

Bait Digging in the Severn Estuary European Marine Site

Data Analysis Report



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1.0	March 2019	Elizabeth West	
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Executive Summary

Surveys of bait digging in the Severn Estuary took place for two years during the period 2012-2013 and 2014-2015. These surveys inform the first semi-quantitative assessment of this activity in the area.

The majority of digging effort is for lugworms on the sandy beaches at Burnham on Sea, Berrow, Brean, Weston-Super-Mare and Sand Bay with more localised targeting of ragworms in some locations. Bait digging effort in the Severn Estuary is greatest in Autumn and Winter, thought to be due to the popularity of sea angling for whiting and cod at this time of year.

Bait digging effort showed mean values of between 0.2-0.8 bait diggers per hour. Median values for the number of holes observed per survey were close to zero with a maximum of 185. The maximum number of bait diggers observed ranged between 2 and 4 diggers per survey depending on the site and year. There was some inter-annual variation in angling effort, possibly relating to the strength of the cod run with effort higher in 2014-2015 than the earlier sampling period. Bait digging was spatially limited at some sites depending on access points, and the areas dug tend to be very small in relation to the size of the intertidal mudflats.

Digging primarily occurred around low tide although it was generally middle to upper shore areas which were dug due to the distance to walk out to low tide, the prevalence of muddy habitat in many areas and the danger involved in walking out on the mudflats. Some commercial activity has occurred in the past and Devon and Severn IFCA officers did observe two individuals who were thought to be digging commercially. These diggers dug considerably more often and for more lugworm compared to recreational diggers. Backfilling of holes did not take place, with most anglers citing the powerful tidal currents quickly naturally backfilling as the reason for not doing so themselves. There were no clear trends in bait diggers perceptions of the trends in lugworm populations, and most did not believe any form of management was necessary.

The findings of this report will be used to inform Habitat Regulations Assessments for the Severn Estuary Special Area of Conservation and Special Protected Area.

1.0 Introduction

1.1 Rationale

Recreational Sea Angling (RSA) is popular throughout the Severn 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 popular elsewhere in the Devon and Severn IFCA's (D&S IFCA) District such as the collection of shore crabs using man-made shelters – 'crab tiling' do not occur in the Severn Estuary.

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'. However, prior to the implementation of the MaCAA and the subsequent formation of IFCAs in 2011, no management body existed within the Severn Estuary that included a remit to monitor or manage bait digging activities. Therefore, no existing data were available to indicate the level of bait digging activity, whether the existing activity was recreational or commercial, and whether there were any conflicts or concerns in relation to bait digging and other users of the marine environment. In addition, much of the Severn Estuary is designated as a European Marine Site (EMS) (Special Area of Conservation and Special Protected Area) and Ramsar site with many smaller SSSIs and NNRs. Further impetus for data collection on bait digging in the Severn Estuary EMS was provided by Defra's Revised Approach relating to fishing activities in European Marine Sites.

1.2 European Marine Sites and Bait Digging

The Severn Estuary is the largest coastal plain estuary in the UK and one of the largest estuaries in Europe. As such, it has a number of International and European conservation designations including Special Area of Conservation (SAC), Special Protected Area (SPA) and Ramsar site covering an area of 73,715.4ha. About one third of this area is composed of intertidal habitats including intertidal mudflats and sand flats, saltmarshes, and rocky shores, which are accessible to bait collectors. Unlike many intertidal areas which are only accessible for short periods of time, the gently shelving mud and sandflats of the Severn result in large areas of intertidal habitat being accessible for long periods of time.

1.3 Effects 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.

1.4 Scope

The baseline survey has three primary aims; i) to identify the primary species targeted by bait collectors in the Severn Estuary ii) to determine the key locations for bait digging activities and iii) to highlight areas for future research and evidence gaps, particularly in relation to bait digging within the EMS

2.0 Methodology

Surveys were carried out at a number of sites within the Severn Estuary EMS which were highlighted by local angling clubs as being important (Figure 1). The sites were primarily sandy and muddy shores where lugworms, *Arenicola marina*, were the target species. A small number of sites with more mixed and rocky sediments were also sampled, which were primarily targeted for king ragworms (*Alitta virens*).

2.1 Survey Design 2012-2013

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. A number of primary sites used in this survey were then subdivided into smaller geographic units known as secondary sites. All the secondary sites within a primary site were targeted within a low tide, meaning only a limited amount of time was spent at each secondary site. Surveys were planned to fall around low tide, starting two hours before low tide and finishing two hours after low tide. All the secondary sites were sampled within the four-hour window. Where possible, even amounts of time were spent at each secondary site but this was dependent on how much time interviewing and mapping of activity took at each site. 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. 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 Survey Design 2014-2015

Surveys carried out in 2014-2015 were semi-stratified to attempt an even coverage of spring and neap tides, weekends, and weekdays. High activity sites were again sampled more often. Primary and secondary sites were adapted to allow for more time at busier secondary sites, resulting in greater survey time at individual secondary sites in 2014-2015 compared to 2012-2013. Surveys were planned to fall around low tide, starting two hours before low tide and finishing two hours after low tide. Some sites sampled in 2012-2013 were not included in the 2014-2015 survey. Portishead was one such example because no bait digging was observed in the first year of surveys. For others sites it was because the sites fell outside the Severn Estuary EMS and the survey in 2014-2015 focused on the EMS.

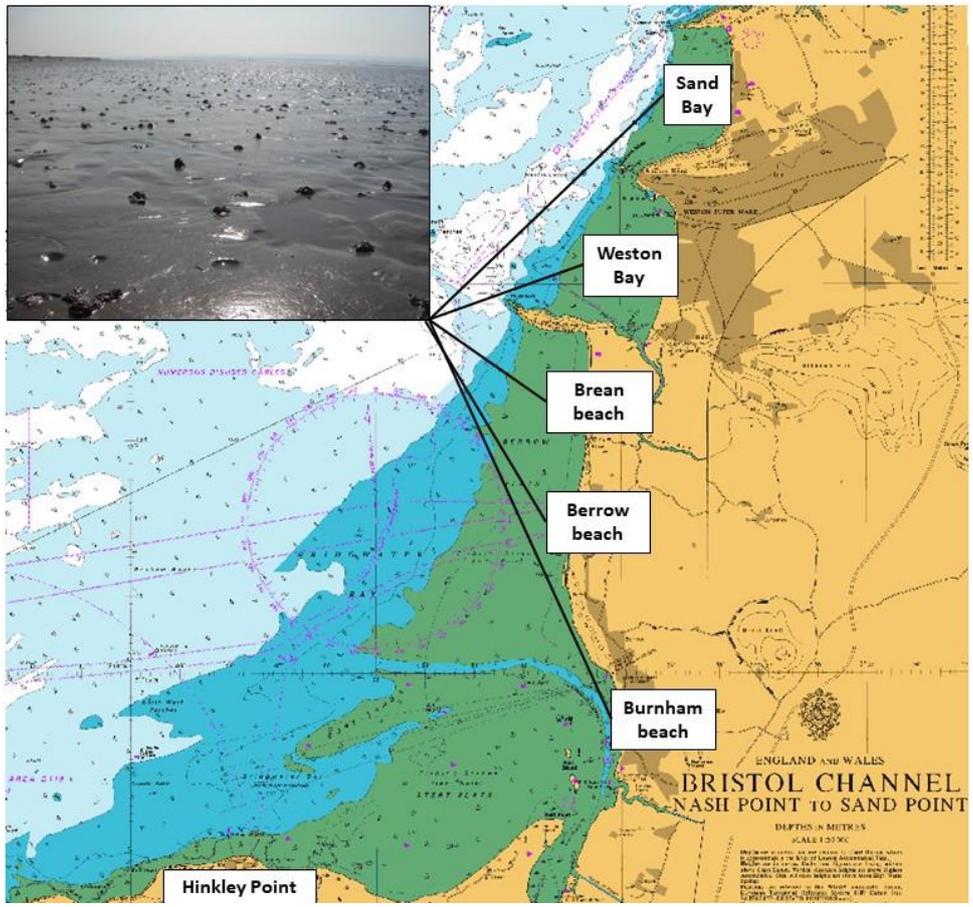


Figure 1. Survey locations for bait digging for lugworms (Weston Bay to Burnham-On-Sea) and ragworm (Hinkley Point)



Figure 2. Bait digging activity in the Severn Estuary a) targeting lugworms in sandy mud habitats at Berrow beach and b) targeting ragworms in sediment patches amongst cobbles and boulder at Hinkley Point

3.0 Results

3.1. Survey Effort

A total of 35 site visits were carried out in 2012-2013 and 33 in 2014-2015. Sites were visited between three and 10 times in 2012-2013 and between three and 14 times in 2014-2015. Hinkley and Stolford were sampled the least during both survey periods and Berrow and Brean the most frequently during both sampling periods (Figure 3). The number of surveys conducted at each site was roughly comparable between the two sample periods. Burnham-on-Sea was sampled more in 2014-2015 (eight visits compares to five in 2012-2013). Berrow and Brean were sampled slightly less in 2014-2015 (10 visits compared to 14 in 2012-2013).

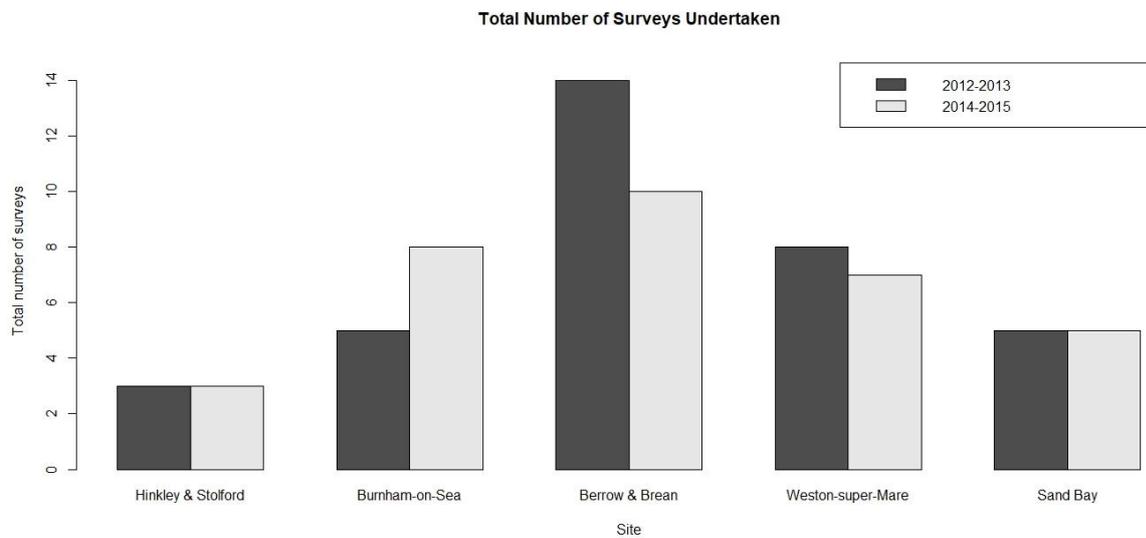


Figure 3. Total number of surveys undertaken at each site

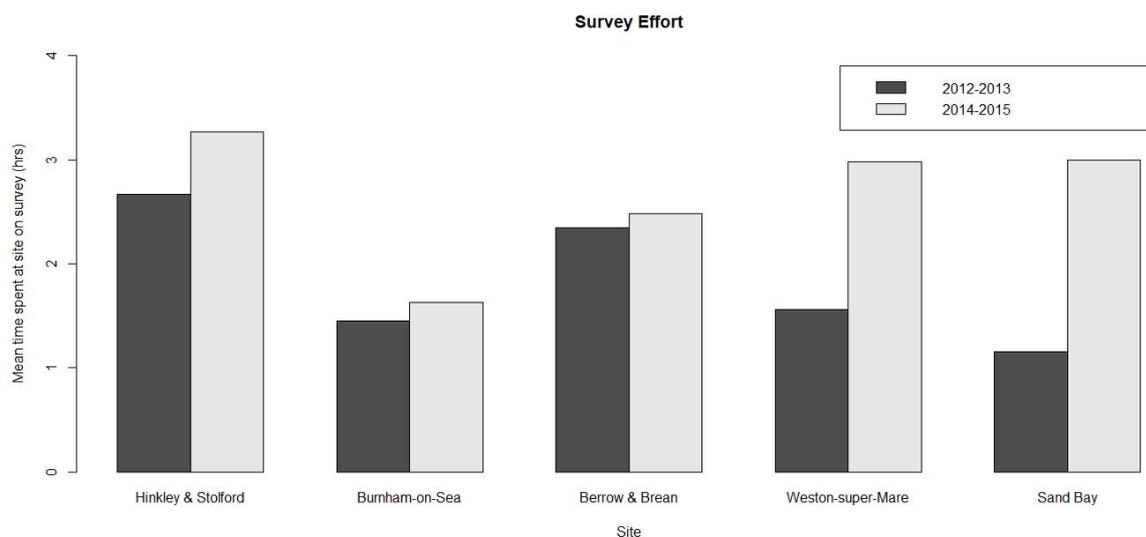


Figure 4. Mean amount of time spent at each site during a survey

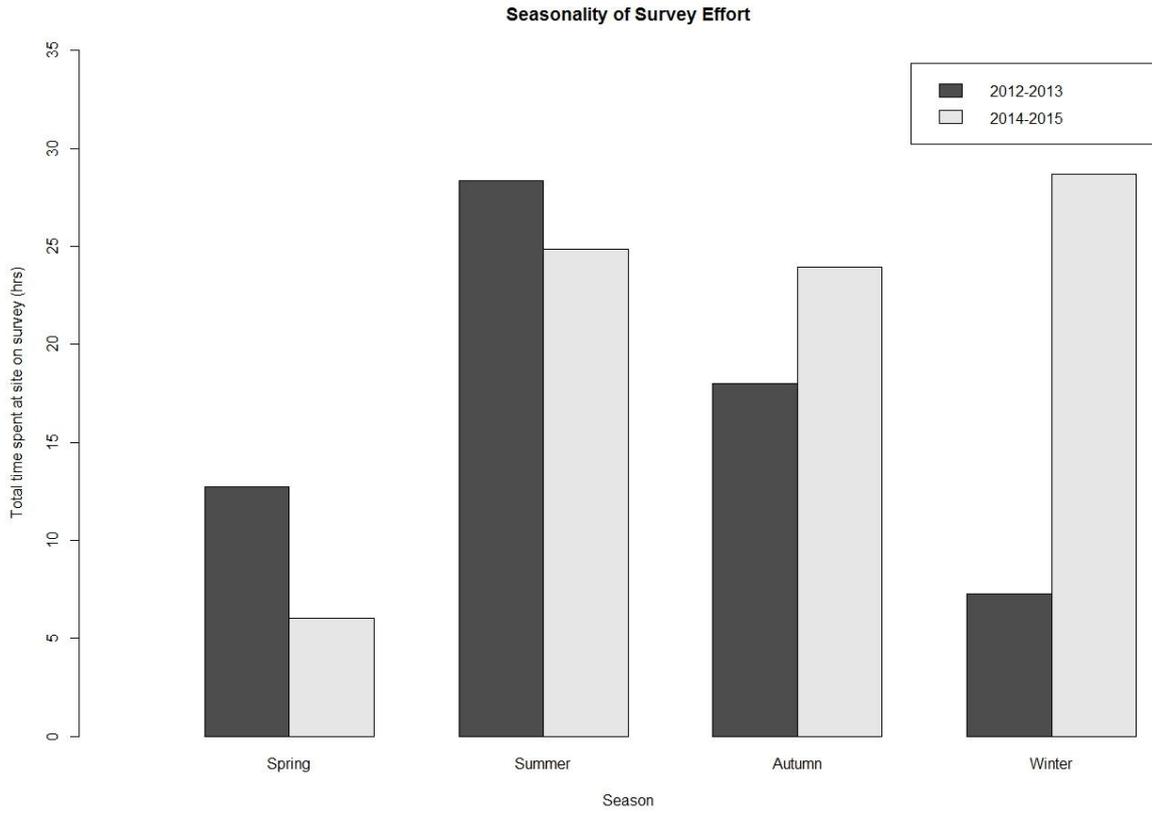


Figure 5. Seasonality of total survey time during the 2012-2013 surveys and the 2014-2015 surveys

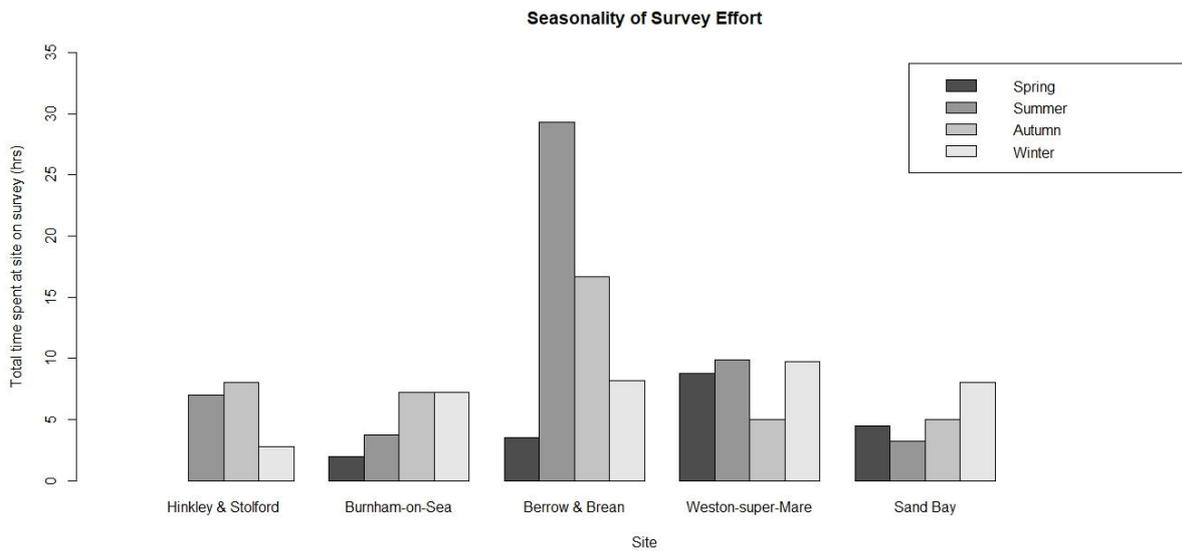


Figure 6. Seasonality of total survey time for each site, all survey periods combined

The amount of time spent at each site increased significantly in 2014-2015 compared to 2012-2013 for three of the five sites (Figure 4). This is due to a change in the sampling strategy, described in more detail in Section 2 of this report. Essentially, surveys moved away from a format of having to cover one primary site comprised of several secondary sites to having surveys focused to only one or two sites. This is due to an increased amount of time spent at Sand Bay and Weston-Super-Mare in particular, as these sites were previously covered by one primary site, and journey times between the two can be significant at certain times of year. In 2012-2013 survey effort was greater in summer, with low survey effort in the winter (Figure 5). In 2014-2015 survey effort was more evenly spread across summer, Autumn and Winter although survey effort in the Spring was relatively low.

3.2 Bait Digging Effort

In 2012-2013 93% of those interviewed were collecting lugworms and 7% ragworms. In 2014-2015 all bait diggers interviewed were collecting lugworms. This is likely due to the exclusion of some sites in 2014-2015 and the lack of effort recorded at Hinkley & Stolford, a known ragworm habitat (Figure 2b).

In 2012-2013 three sites had a mean of 0.2 bait diggers recorded for every hour of survey (i.e. one digger for every five hours of survey) (Figure 7). The exceptions were Weston-Super-Mare with a mean bait digging effort of 0.5 and Hinkley and Stolford of 0.8. However, survey effort was very low at Hinkley and Stolford. Bait digging effort at Hinkley and Stolford was 0 in 2014-2015, suggesting the data for this site should be treated with caution. For all sites except Hinkley & Stolford and Weston-Super-Mare, effort increased in 2014-2015 compared to 2012-2013. Bait digging effort declined at Weston-Super-Mare in 2014-2015 in contrast to the other sites.

The maximum number of bait diggers recorded on any survey was four (at Berrow and Brean in 2012-2013). A maximum of two or three diggers per survey were recorded at all other sites over both survey periods (Figure 8). Bait digging effort was highest in Autumn (2012-2013) and Winter (2014-2015) and lowest in Summer (both survey periods) (Figure 9). This coincides with a peak in effort in RSA effort in the Severn Estuary, with anglers primarily targeting cod. Patterns of effort were similar across the sites (Figure 10).

The number of holes observed had very low median values as surveys regularly observed nobody digging (Figures 10,11 and 12). In line with other metrics of survey effort, the median and maximum number of holes observed was greater in 2014-2015 than 2012-2013 (Figure 11). Burnham-on-Sea had the highest number of holes observed, followed by Weston-Super-Mare (Figure 12). The greatest number of holes and higher median values of bait digging holes were observed in Autumn and Winter (Figure 13).

Bait digging appears to be spatially restricted to areas within easy walking distance of access points. At Burnham-On-Sea there are several potential access points, but at Berrow, Brean and Weston-Super-Mare digging was always observed within a few minutes' walk of the main car parks on the beach. Diggers generally dig around low tide, but unlike in other locations in the D&S IFCA's District, digging is not at the low-tide mark. This is because the tidal range in the Severn Estuary means that the low water mark is an extremely long walk, and the sediment is extremely soft. Digging therefore occurs in more mid- upper shore areas with firmer sediment. Although digging could take place here throughout much of the tidal cycle, bait diggers report digging for a few hours either side of low water. In 2014-2015 the

areas dug were mapped when possible (Annex 1, Figures 14-18). This might include the holes dug by one or more diggers and may have already been present when an officer arrived. Also, areas other than those mapped have been observed being dug in 2012-2013 (for example further north in Sand Bay). However, the maps do give an indication of the height on the shoreline that the digging takes place, and the areas dug during the observed period. Overall, small areas were dug, close to access points as has already been discussed.

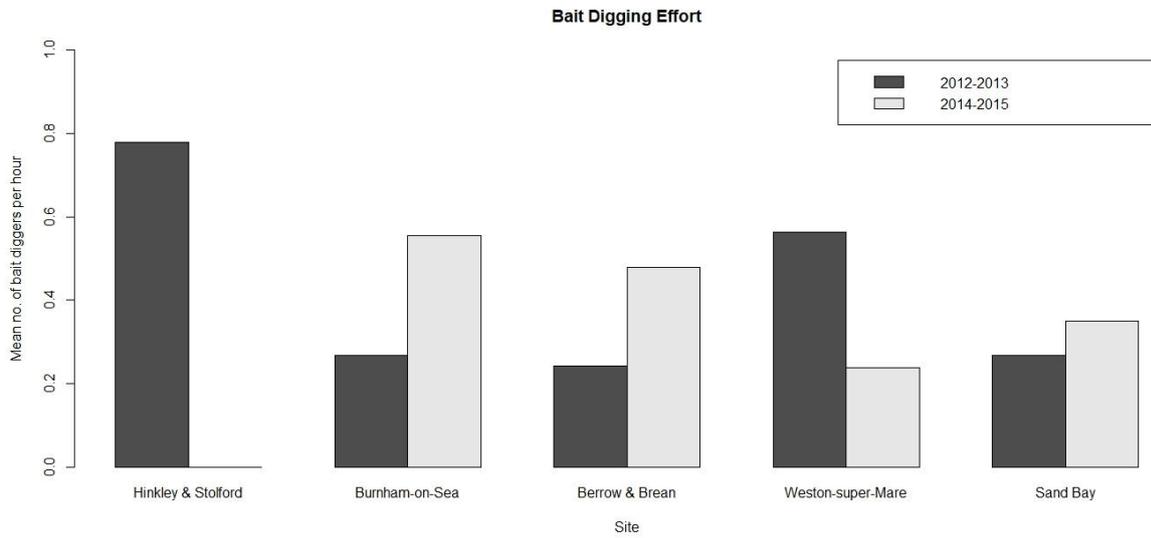


Figure 7. Mean number of bait diggers per hour for both sampling years

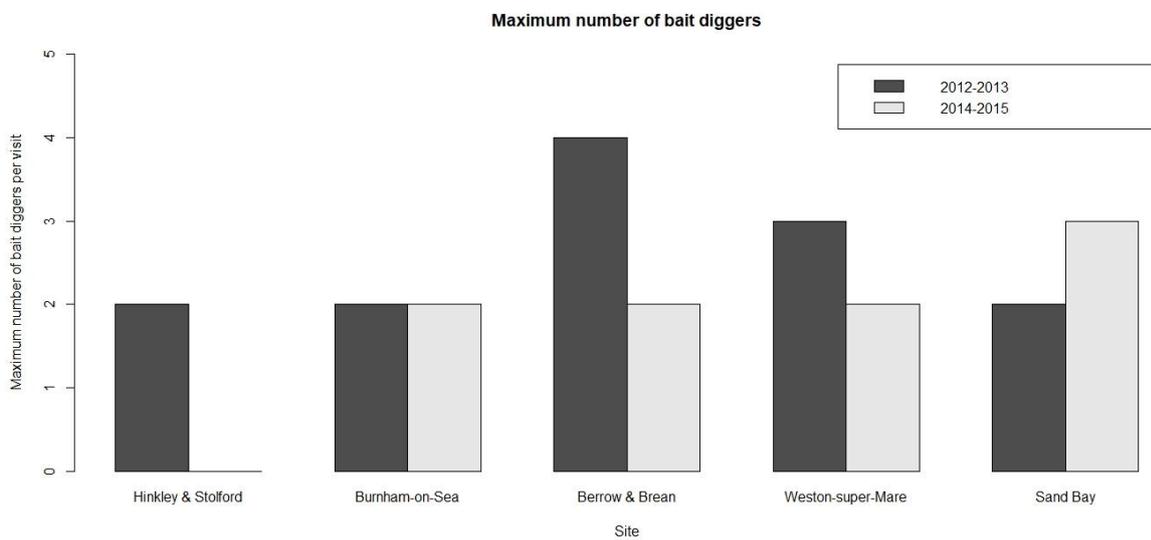


Figure 8. Maximum number of bait diggers observed on any single survey for both sampling years

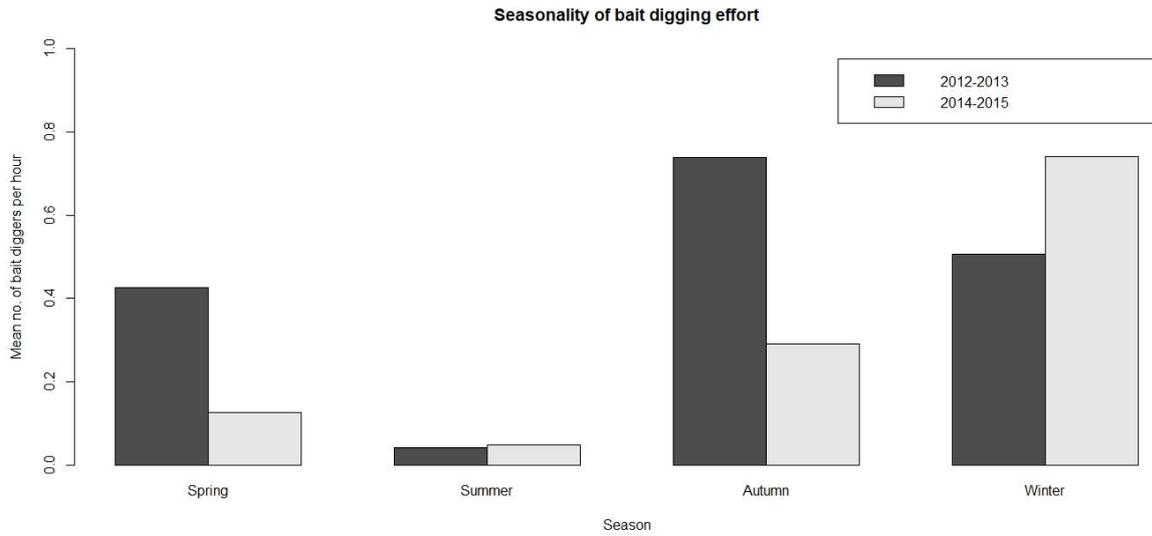


Figure 9 Mean number of bait diggers observed per hour, data for all sites combined, per season for both sampling years

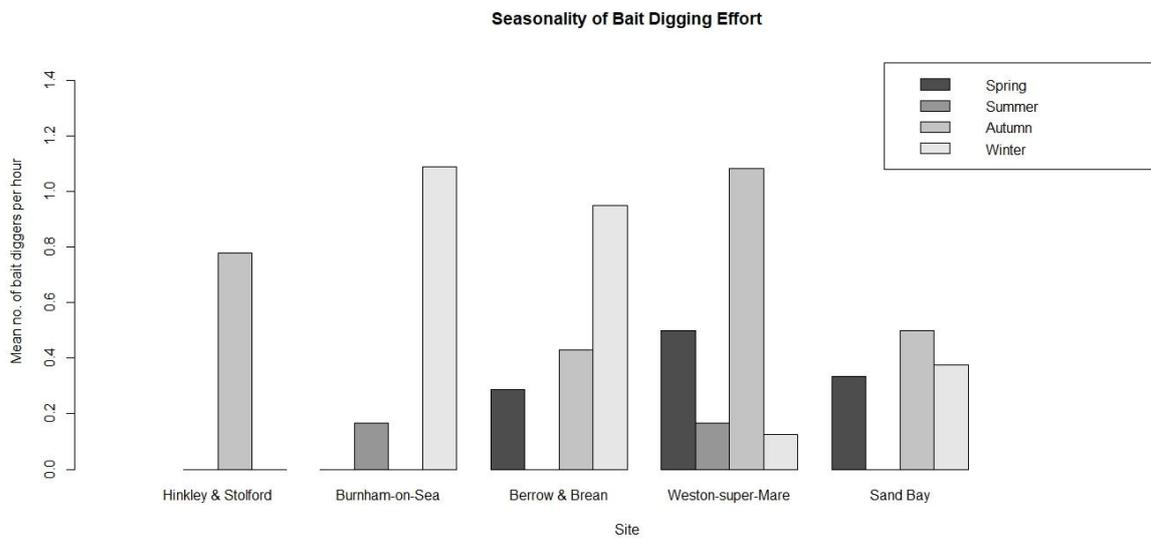


Figure 10. Mean number of bait diggers observed per hour, for each site, per season for both sampling years

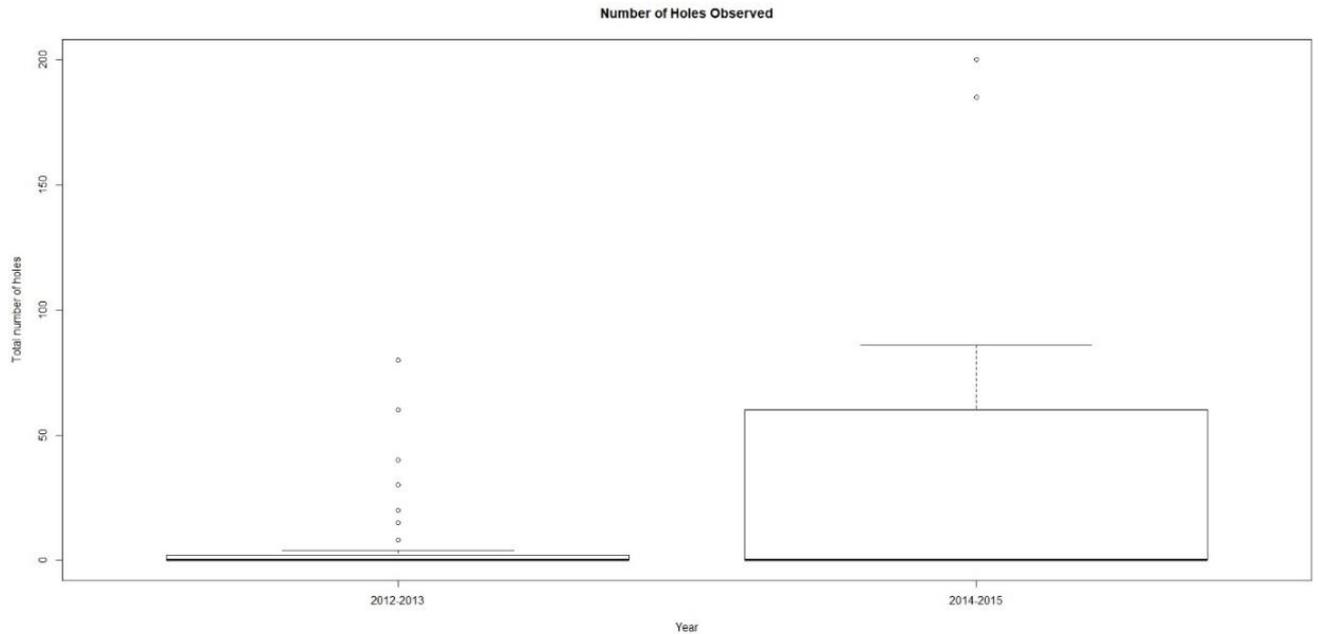


Figure 11. Number of holes observed per trip for each sampling period, all sites pooled. Box and whisker plots show the median number of holes (bold black horizontal line). The top and bottom of the box represent the values of the third and first quartiles respectively. The upper whisker represents the third quartile plus 1.5 x the interquartile range and the bottom whisker represents the first quartile plus 1.5 x the interquartile range. 'Outlier' points (marked individually) are points that are three times the interquartile range.

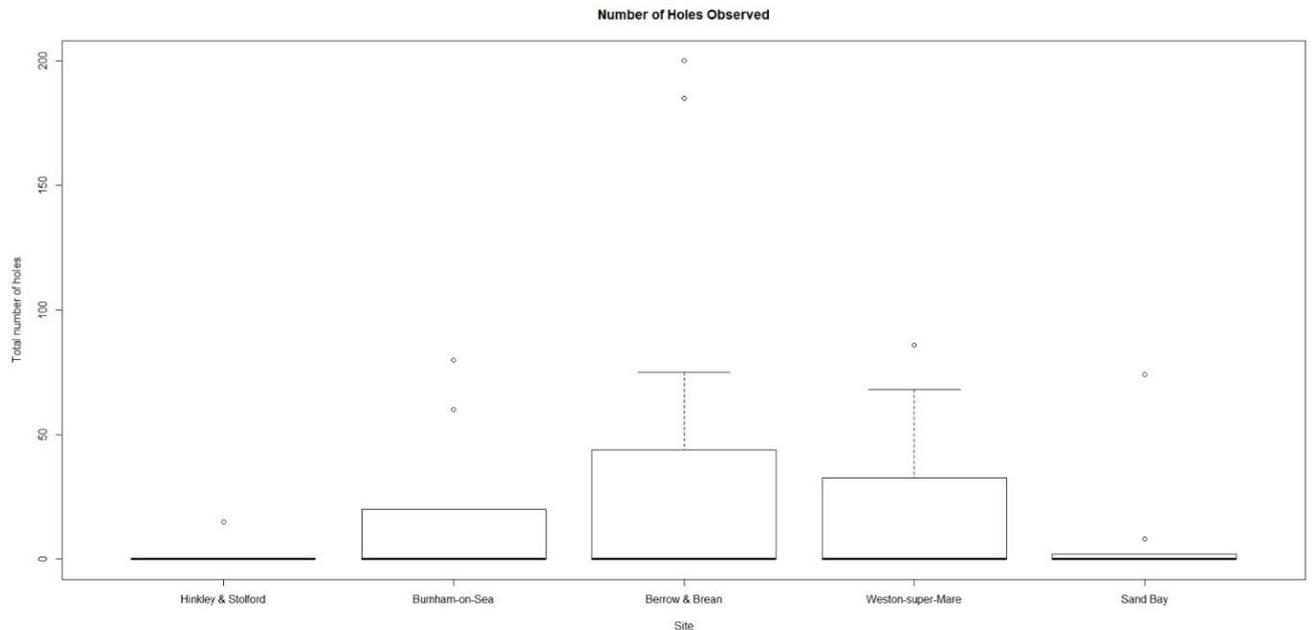


Figure 12. Number of holes per trip observed at each site, data for both sampling periods pooled. The top and bottom of the box represent the values of the third and first quartiles respectively. The upper whisker represents the third quartile plus 1.5 x the interquartile range and the bottom whisker represents the first quartile plus 1.5 x the interquartile range. 'Outlier' points (marked individually) are points that are at least three times the interquartile range.

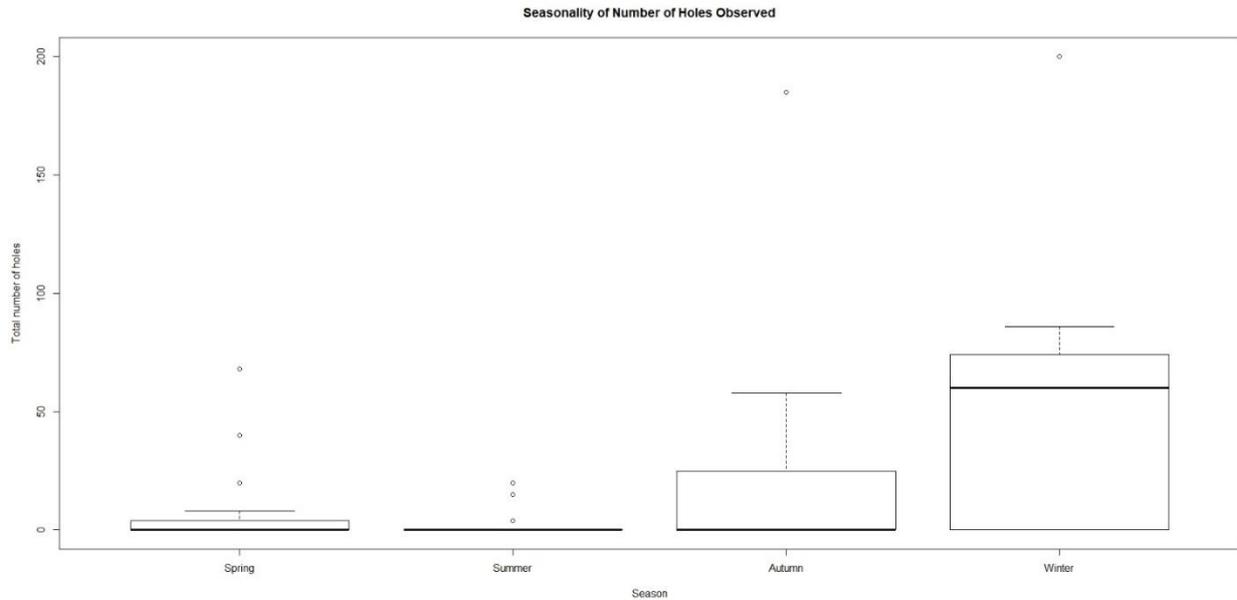


Figure 13. Number of holes observed per sampling trip, per season. Both sampling year and site pooled. The top and bottom of the box represent the values of the third and first quartiles respectively. The upper whisker represents the third quartile plus 1.5 x the interquartile range and the bottom whisker represents the first quartile plus 1.5 x the interquartile range. 'Outlier' points (marked individually) are points that are at least three times the interquartile range.

3.3 Bait Collection Behaviour

Additional information on the effort, behaviour and perceptions of bait diggers was captured during the interviews. Questions differed slightly between the 2012-2013 survey and the 2014-2015 survey, so responses are reported here separately.

2012-2013 Interview Responses

Bait diggers reported targeting between 0.5lbs-8lbs (mean 2.9lbs) of worms per day. Diggers who reported a number (rather than weight) targeted 12-80 worms (mean of 44 worms) per digging trip. Diggers reported using between 0.5lb and 3lb (average of 1.5lb) of lugworms per day whilst fishing, often in combination with other bait. There was a large variability in how long diggers believed worms could be kept alive for (refrigerated) with the length of time reported to be between 0 days to 10 weeks with a mean of 9.9 days and a median of 3 days.

Six respondents believed that some commercial digging takes place. One person mentioned vans coming over from Wales and Ireland to dig bait at Brean in (approximately) 2008 but not more recently. However, the 2012-2013 survey found the mean distance travelled by bait diggers (return trip) was 11.5 miles, with most travelling between 11 and 15 miles with a maximum reported round trip of 30 miles.

One respondent mentioned two local people who were thought to dig for lugworms commercially, supplying local shops. D&S IFCA officers regularly encountered these two bait diggers during the 2012-2013 surveys who were digging significantly more often (up to 6 days a week) and collecting more bait (up to 8lbs each) than other participants. Although they reported collecting for recreational (personal) purposes, the frequency of digging and

amount collected suggests that they may have been collecting commercially. Reports from local anglers support this assumption. Another interview respondent mentioned that charter boat operators occasionally dug for ragworms in the summer. Two others said yes commercial digging happened over the winter, although this had not been observed in more recent years.

There were no clear trends in bait diggers' perceptions of the bait population levels. Two individuals reported declines in ragworms, which seem to have a naturally patchy distribution in the Severn Estuary, and these echoed remarks made by anglers during the Sea Angling 2012 interviews. However, with no baseline information on ragworm populations, this is hard to verify. Concerning lugworms, two respondents believed that Burnham-on-Sea had been 'dug out' with very few adults present. However, a survey of lugworm populations in the Severn Estuary found that Burnham-On-Sea seemed to be a nursery area, with a decline in the proportion of juveniles running from Burnham to Sand Bay (Ross 2013). This may be because of the frequent smothering events at Burnham where mud is deposited on the foreshore, leading to the departure of adult worms and the availability of the habitat for colonisation by juveniles (Ross 2013). Four respondents believed worm populations in the Severn Estuary had increased in recent years, with Burnham being better in 2012-2013 than in other years. Another individual mentioned the greater abundance of worms at Sand Bay in 2013, and a different individual commented that lugworms were larger at Sand Bay in 2013. Two respondents who have been digging for 40 and 50 years respectively in the Severn Estuary believed that there was no long-term change in the worm populations, but that there had been a decline in the number of bait diggers.

No individuals reported back-filling holes with most diggers saying the strong tidal currents in the Severn meant holes back-filled naturally in a single tide.

Only one respondent thought that management was necessary, suggesting a spawning season closure for lugworm at Burnham-On-Sea. Other respondents thought that management was not necessary or would only be necessary if large-scale commercial digging commenced.

2014-2015 Interview Responses

Most bait diggers chose the method of digging holes to collect bait, and five bait diggers dug holes and trenches together. The target number of worms was 77.5, which is an increase compared to 2012-2013, although only five respondents reported the target amount in individual numbers. The target weight was 0.5-2lbs (mean 1.25lbs) which is a significant decrease from 2012-2013. The amount reported as being used for a days fishing was 1.39lbs or ~100 individuals.

The majority of bait diggers said no commercial activity takes place. Two said some took place, although one reported that the individuals doing it had stopped in the last year. No consensus in long-term trends was described with some diggers reporting stable numbers over time, others saying 2014 was a good year and other saying it was declining or a poor year. A number of seasonal observations, such as the worms being deeper in the winter, or less abundant following a period of easterly winds, were also suggested.

No individuals reported back-filling holes with most diggers saying the strong tidal currents in the Severn meant holes back-filled naturally in a single tide. None of the interviewed bait diggers felt that any management was necessary.

4.0 Discussion

D&S IFCA undertook a bait digging survey in 2012-2013 to complement the work being undertaken as part of Sea Angling 2012 and to inform Habitat Regulation Assessments of fishing activities in the Severn Estuary. Anecdotal information from anglers suggested that 2012-2013 was a particularly bad year for cod in the Bristol Channel/ Severn Estuary so that angling effort would be lower in that year and may not be representative. D&S IFCA decided therefore, to continue the sea angling surveys and bait digging data collection for a second season. Reports from anglers suggested that 2014-2015 was a better year for cod, and there certainly appears to have been an increase in bait digging effort in 2014-2015 compared to 2012- 2013. Other temporal patterns (higher effort in Autumn and Winter) appear to be consistent between the two sampling periods. This could also be linked to the popularity of other activities on these beaches in the summer months, reducing the space available for bait digging activities.

There was no clear consensus on long-term patterns of bait distribution. A bait density survey of lugworms at Burnham-on-Sea, Berrow, Brean, Weston-Super-Mare and Sand Bay (Ross, 2013) found remarkably similar spatial patterns of abundance and densities to those reported in the 1970's suggesting no long-term decline in lugworm populations. Reported declines in ragworm population may be plausible if these occur in relatively isolated populations throughout the estuary, however as no long-term data sets exist it would be almost impossible to test this hypothesis. D&S IFCA worked with the Association of Severn Estuary Authorities (ASERA) to produce a bait digging code of conduct, published after the survey work discussed in this report took place. The code promotes back-filing of holes, encourages anglers to avoid saltmarsh and *Sabellaria* and to only take as much bait as they need. It also informs anglers that ragworm may be more sensitive to exploitation in the Severn, and to restrict their take of these species, and to consider purchasing farmed ragworm.

5.0 Conclusions and Future Work

Little commercial bait collection takes place, but where it has been suspected to occur the individuals involved did dig significantly more frequently and for greater quantities of worms than the average angler. An Appropriate Assessment should be undertaken to assess the impacts of bait digging on the protected features of the Severn Estuary European Marine Site, despite the current evidence that most of this activity is likely to be recreational.

Annex 1. Maps indicating location of bait digging observed

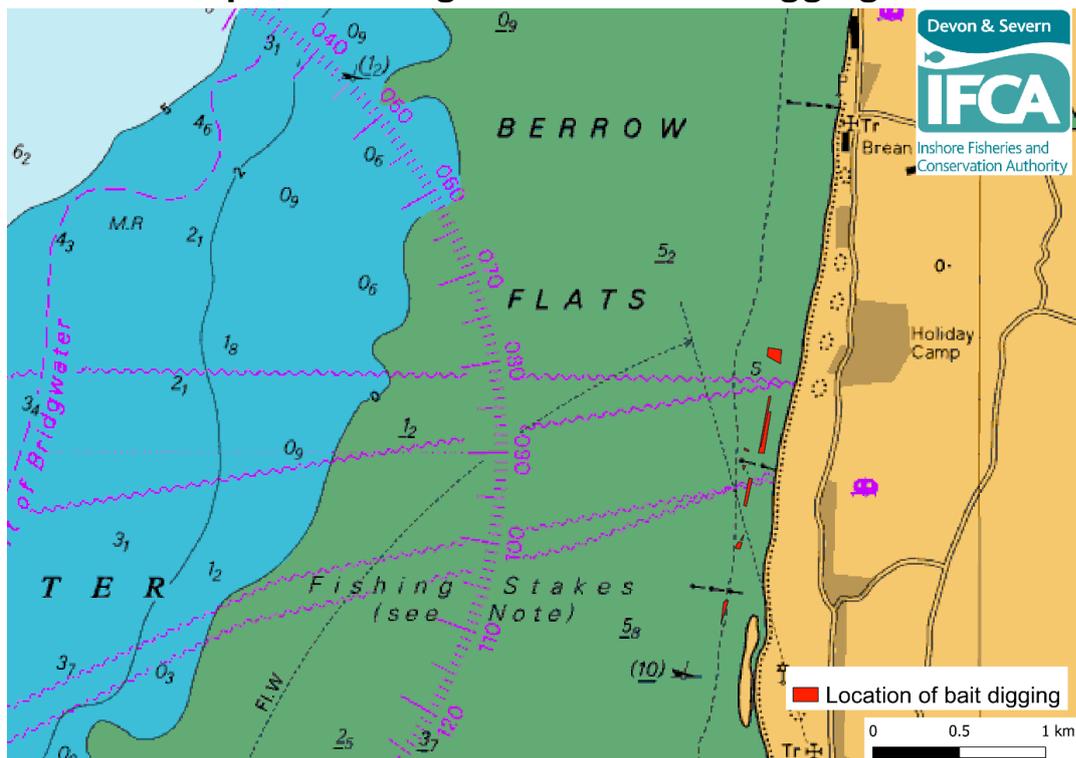


Figure 14. Location of bait digging activity observed at Berrow

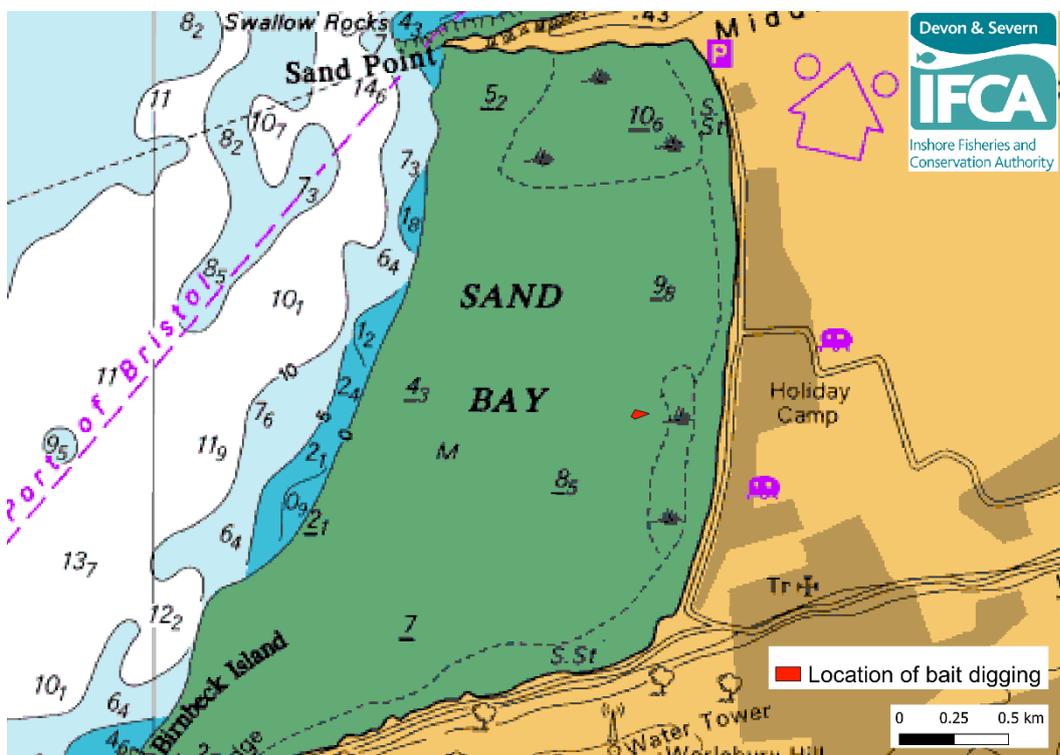


Figure 15. Location of bait digging activity observed at Sand Bay

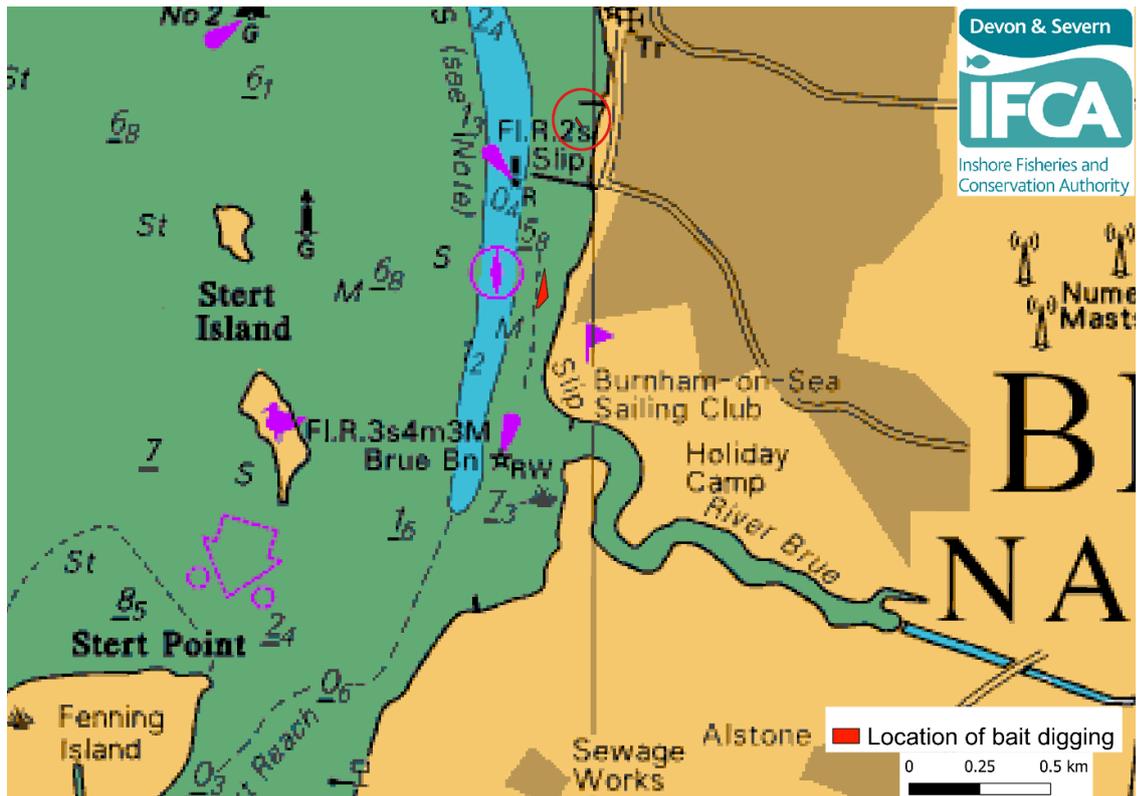


Figure 16. Location of bait digging activity observed at Burnham beach

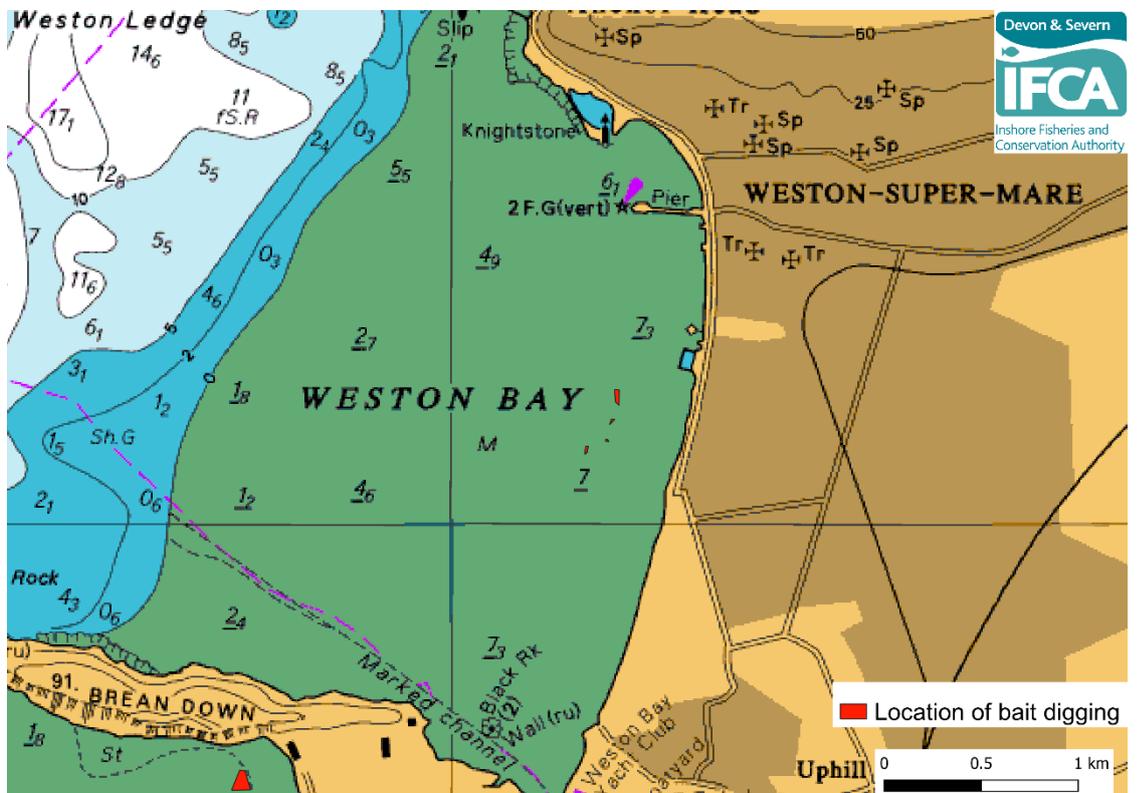


Figure 17. Location of bait digging activity observed at Weston Bay

6. References

ASERA Good Practice Guidelines: <https://www.asera.org.uk/good-practice-guidelines/>

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