

SPATIAL AND TEMPORAL DISTRIBUTION OF MARINE DEBRIS IN SEAFLOOR HABITATS OF THE BALEARIC ISLANDS

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Abstract

The weight and distribution of marine macrodebris in benthic habitats (continental shelves and upper slopes) from bottom trawl scientific surveys at the Balearic Islands was investigated. A time series of 15 years (2001 -2015) was studied at mesoscale level. Most abundant debris were glass, plastic and fishing material. The plastic fraction, which is highly persistent and resistant to biodegradation, showed a high variability in space and time with no clear trend.

Keywords: Plastics, Continental shelf, Time series, Demersal, Balearic Islands

Introduction

The Mediterranean basin is a hotspot of marine biodiversity and it is considered a sensitive ecosystem exposed to invasive species, fishing and tourism activities, numerous maritime routes and densely coastal urbanized zones which can increase marine debris. Former research has already demonstrated high values of microplastics in coastal shallow sediments in the Balearic Islands (1). Moreover, marine debris, especially the plastic fraction may drift and disperse long distances from the coast sinking into benthic and demersal habitats (2). Therefore, the main aim of this investigation is to assess marine debris in bottom trawl areas off the Balearic Islands.

Materials and Methods

Data on marine debris was collected during annual scientific bottom trawl surveys around the Balearic Islands (Western Mediterranean). Samples were taken between 50 and 800 m using the experimental bottom trawl gear GOC-73. Number of stations per survey varied between 41 and 69 per year. Once aboard, marine debris was sorted out and classified into 7 categories: coal, glass, rubber, fishing material, paper, plastic and cloth. Weight of marine debris was determined and standardized to surveyed area (km²).

Results

Mean values of marine debris ranged from 0.0014 ± 0.01 kg/km² (2013 data for paper debris) to 7.61 ± 30.17 kg/km² (2003 data for glass debris). Glass observed in hauls showed high percentages (> 40%) in 2002-2004, 2006, 2011 and 2014. Fishing material was the most abundant type of marine debris (in weight) during three years (2008, 2010 and 2013). Regarding plastic, in 2009 and 2015 more than half of the marine debris sampled in the hauls was plastic and this type of contamination was the most common in 2001, 2005, 2007 and 2012 (Fig. 1). In addition, glass and plastic were observed in hauls throughout all years while the rest of marine debris categories were not. Plastic showed a high variability according to sampling locations with values ranging up to 82.95 kg/km² (Fig. 2) and significant differences were found according to location (PERMANOVA p < 0.001).

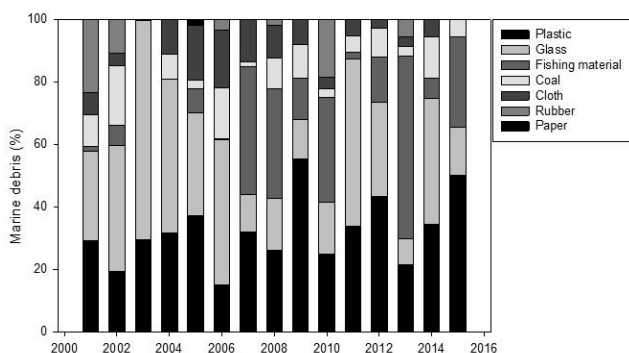


Fig. 1. Marine debris (%) according to 7 debris categories in bottom trawl surveys off the Balearic Island.

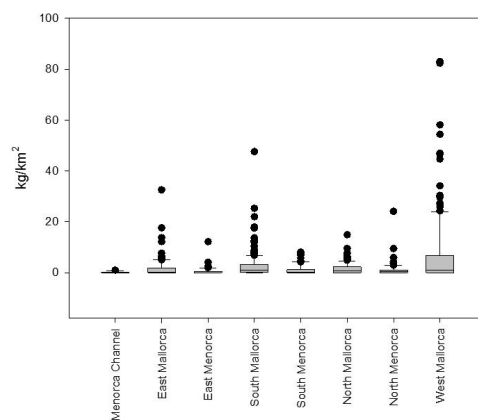


Fig. 2. Box plot with plastic weight at the different locations sampled around the Balearic Islands from 15 years time series including all depths (50 – 800 m).

Discussion

In the last years there has been an emerging number of investigations on marine debris and seafloor, however a large temporal and spatial coverage has not been analyzed. Results from 15 years have shown a large variability amongst debris types, sampling period and locations with quantities of plastic higher in Western followed by Southern Mallorca which is the most urbanized area (it includes the Bay of Palma). Different oceanographic and environmental conditions have been found between the north and the south of the Balearic Islands (3). The major currents characterizing the regional circulation (Northern and Balearic currents) are probably having an important role in marine debris distribution of the Balearic Promontory.

Acknowledgments

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