Use of satellite information to understand de effect of climatic variables on the distribution of elephant seals in North-American and Arctic waters.

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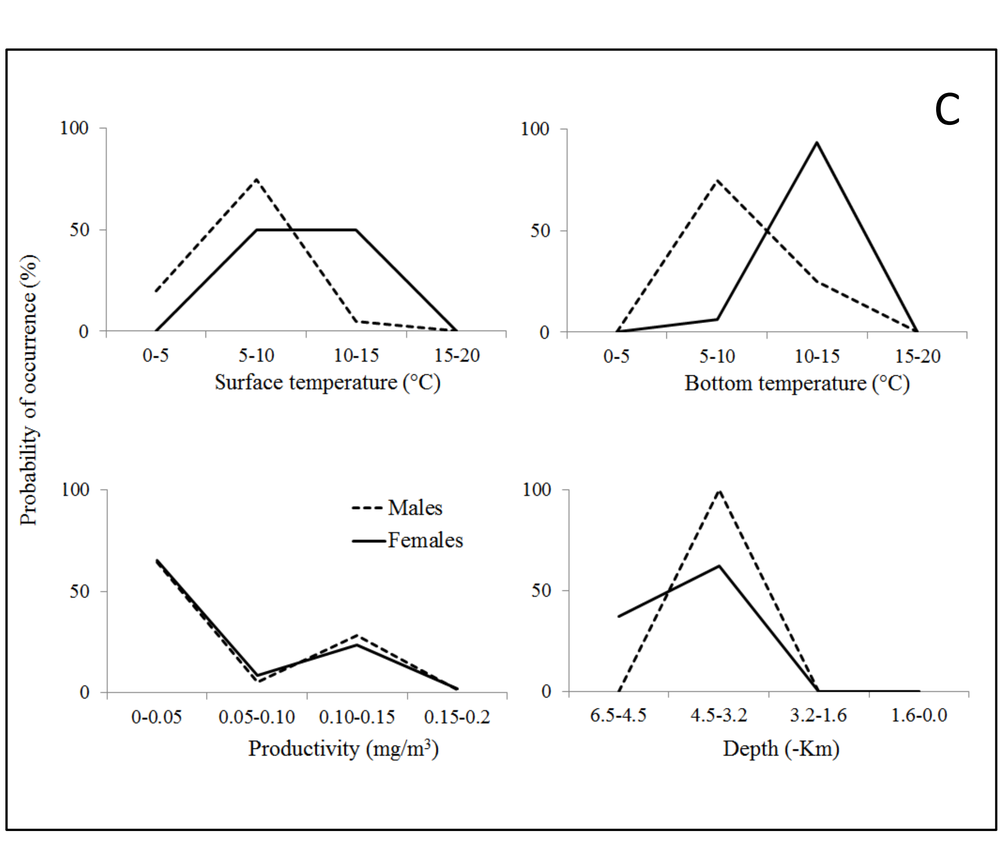
Introduction

- In recent years the use of satellite information has increased in different areas related ecology and conservation. In particular in the use of so-called "species distribution models' (SDMs), which use environmental and climate data as independent variables, and georeferenced records of species to estimate habitat suitability potential and predict ecological changes due to anthropogenic impacts. SDMs are particularly useful in assessing the impact of climate change and protected area design.
- Northern elephant seals (*Mirounga angustirostris*) are among the most sexually dimorphic and polygynous species of all mammals, and they show spatial segregation between males and females. **The objective** of this work was to correlate female and male foraging distributions of these seals with main climatic variables at a biogeographical scale in North Pacific and Arctic waters.

Materials and methods

- We used satellite, website and bibliographical sources to obtain information on adult elephant seal distribution and environmental predictors (surface and bottom sea temperatures, productivity, salinity, winds, and bathymetry) and three species distribution models [*maximum entropy model, environmental niche factor analysis and based on climatic envelopes (BIOCLIM*)] to predict the habitat suitability of ocean regions.
- The missions sources of environmental variables were: ***Aquarius SAC-D, NASA Ocean Biogeochemical Model, Pathfinder AVHRR, Modis Aqua.***
- Model resolution was 300 km x 300 km.
- The area under the ROC curve (AUC) estimated model fit.



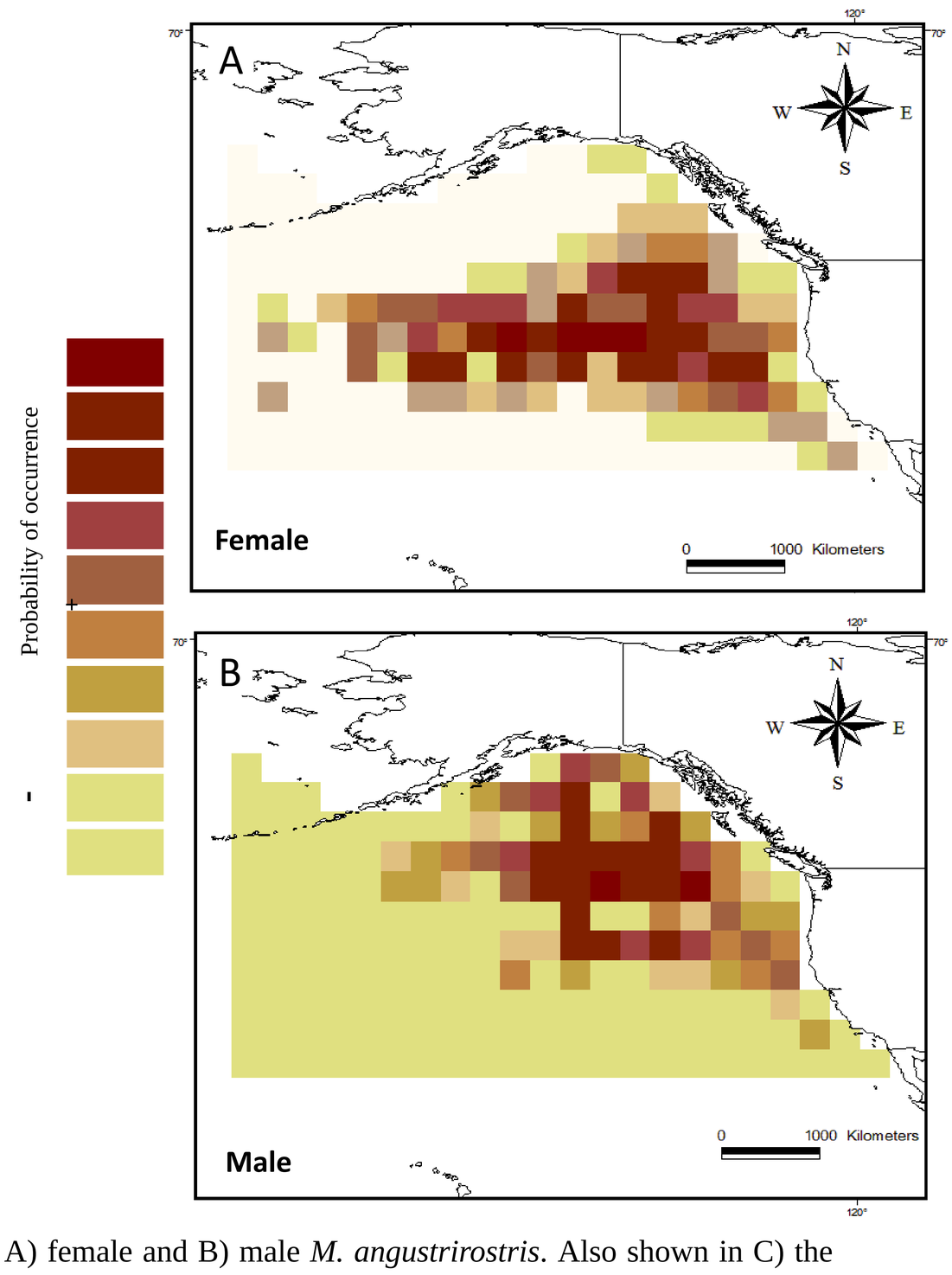


Figure 1. Results obtained BIOCLIM model. Probability of occurrence for A) female and B) male *M. angustrirostris*. Also shown in C) the ratio of *the most* important environmental variables with the probability d occurrence.

Results

- BIOCLIM provided the best fit.
- Sea surface and bottom temperatures were the variables with the highest explanatory power for females, while bathymetry was for males.
- Predictive maps suggest that low temperatures constrain female, but not male, distribution at high latitudes.

Discussion

- We suggest that large size increases foraging efficiency of males because, among other benefits, it augments thermal insulation, improving the use of cold, rich sectors of the ocean.
- Different thermoregulatory abilities between sexes due to size dimorphism should be a complementary explanation of sexual segregation in elephant seals.
- This example serves to show how species distribution models and satellite information can be used to predict key environmental variables that can affect species survival.