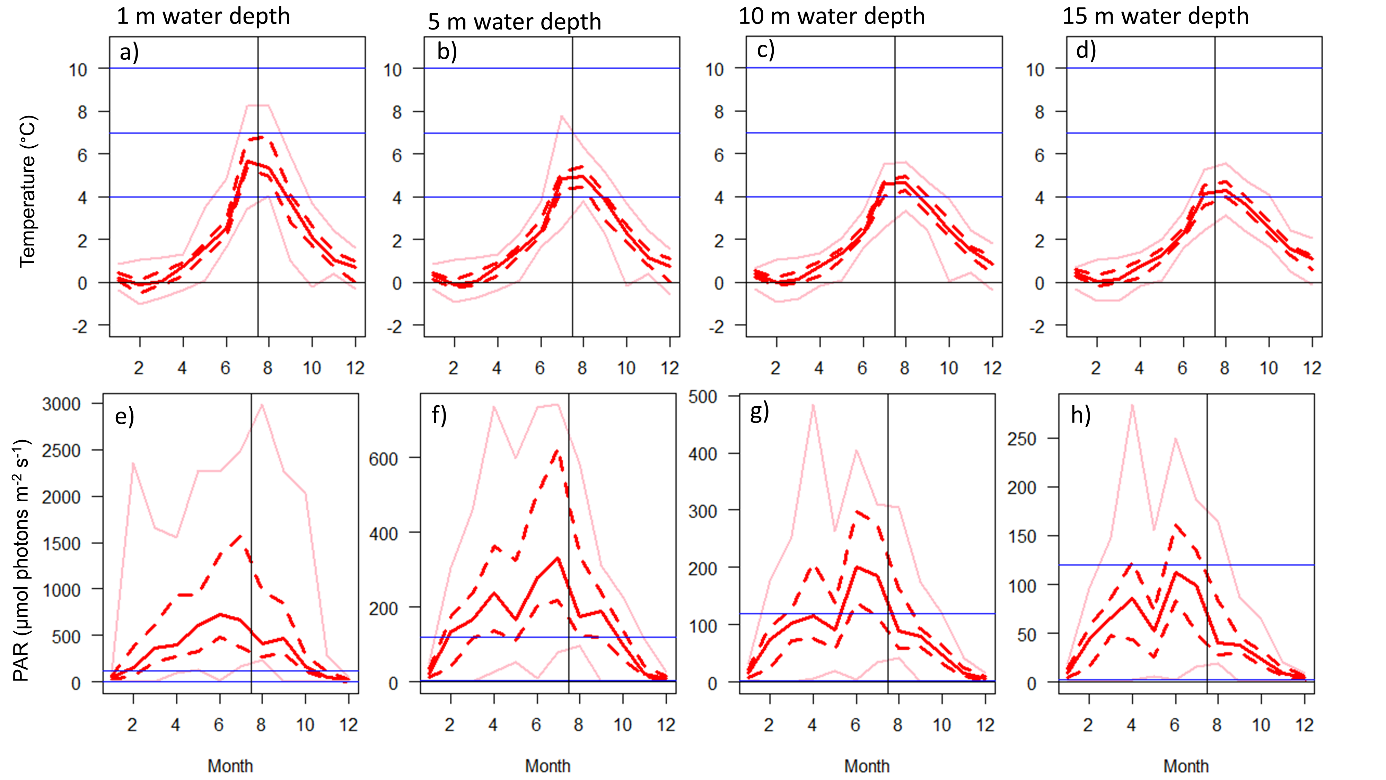
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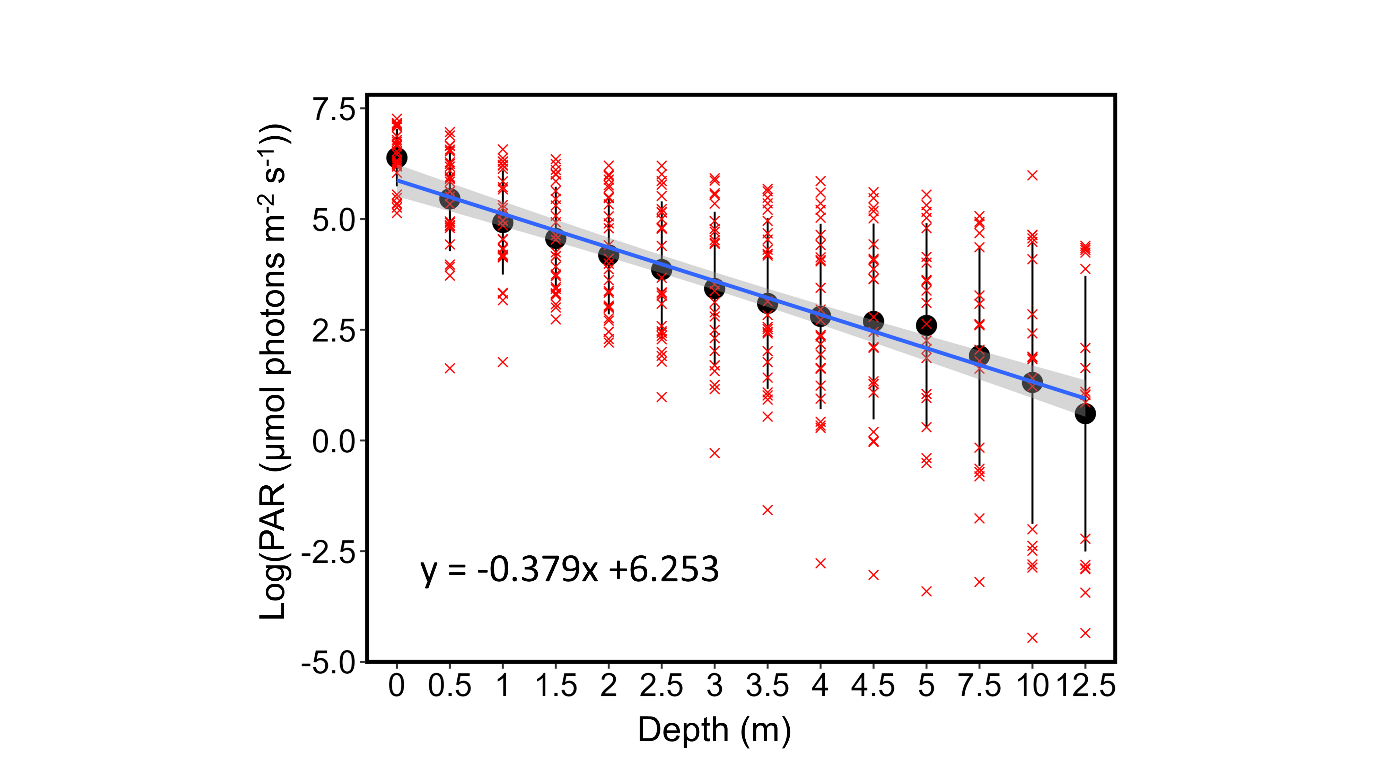


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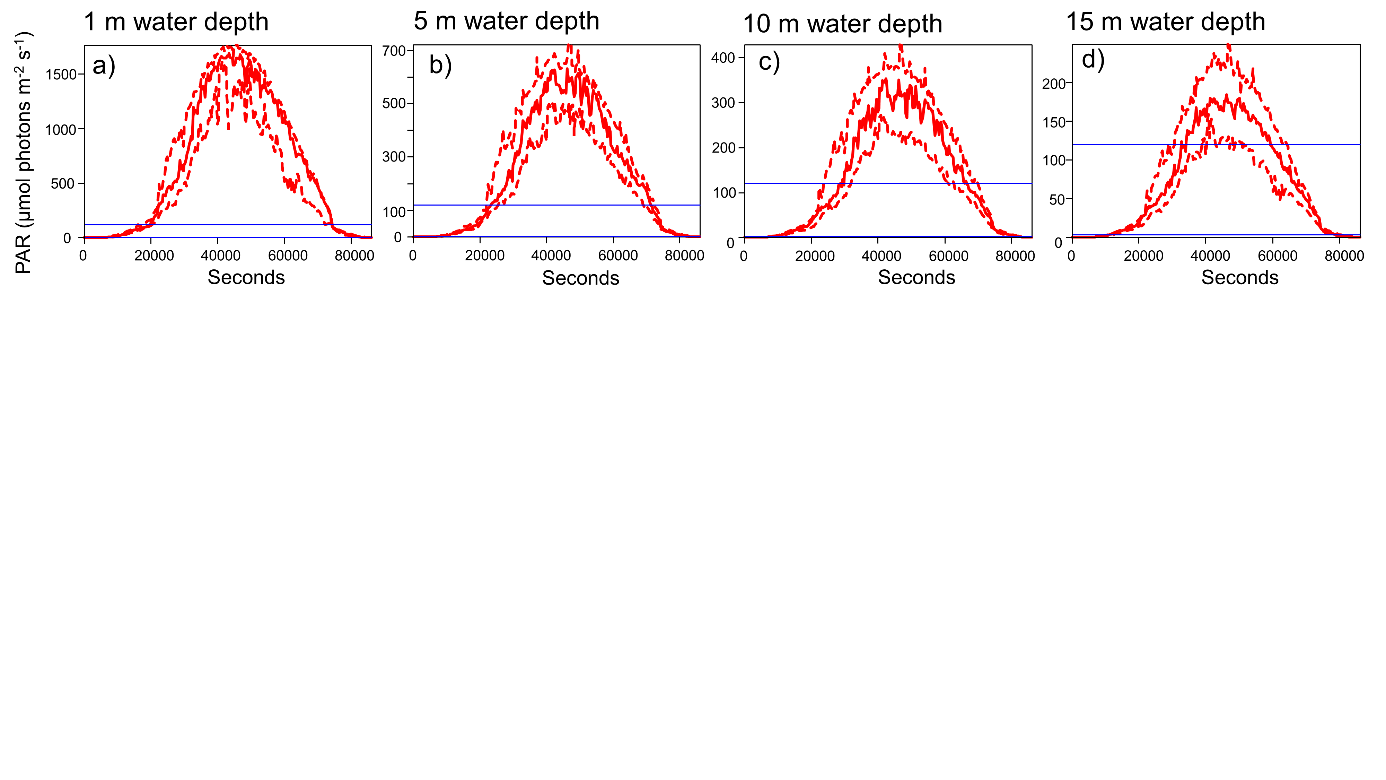
**S1**:Video transect (by Tobias Reiner Vonnahme) through a kelp forest near Nuuk (01.05.2022) taken 0.5 m (+-0.5m) over the bottom or kelp canopy. The transect starts at about 12 m water depth and ends at the surface. Between ca.12 m and 10 m (2:08 min) the kelp species *Agarum clathratum*, *Saccharina latissima*, and *Alaria esculenta* dominate. Between ca. 5 m (2:35 min) and 2 m, *A. clathratum* is absent, while and first-year *A. esculenta* is most abundant. Laminaria sp. becomes increasingly abundant from ca 3-1m depth.



**S2**: Monthly temperature (a-d) and photosynthetically available radiation (PAR; µmol photons m-2 s-1) (e-h) from a marine monitoring station (GF3, G-E-M.dk/data; <https://doi.org/10.17897/KMEK-TK21>) showing median (solid red line), interquartile ranges (dotted lines), and the total range (light red) of the measurements at 1 m (a,e), 5 m (b,f), 10 m (c,g), and 15 m (d,h) depth between 2005 and 2021 at the nearby marine monitoring station (G-E-M.dk/data). Treatment light intensities and temperatures are shown as blue lines.



**S3**: Logarithm of photosynthetically available light (PAR) over water depth (m) in Kongsfjorden, Svalbard. Red crosses: single measurements. Black circles: Mean PAR±SD. Blue line: linear model of PAR intensities over depth ±95 % confidence interval. Data from Niedzwiedz & Bischof (2023b) <https://doi.org/10.1594/PANGAEA.951173>. The experiment's low-light conditions (3 µmol photons m-2 s-1) are at ~15 m water depth.



**S4**: Estimates of mean daily (sec) photosynthetically available radiation (PAR; µmol photons m-2 s-1) at 1 (a), 5 (b), 10 (c) and 15 (d) m depth in July since 2008 shown as median (solid red line) and interquartile ranges (dotted red line). Estimates are based on PAR measurements at 2 m over the bottom from ClimateBasis Nuuk (<https://doi.org/10.17897/8Z2W-D993>, Asiaq) and light attenuation based on PAR profiles measured at a nearby marine monitoring station (GF3, G-E-M.dk/data; <https://doi.org/10.17897/KMEK-TK21>). Treatment light intensities are shown as blue horizontal lines.