

Landscape configuration of seagrass meadows regulates sea urchins predation in a Marine Protected Area: what is the role of bottom predators?

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In Mediterranean benthic ecosystems of shallow water, local-scale predation maintains a main control on both sea urchin population and the ecological structure of macrophyte community. The use of the habitat by local predator guild in dependence on the regional context shapes prey distributions across the environment. On rocky habitat, the sea urchin *Paracentrotus lividus* is widely known as prey of apex fish predators that indirectly shape the structure of benthic assemblages whereas, in structured *Posidonia oceanica*, *P. lividus* can find shelter from predators. In this study, we assessed survival rates of *P. lividus* in a Marine Protected Area (Sardinia) at the aim to evaluate the role of composition and configuration of landscape on its predation risk. Sites of different landscapes were selected in function of their heterogeneity estimated according to the different proportions and spatial interspersion of four classes of habitats defined on the basis of *P. oceanica* meadows arrangement: (1) continuous, (2) fragmented and (3) patchy meadows and (4) absence of seagrass (i.e. rocky bottom with macroalgae communities). In order to capture the domain of the ecological process, a sampling grain 5x5 meters was used as minimal spatial resolution at which information is assessed. Specifically, continuous sampling units in a grid of 7x7 cells yield landscape quadrats of 35x35 m and allowed a finer description of the spatial pattern. For each cell we also estimated structural variables of seagrass habitats such as unburied mat, shoot density, canopy height, cover percent, roughness and the natural abundances of prey and predators. After placing the tagged sea urchins, we daily observed the survival rates for twenty days. Predation risk was significantly higher in continuous and fragmented seagrass habitats and predator marks were typically produced by gastropod's attacks. Landscape indices were used to correlate the amount of available habitat for gastropods movements with sea urchin's predation risk. Interestingly, estimated predation rate was negatively correlated with natural sea urchins density across grid cells. Results suggest that, although fishes are considered among the most important pressures on sea urchin population, especially in effective MPAs, bottom predators' control can be relevant in structurally complex environment such as seagrasses.