

Changes in benthos at alpha ventus

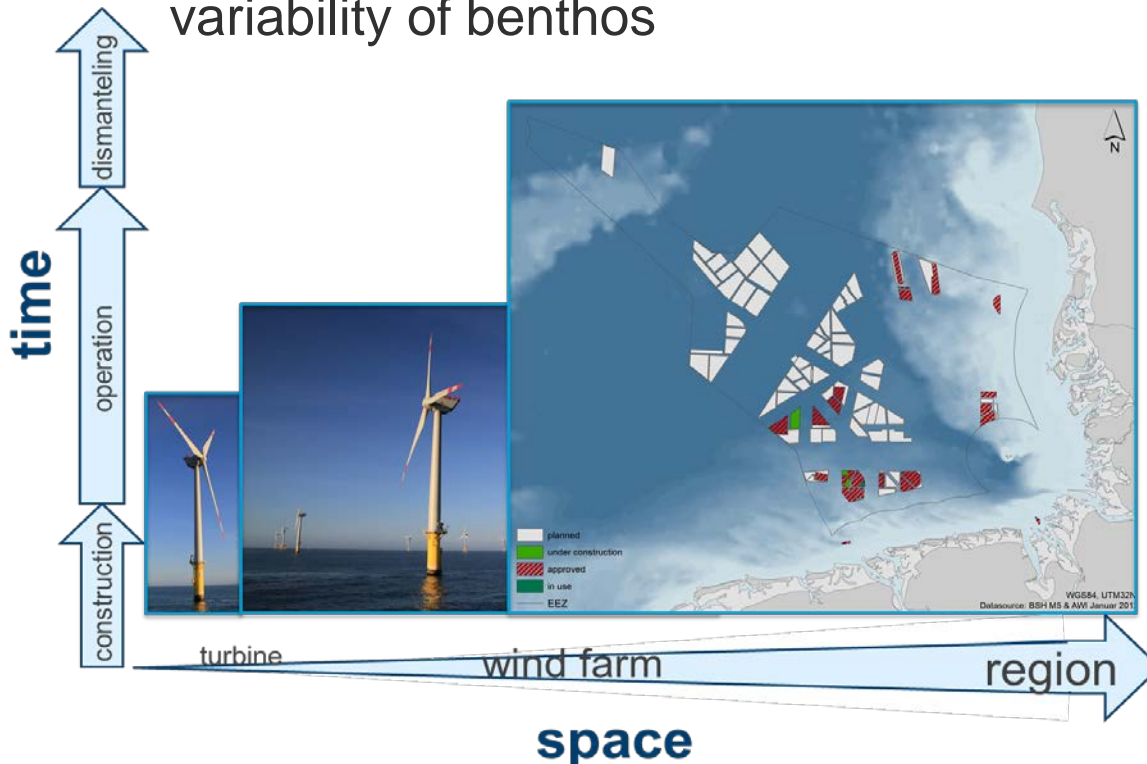
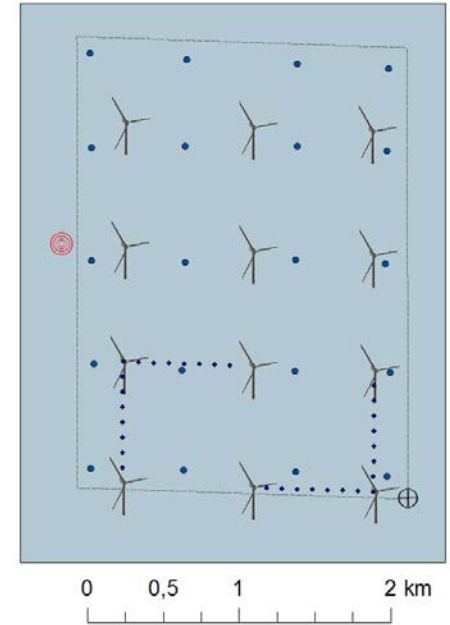
– lessons learnt from monitoring evaluation –

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Andreas Schmidt, Roland Krone, Manuela Gusky

aims of StUKplus project



- evaluation of the German standard for environmental impact assessment (StUK3)
- wind farm effects at different spatial scales: turbine - wind farm – region
- cumulative effects, natural temporal/spatial variability of benthos

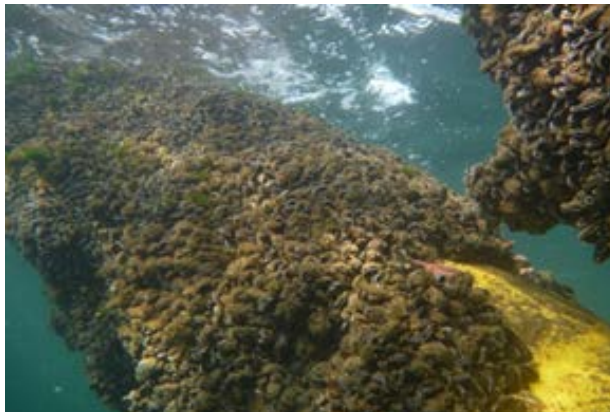
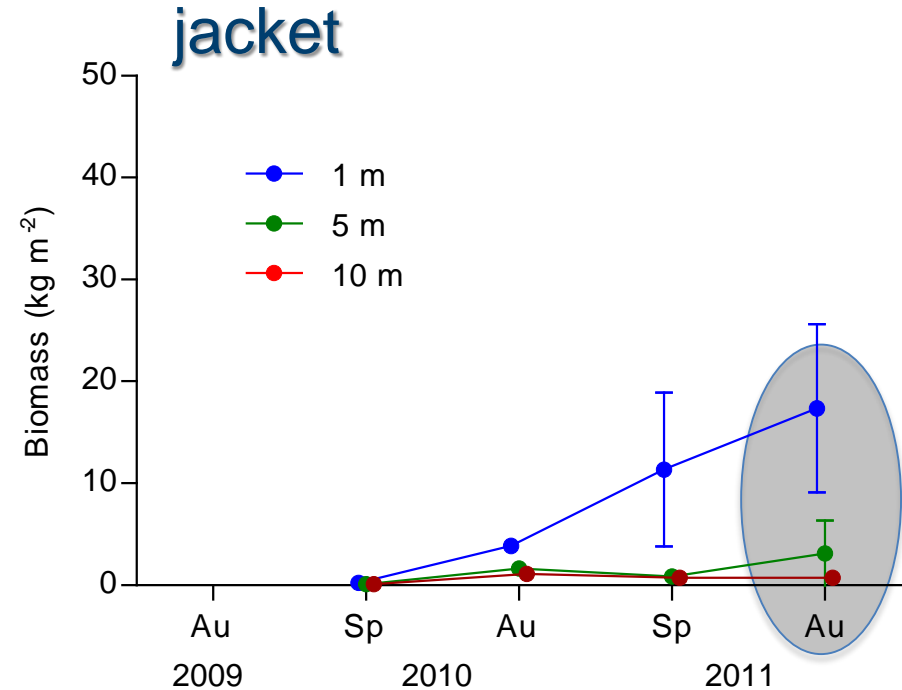
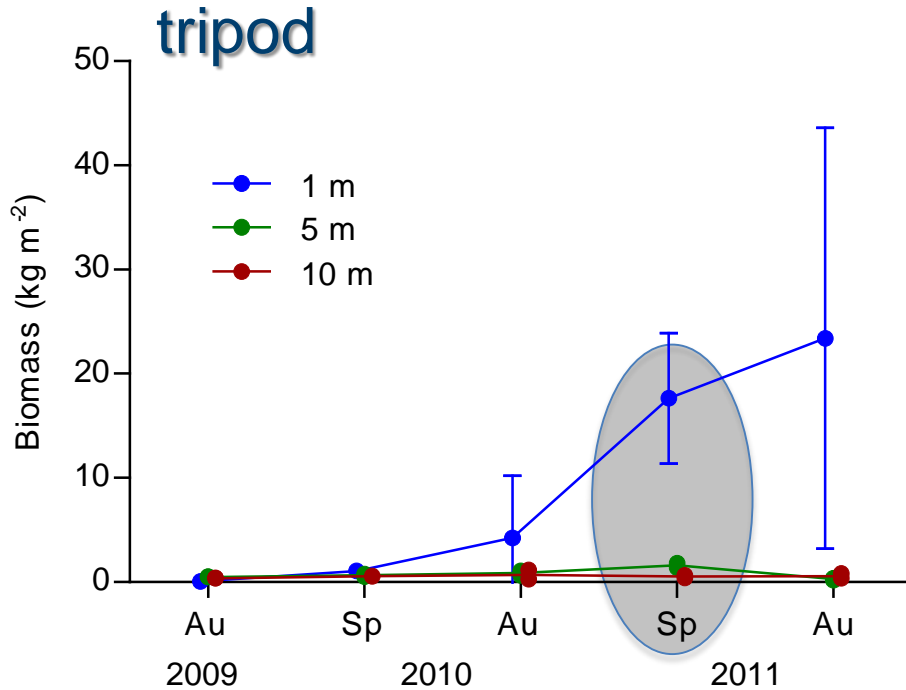


evaluation criteria for sensitive areas

→ permit procedures

→ marine spatial planning

turbine focus - epifouling



Mytilus edulis

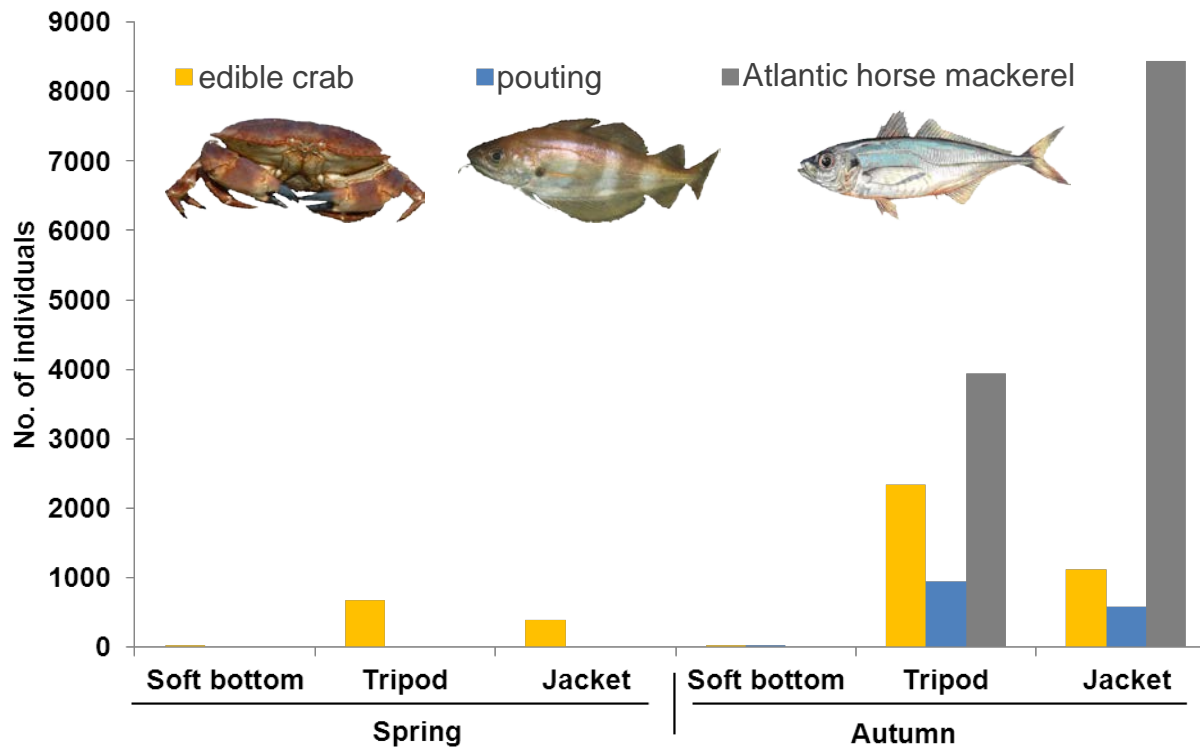


biomass contribution

| | |
|------|------|
| 1 m | 96 % |
| 5 m | 21 % |
| 10 m | 5 % |

turbine focus - megafauna

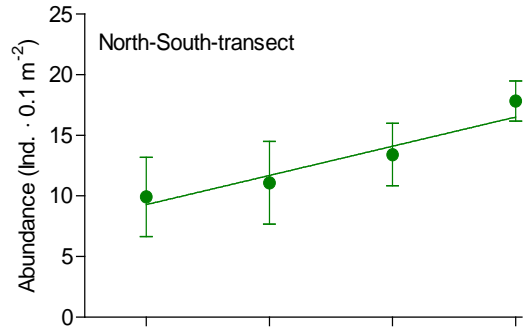
second year after construction



standing stock in alpha ventus ~20,700 edible crabs

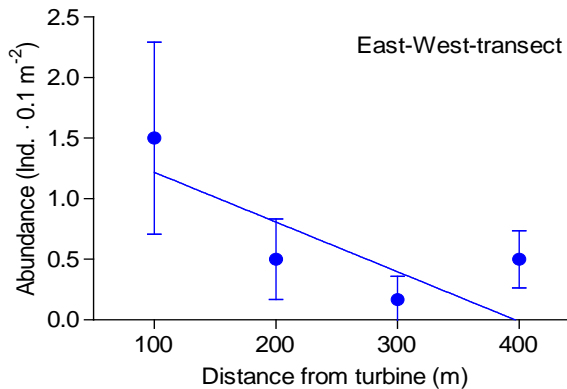
turbine \leftrightarrow wind farm focus species

$\geq 80\%$ occurrence frequency: 19 species



Bathyporeia guilliamsoniana

$R^2 = 0.47$
 $P = 0.01$

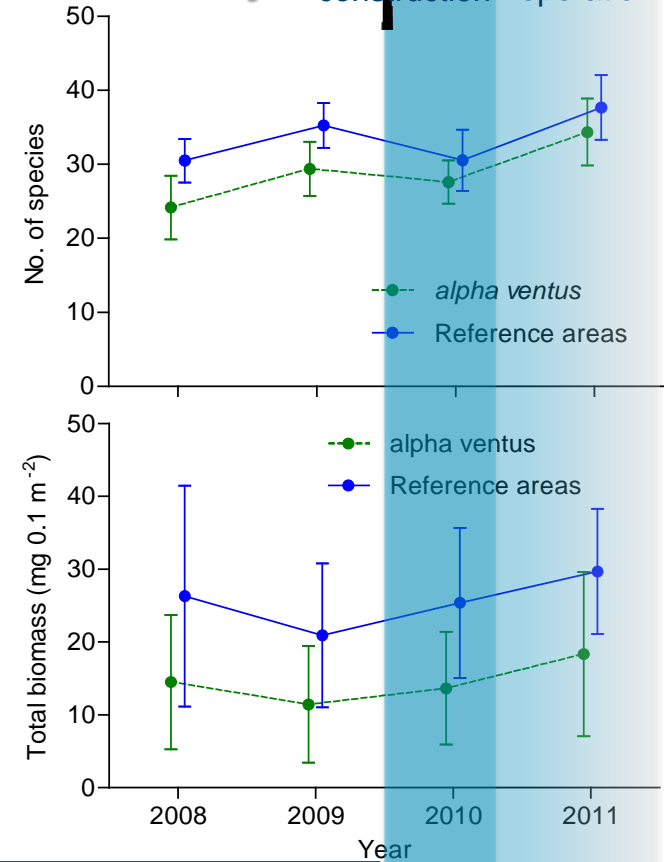


Thracia phaseolina

$R^2 = 0.40$
 $P = 0.02$



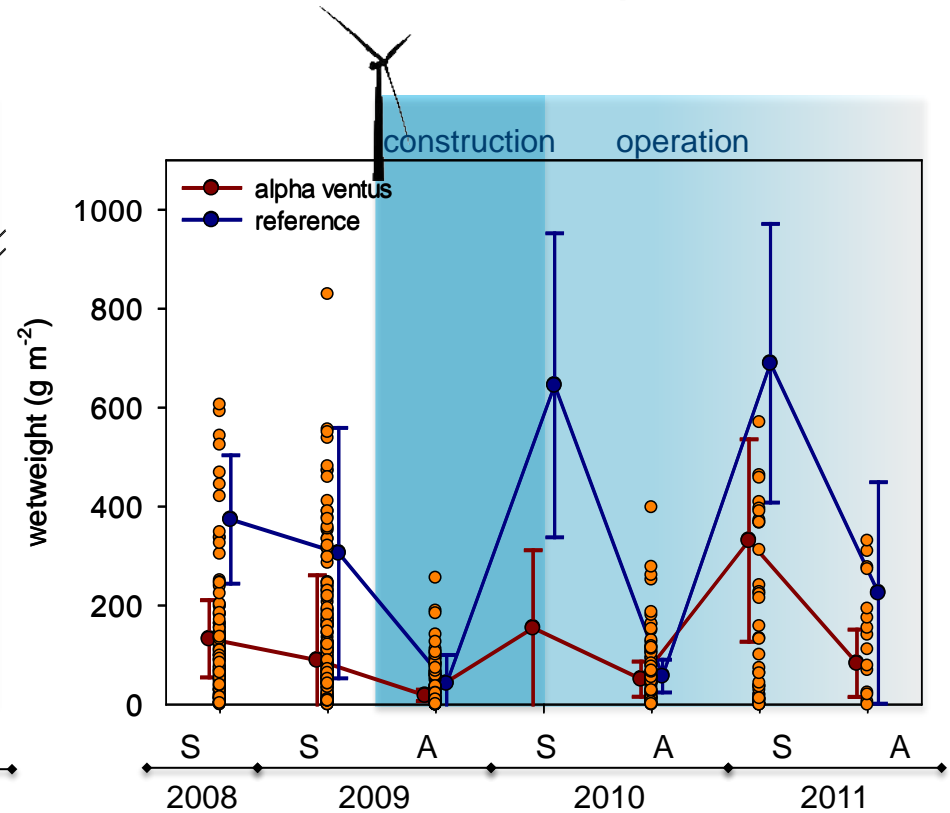
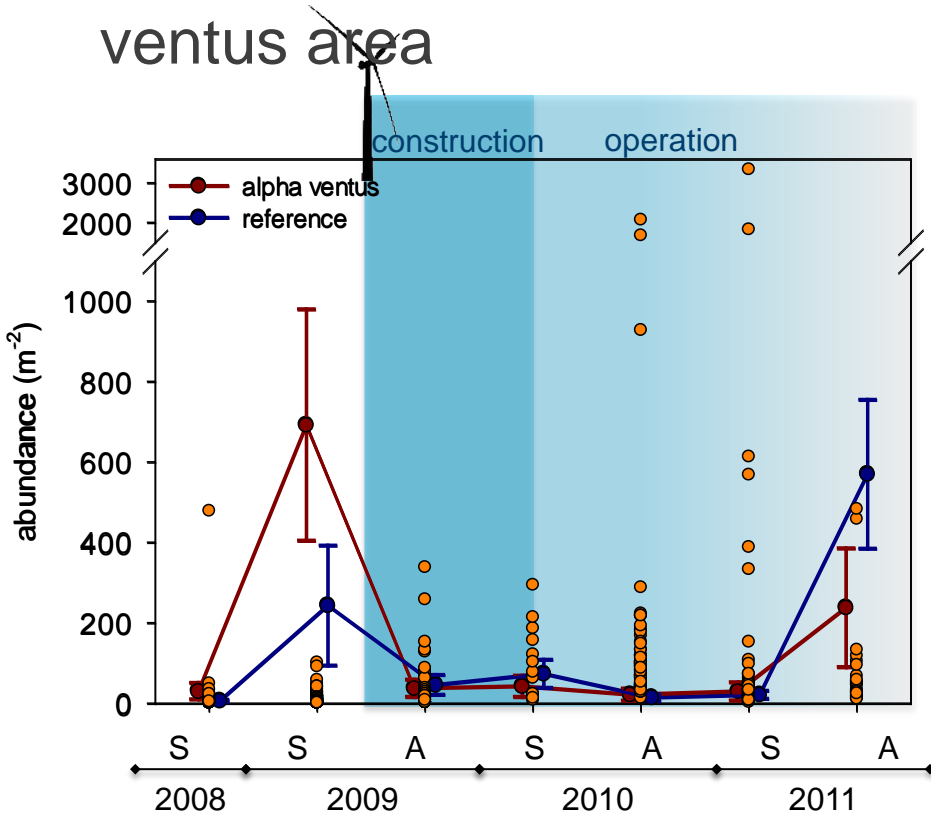
community



- Small wind farm → edge effects?
- Time frame → „slow“ benthic system
- Spatial resolution → local effects (<100 m)

wind farm focus

different temporal development of all community descriptors (species, biomass, abundance) in reference and alpha ventus area

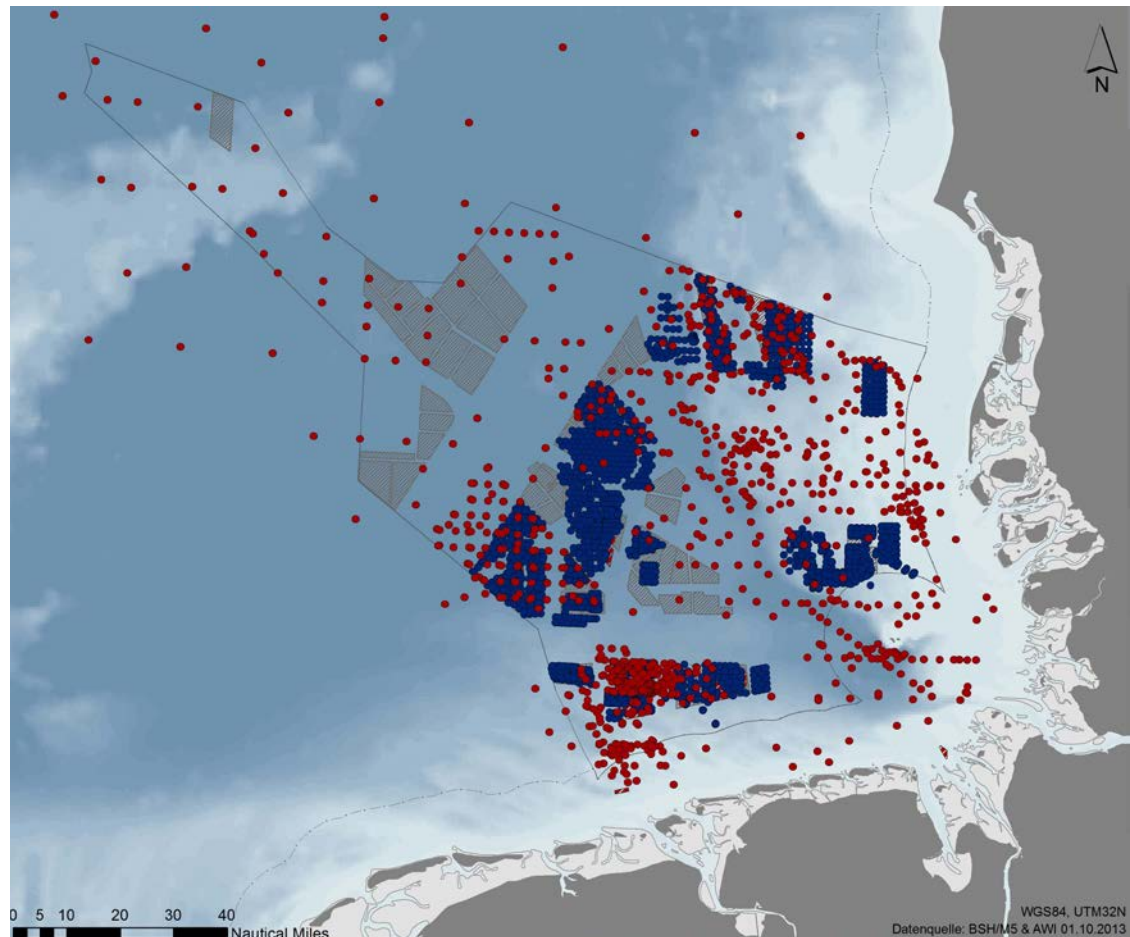


regional focus - database

- database on benthic invertebrates and demersal fish
- relational database system

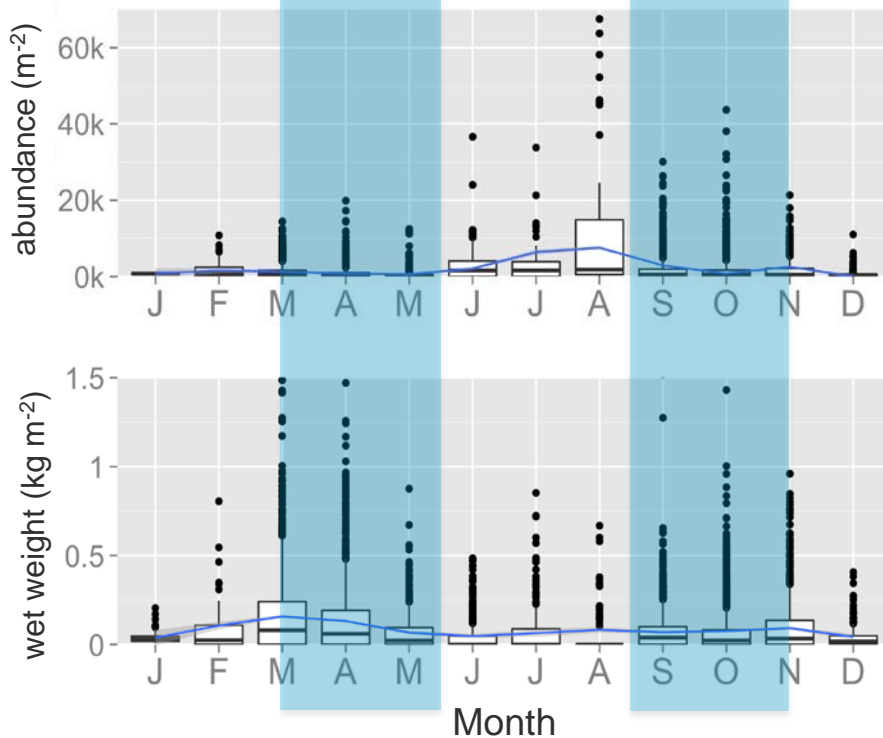
Benthic database

- van Veen grabs, beam trawls
- > 2100 station entries from research projects, > 7000 from EIA
- > 200 000 taxa entries with biomass and abundance



regional: temporal/spatial variability

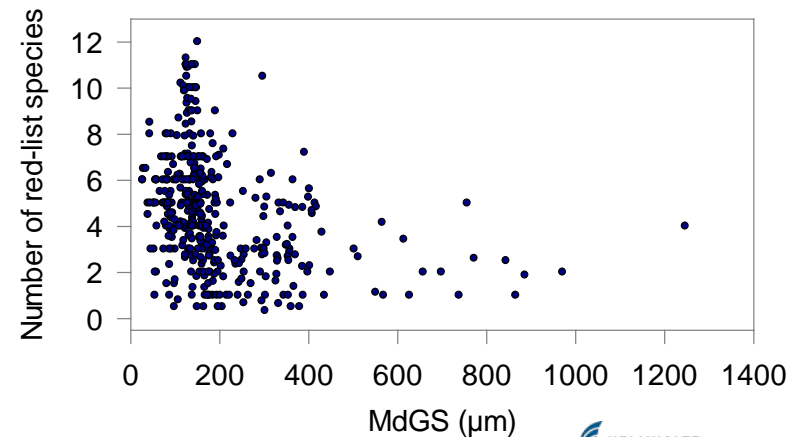
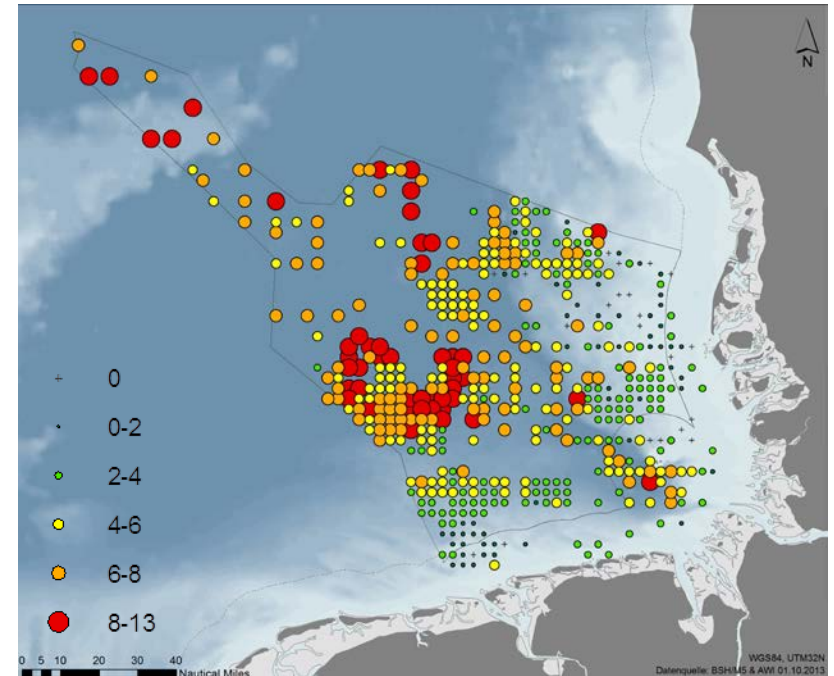
StUK sampling periods



density

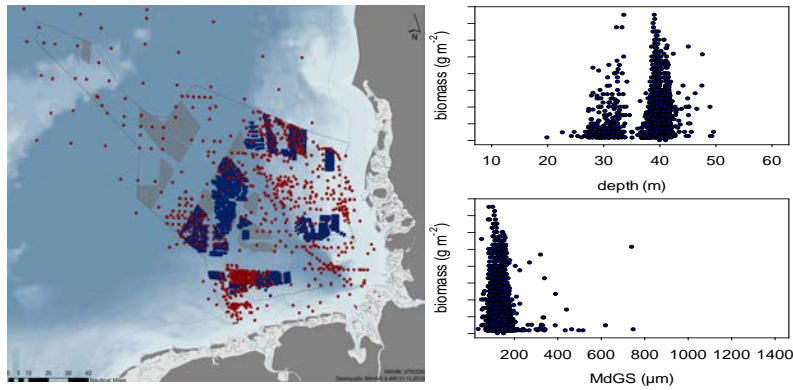


biomass

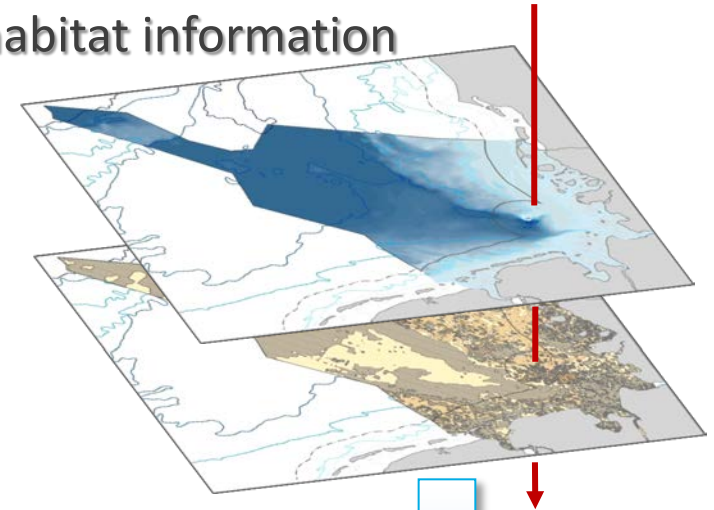


regional: spatial modelling

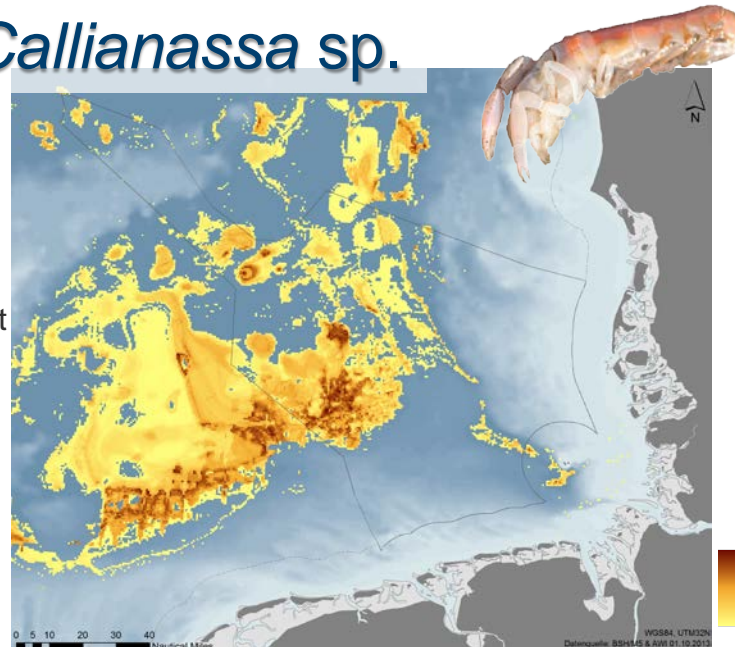
species information



habitat information



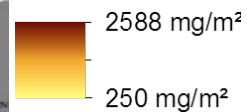
Callinassa sp.



random forest
model

quality:
AUC: 0.92
 R_S : 0.68

error:
 253 mg m^{-2}



outlook – lessons learnt

Monitoring evaluation – StUK 4

extension

- mobile megafauna at turbines
- installation-based infauna sampling (50, 75, 100 m)
- benthic monitoring for installation of cable routes

reduction

- no benthic monitoring in construction phase
- no seasonal monitoring cycle, reduced to autumn
- cluster study, share of reference areas for BACI



www.bsh.de/en/Products/Books/Standard

outlook – where to go



turbine focus

- cause-effect relationships of specific questions, hypotheses based research

wind-farm focus

- most striking things to come: fishery cessation!

regional focus

- service-oriented long-term open data service
decision basis for stakeholders
- Scientific analysis on regional to international scale
model processes, marine ecosystem services & goods



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Chair: Andrew Gill, Jennifer Dannheim

Working Group on Marine
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