

Heatwave responses in native and allochthonous *Sporobolus*: a multi-disciplinary perspective

Filippo Drigo^{1,2*}, Pietro Antolini¹, Riccardo Trentin^{1,3}, Chiara Stefanelli¹, Davide Colaianni¹, Davide De Battisti¹, Chiara Frasson⁴, Laura Airoidi^{1,2}, Gabriele Sales¹, Isabella Moro^{1,2,5}, Cristiano De Pittà^{1,2}

*lead presenter: filippo.drigo@studenti.unipd.it

1 Department of Biology, University of Padova, Padova, Italy

2 National Biodiversity Future Centre (NBFC), Italy

3 Centro de Ciências do Mar do Algarve (CCMAR/CIMAR LA), Campus de Gambelas, Universidade do Algarve, Faro, Portugal

4 Pediatric Research Institute “Città della Speranza”, Padova, Italy

5 Department of Integrative Marine Ecology, Stazione Zoologica Anton Dohrn, Villa Comunale, Napoli, Italy

The Venice Lagoon is a transitional environment, highly impacted by anthropogenic activities and global climate change. It is also considered a hot spot for biodiversity and biological invasion. Here, *Sporobolus maritimus* is a native halophyte, currently threatened by the spreading of the non-indigenous species *S. anglicus* and extreme climatic events, like heatwaves, which are reported with increasing frequency in the Venice Lagoon.

We exposed *S. maritimus* and *S. anglicus* organisms to a simulated five-day heatwave and assessed the morphological, physiological and biochemical responses. These data were integrated with gene expression and metabolite profiling. To identify differentially expressed genes, we also generated and annotated a *de novo* transcriptome for *Sporobolus* species.

We observed a decline in the survival rate of *S. maritimus*, whereas *S. anglicus* showed no increase in mortality. Consistent with this pattern, morphological (structure of the photosynthetic apparatus), physiological (photosynthetic efficiency and pigment content) and biochemical assays (antioxidant enzyme activity) indicated that the native species is more susceptible to heatwave stress and exhibits limited recovery. In contrast, *S. anglicus* demonstrated greater tolerance and a clear capacity to recover for all analysed parameters. Gene expression analyses further suggest that the response of *S. maritimus* is slower and more severely impacted, whereas *S. anglicus* shows a faster and more effective response, highlighting the greater resilience of the non-indigenous species.

Overall, our results indicate that the non-indigenous species *S. anglicus* responds more rapidly to heat stress, limiting damage to the photosynthetic apparatus and coping more effectively with prolonged stress, compared to the native species *S. maritimus*. Taken together, these findings indicate that *S. anglicus* is more resilient to heat stress than *S. maritimus*, raising serious concerns about its persistence in the Venice Lagoon under future climate scenarios and related ecological impacts.