The Life “SeResto” project. A new strategic approach to meet HD & WFD objectives by SEaggrass RESTOration

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Seagrasses are experiencing a global decline, due to anthropogenic threats (i.e. runoff of nutrients, increase of turbidity, pollution, global warming, conflicts with other water uses, etc.)

**Short and long terms consequences**
- Loss of ecosystem services (biodiversity maintenance, regulation of water quality, food source, nursery, protection against erosion, CO₂ sequestration)
- Shift in communities dominance
- Direct and indirect loss of high valuable species and habitats

Restoration efforts are carried out worldwide using different techniques. Success is highly dependent on habitat suitability. Transplantation of large amount of sods and heavy mechanical equipment has consistent impact on donor sites.
Background: Venice lagoon

Venice lagoon (55,000 ha) is characterized by a fragile complex of ecosystems with high environmental value suffering from multiple anthropogenic impacts (directly in the lagoon or, indirectly, in its watershed).

Historically, Venice lagoon was naturally rich in seagrass meadows but in the last decades a drastic decrease has been observed (particularly in the northern basin) with a shift toward other primary producers.

Main factors: high nutrient inputs from the watershed, clam fishing, dredging

At present most of these disturbing factors are drastically reduced and ecological conditions suitable for seagrass are now restored in the area.
1. Consolidating and restoring aquatic habitat 1150* (“Coastal lagoons”) via the transplantation of submerged aquatic angiosperms;
2. Contributing to the achievement of good ecological status in transitional water bodies according to WFD objectives;
3. Quantifying and making good use of the ecosystem services provided by the lagoon environment and the aquatic angiosperms of habitat 1150* in particular.

**General scope**

*LIFE*+ Nature projects aim to improve the conservation status of species / habitats of the Birds / Habitats Directives; the species and habitats targeted must be listed in the annexes of the EU Birds and Habitats Directives as follows:
HABITAT 1150* “Coastal lagoons”
SCI IT3250031 “Northern Lagoon of Venice”

WFD Waterbodies PC1, EC
**C1: Concrete Action**

Trigger and support a process of seagrass recolonization through a network of small transplants widespread, low cost and low impact on the donor sites. Transplantation of seagrasses to small sites distributed throughout the intervention area.

**C2: Actions to support meadow development**

Manual dispersion of rhizomes to reinforce colonization

Protection of transplanted seagrass against weather distress and hydrodynamic forcing (bush bundles)
315 small sods (approx. 30 cm diam.) for a total of 22-25 m²
Expected Results

Following transplantation: 3,500 m$^2$ of very sparse cover (transplanted sods, rhizomes); 2 years after transplantation: 3,500 m$^2$ with ca. 20% plant cover and new growing points in an area of ca. 14 ha; 4 years after transplantation: 3,500 m$^2$ with ca. 80% plant cover and new growing points in an area of 140 ha; 10 years after transplantation: 25-30% of the intervention area colonized by aquatic angiosperms at varying levels of development.
The planting activity

Transplantation of sods

Donor site  | Removal  | Transport  | Installation

Grafting of rhizomes

Harvest  | Installation  | Grafted rhizomes

SeResto - LIFE12 NAT/IT/000331
First transplantations May-June 2014

- In 16 sites, at least 3 sods of *Z. noltei* were planted.

- In 12 sites, *Z. marina* was also included.

- In 3 sites some attempts with *C. nodosa*

- In 3 sites some attempts with *R. cirrhosa*
Preliminary results - Transplanted sods

(survival, growth, cover)

1st monitoring (Sept 2014)
- 0/9
- 1-3/9
- 6-9/9

Extra planting (Oct 2014)

2nd monitoring (Jan 2015)
- 2-5/9
- 6-9/9

Survival next to 100% for *Z. marina*
and to 80% for *Z. noltei*

Some large patches found as result of confluence of single sods
Monitoring of Ecological quality & Biodiversity

**Sediment**
(C, N and P compounds, fine fraction (%), density, pH, Eh, moisture, porosity, density)

**Water**
(C, N and P compounds, SiO$_4$, T, DO, pH, Eh, salinity, TSS, SPM, Chla)

**Biological Quality Elements**
✓ Macrophytes (Macrophyte QUality Index)
✓ Benthic macroinvertebrates (M-AMBI, BITS)
✓ Fish fauna (Habitat Fish Index)

**Ecosystem services**
✓ Total seagrass biomass
✓ Sedimentation, turbidity
✓ Fish productivity
Unsuccessful sites were those more influenced by freshwater inputs.

Unusual meteorological and environmental conditions (unexpected high rainfall in July) led to a low of salinity, to an increase of nutrients (sediment, water) and, hence, to high *Ulva* biomass development.
According to WB typology differences detected for Macrophytes and Macrozoobenthos
WORK IN PROGRESS

- The new 18 stations are being transplanted in these days.
- Rhizome dispersion is a continuous activity carried out all along the project.
- Others activities (monitoring, dissemination, etc.) are in progress, according to the proposed working plan.

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