

# **Investigations of the bird collision risk and the responses of harbour porpoises in the offshore wind farms Horns Rev, North Sea, and Nysted, Baltic Sea, in Denmark**

## **Part II: Harbour porpoises**



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## 0. Executive Summary

In 2005 we started a two-year project on the responses of harbour porpoises in the Danish offshore wind farms Horns Rev in the North Sea and Nysted in the Baltic Sea. The project is financed by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Access to the offshore wind farms was granted by the Danish Energy companies Vattenfall (formerly ELSAM eng.) and DONG energy (formerly Energi E2).

Background of this study is the question, whether there are differences in the presence, echolocation activity and behaviour of harbour porpoises between inside and outside the wind farm or between close to far away (up to 1.5 km away) from a single turbine. The study was conducted with acoustic dataloggers (T-PODs) recording harbour porpoise echolocation signals. The devices were mounted on the seabed in an array of short transects with five T-PODs in a row. Positions with T-PODs covered areas inside and outside the two wind farms Nysted and Horns Rev. In each wind farm area, two rows – totalling in ten devices – were deployed simultaneously. During the campaign, we changed the position of the rows four times, resulting in ten different experiments for each wind farm.

### Calibration

An important prerequisite for T-POD study is the standardisation of the sensitivity. Test tank calibration proved that the version of T-PODs used in this study showed stable sensitivity as the differences between the single devices did not exceed beyond 3 dB re 1µPa pp. Results of field calibration show that with higher temporal resolution, a stronger correlation between test tank results and data collected in the field exists (e. g. PPM). In order to find a good compromise between high temporal resolution and small differences caused by different sensitivities, we decided to use the parameter PP10M. The remaining difference caused by the sensitivity of the T-PODs was set as a random factor when analysing the effect of the wind farm, so that we can exclude any blur caused by the method using T-PODs which are not working completely synchronised.

### Natural variations

In 94 % of the total of 3,591 POD-days of recording during both years in Nysted at least one harbour porpoise signal could be detected. In Horns Rev in 98 % of the total 2,085 POD-days at least with one harbour porpoise signal was detected. This means, harbour porpoises were present inside and outside both wind farms on a nearly daily basis.

Using the parameter PP10M/day three times more harbour porpoises were recorded at Horns Rev than in the Nysted area reflecting a higher density of harbour porpoises in the Horns Rev area, which is consistent with other studies.

In both wind farm areas a high heterogeneity in recorded harbour porpoise signals at a small spatial scale of a few kilometres became evident when comparing the results of different T-POD rows, which were deployed at the same time a few kilometre away from each other. This result shows a high spatial variance in use of a specific area by harbour porpoises, most probably caused by the very dynamic hydrographic features, which govern the distribution of fish.