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[Evaluating the extent and impact of the extreme Storm Gloria on *Posidonia oceanica* seagrass meadows](#)

Science of the Total Environment 908 (2024) 168404.
<https://doi.org/10.1016/j.scitotenv.2023.168404>

Abstract: Extreme storms can trigger abrupt and often lasting changes in ecosystems by affecting foundational (habitatforming) species. While the frequency and intensity of extreme events are projected to increase under climate change, its impacts on seagrass ecosystems remain poorly documented. In January 2020, the Spanish Mediterranean coast was hit by Storm Gloria, one of the most devastating recent climate events in terms of intensity and duration. We conducted rapid surveys of 42 *Posidonia oceanica* meadows across the region to evaluate the extent and type of impact (burial, unburial and uprooting). We investigated the significance of oceanographic (wave impact model), geomorphological (latitude, depth, exposure), and structural (patchiness) factors in predicting impact extent and intensity. The predominant impact of Storm Gloria was shoot unburial. More than half of the surveyed sites revealed recent unburial, with up to 40 cm of sediment removed, affecting over 50 % of the meadow. Burial, although less extensive, was still significant, with 10–80 % of meadow cover being buried under 7 cm of sediment, which is considered a survival threshold for *P. oceanica*.

In addition, we observed evident signs of recently dead matte in some meadows and large amounts of detached drifting shoots on the sea bottom or accumulated as debris on the beaches. Crucially, exposed and patchy meadows were much more vulnerable to the overall impact than sheltered or continuous meadows. Given how slow

P. oceanica

is able to recover after disturbances, we state that it could take from decades to centuries for it to recoup its losses. Seagrass ecosystems play a vital role as coastal ecological infrastructure. Protecting vulnerable meadows from anthropogenic fragmentation is crucial for ensuring the resilience of these ecosystems in the face of the climate crisis.

Keywords: Extreme events, Burial, Unburial, Erosion, Patchiness, Climate change