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Estimating the distribution of the common bottlenose dolphin *(Tursiops truncatus)* in the Ría de Arousa, NW Spain

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Introduction

Species Distribution Models (SDMs) are important tools in determining the distribution of marine mammals, including the species of this study, the common bottlenose dolphin (*Tursiops truncatus*).

The input of SDMs are eco-geographical variables (EGVs) and presence-only or presence-absence data, and the output is a habitat suitability map showing suitable habitat for a species.

Material and Methods

The study area was the Ría de Arousa (NW Spain), which is ideal for mussel farming due to its high productivity, which in turn attracts marine organisms to the area.[i)]

One SDM using presence-only data (MaxEnt) and one SDM using presence-absence data (GLM) used five EGVs; depth, distance to coast, distance to mussel farm, temperature and tide level to predict the distribution of *T. truncatus* in the Ría. I used data from a three-month period (data collected by BDRI from June to August 2014), which accounted for 139 presence records for MaxEnt, and additionally absence data for GLM. Figure 1

Figure 1. The created polygon-shaped vector grid (in QGIS) of the size of 2500 m inside the Ría de Arousa.

The maps with each EGV were interpolated and converted into Idrisi32 Raster-format. Figure 2

The predictive competence of the models was compared by their AUC-values.

Results and Discussion

- MaxEnt performed very well (AUC = 0.95), and GLM had a good fit of data (AUC = 0.70) Figures 3,4

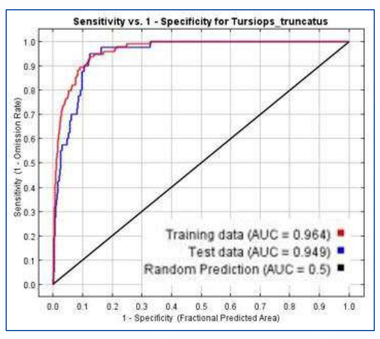

Figure 3. ROC-curve for MaxEnt

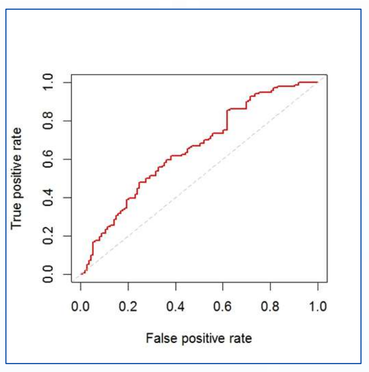

Figure 4. ROC-curve for GLM

- MaxEnt provided visually a good habitat suitability map Figure 5, whereas GLM contributed to the results quantitatively

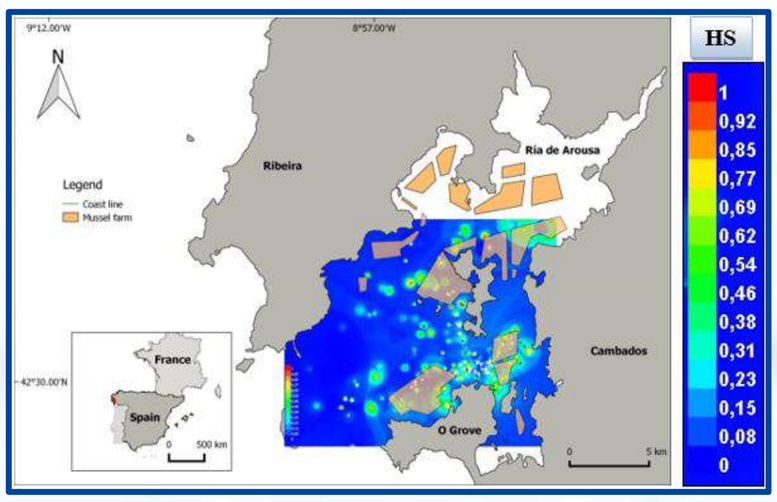

Figure 5. A **habitat suitability map** produced by MaxEnt in logistic output format. Red indicates high probability of suitable conditions, green indicates where the species is found and blue gives low predicted probability of habitat suitability.

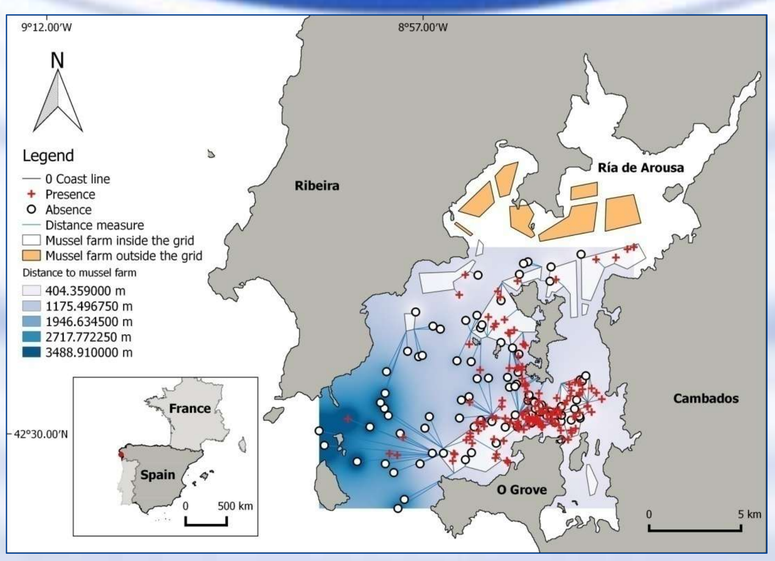

Figure 2. The interpolated map (in QGIS) for the variable ‚distance to mussel farm' in Idrisi32-format.

- The results by both models indicated a strong relation between *T. truncatus* presence and the variable distance to mussel farm (figures 2 and 5)
- Most certainly this is due to the high density of prey species around the mussel farms *T. truncatus* relies on

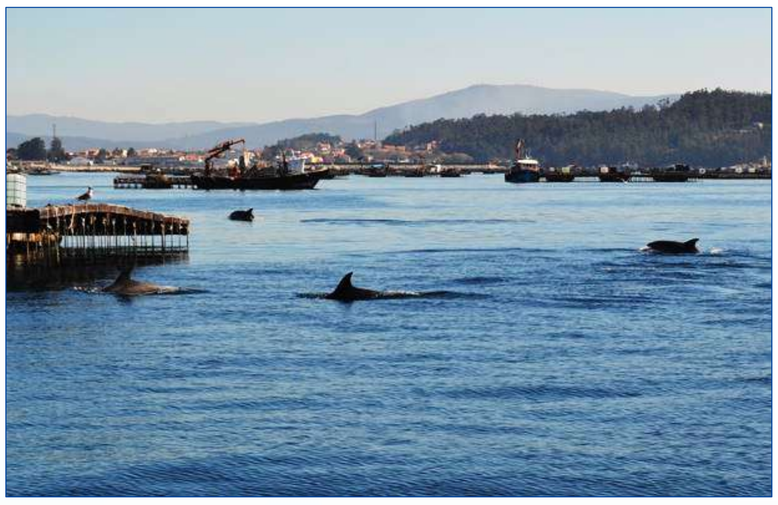

Figure 6. Common bottlenose dolphins occur in the close proximity of mussel farms in the Ría de Arousa (photo from the year 2015).

Conclusions

Mussel farming has a positive impact on the *T. truncatus'* use of habitat in the Ría de Arousa. Previous studies have shown shellfish farming having a negative impact on *Cetaceans* [ii)]

The present study shows new insight not only into the impact of mussel farming on dolphins specifically in the Ría de Arousa, but also worldwide interest due to the contrary results from previous studies obtained

Literature cited

i) Díaz López, B. and Methion, S. (2017) The impact of shellfish farming on common bottlenose dolphins' use of habitat. Mar Biol 164 (4): 83

ii) Würsig, B. and Gailey, G. A. (2002) Marine mammals and aquaculture: conflicts and potential resolutions. Responsible Marine Aquaculture. CAP International Press, New York, 45-59

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