



Eastern Inshore Fisheries and Conservation Authority

# **North Norfolk Coast Habitat Mapping Report 2018-2019**



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## **Abstract**

Over the last three years Eastern Inshore Fisheries and Conservation Authority (EIFCA) have completed six habitat mapping surveys along the North Norfolk Coast. These surveys had the aim of identifying and classifying areas of differing seabed type in order to produce a habitat map of the area and inform current and future fishery management decisions. Broadscale area characterisation was achieved using side scan sonar and ground truthing data collected from footage obtained from seabed video surveys. Data was subsequently processed and analysed, and a habitat map produced for the survey area. The resulting habitat map indicates an area made up of predominantly mixed sediment and sand and muddy sand habitats. A large area of mixed sediment stretches across the top of the survey area, with smaller patches closer to shore. An area of stony reef habitat inshore off Salthouse (near Blakeney) was also identified. The findings provide us with higher confidence habitat data within the survey area and support the spatial restrictions that have been proposed along the North Norfolk Coast to protect vulnerable mixed sediment habitats within The Wash and North Norfolk Coast SAC.

# 1 Introduction

## 1.1 Background

Following the revised approach to the management of commercial fisheries in European Marine Sites announced by DEFRA in 2012, all UK commercial fisheries must be managed in line with Article 6 of the Habitats Directive. This required all existing and potential commercial fishing activities to be assessed using an evidence based, risk prioritised approach, to identify whether there is the potential for an activity to have adverse impacts on specific marine features and species within European Marine Sites and is achieved by completing a Habitats Regulations Assessment (HRA).

EIFCA recently completed an HRA for The Wash and North Norfolk Coast Special Area of Conservation (SAC) shrimp fishery (EIFCA, 2018). This assessment concluded that for sediment types: *A5.3 Subtidal mud* and *A5.4 Subtidal mixed sediment* (EUNIS level 3 classification), the potential for the fishery to have adverse effects on these features could not be ruled out. For the fishery to continue mitigation has been put in place with the aim of removing this potential for adverse effect on site integrity. Mitigation was applied to the fishery in the form of:

- Spatial restrictions on the use of towed fishing gear;
- Technical restrictions on the type of fishing gear; and
- Overall effort limitation in the shrimp beam trawl fishery

Within The Wash and North Norfolk Coast SAC spatial restrictions were applied based on habitat type and its sensitivity to disturbance from shrimp beam trawling. Over the last decade EIFCA have conducted numerous habitat mapping surveys in The Wash, achieving high coverage of the area and providing an abundance of data on the distribution of habitats. This enabled spatial closures to be introduced at a high resolution with confidence, protecting vulnerable habitats whilst enabling the fishery in areas of tolerant habitat, and ensuring site integrity is not compromised. EIFCA have never conducted habitat mapping surveys along the North Norfolk Coast so this same level of confidence in the distribution of habitats does not exist. Therefore, when assessing the fishery and determining appropriate management, feature extent data provided by Natural England has been relied upon. However, whilst the data provides us with detailed information about habitats in the area, it is considered low confidence data<sup>1</sup>. To account for the uncertainty surrounding this data a more precautionary approach to management was required and has led to the proposed introduction of a large spatial restriction to towed demersal gears<sup>2</sup>, prohibiting fishing activity from a significant area along the North Norfolk Coast (Figure 1).

Furthermore, previous experience of classifying mixed sediment (EUNIS A5.4) in The Wash, has identified two different types of habitat that come under this designation.

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<sup>1</sup> Natural England feature extent data for the North Norfolk Coast is considered with caution because it is largely taken from publications over 20 years old.

<sup>2</sup> The Marine Protected Areas Byelaw 2018 has been proposed by EIFCA and is currently awaiting sign off by Defra Secretary of State

EIFCA describe these two types of mixed sediment as: Type A<sup>3</sup> and Type B<sup>4</sup>, with Type A consisting of a larger proportion of pebbles and cobbles and supporting larger and more attached fauna compared to Type B. The HRA for the shrimp fishery concluded that whilst Type A mixed sediment was vulnerable to damage from the fishery, Type B mixed sediment could sustain fishing activity at current levels and did not require any further protection. It is unknown whether both sediment types also exist along the North Norfolk Coast, so when assessing habitats in this area it is important to distinguish between the two.

## 1.2 Aims and Objectives

The habitat mapping surveys completed over the last three years had the aim of improving our knowledge of the distribution of habitats along the North Norfolk Coast and producing a habitat map for the area. By doing this it was hoped that the confidence in the available habitat data would be increased, allowing management to be less precautionary and ensuring proposed seabed closures to bottom towed gear, as a protection measure for designated species and habitats, are appropriate. To achieve this the following objectives were set:

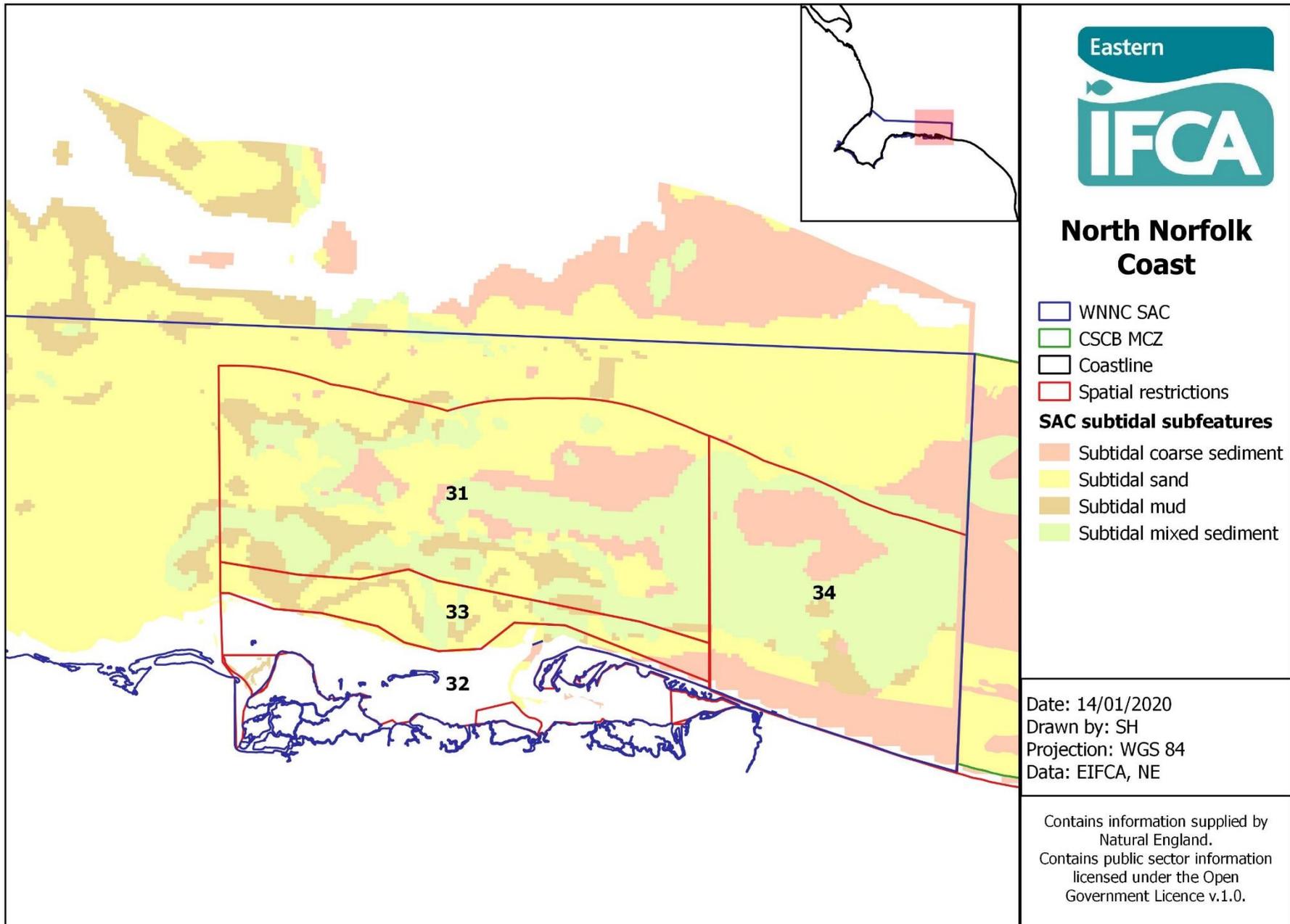
- Conduct side scan surveys for broad scale area characterisation across the survey area;
- Conduct video surveys to provide ground truthing data;
- Process and spatially analyse the data collected from surveys and produce a broad scale biotope map of habitats within the surveyed area;
- Identify whether mixed sediment identified is Type A or Type B;
- Report on the outcomes of surveys and put forward any resulting management recommendations.

The outcomes of the surveys and this report will also inform future fishery management decisions.

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<sup>3</sup> Type A mixed sediment is considered a sediment type composed of poorly sorted, angular, relatively sharp edged large gravel / pebbles, with the inclusion of finer material including some fine sand / mud. This type of mixed sediment is found in the deeper, and therefore more sheltered, central sections of The Wash, and can support populations of both mobile and attached epifauna.

<sup>4</sup> Type B mixed sediment is generally found in shallower areas which are subject to more wave and tidal movement. The gravel fraction in these (if present) is smaller, often smoothed off by constant movement. In many instances, the “larger particle” fraction which drives the classification from muddy sand or mud to mixed sediment is made up of a relatively thin surface layer of broken shell. There is little attached epifauna associated with this type of mixed sediment, and the fauna overall is more impoverished than that associated with the deeper more stable mixed sediment habitat.



**Figure 1:** Chart showing the proposed spatial restrictions to towed demersal gears under the Marine Protected Areas Byelaw 2018 to protect vulnerable subtidal mud and mixed sediments within The Wash and North Norfolk Coast SAC (WNNC SAC). The proposed closure encompasses an existing closure (Area 34) that restricts towed demersal gears (Byelaw 12) and a narrow corridor open to the fishery between October and April (Area 33).

## 2 Methods

### 2.1 Broad scale area characterisation

Habitat mapping surveys were carried out from EIFCA fisheries patrol vessel “FPV *Sebastian Terelink*” during 2017, 2018 and 2019. Initially, broad scale characterisation of the area along the North Norfolk Coast was achieved using an Edgetech 4200 side scan sonar system, operating at dual frequencies of 300 and 600 KHz. With the timeframes and resources available it was not possible to get full coverage of the whole site, instead lines were initially surveyed at distances apart of c. 1.5km, with further lines in between these surveyed with the remaining time available. A total of nine side scan survey lines were completed (Figure 2). The positioning of lines were planned at an angle aligning them with depth contours and tidal flow. As can be seen from the side scan backscatter mosaics (Figure 2), surveys lines were not always straight, this was because of the large number of buoys in the area (particularly inshore) that had to be avoided, resulting in the vessel having to go of course slightly. The ability to survey close to the shore was limited by shallower waters which the side scan towfish cannot be deployed in.

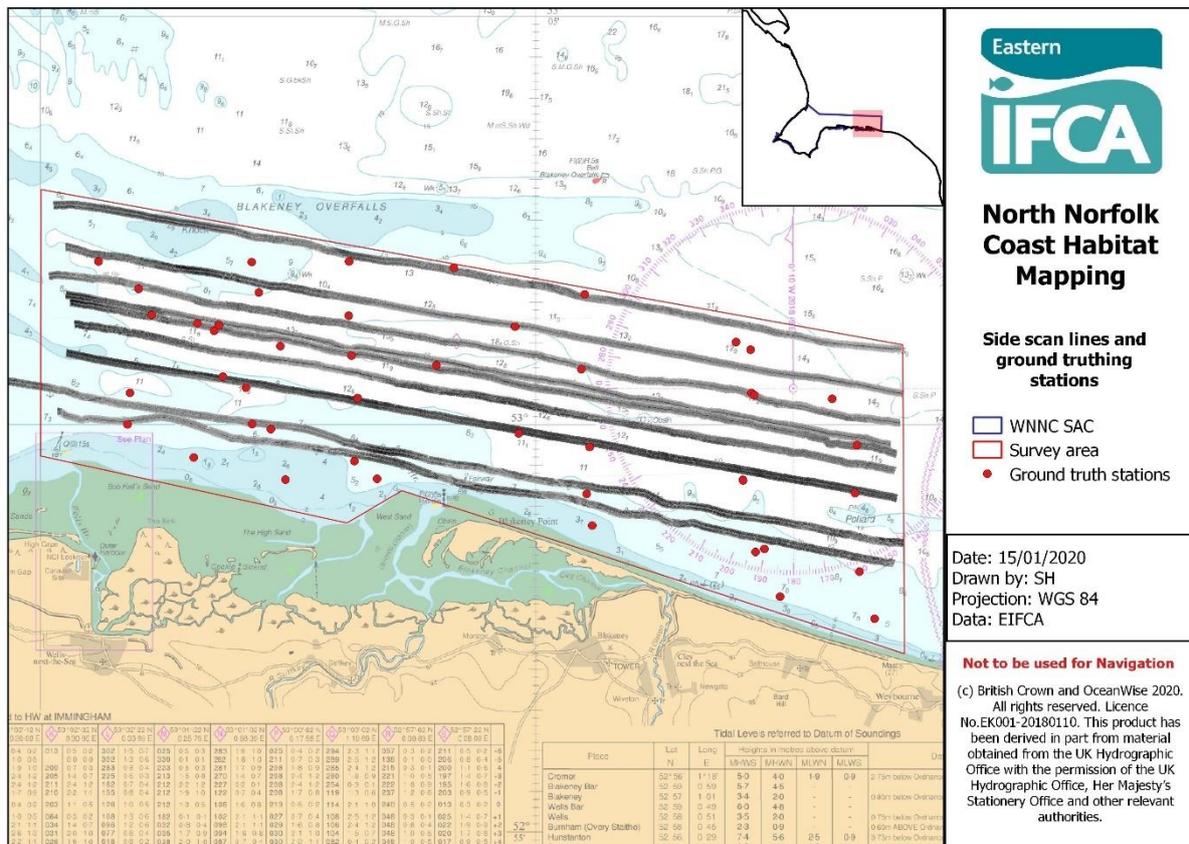
The side scan data was collected using the software package “Discover”, bundled with the side scan equipment. The lower frequency (300 KHz) data was then processed in “Perspective” to produce geo-referenced mosaic TIFF files, which were imported into GIS tools for examination (Figure 2) and comparison with ground truth data. The lower frequency data was used as it generally gave a clearer image compared to the higher frequency output.

### 2.2 Ground truthing surveys

Ground truthing surveys involved collecting video footage using a drop-down camera system across a total of 46 stations within the study area. Survey stations were determined in a semi structured manner (Figure 2). Initially stations were positioned along four N-S lines spaced at equal distances and crossing the side scan lines. After this initial survey further stations were identified based on gaps and areas of interest identified from the side scan mosaics. Appendix 1 provides a chart detailing all the ground truth stations labelled with station numbers.

At each ground truth station the drop-down video camera was deployed and lowered to the seabed. The location of each station was recorded by taking a waypoint using a *Garmin ETrex 10* handheld GPS and the time that each sample was collected was recorded in Coordinated Universal Time (UTC). The camera array included a camera frame bearing a video camera feeding live images back to the surface, a remotely controllable light, red lasers (set at 20 cm apart) and a *GoPro 3 Hero Black* camera recording HD video. This system could move over the seabed to some extent as dictated by the wind and tide acting on both the survey vessel and the rig itself. In this way, more seabed was covered than would be the case with a simple drop, however it meant that the total area covered could not be quantified. The low-definition video

camera feeding the live image was used only as an aiming camera, while the video footage used for further analysis was collected by the high-definition GoPro camera.



**Figure 2:** Chart showing the 9 side scan lines and 46 ground truthing stations completed across the 6 habitat mapping surveys in 2017, 2018 and 2019. The survey area is outlined in red, side scan lines are presented as geo-referenced mosaics and ground truth stations as red points.

### 2.3 Data processing

Video files recorded by the GoPro cameras were examined using the *Kinovea* software. A general description of the seabed was recorded, including descriptions of sediment and notable fauna. Initially an assessment of abundance of fauna using the SACFOR scale was also attempted, however, after discussions regarding the suitability of this method of assessment in a non-quantitative manner it was decided that a qualitative description was more appropriate<sup>5</sup>. A EUNIS level three classification (Table 1) was ascribed based on the seabed description. Still images typical of the video footage were extracted using *Kinovea*. *Sabellaria spinulosa* was not observed in any of the video footage so assessments of reefiness were not required.

Once the side-scan and ground truthing survey data had been collated and processed, the data was spatially mapped using QGIS (v.2.18.11) and used to estimate broad-scale marine biotopes using the EUNIS classification system (Table 1). Larger area polygons were allocated by extending the EUNIS classification of the individual

<sup>5</sup> SACFOR is designed to be used to provide a quantitative assessment of abundance based on a known area. The area observed could not be quantified from video footage for these surveys.

stations to areas showing similar backscatter characteristics from the side scan results. Where there were gaps in the side scan mosaics, lines were extended from the two lines either side to provide the best estimate of habitat boundaries based on the available data.

**Table 1:** Description of EUNIS classifications with standardised colours

EUNIS Code Level		Description	Standardised colour
2	3		
<b>Circalittoral rock and other hard substrata</b>			
<b>A4</b>	A4.1	Atlantic & Mediterranean high energy circalittoral rock	
	A4.2	Atlantic & Mediterranean moderate energy circalittoral rock	
	A4.3	Atlantic & Mediterranean low energy circalittoral rock	
	A4.7	Features of circalittoral rock	
<b>Sublittoral sediment</b>			
<b>A5</b>	A5.1	Sublittoral coarse sediment	
	A5.2	Sublittoral sand	
	A5.3	Sublittoral mud	
	A5.4	Sublittoral mixed sediments	
	A5.5	Sublittoral macro-phyte dominated sediment	
	A5.6	Sublittoral biogenic reefs	
	A5.7	Features of sublittoral sediments	

### 3 Results

A total of six habitat mapping surveys were completed along the North Norfolk Coast between 2017 and 2019, three side scan surveys and three ground truth surveys (Table 2). A summary sheet for each ground truthing station can be found in Appendix 2 and the transcribed raw data for ground truthing surveys, is included as Appendix 3.

**Table 2:** Summary of the habitat mapping surveys conducted by EIFCA during 2017 and 2018 and the corresponding areas within The Wash (SS = side scan, GT = ground truth, DDV = drop-down video).

Date	Area	MPA	Survey Type
2018-07-31	NNC	WNNC SAC	SS
2018-07-31	NNC	WNNC SAC	GT - DDV
2018-08-21	NNC	WNNC SAC	SS
2018-08-22	NNC	WNNC SAC	SS
2018-10-18	NNC	WNNC SAC	GT - DDV
2019-08-27	NNC	WNNC SAC	GT - DDV

#### 3.1 Site report

Mosaics of the side scan survey acoustic imagery, station habitat classifications and assigned biotopes are presented in Figures 3, 4 and 5. Backscatter characteristics in the side scan mosaics clearly show two different seabed types occur across the survey area. These were areas of distinct sand waves and areas of flatter seabed (Table 3). Analysis of video footage identified three habitat types using the EUNIS classification system: the majority were identified as either: *A5.2 Subtidal sand and muddy sand* or *A5.4 Subtidal mixed sediment*, and only one station identified as *A4 Circalittoral rock and other hard substrata*. None of the ground truth stations were identified as *A5.1 Subtidal coarse sediment* or *A5.3 Subtidal mud*. Video imagery for stations classified as mixed sediment showed only Type A mixed sediment.

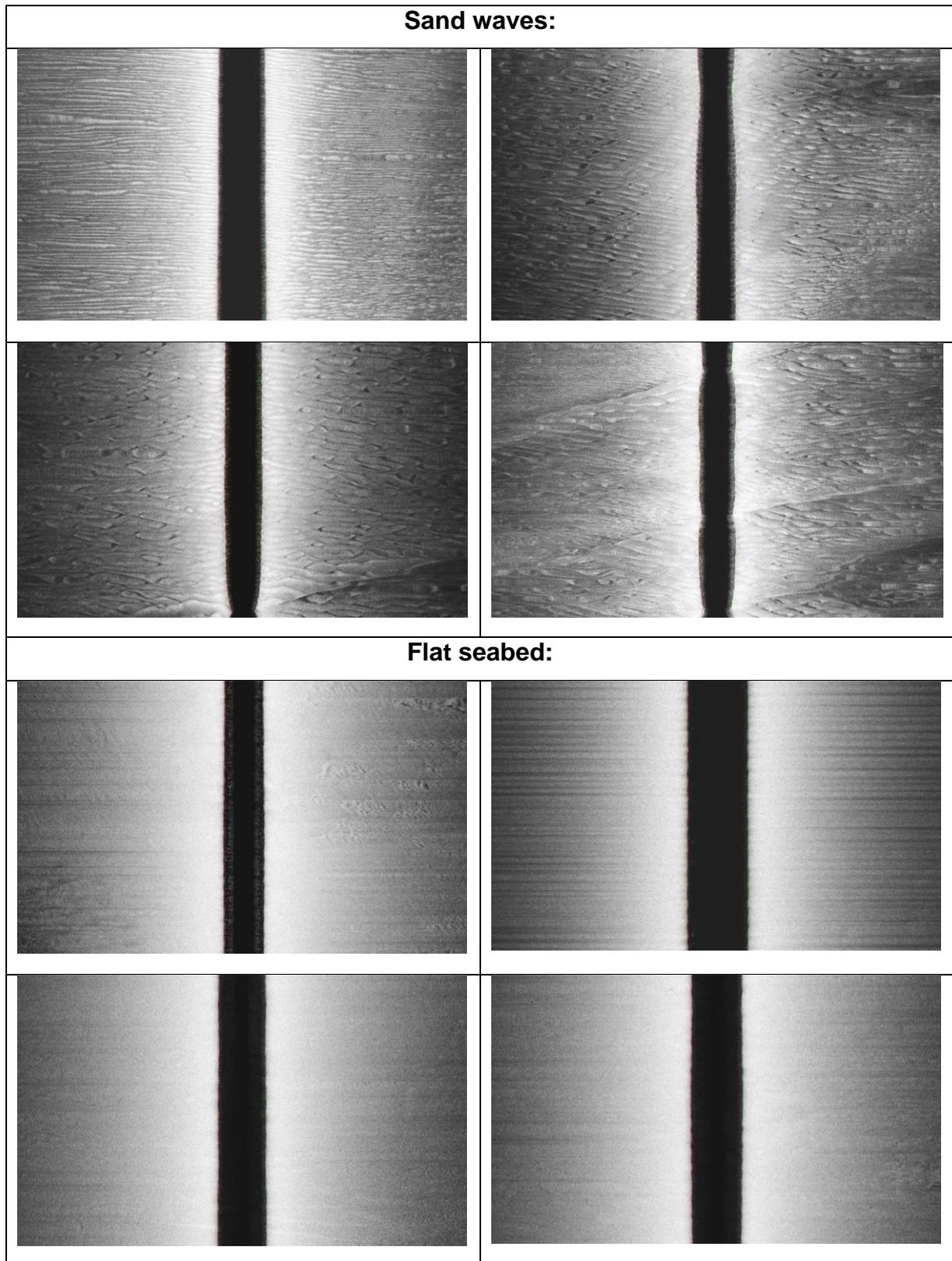
When comparing stations that overlapped with side scan mosaics, those with backscatter characteristics representing sand waves consistently overlapped with ground truth stations that were identified as *A5.2 Subtidal sand and muddy sand* (Figure 3). Similarly, those sections of mosaics with backscatter characteristics representing a flat seabed consistently overlapped with ground truth stations identified as *A5.4 Subtidal mixed sediment* (Figure 3). Changes in backscatter characteristics between the two seabed types were easily identified on mosaics meaning biotope boundaries could be drawn with confidence. However, where there were no side scan mosaics, boundaries were estimated based on surrounding ground truth stations and adjacent mosaics, thus, these areas have a lower confidence associated with them (Figure 4, Appendix 4).

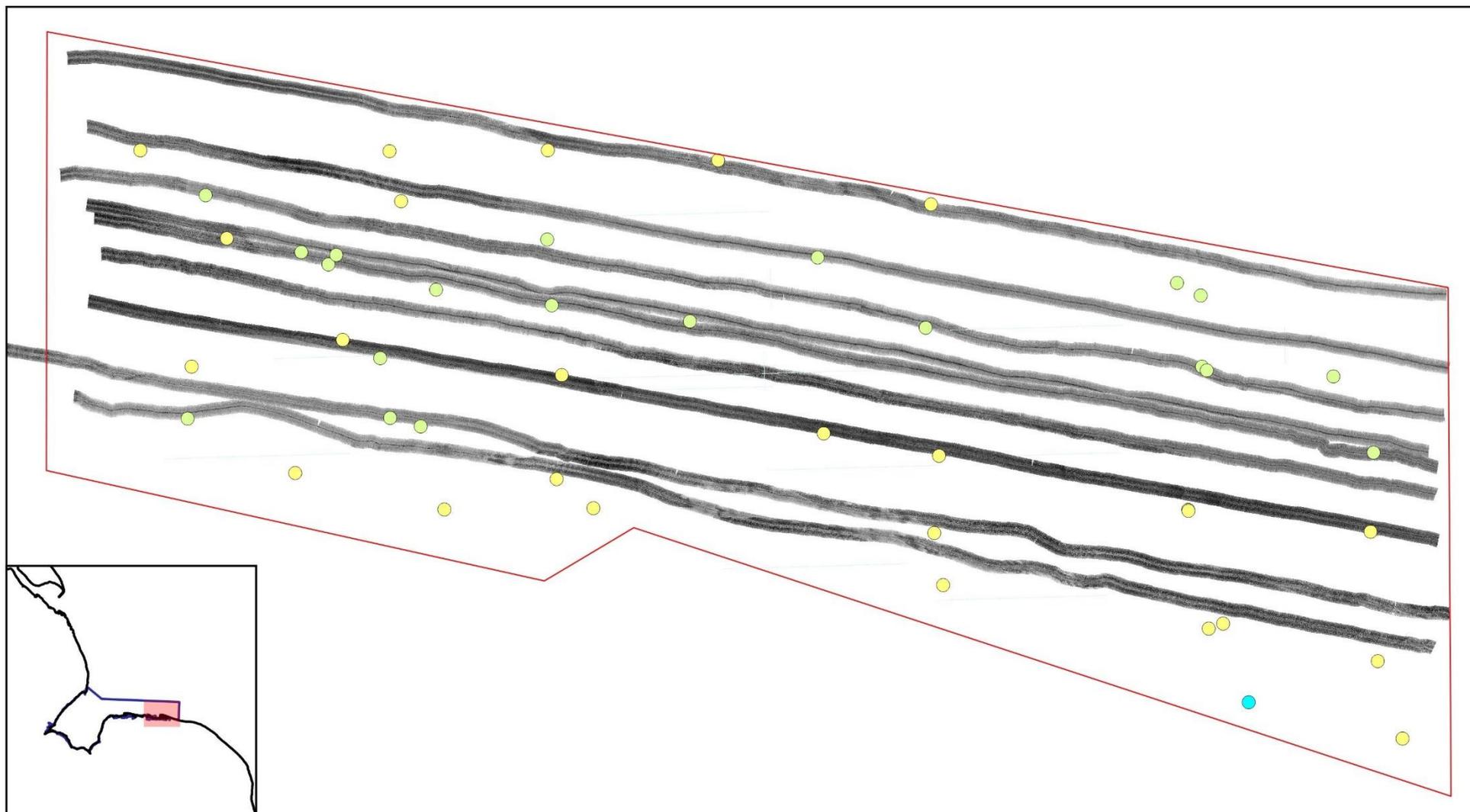
The station identified as *A4 Circalittoral rock and other hard substrata* did not overlap with any of the side scan mosaics. It was, therefore, not possible to draw a biotope around this point. However, as a sensitive habitat it is important to ensure that the presence of this habitat is detailed on the final biotope map (Figure 5).

Appendix 4 provides examples of how biotopes were assigned using the side scan mosaics and ground truthing imagery. Reference should be made to individual station data sheets (Appendix 1 and 2) and the associated transcribed data (Appendix 3) to better understand the result for each area.

The final biotope map (Figure 5) indicates around 50% - 60% of the area to be made up of sand and muddy sand sediments, with a large strip of mixed sediment going across the Northern half of the area and smaller patches of mixed sediment in the Southern half of the survey area. Sand and muddy sand sediments dominate close to shore with some hard substrate present inshore off Salthouse (near Blakeney).

**Table 3:** Examples of the two different seabed types identified from side scan acoustic imagery backscatter characteristics. Images have been processed in Triton perspective and viewed in SonarWave Lite.





Eastern



## North Norfolk Coast Habitat Mapping

Survey area

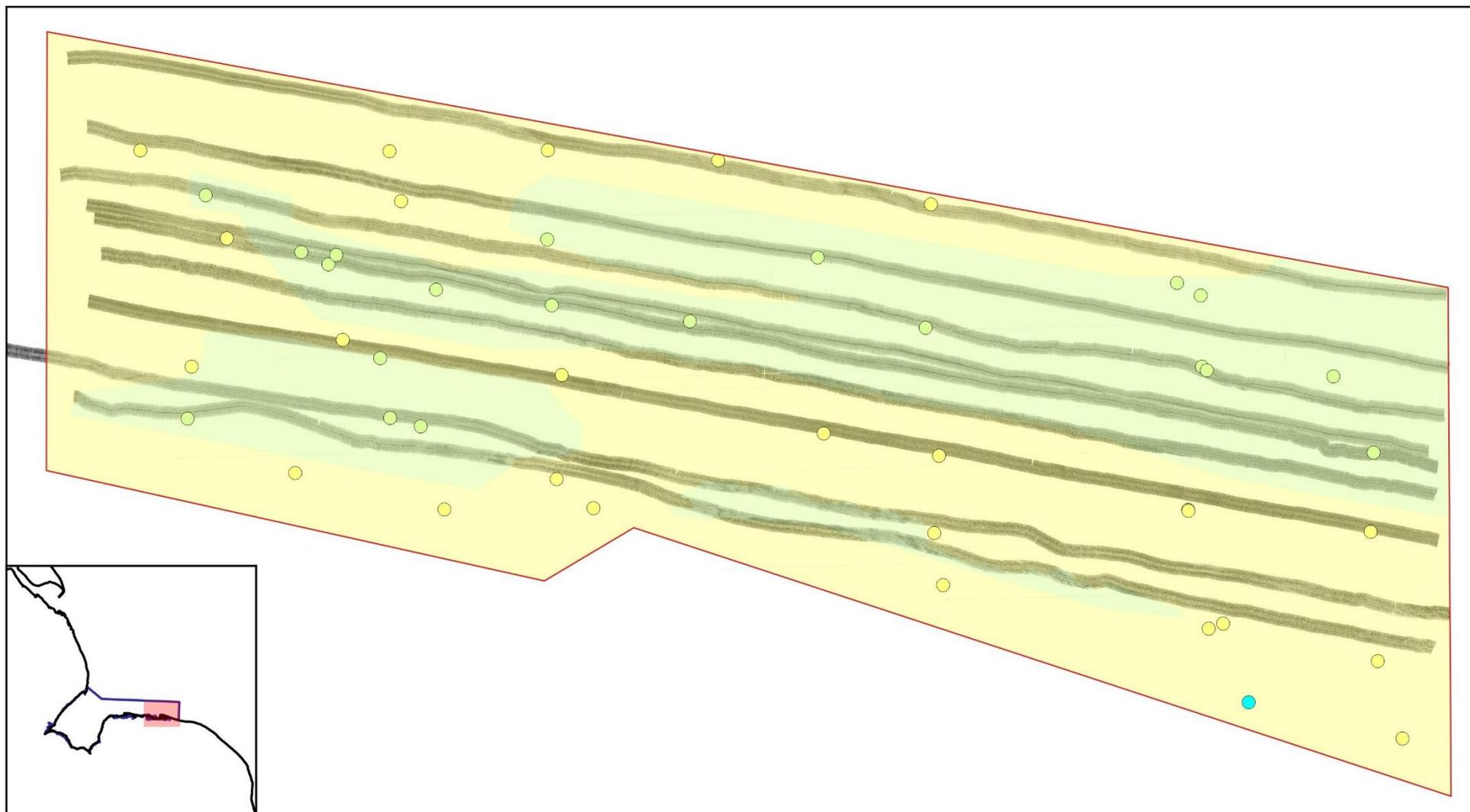
**Side scan mosaics  
and ground truthing  
stations**

**EUNIS habitat classification**

- A4 Circalittoral rock and other hard substrata
- A5.2 Sand and muddy sand
- A5.4 Mixed sediment

Date: 15/01/2020  
 Drawn by: SH  
 Projection: WGS 84  
 Data: EIFCA

**Figure 3:** Chart showing side scan mosaics and EUNIS classification (assessed by eye from video footage) given to each ground truth station.



## North Norfolk Coast Habitat Mapping

Date: 15/01/2020  
 Drawn by: SH  
 Projection: WGS 84  
 Data: EIFCA

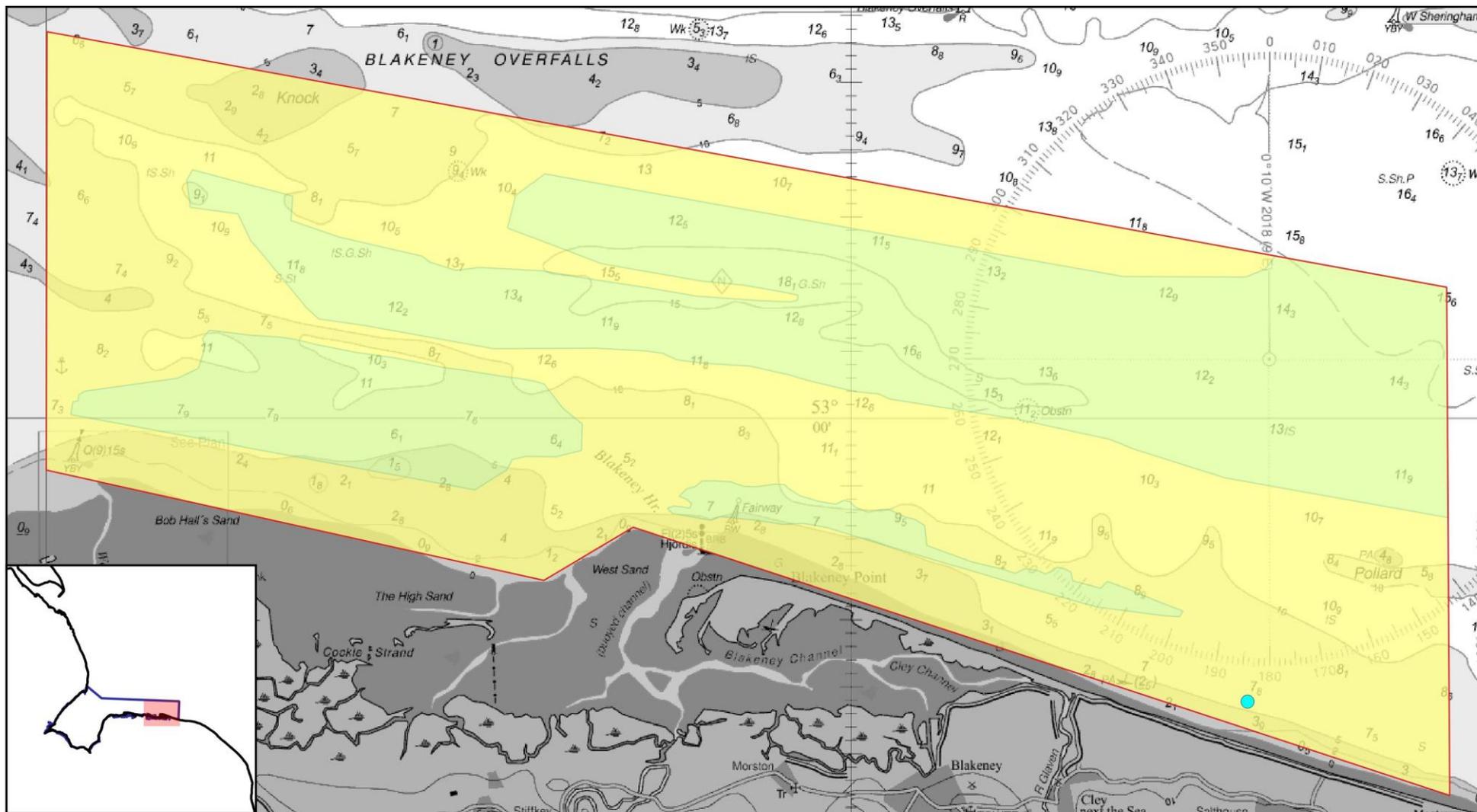
**Side scan mosaics  
and ground truthing  
stations**

Survey area

**EUNIS habitat classification**

Ground truth station	Assigned biotope
<span style="color: cyan;">●</span> A4	<span style="background-color: yellow; border: 1px solid black; display: inline-block; width: 15px; height: 10px; vertical-align: middle;"></span> A5.2
<span style="color: yellow;">●</span> A5.2	<span style="background-color: lightgreen; border: 1px solid black; display: inline-block; width: 15px; height: 10px; vertical-align: middle;"></span> A5.4
<span style="color: lightgreen;">●</span> A5.4	

**Figure 4:** Chart showing the habitat biotopes assigned within the survey areas based on assessment of side scan mosaics and ground truth stations.



	<h2>North Norfolk Coast Habitat Mapping</h2>		Date: 15/01/2020 Drawn by: SH Projection: WGS 84 Data: EIFCA	
	<b>Assigned biotopes</b>	 Survey area	<b>EUNIS habitat classification</b>	<b>Ground truth station Assigned biotope</b>
			 A4	 A5.2  A5.4

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**Figure 5:** Chart showing assigned biotopes overlaid onto admiralty chart.

## 4 Discussion

The habitat mapping surveys conducted have provided us with an improved knowledge of the habitat types present along the North Norfolk Coast and their extent and distribution across the survey area. This has increased the confidence we have in the habitat data available to us, reducing the uncertainty we had when assessing fishery impacts and applying mitigation in the form of spatial restrictions.

Comparison of our data with the feature extent data provided by Natural England (NE) (March 2019) shows large differences in the distribution of habitats (Figure 6). The NE extent data indicates a greater number of habitat types present in the survey area distributed in a patchier manner than those presented in this report. The confidence that we have in the data provided by the EIFCA surveys is much greater than that of the data provided by NE. Most of the data provided by Natural England has been sourced from publications that are over 20 years old (Foster-Smith and Sotheran, 1999), and in such a dynamic environment, habitat in this area is likely to have changed within this time frame. In addition to this, methods and technologies used to assess seabed habitats have vastly improved over the last 20 years. However, whilst the data collected in these surveys is of higher confidence, it is important to remember that full coverage of the area was not achieved and so the distribution of habitats may be patchier than presented in the final biotope map. Additionally, data has been collected over a period of three years, a timeframe in which habitats could have changed.

The NE data release indicates the presence of subtidal mud (A5.3) and subtidal coarse sediment (A.1) in addition to subtidal mixed and sand and muddy sand sediments. These sediment types were not identified in any of the data provided by the habitat mapping surveys conducted for this report. It can be hard to distinguish between subtidal mud and sand sediments using these methods if areas of flat sand are present. However, in these surveys areas of sand identified in both the videos and the side scan mosaics showed clear sand wave formations, increasing the confidence that this habitat type has been identified correctly. Stations: *20180731-00*, *20180731-021*, *20180731-022*, *20181019-003*, *20181019-021*, *20181019-022* and *20190827-113* provide examples of areas identified as mud in the NE data release, however, clearly show areas of sand in video footage from these surveys (see Appendix 1 and 2). Areas of flatter seabed (identified from the side scan mosaics) were consistently associated with video footage that showed the seabed to be dominated by mixed sediments, indicated by the presence of shells and pebbles in the sediment, attached and mobile epifauna and fines disturbed by the camera array when it touched the seabed. Therefore, there is high confidence that mud habitats were not observed during the surveys, however, because we were not able to get full coverage of the survey area we cannot be certain that no subtidal mud exists within the site.

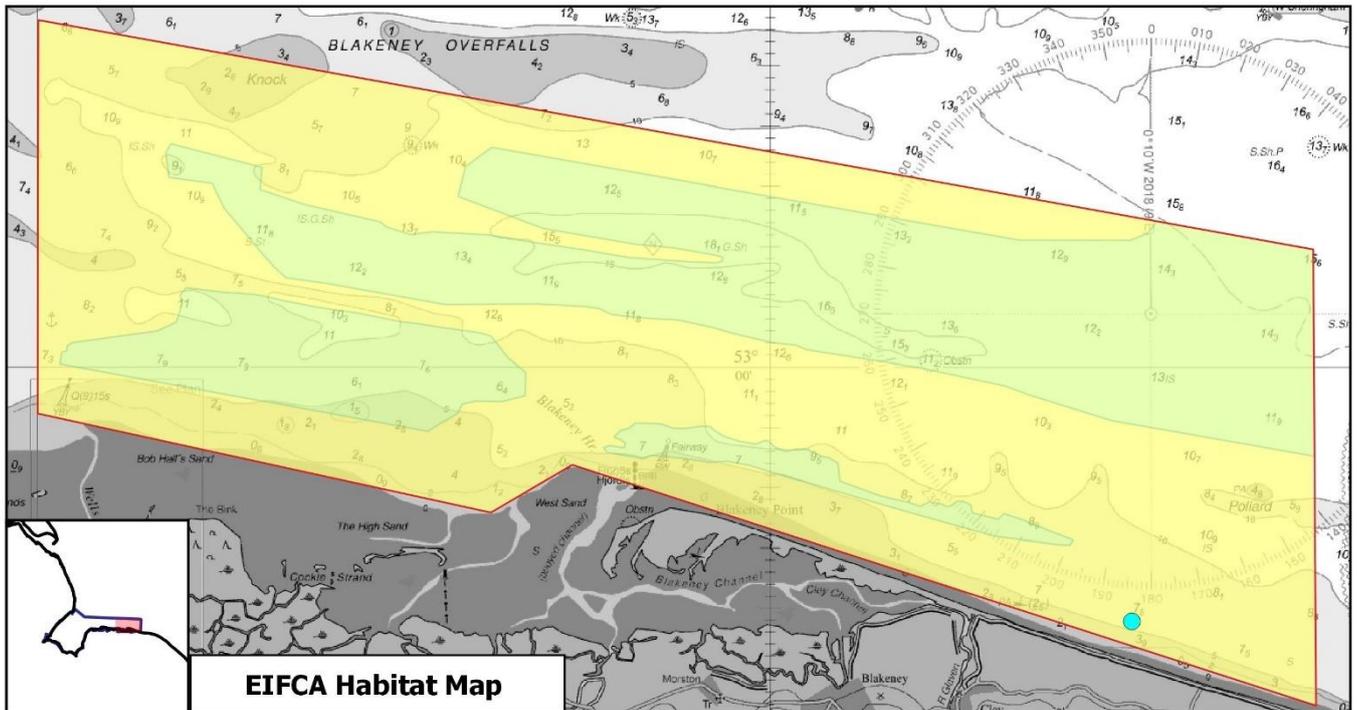
Differentiating between subtidal mixed and subtidal coarse sediments is extremely difficult to achieve using seabed video footage. This is because the key distinguishing factor between the two different types is the percentage of fines (particles <0.063mm) present in the sediment which is impossible to tell by eye. Sediment containing more

than 5% of gravel (>2mm) is classified as either coarse or mixed sediment, with the difference between the two being based on whether sediment contains more than 5% fines, in which case it would be classified as mixed, but if it contains less than 5% it would be classified as coarse. Stations: 20190827-124, 20181019-020, 20180731-020 and 20181019-112 provide examples of areas identified as coarse sediment in the NE data release, however, have been classified as mixed sediment in the video footage from these surveys (see Appendix 1 and 2). The presence of attached and mobile epifauna on the seabed is associated with mixed sediments and so this was used to aid classification of this sediment type. The confidence we have in the classification of this type of sediment is, therefore, lower than that of the sand sediments observed, however, mixed sediments are considered more vulnerable to disturbance than coarse sediments and so if coarse sediment has been incorrectly identified as mixed the resulting management approach will be more precautionary. Ground truthing stations identified as mixed sediment were all considered to be the more vulnerable Type A mixed sediment associated with the presence of attached and mobile fauna and large proportions of gravel and pebble. This further supports the classification of mixed sediment at these stations. In addition, and similarly to subtidal mud, whilst coarse sediments were not observed during surveys we cannot be certain that no subtidal coarse sediment exists within the site because surveys did not achieve full coverage of the site but also because of the reasons described above.

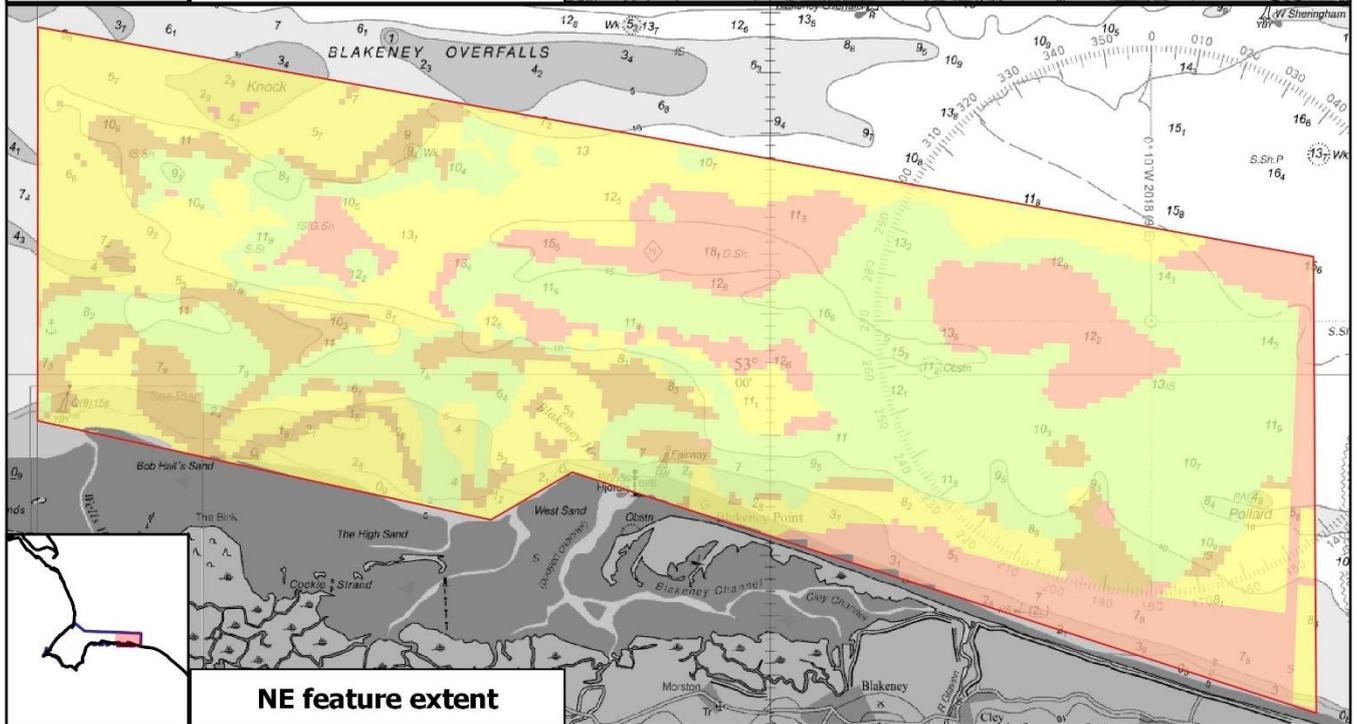
The identification of *A4 Circalittoral rock and other hard substrata* inshore off Salthouse suggests an additional feature exists within the survey site not previously known to occur. Although classified as A4 habitat here using the EUNIS classification system, video footage at this station indicated the presence of stony reef habitat (a habitat type not currently described within the EUNIS system). A4 is the closest habitat type in the EUNIS classification system to stony reef habitat. Such habitat is known to be particularly vulnerable to degradation from beam trawling activities, it is therefore important that its presence is considered when applying management measures to the site, even though the extent of the habitat is unknown.

It is important to note that when assessing seabed video footage, an assessment of habitat type can only be made using observations of the seafloor. The sediments present underneath this top layer may be very different to those on the surface and could lead to the incorrect classification of habitat type. For example, soft sediments such as mobile sand could overlay hard substrate that provides a surface for fauna to attach. Furthermore, the methods involved in this project (video analysis and broadscale area characterisation) are associated with a high level of subjectivity.

Whilst such limitations should be considered when using this data for habitat and fisheries management, the resulting biotope map provides our best estimate of the distribution and extent of habitats within the survey area and as such provides the best available evidence to base management decision on.



**EIFCA Habitat Map**



**NE feature extent**



## North Norfolk Coast Habitat Mapping

Comparison with NE feature extent data (March 2019)

**EUNIS habitat classification**

- A5.1
- A5.2
- A5.3
- A5.4
- A4

Survey area

Date: 16/01/2020  
 Drawn by: SH  
 Projection: WGS 84  
 Data: EIFCA

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**Figure 6:** Comparison of feature extent presented in the habitat map produced from this project (Top) and the feature extent provided by NE (March 2019) (Bottom)

## 4.1 Fisheries management

Figure 7 shows the proposed spatial restrictions<sup>6</sup> to be applied along the North Norfolk Coast overlaid with the habitat map produced from this report. The spatial restrictions are been split into four different areas, labelled 31 to 34. Restrictions in Areas 31, 32 and 34 will permanently exclude towed demersal gears from operating, whereas those in Area 33 will exclude activities during the summer months only.

Areas 31 and 34 are considered as two different management areas as restrictions already exist within Area 34 which prohibit fishing using a trawl net<sup>7</sup>, including shrimp beam trawling. These restrictions were initially brought into place to protect potting grounds rather than to protect vulnerable habitat from towed demersal fishing gear so it is appropriate to keep them separate. In Area 34, the amount of mixed sediment and sand and muddy sand habitats identified from the surveys differ largely from those presented in the NE feature extent map (Figure 6). NE identified a much larger proportion of mixed sediment, particularly in the southern half of the area. However, side scan data from these surveys clearly demonstrates the seabed in southern half of this area to be dominated by sand wave formations. Whilst this presents an area that could be exploited by the shrimp fishery without having an impact on site integrity, the rationale behind the original Byelaw 12 restrictions was to protect potting grounds from trawling activity and gear conflict, and not based on habitat type and its vulnerability to disturbance caused by trawling. Because of this, habitat type in this area will not affect the spatial restrictions on the shrimp fishery.

The station identified as stony reef habitat, known to be particularly vulnerable to damage from towed demersal fishing gears, is located within Area 34, thus is already protected from such fishing activities and does not require any further protection.

The proposed restriction on Area 33 forms a seasonal corridor that will be open to trawling activity between October and April but will prohibit activity throughout the rest of the year. The decision for this seasonal restriction was made based on the area being particularly important to shrimp fishers during the winter season but also forms an important nursery area for finfish species during the summer months. Figure 7 shows the area to be made up of predominantly sand and muddy sand sediments which were assessed in the HRA as not likely to be impacted by shrimp beam trawling at current levels. This supports the seasonal restriction applied, allowing trawling activity to occur during the winter months without having an impact on site integrity.

Area 32 encompasses an intertidal section of The Wash and North Norfolk Coast SAC. Management in this area is not considered within this report as it lies outside the surveyed area.

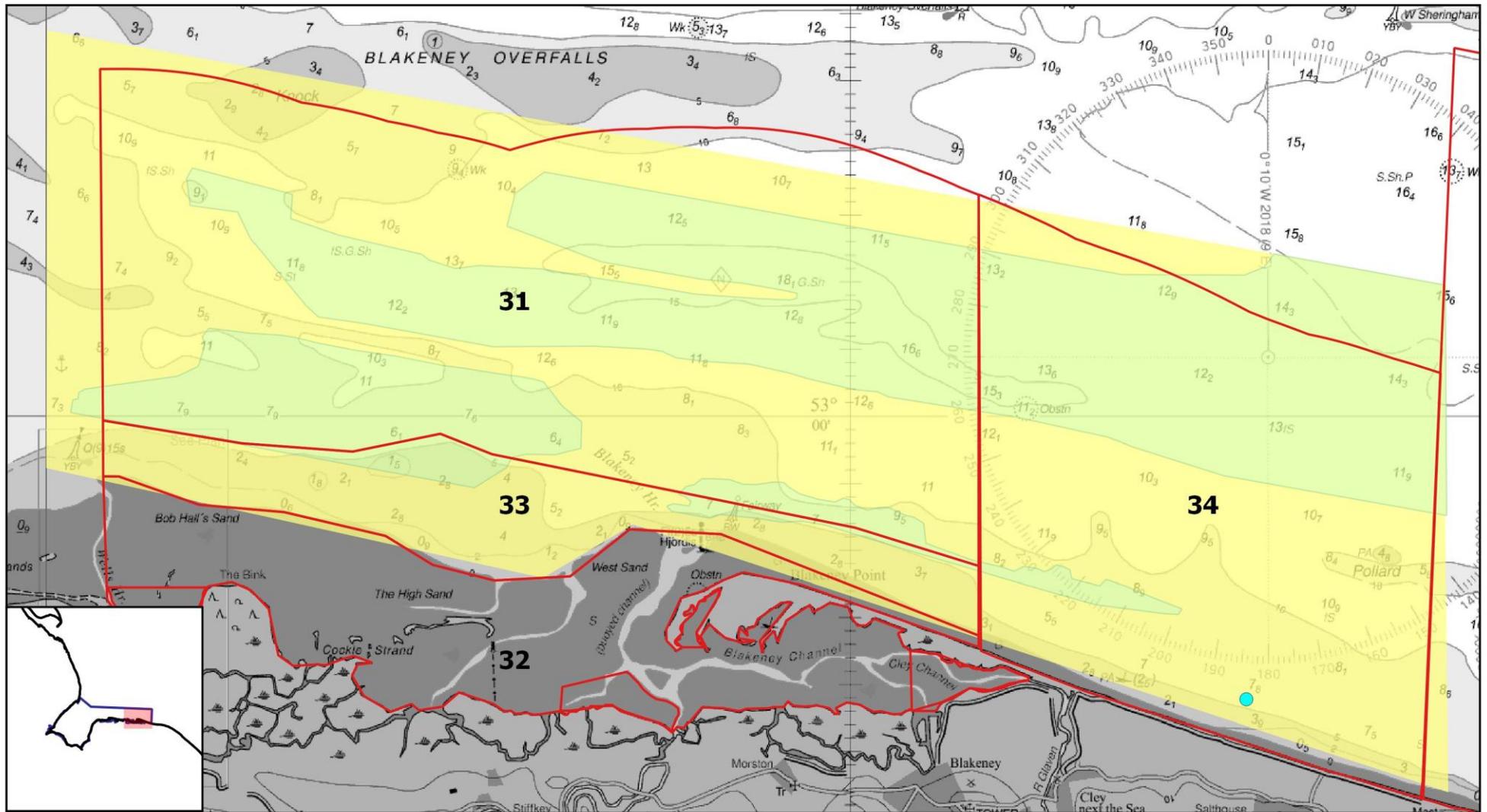
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<sup>6</sup> Marine Protected Areas Byelaw 2019

<sup>7</sup> Byelaw 12 Inshore trawling restriction prohibits fishing using a trawl net, including shrimp beam trawling, in the area: '*No person shall in fishing for seafish in that part of the District which lies within three nautical miles from the 1983 baselines use any kind of trawl net*'. Byelaw was created in 2001 but restrictions were first introduced in 1979 under a different name.

## **4.2 Conclusions**

EIFCA have produced a broadscale biotope map based on the EUNIS classification system for a section of the North Norfolk Coast following the completion of six habitat mapping surveys conducted between 2017 and 2019. Surveys have highlighted differences in the extent and distribution of subtidal habitats assigned with previous attempts to map seabed habitats within the area (NE's feature extent map (March 2019)) but have provided us with data of higher confidence. The findings have increased our knowledge of habitats within the district, reduced the uncertainty surrounding the assessment of shrimp fishing along the North Norfolk Coast and provided further support for the mitigation measures that have been put in place in the form of spatial restrictions to ensure the shrimp fishery does not impact site integrity.



	<h2>North Norfolk Coast Habitat Mapping</h2>		Date: 16/01/2020 Drawn by: SH Projection: WGS 84 Data: EIFCA	
	<b>Marine Protected Area Byelaw 2019 (proposed)</b>	 Restricted areas	<b>EUNIS habitat classification</b>	<b>Ground truth station Assigned biotope</b>
			 A4	 A5.2  A5.4
<p>(c) British Crown and OceanWise 2020. All rights reserved. Licence No.EK001-20180110. This product has been derived in part from material obtained from the UK Hydrographic Office with the permission of the UK Hydrographic Office, Her Majesty's Stationery Office and other relevant authorities.</p>				

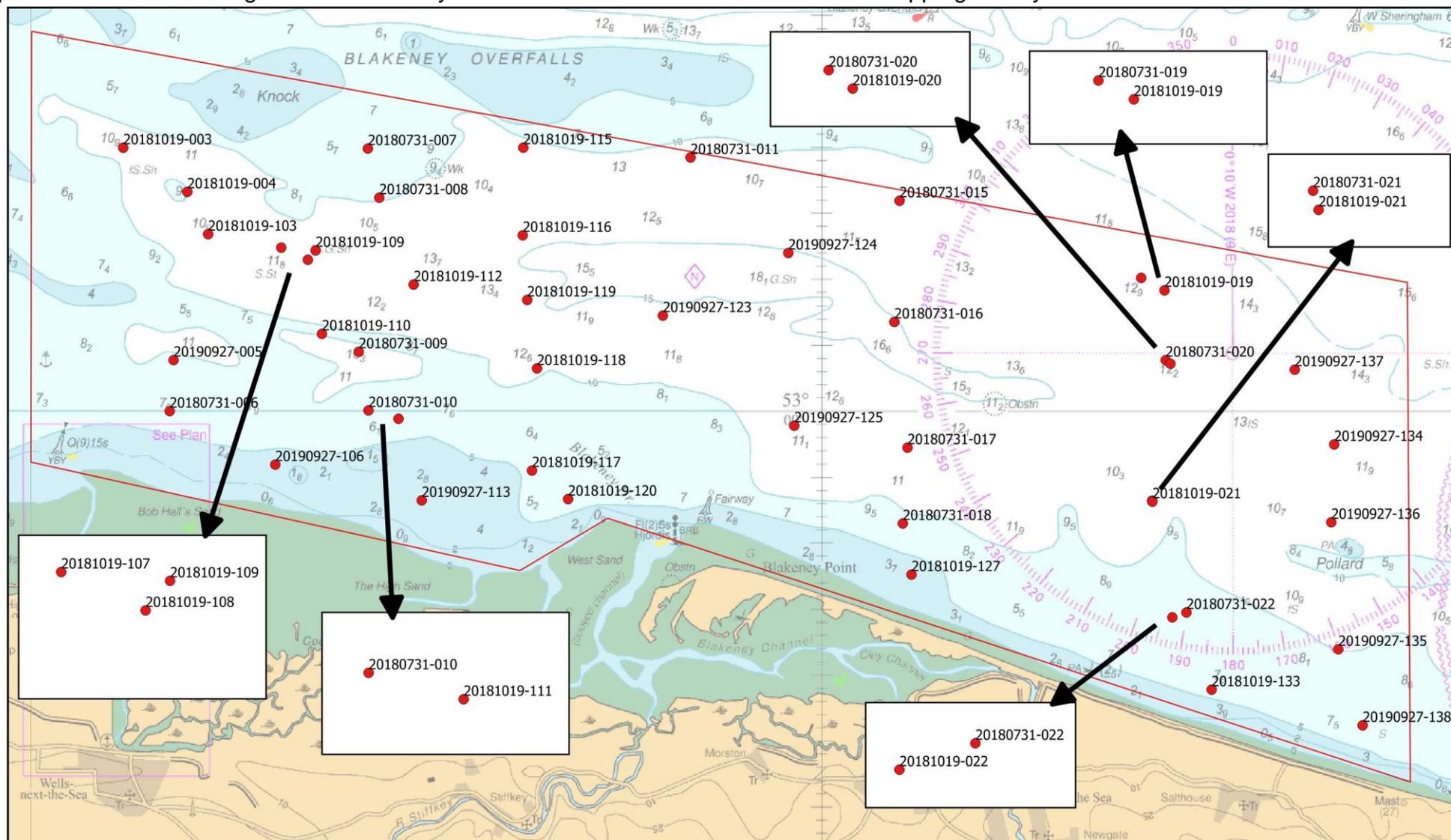
**Figure 7:** Proposed spatial restrictions to towed demersal gears under EIFCA's Marine Protected Area 2019 byelaw overlaid with habitat map produced from this report. Spatial restrictions labelled 31-34.

## 5 References

EIFCA, 2018. Habitats Regulations Assessment: Commercial beam trawling for brown shrimp (*Crangon* spp.) and pink shrimp (*Pandalus montagui*) in The Wash and North Norfolk Coast Special Area of Conservation. Eastern Inshore Fisheries and Conservation Authority.

Foster-Smith, R. L. and Southeran, I., 1999. A broad scale remote survey and mapping of the sublittoral habitats and biota of The Wash and the Lincolnshire North Norfolk coasts. Peterborough, English Nature Research Reports, No. 336.

# Appendix 1: Locations of ground truth survey stations for North Norfolk Coast habitat mapping surveys conducted in 2018 and 2019



## North Norfolk Coast Habitat Mapping

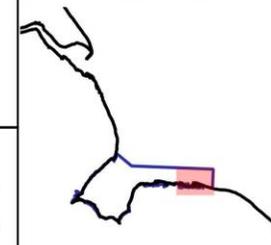
### Location of ground truth stations (2018 - 2019)

- Ground truth stations
- Survey area

Date: 15/01/2020  
 Drawn by: SH  
 Projection: WGS 84  
 Data: EIFCA

### Not to be used for Navigation

(c) British Crown and OceanWise 2020. All rights reserved. Licence No.EK001-20180110. This product has been derived in part from material obtained from the UK Hydrographic Office with the permission of the UK Hydrographic Office, Her Majesty's Stationery Office and other relevant authorities.



**Appendix 2:** Individual station data sheets

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0330	0.9043
	End	53.0335	0.9021
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	7
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand, shell and some pebble. Some patches of dead oyster shells. No fauna observed.			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes –</b> Poor quality video as very fast moving			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0268	0.9067
	End	53.0271	0.9048
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	8
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand, shell, some pebble and some patches of dead oyster shells. No fauna observed.			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0074	0.9024
	End	53.0080	0.8973
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	9
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand and muddy sand, shell and pebbles. First half of tow predominantly dense <i>lanice</i> beds with other attached fauna, second half; dense slipper limpet and sabella bed. <b>SACFOR:</b> <i>Lanice conchilega</i> (S), Sabella (S), sea anemone (A), Goby (F), <i>Asterias rubens</i> (O), Hydroid (A), Bryozoan (C), Slipper limpets (S), Sunstar (O), Shore crab (O), Edible crab (R).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes</b> – Fast video, section in the middle very poor quality.			

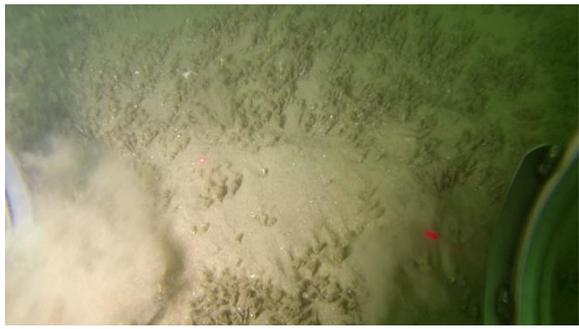
<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0000	0.9045
	End	53.0010	0.9010
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	10
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Areas of dense lanice beds and areas of dense slipper limpet and sabella beds. Sand and muddy sand with shell, small pebbles and attached fauna. SACFOR: Lanice (S), sea anemone (A), slipper limpets (S), hydroid (A), <i>Sabella pavonia</i> (S), <i>Asterias rubens</i> (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes</b> – Fast video, section in the middle very poor quality.			

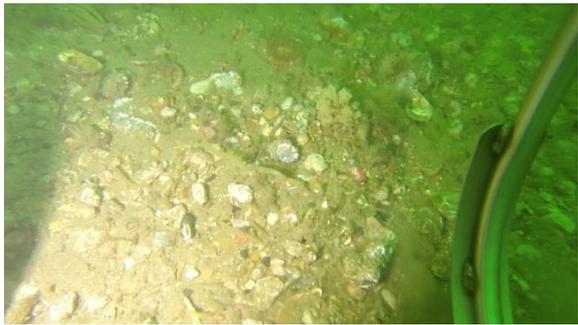
<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0319	0.9724
	End	53.0321	0.9720
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	11
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand, sand ripples, broken shell and some small pebbles in areas. No observed fauna.			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes –</b> Poor quality video as very fast moving			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0264	1.0164
	End	53.0275	1.0119
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	15
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand, broken shell and small pebbles. Second half of video has large patches of dead oyster shell dominating sea bed. Occasional attached fauna, no mobile fauna. <b>SACFOR:</b> Hydroid (O), Bryozoan (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes –</b> Poor quality video as very fast moving			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0111	1.0153
	End	53.0112	1.0133
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	16
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand and muddy sand, shell and small pebbles, possibly mixed sediment, lots of fauna and patches of small abundant lanice. <b>SACFOR:</b> <i>Lanice conchilega</i> (A), bryozoan (C), hydroid (F), Sunstar (O), Flustra (F), Sea Anemone (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes –</b> Poor quality video as very fast moving			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9953	1.0181
	End	52.9958	1.0163
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	17
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand with distinct sand ripples, occasional pebble and attached bryozoan and hydroid, some loose. <b>SACFOR:</b> Bryozoan (O), Hydroid (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes – Poor quality video</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9857	1.0171
	End	52.9867	1.0150
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	18
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
<p>Predominantly sand and muddy sand with some areas of pebble. <i>Lanice conchilega</i> dominate seabed, other attached and mobile fauna present.  <b>SACFOR:</b> <i>Lanice conchilega</i> (S), Bryozoan (C), Hydroid (C), Sea anemone (F) (most likely <i>Urticina feline</i>- Dahlia anemone), <i>Asterias rubens</i> (O), Shore crab (O).</p>			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes –</b> Poor quality video as very fast moving			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0167	1.0674
	End	53.0167	1.0674
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	19
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Shell and pebbles on sand or muddy sand – possibly mixed sediment. Faunal turf predominantly bryozoan <i>Alcyonidium diaphanum</i> hydroids and some flustra. <b>SACFOR:</b> Flustra (F), Anemone (O), Hydroid (C), Bryozoan (C), Hermit crab (C)			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed Sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes –</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0063	1.0725
	End	53.0070	1.0700
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	20
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Pebbles/cobbles and some slipper limpets dominate bed with thick faunal turf and evidence of muddy sand underneath. <b>SACFOR:</b> Flustra (C), Hydroid (A), Bryozoan (F), Asterias rubens, (O), Sea anemone (F), Slipper limpets (C).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed Sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9886	1.0697
	End	52.9886	1.0684
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	21
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand, distinct sand waves with occasional muddier sand in ridges. Some occasional broken shell and pebble also seen in ridges. No mobile or attached fauna, some loose bryozoan.			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

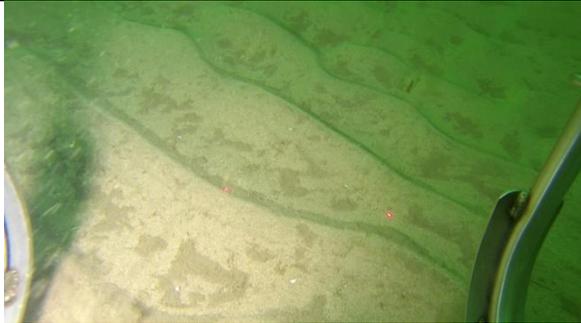
<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9745	1.0769
	End	52.9748	1.0751
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	22
<b>Date of Video survey -</b>	31 <sup>st</sup> July 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand and shell, occasional small clusters of pebbles and lots of loose fauna (hydroid/bryozoan) with some attached. <b>SACFOR:</b> Hydroid (O), Bryozoan (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

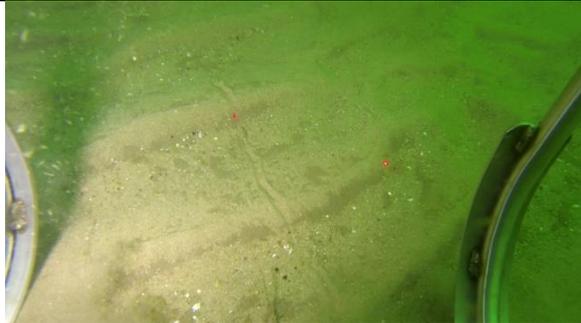
<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0331	0.8528
	End	53.0332	0.8527
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	3
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand with ripples. Some attached hydroid/bryozoan and sand gobies. <b>SACFOR:</b> hydroid (F), bryozoan (O), sand gobies (C).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0276	0.8663
	End	53.0276	0.8663
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	4
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand, muddy sand, pebble and shell – mixed sediment. <b>SACFOR:</b> hydroid (C), bryozoan (O), gobies (O), juvenile asterias rubens (O), sunstar (O), sea anemone (O), shrimp (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes –</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0151	1.0723
	End	53.0152	1.0732
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	19
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand and muddy sand dominated by pebbles and shell. <b>SACFOR:</b> hydroid and bryozoan turf (A), sea anemone (F), sea star (F).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0059	1.0735
	End	53.0060	1.0742
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	20
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Pebbles, cobbles and shell over sand and muddy sand, possible stony reef. Hydroid/bryozoan turf (O), crab (O), sea anemone (F), dead mans fingers (O), sunstar (F), <i>Asterias rubens</i> (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes</b> – camera moving very fast over seabed and on its side, poor video quality			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9884	1.0697
	End	52.9882	1.0697
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	21
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand with ripples. No fauna observed.			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9647	1.0739
	End	52.9739	1.0739
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	22
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand with ripples and some shell. <b>SACFOR:</b> bryozoan/hydroid (O), <i>Asterias rubens</i> (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0222	0.8707
	End	53.0222	0.8706
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	103
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand and shell, sand ripples. <b>SACFOR:</b> Lanice (O), Hydroid/bryozoan (F), juvenile edible crab (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0205	0.8861
	End	53.0205	0.8861
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	107
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand, muddy sand, pebble and shell. <b>SACFOR:</b> hydroid/bryozoan (C), hermit crab (O), sea anemone (O)			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0190	0.8917
	End	53.0190	0.8917
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	108
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand, muddy sand, pebble and shell. <b>SACFOR:</b> hydroid/bryozoan (C).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0202	0.8933
	End	53.0201	0.8931
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	109
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand, muddy sand, pebble and shell. <b>SACFOR:</b> hydroid/bryozoan (C), sea anemone (F), shrimp (O), dragonet (O), gobies (O), shore crab (O), juvenile asterias rubens (O), hermit crab (O), sunstar (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0096	0.8946
	End	53.0096	0.8946
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	110
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand with ripples. No fauna observed.			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes</b> – Poor quality video, very little seabed observed, camera mainly pointing elsewhere.			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9989	0.9108
	End	52.9989	0.9108
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	111
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand, muddy sand, shell and pebble. <b>SACFOR:</b> Hydroid/bryozoan (C), Asterias rubens (F), sea anemone (O), shore crab (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0159	0.9140
	End	53.0159	0.9139
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	112
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand, muddy sand, shell and pebble. <b>SACFOR:</b> Hydroid/bryozoan (F), Sea anemone (O), shore crab (O), sun star (F), slipper limpets (F), sand gobies (C)			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0332	0.9371
	End	53.0333	0.9369
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	115
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Coarse sand with ripples. <b>SACFOR:</b> Hydroid/bryozoan (C), sand gobies (O), <i>Lanice conchilega</i> (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0221	0.9370
	End	53.0218	0.9369
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	116
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand and muddy sand shell and pebble. <b>SACFOR:</b> Hydroid/bryozoan (A), sand gobies (F), shore crab (O), edible crab (O), <i>Asterias rubens</i> (F)			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Mixed sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9924	0.9389
	End	52.9924	0.9389
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	117
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand with ripples. No fauna observed.			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0053	0.9400
	End	53.0052	0.9403
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	118
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand with ripples. <b>SACFOR:</b> <i>Lanice conchilega</i> (0), sand gobies (0).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

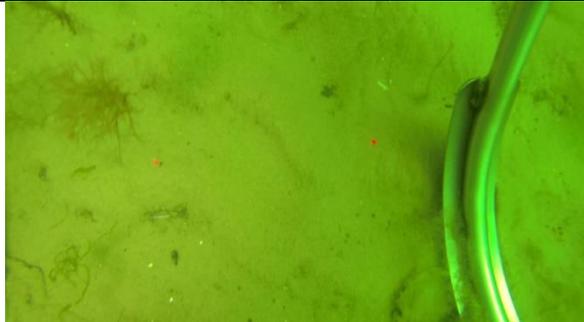
<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	53.0139	0.9379
	End	53.0138	0.9383
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	119
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Dominated by shell and pebble over sand and muddy sand. Coarse or mixed sediment? <b>SACFOR:</b> faunal turf (F), <i>Asterias rubens</i> (O), shore crab (F), sand goby (O), sea anemone (O), slipper limpets (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.4 Coarse sediment			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9888	0.9465
	End	52.9887	0.9469
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	120
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand with ripples and some loose fauna. <b>SACFOR:</b> <i>Asterias rubens</i> (F), shore crab (O), sand gobies (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

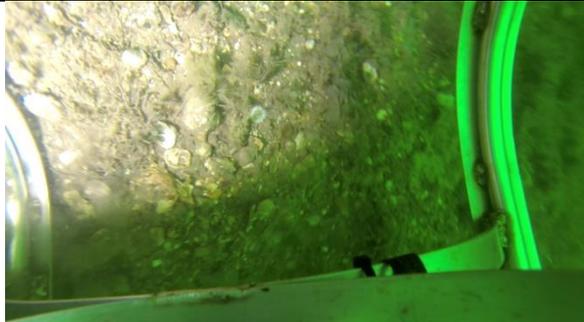
<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9792	1.0189
	End	52.9790	1.0189
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	127
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Sand with ripples, dominated by burrows (possibly razor clams). <b>SACFOR:</b> shore crab (O), sand gobies (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
A5.2 Sand and muddy sand			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location</b> (Degrees.Decimal Degrees WGS1984)	<b>Drift</b>	<b>Lat. N</b>	<b>Long. E</b>
	Start	52.9647	1.0822
	End	52.9644	1.0832
<b>Area -</b>	North Norfolk Coast	<b>Station -</b>	133
<b>Date of Video survey -</b>	19 <sup>th</sup> October 2018	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment (Abundance scale = SACFOR)</b>			
Predominantly pebble and cobble over sand, possible stony reef. <b>SACFOR:</b> Faunal turf (hydroid and bryozoa) (A), Sabella (C), <i>Astrerias rubens</i> (mostly juvenile) (A), sea anemones (A), sea star (O), dead man fingers (O).			
<b>EUNIS code from seabed imagery by eye</b>			
Level 3	Level 4	Level 5	
Stony reef			
<b>Side scan survey conducted on, date:</b>		31 <sup>st</sup> July 2018, 21 <sup>st</sup> and 22 <sup>nd</sup> August 2018	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location (Degrees.DecimalDegrees WGS1984)</b>				
Lat. N	53.0063	Long. E	0.8634	
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	5	
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA	
<b>Example seabed stills (extracted from video)</b>				
				
<b>Description from video assessment</b>				
Sand and muddy sand with shell and pebble, possible mixed sediment towards the end of video. Attached faunal turf – bryozoan and hydroid, sea anemones and slipper limpets. Frequent Asterias rubens and sunstars.				
<b>EUNIS code</b>		<b>Chalk</b>		
A5.2 Sand and muddy sand		Absent		
<b>Side scan survey conducted on, date</b>		NA		
<b>Sabellaria information</b>				
Coverage %	Height cm	Occupancy	Reefiness	Absent
				Absent
<b>Notes – most of video poor quality as moving too fast</b>				

<b>Location (Degrees.DecimalDegrees WGS1984)</b>				
Lat. N	52.9931	Long. E	0.8848	
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	106	
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA	
<b>Example seabed stills (extracted from video)</b>				
				
<b>Description from video assessment</b>				
Sand and muddy sand with occasional shell and pebble. Some attached and loose faunal turf - possibly algae. Occasional <i>Asterias rubens</i> .				
<b>EUNIS code</b>		<b>Chalk</b>		
A5.2 Sand and muddy sand		Absent		
<b>Side scan survey conducted on, date</b>		NA		
<b>Sabellaria information</b>				
Coverage %	Height cm	Occupancy	Reefiness	Absent
				Absent
<b>Notes -</b>				

<b>Location (Degrees.DecimalDegrees WGS1984)</b>			
Lat. N	52.9886	Long. E	0.9157
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	113
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment</b>			
Coarse sand waves. Barren seabed with occasional <i>Asterias rubens</i> and loose faunal turf.			
<b>EUNIS code</b>		<b>Chalk</b>	
A5.2 Sand and muddy sand		Absent	
<b>Side scan survey conducted on, date</b>		NA	
<b><i>Sabellaria</i> information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location (Degrees.DecimalDegrees WGS1984)</b>				
Lat. N	53.0120	Long. E	0.9665	
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	123	
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA	
<b>Example seabed stills (extracted from video)</b>				
				
<b>Description from video assessment</b>				
Mixed sediment – sand and muddy sand, silt, shell and pebble. Seabed dominated by attached faunal turf – hydroids and bryozoans, frequent sea anemones and Sabella pavonia. Frequent sunstars and occasional shore crab and Asterias rubens.				
<b>EUNIS code</b>		<b>Chalk</b>		
A5.4 Mixed sediment		Absent		
<b>Side scan survey conducted on, date</b>		NA		
<b>Sabellaria information</b>				
Coverage %	Height cm	Occupancy	Reefiness	Absent
				Absent
<b>Notes</b> – very poor-quality imagery for most of video as camera moving to much				

<b>Location (Degrees.DecimalDegrees WGS1984)</b>			
Lat. N	53.0199	Long. E	0.9930
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	124
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment</b>			
Mixed sediment – sand and muddy sand, silt, shell and pebble. Seabed dominated by attached faunal turf – hydroids and bryozoans, common sea anemones and <i>Sabella pavonia</i> . Frequent sunstars and occasional <i>Asterias rubens</i> .			
<b>EUNIS code</b>		<b>Chalk</b>	
A5.4 Mixed sediment		Absent	
<b>Side scan survey conducted on, date</b>		NA	
<b><i>Sabellaria</i> information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes</b> – very poor-quality imagery for most of video as camera moving to much			

<b>Location (Degrees.DecimalDegrees WGS1984)</b>			
Lat. N	52.9980	Long. E	0.9942
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	125
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA
<b>Example seabed stills (extracted from video)</b>			
			
<b>Description from video assessment</b>			
Mobile sand with sand waves. No fauna observed.			
<b>EUNIS code</b>		<b>Chalk</b>	
A5.2 Sand and muddy sand		Absent	
<b>Side scan survey conducted on, date</b>		NA	
<b>Sabellaria information</b>			
Coverage %	Height cm	Occupancy	Reefiness
			Absent
			Absent
<b>Notes -</b>			

<b>Location (Degrees.DecimalDegrees WGS1984)</b>				
Lat. N	52.9957	Long. E	1.1080	
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	134	
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA	
<b>Example seabed stills (extracted from video)</b>				
				
<b>Description from video assessment (Abundance scale = SACFOR)</b>				
Possible mixed sediment – sand, shell and pebble, some fines. Attached faunal turf – bryozoan and hydroids and frequent sea anemones. Occasional gobies, Asterias rubens and sunstars.				
<b>EUNIS code</b>		<b>Chalk</b>		
A5.4 Mixed sediment		Absent		
<b>Side scan survey conducted on, date</b>		NA		
<b>Sabellaria information</b>				
Coverage %	Height cm	Occupancy	Reefiness	Absent
				Absent
<b>Notes –</b>				

<b>Location (Degrees.DecimalDegrees WGS1984)</b>				
Lat. N	52.9698	Long. E	1.1089	
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	135	
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA	
<b>Example seabed stills (extracted from video)</b>				
				
<b>Description from video assessment</b>				
Mobile sand with sand waves. Patches of shell and pebble. Barren seabed with occasional <i>Asterias rubens</i> .				
<b>EUNIS code</b>		<b>Chalk</b>		
A5.2 Sand and muddy sand		Absent		
<b>Side scan survey conducted on, date</b>		NA		
<b>Sabellaria information</b>				
Coverage %	Height cm	Occupancy	Reefiness	Absent
				Absent
<b>Notes -</b>				

<b>Location (Degrees.DecimalDegrees WGS1984)</b>				
Lat. N	52.9858	Long. E	1.1074	
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	136	
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA	
<b>Example seabed stills (extracted from video)</b>				
				
<b>Description from video assessment</b>				
Mobile sand with sand waves. Patches of shell and pebble. Frequent attached fauna.				
<b>EUNIS code</b>		<b>Chalk</b>		
A5.2 Sand and muddy sand		Absent		
<b>Side scan survey conducted on, date</b>		NA		
<b>Sabellaria information</b>				
Coverage %	Height cm	Occupancy	Reefiness	Absent
				Absent
<b>Notes -</b>				

<b>Location (Degrees.DecimalDegrees WGS1984)</b>				
Lat. N	53.0051	Long. E	1.0997	
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	137	
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA	
<b>Example seabed stills (extracted from video)</b>				
				
<b>Description from video assessment</b>				
Mixed sediment – sand, shell and pebble, some fines. Majority of seafloor covered with attached faunal turf – bryozoan and hydroids and occasional sea anemone. Occasional gobies and Asterias rubens.				
<b>EUNIS code</b>		<b>Chalk</b>		
A5.4 Mixed sediment		Absent		
<b>Side scan survey conducted on, date</b>		NA		
<b>Sabellaria information</b>				
Coverage %	Height cm	Occupancy	Reefiness	Absent
				Absent
<b>Notes –</b>				

<b>Location (Degrees.DecimalDegrees WGS1984)</b>				
Lat. N	52.9602	Long. E	1.1140	
<b>Area -</b>	Cromer Shoal Chalk Beds MCZ	<b>Station -</b>	138	
<b>Date of Video survey -</b>	27 <sup>th</sup> August 2019	<b>Date of Grab survey -</b>	NA	
<b>Example seabed stills (extracted from video)</b>				
				
<b>Description from video assessment</b>				
Mostly barren coarse mobile sand with occasional patches of fauna rich areas of pebble and cobble. Frequent <i>Asterias rubens</i> and occasional edible crab. Faunal turf, <i>Sabella pavonia</i> and sea anemones associated with areas of cobbles.				
<b>EUNIS code</b>		<b>Chalk</b>		
A5.2 Sand and muddy sand		Absent		
<b>Side scan survey conducted on, date</b>		NA		
<b>Sabellaria information</b>				
Coverage %	Height cm	Occupancy	Reefiness	Absent
				Absent
<b>Notes -</b>				

### Appendix 3: Compiled raw video data

Date	Area	Station	Replicate	Time (UTC)	Waypoint	Video File	Degrees. Decimal degrees		Description of fauna and substrate	EUNIS code	Sabellaria reefiness	Chalk assessment	Notes
							Lat N	Long E					
31/07/2018	NNC	20180731-019	1	14:05:00	7	GOPR2049	53.016707	1.067352	Shell and pebbles on sand or muddy sand – possibly mixed sediment. Faunal turf predominantly bryozoan Alcyonidium diaphanum hydroids and some flustra. SACFOR: Flustra (F), Anemone (O), Hydroid (C), Bryozoan (C), Hermit crab (C)	A5.4	Absent	Absent	
31/07/2018	NNC	20180731-020	1		9	GOPR2050	53.006328	1.072519	Pebbles/cobbles and some slipper limpets dominate bed with thick faunal turf and evidence of muddy sand underneath. SACFOR: Flustra (C), Hydroid (A), Bryozoan (F), Asterias rubens, (O), Sea anemone (F), Slipper limpets (C).	A5.4	Absent	Absent	
31/07/2018	NNC	20180731-021	1	14:35:00	11	GOPR2051	52.988574	1.069656	Coarse sand, distinct sand waves with occasional muddier sand in ridges. Some occasional broken shell and pebble also seen in ridges. No mobile or attached fauna, some loose bryozoan.	A5.2	Absent	Absent	
31/07/2018	NNC	20180731-022	1	14:45:00	13	GOPR2052	52.974451	1.076893	Coarse sand and shell, occasional small clusters of pebbles and lots of loose fauna (hydroid/bryozoan) with some attached. SACFOR: Hydroid (O), Bryozoan (O).	A5.2	Absent	Absent	
31/07/2018	NNC	20180731-018	1	15:04:00	15	GOPR2053	52.985693	1.017099	Predominantly sand and muddy sand with some areas of pebble. Lanice conchilega dominate seabed, other attached and mobile fauna present. SACFOR: Lanice conchilega (S), Bryozoan (C), Hydroid (C), Sea anemone (F) (most likely Urticina feline- Dahlia anemone), Asterias rubens (O), Shore crab (O).	A5.2	Absent	Absent	Poor quality video as very fast moving
31/07/2018	NNC	20180731-017	1	15:14:00	17	GOPR2054	52.995273	1.01809	Coarse sand with distinct sand ripples, occasional pebble and attached bryozoan and hydroid, some loose. SACFOR: Bryozoan (O), Hydroid (O).	A5.2	Absent	Absent	Poor quality video as very fast moving
31/07/2018	NNC	20180731-016	1	15:22:00	19	GOPR2055	53.011147	1.015324	Sand and muddy sand, shell and small pebbles, possibly mixed sediment, lots of fauna and patches of small abundant lanice. SACFOR: Lanice conchilega (A), bryozoan (C), hydroid (F), Sunstar (O), Flustra (F), Sea Anemone (O).	A5.4	Absent	Absent	Poor quality video as very fast moving

31/07/2018	NNC	20180731-015	1	15:30:00	21	GOPR2021	53.026449	1.01642	Coarse sand, broken shell and small pebbles. Second half of video has large patches of dead oyster shell dominating sea bed. Occasional attached fauna, no mobile fauna. SACFOR: Hydroid (O), Bryozoan (O).	A5.2	Absent	Absent	Poor quality video as very fast moving
31/07/2018	NNC	20180731-011	1	15:43:00	23	GOPR2022	53.031909	0.972358	Coarse sand, sand ripples, broken shell and some small pebbles in areas. No observed fauna.	A5.2	Absent	Absent	Poor quality video as very fast moving
31/07/2018	NNC	20180731-007	1	15:56:00	25	GOPR2023	53.033039	0.904336	Coarse sand, shell and some pebble. Some patches of dead oyster shells. No fauna observed.	A5.2	Absent	Absent	Poor quality video as very fast moving
31/07/2018	NNC	20180731-008	1	16:03:00	27	GOPR2024	53.026837	0.906739	Coarse sand, shell, some pebble and some patches of dead oyster shells. No fauna observed.	A5.2	Absent	Absent	
31/07/2018	NNC	20180731-009	1	16:10:00	29	GOPR2025	53.007382	0.902414	Sand and muddy sand, shell and pebbles. First half of tow predominantly dense lanice beds with other attached fauna, second half; dense slipper limpet and sabella bed. SACFOR: Lanice conchilega (S), Sabella (S), sea anemone (A), Goby (F), Asterias rubens (O), Hydroid (A), Bryozoan (C), Slipper limpets (S), Sunstar (O), Shore crab (O), Edible crab (R).	A5.4	Absent	Absent	Fast video, section in the middle very poor quality.
31/07/2018	NNC	20180731-010	1	16:21:00	31	GOPR2026	52.999971	0.904464	Areas of dense lanice beds and areas of dense slipper limpet and sabella beds. Sand and muddy sand with shell, small pebbles and attached fauna. SACFOR: Lanice (S), sea anemone (A), slipper limpets (S), hydroid (A), Sabella pavonia (S), Asterias rubens (O).	A5.4	Absent	Absent	Fast video, section in the middle very poor quality.
31/07/2018	NNC	20180731-006	1	16:37:00	33	GOPR2027	52.999888	0.862545	Initially slipper limpet bed dominates with almost complete coverage, then changes to be a seabed dominated by tube worms with slipper limpets (Sabella pavonina and possibly very small and dense Lanice conchilega. Fauna dominated seabed - sand and muddy sand, pebbles and cobbles. SACFOR: Slipper limpets (SA); Sabella (A); Hydroids (C); Asterias rubens (O); Polychaetes (tube worms, possible Lanice) (SA); Sea anemone (mainly burrowing) (F), Gobies (O); Hermit crab (O).	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-003	1	09:31:38	3	GOPR2129	53.033144	0.85276	Coarse sand with ripples. Some attached hydroid/bryozoan and sand gobies. SACFOR: hydroid (F), bryozoan (O), sand gobies (C).	A5.2	Absent	Absent	
19/10/2018	NNC	20181019-004	1	09:48:02	9	GOPR2130	53.027575	0.866269	Sand, muddy sand, pebble and shell – mixed sediment. SACFOR: hydroid (C), bryozoan (O), gobies (O), juvenile asterias rubens (O), sunstar (O), sea anemone (O), shrimp (O).	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-103	1	09:58:39	11	GOPR2131	53.022231	0.870654	Coarse sand and shell, sand ripples. SACFOR: Lanice (O), Hydroid/bryozoan (F), juvenile edible crab (O).	A5.2	Absent	Absent	

19/10/2018	NNC	20181019-107	1	10:07:52	16	GOPR2132	53.020527	0.886075	Sand, muddy sand, pebble and shell. SACFOR: hydroid/bryozoan (C), hermit crab (O), sea anemone (O)	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-108	1	10:08:18	19	GOPR2133	53.018998	0.891684	Sand, muddy sand, pebble and shell. SACFOR: hydroid/bryozoan (C).	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-109	1	10:20:13	21	GOPR2134	53.020176	0.893313	Sand, muddy sand, pebble and shell. SACFOR: hydroid/bryozoan (C), sea anemone (F), shrimp (O), dragonet (O), gobies (O), shore crab (O), juvenile asterias rubens (O), hermit crab (O), sunstar (O).	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-110	1	10:25:38	23	GOPR2135	53.009647	0.894646	Coarse sand with ripples. No fauna observed.	A5.2	Absent	Absent	Poor quality video, very little seabed observed, camera mainly pointing elsewhere.
19/10/2018	NNC	20181019-111	1	10:34:39	24	GOPR2136	52.998918	0.910791	Sand, muddy sand, shell and pebble. SACFOR: Hydroid/bryozoan (C), Asterias rubens (F), sea anemone (O), shore crab (O).	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-112	1	11:03:02	26	GOPR2058	53.01587	0.91398	Sand, muddy sand, shell and pebble. SACFOR: Hydroid/bryozoan (F), Sea anemone (O), shore crab (O), sun star (F), slipper limpets (F), sand gobies (C)	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-115	1	11:14:26	29	GOPR2059	53.033157	0.937105	Coarse sand with ripples. SACFOR: Hydroid/bryozoan (C), sand gobies (O), Lanice conchilega (O).	A5.2	Absent	Absent	
19/10/2018	NNC	20181019-116	1	11:26:08	31	GOPR2060	53.022087	0.936978	Sand and muddy sand shell and pebble. SACFOR: Hydroid/bryozoan (A), sand gobies (F), shore crab (O), edible crab (O), Asterias rubens (F)	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-119	1	11:36:59	33	GOPR2061	53.013932	0.937924	Dominated by shell and pebble over sand and muddy sand. Coarse or mixed sediment? SACFOR: faunal turf (F), Asterias rubens (O), shore crab (F), sand goby (O), sea anemone (O), slipper limpets (O).	A5.4	Absent	Absent	
19/10/2018	NNC	20181019-118	1	11:47:27	35	GOPR2062	53.005281	0.939988	Sand with ripples. SACFOR: Lanice conchilega (O), sand gobies (O).	A5.2	Absent	Absent	
19/10/2018	NNC	20181019-117	1	12:01:16	39	GOPR2063	52.992381	0.93893	Sand with ripples. No fauna observed.	A5.2	Absent	Absent	
19/10/2018	NNC	20181019-120	1	12:11:08	41	GOPR2064	52.988775	0.946542	Sand with ripples and some loose fauna. SACFOR: Asterias rubens (F), shore crab (O), sand gobies (O).	A5.2	Absent	Absent	
19/10/2018	NNC	20181019-127	1	12:28:29	43	GOPR2065	52.979233	1.018937	Sand with ripples, dominated by burrows (possibly razor clams). SACFOR: shore crab (O), sand gobies (O).	A5.2	Absent	Absent	
19/10/2018	NNC	20181019-133	1	12:51:12	47	GOPR2138	52.96469	1.082199	Predominantly pebble and cobble over sand, possible stony reef. SACFOR: Faunal turf (hydroid and bryozoa) (A), Sabella (C), Astrerias rubens (mostly juvenile) (A), sea anemones (A), sea star (O), dead man fingers (O).	A4	Absent	Absent	

19/10/2018	NNC	20181019-022	1	13:03:43	49	GOPR2139	52.97383	1.073916	Coarse sand with ripples and some shell. SACFOR: bryozoan/hyroid (O), Asterias rubens (O).	A5.2	Absent	Absent	
19/10/2018	NNC	20181019-021	1	13:13:09	51	GOPR2140	52.988444	1.069718	Sand with ripples. No fauna observed.	A5.2	Absent	Absent	
19/10/2018	NNC	20181019-020	1	13:20:44	53	GOPR2141	53.005871	1.073511	Pebbles and cobbles over sand, possible stony reef. Hydroid/bryozoan turf (O), crab (O), sea anemone (F), dead mans fingers (O), sunstar (F), Asterias rubens (O).	A5.4	Absent	Absent	camera moving very fast over seabed and on its side, poor video quality
19/10/2018	NNC	20181019-019	1	13:29:09	55	GOPR2142	53.015141	1.072259	Sand and muddy sand dominated by pebbles and shell. SACFOR: hydroid and bryozoan turf (A), sea anemone (F), sea star (F).	A5.4	Absent	Absent	
31/05/2019	CSCB	20190531-001	1	08:04:10	2		52.863407	1.52904	Sand, muddy sand and shell with patches of pebbles and some cobbles. No evidence of chalk. Faunal turf (O), including Flustra and some other bryozoan and hydroid turf. No mobile fauna observed.	A5.4	Absent	Absent	
31/05/2019	CSCB	20190531-002	1	08:18:49	3		52.854409	1.523633	Sand, muddy sand and shell mixed with pebbles. No evidence of chalk. Occasional hydroid/bryozoan, sea anemones and shore crabs observed.	A5.4	Absent	Absent	Video very fast at times reducing quality
31/05/2019	CSCB	20190531-003	1	08:31:26	4		52.847301	1.516245	Pebble and cobble dominated seabed, some evidence suggesting softer sediment underneath. Fauna poor - occasional hydroid/bryozoan and sea anemones observed. No mobile fauna observed. No evidence of chalk.	A5.1	Absent	Absent	Fast video - hard to observe and id fauna
31/05/2019	CSCB	20190531-0E1	1	08:39:59	5		52.843835	1.511131	Coarse sand and pebble. Fauna poor – occasional sea anemone observed. No evidence of chalk.	A5.1	Absent	Absent	Seabed not observed through whole tow.
31/05/2019	CSCB	20190531-004	1	08:52:12	6		52.878312	1.499277	Sand and muddy sand with pebble covered in silty sediment. Fauna poor – occasional hydroid/bryozoan and sunstar and frequent sea anemone observed. Possible chalk cobble observed.	A5.4	Absent	Cobble and pebble	Poor video quality, seabed not observed through whole tow.
31/05/2019	CSCB	20190531-005	1	09:01:08	7		52.871116	1.493088	Coarse sand with patches of pebble and cobble. Fauna poor – occasional hydroid/bryozoan observed. No evidence of chalk.	A5.1	Absent	Absent	Seabed not observed through whole tow.
31/05/2019	CSCB	20190531-006	1	09:09:43	8		52.860648	1.484282	Coarse sand with patches of pebble and cobble. Fauna poor – occasional sea anemone observed, hydroid/bryozoan attached to cobbles. Chalk pebbles and cobbles present.	A5.1	Absent	Cobble and pebble	Fast video
31/05/2019	CSCB	20190531-008	1	09:19:12	9		52.888621	1.467582	Sand and muddy sand with pebble, cobbles and occasional boulders inc. chalk and evidence of chalk pavement seabed with overlying soft sediment. Fauna rich – abundant attached faunal turf/hydroid/bryozoans, common sea anemones and occasional edible crab, Asterias rubens and sunstar.	A3	Absent	Chalk pavement	Fast video giving poor quality imagery

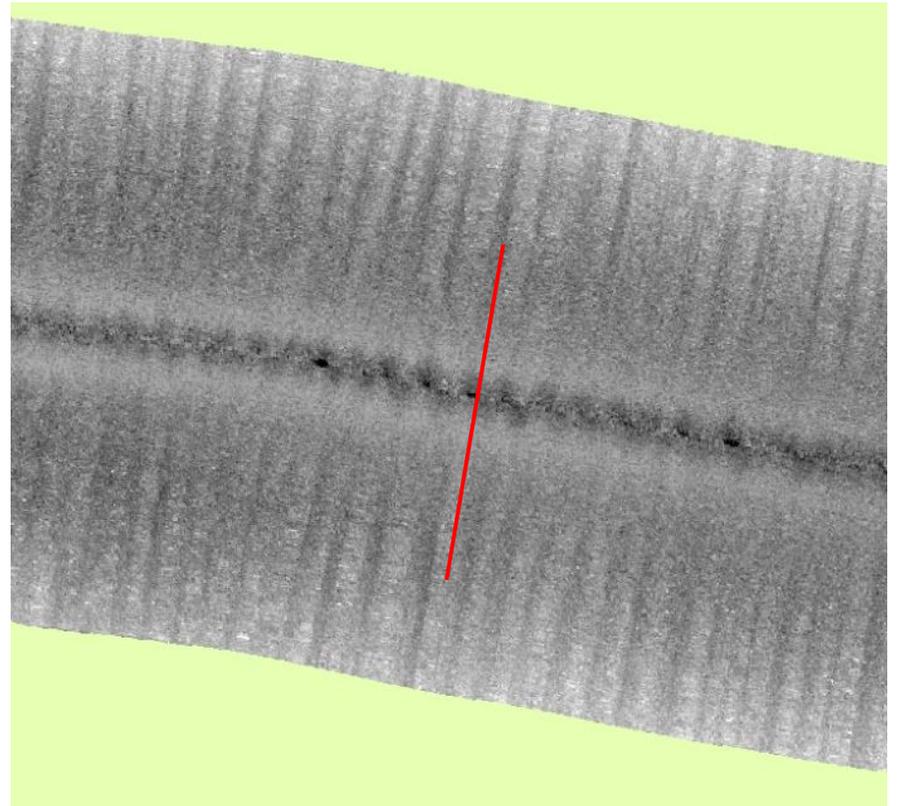
31/05/2019	CSCB	20190531-009	1	09:30:28	10		52.879209	1.454356	Sand and muddy sand with patches of pebbles and some cobble. No evidence of chalk. Hydroid/bryozoan turf attached to pebbles and cobbles and frequent sea anemones.	A5.2	Absent	Absent	Fast video making it hard to observe fauna
31/05/2019	CSCB	20190531-011	1	09:40:15	12		52.902803	1.439738	Seabed dominated by cobbles and pebbles, and possibly some boulders. Chalk pavement and chalk pebbles and cobbles present. Lots of attached fauna and frequent sea anemones. Weed observed suggesting infralittoral.	A3	Absent	Chalk pavement	Video very fast providing poor quality imagery and making it hard to observe fauna
31/05/2019	CSCB	20190531-012	1	09:48:41	13		52.896308	1.431415	Seabed dominated by cobbles and pebbles. Chalk pavement and chalk pebbles and cobbles present. Frequent attached fauna and sea anemones, occasional sunstar. Weed observed suggesting infralittoral.	A3	Absent	Chalk pavement	Video very fast providing poor quality imagery and making it hard to observe fauna
31/05/2019	CSCB	20190531-014	1	10:07:07	14		52.914561	1.412827	Coarse sand with cobbles, pebbles and occasional boulders (including chalk) over chalk pavement. Frequent attached faunal turf and sea anemones. Weed observed suggesting infralittoral.	A3	Absent	Chalk pavement	Video very fast providing poor quality imagery and making it hard to observe fauna
31/05/2019	CSCB	20190531-013	1	10:17:47	15		52.923021	1.419397	Coarse sand over chalk pavement with pebble and cobble. Frequent attached faunal turf and sea anemones. Weed observed suggesting infralittoral.	A3	Absent	Chalk pavement	Video very fast providing poor quality imagery and making it hard to observe fauna
31/05/2019	CSCB	20190531-016	1	10:27:25	16		52.934645	1.391683	Sand and muddy sand seabed dominated with pebble and cobble. No evidence of chalk. Occasional attached faunal turf, occasional Asterias rubens and frequent sea anemones.	A5.4	Absent	Absent	
31/05/2019	CSCB	20190531-017	1	10:38:54	17		52.924818	1.383556	Chalk pavement with overlying sand and muddy sand, pebbles, cobbles and large chalk boulders. Frequent attached faunal turf and occasional sea anemones. Weed present suggesting infralittoral.	A3	Absent	Rugged chalk	Video very fast providing poor quality imagery and making it hard to observe fauna
31/05/2019	CSCB	20190531-019	1	10:48:42	18		52.947054	1.353893	turf, frequent Asterias rubens and sea anemones, and occasional sunstars and crabs. Possible rocky reef.	A5.1	Absent	Absent	Video very fast providing poor quality imagery and making it hard to observe fauna
31/05/2019	CSCB	20190531-020	1	10:59:57	19		52.939235	1.34857	Chalk pavement seabed with pebble and cobble. Abundant attached faunal turf, occasional Asterias rubens and sea anemones. Weed present suggesting infralittoral.	A3	Absent	Chalk pavement	Video very fast providing poor quality imagery and making it hard to observe fauna

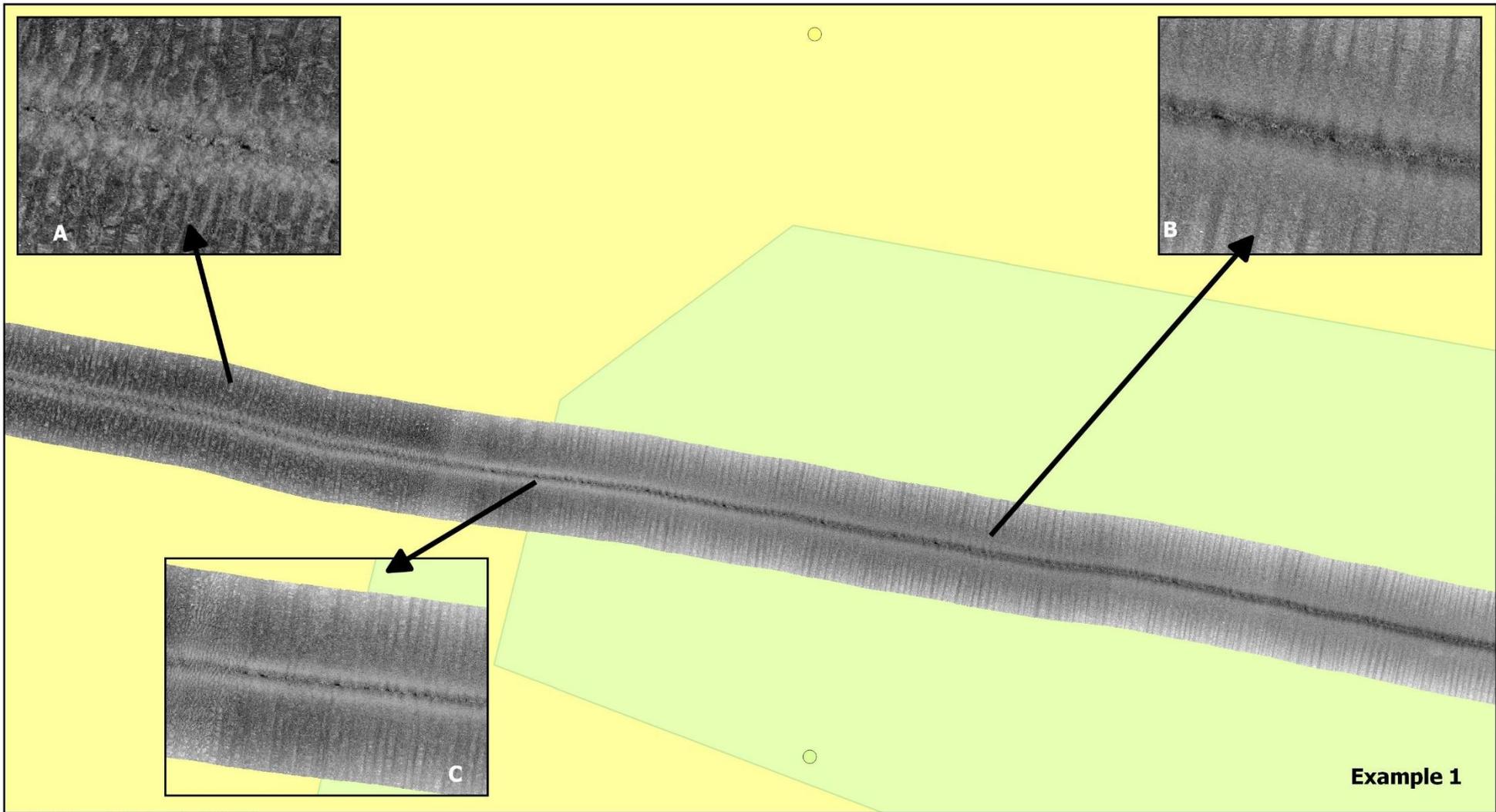
27/08/2019	NNC	20190927-005	1	11:11:14	1	GOPR2128	53.006333	0.863372	Sand and muddy sand with shell and pebble, possible mixed sediment towards the end of video. Attached faunal turf – bryozoan and hydroid, sea anemones and slipper limpets. Frequent <i>Asterias rubens</i> and sunstars.	A5.2	Absent	Absent	most of video poor quality as moving too fast
27/08/2019	NNC	20190927-106	1	11:22:56	4	GOPR2129	52.993134	0.884813	Sand and muddy sand with occasional shell and pebble. Some attached and loose faunal turf - possibly algae. Occasional <i>Asterias rubens</i> .	A5.2	Absent	Absent	
27/08/2019	NNC	20190927-113	1	11:30:29	5	GOPR2131	52.988612	0.915691	Coarse sand waves. Barren seabed with occasional <i>Asterias rubens</i> and loose faunal turf.	A5.2	Absent	Absent	
27/08/2019	NNC	20190927-123	1	11:41:43	6	GOPR2132	53.01195	0.966513	Mixed sediment – sand and muddy sand, silt, shell and pebble. Seabed dominated by attached faunal turf – hydroids and bryozoans, frequent sea anemones and <i>Sabella pavonia</i> . Frequent sunstars and occasional shore crab and <i>Asterias rubens</i> .	A5.4	Absent	Absent	very poor-quality imagery for most of video as camera moving too fast
27/08/2019	NNC	20190927-124	1	11:53:06	7	GOPR2133	53.019855	0.992959	Mixed sediment – sand and muddy sand, silt, shell and pebble. Seabed dominated by attached faunal turf – hydroids and bryozoans, common sea anemones and <i>Sabella pavonia</i> . Frequent sunstars and occasional <i>Asterias rubens</i> .	A5.4	Absent	Absent	very poor-quality imagery for most of video as camera moving too fast
27/08/2019	NNC	20190927-125	1	12:06:26	8	GOPR2171	52.998043	0.994213	Mobile sand with sand waves. No fauna observed.	A5.2	Absent	Absent	
27/08/2019	NNC	20190927-137	1	12:35:05	9	GOPR2172	53.005118	1.099721	Mixed sediment – sand, shell and pebble, some fines. Majority of seafloor covered with attached faunal turf – bryozoan and hydroids and occasional sea anemone. Occasional gobies and <i>Asterias rubens</i> .	A5.4	Absent	Absent	
27/08/2019	NNC	20190927-134	1	12:42:31	10	GOPR2173	52.995675	1.108037	Possible mixed sediment – sand, shell and pebble, some fines. Attached faunal turf – bryozoan and hydroids and frequent sea anemones. Occasional gobies, <i>Asterias rubens</i> and sunstars.	A5.4	Absent	Absent	
27/08/2019	NNC	20190927-136	1	12:49:59	11	GOPR2174	52.985844	1.10742	Mobile sand with sand waves. Patches of shell and pebble. Frequent attached fauna.	A5.2	Absent	Absent	
27/08/2019	NNC	20190927-135	1	13:01:38	12	GOPR2134	52.969792	1.108905	Mobile sand with sand waves. Patches of shell and pebble. Barren seabed with occasional <i>Asterias rubens</i> .	A5.2	Absent	Absent	
27/08/2019	NNC	20190927-138	1	13:08:46	13	GOPR2135	52.960178	1.114033	Mostly barren coarse mobile sand with occasional patches of fauna rich areas of pebble and cobble. Frequent <i>Asterias rubens</i> and occasional edible crab. Faunal turf, <i>Sabella pavonia</i> and sea anemones associated with areas of cobbles.	A5.2	Absent	Absent	

#### Appendix 4: Assigning habitat biotopes based on side scan backscatter characteristics and ground truth video imagery

Once the side-scan and ground truthing survey data had been collated and processed, the data was spatially mapped using QGIS (v.2.18.11) and used to estimate broad-scale marine biotopes using the EUNIS classification system. Large area polygons were allocated by extending the EUNIS classification of the individual stations to areas showing similar backscatter characteristics from the side scan results and by detailing any other distinct features observed, such as clear sand wave formations. Where there were gaps in the side scan mosaics, lines were extended from the two mosaics either side to provide our best estimate of habitat boundaries based on the available data. The charts below show examples of how this was achieved. Whilst these methods involve a high level of subjectivity, the resulting habitat map provides our best estimate of the distribution and extent of habitats within the survey area.

It is important to point out that some sections of the side scan mosaics have straight lines going across them. These are not seabed features but instead an artefact caused by wave motion acting on the side scan towfish and causing it to roll in the water. As it rolls the angle of the beam alters, being more acute on one side and more obtuse on the other side, causing differences in the strength of reflection. As the towfish rolls the other way the relative strength of the return reverses resulting in the banding pattern that we can see (alternatively dark one side and light the other).





Example 1

### North Norfolk Coast Habitat Mapping

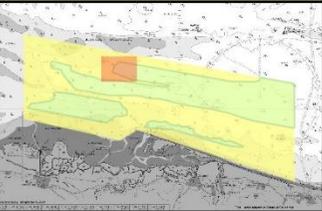
The backscatter observed in Image A shows clear ripple features on the seabed indicative of sand wave formations. There is a clear change in backscatter characteristics (shown in Image C) to backscatter representing a flatter seabed (Image B). Lines either side of the mosaic were drawn based on the habitats identified in ground truth stations and by connecting with lines drawn on

#### EUNIS habitat classification

- A4
- A5.2
- A5.4
- A5.2
- A5.4

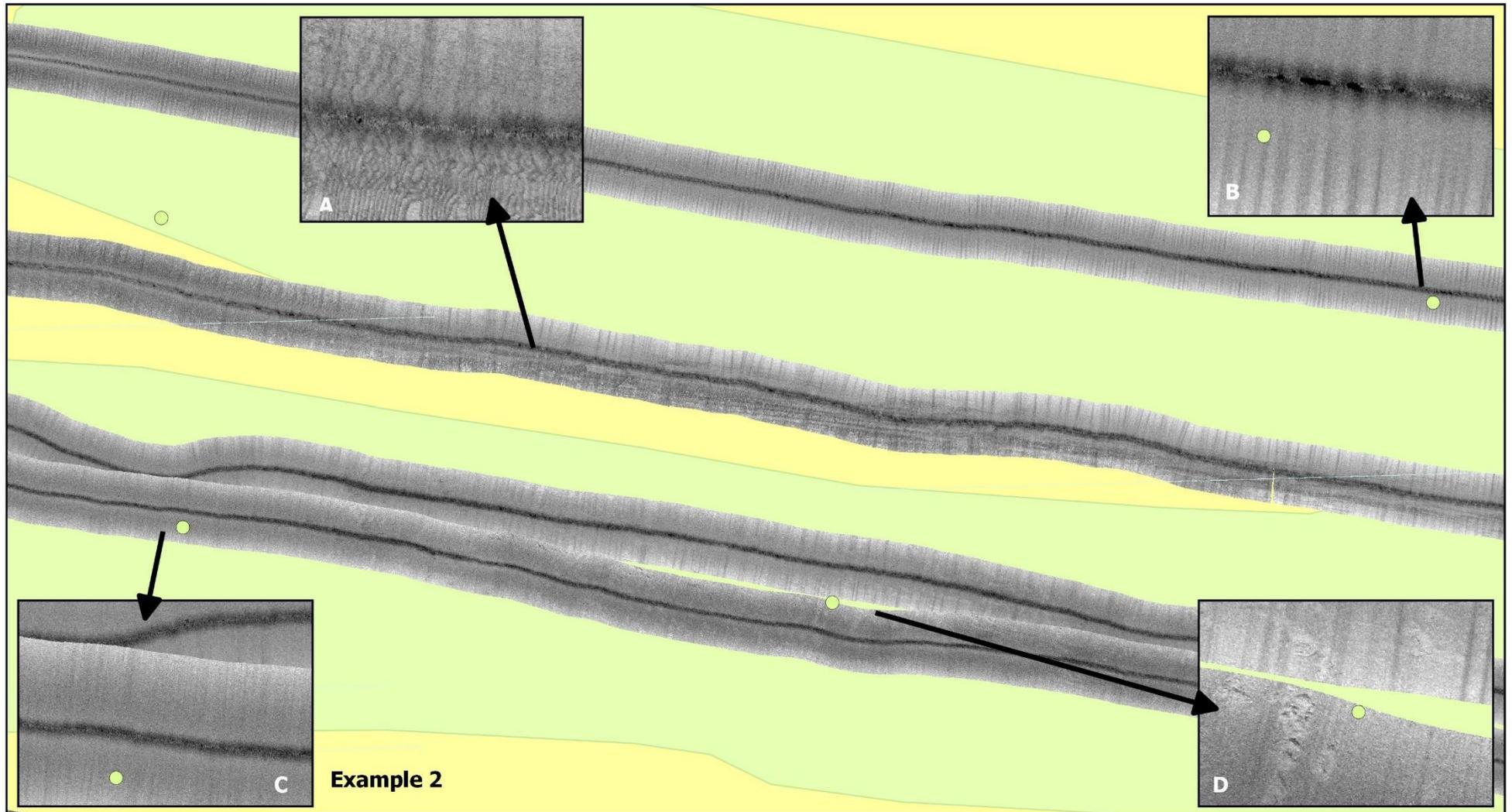


Date: 17/01/2020  
 Drawn by: SH  
 Projection: WGS 84  
 Data: EIFCA

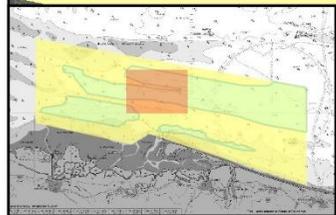


#### Assignment of biotopes

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**Example 2**



**Assignment of biotopes**

## North Norfolk Coast Habitat Mapping

Image A shows a change in the seabed from a flat ground to sand wave formations. The backscatter in Images B, C and D show a flat seabed. The video footage taken from these areas were consistent with that of mixed sediment (Stations: 20190927-124, 20181019-119 and 20190927-123, respectively). However, the backscatter in Image D also indicates the presence of patches of, possibly, rougher ground.

### EUNIS habitat classification

- A4
- A5.2     A5.2
- A5.4     A5.4

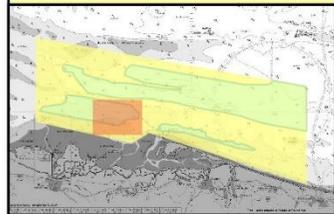


Date: 17/01/2020  
 Drawn by: SH  
 Projection: WGS 84  
 Data: EIFCA

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Example 3



**Assignment of biotopes**

**North Norfolk Coast Habitat Mapping**

Image A shows mainly sand wave formations with a thin strip of flat seabed along the bottom edge of the mosaic. Image B and D show a change in backscatter characteristics from that of a flat seabed to that of sand wave formations. Image C shows a consistently flat seabed. Lines have been drawn to reflect these changes in habitat type and have been estimated in areas when no backscatter data is available, based on ground truth data and adjacent mosaics.

**EUNIS habitat classification**

- A4
- A5.2
- A5.4
- A5.2
- A5.4



Date: 17/01/2020  
 Drawn by: SH  
 Projection: WGS 84  
 Data: EIFCA

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