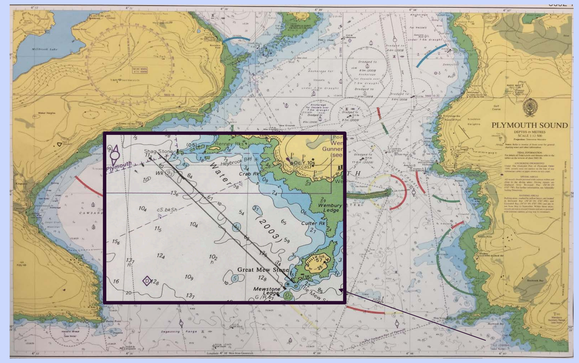
# Habitat Mapping in Plymouth Sound

**Introduction**
The aim of this geophysics investigation was to identify and map different habitats offshore from the Plymouth Sound coastal area. To observe the area video footage of the seabed was combined with data from 3 sidescan sonar transects to create a map of the physical and biological environment. The region is a designated Special Area of Conservation (Jncc.ddefra.gov.uk, 2018), therefore habitat mapping is vital in understanding this important ecosystem in order to maintain and protect it. . The location was chosen because we were interested in the kelp forests which are known to be found in this area (Field, 2012). The transects also lay in an area of geological interest, characterised by tectonic activity such as tilting and faults.

*University of Southampton Group 2*

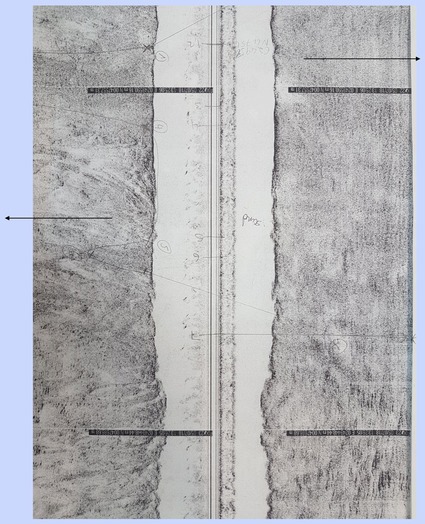
## Location

Transects and video footage was taken between Shag Stone and Great Mew Stone, close to Heybrook Bay.




## Sidescan Sonar

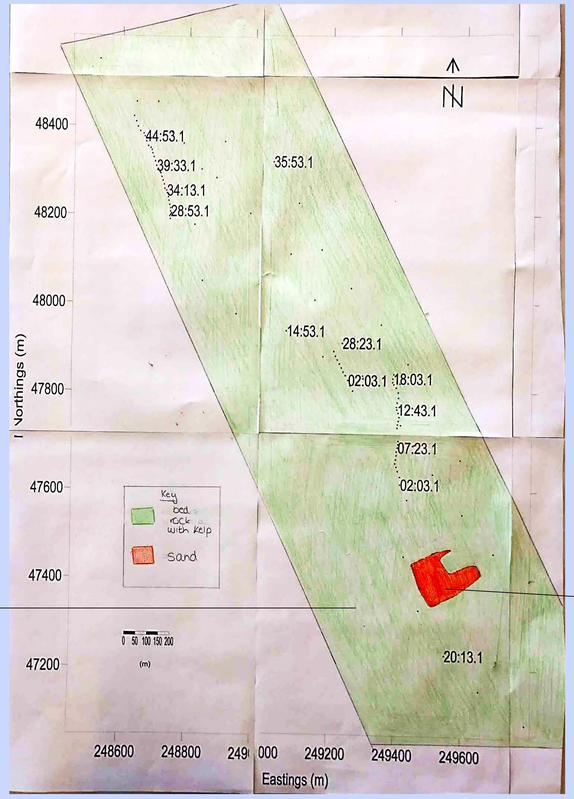
**Methods and Results**
Using a side scan sonar attached to a towfish behind the boat, an image of the seabed was printed out from backscatter recorded by the device. . Different substrates are identified by the darkness of the print, as harder surfaces reflect more so the image produced is lighter in colour. As with the video footage, the track produced (below) showed mainly hard rocky substrate covered in kelp, a lighter image with ripple shaped marks. Patches of sand are also identified by a darker colour and a softer surface.



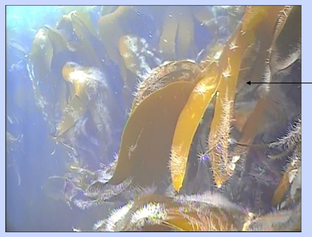
Sand

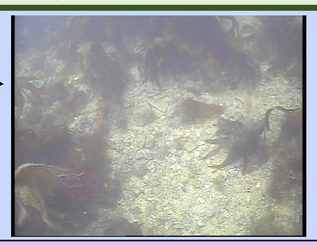
Rocky Substrate

*Fig.1: Navigation track data showing the coordinates of the area surveyed, overlaid with the habitat type. As there was little variation in this area, the majority of the map shows kelp forest with a small patch of sand*




Screenshot of footage showing part of the kelp forest





An occasional patch of sand was also observed between the kelp-covered rock

## Video Camera

**Methods**
The video images were taken from a camera bow-tech attached to a glider that stabilizes its position in the water. The video camera records the sea floor as it is being dragged by the boat. The video resolution counts with 25 shots per second using sunlight to construct the footage.

**Results**
**Video 1**: The bottom here was almost entirely covered by a forest of kelp (Primarily, if not solely Laminaria digitata). The underlying substrate, kelp holdfasts or any potential inhabitants could seldom be seen, due to the extensive cover. Where substrate was seen, which was more frequent toward the end of the video, further inshore, it was patches of rock or sand. Hydroids and bryozoans were often seen encrusting the surface of the kelp fronds, and red algae was sometimes seen between the kelp (Such as Corallina spp.)
**Video 2**: Kelp cover still extensive, but perhaps half that of what was seen Video 1. The rocky substrate and larger stones were more visible in patches devoid of kelp, and red algae was seen in a higher abundance, as were the hydroids and bryozoans encrusting the kelp fronds. Other animals could be seen amongst the kelp, such as starfish or the occasional fish such as Ballan wrasse (Labrus bergylta), though this may have merely been a symptom of the decreased cover lending a better view.
**Video 3**: This video, taken from a position between the two taken before, showed an environment intermediate between them; the substrate was visible to a slightly greater degree than in Video 1, kelp and their hydroids or bryozoan symbionts were always present, and red algae could occasionally be seen between the fronds or when the camera dipped below the kelp canopy.

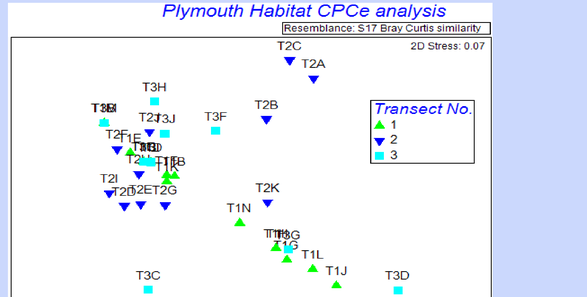



*Fig. 2: MDS plot of the habitats seen in the video transects. Labels are of the format "TXY", where X identifies the video transect from 1-3, and Y identifies the video frame used, where the first is A, the second is B, and so on. Analysis of randomly sampled features from screenshots of the video transects using ANOSIM showed habitats to be similar ($R_{Global}$ = 0.134, $p < 0.05$), as reflected in this figure, the corresponding MDS plot. The closeness of the points on the plot represents the habitat similarity seen in the corresponding screenshots with points from different habitats interspersed.*

Survey taken on 05.07.18 from 12:10 to 15:30 UTC
Tidal state: ebbing
Sea state: smooth
Weather: Alternately cloudy with fog patches
Vessel: Xplorer

**Discussion**
The three transects showed a vast rock bed spanning the habitat mapped. The rocks of the area surveyed date back to the Devonian through to the Carboniferous period and mainly comprises fluvial deposits and marine sediments intruded by granites. When the Rheic Ocean closed, caused by subduction of a tectonic plate, deformation occurred of the rock bed, creating folding, cracks and pinnacles (Humphreys and Smith, 1989). From surveying on land at Heybrook bay, near the offshore habitat mapped, lateral faults were found and the bed was overturned with a dip of 025 degrees and a strike of 050 degrees. Rock pinnacles, fault lines and crevices were seen onland and these reflect those of the underwater landscapes seen in the side scanner transects. Transects 2 and 3 found an area of sediment and this is shown in the habitat map created. Video analysis found that all three areas surveyed were statistically similar to each other and demonstrated that a vast kelp bed was present. The rock bed, with crevices and faults, provides a key surface for kelp holdfasts to attach onto, making the area a highly dense kelp bed. Kelp forests are often protected and so are usually under conservation management. They are major primary producers in the UK coastal habitat, their detritus and dissolved organic matter support ecosystems and they provide structural support for diverse epifauna and epiflora (Field, 2012). During the video footage, wildlife such as starfish and small fish, such as wrasse could be seen, as well as bryozoan species living on the kelp stems and fronds.