

Bait Digging in the Exe Estuary European Marine Site

Data Analysis Report



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Executive Summary

The Exe Estuary is protected under European and UK legislation, namely the Exe Estuary Special Protection Area (SPA). The SPA is designated for the estuary's overwintering bird populations, and numerous supporting habitats.

The area's popularity with sea anglers, combined with its easy to access mudflats mean that it is also an important area for bait digging. The management of bait collection activities fall under the remit of the Devon and Severn Inshore Fisheries and Conservation Authority (D&S IFCA) and so, to inform management decisions, data collection relating to bait digging was carried out.

Bait digging effort levels were monitored both within the estuary over three separate survey periods. The majority of the effort seemed to be focussed on the eastern shore, around the Imperial Recreation Ground at Exmouth.

The data reviewed in this report will be used to assess the impacts of bait digging on the features of the SPA, including intertidal sediment and intertidal seagrass. This will be done through Habitat Regulations Assessments (HRAs). However, there is some concern that bait digging activity may be occurring on seagrass beds, which are currently only protected under voluntary measures. Dependant on the outcome of the HRAs, D&S IFCA may need to consider bringing in protection for the seagrass beds through our review of Hand Working management.

1.0 Introduction

1.1 Rationale

Recreational Sea Angling is popular throughout the Exe Estuary and as a result, so is the collection of bait species. Bait digging for polychaete worms is by far the most common activity, with two main species targeted; blow lugworm *Arenicola marina* and king ragworm *Alitta virens*. Other bait collection activities which are also popular in the D&S IFCA's District, such as the collection of shore crabs using man-made shelters ("crab tiling"), also occur in this site.

Under its obligations set out in the Marine and Coastal Access Act (MaCAA 2009) D&S IFCA must 'seek to ensure that the exploitation of sea fisheries resources is carried out in a sustainable way'. In addition, much of the Exe Estuary is designated as a European Marine Site (as a Special Protection Area) and as part of the work programme following Defra's revised approach to fishing activities in European Marine Sites, data collection relating to bait collection was carried out. Although most of the bait collection in the Severn Estuary is thought to be for recreational purposes, thus placing it outside the scope of the change of approach, because it can be difficult to delineate between commercial and recreational bait collection, D&S IFCA is assessing the impacts of all bait digging, regardless of the intended purposes of the bait collection. Finally, D&S IFCA is currently in the early stages of considering the management of hand working (including bait digging, hand gathering, crab tiling etc.) and this report is intended to both inform the HRA and the development of management by D&S IFCA.

1.3 Potential Impacts of Bait Digging

Direct impacts of bait digging include the effect of the removal of worms on the abundance and population structure of the target species as well as effects on the structure of the wider benthic community. Indirect effects may relate to trampling surrounding habitats whilst accessing worm beds, or disturbance of bird feeding or roosting behaviour through increased presence on the foreshore.

2.0 Methodology

2.1 Study Site

The Exe Estuary Special Protection Area (SPA) is designated for its overwintering waterbird populations. The site extends 10 km south from Exeter to the open sea at Dawlish Warren. It comprises the waters, foreshore, low-lying land, three saltmarshes and an unusual double spit across the mouth of the estuary, and the sand dunes of Dawlish Warren. The mud- and sand-flats support seagrass *Zostera* spp. and *Enteromorpha* beds, and contain an abundance of invertebrates including extensive mussel (*Mytilus edulis*) beds, which together provide rich feeding habitats for wintering waders and wildfowl (JNCC, 2019).

2.2 Survey Design

2.2.1 2012-2013 Survey

The surveys carried out in 2012 and 2013 were randomly selected in terms of day although there was higher sampling effort on weekdays than weekends. Surveys were carried out to

co-ordinate with the Sea Angling 2012 survey methodology. Surveys were planned to fall around low tide, starting one hour before low tide and finishing one hour after low tide. There was a higher survey effort at high activity sites, these were identified during discussions with local sea angling clubs prior to the commencement of the surveys and confirmed by officer's observations during the first few months of data collection (Figure 1). Details of the weather conditions, time, tidal state, number of bait diggers present, number of holes or trenches observed, and GIS co-ordinates of the area dug were recorded for each trip. Interviews were conducted on all surveys where bait digging was observed. Interviews provided additional information on bait digging behaviour, effort and perceptions.

2.2.2 2014-2015 Survey

Surveys carried out in 2014-2015 were semi-stratified in order to attempt an even coverage of spring and neap tides, weekends and weekdays. High activity sites were again sampled more often. Surveys were planned to fall around low tide, starting two hours before low tide and finishing two hours after low tide. One site (Lympstone), which was not sampled in 2012-2013, was added to the 2014-2015 survey as one respondent to the 2012-2013 survey had suggested that bait digging may occur there.

2.2.3 2018 Survey

Following reports of bait digging occurring on the seagrass beds in the Duck Pond area of the estuary, just off the Rec Ground, D&S IFCA carried out further monitoring surveys in this area, to determine if management may be required to protect the seagrass. The area is currently covered by a voluntary code of conduct, which states that bait diggers should not dig near seagrass beds (EEMP, 2018). These surveys were also semi-stratified in order to attempt an even coverage of spring and neap tides, weekends and weekdays. Surveys were originally planned to take place one hour either side of low water. However, after a couple of surveys it became apparent that some bait diggers start work as soon as the ground is exposed by the tide and had left before the survey started (evidence by freshly dug holes). Therefore, the protocol was adapted so surveys on spring tides started three hours before low water and finished at low water, while surveys on neap tides started two hours before low water, finishing at low water.

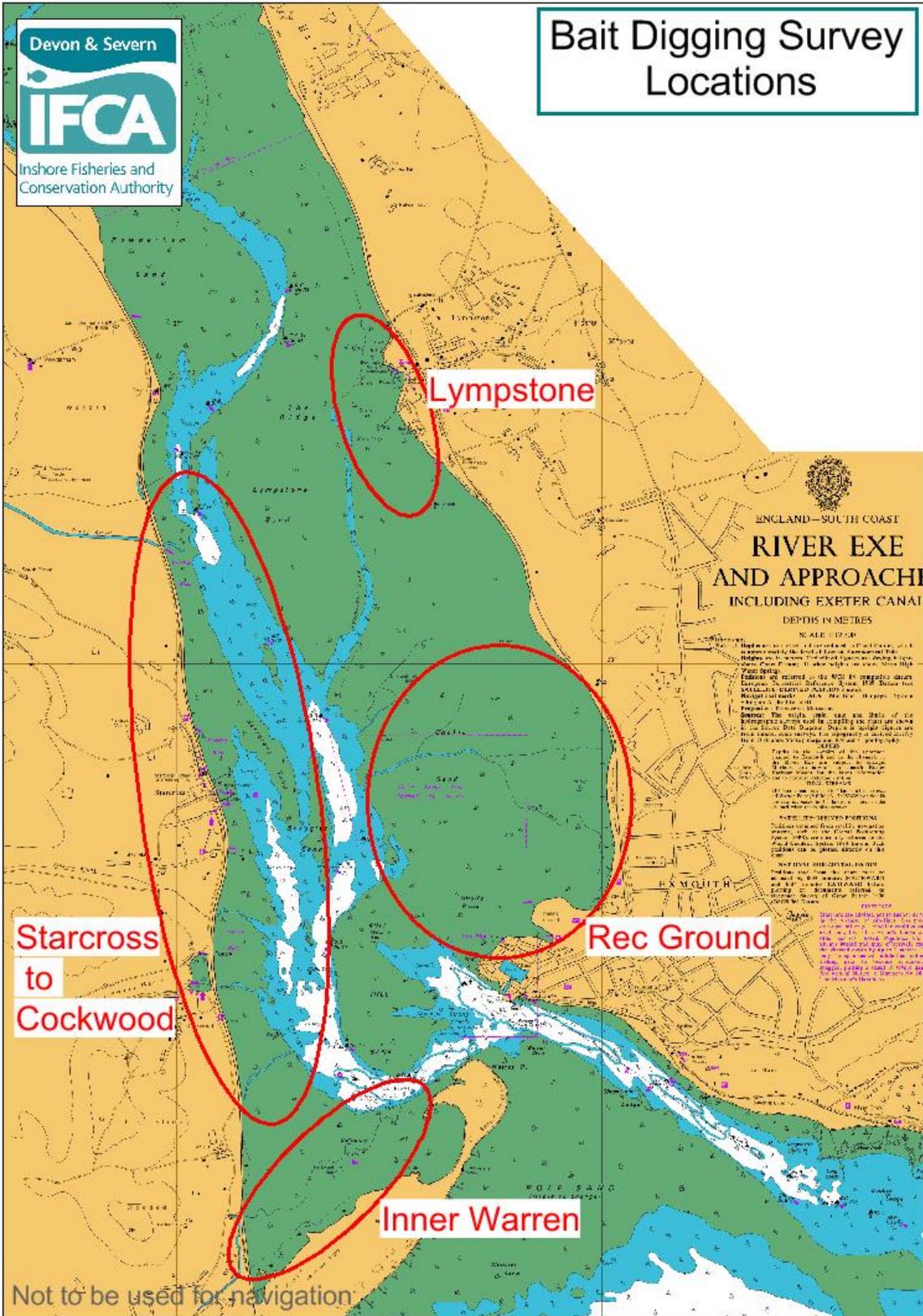


Figure 1. Survey sites

3.0 Results

3.1 Survey Effort

In 2012-2013 a total of 10 surveys were carried out on the Exe Estuary, these comprised two visits to Inner Warren, five visits to Rec Ground, and 3 visits to Starcross to Cockwood. In 2014-2015 32 surveys were undertaken: one at Inner Warren; two at Lympstone; 14 at Rec Ground; 13 at Starcross to Cockwood. Only Rec Ground was re-visited in 2018, for a total of 14 visits (Figure 2).

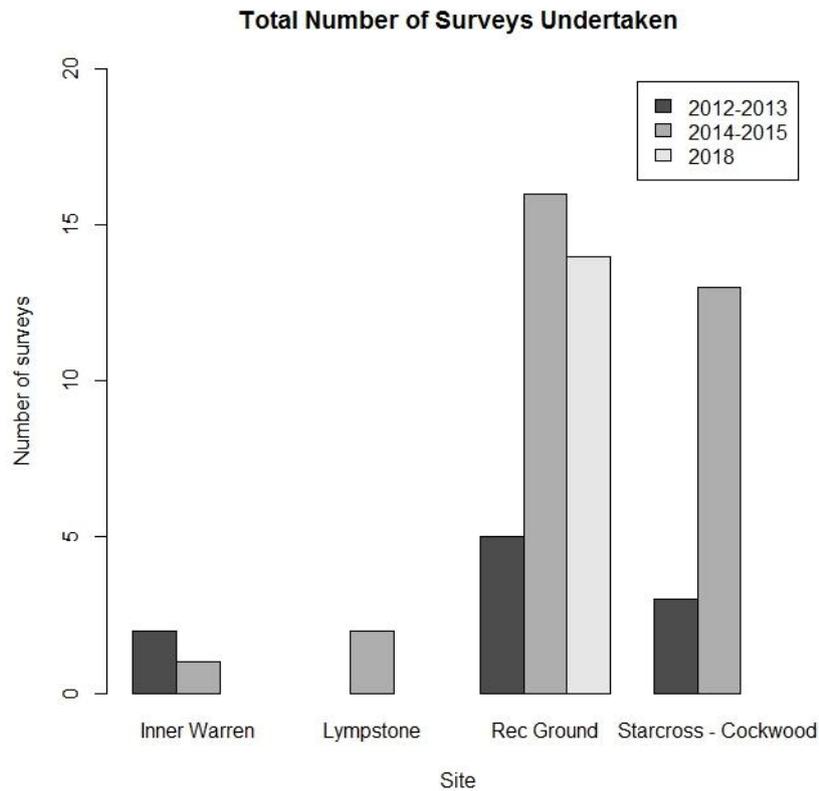


Figure 2. Total number of surveys at each site

In 2012-2013 an average of 1.53 hours was spent on each survey. Whilst in 2014-2015 an average of 2.96 hours was spent per survey, following the longer sampling period described in Section 2. In 2018 (Rec Ground only) an average of 2.37 hours was spent on each survey, again in line with the sampling protocol described previously (Figure 3).

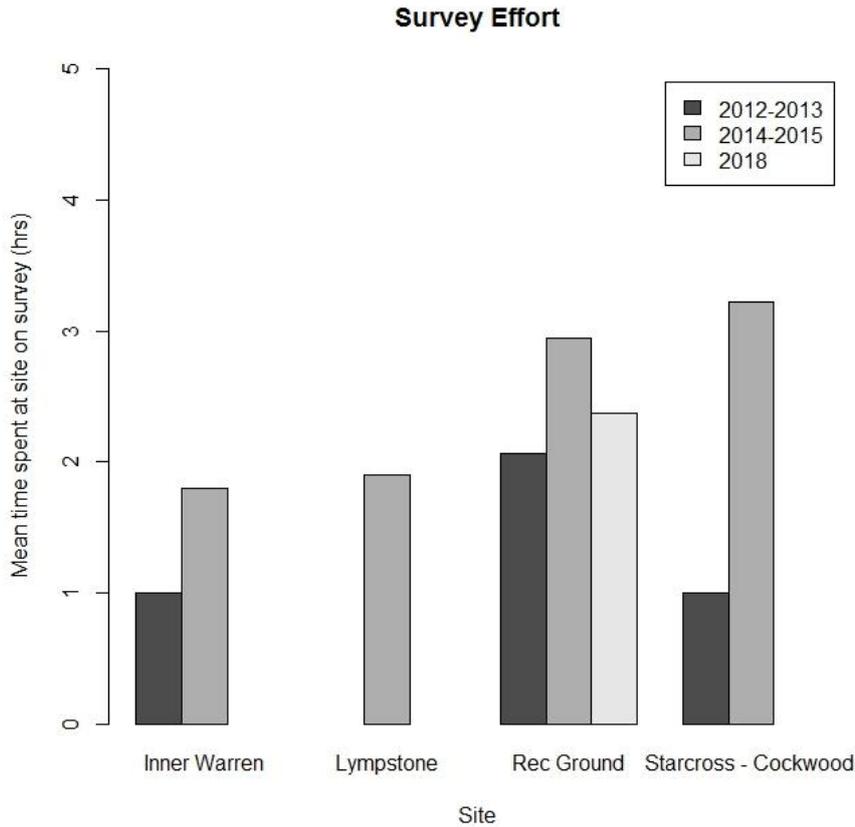


Figure 3. Mean amount of time spent on site for each survey

In 2012-2013 survey effort was almost equal between spring and summer (2.17 and 3.0 survey hours, respectively), with a peak in the autumn at 8.17 hours, and at its lowest in the winter (2.0 hours) (Figure 4). The sampling period ran from October 2012 to October 2013, so October was sampled twice which may account for the higher effort in autumn. In 2014-2015 the sampling effort increased from spring to summer, reaching its peak in autumn and winter at 30.19 and 31.45 hours, respectively. The 2014-2015 sampling period ran from January 2014 to March 2015. Surveys in 2018 were undertaken from June to Oct, meaning that summer had the highest sampling levels (23.02 hours), decreasing in autumn (10.15 hours). It is worth noting that the 2012-2013 surveys were conducted in a more ad-hoc manner, to tie in with Angling 2012 surveys, than those of subsequent years and therefore the survey effort was much lower.

Figure 5 shows that survey effort was lowest at Inner Warren and Lympstone as it is not believed much, if any, bait digging occurs at these sites. Survey effort at the Rec Ground was lowest in the spring (5.15 hours), at its highest in summer and autumn (31.74 and 31.13 hours, respectively), dropping slightly again in the winter to 22.6 hours. The peak in summer and autumn will largely be explained by the additional surveys in 2018, which took place from June to October. Survey effort at Starcross to Cockwood was lowest in the summer (6.63 hours) and highest in the autumn (18.10 hours), which may be accounted for by the double sampling of October in 2012-2013 as described above.

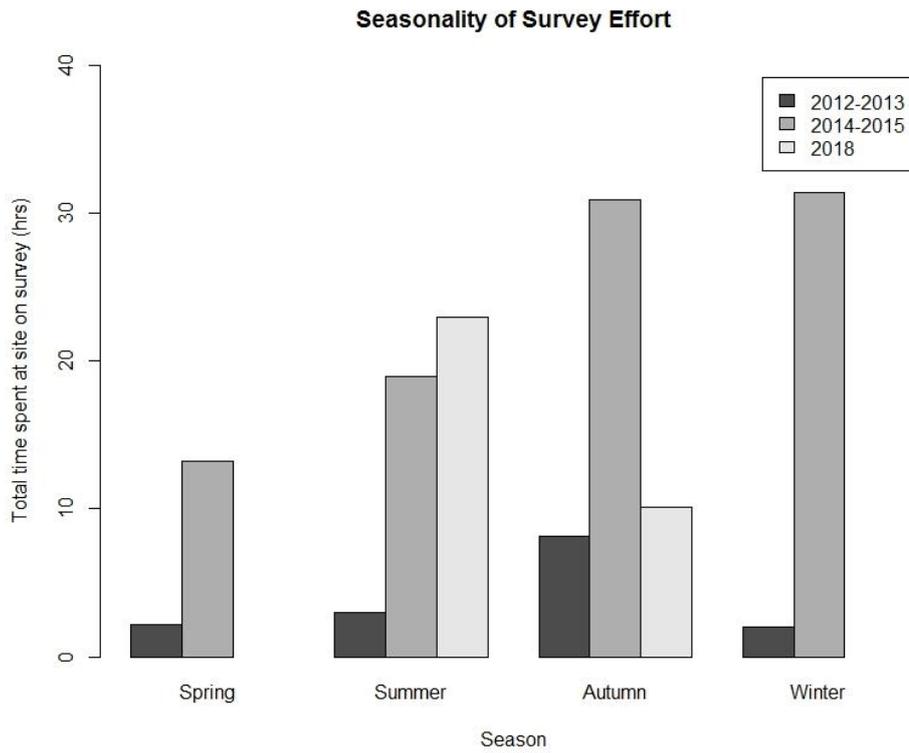


Figure 4. Total time spent on survey, per year

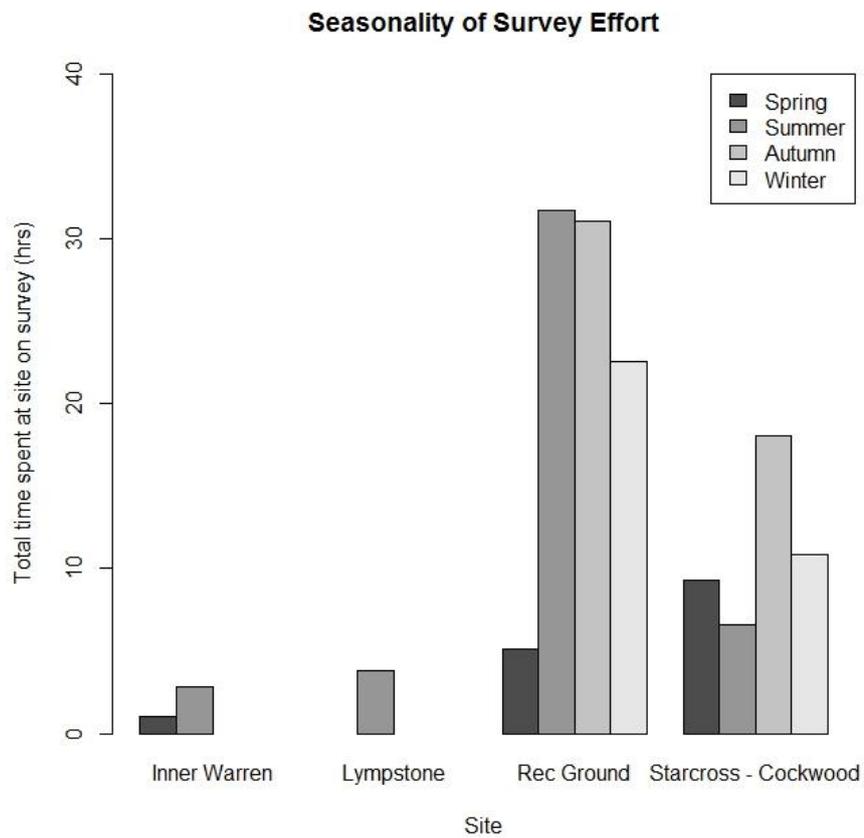


Figure 5. Total time spent on each site, per season

The area surveyed at Starcross to Cockwood covered approximately 57 hectares, while the Rec Ground survey area was 132.5 hectares (Figure 6). The Inner Warren survey area covered 37.41 hectares (Figure 7), and the survey area at Lymptstone extended over 38.84 hectares (Figure 8).

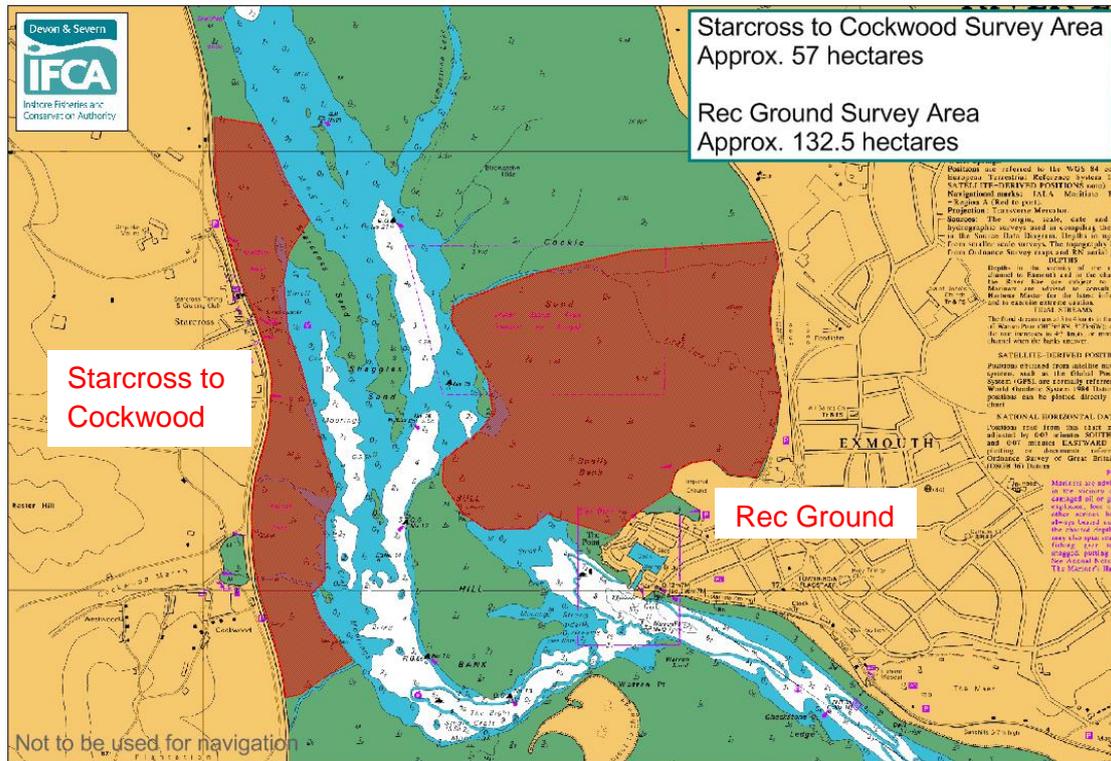


Figure 6. Area covered by survey effort at Starcross to Cockwood and Rec Ground sites.

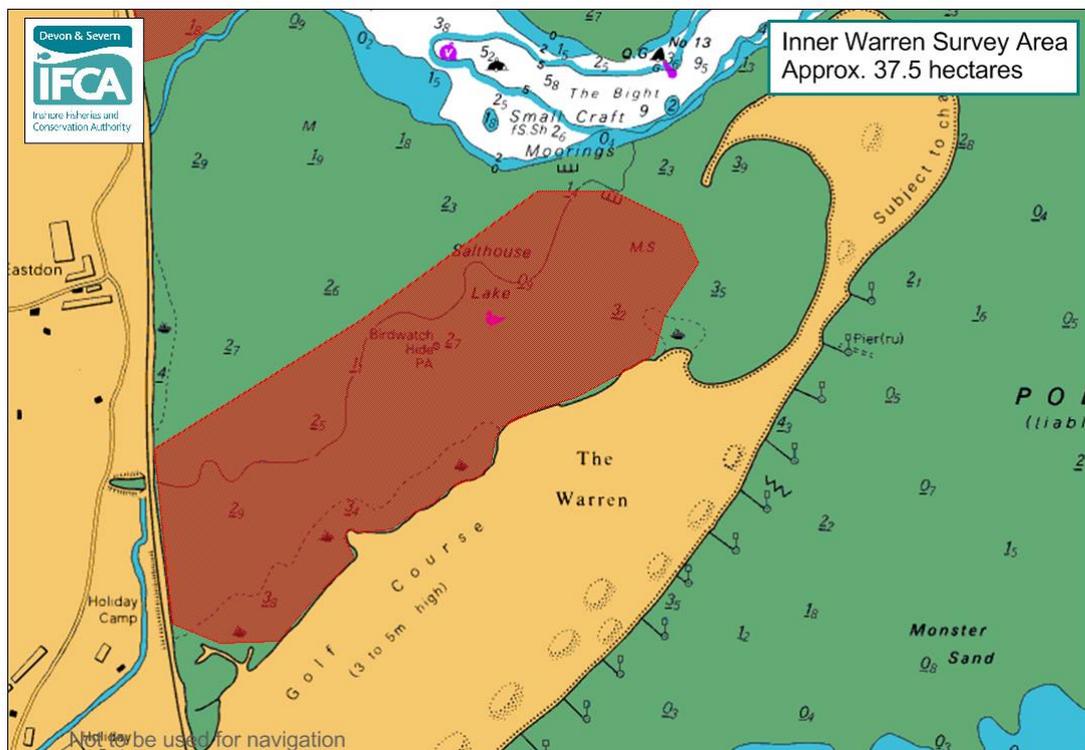


Figure 7. Area covered by survey effort at Inner Warren

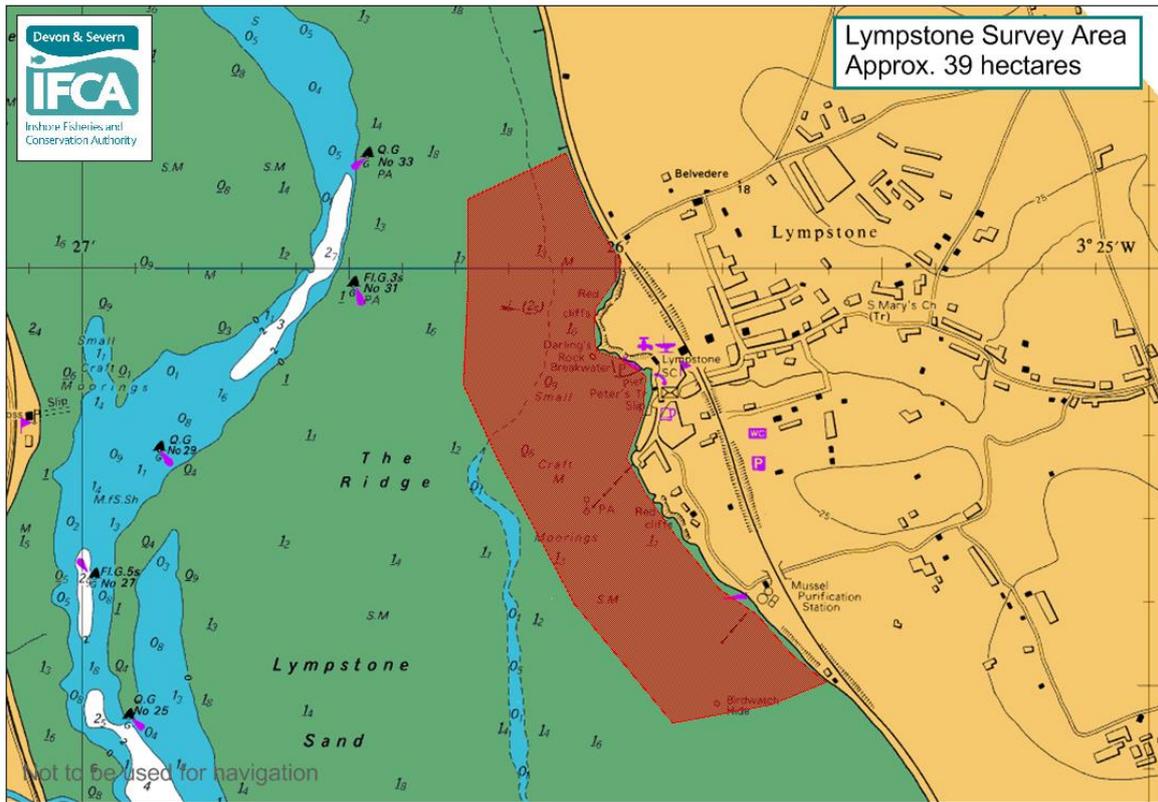


Figure 8. Area covered by survey effort at Lympstone

3.2 Bait Digging Effort, Location and Seasonality

In 2013-2014 the mean number of bait diggers seen per hour at Rec Ground was 0.34, whilst it was 0.16 at Starcross to Cockwood. No bait diggers were seen at Inner Warren. In 2014-2015 the mean number of bait diggers per hour seen at Rec Ground rose to 0.85, but at Starcross to Cockwood it declined slightly to 0.13. No bait diggers were seen at Inner Warren or Lympstone. The bait digging effort at Rec Ground in 2018 was more in line with that seen in 2013-2013, at an average of 0.3 diggers per hour (Figure 9).

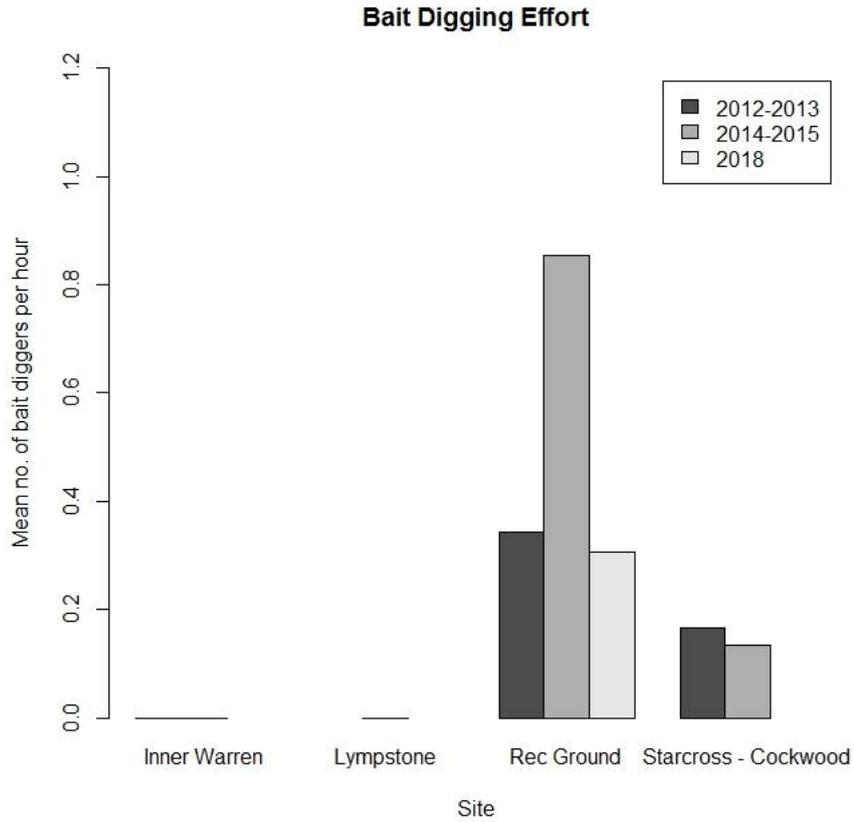


Figure 9. Mean number of bait diggers seen per hour

Diggers were seen on four out the ten surveys in 2012-2013: on three out of the five visits to Rec Ground; one out of three visits to Starcross to Cockwood; and none were seen on the two visits to Inner Warren. In 2014-2015 32 surveys were undertaken and bait diggers were seen on 10 of them; on five occasions each at both Rec Ground and Starcross to Cockwood, out of 16 and 13 visits respectively. None were seen on the single visit to Inner Warren or the two visits to Lympstone. The maximum number of bait diggers seen on a single visit was five, at Rec Ground in 2018 (Figure 10). At both Rec Ground and Starcross to Cockwood the maximum number of bait diggers seen increased between 2012-2013 and 2014-2015, increasing again at Rec Ground in 2018.

Maximum Number of Bait Diggers

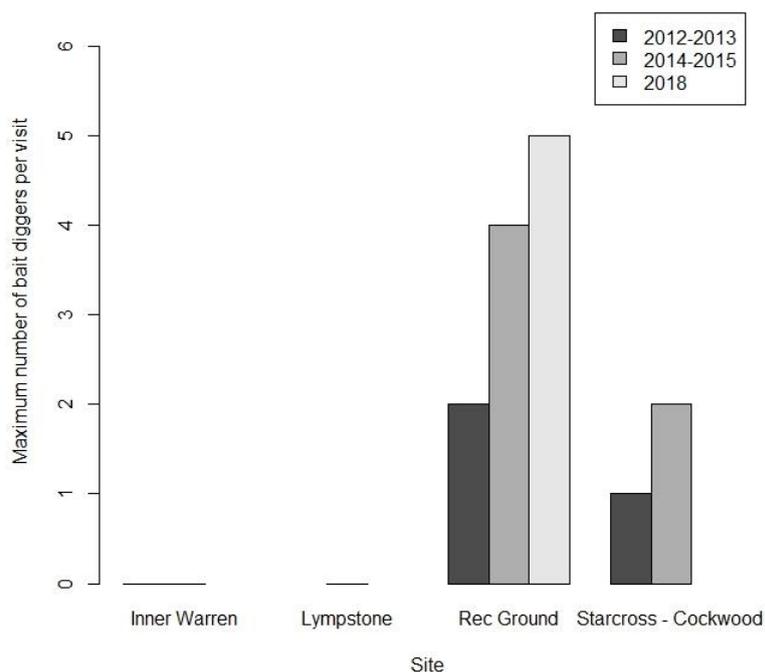


Figure 10. Maximum number of bait diggers seen at each site

In 2012-2013 the bait digging effort (mean number of diggers seen per hour) increased from autumn (0.4) to winter (1.0). No diggers were seen in spring or summer. However, a different pattern was seen in 2014-2015 when effort increased between spring and summer, from 0.5 to 1.2, before declining in the autumn to 0.2, and further in the winter to as low as 0.02. In 2018 effort rose from 0.06 in the summer to 0.9 in the autumn (these figures relate to Rec Ground only) (Figure 11).

Seasonality of bait digging effort

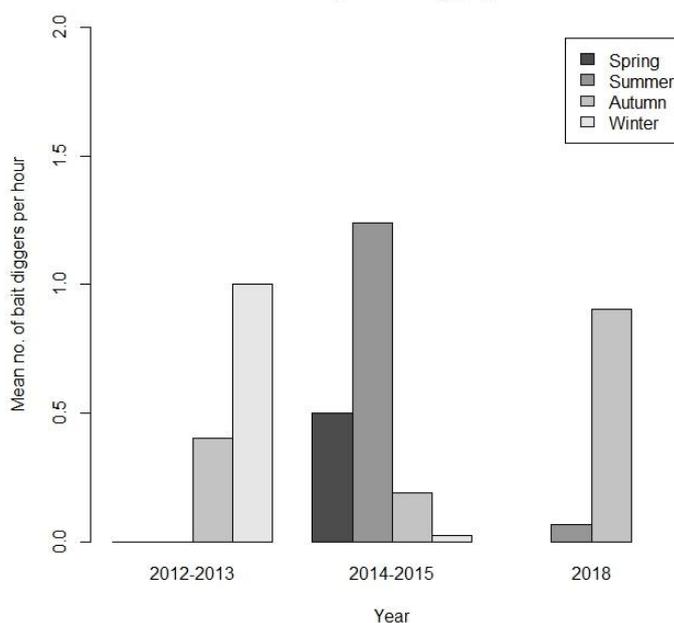


Figure 11. Mean number of bait diggers seen per hour, per season

The seasonality of bait digging effort (mean number of diggers seen per hour) appears to follow different patterns at Rec Ground and Starcross to Cockwood (Figure 12). At Rec Ground effort increases between spring and summer, dropping slightly in the autumn, before decreasing further in the winter. Whereas effort is generally much lower at Starcross to Cockwood, but relatively even across spring, summer and winter, with a peak in autumn.

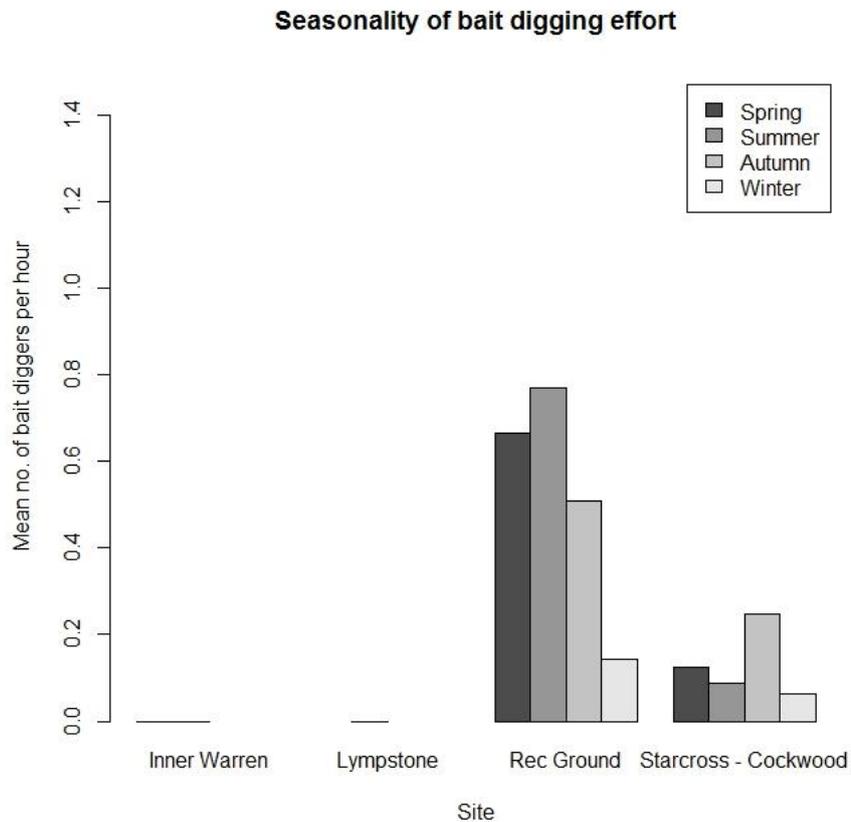


Figure 12. Seasonal effort of bait digging at each site

The majority of bait diggers seen were digging holes, with fewer digging trenches. The largest number of holes seen in one trip was 100 at Rec Ground (2018), whilst the highest number at Starcross to Cockwood was seven (2014-2015) (Figures 13 and 14). In comparison, the largest number of trenches seen in one visit was 19, also at Rec Ground in 2018, while the largest number at Starcross to Cockwood was two (2012-2013). However, this is likely to be an underrepresentation of the number of holes dug on average, due to the soft nature of the sediment making it difficult for surveyors to get close enough to accurately count the number of holes. Therefore, the number of holes or trenches dug was not always accurately recorded. Also, on occasion, bait diggers were still working beyond the end of the survey time, so the final number of holes dug would not have been recorded.

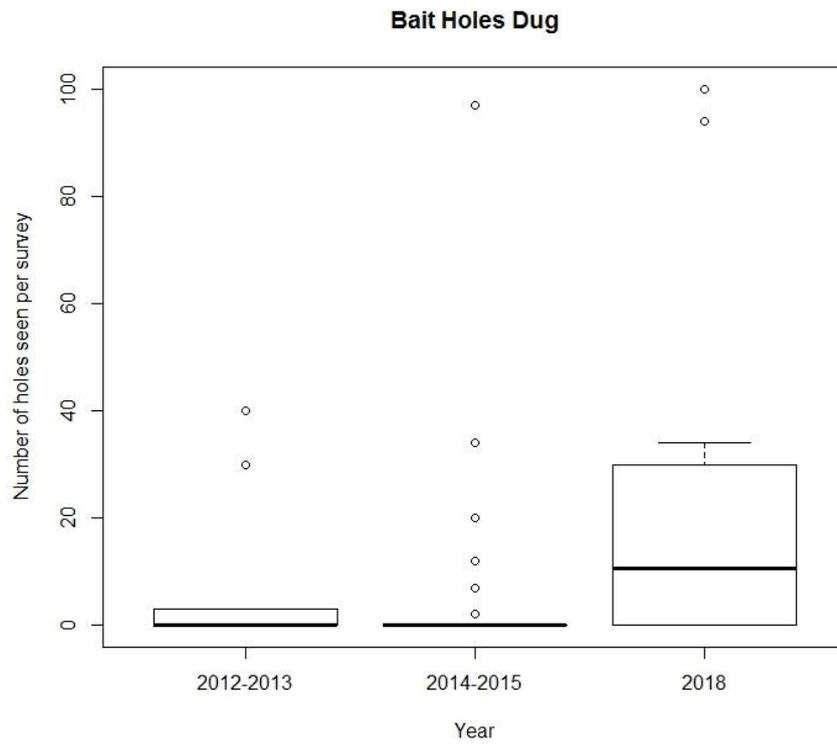


Figure 13. Number of holes dug per survey, by year

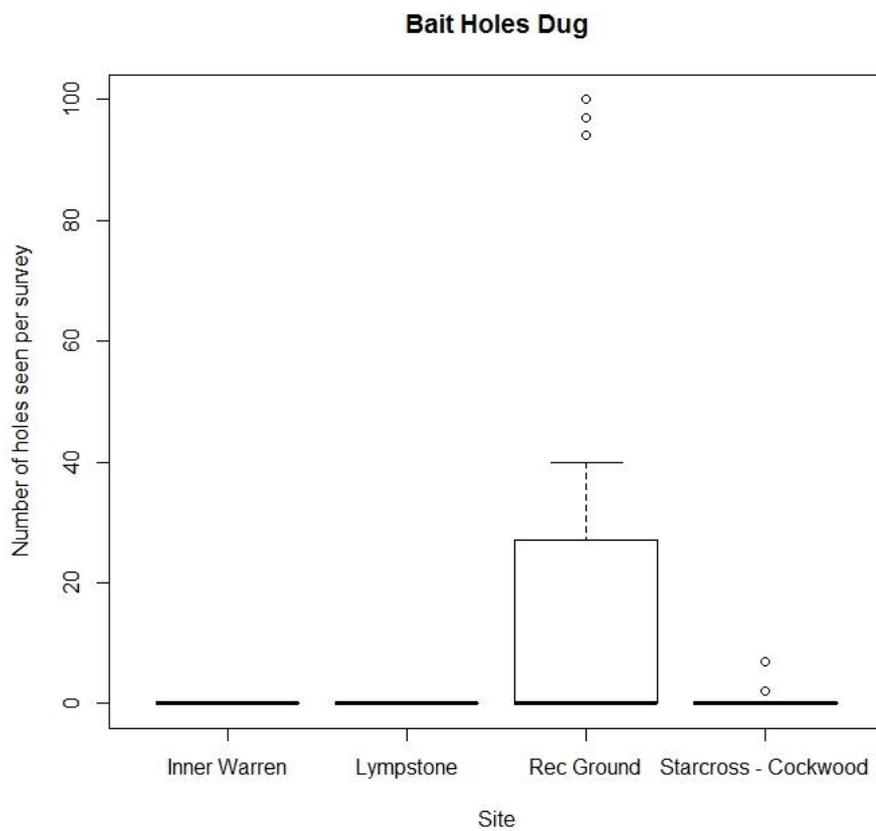


Figure 14. Number of holes dug per survey, by site

At Rec Ground where effort (in terms of number of holes seen per survey) was highest, the mean number of holes seen per survey was relatively consistent between 2012-2013 and 2014-2015, at 14.6 and 10.18 respectively. However, this increased to 23.78 in 2018. But it is worth noting that this increase in mean could be caused by a couple of visits where the number of holes seen was significantly higher than on most trips, e.g. 100 and 94 holes (Figure 15). The trip where 100 holes had been dug was also the trip where the maximum number of bait diggers (5) was seen in any survey.

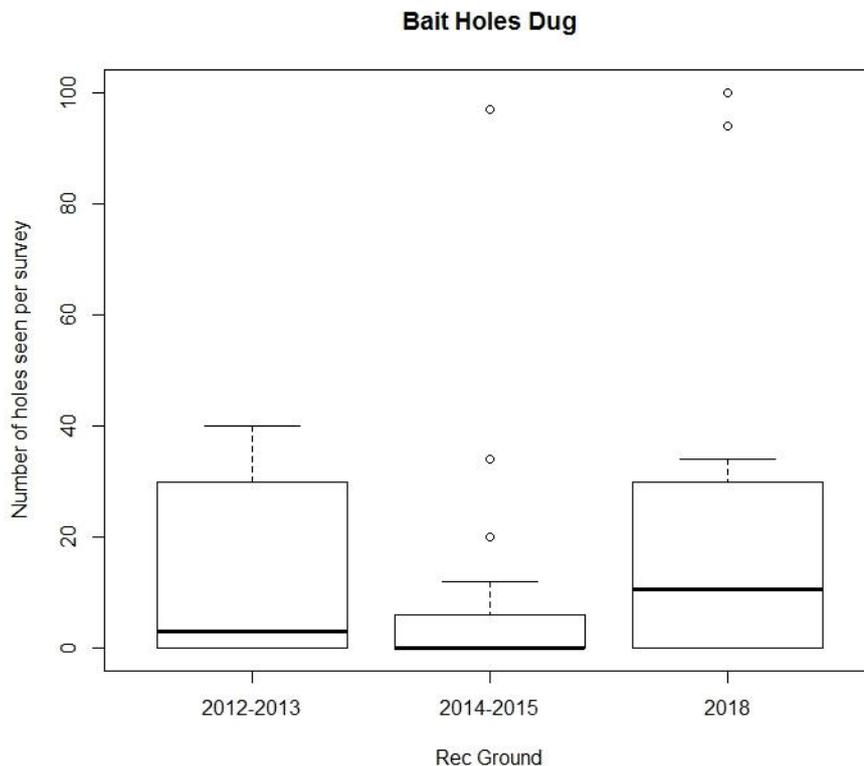


Figure 15. Number of holes dug per survey at the Rec Ground site

3.3 Bait Collection Behaviour

Of the five occasions when the target bait species could be identified on the western shore (Starcross to Cockwood), ragworm was the target species each time. However, on the eastern shore (Rec Ground) the target species was identified on nine occasions, and on seven of these lugworm was the target (ragworm was the target on the remaining two).

One interview respondent confirmed that he was digging commercially, at the Rec Ground site and he did not believe there were any other commercial diggers working locally. No other respondents were aware of any commercial digging taking place.

Sixteen interviews were completed over the course of these surveys. The responses are summarised here:

- All respondents lived locally. The maximum distance travelled was 13 miles (one way).
- 14 of the 16 respondents were digging holes, while only two dug trenches.

- The targeted amount of bait ranged from six to 120 worms, the average target amount was 43.
- All respondents agreed that the best time to dig was at low tide or on the retreating tide, with some adding no later than 1 hour after low tide.
- No respondents had noticed any long-term trends in bait availability, most reporting that it is fairly consistent digging on the Exe (one respondent had been digging on the Exe for 40 years). However, two interviewees in 2014 reported that 2013 had been a bad year for digging and it had improved in 2014. As such, no one felt there was a need to introduce management.
- Eight of the 16 respondents backfilled their holes.
- 10 of the respondents were not aware that there is voluntary Code of Conduct in place for bait collection on the Exe.

3.4 Bait Digging near Seagrass

The focus of the 2018 surveys at Rec Ground was to assess whether bait digging is occurring over the seagrass supporting habitat of the SPA.

Figure 16 shows the records of bait digging activity from the 2018 surveys in black; as point data for the location of a bait digger, as polygons encompassing an area of holes dug, and as a line representing a row of holes. The seagrass as mapped by Environment Agency, 2019, is shown in green. Whilst there does appear to be some overlap between the bait digging activity and the seagrass, none of the completed survey forms recorded any bait digging/holes found directly on seagrass. However, one form did note that the bait digger was working on sandy patches in amongst the seagrass.

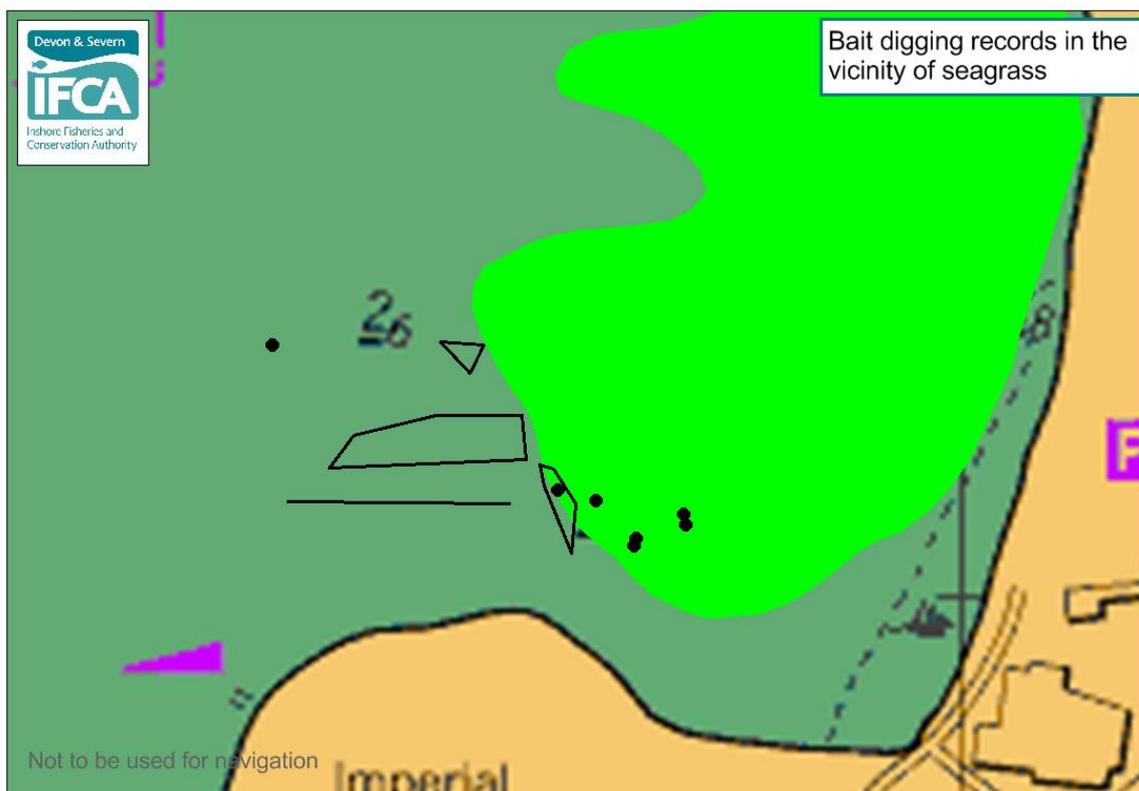


Figure 16. Records of bait digging activity in 2018 (black) near the seagrass beds, shown in green (Environment Agency, 2019)

4.0 Discussion

Ragworm was the primary target species at Starcross to Cockwood, on the western shore of the Exe, while lugworm was the main target species at Rec Ground on the eastern shore. This is likely due to the difference in sediment on the two shores. Ragworms are known to prefer more gravelly/mixed sediment, such as that found on the west bank of the Exe, while lugworms are known to prefer more sandy/muddy sediment, as is found on the east shore.

Effort, in terms of mean number of bait diggers seen per hour, at Rec Ground appeared to be relatively even in 2012-2013 and 2018, but much higher in 2014-2015. This could partly be explained by the sampling effort: in 2012-2013 five surveys were carried out at Rec Ground; in 2014-2015 16 of the surveys were at Rec Ground; and in 2018 the Rec Ground was sampled on all 14 surveys. The similar survey effort between 2014-2015 and 2018 implies that digging effort was higher in 2014-2015 than 2018. However, effort in terms of number of holes seen per survey was highest in 2018. This implies that although there were fewer bait diggers working in 2018 than 2014-2015, they were digging a larger number of holes. Whilst this may appear to be the case, the shorter survey durations in 2018 meant that on some occasions there was evidence (freshly dug holes) bait diggers had already finished working before the survey started. So whilst the holes that had been dug could be counted and mapped, the bait diggers themselves were not recorded.

Although no surveyors recorded any bait digging taking place directly on the seagrass beds, the mapped data appears to show some overlap between this activity and habitat. As with all flowering plants, the distribution of seagrass can shift temporally, and it is known to die back in the autumn/winter after its peak over the summer months. Therefore, although both sets of data were collected in 2018, it is possible that the leaves of the seagrass may have died back when the bait digging was recorded in the area, but the rhizomes and roots may still have been present under the surface of the sediment.

5.0 Conclusions and Future Work

Although there are currently voluntary measures in place to prohibit bait digging on seagrass, the mapped bait digging records appear to show some overlap with the seagrass beds. This interaction will be explored further through a Habitat Regulations Assessment (HRA) to determine if the bait digging activity could be having an adverse effect on the intertidal seagrass supporting habitat of the SPA. The results of the HRA will feed into D&S IFCA's review of management of Hand Working activities and be used to decide if further management measures are needed to protect the feature. Bait digging on other features of the SPA will also be assessed through HRAs.

6.0 References

EEMP (2018) Exe Estuary Management Partnership and South Devon Habitat Regulations Partnership. Exe Bait Collectors Code: A guide for crab collecting and bait digging on the Exe Estuary.

Environment Agency (2019) Seagrass mapping data, 2018 surveys.

JNCC (2019) Exe Estuary SPA site description.

<http://jncc.defra.gov.uk/default.aspx?page=2028>