

Minimizing the effects of pile driving noise on harbour porpoises (*Phocoena phocoena*) with bubble curtains

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Because...

- ...piling for offshore wind turbines causes substantial underwater noise.
- ...previous studies have shown that piling displaces harbour porpoises (*Phocoena phocoena*) of the vicinity of construction site on a temporal and spatial scale.
- ...no noise mitigation system was regularly used so far to reduce negative impacts on marine mammals...



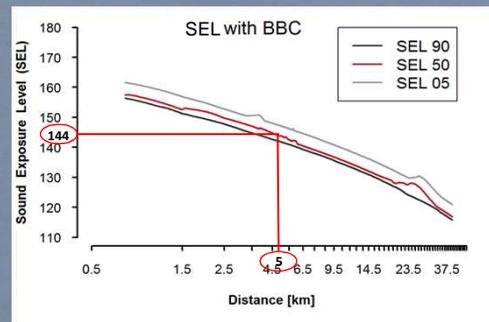
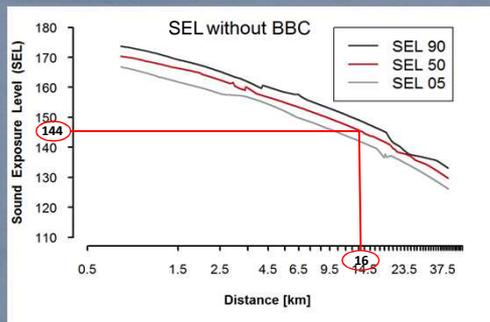
...we...

- ...studied the effect of a „Big Bubble Curtain“ (BBC) during construction of the offshore windfarm „Borkum West II“ in the German EEZ.
- ...deployed the BBC -consisting of a 500 m nozzle hose- around the foundation before the construction platform arrived.
- ...positioned 26 C-PODs covering distances between 0.8km – 36km from each foundation.
- ...we measured noise 750m + 1500m + at 4 positions outside the windfarm area...

...and found this:

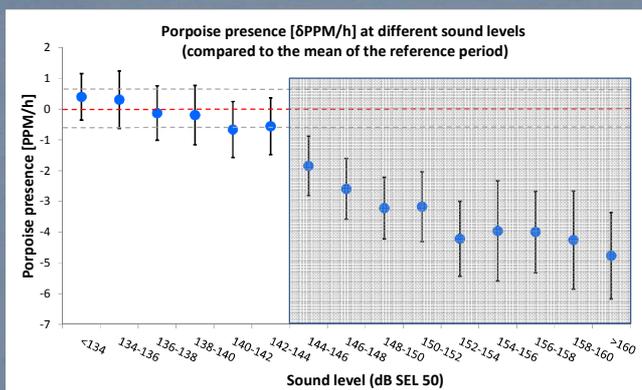


1. Noise mitigation (SEL): BBC with best configurations reduced noise levels (SEL) up to 12 dB re 1µPa.



2. Porpoise response:

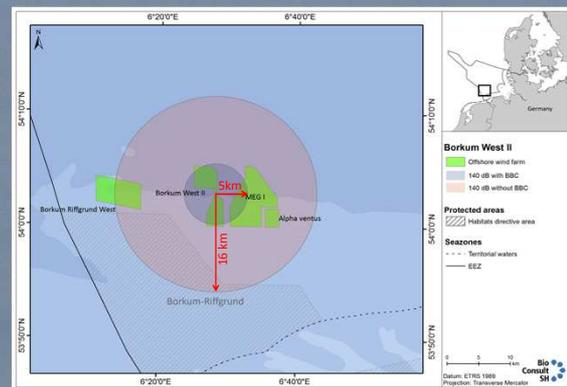
Significant displacement of porpoises >144-146 dB SEL.



Displacement of porpoises is clearly connected with noise level: increasing noise level = more animals displaced + for a longer time.

3. Range of disturbance effects:

Operation of BBC reduced the area impacted by pile driving noise for porpoises from ~800 km² to 80 km², i.e. by 90%!



144 dB SEL corresponds to :

- a disturbance radius of 16km without BBC
- a disturbance radius of 5km with BBC.

Noise reduction during pile driving is an efficient way to avoid large disturbance effects on marine mammals. It is of particular relevance for present plans of simultaneous construction of several windfarms within the same area.

