Corresponding autor
Marc Ruiz-Sagalés
mruizisag@ub.edu

Where and when?

Monthly habitat suitability prediction of two teutophagous cetaceans in the Azores

Marc Ruiz-Sagalés[1,2], Marc Tolosa[1,2], Margarida Rolim[2], José MN Azevedo[2] & Laura González García[2]

1. Department of Evolutionary Biology, Ecology and Environmental Sciences, and IRBio, Faculty of Biology, University of Barcelona, 08028 Barcelona, Spain.
2. cE3c- Centre for Ecology, Evolution and Environmental Changes, Azorean Biodiversity Group,CHANGE – Global Change and Sustainability Institute, Faculty of Sciences and Technology,University of the Azores, Rua da Mãe de Deus, 9500-321, Ponta Delgada, São Miguel – Azores, Portugal.

Introduction

- Ecological requirements act as key factors that determine cetacean distribution patterns (1,2). Within the frame of a climate change scenario, distribution of two teutophagous species in the Azores, the **Risso's dolphin** (*Grampus griseus*), RD, and the **short-finned pilot whale** (*Globicephala macrorhynchus*), SFPW, might experience a shift due to unmatched ecological niche and habitat conditions (3).
- Here, we aimed to determine the **habitat preferences** and predict the **distribution** of both species over the year, at fine resolution.

Methods

- The study area, situated in the **Azores Archipelago**, integrated waters off islands; from the **central** (Faial, Pico, São Jorge and Terceira) and **eastern** group (São Miguel) (Figure 1).

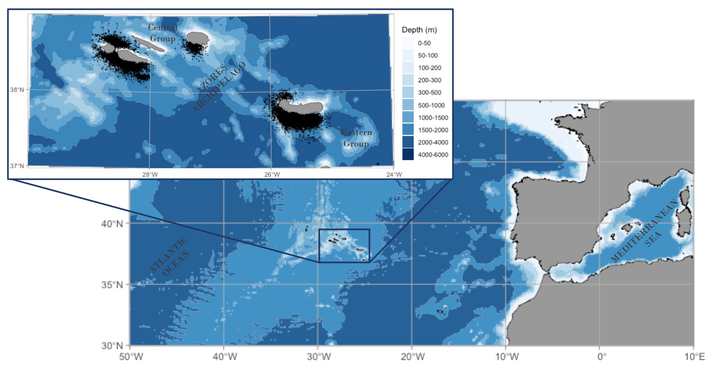

Figure 1. Study area with cetacean opportunistic sightings (in black) reported by the whale-watching companies through the MONICET platform, from 2009 to 2020.

- To assess habitat suitability for each species, we applied presence-background **species distribution models (SDM)** using Maxent algorithm (R 'dismo' package).
- Models were build by combining MONICET (http://www.monicet.net/) presence locations and a selected set of static and dynamic variables: depth (m), slope (°), distance to coast (m), chlorophyll-a (mg/m^3) and sea surface temperature (k). Which were obtained at **high resolution**, temporal (daily) and spatial (0.05°x0.05°), using the E.U. Copernicus Marine Service (https://marine.copernicus.eu) (4).

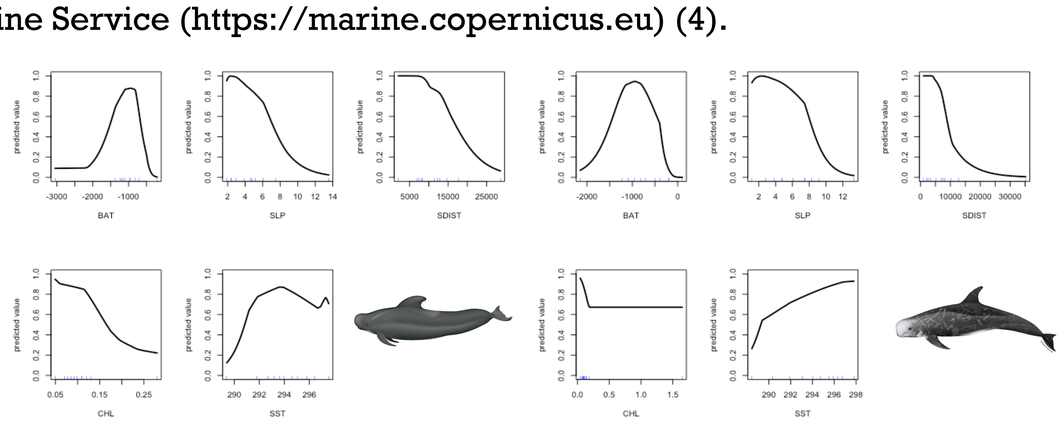

Figure 2. Predicted habitat suitability for each environmental variable (depth, slope, distance to coast, chlorophyll-a concentration and sea surface temperature) for SFPW (left) and RD (right). Image source: American Cetacean Society.

Results

- SFPW preferred deeper areas, further from the coast, than RD. Both species also selected positively warm and low-productive waters, but RD had a wider temperature range tolerance than SFPW (Figure 2).

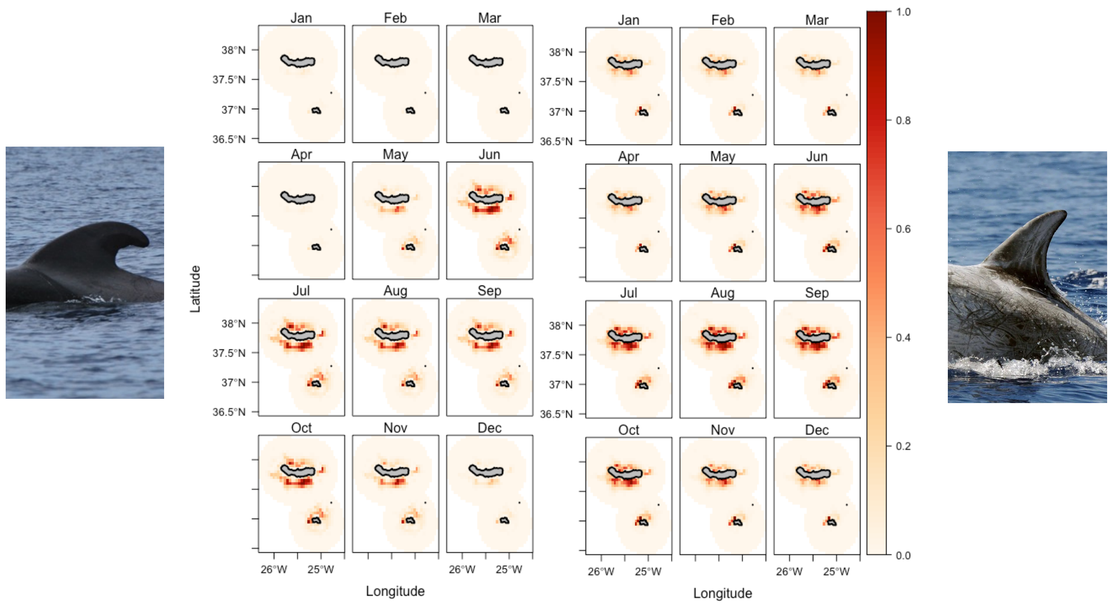

Figure 3. Habitat suitability maps by month of the eastern islands group for SFPW (left) and RD (right).
Image source: Miranda van der Linde & WDC

- We found seasonal variability of habitat suitability, having lower values from December to May for SFPW, while RD presented relatively high values during those months and the rest of the year (Figure 3).

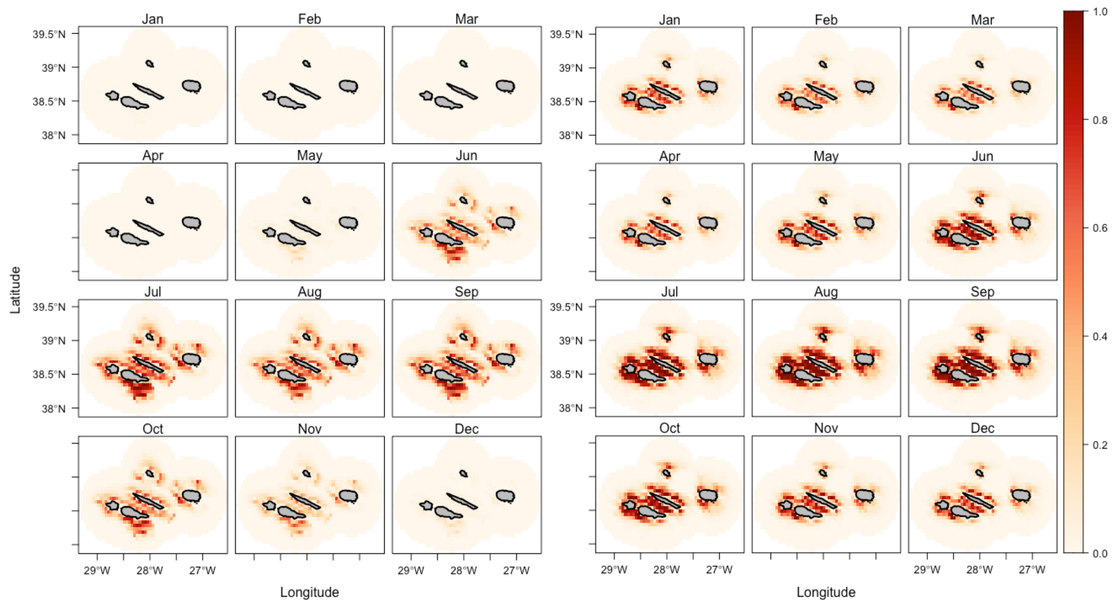

Figure 4. Habitat suitability maps by month of the central islands group for SFPW (left) and RD (right).

- Our results suggest a certain niche segregation, but there is still a large area of suitable habitat that is overlapped during summer and autumn, especially in the central group islands (Figure 4).

Conclusions

- In the Azores, RD and SFPW have slightly different ecological requirements. However, their habitat has a major overlap during summer and autumn, in both island groups.
- The SFPW only shows high habitat suitability between May-June to November, while RD shows it during all the year. This forces SPFW migration during winter and spring, probably to other parts of the Macaronesia (5). This may result in an increase of interspecific competition between this two teutophagous species during summer and autumn, enabling a competitive displacement in the areas where they currently cooccur (6).
- More research is necessary to forecast future scenarios with climate change and to discuss appropriate conservation issues.

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