Drivers of small-scale variability in soft-sediment benthic communities

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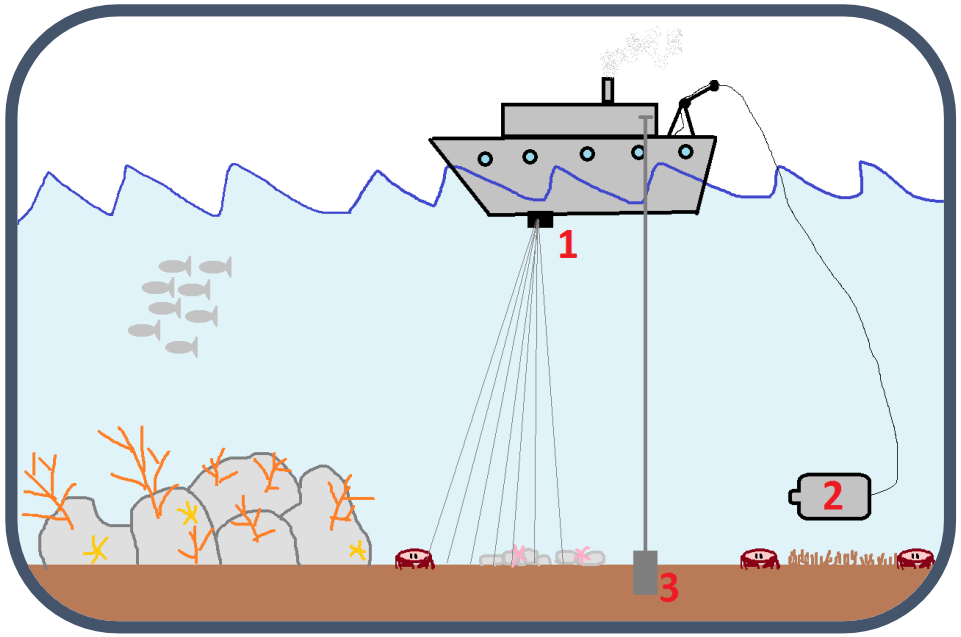

Disclose Symposium, Utrecht, 6 November 2019

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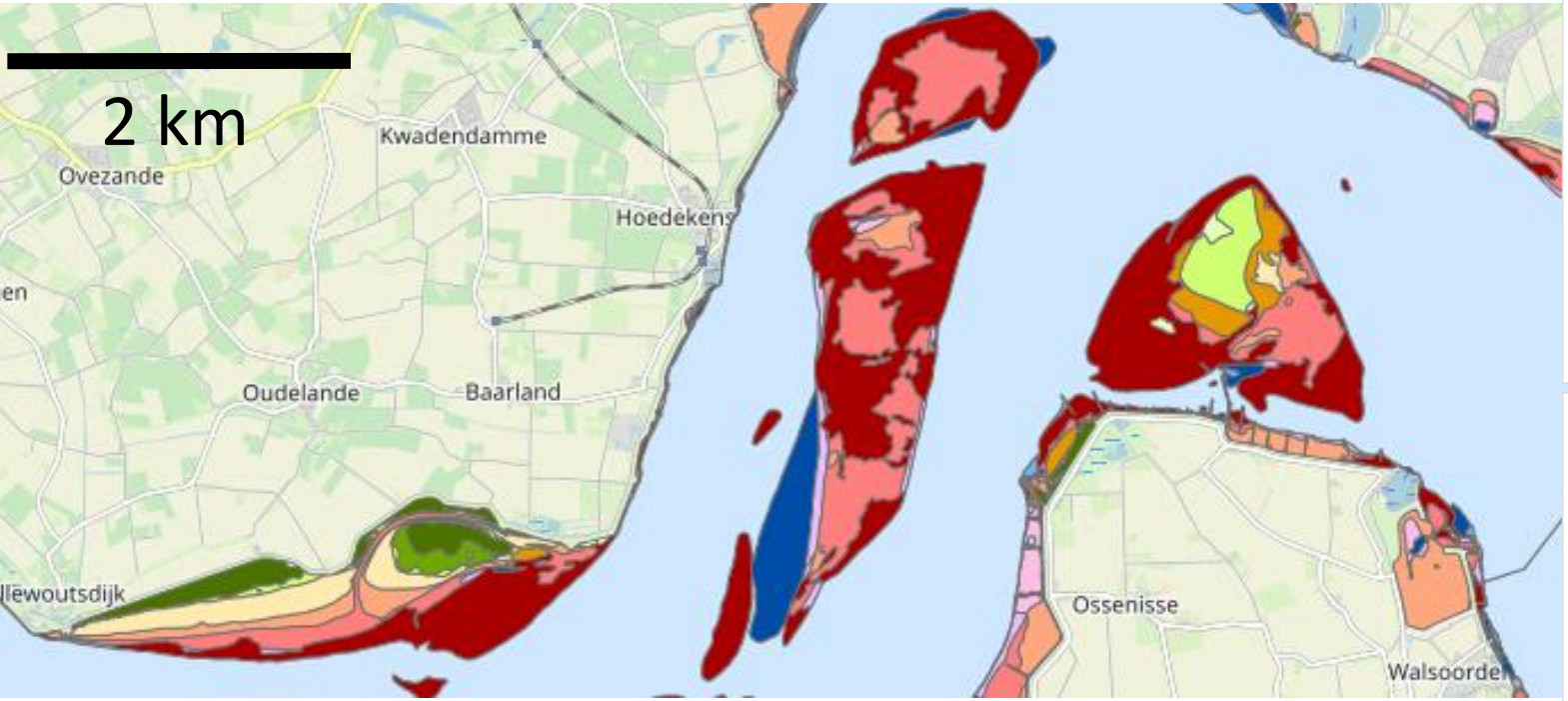
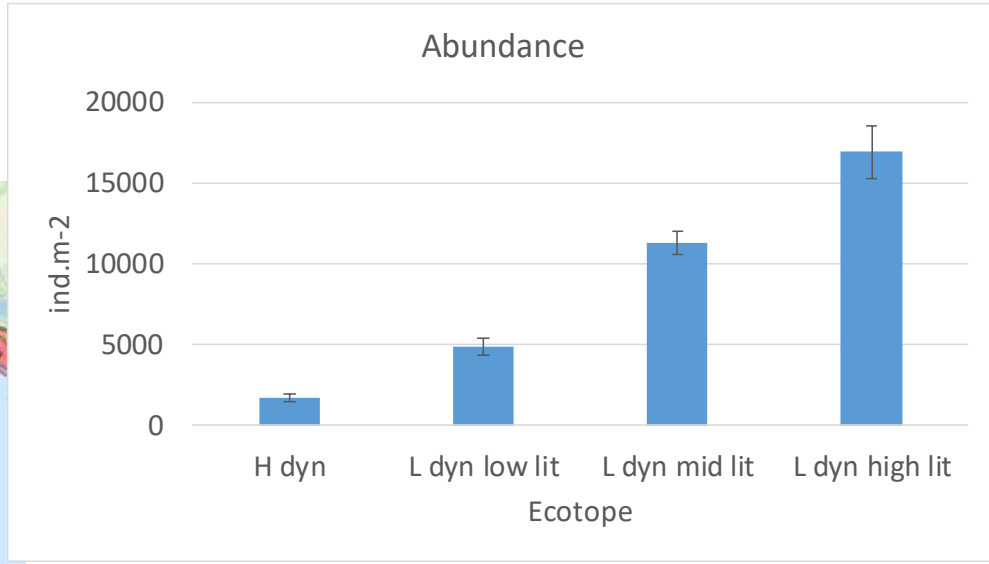
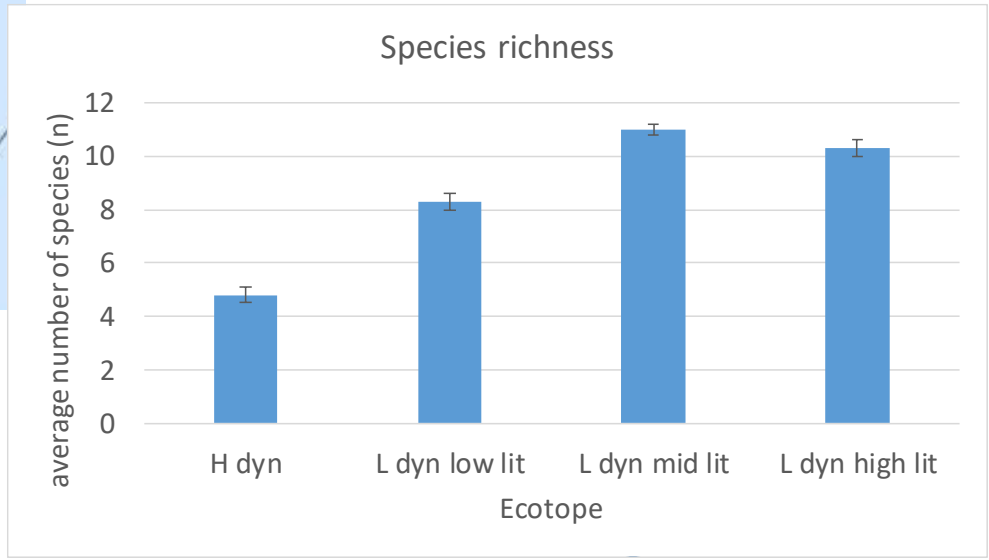
The benthic seafloor

- NOT homogeneous expanses of sand or mud

Intertidal habitats and benthic macrofauna

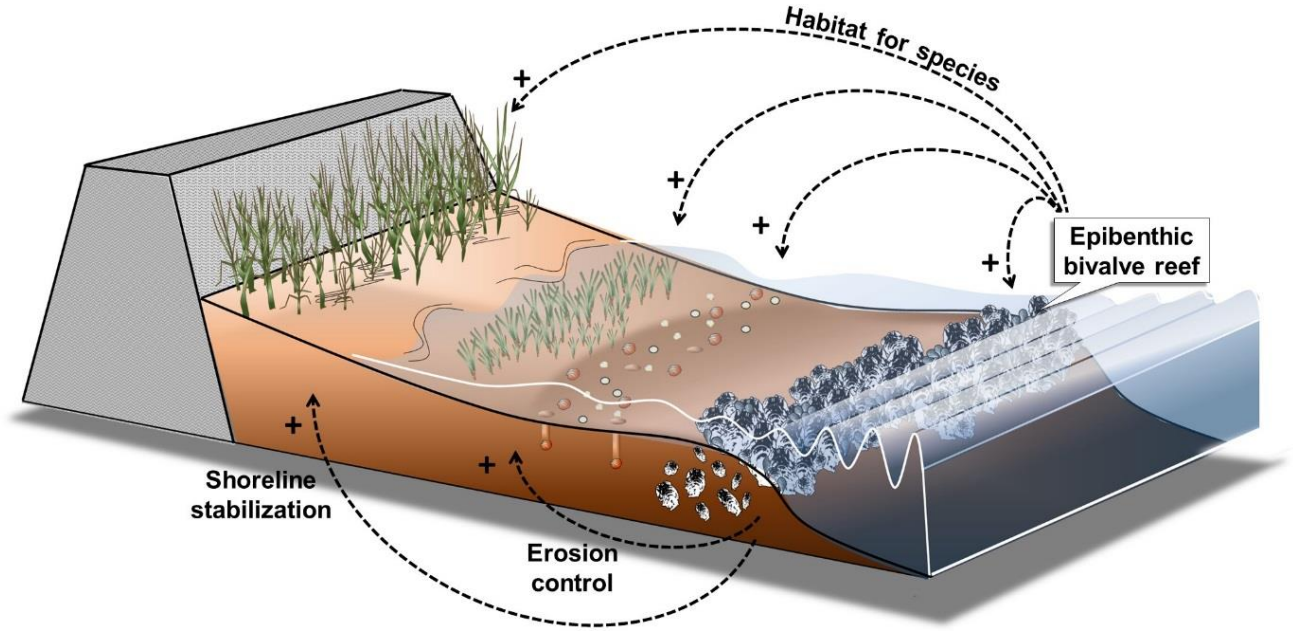






Important drivers/causal factors: salinity, emersion time, sediment type, hydrodynamics, sediment dynamics, etc.

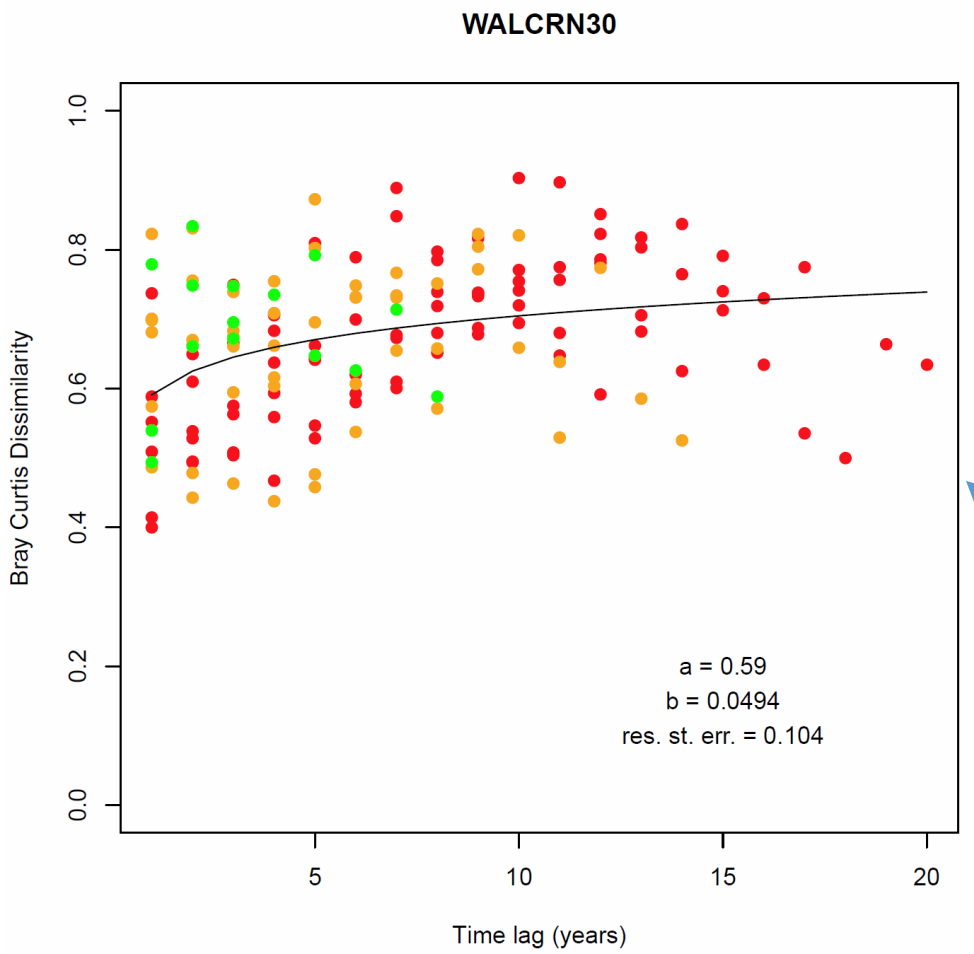
Intertidal habitats and benthic macrofauna

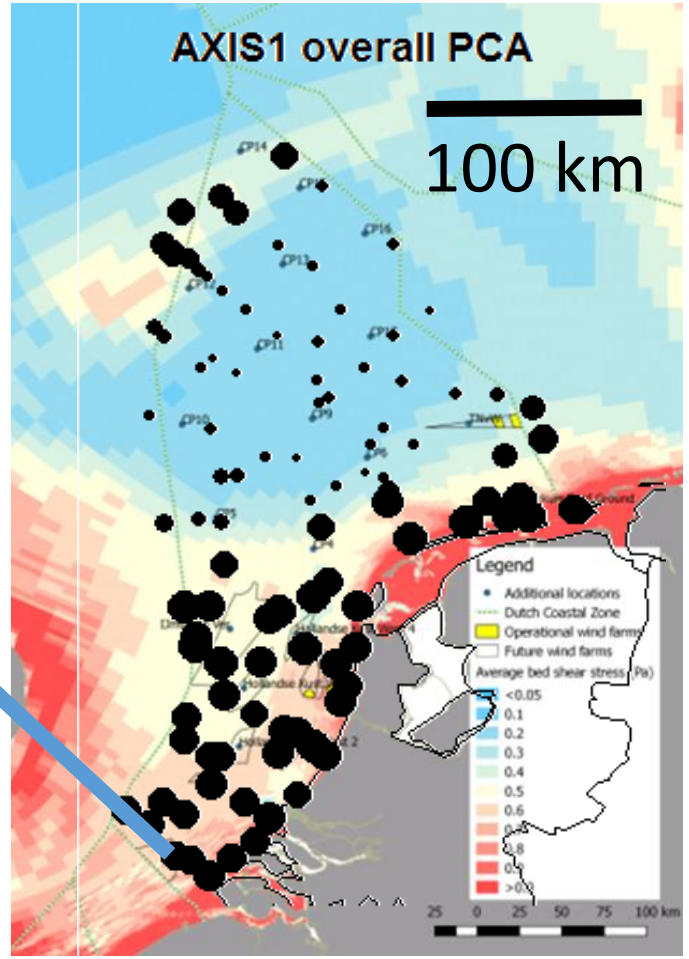


Ysebaert et al. 2019

Important drivers: ecosystem engineers: oysters, mussels => biogenic reefs

North Sea Benthos





Source: Peter Herman

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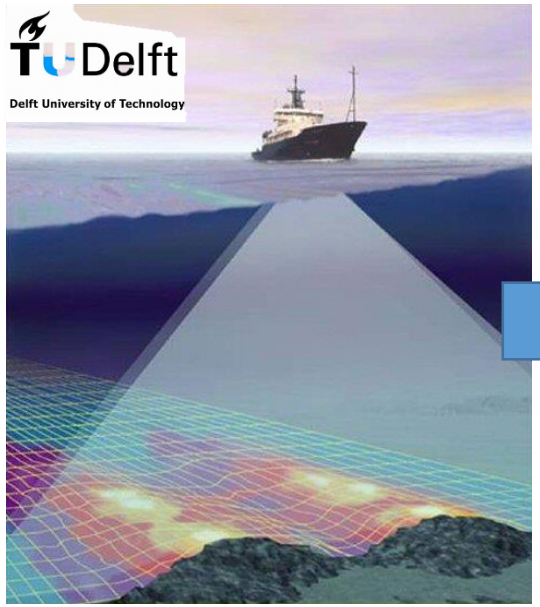
Disclose Brown Bank habitat mapping

- accurately link biodiversity to seafloor morphology and explore if this allow to upscale locally sampled biodiversity patterns to the wider seafloor landscape using a multiscale approach (Mestdagh et al. submitted)



Acoustics

Video observations

Grab samples

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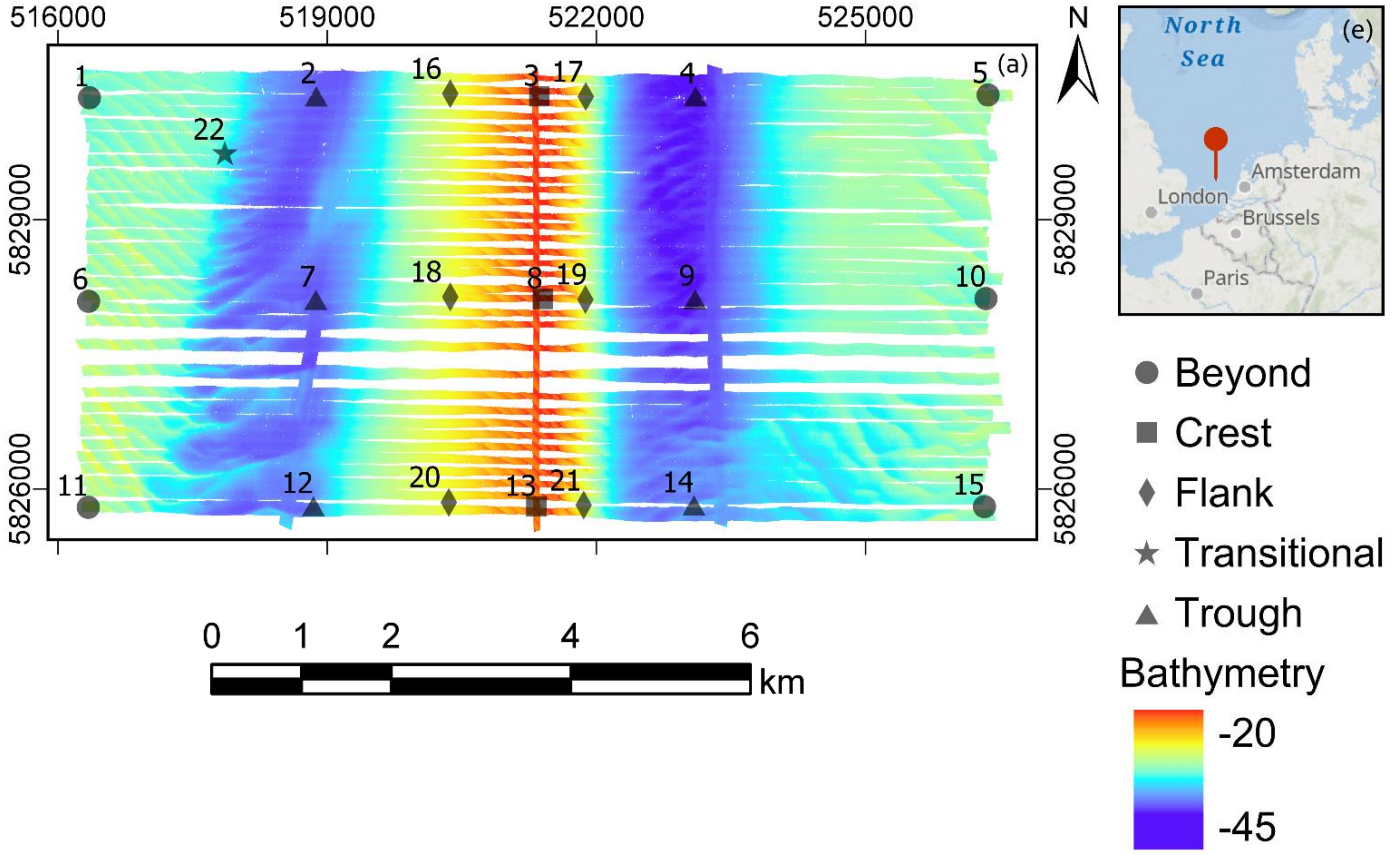
Disclose Brown Bank habitat mapping

- Sampling design

Large sandbank area + smaller-scale sand waves (wave l 200 m, h 5 m) + smaller mega-ripples (wave l 10 m, h 0.1 m)

Based on the MBES bathymetry: 22 stations selected



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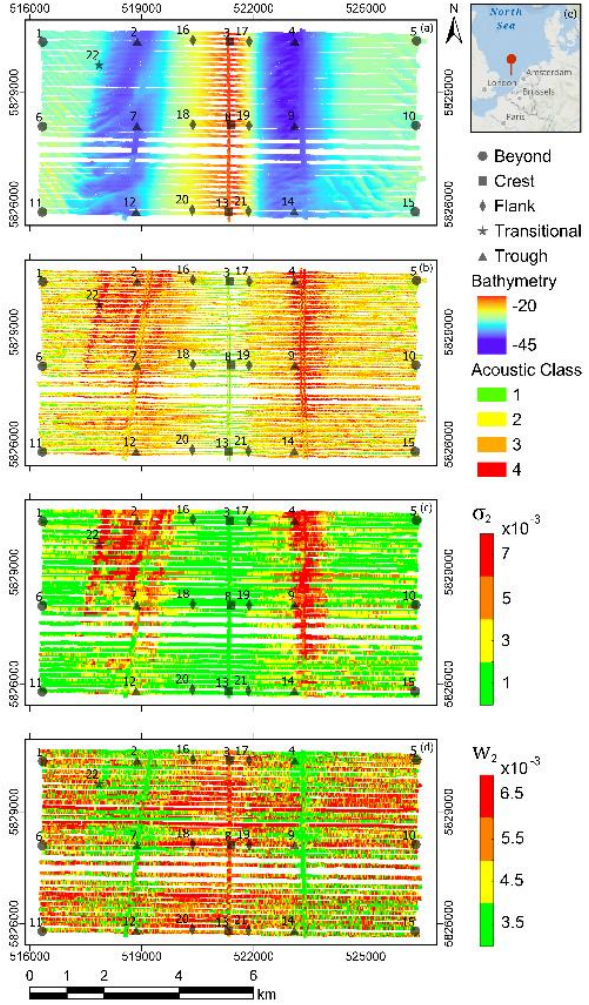
Disclose Brown Bank habitat mapping

- Acoustics (Multi Beam Echo Sounding MBES)

Four acoustic classes for the survey area

From backscatter: sediment median grain size M_z, volume scattering σ_2 *and* surface roughness w_2

Different backscatter values in troughs and crests



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Disclose Brown Bank habitat mapping

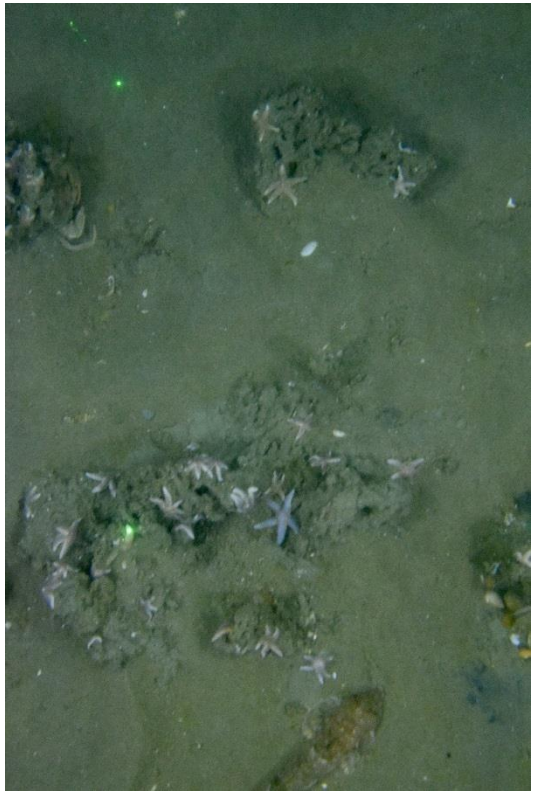
- Video observations (and SPI)

16 taxa: Starfish *A. rubens*, brittle stars, hermit crab *P. bernhardus*

Densities trough > crest

Trough: 3-5 habitat changes per 100m

Sabellaria landscape



university of groningen

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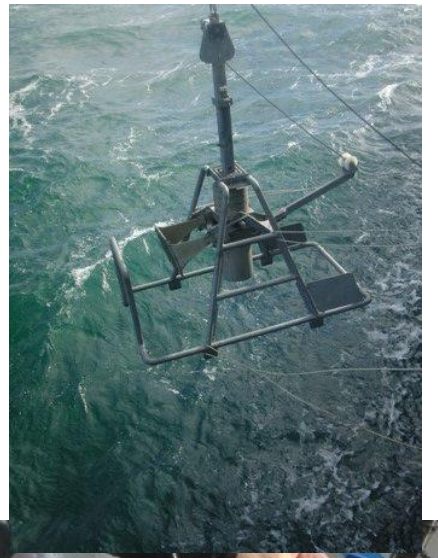
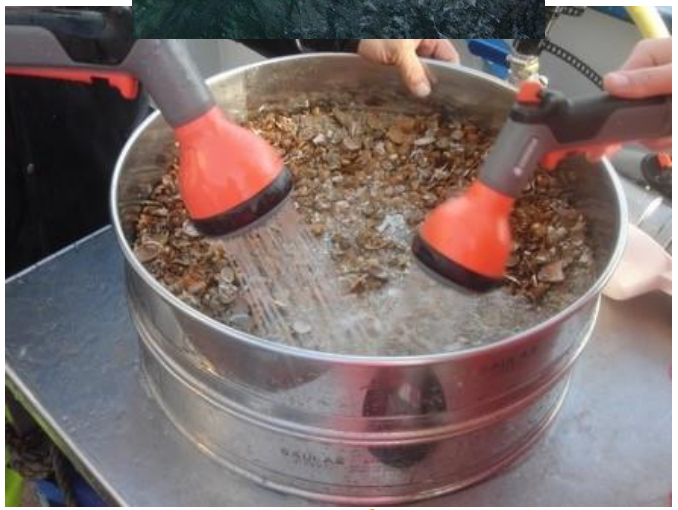
Disclose Brown Bank habitat mapping

- Grab samples





129 taxa, dominated by cumaceans and amphipods

Species richness: lowest (9.4 ± 3.5) on Crest and highest (28 ± 9.5) in Transitional

Densities less mobile species: Trough > Crest

Trough/Transitional: ind. of reef-building Ross worm *S. spinulosa*

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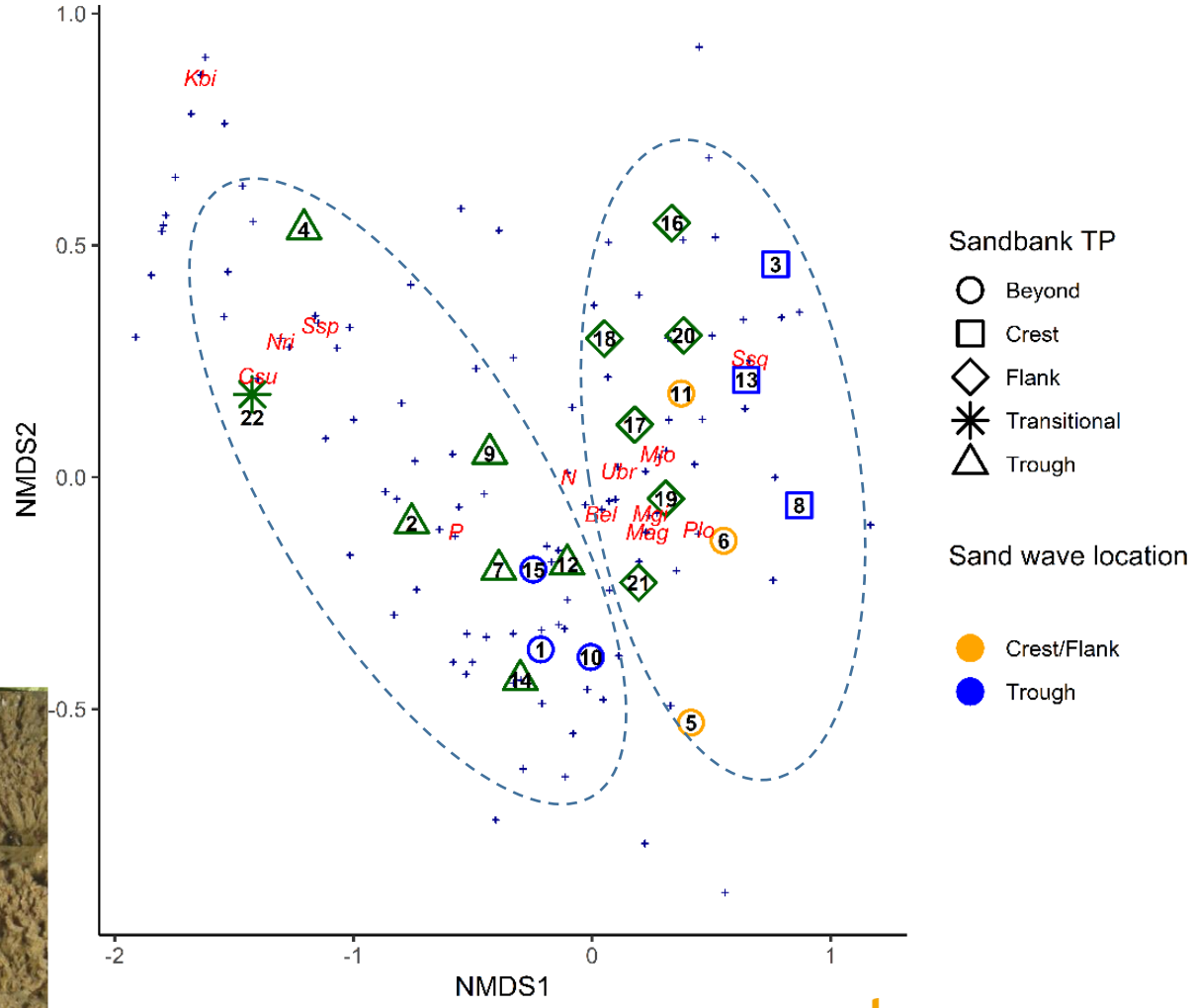
Disclose Brown Bank habitat mapping

- Grab samples

Discriminating species between TPs: hooded shrimp *M. gilsoni*, horseshoe worms *Phoronis* and Ross worm *S. spinulosa*



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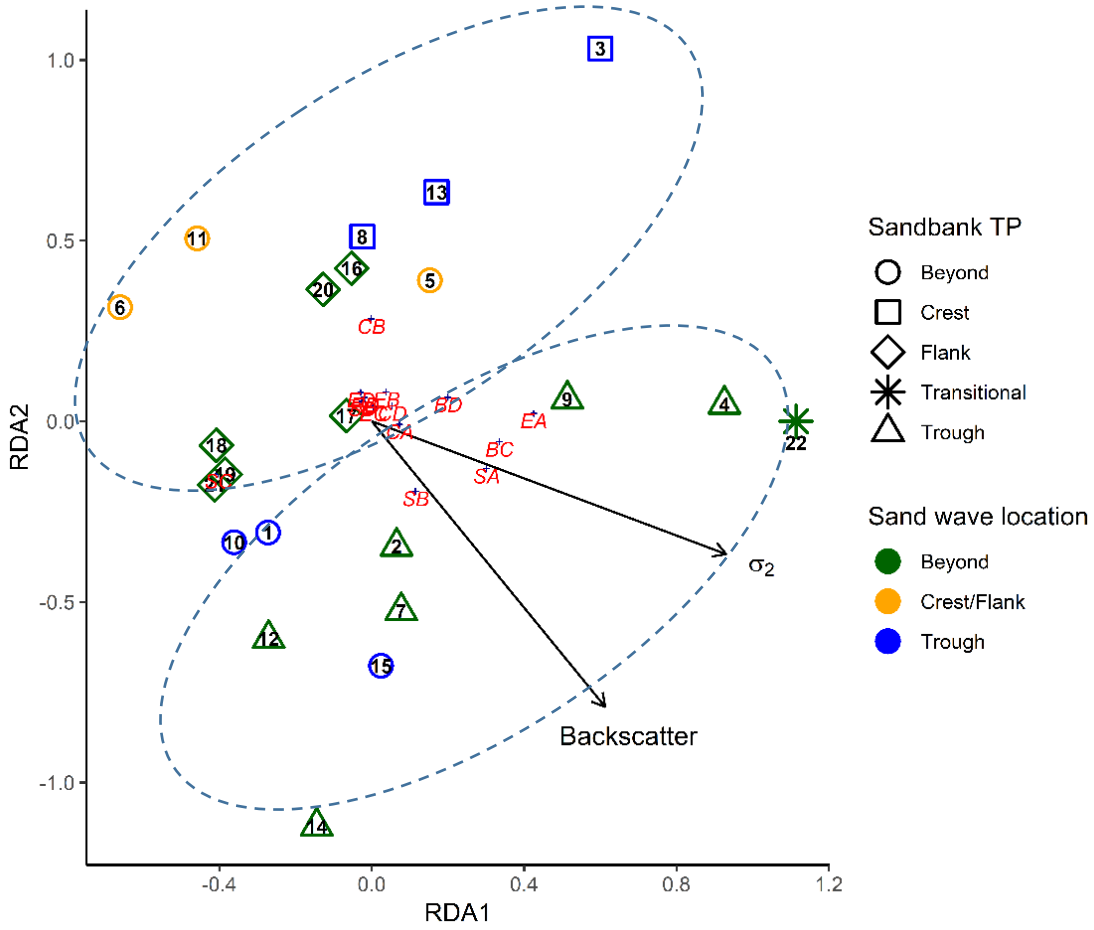
Disclose Brown Bank habitat mapping

- Integration

Video, SPI and MBES show similar features

RDA model based on functional groups: σ_2 and backscatter selected, mostly separating the Trough and Transitional stations from Crest stations



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Conclusions and implications for monitoring

- By combining different sampling methods we obtained a more detailed image of the seafloor
- Traditional designs with only (single) grab samples do not take small-scale heterogeneity of the seafloor into account
- additional techniques useful for information about smaller-scale variability. Acoustic data crucial to identify sand waves, allow to compare patterns in community structure on sandbank and sand wave scale.

Conclusions and implications for monitoring

- Video revealed that *Sabellaria* found in grab samples formed (fragmented) reefs, which occurred only in areas with high volume scattering.
- techniques useful to delineate regions where biogenic structures can be present (potentially serve as tool in conservation management).
- Grab samples needed to properly determine biodiversity and evaluate the community effects of features like *Sabellaria* reefs.
- we recommend the complementary use of MBES and video footage.