Geophysical Benthic Habitat Mapping of the Fal Estuary

Group 3
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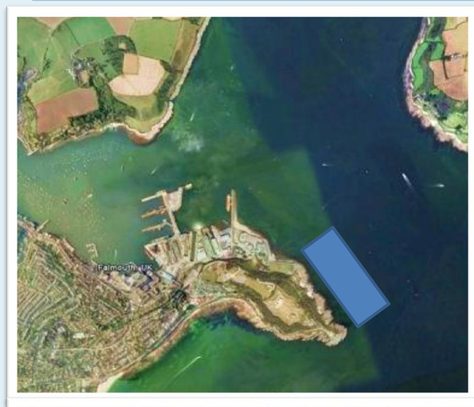
Date: 26/06/2012
Location: Fal Estuary
Vessel: Xplorer
Tide: 0922 UTC
Wind: F2 SW
Sea State: Flat

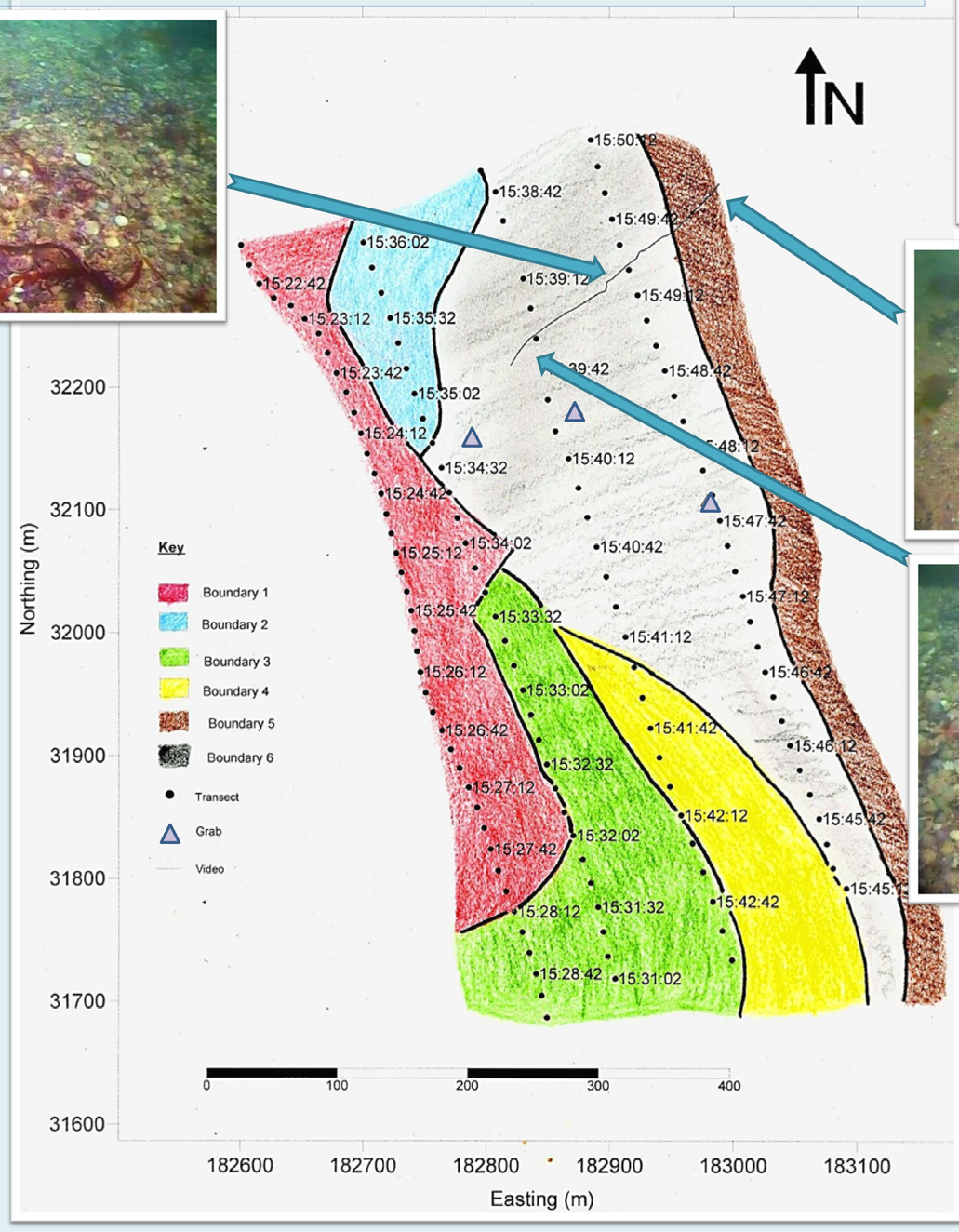
Investigation Aim: To carry out a habitat baseline survey to provide a report prior to the proposed dredging of a new channel in Falmouth Harbour.

The Fal estuary is host to a number of habitats, of which "particular importance are the maerl [coralline algae] beds and *Zostera marina* [seagrass] beds" [1] and the dredging may have detrimental impacts on the biotope. As the Falmouth Estuary has been designated as a Special Area of Conservation (SAC) by the Marine Management Organisation (MMO), it is protected by a number of guidelines to prevent anthropogenic damage to the habitat.

Methods

- Subsurface Duel Frequency Analogue Side Scan Sonar - remotely maps seafloor along 4 different transects; frequency of 410 kHz (high resolution images); swath range of 200m; layback of 4m both vertically and horizontally (small scale negligible effect); tow fish 4m below GPS receiver (mounted on boat).
- Van Veen grab (pictured left) – for ground truthing; marine-grade stainless steel hydrographic line, lowered to seafloor. Grab deployed 3 times along each of our transects. Grabs then sieved through 1cm and 1mm sieves to analyse sediment sizes. Photographic evidence taken for later species identification.
- Van Veen grabs only give a limited amount of data, so used video footage to verify ground truthing, and provide better understanding of biota and habitat.





Screen shot from the video showing the differing bed types across boundaries 5 and 6.

Boundary 1

This boundary was closest to the shore line, and consisted mainly of rocky outcrops of bedrock. An area on the scan shows a small artefact of boat wake, which corresponds to a passing boat, noted down on the trace. This area of the scan also shows some interference with the echo sounder also emitting from the boat.

Boundary 2

This boundary contains bedforms, which when analysed on the trace, have the height of small dunes at H_t(m)=0.189m, and trough length of ripples L_s(m)=0.78m. These values were achieved via standard correction equations applied to the trace. The bedforms are located to the North-east of the survey area, in track 5, and possibly wave induced as tidal forcing in this area is weak.

Boundary 3

On the trace there is evidence of possible further interference with the echo sounder. A lighter return suggests finer sediment, getting coarser towards boundary 4.

Boundary 4

Possible rocky outcrop or coarse sediment patch.

Boundary 5

Very fine sediment, verified by video footage which passed through this boundary. Return becomes very light, consistent darker lines could represent possible artefacts.

Boundary 6

Possible homogenous coarser sediment compared to other boundaries, represented by darker return. Sediment likely to become finer towards boundary 1,2 and 3, and rather sudden change towards boundary 5.

Grab	Location	Depth (m)	Time AST	Biology	Bed	Comments /observations/photos?
1	50 08'56.9268N 5°02'21.1188W	8	16.12	Sea squirt (10cm), juvenile *Crepidula fornicata*, juvenile *Patella vulgata*, maerl, porcelain crab (1cm), *Palmaria palmate*, several small polychaetes (2cm)	Coarse sands. Dead calcareous algae. (30% coverage). Live maerl (5% coverage) Some metamorphic slate, max 15cm length. Many bivalve shells.	Mollusc bivalve shells and slates hosting juvenile limpets, calcareous *Pomatoceros triqueter* casts (see right) and algae.
2	50°08'59.2240N 5°02'26.5620W	7.6	16.51	*Amphioxus*, a variety of bivalves including: *Nucula nucleus* (Common-nut shell). *Teredo navalis* (Great ship worm), maerl, *Littorina littoralis* (Flat Periwinkle)	The substrate was quite siliclastic, highly calcareous and had a high shell coverage.	1st grab cancelled due to grab being held open by a rock, thus losing the entire sediment yield. Live maerl accounted for approximately 5% coverage of the substrate and dead maerl accounted for approximately 30% of the substrate coverage.
3	50°08'58.3464 N 5°02'30.7298W	7	17.24	Maerl (Coralline algae), ribbon worms (Phylum Nerertina), porcelain crab, starfishes, oyster shells (bivalves), Rhodophyta	Substratum consisted of bioclastic material (broken up shells), approximately 90% dead maerl, 10% live maerl.	A lot more maerl (dead or alive) than at grab two. A pregnant crab was observed.

Conclusion

High resolution side scan sonar with relatively few artifacts allowed a clear representation of the sea bed in the survey area. Ground proofing through grabs and video footage has confirmed our analysis of a small area of the survey area, on reflection grabs could have been taken diagonally across the whole area in order to avoid ground proofing in the same boundary zone and increased video footage more fully describing the survey area would have provided tools for greater accuracy in our analysis of the side scan data.

The bed type in the survey area is typical of a wave affected maerl bed[2] displaying clean algal gravel facies. It is likely that the expected small deposition of fine sediment in this area due to the planned dredging[2] will be very short lived due to movement of the bed due to wave action and resuspension of finer sediment. As such it will not affect live maerl or the shelter offered by both live and dead maerl to juvenile fish species.

References

[1] = Mcleod CR, Yao et al, *The Habitats Directive: Selection of Special Areas of Conservations in the U.K. 2nd edition,* jncc.gov.uk/sacselection

[2] = 2009, 'Hydrodynamic and Sediment Regime', *Port of Falmouth Development Initiative – Environmental Statement*, http://falmouthport.co.uk/commercial/html/documents/Section5-HydrodynamicandSedimentRegime.pdf