

Effects of ship traffic on the distribution of harbour porpoise (*Phocoena phocoena*)

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The North Sea is known to be one of the busiest shipping areas in the world. As recent studies indicate that harbour porpoises (*Phocoena phocoena*) are sensitive to ship traffic, the importance of further research on this topic has gained increasing attention. In the present study, two different common monitoring methods were used to investigate this impact.

Methods:

Harbour porpoise data

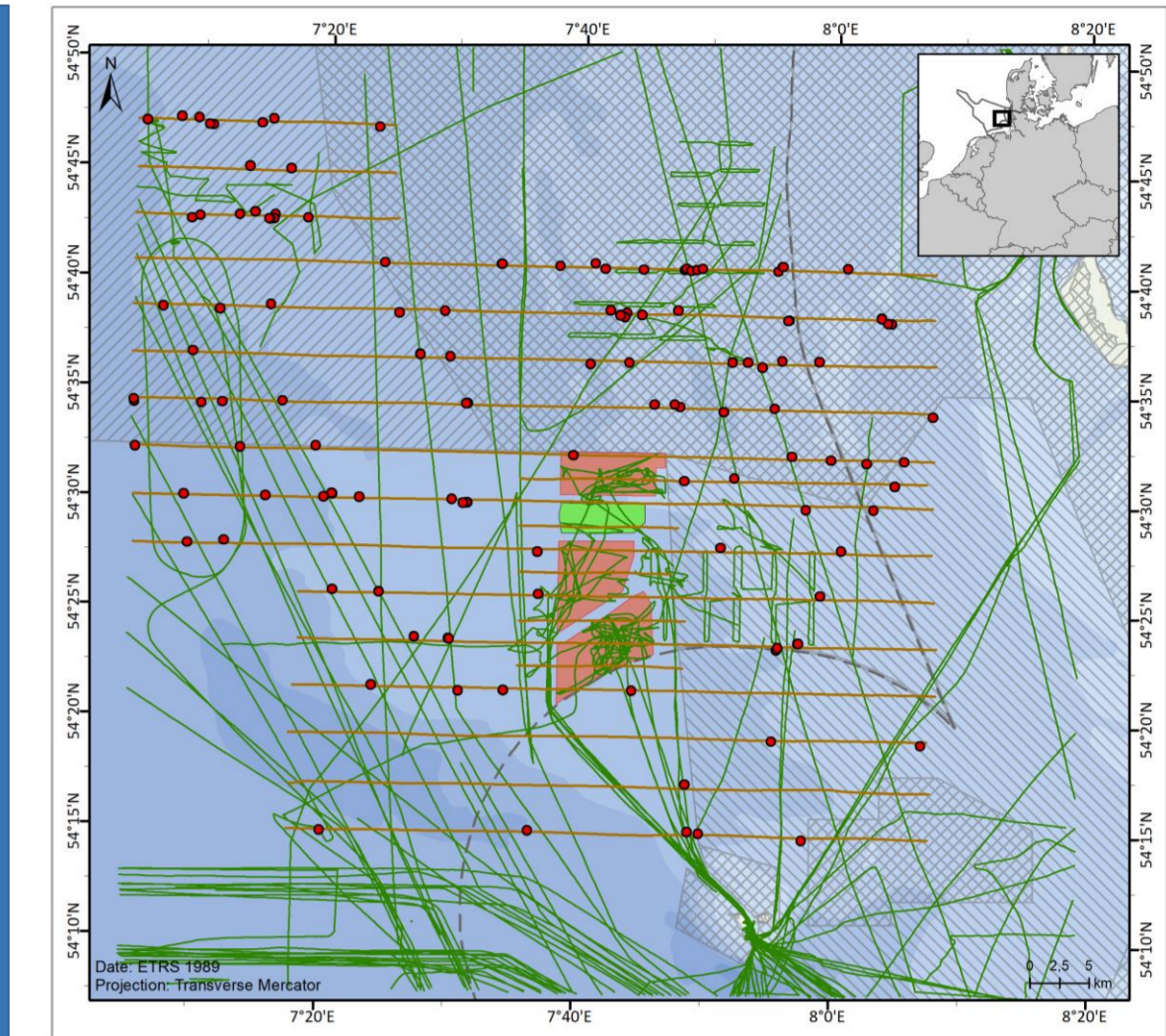
- Absolute porpoise densities derived by 7 digital aerial surveys (HiDef) in 2021 and 2022 (study area: 1,906 km²).
- Detection rates of porpoise clicks derived by C-PODs at 6 different positions (V02, V03, V08, V09, S10, S12) from June 2021 to May 2022.

Ship data

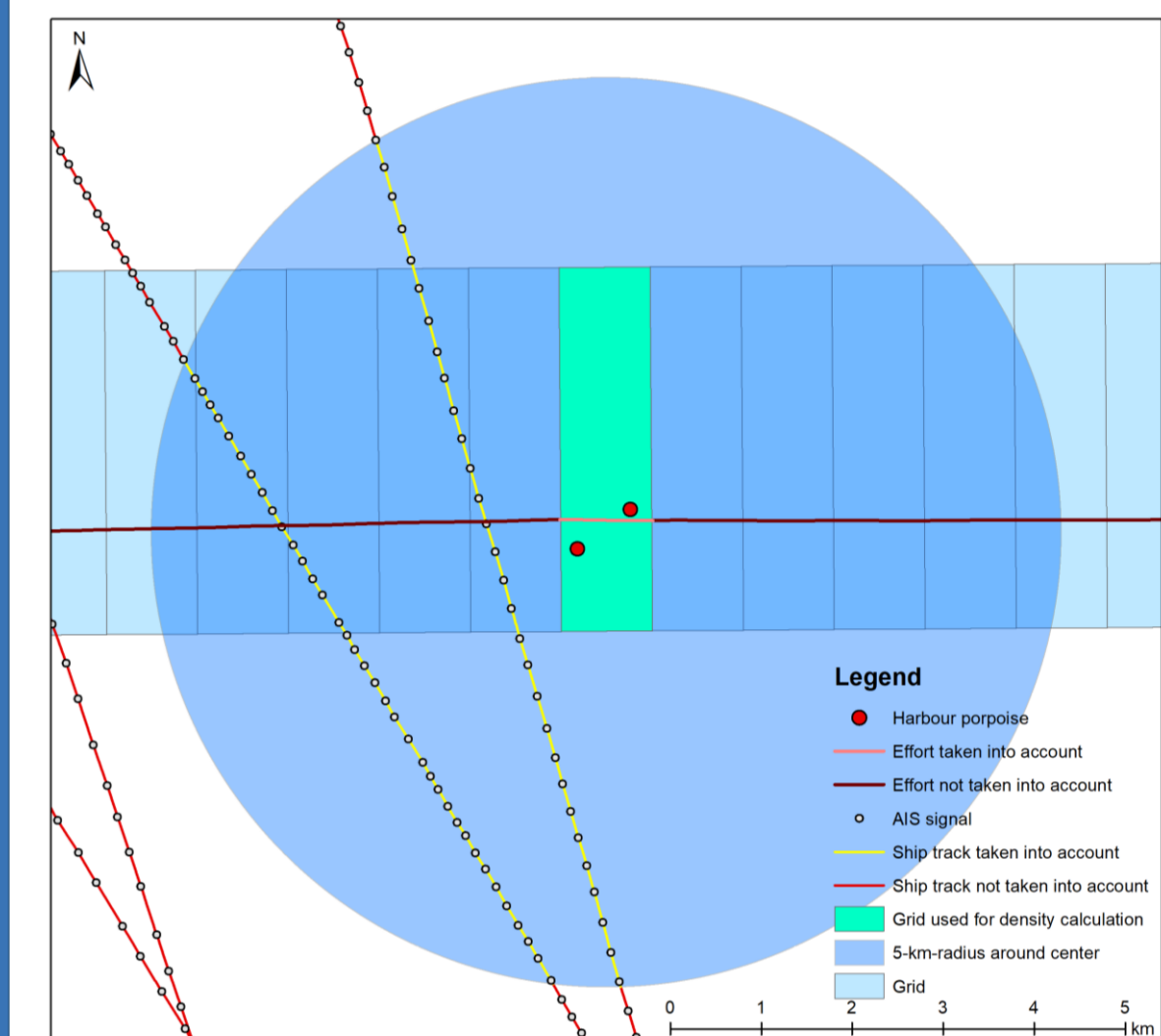
- Ship positions and tracks from AIS (Automatic Identification System) data, an automatic tracking system. For the analyses, only ships which were present during aerial surveys were considered.

Analyses

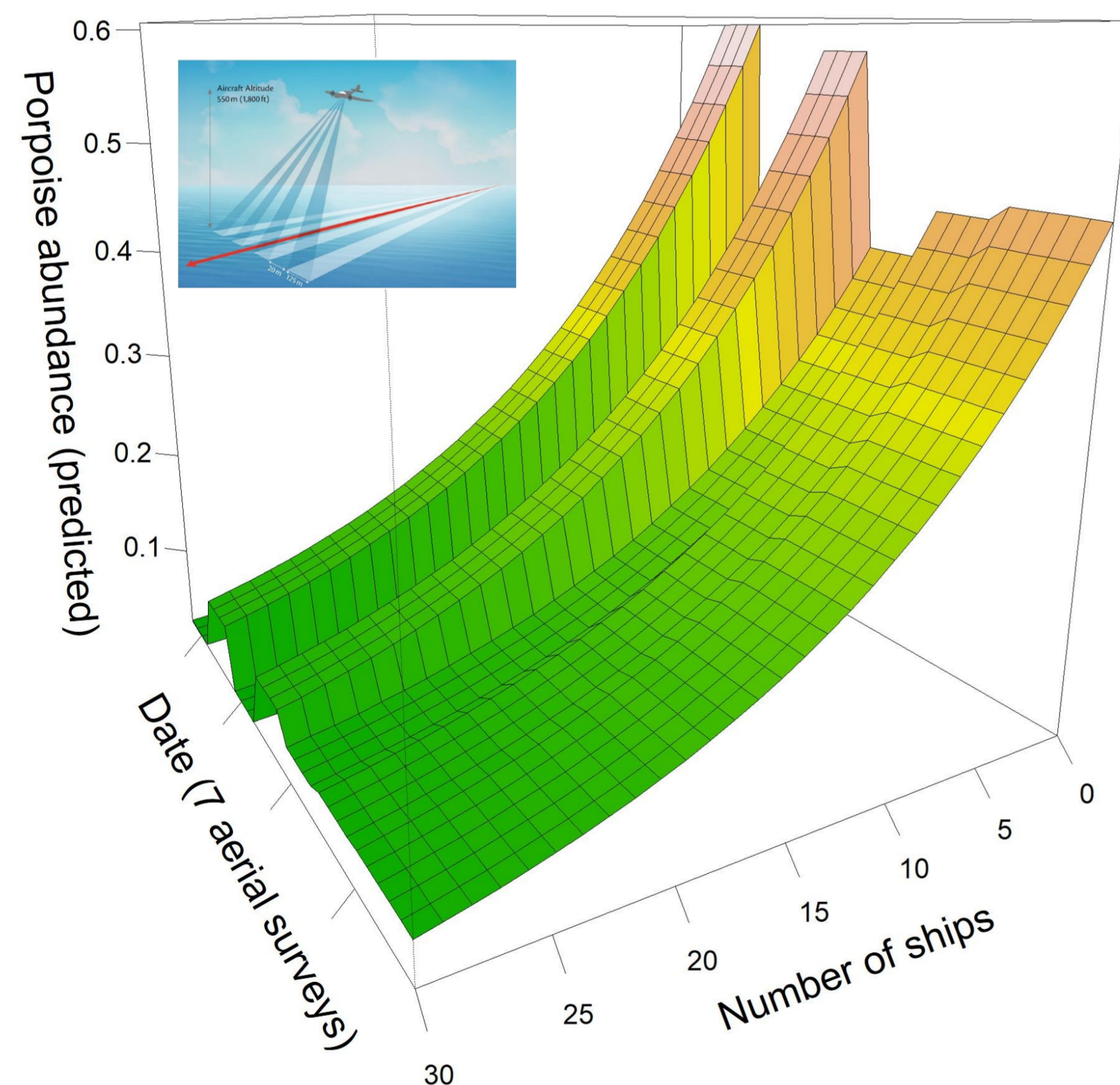
- Aerial survey transect divided into 1 km sections for density calculations.
- Buffers around each section of aerial surveys between 1 km and 5 km for ship presence calculations.
- Buffers around C-POD positions of 5 km for ship presence calculations.
- AIS-Data is matched for exact timestamp and location.
- Statistical analysis using generalized additive mixed models (GAMM).



aerial survey transects

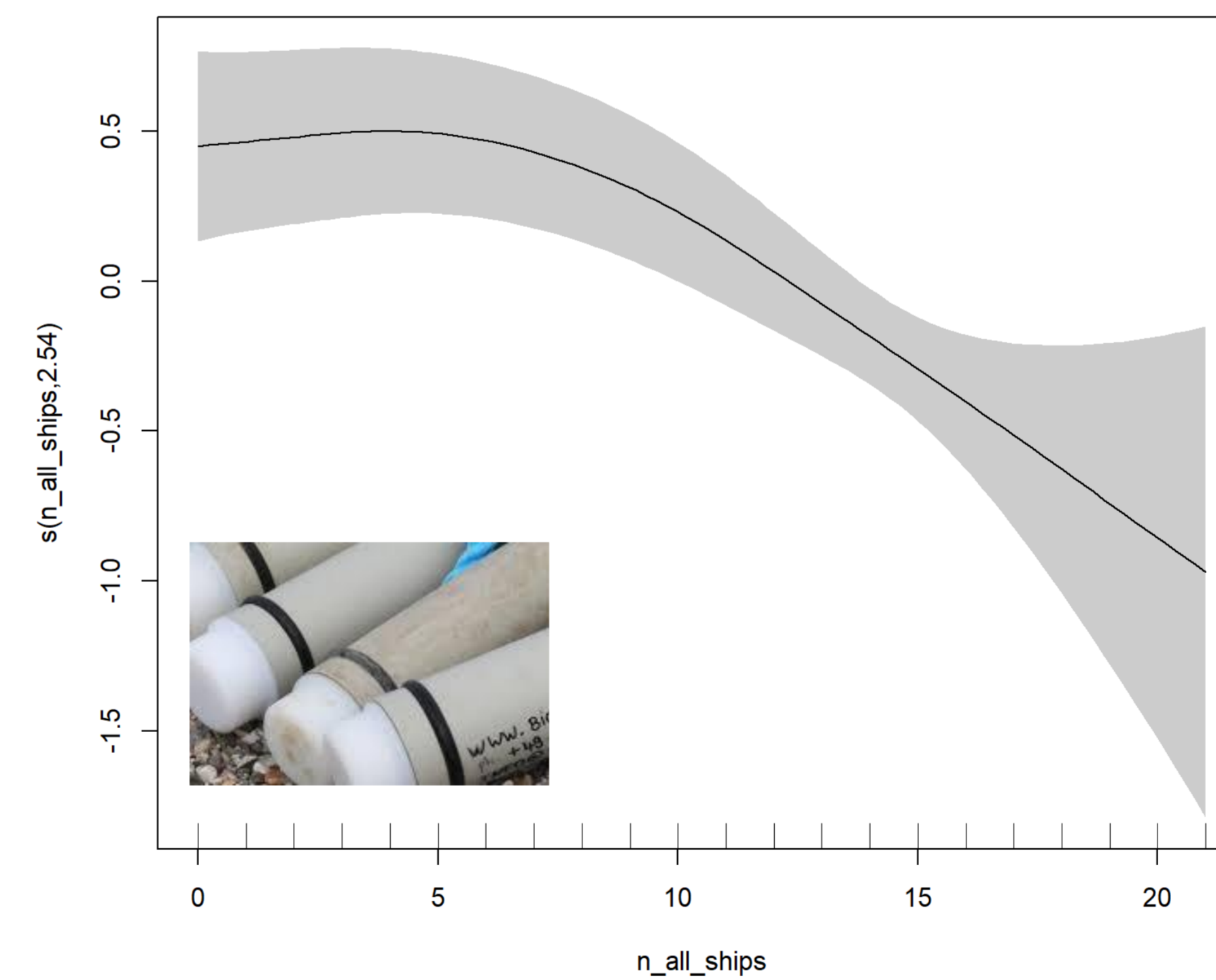


Results – aerial surveys



- Significant negative effect of the number of ships on harbour porpoise density within a 5 km radius around transect section.
- No significant effect of ship speed, ship length and time since passage of the last ship on harbour porpoise abundance.

Results – C-PODs



- Significant negative effect of the number of ships on the detection rates of harbour porpoises in the 5 km radius around C-PODs.

Conclusion

- Harbour porpoises avoid areas with high ship traffic.
- No effects of ship type or speed were observed.
- Both methods obtained the same results, indicating that both methods are equally suitable for shipping traffic impact analyses.
- First study that shows the impact of ship traffic on harbour porpoises using environmental monitoring data.

Supported by:



on the basis of a decision
by the German Bundestag

VISSKA funding reference number (03EE3043B)

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