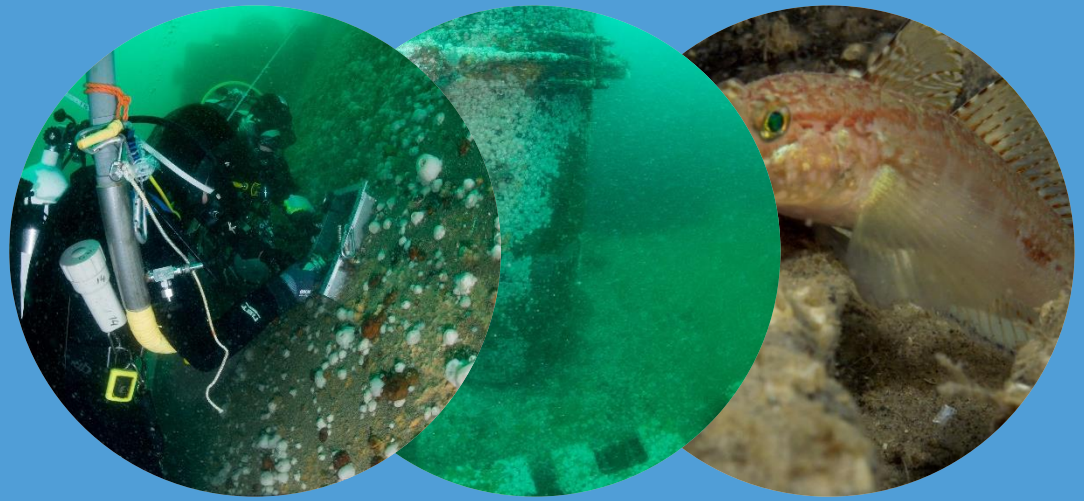
Removal scenarios & benthic biodiversity

WGMBRED ToR D meeting

21 April 2020, Joop W.P. Coolen



WAGENINGEN UNIVERSITY & RESEARCH

Bureau Waardenburg bv
Consultants for environment & ecology

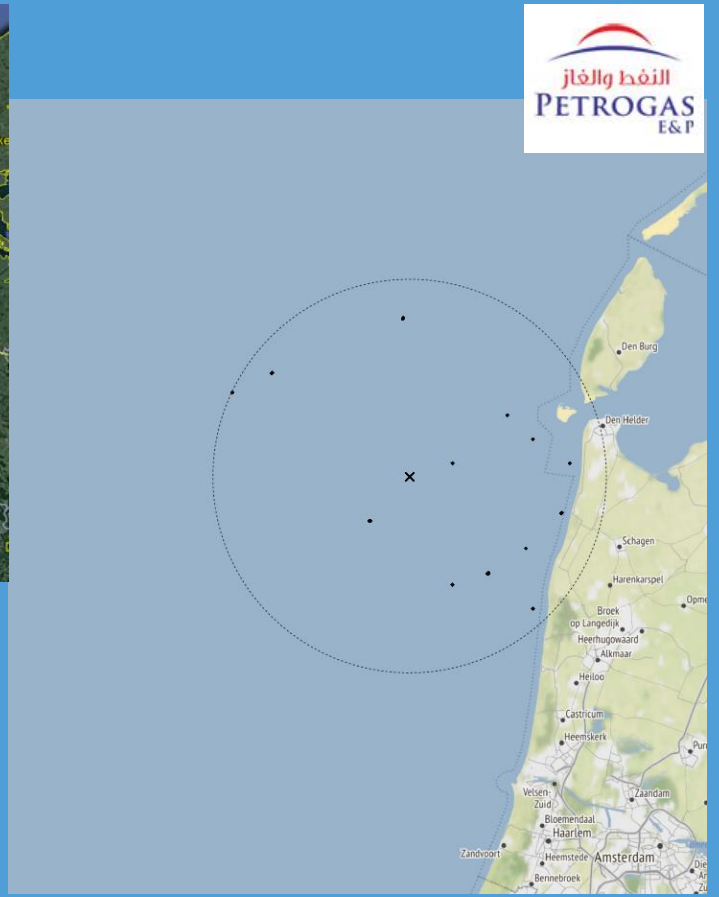
DMP DUTCH MARITIME PRODUCTIONS

SEATEC NAUTICAL MISSIONS

Organisation

- Lead investigator: Joop Coolen
- Field team: Joop Coolen, Joost Bergsma, Floor Driessen, Udo van Dongen, Ben Stiefelhagen, Melchior Stiefelhagen, Peter van Rodijnen, Klaudie Bartelink, Cdt. Fourcault crew
- Lab work: Pre-sorting: Bureau Waardenburg & WMR
  Identification: Babeth van der Weide, Oliver Bittner, Wim de Groot, Midas Siahaya
- Data analysis: Joop Coolen

Location: platform Halfweg - operator: Petrogas



Images by Bureau Waardenburg & Dutch Maritime Productions

Scenarios currently considered (end situation)

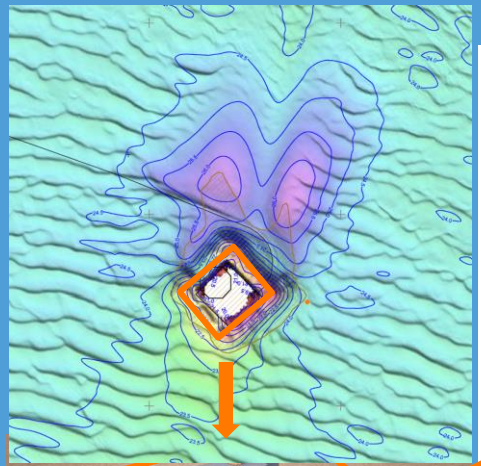
1. **REMOVE CONCRETE & STEEL, LEAVE ROCK**
   The concrete structure is fully removed and the surrounding rock dump is scattered partly across the area while the remaining rock dump is untouched.
2. **LEAVE EVERYTHING**
   The concrete structure is left in place and all rock dump remains untouched.

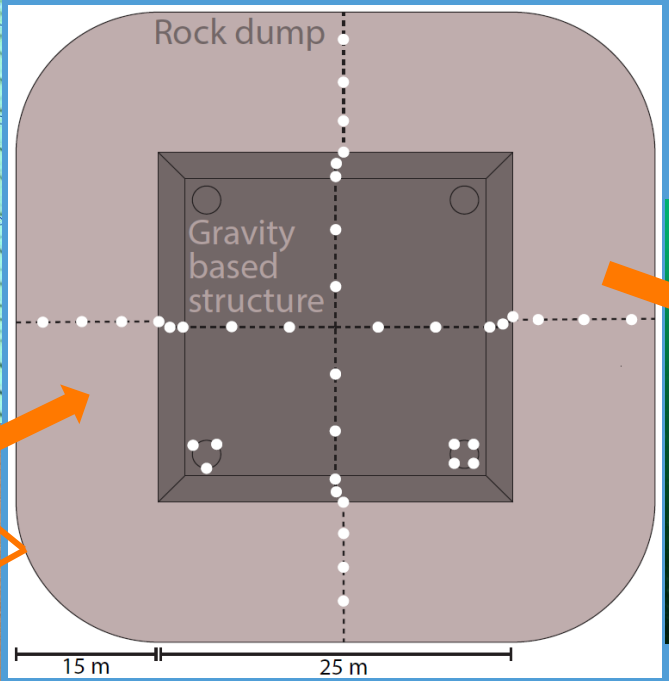
Research questions

- How much do the artificial habitats contribute to the total benthic macrofauna richness & biomass of the local area?
- How much contribution to larger area compared to other artificial structures?
- How similar is the community to natural rocky reefs in NL?
- How would the above change in different removal & leave-in-place scenario’s?

Methods: field work

- Commercial scuba scientific divers sampled in Sept 2019



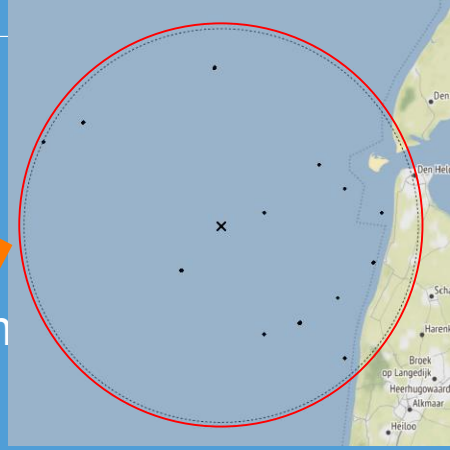


Sample point

Transect lines

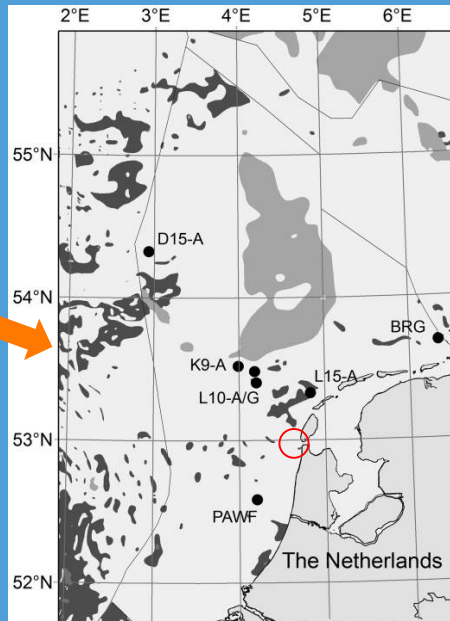
Methods: existing data

60 km diameter circle around Halfweg, obtain long term monitoring data (MWTL) on seabed fauna



Comparison with 'larger area' data:

Joop W P Coolen *et al.*, Benthic biodiversity on old platforms, young wind farms, and rocky reefs, ICES Journal of Marine Science, , fsy092, https://doi.org/10.1093/icesjms/fsy092



Also available in critterbase!

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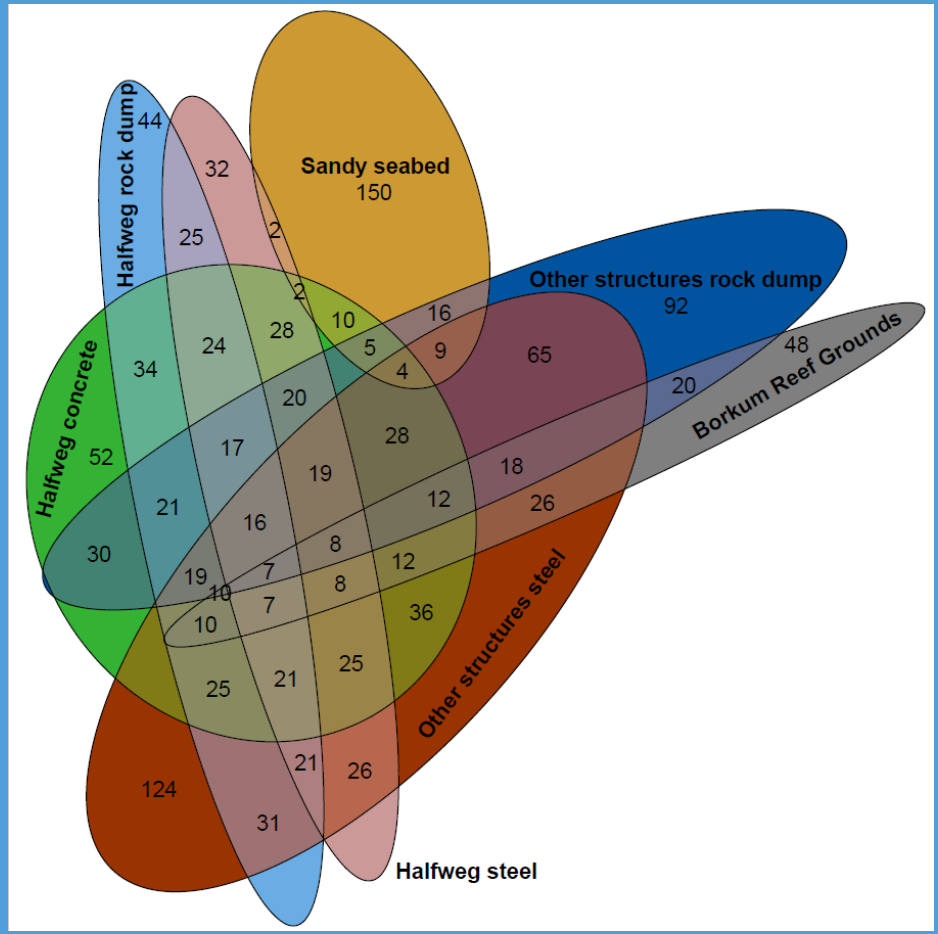
Results: Species richness & uniqueness

Location	Substrate	Species	unique	n
Halfweg	Concrete	52	10	20
Halfweg	Rock	44	9	12
Halfweg	Steel	32	0	7
Halfweg	**All**	**65**	**15**	**39**
Other structures	Rock	92	39	19
Other structures	Steel	124	58	126
Other structures	**All**	**151**	**75**	**145**
Borkum Reef Grounds	**Rock**	**48**	**18**	**11**
Seabed	**Sand**	**150**	**121**	**118**

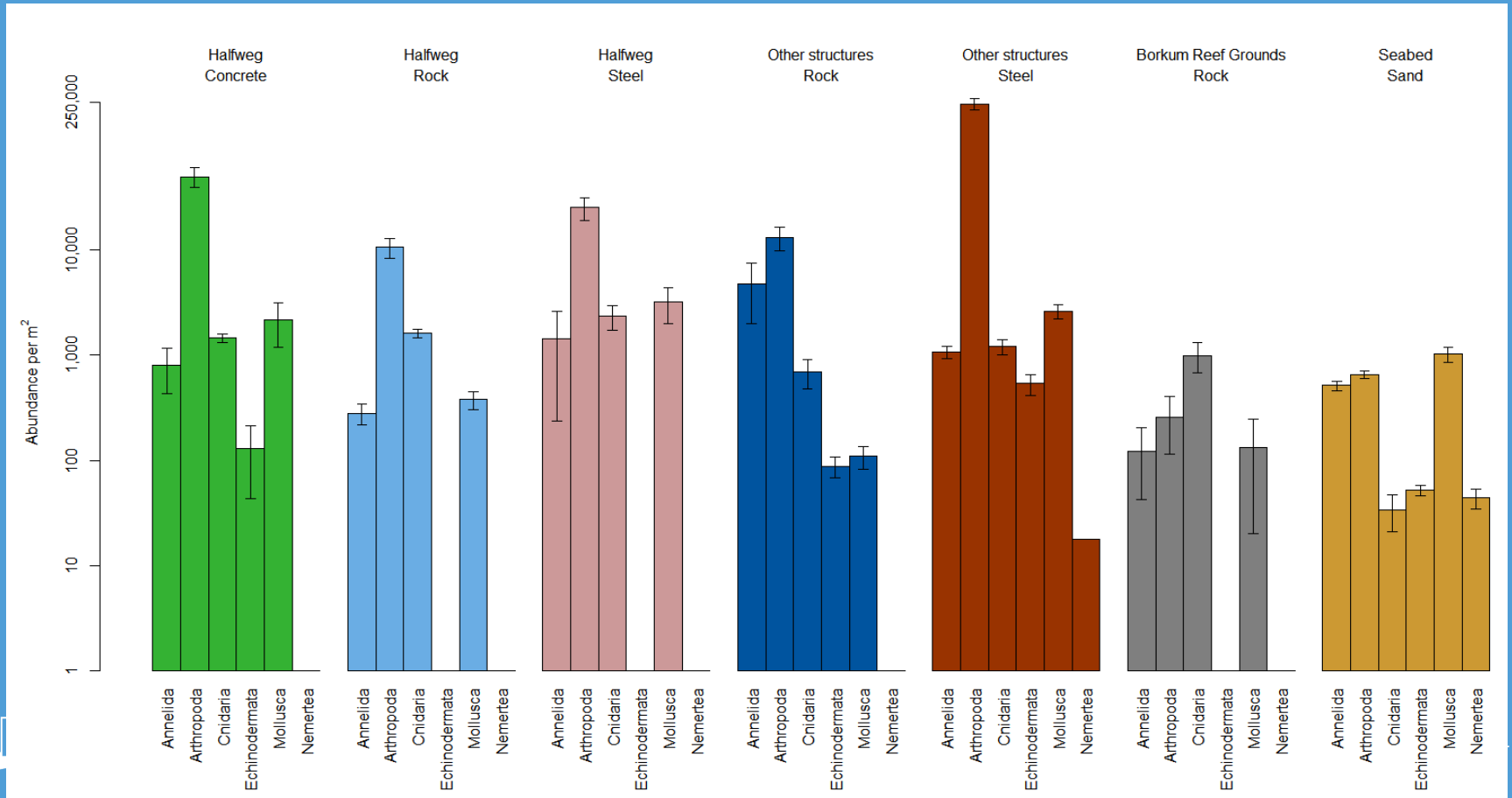
Overlap species composition

Only 1 species: bryozoan *Electra pilosa* present everywhere

2% of species present on all but one substrate



Abundance


Halfweg Concrete
Halfweg Rock
Halfweg Steel
Other structures Rock
Other structures Steel
Borkum Reef Grounds Rock
Seabed Sand
Abundance per m²
1
10
100
1,000
10,000
250,000
Annelida
Arthropoda
Cnidaria
Echinodermata
Mollusca
Nemertea

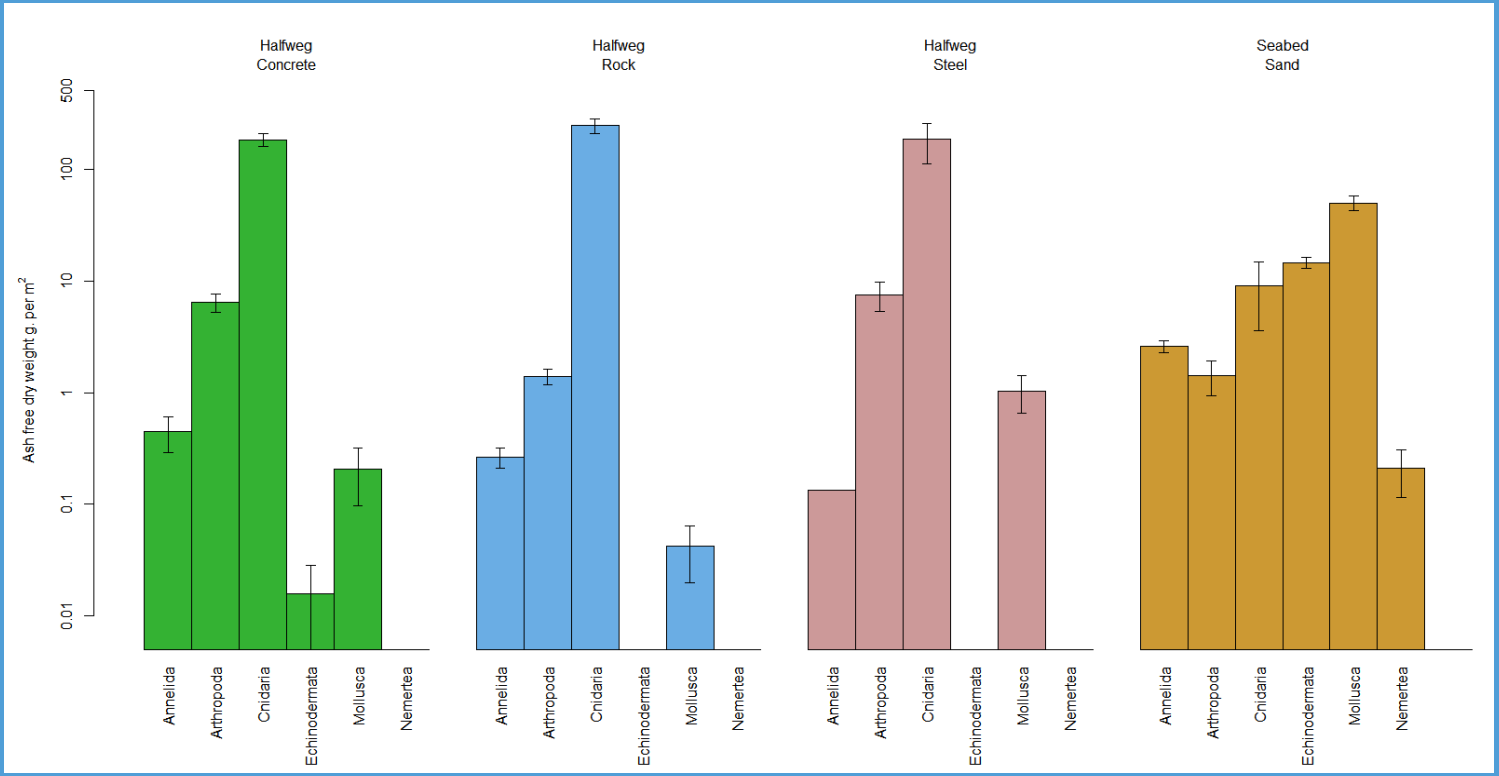
AFDW per m^2

No data available for other reefs! → ToR A lesson learned ☺

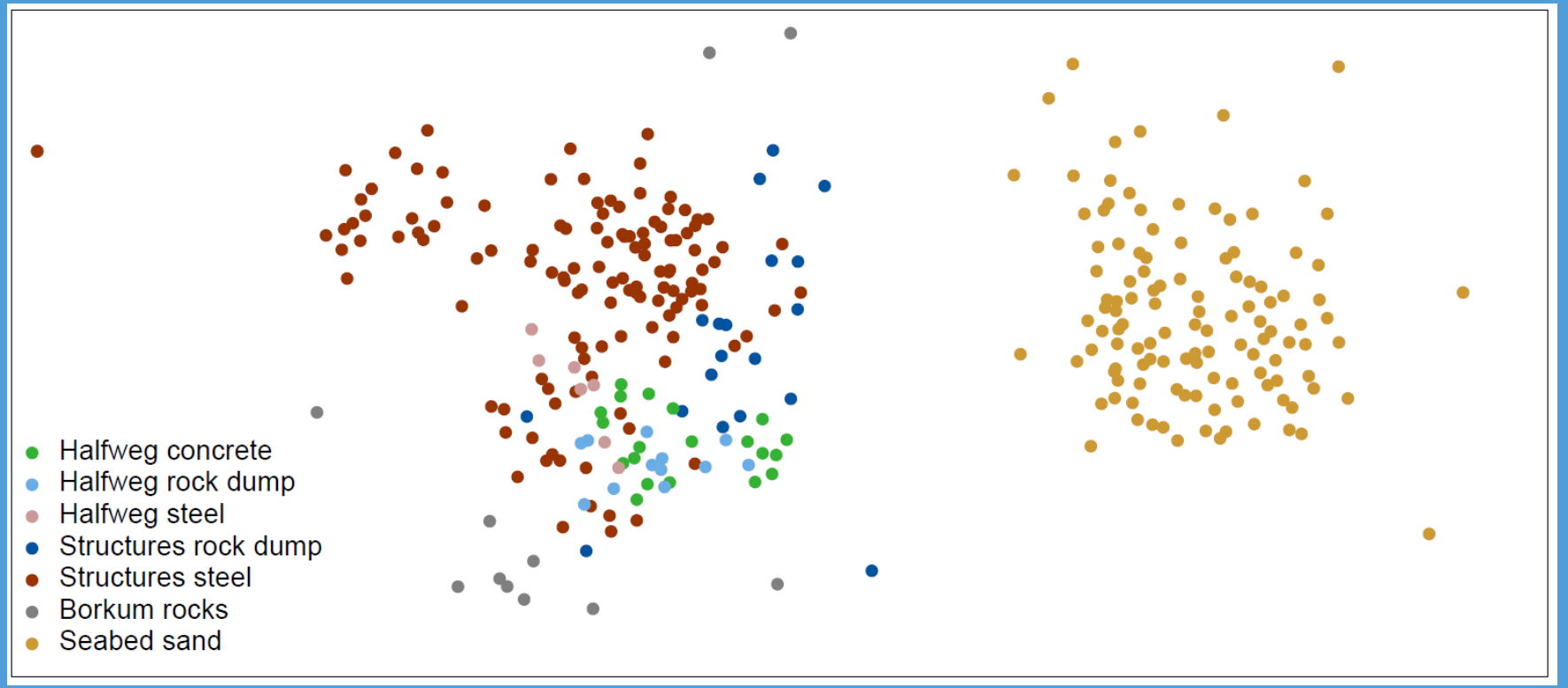
Substrate	mean	se	min	max	median	n
concrete	190	23	8	384	179	20
rock	246	36	101	449	192	12
steel	167	64	19	470	88	7
sand	64	7	0	368	24	118

AFDW per m² per group Halfweg vs seabed

Note now Cnidaria are highest, compared to high abundant Artropoda



Clustering samples by abundance



Discussion results

- 15 out of 65 species not found in any other location
- 2 non-indigenous species found, both common on reefs in NL
- 31% of species on natural geogenic reef also present on Hafweg

- High biomass of plumose anemone (>95%)
- Total biomass on Halfweg: 2,846 kg AFDW
- Same area of seabed (3,617 m2): 232 kg AFDW → 8% of Halfweg

Discussion

- NL policy offshore wind farms:
  - Add concrete or rocks to wind farms to ‘improve’ nature (NID)
- Borkum Reef Grounds habitat is to be protected soon
- Halfweg would be an ideal research location:
  - Learn from a 25 year old community on artificial structure
  - Large & small gradings of rock (habitat use crabs & lobsters)

Conclusions

- Locally high impact compared to seabed: more species & biomass
- Removal of concrete & steel might remove ~10 species in long term
- Low number of non-indigenous species
- NL nature inclusive design policy should also be considered here

Pre-print available from:

Joop W.P. Coolen, Oliver Bittner, Floor M.F. Driessen, Udo van Dongen, Midas S. Siahaya, Wim de Groot, Babeth van der Weide. Impact of removing a concrete gas platform on benthic communities in the North Sea. bioRxiv 2020.04.16.044263

Doi: https://doi.org/10.1101/2020.04.16.044263

Video including Halfweg footage:
https://www.youtube.com/watch?v=gtBPbo2Teq0&vl=nl-NL

Thank you

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Field & lab team for their help

SEATEC vessel crew

EBN & HAME for discussing the results

Oscar Bos for internal review