

Real-time monitoring of harbour porpoise activity around construction sites using the wireless detection system (WDS)

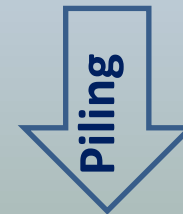
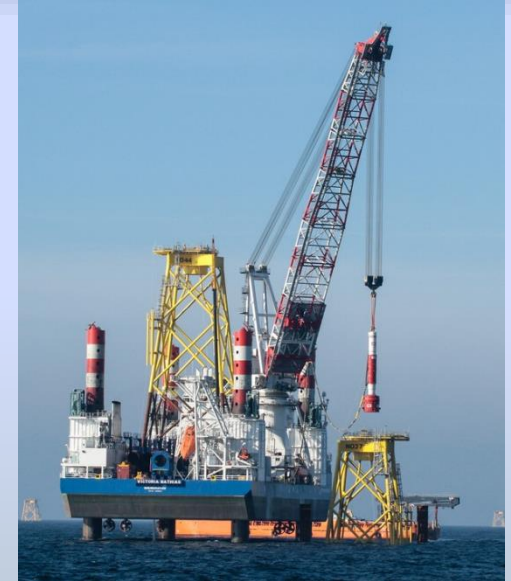


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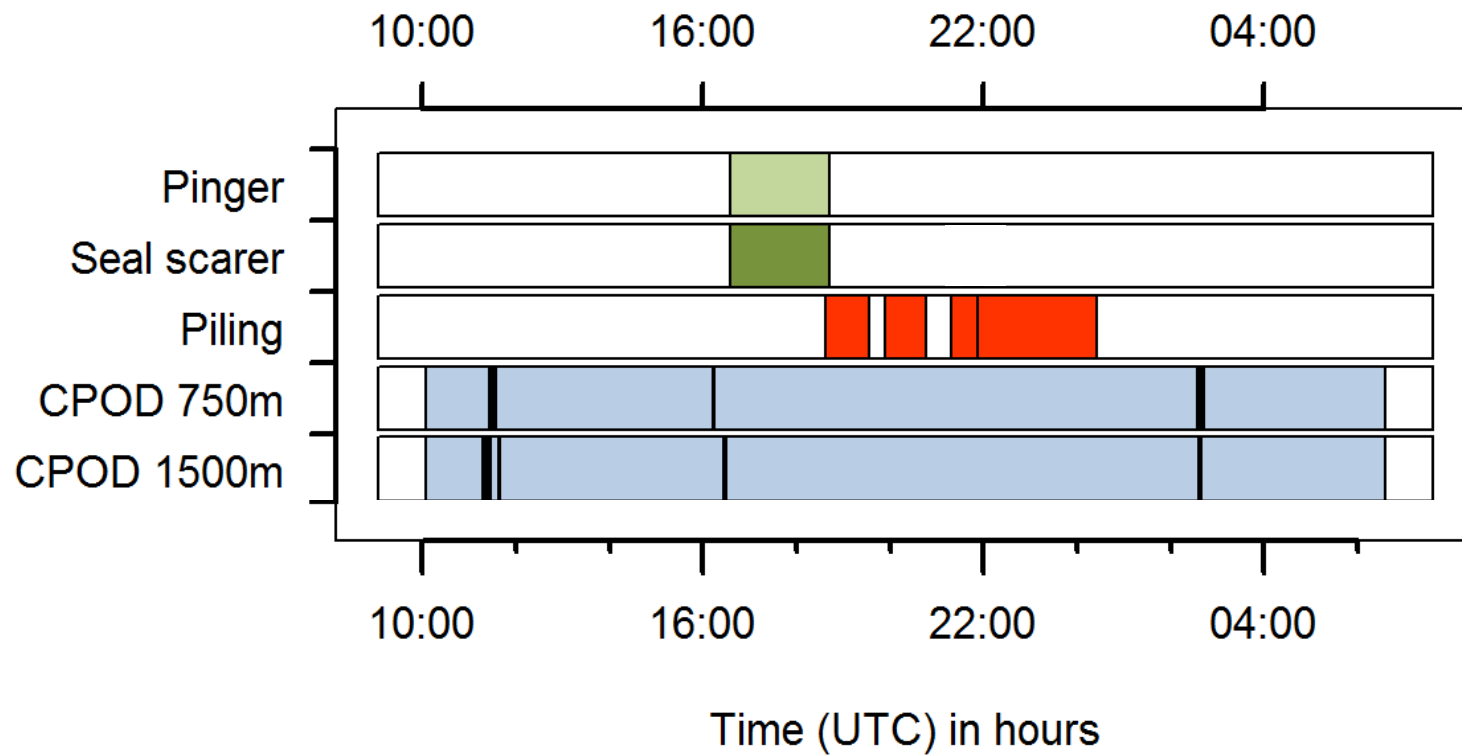
Pile driving noise can harm marine mammals

Standard method to avoid injury (before piling):

noise mitigation system (bubble curtain...)
+
deterrence (Pinger + Sealscarer)
↓
efficiency control (CPOD in 750m + 1500m)
↓
data analysis after piling



Standard efficiency control



Why using an online detection system ?

Sealscarer have been shown to deter successfully, but:

- Not all individuals may react with avoidance behaviour.
- Animals may get used to deterrents.
- Deterrence stops during piling.
- Deterrence might be reduced.
- Noise mitigation might not reach required levels (or not be requested (UK, DK, F)).
- POD data are available only after recovery of PODs.
- Other methods (Marine Mammal Observer) are restricted to daylight and very calm sea.

Research questions

1. Is the WDS a reliable system detecting the presence of harbour porpoises at offshore construction sites ?

2. How is the performance of the WDS?

→ Detection radius of a single WDS buoy

→ in comparison to the established device, the CPOD

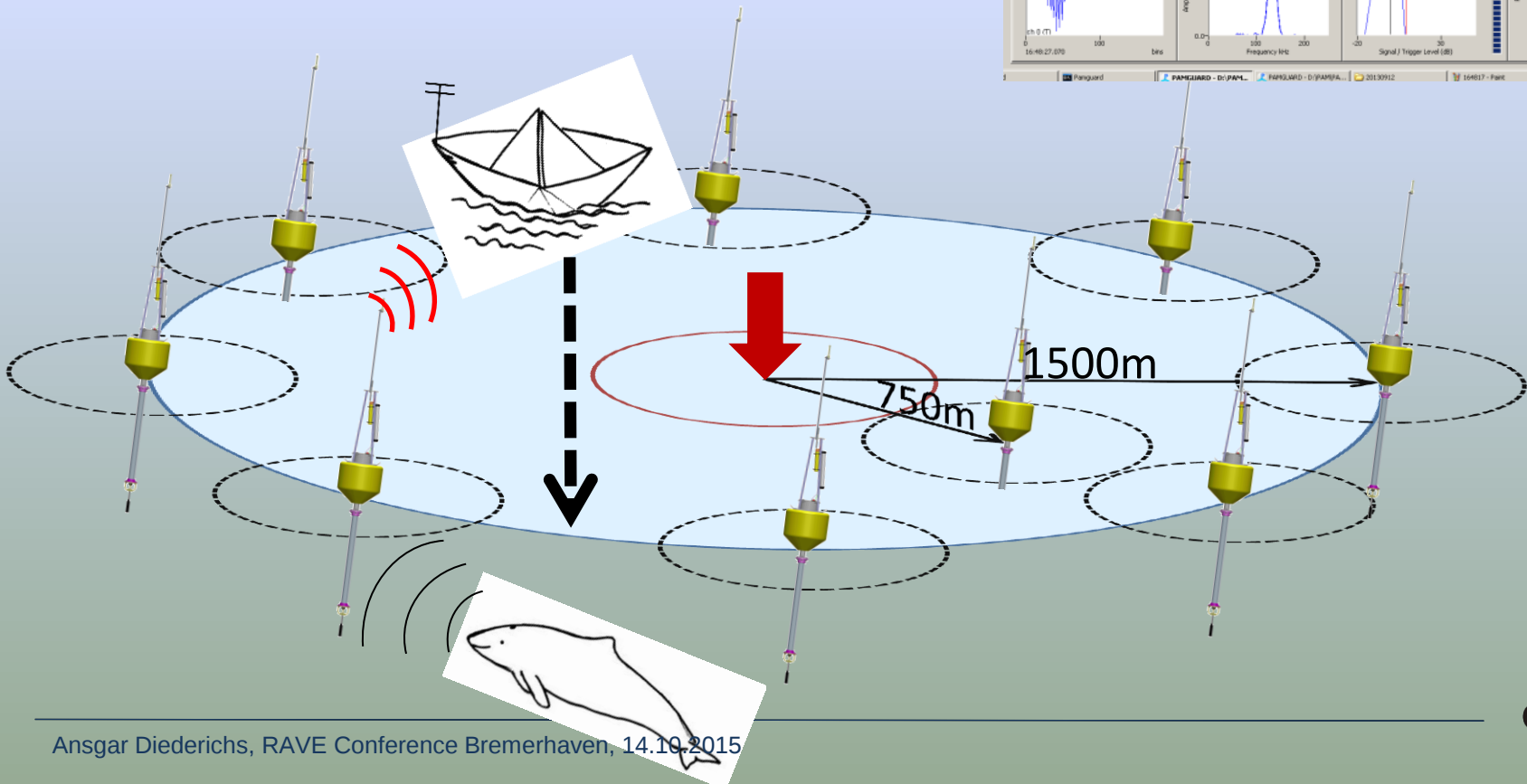
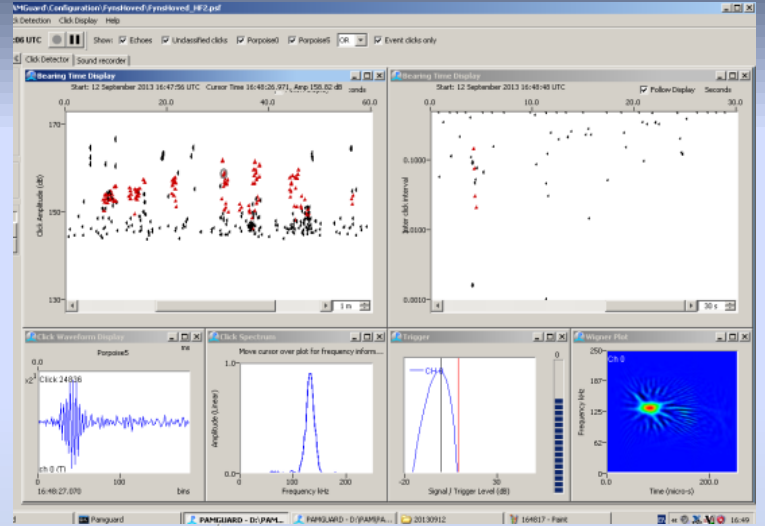
Risks:

1. Porpoises maybe missed and exposed to high noise levels.

2. False positives interfere with construction process.

Outline of WDS application at NSO

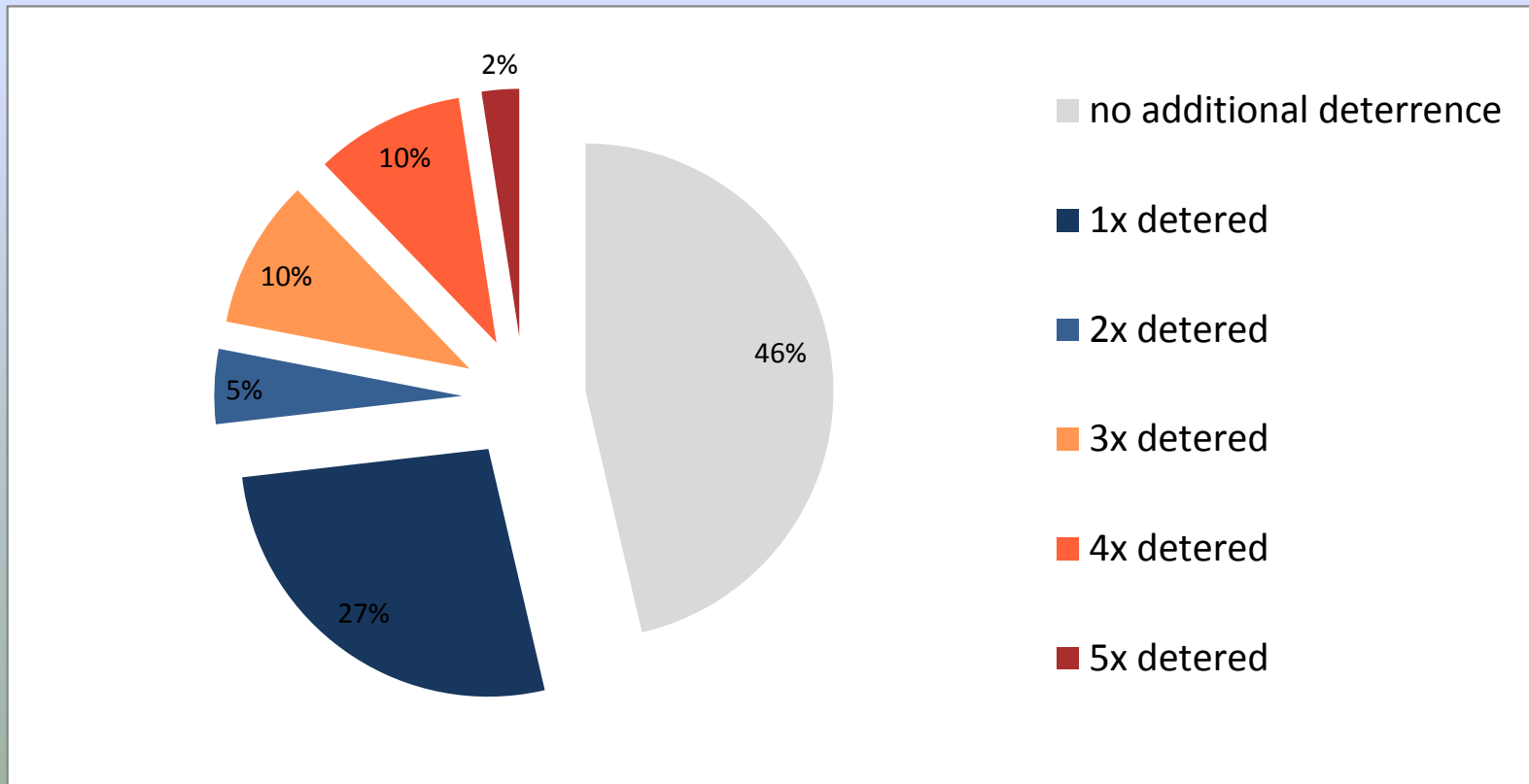
Additional use of Seal Scarer



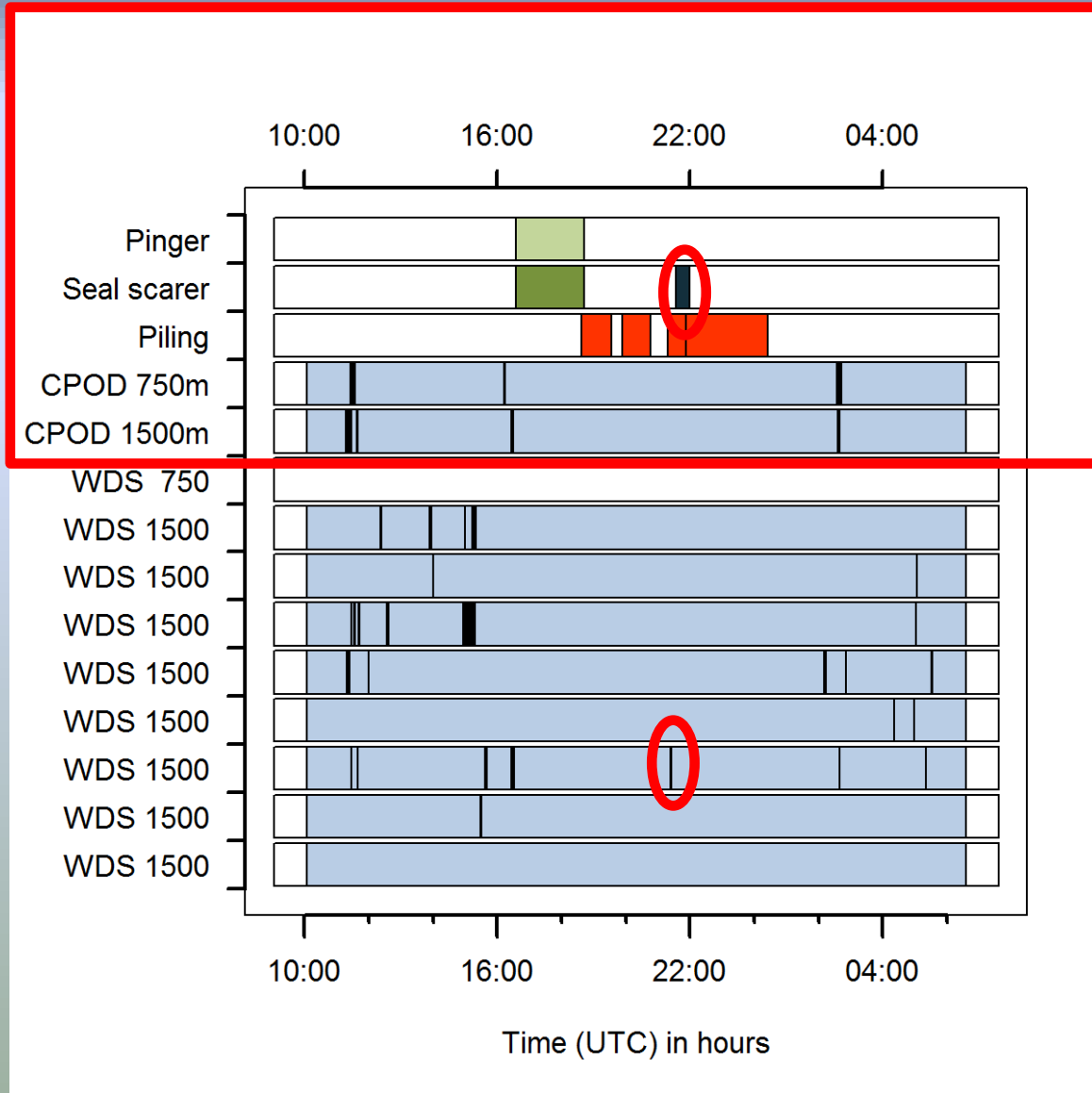
1. WDS application at NSO

WDS (up to 9 buoys): 41 pilings → 28 with detections (68%)

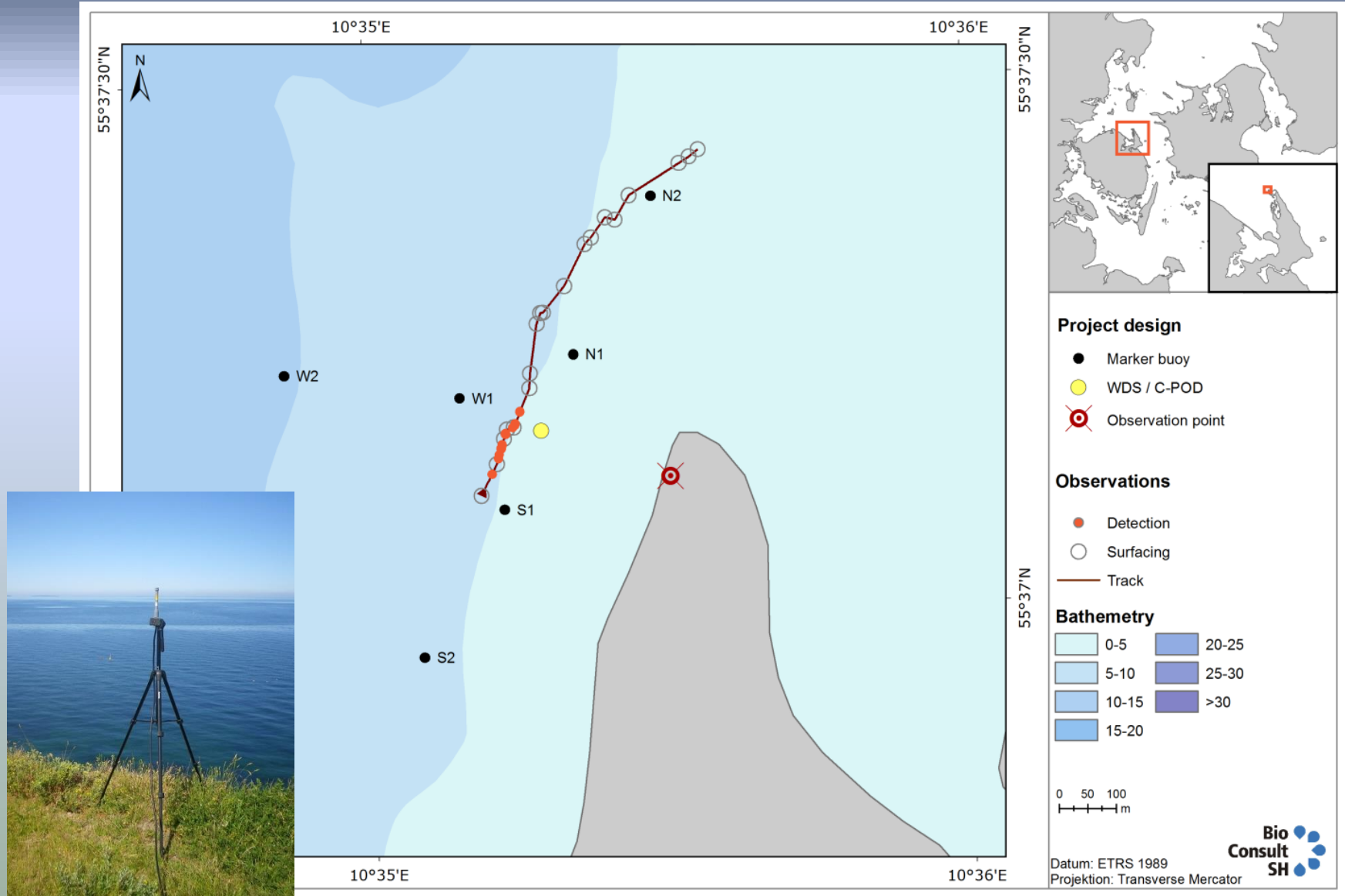
→ 15 detections during pile driving: additional deterrence



1. WDS – a reliable system during pile driving

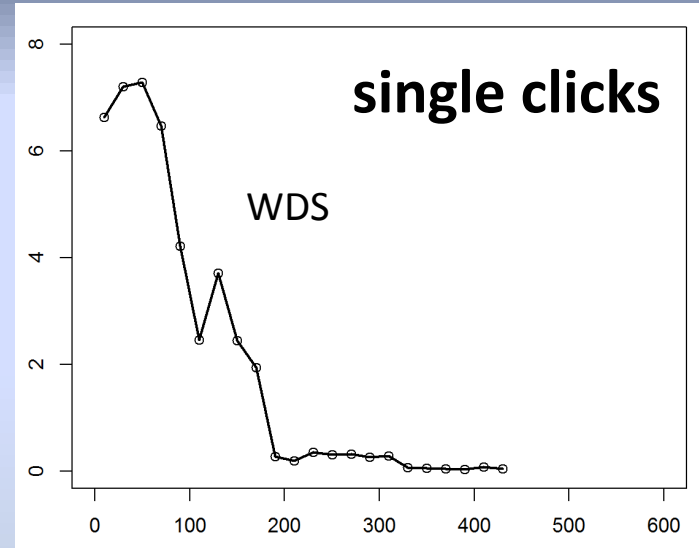
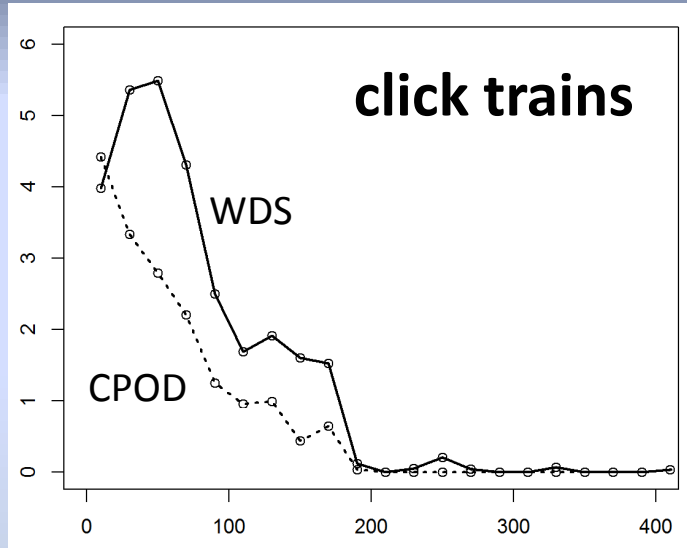


2. Performance of a single WDS buoy: detection range

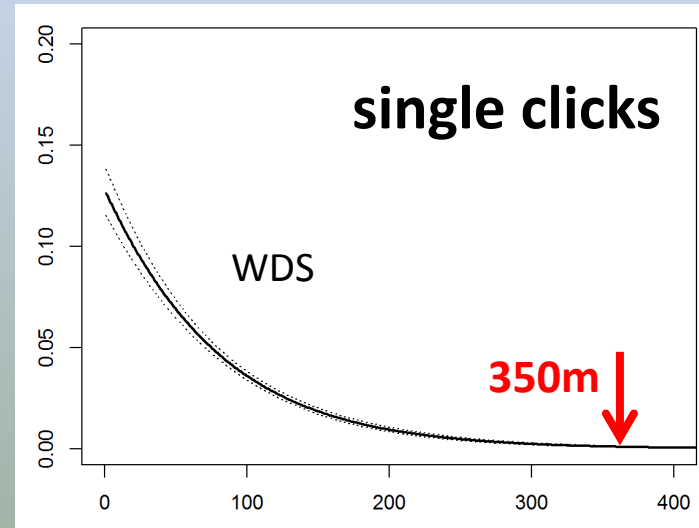
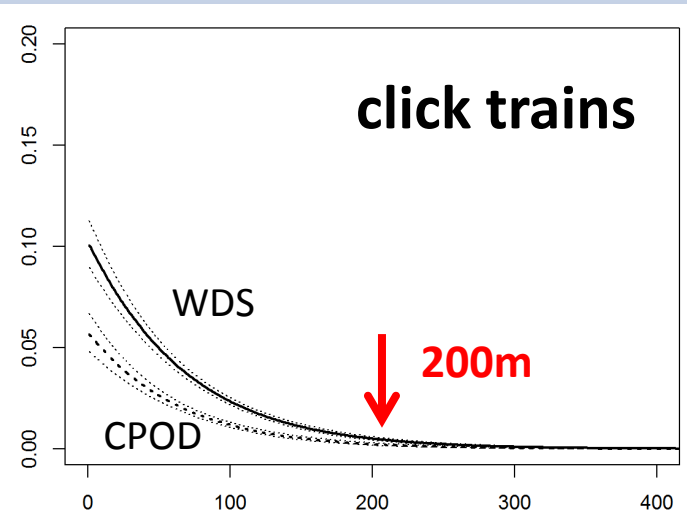


Detection probability

Detection positive seconds per 20m band[%]



Probability of detection



Distance [m]

Mean detection range

mean maximum detection radius:

CPOD: 32 tracks: 106 ± 44 m

WDS: 35 tracks: 140 ± 79 m (only clicks as trains)

52 tracks: 194 ± 97 m (single clicks)

Detection range only within 200 m

80 porpoise tracks within 200 m (average duration 321 sec)

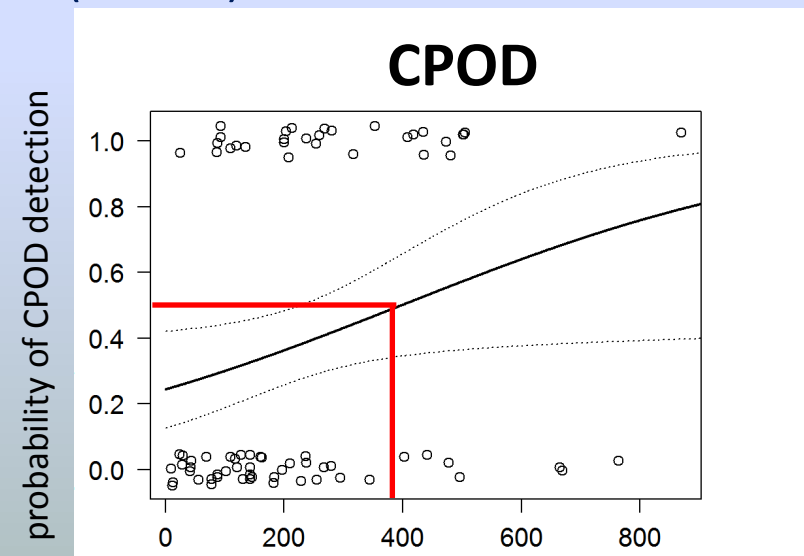
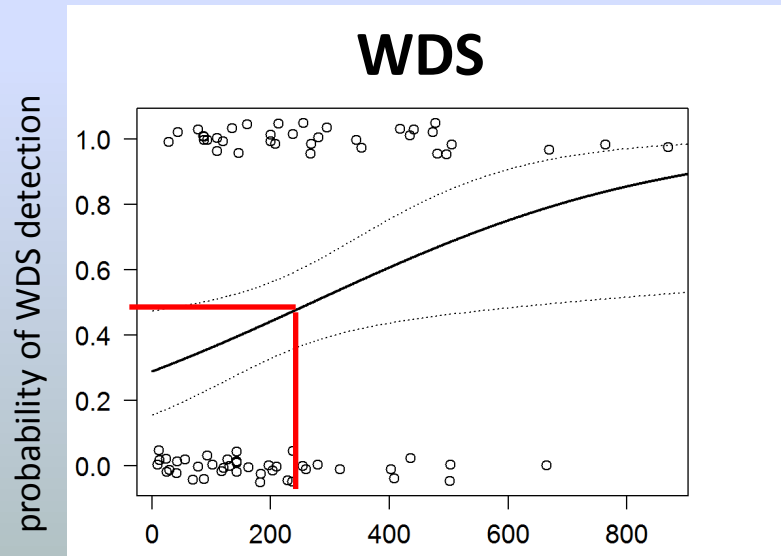
WDS: 39 tracks (48.8 %)

CPOD: 32 tracks (40 %)

only WDS: 17 tracks (21.3 %)

only CPOD: 10 tracks (12.5 %)

both: 22 tracks (27.5 %)



seconds porpoises spent in 200m distance

50% of all animals were detected after:

WDS: 4:31 min

CPOD: 6:38 min

1. Advantages of the WDS at NSO:

- ✓ WDS detected porpoises: animals were often present shortly before and after pile driving.
- ✓ A good spatial coverage of impact area could be achieved: a lot more detections by the 9 WDS buoys compared to two C-PODs.
- ✓ Real-time detection during pile driving allowed immediate use (and control) of further deterrence.

Protection of harbour porpoises to harmful noise could be improved.

2. Performance of the WDS proved by visual observations

- ✓ Theoretical detection probability approaches zero at 200 m for both devices (,trains') and 350m for WDS (single clicks).
- ✓ Mean measured maximum detection range of WDS: 194m (CPOD: 106m).
- ✓ 50% of all animals within 200m are recorded after 4.5 minutes (>2min better than CPODs).
- ✓ WDS also records single clicks.

Real-time monitoring

- offers great potential to protect cetaceans from harmful noise emissions - not only during pile driving
- With knowledge of the detection range of WDS buoys, the deployment design can be adapted to improve overall detection probability.

Many thanks to



and to all persons involved in the study

