

MODELLING SPATIAL DISTRIBUTION OF THE ENDANGERED BIVALVE *PINNA NOBILIS* IN A MARINE PROTECTED AREA

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Abstract

Pinna nobilis spatial distribution and densities have been analysed through a geostatistical approach in Cabrera National Park. Model results indicate that benthic habitats play a key role in the spatial distribution of *P. nobilis*, with higher densities in seagrass meadows of *Posidonia oceanica*. The predict map shows some hotspots of density and provide valuable information for the spatial conservation management of this species.

Keywords: Bivalves, Balearic Islands, Coastal models, Density, Mapping

Introduction

Pinna nobilis is a Mediterranean endemic bivalve under strict protection [1]. Population of *P. nobilis* has been greatly reduced during the last decades [2] as a result of anthropogenic activities. MPAs can guarantee protection to this species. Knowledge on essential habitats and spatial distribution for this species is therefore fundamental to promote proper management strategies. Therefore, the aims of the present study are (i) to study density of *P. nobilis* across different habitats in the MPA, and (ii) create a spatial distribution model of *P. nobilis* densities within the MPA Cabrera National Park.

Materials and methods

The study was carried out at the marine protected area (MPA) of Cabrera National Park in the Balearic Islands (W Mediterranean), protected since 1991. A total of 378 visual census were conducted by scuba diving in line transects to survey *P. nobilis* density in all habitats at depths ranging from 4.2 to 50 meters. A total of 1456 *P. nobilis* individuals were censused. The field survey was carried out at the end of July 2011 and July 2012. We used regression kriging (RK) to predict the spatial distribution of *P. nobilis* densities within the MPA. This approach combines the results of a generalized linear model (GLM) with an autocorrelation map of the residuals calculated with ordinary kriging. The GLM was calculated using different environmental variables (i.e., depth, slope, habitat, wave exposure and zoning protection) as explanatory variables and using the AIC criterion for model selection.

Results and Discussion

P. nobilis maximum densities were found in *P. oceanica* meadows reaching values up to 37.3 ind/100m² in a no-take MPA sheltered site (Santa Maria bay at 8 m depth) (Fig. 1). The prediction map showed that the species is present in the whole MPA up to 50 meters depth, and highlights the presence of some hotspots within the MPA (Fig. 2). A map of the spatial distribution of *P. nobilis*, accompanied with knowledge of its population ecology, provides useful information for the management and monitoring of this endangered species in the MPA.

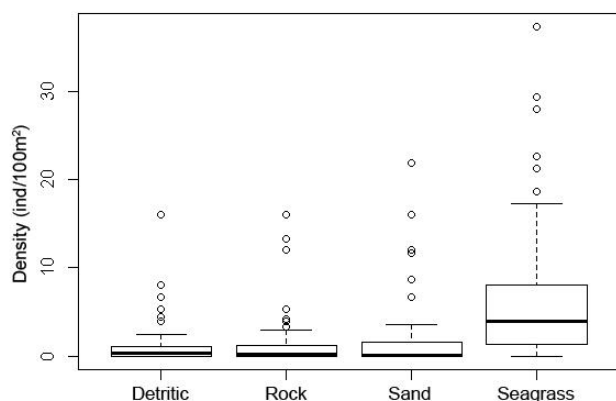


Fig. 1. Box plot of *P. nobilis* density (ind/100m²) in Cabrera National Park for

the different studied habitats. Whiskers: standard error; dots: outliers.

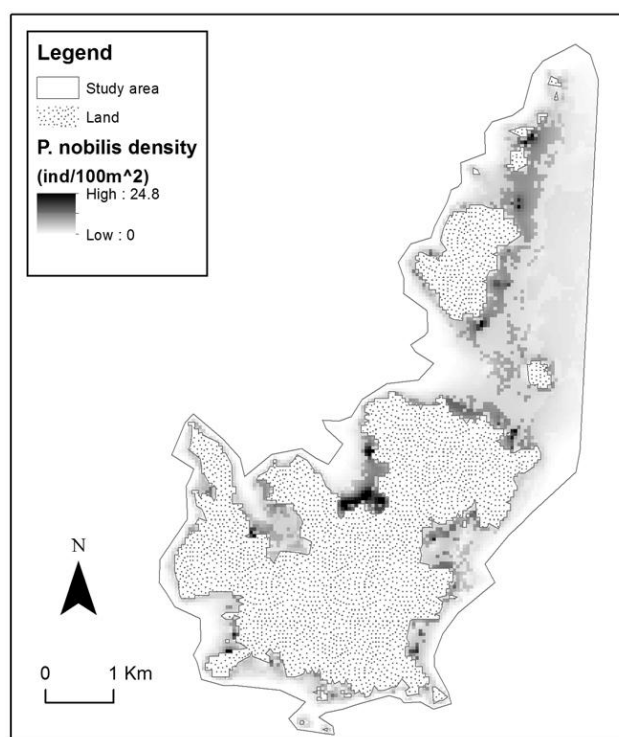


Fig. 2. Prediction map of *P. nobilis* densities within Cabrera National Park MPA.

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References

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