

TOWARDS SUSTAINABILITY INTEGRATING INTERTIDAL SEAGRASS MEADOWS IN COASTAL MANAGEMENT

FIRST STEP: CHARACTERIZATION OF THE SOCIAL-ECOLOGICAL SYSTEM

1. MOTIVATION AND OBJECTIVE

It is thoroughly recognised that the conservation of natural resources and the integration of natural assets in management decisions is something essential to get sustainability.

However, to get an effective integration of natural resources in planning processes we need new holistic approaches that let us discover the existing links between nature and society from a system perspective.

To integrate the role of intertidal seagrass meadows in decision-making processes, one fundamental first step is the characterization of the social-ecological system to better understand the functioning of the coastal environment.

2. MATERIALS AND METHODS

Information search mainly in:

- Scientific literature
- Administrations and local organizations websites

Gathering direct information from field visits:

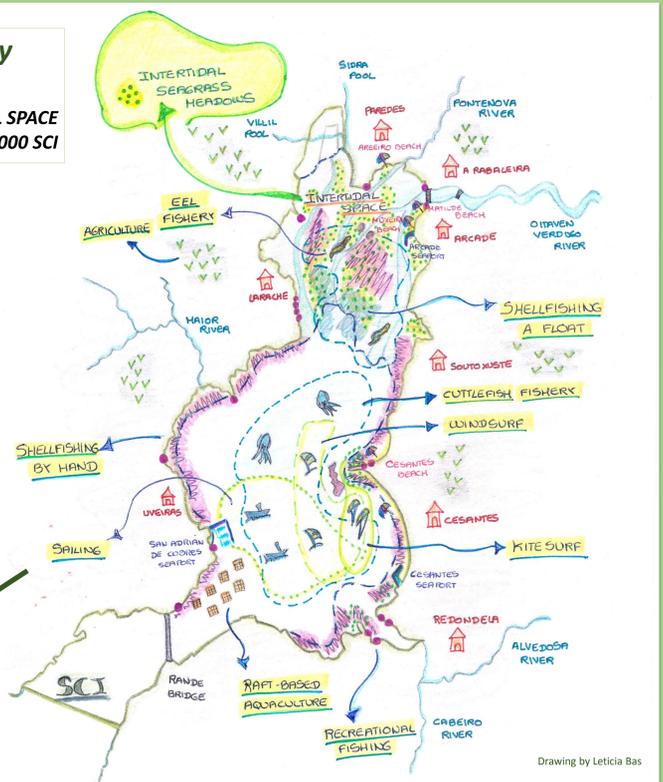
- Ecological: photos, GPS points and tracks
- Social: informal conversations with locals



3. RESULT AND DISCUSSION: THE SOCIAL-ECOLOGICAL SYSTEM

Through characterizing the social-ecological system, we obtain the big picture of the intertidal area. The not obvious relations appear and the structural aspects can be identified. This holistic approach can help to establish priorities in management.

San Simón Bay (NW of Spain)
 --- INTERTIDAL SPACE
 — NATURE 2000 SCI



Drawing by Leticia Bas

THREATS

Nearshore and intertidal location of seagrasses generally enables easy human access and multiple uses as well as exposing seagrass meadows to both terrestrial and marine based threats. (Cullen-Unsworth et al., 2013)

endanger ecosystem services delivery

Natural cycles
 - Severe storms
 - Exposure to air
 - Freshwater pulses

Direct destruction

- Filling and dredging for extension or creation of harbors
- Anchoring and mooring outside harbors
 - Shipping
- Fishing for clams and cockles
- Digging for polychaetes
- Walking on seagrasses in marine bath zones

Indirect destruction
 - Nutrient enrichment
 - Increased turbidity
 - Competition with invasive species
 - Marine pollution



? **reduce threats**

sustain ecosystem services ?

ECOLOGICAL COMMUNITY OF INTEREST

INTERTIDAL SEAGRASS MEADOWS
 LOCALLY NAMED "CEBA"
 Seagrass meadows are important for their ecological functions and ecosystem services such as their role in food web dynamics, seascape interactions and ecological resilience potential.



GOODS AND SERVICES

- BIODIVERSITY MAINTENANCE
- COASTAL PROTECTION
- WATER QUALITY CONTROL
- FINFISH AND SHELLFISH PRODUCTION**

SOCIAL RELEVANCE

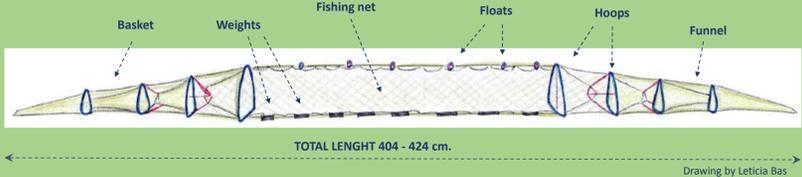
Seagrass meadows as shelter areas for fishing eels

Fishing art: the Butrón

It is a passive fishing art that consists of two baskets connected by a fishing net which points the preys towards the funnels.

Draft mode

Fishing occurs preferentially in areas with seagrasses because the **butrones** are protected by seagrasses from currents and the risk of silting is reduced.



Drawing by Leticia Bas

Competition between cultured bivalves and seagrass meadows



At the intertidal space of San Simón Bay we can find shellfishing by hand and a float.



Cultured bivalves and seagrass meadows compete for space. Frequently both co-occur or are adjacent.

Based on available evidence, eelgrass can coexist with bivalves at low densities used in on-bottom aquaculture on soft sediments, but more research needs to be directed at best management practices that could raise the likelihood of overyielding (total production is larger than expected from averaging the species). (B.R. Dumbauld et al.)

Seagrass meadows as feeding areas

Seagrass meadows are highly productive. This productivity lies at the base of the food chain and is also exported to adjacent ecosystems.

The food web of the intertidal seagrass meadows in San Simón Bay includes species of commercial interest as *cerastoderma edule*, *mytillus galloprovincialis*, *ruditapes decussatus* or *sepia officinalis*.



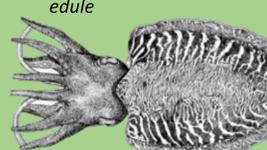
Ruditapes decussatus



Cerastoderma edule



Mytillus galloprovincialis



Sepia officinalis

Images of species source, FAO

The importance of local primary producers should be emphasize, especially that of the microphytobenthos associated to seagrass meadows, which could be available for several primary consumers through resuspension forced by tidal hydrodynamic. (R.Figueira and B.G.Castro, 2010)

GOVERNANCE

Policy: Directrices de ordenación del territorio (DOT)
Field of action: land use planning.

SCI San Simón Bay is consider an important environmental area and its conservation should be a priority.

Policy: Plan Director de la Red Natura 2000 de Galicia
Field of action: restoration, conservation and sustainable use of biodiversity.

Intertidal seagrass beds growth along mudflats and sandflats uncovered by water at low tide, an habitat included in Annex 1 of the European Habitats Directive. *Nanozostera noltii* is consider a wild species of especial protection (RD 139/2011).

Policy: Plan de ordenación del litoral (POL)
Field of action: land-marine use planning.

The intertidal area of San Simón bay is protected and this plan establishes what uses are allowed.

Policy: Plan General de explotación marisquera and planes específicos en zona de libre marisqueo
Field of action: promotion of a sustainable shellfishing and marine environment and biodiversity protection.

Shellfishing regulation includes aspects like harvesting time and working areas. Shellfishing specific plans are elaborated by Fisherman's associations and approved by regional government.

Policy: Plan Hidrológico Galicia-Costa
Field of action: drainage and water treatment initiatives, ensure water provision, flood management, restoration of water bodies in humid areas, energy and water regulation, planning and administrative control of water.

Seagrasses are considered indicators of transitional water body quality. According with the Control Program each three years identification and coverture of these angiosperms should be assessed.

? **knowledge transfer**

SCIENCE

The scientific studies are very important because they bring things to light.
 Tino Casal, recreational fisher

REFERENCES AND BIBLIOGRAPHY

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