

The influence of pile driving noise on Harbour Porpoises



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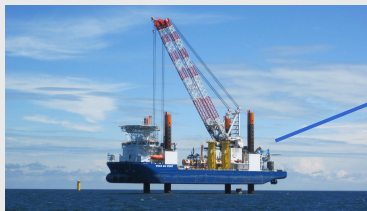


INTRODUCTION

The harbour porpoise (*Phocoena phocoena*) is the most common marine mammal in the Belgian part of the North Sea and is protected by both national and EU law. In the North Sea, the harbour porpoise is considered under threat because of high bycatch levels and increasing noise pollution. Impulsive pile driving noise originating from the construction of offshore wind farms has been shown to affect porpoises up to distances of 20 km from the noise source. Driven by high porpoise densities in Belgian waters, a pile driving ban is in force from the start of January up to the end of April. However, The Netherlands have the Borssele offshore wind farm at only one kilometre away from the Belgian offshore wind farm zone, and do not enforce such an embargo. Considering the high mobility of harbour porpoises, there is a need for improved insights into the impact of pile driving noise on porpoises which can serve as a basis for an objective evaluation of the respective legal regimes.

STUDY SITE

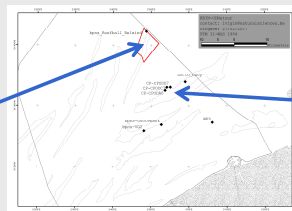
From May 16th to September 22nd 2016 a hydraulic hammer was used to drive 51 steel monopile foundations up to 39 meters into the seafloor at the Nobelwind wind farm located on the Bligh Bank in Belgium.



Piling vessel @ Nobelwind wind farm (July 2017)

STUDY DESIGN

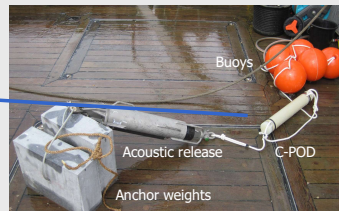
Before, during and after this period, porpoise activity was recorded using passive acoustic monitoring (C-PODs), at various distances from the construction site (2 – > 30 km) and underwater noise levels were recorded using moored hydrophones.



Nobelwind construction area (red) and C-POD locations (black)

DATA ANALYSIS

The data were analysed using CPOD.exe software version 2.044. Of the four levels of confidence (quality) of the data, only high and moderate click train quality was used, with the species filter set to harbour porpoise. Data were graphically analysed using Excel and R studio.



Passive acoustic monitoring-chain

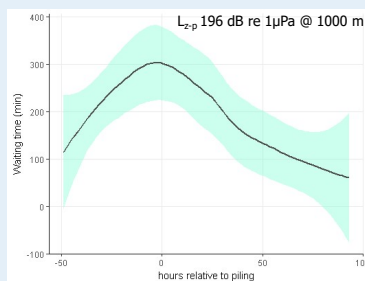


Harbour porpoises (*Phocoena phocoena*) © Solvin Zankl

RESULTS & DISCUSSION

Displacement

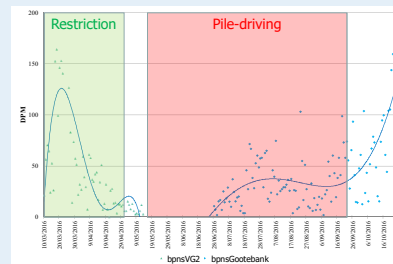
In the vicinity of the pile-driving activities (1–10 km) porpoise detections decreased prior to the start of piling, resulting in an increased waiting time between detections. This decrease in detections can be observed up to 48 hours after piling was completed.



This is in line with results from the German Bight (Brandt *et al.*, 2016) and suggests that increased work vessel traffic acts as a deterrent prior to the start of pile-driving.

Seasonal pile-driving restriction

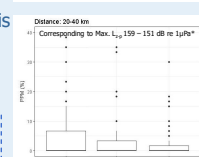
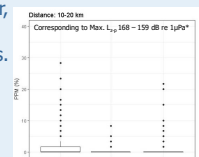
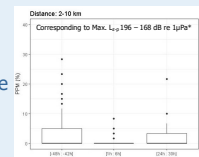
In the southern part of the North Sea, harbour porpoise densities show a seasonal pattern with pronounced increases in spring and, to a lesser extent, in late summer to early autumn (Haelters *et al.*, 2016). As a result, in Belgium pile-driving can not take place between January 1st and April 31st. At VG2, PAM detections decreased near the end of this restriction period, weeks prior to the start of hydraulic piling. Pile-driving at Nobelwind ended at the onset of the autumn peak.



Porpoise detection positive minutes per day at VG2 (green) and Gootebank (blue) with indication of pile-driving period (red).

Spatial extent of displacement

In order to test whether we could observe the spatial extent of harbour porpoise displacement we grouped the C-PODs in three distance classes (1-10, 10-20 and 20-40 km) and compared porpoise detections 48h prior, immediately after and 24h after piling at these locations. In contrast to previous studies (Brandt *et al.*, 2016, Dähne *et al.*, 2013), no significant differences were observed at these distances although it is likely that this is due to insufficient data (resulting from the loss of several moorings).



* Preliminary data based pile-driving of Nobelwind H03

To be continued...in the environmental monitoring report offshore wind - 2017

ACKNOWLEDGEMENTS

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