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Genetic Studies on the Sea

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Introduction

Sea grasses contribute to some of the planet's most productive ecosystems and are one of the most important habitats in tropical and temperate coastal regions because they shape the appearance of the coastline and offer vital ecological and economic functions. They sustain substantial commercial fisheries, nutrient cycling, sediment stability, and carbon sequestration that is vital on a global scale. Due to the expanding effects of coastal development and rising demand for coastal and marine goods and services, there has been a significant global loss in sea grasses over the past few decades.

Description

As 30% of the Mediterranean coastline is populated today (counting 450 million people living and benefiting from the coastal environment), there are inevitable and often irreversible consequences on marine coastal ecosystems. Similar to the general trend, Mediterranean sea grasses, especially the endemic, dominant, and most common species Posidonia oceanica, are significantly regressing. *P. oceanica* meadows are disappearing at a rate of roughly 5% each year, which is hundreds of times faster than the pace at which this species can reproduce. Recent efforts to strengthen legal protection and conservation measures are probably insufficient to stop this decline and stop further losses. As a result, legislation in the Mediterranean and Europe (the EU Water Framework Directive and Marine Strategy Framework Directive) has prioritised protecting the sea grass ecosystem.

From a research perspective, sea grasses have certainly received increase interest globally since the 1990s. In the Mediterranean, over 600 articles focused on sea grass ecology and biology were published in the last ten years only, particularly addressing the root causes of sea grass decline, monitoring approaches and interaction with alien species. In this issue of Aquatic Botany, a series of articles are compiled presenting some of the most recent advancements on Mediterranean seagrass research. The research included in these articles results from the 2009 tri-annual Mediterranean Seagrass Workshop. The workshop typically includes a diversity of pan-Mediterranean seagrass scientists and managers, with over 13 countries represented, and it puts particular emphasis in promoting research from under-presented countries. This special issue presents a variety of methods, strategies, and studies, from investigations at the seascape level to advancements in genomics. To further understand the observed West-East difference and the obvious isolation by distance between each basin, genetic investigations on the maternal cpDNA differential between and within Mediterranean sub-basins in Ruppia cirrhosa were carried out. Nuclear markers revealed a variety of variations with distinctive leaf and fruit characteristics that made it possible to identify hybrids with Ruppia maritima. The West Mediterranean sub-basins and the Balearic sub-basin have been shown to have substantial maternal isolation, and the dispersed distribution of rare haplotypes suggests that birds occasionally travel vast distances to disperse these haplotypes. Sea currents are mentioned as a potential dispersal vector at a vast geographic scale since the haplotype with the lowest number of fruits paradoxically had the highest level of continuous widespread distribution.

The physiological response of sea grasses to disturbance, defining the early effects associated with salt regime variation on *P. oceanica* leaf tissue, using an experimental design aimed at localising aquaporins, the water channel proteins of intracellular and plasma membranes on leaves. The findings suggested that aquaporins are involved in maintaining the osmotic balance in seagrasses by showing peptide rise in response to salt stress. Lepidochronology, a reconstruction method to evaluate temporal patterns in leaf and rhizome development as well as in flowering events in Tunisian meadows, was used by Sghaier et al. (2014) to determine the temporal variability in the growth of *P. oceanica*. Significant correlations between mean rainfall data and vertical rhizome elongation rates were discovered, along with high spatial-temporal variation in the frequency of flowering, great heterogeneity among sites, interannual growth fluctuations, and interannual growth fluctuations. Communities of molluscs connected to *P. oceanica* and they discovered that the only community structure in shallow seas exhibited notable temporal fluctuation, and they pinpointed the main species responsible for the pattern they observed.

They also discovered a negative link between species diversity and stand depth and a positive correlation between species diversity and the density of meadow shoots, with higher values in shallower and denser stands. When comparing historical data sets gathered from 1973 to 2006 on plant traits and meadow structure, we can determine the impact of anthropogenic disturbance on the conservation status of a *P. oceanica* meadow in the eastern Ligurian Sea. There have been reports of a decline in shoot density, especially at shallow and intermediate depths, as well as an upward shift of *P. oceanica*'s lower limit. The organisation of the foliar stratum's malacofauna has changed over time, and variations related to bathymetric gradients and sampling season have also been investigated. Comparatively fewer specimens and more species were recorded in 2006 than in earlier studies. Also looked into the mollusc communities connected to *P. oceanica* in Tunisia. They discovered that the only community structure in shallow seas exhibited notable temporal fluctuation, and they pinpointed the main species responsible for the pattern they observed. They also discovered a negative link between species diversity and stand depth and a positive correlation between species diversity and the density of meadow shoots, with higher values in shallower and denser stands [1-5].

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Conflict of Interest

The Author declares there is no conflict of interest associated with this manuscript.

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