Marine Habitat Mapping in Germany: Application, Progress and Challenges

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Background literature:

Papenmeier et al. (2020), *Geosciences 10*, 100; doi:10.3390/geosciences10030100

Feldens et al. (2019), *Geosciences 9*, 159; doi:10.3390/geosciences9040159

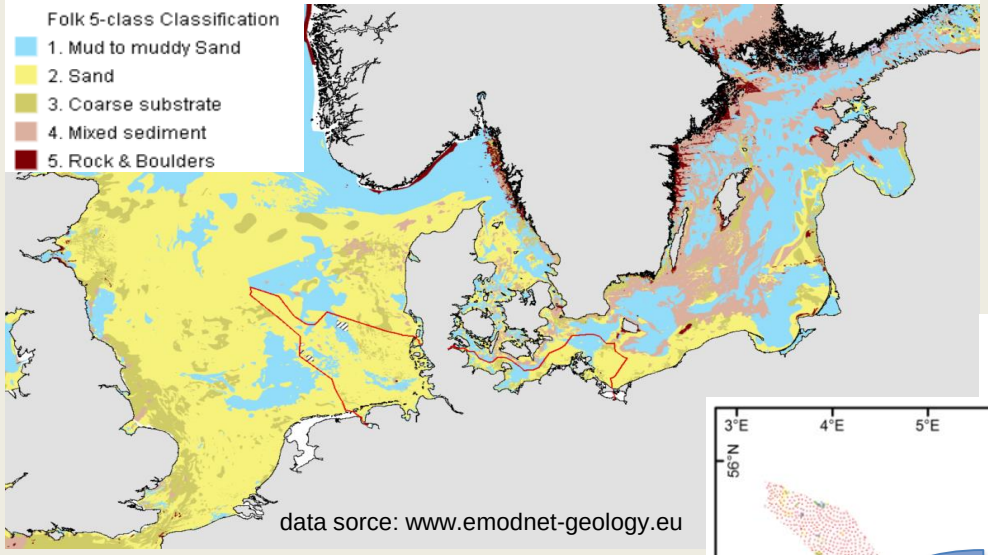
Papenmeier et al. (2018), Geosciences 8, 279; doi:10.3390/geosciences8080279

Boedecker & Heinicke (2018)

BSH (2016)

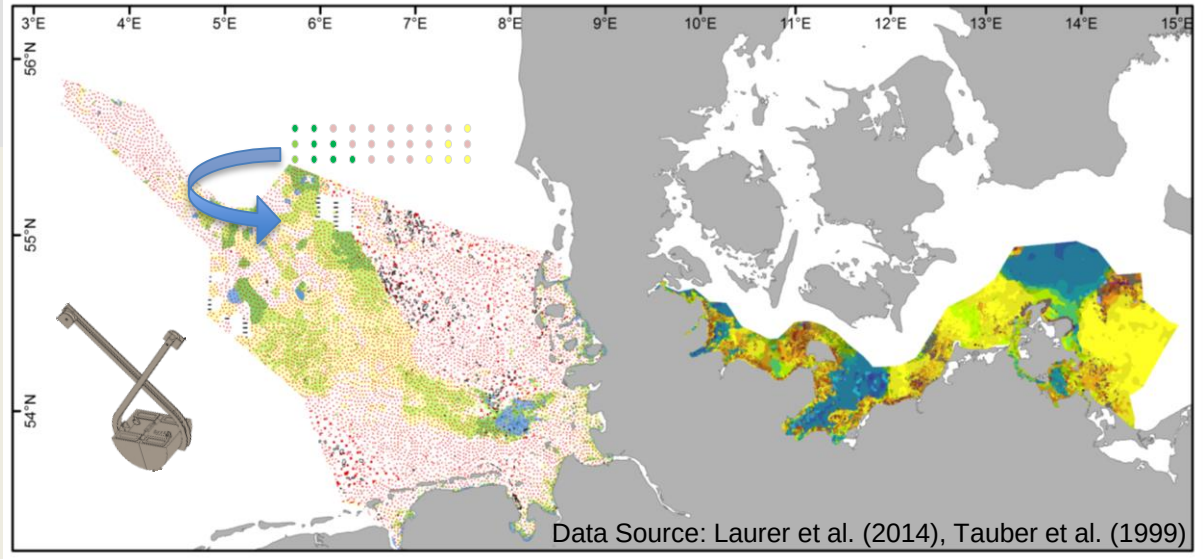
Background: National legislation and European marine policy need high resolution and area-wide maps of the seafloor to e.g. delineate and manage marine protected areas.

Marine sediment distribution in northern Europe



Basic sediment distribution maps are available. **BUT** data basis is often not sufficient to fulfill the needs of decision makers.

Marine sediment distribution in Germany.
North Sea: Figge classification. Baltic Sea: Tauber classification



Example German data base:

- grab samples
- sample resolution: ~1/km²
- sample date: 9-96 yrs ago
- different classification systems

Laurer, W.-U.; Naumann, M.; Zeiler, M. (2014): Erstellung der Karte zur Sedimentverteilung auf dem Meeresboden in der deutschen Nordsee nach der Klassifikation von FIGGE (1981). *Geopotenzial Dtsch.Nordsee, Modul. B, Dok. 1*, 1–19.
Tauber, F. (2012): Meeresbodensedimente und Meeresbodenrelief in der deutschen Ostsee : Karten Nr. 2930 – 2949; Hamburg: Bundesamt für Seeschifffahrt und Hydrographie.

Marine Habitat Mapping in Germany

Papenmeier et al.

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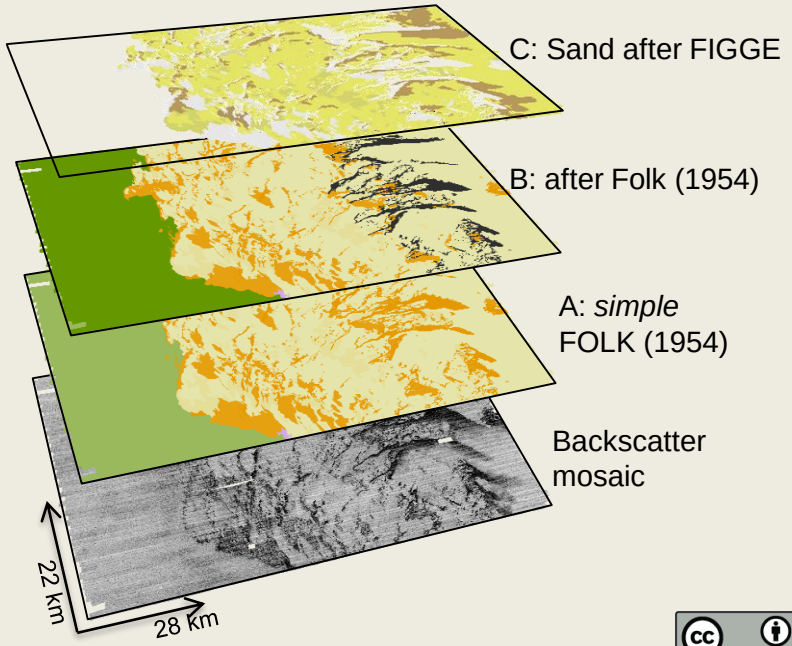
Consortium of science and authority developed a guideline for high resolution mapping with side-scan sonars.

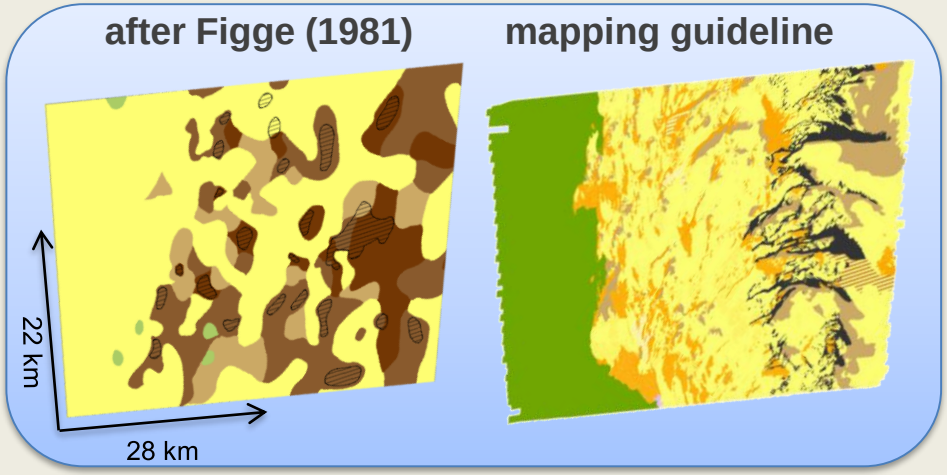
Contents:

- Data acquisition e.g. data resolution
- Backscatter processing
- Delineation criteria
- Sediment classification
- Hydroacoustic catalogue

Multi-layer classification system.
For details check mapping guideline.



Comparison of prior and new sediment maps:
Sonar mapping (right) shows much more details.



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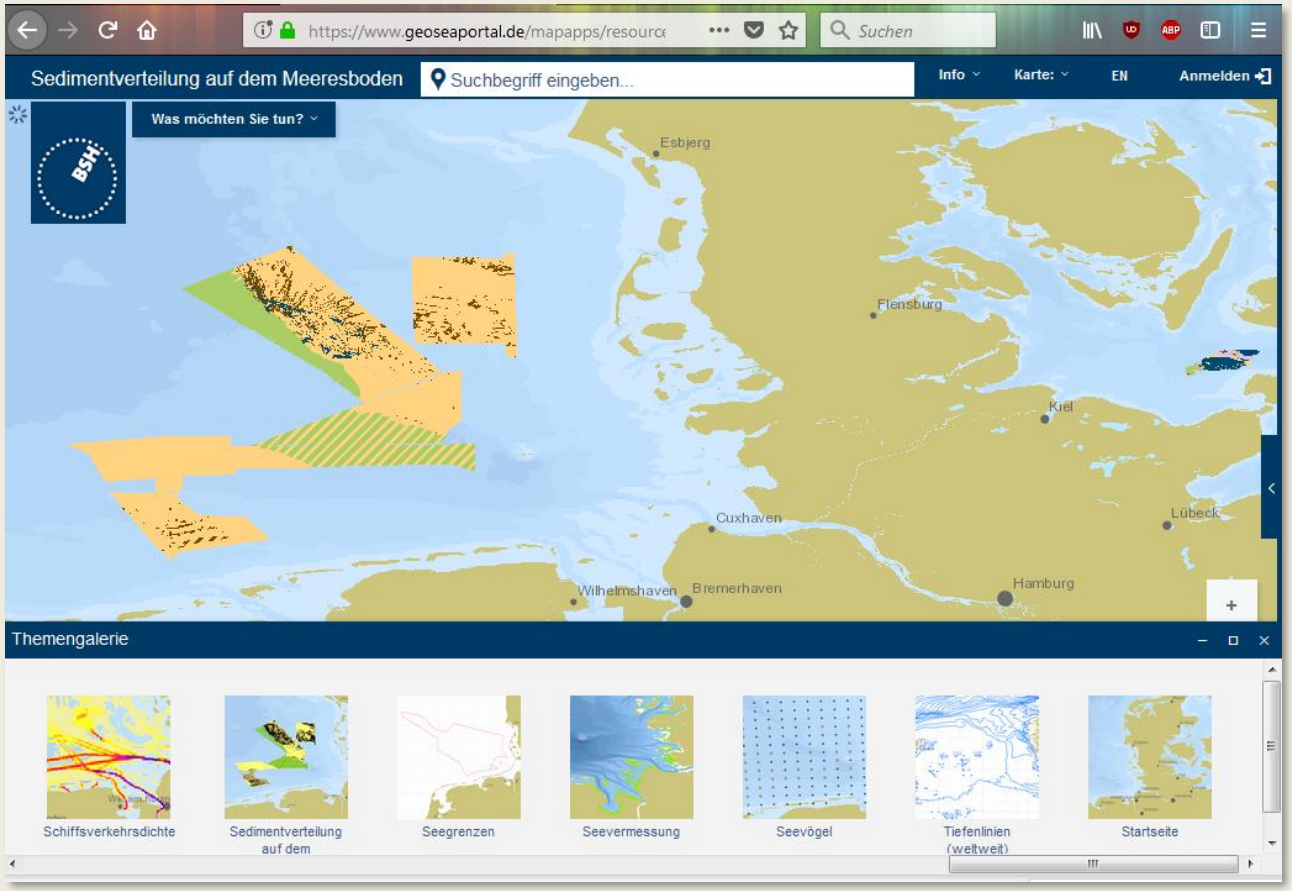
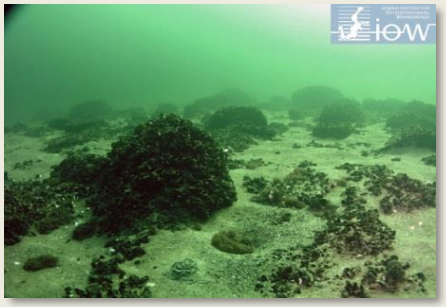
Mapping guideline facilitate consistent data sets.

Data are available on: www.geoseaportal.de



Challenge: hard substrate mapping (objects ≥ 30 cm)

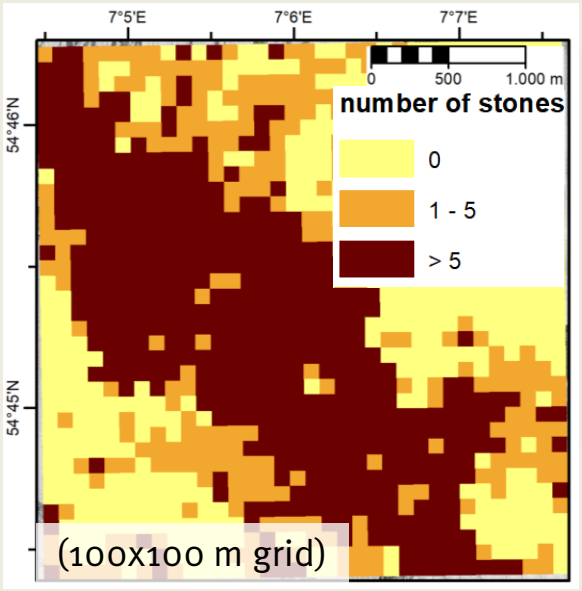
- stones are principally detectable with side scan sonar
- individual object identification on backscatter mosaics is tedious and subjective

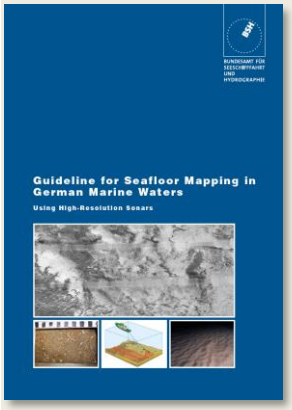


National approaches:

for area wide sediment mapping

Counting objects on backscatter mosaics and classifying raster cells (method under development)



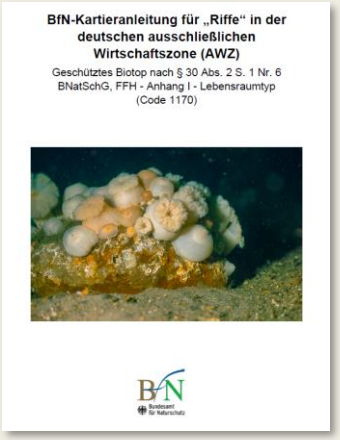


for approval procedures

Individual object identification.

Delineation criteria see:

Boedeker & Heinicke (2018) or Papenmeier et al. (2020)



Both approaches could benefit from automated stone detection.

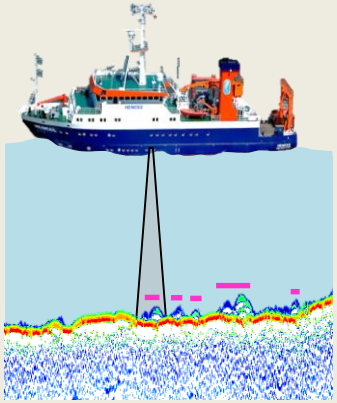
Progress in automated stone detection:

geosciences
MDPI
Article

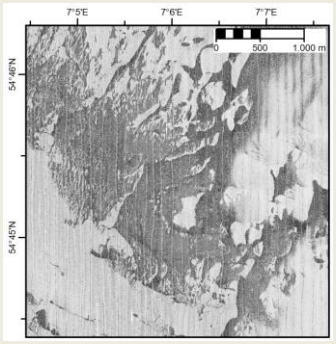
Detection of Stones in Marine Habitats Combining Simultaneous Hydroacoustic Surveys

Svenja Papenmeier * and H. Christian Hass

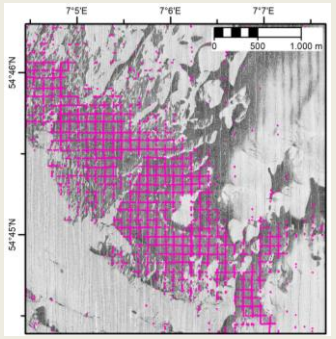
- semi-automated
- no single object detection
- high resolution backscatter data are not necessary



Sediment echo sounder



Backscatter mosaic (1m resolution)



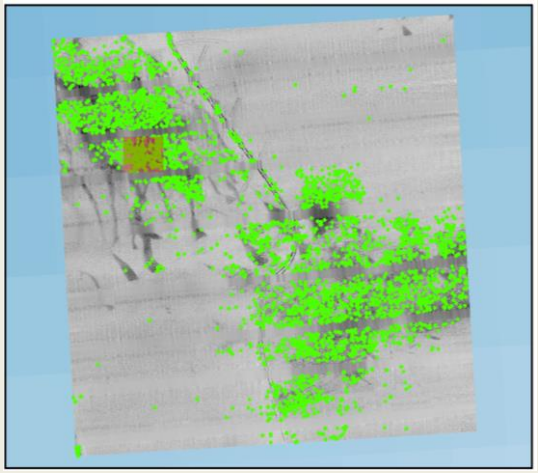
Map of stone occurence

geosciences
MDPI
Article

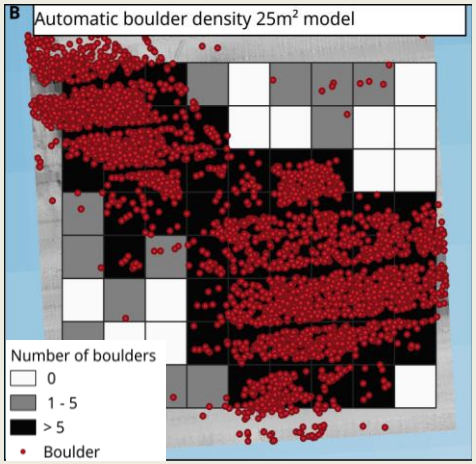
Detection of Boulders in Side Scan Sonar Mosaics by a Neural Network

Peter Feldens [1,*], Alexander Darr [1], Agata Feldens [2] and Franz Tauber [1]

- high agreement with human interpretation
- large trainig data set needed
- some missclassification of e.g. water column
- small objects underrepresented



Manual object identification



Object detection by a neural network

Future Needs:

- improvement of detectable object size
- inclusion of bathymetric data
- larger training sets to make models applicable for a variation of geological sites
- differentiation of stones with attached flora and fauna (e.g. by full waveform data of multibeam echosouder)

Better object identification will help to identify stone assemblages more accurately which is essential to understand ecosystem functioning of hard substrate habitats (reefs) and to find measures to protect those.