



# Effects of the construction and operation of alpha ventus on harbour porpoises

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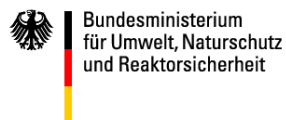
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Gefördert auf Grund eines Beschlusses  
des Deutschen Bundestages

Projektträger

Koordination



# Aim of the project

- Do effects remain constant after repeated sound emissions?
- Is it possible to evaluate the effects taking external anthropogenic and natural impacts into consideration?
- How far are porpoises displaced?

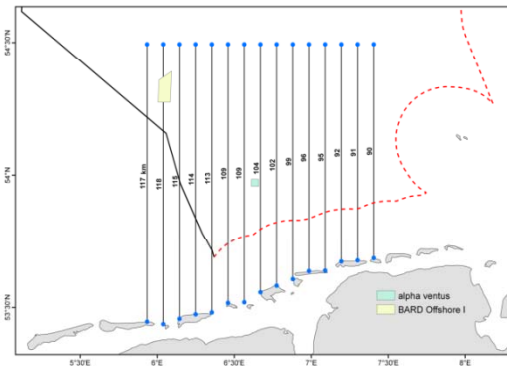
*Is the StUK-research adequate for describing the effects and assessing the impacts?*

***What are the consequences for the local population?***



# Methods

## Aerial surveys



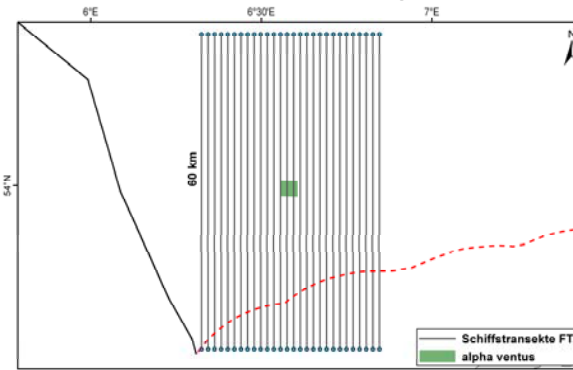
Transect length = 1.560 km  
Area = 10.934 km<sup>2</sup>

g(0)-corrected estimation of density, Bubblewindows, Line-Transect-Distance Sampling

4-5 x yearly, seasonal variation

Large scale approach

## Ship surveys



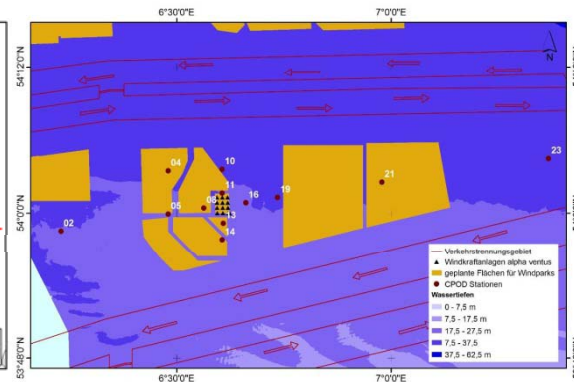
Transect length = 1.680 km  
Area = 2.116 km<sup>2</sup>

SCANS II methodology, double platform, (tracker, big eye, 4 observers, data recorder)

Visual and acoustic registrations

Small scale approach

## Static acoustic monitoring



22 measuring devices reduced to 12 in 2009

AMPOD/MINOS Methodology  
In distances from the wind farm between 1 and 50 km

Echolocation (behaviour) monitoring

Temporal scale





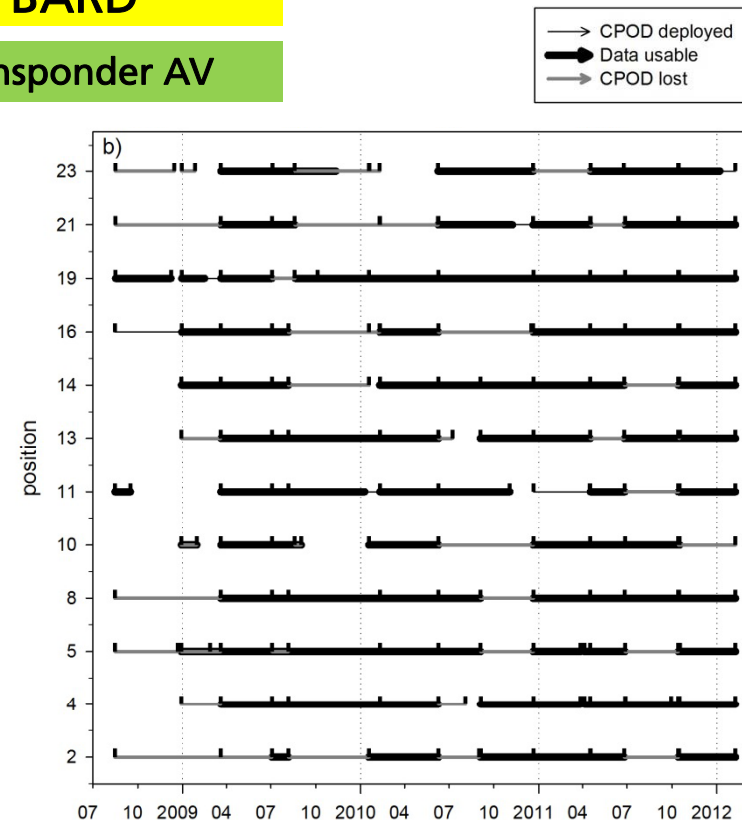
# Overview aerial surveys & acoustic monitoring

2008	15.& 16. 08.2008
	18.& 19.09.2008
2009	11.& 12.04.2009
	23.05.2009
	14.07.2009
	10.& 14.08.2009
	18.09.2009
2010	16.03.2010
	11.& 14.05.2010
	05.& 09.06.2010
	10.& 23. 07.2010
	12.& 17.10.2010
2011	09.&10.04.2011
	02.&07.06.2011
	11.07.2011
	25.& 27.09.2011

Alpha Ventus

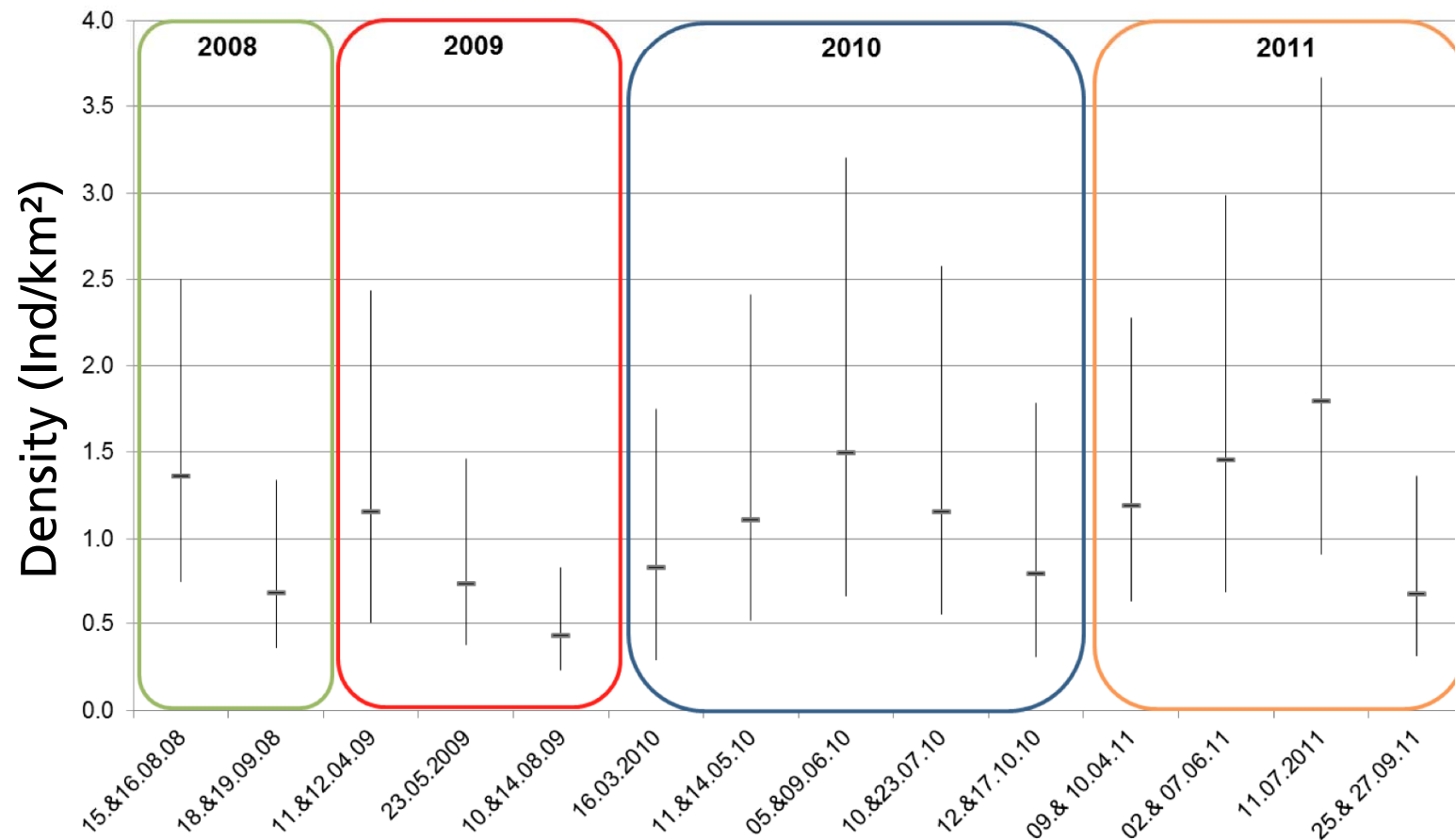
BARD

Transponder AV



# Results aerial surveys

Aug. 2008 to Sep. 2011: 20,000 km on effort, 1,737 sightings with 2,078 individuals (86 calves)



# Results ship surveys

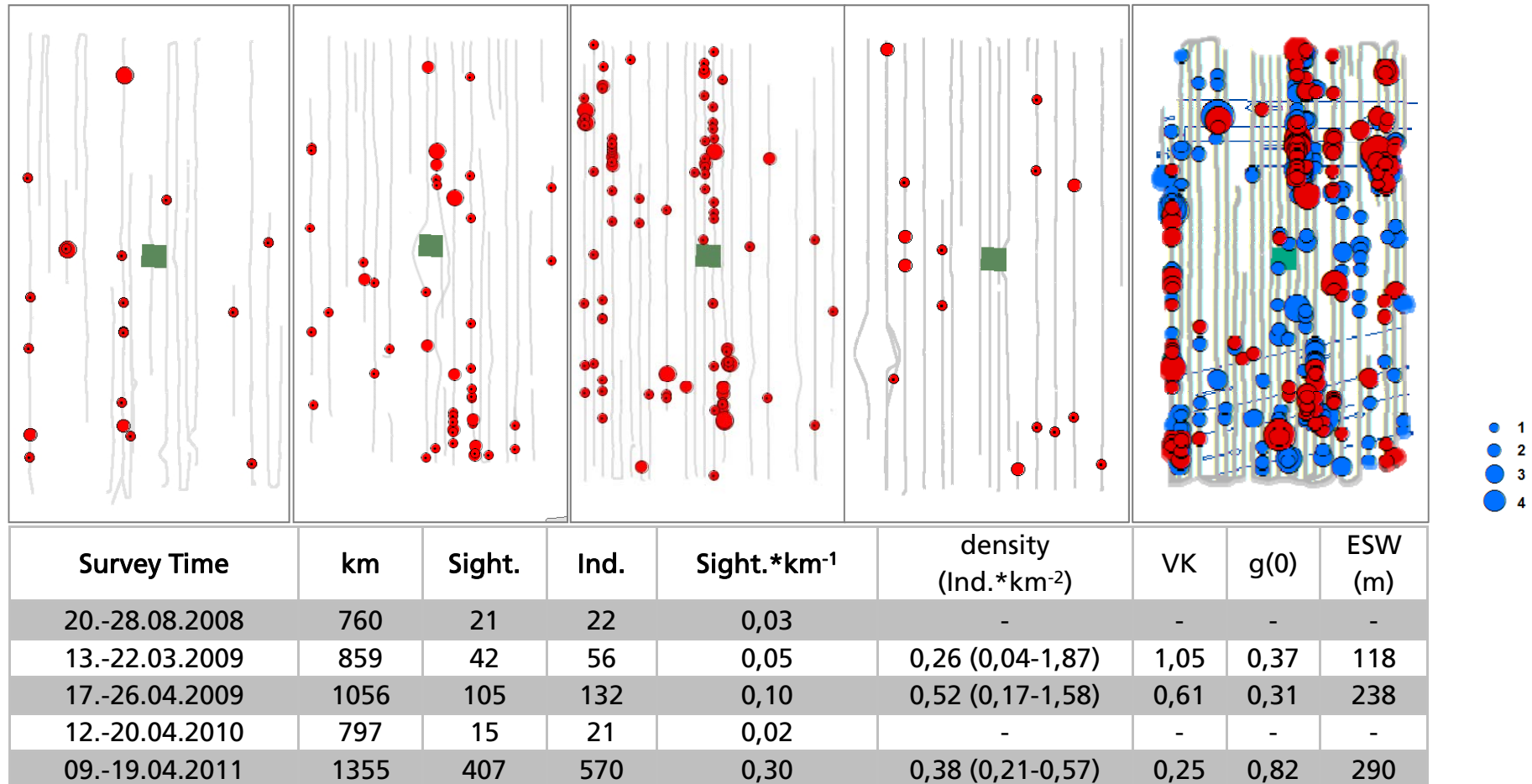
20.- 28. Aug 2008

13.- 22. Mar 2009

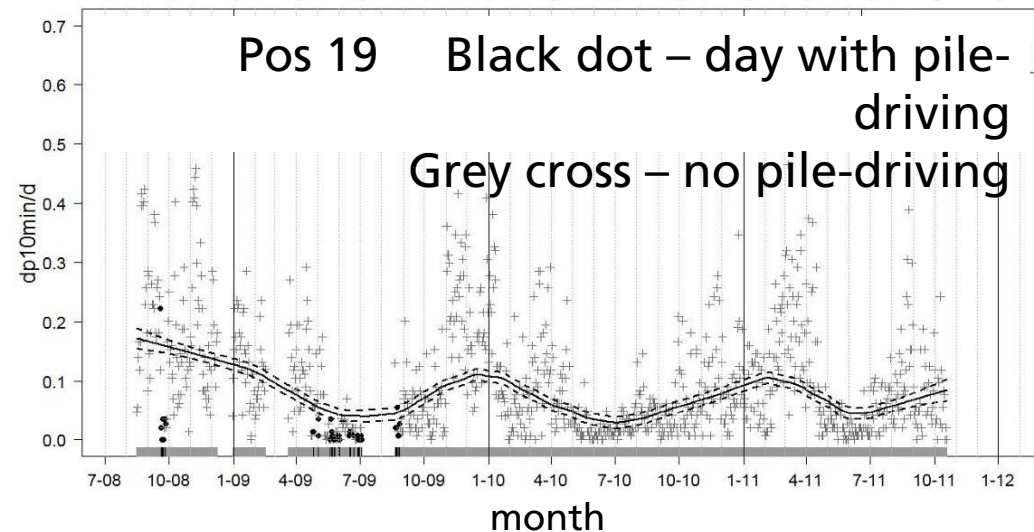
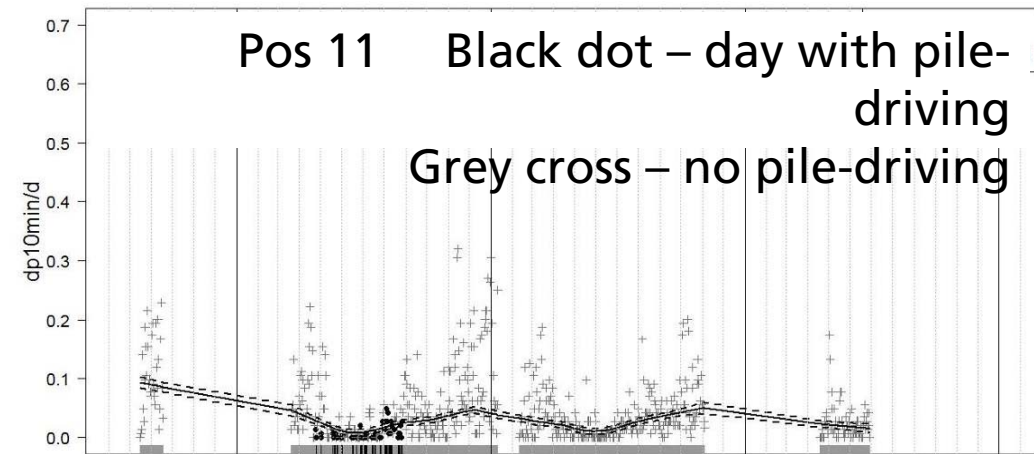
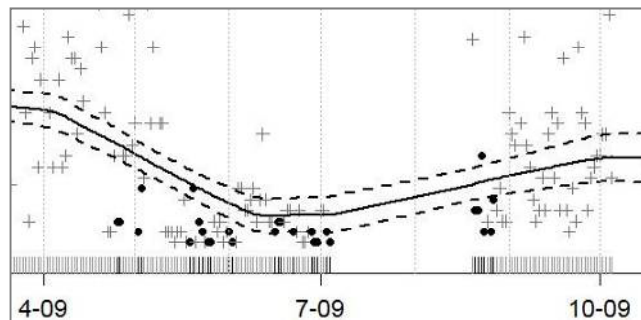
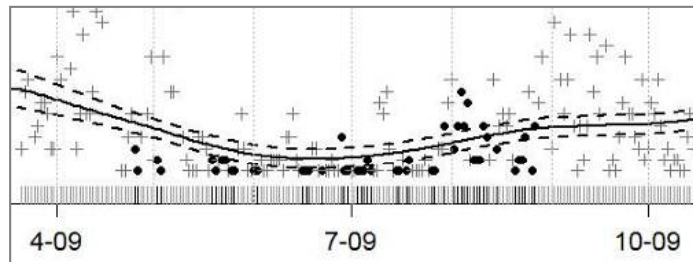
17.- 26. Apr 2009

12.- 20. Apr 2010

10.-24. Apr 2011



# Results static acoustic monitoring

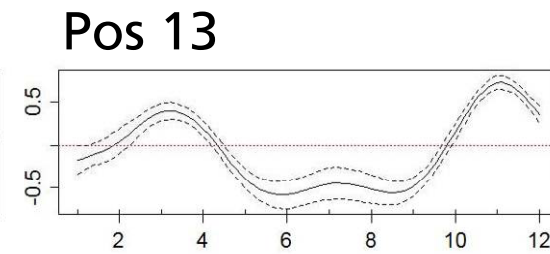
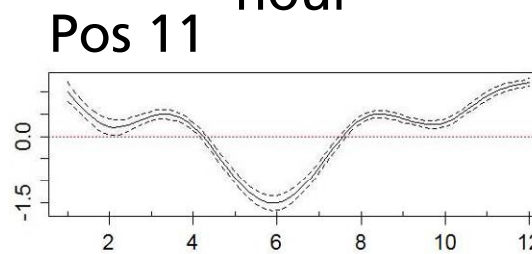
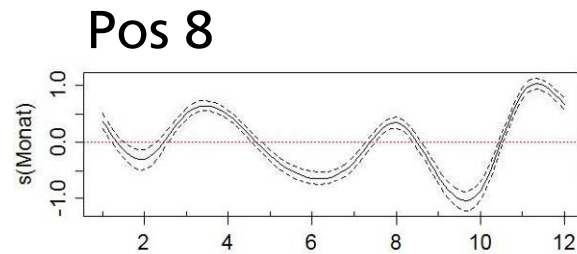
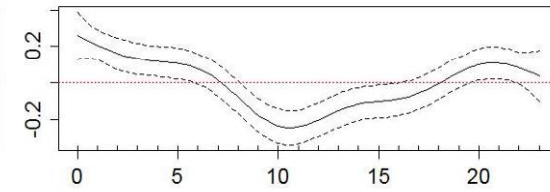
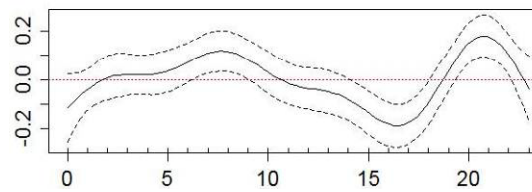
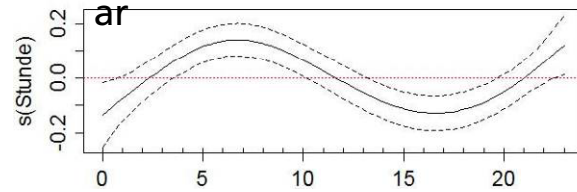




# Close range (1-3 km)

GAM- Analysis (2008-2010)

pp10min~Ramming\*+s(hour)+s(month)+ye



month



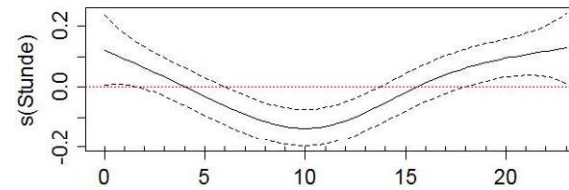
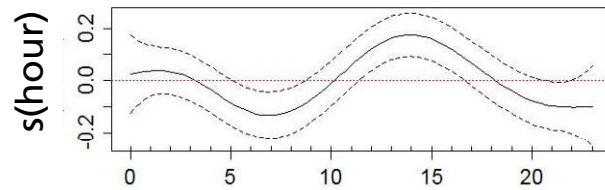
Pos	n	Intercept	Int. Ram.	Effect	Pile-Driving	Year	Month	Hour	Ex. Var.
8	12838	0,42	-1,36	-	< 0,001	< 0,001	< 0,001	< 0,001	10,54%
11	14226	0,00	-1,16	-	< 0,001	< 0,001	< 0,001	< 0,001	13,92%
13	12823	-0,55	-0,86	-	< 0,001	< 0,001	< 0,001	< 0,001	6,46%
16	11286	0,76	-1,67	-	< 0,001	< 0,001	< 0,001	0,003	20,07%

\* The effect is a combination of pile-driving and initial use of acoustic harrassment devices





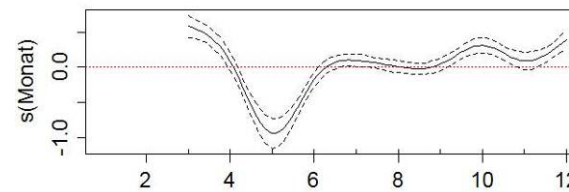
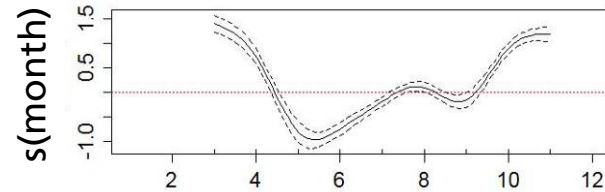
## Far range (25 – 50 km)



hour

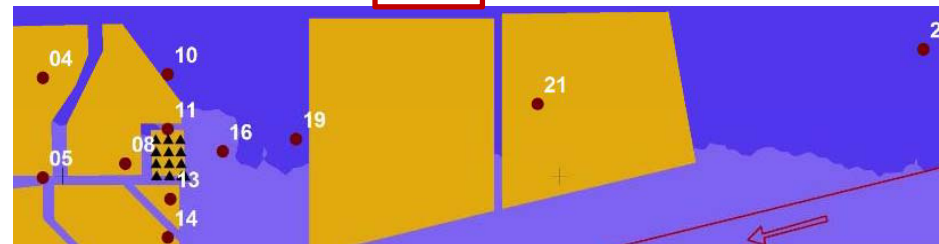
Pos 21

Pos 23

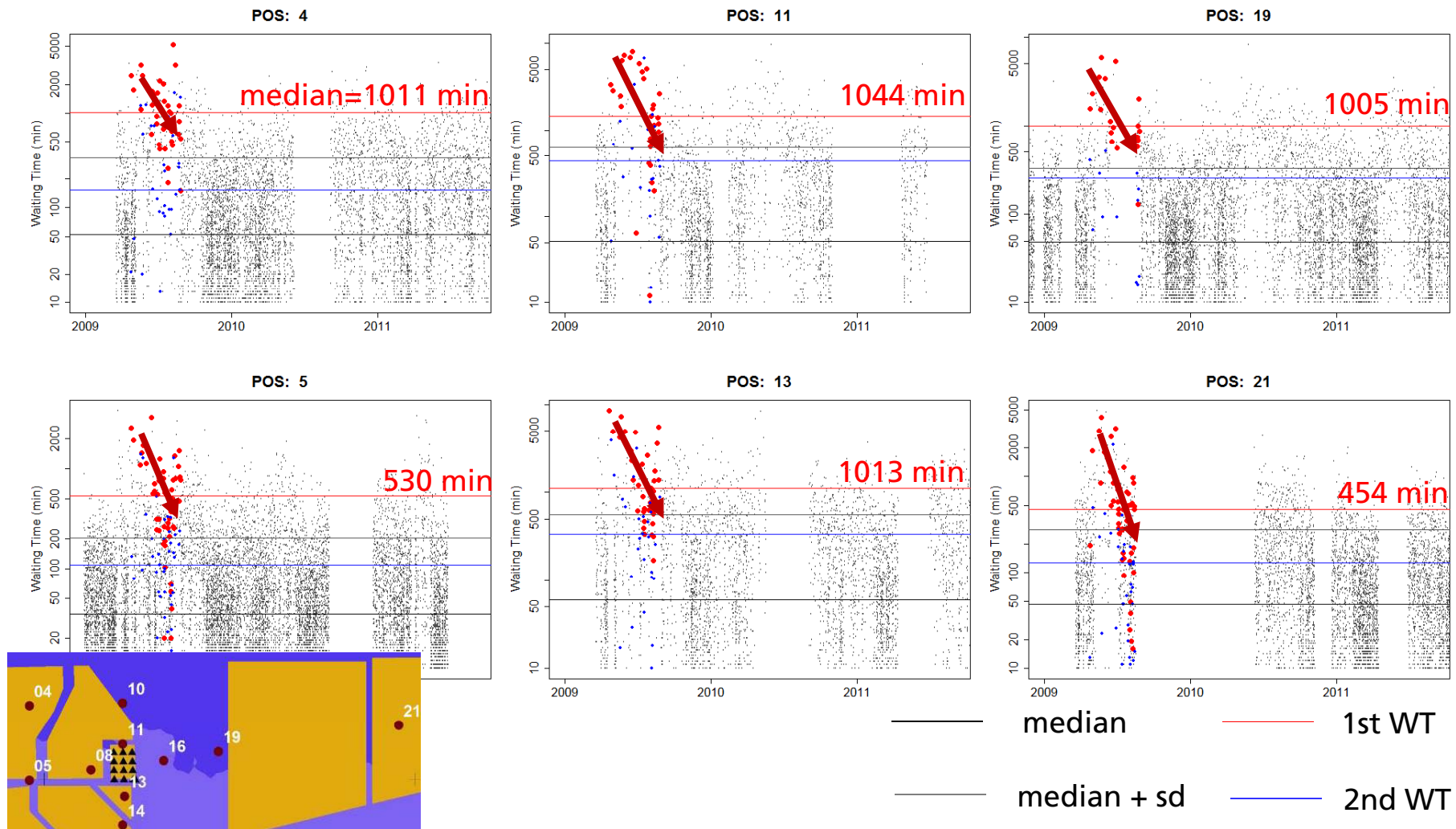


month

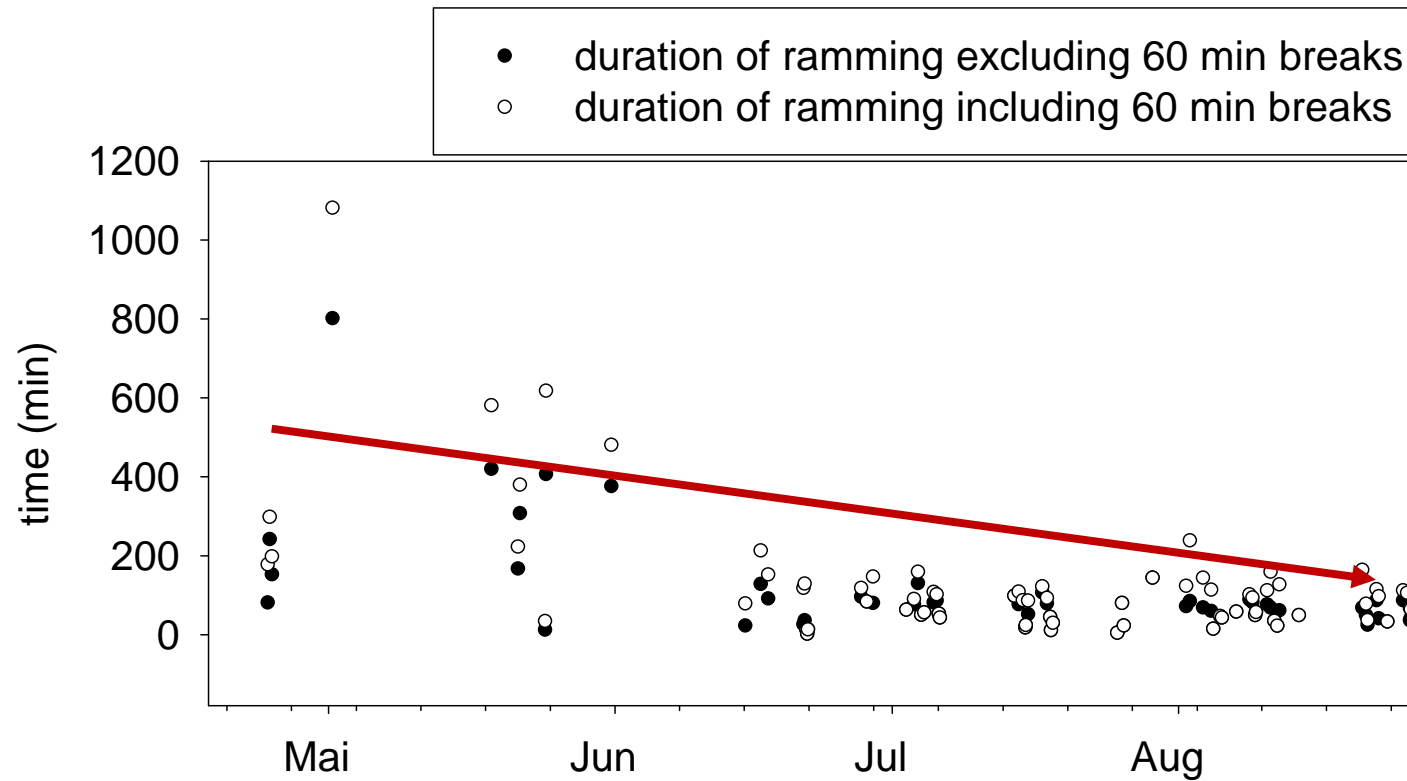
Pos	n	Intercept	Int. P-D.	Effect	Pile-driving	Year	Month	Hour	Exp. Var.
21	7283	-1,81	0,25	+	0,005	< 0,001	< 0,001	< 0,001	13,81%
23	9406	-0,62	-0,54	+	< 0,001	n.s.	< 0,001	< 0,001	3,84%



# Return during pile-driving breaks (Waiting Times)



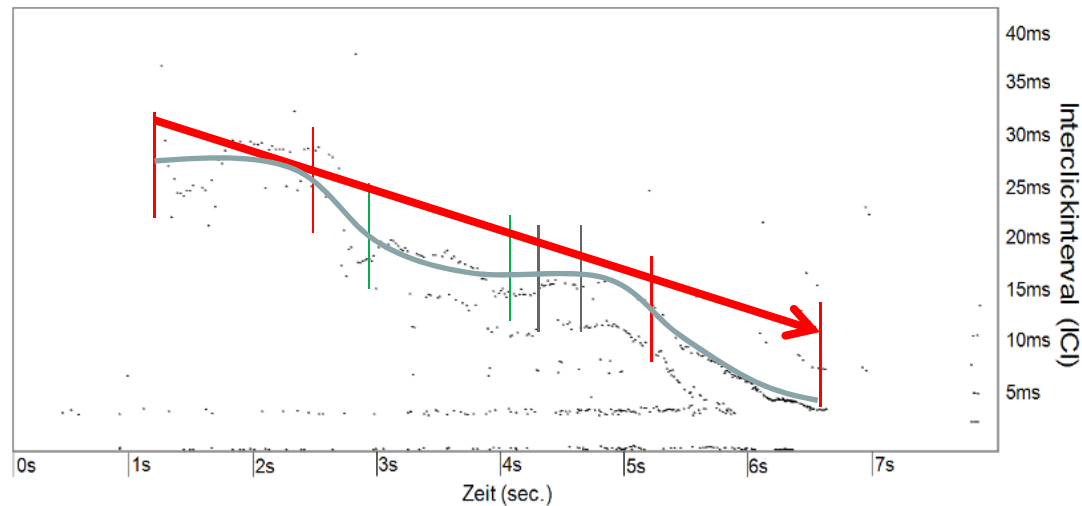
# Return during pile-driving breaks



Pile-driving durations

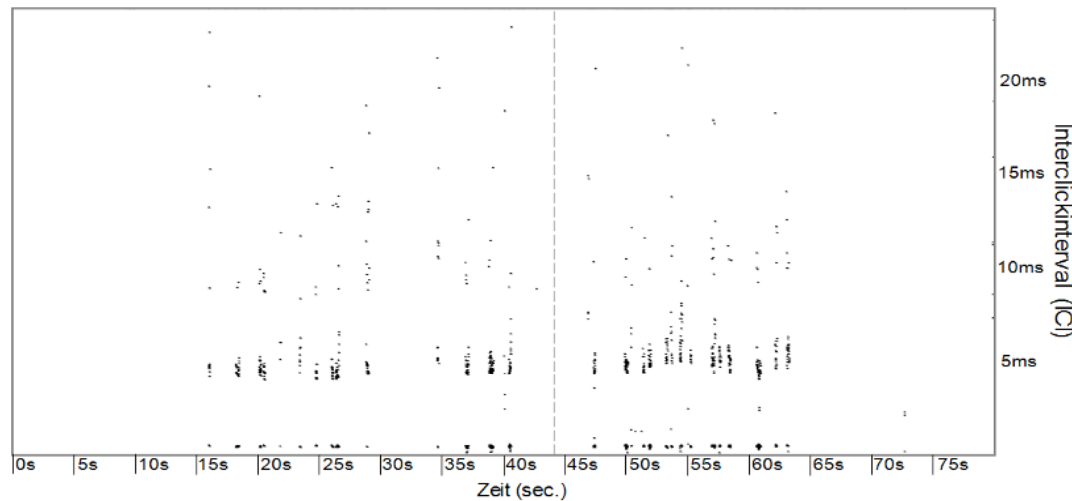


# Behavioural analysis



Approach sequence

Inter-Click-Interval decreases

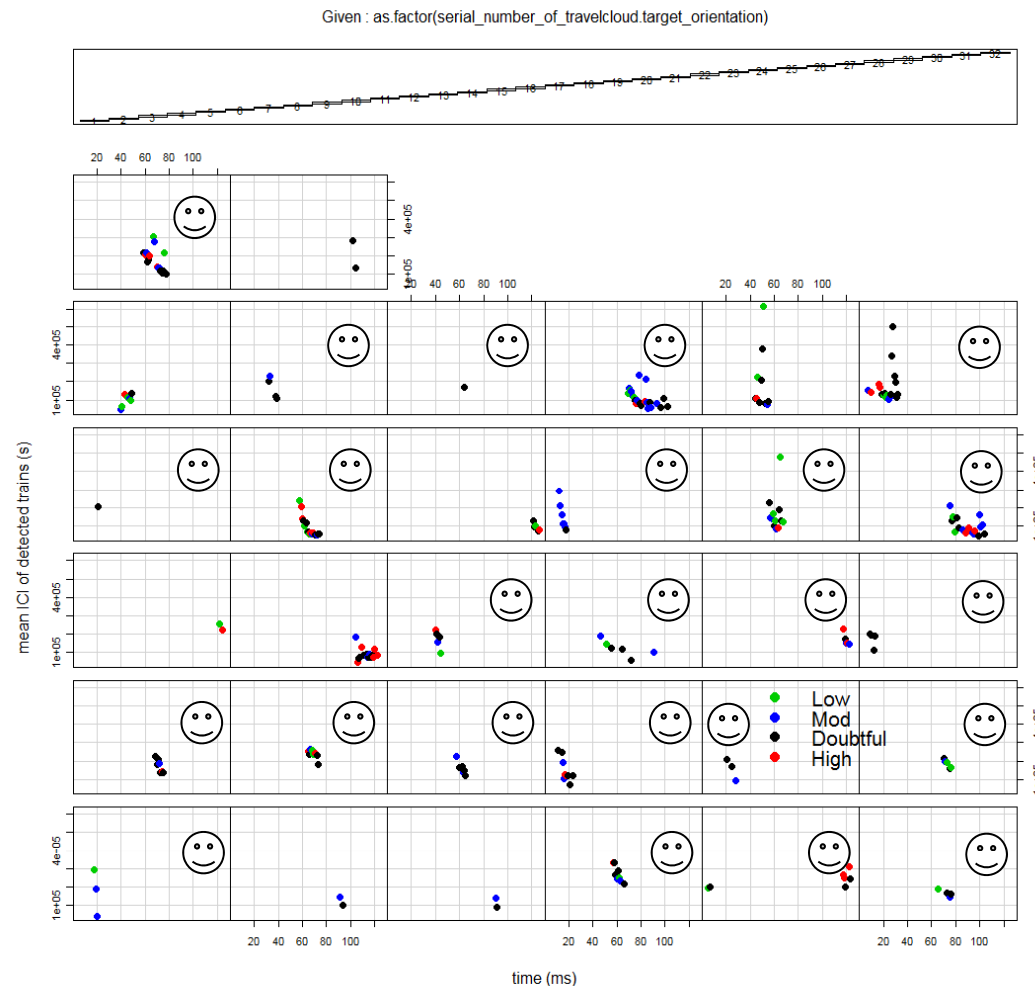


Communication

No clear definition available yet



# Automated behavioural analysis



- First results are promising
- International expert group is necessary to evaluate results and develop more accurate algorithms

# Summary 1

- Do effects remain constant after repeated sound emissions?
  - Return time is influenced by duration of ramming (and season)
  - Shorter return times → multiple exposures?
- How far are porpoises displaced?
  - There was no negative impact at stations 25 – 50 km from the construction site
  - A positive impact could include, that porpoises are displaced towards these positions
- *Is it possible to evaluate the effects taking external anthropogenic and natural impacts into consideration?*
  - Final conclusions cannot be drawn yet



## Summary 2

- **Aerial surveys give a good indication of large scale distribution and abundance**
  - Impacts are likely only to be statistically significant with a very high effort
  - They are absolutely necessary for evaluating the impact on population level
  - One large scale survey would be better suited to estimate cumulative effects than small surveys only designed for one wind park
- **Ship surveys are largely influenced by environmental conditions and only allow for a small area coverage**
  - High necessary logistics
  - Power to correlate observations with effects of pile-driving is low
  - But a whale observer team could join bird observation cruises
- **Static acoustic monitoring is best solution for estimating construction effects**



## Acknowledgements

**Ship surveys:** Linn Lehnert, Kristina Lehnert, René Swift, crews of MV Edna, MV Hydrograph, MV Valdemar and all observers

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Thank you for your attention!