

The coastline of a Marine Protected Area under study: abundance of marine debris

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INTRODUCTION

The Mediterranean Sea has an elevated number of anthropogenic pressures and recurrent accumulation of debris may occur, which can be identified as hotspots of stranded or floating marine debris.

Marine Protected Areas (MPAs) are management tools designed with a long-term focus on habitats and biodiversity conservation associated to ecosystem services and cultural values. With this aim, different protection levels are applied in MPAs to reduce the impact of anthropogenic activities. Nevertheless, the presence of marine debris in MPAs has been widely confirmed.

The **aim** of this study is to identify marine debris accumulation areas (hotspots) and potential marine debris seasonal trend accumulation in the Cabrera Maritime-Terrestrial National Park (Cabrera MPA) in the western Mediterranean Sea (Fig. 1).

MATERIAL AND METHODS

Surveys consisted of monitoring of marine debris in four alternate months during 2021: February, March, May and July. The coastline was observed in detail onboard the RV Enfú (5.75 m length; 0.46 m draught) by using binoculars, and each item was recorded with a hand-held GPS (Fig. 2).



Fig. 2. Technical equipment used during the surveys: RV Enfú, binoculars and hand-held GPS

Cabrera Maritime-Terrestrial National Park (western Mediterranean Sea)

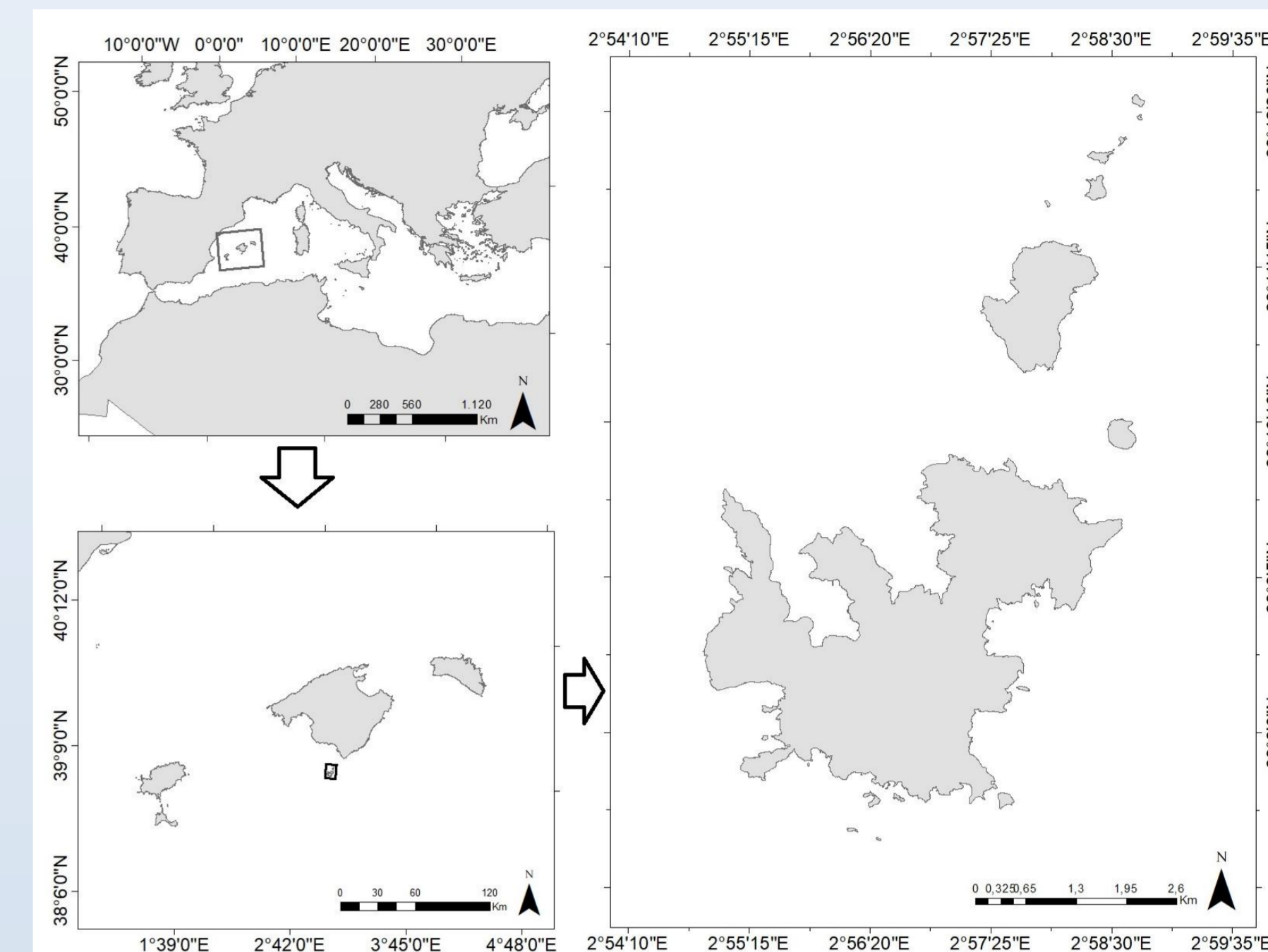


Fig. 1. Study area

RESULTS & DISCUSSION

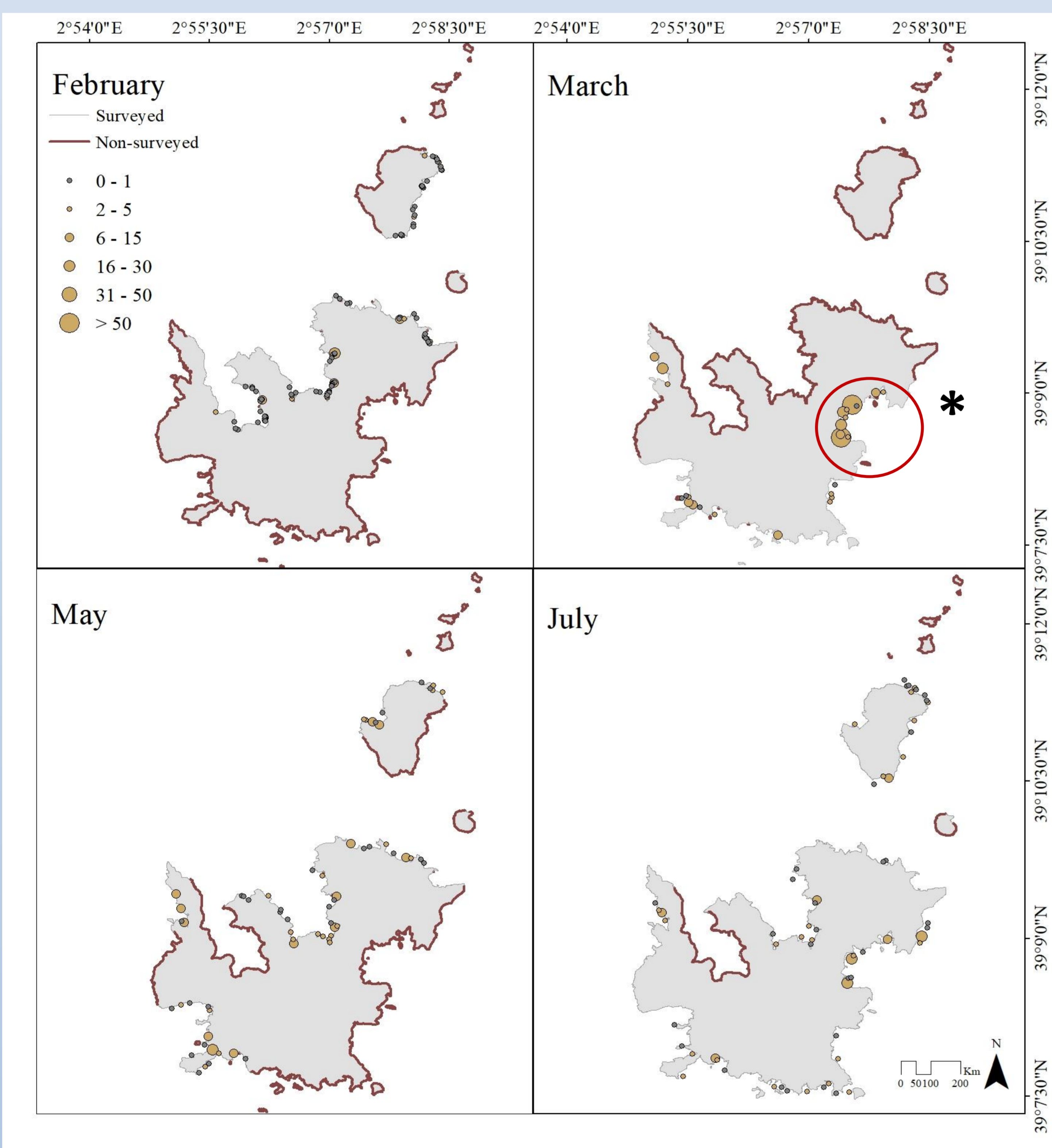
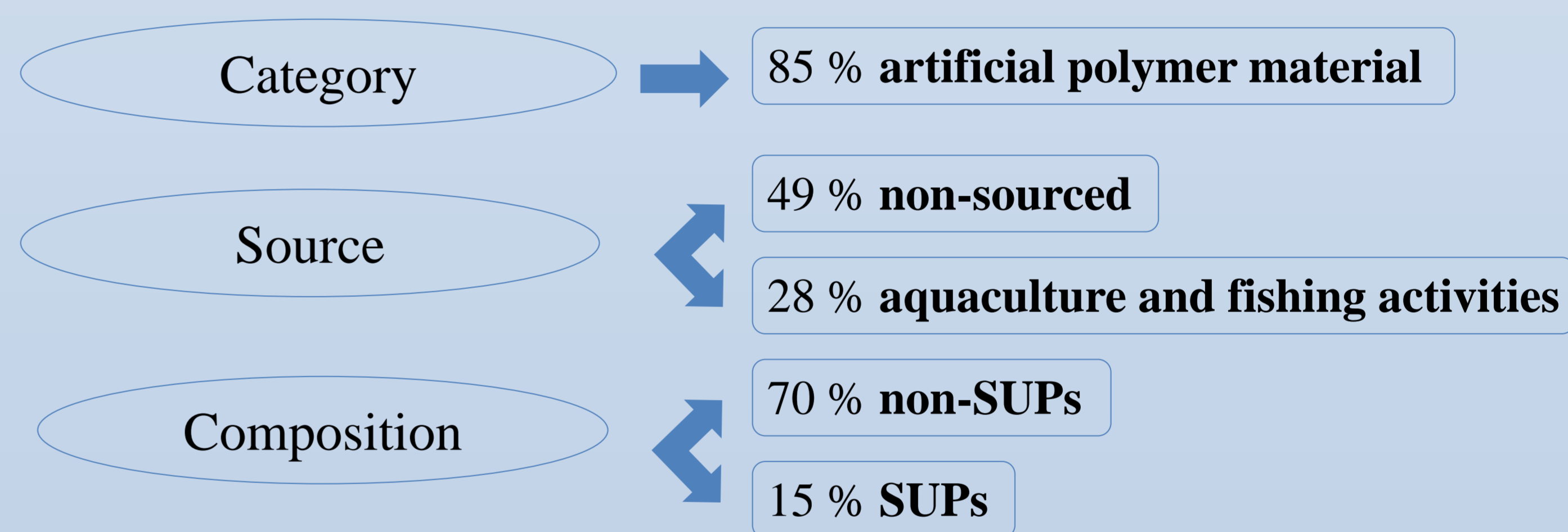


Fig. 3. Abundances of marine debris detected in the study area. Asterisk (*) shows statistical differences between areas.

General: During the four surveys, a total of 852 marine debris items were observed. Statistically differences among areas were found (Two-way ANOVA, $p < 0.05$) with the statistically highest value found in Es Burrí (122.00 ± 94.75 items) (Fig. 3).

Main debris items identified:



❖ The heterogenic distribution of marine debris highlights the role of external factors such as **oceanographic and meteorological processes** in the presence of marine debris in MPAs (with limited anthropogenic activities and strong protection restrictions applied)

❖ Our results confirms that MPAs are sinks for marine **plastic debris**¹ (Fig. 4a).

❖ The elevated percentage of non-sourced items suggest that marine debris come from **distant areas** and a **degradation process**² have experimented (Fig. 4b).

❖ The elevated number of items from **aquaculture and fishing activities** highlight that ghost fishing has reached MPAs, with all the environmental hazards implied³ (Fig. 4b).

❖ Despite in a low abundance, **SUPs** were present at the four surveyed months and almost at all sampled locations suggesting an ubiquity presence (Fig. 4c).

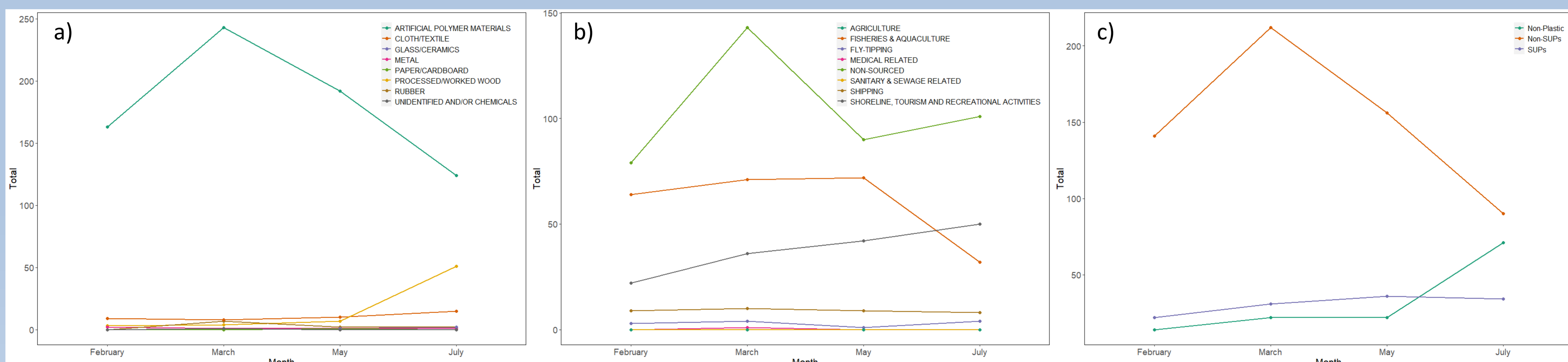


Fig. 4. Categories of the marine debris detected in the study area classified according to a) category, b) source and c) composition

Conclusions The survey of the coastline onboard of a small research vessel is a novel methodology easy implement worldwide. This methodology allows locating stranded marine debris in hide and hard-to-reach locations and studying extensive areas in a limited time without important technical requirements. Our results highlight the ubiquity of marine debris of different categories, sources, and compositions along the coastline of the Cabrera MPA and its surrounding waters.