Resilience of a warm-temperate fucoid to a simulated marine heatwave: Exploring the interplay between life stages and tissues in relation to emersion

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Marine heatwaves (MHW) represent one of the main climatic threats for seaweed assemblages, altering their functioning, structure, and ecosystem services. Experimental simulations allow to assess the potential impacts of MHWs, given the unpredictability of these events and frequently, the lack of responsive workflows to access the target population during these events.

This study explored the ability of the warm-temperate intertidal fucoid *Fucus guiryi* to respond to a simulated MHW. We aimed to evaluate the intraspecific response of different life stages (adult/juvenile/recruit) and blade types (vegetative / fertile−receptacles) in response to emersion, and to ascertain whether previous moderate MHWs in the area might impact its recruitment. The experimental design accounted for daily thermal and emersion fluctuations considering the most intense registered MHW event and maximum air temperatures in the study area.

Photophysiological evaluation revealed that receptacles were the most resilient tissue to the combined effects of heat and emersion, followed by canopy-protected embryos. Vegetative apices and plantlets exhibited marked declines in F_v/F_m, ETR_{max} and NPQ_{max} close to the MHW peak, due to the additive stressors, while embryos were more affected by the end of the experiment. During the recovery and end phases, recruit density dropped by 50% in the MHW treatment, being 80% of extruded structures unfertilized egg packets, while in the control treatment recruitment was successful and up to 35-times higher. *Fucus guiryi* was able to recover from the MHW, but more intense and frequent events might affect their reproductive output and compromise its long-term survival.