



## Exe Estuary Crab Tile Survey 2012



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## 1. EXECUTIVE SUMMARY

Crab tiling is the practice of placing artificial refugia in intertidal areas to encourage use by moulting shore crabs (*Carcinus maenas*). These crabs are subsequently collected for use as angling bait. This method of bait collection is prevalent throughout Devon, in particular the Exe Estuary, which is designated as a Special Protected Area (SPA) for the internationally important bird populations it supports.

Collection of shore crabs on the Exe is managed by both statutory and voluntary means; Devon SFC Byelaw 24 states that the activity must be confined to certain areas of the estuary, whilst a voluntary code of conduct agreed with crab tilers in 2003 requires that the number of tiles must not exceed baseline levels. To ensure that these management measures are being upheld, a crab tile audit is conducted every four years. This survey is the fourth to be conducted on the Exe.

The survey was conducted between July and November 2012, using methodology guidelines produced by the Devon Wildlife Trust and employed on previous surveys. Volunteers from a range of organisations provided assistance in data collection. All areas of crab tiles on the Exe were quantified and mapped, with environmental and physical data also recorded. Crab tile data polygons were produced in MapInfo.

The results showed an overall decrease of 5491 tiles since the last survey in 2008, and a decrease of 5803 since baseline levels were established in 2001. There appeared to be an even decrease in the number of crab tiles on both sides of the estuary, with only one area on the eastern side recording an increase. The reason for the decline in the number of tiles is unknown, but anecdotal evidence from 2008 suggests that tilers are allowing their refuges to become buried. Possible explanations include a decline in crab populations, or a decreased demand for bait. Whatever the cause, it appears that the management measures are currently being adhered to, although the need for continued monitoring remains.

### 2. INTRODUCTION

Crab tiling, also known as crab potting, is a method of collecting shore crabs (*Carcinus maenas*) for use as fishing bait by anglers. Like all other crustaceans, shore crabs moult their shells at intervals during their life cycle, during which they seek a refuge from predators. Crab tilers exploit this behaviour, providing artificial shelters such as roof tiles (hence the name), guttering, drainpipes, chimney pots and tyres. Whilst sheltering under the tiles, the crabs are in the 'soft shell' state i.e. the hard shell has been shed and the new shell has not yet hardened. It is in this state that the crabs are collected for fishing bait, when the tiles are exposed at low tide. This method of bait collection has been used on the Exe for generations, particularly in the Starcross area where rows of hundreds of tiles can be seen from the shore.

Crab tiling on the Exe is managed by Devon SFC Byelaw 24, which limits the area in which crab tiles can be laid, in the interests of conserving marine resources and limiting disturbance to internationally important bird populations within the estuary. A line from Starcross Yacht club across to Exton marks the upper limits of the area, whilst the area close to Dawlish Warren marks the lower limit – any tiles outside of this area are removed. A baseline survey of the number of crab tiles was conducted in 2000/2001, and a voluntary code of conduct was agreed between the crab tilers and the Exe Estuary Management Partnership in 2003. The code states that the number of tiles on the estuary must not exceed numbers recorded in the 2001 survey, and subsequent monitoring surveys have been conducted in 2003/2004 and 2008 to ensure that no new areas of crab tiles have since been established.

Under the Marine and Coastal Access Act (MaCCA, 2009), the Devon and Severn Inshore Fisheries and Conservation Authority (IFCA) assumed statutory responsibility for the management of inshore bait collection activities within their district, including the Exe Estuary. The 2012 survey was conducted by the IFCA in collaboration with the Exe Estuary Management Partnership, Natural England and the Devon Wildlife Trust, as part of an ongoing monitoring programme.

### 3. METHODOLOGY

Fieldwork was conducted between July and November 2012 by IFCA officers, staff from the Exe Estuary Management Partnership, Natural England, and the Devon Wildlife Trust, in addition to volunteers. Several groups of two or three participants worked in different areas of the estuary, having been fully briefed prior to the survey. Each group contained an IFCA officer to improve data standardisation and ensure that the survey was conducted in a safe manner.

All fieldwork was conducted within a period of approximately two hours before and after low tide, and timed to coincide with the lowest spring tides possible. The majority of the survey was conducted on foot, although area EXE18 was accessed by boat due to the hazardous nature of surrounding sediments.

To ensure comparable data, the methodology developed by the Devon Wildlife Trust, and previously used in crab tile surveys on the Exe was repeated (see Appendix 1 for survey guidelines). Identical survey sheets were used to record numbers of tiles in distinct block or line formations, in addition to substrate, type of materials used, orientation, epibiota, and usage status (see Appendix 2 for an example survey form). To assist in location of historic crab tile areas, previous data layers were overlaid onto Ordnance Survey data to create field maps. Once areas of crab tiles had been located, GPS co-ordinates were taken around the perimeters, or at the start and end of each line. These coordinates were later plotted using MapInfo 11.0.4, and used to create data polygons. All associated crab tile data was stored in the data layer.

Crab tiles were counted wherever possible, although estimation was necessary where extremely large numbers of tiles were encountered. In such cases, each team member would make an estimate, and a figure was agreed by consensus. In areas where full access was not possible, due to tidal conditions or deep mud, the size of the area covered by crab tiles was also estimated as accurately as possible for mapping purposes.

#### 4. RESULTS

The results of the 2012 survey are compared to those of previous surveys in Table 3.1, with tile distribution around the estuary compared in Table 3.2. Detailed breakdowns of crab tile distribution in comparison to the 2008 and baseline datasets are presented in Table 3.3 and Table 3.4.

Maps of the 2012 digitised crab tile areas are presented in Figure 3.1 to Figure 3.6. Changes in crab tile areas between 2003/4 and 2012 are displayed graphically in Figure 3.7 to Figure 3.9, as the 2008 layers were not available at the time of writing. The process of crab tile mapping can be subjective, based on the different surveyors involved and their perception of groups of crab tiles as “areas”, and variable tile spacing. Area covered by crab tiles should therefore not be considered as a good indicator of change, and only the number of crab tiles should be taken into account. The usage status of crab tile areas is presented in Figure 3.10, although it should be noted that this measure is reasonably subjective.

**Table 4.1: Comparison of Total Tile Counts**

Survey	Number of Tiles	Difference
2000/1	26,800	-
2003/4	30,302	+ 3502
2008	26,488	- 312
2012	20,997	- 5803

**Table 4.2: Tile Distribution**

Area	Number of Tiles			
	2012	2008	2003/4	2000/1
EXE 04	148	152	410	0
EXE 05	4406	6054	4573	1135
EXE 06	3188	4720	6375	3400
EXE 07	7338	6313	8468	8450
EXE 08	1757	2765	3303	4876
EXE 09	0	0	0	150
EXE 17	330	384	420	1165
EXE 18	1123	1472	1580	900
EXE 19	2463	4022	4218	5820
EXE 20	244	606	955	900
EXE 21	0	0	0	0
<b>TOTAL</b>	<b>20997</b>	<b>26488</b>	<b>30302</b>	<b>26796</b>

**Table 4.3: Comparison of Tile Distribution: 2012 and 2008 Surveys**

Area	Number of Tiles			
	2012	2008	Difference	Percentage
EXE 04	148	152	- 4	-3%
EXE 05	4406	6054	- 1648	-27%
EXE 06	3188	4720	- 1532	-32%
EXE 07	7338	6313	+ 1025	+14%
EXE 08	1757	2765	- 1008	-36%
EXE 17	330	384	- 54	-14%
EXE 18	1123	1472	- 349	-24%
EXE 19	2463	4022	- 1559	-39%
EXE 20	244	606	- 362	-60%
<b>TOTAL</b>	<b>20997</b>	<b>26488</b>	<b>- 5491</b>	<b>-21%</b>

**Table 4.4: Comparison of Tile Distribution: 2012 Survey and 2000/1 Baseline Data**

Area	Number of Tiles			
	2012	2000/1	Difference	Percentage
EXE 04	148	0	+ 148	+ 100%
EXE 05	4406	1135	+ 3271	+ 74%
EXE 06	3188	3400	- 212	- 6%
EXE 07	7338	8450	- 1112	- 13%
EXE 08	1757	4876	- 3119	- 64%
EXE 09	0	150	- 150	- 100%
EXE 17	330	1165	- 835	- 72%
EXE 18	1123	900	+ 223	+19%
EXE 19	2463	5820	- 3357	- 58%
EXE 20	244	900	- 656	- 73%
<b>TOTAL</b>	<b>20997</b>	<b>26796</b>	<b>-5799</b>	<b>- 22%</b>

Figure 4.1: Overall Crab Tile Distribution

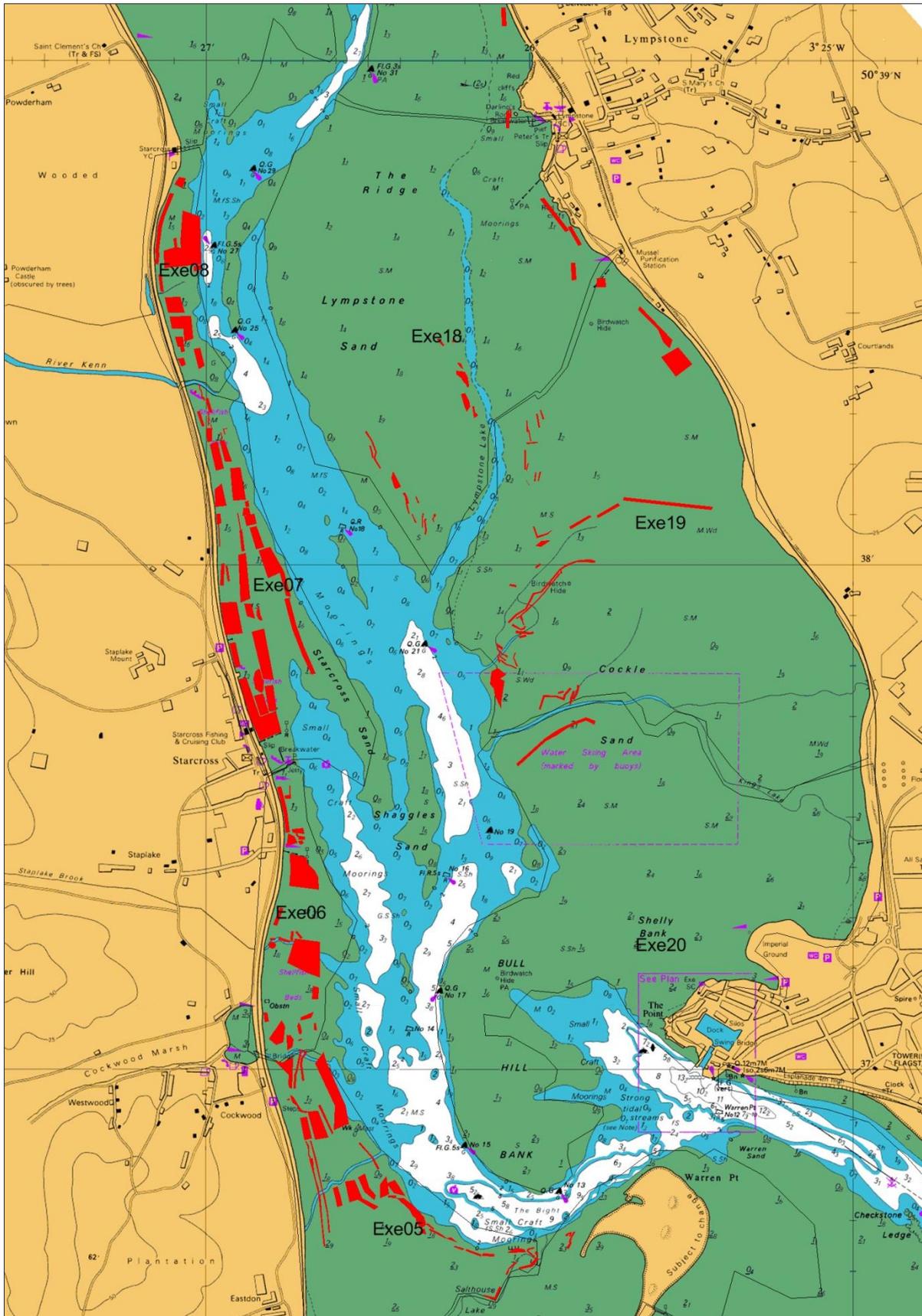


Figure 4.2: EXE08 and EXE07 Crab Tile Distribution

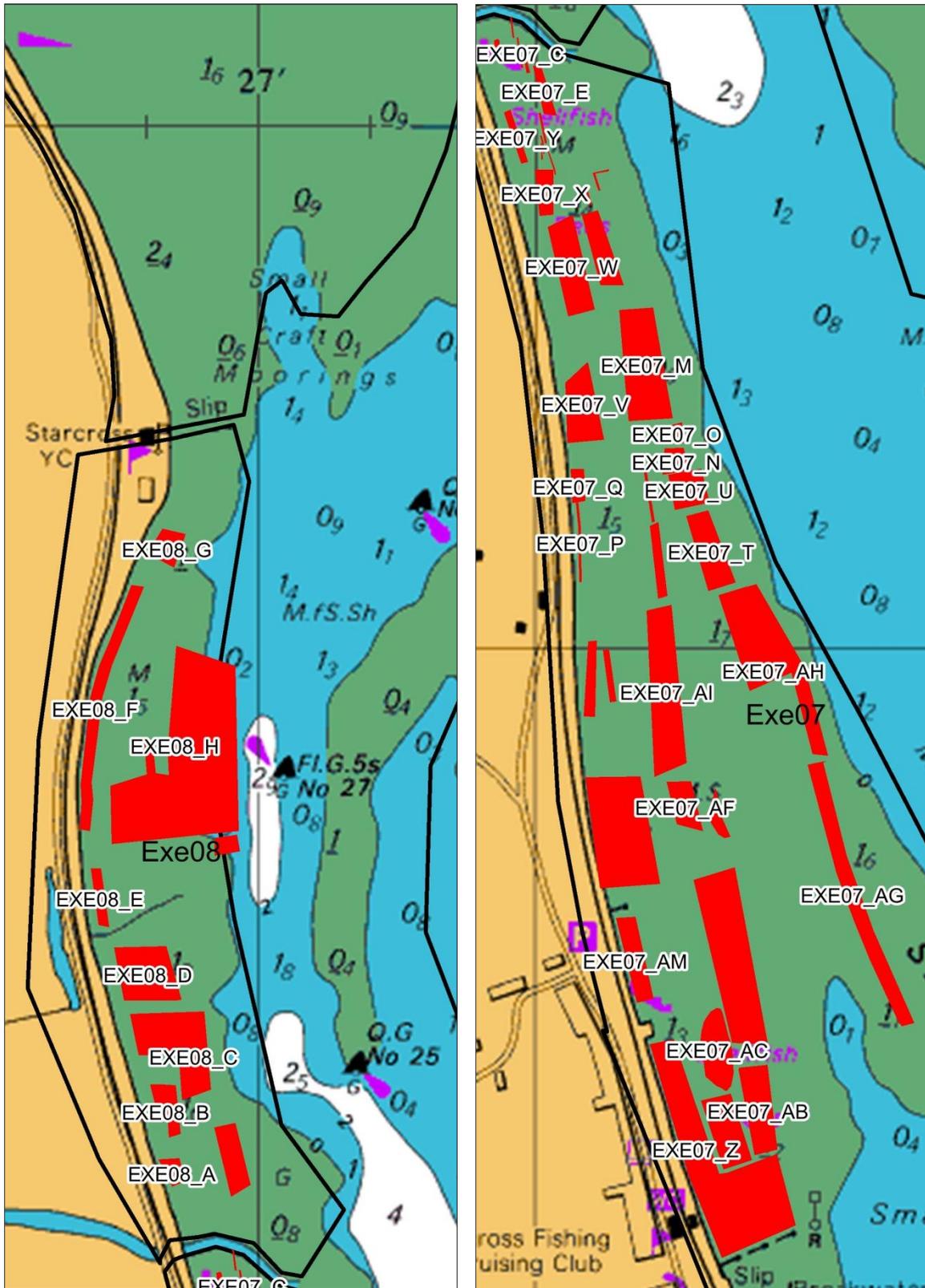


Figure 4.3: EXE06 Crab Tile Distribution

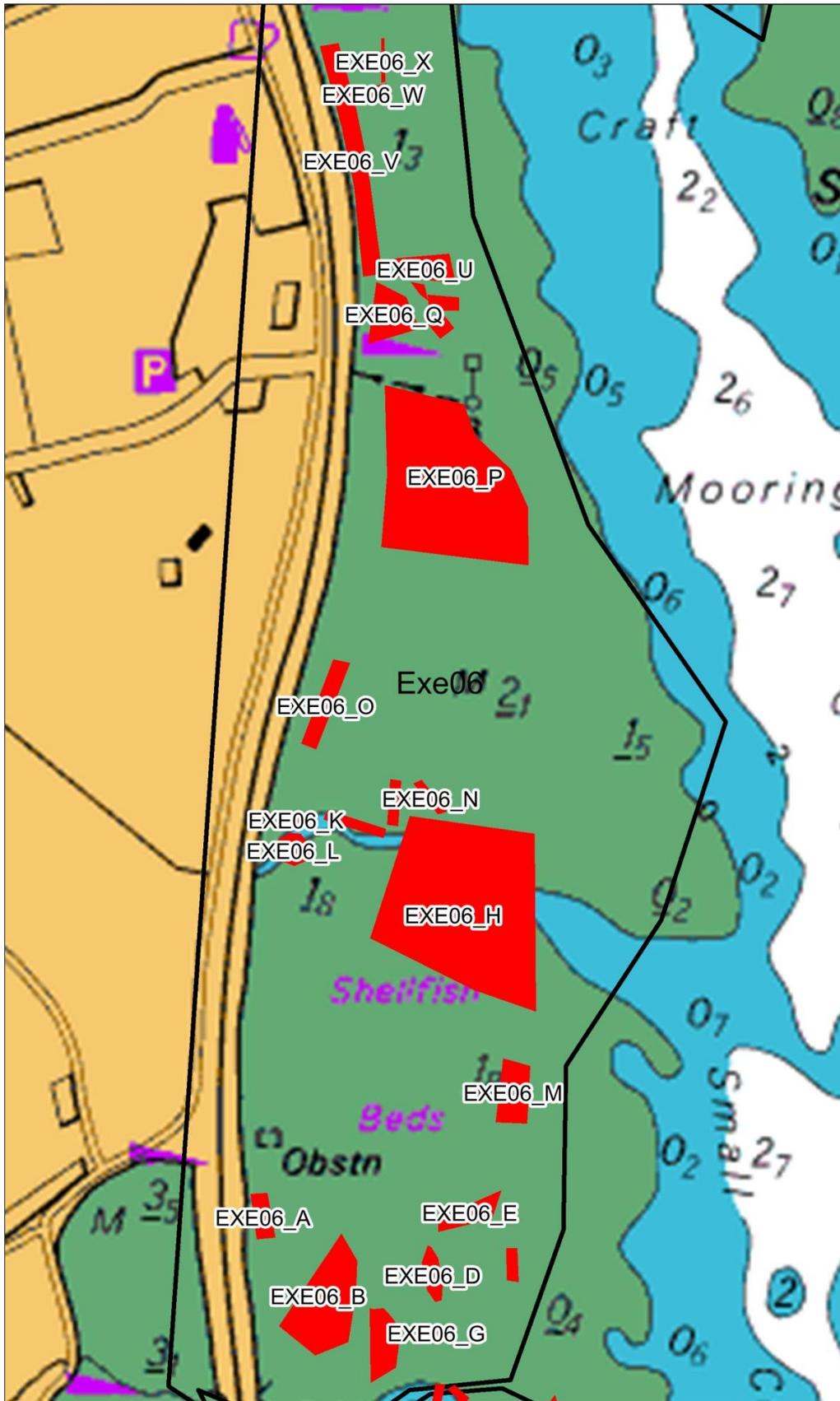


Figure 4.4: EXE04 and EXE05 Crab Tile Distribution

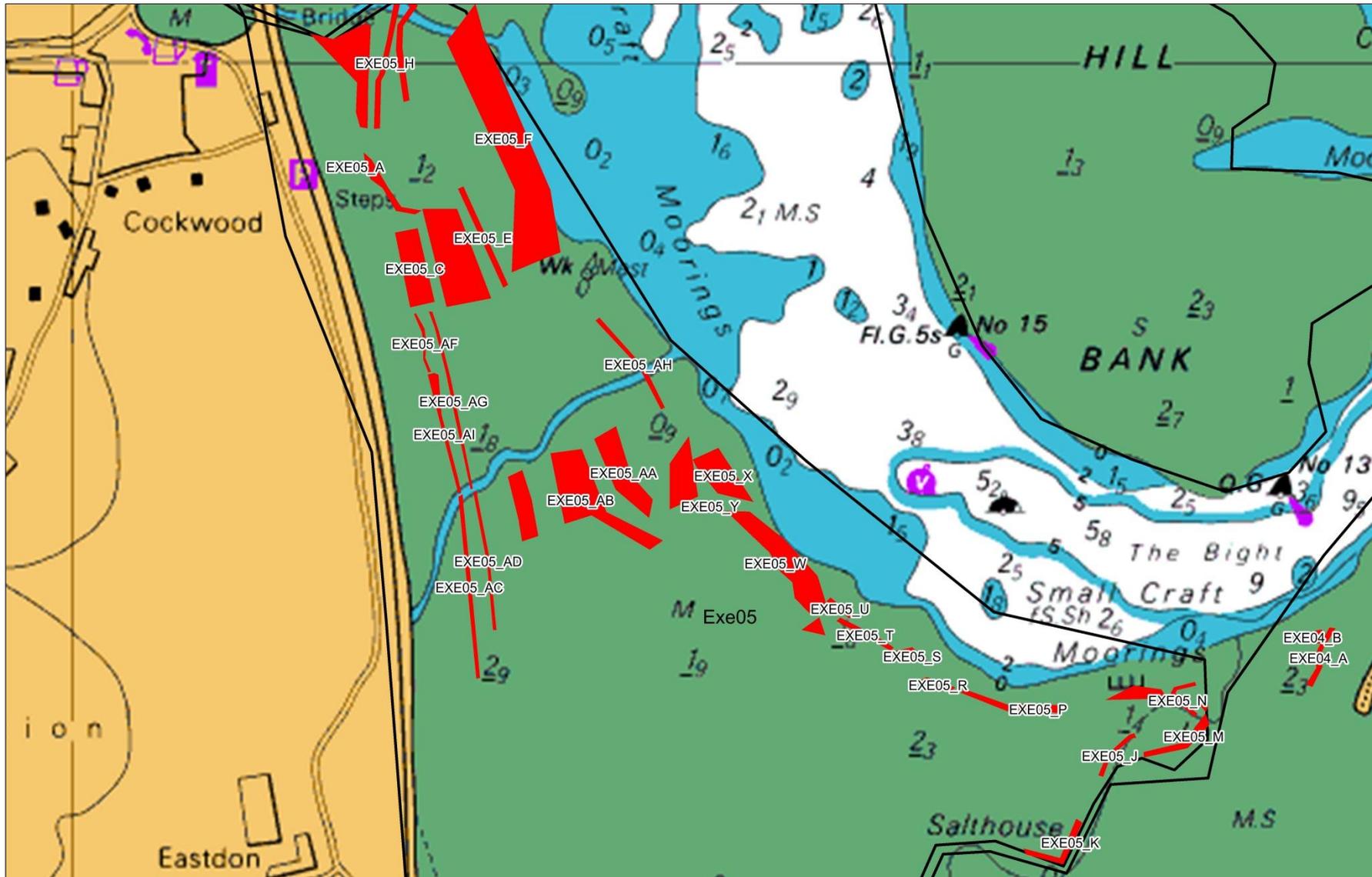


Figure 4.5: EXE 17, EXE 18 and EXE19 Crab Tile Distribution

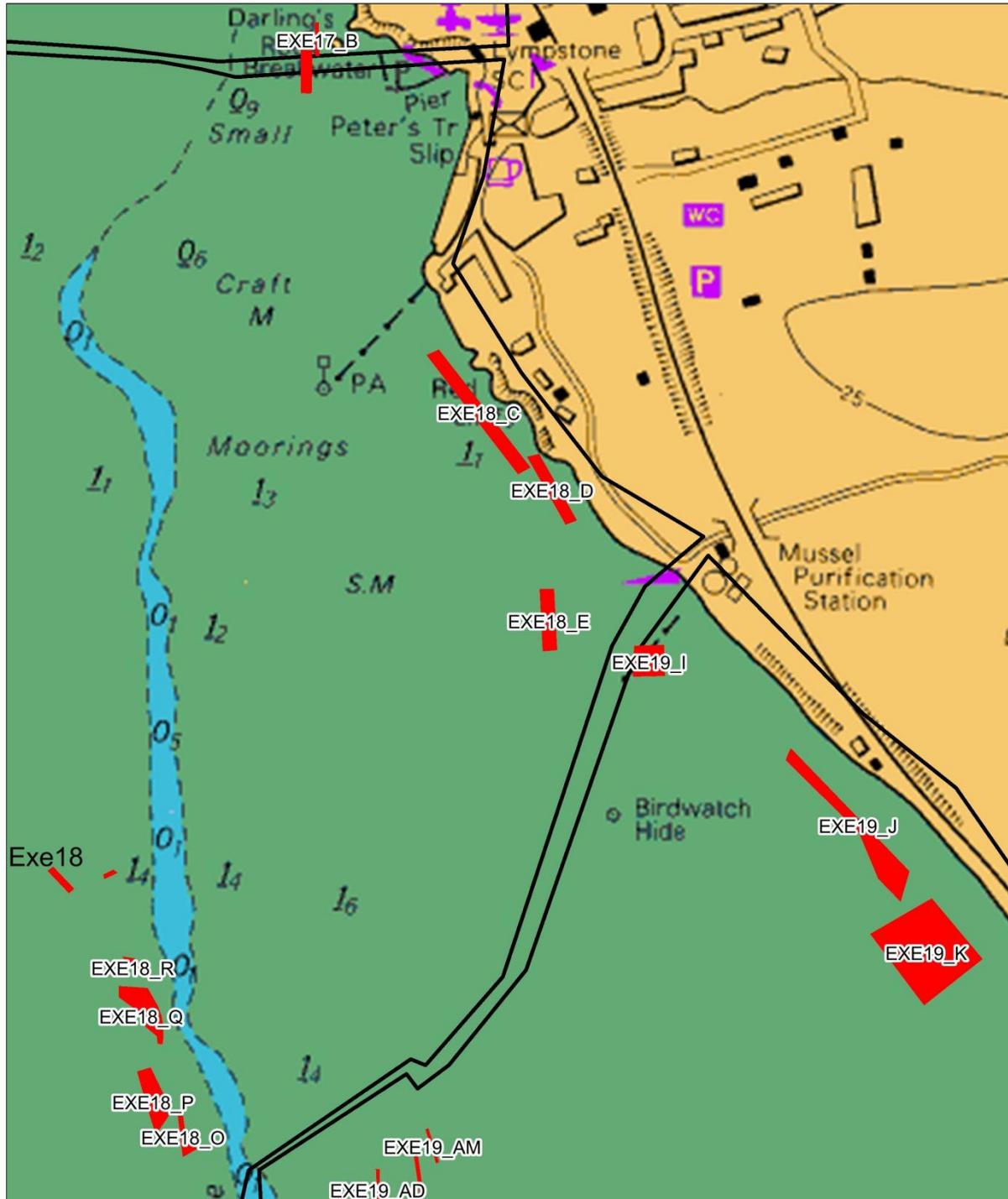




Figure 4.7: Comparison of 2012 and 2003/4 Crab Tile Areas (Upper Estuary)

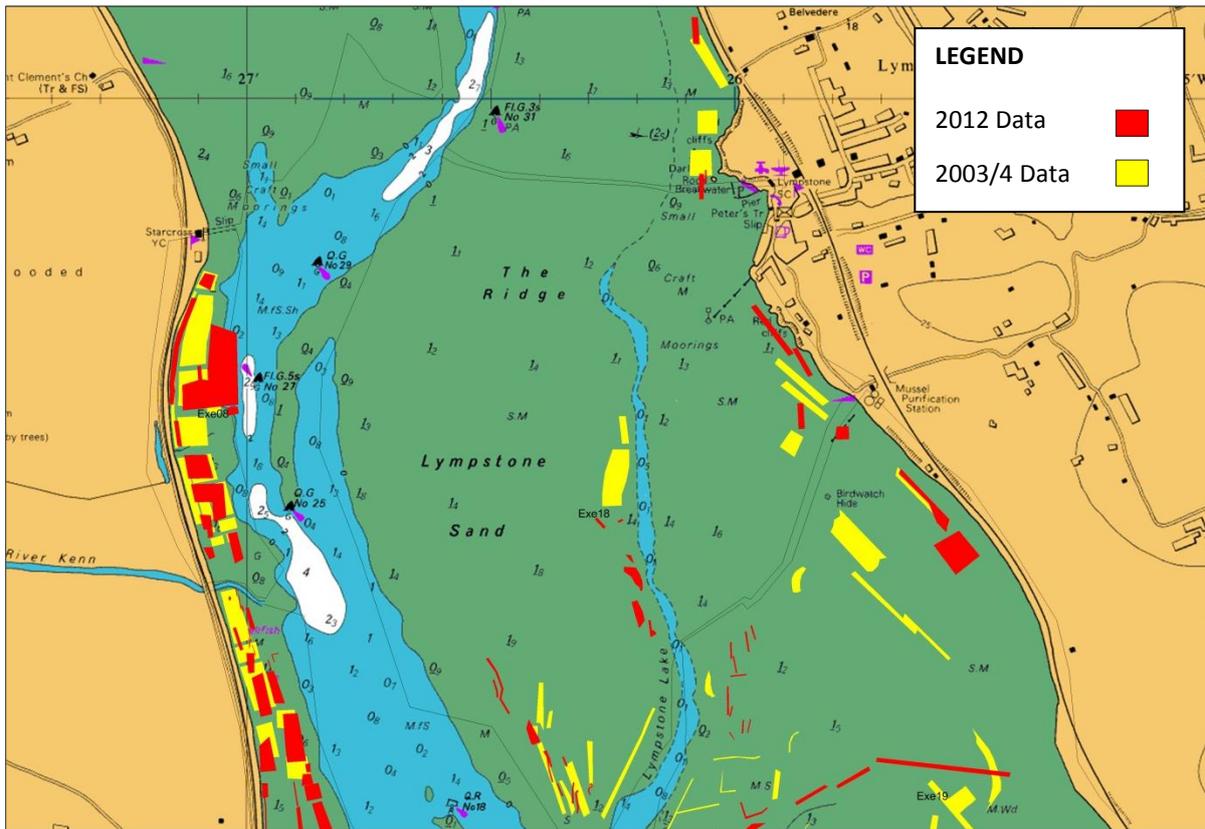


Figure 4.8: Comparison of 2012 and 2003/4 Crab Tile Areas (Mid Estuary)

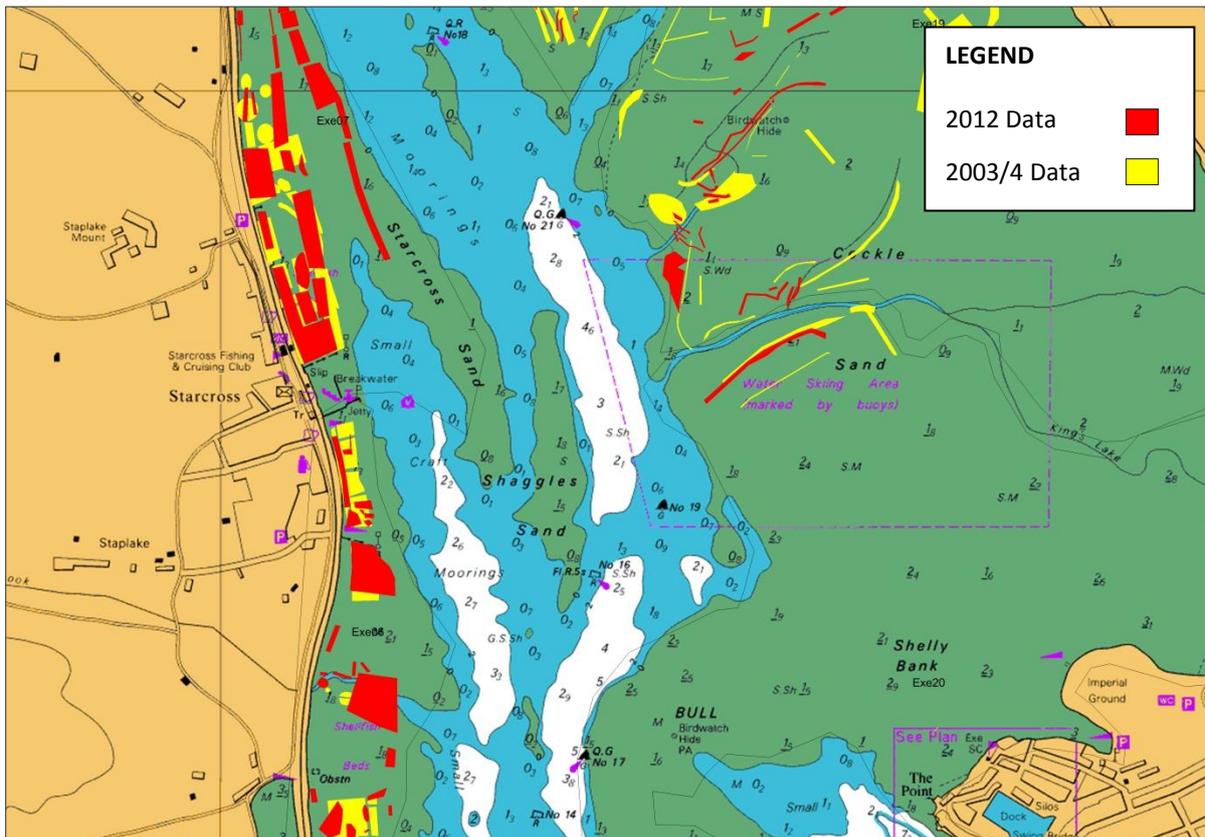


Figure 4.9: Comparison of 2012 and 2003/4 Crab Tile Areas (Lower Estuary)

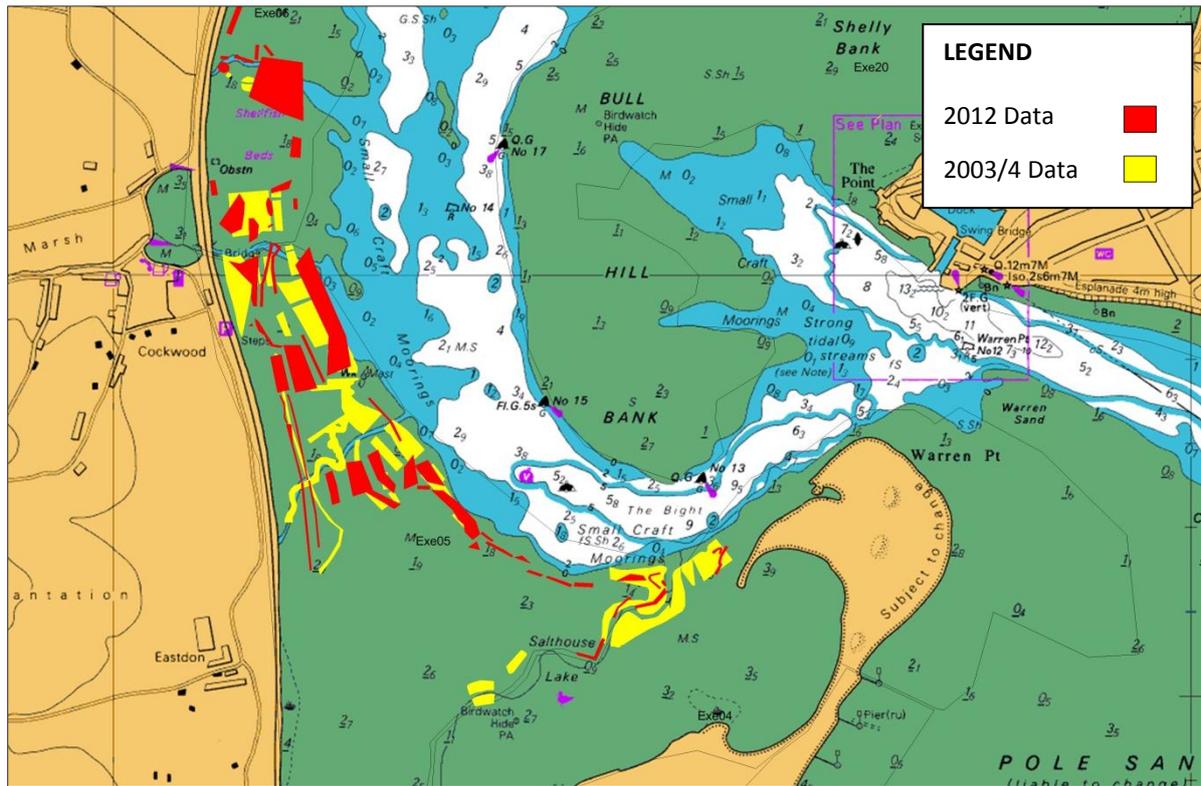
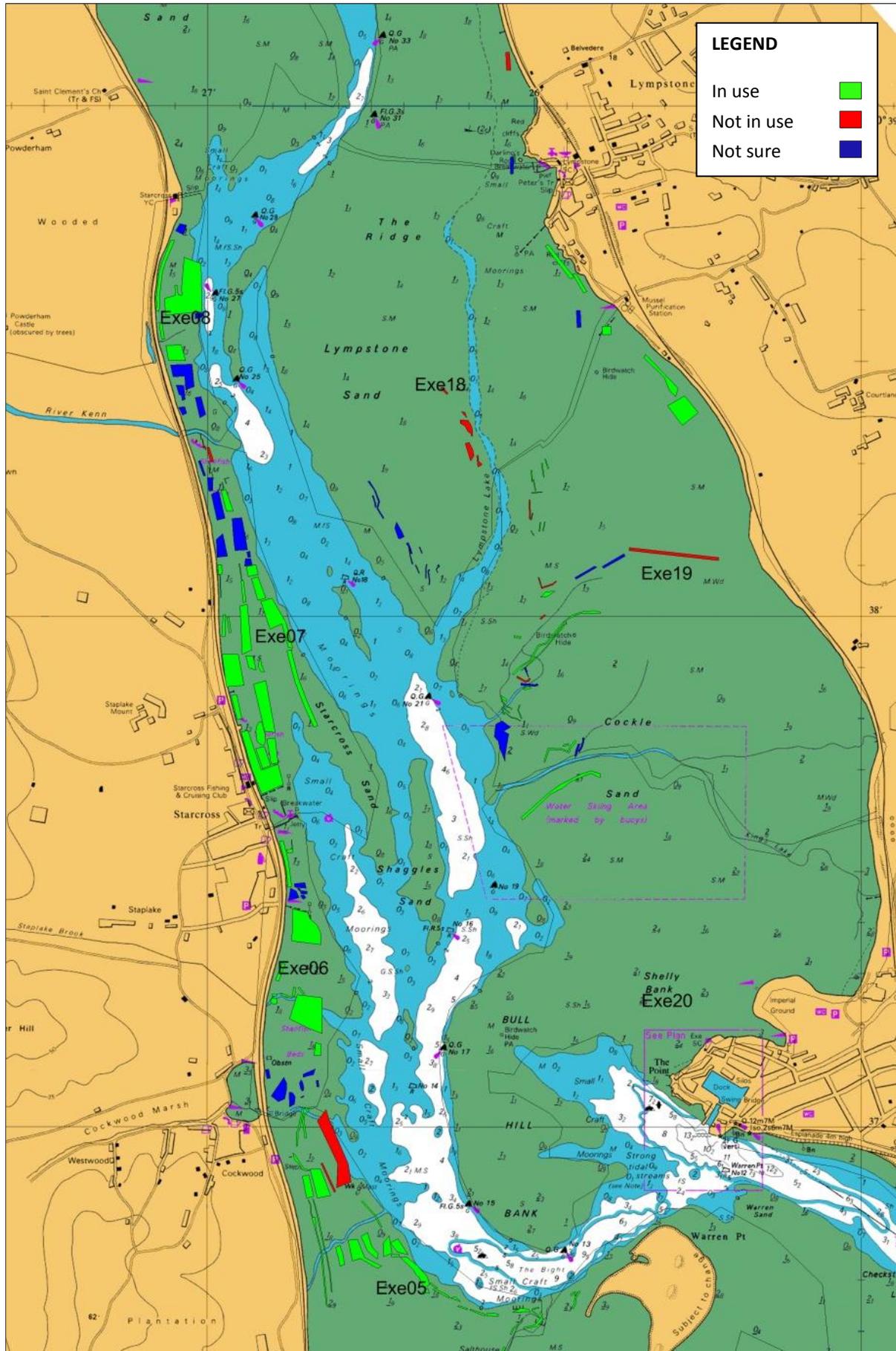


Figure 4.10: Crab Tile Usage on the Exe Estuary



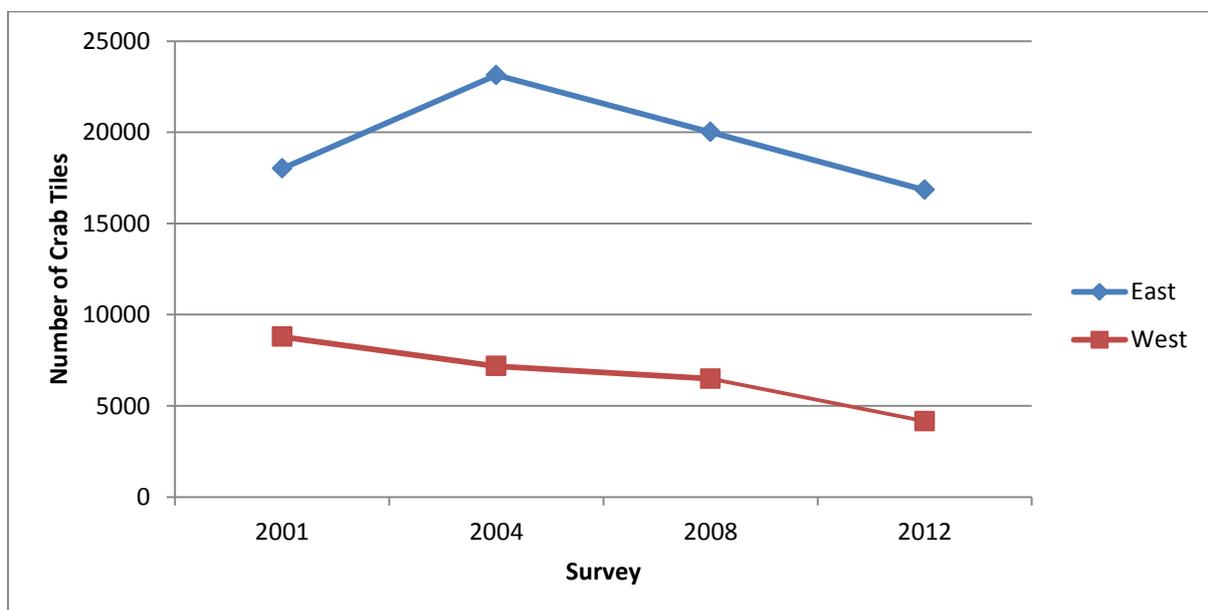
**5. DISCUSSION**

The number of crab tiles on the Exe appears to have declined by a similar order of magnitude between 2008 – 2012 (5491 tiles) and 2003/4 – 2008 (3814 tiles), with a decrease in 2012 numbers in comparison to the baseline dataset (2000/1). Crab tiles were restricted to areas permitted by Devon SFC Byelaw 24, and the results suggest that the voluntary code of conduct continues to be adhered to. Territorial consensus between crab tilers, and the carrying capacity of the fishery are likely to have contributed to the success of the code. The majority of the crab tiles observed appeared to be in use, with a few areas appearing to have been abandoned and in the process of being buried by sediment.

It should be noted that although every effort was made to ensure accuracy, various factors may have contributed to slight discrepancies in numbers of crab tiles recorded. The survey made use of a wide range of volunteers, who may have estimated numbers differently, and who were required to use personal objectivity to determine whether crab tiles were still in use. Tiles may also have been inaccurately estimated due to having sunk into the sediment, or having been mistaken for rocks in areas of mixed sediment. The difficult nature of the survey, due to tidal regimes and hazardous sediments in the upper estuary, may have caused some small areas of crab tiles to be overlooked.

In previous surveys, variation has been noted in the number of crab tiles found within specific areas, as they are periodically moved to increase productivity. These minor redistributions have made little difference to the overriding trend, which for the past two surveys has shown approximately three times as many crab tiles on the eastern shore in comparison to the western shore. This distribution may be due to prey availability and increased accessibility in the vicinity of Cockwood and Starcross. The 2003/4 survey showed a distinct increase in tiles on the eastern shore, corresponding to a slight decrease on the western side, however no such pattern was observed in either the 2008 or present survey. A relatively even decrease on both the eastern and western shores since 2008 is shown in Figure 4.1.

**Figure 4.1: Comparative Crab Tile Distributions on the Eastern and Western Shores**



A decrease in the number of crab tiles has been observed in all areas of the estuary since the 2008 survey, with the exception of EXE07 on the eastern side, which recorded an increase of 1025 tiles. This increase may reflect movement of tiles from adjacent areas EXE06 and EXE08 which displayed decreases by similar amounts (see Table 3.2).

The cause of the general decline in the number of crab tiles is unknown, although it is likely that tilers have ceased fishing their tiles and allowed them to become buried by sediment. The 2008 survey report notes a decrease in tiles from Cockwood to Powderham, which concurred with anecdotal interview evidence that several tilers had stopped maintaining their tiles. Although digitised crab tile areas are subject to a certain degree of error, significant area shrinkage may be observed when layers from 2012 and 2003/4 are overlaid, particularly in the vicinity of Cockwood (Figure 3.7 – 3.9). It is possible that changes to shore crab populations have resulted in crab tilers decreasing numbers of harvested crab tiles to maximise yield per unit effort, however this is unconfirmed. Alterations in recreational angling habits may also have affected demand. Further information would be necessary to clarify the reasons for the decline. The continued success of the voluntary code of conduct is evident from the results, and although a degree of underestimation may be present in the data, it is highly unlikely that this would be large enough to indicate an increase in overall tile number.

## 6. SUGGESTIONS FOR FUTURE WORK

As part of the ongoing management plan for the fishery a regular assessment of the number of crab tiles is essential, however there is potential for the survey to be modified. Although effective and thorough, the current shore-visit methodology is expensive in terms of time and resources, due to the tidal nature of the environment, the size of the estuary and access difficulties. Crab tiles can generally be clearly seen and mapped from high resolution photographs; therefore the acquisition of recent photographic data at low-tide may be a cost-effective alternative to conducting the survey on foot. This approach will necessitate sacrificing data on crab tile material and epibiota, however this information may be considered less critical than accurate mapping of crab tile number and density.

## 7. ACKNOWLEDGEMENTS

Devon and Severn IFCA would like to thank the following organisations for their efforts in providing data, logistical and field assistance for this project; Exe Estuary Management Partnership, Natural England, Devon Wildlife Trust, and The Exmouth Mussel Company. Unaffiliated volunteers and Devon and Severn IFCA enforcement officers also provided invaluable assistance.

**8. APPENDICES**

**APPENDIX 1: Devon Wildlife Trust Survey Guidelines**



**Guidelines for Crab Tile Survey**

These guidelines provide additional information to help clarify sections of the survey form.

**Use one survey form per site.**

**Temporary Site Number –**

Put OS map number found on top right of map, plus both surveyors initials and the number of the site you are about to survey. Mark the position of this site on the OS Map with same reference number.

Example **Map 7/KM/AO/01** if it is the first site, **Map 7/KM/AO/02** if the second and so on.

Then add the number of crab tiles found at the site in a circle, next to the reference number.

Example **Map 7/KM/AO/01** 250

**Grid Reference of Site –**

Refer to OS National Grid instruction sheet in volunteer pack.

**Site Description –**

Physical description of site to include;

Sediment, is there a gradient (pebbles, coarse to fine sediment) from high shore to low shore

Presence/absence of water channels in mudflats

Presence /absence of vegetation on mudflats (other than that growing on crab tiles)

Proximity of site to non-mudflat intertidal habitat eg rocky or sandy foreshore, saltmarsh and any manmade development eg jetty, slipway, groynes, embankment.

*GRADIENT OF FORE SHORE .*

**Spacing of Tiles -**

1 : less than 15 cms apart

2 : 15 – 30 cms

3 : 30 cms - 1metre

4 : 1 – 1.5 metres

5 : greater than 1.5 metres

6 : *RANDOM .*

*DESCRIBE ROW DISTANCES .*

**Sediment Type -**

This will be a fairly subjective assessment, but it is likely that you will be able to differentiate between very fine, silty sediment and coarse, sandier sediment. The on-site training will provide an opportunity assess different sediments.



The following is a guide –

Pebble	= more than 4.0mm across
Granular	= 2.0 – 4.0mm
Very coarse sand	= 1.0 – 2.0mm
Coarse sand	= 0.5 – 1.0mm
Medium sand	= 0.25 – 0.5mm
Fine sand	= 0.13 – 0.25mm
Very fine sand	= 0.063 – 0.13mm
Silt	= 0.002 – 0.13mm
Clay	= less than 0.002mm

### Shore Position -

This relates to distance from waters edge, therefore low corresponds to tiles which are close to waters edge, and high corresponds to tiles positioned furthest away from the water. In some instances the crab tiles may extend from low shore up to high shore, tick all three boxes in these cases.

### Tiles in Use -

When tiles are in use the crab tilers regularly service the traps by removing mud or other material to ensure the crab has easy access to the interior. While this can only be a subjective assessment, it may be possible to determine whether or not the tiles are in use by checking for such signs. Another indication of tiles being in current usage is if the mud around the tiles shows signs of recent trampling.

### Epiflora and Fauna on Tiles –

Coverage – a subjective assessment of extent of growth of flora/fauna on the crab tiles.

### Orientation of Tiles - *Close of Tiles?*

I think this section is self-explanatory, but just in case!

NOTE - PAT FORMS.

Flat - corresponds to tiles which are laid flat on the mud.

45° – corresponds to tiles projecting out of the mud at approximately this angle.

Upright – where tiles are projecting vertically out of the mud.

### Ease of Public Access -

Accessibility to crab tile site –

Vehicular access

Limited / restricted vehicular access

Public footpath / track



Ladders / steps / slipways

If site is only accessible by boat, state here.

**Potential Conflicts -**

We are looking for information regarding any potential or actual conflicts the crab tiles may have with other estuary uses and users.

These include proximity to

Boat moorings

Shellfisheries

Waterski, jetski, canoeing, sailing activities

Feeding waders and wildfowl

Bait digging

COMMERCIAL - U - RECREATION  
VISUAL IMPACT,  
EEL GRASS BEDS,  
SAFETY OF OTHER USERS

**Sketch Map of Site -**

It is important here to orientate the site, please mark North with an arrow.

Sketch the distribution and pattern of tiles and include an approximate scale in metres, so we know the size of the site.

Each site should be identifiable by

Geographical demarcation

and

Pattern of crab tiles:- e.g.

Linear – in line with estuary or lined up along smaller channels in the mudflats

Random – no particular spacing, or linear regime

Include

Areas outside the crab tile site which may be potential areas for expansion, and any reasons why expansion hasn't happened e.g. accessibility, area used for another purpose, mud may be too treacherous.

Areas outside the crab tile site unsuitable for expansion e.g. shingle beach.

Also include other features such as:-

Landmarks

Proximity to jetties

Slipways

Footpaths

Water channels

In other words, a graphical description of what you observe at the site.



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Note : if a crab tile site extends beyond the black demarcation lines on the OS Map, complete a survey form as usual but include the demarcation line in the sketch map and a note to say the site continues onto adjacent map area.  
(See sample sketch map)

**List of Spring tide dates**

**July 1<sup>st</sup> 2<sup>nd</sup> 3<sup>rd</sup> 4<sup>th</sup> and 5<sup>th</sup>**

**July 31<sup>st</sup>**

**August 1<sup>st</sup> 2<sup>nd</sup> 3<sup>rd</sup> 4<sup>th</sup> and 5<sup>th</sup>**

**August 29<sup>th</sup> 30<sup>th</sup> and 31<sup>st</sup>**

**September 1<sup>st</sup> and 2<sup>nd</sup>**

**Thank you for taking part in this survey, the data you collect will be a valuable contribution to an initiative which aims to assess the extent of crab tiling activity in all of Devon's estuaries.**

**APPENDIX 2: Survey Form**

<p><b>FOR OFFICE USE ONLY</b>                  Site No:                  Checked by EO <input type="checkbox"/>                  Checked by DBRC <input type="checkbox"/>                  Tide Times:                  MLW am                      pm                  MHW am                      pm</p>	<p><b>CRAB TILE SURVEY FORM</b></p>			
<p><b>DATE OF SURVEY:</b>  <b>START TIME AT THIS SITE:</b>  <b>FINISH TIME AT THIS SITE:</b>  <b>AMOUNT OF TIME AT THIS SITE:</b></p>	<p><b>ESTUARY:</b>                  TEMP. SITE No:                  GRID REF OF SITE:                  * Please mark location of site on copy of OS map                  (See guidance notes)</p>			
<p><b>SURVEYOR NAME/S:</b></p>	<p><b>CONTACT PHONE No:</b></p>			
<p><b>SITE DESCRIPTION:</b>                  (See guidance notes)</p>				
<p><b>NAME &amp; ADDRESS OF CRAB TILER (If known):</b></p>				
<p><b>NUMBER OF TILES:</b></p>	<p><b>SPACING OF TILES: (1-5 scale):</b>                  (See guidance notes)</p>			
<p><b>SEDIMENT TYPE:</b>                  FINE <input type="checkbox"/>                  MEDIUM <input type="checkbox"/>                  COARSE <input type="checkbox"/>                  OTHER <input type="checkbox"/>                  (Please specify)</p>	<p><b>SHORE POSITION: (See guidance notes)</b>                  HIGH <input type="checkbox"/>                  MEDIUM <input type="checkbox"/>                  LOW <input type="checkbox"/></p>	<p><b>TILES IN USE?</b>                  YES <input type="checkbox"/>                  NO <input type="checkbox"/>                  UNSURE <input type="checkbox"/>                  (See guidance notes)</p>		
<p><b>MATERIAL OF TILE:</b>                  PLASTIC PIPING <input type="checkbox"/>                  TERRACOTTA ROOF <input type="checkbox"/>                  TILE <input type="checkbox"/>                  TYRE <input type="checkbox"/>                  CORRUGATED IRON <input type="checkbox"/>                  CHIMNEY POT <input type="checkbox"/>                  OTHER <input type="checkbox"/>                  (Please specify)</p>	<p><b>EPIFLORA &amp; FAUNA ON TILES:</b>                  (See guidance notes)</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">                 SEAWEED <input type="checkbox"/>                  BARNACLES <input type="checkbox"/>                  NONE (Tiles clean) <input type="checkbox"/>                  OTHER <input type="checkbox"/>                  (Please specify)             </td> <td style="width: 50%; border: none;"> <p style="text-align: right;"><b>COVERAGE</b>                      1=slight 2=medium 3=dense</p> <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/>  <input type="checkbox"/> </td> </tr> </table>		SEAWEED <input type="checkbox"/> BARNACLES <input type="checkbox"/> NONE (Tiles clean) <input type="checkbox"/> OTHER <input type="checkbox"/> (Please specify)	<p style="text-align: right;"><b>COVERAGE</b>                      1=slight 2=medium 3=dense</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
SEAWEED <input type="checkbox"/> BARNACLES <input type="checkbox"/> NONE (Tiles clean) <input type="checkbox"/> OTHER <input type="checkbox"/> (Please specify)	<p style="text-align: right;"><b>COVERAGE</b>                      1=slight 2=medium 3=dense</p> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>			
<p><b>ORIENTATION OF TILES: (See guidance)</b>                  FLAT <input type="checkbox"/>                  45° <input type="checkbox"/>                  UPRIGHT <input type="checkbox"/></p>	<p><b>OTHER</b> <input type="checkbox"/>                  (please specify)</p>	<p><b>EASE OF PUBLIC ACCESS:</b> (See guidance notes)</p>		

**POTENTIAL CONFLICTS:** Please list here  
(See guidance notes)

**SKETCH MAP OF SITE:**  
(Please include distribution and pattern of tiles)  
(See guidance notes)

PLEASE RETURN FORM TO ESTUARY OFFICER BY ..... date

THANK YOU