Supplementary Material S3

# Modeling of habitat suitability

The habitat suitability of cetaceans was modeled using the maximum entropy algorithm (MaxEnt; Phillips et al. 2006). Historical georeferenced sightings (from the 1970s to 2010s) of the odontocetes were compiled from the literature and online databases. Given the high displacement capacity of cetaceans, and because there are no physicals barriers for them in the marine environment, the modeling area was not restricted to the Gulf of Mexico, but it was extended to include the warm-temperate and tropical oceanic provinces of the northwest Atlantic Ocean. The databases generated (one per species) were filtered to reduce the sample bias and the spatial autocorrelation using the distance restriction of the nearest neighbor, which was estimated based on the average daily displacement of each species.

**TABLE S3 |** Total number of georeferenced sightings of the eight odontocetes, period of the presence data, filtering distance (average daily movement), and number of sightings used in the modeling (sample size).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Common**  **name** | **Period**  **(years)** | **Total sightings** | **Filtering distance**  **(km/day)** | **Sample size** |
| Sperm whale | 1978 – 2017 | 810 | 90 | 70 |
| Short-finned pilot whale | 1984 – 2017 | 200 | 80 | 61 |
| Risso’s dolphin | 1990 – 2017 | 330 | 80 | 54 |
| Pantropical spotted dolphin | 1983 – 2012 | 800 | 90 | 93 |
| Clymene dolphin | 1990 – 1998 | 108 | 70 | 37 |
| Atlantic spotted dolphin | 1979 – 2015 | 1,557 | 70 | 128 |
| Rough-toothed dolphin | 1983 – 2017 | 90 | 90 | 37 |
| Bottlenose dolphin | 1971 – 2017 | 3,778 | 35 | 305 |

Environmental predictors included both oceanographic and bathymetric variables. Oceanographic variables were the sea surface temperature (°C) and chlorophyll-*a* concentration (mg/m3), which were included in three metrics: annual mean, minimum, and maximum. Weekly values (8-day composite) of both variables were used and averaged across 16 years (2002-2018) with available data. Bathymetric variables were depth (m), bottom slope (degrees), and distance to the 200-m isobath (m).

Habitat suitability modeling was conducted using the ENMeval package (Muscarella et al. 2014) in R. Models were built with a random sample of 10,000 background points (*i.e*., points not registered as occurrence records in the modeling area that are contrasted with the occurrence positions) and selected the Linear, Quadratic, and Hinge features of the MaxEnt algorithm. The cross-validation of the models was done using the block method that split the presence data into four bins, three as training data and one as test data, based on the latitude and longitude lines that divided the occurrence localities (Muscarella et al. 2014). The performance of each model was evaluated using the area under the receiver-operator curve (AUC), which measures the discriminatory ability of each model, and the omission rate (OR), which indicates the proportion of test localities that fall into cells not predicted as suitable (Philips et al. 2006). The logistic output was selected and the habitat suitability for every 0.041° x 0.041° cell of the modeling area was obtained, which is expressed as an interval between 0 (unsuitable conditions) and 1 (highly suitable conditions). Habitat suitability maps were re-scaled to a resolution of 0.25º x 0.25º to have the same spatial resolution as the oil spill scenarios.

The performance of each model was evaluated using the area under the receiver-operator curve (AUC), which measures the discriminatory ability of each model, and the omission rate (OR), which indicates the proportion of test localities that fall into cells not predicted as suitable (Philips et al., 2006). An AUC of 1 indicates perfect discrimination between sites where the species is present or absent, and an AUC > 0.5 indicates that the model performance is less capable than the random assumption (Elith et al. 2006). The 10 percentile training omission rate (OR10) was used because it is less sensitive to outlier presence locations (Radosavljevic and Anderson 2014). Omission rates greater than the expected value of 0.1 (or 10%) suggest model overfitting (Peterson et al. 2011; Radosavljevic and Anderson 2014). Finally, the contribution percentages returned by each MaxEnt model were used, to evaluate the contribution of each environmental predictor (Phillips et al. 2006).

**TABLE S4 |** Values of the area under the receiver-operator curve (AUC) and the 10-percentile training omission rate (OR10) for each model.

|  |  |  |
| --- | --- | --- |
| **Species** | **AUC** | **OR10** |
| Sperm whale | 0.83 | 0.21 |
| Short-finned pilot whale | 0.83 | 0.18 |
| Risso’s dolphin | 0.87 | 0.27 |
| Pantropical spotted dolphin | 0.74 | 0.25 |
| Clymene dolphin | 0.88 | 0.16 |
| Atlantic spotted dolphin | 0.83 | 0.20 |
| Rough-toothed dolphin | 0.83 | 0.13 |
| Bottlenose dolphin | 0.91 | 0.16 |

The full description of the modeling can be consulted in Ramírez-León et al. (2021).

# References

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