Marine litter and the COVID-19 Pandemic in the Balearic Islands, Spain: A Retrospective Study

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Introduction

In early 2020, the COVID-19 pandemic led to an estimated 57% of the global population (~4.4 billion people) subjected to some form of lockdown and/or mobility restrictions to their residences (Bates et al., 2020). In many areas, an overall improvement in air and water quality was expected although an increase in organic loads in wastewater and solid waste materials due to the increased use of sanitizers and disinfectants and the use of personal protective equipment was observed (Elsaid et al., 2021). Prior to the COVID-19 pandemic, marine litter was already a topic of concern, especially in the Balearic Islands in the western Mediterranean Sea, as its negative impact on marine health are increasingly being reported.

Objectives

- i: categorize coastal floating marine litter in the Balearic Islands pre- and post-pandemic
- ii: evaluate marine litter trends in pristine areas during this time frame

Materials and Methods

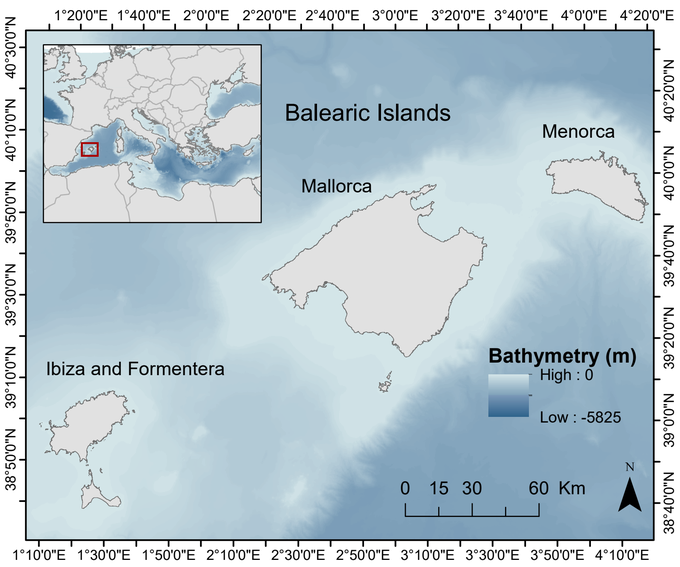

Figure 1. Study area of the Balearic Islands: Mallorca, Menorca and Pitiüses (Ibiza and Formentera) and inset map indicates the location in the western Mediterranean Sea marked by a red extent.

- Study Area:

The Balearic Islands (in red) are an archipelago of four main islands: Mallorca, Menorca, and the Pitiüses (Ibiza and Formentera) and have long been a tourism hotspot for both national and international travellers (Figure 1).

- Marine Litter Collection:

Spatially explicit daily abundances of marine litter collected from sea cleaning boats from 2016 to 2019 and in 2021 was analysed from the coastal area of the Balearic Islands. Marine litter was categorized into plastic, wood, vegetation, other and oil and a spatial analysis was performed to identify marine litter in marine reserves pre- and post-pandemic (Figure 2).

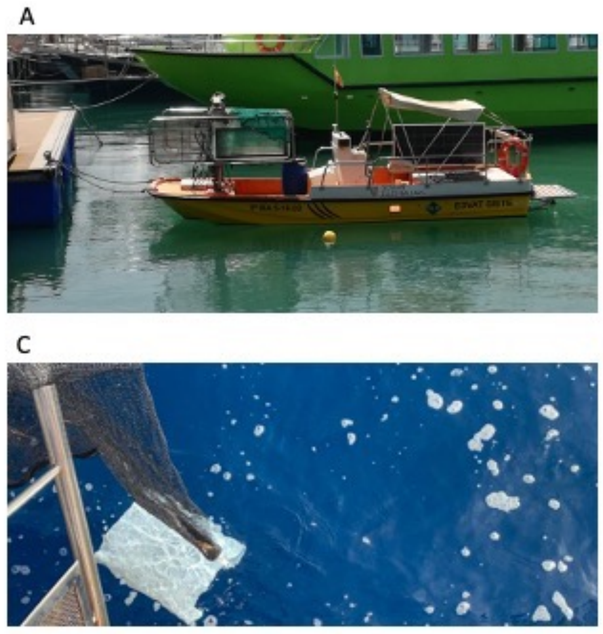

Figure 2 Example of marine litter sea cleaning boat docked within a harbour and an example of a floating plastic shopping bag.

Results and Discussion

From 2016 to 2019 the coastal area of the Balearic Islands was monitored and a total of 278,884.9 kg of marine litter were collected of which 61% was of plastic origin followed by manufactured wood (18%). In the year following the pandemic, 2021, over 25,000 kg of plastic litter was collected, of which plastic litter was also the most abundant, just over 59% of all collected litter. Overall, similar abundances of plastic debris were collected between years in terms of all marine litter types, with plastic consistently above 50% of items collected followed by wood items (Figure 3).

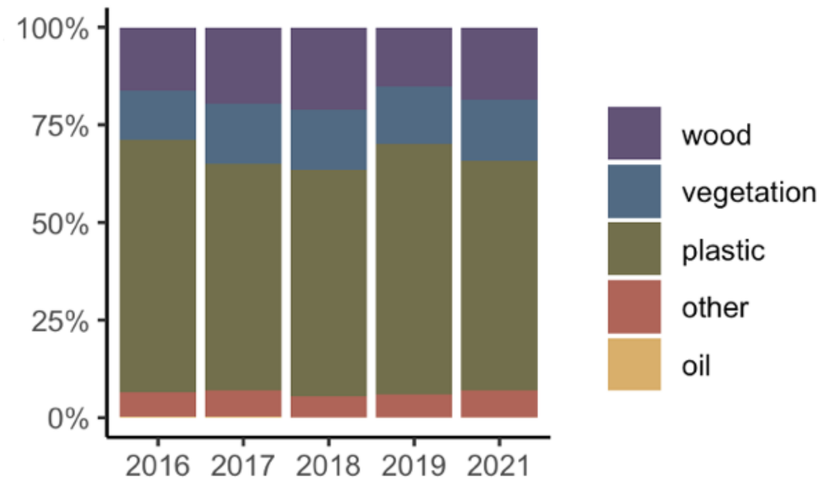

Figure 3 Summary of the marine litter categories by year in terms of kg/km^2 .

Prior to the COVID-19 pandemic, marine litter was present at all of the marine reserves in the Balearic Islands and plastic marine litter was consistently the most common material type collected (58%) and this continued to be the case in the year following the initial year of the global pandemic.

Pristine	Prior to COVID-19	39.9 (± 54.9) kg/km^2
	Post COVID-19	41.9 (± 56.8) kg/km^2
Non-pristine	Prior to COVID-19	42.7 (± 66.7) kg/km^2
	Post COVID-19	28.1 (± 39.1) kg/km^2

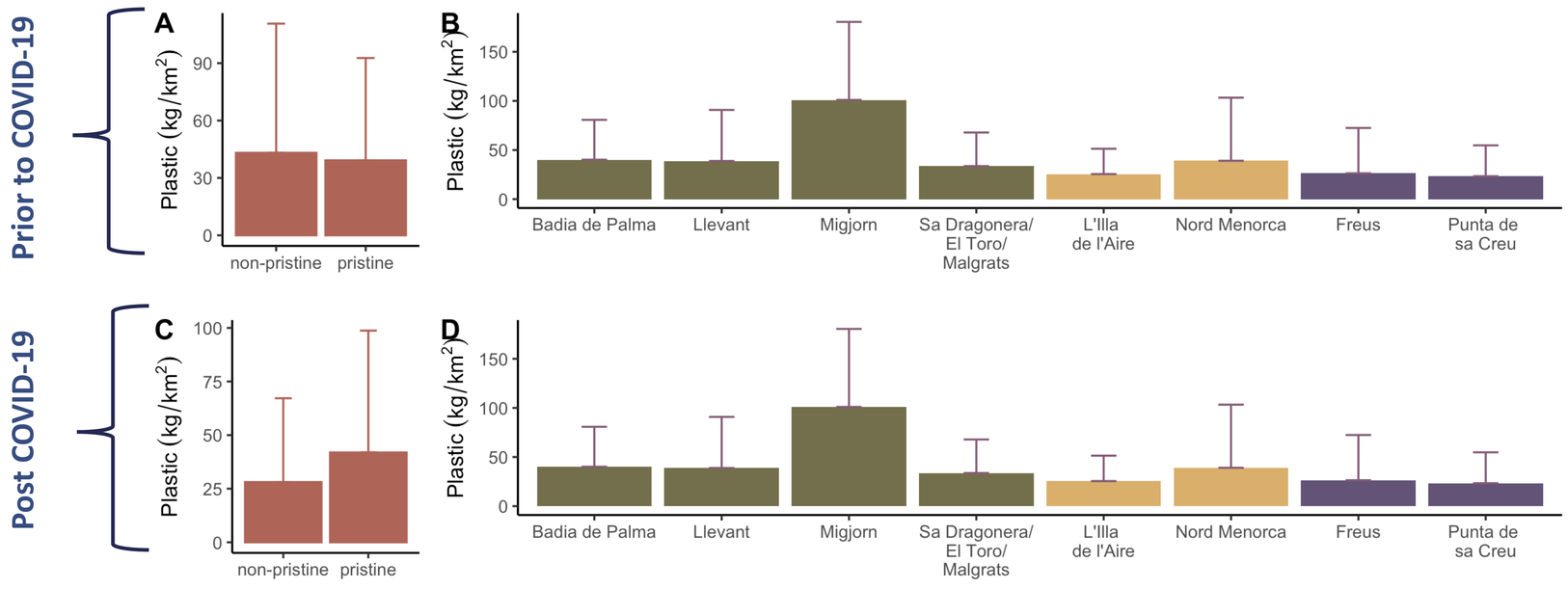

Figure 4 Summary of the plastic marine litter densities from 2016 to 2019: A) non-pristine and pristine areas and B) each of the marine reserves of the Balearic Islands and for 2021 after the COVID-19 pandemic for 2019 C) non-pristine and pristine areas and D) each of the marine reserves of the Balearic Islands. Error bars indicate a 95% confidence interval. For the graphs B and D, marine reserves were coloured according to islands: Mallorca (green), Menorca (yellow) and Pitiüses (dark purple).

Despite the possibility that the COVID-19 pandemic could have reduced the release of litter into the marine environment from coastal environments, similar abundances of marine litter were collected one year after the pandemic, indicating the persistence and pervasiveness of floating marine litter, especially in the Balearic Islands and their marine reserves.

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