

Technical report on cleaning operations for each site

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1. INTRODUCTION

SASPAS (Safe Anchoring and Seagrass Protection in the Adriatic Sea) is a project financed by the European Foundation for Regional Development under the Interreg V-A Program IT-CRO CBC (Priority Axis 3 – Environment and Cultural Heritage).

The partners involved in the project are:

- Municipality Of Monfalcone (IT) - lead partner
- PP1 - Selc Cooperative Company (IT)
- PP2 - National Interuniversity Consortium for Marine Sciences (IT)
- PP3 - Provisional Management Consortium of Regional Natural Park „Coastal Dunes From Torre Canne To Torre San Leonardo“ (IT)
- PP4 - Association for Nature, Environment And Sustainable Development Sunce (CRO)
- PP5 - Kornati National Park (CRO)
- PP6 - University of Rijeka (CRO)
- PP7 - Consortium for coordination of research activities concerning the Venice lagoon system (IT)

Total budget of the project: 1.906.100,00 EUR

Funds of the program (ERDF): 1.620.185,00 EUR

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End of project: 30/06/2022

1.1. Aims and objectives

The main aim of the SASPAS project is to preserve and get a better status of conservation of biodiversity of the Adriatic Sea ecosystem.

The innovative approach in this project that goes beyond the existing practices consists in joint cross-border biodiversity protection and restoration 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 overall objective is to improve seagrass preservation and restoration through: laying safe anchorage innovative systems, performing pilot transplantations, carrying out monitoring activities and by defining an integrated management system for seagrasses in Adriatic area.

The change will result in an increased level of conservation status of habitat types and species in the involved Natura 2000 sites of the Programme area. To reach the foreseen change the project will take a scientific- applied 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.

Since the marine seagrasses and especially the *Posidonia Oceanica* beds (1120*) do not know boundaries and are widespread in all the Program coastal areas, irrespectively to the state in which we are, and also the problems with the conservation status are similar in the two Member States, significant results can be reached only by setting up a good cross-border cooperation within 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 in developing the foreseen Marine Seagrass Safeguard Integrated Management Program with the guidelines with regulations for the management and the correct attitude and behavior in protected areas.

The expected main results of the project are:

- Implementation of the seagrass monitoring system and annual data collection / monitoring campaign
- Installation of environmentally friendly anchorage systems (anchorages and simple signal buoys)
- Seagrass pilot transplantation and integrated management system for seagrass in the Adriatic (GIS Digital Information Platform (DIP))
- Drafting of the Integrated Marine Flowering Management Program (MSSIMP) proposal.

1.2. Structure of Work Package 4

The WP4 of the project (Protecting and restoring marine seagrasses) aims to develop and install an environmentally friendly anchoring systems (anchorage and simple signalling buoys) that can cancel or significantly reduce impacts on marine seagrass meadows caused by the anchorage of leisure boats and to perform transplantations whose aim is to test the up-to-date methods and to assess the possibility to re-establish beds which have disappeared due to human activities.

The WP4 package consists of two activities:

- Activity 4.1. Laying and boot of Environmental-Friendly Anchoring system,
- Activity 4.2. Marine seagrasses pilot transplantations and surrounding seabed clearing.

This document describes the activities planned and carried out within WP 4 activity 2, reporting the seabed cleaning actions in three project areas: Monfalcone (Panzano Bay), Regional Natural Park of Coastal Dunes from Torre Canne to Torre San Leonardo and Kornati National Park.

2. PROJECT AREAS

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

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

Natural Park of Costal Dunes from Torre Canne to Torre San Leonardo and Kornati National Park are characterized by widespread coverage of *Posidonia oceanica*. In both sites, in the summer, there is a significant flow of pleasure boat; however the development of the tourism industry 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 (*Cymodocea nodosa* and *Zostera* spp.) too.



Figure 1. Location of the three project areas.

Both *P. oceanica* and *C. nodosa* play a crucial role in the consolidation of coastal sediments, slowing erosive phenomena, thanks to their radical 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.

2.1. Monfalcone (Bay of Panzano)

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 Areas of Conservation (SAC) “Cavana di Monfalcone” and a Special Areas of Conservation (SAC) and Special Protection Area (SPA) “Foce dell’Isonzo - Isola della Cona” (Mouth of the Isonzo River and Cona Island) (Figure 2).

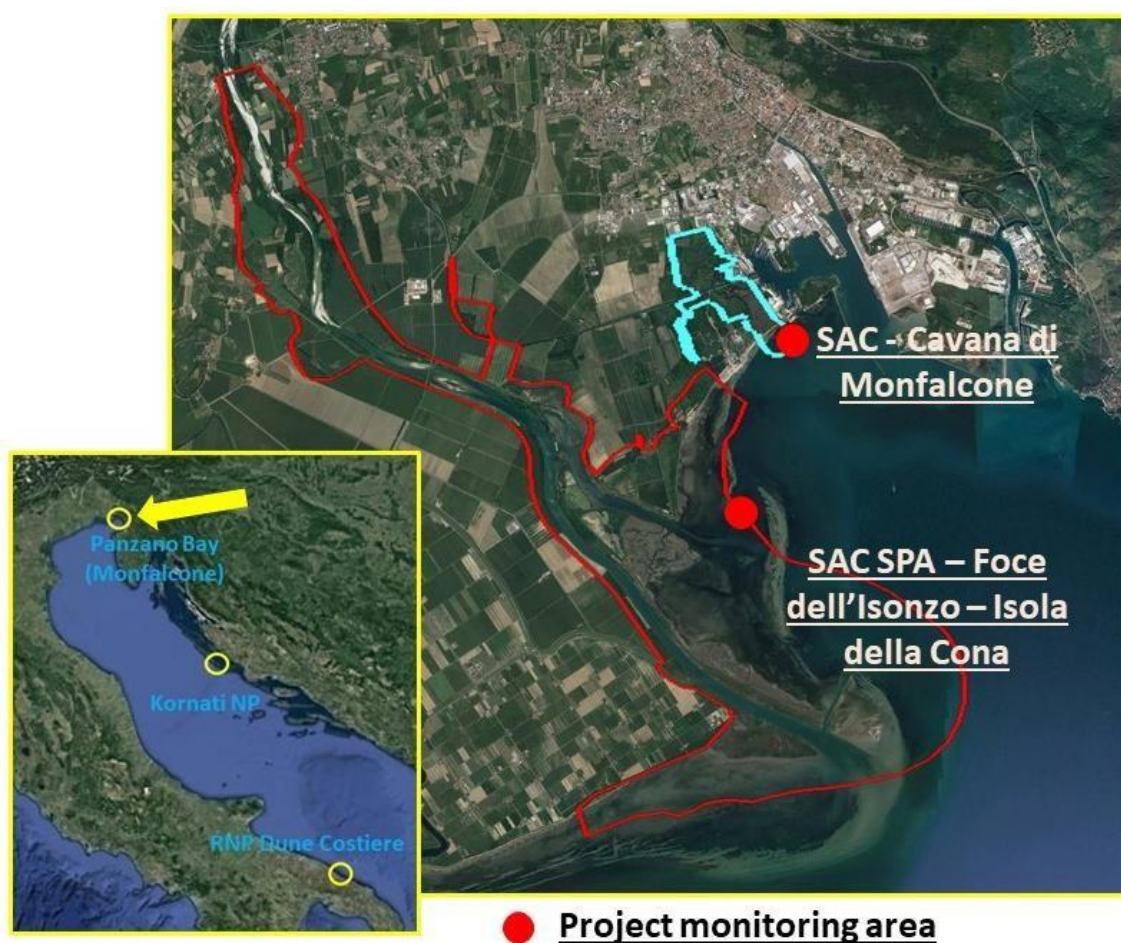


Figure 2. Location of the study areas in the Panzano Bay, positioned in two Natura 2000 sites.

- 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 and it is important because it includes a set of ecological systems characterized by rare habitats in a good state 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 state, water speed, depth and salinity preserve rich and well- diversified aquatic vegetation. The site covers an area of 133 ha, approximately 12 of which are inmarine areas.

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 sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present). These habitats are permanently submerged and predominantly surrounded by deeper water. Above the sand-bank the water depth is rarely greater than 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 noltii* and partly coated by green, blue, brown algae, 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 2.668 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.

2.2. Regional Natural Park of Coastal Dunes from Torre Canne to Torre San Leonardo

The “Regional Nature Park Dune Costiere from Torre Canne to Torre San Leonardo” extends for 1.100 ha, along 8 km of coastline, and includes the inland agricultural areas occupied by centuries-old olive groves and ancient “masserie” (typical Apulian farms) (Figure 3). The perimeter follows the long course of the “lame” (55 km of erosion), which characterizes the Park's territorial morphology; they are linear clefts of the land perpendicular to the coastline, with flat bottom and slightly sloping sides originated by the erosive action of surface waters.

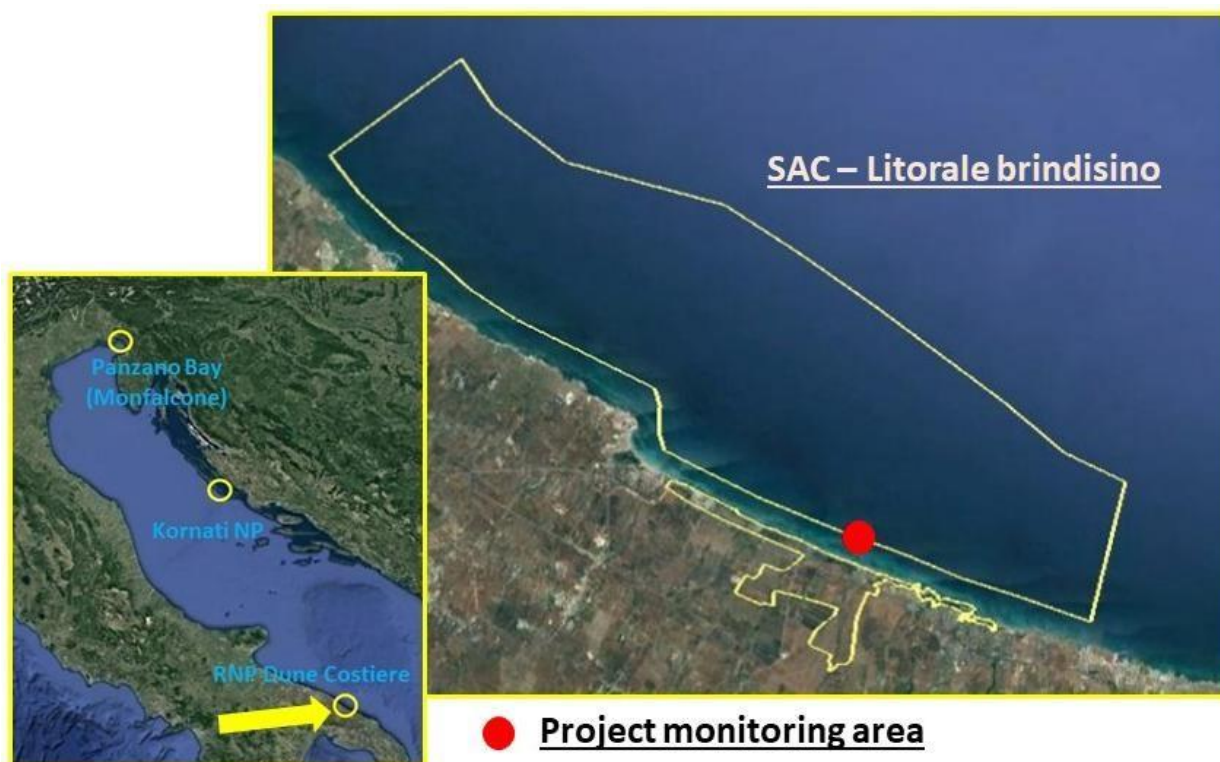


Figure 3. Location of the study area in the RNP Dune Costiere, positioned in a Natura 2000 site.

In the protected area, there are many habitats. Each habitat is a result of the geological, morphological and climatic features of the site that determine the presence of plant and animal species preferring those features. Some of those habitats are considered priority, such the *Posidonia oceanica*. Starting at a depth of 10-12 m, *P. oceanica* meadows are present on sandy bottoms.

The park includes the Special Areas of Conservation (SAC) “Litorale brindisino”.

- Natura 2000 site: SAC IT9140002 - Litorale brindisino

The SAC “Litorale brindisino” covers an area of 7.256 ha, 95% of which is marine. The priority habitat 1120* (*P. oceanica*) covers 50% of its total area. It is also characterized by the presence of coastal wetlands, where rare or endangered species of migratory bird stop or reproduce.

2.3. Kornati National Park

Kornati National Park is designated as Site of Community Importance SCI HR4000001 - Nacionalni park Kornati (**Pogreška! Izvor reference nije pronađen.**). The park¹ was established in 1980 and its management began in 1982. It currently includes 89 islands and reefs, a total area of 217 km², of which almost 80% is marine territory (land 50 km² / sea 167 km²) and a total coastline of 238 km. Karst features dominate its geomorphology. It is estimated that at least 2.500 to 3.000 families of benthic and pelagic fauna live in the Kornati archipelago such as 353 species of algae, 3 species of underwater flowerplants as well as about 850 animal species – 61 species of corals, 177 species of mollusks, 127 species of polychaetes, 61 species of decapod crabs, 64 species of echinoderms and 185 species of fishes. Meadows of *P. oceanica* are also present in the Park, up to depths of 25-30 meters. The presence of alien species is included among the anthropogenic threats. *P. oceanica* is particularly threatened by some algal species: *Caulerpa cylindracea*² (that has been observed in the last years and is spreading in the entire Park) and the turf-forming red algae *Womersleyella setacea* and *Acrothamnion preissii* (two species that grow over *Posidonia* rhizomes).

Public Institution, under the competence of the Ministry of Economy and Sustainable Development, manages the Kornati National Park. The land part of the park is entirely privately owned (around 620 owners).

There are four no-take zones where only scientific research is allowed. Sailing is allowed in the entire Kornati National Park except in the areas of strict protection. Anchoring and overnight stay are allowed only in 19 locations (bays and coves). Autonomous diving is allowed only in organized groups, with a license for autonomous diving in the Kornati NP obtained in advance.

Since 2013, traditional fishing in Kornati National Park is forbidden and only recreational fishing is allowed.

¹ The data cited in the following paragraphs are reported in the articles: Casier, 2011; Mihelcic and Ramov, 2018; Ivković N., 2015.

² *Caulerpa cylindracea* Sonder [previously known as *Caulerpa racemosa* var. *cylindracea* (Sonder) Verlaque, Huisman et Boudouresque]

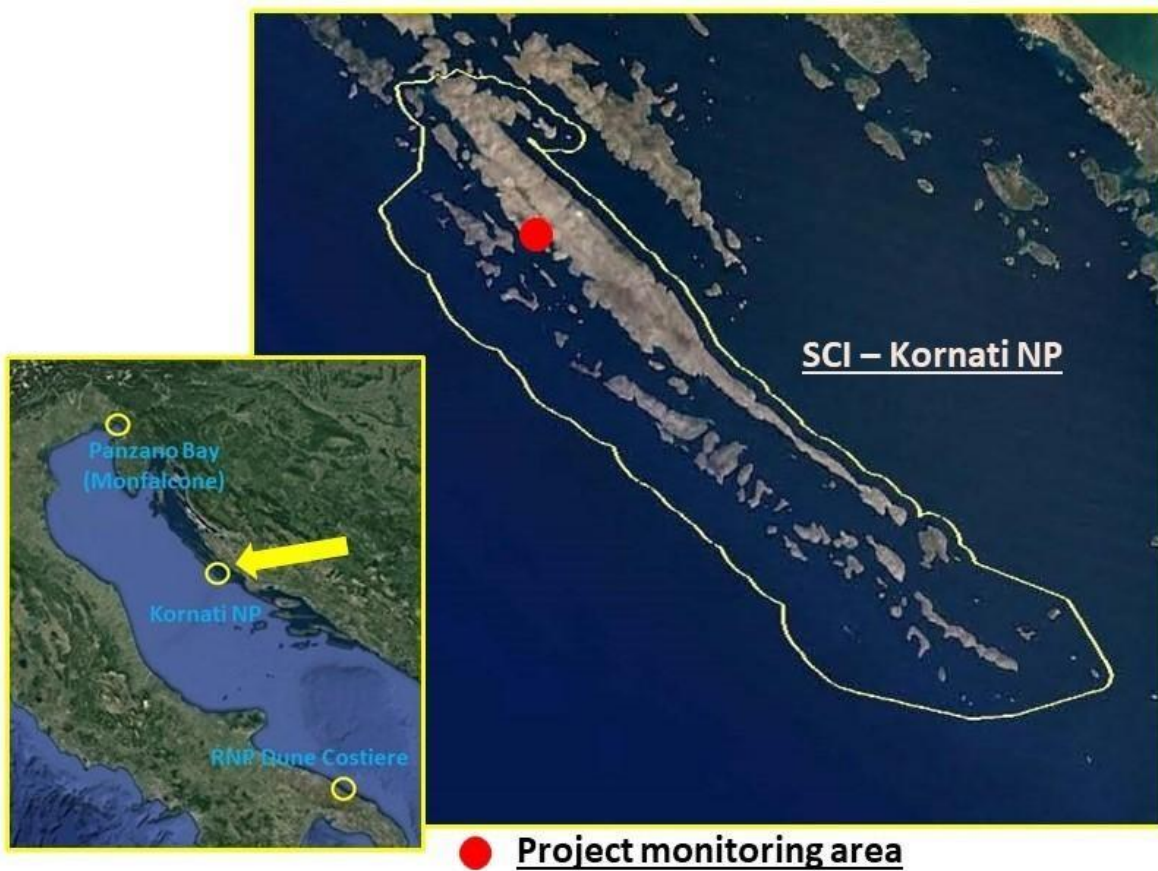


Figure 4. Location of the study area in the Natura 2000 site Kornati NP.

3. SEABED CLEANING ACTIVITIES

3.1. Seabed cleaning activities in Monfalcone (Panzano Bay)

As a part of the SASPAS project, two transplantations of the *Cymodocea nodosa* were performed close to each other near the site (SAC SPA) Foce dell'Isonzo – Isola della Cona. Before each transplantation activities, the seabed was cleaned in the surrounding area.

3.1.1. Seabed cleaning area

In September 2020 and April 2021, the partner SELC, in collaboration with the other partners – CORILA (UNIVE) and CONISMA (Uni-TS), carried out the *Cymodocea nodosa* pilot transplantation activities in Panzano Bay (Figure 5; Figure 6). In the transplanting sites (located near the site - SAC SPA - Foce dell'Isonzo – Isola della Cona) and in the nearby areas, scuba divers looked for rubbish thrown and abandoned across the sites by irresponsible boaters.



Figure 5. Panzano Bay (Monfalcone) and seabed cleaning area (circled in yellow) in September 2020.

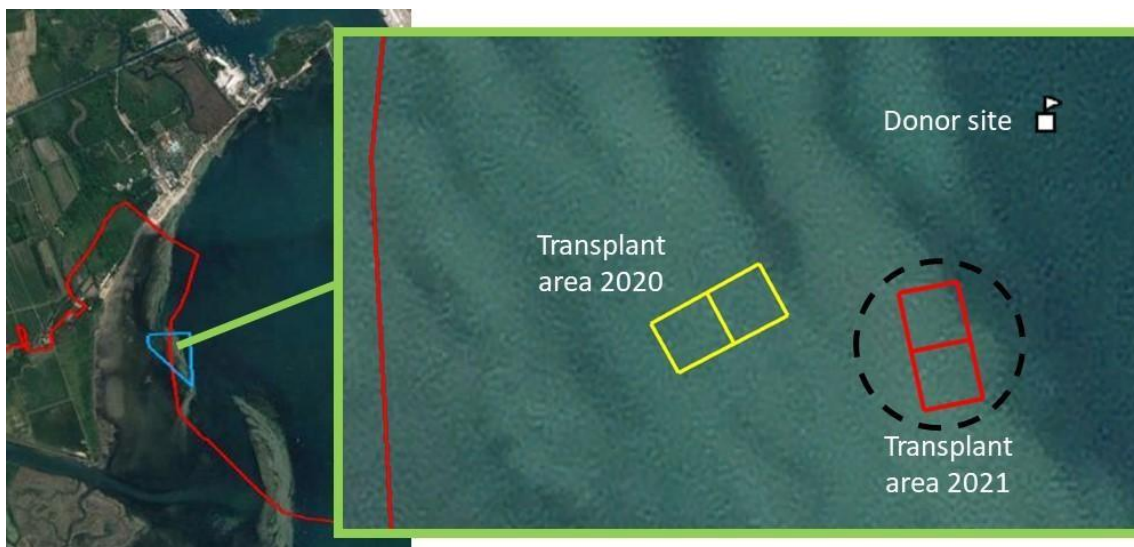


Figure 6. Panzano Bay (Monfalcone) and seabed cleaning area (circled in black) in April 2021.

3.1.2. Methodology and results

Before carrying out the both of *Cymodocea nodosa* pilot transplantation, scuba divers looked for marine debris in the areas where shoots were planned to be transplanted and in the surrounding area. Fortunately, as can be seen from the photos in Figure 7 and Figure 8, little litter was found in the controlled areas (only small pieces of paper and plastic).

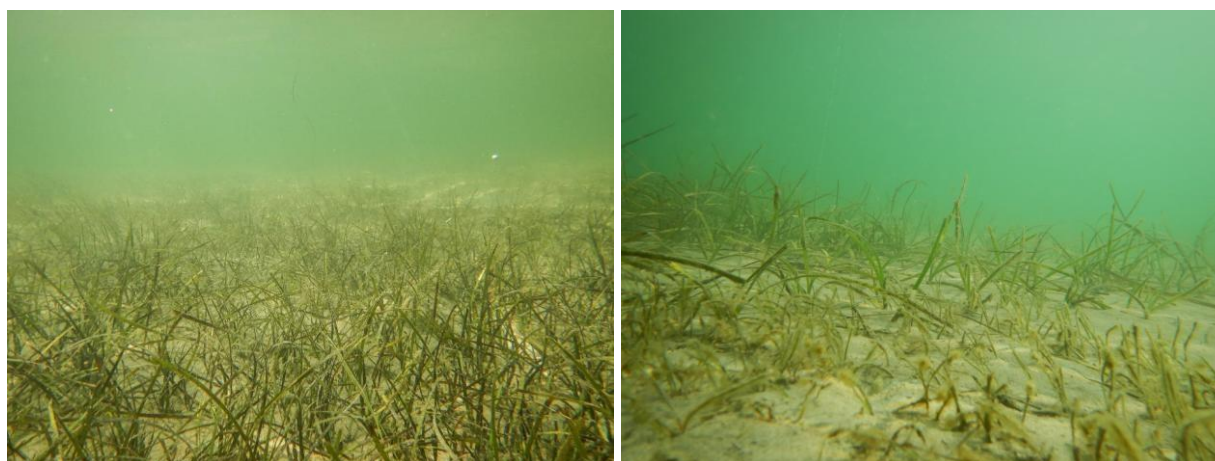


Figure 7. *Cymodocea nodosa* meadow in Panzano Bay – September 2020.



Figure 8. *Cymodocea nodosa* meadow in Panzano Bay – April 2021.

3.2. Seabed cleaning activities in Regional Natural Park of Coastal Dunes

3.2.1. Seabed cleaning area

The Regional Natural Park of Coastal Dunes carried out the transplantation activity on 26th and 27th February 2021, in collaboration with SELC Partner. The transplantation activity was supported by the specialized contribution of Biosurvey Srl, a spin-off of the University of Palermo, Italy. During this activity scuba divers looked for rubbish thrown and abandoned across the sites by irresponsible boaters (Figure 9).

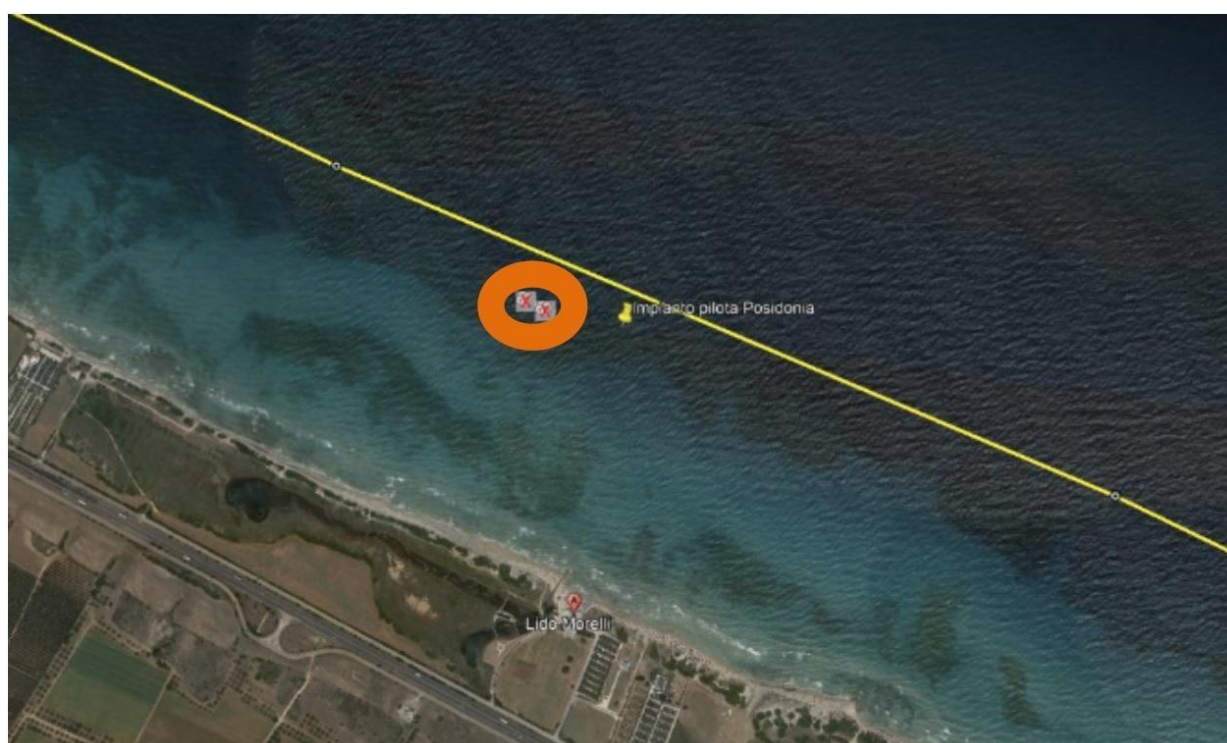


Figure 9. Morelli Site (Regional Natural Park of Coastal Dunes) and seabed cleaning area (circled in orange).

3.2.2. Methodology and results

On 26th February 2021, before carrying out the *Posidonia oceanica* pilot transplantation, scuba divers looked for marine debris in the areas where shoots were planned to be transplanted and in the surrounding area but considering that the selected area is subject to winds that carry litter along the beach, a very few wastes were found (Figure 10).

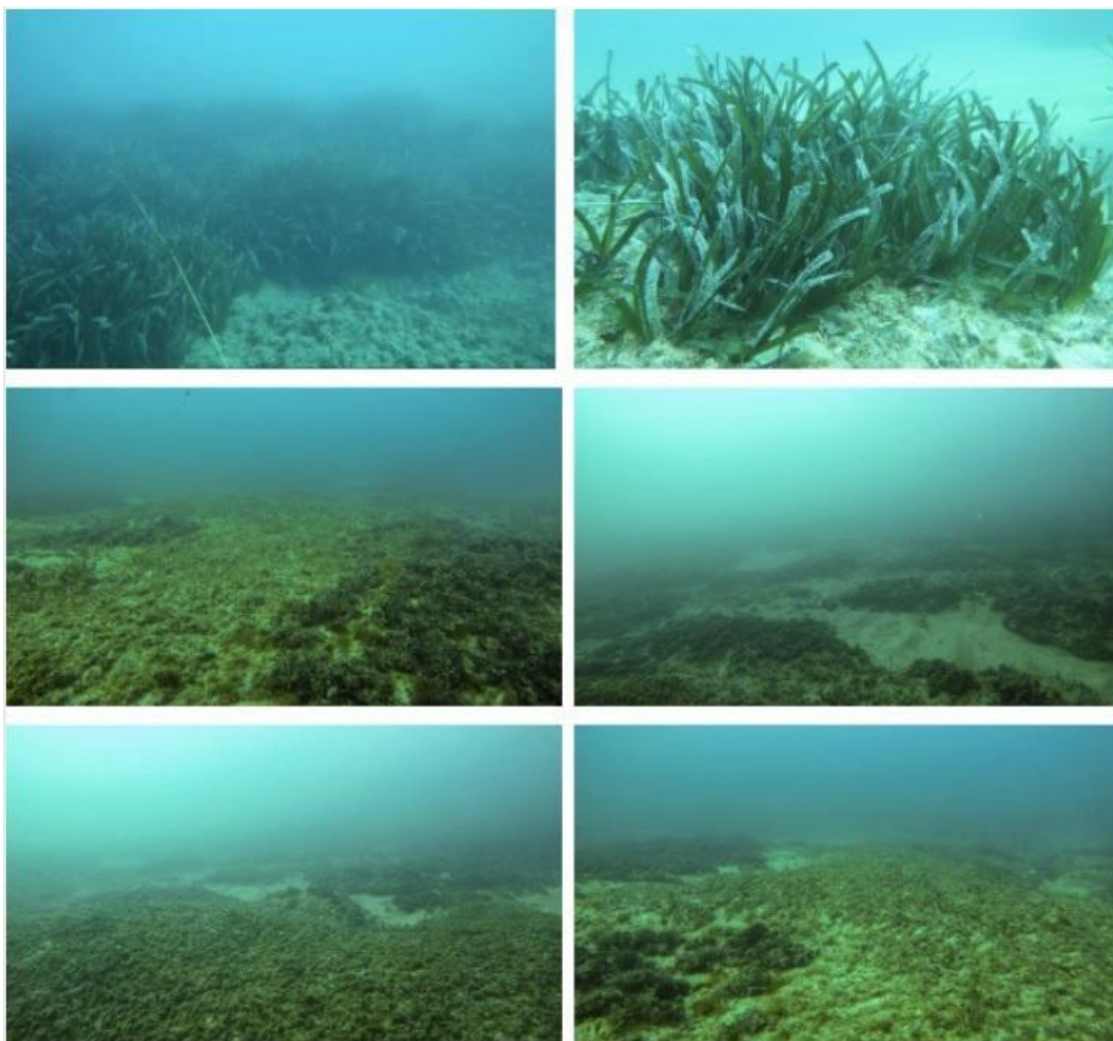


Figure 10. *Posidonia oceanica* in Morelli Site.

3.3. Seabed cleaning activities in Kornati National Park

As a part of the SASPAS project, two transplantations of the *Posidonia oceanica* were performed in the Kornati National Park. Before each transplantation activities, the seabed was cleaned in the surrounding area.

3.3.1. Seabed cleaning area

In October 2019, Kornati National Park, in collaboration with the other partners, carried out the seabed cleaning in the area where *Posidonia oceanica* pilot transplantation was planned and in the surrounding area in Kravljačica Bay (Figure 11). The same activity was carried out in Anica Bay, on the island of Levrnaka, in October 2021, before an additional transplantation (Figure 12).

Both areas represent one of the 19 anchoring sites in Kornati National Park. Uncontrolled anchoring, along with the destruction of seabed biocenoses, brings with it a large amount of litter from irresponsible boaters. Unfortunately, the situation is the same in Kravljačica Bay and Anica Bay, where a certain amount of litter was found.



Figure 11. Kravljačica Bay in Kornati National Park and seabed cleaning area (circled in black).



Figure 12. Anica Bay (Levrnaka Island) and seabed cleaning area (circled in white).

3.3.2. Methodology and results

In both areas, scuba divers have been collecting marine litter in the area where *Posidonia oceanica* transplantation was planned to be performed and their surrounding area. Divers were removing litter using mesh bags.

In Kravljacića Bay, among the collected litter, glass bottles and plastic were the most represented (Figure 13).

In Anica Bay, numerous anthropogenic litter such as cans, bottles, and plastics (Figure 14) were found at the location that divers collected in bags (Figure 15).

After the completed seabed cleaning, at both locations, the waste was disposed of in appropriate containers.



Figure 13. Marine litter in Kravljačica Bay.

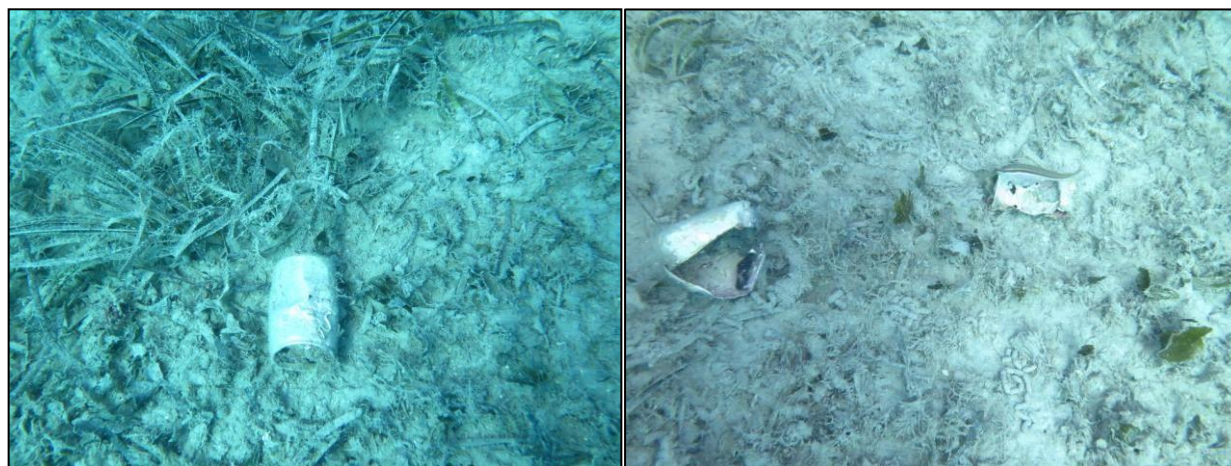


Figure 14. Marine litter in Anica Bay.



Figure 15. The diver collects the litter in a bag.

4. CONCLUSIONS

- As part of the SASPAS project, seagrass transplantations were carried out in three project sites: two locations in Italy - Monfalcone (Panzano Bay) and Regional Natural Park of Coastal Dunes from Torre Canne to Torre San Leonardo and one location in Croatia - Kornati National Park. Before each transplantation activities, marine litter was collected from scuba divers in the surrounding area.
- In Panzano Bay, during both transplantation activities, litter was found in the controlled areas (only small pieces of paper and plastic).
- In Regional Natural Park of Coastal Dunes, during the seabed cleaning, very few litter was found, considering that the selected area is subject to winds that carry litter along the beach.
- In Kravljačica Bay and Anica Bay, during the seabed cleaning, a certain amount of litter was found – cans, bottles and plastic were the most represented.
- Uncontrolled anchoring, along with the destruction of seabed biocenoses, brings with it a large amount of litter from irresponsible boaters.
- During the regular monthly monitoring of the transplanted area, the collection of newly arrived litter continues.