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UNIVERSITAT POLITÈCNICA DE VALÈNCIA IGIC

36TH EUROPEAN CETACEAN SOCIETY
NAVIGATING WATERS OF CHANGE
AZORES 2025

AD-57

"Mapping cetacean presence and abundance and establishing biological indicators in the Port of Cartagena as part of the LIFEPortSounds project."

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INTRODUCTION

As part of the LIFEPortSounds project, this study assesses the spatial presence and abundance of cetaceans around the Port of Cartagena. Based on these findings, sound mitigation measures will be implemented, and their effectiveness will be evaluated to determine whether they lead to positive outcomes for local cetacean populations.

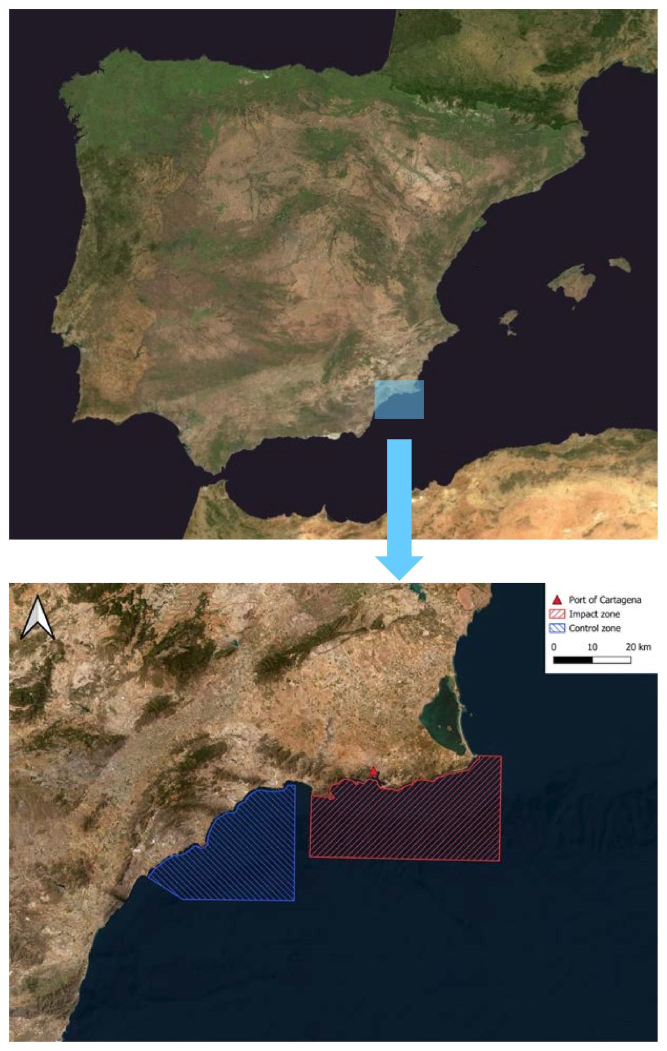
METHODS

We chose a BACI (before-after-control-impact) study, designated the two study areas (Impact and Control) and selected three target species: *Globicephala melas*, *Tursiops truncatus* and *Stenella coeruleoalba*.

We collected both, visual and acoustic data.

Sightings were used to estimate abundance and to develop habitat use models based on Generalized Additive Models (GAMs).

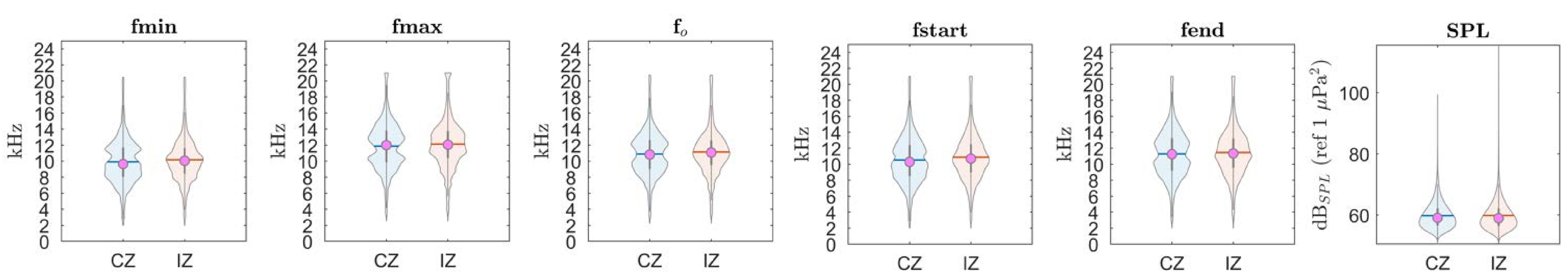
Spectrograms were used to annotate whistle contours and identify species, extracting eight descriptors as input to a decision tree.



RESULTS

Percentage of whistle events, based on A. Gannier et al. 2010 (1) classification method, divided by zone.

Minimum, maximum, mean, start and end frequencies and sound pressure level for all vocalizations, in the impact and control zones:



A sound database catalog with 65 clips of vocalizations of 6 species has been created. https://samaruc.webs.upv.es/index.php/intranet/
Password: **LIFEPortSounds**

Sightings data from 10 boat-based and 10 aerial surveys conducted between 2018 and 2024.

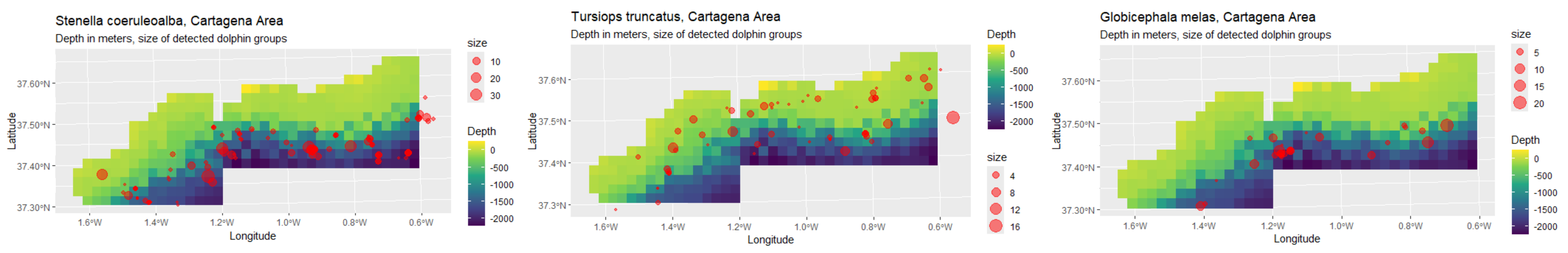
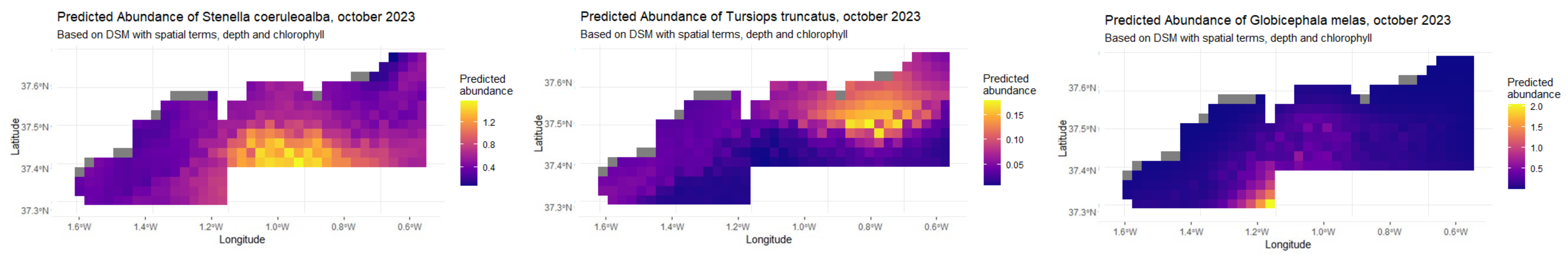


Table 1. Density estimates (individuals/km²), coefficient of variation (CV), lower (LCI) and upper confidence interval (UCI); for each zone.

	Control				Impact			
Species	Density	CV	LCI	UCI	Density	CV	LCI	UCI
S. coeruleoalba	**0.921**	0.467	0.380	2.231	**0.376**	0.339	0.196	0.723
T. truncatus	**0.165**	0.455	0.069	0.392	**0.172**	0.273	0.101	0.292
G. melas	**0.159**	0.669	0.046	0.542	**0.132**	0.476	0.054	0.324

An example of a distribution model for each species, incorporating spatial terms, depth, and chlorophyll as covariates, using chlorophyll data from October 2023.



DISCUSSION

- Density estimates show relatively high uncertainty due to the low number of detections. The substantial overlap between confidence intervals suggests that differences between Control and Impact may not be statistically significant.
- No significant differences in acoustic behavior have been observed between the Impact and Control zones, as expected, since mitigation measures have not yet been implemented.
- Comparing these outputs with post-mitigation results is expected to improve estimate and model accuracy, leading to more insightful conclusions.

Reference: (1) A. Gannier, S. Fuchs, P. Quèbre, and J. N. Oswald, "Performance of a contour-based classification method for whistles of Mediterranean delphinids," *Appl. Acoust.*, vol. 71, no. 11, pp. 1063–1069, Nov. 2010, doi: 10.1016/j.apacoust.2010.05.019.

Life PortSounds Navigation in Cartagena: a whale friendly port
GOBIERNO DE ESPAÑA MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO
Cofinanciado por la Unión Europea
Puerto de Cartagena
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