On mapping and monitoring geodiversity and benthic habitats in a dynamic shallow water coastal environment: Example from Rødsand lagoon, western Baltic Sea

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ECOMAP-project

**WP 1 - COORDINATION**
- **Groundtruthing**
  - Camera
  - Sampling
- **Acoustics**
  - Multibeam/Spotters/VHCl
  - Calibrated Backscatter
- **Optics**
  - Multispectral Imaging
  - Lidar
  - In-situ Laser
- **Processing**
  - Waveform analysis
  - Spectral analysis

**WP 2 - SMALL SCALE, FAUNA**
- Microhabitat analysis using calibrated MBES, biological ground truthing, in-situ laser measurements and acoustic backscatter experiments
  - Benthic fauna
  - Seasonal dynamics of backscatter

**WP 3 - MEDIUM SCALE, FLORA**
- Feasibility study with multi-angle opto-acoustic remote sensing of macrophytes, gas ebullition, laboratory vegetation, and tank measurements

**WP 4 - LARGE SCALE, ABIOTIC**
- Habitat mapping using morphometric variables from acoustic and lidar
  - Bubble and Stone Reefs
  - Sediment morphodynamics
  - Geo-diversity and geological model

**WP 5 - THEORY, SIGNAL PROCESSING**
- Investigation of acoustic and optic wave modulation of each key habitat with waveforms and morphometric spectral analyses

**WP 6 - DEVICE DEVELOPMENT IMPLEMENTATION**
- Backscatter Calibration
  - Multi-frequency, beam angle adaptions
  - Data format adaptions

**WP 7 - DISSEMINATION**
- Remote Sensing Catalogue
  - RESSP
- Customized devices and processing
  - 3M
- PINGO platform
  - BEM
- Holistic seafloor understanding
  - RESSP

**Authorities**
- Manufacturers/Survey companies Research
- Education
- Research

(www.bonus-ecomap.eu)
ECOMAP-project Work Package 4

In situ remote sensing of geodiversity for habitat mapping

Aim

• Developing the best-practice of combined hydroacoustic and optical mapping and monitoring of geodiversity and specific habitats at different water depths.

Objectives

• Acquiring repetitive opto-acoustic data of stone reefs, sandbanks, and bubble reefs.
• Developing geological and geomorphological models.
• Developing best-practice for mapping and monitoring geodiversity.

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Study site

Rødsand lagoon, Western Baltic Sea

(www.gst.dk)
Abiotic components

Topography and bathymetry

Geomorphology
Biotic components

Topography and bathymetry

Benthic flora and fauna
Light Detection And Ranging (LiDAR or lidar)

Airborne

- Topobathymetric lidar in shallow water and land-water transition zones
Groundtruth

Seabed photo, video and bed material sampling
Ridges and swales
Abiotic components

Stones

Elevation (m DVR90)

(www.dn.dk)
Abiotic components

Stones

(www.dn.dk)
Biotic components

Flora

Elevation (m DVR90)

250 m

(www.dn.dk)
Biotic components

**Flora**

5 x height exaggeration

75 m
Concluding remarks

Airborne topobathymetric lidar reveals the role of the interaction between the dynamic coastal processes and the drowned underlying glacial landscape in controlling the spatial distribution of the benthic habitats.

Repetitive airborne topobathymetric lidar can optimise the monitoring of dynamic geodiversity variables and abiotic benthic habitat structures in such dynamic shallow water coastal environments.

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