Habitat Mapping of the Fal Estuary

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Date: 27 June 2016

Location: Fal Estuary

Vessel: Valonia

Tide times :

HW: 09:56(BST)

LW: 16:23 (BST)

Weather Conditions:

Cloud Cover: Overcast (7/8)

Sea State: Slight

Wind: Occasional light wind

Precipitation: None

Introduction

The Fal estuary is a Special Area of Conservation (SAC) located in Cornwall at approximately 50°11'23.95" N and 5°2'7.64" W. This estuary has been granted it's SAC label due to the presence of habitats outlined in annexes 1&2 of the EC Habitats Directive (REF) These habitats include saltmarshes, sandbanks, intertidal and subtidal mudflats, eelgrass and maerl beds. Eelgrass beds are used as a nursing ground for fish and cuttlefish and provide shelter for seahorses and pipefish. Maerl beds are made up of several species of red seaweed with calcified skeletons, which are an essential habitat for species which live amongst, attached to or beneath the maerl. The SAC was designed and implemented by the EU, which aims to protect rare and threatened wildlife both on land and at sea.

The aim of our investigation was to create a habitat map using a geophysical survey, ground-truthing this with a grab sample and videography. Amalgamating the maps of the all the groups to show the extent of the habitats found within the estuary for ecosystem services which can be shown by comparing different years. This was conducted using a side scan sonar (TowFish) which in total mapped approximately 882000 m^2 of the estuary bed. In addition, Van Veen grabs (stainless steel body on a hydrographic line) were deployed (two times in total) and sieved through 1cm/1mm sieves to determine sediment sizes. A high-resolution camera was deployed with the aim of sampling and identifying areas of interest and the biological (flora/fauna) and physical properties (such as sediment type) present within them on the estuary bed.

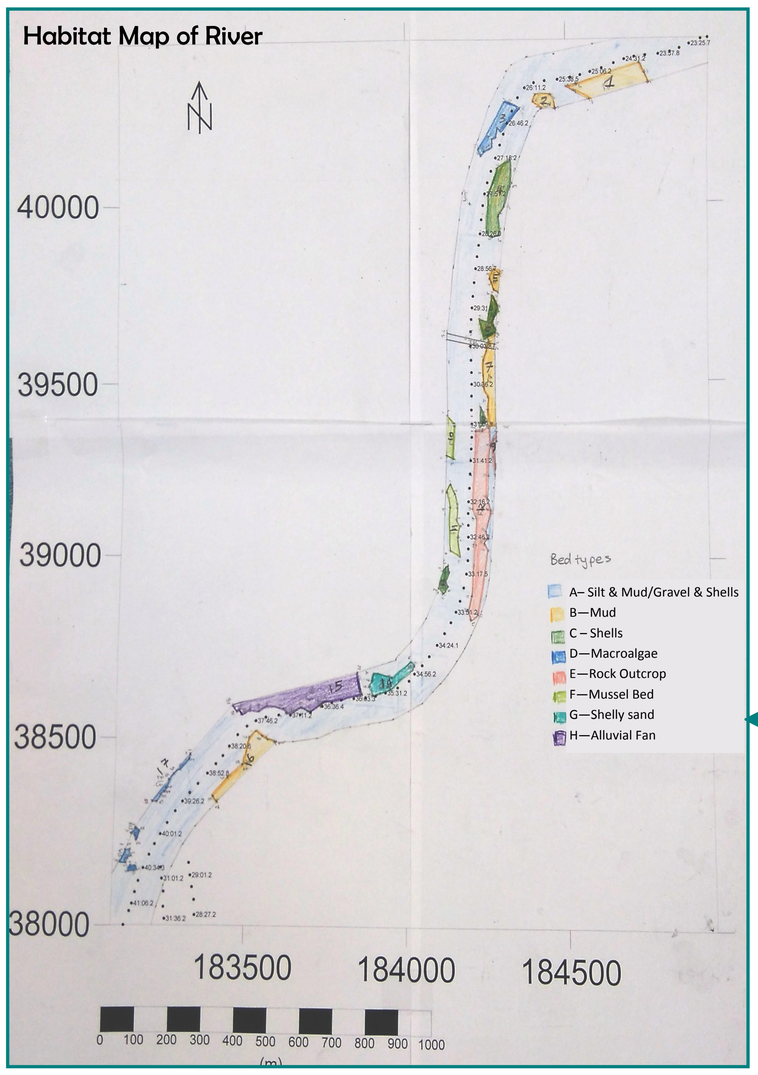
Method

Subsurface Duel Frequency Analogue Side Scan Sonar is used to for the bathymetric survey giving a swath of 150m per track. The chosen survey area covers the river from the mouth of the estuary to confluence between Fal-Ruan and Tresillian-Truro rivers. Additionally, two parallel tracks were surveyed from the river mouth into the estuary. This expands the total coverage adding 'river-end' to the areas already surveyed during the field course. Key features were identified and any disturbances at the surface, such as the wake of passing boats was recorded. A video probe and a Van Veer grab were used to ground-truth the species present and establish the sediment in the habitat. This was carried out by taking four videos of the seafloor, with two in the estuary across the parallel tracks, and two within the river. The sidescan trace was analysed and marked with boundaries around sections of similar levels of backscatter. Using the Surfer 8 software, and the navigational data recorded in OSGB 36 format, the side scan boundaries were overlaid onto a larger plot.

Right- the van veer grab being deployed >

< Left - The tow fish .

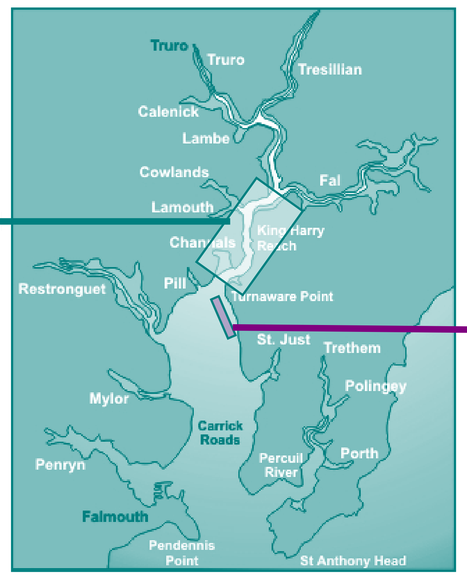
Habitat Map of River



River

The side scan trace of the river reveals a range of possible habitats, reflecting the high variability in the rivers physical parameters. The river varies in depth becoming deeper towards the middle of the channel with remnants of the ria. The meandering of the river alters the sedimentary dynamics, where by finer sediment on the side of the meander where the current slacks (B). The narrowing of the river channel increases the tidal amplitude and current speed thus leading to fluctuations in turbidity; therefore increasing water column nutrient availability, making it optimal for suspension feeders such as mussels (F). The footage implies the river is sparser in macroalgae, suggesting a more challenging environment due to dynamic physical conditions.

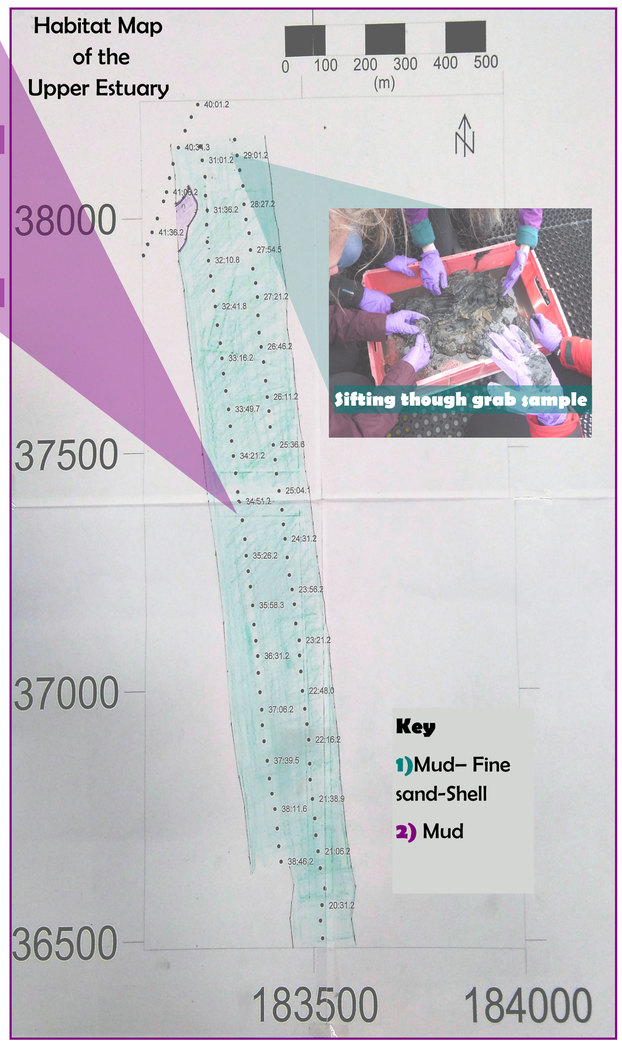
*Due to strong currents, the poor visibility of the video limited the ground truth data and therefore the side scan results are subjective. Similarly a grabs were not conducted due to mechanical fault with the crane. Therefore the results of the trace are subjective interpretations.



^Above - Video stills from the upper estuary. 1) Shows the seabed covered with types of chlorophyta, rhodophyta, phaeophyta 2) Kelp covered in hydrozoa polyps and a juvenile fish 3) predominantly phaeophyta and rhodophyta with a starfish 4) Kelp with encrusting hydrozoa polyps and rhodophyta.

< Left - Map of the Fal Estuary and tributary rivers. [location no date]

Habitat Map of the Upper Estuary



Estuary

The grab taken in the estuary identified several benthic faunal species; a velvet crab, (*Necora puber*), three ragworms (*Nereis diversicolor*) and a slipper limpet (*Crepidula fornicata*). The organisms found were typical of the area, commonly found within silting conditions. The sediment recovered coincides with the chart datum (UKHO 2000), and with the side scan results for the estuary; which is a mixture of mud and silt, of a fine grain particle size.

The video revealed that a variety of macroalgae was found, including 13 species of rhodophyta, including two sessile calcareous varieties, two species of phaeophyta and two species of cholophyta with the most notable being sea lettuce (*Ulva lactuca*). There was also evidence of scattered disarticulated shells, possibly originating from the river.

*The side scan trace appears to reveal finer mud boundary (2), a grab and grain size analysis would need to be conducted to show this was true not a printing artefact.

Conclusion

Overall the estuary showed the substrate to be homogeneous noise of a similar fine grain size mixed with large shells and, macro-algae. The environment allows a flora and fauna to become established and supports biodiversity seen in the video. However, results from the grab show that the entrance to this estuary maybe more challenging , biologically, as finer sediment settles out from the river. Invasive species such as *Crepidula fornicata* found at the entrance to the estuary may need regular observation to monitor development, in case control measures are required to protect SAC habitats. The river showed greater range of substrate on the side scan track, and a significant drop in macro-organisms in contrast to the estuary. The conditions within the middle part of the mapped area are optimal for mussel bed growth. Since harvesting of the existing mussel bed has not been operational since 2014, due to an E. coli outbreak (IFCA 2015), it could prove interesting to compare to previous years to see effect of the beds distribution before and after active aquaculture.

References

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