

Integrating morphological, physiological, and molecular approaches to monitor photosynthetic biodiversity in the Venice Lagoon.

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The Venice Lagoon is one of the largest lagoon systems in the Mediterranean Sea. As a transitional environment, it possesses the characteristics necessary to qualify as a biodiversity hotspot. An analysis of photosynthetic biodiversity records spanning from the 1800s to 2023 revealed the presence in this environment of 902 species, with 375 reported between 2000 and 2023. There was a significant decline in charophytes and heterokontophytes, less pronounced decline of chlorophytes and an increase in rhodophytes. Tracheophytes exhibited no variation from the 1800s to the 2000s. Furthermore, when considering different ecological indexes (EEI and MaQI), there was a decline in species with high ecological valence during the analysed period. During the summer 2023 and spring 2024, a survey carried out on 73 sites comprising salt marshes and wooden poles (*briccole*) revealed the presence of 20 higher plant species, including 16 halophytes and 4 phanerogams, along with 15 rhodophytes, 13 heterokontophytes, and 17 chlorophytes.

The Venice Lagoon is additionally recognized as a hotspot for invasion. It is documented that 33 non-indigenous macroalgal species are present, and among the higher plants the invasive species *Sporobolus anglicus* has been observed and is currently outcompeting the native *S. maritimus*. We currently are setting up a simulated heatwave experiment to monitor the physiological changes (pigment content, PAM, oxidative responses) and gene-expression profiles of both species. Furthermore, we'll be closely monitoring these responses during an actual heatwave in the field slated for the upcoming summer.