

Effects from pile driving operations on harbour porpoises at Horns Reef offshore wind farm, monitored by T-PODs and behavioural observations

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Abstract

The world's largest offshore wind farm was built on Horns Reef in the Danish North Sea in 2002. It consists of 80 2 MW wind turbines, mounted on steel monopile foundations. The monopiles were driven into the seabed with a hydraulic hammer, a procedure generating high underwater noise levels (not quantified). Underwater acoustic alarms (AQUAmark pingers and seal scrammer) were deployed prior to each pile driving operation in order to deter marine mammals from the vicinity of the operation and hence protect them from excessive sound exposure.

Reactions of harbour porpoises were monitored by visual surveys from ship and by acoustic dataloggers (T-PODs), both inside and outside of the wind farm.

Average time from end of each pile driving operation to the first porpoise encounter recorded by the T-PODs increased significantly from the average time between encounters in periods without pile driving (from 50 minutes to close to 300 minutes). Average interval between first and second encounter after end of pile driving was not significantly larger than outside pile driving periods, indicating return to levels normal for the construction period as a whole. Observations from ship surveys showed a significant change in surface behaviour on days with pile driving at distances up to 10 nautical miles from the wind farm. The most frequent behaviour changed from non-directional movement (presumably associated with feeding) to directional movement on days with pile driving operations.

Both data sets point to a strong and immediate effect of the pile driving operations (caused by AQUAmark pingers and seal scrammers and impact sounds from the hydraulic hammer), followed by a rapid recovery to the situation normal for the construction period. This normal situation was not undisturbed, as other, less noisy activities took place during the entire period, as well as a general high level of ship traffic during construction. A separate, ongoing study will address permanent effects from the construction and operation of the wind farm.

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