Relationships between environmental parameters and the microbenthic loop of *Posidonia oceanica* meadows at small spatial scale

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In these times of global change, understanding how carbon flows through ecosystems is of primary importance. In coastal Mediterranean regions, *Posidonia oceanica* meadows produce and store a lot of carbon, but most of it is described as refractory. As a step in the understanding of how organic matter degradation/storage happens in this ecosystem, this study focus on small scale relationships between the microbenthic loop (organic matter, microphytobenthos, bacteria and meiofauna) and environmental parameters (grain size, *P. oceanica* density, vegetal fibre biomass, pore water nutrient content, sediment total carbon (TC), organic carbon (TOC), nitrogen (TN) and phosphorous (TP) contents, phaeopigments and bacterial production (FDC)). Thus, a 1.25 m x 1.25 m frame was put in a pristine *P. oceanica* meadow and twelve points were randomly sampled in May 2008 for all the studied parameters.

At such a small scale, every component of the microbenthic loop presented a heterogeneity, which was the highest for the microphytobenthos biomass and the lowest for total meiofauna abundance (TMA). No relationship was found between the components of the microbenthic loop but the abundances of Turbellaria and Ciliophora were correlated with total organic matter in the sediment (TOM). None of the environmental parameter was linked with the microphytobenthos biomass, suggesting that the high spatial variability observed did not depend on the measured parameters. Relationships were found between TOM and ammonium, total bacteria abundance and biomass (TBA and TBB) and sediment phaeopigments, TMA and TC, TN and TP. TBB variability was however explained by a combination of FDC and nutrient contents in pore water and sediment.

Taking the microbenthic loop as a whole, pore water ammonium and nitrites + nitrates, FDC and phaeopigments were able to explain the observed variability. So, at small scale the variability in the microbenthic loop of a *P. oceanica* meadow is related with parameters linked with degradation processes and bacteria activities (phaeopigments, FDC, ammonium, nitrites + nitrates), except for meiofauna, which is related with the nutrient content of the sediment, especially TC. Those results underline the importance of the relationship between the microbenthic loop and degradation processes, even at a small scale.

Keyword: sediment, microbenthic loop, organic matter, seagrass, degradation

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