

PREDICTING BENTHIC LITTER ZONES AND SOURCES IN MARINE PROTECTED AREAS

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Introduction

Marine Protected Areas (MPAs) are globally recognized as exceptional tools of biodiversity conservation and habitat preservation. The most successful cases are related to complete No-Take zonation schemes, where extractive practices are strictly prohibited.

Such legal framework however, does not confer protection from other impactful pressures arising from within and beyond the MPA's boundaries, such as marine debris.

This study illustrates the spatial distribution of benthic anthropogenic debris in a Cypriot MPA, to highlight the susceptibility of MPAs to this ecological threat, and to identify the sources of this pollution for urgent regulatory action.

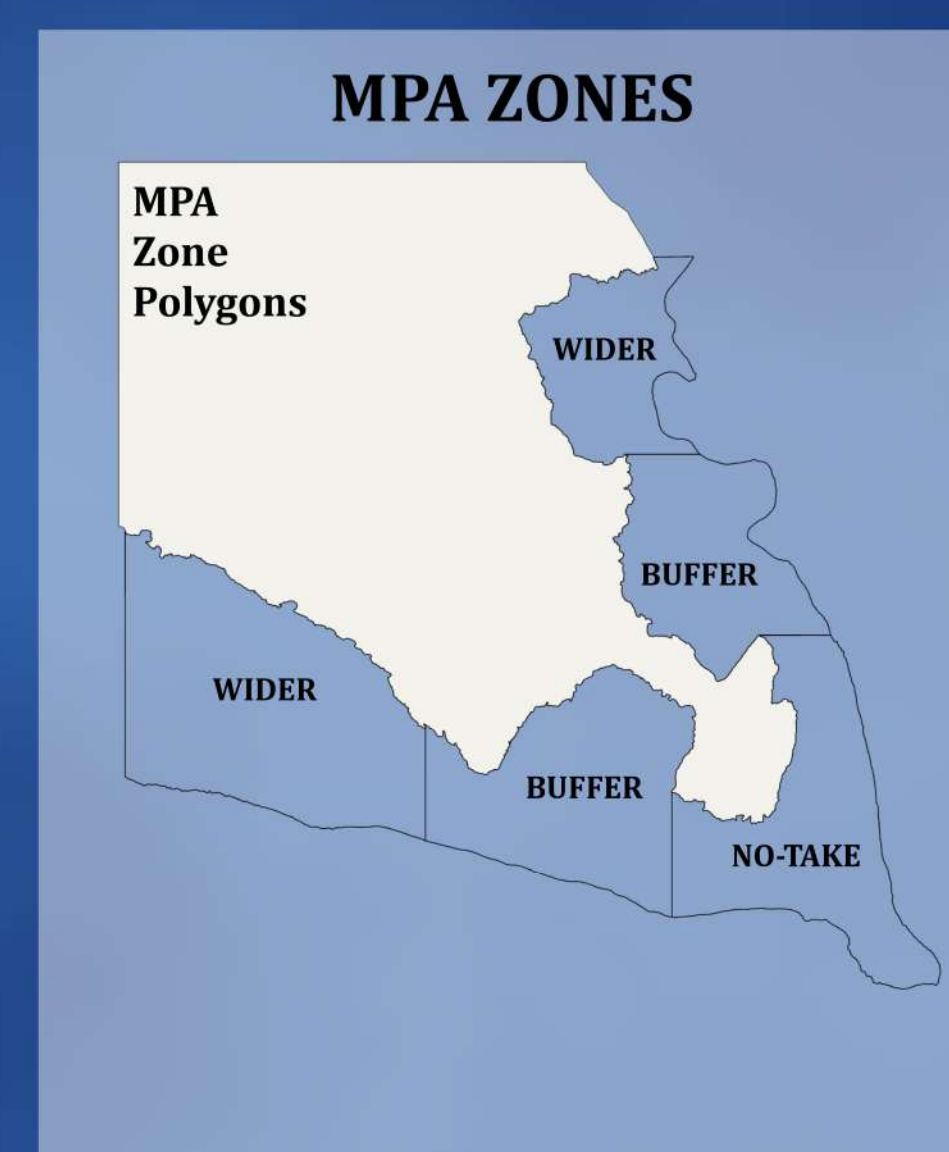
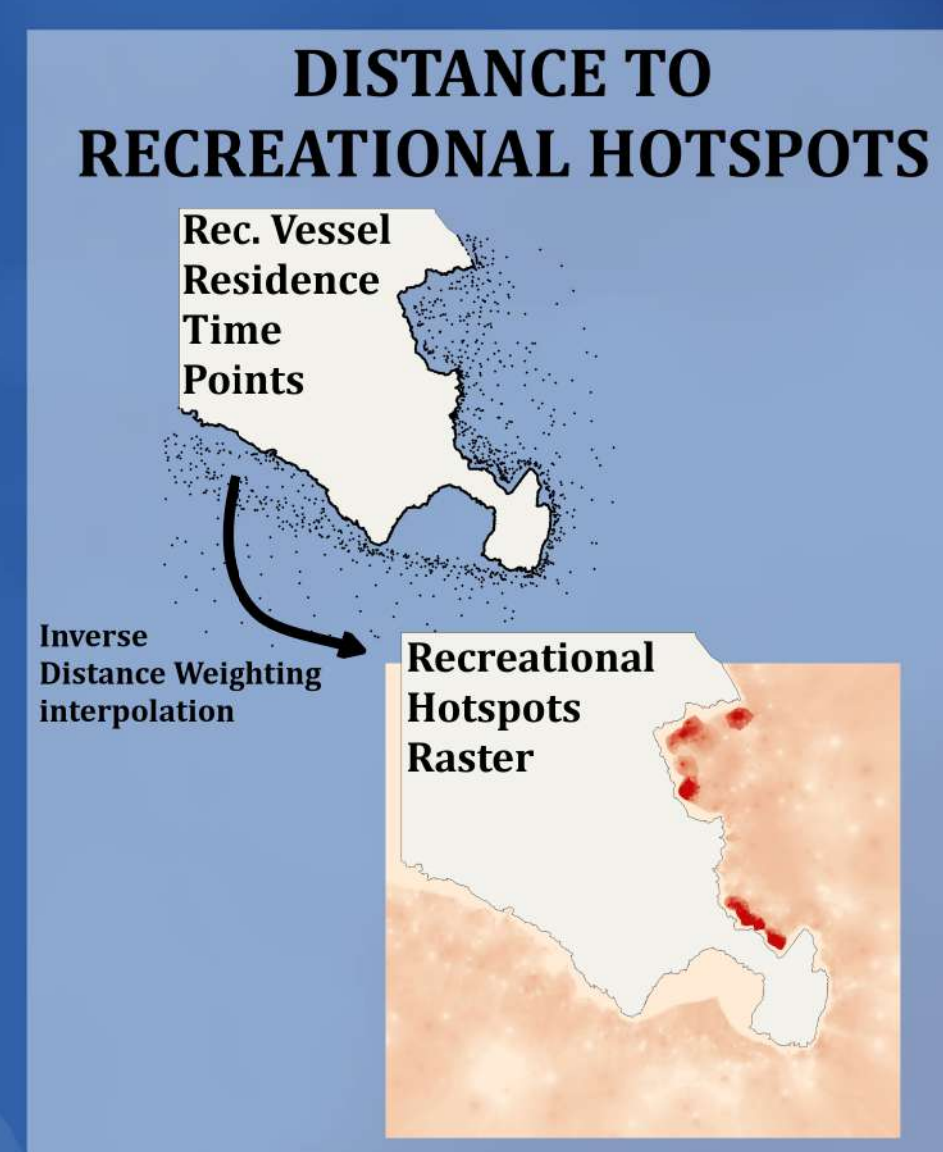
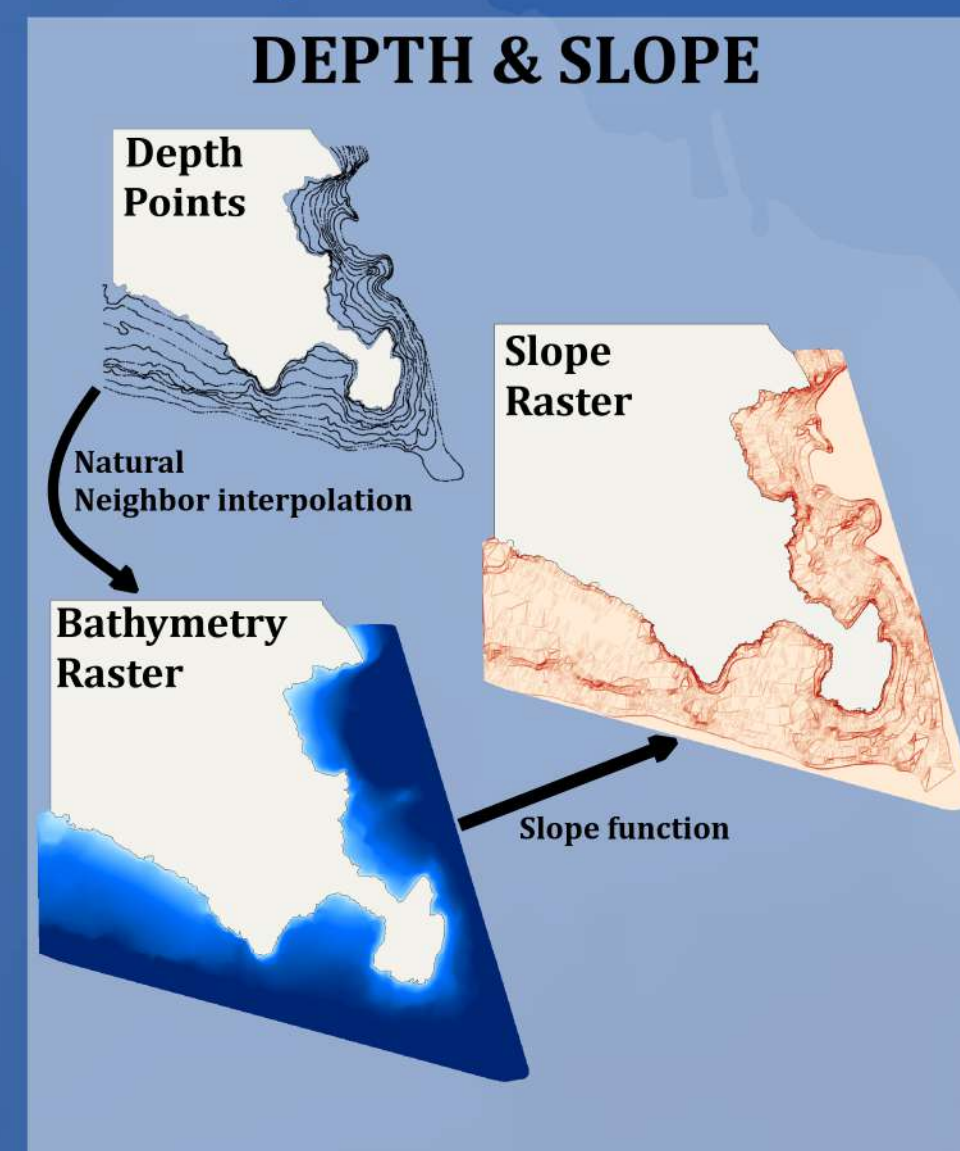


GIS & Statistical Framework

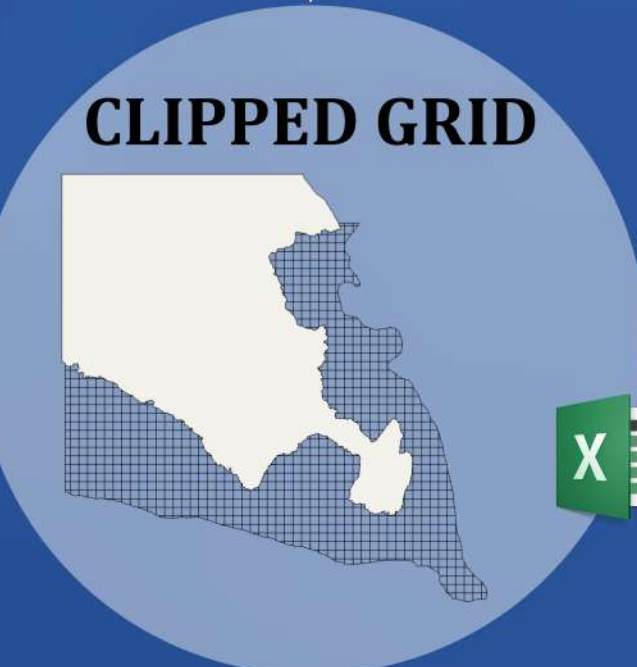
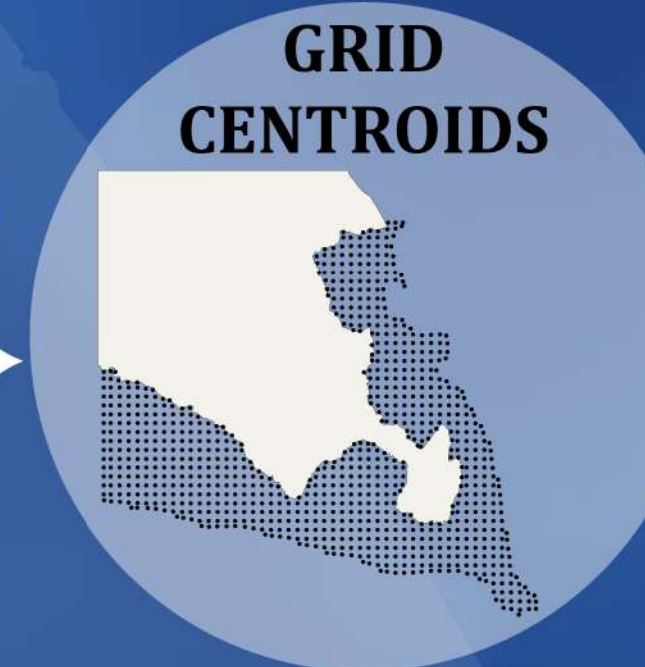
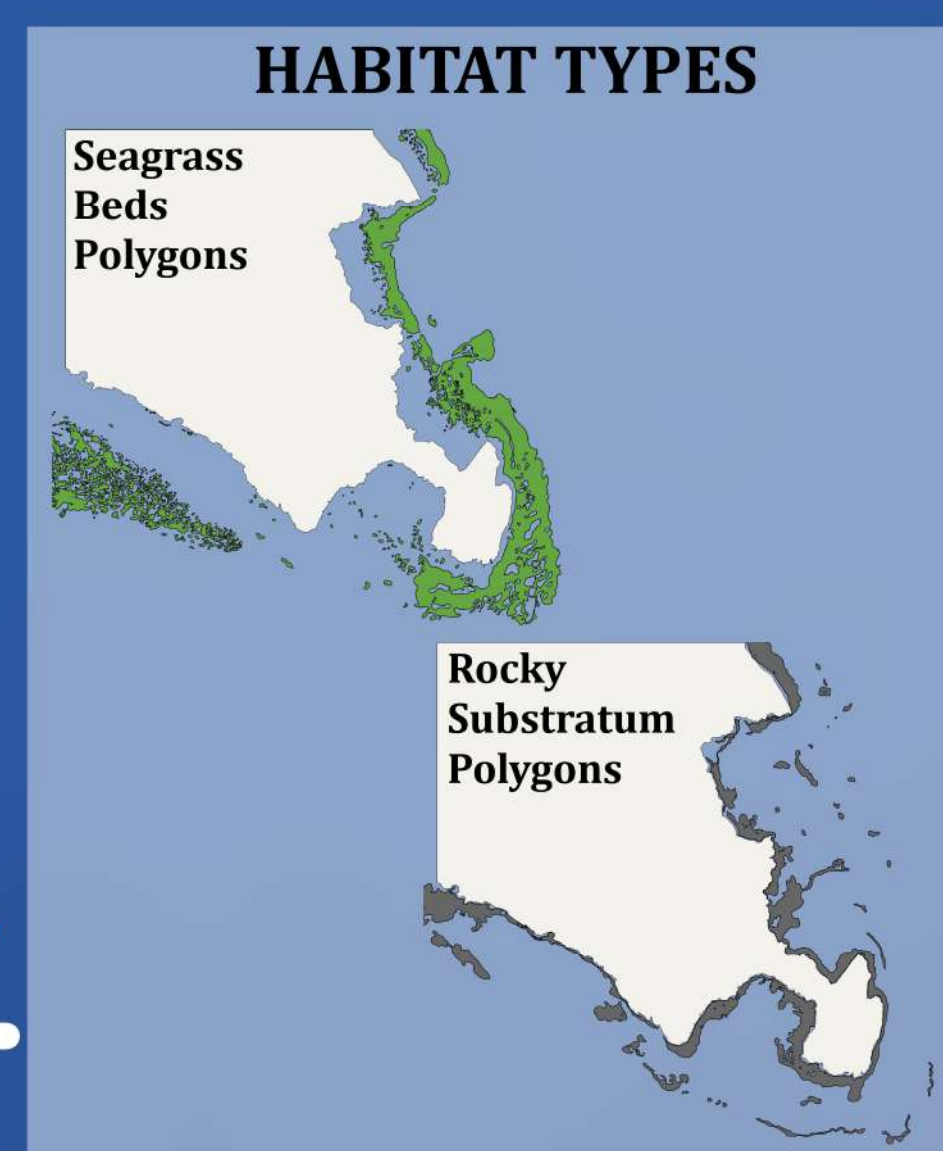
Litter densities were assessed against 5 independent (predictor) variables that likely drive the spatial distribution of benthic debris items:

1. Depth
2. Slope
3. Distance to Recreational Hotspots
4. MPA Zones
5. Habitat Types

31 Generalized Linear Mixed Models (GLMMs) were computed to find the best predictor combination based on the Akaike information criterion (AIC).



The independent variables were assembled from the entire MPA region and the corresponding values or factors were inserted within the overlapping 100 x 100 m grid cells to conduct Density Surface Modelling (DSM).



The best model was used to predict benthic litter densities in each of the grid's unique cells.

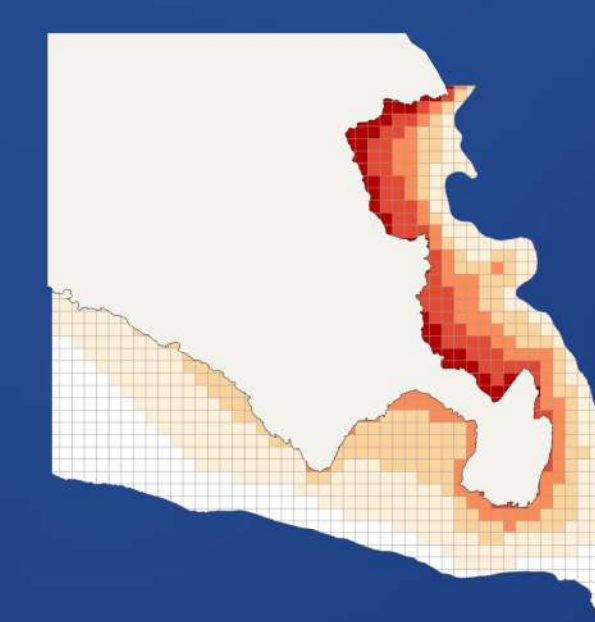
For MPAs to achieve their goals, managers should intensify regulation of anthropic pressures beyond extractive practices and impose strict control on polluting activities

Results & Discussion

Model selection indicated that the best GLMM fit was with depth and distance to recreational hotspots (DRH) as confounding variables.

	Estimate	Std. Error	Z value	P value
(Intercept)	7.0991	0.2490	28.51	< 2e-16 ***
Depth	-0.0348	0.0142	-2.45	0.0143 *
DRH	-0.0003	0.0001	-4.426	9.62e-06 ***

Significant significance: *** < 0.001, * < 0.05



Predicted density surface map of benthic debris across the MPA.

Benthic litter is more concentrated in shallow waters on the eastern coastline of the MPA, where recreational activities are more prevalent and intense.

1130

Benthic debris items per hectare

50



Conference Poster

Infographic



The research was conducted under the framework of the "Mapping of marine Key habitats and assessing their vulnerability to fishing activities in the Mediterranean - MedKeyHabitats II Project" in Cyprus implemented by Marine Environmental Research (MER) Lab on behalf of UNEP-MAP-SPA/RAC in collaboration with the Department of Fisheries and Marine Research, with the financial support of MAVA Foundation, Switzerland, Contract no 01_SPA/RAC_2020.

The marine litter data analysis and the presenting infographic were implemented as part of a doctoral (PhD) thesis at the University of Haifa, Israel, carried out by Ioannis Savva and supervised by Prof. Dror Angel at the Department of Maritime Civilizations.