



# Preliminary research results on the incidence of plastic marine litter in the Central Mediterranean Sea



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**Introduction:** In the framework of “Sea Marvel – Save, Enhance, Admire Marine Versatile Life”, an Interreg V-A Italia-Malta project led by the University of Catania in partnership with the University of Malta, a variety of data was collected during dedicated scientific surveys, and embarkings on ferries using the Fixed Line transect (FLT) method. In collaboration with the Italian Institute for Environmental Protection and Research (ISPRA), the University of Palermo, and the Marecamp association, the SEA MARVEL project effort helped to expand an international monitoring network on cetaceans, sea turtles, sea birds, and marine megafauna using ferries as opportunity platform of observation [1]. Preliminary results of this study help to understand the extent and changing distribution of plastic pollution related to marine biodiversity in that area.

**Area:** The study covered a broad area in the central Mediterranean Sea. This area includes: 1) the Gulf of Catania, a 300 km<sup>2</sup> area on the eastern side of Sicily (Southern Italy) monitored through scientific boats; 2) the Strait of Sicily, including the following transects: Catania-Malta, Porto Empedocle - Lampedusa, and Trapani - Pantelleria (fig.1). The importance of these areas, which results in a great richness in terms of biodiversity, is due to all the biotic and abiotic characteristics, in particular, its hydrology and sedimentology, the presence of canyons and basins, and the shapes of the continental slope [2,3,4,5].

**Methods:** The Fixed Line Transect (FLT) method was applied to collect data on board ferries during surveys conducted in the Strait of Sicily. Meanwhile, the Line Transect (LT) method was applied throughout monitorings carried out in the Gulf of Catania on board small research vessels. The observations were conducted in day-time and optimum weather conditions, with Beaufort sea state <3 for cetacean sightings and <2 for floating marine litter check. In all the platforms of observation, the fixed strip technique was used for monitoring floating marine litter, defining the width band at the beginning of the observation, according to the height and speed of the platform, as well as the visibility conditions (50-100 for large vessels, 4-6 meters for smaller research vessels) (1,6). Data about position, source, sector, material, name, size, colors, and object state of these litter elements were recorded; while for cetaceans, data concerning their position, species, group size, behaviour, distance, angle, swim direction and response to ship were collected. In the specific case of sea turtles, also the probable age was added. Spatial analysis has been calculated using the Geographic Information System (GIS) software QGIS (ver. 3.22) to provide data on marine litter and cetaceans' spatial distribution, visualizing possibly existing relationships. Therefore, a Kernel density analysis was performed, to obtain a heatmap with a 0.06 radius, and 0.001 rows and columns.

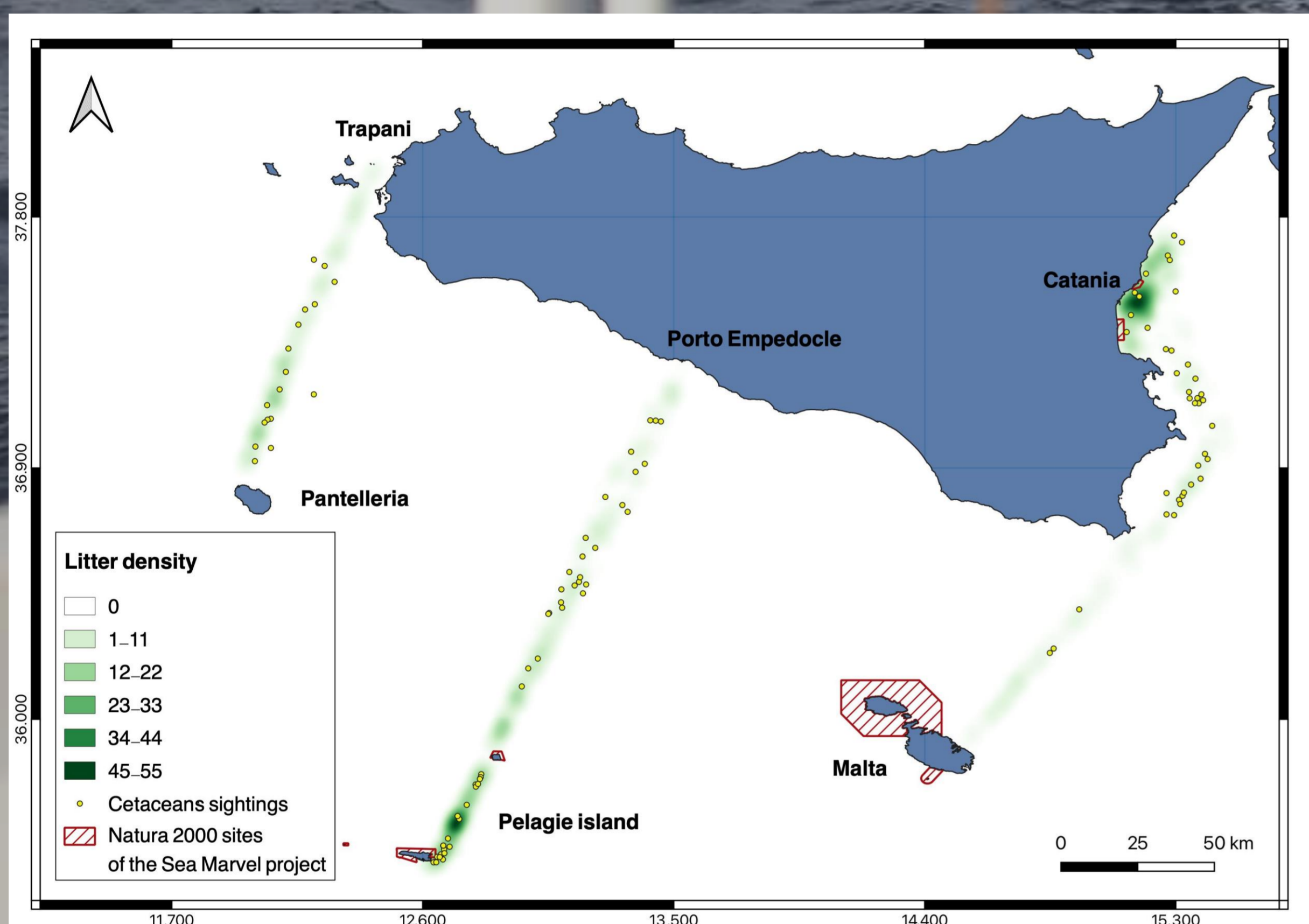
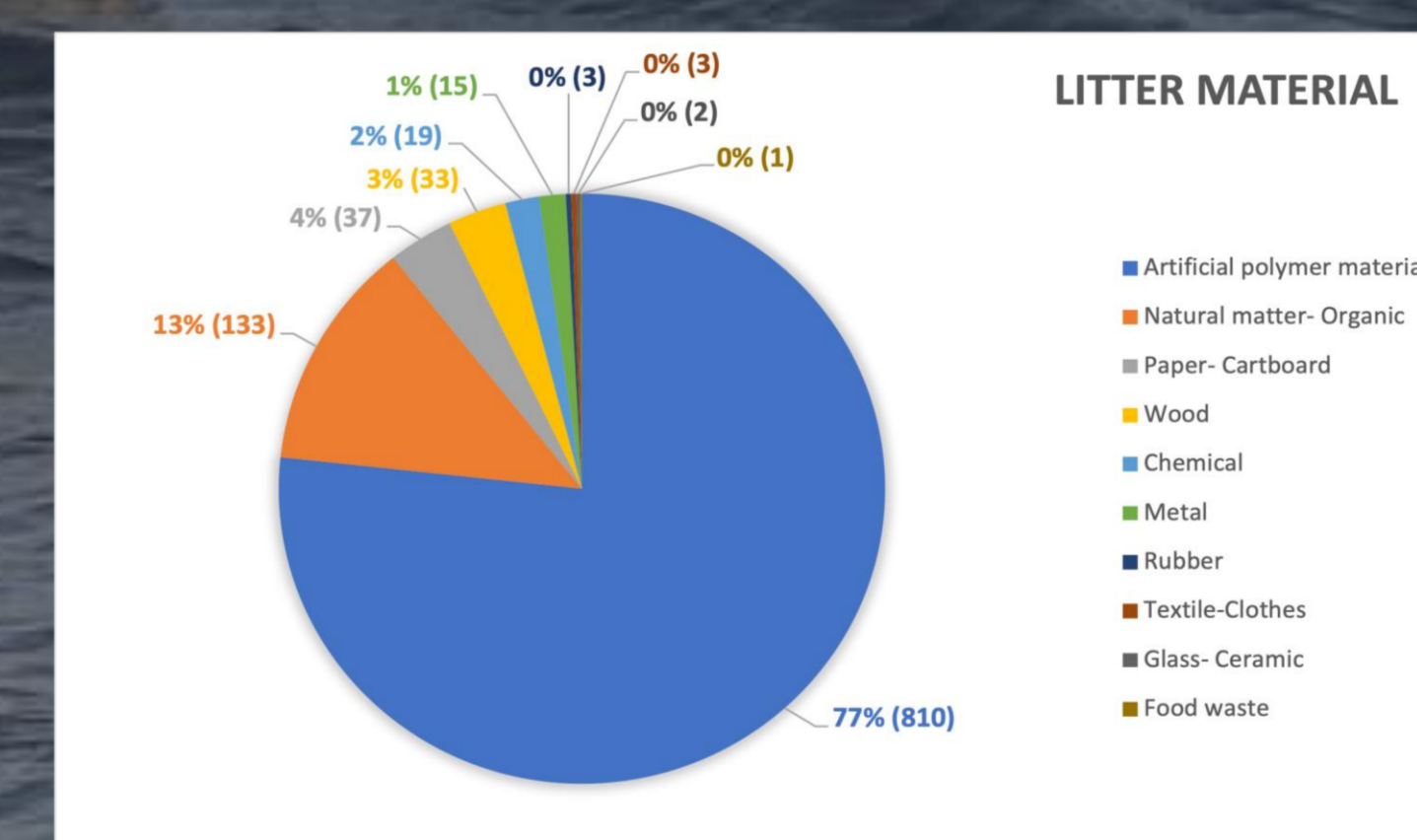
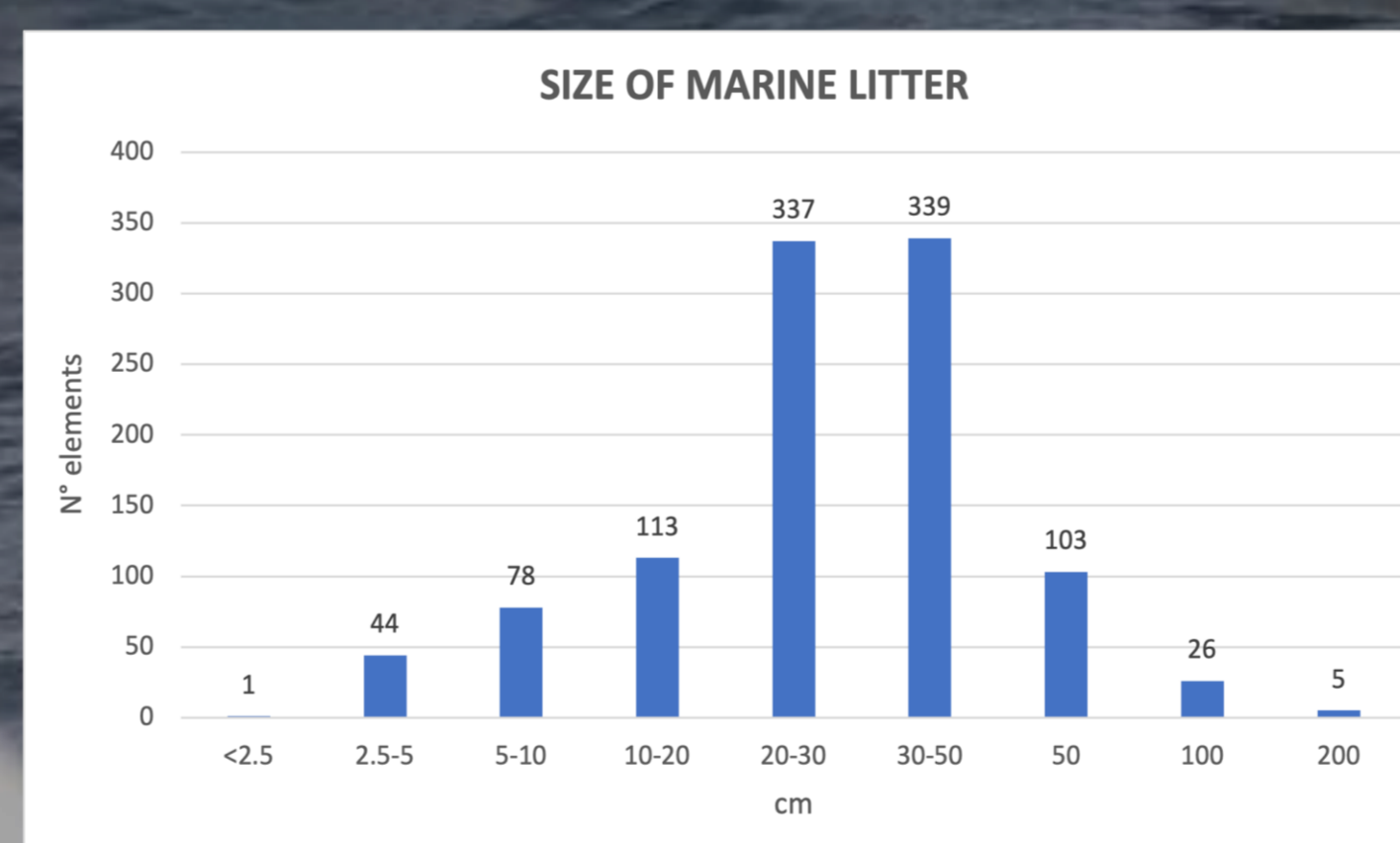


Figure 1. Litter density heatmap (number of litter elements/km).

**Results:** A total of 81 surveys were conducted during the Interreg V-A Italia-Malta SEA MARVEL project, from 29 June 2021 to 23 December 2022. Of these, 58 surveys were performed in the Strait of Sicily, along ferry routes from Catania - Malta, Porto Empedocle - Lampedusa and Trapani - Pantelleria; meanwhile, 23 surveys were carried out in the Gulf of Catania. Overall, 4389.9 NM were covered during 350.4 hours of observation. 1056 elements of marine litter were recorded, with an Encounter Rate = 3.01. Most of the elements had a size between 20 and 50 cm and were made of plastic material (fig.2-3). The larger floating rubbish has been mainly sighted between the Pelagie islands and Sicily. As shown in figure 1, the presence of marine litter was constant along all routes, however, the highest concentrations of floating litter were found between Linosa and Lampedusa islands, and in the Gulf of Catania, specifically between the main city harbour and the MPA “Isole Ciclopi”. During this research, 106 cetaceans' sightings were registered, with an Encounter Rate of 0.30. Along these routes, the attendance of cetaceans appears to be enough regular, therefore their presence overlaps areas with floating litter, even in highly polluted hotspots as shown in figure 1.



Figures 2-3. Size and material of the marine litter observed.

**Conclusions:** The results highlighted the widespread presence of floating waste, mostly made of plastic material, in the Central Mediterranean Sea. The high concentration of these represents a significant problem for the cetaceans living in these areas since entanglement or ingestion events are increasingly common and recurrent, often causing their death. For this reason, stricter conservation measures should be applied in protected areas and on a larger scale.

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## References

- [1] A. Arcangeli, M. Atsi, F. Atzori, M. Azzolin, I. Campana, L. Carosso, R. Crosti, L. David, N. Di Meglio, F. Frau, O. Garcia Garin, C. Giacomini, M. Gregoriotti, E. Martin Moreno, V. Mazzucato, A. Moulin, M. Paraboschi, G. Pellegrino, M. Rosso, M. Roul, G. Sara, A. Scuderi, P. Tepsich, M. Tringali, M. Vighi, Fixed line transect Mediterranean monitoring network (FLT MED Net), an international collaboration for long term monitoring of macro-mega fauna and main threats, Biol. Mar. Mediterr. 26 (2019) 400–401.
- [2] M. Di Lorenzo, M. Sinerchia, F. Colloca, The North sector of the Strait of Sicily: a priority area for conservation in the Mediterranean Sea, Hydrobiologia. 821 (2018) 235–253.
- [3] N. Spanò, E. De Domenico, Biodiversity in Central Mediterranean Sea, Mediterr. Identities - Environ. Soc. Cult. (2017).
- [4] C. Monaco, S. Catalano, G. De Guidi, L. Tortorici, Chapter 5 Geology of the urban area of Catania (Eastern Sicily), (2005).
- [5] S. Carbone, S. Branca, F. Lentini, con M. contributi di Barbono, R.A. Corsaro, A. Di Stefano, V. Ferrara, C. Monaco, S. Longhitano, I. Platania, A. Zanini, con E. la collaborazione di De Beni, C. Ferlito, NOTE ILLUSTRATIVE della CARTA GEOLOGICA D'ITALIA alla scala 1:50.000 foglio 634 CATANIA a cura di, (n.d.).
- [6] A. Arcangeli, I. Campana, D. Angeletti, F. Atzori, M. Azzolin, L. Carosso, V. Di Miccoli, A. Giacoletti, M. Gregoriotti, C. Luperini, M. Paraboschi, G. Pellegrino, M. Ramazio, G. Sarà, R. Crosti, Amount, composition, and spatial distribution of floating macro litter along fixed trans-border transects in the Mediterranean basin, Mar. Pollut. Bull. 129 (2018) 545–554.

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