2014 - 2020 Interreg V-A
Italy - Croatia CBC Programme
Call for proposal 2019 Strategic

MARLESS (MARine Litter cross-border awarenESS and innovation actions)

Priority Axis: Environment and cultural heritage; Specific objective: 3.3 - Improve the environmental quality conditions of the sea and coastal area by use of sustainable and innovative technologies and approaches

D.6.3.1 2 fishermen cooperatives trained on FFL actions and equipped with specifically created networks

Activity Number: 6.7

WP Number 6

Version: FINAL
Distribution: PUBLIC
Date: 16/06/2023

PROJECT MARLESS

Work Package:	WP6
Activity:	AT 6.7 Toobox
WP Leader:	PP6 University of Bologna
Deliverable:	D.6.3.1 2 fishermen cooperatives trained on FFL actions and equipped with specifically created networks

Version:	**Final 1.0**	**Date:**	**13/06/2023**
Type:	**Report**		
Availability:	Public		
Responsible Partner:	Cetacea Foundation PP4		
Involved Partner			
Editor:	Martina Monticelli		
Contributors:	/		

CONTENT:

Pilot Actions to prevent, recover, process marine litter

-Activity 6.7-

WP6 aims to demonstrate the feasibility of several new technologies in the field of prevention, recovery and treatment of marine litter. The activity in question will produce Tool boxes for stakeholders aimed at boosting the transferability of WP main outputs.

1. INTRODUCTION:

In the framework of the directive for the Marine Strategy for the Good Environmental Status of the sea, marine litter consists of items that have been deliberately discarded, unintentionally lost or transported by winds and rivers into the sea and on beaches. It mainly consists of plastics, wood, metals, glass, rubber, clothing and paper. Land-based sources account for up to 80% of marine litter – these include tourism, sewage and illegal or poorly managed landfills. The main sea-based sources are shipping and fishing (EU, 2010). The aim of the project deliverable 6.3.1 is to develop new pilot actions that can improve the ML collection and to define a protocol for collecting macro-litter data in scientific fisheries surveys. Cetacea Foundation participated in this action by developing a new bottom trawler net that catch only marine litter on the sea bottom. The procedure covers observation of macro-litter collected during trials of a new net that is structured to catch only for marine litter. The protocol does not cover the observation of floating litter or non-fishing surveys.

1.1 Brief description of the activity performed

The purpose of the action was to use a trawl net for the collection of marine debris from the seabed. The fishing gear was designed as a trawl net that, thanks to appropriate adjustments in its architecture, is capable of retrieving debris from the seabed without retaining fish species. The gear's rigging and configuration took into account the need to recover waste of extremely variable sizes and weights without causing any stress to the biomass.

The rigging and use of the gear are very similar to those of a traditional trawl net, also aiming to facilitate its implementation among operators who should encounter minimal impact when using it, both in terms of deployment and recovery operations, and in terms of onboard equipment and devices required.

The Fishing For Litter activity within the MARLESS Project took place from the port of Cesenatico in collaboration with Commanders Massimo Bottacchiari and Massimo Rimas.

1.2 Goals achieved

The innovative design and configuration of the gear enabled it to effectively remove 400 kg of waste from the seabed capturing small quantities of fish. The marine litter found was mostly composed by plastic objects, such as mussles socks (around 90%). By implementing careful modifications and adaptations, the net was able to selectively target and extract debris, while allowing most fish species to swim freely through the mesh without getting entangled. The net is not yet fully functional as it does not collect large quantities of waste, and some animal species still get trapped in the net (although to a lesser extent). Therefore, further measures and modifications will be needed to make the tool more effective and, most importantly, to pre-select areas with higher waste accumulation.

2. DELIVERABLE METHODOLOGY*: (first briefly describe what was done, then some tips for the replication of the action – suggestions are reported below)*

The seabed cleaning activities were carried out during non-working days, separate from the regular fishing activities. The activity included 40 campaign (20 with each boat) and two samplings per campaign, lasting approximately 1.5 hours each, for a total of 80 samplings.

2.1 WHERE: Deliverable location description (the location can affect the effectiveness of the action? What about the seasonality?)

The nets were deployed 4 miles offshore, near the mussel farms in Cesenatico, so the high presence of fishing nets could be attributed to this location. However, it would be interesting to observe how the types of waste change as we move further away from the coast.

There are several factors that can influence the replicability of experiments, including the occurrence of phenomena such as storms and currents that can alter the distribution of waste. Additionally, periods of reproduction or spawning of native species can impact the arrangement of waste through burial processes or increased entanglement of animal species. The fishing activity itself should not be overlooked as it can also alter the distribution of waste. All these factors vary depending on the sampling area, so it is essential to have knowledge about the specific area where the experiment is to be replicated, including the composition of the seabed (and any topographical features that could hinder the activity), distribution of animal and vegetal species, and areas of higher waste accumulation.

2.2 WHO: Experts Involved (Which background do you need to perform well the action? What's the minimum team?)

To gain a comprehensive understanding of the characteristics of the sampling areas, we sought the assistance of biologists who contributed to the waste cataloging process and provided guidance to minimize the net's impact on the seabed, marine flora, and fauna. Additionally, we relied on the collaboration of fishermen, who identified areas with the highest waste accumulation and made

necessary modifications to adapt the net to the specific characteristics of the sampling areas and vessels.

Specifically, the personnel required for carrying out the activities includes two fishermen and one scientific researcher for the analysis of the collected waste. Since the tool used is a trawl net, the fishermen are already capable of using it. In fact, the purpose was to create a net that they could use independently to "clean the sea" in the future, on special days, without the assistance of researchers, in order to carry out these activities autonomously.

By encouraging the fishermen's active involvement and providing them with the necessary skills and tools, the initiative aims to establish a sustainable framework for ongoing marine clean-up activities. This approach can have positive ecological, economic, and social impacts, fostering a sense of ownership and responsibility among the local fishing community while addressing the issue of marine debris.

2.3 HOW: Description of the activity realized (specific technology are needed? And the timing needed?)

Given the intended purpose of the designed net, which is solely to capture marine litter, it is imperative to develop a fishing tool that minimizes the incidental catch of any type of animal. Consequently, the lateral panels of the net are constructed with square meshes measuring 20 cm by 20 cm, while the upper section is comprised of longitudinal ropes to facilitate the escape of turtles or large fish (As shown in **Figures 1** and **2**). Furthermore, in order to mitigate substantial impacts on the seabed, the net has been engineered to possess a relatively lighter weight.

In order to make the activity as simple as possible, to facilitate its replication, it requires approximately half a day. The activity itself does not require advanced technology but only a scale and gloves for waste sorting, as well as designated areas for proper waste disposal.

2.4 Outputs achieved vs Outputs expected

During the period of network experimentation, conducted between 2022 and 2023, a total of 80 samples were carried out, from which we managed to recover approximately 400 kg of marine litter. From our perspective, the volume of the recovered waste turned out to be lower than expected, considering that we anticipated a greater quantity. Additionally, some accidental captures occurred during the process, such as marine turtles and a few stingrays. However, it is important to

highlight that significant improvements were observed during subsequent campaigns following the implementation of modifications made by the fishermen. Finally, a considerable progress should also be emphasized in terms of reducing non-target catches.

2.5 ***SWOT ANALYSIS***

	Helpful	***Harmful***
Internal Origin	*STRENGHT:* *It effectively removes waste without excessively catching fish or other non-commercial species.* *Since the tool used is a trawl net, the fishermen are already capable of using it. In fact, the purpose was to create a net that they could use independently to "clean the sea" in the future, on special days, without the assistance of researchers, in order to carry out these activities autonomously.*	*WEAKNESS:* *Still in the experimental phase, it is unable to completely exclude fish and other animals.* *It has an impact on the seabed as it remains a trawl net.* *Special research is needed before conducting proper collection. Additionally, the tool must be designed with suitable characteristics for the vessel that will use it and may require minor adjustments to better adapt it to the surrounding environment and the boat's characteristics.*
External Origin	*OPPORTUNITIES:* *If carried out in waste hotspots, a significant amount of marine litter could be collected in a short amount of time without compromising the safeguarding of the marine environment.* *It could reduce the labor force required for marine waste removal and actively contribute to environmental recovery.* *Recycling collected waste and using it for other initiatives.*	*THREATS:* *It is an activity that depends on weather conditions, which could affect the success of the campaign. Additionally, collection activities are closely linked to the seabed's structure and can only be applied to sandy bottoms.* *There is a possibility of the net breaking in case of encounters with rocks, wrecks, or other debris that can compromise the functionality of the tool.*

3. CONCLUSION / SUMMARY:

During the conducted experiments, a total of 400 kg of waste was collected in just 80 samplings carried out in the port of Cesenatico. Throughout these experiments, several modifications were made to the net in order to improve the efficiency of the tool, adapting it to the specific characteristics of the vessels and the different types of seabed where the sampling campaigns took place. The main objective of this experimental phase was to develop a net that would be easy to use and would require a reduced number of operators to ensure its replicability. Thanks to the similarity of the tool to a trawl net, it was easier to involve fishermen in the sampling activities, as they were able to use the net independently without the need for technical support. Although the results obtained from this pilot study did not reach complete satisfaction, it can be affirmed that further modifications will allow for the refinement of the tool. In order to fully exploit the potential of this net, it would be advisable to conduct preliminary studies on the areas to be cleaned, in order to identify the hotspots of marine litter and remove them at a later stage.

4. TRANSFERABILITY*:*

Marine debris poses an escalating threat to marine ecosystems and fishing activities. Fishermen have long been regarded as the "sea scavengers" bringing tons of marine waste to port. However, these wastes not only cause damage to ecosystems but also have a negative impact on fishermen's activity as they can harm equipment and compromise the quality of fish. Therefore, it is crucial to find a solution for the management of marine litter. In this regard, thanks to the pilot actions of the MARLESS Project, a tool has been provided to fishermen that facilitates their fishing activities while contributing to the improvement of the health of marine ecosystems.

The waste fishing operations conducted as part of the project took place on days separate from regular fishing days. The goal of the experimentation is to propose the use of this tool during non-working days as a means of cleaning the sea during times when regular fishing activities are not possible (e.g., adverse weather conditions).

The tool used has been designed to ensure ease of replication. It is a modified trawl net with the aforementioned modifications. To ensure greater replicability efficiency, it is essential to evaluate aspects such as seafloor geomorphology, specific composition of fauna and flora, and their life cycles, as well as to have knowledge of the areas with the highest distribution of marine debris.

5. MEDIA

Figure 1 *- Photo of the net.*

Figure 2 *- Detail of the longitudinal ropes in the upper part of the net.*