

Spatial distribution of plastic pollution in a protected coastal Mediterranean wetland

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BACKGROUND

- Plastic is persistent pollutant that widespread worldwide, impacting every type ecosystems. Beaches and dunes are considered hotspots of plastic pollution
- Mediterranean Sea is one of the most impacted areas. The main factors are: the semi-enclosed nature and special hydrodynamics, a coast with a high population density, intensive fishing, transport and tourism activities.

- Plastic litter can increase in permeability and grain size of sand modifying the biogeochemical cycles, interact with dune vegetation, adsorb environmental chemicals and impact several organisms, specially the meiofauna community.
- **Aim:** investigate (i) the occurrence and distribution of plastic litter in a protected area and (ii) the relationship between plastic litter and natural debris.

METHODS

- The study area is the beach of 'Torre Flavia Wetland' Natural Monument (Special Protection Area IT6030020), a small protected coastal Mediterranean wetland (15 ha) located on the Tyrrhenian seashore.
- Plastic or natural items are collected in 16 sampling sites of two transects located in different areas of beach. The two transects, A and B, are 500 m apart (Figure 1).
- Each sample is sorted according to the characteristics of the items: anthropogenic (*i.e.* plastic litter) or natural (*i.e.* vegetal or animal origin).
- Each item is weighted, after being dried at room temperature for 24 hours.
- Anthropogenic items are classified according to shape (*i.e.* fragments, pellets, fibres), colour and size (*i.e.* macro, meso e microplastics).
- The egagropiles of *Posidonia oceanica* collected, are opened and the eventual plastic items entrapped are also classified.



Figure 1. Study area (red line) and two sampling transects (yellow rectangles) in 'Torre Flavia Wetland' beach.

RESULTS & DISCUSSIONS

- Transept B has more plastic items than transept A (Figure 2). The proximity of transept B to the river mouth and breakwater and being a more touristic area could explain the higher concentration of plastics.
- Microplastic items are the most abundant size found in both transects and white is the prevalent colour (Fig. 3), probably due to environmental exposure of plastics deposited on the beach.
- The most frequent plastic shape found in the beach is fragment (63.3%), followed by pellet (36.3%) and fibre (0.4%).

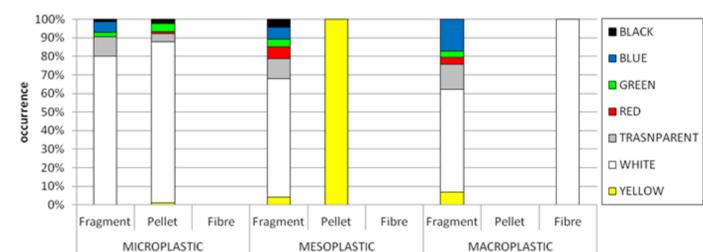


Figure 3. Occurrence of plastic colours according to size (micro-, meso-, macroplastic) and shape (fragment, pellet, fibre) of the items.

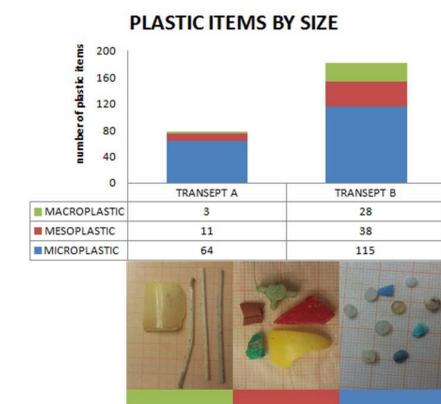


Figure 2. Number of plastic items and examples collected from transept A and B and divided by size (macro-, meso-, microplastic).

- In the egagropiles plastic items are mostly transparent fibres (Fig. 4). Fibres (85%) are more abundant than pellets (10%) and fragments (5%). A selection of plastic shape distribution it is observed: in the beach more fragments are found while the egagropiles entrapped more fibres, probably due to the similarity between the size of plastic fiber and natural one present in the egagropiles.
- Natural debris and plastic items are present in all sampling points in variable weight. Natural debris does not show a difference between the transects but there is a positive significant correlation between plastic and natural weights of transept B samples (Pearson, $r = 0.6$, $p < 0.05$).

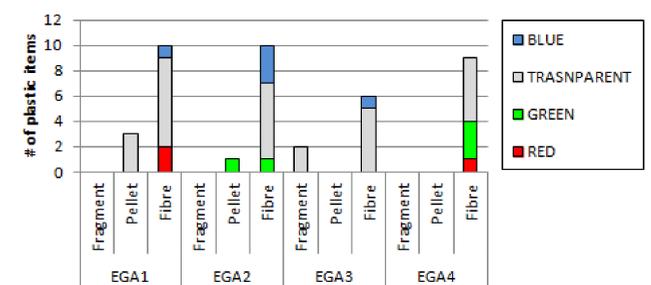


Figure 4. Number, shape and colour of plastic items entrapped in the 4 egagropiles (EGA1-4) collected from meso-transept B.

CONCLUSIONS

- ✓ Our results show the presence of plastic litter on the coast of the protected area 'Torre Flavia Wetland', generating concerns on ecosystem conservation.
- ✓ There are several special protection species (147/2009/UE 'Bird' Directive) that could be threatened by the presence of plastic. For example, many birds nesting in the wetland can ingest microplastics litter.

- ✓ Detect spatial distribution of plastics along the coast and identify the sources, allows to intervene on the areas that most need removal and restoration interventions.
- ✓ Identified the size of plastic litter, it is possible proceed with targeted clean-up actions according to the presence of large items or microplastics.
- ✓ Citizen science projects can increase the success of beach cleaning actions.

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