



**PLASTIC
BUSTERS**



Union for the Mediterranean
Union pour la Méditerranée
الإتحاد من أجل المتوسط



PLASTIC BUSTERS PROJECT: BRIDGING NORTH AND SOUTH MEDITERRANEAN IN MARINE LITTER MONITORING AND MITIGATION ACTIONS

Maria Cristina Fossi, Silvia Casini, Cristina Panti
and Plastic Busters team of the Biomarker Laboratory,
University of Siena, SDSN MED

Italy

Fossi@unisi.it



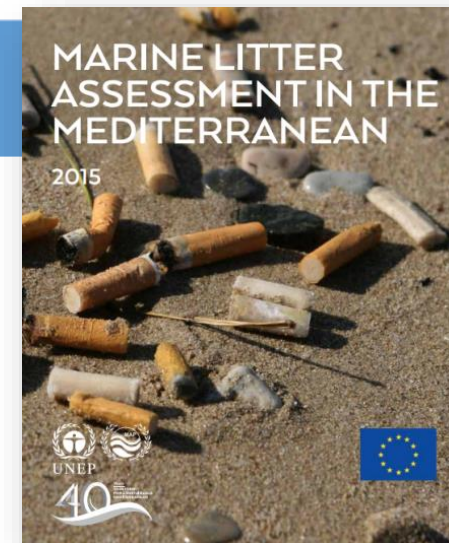
Mediterranean



UNIVERSITÀ
DI SIENA
1240



MARINE LITTER IN THE MEDITERRANEAN SEA



- An highly urbanized and developed coastline
- A closed basin
- 30% of the maritime traffic
- A touristic destination
- Large rivers (Rhône, Nile, Po)

THE MOST AFFECTED AREA WORLWIDE FOR MARINE LITTER

- Some of the largest amounts of Municipal Solid Waste (MSW) are generated annually per person in the Mediterranean Sea (208 – 760 kg/Year)
- An estimated 731 tons of plastic is littered every day, with important differences depending on country
- Cigarette butts may reach 40% of stranded litter
- the highest densities of marine litter stranded on the sea floor, up to 100,000 items / km² (French Coast) are found in the Mediterranean Sea
- the highest densities of floating microplastics , up to 4680,000 items / km² (Southern Adriatic) are found in the Mediterranean Sea

Marine litter impact: what happens in the Mediterranean sea?



7 plastic items in the stomach



145 plastic items in the stomach



5 Kg of plastic in the stomach

More than 91 marine vertebrate species affected by marine litter in the Mediterranean basin





Knowledge gaps

MEDITERRANEAN SEA: ONE OF THE MOST AFFECTED AREAS FOR MARINE LITTER

Impact on Biodiversity?

Identification of Bioindicators?

Identification of Hot Spots Areas?

Impact on MPAs?

Impact on Fisheries?

Impact on Human Health?

Identification of reduction and mitigation measures



Why Plastic Busters ?

Plastic Busters on basin scale

A crucial aspect of the marine litter issue, underlined by the **Barcelona Convention within the Regional Plan for Marine Litter** (Istanbul 2013) is that: "Marine pollution knows no border, pollution in one country affects all other 21 countries, hence there is a need for a regional approach".

Plastic Busters is the first project at basin scale that binds the Southern and Northern Mediterranean countries on the issue of Marine Litter under the umbrella of UNEP/MAP and UfM, with 10 countries already involved in the project and 12 countries endorsing the project.



Diagnosis of the problem to identified specific solutions

- Impact on Biodiversity?
- Impact on Fisheries?
- Identification of Hot spot areas?
- Impact on Human?



Project coordinator
Maria Cristina Fossi
Biomarker Laboratory, University of Siena, Italy



SDSN-MED

Flagship project



2013

UfM Labelling



Union for the Mediterranean
Union pour la Méditerranée
الإتحاد من أجل المتوسط

2016

MED-Interreg

Plastic Busters MPAs:
preserving biodiversity from plastics in Mediterranean Marine Protected Areas

PROJECT BUDGET	ERDF / IPA	PROJECT DURATION
5.055 M €	4.296 M €	48 Months

2018

ENI -CBC



2019 - 20



Plastic Busters MPAs:

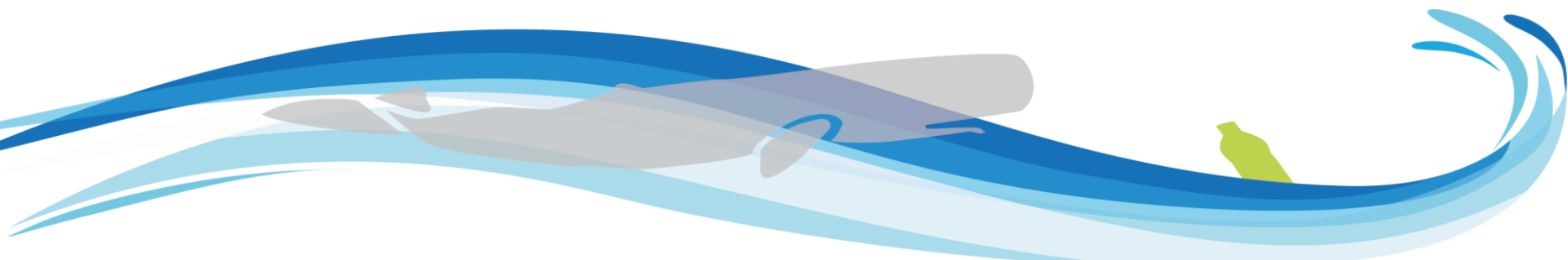
preserving biodiversity from plastics in Mediterranean Marine Protected Areas



5.055 M €
PROJECT BUDGET

4.296 M €
ERDF / IPA

48 Months
PROJECT DURATION

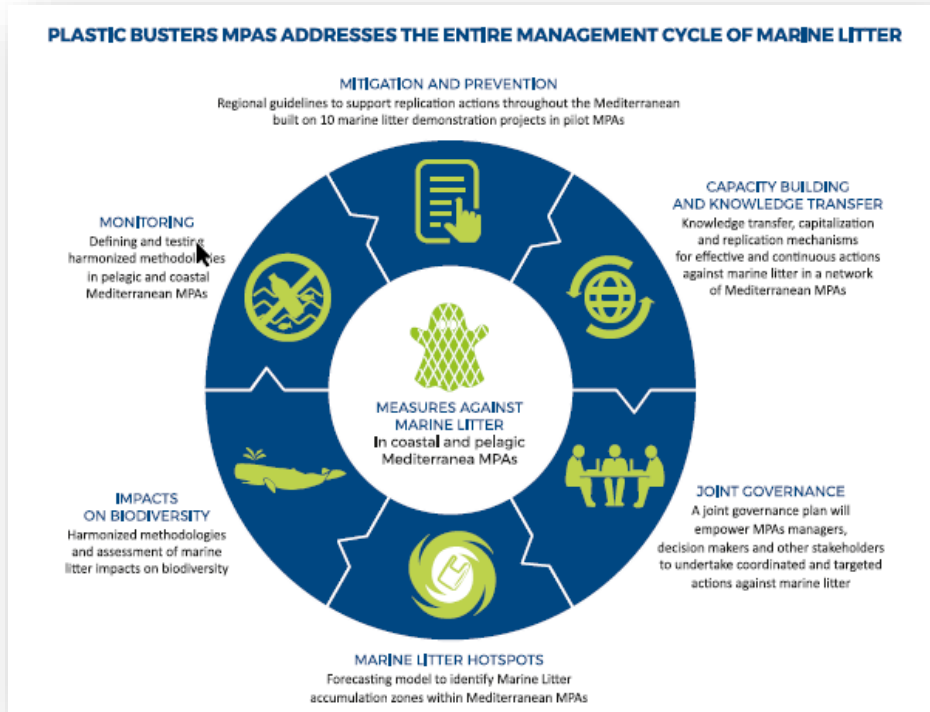


Interreg 
Mediterranean
PLASTIC BUSTERS MPAs

Project co-financed by the European Regional Development Fund

Plastic Busters MPAs general objectives

Novelty - Whole Management Cycle Of Marine Litter



- **PlasticBusters MPAs**, is a 4-year-long project Interreg Mediterranean funded project aiming to contribute to **maintaining biodiversity and preserving natural ecosystems** in pelagic and coastal **marine protected areas (MPAs)**, by defining and implementing a **harmonized approach against marine litter**.
- The project entails actions that address the **WHOLE MANAGEMENT CYCLE OF MARINE LITTER**, from **monitoring and assessment to prevention and mitigation**, as well as actions to **strengthen networking** between and among pelagic and coastal MPAs located in Italy, France, Spain, Croatia, Albania and Greece.
- The project will support the **implementation** of the **MSFD** and the **Barcelona Convention Regional Plan on Marine Litter Management** in the Med.

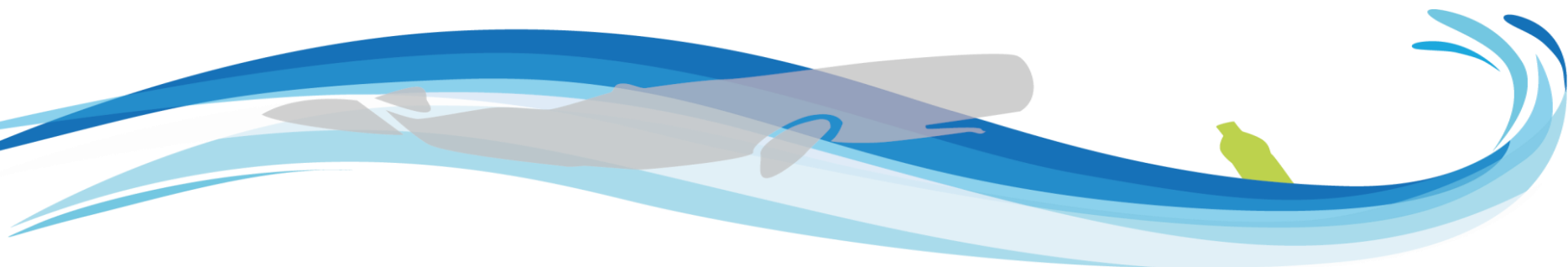
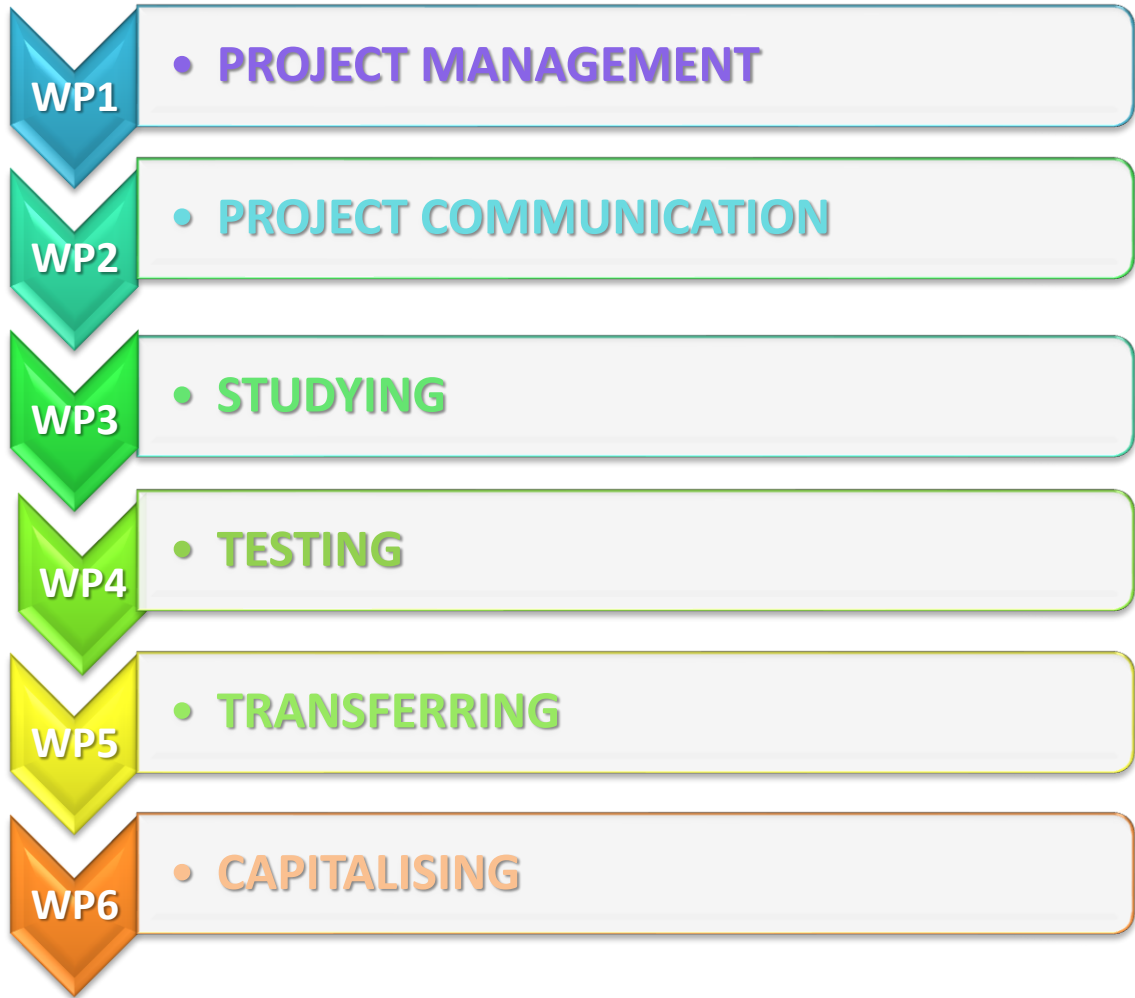


Plastic Busters MPAs:
preserving biodiversity from
plastics in Mediterranean
Marine Protected Areas

5.055 M €
PROJECT BUDGET

4.296 M €
ERDF / IPA

48 Months
PROJECT DURATION



Plastic Busters MPAs WP4: Novelty - Harmonized Diagnosis in the Environment

4.1 – Coordinating WP 4

4.2

Piloting harmonized ML monitoring in Med MPAs to assess ML (macro- and micro-plastics) in the coastal and pelagic environment

4.3

Piloting harmonized ML monitoring approaches in Med MPAs and hotspots to establish the impacts on biota, including endangered species and fishery resources

4.4

Testing the ML forecasting model

4.5

Preparation of the demo projects

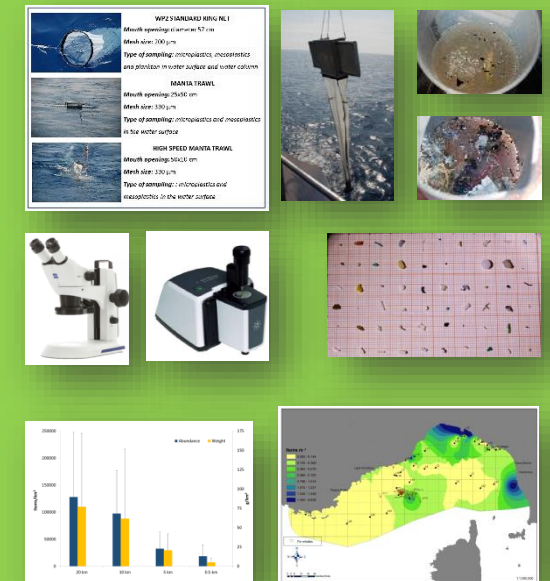
4.6

Piloting ML prevention and mitigation measures

Macroplastics



Microplastics



MARINE LITTER MONITORING

Plastic Busters MPAs WP4:

Novelty - Harmonized Diagnosis in Biota

4.1 – Coordinating WP 4

4.2

Piloting harmonized ML monitoring in Med MPAs to assess ML (macro- and micro-plastics) in the coastal and pelagic environment

4.3

Piloting harmonized ML monitoring approaches in Med MPAs and hotspots to establish the impacts on biota, including endangered species and fishery resources

4.4

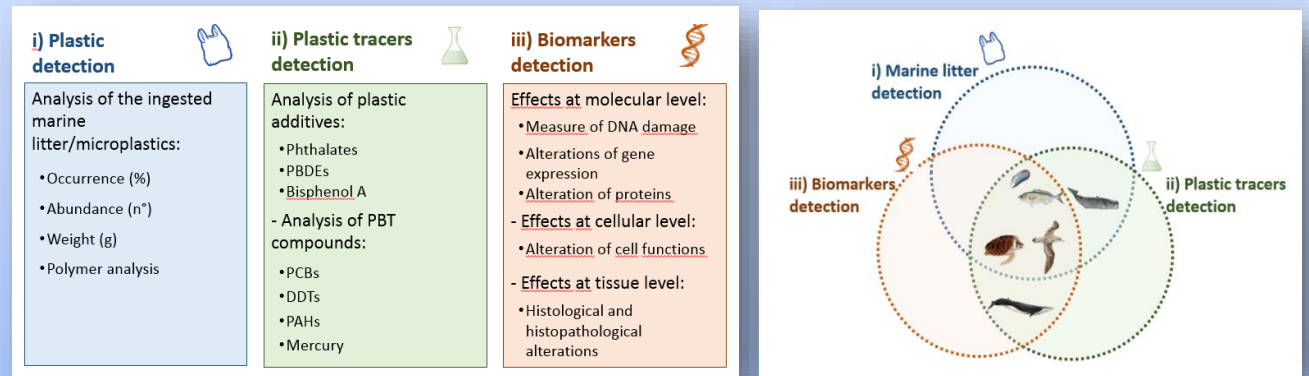
Testing the ML forecasting model

4.5

Preparation of the demo projects

4.6

Piloting ML prevention and mitigation measures



MARINE LITTER IMPACTS ON BIOTA

Interreg
Mediterranean

PLASTIC BUSTERS
MPAs

Project co-financed by the European
Regional Development Fund

Plastic Busters MPAs WP4: Novelty – Three Fold Monitoring Approach in Biota

Commercially harvested species



Endangered species



i) Plastic detection

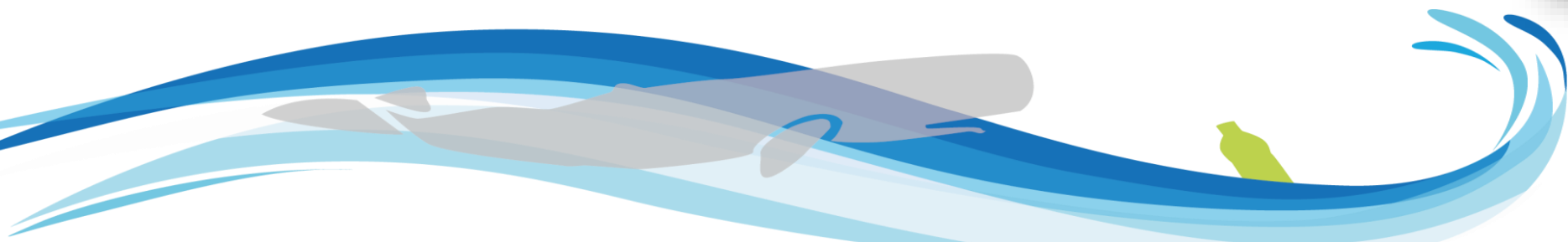
- Analysis of the ingested marine litter/microplastics:
 - Occurrence (%)
 - Abundance (n^o)
 - Weight (g)
 - Polymer analysis

ii) Plastic tracers detection

- Analysis of plastic additives:
 - Phthalates
 - PBDEs
 - Bisphenol A
- Analysis of PBT compounds:
 - PCBs
 - DDTs
 - PAHs
 - Mercury

iii) Biomarkers detection

- Effects at molecular level:
 - Measure of DNA damage
 - Alterations of gene expression
 - Alteration of proteins
- Effects at cellular level:
 - Alteration of cell functions
- Effects at tissue level:
 - Hystological and hystopathological alterations



Plastic Busters MPAs activities in MPAs

Novelty – Risk Assessment - From Diagnosis to Mitigations



WP4 -Testing

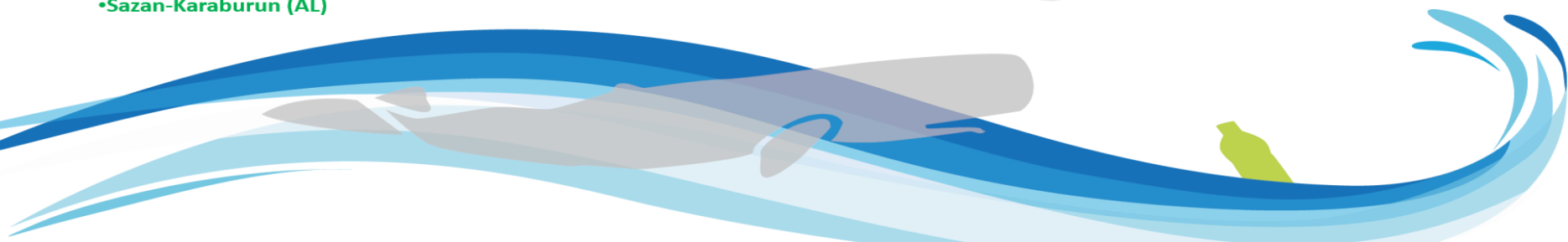
- Pelagos Sanctuary (IT,FR,MC)
- Tuscan Archipelago (IT)
- Zakynthos National Marine Park (GR)
- Parque Nacional Del Archipiélago De Cabrera (SP)

WP5-Transferring

- Reserve Naturelle des Bouches de Bonifacio (FR)
- Parc National de Port-Cros (FR)
- Pelagie Islands MPA (IT)
- Res-Lošinj MPA (HR)
- Sazan-Karaburun (AL)

Diagnosis

Mitigations



Plastic Busters MPAs WP4: *Novelty – Specific Mitigation Measures*

4.1 – Coordinating WP 4

4.2

Piloting harmonized ML monitoring in Med MPAs to assess ML (macro- and micro-plastics) in the coastal and pelagic environment

4.3

Piloting harmonized ML monitoring approaches in Med MPAs and hotspots to establish the impacts on biota, including endangered species and fishery resources

4.4

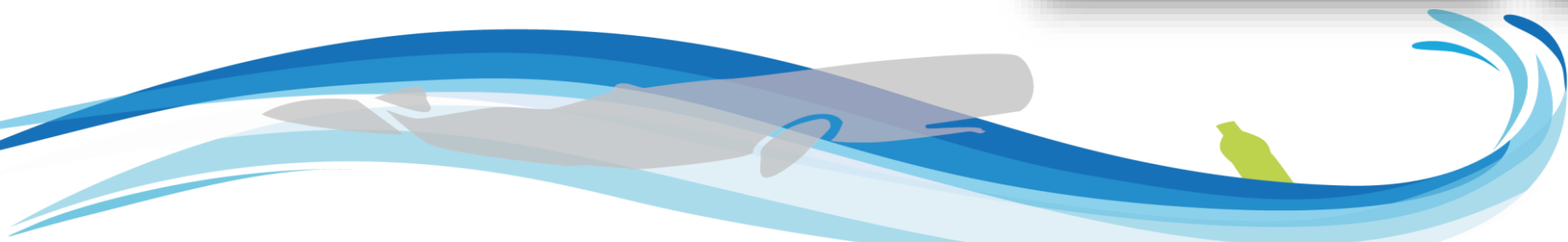
Testing the ML forecasting model

4.5

Preparation of the demo projects

4.6

Piloting ML prevention and mitigation measures





From the Diagnosis to the Mitigation



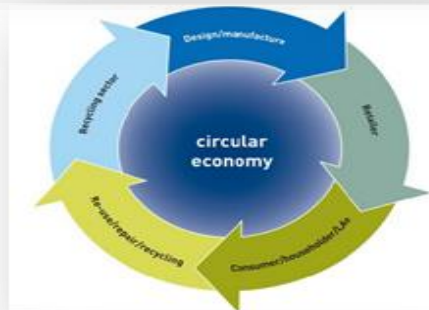
Plastic Busters project and circular economy approach:

Which are the most effective actions to put on place for removing/reducing marine litter from the Med and what about their impacts on jobs and economical growth in the Mediterranean sea basin?

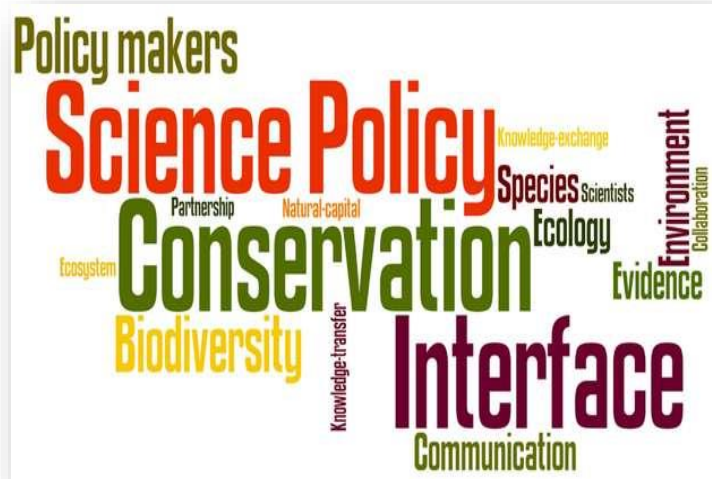


It is essential to develop at **basin scale** specific **prevention and mitigation measures/actions** (outlined in the UNEP/MAP Regional Plan on Marine litter Management in the Mediterranean under article 9 and 10) aiming to reduce the input and impacts of marine litter in the Mediterranean coastal and marine environment:

- a) **Single - use plastic reduction in MPAs;**
- b) **Deposit refund systems for beverage packaging;**
- c) **Fishing for litter, targeted recovery of ghost nets and derelict fishing gear management;**
- d) **Circular economy approach – turning plastic marine litter into products;**
- e) **The no-special-fee system to reduce dumping at sea;**
- f) **Bioremediation and biodegradation process on plastics;**
- g) **Sustainable aquaculture.**

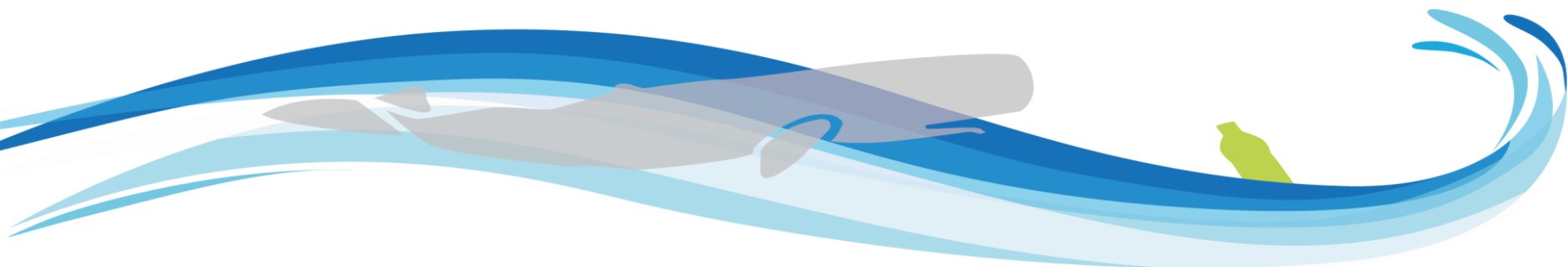


Plastic Busters MPAs WP5: *Transferring in other MPAs*



WP5 tackles one of the main challenges of our era and one of the main challenges of all science-policy-society projects which is to bridge the gap between science, policy and society and connect the information production and knowledge generation to its use in the decision making process at different levels.

- ✓ WP5 activities are important for the project success as these are expected to strengthen knowledge exploitation, **networking exchange, stakeholders' collaboration** and dialogue towards concrete, effective and continuous actions against marine litter in Med MPAs.
- ✓ The **transferring activities** will create the enabling environment for a truly transnational **Mediterranean common approach against marine litter in Med MPAs**.
- ✓ They will guarantee that the necessary tools and competences are in place in order to promote the uptake of the project results **by additional Med MPAs** (see Act.6.3), **policy and decision makers** (see Act.6.4) and other **relevant stakeholder**.



Plastic Busters MPAs WP 6: *Capitalizing and Governance*

6.1 Coordinating of WP6

6.2 Capitalizing and building synergies with other related initiatives

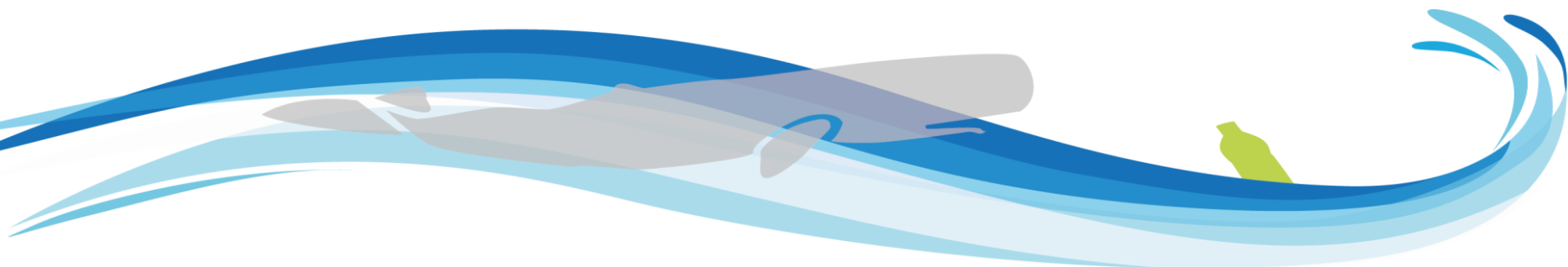
6.3 Promoting the uptake of the project results by Med MPAs

6.4 Promoting institutional uptake of the project results

6.5 Lobbying and advocacy to promote the uptake of the project results



The project will support the **implementation** of the **MSFD** and the Barcelona Convention **Regional Plan on Marine Litter** Management in the Med.



PLASTIC BUSTERS ON BASIN SCALE

TRANSFERRING/CAPITALIZATION OF PLASTIC BUSTERS MPAs



Union for the Mediterranean
Union pour la Méditerranée
الإتحاد من أجل المتوسط



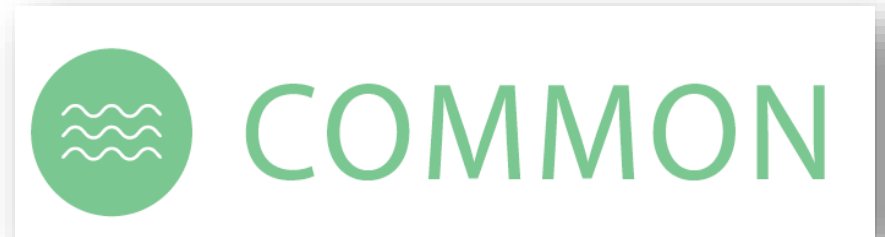
ENI
CBCMED
Cooperating across borders
in the Mediterranean

Plastic Busters MPAs:
preserving biodiversity from
plastics in Mediterranean
Marine Protected Areas

5.055 M €
PROJECT BUDGET

4.296 M €
ERDF / IPA

48 Months
PROJECT DURATION



PLASTIC BUSTERS ON BASIN SCALE



Thematic Objectives B.4 - Environmental protection, climate change adaptation and mitigation (Address common challenges in environment)

COastal **M**anagement and **MO**nitoring **N**etwork for tackling marine litter in Mediterranean sea

Partners

Legambiente Onlus – ITALY (LP)
University of SIENA – ITALY
C.I.H.E.A.M. – Istituto Agronomico Mediterraneo di Bari –ITALY
Institut National des Sciences et Technologies de la Mer – TUNISIA
Amwaj of the Environment Beirut - LEBANON
Tyre Coast Nature Reserve – LEBANON
University of Sousse – TUNISIA

Geographic coverage
Tunisia, Italy, Lebanon

Budget
€ 2.223.421,48



PLASTIC BUSTERS ON BASIN SCALE



General objective

The **COMMON** project aims at applying the **Coastal Zone Management principles** to the **marine litter management in 5 pilot coastal areas** through a local coordination and the Mediterranean networking among different stakeholders.

Specific Objectives

1. Testing an integrated strategy for **marine litter management and disposal at coastal level** that could be transferred to the whole Mediterranean area
2. Building **multi-stakeholder networks at basin-level** for tackling marine litter in a coordinate and integrated manner
3. Enhance the capacity of public authorities in **5 pilot areas**, to plan for sustainable management, use and **monitoring marine litter sources, treatment and consequences**, employing an effective participatory approach **involving relevant stakeholders and local communities**



WP3- Improving knowledge of litter sources and impact on marine ecosystems in 5 pilot coastal areas



WP3 (Project implementation) Improving knowledge of litter sources and impact on marine ecosystems in 5 pilot coastal areas *University of Siena Italy*

- ✓ The overall objective of this WP is to improve knowledge of ML sources and impact on Mediterranean marine ecosystems focusing in 5 pilot coastal areas: **Tyre (Lebanon), Maremma and Northern Puglia (Italy) and Kuriat Island and Monastir (Tunisia).**
- ✓ The activities of this WP will contribute to **maintain biodiversity** and preserve natural ecosystems in coastal areas, to monitor the source and **impact of ML on fish species** of commercial interest by defining and implementing a harmonized approach against ML.
- ✓ The main outcomes of this WP will facilitate the **identification of ML sources** in order to design effective **mitigation actions** in the 5 pilot coastal areas (activities of WP4 and 5).



COMMON – Three Fold Monitoring Approach in Fish

A 3.1.2 Studies and data collection on the source and impact of ML on marine species of commercial interest



This activity will focus on studies **on sources and impact of ML on fish species** of commercial interest in the 5 coastal zone areas.

Harmonized ML monitoring approaches will be applied to perform:

- a) **ML sources** analysis and sampling;
- b) **fish species sampling** in collaboration with local fishermen;
- c) **ecotoxicological investigation (plastic ingestions, contaminants, biomarkers)** in edible species;
- d) detection of the **impact of ML on fishery** and aquaculture resources in relation to the ML sources



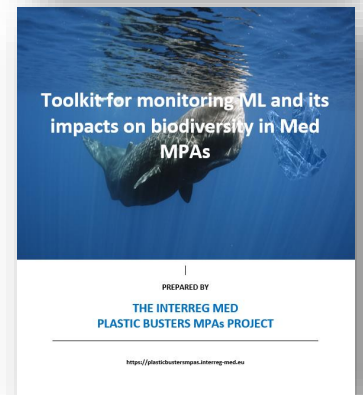
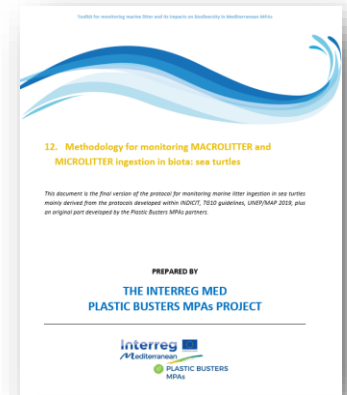
COMMON – Three Fold Monitoring Approach in Sea Turtle

A 3.1.4 - Studies and data collection on the impact of marine litter on sea turtles in the Mediterranean sea



This activity will focus on studies and data collection on the **impact of ML on sea turtles** in the 5 project pilot areas. Harmonized ML monitoring approaches will be applied to perform:

- survey and **sampling of stranded and hospitalized (rescue centres) sea turtle**;
- ecotoxicological investigation** of the impact of ML (**plastic ingestion, POPs, plastic additives, biomarkers**) in the target species;
- final assessment and **risk analysis** of the impacts of ML on *C. caretta* and *C. mydas*





mipaaf
ministero delle politiche
agricole alimentari e forestali

FEAMP
2014 | 2020

 UNIVERSITÀ
DI SIENA 1240

 Università
Ca' Foscari
Venezia



AdriCleanFish

Biodiversity conservation in the Adriatic Sea: monitoring, collection and assessment of the impact of marine litter on fish species for the conservation of the resources and a sustainable fishing

Tutela della biodiversità nel Mar Adriatico: monitoraggio, raccolta e valutazione degli impatti dei rifiuti marini sulle specie ittiche per la conservazione delle risorse ed una pesca sostenibile

Project PO FEAMP 2014/2020 misura 1.40;

Project number 48/RBC/18, approved by MIPAAF with decree n. 6569 om 15 april 2019



 AdriCleanFish

AIM OF THE PROJECT

The main aim of the **AdriCleanFish** project is to deepen the issue of the impact of **marine litter** on **fishery activities** and to **raise awareness** among the main stakeholders on this issue to **preserve biodiversity and promote a sustainable fishing** within the PO **European Maritime and Fisheries Fund** programme.

The project address the following criteria required from the **European Maritime and Fisheries Fund (1.40)**:

- a) Collection of fishing gears and marine litter by fishermen (**Fishing for Litter**)
- g) Environmental Awareness **which includes fishermen for the protection and restore of marine biodiversity**
- i) **Participation to actions to maintain biodiversity and ecosystem service**



PROJECT AREAS



CHIOGGIA



CIVITANOVA
MARCHE

6 FISHING BOATS PER AREA



ACTIVITIES

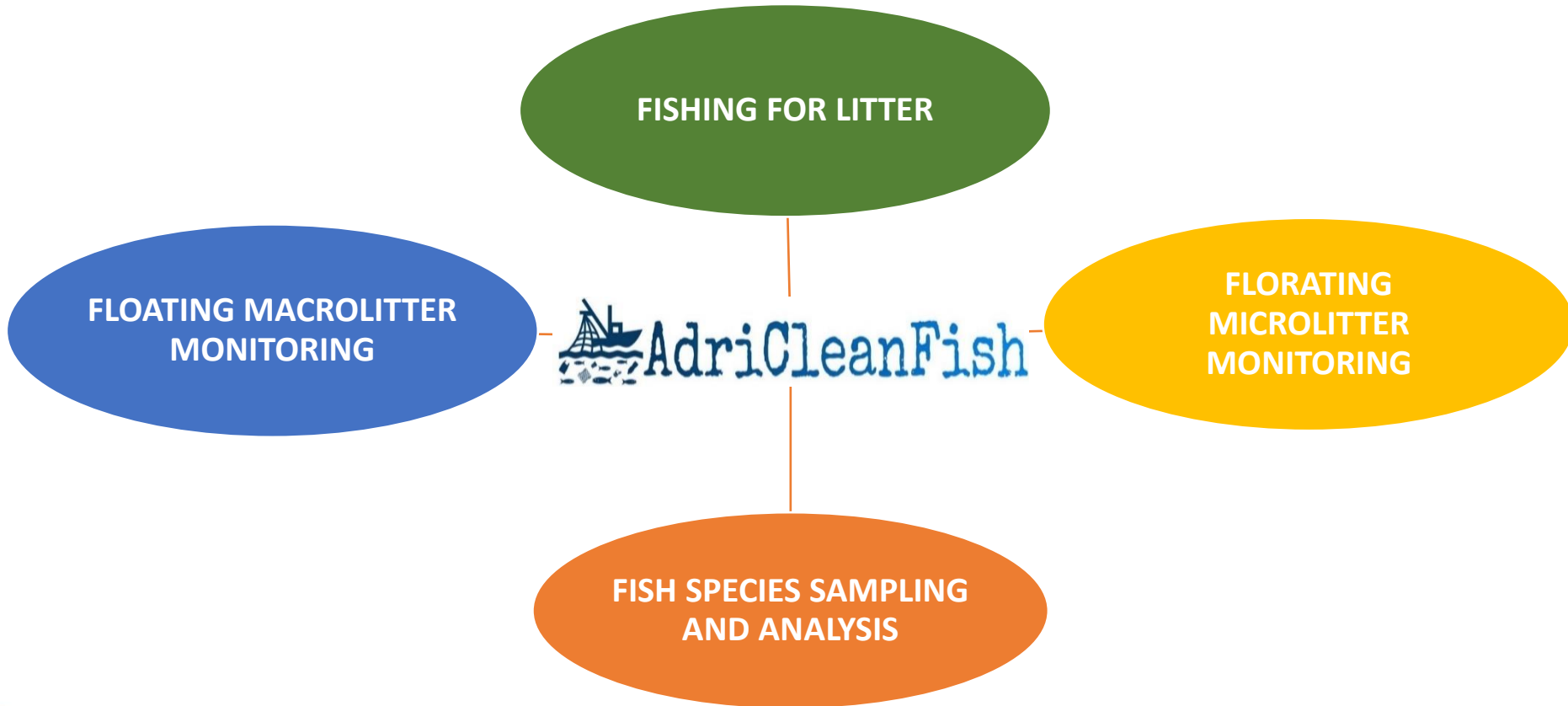
Preparatory activities



January-February 2020
Sampling with fishermen

March-August 2020
Sample analysis and data elaboration

End of the project
30 September 2020



UNIVERSITÀ
DI SIENA 1240

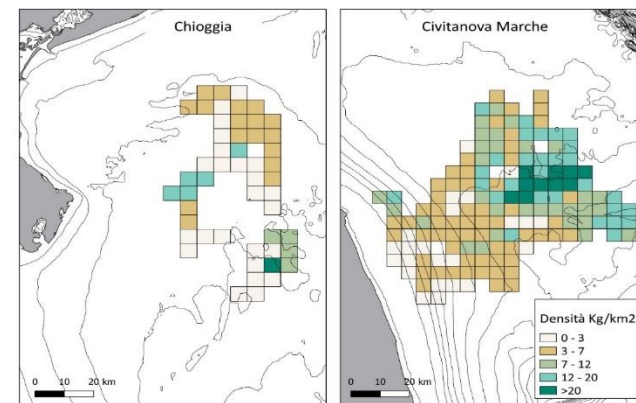


Università
Ca' Foscari
Venezia

FISHING FOR LITTER ON THE SEA BOTTOM WITH FISHING BOATS



Risk analysis



SELECTED FISH SPECIES



Red mullet (*Mullus barbatus*)



European Anchovy (*Engraulis encrasicolus*)



European Sardine (*Sardina pilchardus*)



Sole (*Solea solea*)



Horse mackerel (*Trachurus trachurus*)

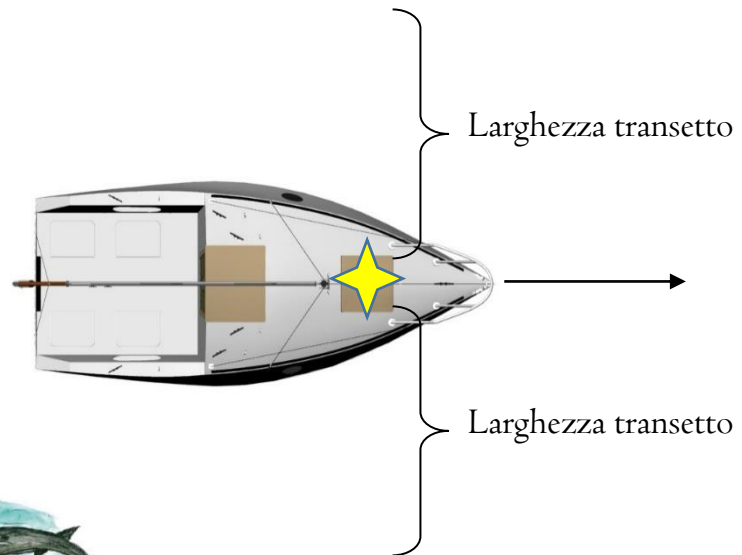
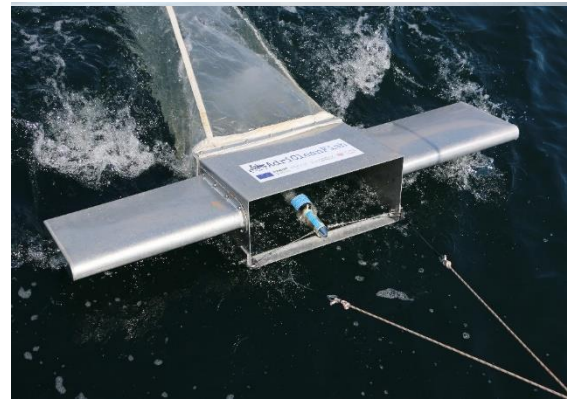
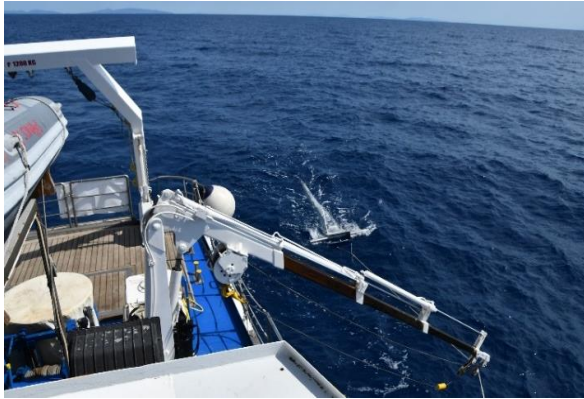


European hake (*Merluccius merluccius*)

➤ **SAMPLES ANALYZED FOR MICROPLASTIC INGESTION, CONTAMINANT ACCUMULATION AND BIOLOGICAL RESPONSES**



FLOATING MICROLITTER MONITORING WITH “MANTA NET” AND FLOATING MACROLITTER SURVEY



TEAM



M. Cristina Fossi, Cristina Panti, Matteo Baini, Silvia Casini, Ilaria Caliani, Tommaso Campani, Matteo Galli, Dario Giani, Giacomo Limonta, Margherita Concato, Alessandro Galli, Francesca Cossu



Acknowledgements

