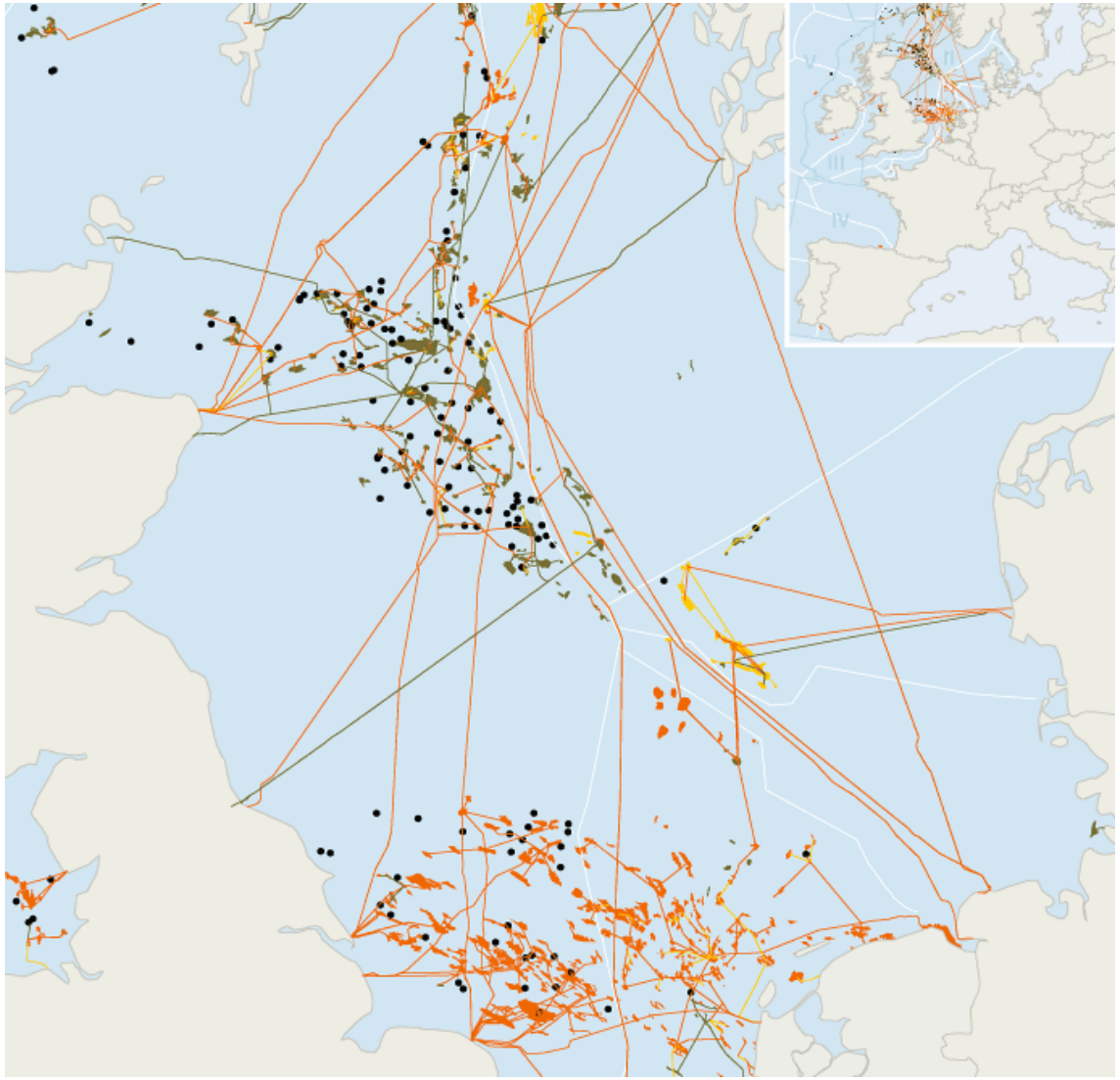
National Oceanography Centre

AUTONOMOUS TECHNIQUES FOR INFRASTRUCTURE ECOLOGICAL ASSESSMENT (AT-SEA)

ANDREW GATES & MATTHEW KINGSLAND

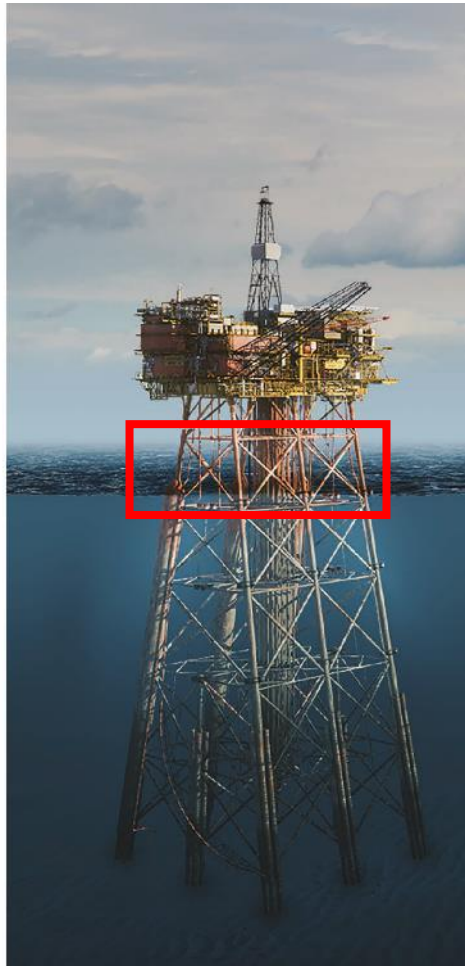
Official Sensitive Commercial

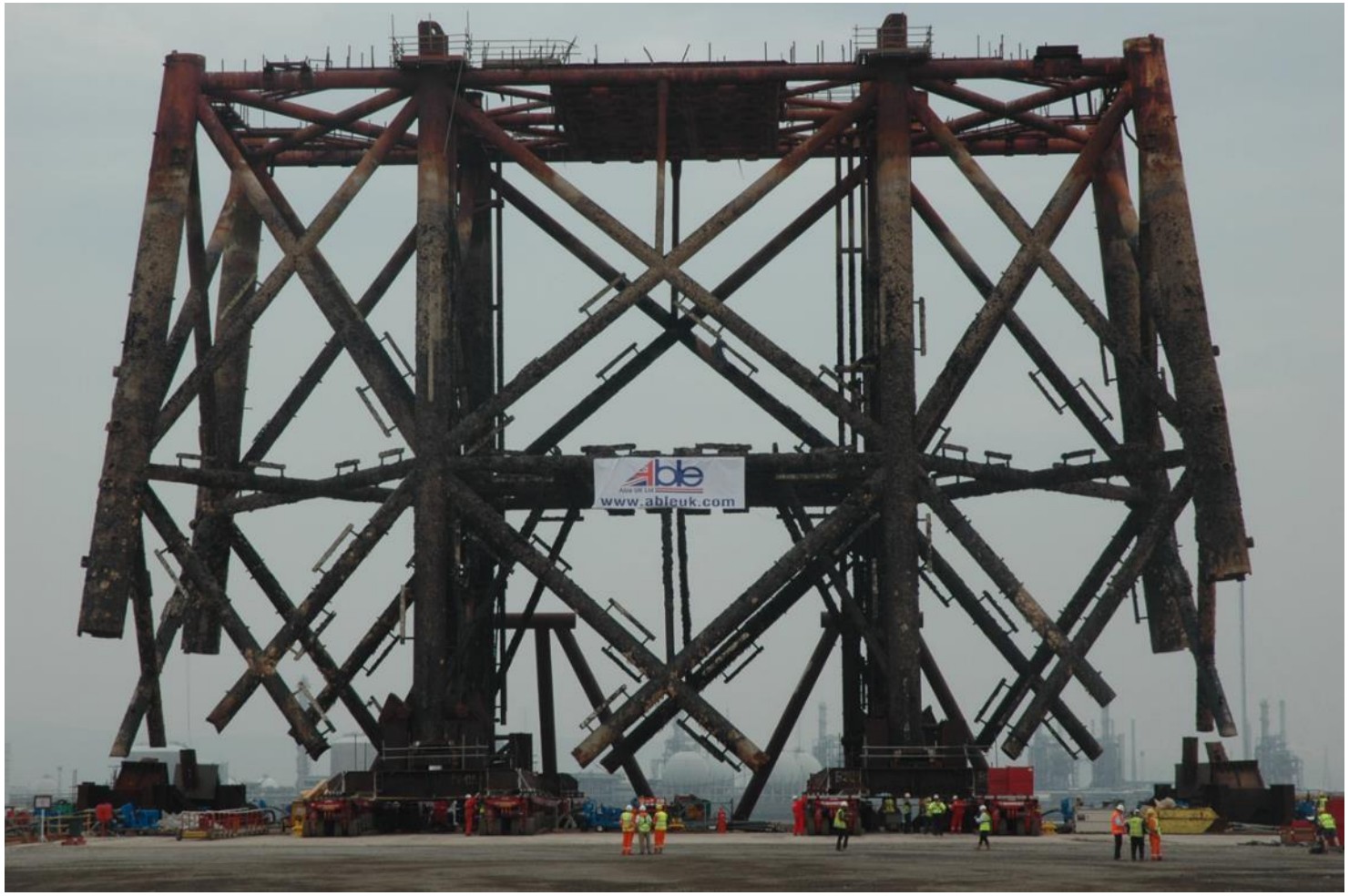
UK NORTH SEA



- First offshore well in 1964
- Now 475 oil & gas installations
  - 45,000 km of pipelines
- ~10% of North Sea installations already entered the decommissioning phase
- Most of the remaining need to be decommissioned by 2050
- Several options for decommissioning – reefs to removal

A TYPICAL OIL PLATFORM





MARINE ENVIRONMENTAL SURVEY - CHALLENGE

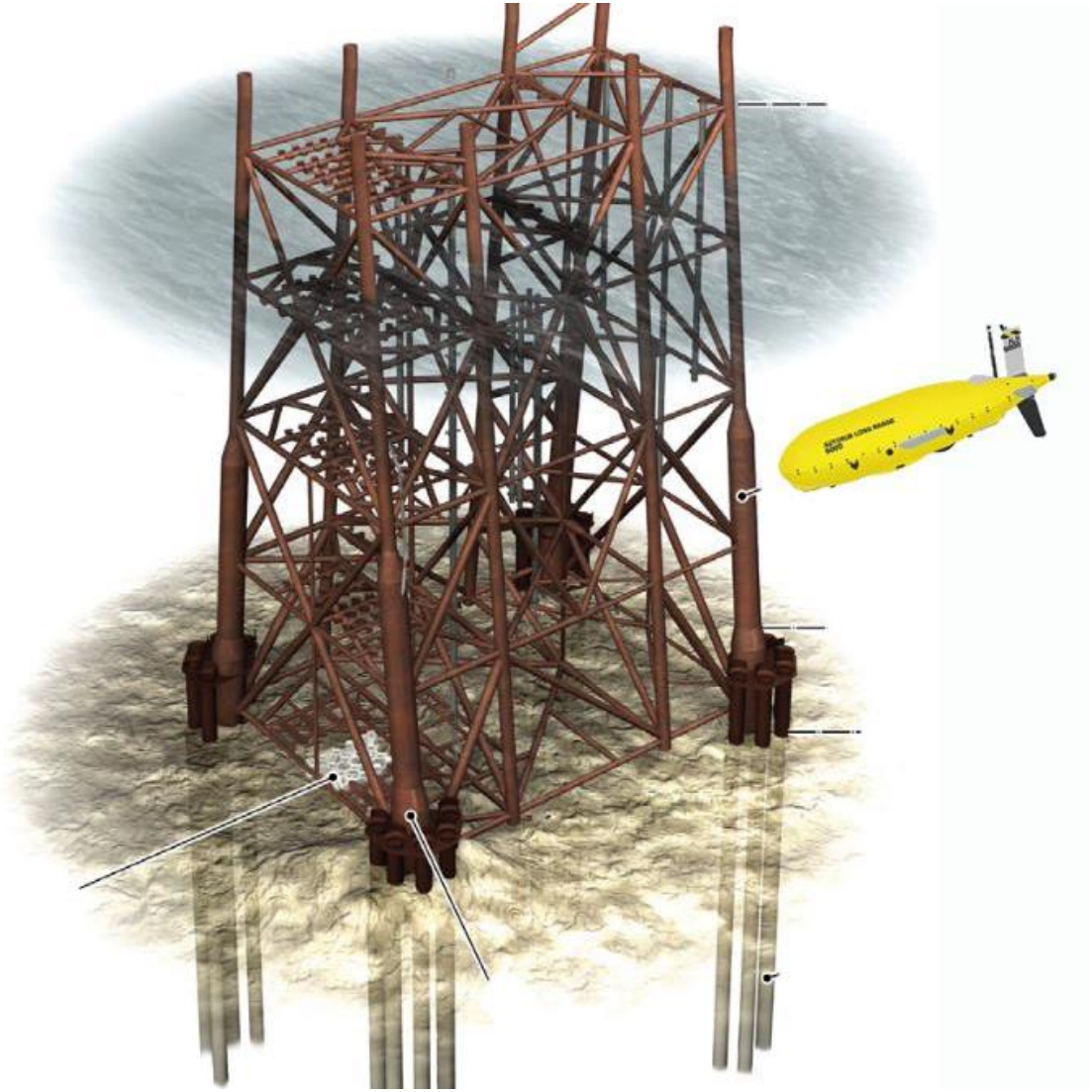
National Oceanography Centre

- Role of structures in ecosystem is complex: positive and negative effects
- Decisions need to be made on decommissioning by the companies and regulator
- All requires robust scientific evidence
- Includes new data gathered by regular environmental survey and monitoring

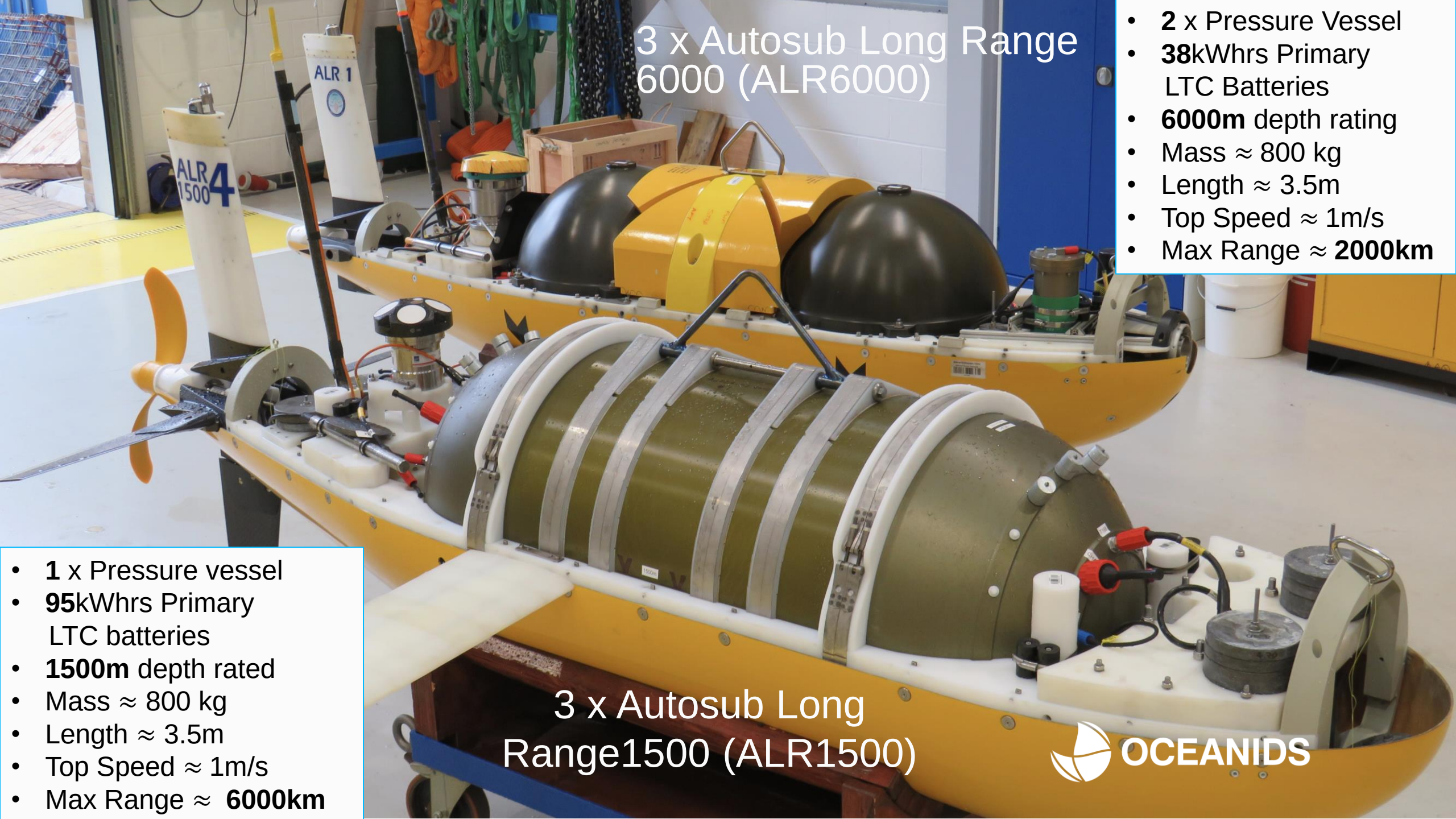
MARINE ENVIRONMENTAL SURVEY - OPPORTUNITY

- There is a clear need for a survey and monitoring procedure that is:
  - highly efficient
  - limits potential costs, risks and emissions
  - fits the regulators' needs.
- Advances in **marine autonomy** offer the prospect of substantial efficiency gains over current practise
- Autonomous operations largely unproven in this area – limiting application

AT-SEA



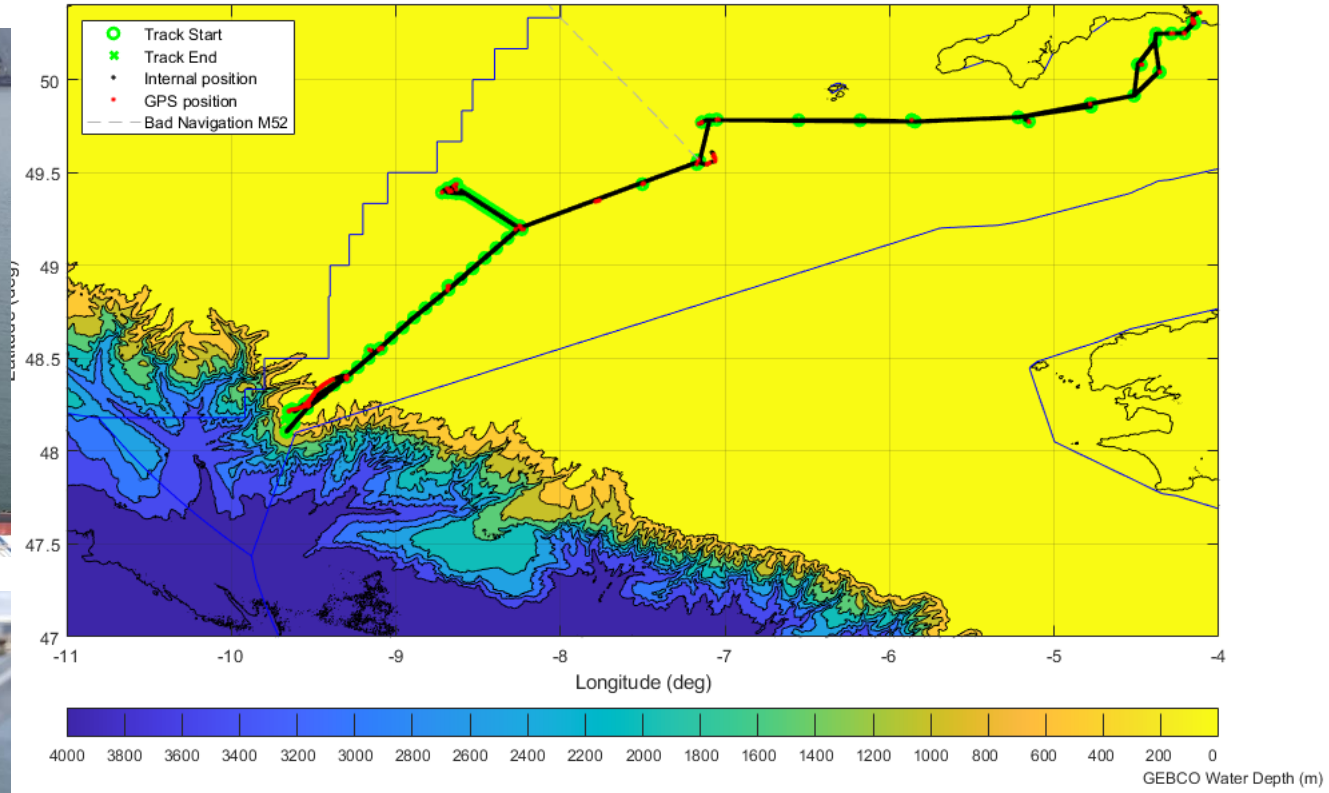
- NERC and Industry consortium – INSITE
  - Investigating the ecological role of structures in the North Sea
- AT-SEA Project funded
  - **Aim: Demonstrate the feasibility and value** of fully **autonomous monitoring** of multiple **decommissioning**-related **sites** without the aid of a support vessel

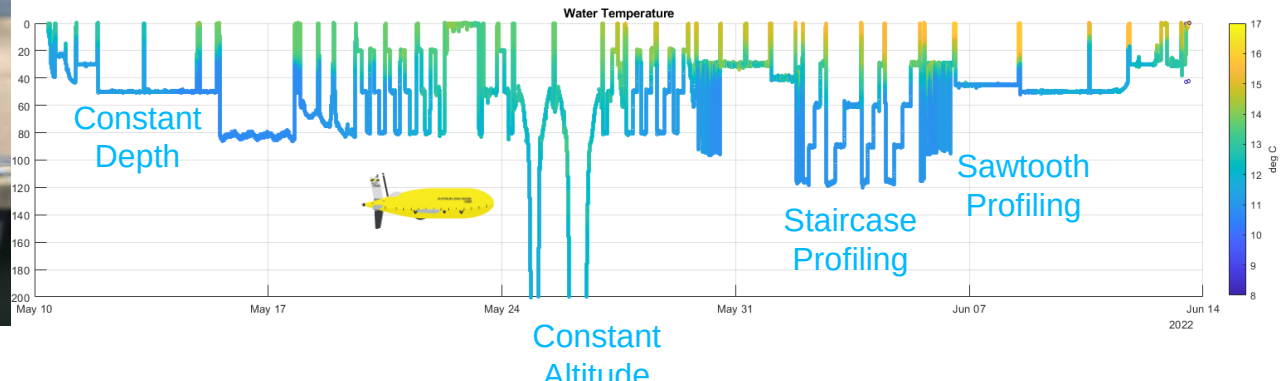


- **2** x Pressure Vessel
- **38**kWhrs Primary LTC Batteries
- **6000m** depth rating
- Mass ≈ 800 kg
- Length ≈ 3.5m
- Top Speed ≈ 1m/s
- Max Range ≈ **2000km**

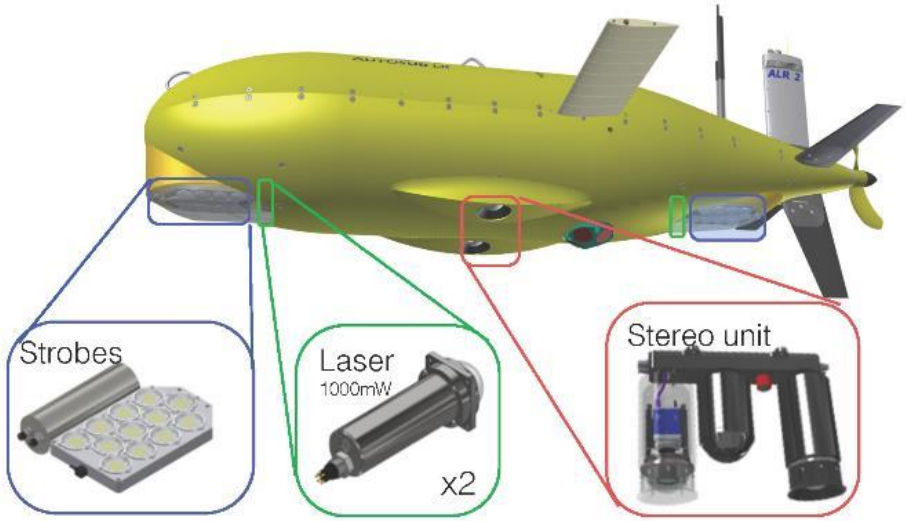
- **1** x Pressure vessel
- **95**kWhrs Primary LTC batteries
- **1500m** depth rated
- Mass ≈ 800 kg
- Length ≈ 3.5m
- Top Speed ≈ 1m/s
- Max Range ≈ **6000km**

LONG DISTANCE PROVING TRIAL (LDPT) APRIL 22





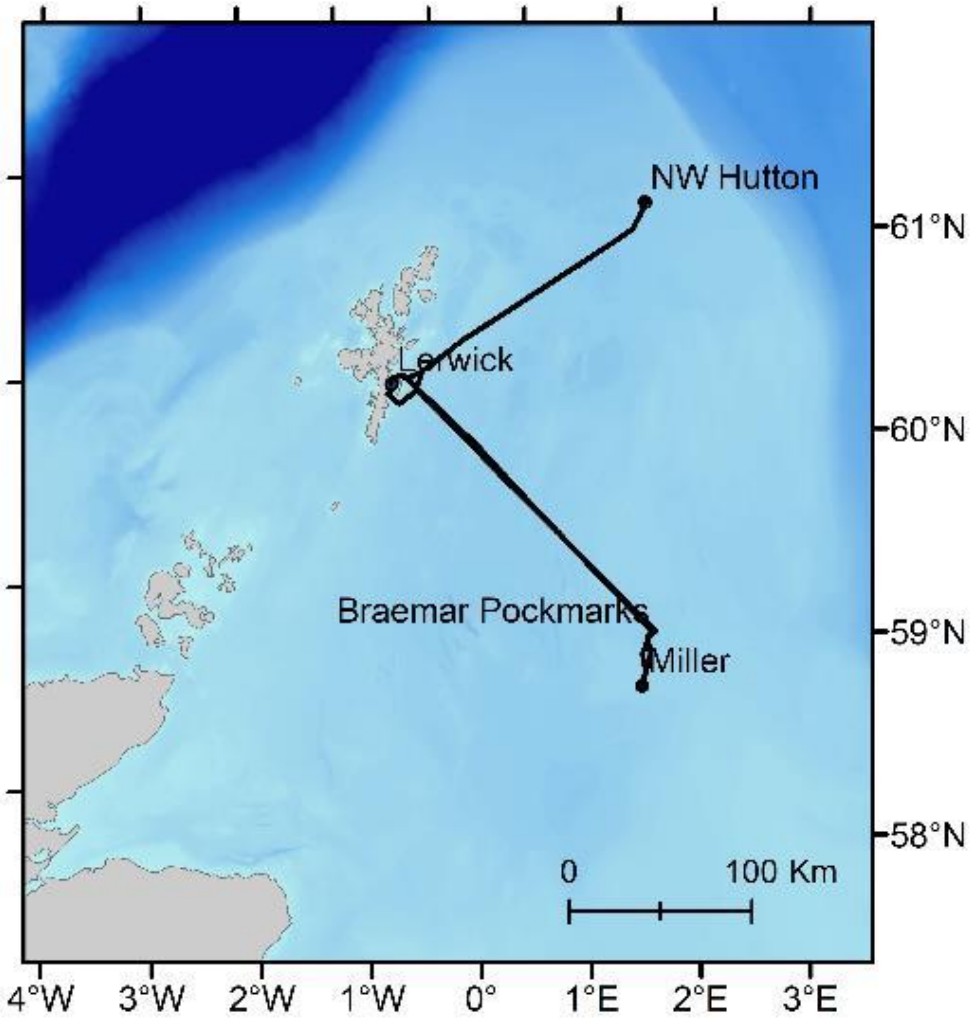
AUTONOMOUS PLATFORM



- 19 September – 11 Oct 2022, Lerwick, Shetland

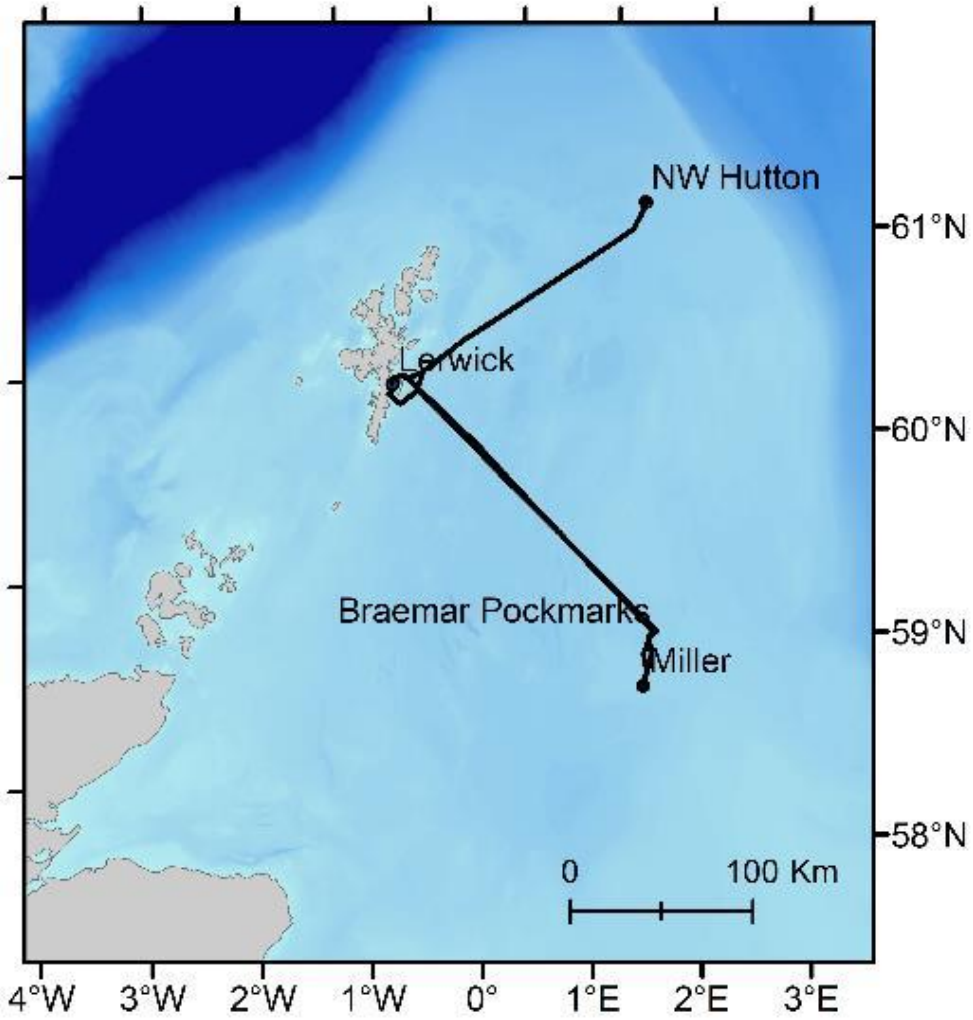
- Sensors
  - Seabird SBE 52 MP conductivity, temperature, depth, with SBE43F dissolved oxygen;
  - 300 kHz RDI workhorse acoustic Doppler current profiler (ADCP) with bottom tracking capabilities)
  - Hydrocarbon sensors
    - Wetlabs seaOWL UV-A fluorescence-based oil-in-water sensor
    - Franatech METS Methane sensor)
    - Chelsea PAH+ UV fluorometer
  - BIOCAM seabed imager.

DEPLOYMENT


NW Hutton
Lerwick
Braemar Pockmarks
Miller
61°N
60°N
59°N
58°N
0
100 Km
4°W
3°W
2°W
1°W
0°
1°E
2°E
3°E

DEPLOYMENT

- Shore launch - Shetland
- NW Hutton
  - 144m water depth, produced oil and gas, a steel jacket platform partly removed during decommissioning in 2009
- Recharge and data download in Shetland
- Miller
  - 102m depth, produced oil and gas, a steel jacket platform (upper jacket already removed) scheduled to be removed during the project
- Braemar Pockmarks Special Area of Conservation
  - 120m depth. An area with known persistent hydrocarbon seepage
  - act as an analogue for a decommissioning leakage scenario
- Return Shetland



DATA TELEMETRY

https://mars.noc.ac.uk/?from=2023-09&until=2023-12

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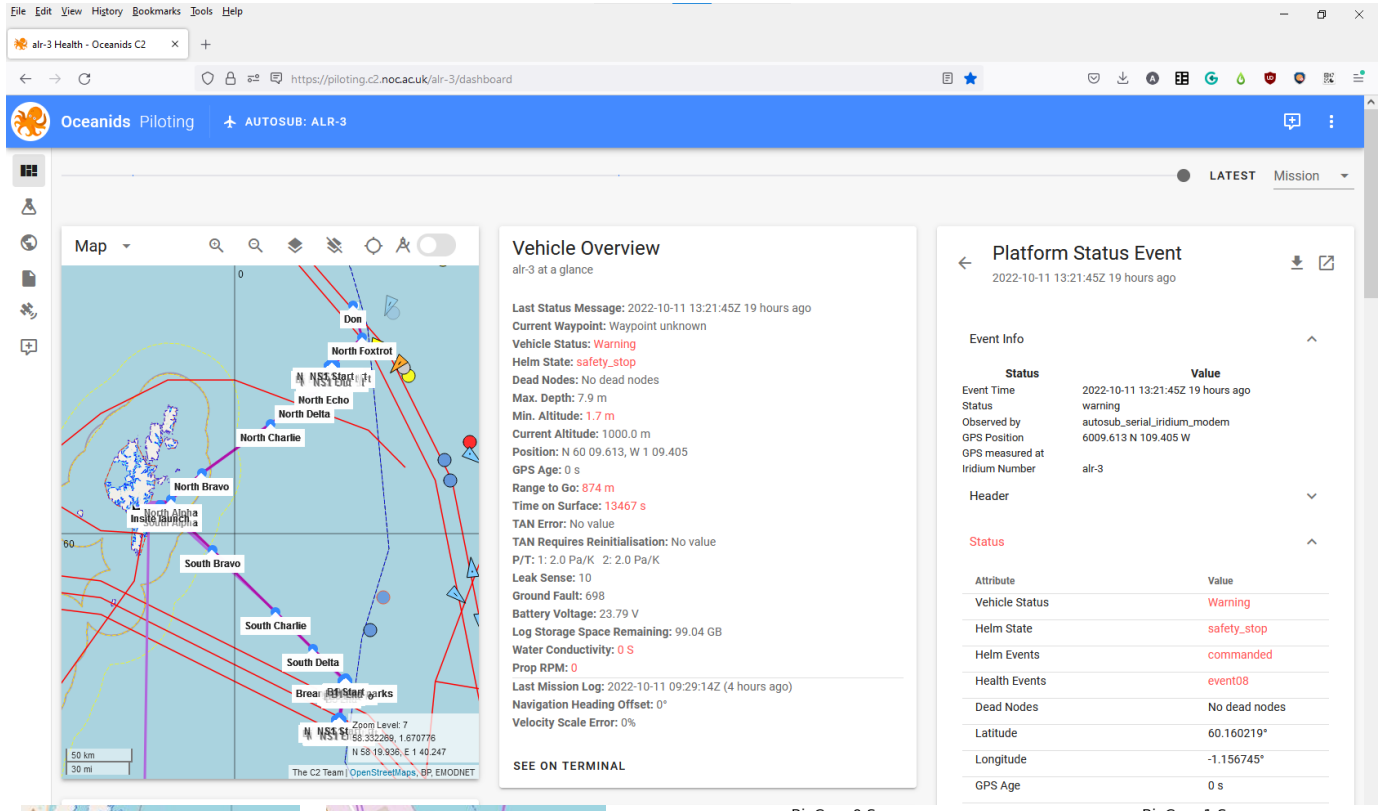
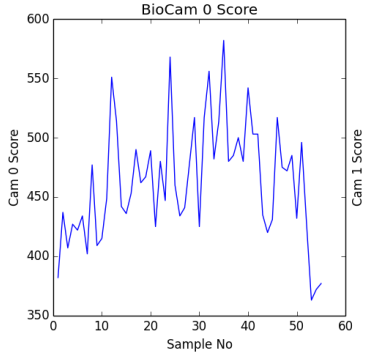
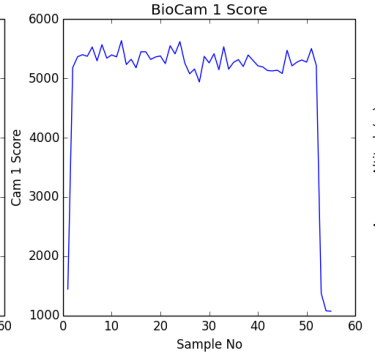
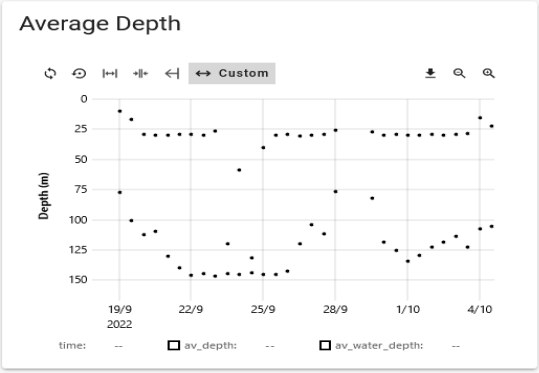
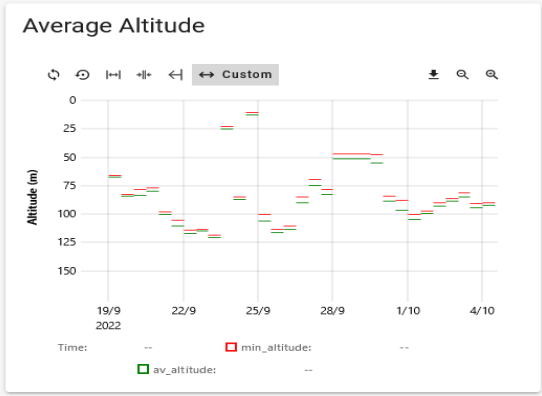
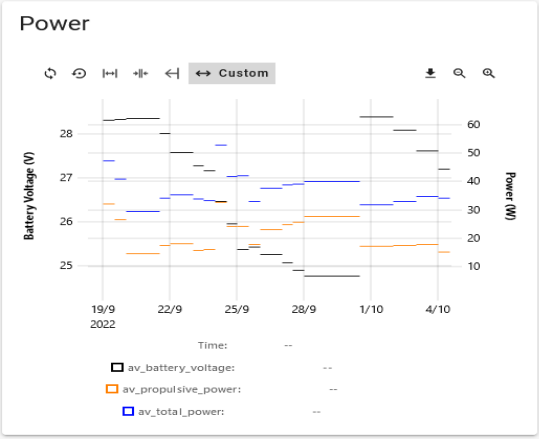


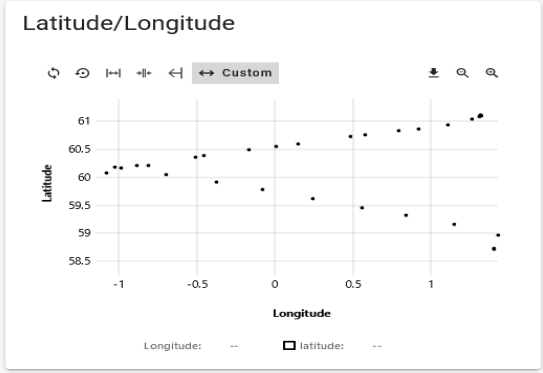




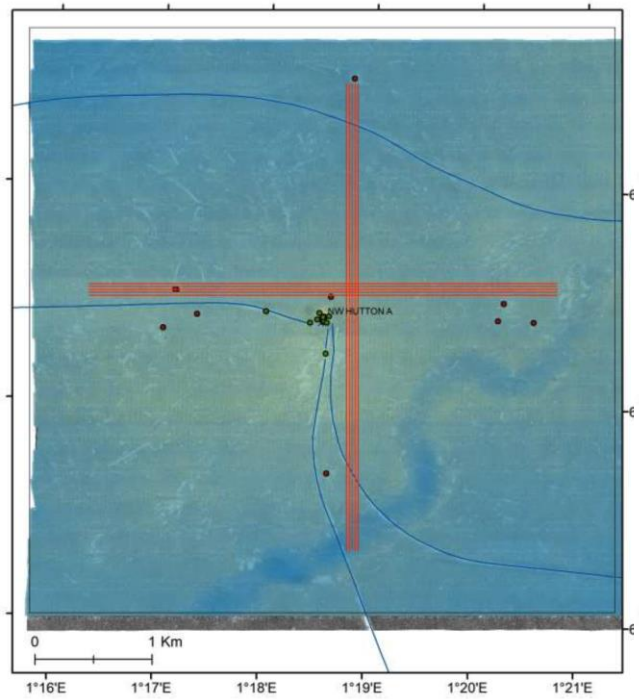


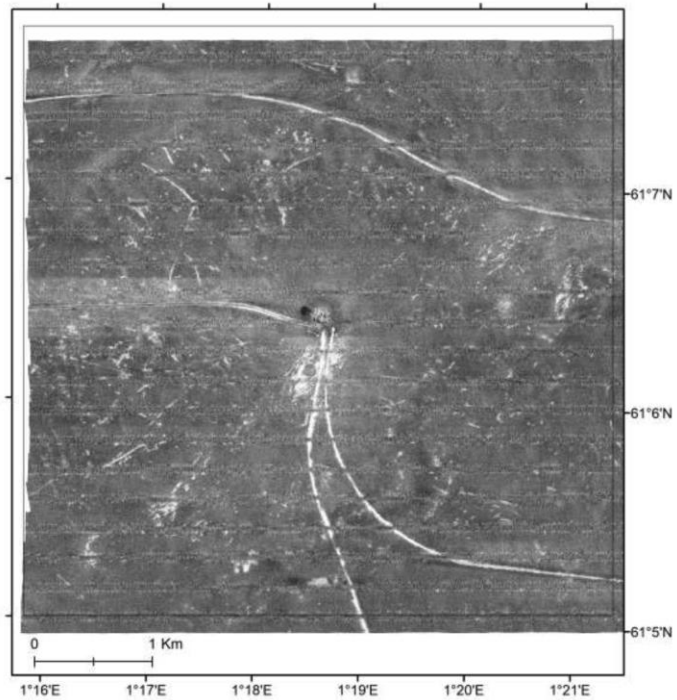


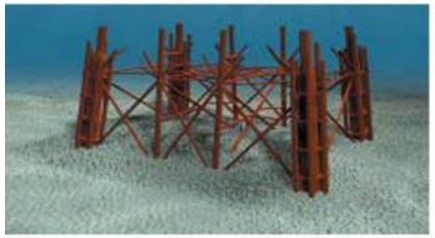




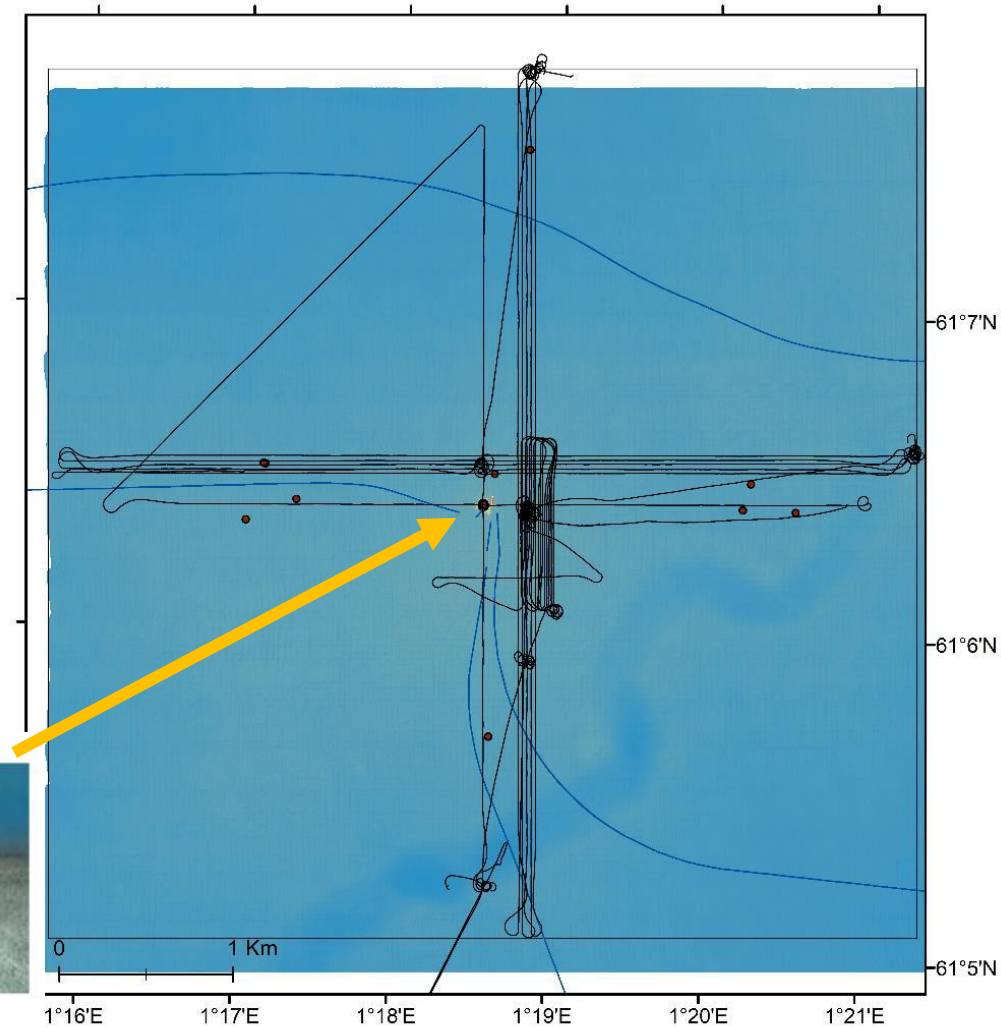
NW HUTTON







NW Hutton

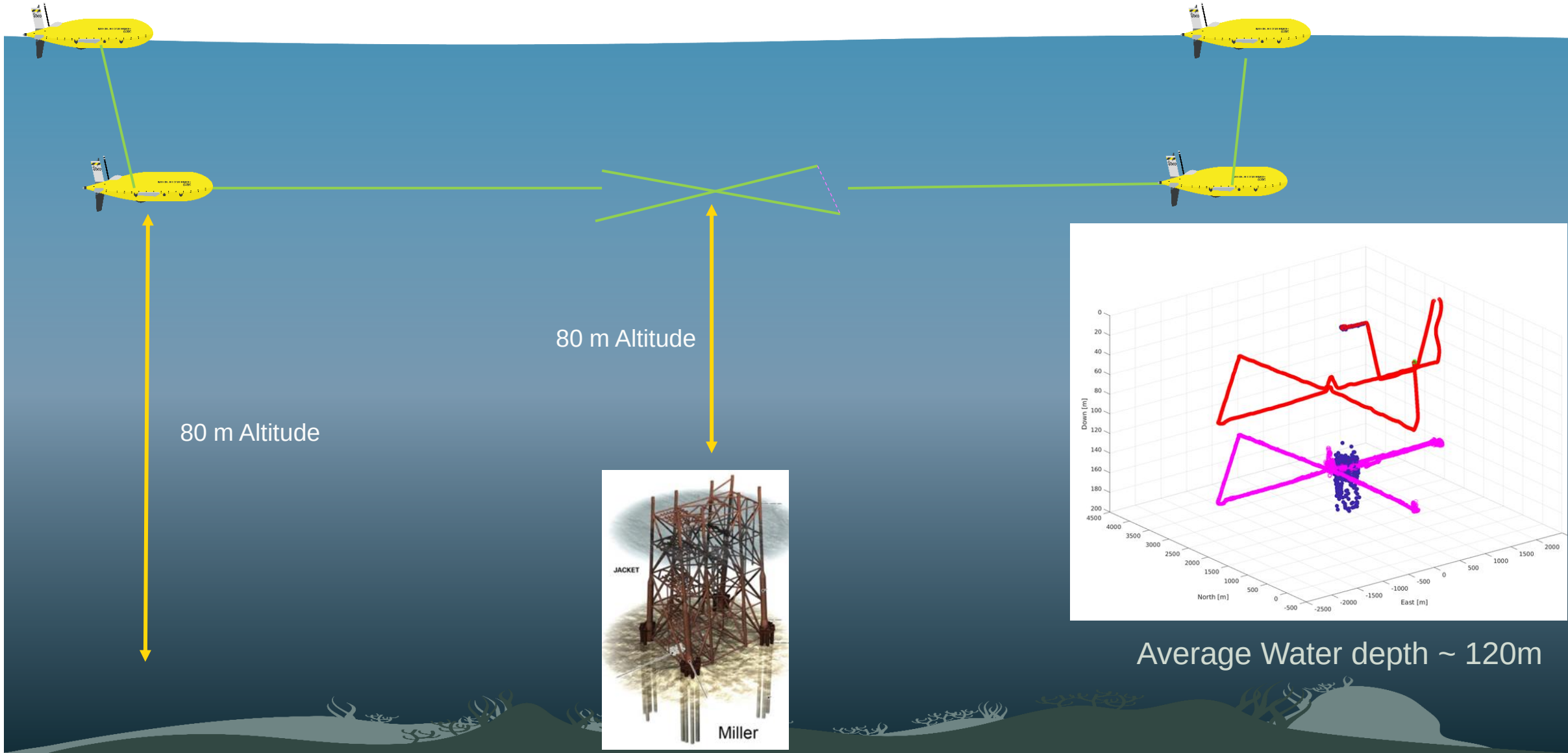


- Planned to do an + Around the site
- Before hand we went over the legs to confirm where they were collect ADCP & DVL data

ADCP SURVEY

Start Survey

End Survey



Average Water depth ~ 120m

OVER SATELLITE MISSION FEEDBACK

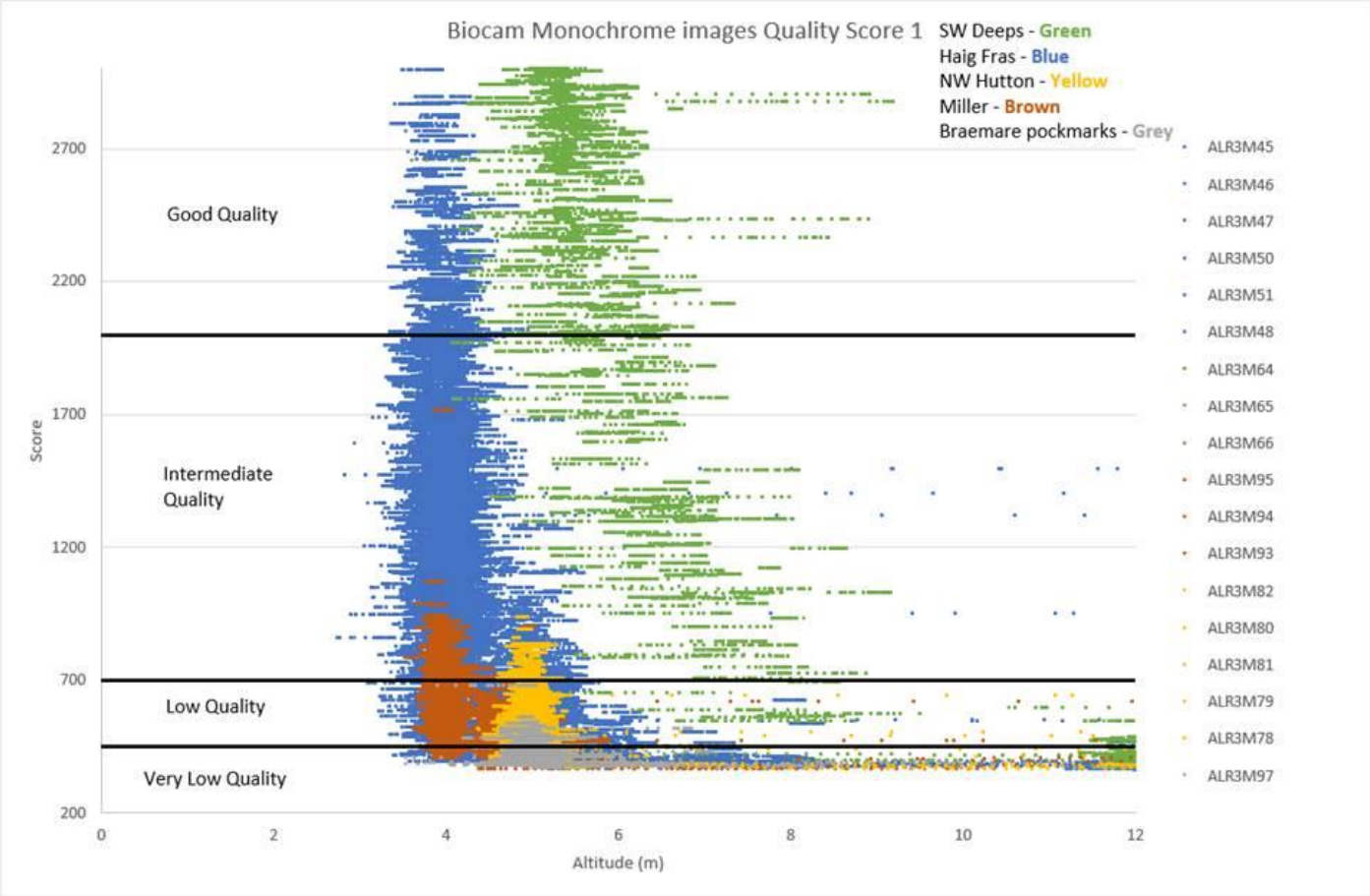
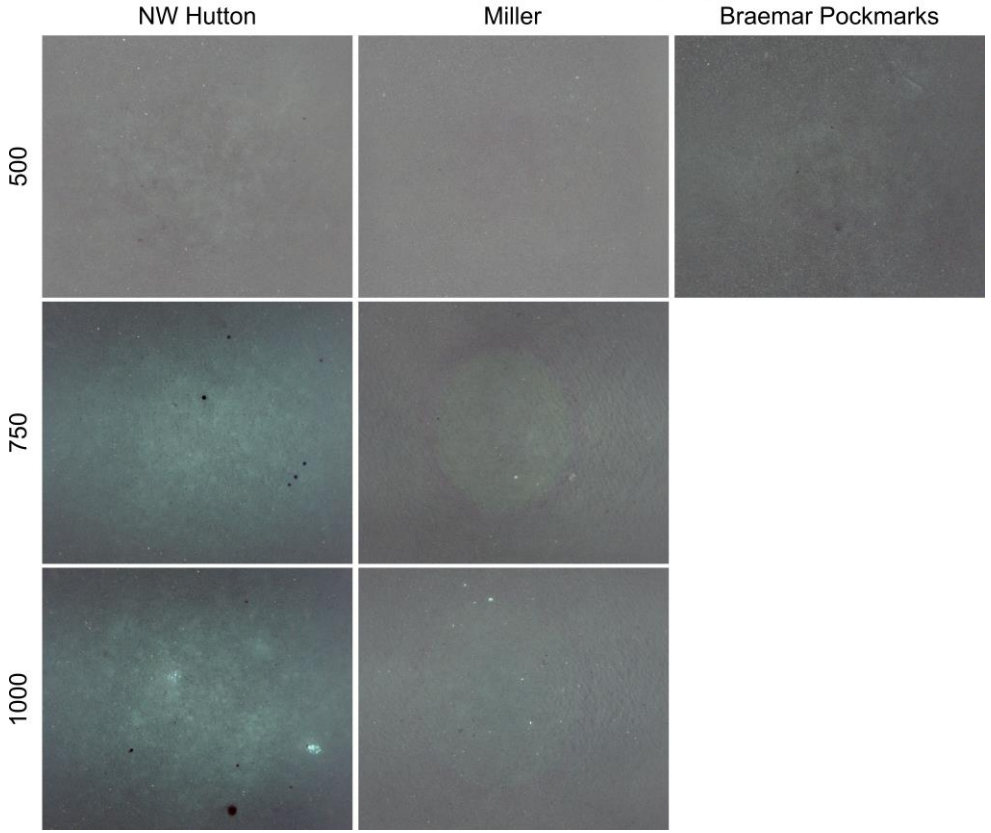
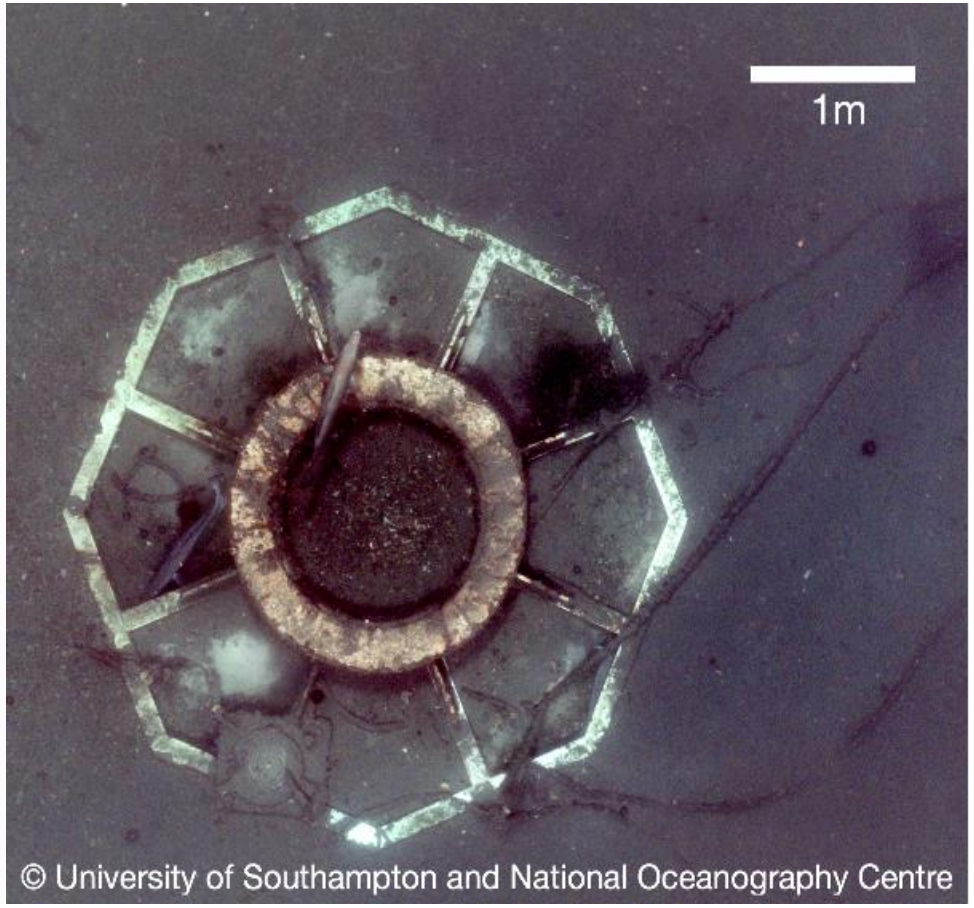
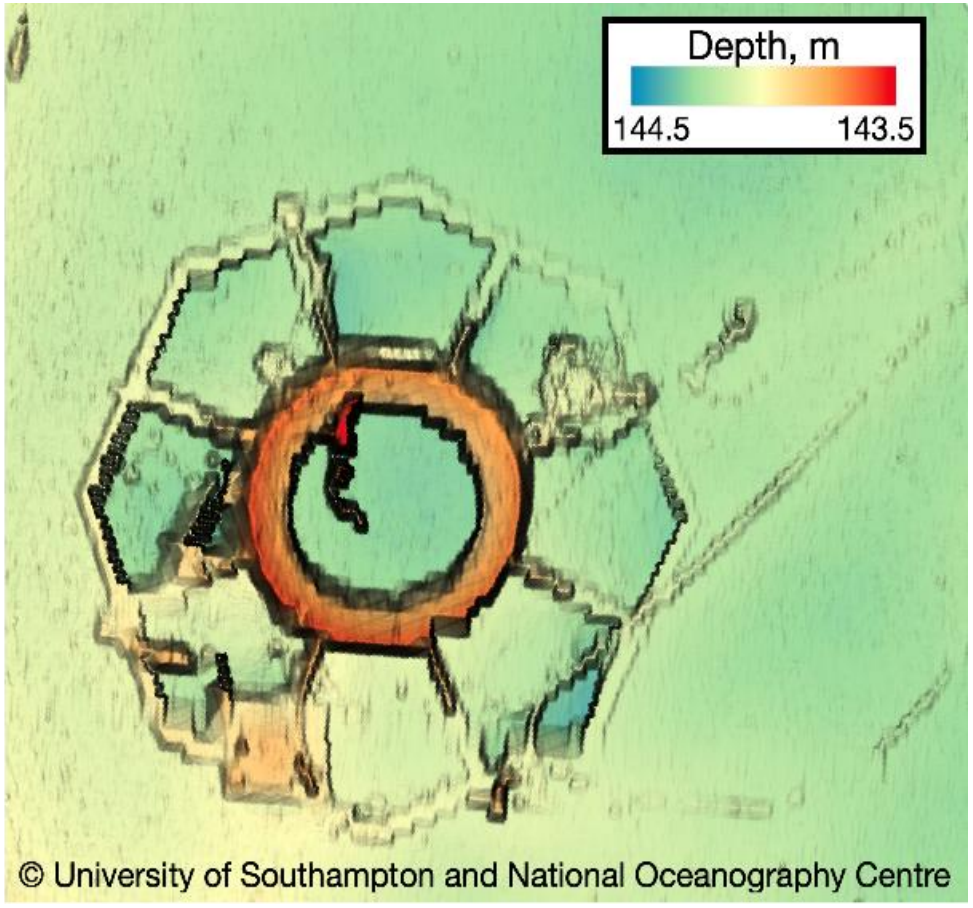


Image scores from Insite deployment

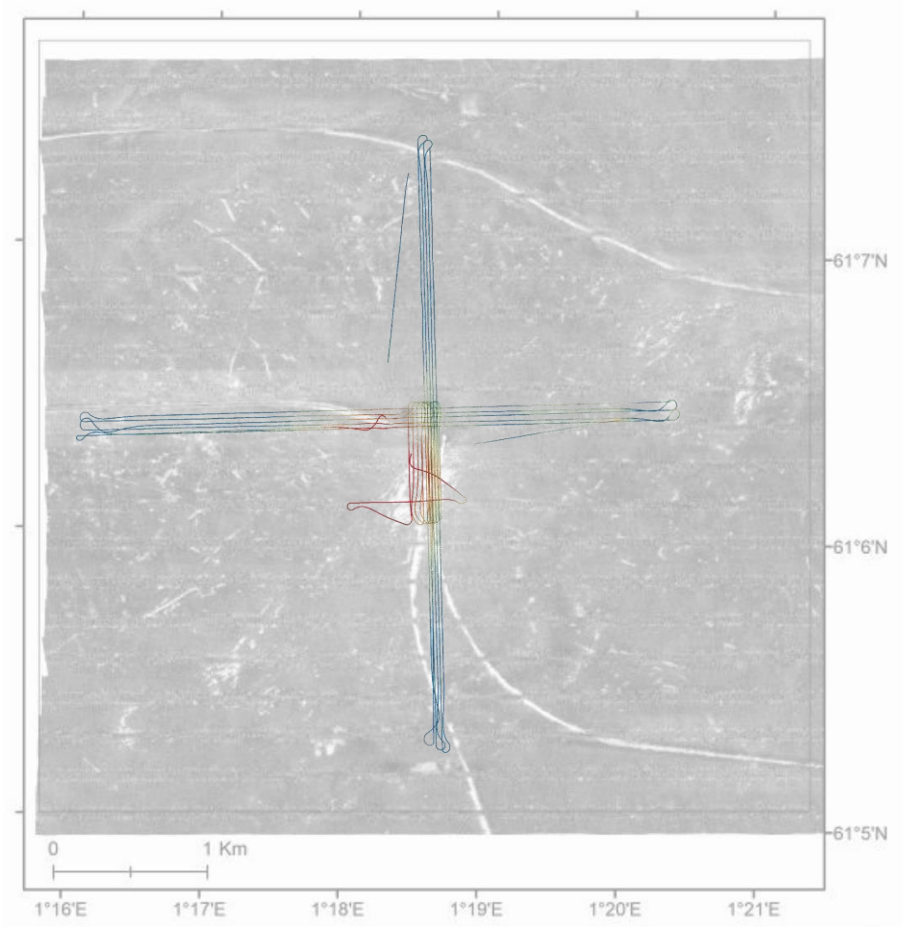


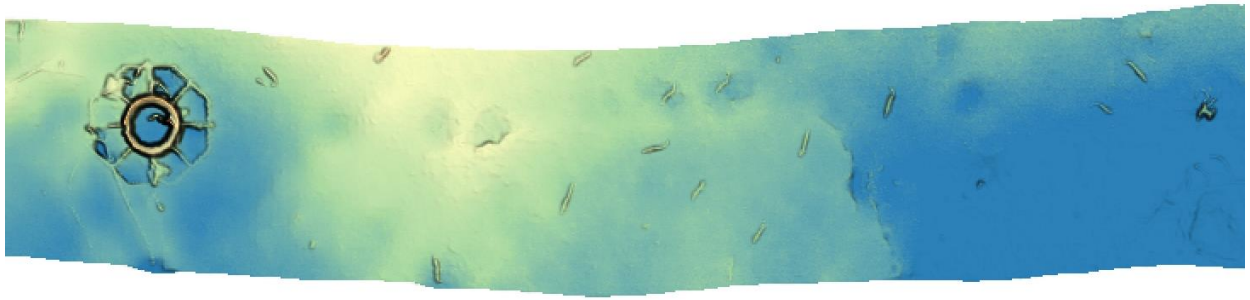
RESULTS - OLD POSITIONING GUIDE?

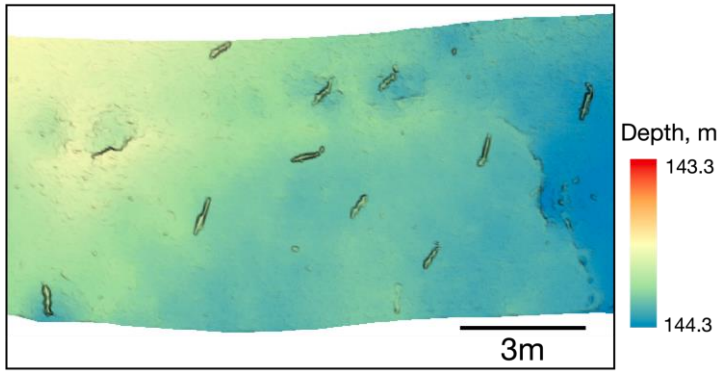




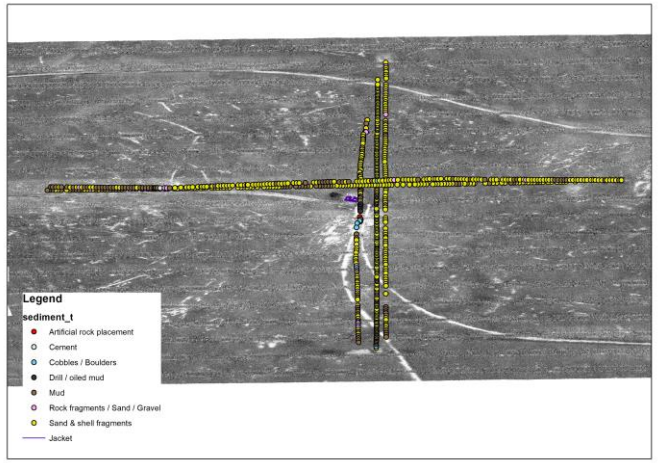
RESULTS

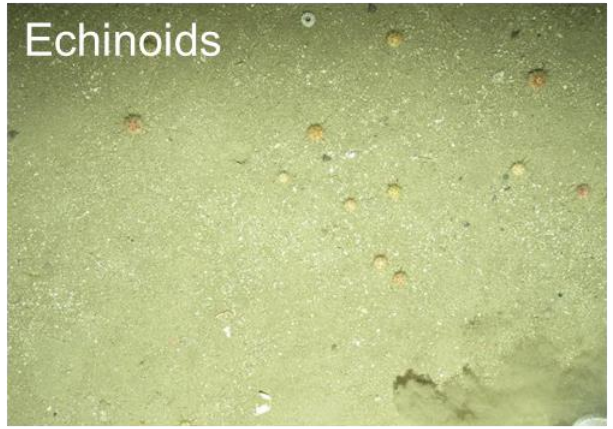

61°7'N
61°6'N
61°5'N
0
1 Km
1°16'E
1°17'E
1°18'E
1°19'E
1°20'E
1°21'E

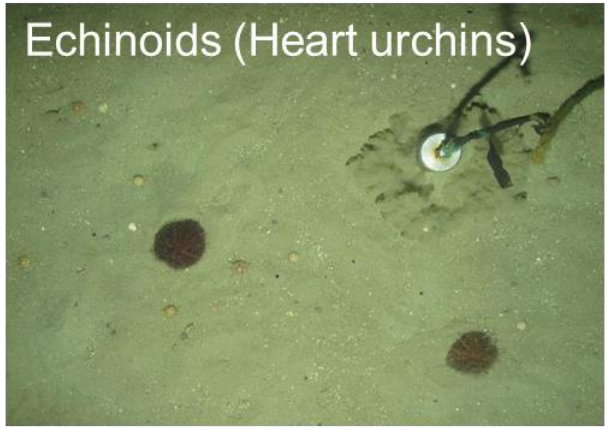


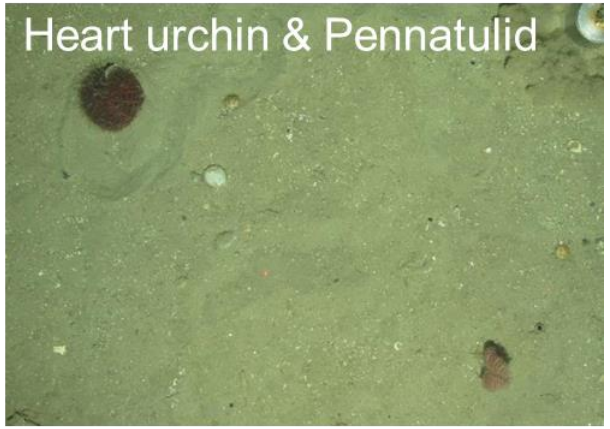

Depth, m
143.3
144.3
3m

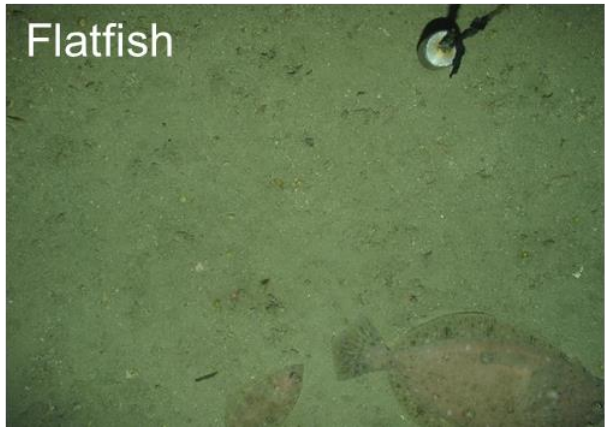
COMPARISON WITH TRADITIONAL METHODS

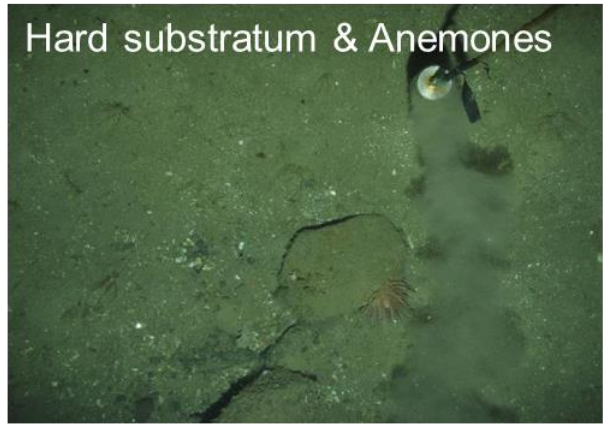




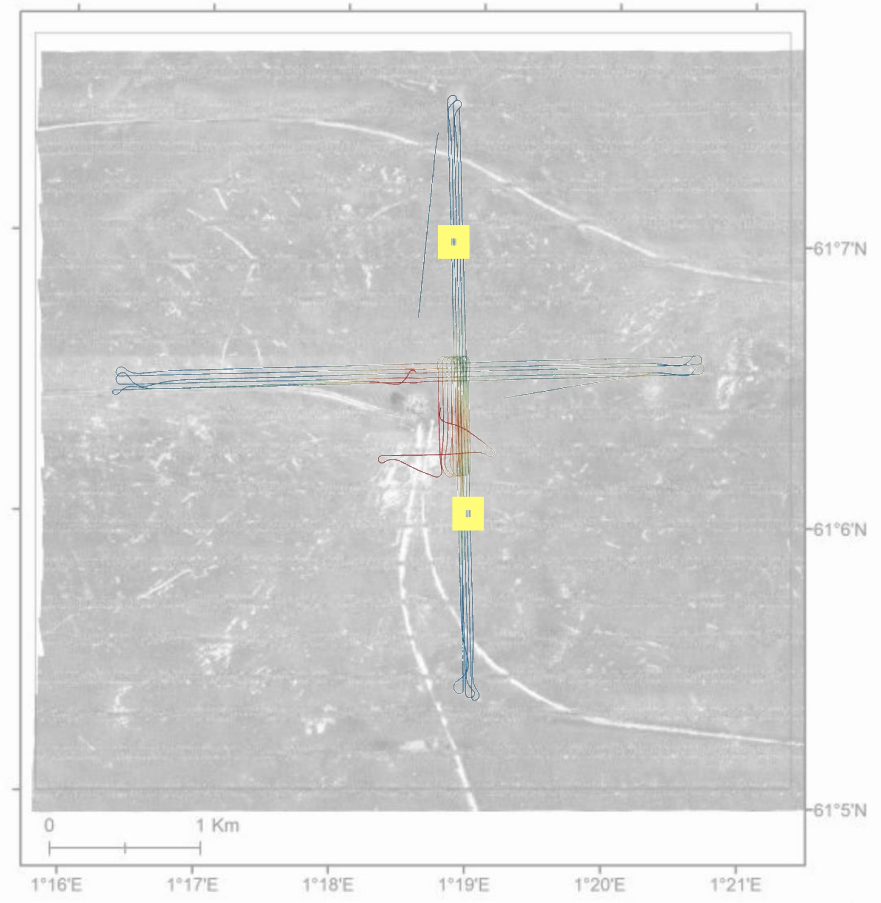


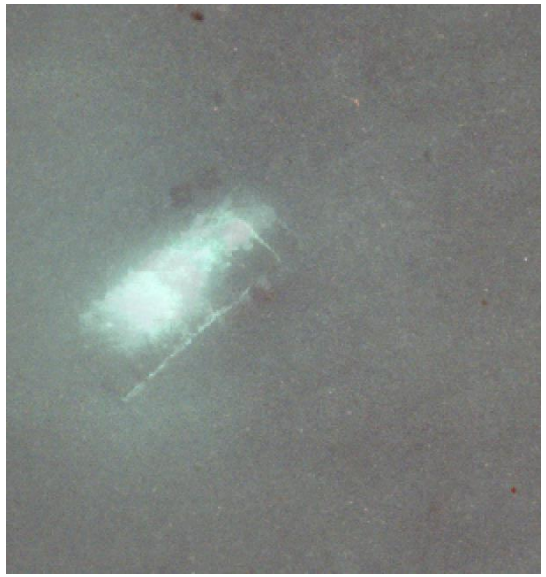


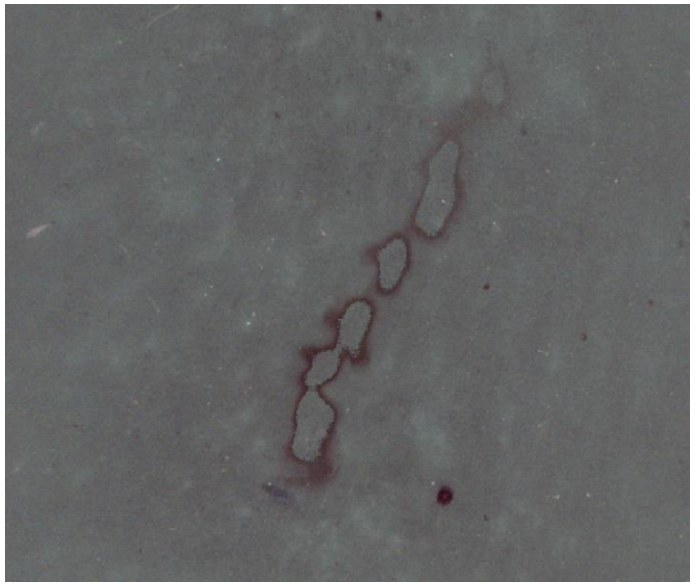


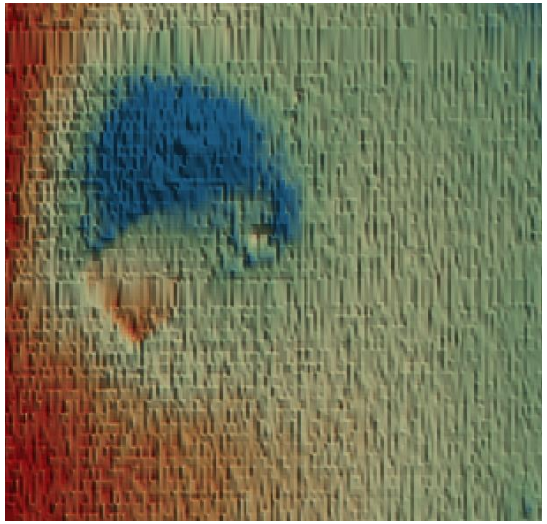


RESULTS – OIL DRUMS









SUMMARY

Will work with BP, the INSITE consortium and other industry and regulatory stakeholders to:

- Improve understanding of key decommissioning sites visited
- Understand how the novel autonomy-based approaches can improve and develop standard industry practice
- Reduce environmental impact of surveys – net zero

Future

- AT-SEA part of an exciting series of long range missions already done by the MARS team e.g. ALR Long-Distance Proving Trial
- Future missions planned e.g. to Marine Protected Areas
    - e.g. Central Fladden MPA

ACKNOWLEDGEMENTS

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Blair Thornton, Adrian Bodenmann (University of Southampton)

- AUV Team:

Philip Bagley, James Burris, Robert Templeton, Rachel Marlow, Edward Chaney, Terry Wood, Alex Phillips

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