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THE PROJECT

The Save our Seagrass (SOS) project is led by Wild Planet Trust. This report describes the seagrass assessments that took place at Fishcombe Cove, Brixham and Beacon Cove, Torquay.

Summary

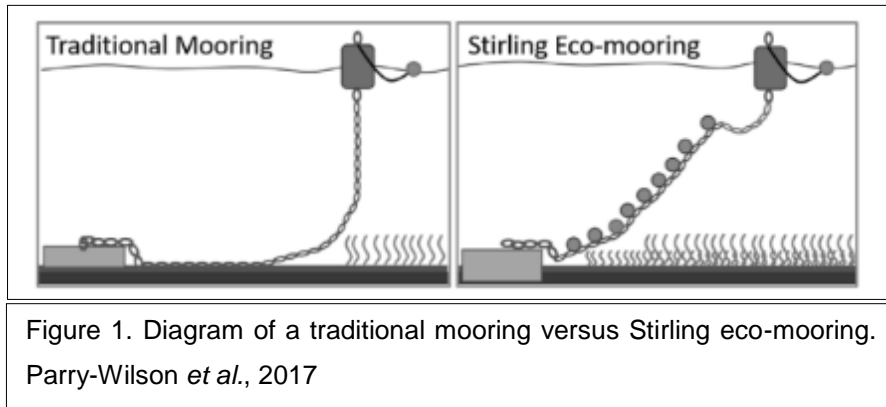
The Advanced Mooring System installed at Fishcombe continues to be very effective at reducing anchoring and its associated threats to seagrass. Fishcombe is an extremely busy cove with a lot of recreational activity and this is likely why we see denser seagrass in Beacon Cove, as well as differences in localised exposure to certain weather conditions. However, our data is starting to show recovery around the moorings and expansion of the seagrass meadow at Fishcombe. The generous support of our funders over the last few years has allowed us to connect and engage with our local diving community, collecting data to inform conservation efforts moving forward. We are eagerly planning the next phase of the project which will also focus on local engagement with the wider community of Torbay to empower them to protect this amazing habitat.

Sites

Fishcombe Cove sits just North of Brixham Harbour and is one of the most sheltered bays in Torquay. This feature, along with the presence of local facilities and easy access to the town, means it has great appeal to boat users to spend a few hours or even stay overnight. Data from previous studies completed by Wild Planet Trust showed that many recreational boats were anchoring in or very close to the seagrass bed. Anchoring in a bed of seagrass has been observed to do sufficient damage to the rhizome mat, resulting in reduced density with a recovery period estimated at 10+ years. In 2017, a trial mooring was installed, which was regularly used, however it alone was incapable of halting the large number of anchoring in the Cove. This mooring was removed when Wild Planet Trust installed 3 Advanced Mooring Systems (AMS) with funding provided for three years.

Beacon Cove is situated East of Torquay Marina, below the previous Wild Planet Trust site "Living Coasts". Beacon is a small site that has been dredged historically, before the Marine Conservation Zone was designated. The dives here are instrumental in monitoring a seagrass bed that does not have moorings, therefore is subject to multiple anchoring activities per day. Beacon is subject to a variety of different environmental conditions when compared to Fishcombe, however with an abundance of data spanning several years this can be used as a comparison for seagrass bed health.

Alongside seabed data from Fishcombe, Wild Planet Trust have also collected data on mooring and anchoring behaviour before and after the eco-moorings were installed. The results of which will be analysed to ascertain a correlation between anchoring frequency and seabed health.



The AMS that were installed on the 14th October 2021 are Stirling Eco-Moorings, developed by the Ocean Conservation Trust (Figure 1.). These work by attaching a series of floats to the mooring chain to lift them off the seabed, therefore reducing drag. The presence of three moorings spaced evenly within the relatively small cove will hopefully reduce the number of anchoring occurrences.

Aims of this study include:

- Assess the popularity and use of 3 eco-moorings installed in Fishcombe Cove.
- Assess the overall seagrass bed health within both Fishcombe Cove and Beacon Cove.
- Compare two-year data for Fishcombe Cove to assess whether the seabed is recovering in relation to a change in anchoring behaviour.

METHODS

Seagrass health

Survey location

The drop-off points for divers were selected using QGIS, based on seagrass extent data provided by surveys conducted by SOS (2019, 2020, 2021), Community Seagrass Initiative (CSI, 2016) and Devon and Severn IFCA (2014, 2016, 2017) represented as polygons (Figure 2.). Within Fishcombe, detailed mapping of the seagrass bed by SOS divers (2019/20) determined the location of the three eco-moorings, which provided a useful permanent reference on the seabed. This was supplemented with 4 points determined to be equally spaced between the moorings, allowing us access to most of the cove. The 6 sampling points in Beacon Cove were determined in the same way.

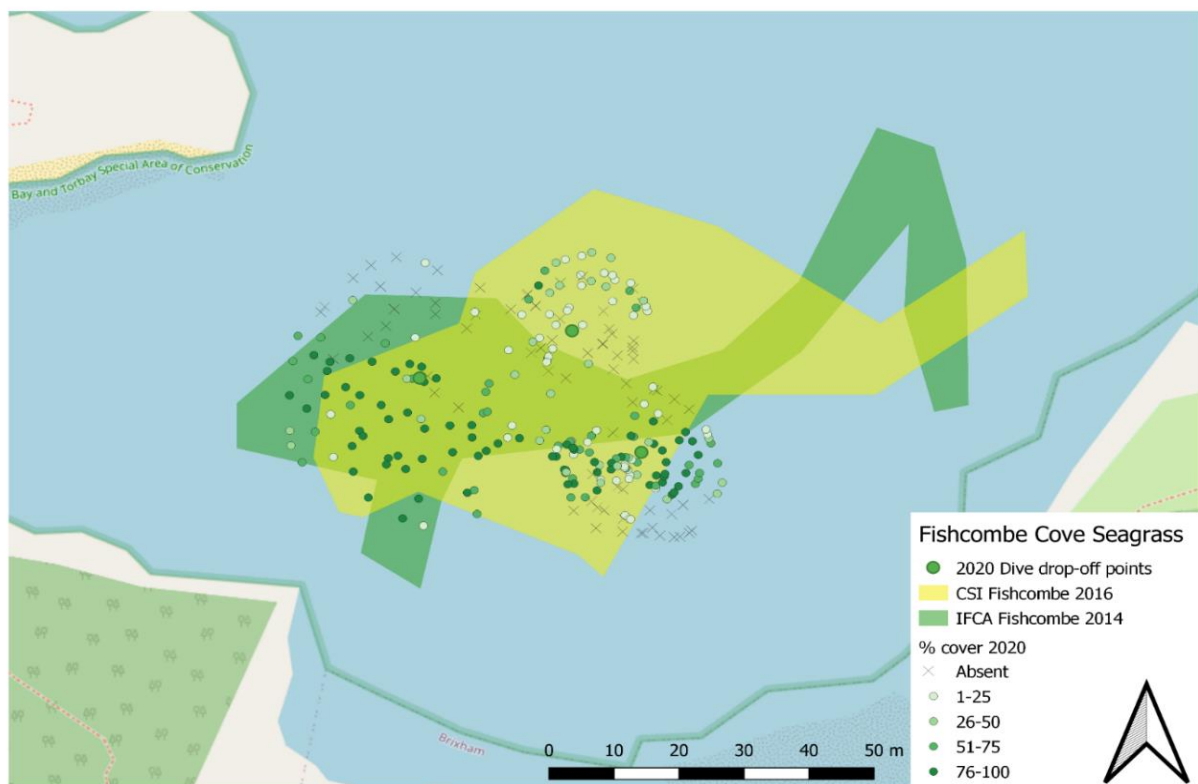


Figure 2. A collection of polygons showing seagrass presence contributing to the survey drop off points for 2022. (IFCA 2014; SOS 2019, 2020).

Survey method

Over the course of 2022 we carried out 14 dives across the two sites, with the help of 12 volunteers. We also visited St. Mary's Bay on a recce dive, where unfortunately we were unable to find presence of a seagrass bed.

The photographs were georeferenced and mapped prior to being merged with our dataset recording shoot density, leaf length, rhizome damage, presence of flowers/seeds and sediment type/depth.

Mooring evaluation

Survey location

Fishcombe Cove Café sits on the beach within Fishcombe Cove and has views of the cove (excluding the smaller Churston Cove to the East). This includes the points in the cove where the 3 eco-moorings were installed. With permission from the café owner, Wild Planet Trust constructed a box to house a camera trap to collect images at 15-minute intervals during daylight hours.

Survey method

Data was collected over a course of 191 days between 01/09/2021 – 24/11/2021, 28/04/2022 – 07/06/2022 and 19/07/2022 – 21/09/2022. Over this time, a total of 9,485 legible photos were taken (excluding illegible photographs). Photos were classed as illegible if the moorings were out of focus, usually due to poor light levels or unfavourable weather conditions. The camera was timed to run between 4am and 10pm, resulting in approximately 73 photographs taken per day. Between 14th October 2021 and 24th November, Mooring 1 was out of site, Mooring 2, Mooring 3 and the Old Mooring were in clear sight. From the 28th of April onwards all 3 remaining moorings were in view of the camera.

Data was collected to note whether boats moored, anchored, or passed through the cove – if the boat was seen in the same position on two consecutive images (i.e., 30 minutes) it was assumed to have moored/anchored. The data were categorised on their location – either moored on M1, M2, M3 or Old Mooring or anchored outside the yellow line (Outer - deep water) or inside the yellow line (Inner - shallow water). The line between the deeper and shallower water was determined by previous presence of seagrass bed (calculated via previous efforts by volunteer divers to map the seagrass) and its associated depth. This differentiation between “outer” and “inner” reflects loosely on whether anchoring in this area will have associated effects on the seabed, not the definite presence of seagrass. It was also reported for each anchored (inner) boat whether there was a mooring free at the time of arrival, showing that they had the option to moor instead of dropping anchor. N.B. this data was not collected between 14/10/21 – 24/11/21 as M1 was out of site during this period.

If the same vessel was seen leaving then re-anchoring/mooring it was re-counted, if the same vessel was noted on two consecutive days (i.e., anchored/moored overnight) then it was

recounted. Care was taken to not count the same vessel twice, however due to the quality of the photos this cannot be guaranteed, and therefore brings a level of inaccuracy to our data.

Data analysis

All statistical analysis for this project were run in R. This included Welch's t-test's to identify differences in anchoring pressures before and after the moorings were installed as well as differences between anchoring in shallow water versus deeper water (before and after mooring installation). A one-way ANOVA was used to distinguish whether there was any mooring preferences within the cove and a two-way ANOVA was used to investigate the pressure from other boat users.

RESULTS AND DISCUSSION

Seagrass Health

When analysing the data collected reflecting on the seagrass health, Beacon Cove was seen to have a much denser bed, with more seagrass shoots per m² and a patch occupancy rate of 100%. This is compared to an occupancy rate of just 62% at Fishcombe, demonstrating the patchiness of this seagrass bed. The patch occupancy rate within the Fishcombe seagrass bed has increased from 39% in 2021 to 62% in 2022, showing positive signs of a recovering and expanding seagrass meadow.

At Beacon, we observed the average density of seagrass shoots significantly increasing from 2021 to 2022 at 3 locations within the cove. However, there was only one area surveyed in Fishcombe showing signs of increased shoot density (Welch's t-test, $p=0.057$). This was observed below Eco-mooring 1 (closest to Churston Cove). This result suggests that in time, with repeated surveys, the seagrass bed here will most likely increase in shoot density (in the event of no further damaging behaviours and the same level of water quality seen in 2021 and 2022).

The increase in shoot density observed below Mooring 1 suggests that the presence of moorings may be promoting seagrass growth by reducing damaging behaviours, however there may be other threats affecting this bed as a whole. The information we gained from this study also suggests that eco-moorings are unnecessary at Beacon Cove, as the seagrass bed is denser and does not experience the same physical damage. However, this statement could be verified by the presence of a camera trap to record anchoring pressure.

The visual representation of seagrass density within Fishcombe Cove can be found in Figure 4.

The three moorings at Fishcombe Cove all had seagrass present within 5m of their bases, however there was a significant difference in density and leaf length. This showed that Mooring 1 (which is in the shallower, more sheltered part of Fishcombe, towards Churston Cove) has a seagrass bed which is considerably denser with longer leaves when compared to Mooring 3 (which is further out and more exposed to wind and anchoring pressure). Seeds were found on seagrass fronds at Mooring 1, FC5 and FC6, demonstrating that this seabed is actively reproducing.

Whilst diving in and around the seagrass meadows at Fishcombe Cove, our volunteers anecdotally mentioned that there was a lack of mobile species. This may be due to low seagrass density levels (Edgar and Shaw, 1995; Jackson *et al.*, 2002), however it could also be due to other factors. For example, as a very busy cove over summer, the amount of noise pollution produced by boats may have negatively impacted the reproductive capabilities of species within the cove, possibly even resulting in a general movement away from the area (Weilgart, 2018). Due to these comments, we also compared species diversity from 2021 and 2022, on the dives completed in the same month (September). Results showed that the species diversity around Mooring 1 had a significant decrease in species diversity (Paired t-test, $p < 0.001$), whereas there was no difference found at Mooring 2 (Paired t-test, $p > 0.05$).

With the increase in shoot density found at Mooring 1, a decrease in species diversity is not what was expected. This may mean other factors are affecting the mobile species, such as high noise pollution in 2022. This result must also be taken incredulously, as there was a small sample size (one dive per year) and a variation in the skill of divers carrying out the species ID dives.

Mooring evaluation

The work recording the anchoring and mooring pressure of vessels within Fishcombe Cove demonstrated a substantial decrease in anchoring within seagrass areas, with the majority of boats choosing to attach to a mooring instead. This is in line with our objectives outlined when installing the moorings and will hopefully contribute to an increase in seagrass health in the Cove. Since the moorings were installed, anchoring occurrences has fallen from 56% of visiting boats to 30%. This reduction in anchoring pressure was also reflected in the analysis of boats anchoring in shallower water compared to deeper water, with both areas experiencing significantly reduced numbers of boats dropping anchor.

No significant difference was found when comparing the use of each mooring, suggesting that all three are in an appropriate location within the cove. Interestingly, the presence of a boat on one of the eco-moorings coincided with approaching boats also using a mooring. We

cannot say for sure that this was not their original plan, however a thought should be spared to the effect of peer pressure on boat user's behaviour regarding mooring use. As demonstrated in a study done by Wester and Eklund, 2011, a large proportion of boat users gain vital information from their peers and look for acceptance within the boating community.

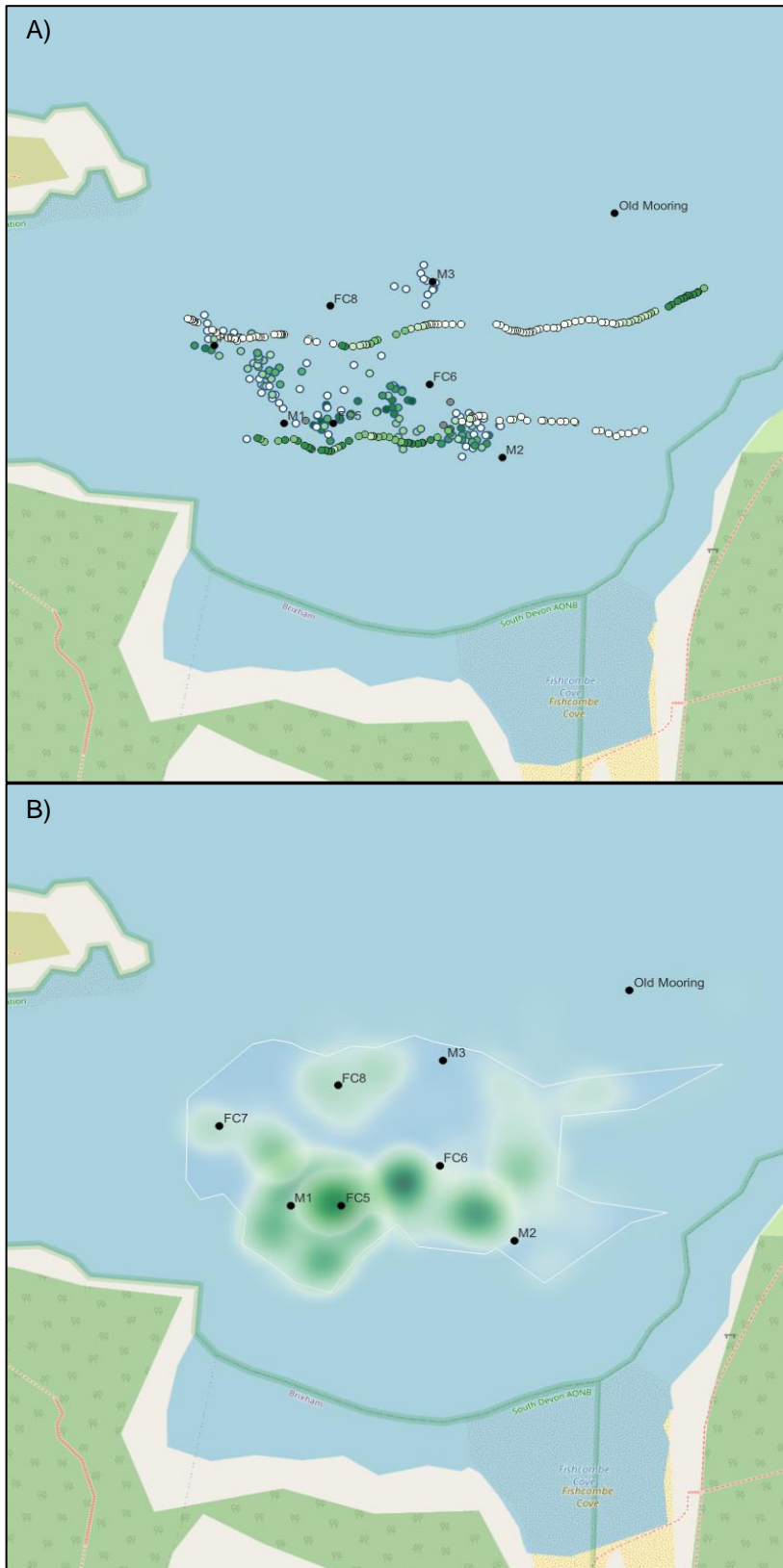


Figure 4. A) Survey data points showing seagrass density within Fishcombe Cove, from data collected in 2022. B) A heatmap showing seagrass density in Fishcombe Cove, based on data collected in 2020, 2021 and 2022. N.B. The white line shows the area surveyed.

The camera trap footage also identified a disparity between the numbers of powerboats dropping anchor compared to sailboats. This may reflect a lack of understanding or opportunities for learning for these users. This may be vital information for further advocacy work, as learning how these users communicate and gain knowledge needs to be accessed to progress further. The continued presence of vessels anchoring within the seagrass bed suggests that constant education efforts are required. In time, this will hopefully result in a behaviour change towards a more nurturing attitude when it comes to seagrass beds.

FUTURE SURVEY WORK AT FISHCOMBE

- The results of this year's monitoring efforts have outlined the importance of continuous monitoring at Fishcombe Cove, with the same methods used in 2021 and 2022, to identify any adjustment in seagrass health.
- These monitoring dives should also be supplemented with Species ID dives in order to determine a change a) throughout the year and b) over the course of 3 years.
- An advocacy programme run by Wild Planet Trust aims to identify the knowledge and perceived barriers of seagrass conservation in a holistic approach to conservation. This will involve discussions with local marine users, from swimmers to fishermen, to engage the whole community. This will hopefully give us a good platform to start a more interactive outreach programme, educating both locals and visitors to the benefits of the marine environment in Torbay.

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