
Mapping of extreme shallow coastal area with an ASV-borne cost effective multibeam echo sounder

June 2021, Gdynia (Poland)

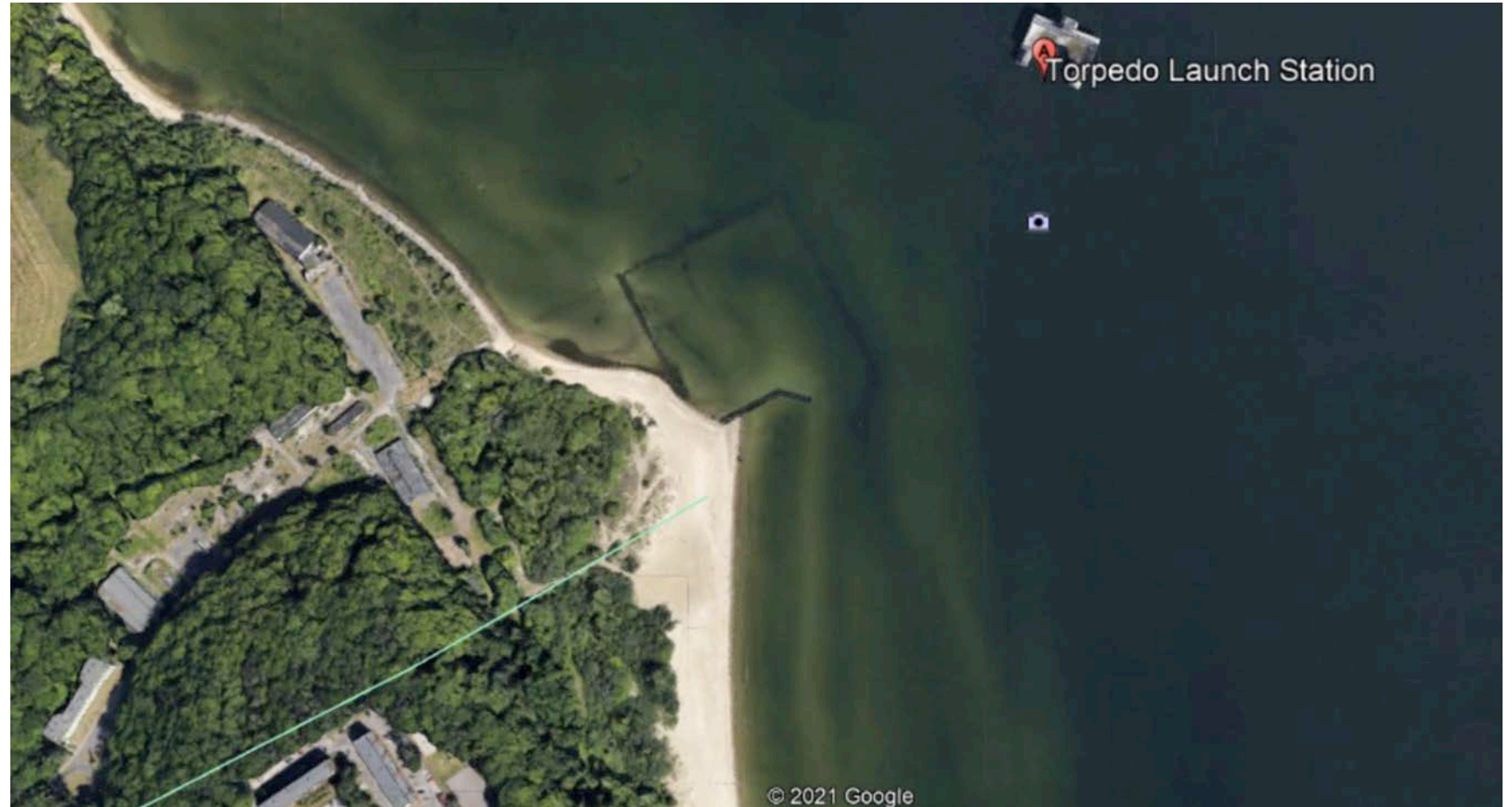
Challenges



- Mapping of extremely shallow waters is a typical task in many seashore environmental or wildlife prevention projects.
- In such applications both the low draught of the survey-platform, and the very short measuring range of the echosounder are critical.
- Small draught is possible with a catamaran body ASV (USV), - however in that case the small size and weight, also the low power consumption of a multibeam echosounder become critical.
- Baywei joined with a Polish ASV Developer to test and demonstrate together the capabilities a cost-effective catamaran unmanned surface vehicle and our cost efficient and accurate MBES.

The site

Historical torpedo test-range, Gdynia, Baltic-sea





The Autonomous Surface Vehicle



1.2 m long

Ultralight

Low draught

Max. speed: 3 knots when fully loaded

Twin electric engines

Long-range WiFi

Battery to power for ASV and MBES

The Multibeam Echosounder



Baywei M5 Multibeam Sonar with Integrated GNSS/INS

Specifications:

Swath coverage	Up to 130 degrees
Number of RX beams	256
TX beam width along-track	145°
RX beam width	1° ±0.1
Range	>100m
Beam distribution	Equi-Distant and equi-angular beam distribution
Roll stabilisation	Yes
Pressure rating	100m
GNSS/INS	INS in Sonar
Position	HOR: ±(8mm +1ppm X Distance from RTK Station) VER: ±(15mm +1ppm X Distance from RTK Station) (Assumes 1m GNSS Separation)
Heading Accuracy	0.08° (RTK) with 2m Antenna Separation
Pitch/Roll Accuracy	0.03° Independent of Antenna Separation
Heave Accuracy	2cm or 2% (TRUEHEAVE™). 5cm or 5% (Real Time)
Ping Rate	50 Hz
Outputs	Bathymetry, Side Scan
Compatible with	Qinsy, Hypack, EIVA and others
Weight	Air: 3.5 kg Water: 1.1 kg

Setup



Baywei deck unit with all connections

Vehicle computer, electronics and battery in a waterproof, hard carry case

Baywei M5 multibeam echo sounder



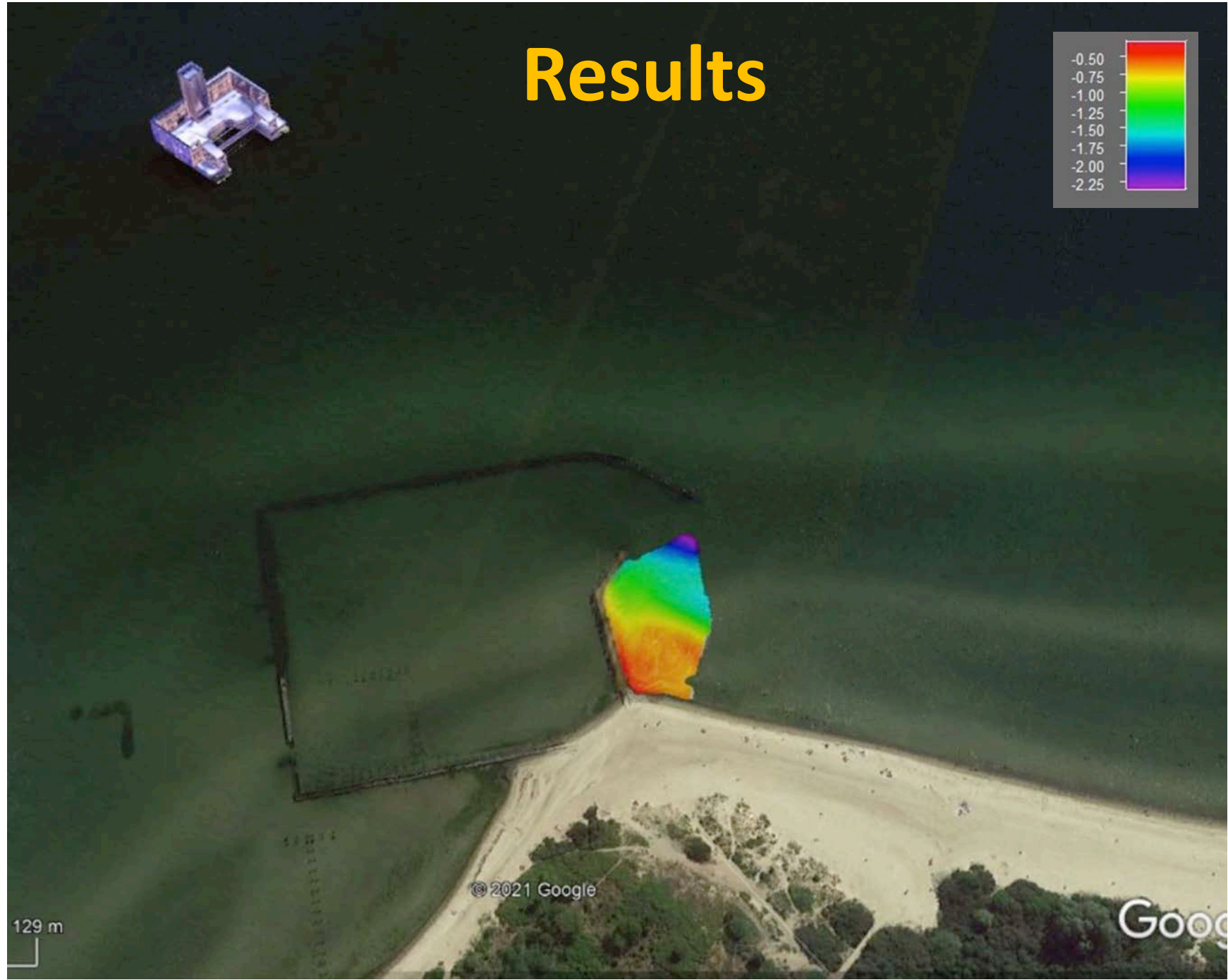
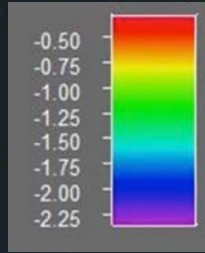


Simple operations

ASV operation, multibeam setup and data acquisition with a **single tablet**

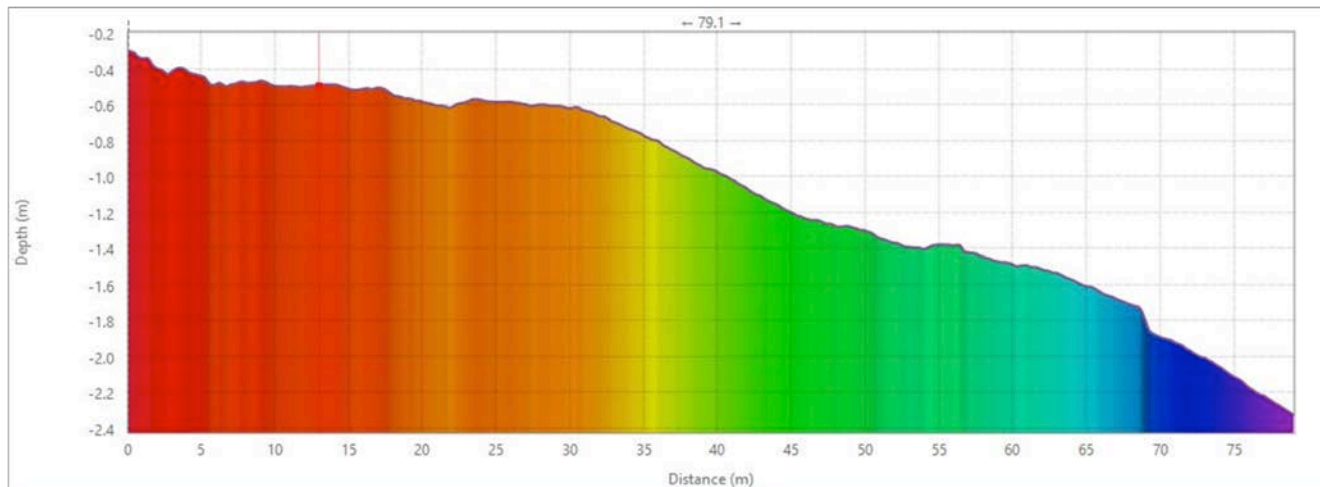
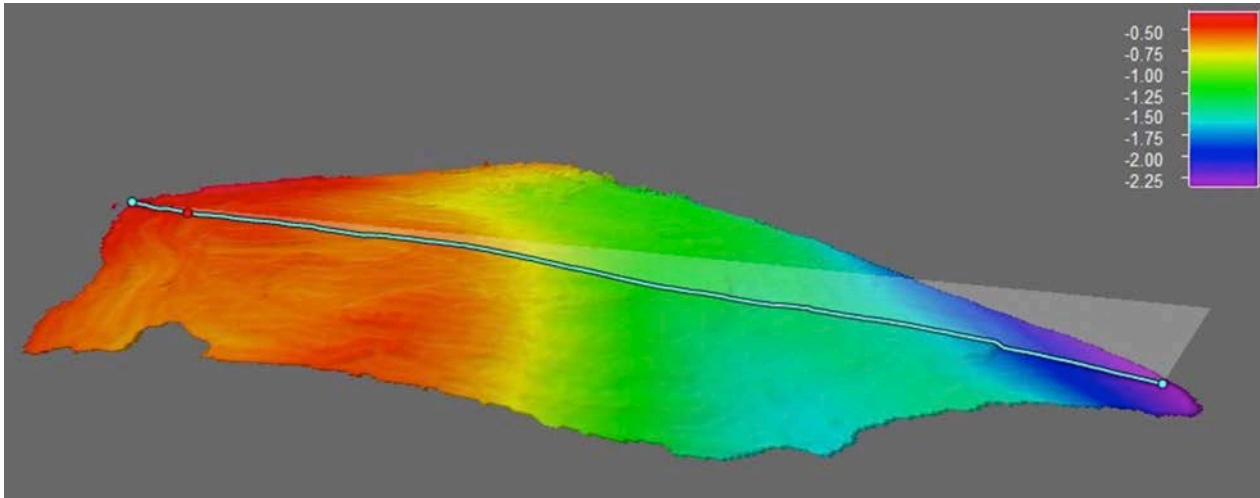


Results



Area: 80m x 50m
Depth range: 0.3m – 2.4m
Mean depth: 0.98m

Data example: Bathymetric profile



- Area: 80m x 50m
- Depth range: 0.3m – 2.4m
- Mean depth: 0.98m
- Data processing: QPS Qimera
- Real-time GNSS corrections been applied for high accuracy positioning and
- Dual GNSS antenna system combined with INS for precise 3D heading and attitude calculation.

Conclusions



- Extremely shallow waters are a challenging environment for running hydrographic surveys. If there is high turbidity, the multibeam echo sounder (MBES) is the only efficient solution.
- Combination of an easily maneuverable ASV and a compact, integrated MBES was a very efficient solution for quick mapping of very shallow coastal zones.
- It was impossible to map this area by any other survey platform.
- The light construction of ASV and Baywei M5 allowed for 2 people to complete the bathymetric survey.
- Low power consumption of Baywei M5 ensured longer working time for the complete setup, therefore a bigger area was covered with one battery set.

