Habitat Mapping of Falmouth Bay

Introduction

Falmouth Bay is located in Cornwall in Southwest England. This area is a designated Special Area of Conservation (SAC) site and consequently it is important to map the benthic habitat of the area. Habitat mapping was achieved using both side scan sonar and underwater videography. The location, shown in figure 1, was chosen as the area as it had previously been partially sampled. This survey extended the previous work so that the map could be completed. With ecosystem services becoming increasingly important and anthropogenic activities putting growing pressure on marine environments, an improved understanding of the seafloor ecosystems is needed. Falmouth Bay is of economic importance due to its fishing industry, scuba diving, boat trips to see marine mammals and transportation. However it is also of scientific importance as it is home to vulnerable and rare species such as maerl and eel grass. Hence it is important to map and identify different benthic habitats and communities so that such species can be protected and any deleterious impacts monitored. The eel grass and maerl bed habitats are vital for a range of juvenile fish as they provide shelter and protection, the removal of such habitats could bring about a significant shift in the community composition which could have consequences on nutrient concentrations and water quality.

Date: 23/06/2016
Vessel: MTS Xplorer
Weather: 2/8 cloud cover
Sea state: Smooth
High tide: 7:56 & 20:08 GMT
Low tide: 2:04 & 14:21 GMT
Group 2 - 2016

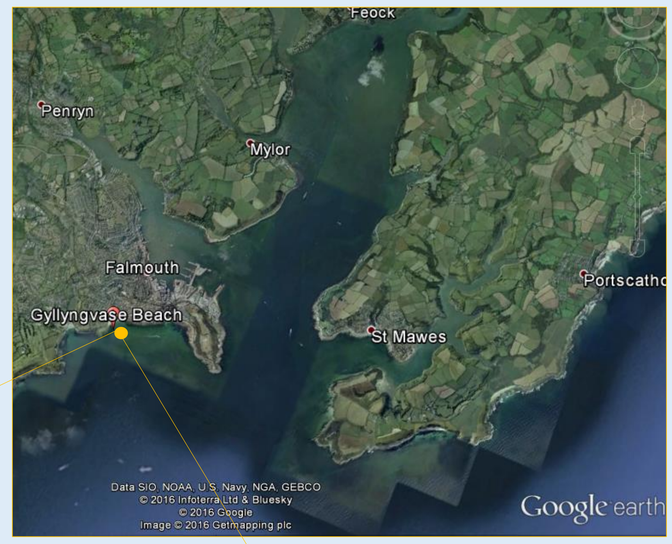

Figure 1. Location of the area in which the habitat mapping was conducted. The yellow square is representative of the width and length of the four tracks of side scan sonar. The black arrows represent the track that the boat drifted over during the video transect. Made using Google Earth Pro (1).

Habitat Map

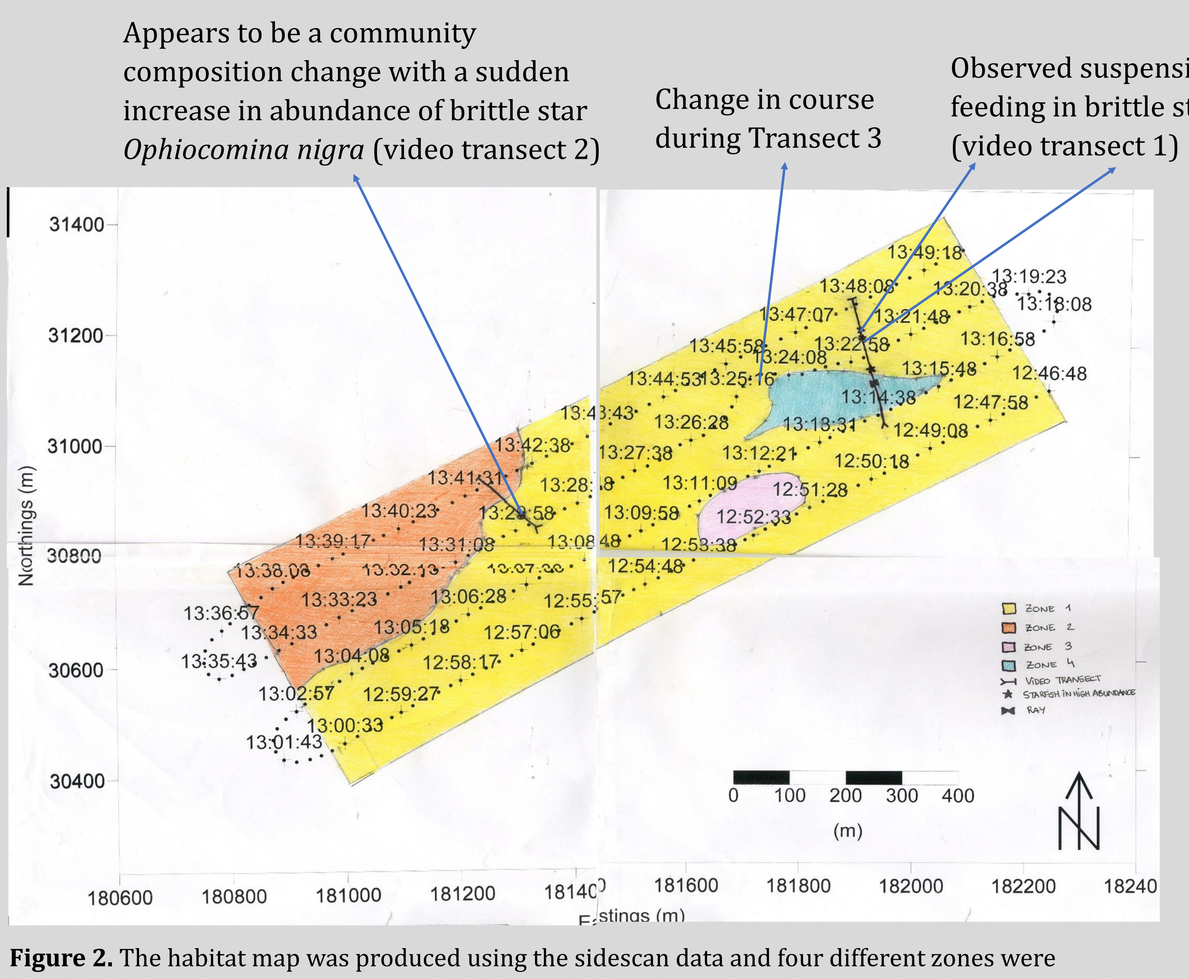

Figure 2. The habitat map was produced using the sidescan data and four different zones were identified. The video transects are marked along with locations of significance. The plot was created using Surfer by plotting the ship track undertaken whilst using the Towfish. The habitats were then mapped by hand on the plot.

The sidescan sonar Towfish revealed larger bedforms (wavelength 1-2 metres, height 20-60 cm) in Zone 1 (yellow), which predominated throughout the surveyed area. This showed the seabed to be homogenous in this location. The bedforms were deduced to be straight transverse sand waves using the classification system of Sam Boggs (2). In Zone 2 (orange) the bedforms are considerably smaller (wavelength <1, height approximately 30 cm). This was evidenced in the video transect over Zones 1 and 2. It also coincided with the appearance of the brittle stars shortly after entering Zone 1. Zone 3 (pink) was a dark patch on the sidescan with higher backscatter, suggesting that it was coarser material (3) such as rock, however no video transect was conducted in this area. The rocks were calculated to be between 0.4 and 1 metres high. Zone 4 (blue) presented fewer shadows on the sidescan with barely any bedforms, although there was little evidence of this on the video footage. Additionally whilst conducting transect 3 over Zone 4 we had to change course due to another vessel which affected the quality of the scan.

Underwater Videography

Two benthic video transects were conducted during the survey, Figure 2 shows examples of the different species present on the sea floor. In both transects the most dominant organisms found were the brittle stars *Ophiocomina nigra* (Fig 3A) and *Ophiothrix fragilis.* Other species identified were the common star fish *Asterias rubens* (Fig 3C), the coralline algae *Lithothamnion carallioides,* and one spotted ray (*Raja montagui).* The first video transect showed vast numbers of *O. nigra* filter feeding by raising their arms; this could be evidence of the mucus-net feeding method (4). *O. fragilis* was also observed to filter feed. Additionally, individuals tended to cluster together whilst feeding (Fig 3F) whereas *O. nigra* was distributed evenly throughout. Previous studies (5) have also observed that such agglomerations can enable filter feeding in fast moving currents that might otherwise sweep brittle stars away. Dense populations can result from pseudocopulation, a behaviour exhibited by both species which are known to breed in summer around Britain (6) . Pseudocopulation is driven by the release of pheromones from the initial spawning stars and consequently encourages other individuals to congregate and synchronise reproductive cycles (7).

Throughout both transects the bed forms and sediment composition were homogenous, contrastingly the distribution of benthic echinoderms varied between the two transects. The precise location of these changes can be seen above on the habitat map. The seabed was composed mainly of broken shell which is likely due to the high wave energy of Falmouth Bay as it is not protected from South and Southeasterly weather (8). Furthermore, Falmouth Bay has experienced high wind speeds (up to 63km/h) in the recent months of April and May (9) and this may have broken up existing shells or swept it into the bay from elsewhere. The video also showed the troughs of the bedforms to have trapped larger pieces of organic, marine debris (Fig 3E) implying that they were formed at least a few months ago. This coincides with the larger wind speeds recorded during April and May and therefore it could be inferred that the sand waves formed around this time.

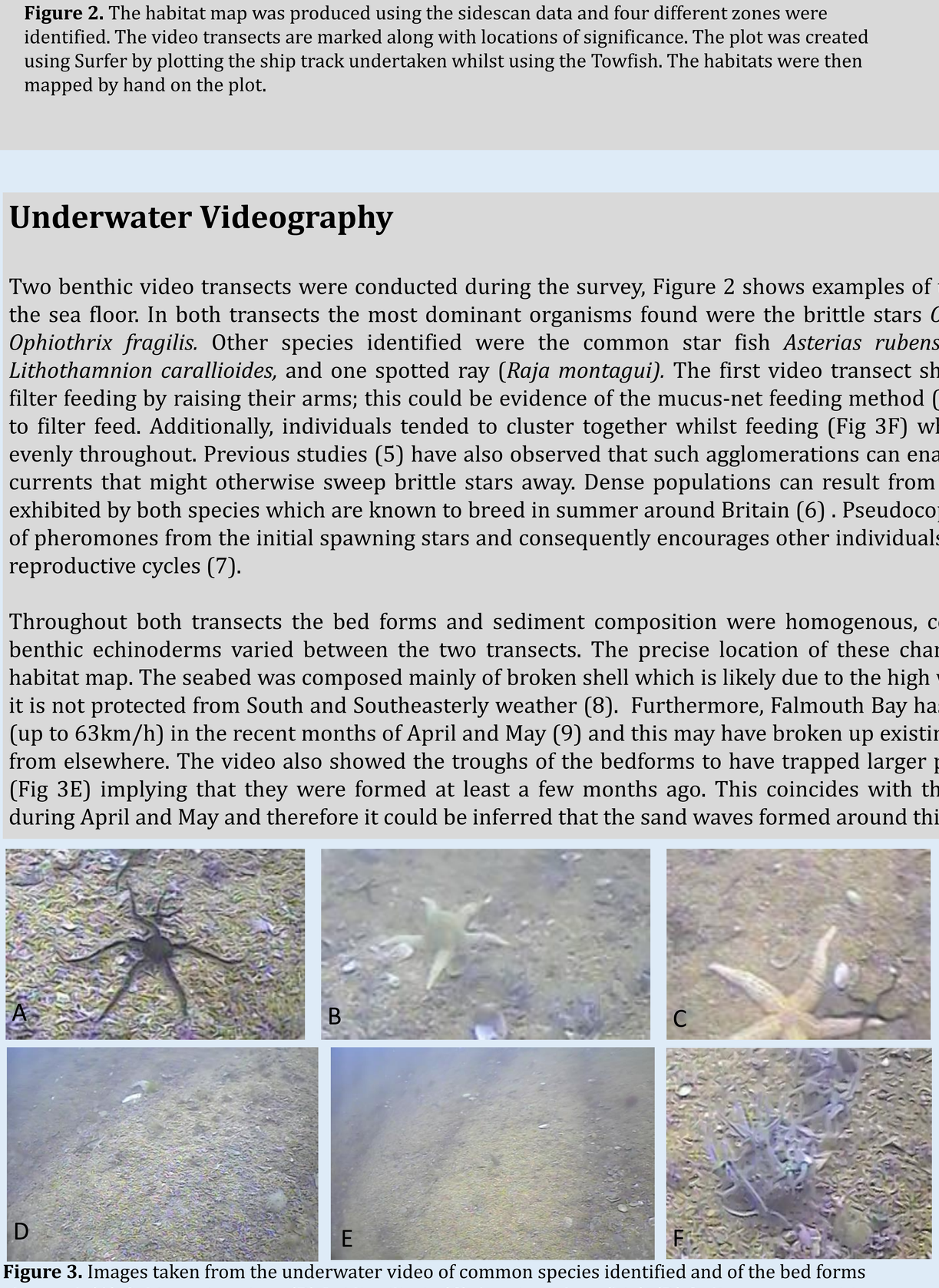

Figure 3. Images taken from the underwater video of common species identified and of the bed forms observed. (A) *Ophiocomina nigra,* (B) *Luidia ciliaris,* (C) *Asterias rubens,*(big), (D) Sediment composition, consisting of broken shell and gravel, (E) Large sand wave bed forms, (F) *Ophiothrix fragilis* filter feeding agglomerations

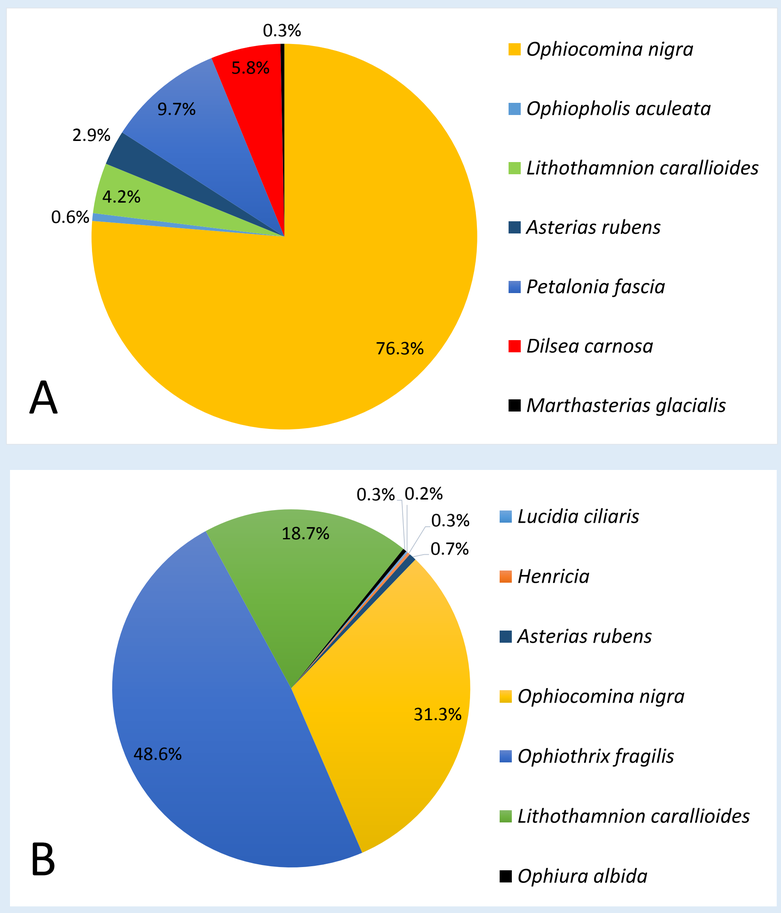

Figure 2. Abundance of different benthic species identified from the underwater video. (A) **Start:** 181295.8 m E, 30923.9 m N **End:** 181378.8 m E, 30848.5 m N (B) **Start:** 181855.5 m E, 31244.5 m N **End:** 181943.1 m E, 31101.2 m N.

References

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