

WHERE ARE THE MINKES?

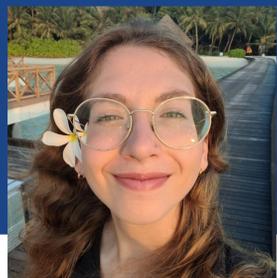
Influence of present and future environmental conditions on the abundance and distribution of the common minke whale (*Balaenoptera acutorostrata*)

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Introduction

Very little is known about the implications of climate change on the common minke whale⁽¹⁾ (*Balaenoptera acutorostrata*) (Fig. 1) and how they will affect the future abundance and distribution of this species. In this study, **we explore the population of common minke whale in the Algarve region** (south of Portugal), **we assess how the environmental variables sea surface temperature (SST), and chlorophyll-a concentration (Chl-a) can potentially influence its abundance, and we understand the potential future habitat suitability in an area of the North Atlantic Ocean⁽¹⁾.**



Fig. 1 - Adult *B. acutorostrata* in southern Portugal © AIMM.

Methodology

Dedicated and opportunistic boat surveys in the Algarve collected presence data (108 sightings between 2015 and 2023) of common minke whales (Fig. 2) on which the Generalized Additive Models (GAMs) were applied to assess non-linear relationships between environmental variables and whale occurrence.

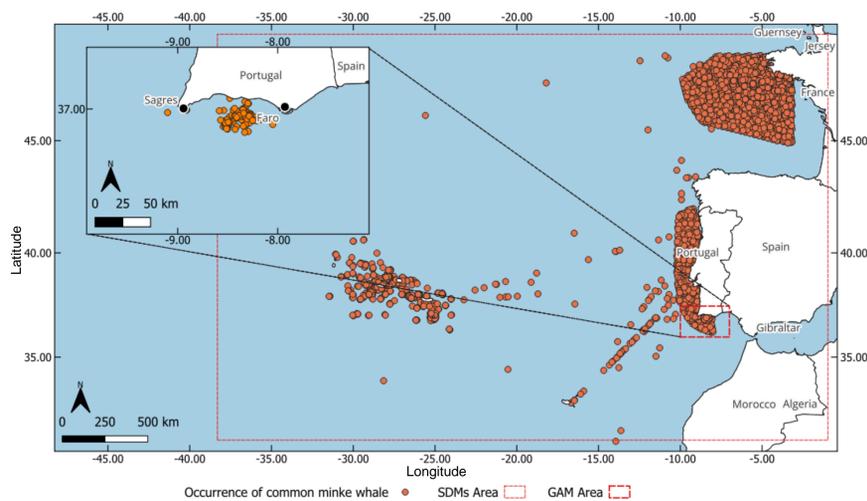


Fig. 2 – Areas of study and occurrences of *B. acutorostrata*.

For the Species Distribution Models (SDMs) data from GBIF was added to the field data (6615 records) to increase the precision of the predictions of future distributions of the species under four Shared Socioeconomic Pathways (SSPs: 1-1.9, 1-2.6, 4-6.0, 5-8.5; CMIP6), across three timeframes—2030, 2040, and 2050—to evaluate the potential impacts of climate change on the species' range in the North-Eastern Atlantic (Fig. 2).

Discussion and Conclusion

There is a significant relationship between environmental variables and the monthly abundance rate of *B. acutorostrata* in the Algarve, as **monthly abundance appears to be linked to SST and Chl-a, likely reflecting shifts in prey availability⁽²⁾. SDMs project a poleward shift in suitable habitats, predominantly influenced by SST and Chl-a, with potential implications for the species' feeding and migratory behavior⁽³⁾.** Further research is needed to clarify the influence of additional environmental variables on whale distribution and to inform effective conservation strategies for this understudied and increasingly threatened species.

Results

The GAM analysis revealed a significant relationship between environmental variables and abundance rate: **SST showed a strong influence, while Chl-a exhibited a weaker but relevant influence.**

In the SDMs analysis, **the environmental variables that predominantly influenced the projections were SST and Chl-a**, while the others (phytoplankton concentration and bathymetry) had a minor impact. Looking at the predictions, the comparison of current habitat (Fig. 4) with future projections across different climate scenarios shows clear patterns in habitat suitability shifts:

- **SSP1-1.9 & SSP1-2.6:** show increased suitability at higher latitudes and decreased suitability near the equator. Changes in SSP1-2.6 are slightly less pronounced than in SSP1-1.9.
- **SSP4-6.0 & SSP5-8.5:** exhibit an overall decline in suitability across latitudes. SSP4-6.0 shows a strong reduction, affecting even higher latitudes and causing a major drop near the equator. SSP5-8.5, while still showing a decline, presents slightly better conditions than SSP4-6.0, with less severe losses at both ends of the latitudinal range.

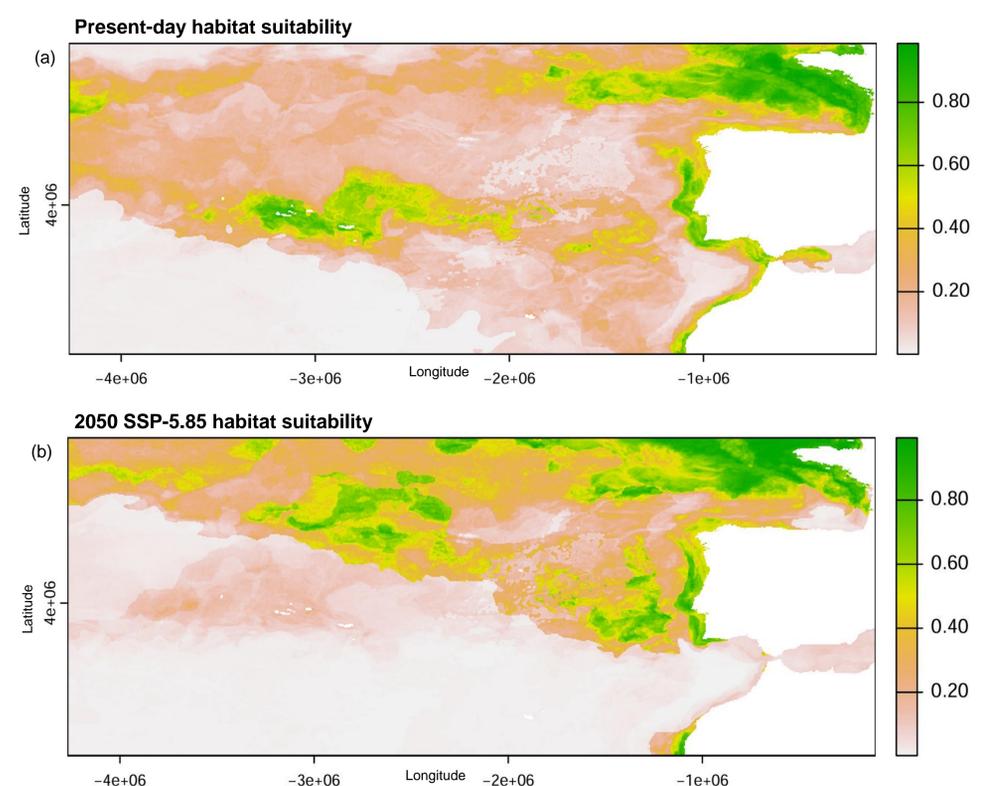


Fig. 4 – Maps of the habitat suitability of the present day (a), and of 2050 in scenario SSP5-8.5 (b).

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More info here!



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