Fisheries in EMS Habitats Regulations Assessment for Amber and Green risk categories

NWIFCA-MB-EMS-UNDERSIZE MUSSEL MORECAMBE BAY HANDGATHERING AND DREDGE FISHERY

16th July 2021 – Updated 27th July 2021

Site: Morecambe Bay and Duddon Estuary

European Designated Sites:
- UK0013027 Morecambe Bay Special Area of Conservation (SAC)
- UK9020326 Morecambe Bay and Duddon Estuary SPA
- UK11045 Morecambe Bay Ramsar
- UK11022 Duddon Estuary Ramsar

European Marine Site: Morecambe Bay and Duddon Estuary

Qualifying Feature(s):

SAC and Ramsar

H1110. Sandbanks which are slightly covered by sea water all the time; Subtidal sandbanks
H1130. Estuaries

H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats
H1150. Coastal lagoons
H1160. Large shallow inlets and bays
H1170. Reefs
H1220. Perennial vegetation of stony banks; Coastal shingle vegetation outside the reach of waves (NON MARINE)
H1310. *Salicornia* and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand; Pioneer saltmarsh
H1330. Atlantic salt meadows (*Glauco-Puccinellietalia maritimae)*
H2110. Embryonic shifting dunes (NON MARINE)
H2120. Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram (NON MARINE)
H2130. Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland (NON MARINE)
H2150. Atlantic decalcified fixed dunes (*Calluno-Ulicetea*); Coastal dune heathland (NON MARINE)
H2170. Dunes with *Salix repens ssp. argentea* (*Salicion arenariae*); Dunes with creeping willow (NON MARINE)
H2190. Humid dune slacks (NON MARINE)
S1166. *Triturus cristatus*; Great crested newt (NON MARINE)
Natterjack Toad (NON MARINE)

SPA and Ramsar

A026 Egretta garzetta; Little egret (non-breeding)
A038 *Cygnus Cygnus*; Whooper swan (non-breeding)
A040 *Anser brachyrhynchus*; Pink-footed goose (non-breeding)
A048 *Tadorna tadorna*; Common shelduck (non-breeding)
A050 Anas Penelope; Wigeon - (non-breeding – Ramsar only)
A054 *Anas acuta*; Northern pintail (non-breeding)
A063 *Somateria mollissima*; Common eider (non-breeding – Ramsar only)
A067 Bucephala clangula; Goldeneye - (non-breeding – Ramsar only)
A069 Mergus serrator; Red-breasted merganser - (non-breeding – Ramsar only)
A130 *Haematopus ostralegus*; Eurasian oystercatcher (non-breeding)
A137 *Charadrius hiaticula*; Ringed plover (non-breeding)
A140 *Pluvialis apricaria*; European golden plover (non-breeding)
A141 *Pluvialis squatarola*; Grey plover (non-breeding)
A142 *Vanellus vanellus;* Lapwing - (non-breeding – Ramsar only)
A143 *Calidris canutus*; Red knot (non-breeding)
A144 *Calidris alba*; Sanderling (non-breeding)
A149 *Calidris alpina alpina*; Dunlin (non-breeding)
A151 *Calidris pugnax;* Ruff (non-breeding)
A156 *Limosa limosa;* Black-tailed godwit (non-breeding)
A157 *Limosa lapponica*; Bar-tailed godwit (non-breeding)
A160 *Numenius arquata*; Eurasian curlew (non-breeding)
A162 *Tringa totanus*; Common redshank (non-breeding)
A169 *Arenaria interpres*; Ruddy turnstone (non-breeding)
A176 Larus melancephalus; Mediterranean gull (non-breeding)
A183 *Larus fuscus*; Lesser black-backed gull (Breeding, non-breeding)
A184 *Larus argentatus*; Herring gull (Breeding)
A191 *Sterna sandvicensis*; Sandwich tern (Breeding)
A193 *Sterna hirundo*; Common tern (Breeding)
A195 *Sterna albifrons*; Little tern (Breeding)
Phalacrocorax carbo; Cormorant – (non-breeding – Ramsar only)
Podiceps cristatus; Great crested grebe - (non-breeding – Ramsar only)
Seabird assemblage
Waterbird assemblage

Site sub-feature(s)/Notable Communites:

SAC and Ramsar

Sandbanks which are slightly covered by sea water all the time – Subtidal coarse sediment, subtidal mixed sediments, subtidal sand, subtidal mud.

Estuaries - Intertidal mud, intertidal sand and muddy sand, intertidal mixed sediments, intertidal coarse sediment, intertidal rock, intertidal stony reef, intertidal biogenic reef: mussel beds, subtidal coarse sediment, subtidal mixed sediments, subtidal sand, subtidal mud, Salicornia and other annuals colonising mud and sand, Atlantic salt meadows (Glauco-Puccinellietalia maritimae).

Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats – Intertidal mud, intertidal sand and muddy sand, intertidal mixed sediments, intertidal seagrass beds, intertidal coarse sediment.

Coastal lagoons

Large shallow inlets and bays – Intertidal mud, intertidal sand and muddy sand, intertidal mixed sediments, intertidal seagrass beds, intertidal coarse sediment, intertidal rock, intertidal stony reef, intertidal biogenic reef: mussel beds, intertidal biogenic reef: Sabellaria spp., subtidal stony reef, circalittoral rock, subtidal coarse sediment, subtidal mixed sediments, subtidal sand, subtidal mud, Salicornia and other annuals colonising mud and sand, Atlantic salt meadows (Glauco-Puccinellietalia maritimae).

Reefs – Circalittoral rock, intertidal biogenic reef: mussel beds, intertidal biogenic reef: Sabellaria spp., intertidal rock, intertidal stony reef, subtidal stony reef.

Perennial vegetation of stony banks: Coastal shingle vegetation outside the reach of waves

***Salicornia* and other annuals colonising mud and sand: Glasswort and other annuals colonising mud and sand; Pioneer saltmarsh**

Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (referred to as Saltmarsh)

Embryonic shifting dunes

Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"); Shifting dunes with marram

Fixed dunes with herbaceous vegetation ("grey dunes"); Dune grassland

Atlantic decalcified fixed dunes (*Calluno-Ulicetea*); Coastal dune heathland

Dunes with *Salix repens spp. Argentea* (*Salicion arenariae*); dunes with creeping willow

Humid dune slacks

Great crested newt (*Triturus cristatus*)

Supporting habitat: Great crested newt (NON MARINE) – coastal sand dunes
Natterjack Toad (NON MARINE)- coastal sand dunes

SPA and Ramsar

Annual vegetation of drift lines, Atlantic salt meadows (Glauco-puccinellietalia maritimae), coastal lagoons, freshwater and coastal grazing marsh, intertidal biogenic reef: mussel beds, intertidal coarse sediment, intertidal mud, intertidal rock, intertidal sand and muddy sand, intertidal seagrass beds, intertidal stony reef, Salicornia and other annuals colonising mud and sand, water column.

Generic sub-feature(s):

Intertidal mud and sand, Intertidal mud, Seagrass, Saltmarsh spp., Brittlestar beds, Subtidal muddy sand, Intertidal boulder and cobble reef, Subtidal boulder and cobble reef, *Sabellaria* spp. reef, Intertidal boulder and cobble reef, Surface feeding birds, Estuarine birds, Intertidal mud and sand, Intertidal boulder and cobble reef, Saltmarsh spp., Coastal lagoons.

High Level Conservation Objectives:

Morecambe Bay SAC

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed above), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

Morecambe Bay SPA

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified and the Ramsar Site and the wetland habitats and/or species for which the site has been listed (the 'Qualifying Features' listed above), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive and ensure that the site contributes to achieving the wise use of wetlands across the UK, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

Duddon Estuary SPA

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified and the Ramsar Site and the wetland habitats and/or species for which the site has been listed (the 'Qualifying Features' listed above), and subject to natural change;

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive and ensure that the site contributes to achieving the wise use of wetlands across the UK, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features, and,
- The distribution of the qualifying features within the site.

Lune Marine Conservation Zone (MCZ)

The site is designated for smelt (*Osmerus eperlanus*) with a recover objective.

Updated conservation advice for Morecambe Bay and Duddon Estuary SPA.

Changes specific to this HRA;-

- Grey plover, dunlin, sanderling and turnstone have a restore target for population due to declines in population exceeding regional and national trends.

Fishing activities assessed:

Gear type(s):

Hand-gathered – Undersize Mussel (*Mytilus edulis*)
Vessel dredge - Undersize Mussel (*Mytilus edulis*)

1. Introduction

1.1 Need for an HRA assessment

The NWIFCA proposes to authorise a number of undersize (less than 45mm) mussel hand-gathered and vessel dredge fishery within the site.

The proposed opened fisheries will be by permits issued under NWIFCA Restrictions on the Use of a Dredge 2017, and by authorisation issued under NWIFCA Byelaw 3, Permit to Fish Cockles and Mussels by derogating against the minimum landing size for mussel for the hand gathered fishery.

This proposal is classed as a plan or project and the area lies within a European designated site (also commonly referred to as Natura 2000 sites), and therefore has the potential to affect the designated features. European sites are protection under the Conservation of Habitats and Species Regulations 2017. The proposal site is within the Morecambe Bay and Duddon Estuary SPA and the Morecambe Bay Special Area of Conservation (SAC). The site is listed as Morecambe Bay Ramsar site, and Morecambe Bay, Site of Special Scientific Interest (SSSI).

As a competent authority under the provisions of the Habitats Regulations, the NWIFCA should have regard for any potential impacts that a plan or project may have. Under the provisions of the Habitats Regulations, NWIFCA has undertaken an Appropriate Assessment of the proposal, in accordance with Regulation 61. Natural England is a statutory consultee on the Appropriate Assessment stage of the Habitats Regulations Assessment process, and their advice is incorporated into this document.

1.2 Proposal

The NWIFCA proposes to authorise a number of undersize (less than 45mm) mussel hand-gathered and vessel dredge fishery within the site. These are:

- A permitted dredge, seed mussel fishery at Perch and Black Scar (Fleetwood) to open July / August 2021.
- A authorised hand gathered seed mussel fishery at Heysham Flat to open July / August 2021.
- A permitted dredge and hand gathered, seed mussel fishery at South America (North Morecambe Bay) to open July / August 2021.
- A permitted dredge, seed mussel fishery at Falklands (North Morecambe Bay) to open July / August 2021.

The proposed opened fisheries will be by permits issued under NWIFCA Restrictions on the Use of a Dredge 2017, and by authorisation issued under NWIFCA Byelaw 3, Permit to Fish Cockles and Mussels (para 6.) by derogating against the minimum landing size for mussel for the hand gathered fishery.

The purpose of this site specific assessment document is to assess whether or not, in the view of NWIFCA the proposed fishing activity of hand-gathering and vessel dredging of undersize mussel at a number of mussel bed listed in Morecambe Bay is likely to have a significant effect on the qualifying features of the Morecambe Bay and Duddon Estuary European Site and on the basis of this assessment, whether or not it can be concluded that the activities will not have an adverse effect on the integrity of this European Site.

2. Information about the EMS

(See cover pages).

3. Interest feature(s) of the EMS categorised as 'Red' risk and overview of management measure(s) (if applicable)

The Morecambe Bay and Duddon Estuary European Site interest features, boulder and cobble reef, *Sabellaria alveolata* reef and Seagrass beds are protected from all bottom towed gears, in addition Seagrass beds are protected from bait collecting or working a fishery by hand or using a hand operated implement through a prohibition under NWIFCA Byelaw 6, introduced in May 2014.

4. Information about the fishing activities within the site

4.1 Background

It is important to note that mussel beds in Morecambe Bay are almost exclusively found on hard substrate - post-glacial moraine skears – and consequently respond quite differently to fishing pressures than in other fisheries such as the Wash in the UK and the Waddensee in the Netherlands where mussel beds are on soft substrates. There are two distinct mussel resources in Morecambe Bay that can be highly variable in abundance and distribution. These are size mussel (>45mm), and undersize (seed and part-grown) mussel.

A feature of Morecambe Bay is the irregular but frequent occurrence of large and extensive mussel spat settlements. These settlements are usually very dense with little or no embyssment to the underlying substrate and quickly build up large amounts of sediment and pseudo-faeces (mussel mud). Within a very short space of time these populations become unstable and vulnerable to erosion through weather and/or tide, or predation from vast numbers of starfish. They are referred to as "ephemeral" beds (Dare, 1971 & 1976) and the Authority takes the line that although they are undersized they should be fished as early as possible as they would otherwise be washed out of the fishery and a valuable commercial resource lost. The mussel is fished, either by hand-raking or by specialised mussel dredgers, neither of which impact the cobble and boulder skears due to the deep soft mud layer on which the mussel sits. Removal of undersize has also been authorised over the years when huge swarms of common starfish (*Asterias rubens*) have been present on a bed, predating voraciously on mussel of varying sizes dependent on the size of the starfish and their ability to open the shells. The harvested mussel is re-deposited in other areas to grow on until of a commercially viable size. The number of mussel cultivation sites has grown in areas such as the Wash, Northern Irish and Irish loughs, and the Menai Strait, the latter of which is an MSC accredited sustainable fishery. Relaying in Morecambe Bay has been trialled unsuccessfully as the mussel, even though relaid in more sheltered areas, is unable to persist due to the prevailing environmental conditions.

4.2 Mussel Hand-gathering

Hand gathering of mussel has been a long-standing traditional fishery within Morecambe Bay and the Duddon Estuary. Methods have changed very little over the years, with a rake and net bag used to remove the mussel from the underlying muddy substrate. Hand gathers access the beds mainly by ATVs and occasionally tractors due to the soft sediment. Depending on the area being fished, fishing is often limited by the tides and can be severely restricted. There is little to no by-catch associated with this fishery as it is highly selective.

Hand gathering of seed mussel is by written authorisation to current NWIFCA Byelaw 3 permit holders only. Areas permitted for harvest are incorporated into the authorisation conditions, along with any other restrictions. Seed mussel is transported, usually by road-freight, to its relaying destination.

4.2.1 Regulation of Hand-gathering

NWIFCA regulates mussel hand-gathering fisheries in its District through a suite of byelaws. Regulations relating specifically to hand gathering of mussels in Morecambe Bay are listed below. The full text of the regulations available on the NWIFCA website (https://www.nw-ifca.gov.uk/byelaws/).

NWIFCA Byelaw 3	Permit to fish for cockles and mussels
NWSFC Byelaw 13a	Cockles and mussels – management of the fishery
NWSFC Byelaw 16	Shellfishery – temporary closure

NWIFCA Byelaw 3 Permit to Fish for Cockles and Mussels was introduced in 2012 and succeeded in creating vastly improved management of the fisheries creating a more professional and responsible group of fishers. Under these regulations, the number of permit holders has reduced significantly. There are currently a maximum of 137 NWIFCA Byelaw 3 permits, which could be issued for the 2020 – 2021 season and a maximum of 147 permits, which could be issued for the 2021 – 2022 season. Without a permit within the NWIFCA district it is still permissible when mussel beds are open for 5kg per person per day of size mussel to be collected for human consumption.

NWIFCA are currently in the process of replacing the current byelaw with a new byelaw NWIFCA Byelaw 3 (2020) which if it comes into force during the 2021 – 2022 fishery will replace the current management. There are no changes in the byelaw that need to be considered in the HRA as the byelaw will build on and improve the current ability to manage the fishery.

4.3 Mussel Dredging

Dredging of undersize mussel for aquaculture has been a regular occurrence in Morecambe Bay since the 1960s. Dredging of mussel for aquaculture has developed significantly with technology concentrating on gear with low environmental impact. Seed mussel dredgers scoop up the top layer of loose mussel and mussel mud, bringing the catch through the water giving the mud a chance to flush through the netting, and depositing the catch in open holds on-board. There is little by-catch associated with this fishery, with starfish, shore crab, and the occasional flatfish found in the catch.

Mussel is typically transported by vessel to where it is going to be re-laid where it is flushed through the sides of the vessel and straight on to the bottom growing lays. In areas such as the Menai Strait where much of the Morecambe Bay mussel goes, operators work together to farm the mussel. Long-standing studies of what works in practice along with a wealth of research with Bangor University scientists has led to a method of moving mussel around to gain best growth potential and minimise losses from crab and starfish predation. Much of this depends on the size of mussel when wild caught and the strength of its shell.

4.3.1 Regulation of Dredge Fishery

Dredging of undersize mussel has been previously been managed by the North West and North Wales Sea Fisheries Committee (NW&NWSFC) under a 30 year Fishery Order - the Morecambe Bay Mussel Fishery Order (MBMFO) 1978, whereby fishing could only be carried out by licensees of the Order. The SFC was the holder of the MBMFO and also the Menai Strait Several Order where it leased out areas for aquaculture. The MBMFO expired in 2009, and the administrative area for NWIFCA changed, removing North Wales and adding Cumbria to the old NW&NWSFC boundaries. NWIFCA managed the fishery from 2009 - 2017 by written authorisation.

In 2017 NWIFCA introduced a dredge byelaw that prohibits dredge fishing of all types across the District unless specifically permitted by the Authority, in which case fishers must apply and pay for a permit, with a fee structure based on vessel length. Areas permitted for dredging are incorporated into permit conditions, along with any other restrictions. Dredge permits fluctuate each year depending on the seed mussel resource since the byelaw NWIFCA have issued a maximum of three permits in one year.

4.4 NWIFCA Un-written Policy on Seed Mussel

NWIFCA has been developing a Morecambe Bay mussel management plan over many years, unfortunately there have been a number of outstanding criteria to decide on in terms of brood stock and bird food requirement. It is planned to complete this work in the future to assist with the policy of managing the mussel fisheries.

Naturally there is some competition between sectors for mussel resources, and in the past there have been major disagreements. Due to the make-up of IFCAs and the inclusion of fishery interests in committee members, these disagreements could at times dominate committee meetings. NWIFCA set up a separate stakeholder forum to remove these discussions from committee proceedings, called the Bivalve Mollusc Working Group (BMWG). Established in 2015 it is made up of NWIFCA officers, stakeholder representatives from all sectors of the fisheries along with Natural England and nature conservation representatives.

In 2017 BMWG agreed a definition of ephemerality in relation to the mussel resources to assist NWIFCA in making decisions on when mussel could be harvested as seed is provided below:

Certain conditions need to occur for the NWIFCA to authorise fishing of seed mussel, namely that the stock has been assessed as in imminent likelihood of being lost to the fishery through natural causes, and subsequently that a high proportion of it will not grow through to reach size; and that conditions pertain to fishing being possible without risk of damage to the cobble and boulder substrate conservation features. These include:

- settlement in high abundance and density, and;
- fast growing and high deposits of pseudofaeces (mussel mud), and;
- the mussel mud becoming very soft and loose and at risk of being washed out, taking the mussel with it;
- or dense settlement being heavily predated on by thousands of starfish.

The fishery is highly variable depending on the vagaries of the stock, and the changes in the dynamic environment of the north west coast and have to be assessed on a year by year basis.

In addition to the variables outlined above affecting the recruitment and longevity of mussel within the Bay, the fact that the natural environment is highly changeable with sandbanks and channels shifting tens of metres overnight adds a further complexity to what can affect the stock on an annual if not seasonal basis. In light of the high unpredictability of stock and conditions NWIFCA scientists assess each bed to ensure that authorisation / permitting of seed mussel removal only occurs when the mussel is in a vulnerable condition. This is itself can be challenging as some areas in some years can only be accessed by boats drying out over low water.

4.5 Biosecurity

Morecambe Bay is currently shellfish disease free and the Authority considers it a priority to maintain this status. The non-native species Chinese Mitten Crab (Eriocheir sinensis), Wireweed (Sargassum muticum) and Leathery Sea-squirt (Styela clava) have previously been recorded within the area. In order to implement effective measures to prevent the introduction and / or spread of diseases or non-natives the Authority has developed and published a Biosecurity Plan, detailing controls and conditions that will be applied to all commercial shellfish activities. The Biosecurity Plan seeks to ensure that consignments and/or areas from which they come, are regularly and thoroughly checked for invasive non-native invasive species (INNS). NWIFCA now has firm evidence of Chinese mitten crabs in Morecambe Bay. In September 2020 two adult Chinese mitten crab were caught and retained and were subsequently confirmed by NWIFCA. Gathers have been advised to inspect their catch for Chinese mitten crabs whilst fishing on mussel beds and a reporting system is in place in the NWIFCA biosecurity plan. Officers from the NWIFCA also completed quarterly monitoring and surveillance on Heysham Flat and Foulney mussel beds, producing report to assist other regulators between 2018 and 2020. Officers have produced informative posters for the general public in order to raise awareness of the risk of the Chinese mitten crab, and requirement to report sightings.

4.6 Variability of Stock and Conditions

Managing a resource such as mussel in Morecambe Bay is hugely problematic due to the highly dynamic environment in which it is found, the vagaries of mussel recruitment, changing weather patterns particularly associated with climate change, and variability of predator presence, particularly from common starfish. It is impossible to predict what will occur from one year to the next, and in times and places from one month to the next. NWIFCA holds decades of reports, stock assessments and photographic evidence on this resource.

Morecambe Bay is characterised by vast areas sand underlain by glacial moraine. The channels shift, sometimes hundreds of metres overnight. The sand also moves around, sometimes covering over the glacial moraine, sometimes leaving it exposed. There are a number of examples where large areas have been covered in sand overnight.

Some areas of exposed moraine are relatively static due to their height on the shoreline and presumably shelter - Heysham Flat main skear, and Foulney Twist (main skear). The bottom ends of both of these areas have been sand covered in the past decade. Other areas are highly changeable and can change month on month, with areas that have been exposed one month, observed buried by a sand covering a month later.

Mussel needs a hard substrate on which to recruit, and when the moraine is exposed it provides ideal conditions. Where the brood stock for the dense aggregations seen in the Bay is situated has not established. There are older mussel stocks positioned on the upper reaches of Foulney and Foulney Ditch in most years and these may act as breeding stock. However, some larval dispersal modelling by Bangor University, although not specifically focussed on Morecambe Bay mussel, has provided evidence to the hypothesis that brood stock actually lies much further south even within the Mena Strait, has credence.

When considering the data from Dr Dare that 0 - 25% of stock might remain following natural scour, wash out and predation, a fact also observed by NWIFCA scientists, and also that dredge fishing is never 100% efficient and that a percentage of stock will remain post-fishing, it is natural to assume that some of this remaining mussel may over-winter. Un-embyssed seed mussel has an ability to ‘hunker down’ into the sediment when space allows in order to avoid the elements, particularly the effects of wind. This is commonly observed on Morecambe Bay mussel beds and can occur in coarse ground as well as soft. This provides some protection against scour. A frequent occurrence in the following spring is the next cohort of dense spat settling on top of this remaining mussel and smothering it. As the new mussel grows (rapidly) and puts down high levels of mussel mud, the older mussel disappears under this accumulation and generally dies.

4.7 Current Status of Stock

Perch Scar and Black Scar Mussel Inspection 04-06-20

LW: 07:46 0.7m (Liverpool Tides)

The Fleetwood mussel beds were inspected starting at Rossall Scar, then Necking, Kings and finishing on Perch and Black Scar as shown in Figure 1.

Black Scar
Black Scar has had a dense 2021 mussel settlement of approximately 80-90% coverage (Figure 2). The mussel was 2-4mm and had settled on the hard substrate (Figure 3). There were small areas of 2020 size mussel mixed in and on the channel edge (Figure 4). The approximate area of the mussel was 5.3 hectares.

Perch Scar
Perch Scar has had a dense 2021 mussel settlement of approximately 90% coverage on the main area (Figure 5). The settlement was less dense on the bed edges. The mussel was 8-10mm (Figure 6). There were occasional small areas of 30-45mm mussel mixed in with the seed and size mussel along the channel edge. Evidence of mussel mud from 2020 and there were a number of Oystercatchers present on the scar. The approximate area of the mussel was 7.9 hectares.

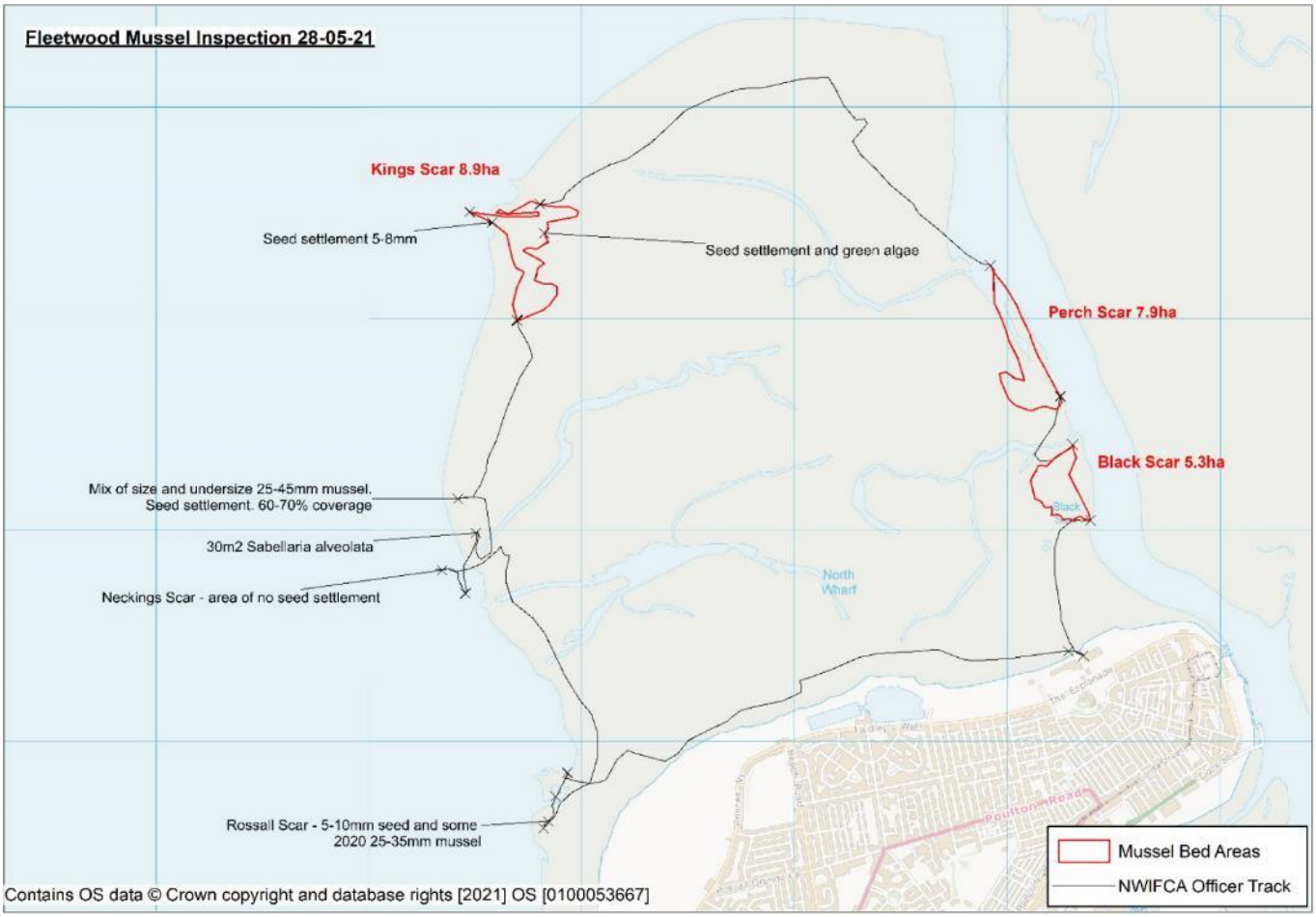


Figure 1. Overview of the mussel inspection 28-05-21.

Figure 2: Black Scar 2021 Mussel settlement 28-05-21.

Figure 3: Black Scar Mussel Bed 28-05-21.

Figure 4. Black scar 2020 mussel 28-05-2021.

Figure 5. Perch Scar 2021 mussel settlement 28-05-2021.

Figure 6. Perch Scar 2021 mussel settlement 28-05-2021.

Black Scar

The mussel on Black Scar was 10-20mm in size and in places showed signs of roping up and clear indications of scour occurring. The mussel had put down mussel mud to depths of approximately 10-20cm but there were also patches of bare cobble and broken shell. Figure 3 illustrates the unembyssed mussel becoming loose and putting out byssus threads in an effort to attach to conspecifics for security. The tide and wave action rolls this layer of embyssed mussel until the weight and looseness of the underlying mud renders it too unstable to hold on and it gets washed away.

Fig. 1 - Extent of seed mussel on Black Scar 26-07-21.

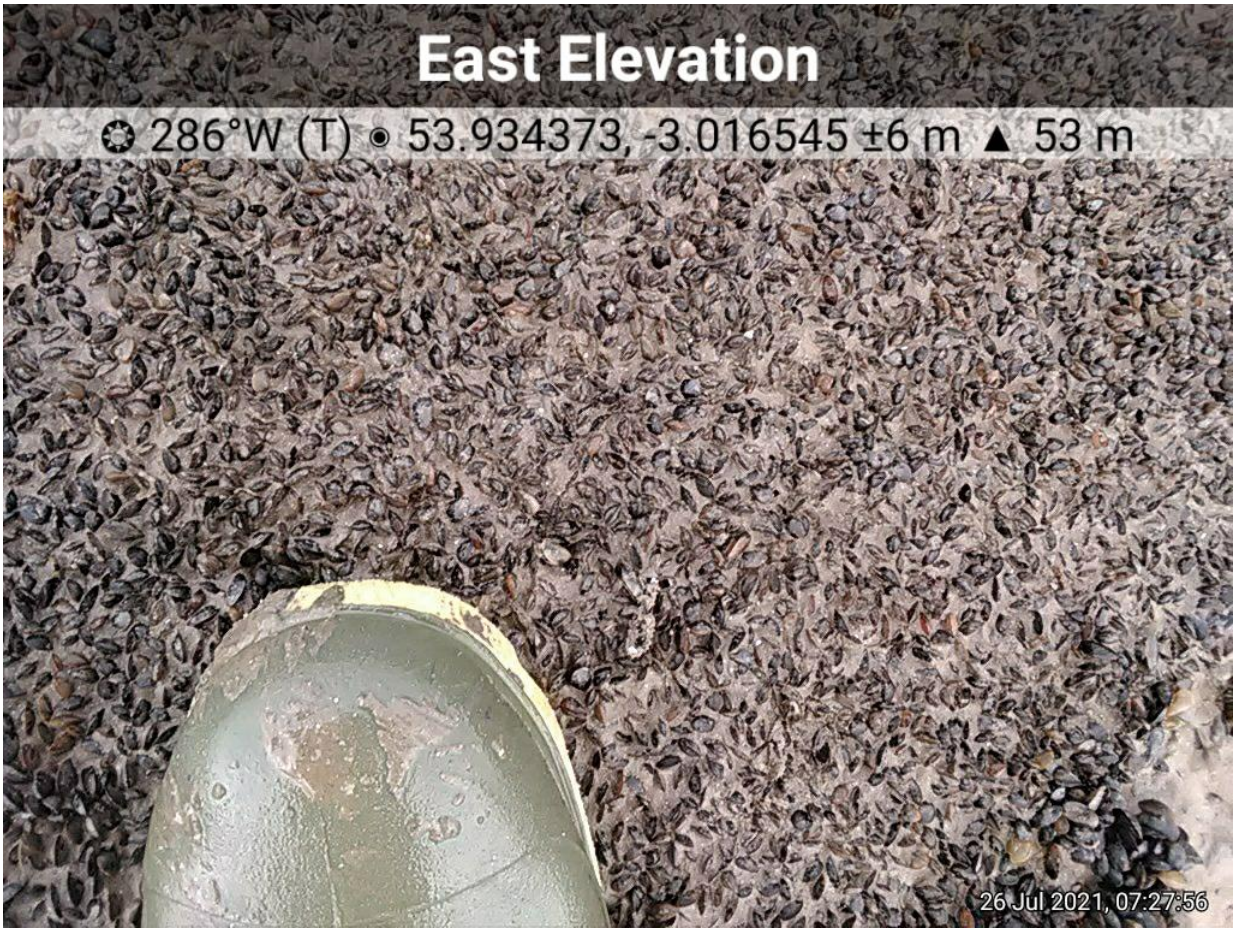


Fig 2 – Mussel on Black Scar 26-07-21.

Fig. 3 - Roping up of seed mussel on Black Scar 26-07-21.

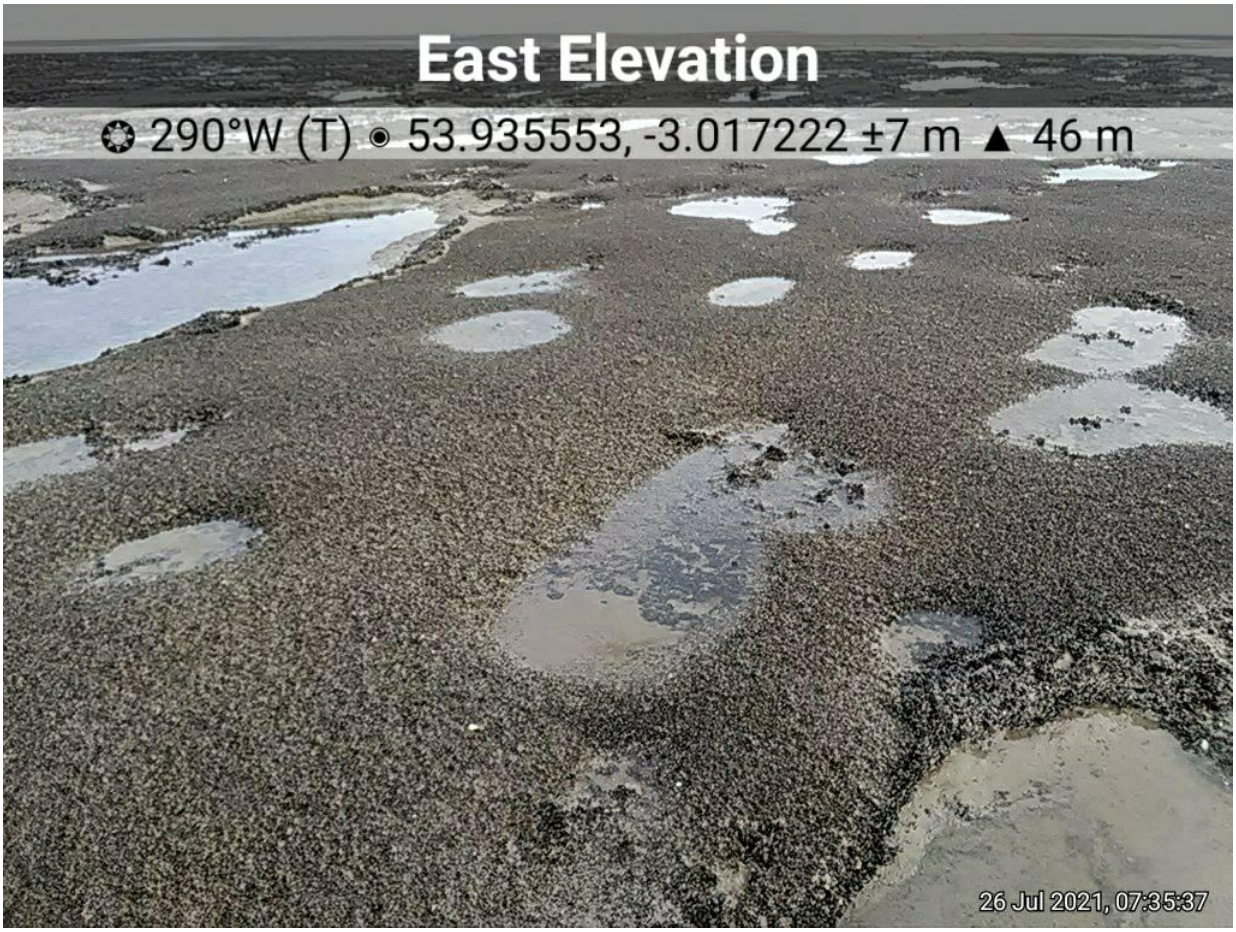


Fig. 4 – Example of mussel on Black Scar 26-07-21.

Perch Scar

The mussel on Perch Scar was in the size range of 10-20mm, and was packed into a soft thin layer of mussel mud (10-20cm). The mussel covered approximately 80% of the Scar and the mussel mud was deeper (30-40cm) and softer at the Northern end of the bed.

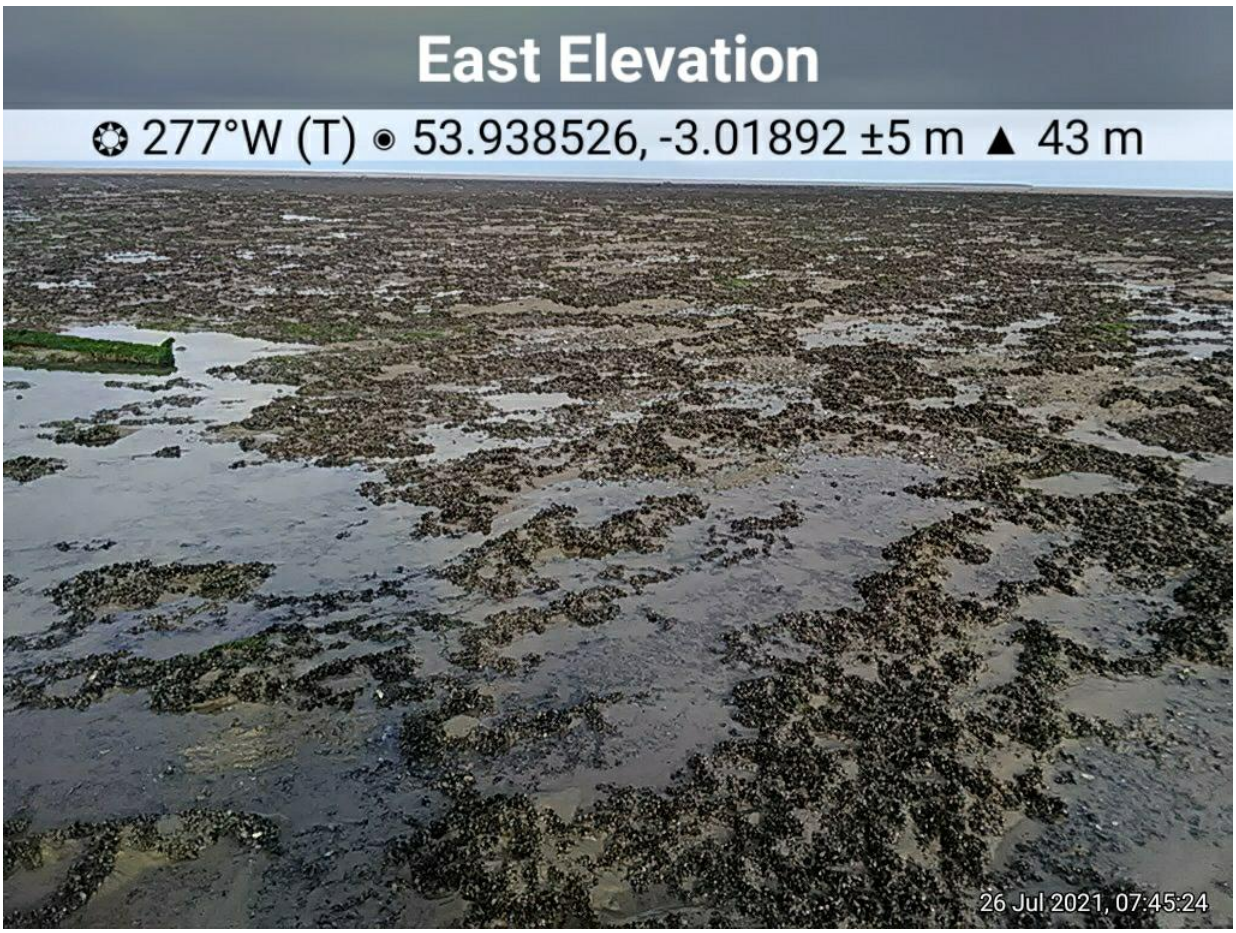


Fig. 5 - Extent of seed mussel on Perch Scar Scar 26-07-21.

Fig. 6 - Mussel on Perch Scar 26-07-21.

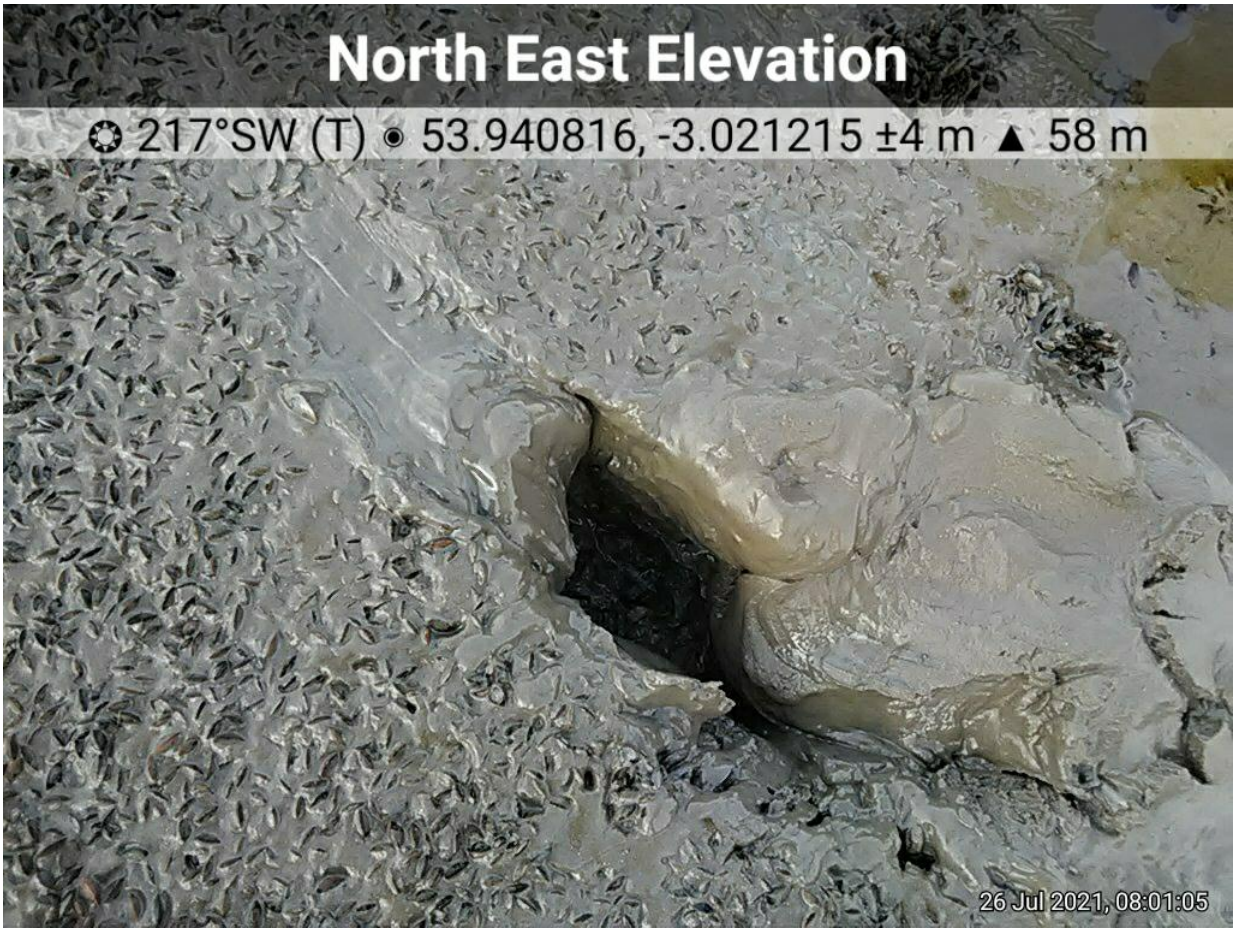


Fig 7 – Mussel Mud on Perch Scar 26-07-21.

Heysham Flat Mussel and *Sabellaria alveolata* Inspection 26-05-21

Tides LW 18:39 0.7m (Liverpool tides)

The skear was accessed on foot to inspect the mussel on Heysham Flat to assess if there had been a mussel settlement since it was last inspected at the end of March, when there was little evidence of a settlement. As previously reported much of the end of the skear from Conger Rock to Dallam Dyke is covered in *Sabellaria alveolata.* Due to the extensive coverage of S*abellaria alveolata,* access was limited to the area East of Conger Rock to ensure no damage was caused. The Eastern edge of the *Sabellaria alveolata* was mapped to show approximate extent (Figure 1).

There was evidence of a 2021 mussel settlement (Figures 2 and 3) which was constant across the bed East of the line in Figure 1, on most of the exposed skear. The mussel had a dense coverage of 70-80% at a size of 8-10mm. On the edges of the *Sabellaria* alveolata the was evidence the mussel had settled on it (Figure 4), however the majority of the *Sabellaria* alveolata did not appear black in colouration and therefore it was assumed that seed has not settled on it. There were also some small patches of 20-30mm mussel mixed in with the settlement (Figure 5).

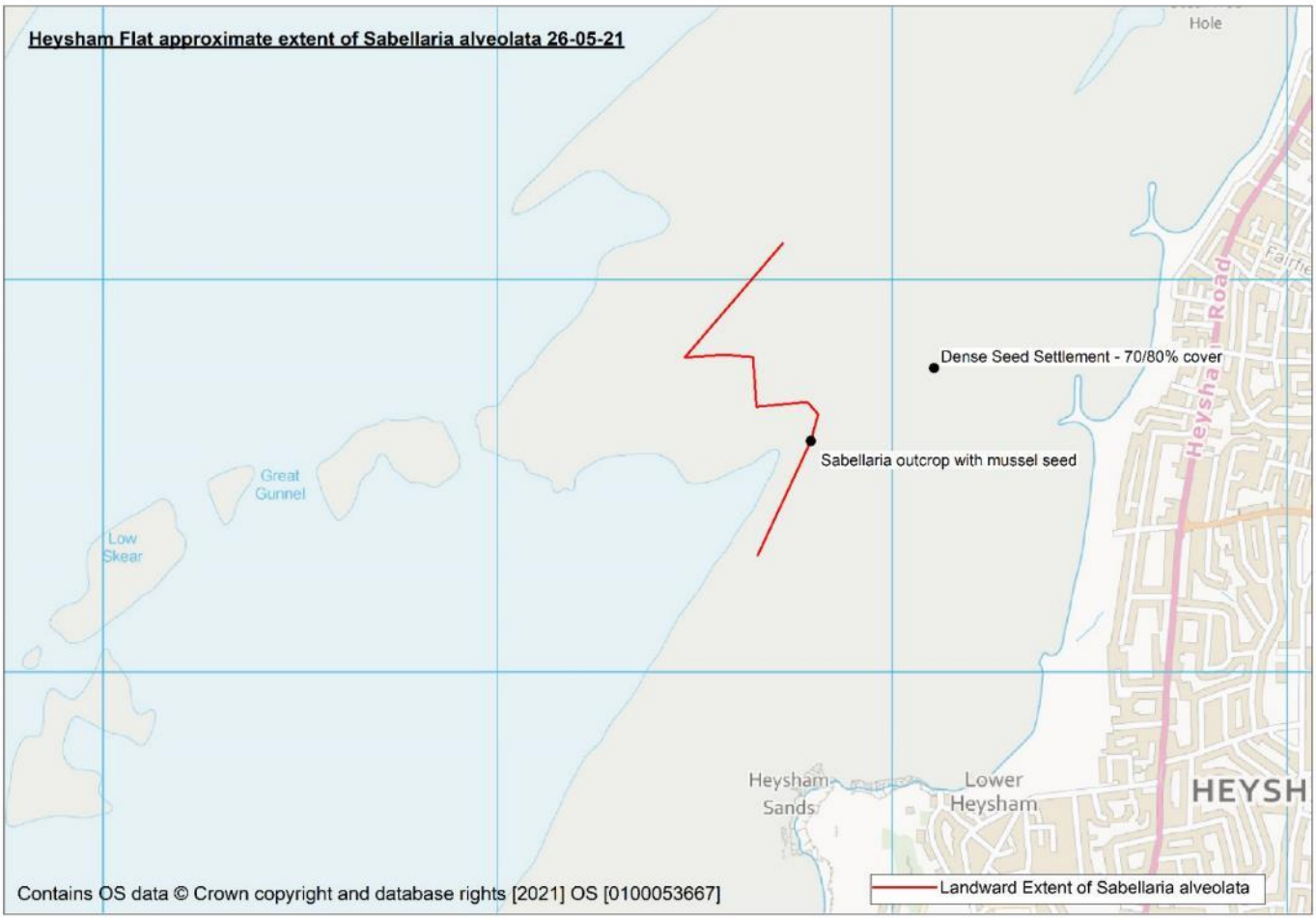


Fig.1 Approximate edge of *Sabellaria alveolata* 26-05-21.

Fig.2 2021 Mussel settlement 26-05-21.

Fig.3 2021 Mussel settlement 26-05-21.

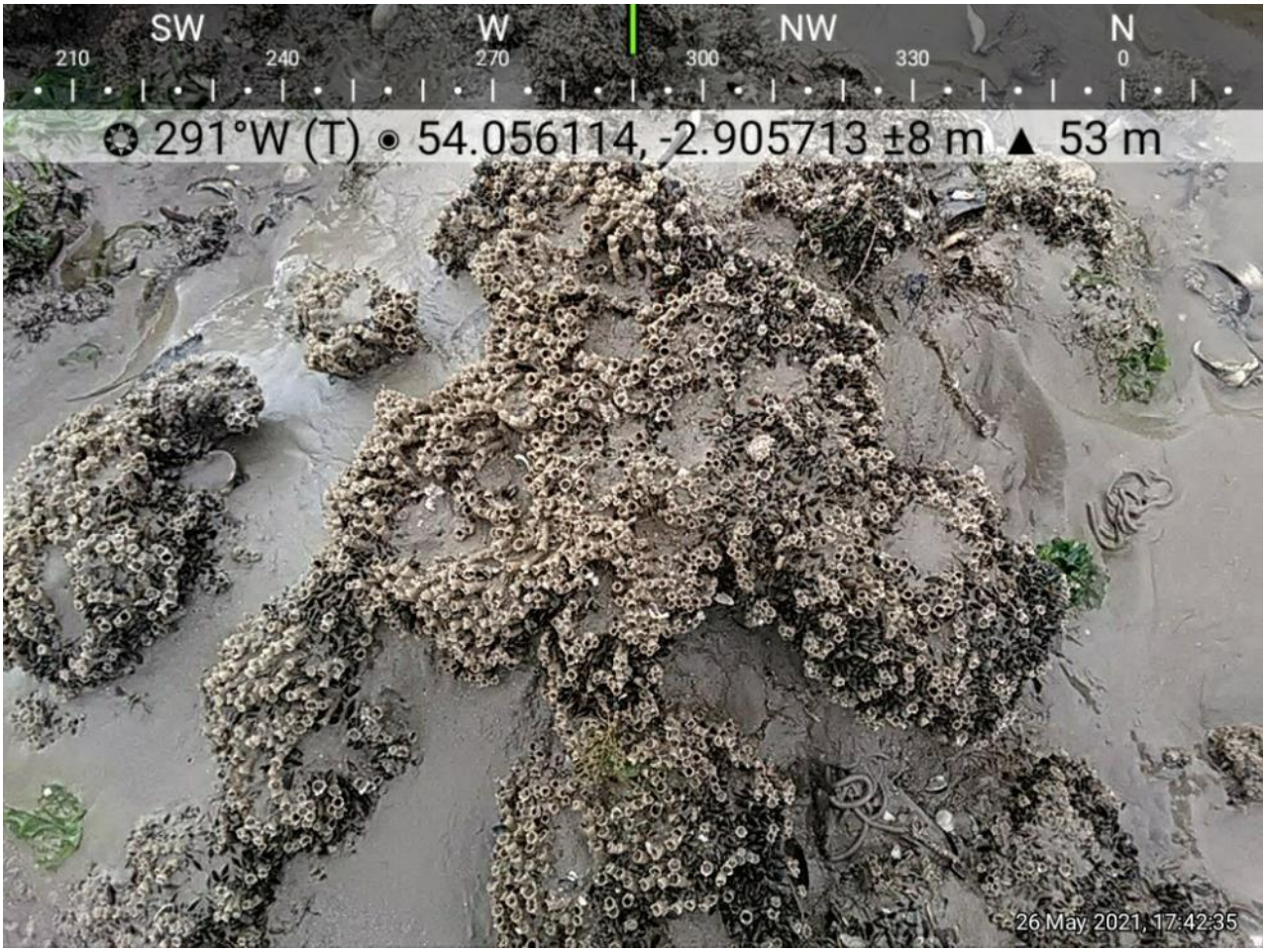


Fig.4 *Sabellaria alveolata* and mussel seed settlement 26-05-21.

Fig.5 2021 Mussel settlement and patch of 20-30mm mussel 26-05-21.

Heysham Flat Mussel and *Sabellaria alveolata* Inspection 25-06-21

Tides LW 06:44 1.1m (Liverpool tides)

The skear was accessed on foot to inspect the mussel on Heysham Flat (Figure 1) to assess the mussel settlement since it was last inspected at the end of May, when there was evidence of a settlement. It was previously reported much of the end of the skear from Conger Rock to Dallam Dyke is covered in *Sabellaria alveolata.* However the *Sabellaria alveolata* reef has been covered by an extensive mussel settlement, the mussel has already started putting down mussel mud, completely covering the reef (Figure 2). The coverage of S*abellaria alveolata* visible has drastically reduced and is now confined to the Northern and Southern edges of the main skear.

The mussel was constant across the majority of the main skear. The mussel had a dense coverage of 70-100% at a size of 10-20mm, with some smaller mussel of 8-10mm closer to shore (Figures 3 and 5). On the edges of the *Sabellaria* alveolata it was evident that the mussel had settled on it (Figure 4). There were occasional patches of 20-30mm mussel mixed in with the seed.

Dallam Dyke was not crossed but the further skears appeared black in colouration so it is assumed that seed settlement has occurred.

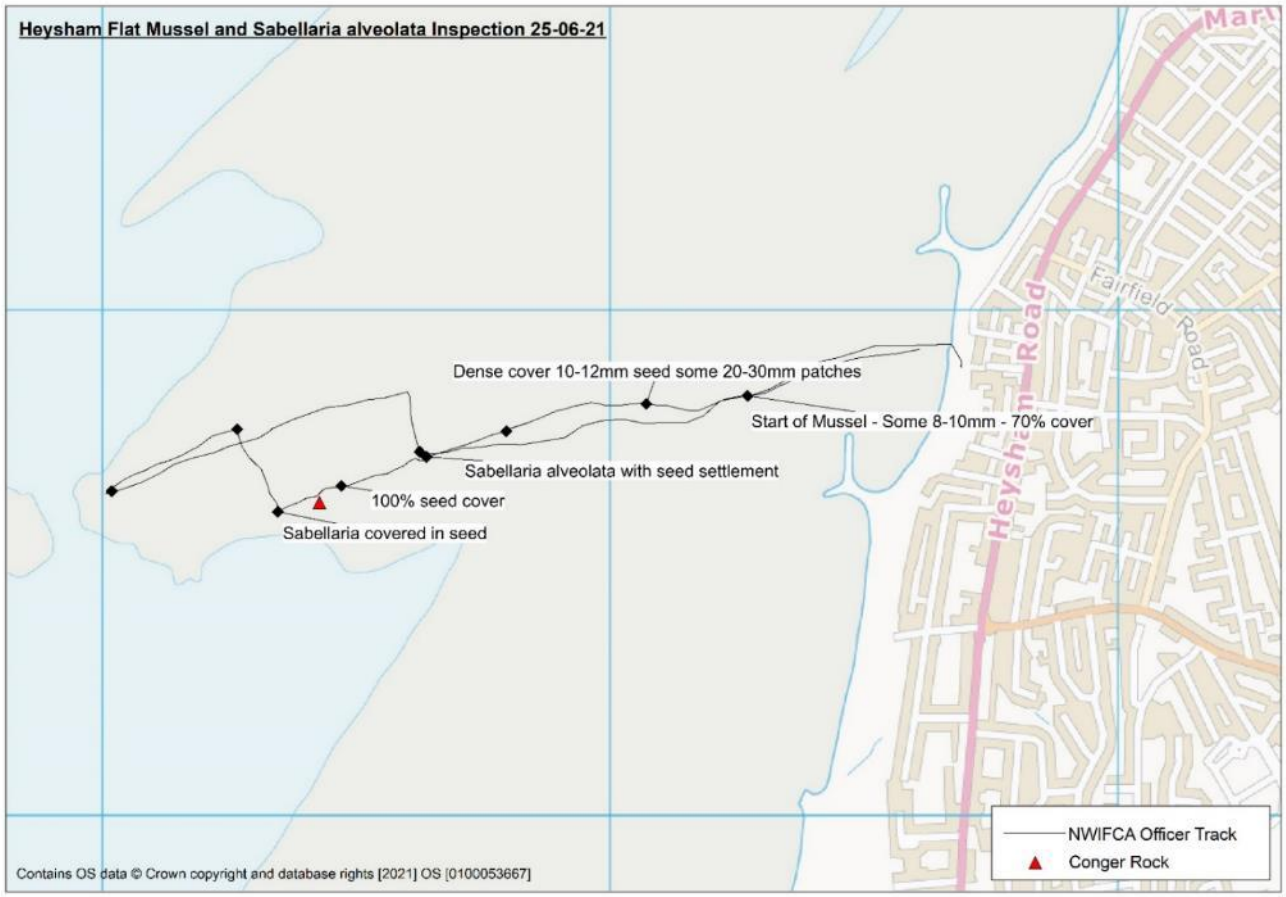


Fig.1 Map of Heysham Flat and approximate extent of *Sabellaria alveolata* 25-06-21.

Fig.2 2021 Mussel settlement 25-06-21.

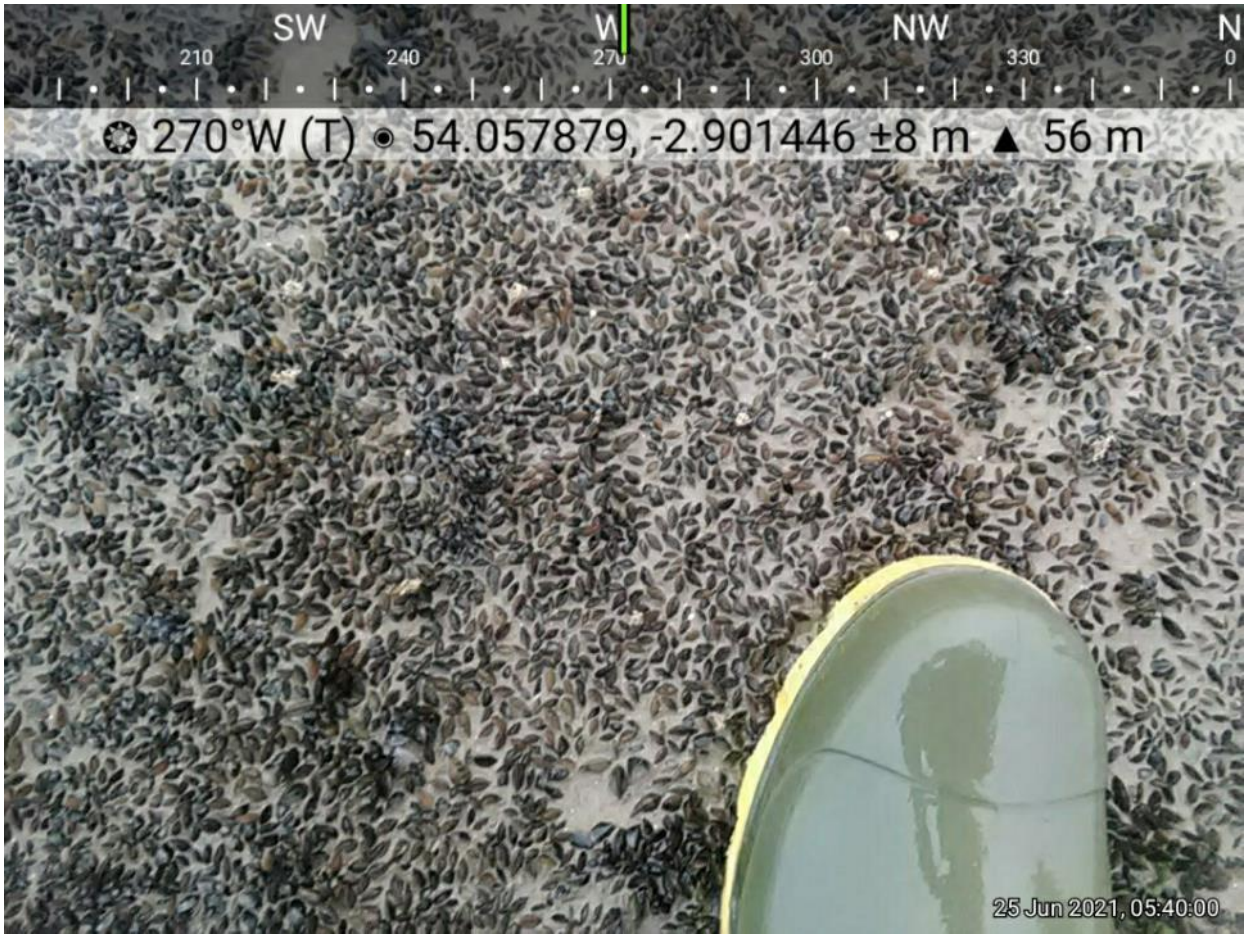


Fig.3 2021 Mussel settlement 25-06-21.

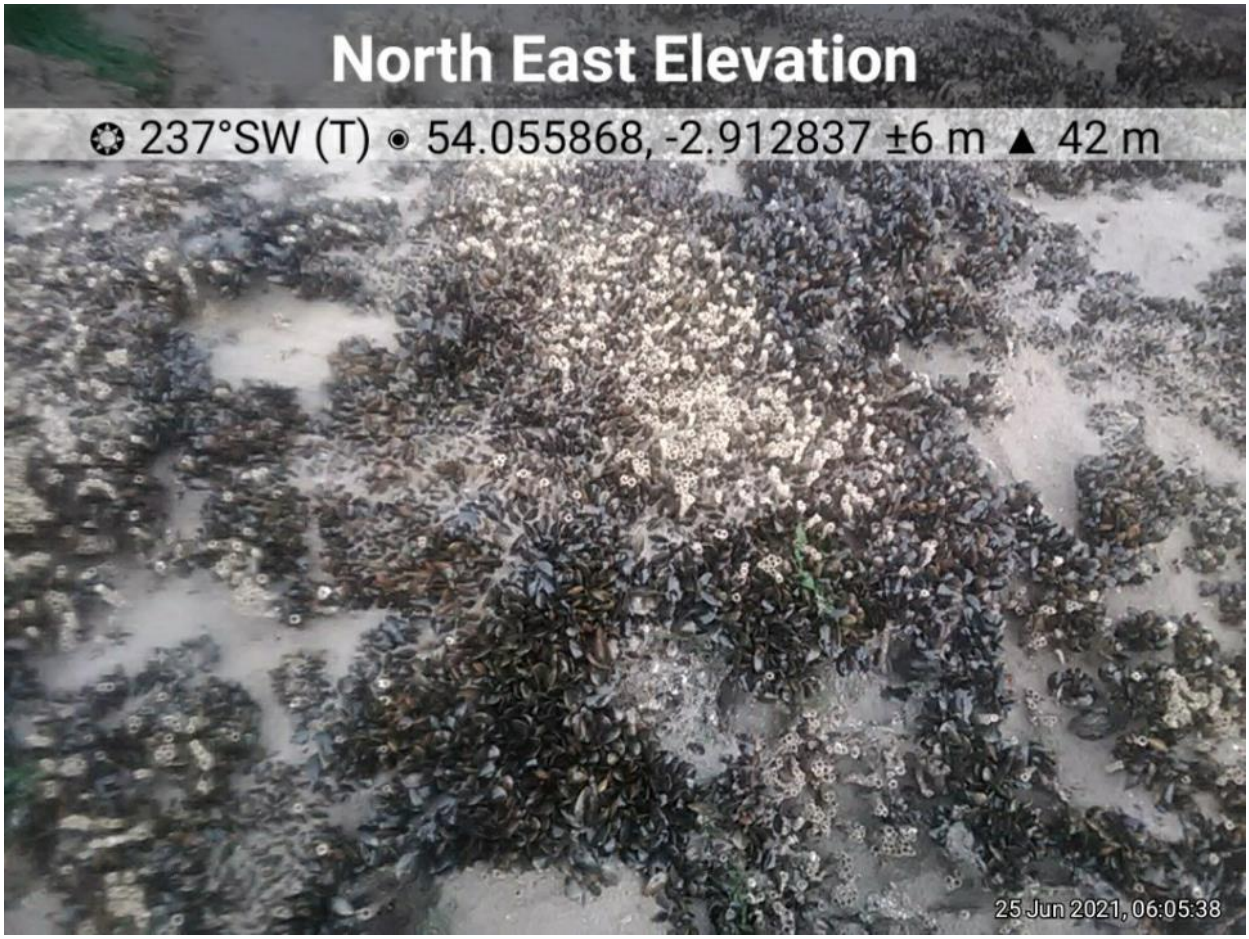


Fig.4 *Sabellaria alveolata* and mussel seed settlement 25-06-21.

Fig.5 2021 Mussel settlement and patch of 20-30mm mussel 25-06-21.

Heysham Flat Mussel Inspection 23-07-21

The skear was inspected to provide an update on the condition of the mussel to inform management of the mussel fishery. The mussel has put down a significant layer of mud. The mussel varies from 8-10mm high up the skear, to 10-20mm in the mid-section of the skear, some areas contain some 25-35mm mussel mixed in with the 10-20mm mussel. The mussel is very loose and has begun to scour in places. Most of the *Sabellaria alveolata* is not visible from conger rock to Dallam dyke, other than around the edge of the skear and where the mussel mud is thinner.

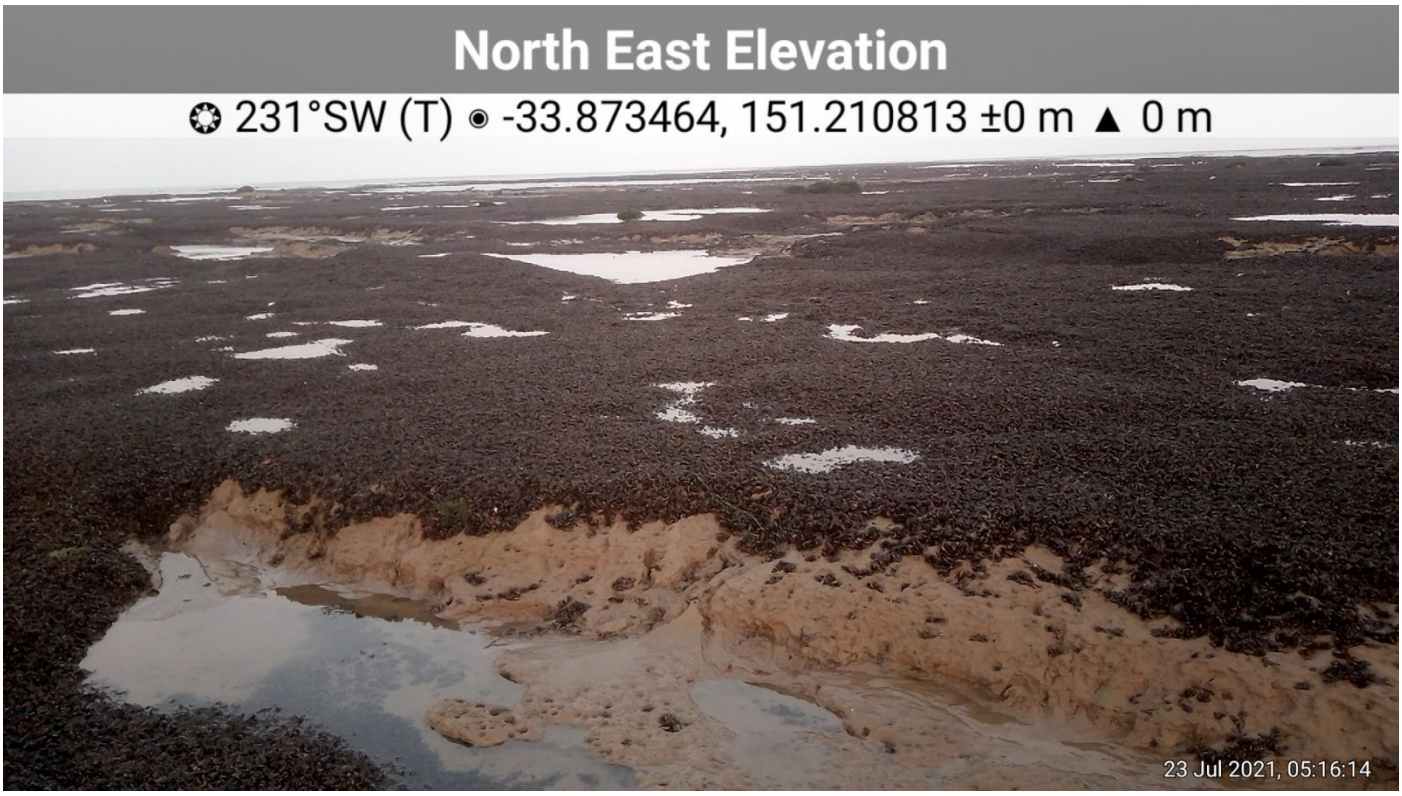


Fig.1 Mussel on a thick layer of mussel mud 23-07-21.

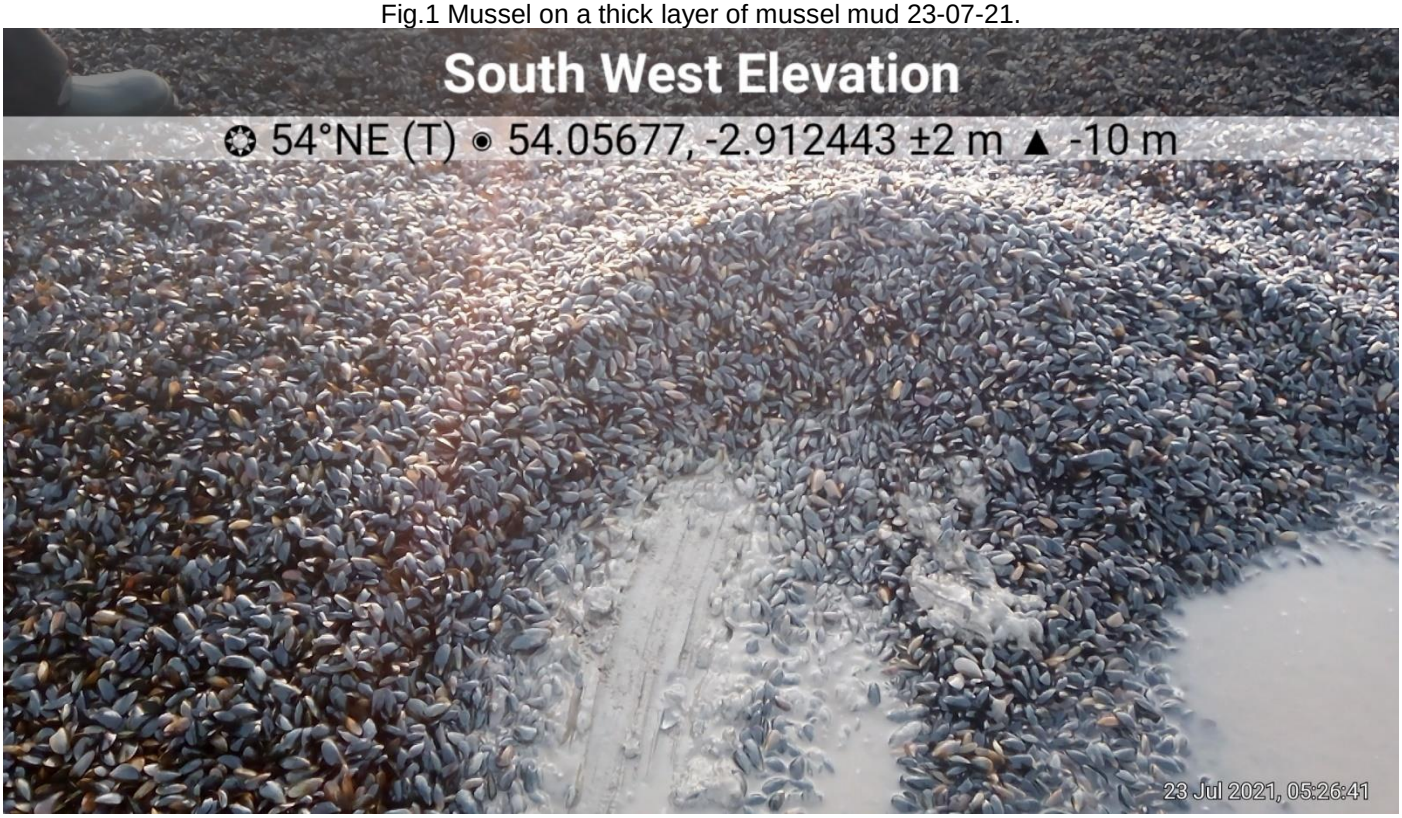


Fig.2 Loose dense mussel 23-07-21.

Fig.3 Areas of bare mud where the mussel has scoured 23-07-21.

Fig.4 Areas of bare mud where the mussel has scoured 23-07-21.

South America Mussel Inspection (Quad) 27/05/21

LW: 06:58 0.8m (Liverpool tides)

South America

The area of South America was inspected to monitor the condition of the mussel observed in March 2021 and to assess if there had been any further mussel settlement. South America was accessed by quad bike, and an inspection was carried out on foot. The perimeter was mapped (Figure 1) but officers were limited by

tidal height with mussel continuing into the water on the Southern extremity. The area mapped had an area of 13.9ha.

There was a mix of size classes of mussel across the bed with what appeared to be a number of 2021 settlements ranging from 5-12mm (Figure 2 and 3). There were areas of 2021 mussel settlement mixed with areas of 25-30mm mussel (Figure 4) and areas of 2021 mussel settlement with some larger 40-50mm mussel (Figure 5). The amount of larger mussel 25-50mm was more abundant than in survey in March, it is possible that the mussel was not as visible as it was under the mat of newly settled mussel in March, the mussel has also likely grown since the March survey. The mussel was on a layer of sand meaning most of the hard substrate previously reported is no longer visible.

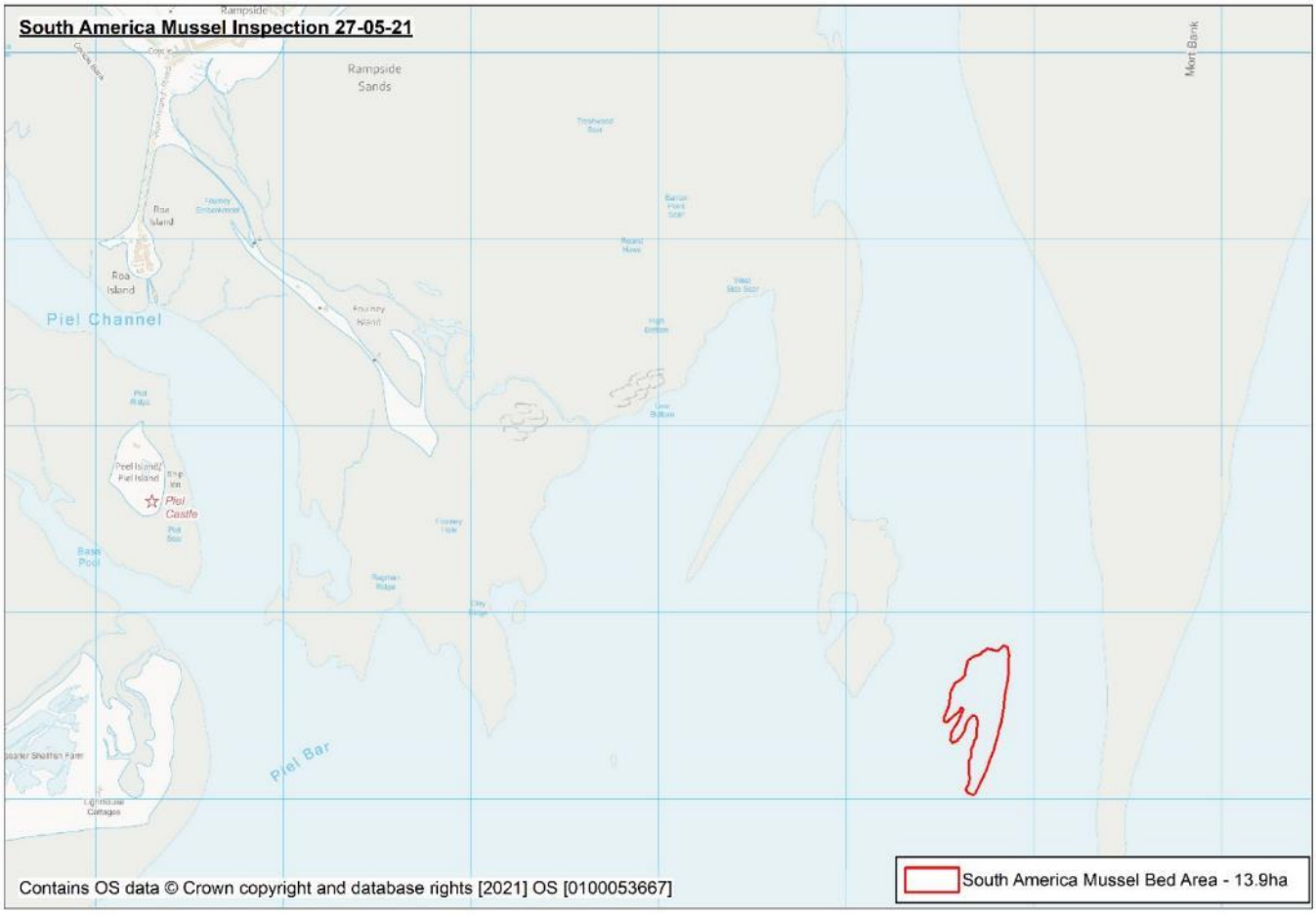


Fig 1 – Estimated extent of mussel on South America 27-05-21

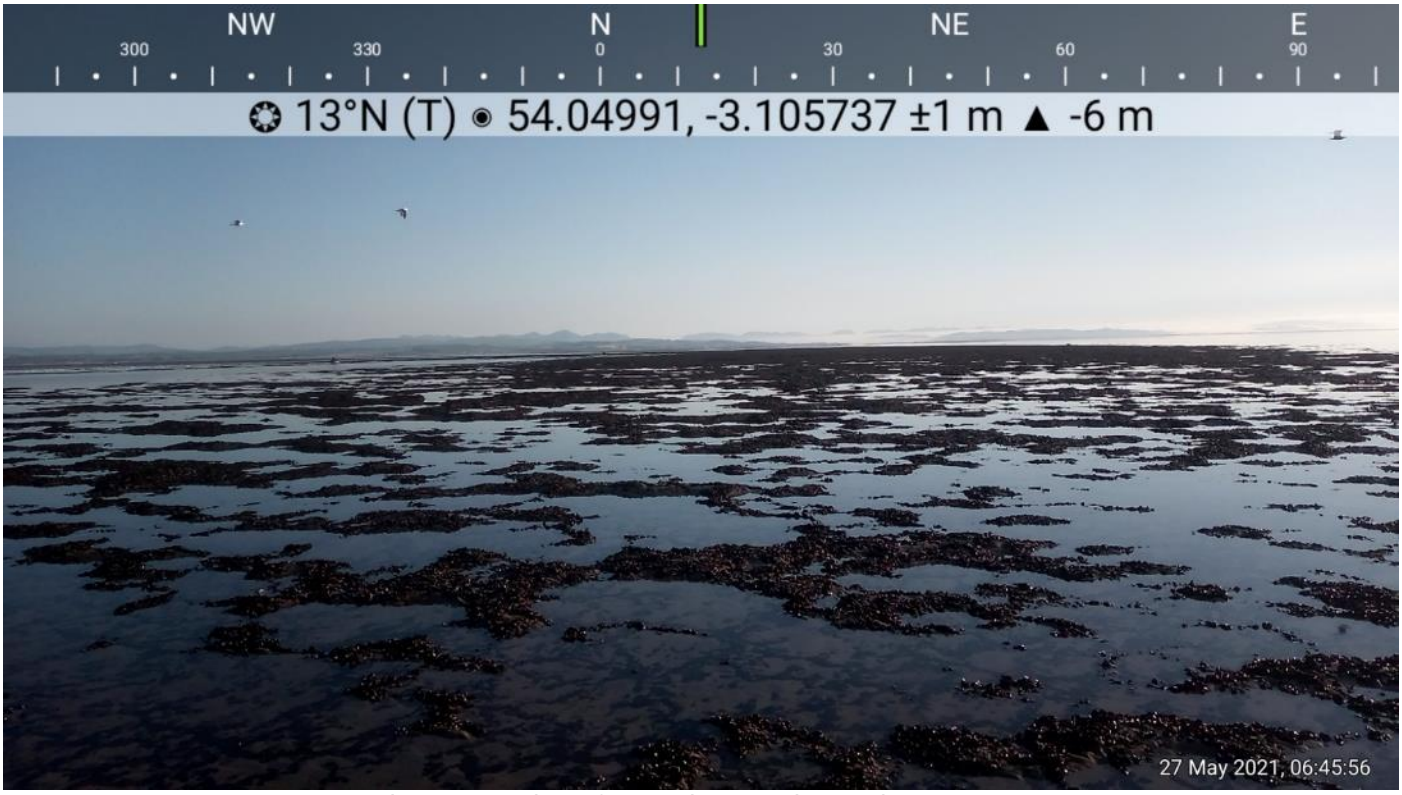


Fig 2 – Overview of mussel on South America 27-05-21

Fig 3 – Varying size of 2021 mussel settlement on South America 27-05-21

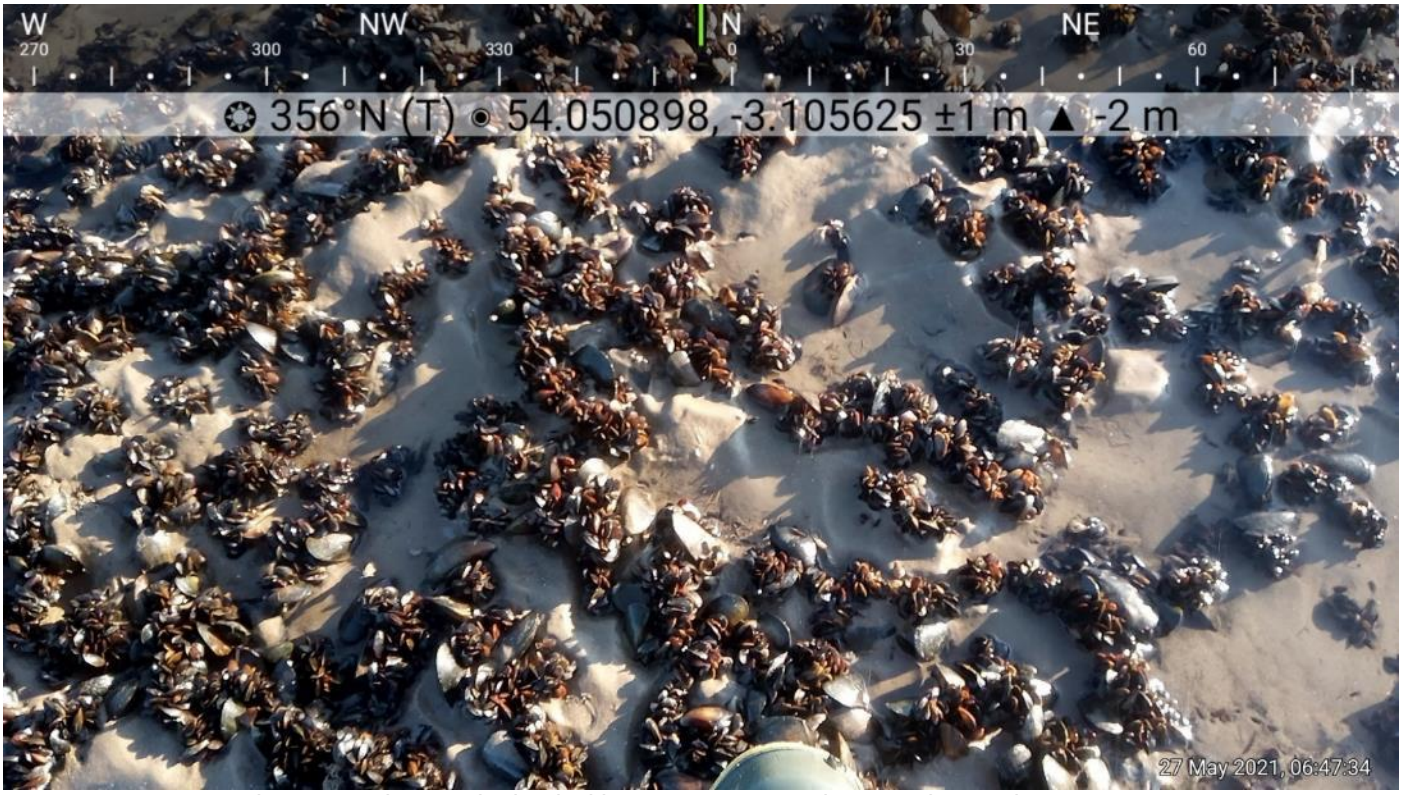


Fig 3 – Seed mussel mixed with 25-30mm mussel on South America 27-05-21

Fig 3 – Seed mussel mixed with 40-50mm mussel on South America 27-05-21

South America Mussel Inspection (Quad) 25/06/21

LW: 06:44 1.1m (Liverpool tides)

South America

The area of South America was inspected to monitor the condition of the mussel first observed in March 2021 and inspected in May 2021 and to assess if there had been any further mussel settlement. The area could not be assessed by quad bike as the ground leading to the South America had changed and the tide did not ebb as expected. This could have been due to weather and channel levels due to rainfall. The bed was accessed by foot and officers only had limited time due to the tide. Only the northern end of the bed was inspected before officers needed to leave. The bed looked to be of similar shape and size to previous inspections.

On the northern area of the bed, the mussel was made up of a majority of 15-20mm mussel with a small amount of 10-15mm mussel (Figures 1, 2 & 3). Larger mussel was not noted in this area of the bed. The mussel was very loose and sitting on top of loose sand. No mussel mud was noted. The mussel was patchier in distribution with larger areas of bare sand in between the mussel compared to the previous inspection on 27/05/21.

Fig 1 – Overview of mussel on the Northern End of South America 25-06-21

Fig 2 – Majority 15-20mm mussel with some 10-15mm on South America 25-06-21

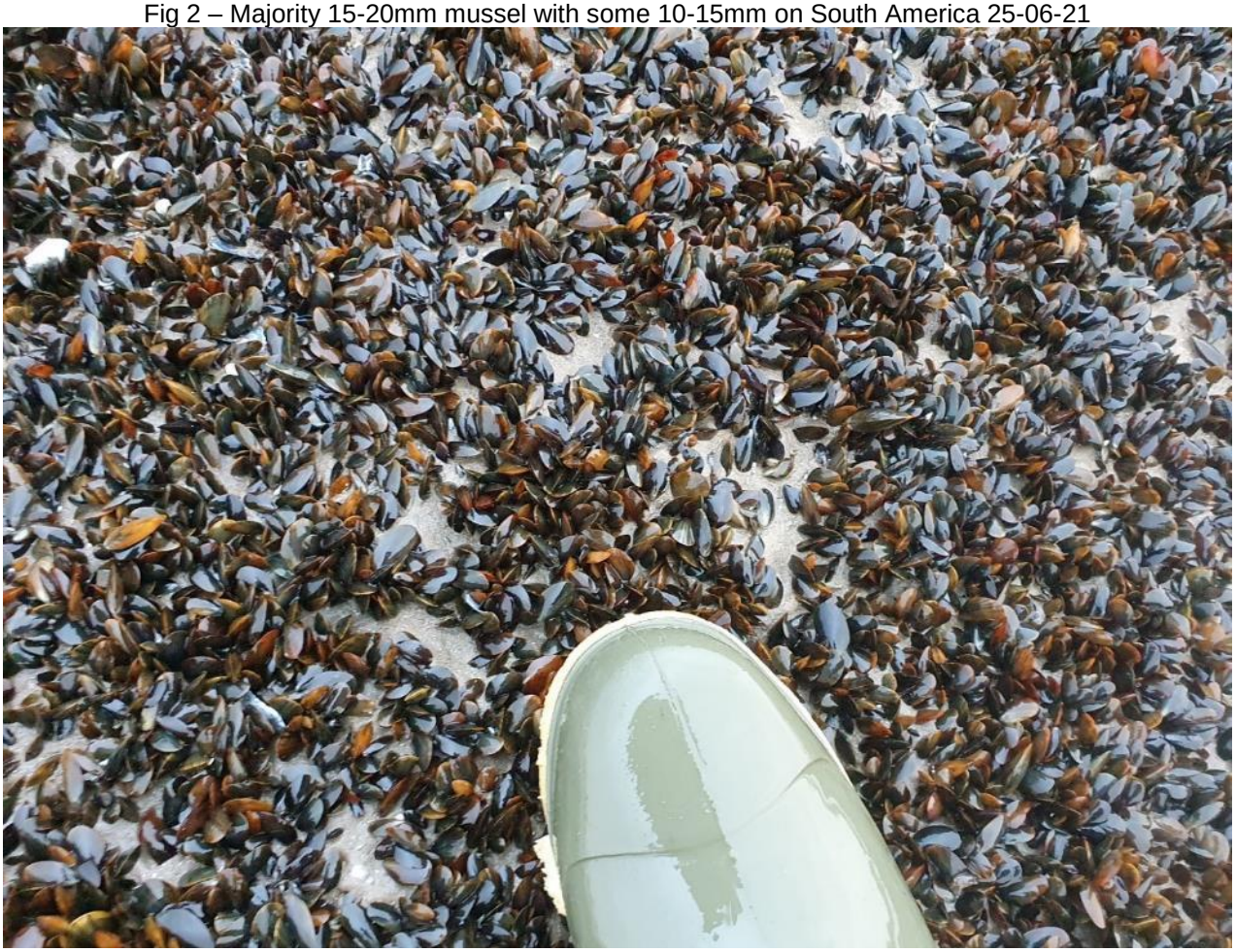


Fig 3 – 15-20mm mussel on South America 25-06-21

South America Mussel Inspection (Heliflight) 27/06/21

Officers attended an industry heliflight which reveal that the extent of South America extends for a considerable distance in the water as shown in Figure 1 and 2. Locations of where the mussel stopped in the water were recorded and an estimated area provided in Figure 1 of 29.9ha.

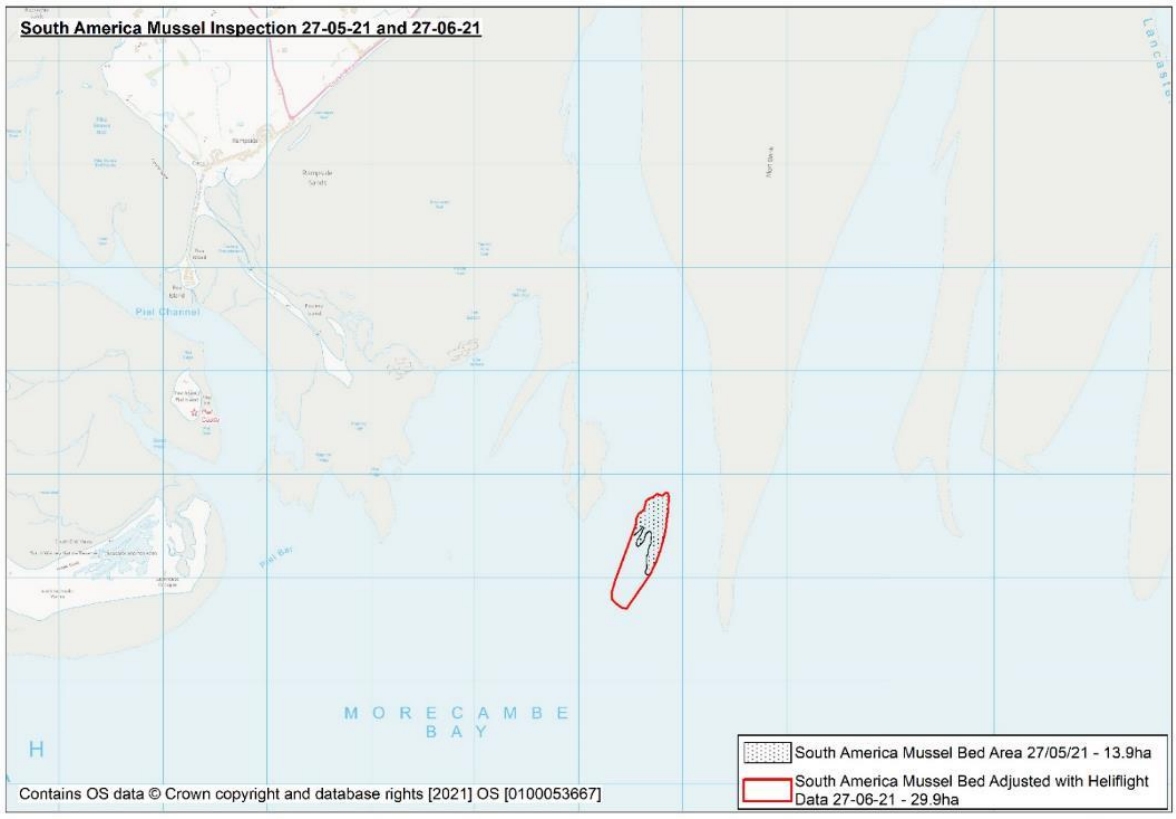


Fig 1 – Estimated extent of mussel on South America 27-06-21

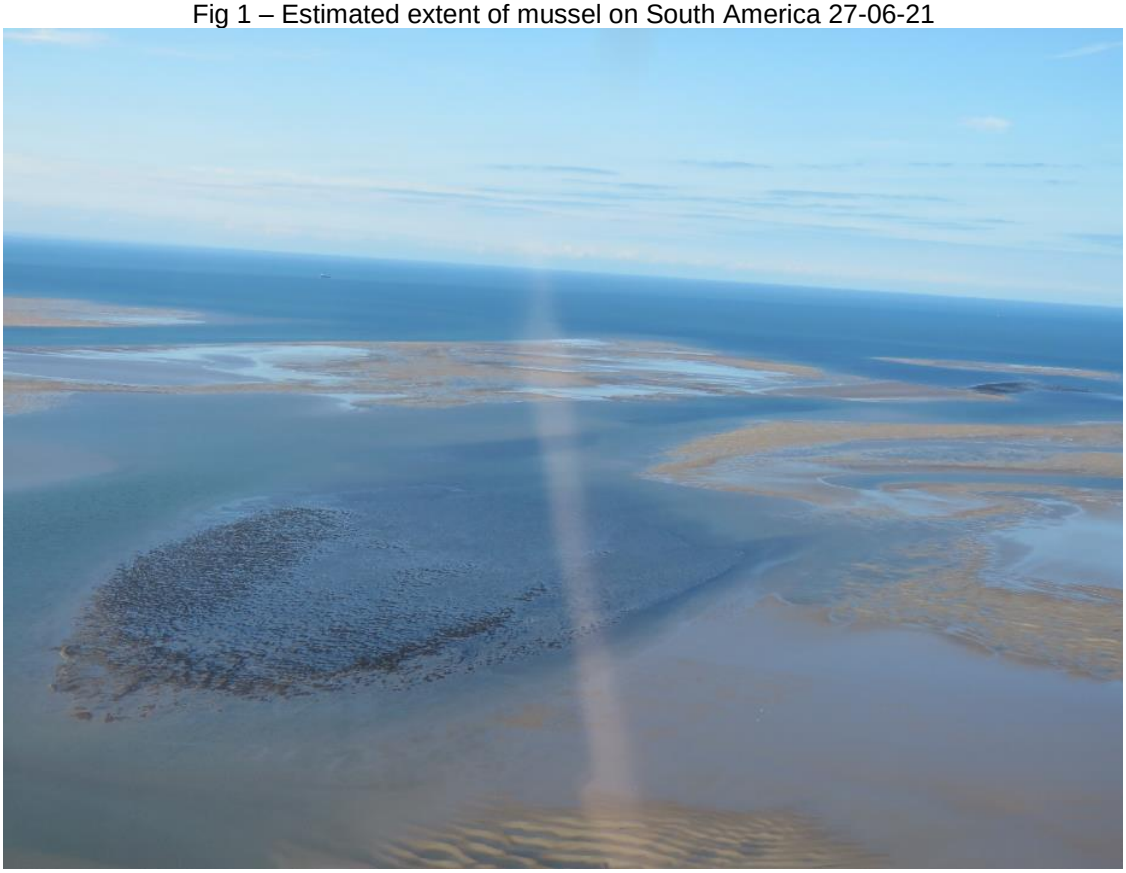


Fig 2 – Estimated extent of mussel extending into the water on South America 27-06-21

South America Mussel Inspection (Quad) 26/07/21

LW: 08:18 0.9m (Liverpool tides)

South America

The area of South America was inspected to monitor the condition of the mussel observed in June 2021 and to assess if there had been any further mussel mud development. South America was accessed by quad bike, and an inspection was carried out on foot. Figure 1 provide an estimated map of the area of mussel taken from May (quad inspection) and June (heliflight).

The majority of mussel was 20-25mm with some smaller 15-20mm mixed in (Figure 3). Some areas had very small amounts of larger 45-50mm mussel in amongst the 20-25mm mussel (Figure 4). Over most of the bed, the mussel was sitting on a layer of muddy sand, with the mussel being very loose (Figure 5). In a couple of small areas, the 20-25mm mussel was hard in sand (Figure 6). Only 1 or 2 small areas of cobble were present on the bed, in between the peaks and banks of mussel sitting on sand. The largest banks of mussel on sand were approximately 30-40cm in height.

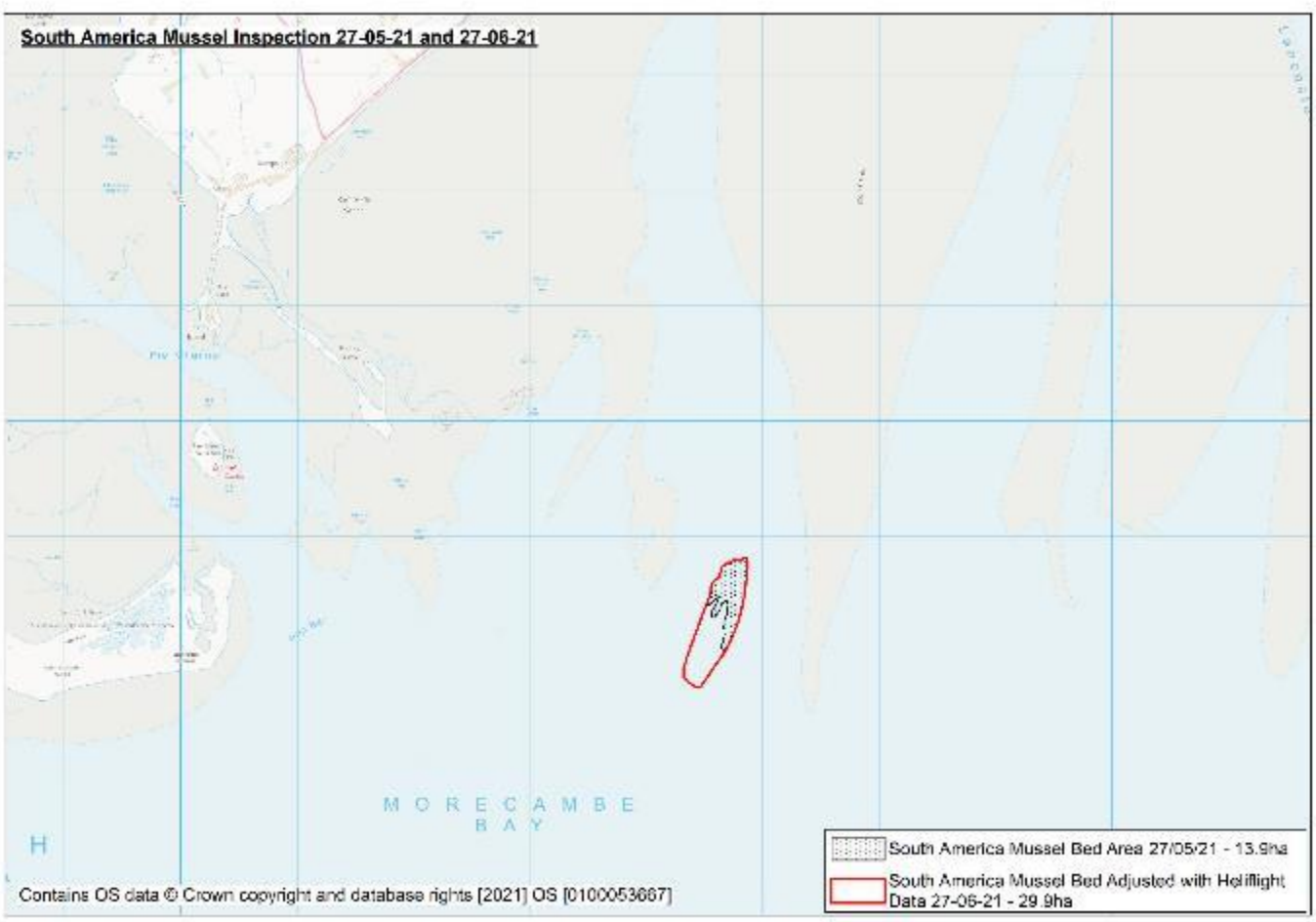


Fig 1. Overview of size of the South America from May and June inspection data

Fig 2. Overview of mussel on South America 26-07-21

Fig 3. 20-25mm mussel with some 15-20mm mussel on South America 26-07-21

Fig 4. 45-50mm mussel mixed in with 20-25mm mussel on South America 26-07-21

Fig 5. 20-25mm mussel sitting on muddy sand on South America 26-07-21

Fig 6. 20-25mm mussel hard in sand on South America 26-07-21

Heliflight Mussel Survey, Falklands 26-04-21

Low water: 18:21 0.7m (Liverpool Tides)

On 26th April 2021, a helicopter survey was undertaken to assess the mussel stocks in Morecambe Bay, figure 1. This report outlines the observations of mussel stock on Falklands mussel bed.

Falklands

The area of exposed ground witnessed in 2019-2020 was covered in a large area of *Sabellaria alveolata,* waypoints 18 and 19*.* The *Sabellaria alveolata* is covered in a significant 2021 mussel settlement. As shown below in Figures 2 and 3.

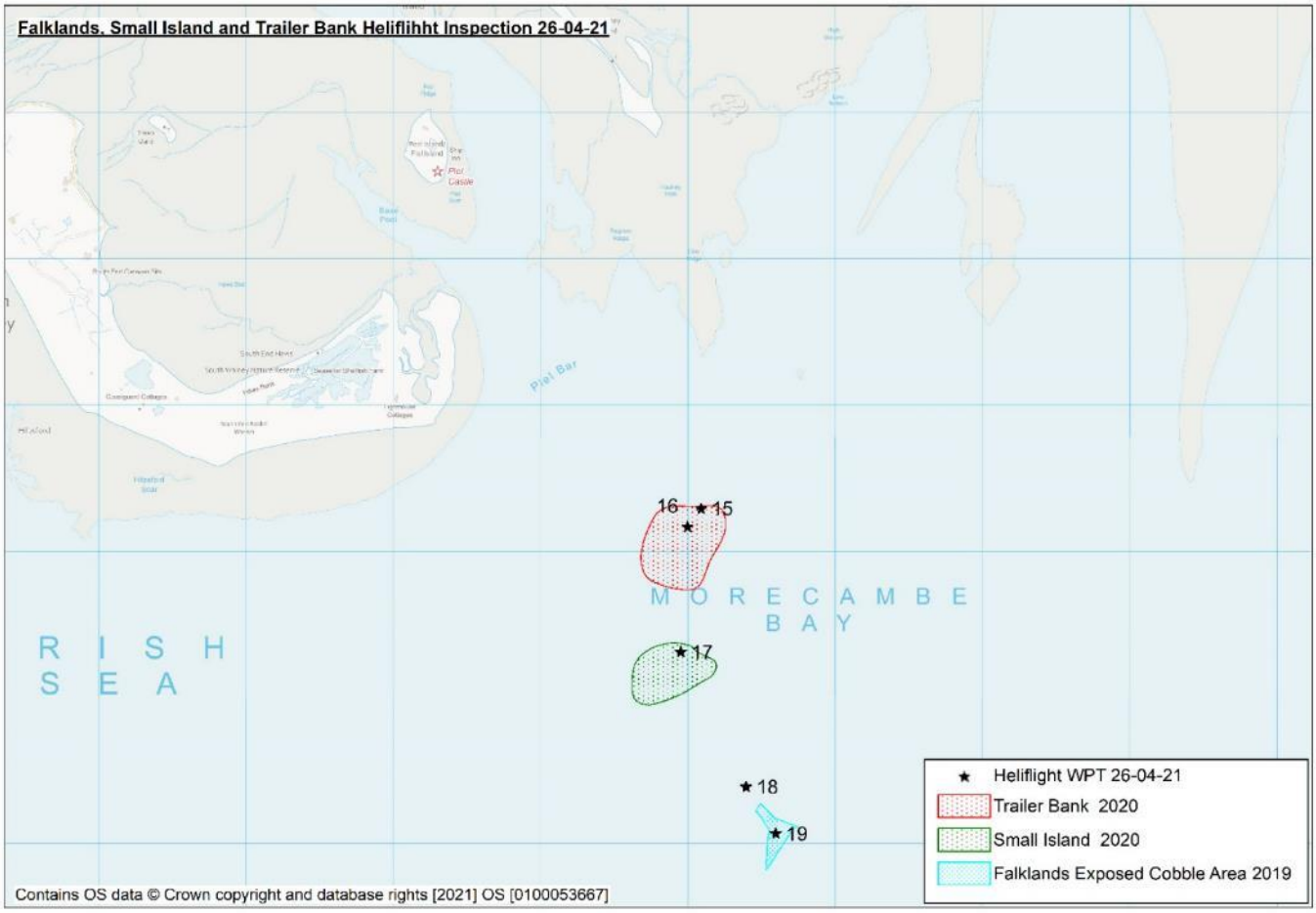


Fig 1 – Map of previously mapped areas and waypoints taken by NWIFCA on Industry Heliflight 26-04-21

Fig 2 – Falklands *Sabellaria alveolata* and 2021 mussel settlement 26-04-21

Fig 3 - Falklands *Sabellaria alveolata* and 2021 mussel settlement 26-04-21

Heliflight Mussel Survey, Falklands 26-05-21

Low water: 18:49 0.7m (Liverpool Tides)

This report outlines the observations of mussel stock on Falklands mussel beds. On 26th May 2021, a return heliflight survey was undertaken to assess the mussel stocks of the North Morecambe Bay drying areas which are not accessible from land. An estimated perimeter was obtained by flying around the area of mussel on Falklands (Figure 1.

Falklands

As previously reported a large area of *Sabellaria alveolata* has had a dense settlement of 2021 mussel as shown in Figures 2 and 3. Since the inspection in April there has been at least once additional settlement. The area of exposed ground on the western edge had received a newer settlement and extended into the water. The estimated size of the area is 36 hectares.

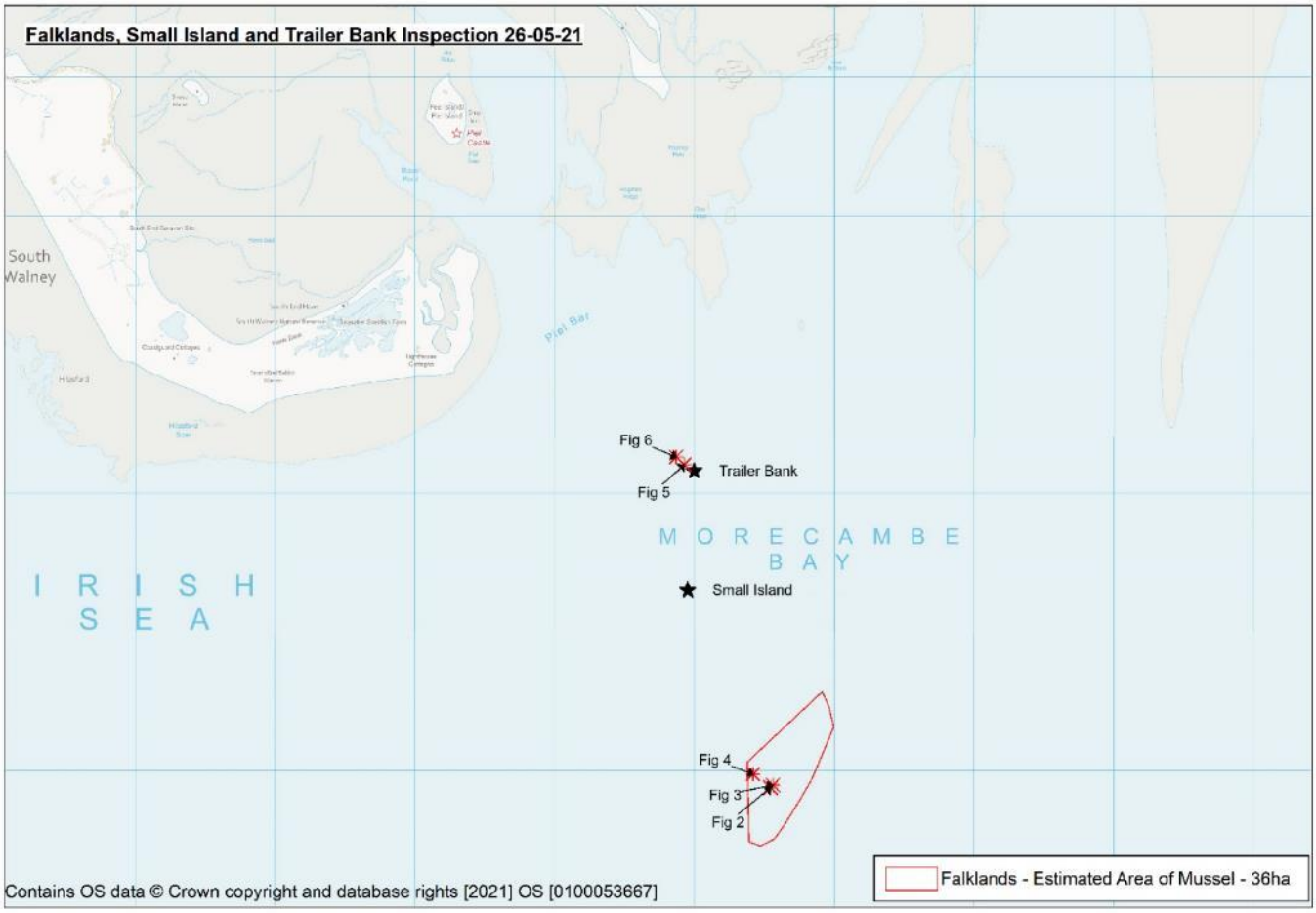


Fig 1 – Map of previously mapped areas and waypoints taken by NWIFCA on Industry Heliflight 26-05-21

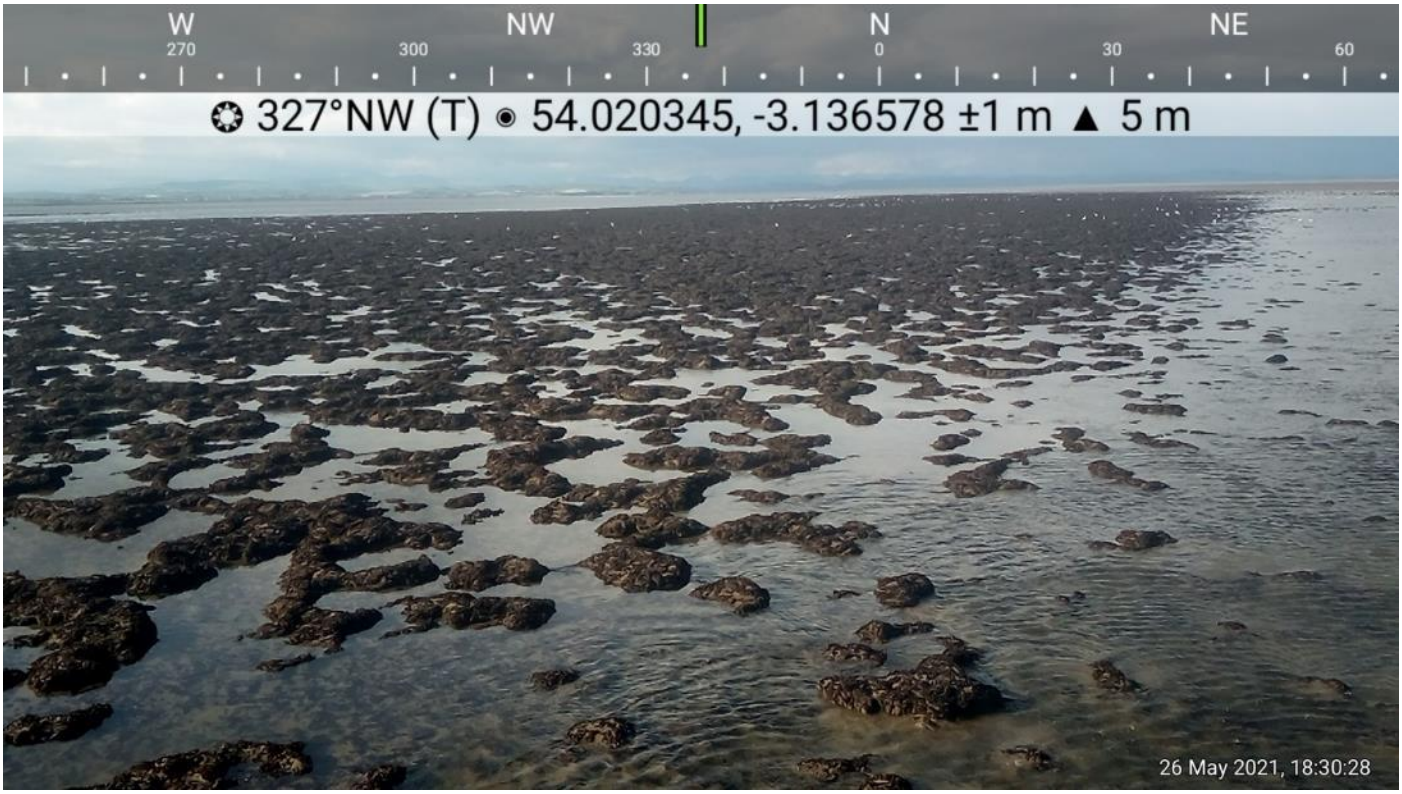


Fig 2 – Falklands *Sabellaria alveolata* and 2021 mussel settlement 26-05-21, looking NNW

Fig 3 - Falklands *Sabellaria alveolata* and 2021 mussel settlement 26-05-21, looking SWW

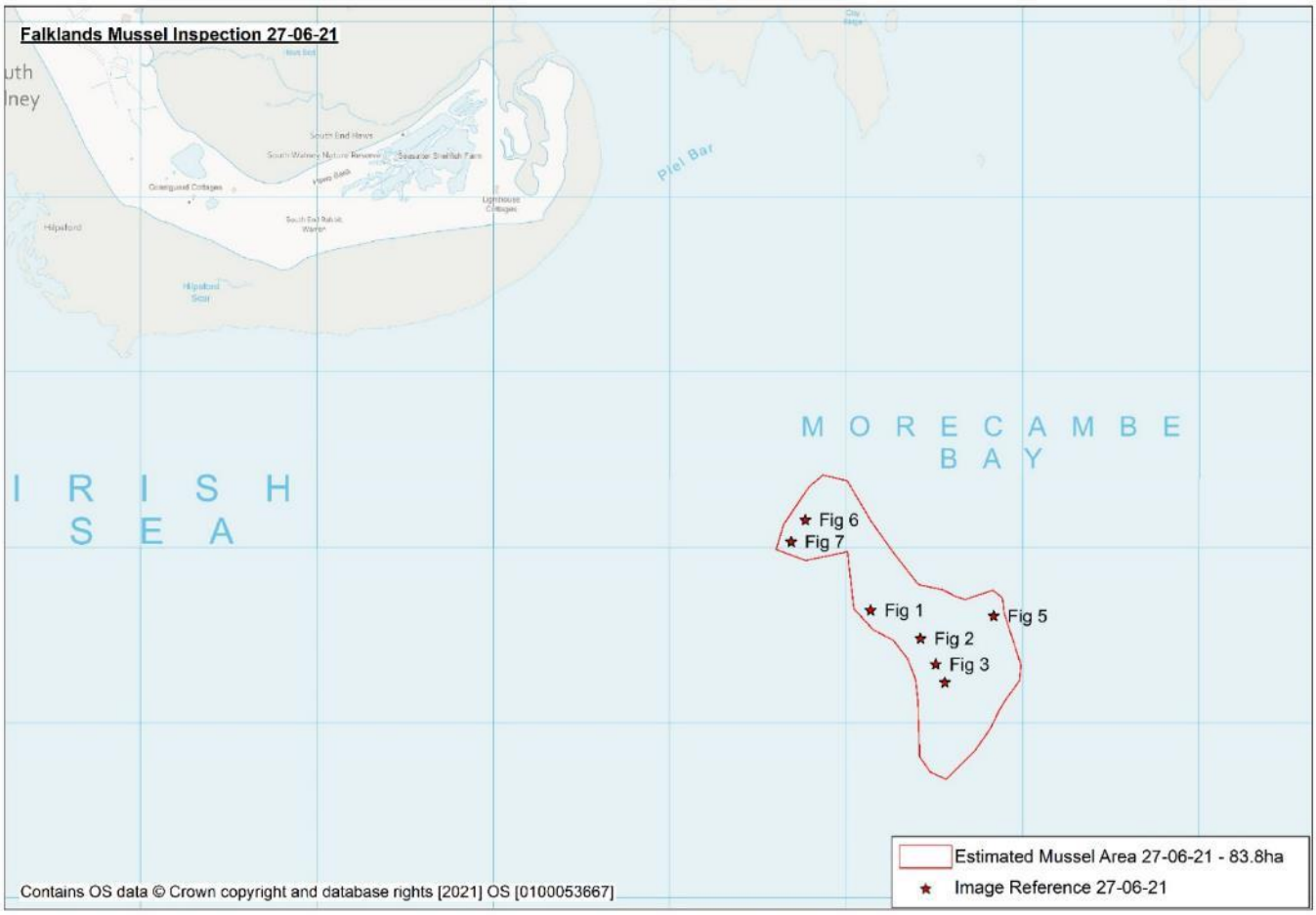
Fig 4 - Falklands 2021, western edge mussel settlement 26-05-21

Heliflight Mussel Survey, Falklands 27-06-21

Low water: 08:27 1.0m (Liverpool Tides)

This report outlines the observations of mussel stock on the Falklands obtained from an industry heliflight with an NWIFCA present. The area previously inspected and reported on has increase in size significantly with a lot more mussel present in the water. A rough estimated perimeter was obtained by flying around the area of mussel on Falklands (Figure 1), there should be some caution applied to the perimeter due to the accuracies of tracking the edge of a mussel bed which is submerged and patchy during a heliflight. The area provided in the map is likely to be an over estimate.

The is a mix of density across the bed with a large area of dense 2021 mussel with some patchy areas in the water. The mussel was on a mix of sand a mud. The area of *Sabellaria alveolata* present in the survey in May was not identifiably and is most likely buried under and layer of mussel and sediment (sand / mud). There was no starfish witnessed across the bed.



Map of estimated area of mussel 27-06-21

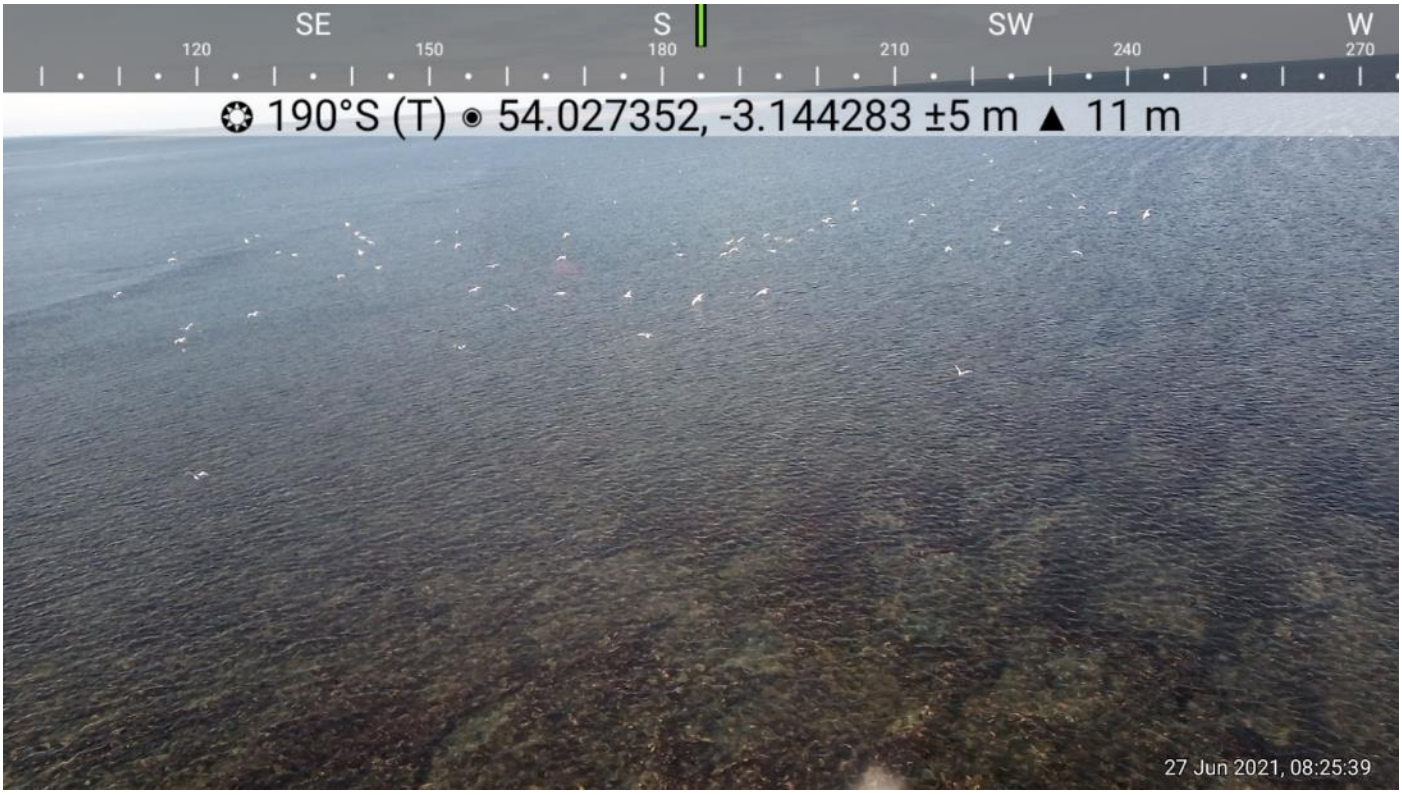


Fig 1 – Falklands 2021, mussel extending into the water 27-06-21

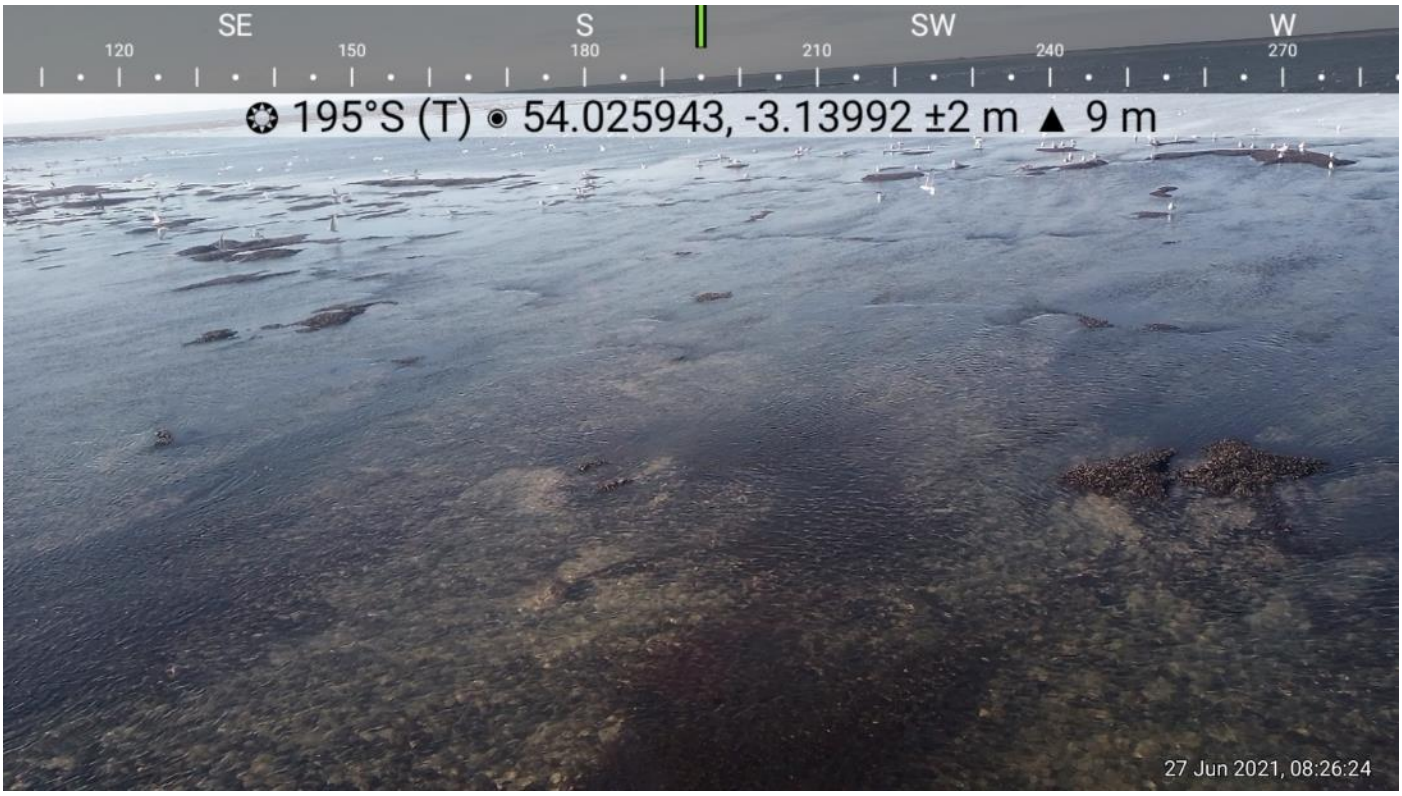


Fig 2 - Falklands 2021, mussel extending into the water 27-06-21

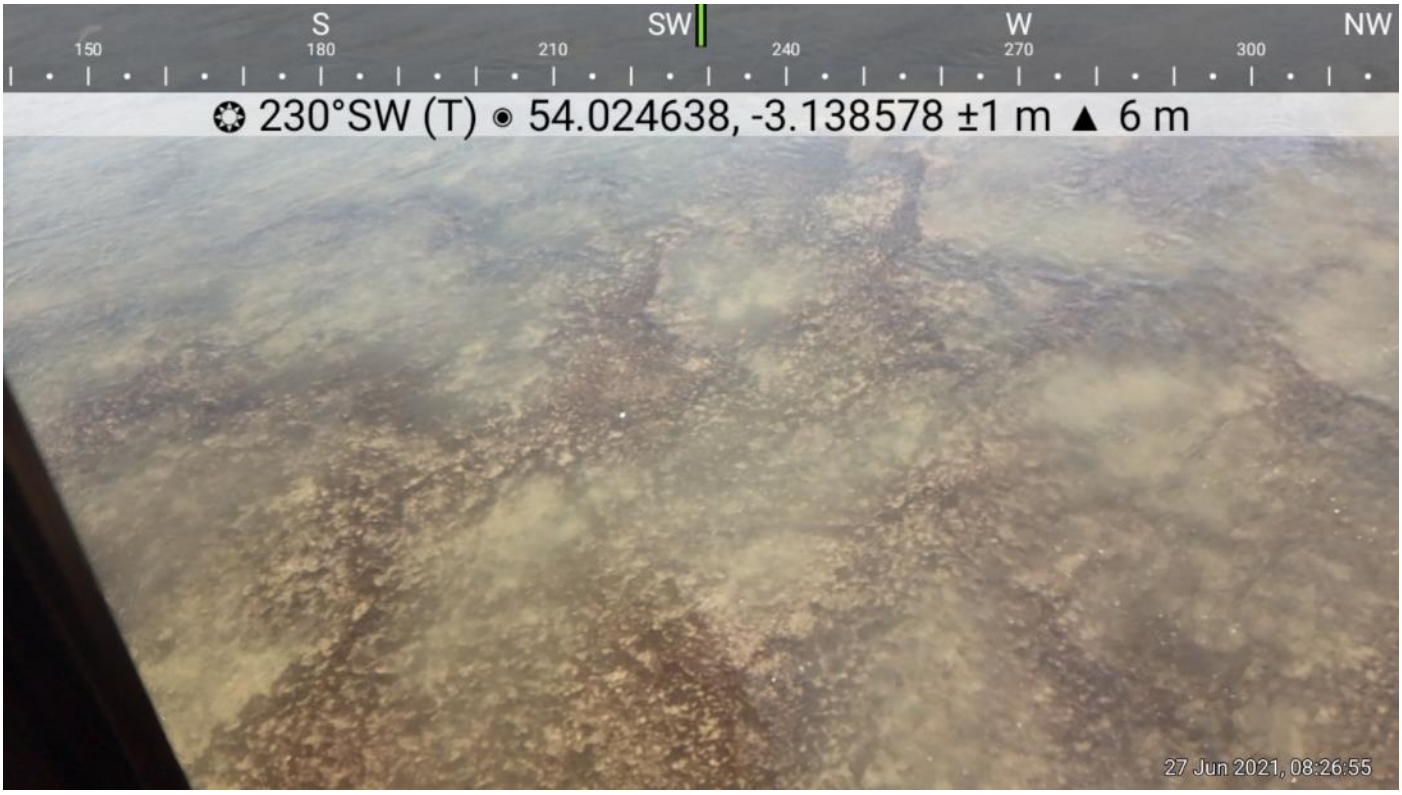


Fig 3 - Falklands 2021, mussel extending into the water 27-06-21

Fig 4 - Falklands 2021, mussel drying area 27-06-21

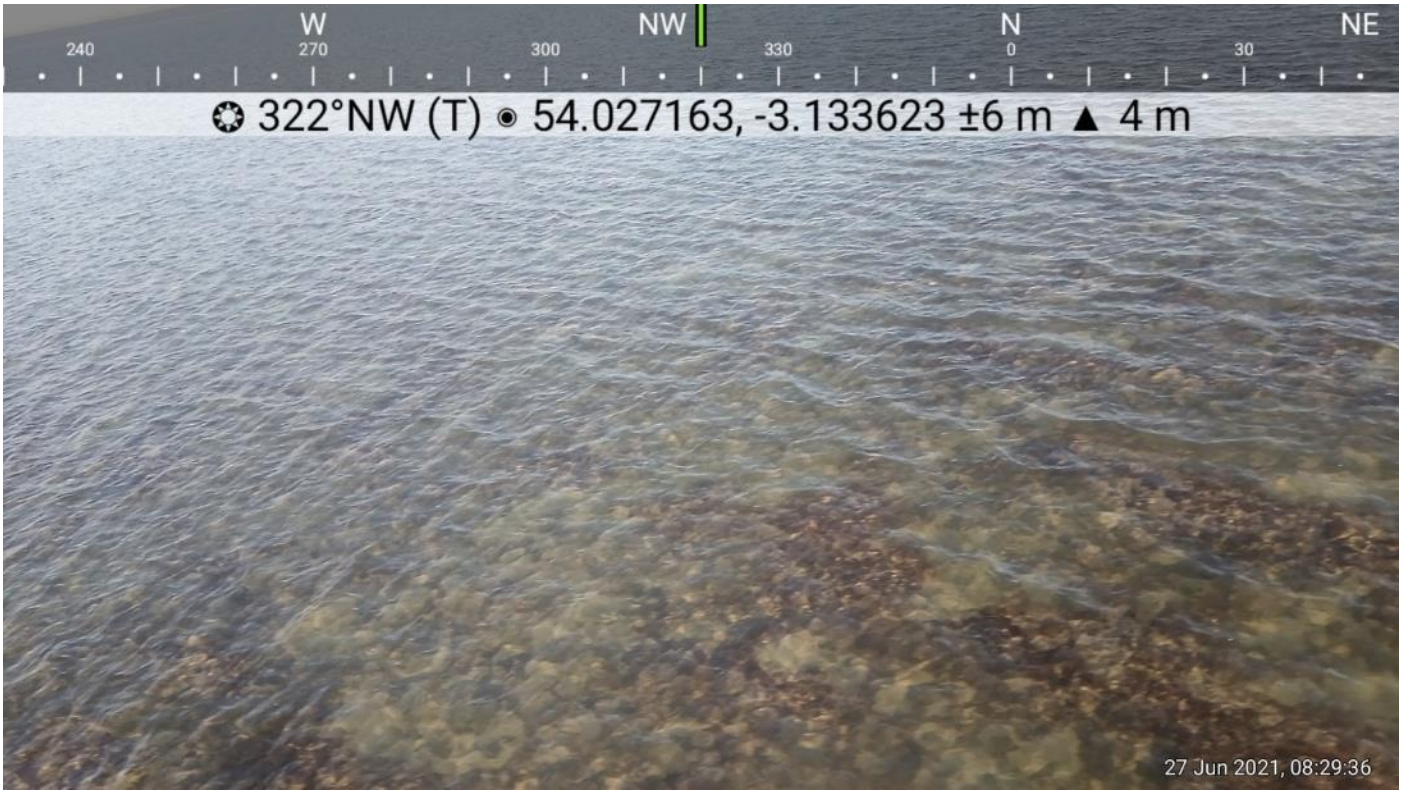


Fig 5 - Falklands 2021, mussel extending into the water 27-06-21

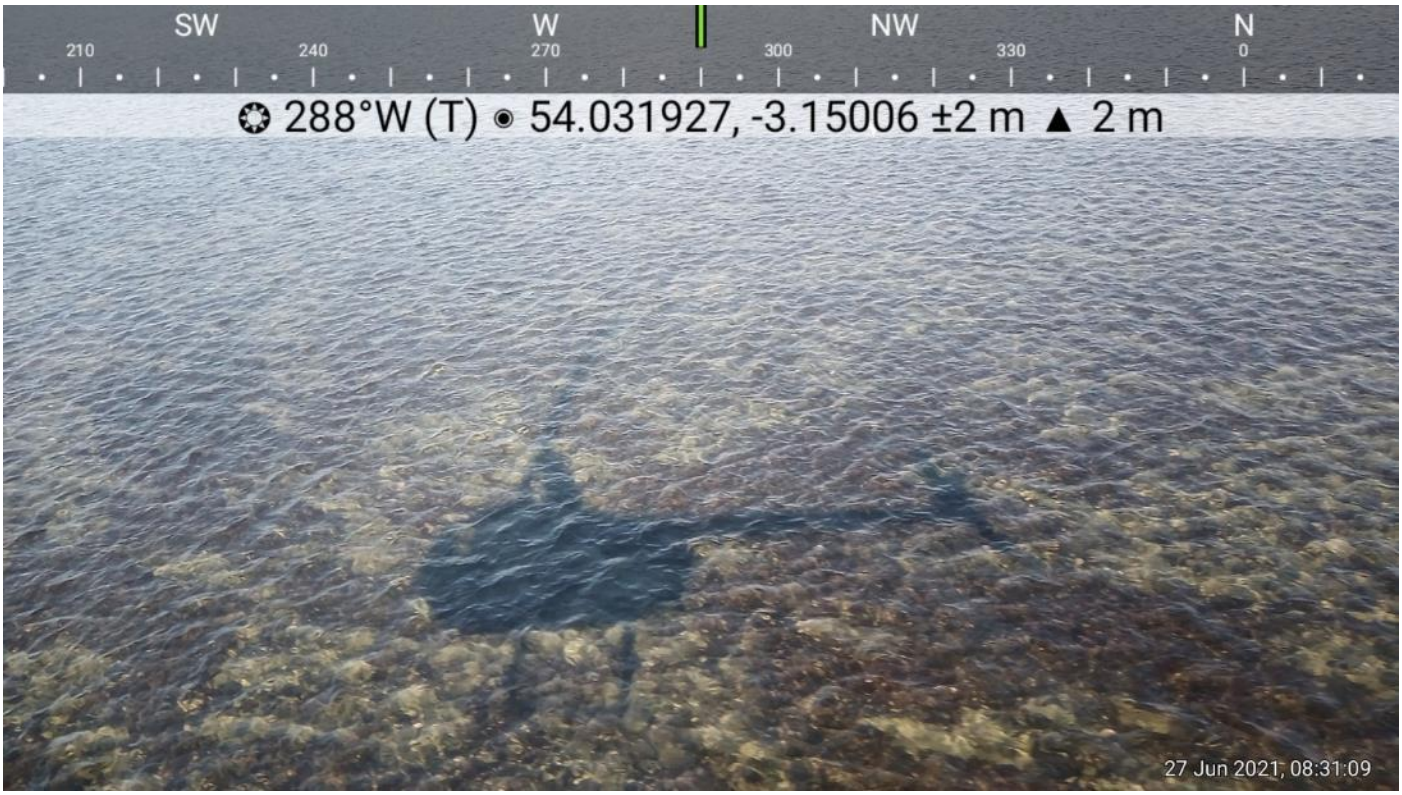


Fig 6 - Falklands 2021, mussel extending into the water 27-06-21

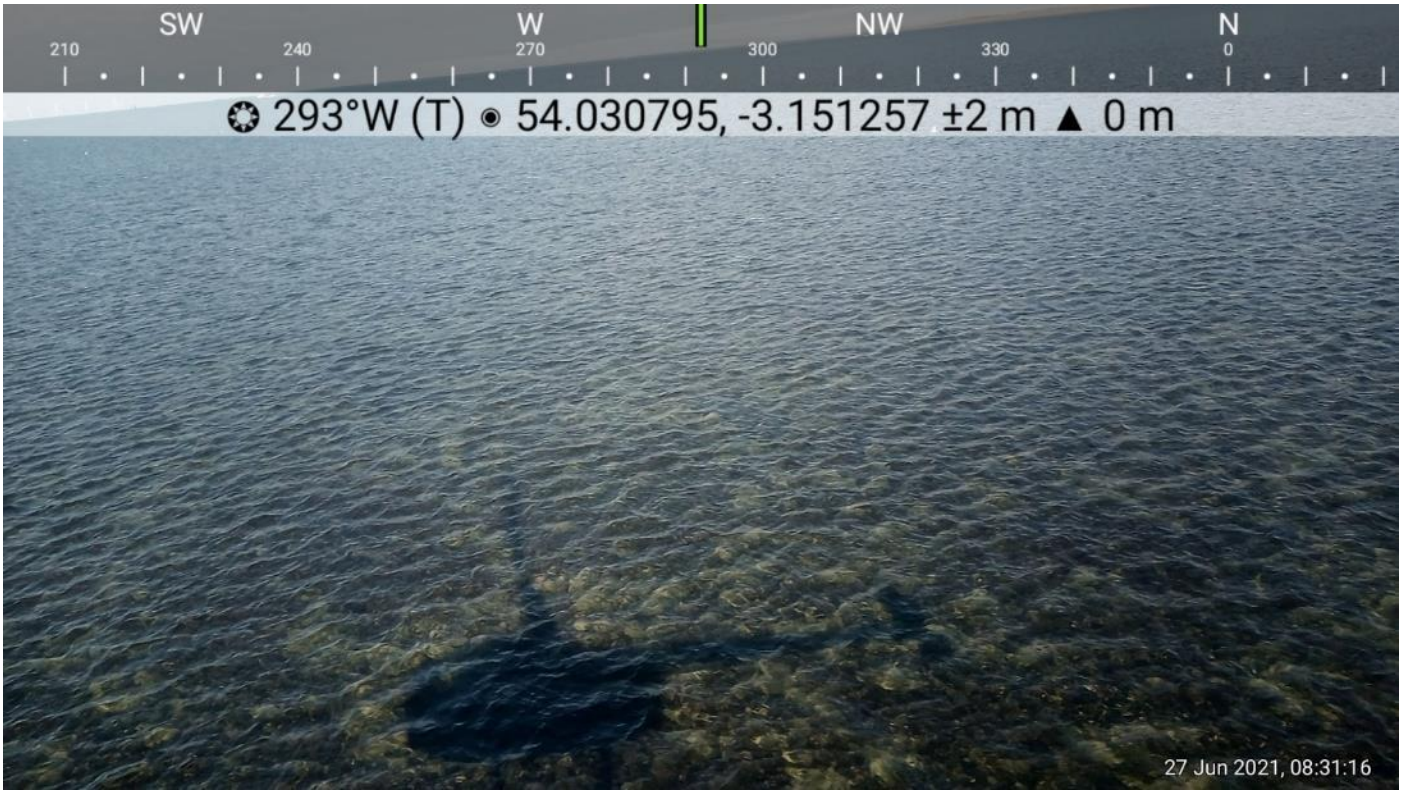


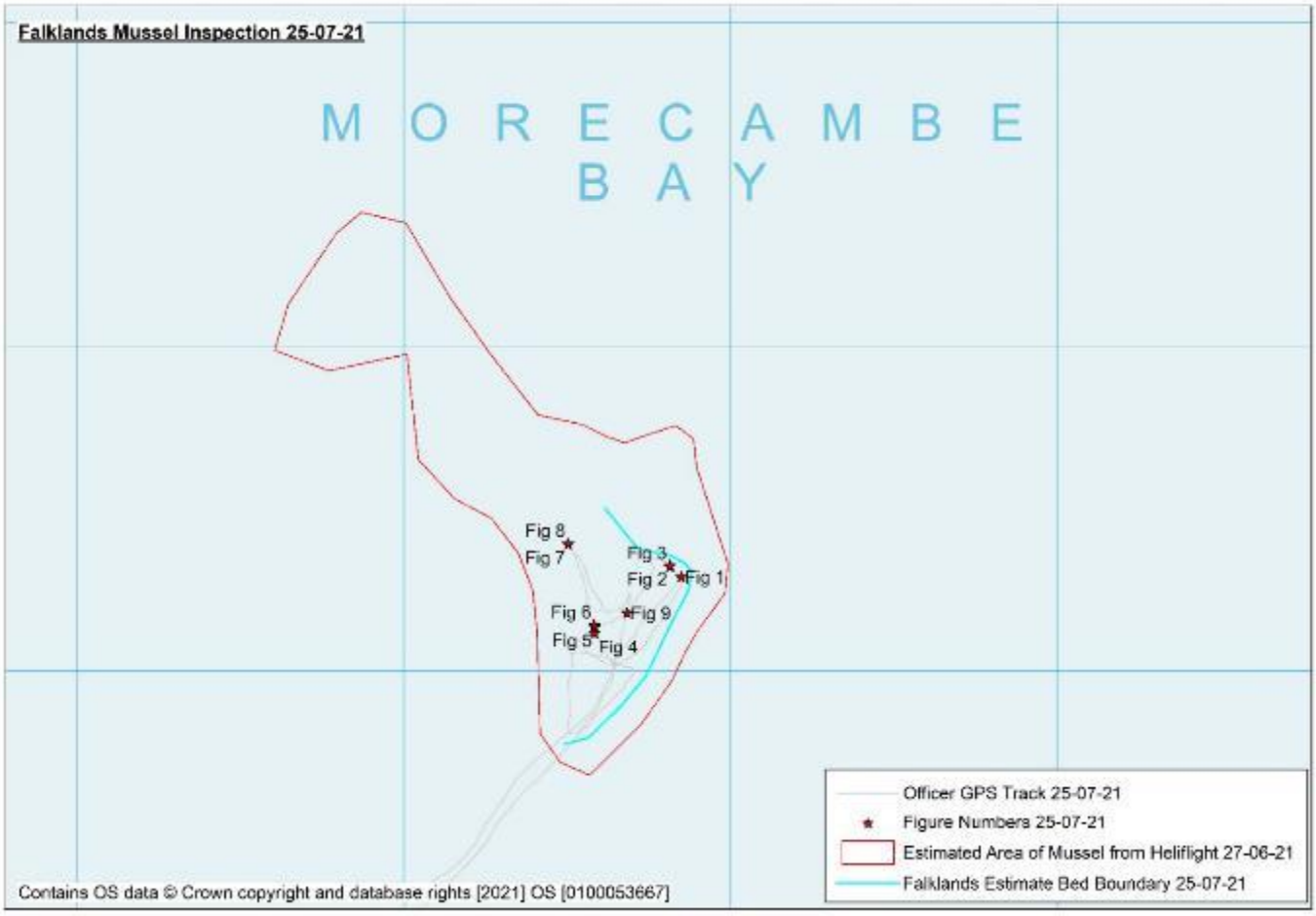
Fig 7 - Falklands 2021, mussel extending into the water 27-06-21

Falklands Mussel Inspection 25-07-21

Low water: 07:30 1.0m (Liverpool Tides)

The area known as Falklands which has previously been reported on from the 2021 industry Heliflights was inspected to provide an update on the condition of the mussel to inform management of the potential mussel fishery. Officers dried the RHIB out and inspected the bed on foot. Only areas that had dried or were in shallow water could be inspected. The Northern extent of the bed was not inspected as access was not possible. Figure shows the previously estimated area calculated from the June heliflight. A line showing the extent of the Eastern and Southern boundary has been provided as this could be easily estimated from the inspection.

The area is very mixed in mussel density and substrate. The mussel varies in density across the bed with areas of sparse mussel and areas of dense mussel. The Eastern side of the bed has reduced significantly in mussel density and coverage from that observed on the June Heliflight.
Much of the rest of the bed was a mix of denser mussel on the top of sand and depressions with exposed hard substrate and *sabellaria alveolata*. The exposed hard substrate was consistent across most of the area inspected. The Sabellaria alveolata was more concentrated South of figures 3 and 6 although present across most of the inspected area.



Map of estimated area of mussel 25-07-21

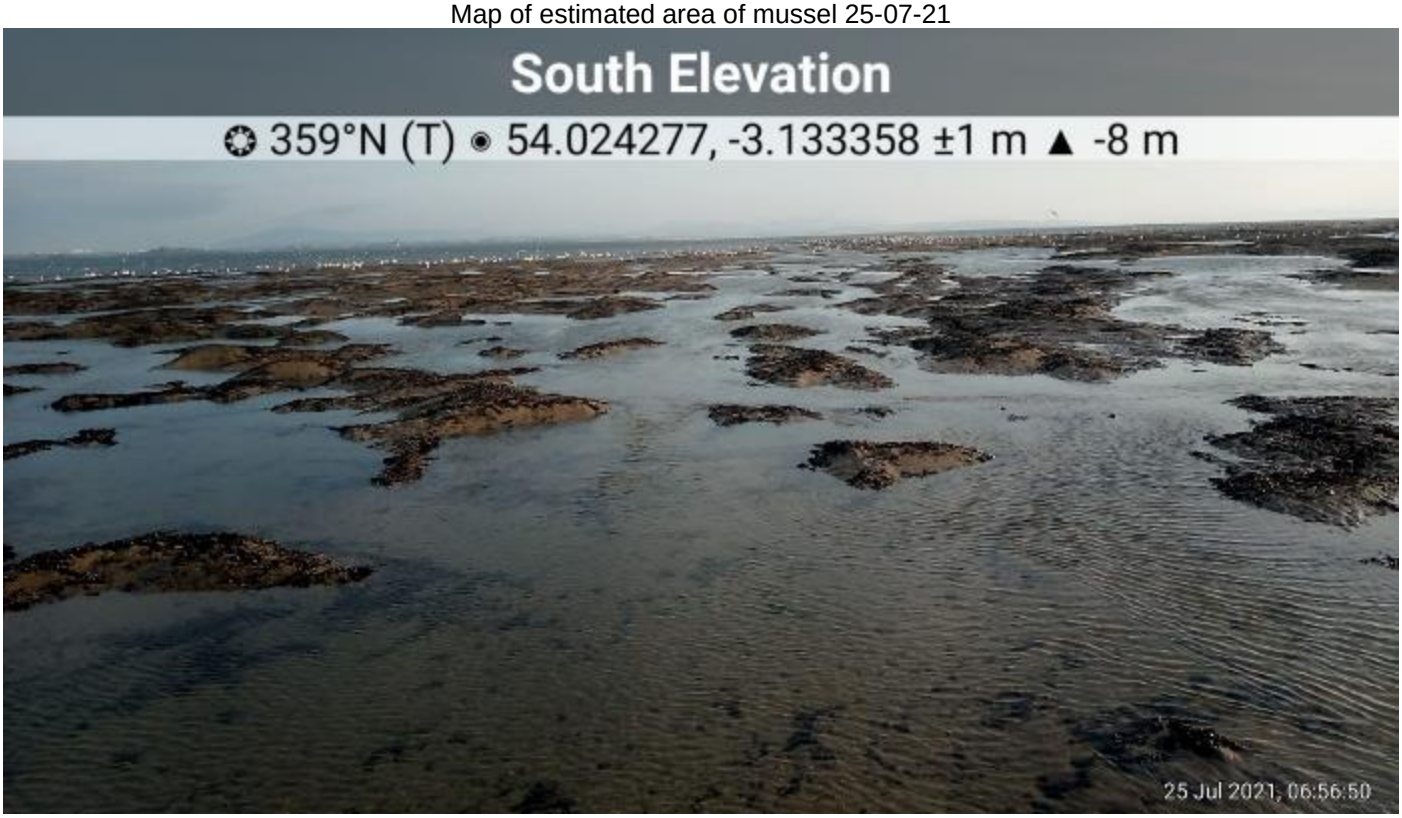


Fig 1 – Falklands 2021, sparse mussel coverage to the East of the bed 25-07-21

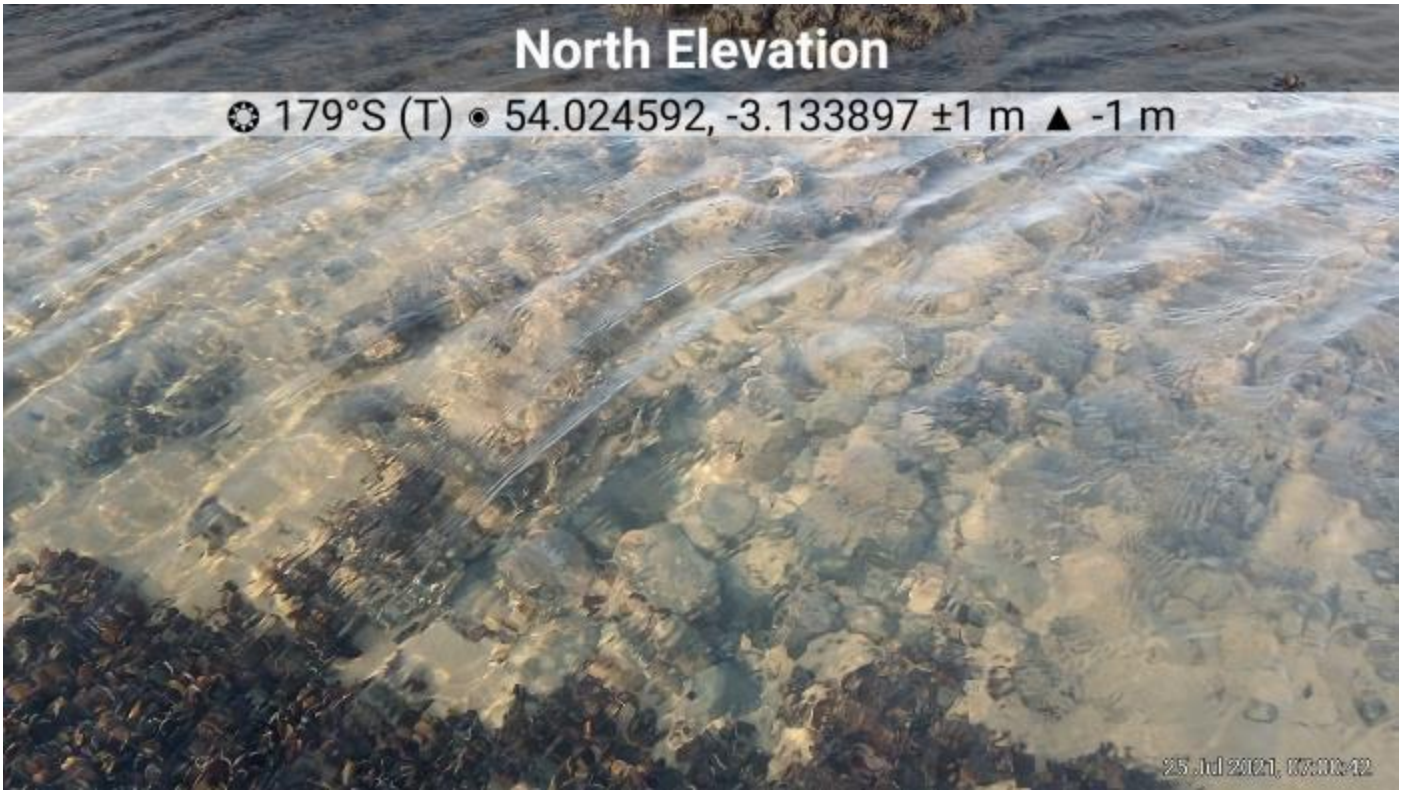


Fig 2 - Falklands 2021, example of bare cobble between patches of mussel. 25-07-21

Fig 3 - Falklands 2021, example of exposed *Sabellaria alveolata*. 25-07-21

Fig 4 - Falklands 2021, example of exposed hard ground and *Sabellaria alveolata*. 25-07-21

Fig 5 - Falklands 2021, area of dense mussel. 25-07-21

Fig 6 - Falklands 2021, area of mixed hard, *Sabellaria alveolata* and mussel. 25-07-21

Fig 7 - Falklands 2021, area of dense mussel. 25-07-21

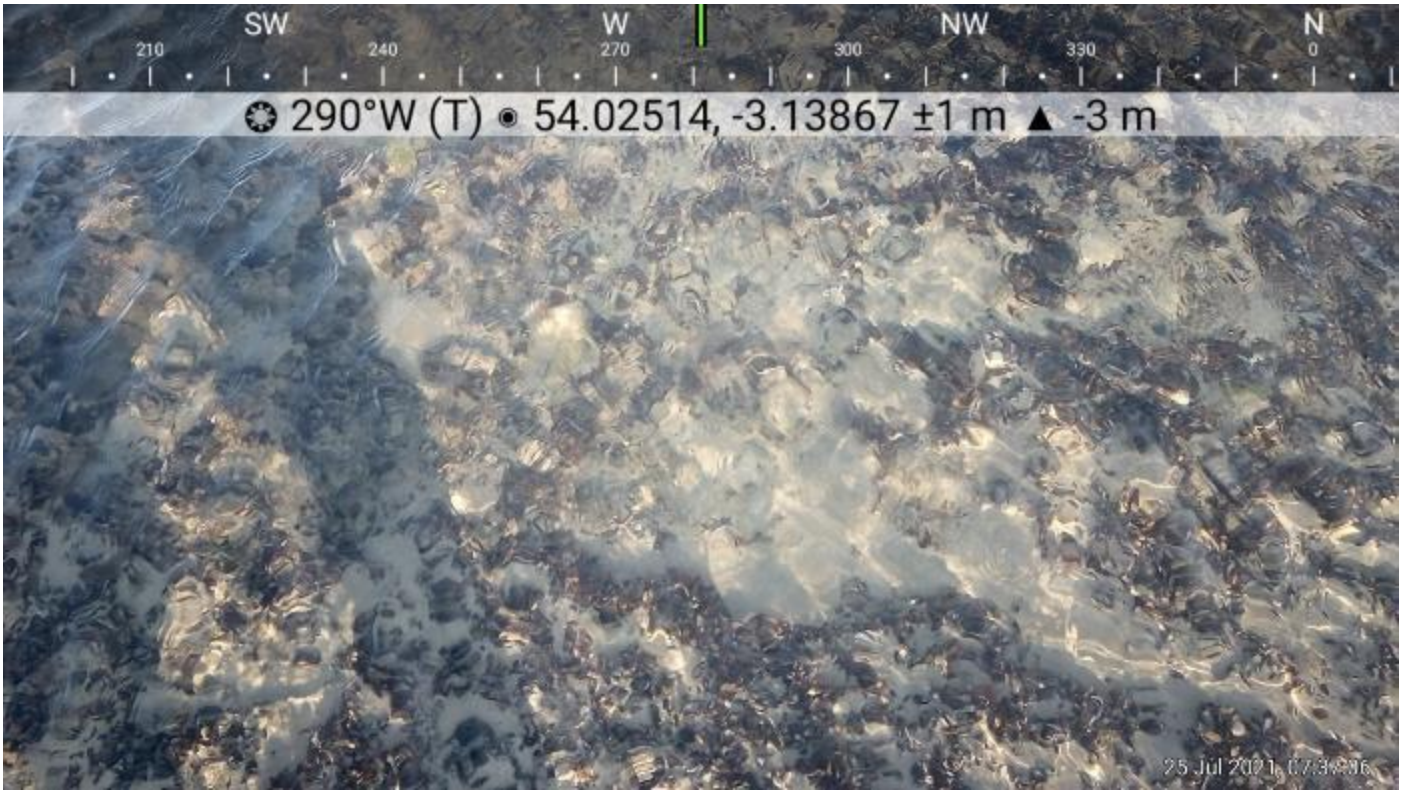


Fig 8 - Falklands 2021, area of patchy mussel on a thin layer of sand with some exposed hard ground. 25-07-21

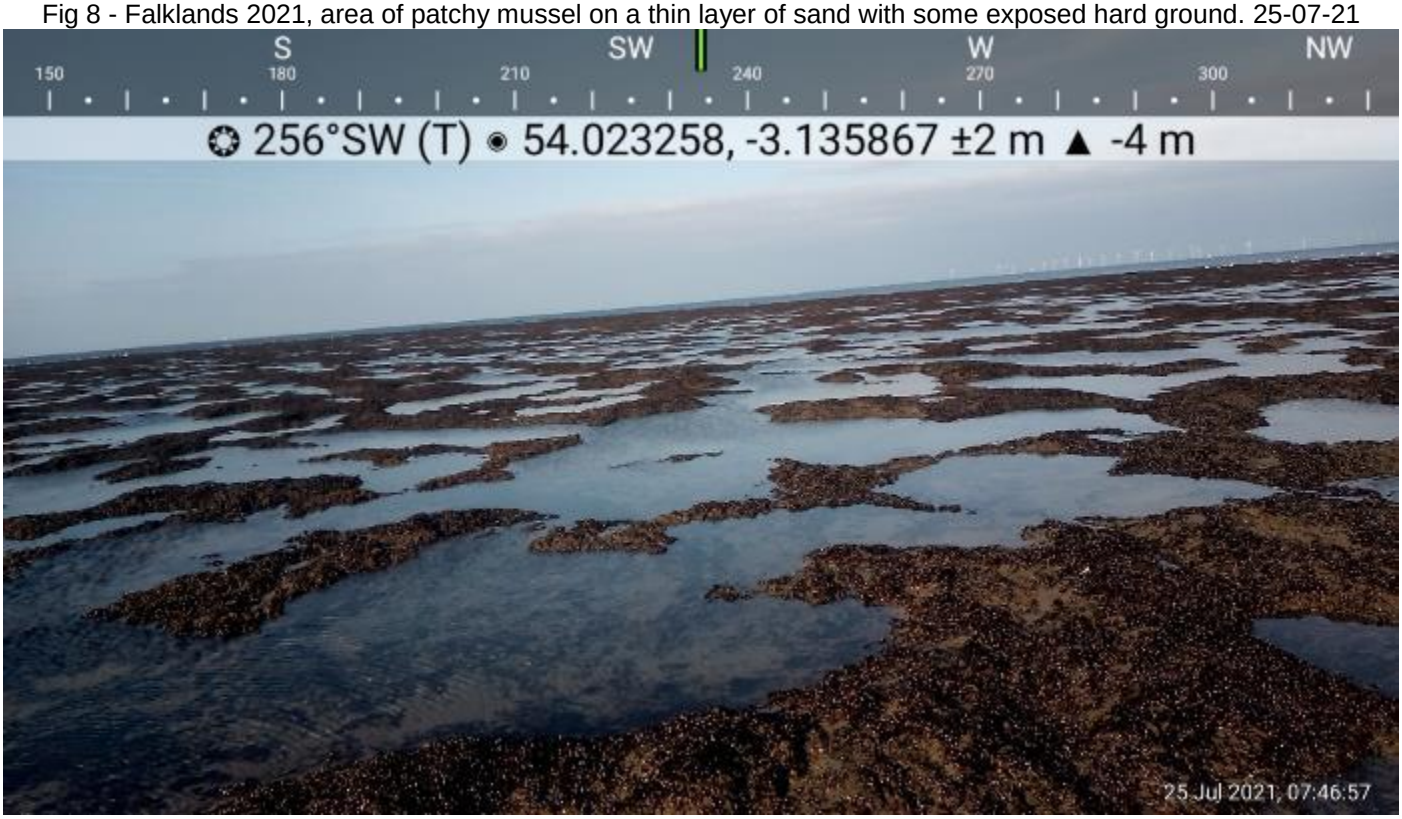


Fig 9 – Overview of Falklands. 25-07-21

4.8 Information on Fishing Activity - Hand-gathering

South America and Heysham Flat will be permitted under written authorisation against NWIFCA Byelaw 3 para. 6, minimum landing size to all NWIFCA byelaw 3 permit holders.

Knowledge of recent activity levels would suggest that there is a possibility that the will be very little hand gathering on either bed. Although Heysham has being open in recent years it has not been fished, which is

thought to be done to market drivers and other fisheries being open. Going on figures from a couple of years ago, officers predict there will be a maximum of 30 byelaw 3 permit holders per tide will prosecute the fisheries.

4.9 Information on Fishing Activity - Dredge

NWIFCA have not issued any permit to dredge in 2021. Previous year's knowledge would indicate there would be a maximum of five vessels fishing.

5. Test for Likely Significant Effect (LSE)

The Habitats Regulations Assessment (HRA) is a step-wise process and is first subject to a coarse test of whether a plan or project will cause a likely significant effect on an EMS[1].

Is the activity/activities directly connected with or necessary to the management of the site for nature conservation? NO

5.1 Table 1: Assessment of LSE

Features: All qualifying features and sub-features have been screened out other than those in the table below, due to there being no interaction between the fishing activity and the qualifying features and sub-features.

Pressures: All pressures from the Advice on Operations table provided in the Morecambe and Duddon Estuary Conservation Advice package have been screened out, other than the pressures in the following table, due to the nature of the fishing activity.

Qualifying Feature	Sub-feature	Potential pressure(s)	Sensitivity	Potential for Likely Significant Effect?	Justification and evidence
H1130. Estuaries H1140. Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats H1160. Large shallow inlets and bays SPA Supporting Habitats	Intertidal mud	Abrasion/disturbance of the substrate on the surface of the seabed Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Sensitive Sensitive	No No	Activity does not occur within the vicinity of intertidal mud. Access to fishery will not be over the feature.
	Intertidal sand and muddy sand	Abrasion/disturbance of the substrate on the surface of the seabed Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Sensitive Sensitive	No No	Hand-gathered access to fishery will be over feature but unlikely to have any impact in such a highly dynamic site, due to low levels of effort and number of tides available for fishing. Hand-gathered access to fishery will be over feature but unlikely to have any impact in such a highly dynamic site, due to low levels of effort and number of tides available for fishing. Boat access over high water and no impact on intertidal sand and muddy sand features.

[1] Managing Natura 2000 sites: http://ec.europa.eu/environment/nature/natura2000/management/guidance_en.htm

	intertidal /subtidal mixed sediments, intertidal coarse sediment	Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Sensitive	Yes	Potential for interaction with mixed and coarse sediments. Feature and pressure taken through to AA.
	Intertidal / subtidal stony reef	Abrasion/disturbance of the substrate on the surface of the seabed	Sensitive	Yes	Both hand-gathering and seed mussel dredge fishing remove the mussel from the surface of the seabed and there is potential for abrasion / disturbance / penetration of the substrate on and below the seabed. Feature and pressures taken through to AA.
	Intertidal / subtidal biogenic reef: including mussel and Sabellaria communities	Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion	Sensitive	Yes	
		Genetic modification & translocation of indigenous species	Sensitive	No	The area is shellfish disease and INNS free. Industry are encouraged to use recognised procedures to ensure equipment is clean of INNS. Consignments are monitored closely through CEFAS shellfish hygiene inspections, and NWIFCA liaison with regulators in Ireland and North Wales to ensure risk of translocation is minimal
		Litter	Sensitive	Yes	Feature and pressure taken through to AA.
		Removal of non-target species	Sensitive	No	There is little or no by-catch in this highly selective fishery.
		Removal of target species	Sensitive	Yes	Feature and pressure taken through to AA. The proposal is to remove mussel from the skear. Mussel beds are a characteristic and fluctuating community of the intertidal boulder and cobble skear interest sub-feature.
A026 Egretta garzetta; Little egret	Supporting Habitats assessed above	Removal of target species (Mussels)	Some species sensitive, others screened out	Yes	Species sensitive to removal of mussels: - Common eider - Eurasian oystercatcher - Red knot - Herring gull - All other shore feeding SPA feature which occasionally feed on infaunal molluscs.
A038 *Cygnus Cygnus*; Whooper swan					
A040 *Anser brachyrhynchus*; Pink-footed goose					
A048 *Tadorna tadorna*; Common shelduck					
A050 Anas Penelope; Wigeon		Removal of non-target species	Sensitive	No	Highly selective fishery. No by-catch or discards of non-target species.
A054 *Anas acuta*; Northern pintail		Visual disturbance	Sensitive	Yes	All species taken through to AA
A063 *Somateria mollissima*; Common eider (Breeding)					
A067 Bucephala clangula; Goldeneye					
A069 Mergus serrator; Red-breasted merganser					
A130 *Haematopus ostralegus*; Eurasian oystercatcher					
A137 *Charadrius hiaticula*; Ringed plover					
A140 *Pluvialis apricaria*; European golden plover					
A141 *Pluvialis squatarola*; Grey plover					
A142 *Vanellus vanellus;* Lapwing					
A143 *Calidris canutus*; Red knot					
A144 *Calidris alba*; Sanderling					

A149 *Calidris alpina alpina*; Dunlin *A151 Calidris pugnax;* Ruff A156 *Limosa limosa;* Black-tailed godwit A157 *Limosa lapponica*; Bar-tailed godwit A160 *Numenius arquata*; Eurasian curlew A162 *Tringa totanus*; Common redshank A169 *Arenaria interpres*; Ruddy turnstone *A176 Larus melancephalus;* Mediterranean gull *Phalacrocorax carbo;* Cormorant *Podiceps cristatus;* Great crested grebe A183 *Larus fuscus*; Lesser black-backed gull (Breeding) A184 *Larus argentatus*; Herring gull (Breeding)					
A191 *Sterna sandvicensis*; Sandwich tern (Breeding)					
A193 *Sterna hirundo*; Common tern (Breeding)					
A195 *Sterna albifrons*; Little tern (Breeding)					
Seabird assemblage					
Waterbird assemblage					

Is the potential scale or magnitude of any effect likely to be significant?[2]	**Alone** Yes **Comments :**	**OR In-combination[3]** Yes **Comments :** These activities also occur at the site: • Beam Trawl (Shrimp) • Pots and Creels • Light otter trawl (Fish) • Drift and Fixed nets (including stake) • Hand working (size mussel) • Hand-working (cockles)
Have NE been consulted on this LSE test? If yes, what was NE's advice?	No - NWIFCA consider AA required	

[2] Yes or uncertain: completion of AA required. If no: LSE required only.
[3] If conclusion of LSE alone an in-combination assessment is not required.

6. Appropriate Assessment

Potential risks to features

6.1 Potential risks to SAC and SPA supporting habitat features

- Intertidal / subtidal mixed sediments, intertidal / subtidal coarse sediment
- Intertidal / subtidal stoney reef
- Intertidal / subtidal biogenic reef: including mussel and *Sabellaria alveolata* communities

6.1.1 Pressures and Potential Impacts

i. Abrasion/disturbance of the substrate on the surface of the seabed
ii. Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion.

i) and ii) assessed together - both hand-gathering and seed mussel dredge fishing remove the mussel from the surface of the seabed and there is potential for abrasion / disturbance / penetration of the substrate on and below the seabed from the use of rakes and dredges.

iii. Litter

Past hand-gathered fisheries have had a poor reputation for large amounts of litter being deposited on the parking and access areas, and being left on the fishery. Items have included food and drink receptacles, net bags and sacks. Potential impacts could include entanglement of fish and birds in the bags and sacks, and swallowing / entanglement by / of birds and mammals (both marine and terrestrial) of other litter.

iv. Removal of target species from biogenic mussel bed communities

Potential to affect the presence and spatial distribution of feature communities, the presence and abundance of typical species and the species composition of component communities.

6.1.2 Exposure

i. Abrasion/disturbance of the substrate on the surface of the seabed
ii. Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion

Intertidal / subtidal mixed sediments, intertidal / subtidal coarse sediment and Intertidal / subtidal stoney reef

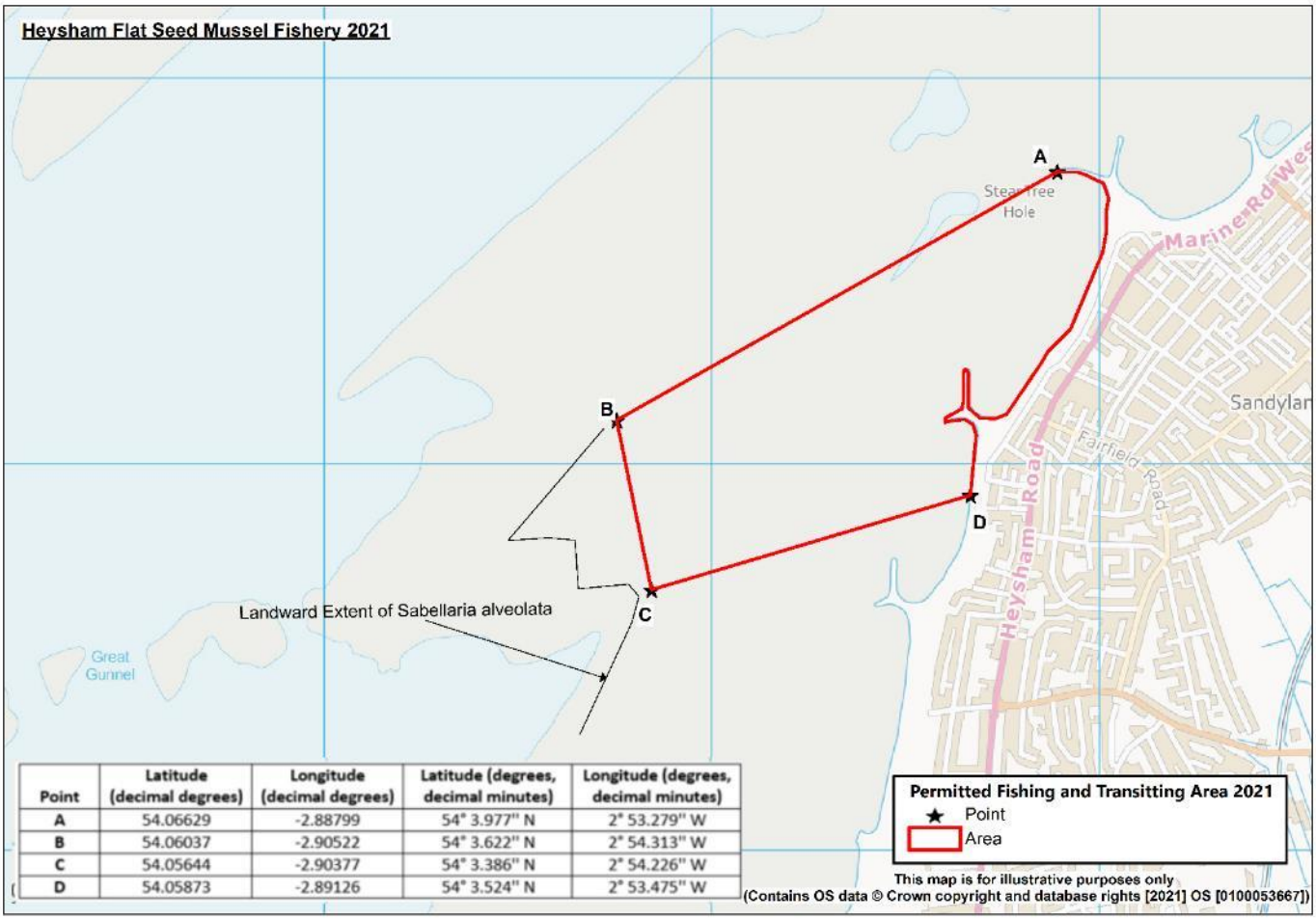
Hand-gathered Fishery: the mussel sits on a layer of soft substrate (mixture of mud, sand and sandy mud) which in places is over a metre thick. Hand-raking skims the mussel from its underlying sediment, with no contact with the cobble and boulder reef beneath.

Dredge Fishery: the dredges used in the fishery have been developed over many years to impact the environment as little as possible by scooping the top layer (~10cm) of mussel and mud from the remaining layer and leaving the cobble substrate undisturbed.

There is a history of both of these fishery activities occurring on this area with no known impact to the underlying features. ***The NWIFCA can conclude that due to the prevailing conditions of thick mud that abrasion and penetration on and below the surface of the seabed will have no risk of adverse effect on the integrity or conservation status of the designated features within the site.***

Intertidal / subtidal biogenic reef: Sabellaria alveolata communities

Section 4.7 gives details of the *Sabellaria alveolata* that is present on the Heysham Flat. Although the area of *Sabellaria alveolata* has received a dense mussel settlement on it and has been buried in mussel and mussel mud, meaning there is minimal chance of survival. Previous advice from Natural England for Heysham Flat seed mussel fishery in 2016 highlights the importance of protecting the underlying 3D structure for potential future colonisation of *Sabellaria alveolata*. To ensure no impact to the buried *Sabellaria alveolata* the area has been removed for the fishery as shown below. Officers tracked around the landward extent of the *Sabellaria alveolata* on Heysham Flat during the inspection in May, prior to the *Sabellaria alveolata* getting smothered.



Point	Latitude (decimal degrees)	Longitude (decimal degrees)	Latitude (degrees, decimal minutes)	Longitude (degrees, decimal minutes)
A	54.06629	-2.88799	54° 3.977'' N	2° 53.279'' W
B	54.06037	-2.90522	54° 3.622'' N	2° 54.313'' W
C	54.05644	-2.90377	54° 3.386'' N	2° 54.226'' W
D	54.05873	-2.89126	54° 3.524'' N	2° 53.475'' W

Map showing proposed Heysham fishery excluding the buried *Sabellaria alveolata*.

Section 4.7 gives details on the substrate under the mussel and shows that although the mussel has scoured and decreased in density there is a significant amount of hard substrate and *Sabellaria alveolata* exposed. Therefore NWIFCA cannot be confident that the underlying features are protected and as mitigation this fishery will remain closed.

The NWIFCA can conclude with the additional mitigation to remove the area of Sabellaria alveolata from the authorised fishery on Heysham and that the Falklnads fishery does not open that abrasion and penetration on and below the surface of the seabed will have no risk of adverse effect on the integrity or conservation status of the designated features within the site.

iii. Litter

Since 2016 there have been a number of cockle fisheries in Morecambe Bay (Newbiggin, Flookburgh, Leven Sands and Pilling Sands) and in most years there has been a fishery on Heysham Flat for seed mussel as well as on-going size mussel fisheries around Morecambe Bay. There have only been a few reports of litter being an issue at any of these fisheries, which are regularly inspected by fishery officers. Where issues have been raised officers work with gatherers, buyers and the local authority to resolve the issues. A Code of

Practice for Intertidal Hand-gathering includes responsibility for littering. NWIFCA takes a swift response to any alerts to littering issues.

There is very little risk of littering from the vessel dredge fishery. Vessels are large and modern and have all facilities for dealing with litter aboard.

The NWIFCA is confident that littering will be minimal and controlled and monitoring will be in place to identify quickly if litter is a problem. ***Therefore the NWIFCA can conclude that litter will have no risk of adverse effect on the integrity or conservation status of the designated features within the site.***

iv. Removal of target species - Intertidal biogenic reef: including mussel and *Sabellaria alveolata* communities

The fishery is only being authorised due to the high likelihood that the single year class of 2021 mussel will wash out along with much of the mud on which it sits. Therefore, this resource would be removed by natural events whether fished or not. Although attempts have been made over the years to identify where the mussel is washed to, it has never been found within the Bay and is believed to either wash right out into the wider Irish Sea or to die.

NWIFCA is confident that the removal of target species will have no risk of adverse effect on the integrity or conservation status of the designated features within the site.

6.2 SPA and Ramsar Features

- SPA and Ramsar birds

6.2.1 Potential Impacts

i) Removal of target species (mussels) for Common eider, Eurasian oystercatcher, Red knot, Herring gull, and those SPA features which occasionally feed on infaunal molluscs;

Mussels form part of an important prey resource for eiders, oystercatchers, knot and herring gull, as well as forming part of a wide variety of prey items for many of the designated species including grey plover, dunlin, sanderling and turnstone. If bird populations are to be maintained, or restored to healthy condition, sufficient shellfish to meet their demands must remain for them.

The impact of removal of essential prey resource by fishing activity varies at different times of the year. For example, prey resource requirements are far greater during autumn and at the beginning of winter than at other times of the year, as enough resource needs to be present for all the birds to feed through the cold months, when energy requirements are higher. Over-wintering waders require to put on weight and get into best condition in the spring prior to migrations for the summer, or they will not survive long flight distances and suffer high mortalities. Equally the breeding eider population of Morecambe Bay needs to get into prime condition prior to mating in order to reproduce successfully. This applies to both sexes but in particular to females who once on the nest do not feed again until ducklings have fledged, a period of up to three weeks. There have been concerns raised over the Bay's eider population, its sex ratio skew (3:1 males to females) and the lack of success in breeding.

Oystercatchers eat a range of sizes of mussels. Although the birds will eat alternative prey species when shellfish are scarce, these prey often are not as nutritious and do not enable birds to survive as well, and in such good body condition, as when shellfish are abundant (Atkinson et al 2003;Goss-Custard et al 2004).

Knot eat smaller bivalves with lower and upper size limits of around 5 and 12.5mm shell length respectively (Bell et al 2001).

Eiders generally feed on a mixed range of sizes of bivalves, although it is understood they will consume high quantities of small mussels when they are available.

Herring gulls fed on a range of sizes of bivalves with around 20mm thought to be the preferred size (Hilgerloh *et al*, 1997)

ii) Visual disturbance - All SPA species within vicinity of fishery, on the saltmarsh access route and over the sandbanks.

Visual disturbance could impact on the condition of any of the listed bird species, by causing unnecessary energy expenditure if flushed and taking to flight. For birds feeding on the affected areas it could also reduce feeding times, and increase competition if birds are forced to concentrate into reduced feeding areas.

6.2.2 Exposure

i) Removal of target species (mussels) for Common eider, Eurasian oystercatcher, Red knot, Herring gull;

The mussel is most vulnerable to natural wash out and therefore would not be available to the birds whether fished or not. The size of the mussel to be removed by the fishing activity is in the 20 - 30mm size range and therefore outside of the typical feeding size range for knot, but within the feeding range for eider, oystercatcher and herring gull. Although no specific figures have been given for the bird food requirements for bivalve eating birds, using the summary of the cockle and mussel beds provided (Annex 6) and the reasons listed below, NWIFCA is confident that the bird food requirements are met for the site.

- fishing is never 100% efficient and neither method will remove all of the mussel from the bed
- removing its density and disturbing some of the mud could possibly have a stabilising effect for the remaining mussel
- there will be a limited number of hand-gatherers prosecuting the fishery with a maximum of 30 permit holders fishing over low water. If they fish Heysham and South America they will not be fishing other beds
- Although seed mussel fisheries have been authorised on Heysham Flat and South America in 2020 neither were fished.
- A large proportion of Heysham flat will remained closed due to protecting the underlying 3d structure of *Sabellaria alveolata*, which is covered in mussel and available as bird fodd until it washed away.
- the dredge vessels will fish over high water on smaller tides around the neap tide. They are naturally likely to remove more of the resource.
- wader numbers are greatest during the winter months meaning feeding requirements are lower during the time of the fishery.
- plentiful mussel stock present on other beds and some additional cockle stocks as alternative feeding (Annex 5).
- Aldingham, Leven, Flookburgh, Warton and Middleton cockle beds will remain closed until at least 1st September 2021 giving alternative feeding.
- Pilling and Newbiggin are proposed to open as cockle fisheries. The size cockle on the proposed open beds are only in discrete locations and fishing will only occur in areas where the size cockle is at the greatest densities. Although there is size cockle on a large proportion of the beds, much of the

beds will remain unfished because the cockle density is not high enough to make it commercially viable to fish it. The area of cockle with more than 20 per m² size cockle is 625 hectares of a total of 2433 hectares of cockle bed, which equates to 25.7 % of the total open cockle bed area. In reality, a much smaller area than this will be fished as it will only be the areas where there is a greater density of cockle that will be fished.

NWIFCA is confident that the removal of target species (mussel) will have no risk of adverse effect on the SPA features, which utilise mussel as a prey source and therefore have no risk of adverse effect on integrity or conservation status of the site.

ii) Visual disturbance - All SPA species within vicinity of fishery, access route and over the sandbanks

Little egret have the potential to be disturbed when feeding. Little egret prefer to feed in shallow water 10cm to 20cm in depth (Kushlan & handcock 2005). There is potential for the birds to be disturbed by hand-gathering when tractors and quad bikes are travelling to and from the fishing areas and fishing. Little egret commonly feeds in solitary or in lose flocks (del hoyo et al. 1992), and therefore any disturbance is likely to affect only a few individuals and any displacement temporary and short lived for the following reasons;-

- the fishing can only occur over low water and on large spring tides at South America
- the gatherers will only travel once to and from from the fishing area per tide
- the authorised area is small with an estimated total area of 9.5ha

Golden plover are only likely to feed in the intertidal areas when weather conditions are harsh and the ground is hard from frost on their normal inland feeding areas. Due to the fishing activity occurring mainly in August - September it is unlikely that golden plover will be found near the fishery.

Dunlin, black tailed godwit, bar tailed godwits, curlew and redshank mainly target mudflats as their feeding grounds. Lapwing use a variety of habitats (marine and terrestrial), and when present on the intertidal they tend to target mudflats. The fishing activity does not occur on or near to mudflats. Redshank are found on saltmarsh and are known to nest on saltmarsh but the fishing activity does not occur on or near saltmarsh. All access to the fishing grounds by hand-gatherers is by established access routes, and by vessels from open sea over high water; visual disturbance is unlikely.

Oystercatcher, ringed plover, grey plover, knot, sanderling and turnstone all feed on a variety of substrates in the intertidal area. Waders will move in and out with the tide feeding in and on the sediment, each wader will have a preferred prey source and size. Travel by hand-gatherers to and from the authorised area and fishing has the potential for disturbance. Visual disturbance to Oystercatcher, ringed plover, grey plover, knot, sanderling and turnstone will be minimal and any displacement temporary and short lived for the following reasons:

- the fishing can only occur over low water and on large spring tides at South America
- the gatherers will only travel once to and from the fishing area per tide
- plentiful mussel stock present on other beds and some additional cockle stocks as alternative feeding (Annex 5) giving large areas of undisturbed feeding.
- there will be a limited number of hand-gatherers prosecuting the fishery with a maximum of 30 permit holders fishing over low water. While they fish South America they will not be fishing other beds
- the dredge vessels will fish over high water on smaller tides around the neap tide. ie. at times when the birds will be resting or feeding on inshore / inland sites.

Shelduck, pintail and wigeon spend a proportion of their time feeding on intertidal mud. The fishing activity does not occur on or near to mudflats meaning disturbance is unlikely. Red breasted merganser, cormorant and great crested grebe spend the majority of time on the water, so there will be minimal to no disturbance

from an intertidal fishery accessed from the shore. Whooper swans and pink footed geese numbers are greatest during the winter, and as the fishery is in August to September and for a short period of time disturbance is likely to be minimal if any.

Eiders are known to feed on submerged mussels at shallow depths (2-3m) (Larsen & Guillemette 2000) and are regularly observed at or near to the Falklands beds, Foulney Island, Low Bottom, Morecambe and Fleetwood. Visual disturbance to Eiders by the fishing activity will be minimal and any displacement temporary and short lived for the following reasons:

Hand-gathering:

- no visual disturbance to feeding eiders from hand-gatherers as feeding on different tides to the fishing activity
- eiders loafing or resting on the exposed intertidal areas are mainly around Foulney and Walney Channel which is not part of the access route to Heysham or South America. Those resting on the sands may be minimally disturbed as the quad bikes pass once on the way to the fishery and once on the way back over a low number of tides. They may have become habituated at South America to this activity due to the regular quad bike access on to the Foulney mussel bed.

Dredge fishery:

- low number of boat with a large capacity meaning the fishery is often short lived.
- fishing lasts around 4-5 hours over high water at which point the boats are likely to move offshore until the next tide
- once the vessel has taken a load it has to steam back for a day or two to the operators lays
- fishing is not expected to take place over spring tides which futher reduced the potential for visual disturbance.

Mediterranean gull, lesser black-backed gull, herring gull are present on both the intertidal and open water and therefore there is potential for visual disturbance from access and fishing to the authorised area. Visual disturbance to gulls will be minimal and any displacement temporary and short lived for the following reasons:

- fishing by hand-gatherers can only occur over low water and on large spring tides at South America
- the gatherers will only travel once to and from the fishing area per tide
- plentiful mussel stock present on other beds and some additional cockle stocks as alternative feeding (Annex 5) giving large areas of undisturbed feeding.
- A large proportion of Heysham flat will remained closed due to protecting the underlying 3D structure of *Sabellaria alveolata*, which is covered in mussel and available as an undisturbed area.
- there will be a limited number of hand-gatherers prosecuting the fishery with a maximum of 30 permit holders fishing over low water. While they fish South America they will not be fishing other beds
- the dredge vessels will fish over high water on smaller tides around the neap tide. ie. at times when the birds will be resting or feeding on inshore / inland sites.

Sandwich tern, common tern, and little tern rarely use the intertidal area at low water but will use the shallow areas covered by water. The tern species do nest in coastal areas but none of the known nest areas are access points for the fishery. The known nesting areas for terns in the European Site are Foulney and Hodbarrow. There is potential for fishing activity to disturb the terns while fishing in shallow water at low tide but terns have large foraging ranges and will not be displaced a large distance by the fishing activity. The main times of year when they are present are now passed.

The NWIFCA is confident that visual disturbance to the SPA features will have no risk of adverse effect on the integrity or conservation status of the site.

7. Management and Mitigation to Ensure No Adverse Effect on the Integrity of the European Site:

In order for the NWIFCA to be fully confident of no risk of adverse effect on the integrity or conservation status of the sites a precautionary approach is being taken, and the following management measures implemented:

a) Rigorous enforcement of the conditions set out in the authorisation and permit conditions including sensitive areas outside of the fishery;
b) Monitored landings through:

   i. Regular IFCO reporting of numbers fishing and estimates of quantities removed;

   ii. Landings returns from Byelaw 3 permit holders and Dredge permit holders (required under both byelaws);

c) Monitoring and inspection to inspect catch and ensure that there are no litter issues;
d) NWIFCA enforcement officers will use intelligence and contacts with fellow enforcement agencies to pursue any suspicions of non-permitted or illegal gathering activity;

Table 2: Summary of Impacts

Feature/Sub feature(s)	Conservation Objective	Potential pressure[4] (such as abrasion, disturbance) exerted by gear type(s)[5]	Potential ecological impacts of pressure exerted by the activity/activities on the feature[6] *(reference to conservation objectives)*	Level of exposure[7] of feature to pressure	Mitigation measures[8]
Intertidal mixed sediments, intertidal coarse sediment Intertidal biogenic reef: including mussel and Sabellaria alveolata communities	Maintain or restore the extent, distribution structure or function of the feature.	Abrasion/disturbance of the substrate on the surface of the seabed	Both hand-gathering and seed mussel dredge fishing remove the mussel from the surface of the seabed and there is potential for abrasion / disturbance / penetration of the substrate on and below the seabed from the use of rakes and dredges.	As in 6.1.2(i) + (ii)	Additional management required by removing area of *Sabellaria alveolata* from the fishing area at Heysham. Falklands mussel bed to remain closed.
		Penetration and/or disturbance of the substrate below the surface of the seabed, including abrasion			Additional management required by removing area of *Sabellaria alveolata* from the fishing area at Heysham. Falklands mussel bed to remain closed.
		Litter	Litter could pose potential threat to wildlife, especially birds through ingestion or entanglement	As in 6.1.2 (iii)	None - current management measures sufficient with monitoring of the fishery
		Removal of target species	Potential to affect the:- - Presence and spatial distribution of the feature communities - Presence and abundance of typical species - The species composition of component communities	As in 6.1.2 (iv)	None - current management measures sufficient with monitoring of the fishery

[4] Guidance and advice from NE.
[5] Group gear types where applicable and assess individually if more in depth assessment required.
[6] Document the sensitivity of the feature to that pressure (where available), including a site specific consideration of factors that will influence sensitivity.
[7] Evidence based e.g. activity evidenced and footprint quantified if possible, including current management measures that reduce/remove the feature's exposure to the activity.
[8] Detail how this reduces/removes the potential pressure/impact(s) on the feature e.g. spatial/temporal/effort restrictions that would be introduced.

- *Somateria mollissima*; Common eider - *Haematopus ostralegus*: Eurasian oystercatcher - *Calidris canutus*; Red knot *Larus argentatus*; Herring gull	Maintain or restore the population of each of the qualifying features, and, the distribution of the qualifying features within the site	Removal of target species (mussels)	Potential to affect the:- - Food availability - Condition and survival of SPA species - Abundance of SPA species	As in 6.2.2 (i)	None - current management measures sufficient with monitoring of the fishery
- Common eider - Eurasian oystercatcher Red knot Little egret Whooper swan Pink-footed goose Common shelduck Wigeon Northern pintail Common eider Goldeneye Red-breasted Merganser Eurasian oystercatcher Ringed plover European golden plover Grey plover Lapwing Red knot Sanderling Dunlin Ruff Black-tailed godwit Bar-tailed godwit Eurasian curlew Common redshank Ruddy turnstone Mediterranean gull Cormorant Great crested grebe Seabird assemblage Waterbird assemblage Lesser black-backed gull Herring gull Sandwich tern Common tern - Little tern	Maintain or restore the population of each of the qualifying features, and, the distribution of the qualifying features within the site	Visual disturbance	Potential to affect the:- - Condition and survival of SPA species - Abundance of SPA species - Extent and distribution of supporting habitat available whilst a fishing activity is occurring	As in 6.2.2(ii)	None - current management measures sufficient with monitoring of the fishery

7. Conclusion[9]

The authorisation, permit, management and mitigation measures incorporated into this fishery, the use of an effective enforcement team of NWIFCA Officers with multi-agency support, the highly dynamic environment in which the fishery lies, and the recorded history of the resources in this area, allows the NWIFCA to conclude that:

- A permitted dredge, seed mussel fishery at Perch and Black Scar (Fleetwood) in July / August 2021.
- A authorised hand gathered seed mussel fishery at Heysham Flat in July / August 2021.
- A permitted dredge and hand gathered, seed mussel fishery at South America (North Morecambe Bay) in July / August 2021.

will not have an adverse effect on the integrity of the European Site.

8. In-combination assessment[14]

8.1 Other ongoing and Authorised Fisheries to be Included in the In-combination assessment:

Tractor shrimp fishery – it is possible that some operators could go shrimp fishing in close proximity with the mussel fishery.

Size mussel fisheries – there is an active hand-gathered size mussel fishery in Foulney.

Size cockle fishery – potential opening of Pilling sand and Newbiggin, HRA currently with Natural England.

8.1.2 In Combination Assessment

Low water intertidal fisheries:

The shrimp fishery has undergone an HRA which concluded no adverse effect on the integrity of the European Site. Most of the shrimp fishing occurs between spring and autumn with autumn being the key time. Most of the shrimp tractor fishers in Morecambe Bay are also NWIFCA Byelaw 3 permit holders. Most of them prosecute a range of fisheries and it is most likely that they will fish size mussels at Foulney or possibly the undersize mussel at Heysham and South America which will result in reduced shrimp fishing, and move on to the cockles when the beds open.

The size mussel fishery is open throughout the District all year round for Byelaw 3 permit holders. Each fishery is rigorously monitored and enforced by warranted IFCOs. In reality each fishery is only prosecuted by low numbers and modest amounts of mussel removed. For example in the first four months of 2021 landings reports for the north Morecambe Bay mussel beds, which include Low Bottom, Foulney Ditch, Walney Channel, Foulney and Foulney Island, came to 204 tonnes. Biomass estimates made from Dutch Wand survey data in May came to 3081 tonnes for Walney Channel and 8251 tonnes for Foulney and Foulney Island, illustrating what a low level and sustainable fishery it is. These are the same gatherers who will prosecute the undersize mussel if they chose and therefore in relative terms of resource removed and disturbance risk there is no effect.

Cockle fisheries are separately assessed at the proposal for Pilling and Newbiggin HRA is current with Natural England for formal advice. Should these fisheries open it will divert effort from mussels. The overall effect in combination can therefore be negated.

[9] If conclusion of adverse effect alone an in-combination assessment is not required.

Considering cockle, size mussel and shrimp fisheries in the Bay in combination with intertidal hand-gathering of seed mussel the NWIFCA can conclude no adverse effect on the integrity of the European Site providing the management measures of the authorised mussel fishery are implemented and enforced.

High water dredge fishery:

The area of the fishery is small in size a prosecute by a low number of vessels. The resource would be lost to natural causes if not fished. Dredging occurs over different tides to hand-gathering and tractor shrimping.

Considering cockle, size mussel and shrimp fisheries in the Bay in combination with dredge fishery of seed mussel the NWIFCA can conclude no adverse effect on the integrity of the European Site providing the management measures of the authorised mussel fishery are implemented and enforced.

9. Summary of consultation with Natural England

Natural England were involved in discussions around the management of the fishery when discussed at TSB.

10. Integrity test

The NWIFCA concludes no adverse effect on the integrity of the European Site providing the management and mitigation measures of the undersize mussel fisheries 2021 are implemented and upheld.

Annex 1: Reference list

Atkinson, PW *et al*. 2003. Changes in commercially fished shellfish stocks and shorebird populations in the Wash, England. *Biol Con*, 114, 127-141

Bell, MC *et al*. 2001. Fisheries and bird predation as components of cockle (Cerastoderma edule) mortality in the Burry Inlet, South Wales. In: The Life History, Dynamics and Exploitation of Living Marine Resources: Advances in Knowledge and Methodology CM 2001/J:02 ICES

Bustnes, JO. (1998). Selection of blue mussels Mytilus edulis, by Common eiders, Somateria mollisima, by size in relation to shell content. Canadian Journal of Zoology **76**: 1987 – 1790. http://www.nrcresearchpress.com/doi/abs/10.1139/z98-111

CCW? (2011). *Consideration of risks involved with the removal of mussel seed from the Salisbury Bank, Dee Estuary, that may contain the non-native Chinese Mitten Crab Eriocheir sinensis.* Report for Welsh Government.

Cook, B. (2008). *Seed mussel removal from Foulney Twist Appropriate Assessment*. North Western and North Wales Sea Fisheries Committee – unpublished.

Cook, A.S.C.P, & Burton, N.H.K. 2010. *A review of the potential impacts of marine aggregate extraction on Seabirds*. Marine Environment Protection Fund (MEPF) Project 09/P130

Dare, P.J. (1976). *Settlement, growth and production of the mussel Mytilus edulis L. in Morecambe Bay, England.* Fish. Invest. Minist. Agric. Fish. Food lond. Ser. II. 28: 1-25

Dare, P.J. (1971). Preliminary studies on the utilisation of the resources of spat mussels, (Mytilis edulis L.) occurring in Morecambe Bay, England. International Council on the Exploration of the Sea Committee Meeting, K11. 1–6 (Shellfish and Benthos Comm.).

Dubois, S., Retiere, C. & Olivier, F. (2002). *Biodiversity associated with Sabellaria alveolata (*Polychaeta: Sabellariidae*) reefs: effects of human disturbance*. Journal of the Marine Biological Association of the UK. 82. pp. 817-826.

Dubois, S., Barille, L., Cognie, B. & Beninger, P. (2005). *Particle capture and processing mechanisms in Sabellaria alveolata (*Polychaeta: Sabellariidae*).* Marine Ecology Progress Series. 301. pp. 159-171.
.
Dubois, S., Barille, L., Cognie, B. & Beninger, P. (2006a). *Feeding mechanisms of the polychaete Sabellaria alveolata revisited: reply to Riisgard & Nielson (2006).* Marine Ecology Progress Series. 328. pp. 307-311.

Dubois, S., Commito, J.A. Olivier, F. & Retiere, C. (2006b). *Effects of epibionts on Sabellaria alveolata* (L.) *biogenic reefs and their associated fauna in the Bay of Mont Saint-Michel.* Estuarine, Coastal and Shelf Science. 68. pp. 635-646.

Dubois, S., Comtet, T., Retiere, C. & Thiebaut, E. (2007). *Distribution and retention of Sabellaria alveolata larvae (*Polychaeta: Sabellariidae*) in the Bay of Mont Saint-Michel, France.* Marine Ecology Progress Series. 346. pp. 243-254.

Essink, K. 1999. Ecological effects of dumping of dredged sediments; options for management. *Journal of Coastal Conservation*. 5: 69-80.

Egerton, S. (2014). *Distribution mapping and health assessment of honeycomb worm, Sabellaria alveolata, reefs on Heysham Flat, Lancashire.*

Foster, V. (2015). Update 2014: Distribution mapping and health assessment of honeycomb worm, *Sabellaria alveolata,* reefs on Heysham Flat, Lancashire.

Frechette, M., Aitken, A.E. & Page, L. 1992). *Interdependence of food and space limitation of a benthic suspension feeder: consequences for self-thinning relationships. Mar. Ecol. Prog. Ser. 83: 55-62.*

Furness, R, W., Tasker, M, L. 2000. Seabird – fishery interactions: quantifying the sensitivity of seabirds to reductions in sandeel abundance and identification of key areas for sensitive seabirds in the North Sea. Marine Ecology Progress Series, Vol 202: 253-264.

Gascoigne, J., Osborn, G., Kantola, K., Cook, B., Galanidi, M., Saurel, C., Donald, E. and Kaiser, M. (2007). *Partial harvesting of intertidal seed mussel beds: consequences for mussel growth and mussel bed biodiversity. (*Unpublished*?)*

Goss-Custard JD *et al*. 2004. When enough is not enough: shorebirds and shellfishing. *Proc R Soc Lond* B 271, 233-237

Goss-Custard, J.D., Stillman R.A., West, A.D., Caldow, R.W.G., Triplet, P., le V. dit Durell S.E.A. & McGrprty, S. (2004). *When enough is not enough: shorebirds and shellfishing.* Proceedings of the Royal Society of London. B. **271**, 233-237.

Gruet, Y. (1984). *Granulometric Evolution of the Sand Tube in Relation to growth of the Polychaete Annelid Sabellaria alveolata (*Linne*) (Sabellariidae).* Ophelia. 23(2). pp. 181-193

Gruet, Y. (1986). *Spatio-temporal Changes of Sabellarian Reefs Built by Sedentary Polychaete Sabellaria alveolata (*LINNE*).* Marine Ecology. 7(4). pp. 303-319.

Hamilton, D.J., Nudds, T.D. and Neate, J. (1999). Size-Selective Predation of Blue Mussels (*Mytilus edulis*) by Common Eiders (*Somateria mollissima*) under Controlled Field Conditions. The Auk. Vol. **116**, No. 2 (Apr., 1999), pp. 403-416 http://www.jstor.org/stable/4089374?seq=1#page_scan_tab_contents

Hilgerloh (1997). Predation by birds on blue mussel *Mytilus edulis* beds of the tidal flats of Spiekeroog (southern North Sea). Marine Ecology Progress Series. Vol. **146**. 61-72.

Knott, M. (2009). The Effect on the Stability of the Reefs Built by the Honeycomb Worm (*Sabellaria alveolata*) in relation to the population density of the Blue Mussel (*Mytilus edulis*) and the Implications for the management of the seed mussel fishery at Heysham Flat Skear, Morecambe Bay, England. Dissertation as part of BSc (Hons) Degree in Marine Biology & Coastal Zone Management. Lancaster University with Blackpooland the Fylde College.

Larsen, J.K. and Guillemette, M. (2000). Influence of annual variation in food supply on abundance of wintering common eiders *Somateria mollissima* MARINE ECOLOGY PROGRESS SERIES. Vol. **201**: 301–309. http://www.int-res.com/articles/meps/201/m201p301.pdf

MAFF and NW&NWSFC Surveys. 1968 – 2001.

Maree, B.A, Wabless, R.M, Fairweather T.P, Sullivan, B.J, Yates, O 2014. Significant reductions in mortality of threatened seabirds in a South African trawl fishery. *Animal Conservation.* Volume 17, issue 6 pages 520-529.

Mettam, C., Conneely, M.E. & White, S.J. (1994). *Benthic macrofauna and sediments in the Severn Estuary.* Biological Journal of the Linnean Society. 51 pp. 71-81.

Natural England Marine Interim Conservation Advice for Special Protection Area (UK9005081), UK9005081_Morecambe_Bay_SPA_Advice_on_Operations
UK9005081_Morecambe_Bay_SPA_SAT_Birds

Natural England Marine Interim Conservation Advice for Special Area of Conservation (UK0013027), UK0013027_Morecambe_Bay_SAC_Advice_on_Operations
UK0013027_Morecambe_Bay_SAC_Generic_SAT_Habitats
UK0013027_Morecambe_Bay_SAC_Generic_SAT_Species

NWIFCA – TSB Minutes. (9th August 2016). http://www.nw-ifca.gov.uk/app/uploads/TSB-2016-Minutes-9-Aug.pdf

Oliver, C. (2016). Update 2015 Distribution mapping and health assessment of honeycomb worm, Sabellaria alveolata, reefs on Heysham Flat, Lancashire.

Porras, R., Bataller, J.V., Murgui, E. & Torregrosa, M.T. (1996). *Trophic Structure and Community Composition of Polychaetes Inhabiting Some Sabellaria alveolata* (L) *Reefs Along the Valencia Gulf Coast, Western Mediterranean.* Marine Ecology. 14(4). pp. 583-602.

Thaxter et al. (2010). Wintering population of eider currently exceeds the SPA baseline but Morecambe Bay has shown greater decline from the post-designation increase regionally and nationally in wintering eider population than at the national scale, suggesting site specific pressures. http://app.bto.org/webs-reporting/?tab=alerts

Tyler-Walters, H. & Arnold, C. (2008). *Sensitivity of Intertidal Benthic Habitats to Impacts Caused by Access to Fishing Grounds.* Report to Cyngor Cefn Gwlad Cymru / Countryside Council for Wales from the Marine Life Information Network. (MarLIN). UK.
UKBAP. 2008.

Wilson, D.P. (1968a). *The settlement behaviour of the larvae of Sabellaria alveolata* (L.*)* Journal of the Marine Biological Association of the UK. 48. 387-435.

Wilson, D.P. (1968b). *Some aspects of the development of eggs and larvae of Sabellaria alveolata* (L.) Journal of the Marine Biological Association of the UK. 48. 367-386.

Wilson, D.P. (1971). *Sabellaria colonies at Duckpool, North Cornwall. 1961 – 1970.* Journal of the Marine Biological Association of the UK. 51. 509-580.

Wilson, D.P. (1974). *Sabellaria colonies at Duckpool, North Cornwall. 1971 – 1972, with a note for May 1973.* Journal of the Marine Biological Association of the UK. 54. 393-436.

Wilcox, R. (2013). Review of the incidence of pearling in the mussel, *Mytilus edulis*: With reference to the mussel beds of the Walney Channel, Barrow-in-Furness, Cumbria, England. Cumbria Wildlife Trust and NWIFCA.

Woolmer, A.P. 2011a*. Standard Operating Procedure for screening seed mussel beds for the Chinese mitten crab (Eriocheir sinensis)*. Report to Bangor Mussel Producers Association. pp 11.

Woolmer, A.P. 2011b. *Chinese mitten crab (Eriocheir sinensis) Assessment Salisbury Bank Seed Mussel Bed (Dee Estuary): Dredge Survey*. Report to Bangor Mussel Producers Association. pp 5

Woolmer, A.P. 2011c. *Chinese mitten crab (Eriocheir sinensis) Assessment Salisbury Bank Seed Mussel Bed (Dee Estuary): Timed Search Foot Survey*. Report to Bangor Mussel Producers Association. pp 8

Woombs, M. (1999). *Monitoring of Biotopes on Rocky Skears in Morecambe Bay, European Marine Site. A Report for English Nature.* W.A. Marine & Environment.

Annex 2: Natural England's consultation advice

Date: 29 July 2021
Our ref: 360501
Your ref: Morecambe Bay Seed Mussel Fishery 2021 HRA Draft

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BY EMAIL ONLY

Dear Jon Haines,

Morecambe Bay Seed Mussel Fishery 2021 HRA Draft

Thank you for your consultation dated 16 July 2021 and the updated HRA received on 27 July 2021. The following constitutes Natural England's formal statutory response.

The Conservation of Habitats and Species Regulations 2017 (as amended) and The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended)

We can confirm that the proposed works are located within **Morecambe Bay SAC, Morecambe Bay and Duddon Estuary SPA, Morecambe Bay Ramsar**.

Assessment of likely significant effect
Natural England's advice is that this proposed development may contain (or require) measures intended to avoid or reduce the likely harmful effects on a European Site, which cannot be taken into account when determining whether or not a plan or project is likely to have a significant effect on a site and requires an appropriate assessment (noting the recent People Over Wind Ruling by the Court of Justice of the European Union).

For this reason, we advise that on the basis of the information supplied that the application may have a likely significant effect on these sites. The application requires an appropriate assessment in accordance with the Conservation of Habitats & Species Regulations 2017 (as amended).

Appropriate assessment
We note that your authority, as competent authority under the provisions of the Habitats Regulations, has undertaken an Appropriate Assessment of the proposal in accordance with Regulation 63 of the Regulations.

Natural England is a statutory consultee on the Appropriate Assessment stage of the Habitats Regulations Assessment process.

Your appropriate assessment concludes that your authority is able to ascertain that the proposal will not result in adverse effects on the integrity of any of the sites in question. Having considered the assessment, and the measures proposed to mitigate for all identified adverse effects that could potentially occur as a result of the proposal, Natural England advises that we concur with the assessment conclusions, providing that all mitigation measures are appropriately secured in any permission given.

Marine and Coastal Access Act 2009

The works, as set out in the information supplied by the applicant, are not sited within or near to a Marine Conservation Zone. Natural England have not identified a pathway by which impacts from the development would affect the interest features of the site(s). We are therefore confident that the works will not hinder the conservation objectives of such a site.

Wildlife and Countryside Act 1981 (as amended)

We can confirm that the proposed works are located within **Morecambe Bay SSSI, South Walney and Piel Channel Flats SSSI, Wyre Estuary SSSI**. Natural England advises that the proposal, if undertaken in strict accordance with the details submitted, is not likely to damage the interest features for which the site has been notified.

For any queries relating to the content of this letter please contact me using the details provided below.

Yours sincerely,

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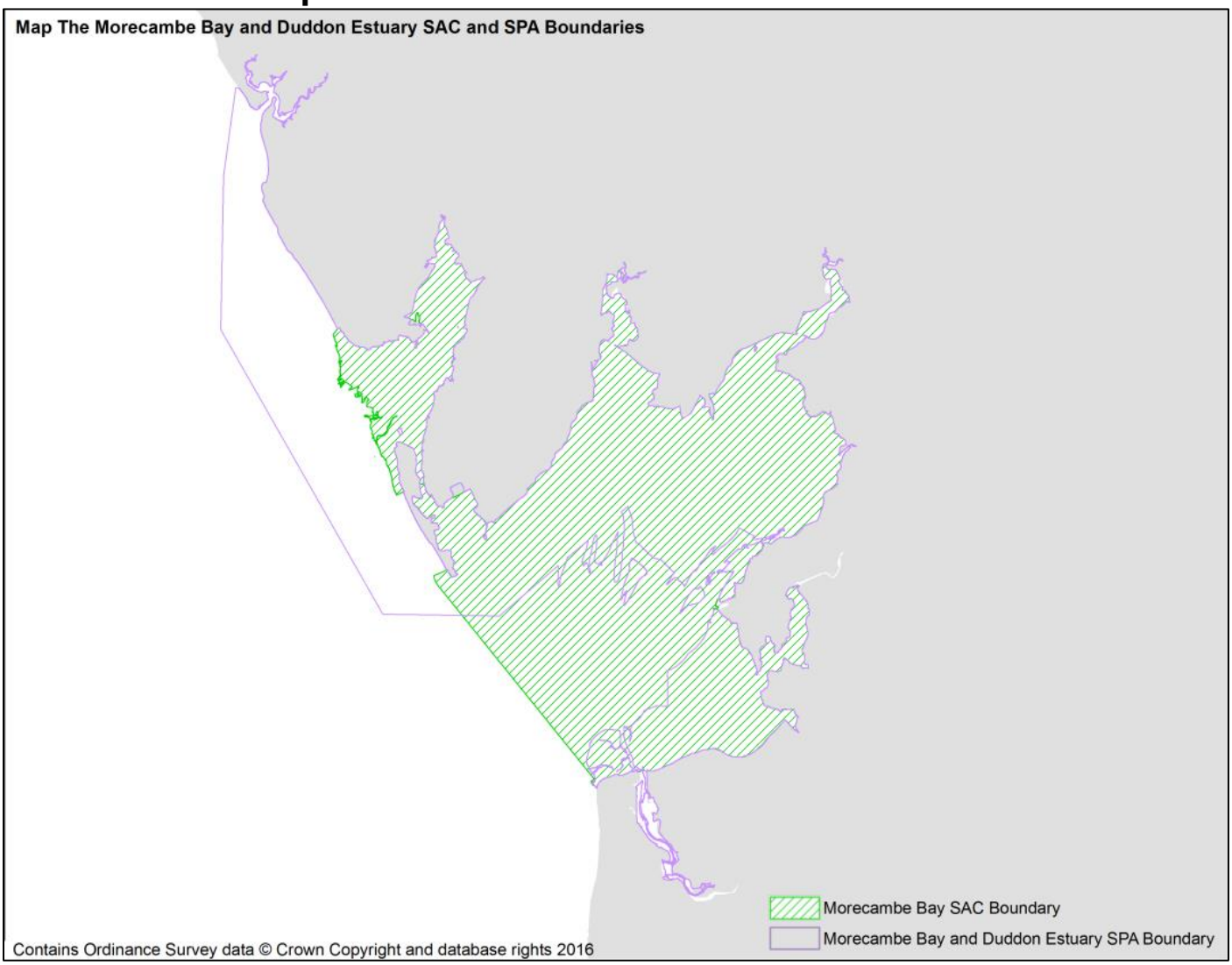
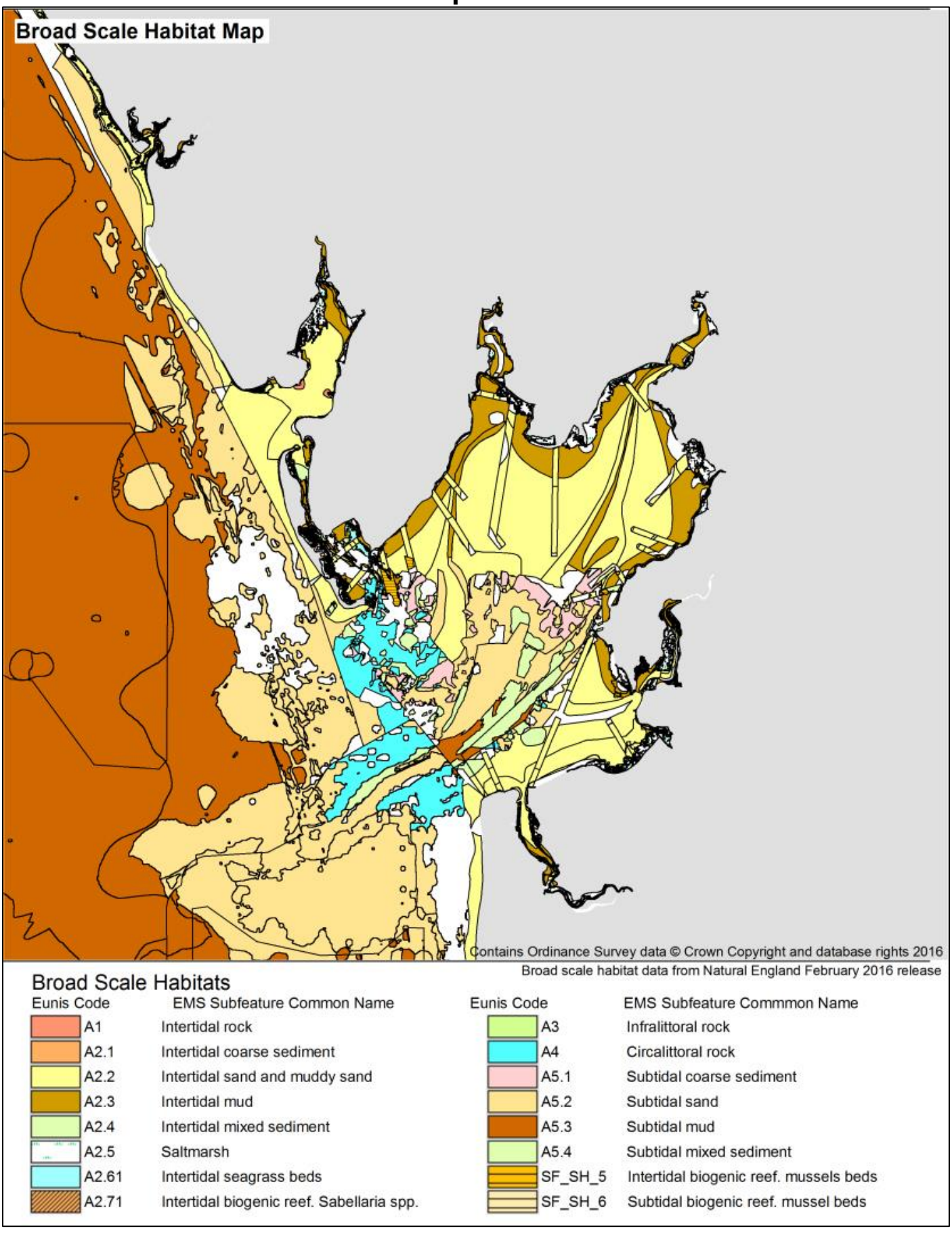
Annex 3: Site Map



Annex 4: Broad Scale Habitat Map



Annex 5 – Summary of Mussel and Cockle Beds in Morecambe Bay (NWIFCA July 2021) from industry, inspections and surveys

Date	Location	Skear	Survey Method	Tide Height (m)	Description
02/03/21	North Morecambe Bay	South America	Inspection	0.8	The area had received a dense 2021 mussel settlement which was present on stoney substrate, shell debris, dead *Sabellaria alveolata* and live 2020 mussel, the new settlement was approximately 2-3mm in size (figures 5 and 6). The settlement is earlier than what has been witnessed in recent years.
26/04/21	Fleetwood	Rossall skear	Heliflight	0.7	Plenty of starfish spread out over the scar. Sparse mussel/ cobble with no significant patches of mussel.
26/04/21	Fleetwood	Neckings	Heliflight	0.7	Plenty of starfish spread out over the scar. Sparse mussel/ cobble with no significant patches of mussel.
26/04/21	Fleetwood	Kings Scar	Heliflight	0.7	Plenty of starfish spread out over the scar. Sparse mussel/ cobble with no significant patches of mussel.
26/04/21	Fleetwood	Perch Scar	Heliflight	0.7	Sparse patches of old size mussel. Nothing significantly new yet.
26/04/21	Knott End	Wyre End	Heliflight	0.7	From distance it appeared to have small patches of mussel around the edge with cobble covering most of the scar.
26/04/21	Heysham	Heysham Flat	Heliflight	0.7	Unable to inspect closely due to the Heysham exclusion zone. Furthest skear looked to be the darkest in colour with mussel and Sabellaria around the edges. The next skear in had large patch of *Sabellaria alveolata* reef with what looked like areas of cobble. *Sabellaria alveolata* can be seen to spread widely over the main skear. Outer skears were sparse and cobbled in the centre.
26/04/21	North Morecambe Bay	Low Bottom	Heliflight	0.7	Remnants of last year's size mussel but very patchy and sparse in distribution. Cobble and sand.
26/04/21	North Morecambe Bay	Falklands	Heliflight	0.7	Covered in a large area of Sabellaria *alveolata* at the moment. Newer mussel growing on top.
29/04/21	North Morecambe Bay	Foulney	Dutch Wand	0.6	6332 tonnes of size mussel and 1919 tonnes of undersize mussel over 56.8 hectares. There was no separation made between the main Foulney bed and Foulney Island as the mussel had spread between the two and the channel had filled in. the size class is varied across the bed, with the size mussel >45 mm predominantly on Foulney Island and an area of 25-

					45mm mussels in the middle section of the main skear. Evidence of multiple 2021 settlements in some areas.
30/04/21	North Morecambe Bay	Walney Channel	Dutch Wand	0.8	2671 tonnes of size mussel and 410 tonnes of undersize mussel over 18.67 hectares. The most abundant size class towards the channel edge is greater than 45 mm. Across a large proportion of the bed, there is a mix of three size classes 10-<25mm, 25-<45, and 45<mm. The cobble bank that had developed along the channel edge, and noted in previous surveys, is still prominent and it is hypothesised that this could offer some protection against scour. Similar to the previous year's survey, the mussel along the channel edge was noted as present in banks of mussel with bare cobble in between.
25/05/21	Knott End	Wyre End	Inspection	0.9	There has been a dense 2021 settlement of spat across approximately two thirds of the main skear, with the northern edge of the bed having received no settlement. Small areas of raised cobble were observed which were either bare or with low spat settlement as indicated in figure 1. Along the eastern edge of the skear the 2021 mussel settlement was mixed with small areas of 15-40mm mussel.
26/05/21	Heysham	Heysham Flat	Inspection	0.7	There was evidence of a 2021 mussel settlement which was constant across the bed on most of the exposed skear. The mussel had a dense coverage of 70-80% at a size of 8-10mm. Extensive *Sabellaria alveolata* reef and on the edges of the *Sabellaria alveolata* there was evidence the mussel had settled on it, however the majority did not appear black in colouration and therefore it was assumed that seed has not settled on it. There were also some small patches of 20-30mm mussel mixed in with the settlement.
28/05/21	Fleetwood	Rossall skear	Inspection	0.7	Rossall Scar has had a 2021 mussel settlement of approximately 40-50% coverage. The mussel was 5-10mm and was mixed in with some 25-35mm 2020 mussel. Some live *Sabellaria alveolata* was present and covered in seed.
28/05/21	Fleetwood	Neckings	Inspection	0.7	There was mussel (35-50mm) which had persisted through the winter on the scar with the majority being size. Some area had received a 2021 settlement but it was inconsistent with a dense band of 2021 seed. The full extent was not mapped due to the order the scars

					were inspected. There was *Saccharina sp.* present on some of the hard substrate.
28/05/21	Fleetwood	Kings Scar	Inspection	0.7	Kings Scar has had a 2021 mussel settlement which varies across the skear in density, with some dense areas. Along the South Eastern edge the mussel seed was mixed with green algae. There was a strip of bare cobble running across the middle of the mussel bed which had not received a settlement of mussel. There were some small areas of *Sabellaria alveolata* on the northern edge of the mussel.
28/05/21	Fleetwood	Perch Scar	Inspection	0.7	Perch Scar has had a dense 2021 mussel settlement of approximately 90% coverage on the main area. The settlement was less dense on the bed edges. The mussel was 8-10mm. There were occasional small areas of 30-45mm mussel mixed in with the seed and size mussel along the channel edge. Evidence of mussel mud from 2020 and there were a number of Oystercatchers present on the scar.
28/05/21	Fleetwood	Black Scar	Inspection	0.7	Black Scar has had a dense 2021 mussel settlement of approximately 80-90% coverage. The mussel was 2-4mm and had settled on the hard substrate. There were small areas of 2020 size mussel mixed in and on the channel edge.
25/06/21	North Morecambe Bay	South America	Inspection	1.1	Only the northern end of the bed was inspected due to access issues and timings. The mussel at this end appeared to be washing out in comparison to the previous visit, with larger patches of sand. The majority of mussel present at this end was 15-20mm in size and sitting loosely on top of sand.
26/06/21	Heysham	Heysham Flat	Inspection	1.1	Due to an extensive settlement of mussel seed which is putting down mussel mud, the coverage of *Sabellaria alveolata* visible has drastically reduced since the previous inspection. It is now confined to the Northern and Southern edges of the main skear. There was evidence of a 2021 mussel settlement which was constant across the majority of the main skear. The mussel had a dense coverage of 70-100% at a size of 10-20mm, with some smaller mussel of 8-10mm closer to shore (Figures 3 and 5). On the edges of the *Sabellaria alveolata* there was evidence the mussel had settled on it (Figure 4). There were also patches of 20-30mm mussel mixed in with the settlement.

27/06/21	Duddon Estuary	Hard Acre	Inspection	1	The mussel had grown significantly since the previous inspection with at least a third of the area containing 35-45mm mussel. Along the northern edge of the bed, there was a dense covering of 15-20mm mussel amongst less dense 20-40mm mussel. Some areas of the mussel were covered in a thin layer of sand and there were large numbers of sand mason between the mussel.

Cockle Bed	Name of Parts of Cockle Bed if Split	Bed Area (ha)	Estimated Biomass of Size Cockle (tonnes)	Estimated Biomass of Undersize Cockle (tonnes)
Newbiggin	Total	999	1600-1700	200-300
Aldingham	Total	306	250-300	25-50
Leven	Total	1319	600-700	125-150
Flookburgh	Total	2240	900-1000	175-225
Warton	Main Area	181.8	55	15-20
	Dense Area	8.4	50-55	>5
Middleton	Total	601	400-450	40-55
Pilling	Total	1434	2200-2300	150-200
TOTAL		**7089.2**	**6005-6560**	**735-1005**