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National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

UNIVERSITY OF Southampton

Falmouth Geophysical Survey and Benthic Habitat Mapping.

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Falmouth

The Falmouth estuary is one of the most unique in the Cornwall area and across the UK, it has special significance based on its characteristics as it is classified as a Special Area of Conservation due to the diversity of habitats found in this areas. For example; the Maerl (*Phymatolithon calcareum* and *Lithothamnion corallioides*) beds which are the largest in south-west Britain. They particularly important for harbouring an abundance of infaunal and epifaunal species[1].

Figure 1 (Left): The Xplorer Vessel on which the raw data was collected.

Background

Other types of habitats found in this area include; mudflats, saltmarshes, rocky shores, eelgrass beds and oyster beds due to the shear diversity of the habitats this site is of unprecedented scientific significance[1]. Before its significance was understood there were large anthropogenic impacts threatening these areas such as; mining of metalliferous deposits which include, copper, lead, iron and other minor metals, after the closure of the last mine in 1991[2], mining sites the contaminants have spread from the initial area of deposition in Restronguet Creek, which is labelled as most metal polluted estuary in the UK, to adjacent creeks on the western side such as Mylor[3].

Metadata

Vessel:	**Xplorer**
Date:	**11/07/17**
Start Time:	**11:14 UTC**
End Time:	**14:30 UTC**
Conditions:	**Overcast, Heavy Precipitation**
Cloud Cover:	**8/8**
Low Tide:	**13:54 UTC**
High Tide	**07:32**
Tide:	**Ebb**
Semilunar Tide:	**Spring**

Station	Time	Longitude	Latitude
Drift 1	**11:46- 11:51 UTC**	**50°13.434N**	**005°51.372W**
Drift 2	**12:07- 12:12 UTC**	**50°12.333N**	**005°02.239W**
Grab 1	**12:22 UTC**	**50°12.332N**	**005°02433W**

Underwater Video Analysis

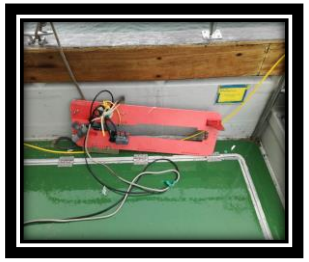


Figure 1 (Above): The camera attached to the sledge system aboard Xplorer

A benthic habitat video survey was conducted at two sites:
1. **50°13.4N, 005°01.002W**
2. **50°12.333N, 005°02.239W**

Once the camera sledge system was deployed a visual image of the benthic habitat was obtained, it was then observed using a video monitor which recorded a copy however a backup copy was also acquired using a mobile device.

Video 1 Screenshots:

Echinodesmata Asterias Reubens

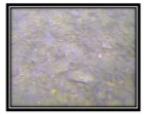
Porifera

Crepidula femicata

Video 2 Screenshots:

Rhyodophya

Porifera



Ostreidae

Video 1 showed evidence that the sediment type was infralittoral mixed sediment (SS.SMX.IMX). This is due to the high abundance of the epifaunal species *Crepidula femicata* (slipper limpet) and also due to other species such as the common star fish *Echinodesmata Asterias Reubens*. The habitat is also characterised by anoxic, cohesive muds overlaid with bioclastic debris.
However, as most of the species that characterise this sediment classification are infaunal species the exact habitat could not be determined from the video alone. Therefore, other quantitative data would have to be taken to confirm the predicted sediment habitat.

Video 2 showed evidence of two different types of sediment habitats. One was dominated by yellow and red microalgae attached to hard substratum. This habitat was not covered by the sonar side-scan transect. There was a sharp gradient leading into the second habitat, infralittoral coarse sediment, which was characterised by coarse, bioclastic sediments, predominately oyster shells, suggesting the habitat was adjacent to a main oyster bed.

Geophysics

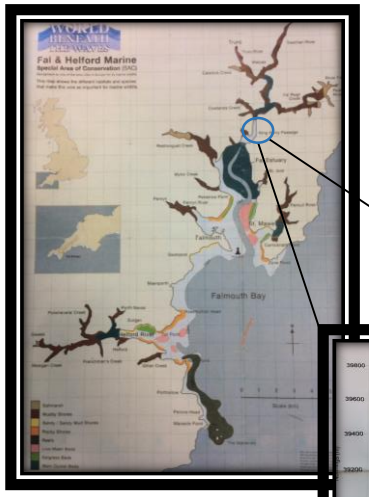


Figure 2 (Left): An aerial map of the Fal and Helford Marine Special Area of Conservation indicating the different habitats and species that make the area so important. The figure also marks the area where the transect was conducted.

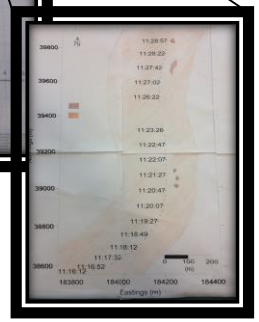


Figure 3 (Right): The ship track habitat map showing a single transect from **50°12'29.9"N 005°01'49.9"W** to **50°13'09.8"N 005°01'37.3"W**

The orange boundary represents the infralittoral mixed sediment and the brown boundaries represent rocky outcrops.

A subsurface dual frequency analogue Side Scan Sonar mapped the seafloor following a single transect from a to b firing at a frequency of 100kHz. The transect produced was then used to produce a habitat map (Figure 3).

However, there are several disadvantages of using the sonar scanner such as; the inability to examine further than the seabed surface without conducting ground truthing. Furthermore, disruption from other vessels will be detected by the sonar creating artefacts.

Figure 4 (Left): Group 14 personal picture.

Van Der Veen Grab

A Van Der Veen grab was taken to give a true representation of the infauna and sediment of the habitat at the start point of the transect. The sample was then filtered through a 2mm and a 0.5mm sieve respectively to more accurately determine the contents of the sample.

Figure 5 (Left): The Van Der Veen grab aboard the vessel

The data collected from the Van der Veen grab contained a variety of infaunal and epifaunal species like *Lanice conchilega* or better known as the sand mason worm, they form tubes structures which house them and these were found in high abundance throughout our sample. Other worm species such as: *glycera lapidum* and *Leucosiidae* crab. These species are all abundant in the 'Infralittoral coarse sediment' habitat (SS. SCS. ICS), however some species which are characteristically abundant in this category were not found in the grab sample. This is possibly due to obtaining only a small sample size, which suggests the acquired sample is not truly representative of the habitat due to low data.

Figure 6 (Above): separation of grab sample.

Figure 7 (Above): showing sieved infralittoral mixed sediment type.

References

1. Jncc.defra.gov.uk. (2017). *Fal and Helford - Special Area of Conservation - SAC - Habitats Directive*. [online] Available at: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0013112 [Accessed 13 Jul. 2017].

2. Langston, W. (2003). *Site characterisation of the South West European marine sites*. Plymouth: Marine Biological Association, p.15.

3. Bryan, G. and Langston, W. (1992). Bioavailability, accumulation and effects of heavy metals in sediments with special reference to United Kingdom estuaries: a review. *Environmental Pollution*, [online] 76(2), pp.89-131. Available at: https://www.ncbi.nlm.nih.gov/pubmed/15091993 [Accessed 13 Jul. 2017].