Harbour porpoise (*Phocoena phocoena*) in the Wadden Sea World Heritage Site

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Background

The harbour porpoise is considered part of the 'Outstanding Universal Value' characterising the Wadden Sea World Heritage Site. The Trilateral Wadden Sea Plan has specified two conservation targets: (1) viable stocks and a natural reproduction capacity and (2) conservation of habitat quality.

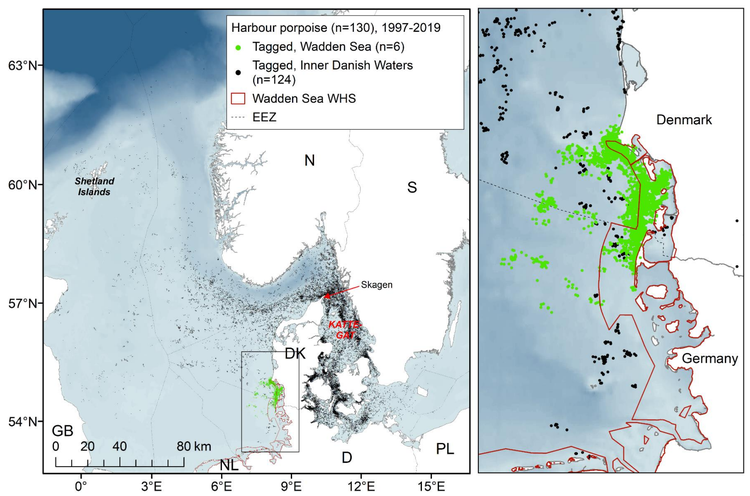
Objective

- Assess the current knowledge and occurrence of the harbour porpoise in the Wadden Sea area by collating and analysing data from regional and national research projects using telemetry, aerial surveys, strandings and passive acoustic monitoring (PAM), obtained over the years 1990–2020.
- Evaluate spatial and temporal coverage of research and monitoring programmes (anno 2022) and their suitability for the required assessment of viability, natural reproductive capacity and habitat quality.

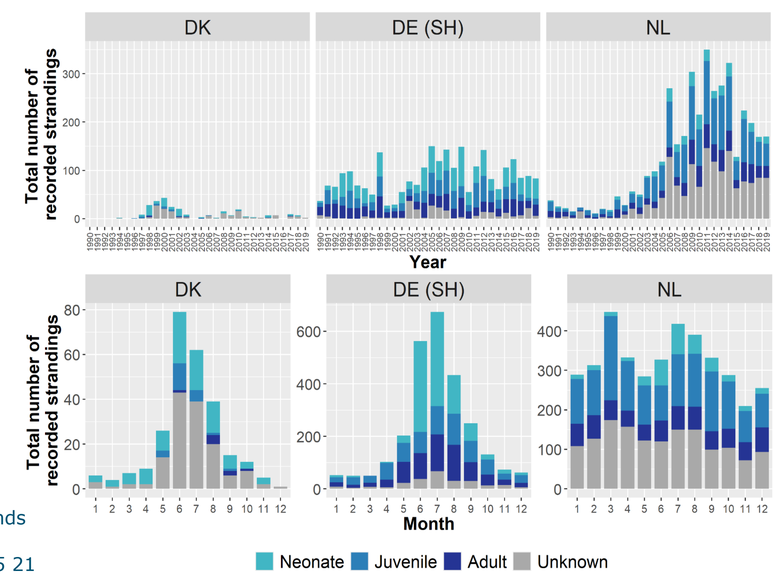
Results

Harbour porpoises are regular inhabitants of the Wadden Sea area and adjacent waters, showing seasonal movements and changes in local occurrence over time.

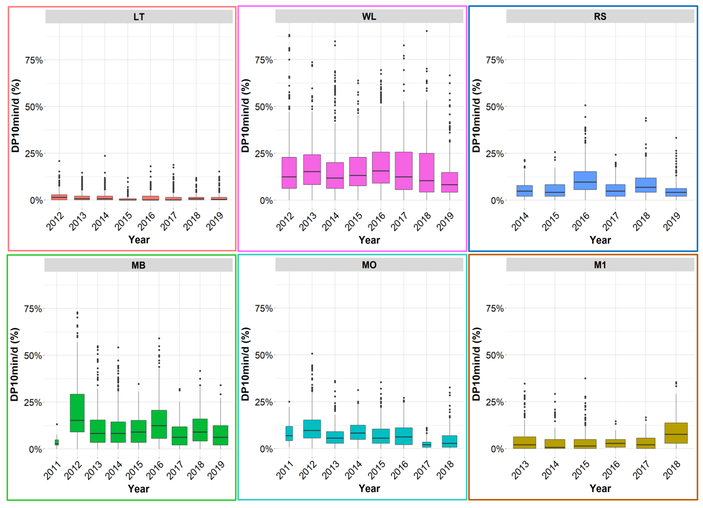
- **Aerial surveys**: Effort is patchy, with limited effort in inner Wadden Sea. Porpoise distribution is not homogeneous.
- **Telemetry**: Animals tagged in the Wadden Sea show high degree of residency, spending on average 67% of their time in the Wadden Sea World Heritage Site (Figure 1).
- **Strandings & post-mortem**: Historical and seasonal patterns in strandings differ between the countries (Figure 2).
- **PAM**: Acoustic activity differed between stations, as did relationships to month, time of day and tide (Figure 3 & 4).



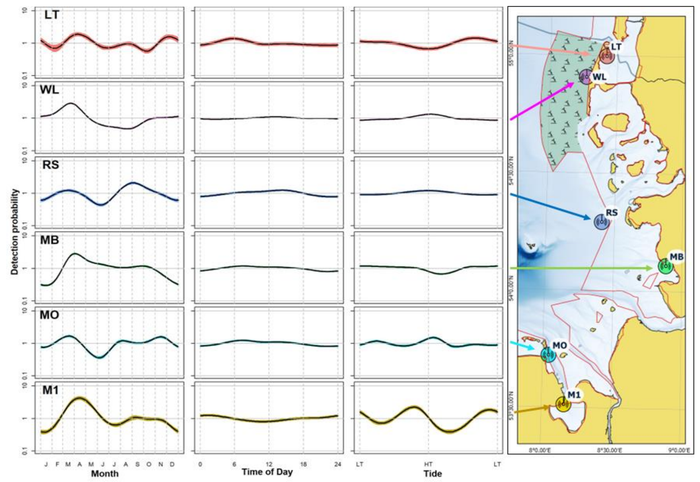
< Figure 1. Argos locations of the harbour porpoises tagged by AU between 1997 and 2019. Black dots show the locations of porpoises tagged in the inner Danish waters and Skagerrak (124 individuals) and green dots represent porpoises tagged in the Wadden Sea (6 individuals).



> Figure 2. Total number of strandings per year (top) and month (bottom), per country and age class. DK, Denmark; DE (SH), Schleswig–Holstein Germany; NL, the Netherlands



< Figure 3. Percentage of time where echolocating porpoises were recorded, shown as box plots of the DP10min/day per PAM station per year. Median drawn (black horizontal line, box—25 and 75% quantile), with whiskers (1.5 × interquartile range according to (Tukey 1977), the length of the whiskers is determined by the maximum and minimum value) and outliers (represented by black dots). The width of the individual boxes reflects the sample size.



> Figure 4. Relationships between month, time of day and tide with the detection probability (DP) of porpoise at six PAM stations (averaged over the monitoring period including 95% CI (coloured area). DP is represented relative to the y axis, with values y > 1 indicating a higher likelihood of porpoises being detected (positive effect) and values y < 1 a lower likelihood of porpoises being detected (negative effect).

Conclusions & Recommendations

- Monitoring and research efforts are mostly implemented nationally or regionally, leading to a mismatch in the spatial and temporal coverage within the trilateral region.
- Member parties should apply coordinated monitoring methods aligned with conservation objectives, coordinate with adjacent Natura 2000 sites, streamline with inter-national law and agreements, and encourage joint databases.
- They should continue trilateral collaboration on porpoises in the Wadden Sea, promote international knowledge exchange, facilitate expert knowledge and public awareness initiatives, and evaluate and adapt conservation objectives with clear guidance on key terms and assessment criteria.

Table 1. Overview of research methods and possible monitoring criteria for harbour porpoise in the Wadden Sea. ● suitable; ◔ suitable method in part of the Wadden Sea area; ○ not suitable

Monitoring Criteria \ Methods	Aerial surveys	Strandings database	Post-mortem examinations	PAM	Telemetry
Abundance	◔	○	○	○	○
Index of occurrence	◔	◔	○	●	○
Diel and seasonal distribution	◔	◔	○	●	◔
Habitat use	◔	◔	◔	●	●
Behaviour	◔	○	○	◔	●
Feeding ecology	◔	○	◔	◔	◔
Reproduction	◔	◔	◔	○	○
Age structure	○	◔	◔	○	○
Health	○	○	◔	○	○

Acknowledgements

A significant portion of the data presented here was collected through long-term programs. We especially thank the dedicated volunteers who contributed over the years, as well as the agencies funding this work (detailed in the funding declaration of the paper). Our gratitude goes to the stranding network volunteers and organizations for their assistance with reporting and retrieving stranded specimens.

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