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Case studies for the recovery and valorization of plastics collected from the seabed

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“Connecting the system of Ports and Harbours to unlock the potential in preventing and reducing the effects of Marine Litter across the Mediterranean Sea”

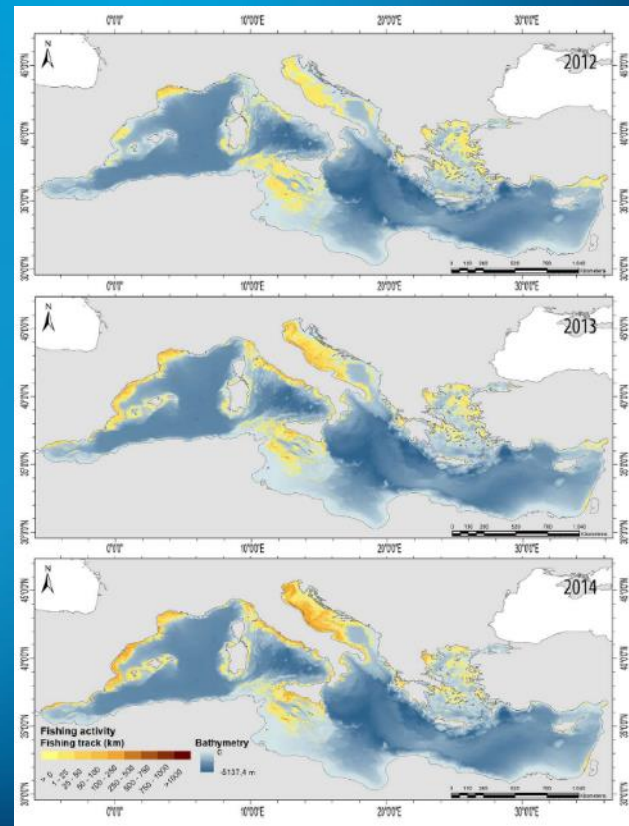
Ecomondo
27th October, 2021

Fishing effort in the Mediterranean Sea

Fishing activity maps produced by AIS data (automatic identification system) for the Mediterranean basin (Ferrà et al., 2018)

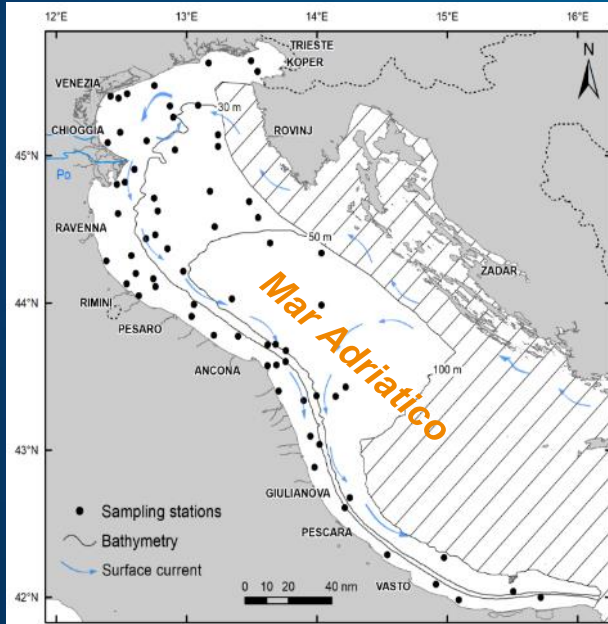
Intense trawling activity in the Mediterranean Sea

The Adriatic Sea: one of the most exploited basins in the Mediterranean





Mapping of the litter “problem” in the Adriatic seabed



Litter collected on the seabed from fisheries (SoleMon PLNRDA Project) (Strafella et al. 2015 MPB; Strafella et al 2016 WM)

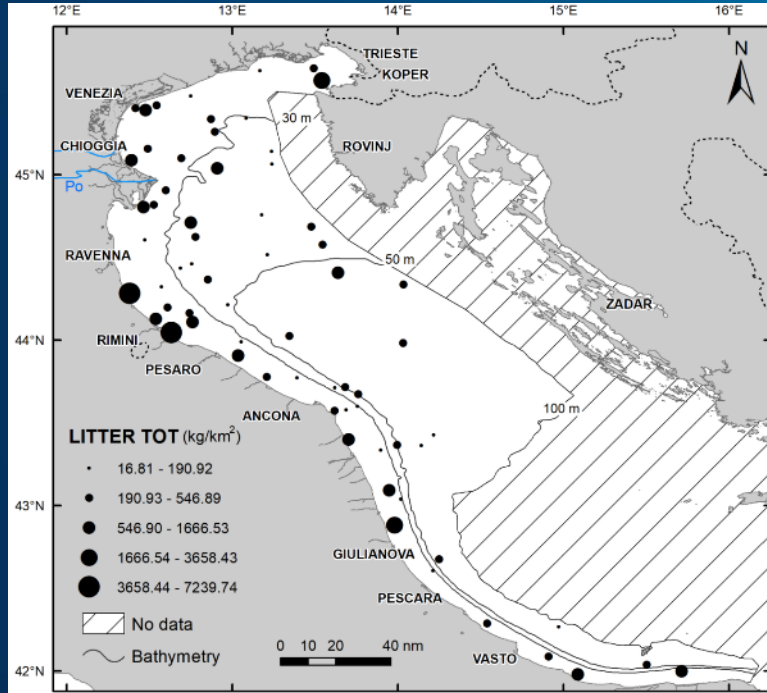


The Adriatic Sea: a hot-spot of benthic litter compared to other seas



Seabed litter

Spatial distribution



Density (kg/km²)

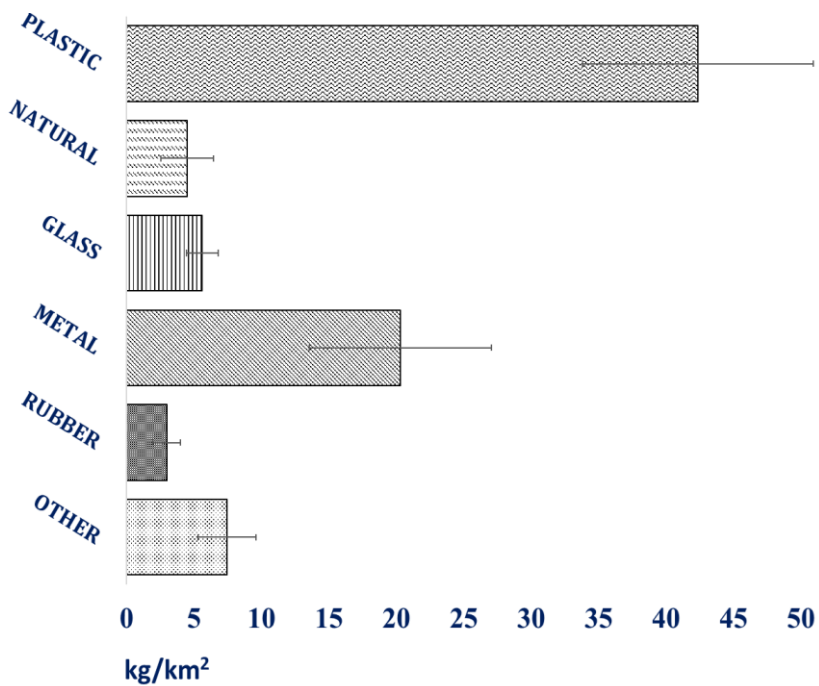
Year	Min	Max	Media ± se	Tot
2011	0.00	2461.83	159.98 ± 54.49	10718.84
2012	0.00	3802.23	162.50 ± 65.11	10887.42
2013	0.00	997.12	82.44 ± 21.90	5523.47
2014	0.15	2228.49	81.82 ± 34.26	5482.18
2015	1.43	870.90	87.24 ± 18.23	5845.23
2016	0.76	395.11	41.99 ± 9.16	2813.62

Total waste collected in 6 years
41270.76 kg/km²

Average ± se
102.66 ± 41.91 kg/km²



Litter composition





Litter composition





Litter composition





How can the marine litter issue be addressed / mitigated: two case studies examples in the city of Ancona

- 1) Re-usable fish boxes with microchip
- 2) An experimental circular economy project aimed at the re-use of plastic accidentally collected at sea during the fishing activity



1) The problem: polystyrene boxes for fish

- In the Ancona fish market alone, 450,000 boxes of polystyrene are used every year
- The use of polystyrene boxes is related to important problems, among these
 - Polystyrene boxes are not reusable
 - The risk of losing the boxes at sea, and its consequences for the environmental health (no biodegradability, extremely durable and persists in the marine environment)
 - The cost of supply (~ 0, € 50 / pc. – € 225,000 / year)
 - Economic and environmental costs related to waste disposal





A mitigating solution: polypropylene reusable box

- 1 stock of 50,000 polypropylene boxes replaces the current 450,000 polystyrene boxes / year (same internal volume)
- PP boxes reusable (cleaning process required) and recyclable
- Pollution caused by polystyrene is eliminated
- Plastic boxes are designed with an ice cap to avoid any direct contact between fish and ice
- Designed plastic boxes allow traceability, through a microchip included in the colored handle
- Polypropylene is a highly reusable plastic polymer after primary use





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The new Fish Market at the Port of Ancona, where the recyclable – reusable plastic boxes will be used to place the fish to be sold and transported

ANSA.it • Marche • Pesca: Marche, bando per sostituire cassette polistirolo

Pesca: Marche, bando per sostituire cassette polistirolo

Regione favorisce plastica riutilizzabile. Aguzzi, tavolo tecnico

Redazione ANSA

ANCONA
13 ottobre 2021
16:44
NEWS

Suggerisci



Marche regional announcement to replace polystyrene (October 2021)



2) Implementation of an experimental circular economy project for the valorization/reuse of plastic accidentally collected at sea during fishing activity

- To launch a shared process for collection and management of waste dispersed at sea and accidentally intercepted during fishing activities (focus on recoverable fractions)
- (On an experimental basis) To achieve a knowledge base on types/quantities (with reference to plastics), issues related to management and possibilities of material recovery through industrial processes, to consolidate larger-scale models

Professional fishing as a concrete opportunity to collect waste, an “already-available” tool to reduce marine pollution

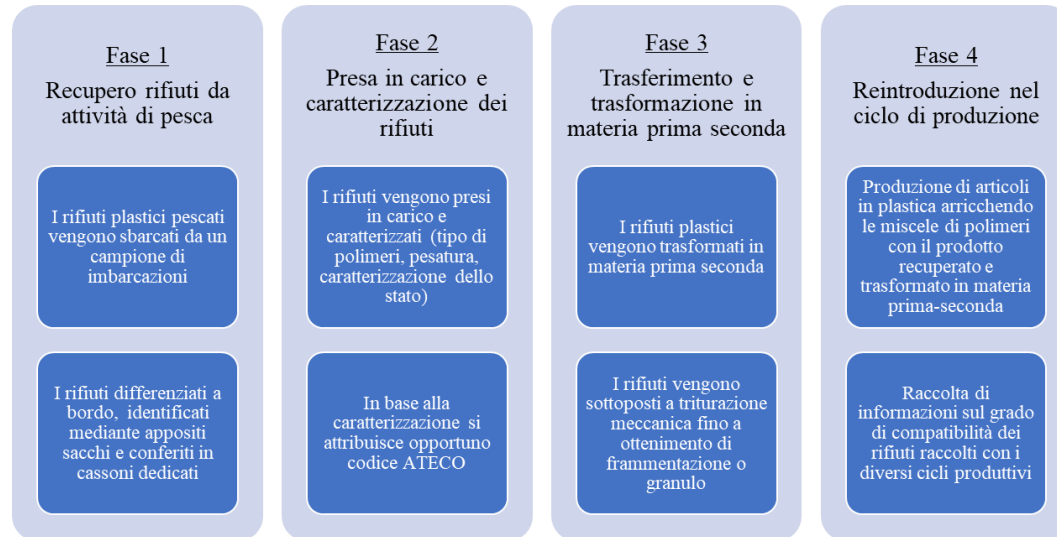
Benefit from the fishery professional sector and the whole community

Ancona, al via protocollo per la gestione dei rifiuti in plastica dispersi in mare



Participants:
CNR IRBIM (Coordinator)
Regione Marche
Comune di Ancona
Capitaneria Porto di Ancona
Autorità di Sistema Portuale del Mare Adriatico Centrale
Associazione Produttori pesca Ancona
Garbage s.r.l.
Centro assistenza ecologica srl
Nexus s.r.l.

Valorization and reuse of plastic accidentally collected at sea during fishing activity



Flow chart of the recovery and reuse process of plastic waste recovered from fishing activities

Phases 1 and 2: Recovery of plastic collected at sea during fishing activity and its characterization

Phase 1

The plastic waste caught is disembarked at port by a sample of boats (5 boats participating)

Waste is separated on board, identified by means of special bags and delivered to dedicated bins

Litter management and transport operations carried out according to pending environmental legislation for the transport of waste through a Company registered in the national register of environmental managers

Phase 2

The waste is taken over and characterized (type of polymers, weighing, state characterization)

Based on the characterization, the ATECO code is attributed

Materials	Kg	%
Plastic bottles	14,3	17,4
Sheets	17,8	21,7
Nets	15,0	18,3
Polystyrene boxes	1,0	1,2
Plastic boxes	4,2	5,1
Various plastics	0,4	0,5
Rubber	5,8	7,1
Various metals	4,8	5,8
Fabrics	17,2	21,0
Various	1,6	1,9

Phase 3: Transfer and transformation into secondary raw material (PP and PE only)

Grinding

PP and PE waste basket
collected from fishing



Ground plastic



Phase 3: Transfer and transformation into secondary raw material (PP and PE only)

Grind insertion in extrusion



Granulation



Granules





Phase 4: Reintroduction into the production cycle

Obtained granulate from marine litter

Production waste



Granulate produced sent to the CAE S.r.l. to verify the characteristics to identify it as “END OF WASTE”.

CAE has performed, as required by Legislative Decree 5 Feb 1998, the technical tests to verify if the granulate produced is made up of heterogeneous plastic mixtures based on polyolefins coming from post-consumer materials and could have the characteristics to be destined for different transformation technologies.

Standard UNI 10667-16 was applied (for secondary raw materials obtained from the recycling of post-consumer plastic materials)

This test defines the requirements and test methods of heterogeneous mixtures based on recycled polyolefins to be used alone and/or mixed with other materials to be transformed into various forms and/or produce products by extrusion molding and/or other technologies of transformation

Phase 4: Reintroduction into the production cycle and production of plastic items by enriching the polymer blends with the recovered/transformed product

New product!

The analyzes carried out at the CAE S.r.l. of Ancona highlighted **compliance** with the UNI 10667-16: 2005 standard; therefore the material deriving from the plastic recovered from the Adriatic seabed from the fishing boats of Ancona, after the recycling activities **have assumed the status of End of Waste**, therefore they can be reintroduced into production cycles.

The good quality of the plastic granule and its industrial application was observed by Nexus srl technicians who confirmed the use of the material both as a stock mixed with other recycled plastics and as a separate stock





So.... giving marine plastic a
new life is possible?

Let's make our experiment
bigger and start a new era to
recycle marine plastic litter

Thank you for your attention

