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Thermal resilience in embryos of *Fucus guiryi* from a marginal iteroparous southern population: May they cope with ongoing global warming?

Canopy-forming macroalgae are experiencing severe biodiversity loss, species shifts and population decline in the face of global change. Single- and few-celled stages of their life-history are a key pole for recruitment and population persistence while being highly sensitive to environmental stress. In this work, thermal resilience of embryos of *Fucus guiryi* from the Strait of Gibraltar was investigated in relation to seasonal changes of actual temperature regime. Present maximum temperature in this region range from 23 °C (benthic) to 27 °C (air), but they may rise up to 24.6-27.8 °C by 2050 (RCP8.5). To test whether seasonal maternal acclimation confers thermal resilience, embryos were isolated from plants in early/late summer and late winter, since *F. guiryi* produce fertile gametes across the year at this location (iteroparous). Survival, growth, development and photosynthesis were tested under control (15 °C) and warming conditions (25 °C). At 15 °C, embryos showed consistent responses across seasons and exhibited higher growth and photosynthesis, greater volume and further development than at 25 °C. Interestingly, winter embryos attained the greatest thermal resilience, showing similar survival and photosynthetic responses at both temperatures, despite lower growth and development at 25 °C. Early summer embryos were the most heat-sensitive, showing growth and photosynthesis reductions of 75%, and 50% survival. Enhanced physiological performance of late summer embryos suggested a warm-hardiness process due to maternal acclimation, while also reflecting a detrimental effect of summer-heat accumulation when compared to the winter responses. Despite optimal to sup-optimal thermal threshold of *F. guiryi* embryos keeps between 23-25 °C seasonally, the decline in physiological performance towards 25 °C became less steep from early summer to winter. In the near future, embryos of *F. guiryi* might cope with projected warmer winters but strive at high temperatures during the onset of the warming season and chronic summer heat stress.

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