Modelling the redistribution of harbour porpoises due to pile driving

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Introduction

The harbour porpoise *Phocoena phocoena* is the most abundant marine mammal in the southern North Sea, and at the same time the most sensitive one to excessive underwater sound. We investigated the displacement of harbour porpoises during impulsive pile driving for the construction of an offshore windfarm (March – April 2011), and developed a redistribution model.
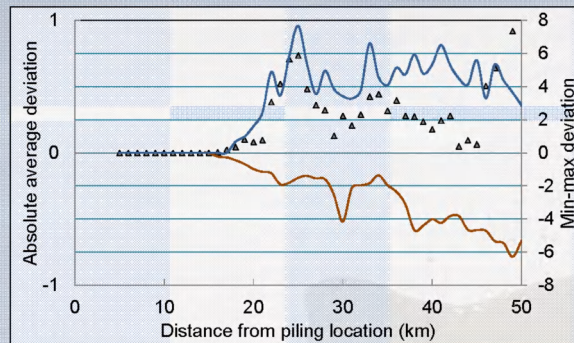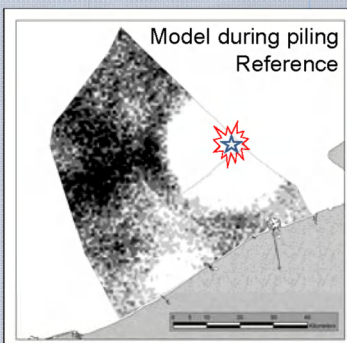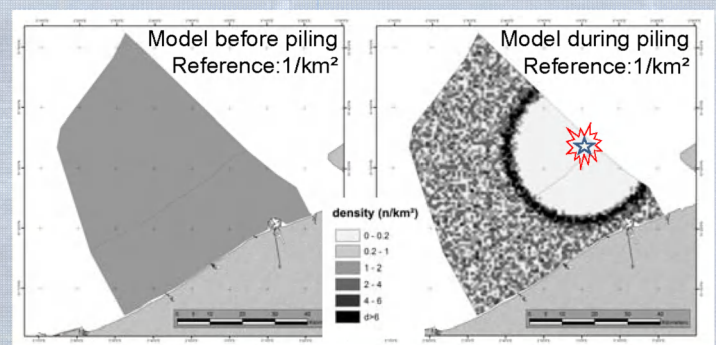
Surveys

1) Standardised aerial (distance) surveys before piling (reference situation) and during piling
2) Transformation of observations into a density surface map
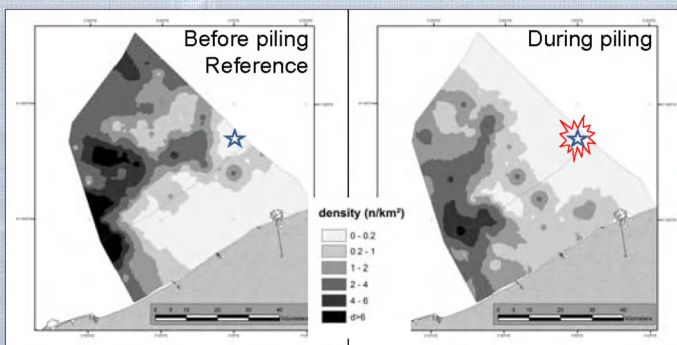
Model

3) Model development, based on anticipated directional and random movement of porpoises
4) Modelling redistribution using hypothetical data (av. of 1 animal/km²): 2h piling, 2h no piling

5) Application of the model to the reference situation
6) Quantification of model results vs. actual situation, as a function of the distance from the piling location

Figure extreme left: Density surface map resulting from the application of the model to the reference situation
Figure left: Deviation of the model from the redistribution observed, based on normalized maps, as a function of the distance from the piling location (triangles; left axis), and min/max deviation (lines, right axis)

Conclusions

1) Aerial surveys suggested a displacement of porpoises up to more than 20 km from an active piling site.

2) The model results showed a good agreement with observations in the area around the piling location.

3) The model can be used to predict the redistribution of harbour porpoises in different piling conditions.

Images: background top: Jan Haelters; background bottom: B.Vastenhouw

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