



## From seascape level to functional ecology: A case study over *P. oceanica* seagrass meadows in Calvi, Corsica

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### 1. *Posidonia oceanica* meadow seascapes and their decline

The most prominent aspect of *Posidonia oceanica* is certainly its ecological role (Boudouresque & Meinesz 1982, Pergent et al. 1994). Forming some of the most productive seagrass ecosystems worldwide (Pergent et al. 1994), it serves as feeding and nursery areas for hundred of species, including various commercially important ones (Boudouresque et al. 2012).

Marine scientific community has lately grown aware of the alarming decline of the meadows in Mediterranean Sea (Telesca et al. 2015); mainly driven by and local anthropogenic stressors such as bottom trawling, anchoring or eutrophication, all together producing **fragmentation** of this valuable habitat.

Fragmentation and the study of the seascape structure it is generally addressed by the seascape ecology, which combines the spatial approach of geography with functional ecology (Bostrom et al. 2011). Indeed, the real interest it is also to investigate the changes that are being produced within the habitat regarding the ecological functions (Turner 1989, Sleeman et al. 2005).

### 2. Linking seascape features to functional ecology: the key concept Edge effect

For this study two sites were selected in the bay of Calvi, Corsica (France). First site (1) is considered to be an environmentally well-preserved area, as no direct anthropogenic impacts have been noticed. Site (2), instead, it is well know for receiving direct impact such as leisure boat anchoring (commonly 10-20m depth), thus the natural structure has suffered a fragmentation process due to the mechanical damages.

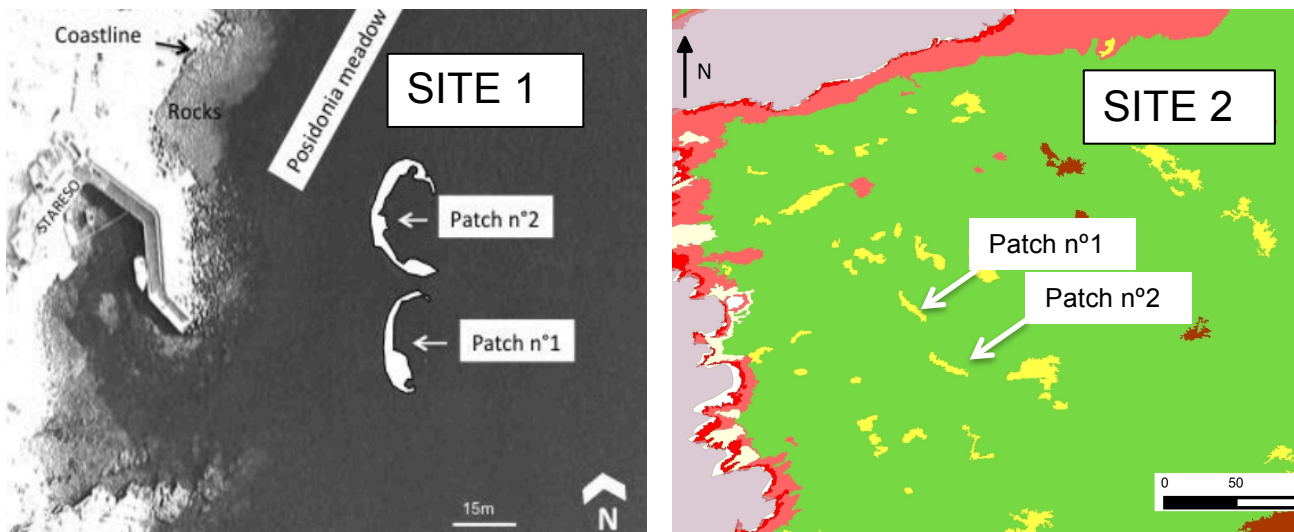


Fig. 1 : Cartography of both sampling sites and the Sand Corridors (SC) (patches) used for samplings.

We chose Sand Corridor's (SC) edges over the *P.oceanica* meadows to study the ecological impacts of fragmentation in the habitat. SC are one of the main structures that naturally occur in between 10-20m depth, these are defined as channels with a length ranging from 10 to 350 m and a width from 2 to 20 m, and positioned parallel to the coast, most probably generated by the water movement (Abadie et al. 2015).

In fact, edges have been studied for decades due to they are considered a key-component to understand how landscape composition influences the habitat quality (Ries et al. 2004). Hence, **the 'Edge effect'** which is a key concept in seascape ecology, can be considered as the patterns in biological and physical parameters such as species richness and interaction, food availability, disturbance, temperature or biological architecture amongst others (Murcia 1995). Its understanding is essential for management and conservation (Ries et al., 2004; Hinchey et al., 2008).

A multidisciplinary approach combining canopy community invertebrate studies, epiphytes biomass, plant physiology (photosynthetic rate), and seagrass structural parameters characterization was developed in order to investigate whether these anthropogenic pressures can cause disturbances in the ecological functioning. Different zones within the meadows were analysed: the core and the edges.



### 3. Results and discussion

Regarding literature, at small to intermediate spatial scales, seagrass structural features such as biomass/shoot density or structural complexity have already shown correlations with species richness and abundance of seagrass-associated fauna (Bologna & Heck 2002). However, first results showed in our case study showed only a few weak changes in the community structure and abundance of organisms between sites. Deeper vagile-fauna taxonomic studies could eventually show some significant changes regarding *P. oceanica* associated invertebrate assemblages.

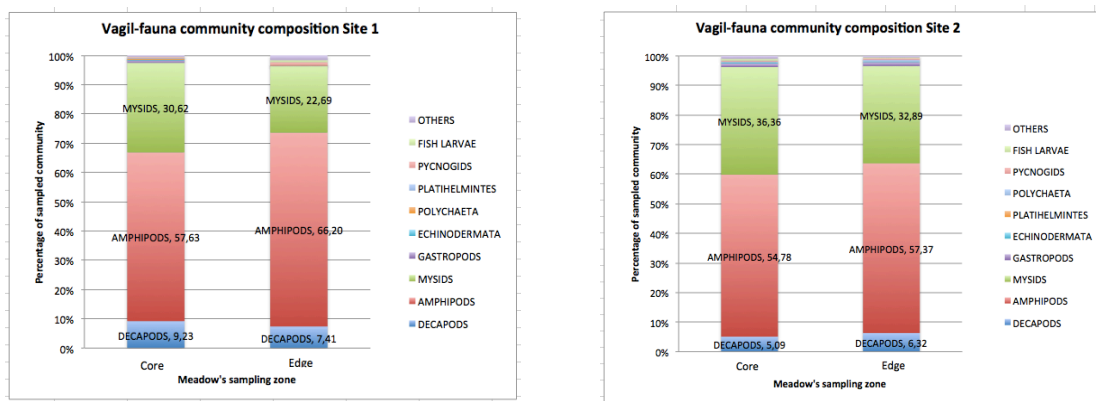


Fig. 2: Qualitative results of seagrass associated vagil organisms community structure.

Differences in *P. oceanica* bed architectural parameters were detected, though (see fig. 3). Results showed that edges presented a reduced biomass and contrasting both sites, we remarked that a decrease on shoot density parameters was significant in site 2 most likely due to fragmentation processes occurring, associated with leisure boat anchoring. We noticed also differences in epiphyte biomass measurements: edges showed on average higher epiphyte abundance than the core meadows and moreover, we found that biomass was higher on non-impacted site than on the non-impacted one.

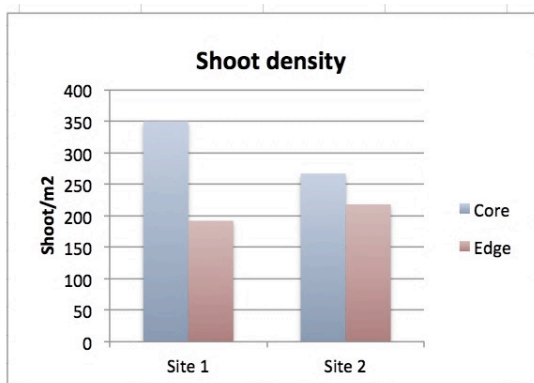


Fig. 3: Shoot density results displayed by site and area of the meadow.

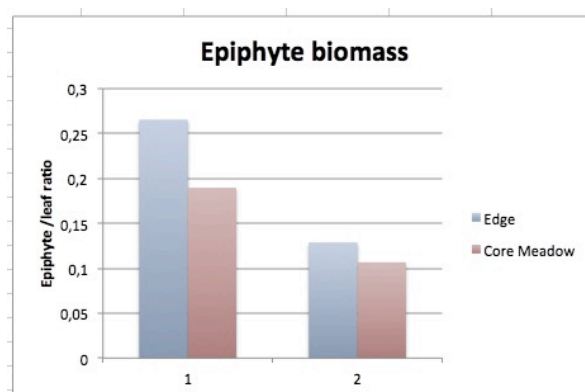
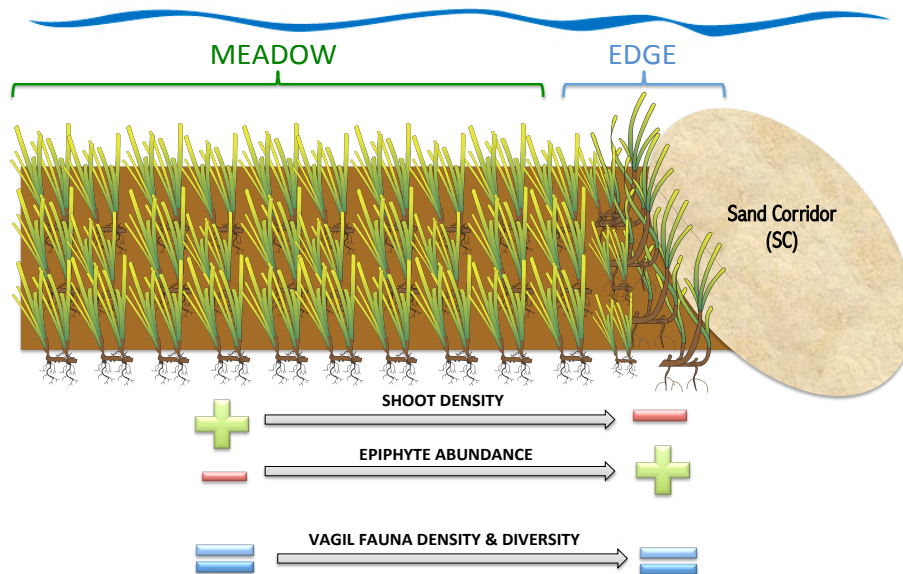


Fig. 4: Epiphyte biomass results displayed by site and area of the meadow.



**Fig. 5: Schematic representation of the main outcomes of this study for measured parameters. Where shoot density increased over the core whereas epiphyte abundance showed a decrease. Leaf surface, vagil-fauna density & diversity and ETR maximal results (photosynthetic rate) resulted to have a neutral edge response.**

#### 4. Conclusions

We concluded that *Posidonia oceanica* meadows are complex ecosystems regarding ecological functions and the dynamic, as well as the evolution of the habitat is driven by the interaction of multiple players.

This study pointed out that *P. oceanica* edges differ from the core of meadow, mainly owing to the differences on the seagrass structural parameters. However, we were not able to identify ecological differences between both non-impacted and impacted sites regarding the parameters studied. Thus, the ecological distinctions of natural and anthropogenic fragmented areas within the seagrass matrix are far from being well understood.

That's why further research is needed both at small-scale ecological functioning and seascape-scale levels.