The impact of potting on seagrass
Survey field report

Survey field report
(20161101_CIFCA_SAC_FAH_Potting_Impact_Survey)

Completed by: Cornwall Inshore Fisheries and Conservation Authority (CIFCA)

Authors: Annie Jenkin, Colin Trundle, Kimara Street, Ryan Mathews and Hilary Naylor

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Cornwall IFCA
Chi Gallos
Hayle Marine Renewables Business Park
North Quay
Hayle
Cornwall
TR27 4DD

Tel: 01736 336842
Email: enquiries@cornwall-ifca.gov.uk

Contents

List of Figures

List of Tables

1 Project Background

Cornwall IFCA, (CIFCA) carried out this survey with an aim to assess the impact of potting on the seagrass habitat. The reason for doing this survey is that in 2012, the Department for Environment, Food and Rural Affairs (Defra) announced a revised approach to the management of commercial fisheries in European Marine Sites (EMS). The objective of this revised approach is to ensure that all existing and potential commercial fishing activities are managed in accordance with Article 6 of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, the 'Habitats Directive'.

The revised approach to management is being implemented on an evidence based, risk-prioritised, and phased basis. Risk prioritisation is informed by applying a matrix of the generic sensitivity of the sub-features of EMS to a suite of fishing activities as a decision making tool. These sub-feature/ activity combinations have been categorised according to specific definitions, as red, amber, green or blue (high, medium, low and no risk).

Activity/feature interactions identified within the matrix as red risk have the highest priority for implementation of management measures by the end of 2013 in order to avoid the deterioration of Annex I features in line with obligations under Article 6(2) of the Habitats Directive. Activity/feature interactions identified within the matrix as amber risk require assessment to determine whether management of an activity is required to conserve site features. Activity/feature interactions identified within the matrix as green also require an assessment if there are potential in-combination effects with other plans or projects. Activity/feature combinations where there is no interaction (no risk) are identified within the matrix as blue and no assessment is required.

Assessments of existing fisheries activities are being carried out in a manner that is consistent with the provisions of Article 6(3) of the Habitats Directive and the Habitats Regulation Assessment (HRA) process. The purpose of this assessment is to ascertain whether the fishing activities stated above (potting) have an effect equivalent to a Likely Significant Effect (LSE), or an Adverse Effect on Integrity (AEOI) of, the feature/ sub-features of the EMS. The assessment will determine whether management measures are required in order to ensure that assessed fishing activity or activities will have no adverse effect on the integrity of the EMS. If measures are required, the revised approach requires these to be implemented by 2016. In this instance, the measures are delayed because of the requirement for more survey work.

As part of this process the impact of potting on seagrass needs to be assessed for both Special Areas of Conservation (SAC) within the CIFCA district; Fal and Helford SAC and the Plymouth Sound and Estuaries SAC. Due to the extent and proximity of the seagrass beds in the River Fal to the CIFCA research vessel the survey was carried out in the Fal. The subtidal seagrass within the Fal is a sub-feature of the Fal and Helford SAC.

1.1 The impact of potting

Potting is a fishing activity which often occurs where seagrass is found. This activity can lead to damage to the seagrass, which is not physically robust (D'Avack *et al*., 2015). It has been documented that potting can cause surface abrasion which damages or removes the rhizomes, leaves and stems of the seagrass plant which are above the surface and damages the roots which are only shallowly buried (D'Avack *et al*., 2015; Morgan and Chuenpagdee, 2003). This impact could result in a loss of productivity if the above-ground biomass is removed and death of the plants if the root is removed (D'Avack *et al*., 2015). The damage from potting can be caused during the setting of the pots, their associated lines, by movement during rough weather and large swells as the pots will move and not remain stationary and during the hauling process as pots are often dragged along the seabed instead of being hauled straight up (Walmsely *et al*., 2015).

The potential for damage is lower for a single pot than a string of pots as a single pot has a much smaller footprint (Morgan and Chuenpagdee, 2003). Setline traps can also cause more damage than hauling single pots, but there is a risk of considerable cumulative damage if the use of pots is intensive (D'Avack *et al*., 2015; Morgan and Chuenpagdee, 2003).

The sensitivity of seagrass to potting has been categorised as highly sensitive to high intensities (pots are categorized seagrass beds as being highly sensitive to high intensities of potting (pots lifted daily, with a density of over 5 pots per ha) and medium sensitive to lower levels (pots lifted daily, less than 4 pots per ha) (Hall *et al*., 2008). It should be noted that no direct evidence was found to confirm these estimates.

1.2 Aims and objectives

1.2.1 Aims

- To assess the impact of potting within the seagrass habitat

1.2.2 Objectives

- Collect high quality video imagery of fishing pots being hauled after having been set on the seagrass habitat to enable an assessment of the impact of the activity within this habitat.

2 Methodology

2.1 Equipment Specifications

The Fal and Helford SAC potting impact survey was completed from Cornwall IFCA's survey vessel R/V Tiger Lily VI (Figure 1). She is a South Boats 11m Island MkII catamaran with twin IVECO 450hp engines; her Callsign is MRWR7.This vessel has been refitted for survey work and includes a purpose built survey station within the wheelhouse, fitted with an uninterruptable power supply (UPS) and a dedicated GPS with NMEA outputs. All positions are recorded using the Long/Lat WGS84 projection and sourced from the dedicated survey GPS (Furuno

GP-32). All times are recorded as UTC and taken from the same source as the position data. The clocks on all of the data capture PCs were synched prior to departing.

Ground truthing was initially carried out with a Remotely Operated Vehicle (ROV). The system used was a Video Ray Pro 4. This was used to identify the densest seagrass bed to carry out the assessment. The system enables a continuous real-time video feed via a tether to the ROV control topside unit. An in-built compass and pressure sensor provided depth and heading information. The files were saved to a portable laptop for later review. The date, time, latitude, longitude, heading, depth and temperature were overlaid on to the video feed.

The system details are available online: http://www.videoray.com/homepage/new/professional-rovs/videoray-pro-4/standard-base.html

After identifying the survey location, cameras were used attached to poles which were subsequently attached to the fishing pots. The cameras used for the impact assessment were a GoPro Hero 2 and two ThiEYE Action Camera Sports HD Camcorders. The cameras were placed in dustproof, shakeproof, waterproof housing. Wooden poles were positioned at angles into the pots and the cameras were then attached to the poles. The cameras and poles were secured using cable ties.

Additional equipment included six, side eye fishing parlour pots which were attached to a backline by short ‘straps’. The pots were rigged in a manner consistent with commercially used pots. The string of pots was surface marked with a float at either end.

Figure 1: Cornwall IFCA's dedicated survey vessel, R/V Tiger Lily VI.

2.2 Personal Protective Equipment (PPE)

R/V Tiger Lily VI is MCA coded to Cat 2 and is fitted with all necessary safety equipment, including life rafts, lifejackets, first aid kits and fire suppression systems. While working on deck all crew are required to wear lifejackets, PLBs and steel toe cap boots.

There were no reported accidents or near misses on the day.

2.3 Methodology

The survey was carried out on 1st November 2016 which was chosen as a survey day due to low tide being at 11:53 which meant the survey could be carried out over slack tide to limit the effects of tidal currents on the survey equipment. The survey was carried out during the autumn when the seagrass bed is dying back naturally to limit the impact the survey would have on the habitat.

2.4 Survey site

The survey was carried out on the seagrass bed on the South side of St.Mawes harbour (Figure 2).

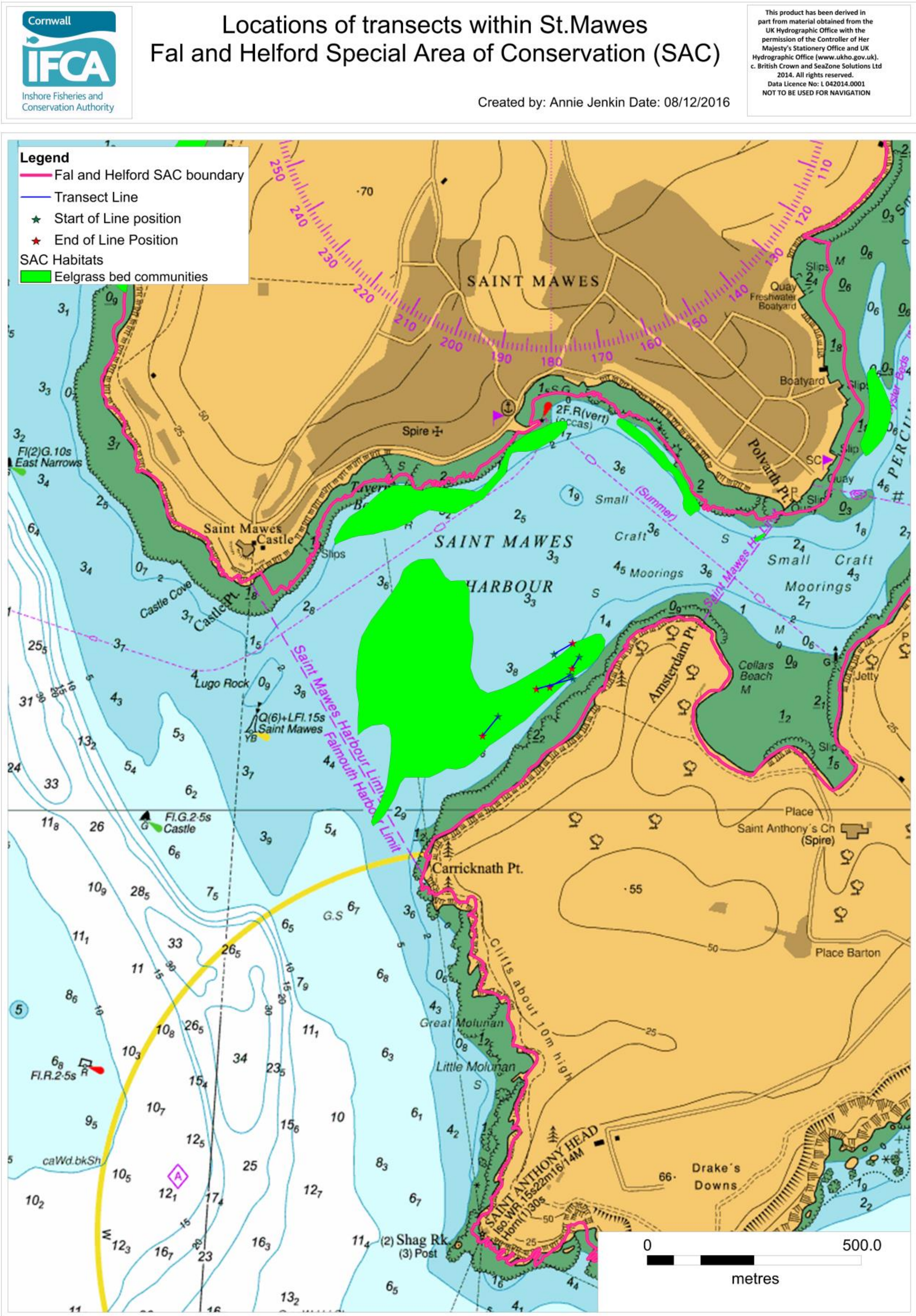


Figure 2: The location of the seagrass bed at St.Mawes Bank which was surveyed on 1st November 2016 by Cornwall IFCA.

2.5 ROV Operation and Deployment

An initial survey was carried out to ground-truth the seagrass and identify areas with the most dense seagrass to carry out the survey. The ROV was also used to see whether a straight line could be run with the ROV whilst Tiger Lily drifted with the tide. A straight line could have provided video footage from before any potting was carried, which could have been repeated afterwards to assess the impact.

The ROV was deployed within a known seagrass bed. The survey vessel's echosounder display was also used to identify patches of dense seagrass. The ROV was lowered into the water by hand over the starboard side of the vessel. During operation, the ROV was controlled solely by one person at a time, with supervision from senior members of staff. A second operator was on deck monitoring and controlling the amount of tether that was deployed with the ROV, as well as keeping an eye on the ROV ensuring that it remained on the seabed near to the starboard side of the vessel.

The ROV was recovered by hand to deck. At the end of the ROV survey the videos were copied in to a folder on the portable laptop desktop and then to an external hard drive back in the CIFCA office.

2.6 Camera Operation and Deployment

The six pots were lined up on the starboard side of the back deck of Tiger Lily and strung together in order that they would be deployed. A float was attached to either end to make it easier to recover the pots. Each camera was numbered from 1 to 3 with the ThiEye cameras labelled as cameras 1 and 3 and the GoPro labelled as camera 2. The cameras were then attached to the pots on wooden poles using cable ties to secure the cameras and the poles. A number of different methods were trailed (initially with the GoPro and then without as poor quality footage) before the optimum position was found, these included;

- Three different pots with one pole on each, two facing forwards and one facing back (Position 1)
- One pot with two poles on same pot, one facing forward and one facing back (Position 2)
- One pot with three poles on same pot, one facing forward, one facing back and once attached to a pole higher up lying parallel to the base of the pot with a camera facing much further back (Position 3)

The different camera set ups are shown in Figure 3. These were positioned at angles (as described above) to ensure the best field of view was in shot and the cameras would not be damaged as the pot was being recovered.

Figure 3: The six pots set up on the starboard side of R/V Tiger Lily VI with the survey poles and camera housing attached. The positions from left to right are position 1, position 2 and position 3 which are described above

The cameras were set up prior to each deployment, with time and date synched, the time and date stamp selected, 720P 120fps. The cameras were then placed inside their respective housing and started recording. The time was noted down in the survey log. A deck slate was used for each camera displaying the survey title, camera number, pot number (number that the pot was shot) (Figure 4), the shoot number and the time which proved a quality assurance (QA) record.

Figure 4: An example of the deck slate in use and the set up of the poles and cameras used for the survey

The pots were then deployed over the starboard side of the vessel. The waypoint (mark) was created in OLEX to indicate the start position of the string of pots on the seabed. This was also repeated on recovery to indicate the end of each transect.

Once the last float was deployed, the vessel was moved away from the string in order to prevent any entanglement from occurring. The pots were then recovered one by one in a slow and steady manner. The survey vessel was allowed to hang back on the backline to create maximum drag on the pots during hauling. As the pots were being hauled, the backline was run up and down the starboard side of the vessel between the pots and the bulwark to avoid any entanglement on deck. Images of the pots being hauled are shown in Figure 5. The pots were placed on the deck with the bridle facing the bulwark to avoid causing a trip hazard.

Figure 5: The pots being hauled using the hauler as shown and ensuring the cameras were safely recovered on each deployment

Once recovered safely to deck, the cameras were removed from their housing, the memory cards extracted and the videos were then downloaded onto a laptop. They were reviewed to check if the positions of the cameras were at the best angles after each deployment and that the video was of good quality before deploying the pots again.

2.7 Data handling

OLEX was used to record waypoints/ marks at the start and end of each shoot. These were transferred out of OLEX as a .gz file, extracted using 7-Zip (7-Zip V9.20) and converted to a .txt file using OLEX to GPSU File Converter (OLEX to GPSU File Converter V1.05). the resulting file could then be converted to .txt file using MS Notepad. When opened in Excel, the file had all irrelevant header data removed and replacement field headers applied. Once completed and reviewed, the Excel file was then transferred to the GI software where data points were created to give a visualisation of the location of each shoot.

Video files from the ROV were initially transferred to a folder on the portable laptop desktop and video files from the cameras were downloaded from their memory cards and saved in to the same survey folder. A WD passport external hard drive was then used to transfer the survey folder from the survey laptop to the G:drive in the CIFCA office.

3 Results

A total of three drift tows were completed with the ROV and five shoots completed with the camera set up. The five shoots provided 58 minutes and 41 seconds of video, and 8 minutes 26 seconds footage of pots being hauled. The locations of the transects are shown in Figure 6.

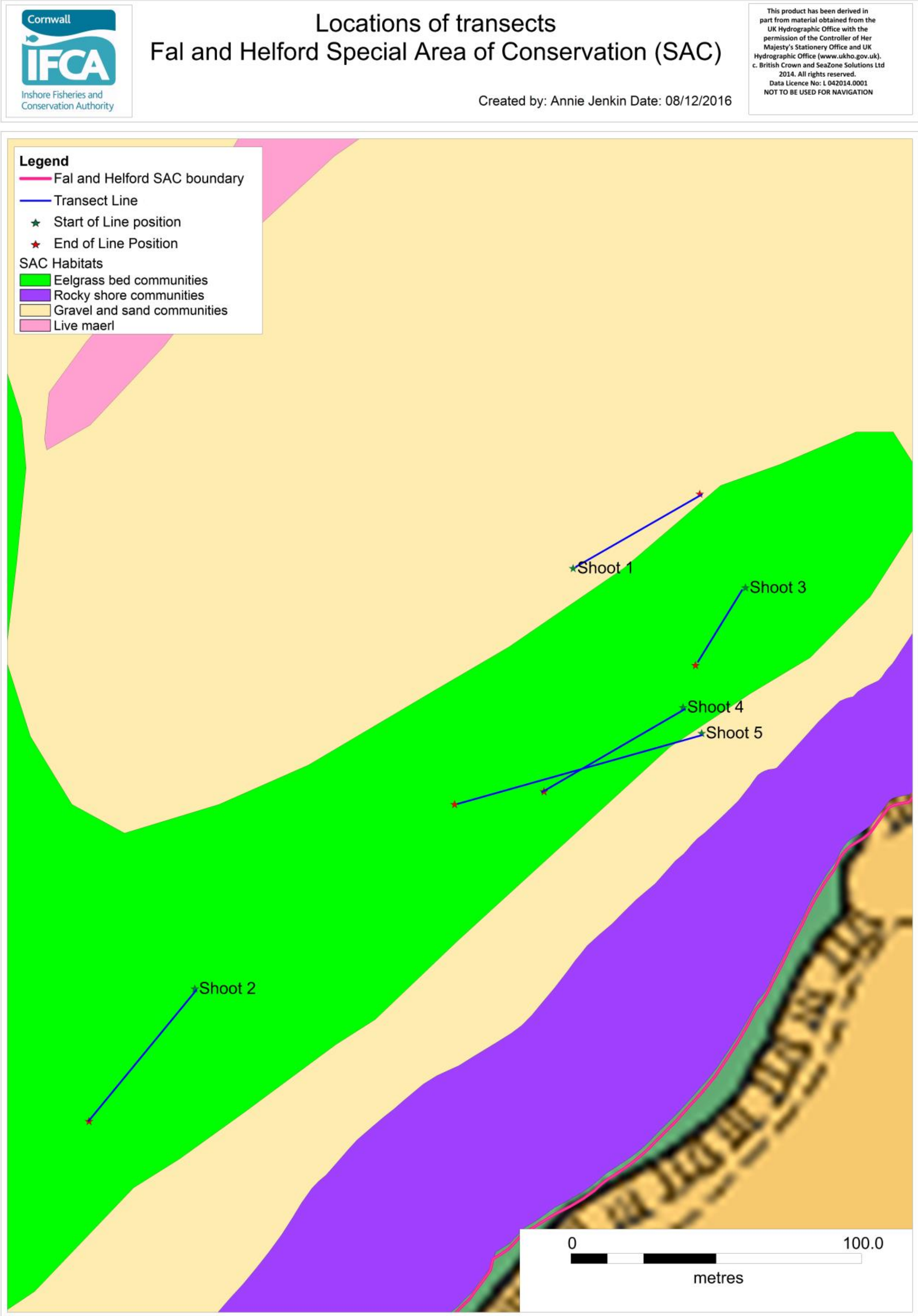


Figure 6: The location of the transects within the seagrass bed at St.Mawes Bank which was surveyed on 1st November 2016 by Cornwall IFCA.

A summary of each shoot is provided in Table 1 and the position data for each shoot is provided in Table 2.

Any issues with equipment are noted below.

Issues:

There were a few technical issues during the survey. The first was that the ROV could not be kept in a straight line. It was decided that the before and after impact study would not be accurate when using the ROV because we could not be certain if the same transect line was repeated or not. The second was that the GoPro housing was misting up and producing very hazy images. After the first transect the GoPro was not used again. The video data from one of the ThiEye cameras froze had an intermittent freeze issue on playback..

It also took a few attempts to work out what positions the cameras should be in to enable the best view and which bits of seagrass were the densest for the assessment.

Table 1: Summary of each shoot and camera information for a survey carried out on 1st November 2016

Date	Shoot number	Number of Cameras	Camera number	Camera facing	Order pot hauled	Time deployed	Time recovered	Length of time of pot in water (minutes)	Length of time being dragged (minutes)	Comments
01/11/2016	Shoot 1	3	1	Back	5th	12:00	12:07	06:36	00:11	Patchy seagrass
			2	Back	3rd			05:06	00:11	
			3	Fwd	1st			03:30	00:04	
01/11/2016	Shoot 2	2	1	Fwd	1st	12:49	12:55	03:23	00:02	Patchy seagrass
			3	Back	1st			03:23	00:02	
01/11/2016	Shoot 3	2	1	Back	2nd	13:09	13:12	03:42	00:48	Dense seagrass
			3	Fwd	2nd			03:37	00:48	
01/11/2016	Shoot 4	2	1	Fwd	3rd	13:30	13:37	05:15	01:10	Dense seagrass
			3	Back	3rd			05:15	01:10	
01/11/2016	Shoot 5	3	1	Far Back	4th	14:33	14:37	06:18	01:20	Dense seagrass
			1	Fwd	4th			06:18	01:20	
			1	Back	4th			06:18	01:20	

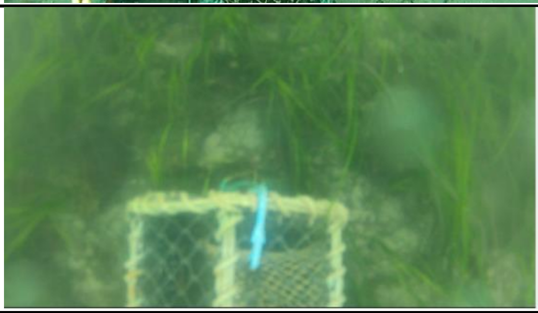
Table 2: Fal and Helford Potting Impact on Seagrass Survey start of line and end of line survey positions

Date	Shoot number	Start of Line Latitude	Start of Line Longitude	End of Line Latitude	End of Line Longitude
01/11/2016	Shoot 1	50.15325	-5.01358	50.15348	-5.01297
01/11/2016	Shoot 2	50.15195	-5.01540	50.15154	-5.01591
01/11/2016	Shoot 3	50.15319	-5.01275	50.15295	-5.01299
01/11/2016	Shoot 4	50.15282	-5.01305	50.15256	-5.01372
01/11/2016	Shoot 5	50.15274	-5.01296	50.15252	-5.01415

3.1 Representative Screenshots

The following images are representative of the habitats recorded during this survey (Table 3).

Table 3: Representative screenshots showing the pots on the seabed stationary and being hauled on the seagrass habitat.

Shoot	Camera number	Pot on seabed	Pot being hauled
Shoot 1	1		
Shoot 1	2		
Shoot 1	3		
Shoot 2	1		
Shoot 2	3		

Shoot 3	**1**		
Shoot 3	**3**		
Shoot 4	**1**		
Shoot 4	**3**		
Shoot 5	**1**		
Shoot 5	**3**		

4 Discussion

The survey which Cornwall IFCA carried out demonstrates that hauling pots which have been deployed on a segrass bed in St.Mawes harbour in Cornwall did have an impact on the seagrass beds. The underwater video data showed leaves being removed from the seabed and floating free after the pot had been dragged across the seabed as well as loose leaves caught on the pot being recovered to the surface (Figure 4).

The level of impact has not been quantified as part of this study.

Figure 4: An example of the seagrass bought back up during the survey

Damaged pots

One of the pots used during the trial had a piece of rubber skirt that was damaged and sticking out from the pot at the bridle end. Figure 5, shown below, displays the pot with the rubber skirt extending from the upper corner. Each time this pot was hauled there was more seagrass found to be attached to the pot than any of the others (Figure 5).

Figure 5: A damaged pot being recovered to deck with seagrass caught on the rubber

Variables

There are a number of variables in this study that have not been looked at in detail. These include;

- The number of pots being hauled – CIFCA are unsure if the number of pots being hauled has an impact on the amount of seagrass being removed.
- The haul speed – the hauler on Tiger Lily operates at a fairly slow speed compared to haulers on fishing boats. CIFCA are unsure if the slower haul speed causes more seagrass to be removed as it's possible that the pots were being dragged for a longer period of time.
- The type of pot being used – some pots are heavier/lighter and this could have an impact of the amount of seagrass removed. The most likely pot to be used on a seagrass bed in the UK is a cuttlefish trap (Walmsley *et al*., 2015). It is more usual to see lightweight, cylindrical traps set to target prawns (*Paleamon serratus*) being used within the Fal.
- The time of year – this study was carried out during the autumn when the seagrass was naturally dying back. The seagrass might be more easily removed as the plants naturally lose their leaves at this time of year possibly making them more susceptible to damage and so the study might show that potting has more of an impact during the Autumn/Winter than during the Spring/Summer months. It was noted that the majority of seagrass brought to the surface on the pots was brown or black.

Sensitivity assessment

The report 'Evidence for Management of Potting Impacts on Designated Features' found that there is currently no evidence available for maerl or seagrass and that both sub-features have a high sensitivity to heavy potting activity, medium sensitivity to moderate levels of potting activity and low sensitivity for light and single use potting. They have suggested that ongoing research may provide evidence and further research or monitoring is recommended where potting intensity is 'moderate to high' (Walmsley *et al*., 2015).

Sensitivity assessments have shown that when pots are continuously set and hauled they can cause damage by leaf shearing, damaging meristems (which are the areas where active cell division, and therefore, growth takes place (Marba *et al*., 2004)), uprooting plants and if left for long enough on the bottom, can cause damage by smothering and light attenuation (Roberts, *et al*., 2010). The extent of the damage by pots will depend on the number of pots set, soak time and the hauling frequency (JNCC and NE, 2011).

Seagrass beds have been assessed as having a high sensitivity to heavy levels of potting activity, medium sensitivity to moderate, and low levels of potting, and low sensitivity to single potting usage (Hall *et al*., 2008).

Other studies

There are not many previous studies which have investigated the impact of potting on designated marine features such as seagrass or maerl, therefore there are data gaps looking specifically at the impact of potting on either of these habitats (Walmsley *et al*., 2015).

One of the few studies carried out investigated the impact of lobster traps on seagrass beds in the Florida Keys National Marine Sanctuary. They found that seagrass beds can be displaced by derelict traps and long-soaking traps, they can also have an adverse effect when dragged across the bottom by adverse weather or by boats. The damage from lobster pots was primarily found to be seasonal with the greater impact between July and April (NOAA, 1996). It should be noted that the predominant type of seagrass within the Florida Keys National Marine Sanctuary is *Halophila decipens*, which is a very fragile species that is easily dislodged.

Each study carried out looking at the potting/seagrass interaction should be based on a site-specific basis.

4.1 Survey Limitations and recommendations for future surveys

The survey had a number of limitations, many of which are also recommendations for future surveys. These include;

- Light – towards the end of the day when camera work was still being carried out the light was fading which made the video footage more difficult to see.
- GoPro Camera housing – The housing on the GoPro worked much better out of the water than in it and caused the image to blur once the camera was in the water.
- Hauling speed.
- Soaking time – the pots could be left for varying periods of time
- The ROV – it was difficult to maintain a steady course using the ROV which meant a before and after impact assessment could not be carried out. Improved positioning of the vehicle by Ultra Short Base Line (USBL) equipment would enable an ROV to be better used for a before and after study.
- Quantity –the impact will vary on the number of pots being hauled. The maximum number of pots available for this survey was six. It would be beneficial to repeat the survey with an increased number of pots to see if the impact is greater.
- Size of gear – the weight of fishing pots varies greatly for the species which hare targeted and some will have more/less of an impact than others.
- Using remote video footage – each time the pot was hauled a plume of sediment was kicked up which caused limited visibility. It might be beneficial to try and record the impact of potting from a remote camera for any future surveys which could assess the survey area before and after for a longer period of time to see the impact more accurately.

- Repeat the survey at different times of year to see whether the seagrass is more resilient depending on the time of year the potting is carried out.
- To investigate the impacts further it is recommended that a number of further investigations are done, including; a survey involving more and less pots on a string, use different types of pot, leaving the pots on the seabed for longer, do a before and after impact study.
- Other impacts – there are a number of other impacts that potting has on seagrass. These include smothering which reduces photosynthesis and the movement of pots during storms and swells. These could be looked at during another survey.

A number of other possible ideas have been identified for future surveys;

- CIFCA are not currently aware of the level of potting which occurs on the seagrass beds. A more detailed study would be required to investigate the levels of potting which occur on this habitat.
- It would be recommended that once areas of high intensity potting are identified than further research and monitoring is carried out.
- The impact of anchoring has not been looked at in detail. It would be useful to carry out a comparison of the impact of repeated anchoring on a seagrass bed compared to the impact of potting. The seagrass bed surveyed during this study is subjected to a heavy amount of anchoring during the spring and summer by recreational boat users (Figure 6).

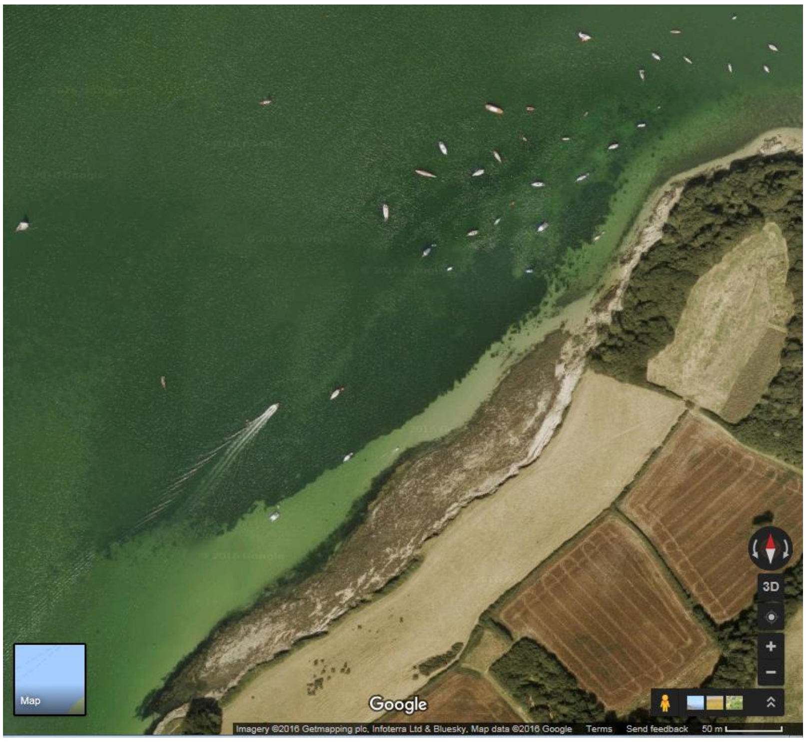


Figure 6: Recreational boat users moored on the seagrass bed in St.Mawes. Copyright: GoogleEarth

- It has been documented that traps and pots can cause a reduction in biomass and smothers algae cover (Morgan and Chuenpagdee, 2003).

4.2 Conclusion

The survey identified that the setting and hauling of pots on seagrass did have an impact. The full nature of the impact could not be assessed during this survey but it was clear that leaves were removed when the pots were being hauled. This impact was seen to be exacerbated if the pot was damaged causing part of the pot to protrude. In this survey, one of the pots had part of the rubber skirting sticking out on one of the leading corners.

Although there was an impact to the seagrass, it is felt that other factors would need to be investigated before a more definite assessment of the impact could be made. A number of limitations of the survey method have been highlighted and these will be investigated for future methodologies. The level of activity and the type of pots used were believed to be the most important factors to the level of impact to the seagrass habitat. Also, where an impact has occurred to a seagrass bed, it has been highlighted that the use of pots is not the only vector for impact and other factors such as anchoring will also have an effect. The anchoring of recreational craft on seagrass has the potential to have a deleterious impact, it would perhaps be prudent to address anchoring impacts alongside the issue of potting on the habitat.

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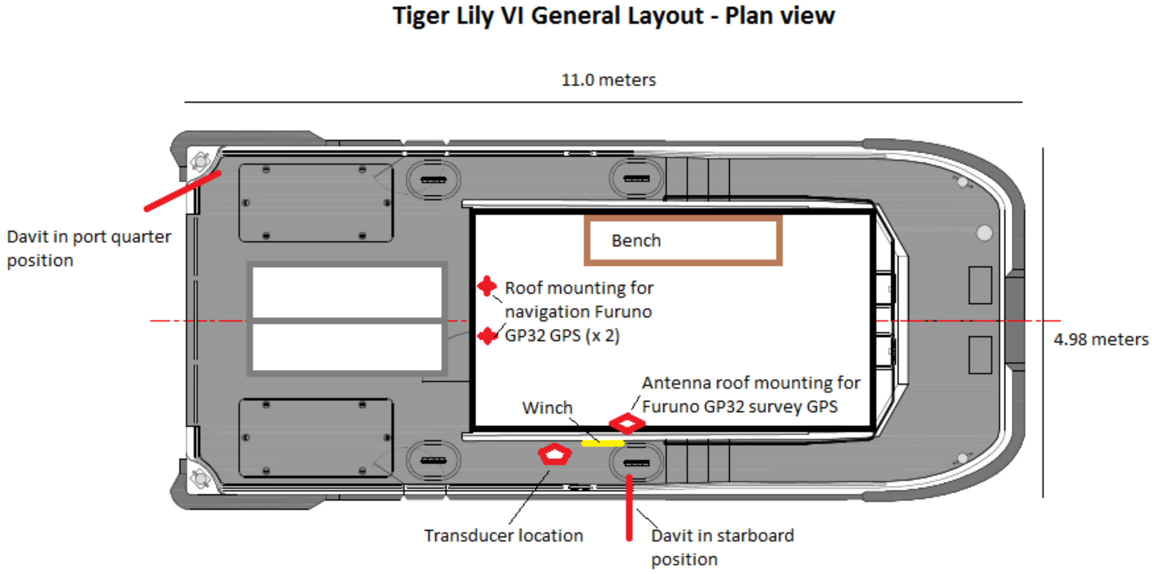
6 Appendices

Annex 1 – Daily log for 1st November 2016

Crew: Colin Trundle (SiC) - Cornwall IFCA, Kimara Street (SO) - Cornwall IFCA, Annie Jenkin (SO) - Cornwall IFCA, Ryan Mathews (SO) - Cornwall IFCA,
Skipper - Dan Matthew - Cornwall IFCA.
Guests: Steph Davies (Devon and Severn IFCA)
Vessel: R/V Tiger Lily
All times are in UTC.

Time	Activity
06:30	Crew muster aboard Tiger Lily and prepare for sea
06:45	Depart from Mylor – head to Trefusis Point
07:15	Arrive at Trefusis Point bank to recover wrasse sampling gear as part of another survey
07:32	First string of first gear recovered.
07:59	First string of wrasse gear baited, then deployed
08:54	Second string of wrasse gear recovered.
09:15	Second string of wrasse gear baited, then deployed
09:27	Finish wrasse survey and head to St.Mawes bank to start potting impact survey.
09:37	Start setting up pots and getting cameras ready and in position
10:07	ROV deployed
10:16	ROV trial run 1
10:35	ROV trail run 2
10:51	ROV trail run 3
11:07	ROV recovered to deck
11:15	Review ROV footage
11:30	Set up pots and cameras
12:03	Shoot 1 – pots deployed
12:07	Shoot 1 – pots recovered
12:49	Shoot 2 – pots deployed
12:55	Shoot 2 – pots recovered
13:09	Shoot 3 – pots deployed
13:12	Shoot 3 – pots recovered
13:30	Shoot 4 – pots deployed
13:37	Shoot 4 – pots recovered
14:33	Shoot 5 – pots deployed
14:37	Shoot 5 – pots recovered
15:15	Review footage and discuss
16:30	Recover 1st string of wrasse gear
17:00	Recover 2nd string of wrasse gear
17:30	Deploy 1st string of wrasse gear (doors open)
17:45	Deploy 2nd string of wrasse gear (doors open)
18:45	Alongside quay in Mylor to unload gear
19:15	Alongside and crew ashore

Annex 2 – RV Tiger Lily Deck Plan & Offsets



Settings

Equipment			Offset (m)		
NMEA Device	**Make/Model**	**Offset Name**	**X (Forw'd)**	**Y (Port)**	**Z (+)**
Navigation depth sounder	Furuno Navnet	Furuno transducer	5.5	0.75	-0.5
Survey GPS	Furuno GP32	Furuno mushroom antenna	4.8	1.0	