



# Plastic pollution in rocky coastal areas of high ecological value: development of innovative technologies to assess the impact, removal and recycling of materials

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## OCCURRENCE OF MARINE PLASTIC DEBRIS IS A WELL-KNOWN ISSUE..

..which worsens in basins with limited water exchanges and densely populated coasts as the Adriatic Sea.

Remaining in the sea for hundreds years, plastic can transport inner additives [1] and adsorbs chemicals on its surface, which can be released again in the environment [2,3,4], posing potential risk to marine biodiversity.



## AIM

This PhD project aims to investigate the presence and the effects of plastic litter (both macro- and microplastics) in the marine environment with a special focus on the Conero Riviera, including both field sampling activities and laboratory experiments. Specific objectives are to study: (i) plastic-biota interaction and possible consequent adverse effects and (ii) role of plastics as carriers of contaminants

## OCCURRENCE OF MICROPLASTICS IN MARINE ENVIRONMENTAL AND BIOLOGICAL SAMPLES COLLECTED ALONG THE CONERO RIVIERA (Ancona, Italy) AND ASSESSMENT OF POLYMERIC NATURE THROUGH MICRO-FOURIER TRANSFORM INFRARED SPECTROSCOPY (μFTIR)

### SAMPLING ACTIVITIES

**SAMPLING AREA**

**ABIOTIC SAMPLES**

**BIOCOTIC SAMPLES**

**SAMPLING PERIODS**

- 1) autumn-winter
- 2) spring-summer

**Water column: Micro Plastic Particle Pump** with 3 filters mesh sizes 300μm, 100μm and 20μm (filtration capacity 1m<sup>3</sup> water/10 min).

**Water surface (first 20 cm): Manta net** 300μm mesh (equipped with a flow meter), lowered from the boat, left floating and transported along fixed transects.

**Sediment: specific bucket** (Van ven grab)

### LABORATORY ANALYSIS

DIGESTION OF BIOTIC SAMPLES	SEPARATION OF ABIOTIC SAMPLES	FILTRATION
10% KOH or 15% H <sub>2</sub> O <sub>2</sub> solution	ultra-saturated NaCl or NaI solution	Cellulose Acetate Membrane Filter 0.8 μM

### FINAL DIGESTION

15% H<sub>2</sub>O<sub>2</sub> solution

### VISUAL SORTING

### POLYMERIC IDENTIFICATION of MPs

## LEACHATES FROM BEACHED AND NEW PLASTIC ITEMS: ASSESSMENT OF CHEMICAL COMPOSITION AND ECOTOXICITY TO MARINE ORGANISMS

### COLLECTION AND CHARACTERIZATION OF BEACHED PLASTIC ITEMS

**SAMPLING AREA**

**SAMPLING ACTIVITY**

**5 CATEGORIES**

- 1 Heterogeneous Fragments (HF)
- 2 Polystyrene Boxes (PB)
- 3 Mussel Nets (MN)
- 4 "Rapido" Trawls Rubber (RTR)
- 5 Drink Bottles (DB)

**PLASTIC POLYMER IDENTIFICATION (FT-IR)**

### LEACHATES PREPARATION AND ANALYSES

Items are cutted in fragments ≤ 1cm<sup>2</sup>

**VIRGIN** **BEACHED**

Seawater Leaching Time (LT) 72h

100 g/L Plastic-Water Ratio (except for PB and DB)

#### PLASTIC LEACHATE FOR CHEMICAL ANALYSIS

HPLC for PAHs  
GC with FID for AHs  
AAS metals

2<sup>a</sup> Washing Solution

**Organic compounds** methanol (LT 4h)  
**Metals** nitric acid 20% (LT 4h)

#### PLASTIC LEACHATE FOR ECOTOXICOLOGICAL BIOASSAYS

Leachate is filtered with a Minisart syringe filter 0.45 μm to avoid mechanical disturbance of plastic particles

Tested at different dilutions

**A. fischeri**  
**P. tricornutum**

### RESULTS

**Tab. 1 Polymer composition of samples expressed in percentage.**

Category	Polymer	Percentage
HF	polypropylene (PP)	73%
	polyethylene (PE)	6.66%
	polystyrene (PS)	6.66%
	polyethylene terephthalate(PET)	6.66%
MN	polypropylene (PP)	67%
	polyethylene (PE)	33%
PB	polystyrene (PS)	100%
DB	polyethylene terephthalate (PET)	100%
RTR	undefined polymer (rubber)	
	polyamide fiber (PA)	

**Fig. 4** Concentration (mean ± st. dev.; n = 3) of AHs (μg/g) and PAHs (ng/g) measured in virgin and beached plastic leachates.

### SCIENCE OUTREACH

**«TOGETHER FOR THE MEDITERRANEAN SEA»**  
 HOW TO OBTAIN CLEAN ENERGY FROM PLASTIC WASTE RECOVERED FROM THE SEA

IN COLLABORATION WITH **TEZENIS**, **MAREVIVO**, **IRIS**, **Garbage Group**

**«PLASTIC LITTER IN ADRIATIC BASIN»**  
 REPORT IN COLLABORATION WITH **GREENPEACE**

SCAN ME!