

ASSESSING SPATIAL AND TEMPORAL DISTRIBUTIONS OF MARINE LITTER: 11-YEAR DATASET OF COASTAL FLOATING MARINE DEBRIS IN THE BALEARIC ISLANDS

Montserrat Compa Ferrer ^{1*}, Josep Maria Aguiló ², David March ³ and Salud Deudero ¹

¹ Instituto Español de Oceanografía. Centro Oceanográfico de Baleares. - montse.compa@ba.ieo.es

² Agència Balear de l'Aigua i la Qualitat Ambiental, Govern de les Illes Balears.

³ Sistema d'Observació i Predicció Constaner de les Illes Balears

Abstract

The present work constitutes a preliminary assessment of the spatial and temporal distribution of floating marine debris along the Balearic Islands' coastline during the months of May - October from 2005 to 2015. This long-term dataset indicates marine debris was found in 42.46% of all monitoring surveys, with plastic marine debris being found in 93.41% of the marine debris surveyed. Elevated accumulation zones were present in the southern regions and plastic was consistently the most abundant for both nearshore and offshore coastal areas. This study provides insight into the magnitude of marine debris surrounding the Balearic Islands highlighting the need for action and awareness to address its increasing pressures on marine and coastal ecosystems.

Keywords: Coastal management, Pollution, Plastics, Mediterranean Sea

Introduction

Marine debris is ubiquitous throughout all marine and coastal ecosystems, vastly impacting both ecological and biological conditions creating a need for global action [1,2,3]. Initial results from an on-going marine debris removal and monitoring program over an 11-year period are presented in this study to describe the spatial and temporal distribution of floating marine debris (FMD) along the Balearic coastline.

Methods

From 2005-2015, coastal FMD was collected during the annual marine debris removal and monitoring program coordinated by ABAQUA (Agència Balear de l'Aigua i Qualitat Ambiental) on the islands of Mallorca, Menorca, Ibiza and Formentera. During this program, marine debris was collected daily on previously established monitoring survey areas from May - October (months vary yearly) along the coastline of each island. The fleet of 33 boats conducting the monitoring covered two coastal areas: nearshore from 0-500m from the shoreline (2005-2015) and offshore from 500-5000m from the coast (2005-2010). For the purpose of this study, marine debris was divided into four categories: plastic, wood, organic material (e.g., algae, jellyfish) and other (e.g., metal, fabric, oil).

Results and Discussion

Preliminary results from this study indicate marine debris was abundant along the entire Balearic coastline and plastic was present in 93.41% of all surveys containing marine debris. The estimated density of marine debris was divided into two categories for nearshore and offshore surveys, with offshore surveys showing a greater concentration of FMD, especially in the southern regions of the islands (Figure 1).

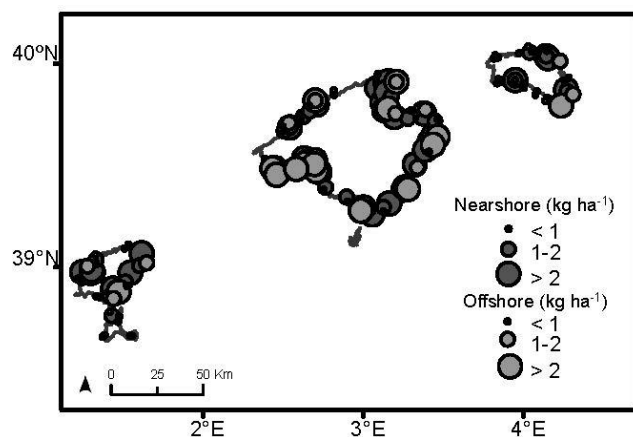


Fig. 1. Average marine debris densities (kg ha^{-1}) for nearshore (dark grey) 2005-2015 and offshore (light grey) 2005-2010 for the Balearic Islands of Mallorca, Menorca, Ibiza and Formentera.

Of the annual averages of marine debris estimated for each location at all sites, plastic marine debris was consistently the most abundant both nearshore and offshore (Figure 2). Although these results are preliminary, they give a brief description of marine debris surrounding the Balearic Islands and plastic marine debris being the most dominant regardless of location or time. Further research through modeling and integrating physical processes will allow for a more comprehensive approach into understanding the mechanisms that drive the distribution and accumulation of plastic marine debris.

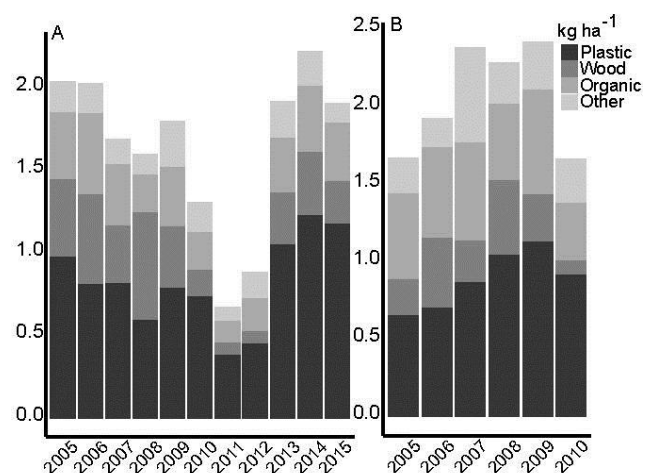


Fig. 2. Summary of average annual marine debris (kg ha^{-1}) collected along the Balearic Islands' coast. Nearshore (A) is 0-500m from 2005-2015 and offshore (B) is 500-5000m from 2005-2010.

References

- Eriksen, M., Lebreton, L.C., Carson, H.S., Thiel, M., Moore, C.J., Borroer, J.C., Galgani, F., Ryan, P.G. and Reisser, J., 2014. Plastic pollution in the world's oceans: more than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea. *PLoS one*, 9(12), p.e111913.
- Law, K.L., Moret-Ferguson, S.E., Goodwin, D.S., Zettler, E.R., DeForce, E., Kukulka, T. and Proskurowski, G., 2014. Distribution of surface plastic debris in the eastern Pacific Ocean from an 11-year data set. *Environmental science & technology*, 48(9), pp.4732-4738.
- Pham, C.K., Ramirez-Llodra, E., Alt, C.H., Amaro, T., Bergmann, M., Canals, M., Davies, J., Duineveld, G., Galgani, F., Howell, K.L. and Huvenne, V.A., 2014. Marine litter distribution and density in European seas, from the shelves to deep basins. *PLoS One*, 9(4), p.e95839.