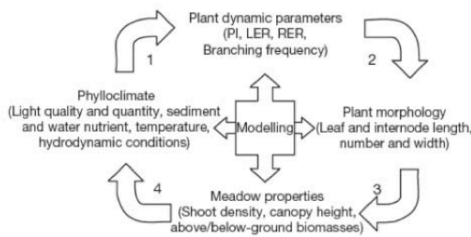


## Summary of the Project USEABLE

The main goal of this project was to determine the interplay between flow characteristics and seagrass canopy properties in determining the food supply within the canopies, and therefore, to influence the diversity of filter feeding species (Figure 1). Although this main goal was fully reached across this project, we broader this objective by including other functional groups and by studying the continuous feedbacks between animals, plants and environment (Figure 2), that is using an ecosystem perspective. To undertake such global perspective we split this main objective in two general goals, each one with its own methodological approach.

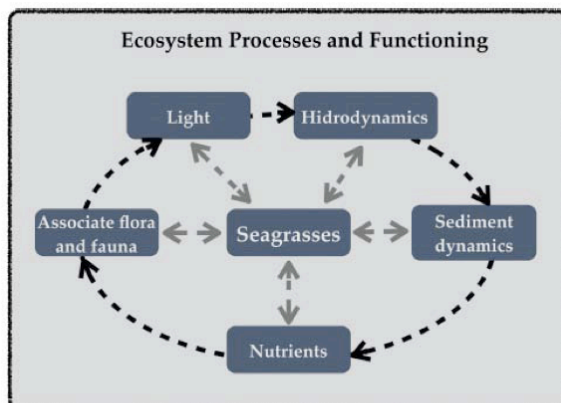


**Figure 1.** Simple schematic framework illustrating how complex functional-structural seagrass models (FSSMs) may be built using simple growth rules at module level, and plant dynamic parameters, phylloclimate and feedbacks between biotic and abiotic elements. 1: Phylloclimate regulates plant dynamic parameters at module level; 2: plant dynamic parameters yield individual module and plant morphology; 3: whole plant morphology and ultimately meadow attributes arise from sum of all individual modular responses; 4: heterogeneous meadow attributes modify phylloclimate variables which, in turn, influence plant dynamic parameters. (from Brun et al. 2006a).

Following is a short summary on the state of the art and on the main outcomes from the project.

Currently, there is a growing evidence relating diversity to the strength of the ecosystem processes (e.g. primary and secondary production, nutrient cycling and fluxes, food webs...) and functioning (e.g. resistance, resilience, invasibility). Thus, since one of the most important ecosystem functions provided by seagrasses is to support a high biodiversity when compared with bare areas, the documented regression of seagrass habitats may impair the functioning of coastal ecosystems and may have profound consequences for

human welfare. Under such scenario, enhancing our understanding on the potential positive interactions between seagrasses and associated communities is an imperative for successful conservation and restoration strategies.

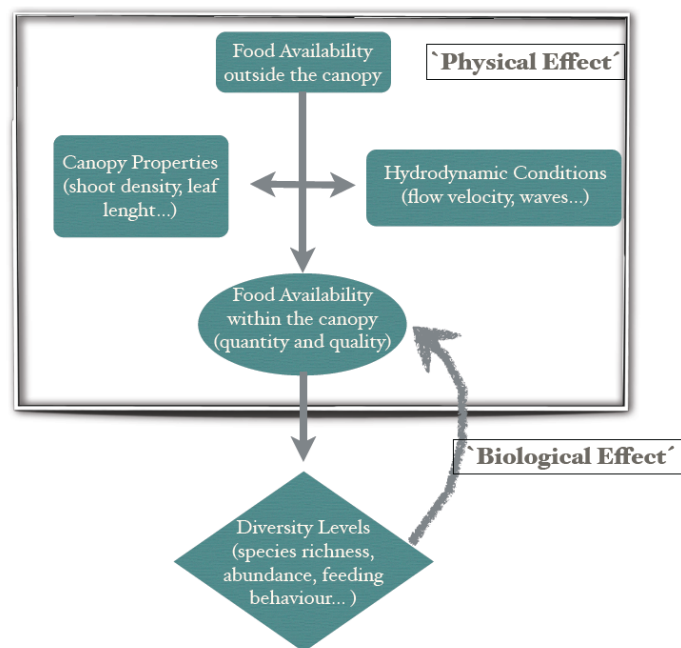


**Figure 2.** Simple scheme on how different compartments of the ecosystem interact in a bidirectional way with seagrasses and ultimately determine the ecosystem processes and functioning.

Many studies have demonstrated that seagrass canopies alter these hydrodynamic forces with the magnitude of this change relying on canopy characteristics. Thus, the presence of a seagrass canopy may alter the rate by which a resource is refreshed within the canopy and determine the resource availability within the canopy, which will affect both seagrasses and organisms living within the canopy. Results derived from seasonal monitoring, in situ experiments and flume tank experiments developed during this

project, showed the existence of a spatial explicit effect on the food intake rate

(FIR) in active filter feeding organisms. In addition, FIR was also dependent on flow characteristics (velocity and waves), on canopy properties (density and morphology) and on organism traits (size and pumping rate) generating a complex interrelationship between them. Although this project showed that seagrasses might promote a bottom-up control on fauna depending on seagrass canopy traits and environmental conditions, the activity of the organisms, and mainly, the active of filter feeding organisms may indirectly feedbacks on plants, which may establish a complex and dynamic regulation pathways between plants and animals. Furthermore, the quantity and quality of edible particles is expected to change when water crosses through the seagrass canopy. Thus, since macrofauna, and mainly filtering organisms are often highly selective for particle collection, filtration, and rejection, the gradient generated for resource availability within and outside the canopy might play a critical role determining what and how organisms are distributed in the seagrass habitat (i.e. 'a physical effect'). Furthermore, a second type of interactions may surge as feeding is not a neutral process, and organisms also modify the quantity and quality of available food when capturing their aliment (i.e. consumption of particle and/or production of biodeposits; i.e. 'a biological effect'). Thus, the results derived from this project suggested that food availability within and at the edge of the seagrass canopies can be the result of a complex interrelationship among: i) physical effects on food availability mediated by canopy properties, flow characteristics and food availability outside the canopy and, ii) biological effects determined by the response of the organisms, which finally may contribute to determine changes (i.e. species richness, abundance, feeding behaviour ...) in the associated fauna (Figure 3).



**Figure 3.** Simple diagram representing the two orders processes affecting to biodiversity levels within seagrass meadows: i) a physical effect mediated by interactions between seagrass canopies and flow characteristics and ii) a biological effect mediated by the active feeding activity of the organisms. While “physical effect” may play an important role determining diversity level at the first temporal phases, “biological effect” may finally determine the diversity of species thriving within seagrass canopies.