

NEUSTONIC MARINE MICROPLASTICS AND ZOOPLANKTON IN THE COASTAL WATERS OF CABRERA MPA (NW Mediterranean Sea) (334376)



V. Fagiano¹, C. Alomar², M. Compa Ferrer², G. Mateu-Vicens¹, S. Deudero²



¹ University of the Balearic Islands, Ctra. Valldemossa km 7.5, E-07122 Palma de Mallorca, Spain

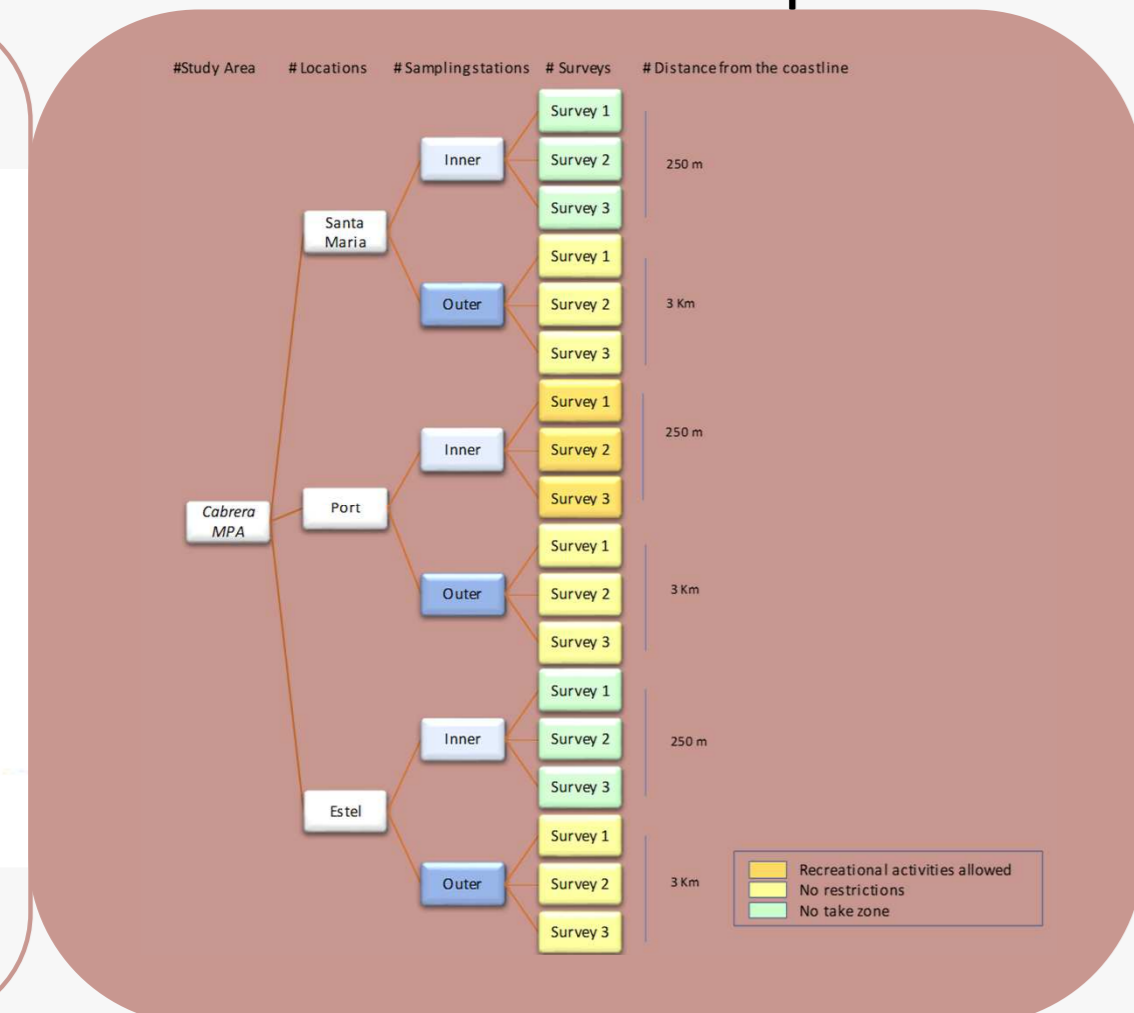
² Instituto Español de Oceanografía, Centro Oceanográfico de Baleares, Moll de Ponent s/n, 07015 Palma de Mallorca, Spain

Introduction

Within the effects of microplastics (MPs) on biota it is of special interest to highlight their effects on zooplanktonic organisms having a key role on local food web structures⁽¹⁾. As to which are the effects of MPs abundances on zooplanktonic community assemblage and composition, particularly in coastal ecosystems, it is still an open question. The present study addresses MPs distribution and composition within Cabrera MPA as well its influence on local zooplanktonic community assemblage.

Methods

The study area



Samples collection

18 manta trawl surveys

Manta net mesh size: 300 μm
15 minutes; average speed: 1.5/2 Knots
GPS continuous track



MP detection and classification

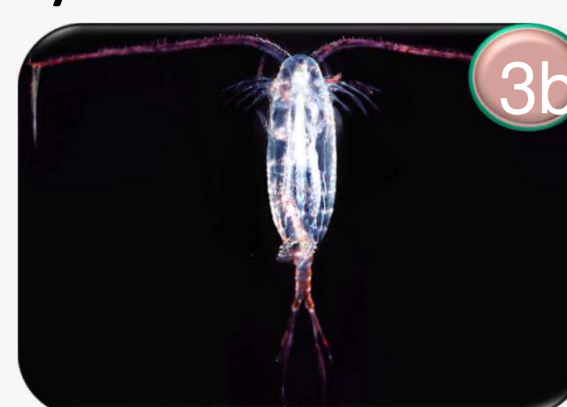
7.047 items detected
484 items classified (color and shape)



Zooplankton descriptive and semi-quantitative analysis

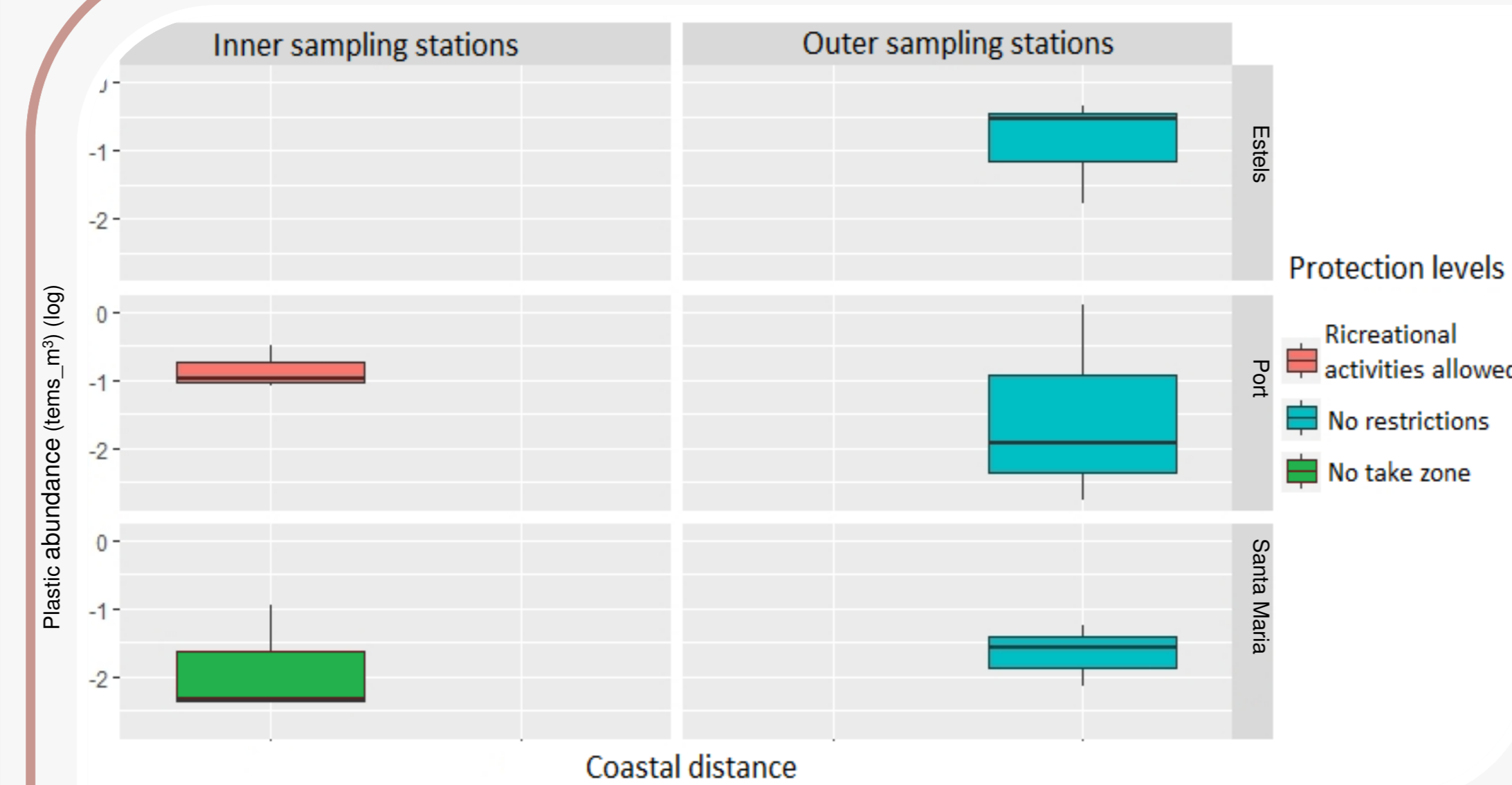
Zooplankton was taxonomical classified

Abundance was calculated for each taxa
the microplastic to zooplankton ratio was established⁽²⁾



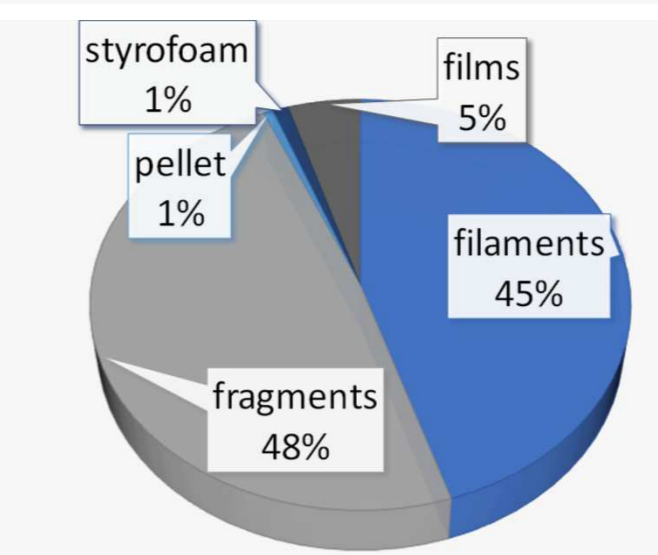
Results

Abundance and composition of MP along coastal areas of Cabrera MPA

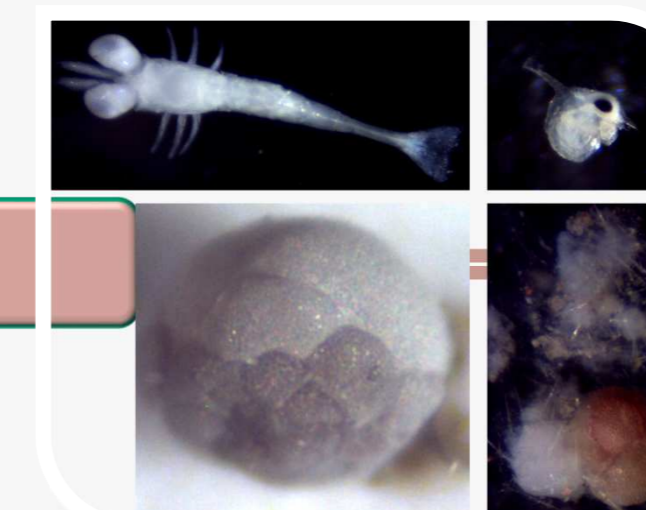


Box plot summary of the abundance (items/m³) for the MP collected at each location (Santa Maria, Port and Estels) considering coastal distance (inner and outer sampling stations) and site's specific protection levels

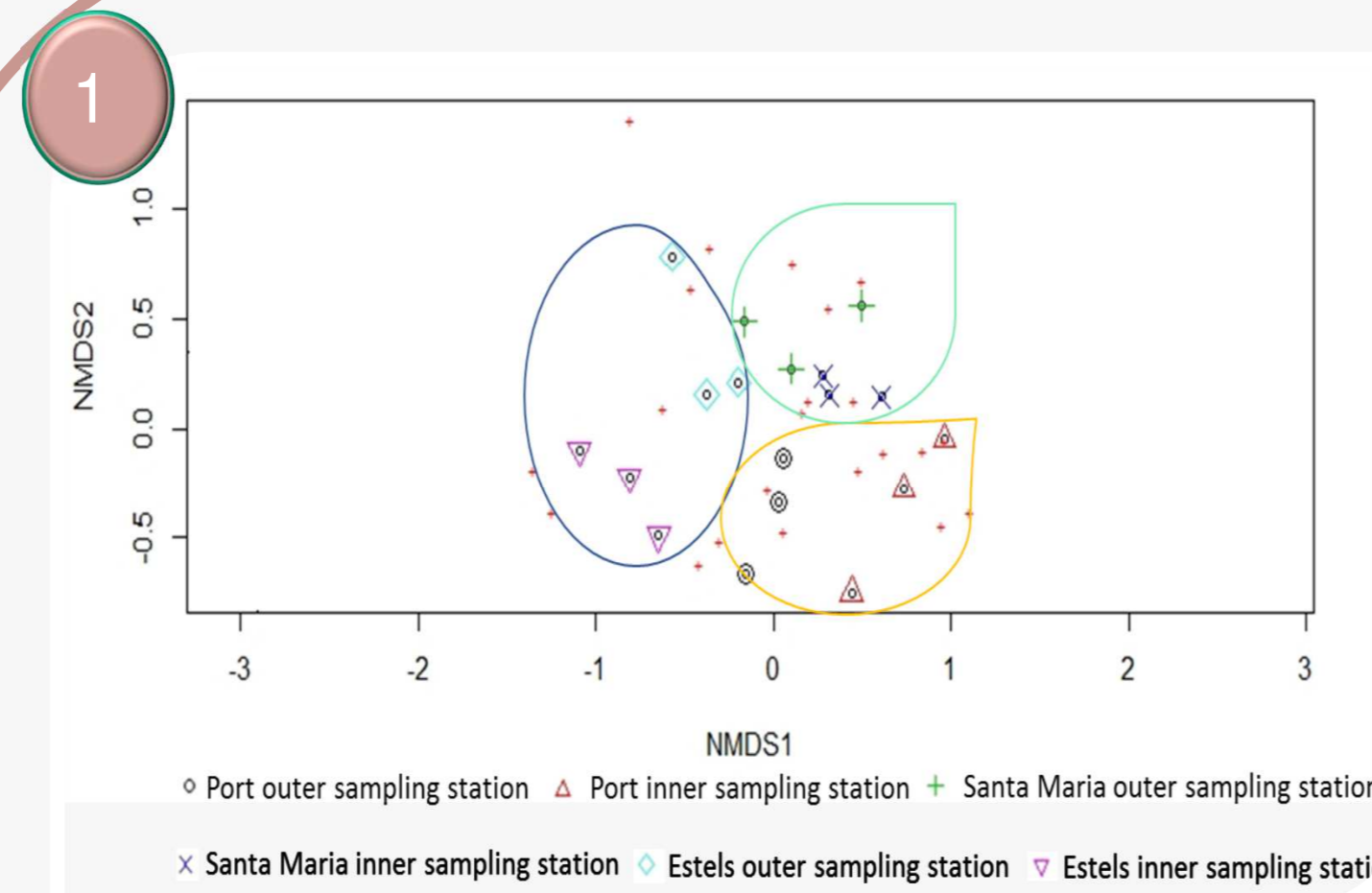
- MPs were found at each location and in all samples with an overall average abundance of 3.52 (± 8.81) items/m³.
- MPs were uniform distributed (no significant differences detected between sampling sites, coastal distances and site's specific protection levels [aov; p_value > 0.5]).
- Plastics compositions suggest that MPs detected could be aged and arriving from far contamination sources.



Pie chart summarizing total MP collected by manta trawl within Cabrera MPA categorized for shape

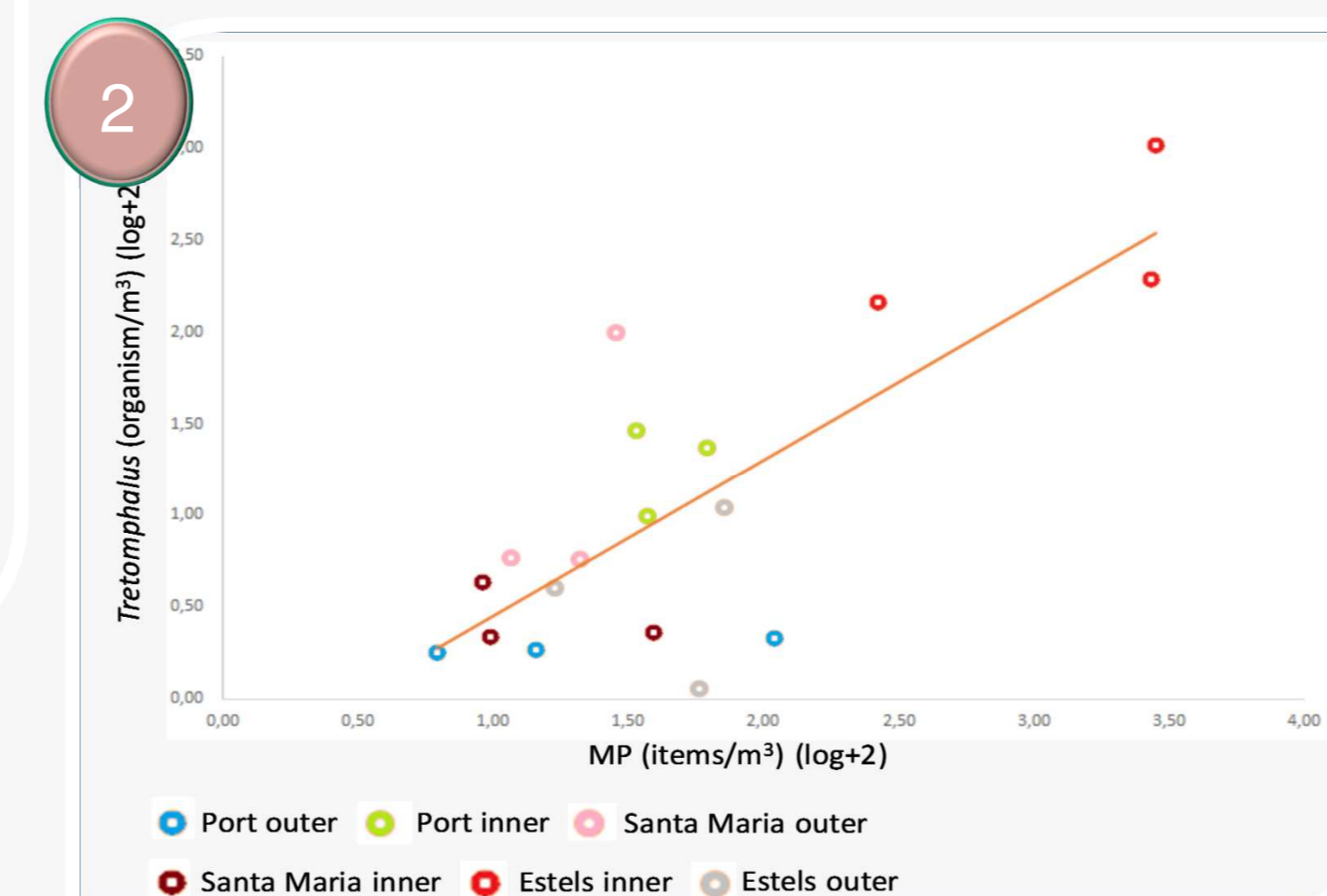


Zooplanktonic communities composition



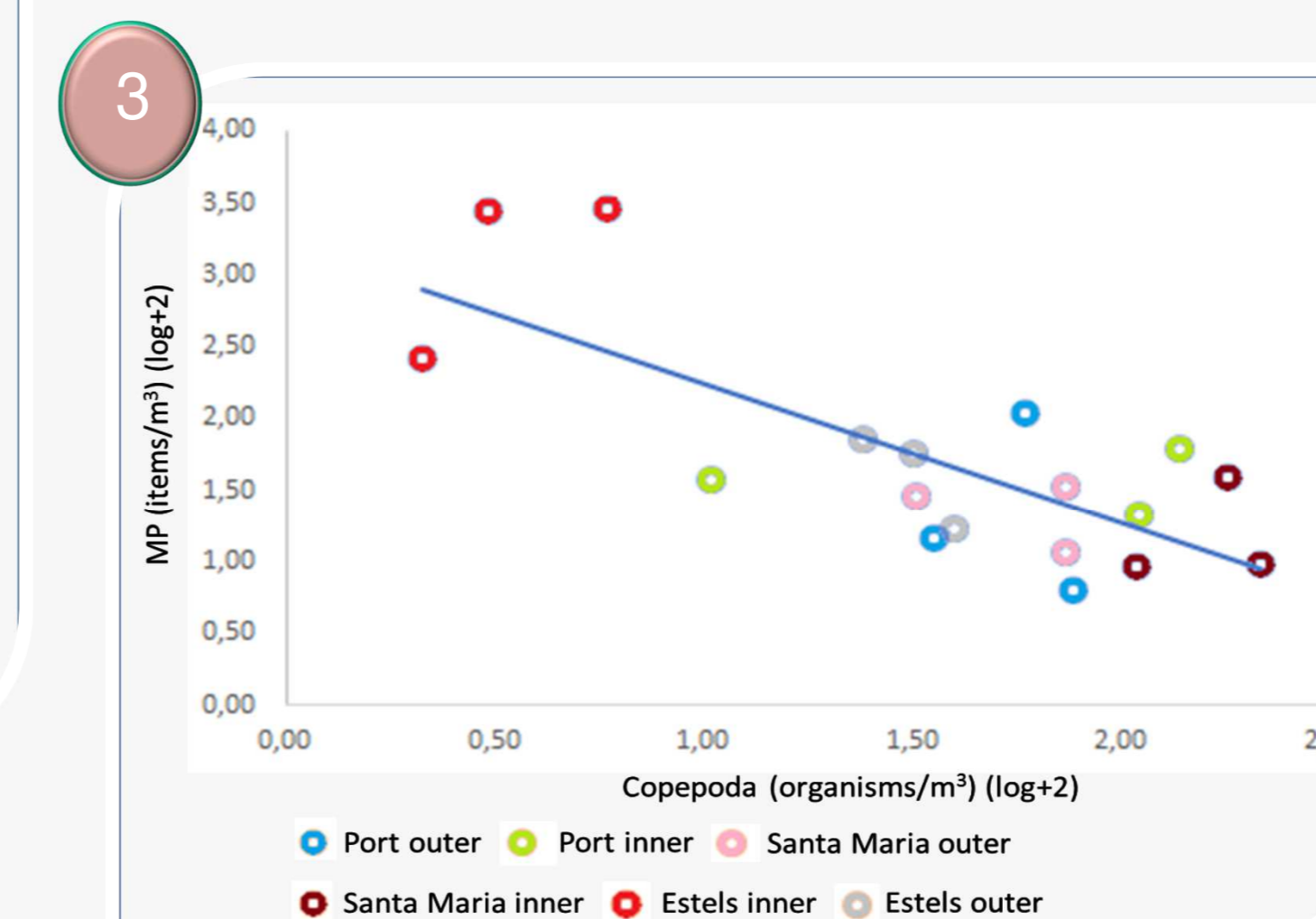
Multidimensional scaling (NMDS) ordination based on Bray-Curtis similarity matrix illustrating location related pattern in zooplanktonic community assemblage within the coastal waters of Cabrera MPA. (Stress value = 0.18)

- Zooplanktonic community composition is influenced by location (manova; p_value < 0.05, R² = 0.35) and MPs abundance (manova; p_value < 0.05, R² = 0.35).
- No correlations were found between the mean average abundances of MPs and zooplankton (glm, p_value > 0.5).



Abundance of the planktonic-stage (*Tetromphalus*) of the foraminifer *Rosalina globularis* (organisms/m³) in function of MP (items/m³) abundance detected at each location (Port, Santa Maria and Estels) considering coastal distance (inner and outer sampling station) within Cabrera MPA. The x and y axis were log transformed to consider to the range of abundances.

- A positive linear correlation was found between *Tetromphalus* (planktonic stage of the foraminifer *Rosalina globularis*) and MPs abundances (glmrob, p_value < 0.001).



MP abundance (items/m³) detected at each location considering coastal distance within Cabrera MPA in function of Copepoda taxa abundance (organisms/m³). The x and y axis were log transformed to consider to the range of abundances

- A negative correlation was found between MPs and Copepoda taxa abundance (Spearman core.test, p_value < 0.001).

Discussion

- MPs average abundances found within Cabrera MPA showed higher values than those detected at the closest more anthropized area of Mallorca [0.16 (± 0.29) items/m³].
- MPs composition suggested far contamination sources as predominant.
- MPs appeared able to influence the local zooplanktonic community assemblage with no effects on its global abundance.
- A positive correlation was found between MPs and *Tetromphalus*. This species seems able to utilize MPs for its dispersion, while a negative correlation with Copepoda abundance was detected suggesting a role of this taxa in MPs removal from surface waters.

This work highlights an important and complex interaction between zooplankton and MP, being able to mutually influence their distribution and composition. Moreover, results confirm that MPAs are not protected from MP pollution

Bibliography

- Setälä, O., Fleming-Lehtinen, V., & Lehtiniemi, M. (2014). Ingestion and transfer of microplastic in the planktonic food web. *Environmental pollution*, 185, 77-83.
- Kang, J. H., Kwon, O. Y., & Shim, W. J. (2015). Potential threat of microplastics to zooplanktivores in the surface waters of the Southern Sea of Korea. *Archives of environmental contamination and toxicology*, 69(3), 340-351.

Acknowledgments

This study was supported by the EU-funded Interreg Med project: Plastic Busters MPAs: preserving biodiversity from plastics in Mediterranean Marine Protected Areas, co-financed by the European Regional Development Fund. Authors acknowledge the Cabrera National Park staff (CAIB) for permissions and facilities.