**Introduction**

Plymouth sound -> area surveyed.

Aims of the survey - To determine the features of the marine habitat in the selected region of Plymouth Sound, including the types of sediment and geological features of the seafloor using acoustic survey as well as identification of biotype and species assemblages. This allows visualisation and assessment of the type of habitat, its quality, and the effects of anthropogenic activity in the area.

(Hart, Price and Smart, 2009) – Paper where we found the geology map from

“Sediment-distribution-map-of-Plymouth-Sound-and-the-location-of-some-of-the-sampling” in Photos/photos\_DN

**Methods**

Identification of a survey area – why this location and how was it chosen?

The study location was selected based on the findings of Hart, Prince, and Smart (2009) (Figure #). The site selected was identified as having a wide range of potential substrate types consisting of:

* Shell gravel
* Sand
* Muddy sand
* Mixed mud, sand, gravel

However, the study was conducted in 2009 thus the distributions of sediments were likely to have shifted meaning that the observed distributions are likely to differ from those of Hart, Price, and Smart (2009).

INSERT SENTENCE ABOUT WHEN LAST EUNIS SURVEY WAS CONDUCTED AND HOW ITS ALSO AN UPDATE TO THAT.

**Sediment grab**

2L – Van Veen grab

Can work out volume of sediment grab based on picture – use area of cylinder?

Photos\_DN/IMG\_9597.DNG

Photos\_DN/IMG\_9593.DNG?

Volume of sediment grab = 2000cm3

Assume sediment grabbed is roughly cylindrical based on IMG\_9597

Assume r to be 4cm, and h to be 16cm, thus area = 502cm3

Grab split into 2 pieces, 502 x 2 = 1004

Grab split into 2 pieces, 502 x 2 = 1004

A 2L van veen grab was used to take a semi-quantitative sample of sediments that had been determined as softer from the sidescan image. The sample from the grab was then sieved through a 2 mm and 1 mm sieve and analysed for biota.

A 2-litre Van Veen grab was used to take semi-quantitative samples of sediments along the video transects (Table 1), grabs were then deployed at three different sites per transect where the substrate was deemed as suitable for a grab (Table 2).

The sediment grab samples were then sieved through 2mm and 1mm sieves in succession to separate the biota from the fine sediment. The biota was then removed from the sieves and then identified.

The efficiency of a Van Veen grab is dependent on the conditions of the sea, with the best replicability and efficiency occurring when the ship is anchored and the weather is calm (Lie and Pamatmat, 1965). The conditions out at sea were windy leading to the ship rocking which likely led to a low grab efficiency, with the grab often containing roughly 1 litre of sediment.

3 grabs per soft sediment site, beginning, mid-point, and end.

<https://aslopubs.onlinelibrary.wiley.com/doi/abs/10.4319/lo.1965.10.3.0379>

* Efficiency defined by volume of sediment sampled compared to theoretical volume sampled.
* “A van veen grab is efficient in sampling the benthos and will give good replication if the ship is anchored and weather is not too bad.”

Station 1

* Grab 1 – 50°20.7639’N, 4°8.83181’W
* Grab 2 – 50°20.8747’N, 4°8.7253’W
* Grab 3 – 50°20.9655’N, 4°8.6410’W

Station 2

* Grab 4 – 50°20.8370’N, 4°8.4967’W
* Grab 5 – 50°20.8597’N, 4°8.4626’W
* Grab 6 – 50°20.9630’N, 4.8.3518’W

Station 3

* No grabs carried out due to hard sediment.

|  |  |  |
| --- | --- | --- |
| **Table 1 - Sediment Grab Stations**  Stations at which sediment grabs were taken along the drift transects. Each grab was taken with a 2-litre Van Veen grab. No samples were taken at Station 3 due to the site being composed of hard rocky substrate. | | |
| **Drift Transect** | **Latitude** | **Longitude** |
| **1** |  |  |
| Grab 1 | 50°20.7639’N | 4°8.8381’W |
| Grab 2 | 50°20.8747’N | 4°8.7253’W |
| Grab 3 | 50°20.9655’N | 4°8.6410’W |
| **2** |  |  |
| Grab 4 | 50°20.8370’N | 4°8.4967’W |
| Grab 5 | 50°20.8597’N | 4°8.4626’W |
| Grab 6 | 50°20.9630’N | 4°8.3518’W |
| **3** | No grabs due to hard sediment | |

Potentially useful references

**Sidescan**

5 transects carried out, 0.9 nautical miles each.

0.9 nautical miles = 1666.8 m

The geoacoustic pulSAR sidescanner (GeoAcoustics, 2016) uses an active sonar system on a towfish that was pulled behind the boat at a depth of 7 metres from the seafloor, surveying an area of 75 metres either side of the towfish. The towfish uses 2 transducers to emit an acoustic pulse at a frequency of 500 khz. These signals reflect off the seabed or oceanographic features and the backscatter from these is received by the transducers. The transducers measure the strength of the returning signal, this is determined by the type of substrate or seafloor features present, with a harder substrate returning a stronger signal. As the towfish was towed behind the boat along parallel transects these were laced together to form a mosaic seafloor image showing the different seafloor sediment and features, the nature of which can be determined using ground truthing such as sediment grabbing or video.

(GeoAcoustics, 2016)

**Sound velocity profiler**

A Valeport SWiFT SVP (Valeport, 2024) was used to profile the sound velocity in the water column (celerity). Celerity is a function of temperature, salinity, and pressure; at the depths surveyed, temperature is the main control of celerity. Based on the water profile a depth of 7m was identified as an ideal depth to tow the sidescanner. This decision was based on the depth at which the rate of change of celerity slowed.

<https://www.geoacoustics.com/products-main-pulsar>

**Video**

Didn’t have enough rope initially so changed from bunny hopping to drifting.

Frame with SONY cameras attached

Drift for 10 minutes.

Station 1 – 50°20.7447’N, 4°8.8659’W – 50°20.8360’N, 4°8.6749’W

Station 2 – 50°20.8300’N, 4°8.5122’W – 50°20.9604’N 4°8.3380’W

Station 3 – 50°20.9655’N, 4°8.6410’W – 50°20.7964’N 4°8.9544’W

Video surveys were taken at 3 sites on 03/07/2024, each video transect was carried out for 10 minutes whilst the boat drifted (see *Trackplot*). Two Sony 4k action cams (Sony, 2024) were used to capture forward-facing and bottom-facing video footage on a rig (Figure #). For Station 1 (Table #) a hybrid approach was used, initially a bunny hop approach (the camera sits on the bottom briefly before moving) was attempted, however, the boat was drifting too quickly leading to a change in the methodology where a drifting approach was used. The drifting approach consisted of allowing the rig to float 1m above the seabed whilst the boat drifted. This approach was used for the latter half of Station 1, and Stations 2 and 3.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Table 2 -** **Video transect Stations**  Stations at which video transects were taken, each transect was carried out for 10 minutes whilst the boat was allowed to drift freely. | | | | |
| **Station Number** | **Start Point** | | **End Point** | |
| **Latitude** | **Longitude** | **Latitude** | **Longitude** |
| Station 1 | 50°20.7447’N | 4°8.8659’W | 50°20.8360’N | 4°8.6749’W |
| Station 2 | 50°20.8300’N | 4°8.5122’W | 50°20.9604’N | 4°8.3380’W |
| Station 3 | 50°20.9655’N | 4°8.6410’W | 50°20.7964’N | 4°8.9544’W |

Figure # - Species Count for each Video Transect

Results of a cumulative species count in each transect. Station 1 (S1) and Station 3 (S3) plateaued before the camera was retrieved. Station 2 (S2) still had a rising species count by the time the camera was retrieved, suggesting an incomplete survey of the total number of species present.

Eunis id

The sampled area is within lower infralittoral zone, with the depths ranged from 6 to 11 m. the sampled areas were deemed to be a moderate energy region behind the breakwater, but the region still experiences strong tidal flows. The video transects illustrated the variation of soft sediments dotted with rocks, this informed the designation of Infralittoral mixed sediments (A5.43) for muddy sand in area 1 and rocky sand in area 2.

Within the Rocky sand region, the abundance of the [Amphipholis squamata](https://www.marlin.ac.uk/habitats/detail/354/venerupis_senegalensis_amphipholis_squamata_and_apseudes_latreilli_in_infralittoral_mixed_sediment) collected in the grabs points towards the designation of A5.433, however no identifying species could be identified to further classify the sites,

The video transects over area 3 illustrated muddy sandy rock with a mix of large kelp species pointing towards low energy infralittoral rock [Kelp in variable salinity on low energy infralittoral rock](https://www.marlin.ac.uk/habitats/detail/345/kelp_in_variable_salinity_on_low_energy_infralittoral_rock) A3.32 however due to the large distance over the sample area it wasn't possible to id key identifying species to further classify the site.

ArcGIS

Arcgis map caption

The map of the Plymouth sound the Sidescan sonar imaging, overlayed by the substrate regions; Muddy sandy rock (green), Muddy sand (blue), Rocky sand (pink). The video transects are denoted by line at station 1 (red), 2(blue),3(pink) and the location of grabs denoted by triangles for station 1 and squares for station 2.

**Discussion**

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**References**

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