Arkona Offshore Wind Farm

Passive acoustic monitoring - Field work report

Scientific note from DCE – Danish Centre for Environment and Energy

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Data sheet

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1 Introduction

In July 2022, Aarhus University was contracted by SWECO AB to conduct a one-year baseline study and impact assessment of harbour porpoises as well as noise monitoring within the pre-investigation area for the Arkona Offshore Wind Farm (OWF). Aarhus University recommended passive acoustic monitoring (PAM) within the project site for the Arkona Offshore Wind Farm, for which the deployment of five stations in the area was agreed. The proposal was based on the following:

- There have never been any PAM or other studies for harbour porpoises conducted in the area. The new stations are needed to examine whether this – like the neighbouring Natura 2000 site – is an important area for porpoises and, if so, which seasons are important.
- The OWF site is in the transition zone between the Belt Sea harbour porpoise population and the critically endangered (assessed by International Union for Conservation of Nature (IUCN)and the Helsinki Commission (HELCOM)) Baltic Proper population of harbour porpoises and thus may be used by both populations.
- Five stations have been shown in the Danish National Monitoring Program to provide sufficient data to cover variation in distribution in similar sized areas.

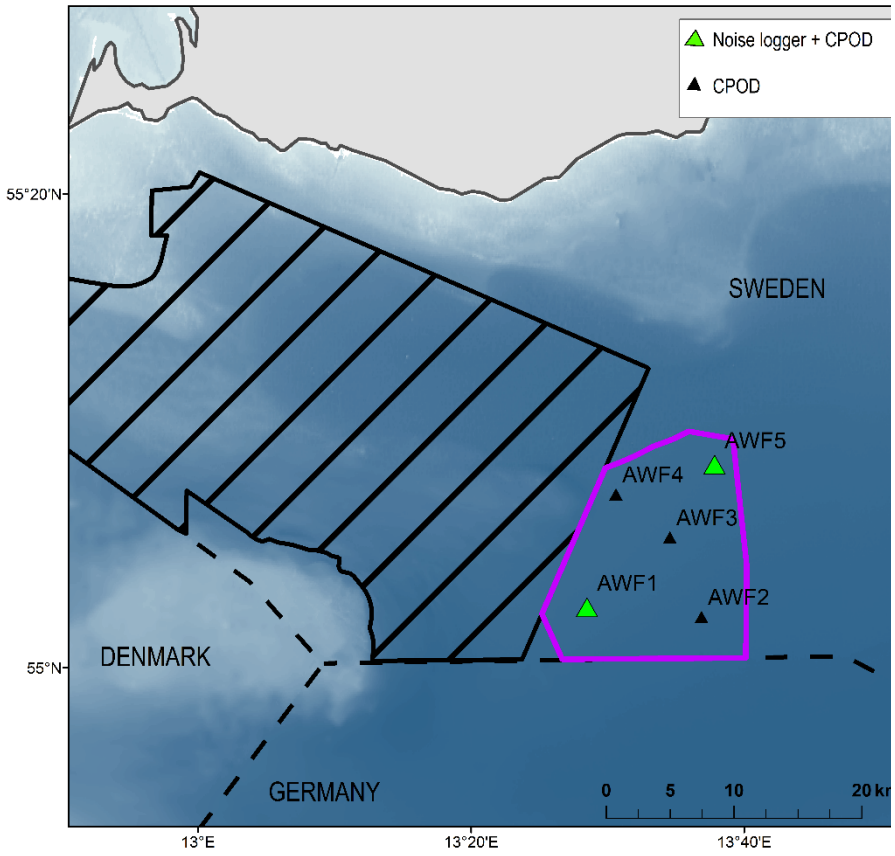
Here, we report the data collected by the five CPOD stations for one year.

2 Method

As harbour porpoises are the only expected cetacean in these waters, we suggested the use of CPODs as the main PAM system. This system is specially developed to detect porpoises sound signals and is the most used, and well-tested, PAM system for porpoises in the Baltic. This method will allow the use and comparison of the results from other former and ongoing monitoring studies of porpoises, i.e., the SAMBAH project (2011-2013, www.sambah.org). The proposed monitoring program for the Arkona Offshore Wind Farm project will therefore only deploy CPODs within the project area (see *Figure 2.1*) between August 2022 and August 2023.

Five CPODs (chelonian.org) were deployed within the windfarm project area at 2 m above the bottom using anchors and rope (handled by Karlskrona Sjötjänst AB). This number has proven to be sufficient to monitor porpoises within similar sized marine projected areas and is thus currently used in the Danish national monitoring program (Hansen *et al.* 2023). The CPODs were deployed in a random grid, which is also employed in the Swedish and the Danish national monitoring program for harbour porpoises, ensuring unbiased representation of the harbour porpoise distribution in the area.

In addition, 2 noise loggers were deployed at stations 1 and 5, to monitor ambient noise levels in the region. The methodology details and results from these analyses will be included in a forthcoming separate report.



Figur 2.1. PAM stations the Arkona Offshore Wind Farm investigation area indicated in purple. Shaded area is the Natura 2000 site "Sydvästskånes utsjövatten".

For all deployments (A-D, see *Table 2.1*), equipment to be moored at each station was prepared by AU personnel, while the deployment and retrieval were handled by Karlskrona Taxi. Each deployment was approximately 90 days (*Table 2.1*), with deployment A starting in August 2022, deployment B in November 2022, deployment C in February 2023, and the final deployment D in May 2023. Days of which stations were serviced (deployed/retrieved) were excluded from analysis as the porpoise detection results may be affected by the service vessel. For example, while deployment A has 84 days between its deployment (22/08) and retrieval (13/11) date, only 82 full recorded days are included in this analysis (23/08-12/11).

Tabel 2.1. Deployment periods of the 5 passive acoustic monitoring stations within the proposed Arkona OWF. * deployment and retrieval days are excluded.

Deployment ID	Deployment date	Retrieval date	Entire days recorded*
A	22/08/2022	13/11/2022	82
B	13/11/2022	14/02/2023	92
C	14/02/2023	14/05/2023	88
D	14/05/2023	12/08/2023	89

The data was analysed in CPOD.exe, using its proprietary algorithm to identify porpoise clicks and applied the Hel1-filter to those results The hel1 filter was developed during the SAMBAH project (www.sambah.org) to avoid false positive porpoise signals from the Baltic Proper in particular (Amundin et al. 2022). Lastly, the data was exported as detection positive minutes (DPM) per day and percentage detection positive days per month was calculated.

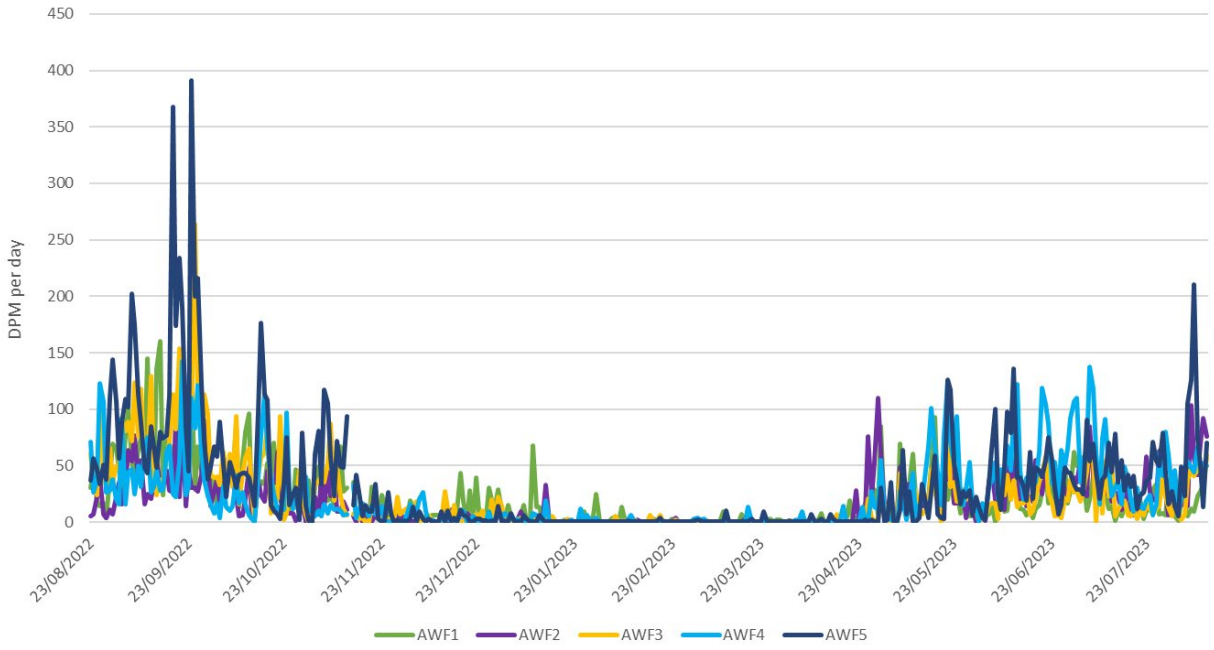
3 Results

Analysis of percentage detection positive days (%DPD) showed seasonal use of the area by porpoises, peaking in mid-Spring through mid-Autumn. Clicks were detected on 97-100% of days from August to October 2022, but from November 2022 detections decreased significantly each month with February and March 2023 having the lowest levels of detection positive days, i.e., only 14-15% on average (*Table 2*). From May to August 2023 the number of %DPD increases with porpoise on average detected on 91-100% of days.

Figur 3.1. Overview of percentage harbour porpoise detection positive days (DPD) per month on the five stations at the Arkona Offshore area from 22nd August to 12th August 2023.

Month	AWF1	AWF2	AWF3	AWF4	AWF5	Average
Aug	100	100	100	100	100	100
Sep	100	100	100	100	100	100
Oct	100	97	97	97	100	98
Nov	90	79	86	79	86	84
Dec	81	32	61	71	55	60
Jan	48	32	35	39	19	35
Feb	22	15	22	7	7	15
Mar	23	6	6	16	19	14
Apr	37	33	23	27	27	29
May	93	90	90	93	87	91
Jun	97	100	100	100	100	99
Jul	100	100	97	100	100	99
Aug	100	100	100	100	100	100

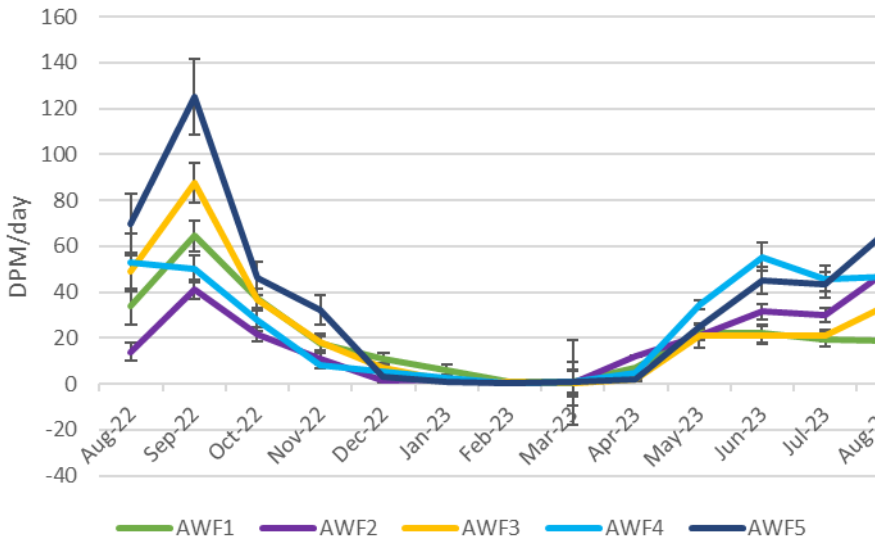
When examining the data as detection positive minutes per day (max 1440) the large variation in porpoise activity between days is apparent. Particularly high levels of porpoise detections were registered on AWF5 between the 16th of September and the 27th of September (*Figure 3.2*). From November 2022, detections decreases and to the end of April 2023, very few porpoises are detected on the stations. From the last week of April levels increase again. Level of detections varies between stations from the end of April to the middle of August 2023, but a continued harbour porpoise presence is recorded in these months.



Figur 3.2. Harbour porpoise detection positive minutes (DPM) per day on the five stations at the Arkona Offshore area from 22nd August 2022 to 12th August 2023.

The data were also plotted as the average detection positive minutes per month (*Figure 3.3*). Most detections were registered during September 2022 on all stations except AWF4, which had the highest average detections in August 2022. It is very clear that after November 2022 the level of porpoise detections decreases substantially but begin to increase again at the end of April.

Figur 3.3. Harbour porpoise average detection positive minutes per day (DPD/day) per month on the five stations at the Arkona Offshore area from 22nd August 2022 to 12. August 2023.



4 Conclusion

The collected data clearly indicates that harbour porpoises are present in higher numbers from May to November with a peak in September compared to the period from December to April where only few detections are recorded per month on each station. However, it should be noted that even in the month of lowest detections porpoises are detected on 14-15% of days which is not negligible. Especially since the Arkona OWF site is located in the transition zone between the Belt Sea and the Baltic Proper harbour porpoise population, and it has been hypothesized that the critically endangered Baltic Proper population may move west into this transition zone in the winter (Amundin *et al.* 2022). So, the few detections during winter could be individuals from the Baltic Proper population.

5 References

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