

TECHNICAL REPORT ON TRANSPLANTATION STATE AND PROGRESS (Panzano Bay - Monfalcone)

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Activity Title	Marine seagrasses pilot transplantations and surrounding seabed cleaning
Partner in Charge	PP5 – Kornati National Park Public Institution
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Abstract

This document (deliverable D.4.2.3) describes the results of the activities planned in WP 4.2 (Marine seagrasses pilot transplantations and surrounding seabed cleaning) to update the status and progress of the seagrass pilot transplantations in the Panzano Bay (Monfalcone) site.

The transplantations of sods of *C. nodosa* carried out at the Monfalcone site showed that a fundamental condition is represented by seasonality. Spring transplantation, compared to autumn one, allows a rapid and immediate development of the rhizomes and of the root system. The cuttings method (staples), although already favorably tested does not appear to be suitable because of the exposure of the area to the north-east winds (high impact on these shallows).

1. Introduction

1.1. Aim and objectives

SASPAS (Safe Anchoring and Seagrass Protection in the Adriatic Sea) is an INTERREG project that aims to provide a proposal to develop and share actions and advanced policies for the conservation and sustainable use of the territory.

The common challenge of Project SASPAS is to preserve and get a better status of conservation of biodiversity of the Adriatic Sea ecosystem in order to decrease its vulnerability.

The overall objective is to improve the conservation and restoration of seagrasses by installing safe anchoring systems, performing pilot transplantations, carrying out monitoring activities and establishing an integrated management system for seagrasses in the Adriatic area. The change will result in an increase in the level of conservation of habitat types and species in the Natura 2000 sites involved in the Project areas. To achieve the envisaged change the project will adopt a scientific-applicative approach, following the DPSIR (Driving force – Pressure – State – Impact - Response) causal framework, analyzing the interactions between society and the environment - the cause-effect relationships between interacting components of complex social, economic, and environmental systems. By doing so, it is possible to measure the effectiveness of responses put in place.

Since marine seagrasses and especially *Posidonia oceanica* beds (1120*) are widespread along the coastal areas of Interreg Programme and their conservation status is similar in the two Member States, significant results can only be achieved by establishing a good cross-border cooperation between the Italian and Croatian key partners. The cross-border approach ensures coordinated and cooperative actions in planning and performing the protection and restoration activities, as well as in the development of the envisaged Marine Seagrass Safeguard Integrated Management Program (i.e., the proposed guidelines for the management and proper behavior in protected areas). The innovative aspect, which goes beyond the existing common practices, consists in the joint protection and restoration of biodiversity at transboundary level through the development of specifically- tailored innovative solutions, harmonized for the Adriatic area and applicable to other similar realities facing with the same biodiversity protection and restoration issues.

The project activities have been carried out within the three project study sites (Figure 1):

- Monfalcone (Bay of Panzano),
- Kornati National Park – (Nacionalni Park Kornati),
- Regional Natural Park of Coastal Dunes from Torre Canne to Torre San Leonardo.

This proposal is well suited to the Adriatic, in particular to the Apulia (Regional Natural Park of Coastal Dunes from Torre Canne to Torre San Leonardo) and Kornati National Park, characterized by widespread coverage of *P. oceanica*. In both sites, in the summer, there is a significant flow of pleasure boats, and the development of the industry tourism cannot fail to reckon with the need to preserve the quality of the

territory, understood as a whole between land, coast and sea. In Monfalcone (Bay of Panzano), there is an important coverage of marine seagrasses (i.e., *Cymodocea nodosa*) too.

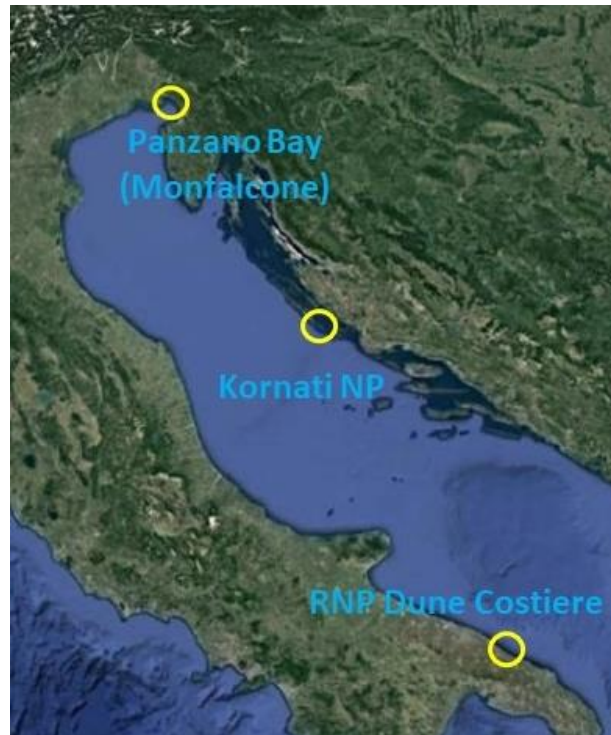


Figure 1. Location of the three project sites.

Both *P. oceanica* and *C. nodosa* play a crucial role in the consolidation of coastal sediments, slowing erosive phenomena, thanks to their rhizomial apparatus with which they anchor to the bottom; with the leaf they promote the capture of suspended sediments, helping to limit turbidity, not to mention a number of benefits for marine and lagoon organisms.

The main project outputs related to the planned activities are:

- monitoring system with data collections/monitoring campaigns,
- placement of environmentally friendly anchoring systems (anchorage and simple signaling buoys) and pilot seagrass transplantations,
- Integrated Management System for seagrasses in the Adriatic area, made by a GIS Digital Information Platform (DIP) and a Marine Seagrass Safeguard Integrated Management Program (MSSIMP).

Protected areas managers, local, regional, and national public bodies, environmental associations, and NGOs, as well as the public will mainly benefit from the project activities.

1.2. Structure of Work Package 3

The objective of the Work Package 3 - *Integrate real-time monitoring system of marine seagrasses (phanerogamae) - in the involved Natura 2000 sites* – is to monitor and gather data on marine seagrasses in the three project sites, to improve the protection and to restore the biodiversity in the cross-border area.

The WP3 package consists of three activities:

- activity 3.1 - Preliminary Environmental Survey,
- activity 3.2 - Driver and Pressure Identification and Assessment,
- activity 3.3 - Monitoring campaigns.

Monitoring campaigns were carried out to control the plants phenological life cycle and the spatial dynamics of marine seagrasses as a response to the concrete actions (activity 3.3). Moreover, they helped to identify the potential impacts that the project could have on seagrass meadows and other valuable habitats and species. They were also monitored the status and progress of the seagrass pilot transplantations planned in WP 4 Activity 2 (Marine seagrasses pilot transplantations and surrounding seabed clearing).

All the activities were conducted adopting up-to-date safety protocols, to reduce risks during underwater operations. Expert marine and transitional water biologists, according to standard operating procedures for the macrophytobenthos, performed laboratory analyses of collected samples.

Pilot transplantation tests of *Posidonia oceanica* and *Cymodocea nodosa* were conducted with the aim of evaluating the effectiveness of some methods in difficult environmental contexts, in relation to the existence of various pressures, such as mainly the anchoring of pleasure boats.

The controls carried out on the transplantation plots were aimed at quantifying, among other parameters, the percentage of development of the shoots of the relocated plants.

This document (deliverable D.4.2.3) describes the results of the activities planned in WP 4.2 (Marine seagrasses pilot transplantations and surrounding seabed cleaning) to update the status and progress of the *Cymodocea nodosa* pilot transplantations in the Panzano Bay (Monfalcone) site.

2. The Panzano Bay (Monfalcone) project area

The Bay of Panzano is a small bay of the Adriatic Sea (Friuli-Venezia Giulia), located in the northern part of the Gulf of Trieste, limited to the south-west by the Punta Sdobba, at the mouth of the Isonzo River. Inside the Panzano Bay are located two Natura 2000 sites: a Special Area of Conservation (SAC) “Cavana di Monfalcone”, a Special Area of Conservation (SAC) and a Special Protection Area (SPA) “Foce dell’Isonzo - Isola della Cona” (Mouth of the Isonzo River and Cona Island) (Figure 2).

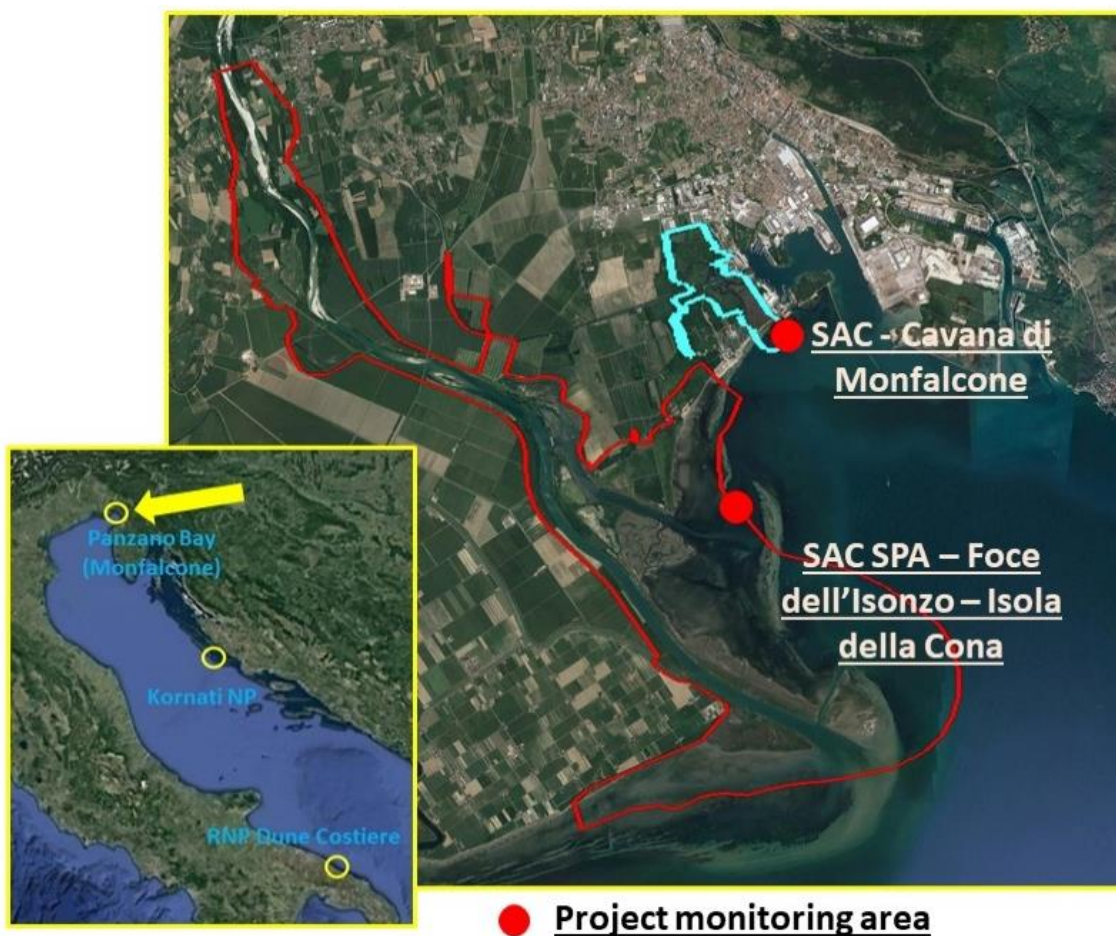


Figure 2. Location of the study areas in the Panzano Bay, positioned in two Natura 2000 sites.

Natura 2000 site: SAC IT3330007 - Cavana di Monfalcone

The “Cavana di Monfalcone” SAC extends over a surface of 133 ha, of which 12% is marine, in the transition area between the flat land and the Adriatic Sea. It is important because it includes a set of ecological systems characterized by rare habitats in a good status of conservation. A complex system of spring canals is still present, not modified by land reclamation. It is a site that includes the spring ecological system closest to the coastline and therefore in direct contact with salt and marine waters. Aquatic surfaces with different trophic status, water speed, depth and salinity preserve a rich and well-diversified aquatic vegetation.

Habitat 1110 (“Sandbanks which are slightly covered by sea water all the time”) is present in the marine zone of the site. It consists mainly of sandy sediments (larger grain-size sediments, including boulders and cobbles, or smaller grain-size sediments including mud may also be present). These habitats are permanently submerged and predominantly surrounded by deeper water. Above the sand-bank the water depth rarely exceeds 20 m. In these sub-littoral sandbanks, seagrass meadows can be present: *Zostera marina* (in brackish-salt waters), *Cymodocea nodosa* (in salt waters) and *Zostera noltei* in shallower salty waters.

The other Habitat identified is the 1140 (“Mudflats and sandflats not covered by sea water at low tide”) and is characterized by sands and mud emerging during the low tides, partially covered by *Zostera noltei* and partly coated by green, blue, brown macroalgae, and diatoms.

Natura 2000 site: SAC SPA IT3330005 - Foce dell’Isonzo - Isola della Cona

The “Foce dell’Isonzo – Isola della Cona” SAC SPA covers an area of 2668 ha, 40% of which is marine. It is situated in the eastern part of the Friuli Venezia Giulia region along the last stretch of the Isonzo River and coincides in large part with the “Foce dell’Isonzo Regional Nature Reserve”.

The marine part of the site covers about 1.100 ha of shallow waters with relevant extensions of seagrass meadows; in the marine part of the site the Habitat 1110 (“Sandbanks which are slightly covered by sea water all the time”) and the Habitat 1140 (“Mudflats and sandflats not covered by sea water at low tide”) are present.

3. The marine seagrass transplantations

In Panzano Bay-Monfalcone, as planned in WP 4 activity 2, two pilot transplantation campaigns were carried out: the first in September 2020 and the second in April 2021. *C. nodosa* transplantation were carried out using two different manual techniques: a) manual harvesting from donor sites and transplanting by sods and manual harvesting from donor sites and b) transplanting by bare-root transplant cuttings (sprigs).

The acceptor sites for the pilot transplanting were identified in parcels near the SPA, SAC Foce dell'Isonzo - Isola della Cona, in areas characterized by the presence of *C. nodosa* meadows mixed with other species (*Zostera noltei* and *Z. marina*), shallow depth and the occurrence of anchoring pressures due to small boats. For both transplantations, a healthy continuous meadow was selected nearby as a donor site, where plants were collected with adequate spacing, to avoid stress (Figure 3).



Figure 3. Bay of Panzano: location of the pilot seagrass transplantation areas (host and donor sites).

For each transplantation, two square transplant areas (10 m x 10 m) were selected: one for the manual transplanting method by collection and planting of vegetated sods (Figure 4) and one for the transplanting by manual collection of shoots - bare root planting cuttings (Figure 5).

Altogether, 100 sods and about 100 sprigs of *C. nodosa* were placed in the transplantation areas during each transplantation campaign.



Figure 4. Pilot transplantation of *C. nodosa* sods in Panzano bay-Monfalcone in September 2021: a) identification of the donor meadow; b) collection of sods; c, d) temporary storage of sods and their transport to the site to be reforested; e, f) manual planting of sods into the substrate by means of jute bags.



*Figure 5. Pilot transplantation of *C. nodosa* sprigs in Panzano bay-Monfalcone in April 2021: a) temporary storage of sprigs and their transport to the site to be reforested; b, c) sprig attachment to staples; d) sprigs planting into the substrate by means of staples.*

3.1.1. Monitoring of seagrass transplantations

The main results of the monitoring campaigns are reported in Table 1.

Table 1. Sods and Staples survival rate (monitoring campaigns of January 2021, September 2021 and May 2022)..

		Monitoring campaigns		
		January 2021	September 2021	May 2022
First pilot transplantation (carried out in September 2020)	Sods survival rate (%)	95	50	50
	Staples survival rate (%)	?	< 10	0
Second pilot transplantation (carried out in April 2021)	Sods survival rate (%)	-	100	90
	Staples survival rate (%)	-	70	50

First pilot transplantation (carried out in September 2020)

January 21 campaign: approximately 95% of the sods transplanted in September 2020 were still present (Figure 6). Regarding the transplanted cuttings, the small leaf size of *Cymodocea nodosa*, due to the slow growth during the winter months, made it more difficult to identify them, so it was not possible to confirm their presence or absence.

September 2021 campaign: sods showed a good development in 50% of cases, as the remaining 50% got eroded (Figure 7 and Figure 8). Regarding the other technique, only few transplanted cuttings were found (<10%). These losses showed that the cuttings technique was not the most suitable for the area (exposed to the Autumn storms, that occurred shortly after the transplantation).

May 2022 campaign: although a yet scarce seasonal development of the aboveground compartment, some 50% of sods resulted growing with a limited enlargement of the colonized area (Figure 9). No sign of growing in the staple cutting area.

Additional pilot transplantation (carried out in April 2021)

September 2021 campaign: sods showed a rapid leaf/rhizome development and a rapid and wide colonization of the seabed reaching about 100% of success (Figure 10 **Errore. L'origine riferimento non è stata trovata.**). Regarding the transplanted shoots, by staples, about 70% survived the transplantation. These results, according to observations, are due to a) the vegetative period (spring), favorable to the development of plants and b) the refinement in the transplantation technique, with more care in levelling sods during positioning.

May 2022 campaign: the area presents a general coverage of rhizomes and very short shoots, which interests a large surface around the transplant parcel (sods showed about 90% of success) (Figure 12). Very scarce leaf canopy development due to yet scarce seasonal development. 50% of staple cuttings resulted present.

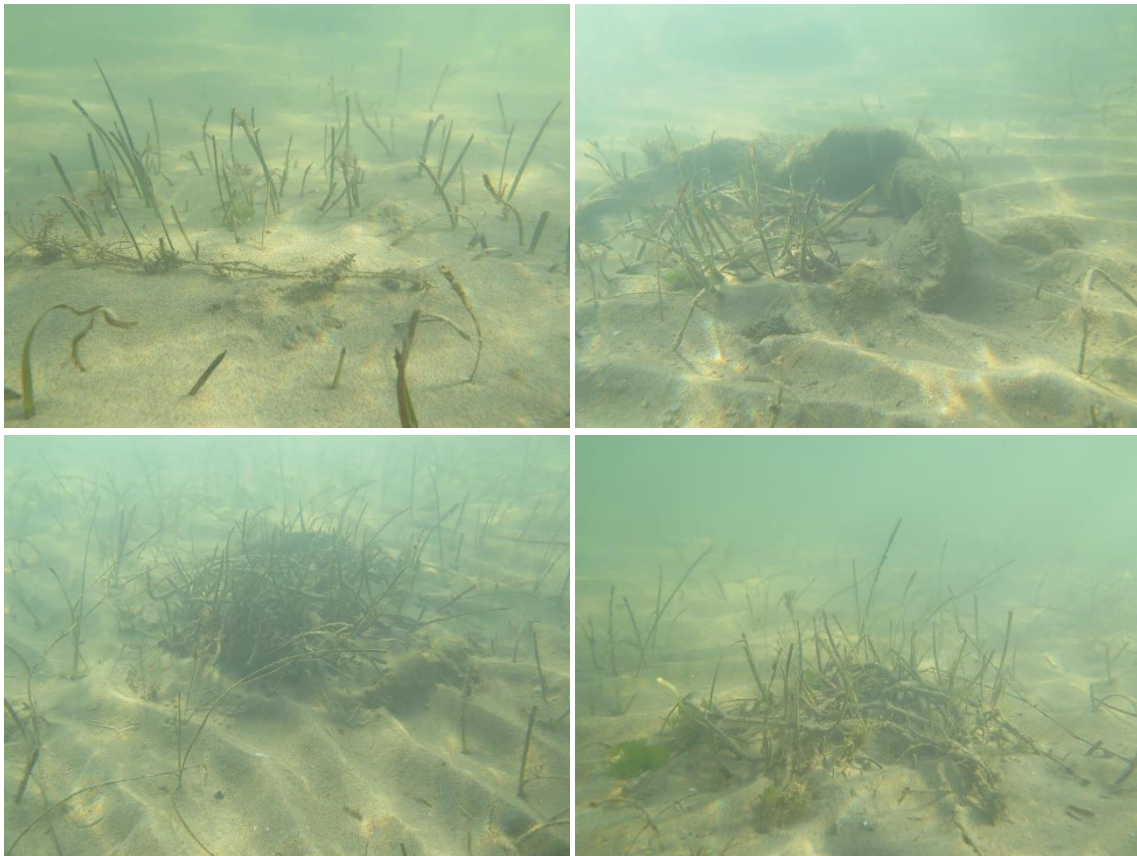


Figure 6. January 2021: sods of Cymodocea nodosa transplanted in September 2020.



Figure 7. September 2021: sods of C. nodosa transplanted in September 2020 that got eroded.



Figure 8. September 2021: sods of C. nodosa transplanted in September 2020 that showed a good development.



Figure 9. May 2022: sods of Cymodocea nodosa transplanted in September 2020.



*Figure 10. September 2021: sods of *C. nodosa* transplanted in April 2021 that showed a good development.*



*Figure 11. September 2021: sods of *C. nodosa* transplanted in April 2021 that showed a rapid and wide colonization of the seabed.*

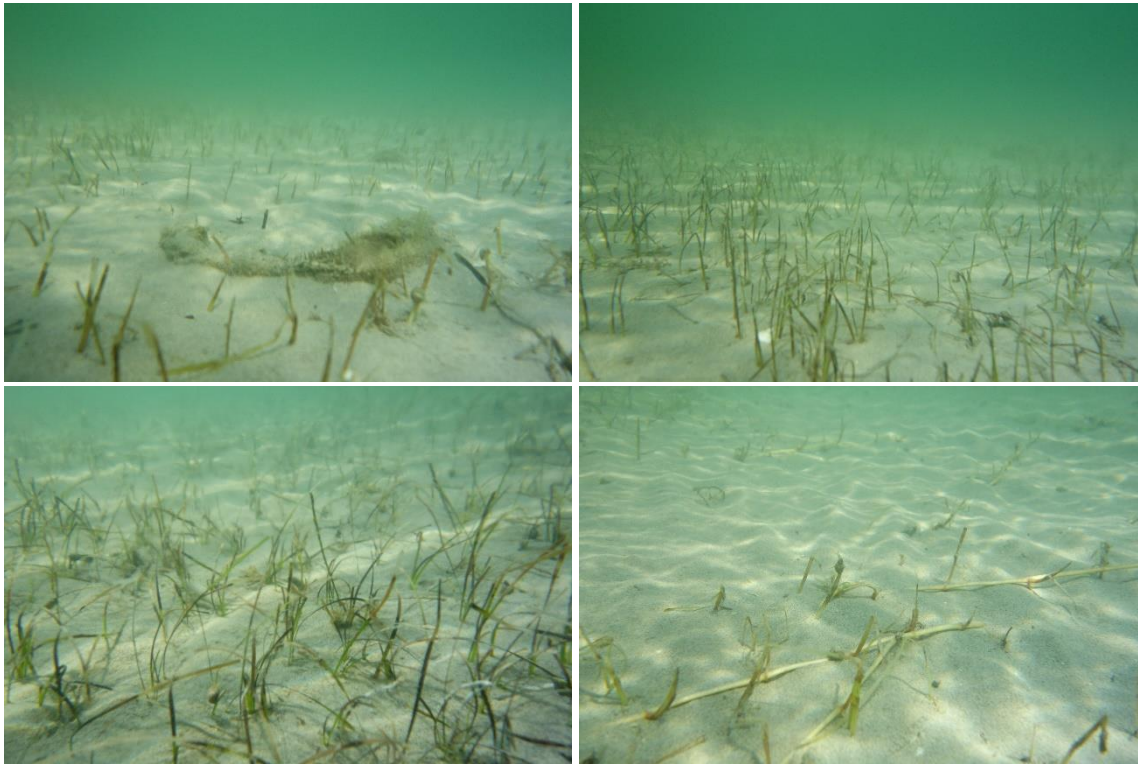


Figure 12. May 2022: sods of Cymodocea nodosa transplanted in September 2020.

4. CONCLUSIONS

The transplantations of *C. nodosa* carried out at the Monfalcone site showed that a fundamental condition is represented by seasonality. It turned out that spring transplantation, compared to autumn one, allows a rapid and immediate development of the rhizomes and of the root system in a favorable moment for the plant, which is characterized by strong seasonality, being a marine seagrass of sub-tropical origin. The control at the end of summer 2021 showed a strong colonization which showed high densities and coverages outside the limits of the transplanted sods. Taking into account the exposure of the area to the north-east winds, which have a high impact on these shallows, the cuttings method, although already favorably tested and valid from a technical point of view, does not appear to be suitable.