**NORTH WESTERN INSHORE FISHERIES AND CONSERVATION AUTHORITY**

**DREDGING OF SEED MUSSEL FROM NORTH MORECAMBE BAY**
**ASSESSMENT OF LIKELY SIGNIFICANT EFFECT JUNE 2016**

## Background

1.1 The North Western & North Wales Sea Fisheries Committee (NW&NWSFC) regularly authorised the removal of seed mussels from the Morecambe Bay Mussel Fishery Order (1978) area. This was a semi-sublittoral boat dredge fishery targeted at what are referred to as "ephemeral" beds – areas of mussel settlement that have a high probability of loss through wind or tide, or starfish predation prior to the mussels reaching size/maturity.

1.2 It was always NW&NWSFC's intention to renew this Order when it expired in January 2009. However, this could not be done due to an embargo on the renewal of Regulating and Several Orders pending the outcome of a prolonged legal battle over landholders' property rights within Fishery Order areas.

1.3 Although this matter was resolved in 2009, for various reasons a replacement Order was not established. The area in question is managed under byelaw by the North Western Inshore Fisheries and Conservation Authority (NWIFCA) that replaced the previous Sea Fisheries Committee on 1st April 2011.

1.4 The management approach and philosophy towards the fishery continues much as before, ie. to allow dredging for mussels on "ephemeral" beds at the earliest opportunity to minimise the chances of a valuable resource being lost to the fishery.

1.5 Interest in seed mussel from Morecambe Bay is high, and is used for relaying in aquaculture operations. An application to dredge seed mussel from the areas known as the South America and Falklands beds has been received from the Bangor Mussel Producers Association, a fishery accredited as sustainable under the Marine Stewardship Council.

1.6 Morecambe Bay is a highly dynamic and changeable drying embayment, where sandbanks shift unpredictably. Over the past three years the cobble and boulder skears to which mussels recruit have mainly been covered over by sand. None of the South America bed was exposed in 2015. The Falklands bed held some persisting mussel from 2014 and had a sparse spattering of spat recruitment which appeared to wash out. There was no seed mussel fishery on these beds in 2015.

1.7 An inspection was made by quad bike on 9th May 2016 (0.5m tide) accessing the beds in question from the shore. It was only possible to reach the Falklands bed on the hour around low water due to water still covering the sandbanks until then. The South America area was passed on the way to the Falklands.

South America – there was a limited area of skear exposed which was covered in mussel spat and gulls. It was problematic to track the bed and obtain an estimate of the size of the area due to time and tide constraints. However a very rough estimate from mapping software is given as 19 ha (probably under-estimate). (See Fig. 1).

Falklands – the northern half was devoid of mussel (had previously had 2014 mussel cover). The southern half of the bed had some remaining size which was being devoured by starfish, which in turn were being predated on by gulls. There was evidence of pinprick mussel spat settlement on top of the larger mussel and in amongst the cobbles. A GPS track round the exposed bed was taken and estimated as 3.8 ha. The mussel appeared to continue out into submerged areas that could not be accessed.

1.8 An industry heliflight was attended by a NWIFCA Science Officer on 6th June 2016. This provided visual evidence that the size mussel had gone along with the larger starfish. The new spat also appeared to have gone but this needs to be verified by a further flight / inspection as it may have been too small to be seen from the air. It could be seen that mussel extended out into sub-tidal areas. A new area to the west that had not been known to hold mussel before was also found and from very rough mapping was estimated at being around 115 ha in size (Fig. 1).

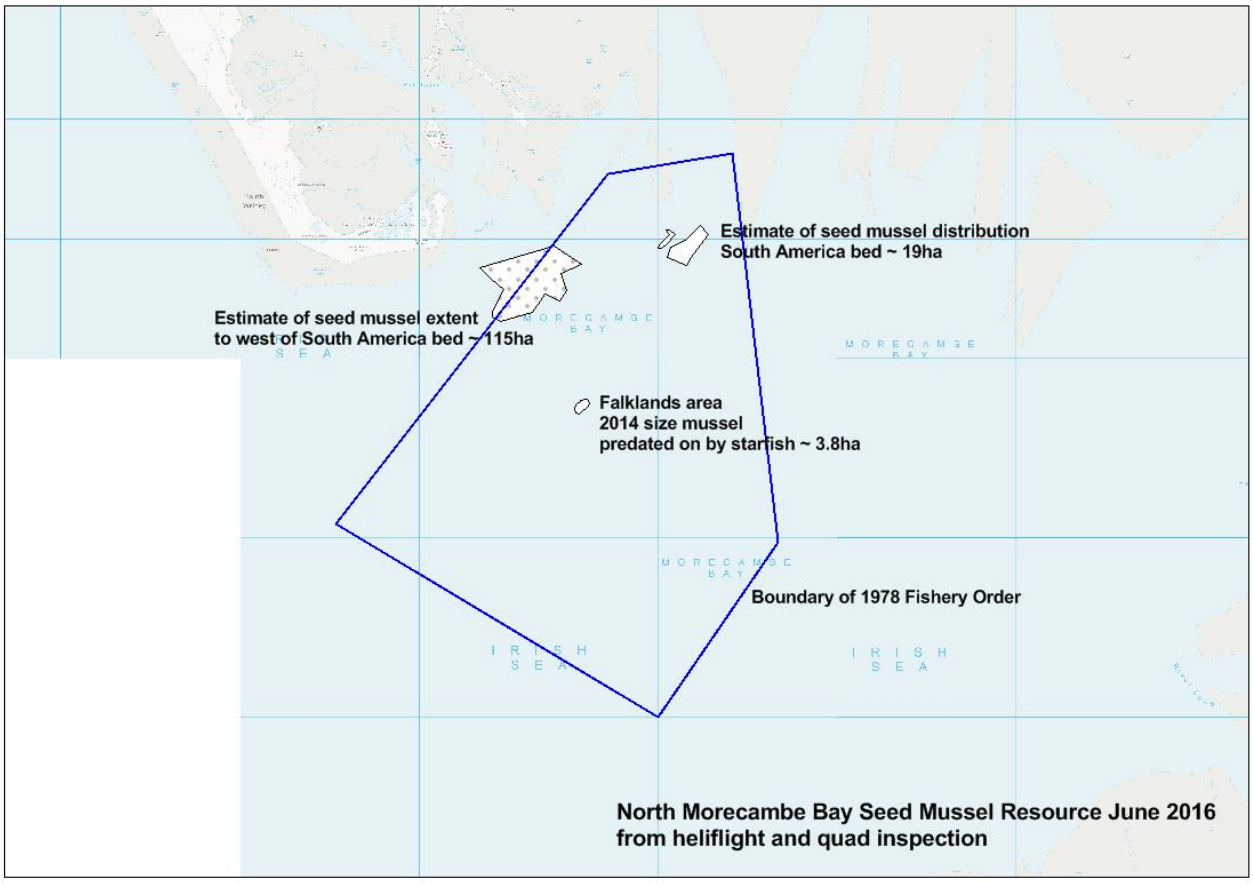


Fig. 1. Morecambe Bay Seed Mussel – Falklands and South America seed mussel resource from quad and heliflight inspections May and June 2016.
Blue polygon show boundary of old 1978 Fishery Order.

## Proposal

The NWIFCA proposes to authorise a limited boat dredge fishery for seed mussel in the area shown on the map at Annex B from 11th July until 31st October 2016. The stock is covered in predatory starfish and unlikely to survive this pressure, and harvesting is likely to be finished within three to four weeks. A greater period of time is proposed for the authorisation as a contingency for poor weather.

The NWIFCA has carried out stock assessments and inspections of other mussel beds around Morecambe Bay over the spring low tides of May / June to provide data to inform this assessment.

Details of the area in question and the fishery during 2010 – 2014 can be found in Annex A, providing background to the justifications and reasoning in this current assessment.

## Assessment of Mussel Biomass

Although the NWIFCA utilises survey methodologies such as the 'Dutch Wand' methodology, at certain times to assess mussel biomass, enormous questions remain over the validity of such data for more than a few days after the survey time in an area such as Morecambe Bay, and its application to management decisions over mussel resource.

Mussel can and does recruit to skears in the Bay in extraordinarily dense aggregations, and depending on tidal height and period of inundation, as well as sea temperature and chlorophyll levels, can put on growth exceedingly fast, thus increasing biomass equally rapidly. On the contrary, the highly dynamic environment and the process of mussel putting down deep levels of soft mud in pseudofaeces, can also lead to rapid erosion and wash out so that biomass can be diminished overnight. Dense recruitment also results in high levels of competition for food and space, and the act of fishing can have a 'thinning' effect which can actually lead to an increase in biomass.

The resource requirement on the NWIFCA to provide biomass data in which a satisfactory level of confidence could be placed is not realistic or achievable in a constantly changing environment like the Bay.

### Other mussel beds within Morecambe Bay

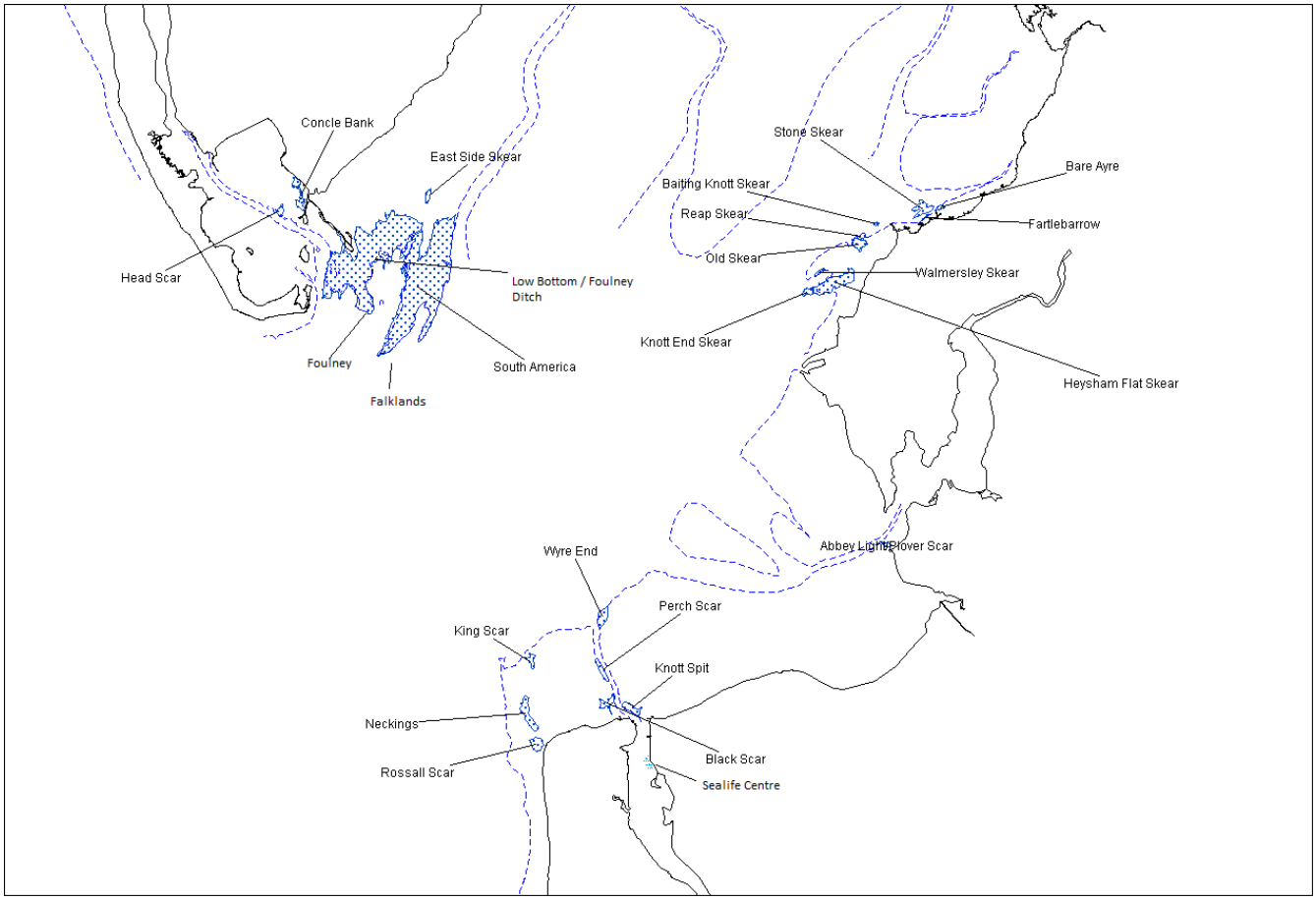


Fig. 2. Illustration of the position of mussel beds in Morecambe Bay and Fleetwood.

Duddon Estuary – Hardacre:

A survey was due to be carried out on the mussel bed at Hardacre on 7th June 2016 (0.6m tide). IFCOs had reported a spat settlement there earlier in the spring. However when officers arrived they found the sandbanks had shifted and the cobble skears holding mussel were now covered over. Subsequently there is no mussel resource of any note in the Duddon in 2016.

North Morecambe Bay – there are a number of mussel beds in North Morecambe Bay. The map in Figure 3 illustrates their positons in relation to one another.

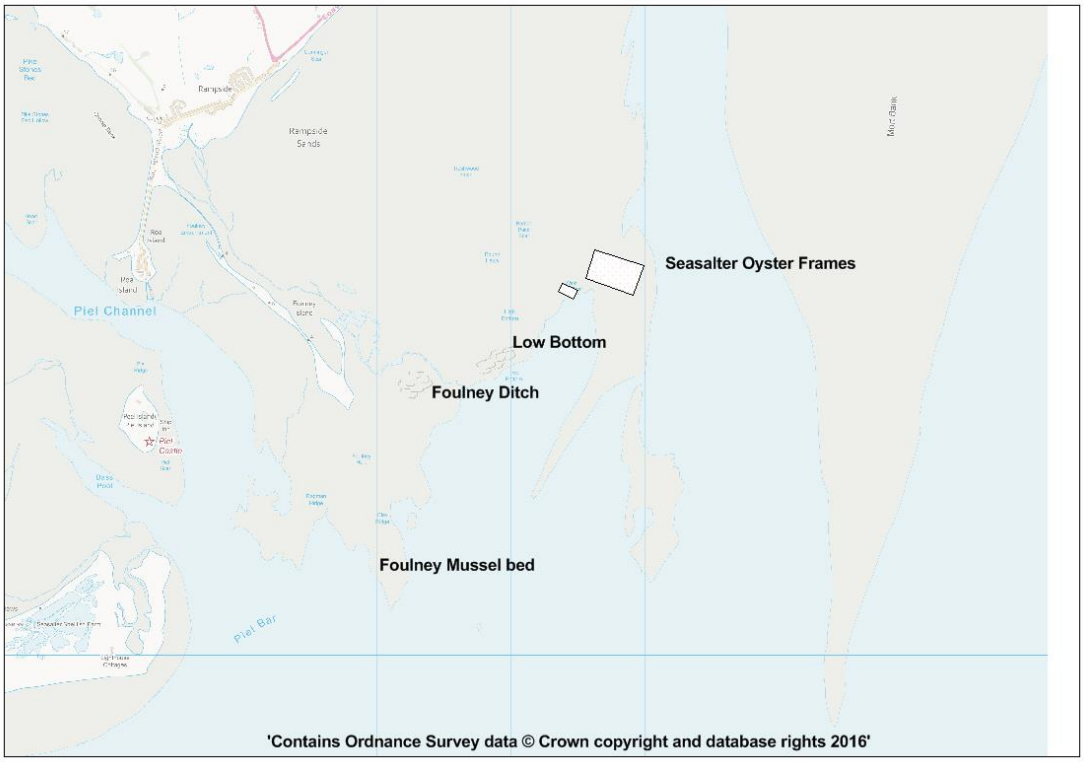


Fig.3. Illustration of position of mussel beds and oyster frames in North Morecambe Bay.

Foulney:

A survey was carried out on 10th May 2016 (0.8m tide) with transects taken across the survey area, with 0.5m² quadrat every 50m recording percentage of mussel type.

The target area of the survey was the main area on Foulney. The area surveyed has a covering of spat which was seen in most survey stations. At the bottom of Foulney (known as the Island) there is an area of mature clean mussel (45+mm) which has a covering of 2016 settlement. Higher up the main skear the mussel is smaller and undersize, and shown on the map as small mature clean which has a settlement of this year's spat on it. Moving to the top of the skear the mussel becomes much more mixed and barnacled mussel starts to appear (Fig. 4).

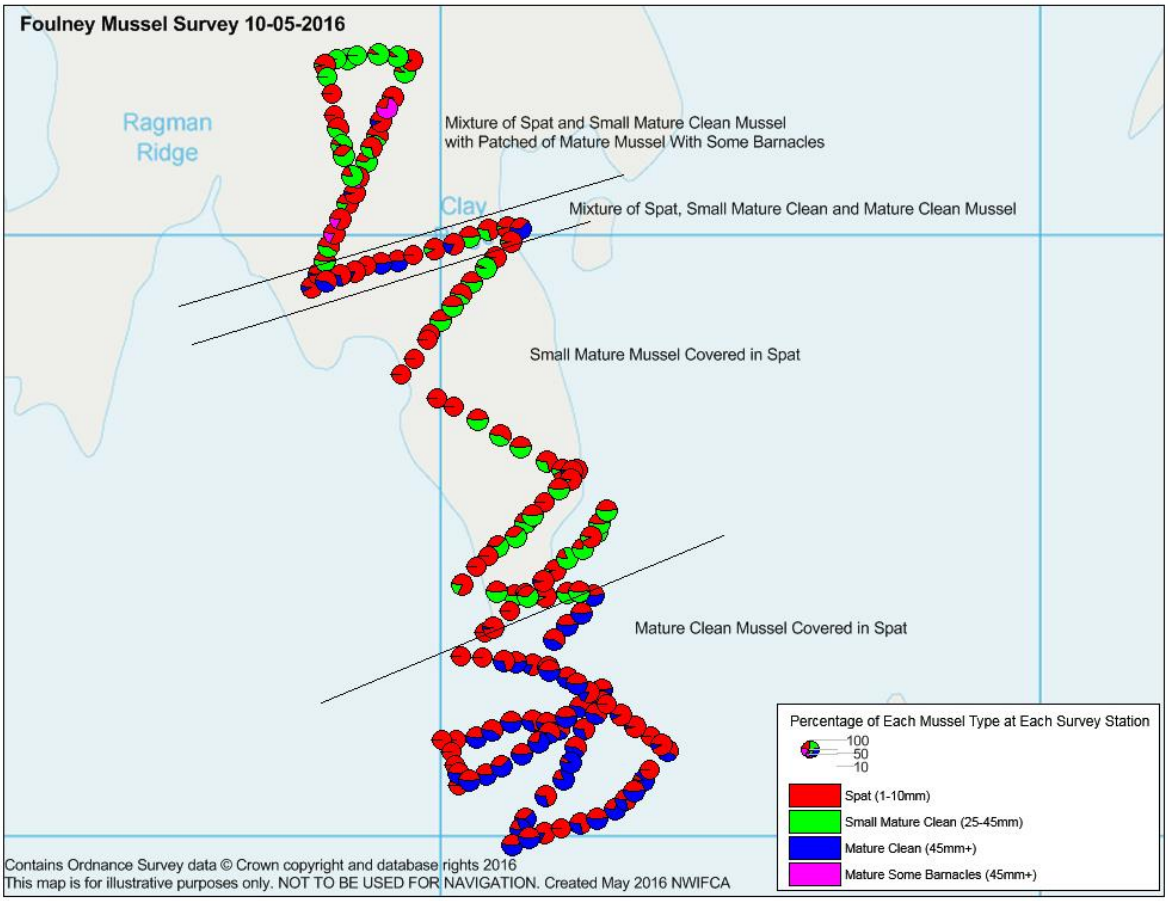


Fig. 4. Thematic map of Foulney Mussel Survey results (10th May 2016)

Foulney has been inspected and surveyed for many years by the NW&NWSFC and NWIFCA. The main skear area has stayed relatively constant and it is reasonable to make an estimate of the area covered in mussel from previous years mapping as being around 41ha holding around 5000 tonnes of mussel.

Foulney Ditch:

A survey was carried out on the Foulney Ditch area on 5th June 2016 (0.8m tide) with transects taken across the survey area, with 0.5m² quadrat every 50m recording percentage of mussel type.

The survey target area was between the 'Ditch' (see Fig. 2) and the previously surveyed area on Foulney (surveyed 10-05-16). The aim was to find the area of stunted mussels which is reported never to reach size before the next years spat covering. The mussel below MLS is reported to get choked out by the new settlement.

The surveyed area has a good covering of newly settled spat which ranged from 2-8mm with the larger spat nearer the low water mark and near to the channel known as the 'Ditch'. There are clear zones with the mussel higher up the shore being older and covered in barnacles (Fig. 5), moving to mussel with a few barnacles mid shore (Fig. 6), to mature clean and small mature clean (40mm size class) at the low water mark. At the bottom of the Ditch there was an area of clean mussel which was a mixture of between 40 and 50 mm. Both of the latter areas were covered in 2016 spat (Fig. 7).

Fig.5. Old barnacled mussel forming a lrage part of the bed on the upper reaches of the 'Ditch' area at Foulney. (5th June 2016).

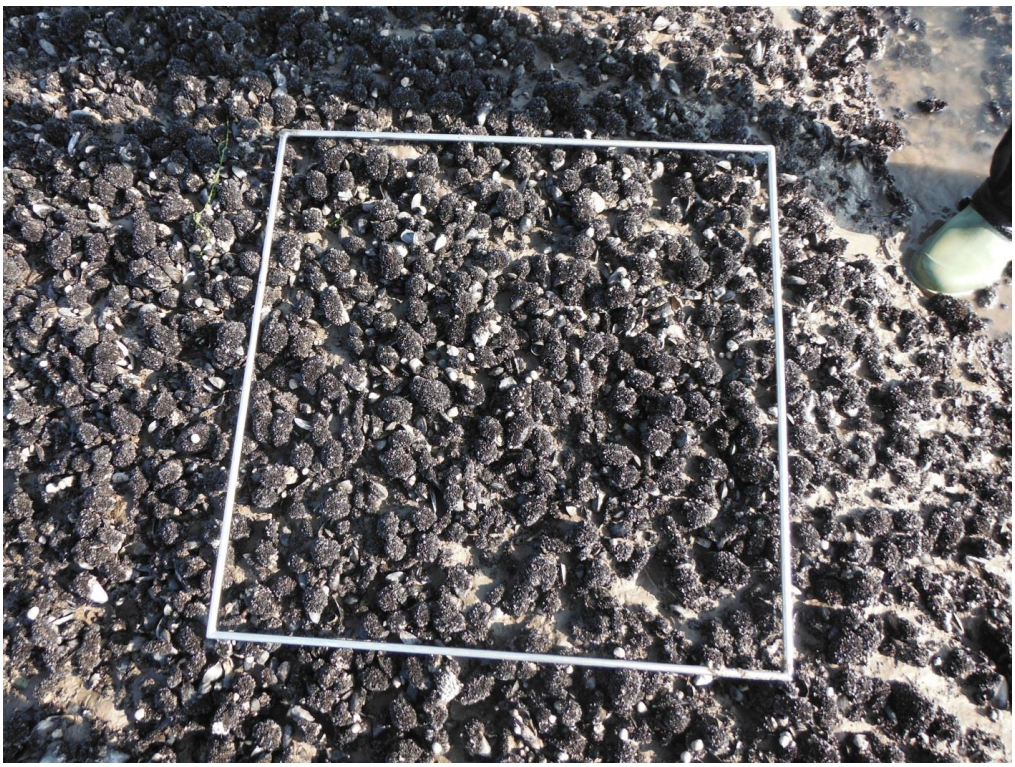

Fig. 6. Mature barnacled mussel with spat cpvering on the mid shore of the 'Ditch' area at Foulney. (5th June 2016).

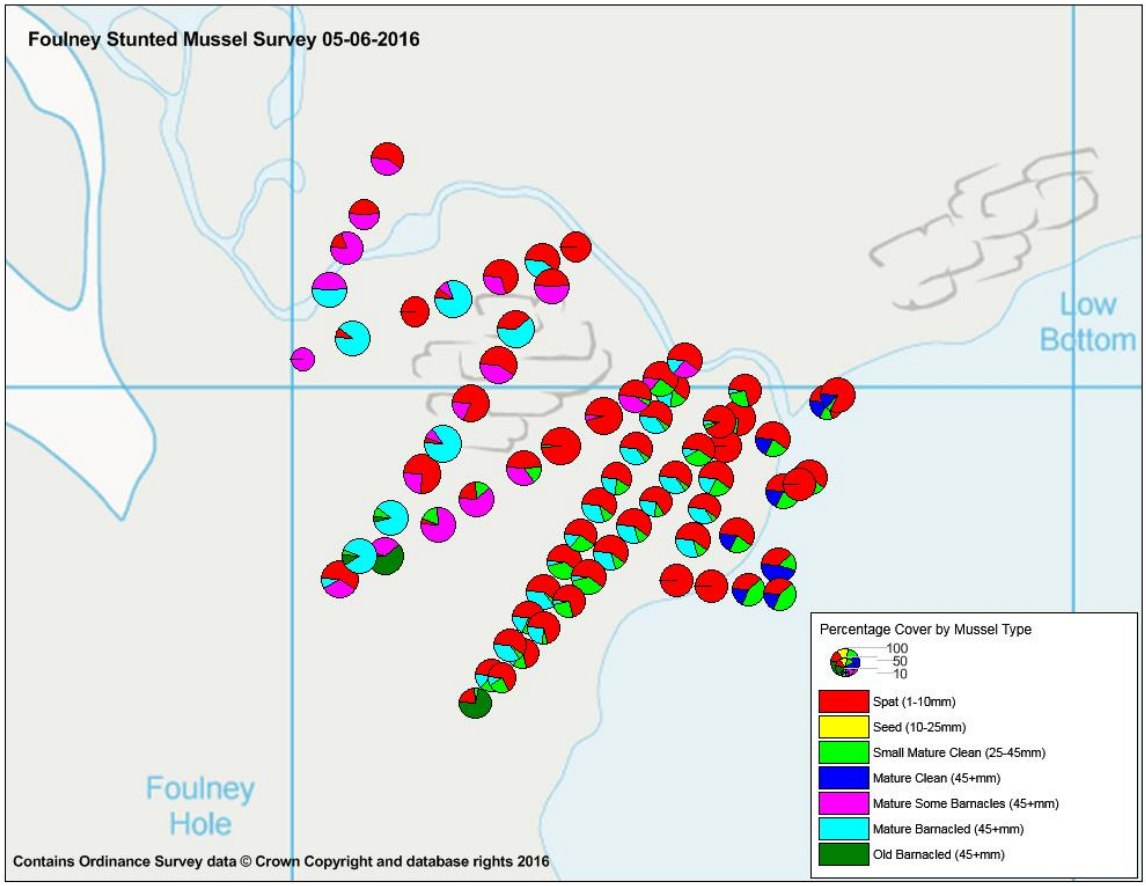


Fig.7. Thematic map of Foulney Ditch mussel survey results (5th June 2016).

Low Bottom – area between Foulney Ditch and the Seasalter Oyster Farm:

An inspection was carried out on 6th May 2016 (0.8m tide) when GPS positions and the type of mussel found at each location was recorded. From this rough polygons were mapped recording the areas of change in mussel types. A large part of the intertidal area had received a very dense covering of 2016 mussel, estimated at 1.2 km² which is growing on at different rates. An indication of the size of spat was given. It was seen that the larger spat was closer to the low water mark (Fig.8).

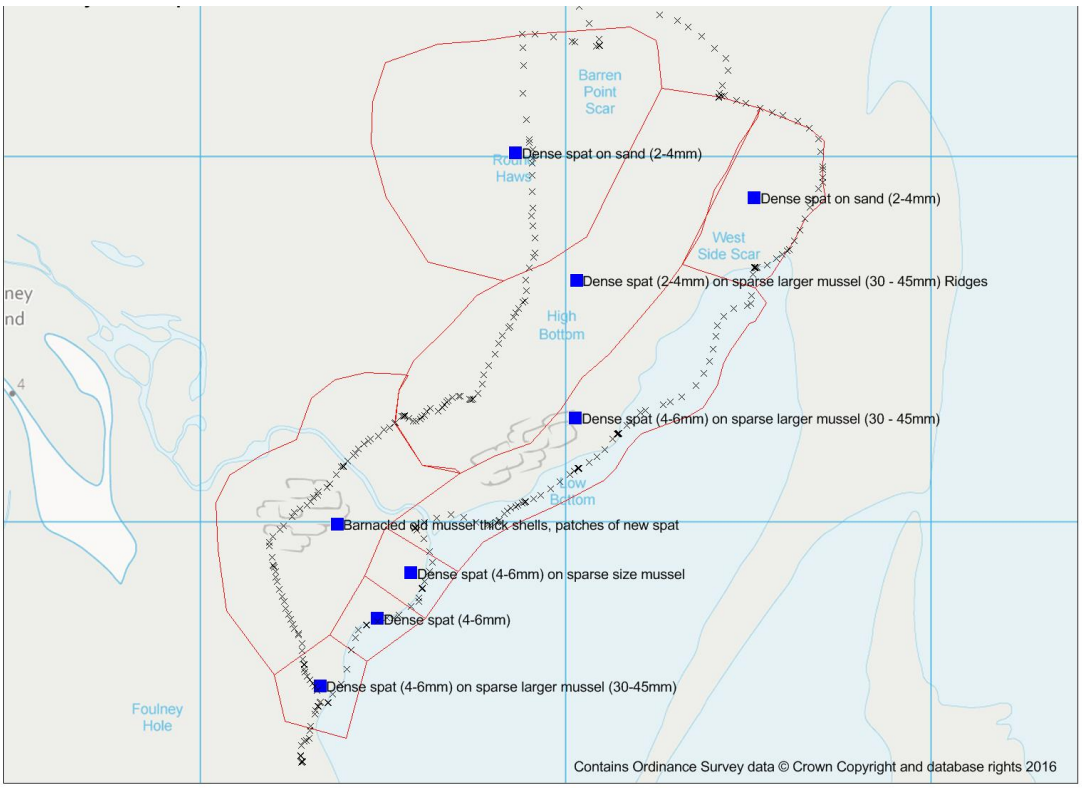


Fig. 8. Mapping to show area pf mussel settlement and different size zones between Foulney Ditch and the oyster frames. 6th May 2016.

Heysham Flat

As it is possible to readily walk over Heysham Flat skear, regular inspections are made of this mussel resource. A foot inspection was carried out on 5th May 2016 (0.5m tide) when officers concentrated on accessing Knott End skear. It was evident that a vast seed mussel settlement had covered the skear from high up near the shoreline to the bottom of Knott End skear. It covers the *Sabellaria alveolata* reef area which is in really bad condition, and the worst it has been seen since 2008 (Knott M. pers. comm.) The only relatively healthy area of reef is very small and on the northern extent of the skear next to the channel, although it was surrounded by new mussel on other clumps so may not survive.

There was an expanse of bare cobble and stone on Knott End skear. The area of densest seed was nearest to Dallam Dyke and the bottom end of the main skear held some size mussel of around 55mm length.

No attempt was made to get across to the Out Skears due to tidal conditions. However there were gulls on them and they looked black so it is reasonable to assume they still hold size mussel.

A full mussel survey was carried out on 23rd May (1.5m tide). Only the main skear was surveyed using zig zag transects from a centre line defined by GPS. It incorporated 50 paces between quadrats. Percentage cover of the two main mussel types were recorded per station and a thematic map produced (Fig. 9).

As is a regular occurrence there was mostly spat higher up the shore, transitioning into seed (around 10mm) lower down where the skear remains under waters for longer.

As the tide ebbed off the lower end of the skear gulls were seen feeding on the mussels on the bottom skears across Dallam Dyke, and some oystercatchers and knot were observed

in the area. There was very little *Sabellaria alveolata*: only some very small patches alive, with much covered in mussel mud and spat/seed.

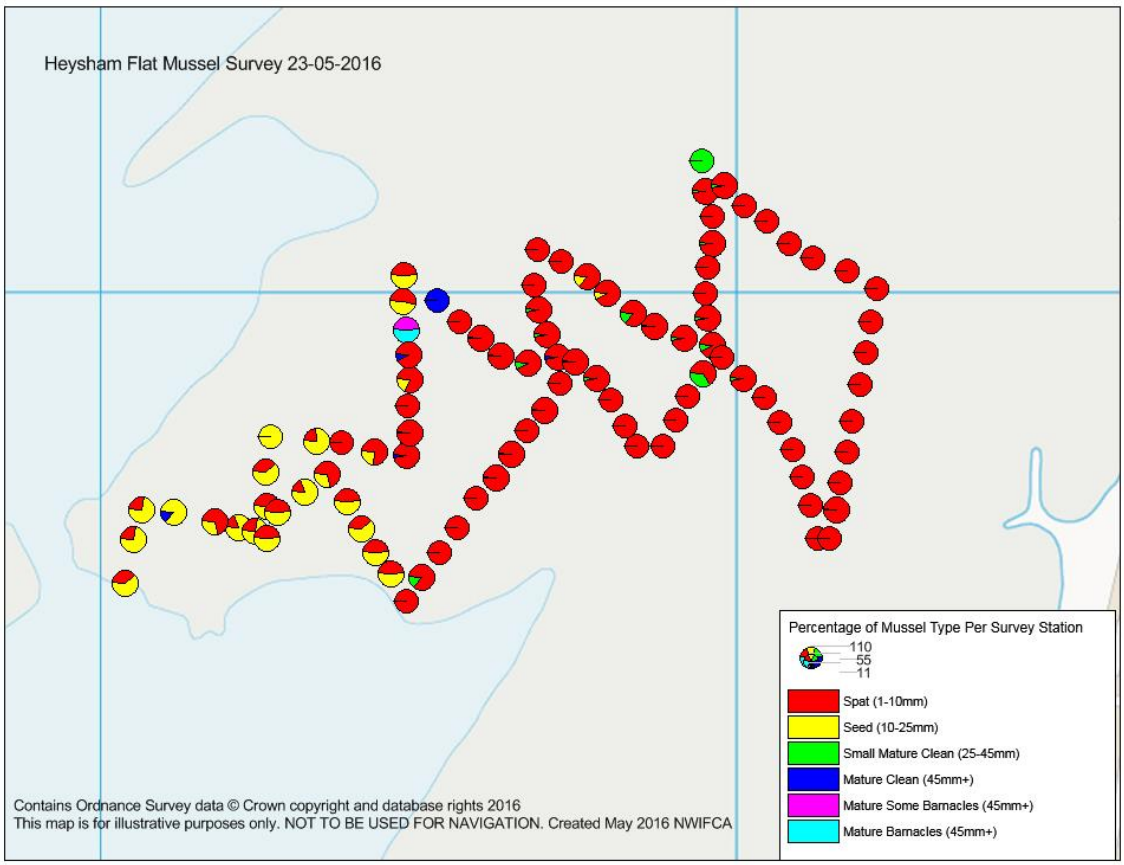


Fig. 9. Mapping of the Heysham Flat mussel survey showing the areas dominated by mussel spat and seed (23rd May 2016)

Fleetwood Beds:

the mussel beds at Fleetwood were inspected on 6th June 2016 (0.6m tide). Positions of these beds are shown in Figure 10. The mussel resource on each bed is described below:

GPS tracks were recorded of the edge of the mussel beds (Black Scar, Perch Scar, Kings Scar and Neckings) and notes were taken to describe the cover and size of the mussel. This information was made into maps using MapInfo: see figures below for detail of the mussel beds. It was not possible to map Rossall Scar as two ATVs got stuck in the soft mud just before the Scar at low tide, so the team had to leave the beach.

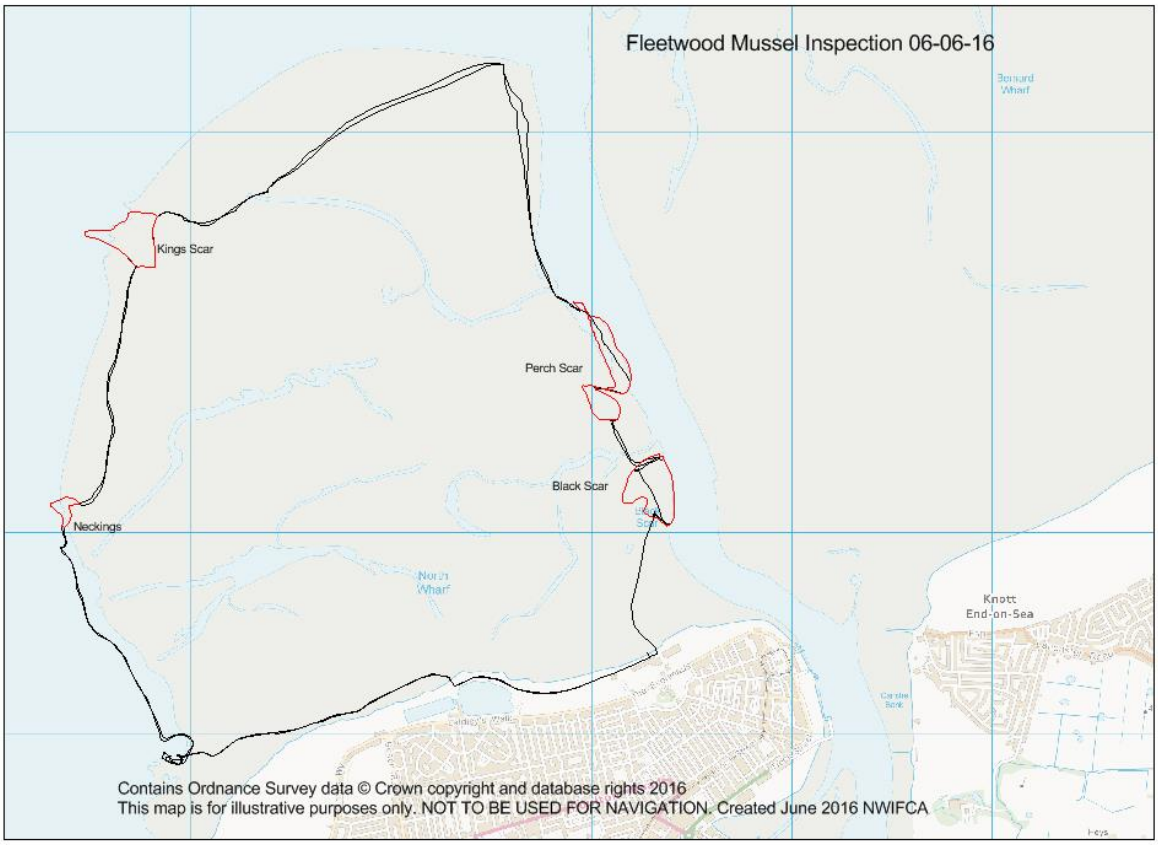


Fig.10 Illustrative map of the positions of the Fleetwood skears. 6th June 2016.

Black Scar: an estimated area of 5.8 ha had 80% cover of 5-8mm mussel, with size mussel along the channel edge (Fig. 11).

Perch Scar: an estimated area of 5.3 ha had a main area 80 – 100% cover of 5-8mm mussel, with a further area having 50% cover of 5-8mm mussel (Fig. 11).

King Scar: only around 0.1ha of the 5.3ha skear had mussel cover, of around 5-8mm. There was a small patch of remaining size mussel.

Neckings: minor spat settlement on this skear.

Rossall Scar: a visual from the heliflight that took place on the same day reported minor spat settlement on this skear.

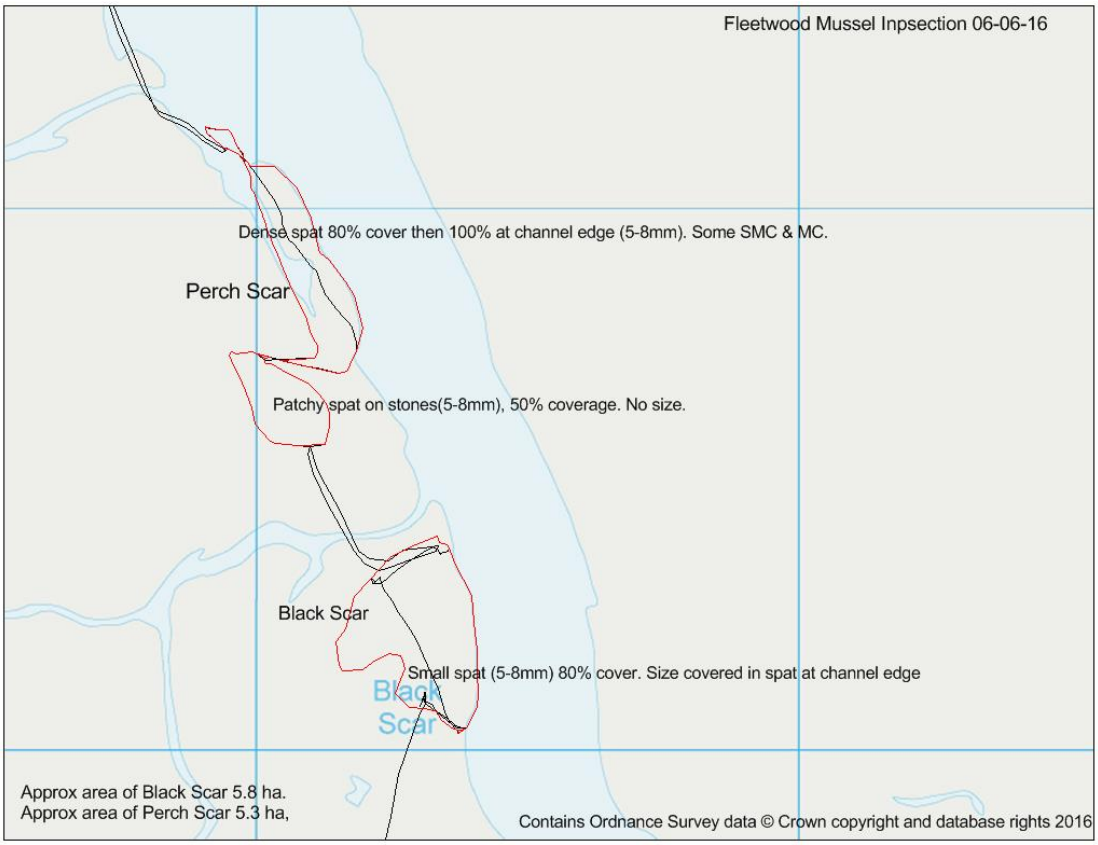


Fig.11. Illustrative mapping of the seed mussel at Perch Scar and Black Scar, Fleetwood, 6th June 2016

Wyre End Skear:

the Wyre End skear and Knott Spit mussel beds (Knott End) was inspected on 8th June (0.8m tide). The bed boundaries were tracked on foot with a GPS. One transect was taken through the middle of the bed and the mussel type was recorded.

There has been a new settlement of mussel which was found on Wyre End skear itself and on patches of mud and sand to the east of the skear. The spat has settled on most surfaces, sand, mud, cobble, live size mussel and dead shell. The spat ranges from 1-2mm to 5mm with the smaller spat being higher above the low water mark. There is a shingle / cobble area in the middle of the skear with a raised elevation. No mussel was found directly on top of this feature but there was pinprick spat down the sides of it (1-2mm). Running south from the main Wyre End skear there is a long thin strip of hard substrate that has had a new settlement of spat (1-2mm). The combined area of these two skears was estimated as 21.7ha (Fig. 12).

Knott spit which is located just off of Knott End-On-Sea has had a good covering of spat in the 4-6mm range, with around 70% - 80% cover. There was an area of size mussel running along the edge of the Wyre. From previous years' mapping Knott Spit totals an area of 16.4ha. Due to the tide a full inspection of the area was not completed. There is another area of mussel further up the Wyre from where the hygiene samples are collected which is estimated to be 100m by 20m running along the edge of the Wyre which is a mixture of size and spat, and known as the Sealife Centre.

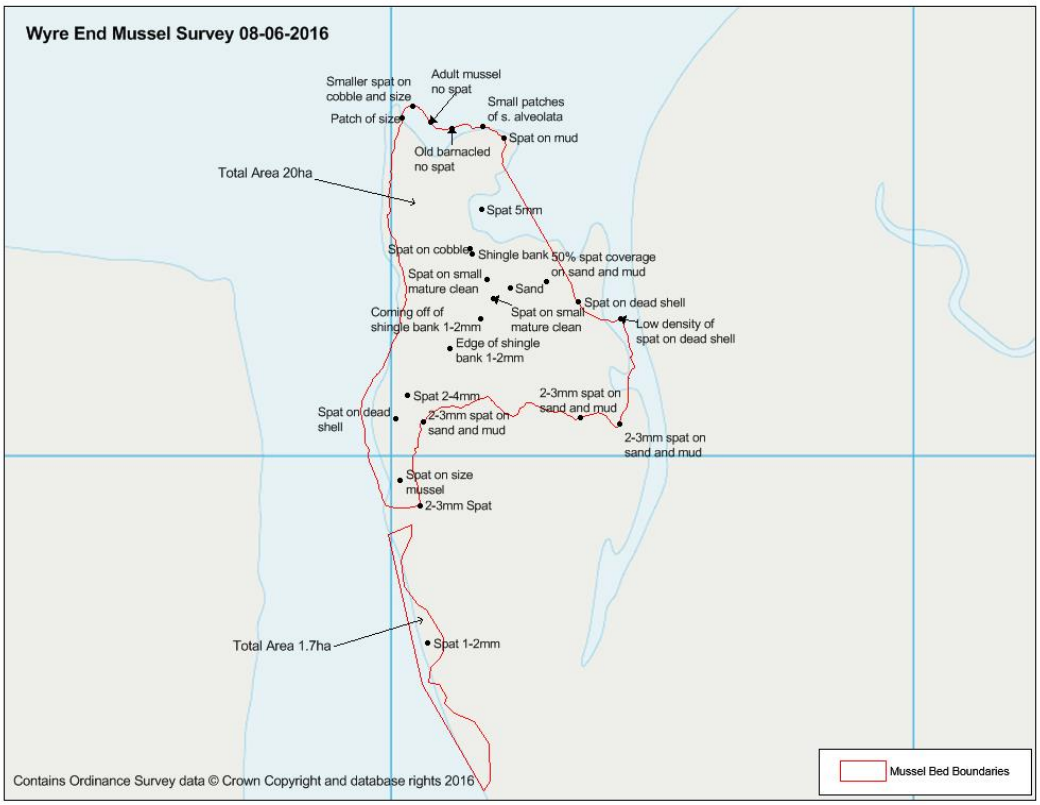


Fig. 12. Illustrative mapping of Wyre End skear and Knott Spit. 8th June 2016.

## 2. List of interest features

2.1 Large shallow inlets and bays

- intertidal boulder and cobble skear communities
- subtidal boulder and cobble skear communities
- brittlestar bed communities
- intertidal boulder clay communities
- coastal lagoon communities

2.2 Mudflats and sandflats that are not covered by seawater at low tide

- mud communities
- sand communities
- eelgrass beds

2.3 Estuaries

2.4 Reefs

2.5 Perennial vegetation of stony banks (vegetated shingle)

2.6 Atlantic salt meadows (saltmarsh)

2.7 *Salicornia* and other annuals colonising mud and sand (pioneer saltmarsh)

2.8 Sandbanks, which are slightly covered by seawater at all times

2.9 Sand dune Communities

2.10 Coastal Lagoons

2.11 Great crested newt

2.12 Annex 1 species: Little Tern, Sandwich Tern, Common Tern, Arctic Tern, Bar-tailed Godwit, Golden Plover

2.13 Migratory species: Herring Gull, Lesser Black-backed Gull, Pink-footed Goose, Shelduck, Oystercatcher, Grey Plover, Knot, Dunlin, Pintail, Curlew, Redshank, Turnstone, Ringed Plover, Sanderling

2.14 Nationally important aggregations: Great-crested Grebe, Cormorant, Wigeon, Teal, Eider, Goldeneye, Red-breasted Merganser, Lapwing, Black-tailed Godwit

2.15 Qualifying Assemblages: Seabirds; Waterfowl

## 3. Test of Likely Significant Effect

Refer to matrix below and only include those to which the interest features are sensitive.

| **Are the interest features potentially exposed to the hazard?** | | | | |
|---|---|---|---|---|
| **Site & designation** | **Interest feature** | **Interest sub-features** | **Potential hazard** | **Potential exposure to hazard and mechanism of effect/impact if known** |
| **Morecambe Bay SAC** | Large shallow inlets and bays | intertidal boulder and cobble skear communities | Physical disturbance and abrasion | Harvesting of seed will be carried out from boats over high water. Dredging operations will skim the seed mussel from its underlying layers of mussel mud, ensuring no contact with the skear.<br>**No likely significant effect** |
| | | subtidal boulder and cobble skear communities | Physical disturbance and abrasion | Harvesting of seed will be carried out from boats over high water. Dredging operations will skim the seed mussel from its underlying layers of mussel mud, ensuring no contact with the skear<br>**No likely significant effect** |
| | | brittlestar bed communities<br><br>intertidal boulder clay communities<br><br>coastal lagoon communities | Physical disturbance and abrasion | Interest feature not located close to fishery<br>**Not significant** |
| | Perennial vegetation of stony banks (vegetated shingle)<br><br>Atlantic salt meadows (saltmarsh)<br><br>Salicornia and other annuals mud and sand (pioneer saltmars | | Physical disturbance and abrasion | Interest feature not located close to fishery<br>**Not significant** |
| | Sandbanks, which are slightly covered by seawater at all times | | Physical disturbance and abrasion | Harvesting of seed will be carried out from boats over high water. Mussels do not settle on sandbanks and therefore these areas are not targeted by the fishery, which uses ground discrimination equipment from the vessels. |

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| | | | | **No likely significant effect** |
| | Various Sand dune Communities<br><br>Great crested newt<br><br>Coastal Lagoons | | Physical disturbance and abrasion | Interest feature not located close to fishery<br>**Not significant** |
| | Mudflats and sandflats that are not covered by seawater at low tide | mud communities | Physical disturbance and abrasion | Harvesting of seed will be carried out from boats over high water. No gear / feature interaction.<br>**No likely significant effect** |
| | | sand communities | Physical disturbance and abrasion | Harvesting of seed will be carried out from boats over high water. No gear / feature interaction.<br>**No likely significant effect** |
| | | eelgrass beds | Physical disturbance and abrasion | Interest feature not located close to fishery or access routes<br>**Not significant** |
| | Estuaries | | None additional to above | |
| | Reefs | | None additional to above | |
| | Large shallow inlets and bays | Intertidal boulder and cobble skear communities (including mussel communities) | Removal of mussels | The proposal is to remove mussel from the intertidal skear. Mussel beds are a characteristic and fluctuating community of the intertidal boulder and cobble skear interest sub-feature.<br><br>**Likely significant effect** |
| | | subtidal boulder and cobble skear communities (including mussel communities) | Removal of mussels | The proposal is to remove mussel from the subtidal skear. Mussel beds are a characteristic and fluctuating community of the subtidal boulder and cobble skear interest sub-feature.<br><br>**Likely significant effect** |
| | | brittlestar bed communities<br><br>intertidal boulder clay communities<br><br>coastal lagoon communities | Removal of mussels | Interest feature not located close to fishery<br>**Not significant** |
| | Perennial vegetation of stony banks (vegetated shingle) | | Removal of mussels | Interest feature not located close to fishery<br>**Not significant** |

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| | Atlantic salt meadows (saltmarsh)<br><br>Salicornia and other annuals mud and sand (pioneer saltmars | | | |
| | Sandbanks, which are slightly covered by seawater at all times | | Removal of mussels | Mussels are not present on sandbanks. Modern navigational equipment allows precise targeting of fishing on the mussels and thus avoidance of other sensitive features. No gear / feature interaction.<br>**Not significant** |
| | Various Sand dune Communities<br><br>Great crested newt<br><br>Coastal Lagoons | | Removal of mussels | Interest feature not located close to fishery<br>**Not significant** |
| | Mudflats and sandflats that are not covered by seawater at low tide | mud communities | Removal of mussels | Mussels are not present on sandbanks. Modern navigational equipment allows precise targeting of fishing on the mussels and thus avoidance of other sensitive features. No gear / feature interaction.<br>**Not significant** |
| | | sand communities | Removal of mussels | Mussels are not present on sandbanks. Modern navigational equipment allows precise targeting of fishing on the mussels and thus avoidance of other sensitive features. No gear / feature interaction.<br>**Not significant** |
| | | eelgrass beds | Removal of mussels | Interest feature not located close to fishery or access routes<br>**Not significant** |
| | Estuaries | | None additional to above | |
| | Reefs | | None additional to above | |
| **Morecambe Bay SPA** | Annex 1 species: Little Tern, Sandwich Tern, Common Tern, Arctic Tern, Bar-tailed Godwit, Golden Plover | | Disturbance | The area is subject to continuous boat traffic of various sizes at most times of day throughout the year. Fishing will be by one or two boats while the beds are submerged. There will be no increase in disturbance over normal background levels. It is understood that the fishable area is not an important area of the SPA for these bird species.<br>**Not significant** |

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| | Migratory species: Herring Gull, Lesser Black-backed Gull, Pink-footed Goose, Shelduck, Oystercatcher, Grey Plover, Knot, Dunlin, Pintail, Curlew, Redshank, Turnstone, Ringed Plover, Sanderling | | Disturbance | The area is subject to continuous boat traffic of various sizes at most times of day throughout the year. There will be no increase in disturbance over normal background levels. As fishing will be by boat while the beds are submerged any birds utilising the beds at low tide will not be disturbed.<br><br>**Not significant** |
| | Nationally important aggregations: Great -crested grebe, cormorant, wigeon, teal, eider, goldeneye, red-breasted merganser, lapwing, black-tailed godwit | | Disturbance | Eiders may be utilising the submerged bed for feeding or loafing nearby at the time of fishing activity.<br><br>**Likely significant effect** |
| | Annex 1 species: Little Tern, Sandwich Tern, Common Tern, Arctic Tern, Bar-tailed Godwit, Golden Plover | | Harvesting of mussels | Mussels are not key prey for these Annex 1 species.<br>**Not significant** |
| | Migratory species: Herring Gull, Lesser Black-backed Gull, Pink-footed Goose, Shelduck, Oystercatcher, Grey Plover, Knot, Dunlin, Pintail, Curlew, Redshank, Turnstone, Ringed Plover, Sanderling | | Harvesting of mussels | At low tides in the past when exposed, herring and lesser black-backed gulls have been observed on the beds in congregations numbering estimated several thousands. It has been observed that the gulls were targeting starfish that predate on the larger mussels on the mussel beds. In 2016, gulls have been observed in the proposed fishery area.<br><br>**Likely Significant Effect**<br><br>The removal of mussel through harvesting has the potential to remove a key prey resource for oystercatcher, knot and possibly herring gulls.<br><br>**Likely significant effect**<br><br>Mussels are not key prey for the other listed species.<br>**Not significant** |

| | | | | |
|---|---|---|---|---|
| | Nationally important aggregations: Great -crested grebe, cormorant, wigeon, teal, eider, goldeneye, red-breasted merganser, lapwing, black-tailed godwit | | Harvesting of mussels | The removal of mussel through harvesting has the potential to remove a key prey resource for eiders.<br><br>**Likely significant effect**<br><br>Mussels are not key prey for the other listed species.<br>**Not significant** |
| | Qualifying Assemblages: Seabirds; Waterfowl | | None additional to above | |

## 4. Assessment of likely significant effect

Is the potential scale or magnitude of any effect likely to be significant?

a) Alone? Yes.

b) In combination with other plans or projects? Yes.

There is a proposal for a seed mussel hand-gathered fishery at Heysham Flat in August and there is on-going hand-gathering of size mussel at Foulney, Morecambe Bay on low water tides. The in-combination effects need to be assessed on the SPA bird features identified.

**Conclusion: Is the proposal likely to have a significant effect alone or in combination on a European site?**

It is considered that the removal of seed mussel has the potential to have a significant effect on the Natura 2000 features noted above. An Appropriate Assessment of the proposal is therefore necessary before the proposed seed mussel harvesting can be permitted.

The assessment of likely significant effect of this proposal concluded a likely significant effect on the following features of interest in the Morecambe Bay SAC, SPA and Ramsar Site. These features will be the subject of this appropriate assessment.

Intertidal boulder and cobble skear communities (including mussel communities)
Subtidal boulder and cobble skear communities (including mussel communities)

Migratory species: Oystercatcher, Knot, Herring Gull
Nationally important aggregations: Eider
Qualifying Assemblages: Seabirds; Waterfowl

**Appropriate Assessment**

The scope of the appropriate assessment was the following:

- Vessel disturbance to birds
- Physical removal of seed mussel and associated starfish (prey for herring gull)

### a) Vessel Disturbance to Birds - eiders

The mussel beds in north Morecambe Bay are in close proximity to South Walney and Foulney Islands, which are the centre of the Morecambe Bay eider breeding colonies. Current Natural England advice states that the wintering population of eider currently exceeds the SPA baseline but Morecambe Bay has shown a greater decline from the post-designation increase regionally and nationally in wintering eider population than at the national scale, suggesting site specific pressures (Thaxter et al. 2010). This requires further investigation but suggests a precautionary approach should be adopted.

As diving ducks, 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, Duddon (Hardacre bed), Foulney Island, Morecambe and Fleetwood. The harvesting of mussels by boat has the potential to disturb eiders feeding on the mussel beds themselves, or loafing around the area of the beds.

The area is subject to continuous boat traffic of various sizes at most times of day throughout the year. Fishing will be by boats while the beds are submerged on neap tides over two to three hours

around high water. The resource is limited and it is not anticipated that the fishery will continue for more than a month maximum. As it is restricted temporally any potential impact of disturbance is limited. There are also other areas within Morecambe Bay holding mussel which the eiders could access during these times without much increase in energy expenditure that will not be subject to boat fishing – Foulney (closer inland) which holds a mix of sizes of mussel, along the north Morecambe Bay coast from Foulney to the oyster frames, Heysham Flat holding mainly small < 45mm mussel, the outer skears at Heysham holding size and undersize mussel, Wyre End and Fleetwood beds.

***Consequently it is considered that the disturbance to eiders caused by the dredge harvesting of the mussels will be limited and there are alternative undisturbed sites for feeding and loafing during the times of fishing.***

**b) Physical removal of seed mussel**

Mussel communities - on intertidal and subtidal boulder and cobble skears

The proposal is to harvest seed mussels by boat dredge from beds which have been described as ephemeral (Dare. 1976) that are habitually subject to extensive mussel settlement that are unstable, lying on soft mud and which recurrently get scoured out by autumn / winter storms, or heavily predated by starfish. This description has been borne out through a time series of survey work (MAFF and NW&NWSFC Surveys. 1968 – 2001. NWIFCA 2011 - 16). Experience suggests that if left un-fished, these mussels may be subject to rapid loss through erosion or predation.

The site inspection in May showed that the adult mussel that had persisted through the winter 2015-16 was under threat from starfish predation and by June it was evident that this stock had been wiped out. The evidence of a mass settlement of a new cohort of starfish on the newly settled mussel suggests that this stock will potentially also be eradicated very quickly through predation. An indication of the mass of starfish found on these beds is shown in Figure 13. The many years' experience of industry and NWIFCA officers bears witness to this event, and that there is a short window of opportunity for the resource to be harvested and used for relaying in other areas or subject to total loss.

NWIFCA Officers have records of the spatfall, and survival of mussels in Morecambe Bay over many years. In years when these substrates are covered in sand, recruitment is not possible. Annual spatfalls have regularly been heavy when hard substrate cobble and boulder skear ground is un-covererd. Mortality of first-year mussels is usually very high. If they are not consumed by starfish when small (Fig. 14), in many years virtually the entire stock of mussels has been lost in the autumn and winter storms of their first year, due to erosion of the soft mussel mud put down by the mussels. Even when a proportion of the stock has survived this winter period, such as 2014-15, it is rare for it to grow through to size as starfish predation is heavy. The vast swarms of starfish can wipe out a whole bed of densely packed mussel in weeks.

Therefore the physical removal by harvesting will not result in a significant difference in remaining stock than natural processes.

***Consequently it is considered that the harvesting of the mussels will have no greater effect on the mussel communities on intertidal and subtidal boulder and cobble skears than natural processes.***

Fig. 13. Illustration of the swarm of starfish on the size mussel on the Falklands bed (foot inspection) in May 2016

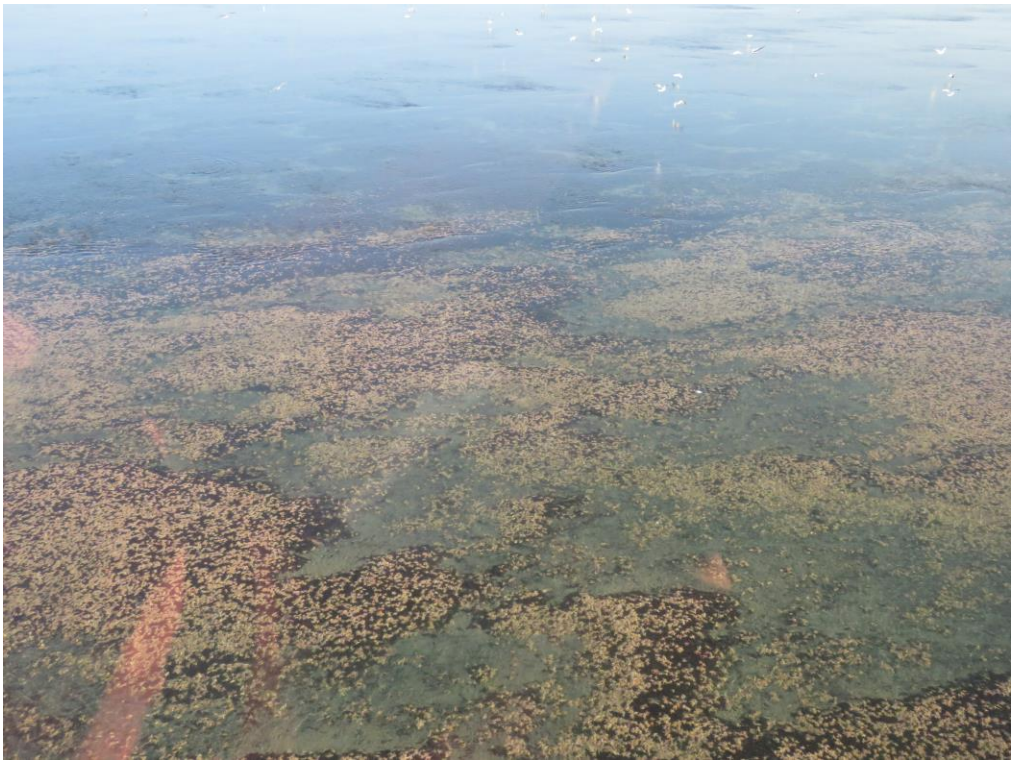

Fig.14. Illustration of the swarm of young starfish on the seed mussel on the Falklands bed (heliflight) in June 2016

Birds – oystercatcher and knot

a) Natura England have provided the following on the importance of the EMS to oystercatcher:

'The non-breeding population of Eurasian oystercatchers (hereafter oystercatchers) in Great Britain is estimated to be 320,000 individuals; the 820,000 biogeographic estimate relates to the *ostralegus* population. Oystercatchers are widespread but slowly declining nationally since the 1990s.

WeBS data show the pSPA held a five year peak mean value of 55,888 individuals (2009/10 – 2013/14), representing 6.8% of the biogeographic population. Oystercatchers were part of the original citation for Morecambe Bay SPA, and the site ranks consistently first for oystercatcher abundance in the UK. However, the Duddon Estuary also supports several thousand individuals, meaning the combined pSPA holds a substantial proportion of both British (17.5%) and biogeographic (6.8%) totals.

Condition Assessment: Not Assessed

No WeBS alert. The number of oystercatcher overwintering in Morecambe Bay has remained stable at the site, NW and GB levels but the increasing proportion of regional numbers supported by this site suggests that the environmental conditions remain relatively favourable and site is becoming increasingly important on a regional scale'.

b) Natura England have provided the following on the importance of the EMS to knot:

'The non-breeding population of knots in Great Britain is estimated to be 320,000 individuals; the 450,000 biogeographic estimate relates to the *islandica* race thought to winter in Britain. Knots are widely distributed throughout Britain in the winter and numbers have been largely stable over the past 30 years. Morecambe Bay consistently ranks amongst the sites holding the greatest number of knots in the UK.

WeBS data show the pSPA held a five year peak mean value of 32,739 individuals (2009/10 – 2013/14), representing 7.3% of the biogeographic population. Knots were part of the original citations for Morecambe Bay SPA and Duddon Estuary SPA, reflecting the importance of both areas; the former holds larger numbers than the latter, which has undergone some recent declines in numbers.

This species (*islandica* subspecies) migrates from breeding grounds in north eastern Canada, Greenland and Iceland to winter on this SPA and other sites within the UK and Europe. Migration starts in August with peak numbers recorded in September and October. The birds return to their breeding grounds from March with very few individuals remaining into May.

Condition Assessment: Not Assessed

Medium alert, medium term but treat with caution. Numbers overwintering in Morecambe Bay have fluctuated making interpretation of the underlying trend difficult. Numbers at NW and GB levels have remained relatively stable long term'.

Young mussels are a key food resource for waders such as oystercatchers and knot in particular. However, the mussels that will be harvested are not attached to the hard substrate, and are likely to be lost through erosion. Observations over many years indicate that this process will accelerate through the autumn period, and that the harvestable stock may not persist, and will not remain available as prey for birds.

The stock on the Falklands and South America beds is regarded as ephemeral and subject to loss by natural processes if left un-fished. Observations over the last few years have substantiated that mussels remaining from dredged areas can sometimes overwinter but have then been ravaged by starfish, smothered by sand or scoured out, particularly when smothered by a new recruitment and its associated unstable mussel mud.

Assessments of all the mussel beds within Morecambe Bay and the Duddon Estuary have been made to inform this HRA, and the likely impacts on bird prey resource. Details are given above. The main alternative bed is Foulney with an estimated biomass of around 5000 tonnes (early August 2015). This bed is open as a size mussel fishery to hand-gatherers at the present time, but is unlikely to see much activity other than on the largest spring tides (for access to the mussel on the 'Island') as the majority of the mussel on the bed is undersize.

Additional mussel resource which is not currently being fished is situated all along the foreshore from Foulney to the oyster frames, the outer skears at Heysham Flat, Wyre End and the Fleetwood beds.

There is also a proposal for a hand-gathered fishery on Heysham Flat for seed mussel (<45mm). Hand-gathering is not 100% efficient and may even serve to thin out the mussel on the rest of that skear, improve the bed's stability and allow it to grow on. It has been estimated that 4000 tonnes of mussel is available in the main fishable area. The level of activity predicted (based on recent years fishing) indicates that around 40 hand-gatherers maximum will prosecute the fishery and that only a proportion of this mussel will actually be fished (expected maximum 1000 tonnes from 2014 and 2015 returns, 503 and 684 respectively), therefore leaving a resource for birds.

The bottom skears at Heysham will only see a limited amount of effort due to tidal restrictions and therefore the majority of this stock is likely to remain unfished and available as prey resource, covering an area of ~5.7ha.

***Consequently it is not considered that the boat harvesting of the mussels will affect the feeding of oystercatchers and knot as alternative areas holding mussel within their size preference is available and is not being fished.***

Birds – herring gull

Natura England have provided the following on the importance of the EMS to herring gull:

'The breeding population of European herring gulls in Great Britain is estimated to be 130,000 pair). This estimate relates to the race *argenteus*, which all breeding birds in GB are considered to belong to. Herring gulls have declined markedly in recent years (-30% in the UK between 2000 and 2013), and are now on the 'red list' of Birds of Conservation Concern because of longer-term declines.

Herring gulls were a qualifying feature of the original Morecambe Bay SPA, holding 10,000 pairs according to the citation (1991). This represented 7% of the GB population at time of classification, though the proportion of the biogeographic population is not given (retrospectively this has been calculated as 1.0%). It was not a feature of the Duddon Estuary SPA, as only very small numbers of pairs breed at Hodbarrow. Latest data (2011-2015) show the five year peak mean to have declined to 1,588 pairs (0.5% biogeographic population of 340,000 pairs); this value includes birds nesting at South Walney (within Morecambe Bay SPA) and Hodbarrow (within Duddon Estuary SPA).

The original baseline citation (1991) value of 10,000 pairs has been retained for the new pSPA.

Condition assessment: Unfavourable or unfavourable recovering

Herring gulls are omnivorous, feeding on fish (marine and freshwater), crabs, cockles and mussels in tidal flats but also on terrestrial prey items such as earthworms and beetles, and garbage. They are opportunists and take advantage of any available food resource. When seen on mussel beds it is regularly observed that they are feeding on starfish, which in turn are predating on the mussel.

Mussel prey:

However, the mussels that will be harvested are not attached to the hard substrate, and are likely to be lost through erosion. Observations over many years indicate that this process will accelerate through the autumn period, and that the harvestable stock may not persist, and will not remain available as prey for birds.

The stock on the Falklands and South America beds is regarded as ephemeral and subject to loss by natural processes if left un-fished. Observations over the last few years have substantiated that mussels remaining from dredged areas can sometimes overwinter but have then been ravaged by starfish, smothered by sand or scoured out, particularly when smothered by a new recruitment and its associated unstable mussel mud.

Assessments of all the mussel beds within Morecambe Bay and the Duddon Estuary have been made to inform this HRA, and the likely impacts on bird prey resource. Details are given above. The main alternative bed is Foulney with an estimated biomass of around 5000 tonnes (early August 2015). This bed is open as a size mussel fishery to hand-gatherers at the present time, but is unlikely to see much activity other than on the largest spring tides (for access to the mussel on the 'Island') as the majority of the mussel on the bed is undersize.

Additional mussel resource which is not currently being fished is situated all along the foreshore from Foulney to the oyster frames, the outer skears at Heysham Flat, Wyre End and the Fleetwood beds.

There is also a proposal for a hand-gathered fishery on Heysham Flat for seed mussel (<45mm). Hand-gathering is not 100% efficient and may even serve to thin out the mussel on the rest of that skear, improve the bed's stability and allow it to grow on. It has been estimated that 4000 tonnes of mussel is available in the main fishable area. The level of activity predicted (based on recent years fishing) indicates that around 40 hand-gatherers maximum will prosecute the fishery and that only a proportion of this mussel will actually be fished (expected maximum 1000 tonnes from 2014 and 2015 returns, 503 and 684 respectively), therefore leaving a resource for birds.

The bottom skears at Heysham will only see a limited amount of effort due to tidal restrictions and therefore the majority of this stock is likely to remain unfished and available as prey resource, covering an area of ~5.7ha.

***Consequently it is not considered that the boat harvesting of the mussels will affect the feeding of herring gull as alternative areas holding mussel within their size preference is available and is not being fished.***

Starfish prey:

Officers' observations over numerous years support the view that herring gull when sighted on mussel beds in large aggregations in north Morecambe Bay are feeding on starfish, which in turn are predating the mussel. It is one way in which starfish covered mussel beds can be found as the water is receding. Large starfish tend to be found on larger mussel, with new cohorts feeding on seed mussel. In some years mass mortalities of starfish are seen when dead starfish are washed up along the shoreline in their thousands. Interestingly, this is not seen on other parts of the Bay, but has been reported in the Solway.

Mussel dredging will remove the starfish that are on the targeted mussel at that time. The industry remove them in the dredges and transport them with the seed mussel to their lay areas, where

they are deposited in the higher tidal reaches, leaving them there for gulls in other areas to pick on.

It is not considered that starfish constitute a major element of herring gulls diet. As opportunist scavengers they are taking advantage of a ready food resource, but there is a wide variety of alternatives available to them. Some starfish are currently present on the bottom end of Foulney which will uncover on similar if not the same tides as the dredge area and so provides alternative feeding, if starfish is the preference.

***Consequently it is not considered that the removal of the starfish will affect the feeding of herring gull as alternative food resources are available within the north of Morecambe Bay.***

Birds – eiders

Natura England have provided the following on the importance of the EMS to eiders:

'Eider (breeding) are considered to be non-migratory and hence not covered by the Birds Directive and SPAs. Breeding eider are a designated feature of South Walney & Piel Channel Flats SSSI (baseline population 950 prs).

Eider (non-breeding) are a main component of the SPA qualifying waterbird assemblage feature, present in numbers exceeding 1% of the GB total and exceeding 2,000 individuals. Eider are a Ramsar qualifying feature.

When the site was first classified the site supported nationally important numbers of this species (4,800 individuals: 1984/5 – 1988/9). It regularly supports over 6,000 (>8% of UK non-breeding population with 12,000 recorded in the 1990s. An aerial survey of eider by APEM commissioned by Natural England estimated a population size of 6,389 in March 2011. Current 5yr mean peak (2009/10 – 2013/14) is 5886 birds.

Condition Assessment: Not Assessed

Eiders remained relatively stable in Morecambe Bay throughout the 1990s but have declined sharply since 2000. Morecambe Bay supports a substantial proportion of the regional total of eiders, but this has fallen from over 95% in the mid-1990s to less than 40% in the most recent winters. The regional decline in eider numbers can therefore be largely traced back to the decline in the SPA. In contrast, at the national scale, numbers have remained relatively stable throughout this period, which suggests that the decline has been driven by site-specific pressures. These issues could be due to a number of different factors.

The wintering population currently exceeds 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'.

There have been concerns about the eider population and its breeding success in Morecambe Bay, and in particular those nesting on the nearby site at Walney Island, although investigations into reasons for lack of breeding success are inconclusive. There are many potential contributory factors suggested for this decline including and significantly predation by land mammals. However, one factor identified by Natural England may be the removal of seed mussel, and this factor has been fully considered in undertaking this Appropriate Assessment.

From literature mussels have been shown to constitute between 68% and 80% of eider diets depending upon mussel spatfall (Hilgerloh 1997). Seed mussels may be a potential food resource for eider, although there are conflicting opinions on the importance of their size preference. Goss-Custard *et al.* (2004) report that eiders mainly eat larger size mussels; while elsewhere eiders have been shown to preferentially target mussels in the small to intermediate size (1-40mm, generally selecting for sizes under 30mm) ranges (Bustnes 1998; Hamilton et al. 1999) and at

shallow depths (Larsen & Guillemette 2000). Both these factors would increase energetic profitability with a reduced shell mass to flesh ratio and a reduced amount of energy lost to diving activity.

The stock on the Falklands and South America beds is regarded as ephemeral and subject to loss by natural processes if left un-fished. Observations over the last 24 months have substantiated that mussels remaining from dredged areas can overwinter but have then been ravaged by starfish, smothered by sand or scoured out, particularly when smothered by a new recruitment and its associated unstable mussel mud.

Modern seed mussel dredging is reported to be around 70% efficient, therefore leaving some of the resource in situ. There is also evidence to support the claim that fishing thins the mussel out and can actually increase biomass until such time as natural processes remove it (Frenchette et al. 1992. Gascoigne et al. 2007. Cook. 2008).

In order to assess alternative mussel prey resource for eiders, assessments of all the mussel beds within Morecambe Bay and the Duddon Estuary have been made to inform this HRA. Details are given above. The main alternative bed is Foulney with an estimated biomass of around 5000 tonnes (early August 2015). This bed is open as a size mussel fishery to hand-gatherers at the present time, but is unlikely to see much activity other than on the largest spring tides (for access to the mussel on the 'Island') as the majority of the mussel on the bed is undersize.

Additional mussel resource which is not currently being fished is situated all along the foreshore from Foulney to the oyster frames, ie. in close proximity and already utilised by eiders, the outer skears at Heysham Flat, Wyre End and the Fleetwood beds.

There is also a proposal for a hand-gathered fishery on Heysham Flat for seed mussel (<45mm). Hand-gathering is not 100% efficient and may even serve to thin out the mussel on the rest of that skear, improve the bed's stability and allow it to grow on. It has been estimated that 4000 tonnes of mussel is available in the main fishable area. The level of activity predicted (based on recent years fishing) indicates that around 40 hand-gatherers maximum will prosecute the fishery and that only a proportion of this mussel will actually be fished (expected maximum 1000 tonnes from 2014 and 2015 returns, 503 and 684 respectively), therefore leaving a resource for birds.

The bottom skears at Heysham will only see a limited amount of effort due to tidal restrictions and therefore the majority of this stock is likely to remain unfished and available as prey resource, covering an area of ~5.7ha.

***Consequently it is not considered that the boat harvesting of the mussels will affect the feeding of eiders as alternative areas holding mussel within their size preference is available and is not being fished.***

Additional Note: despite the excellent work carried out during the Eider Risk Review many questions still remain around the eider population of Morecambe Bay, reasons for the apparent decline in its breeding success, predation pressures, feeding preferences and relation to the mussel fisheries. Shellfish harvesting is an important economic activity in the Bay and many of these questions have been circulating around the fisheries for many years. The NWIFCA fully supports the proposals for a full-time 3 year PhD studentship as a cost-effective way to attaining a more in-depth understanding of these issues and ideally to provide some conclusive research so that a consensus can be reached. This would facilitate a faster, more efficient HRA for each year's fishery.

**Management:**

Boats will be required to submit weekly catch returns and fishing will be monitored for by-catch and policed by NWIFCA officers to ensure it is conducted within the authorised area (Annex B). Authorisations issued in 2016 have a range of conditions attached (see Annex C) to aid enforcement including a stipulation that at any time while the vessel is within the authorised box the AIS equipment must be switched on. This will aid the NWIFCA to ensure compliance. NWIFCA officers have the power to withdraw authorisations at any point should the need arise, and will consult with Natural England throughout the duration of the fishery. Should there be concerns that losses of mussel around Morecambe Bay is occurring which will impact on the available bird feeding resource, the NWIFCA will withdraw authorisations and close the fishery.

NWIFCA believes that the fishing that will take place under this proposal is of a nature that is analogous to the natural processes that will inevitably result in large losses of mussels from these settlements. In view of this and the controls on effort that are implicit and additionally available, we conclude that there will be no risk of adverse effect on the integrity or conservation status of the SAC or SPA features of Morecambe Bay and the Duddon Estuary.

Appropriate assessment – summary table

| Hazard | Interest feature | Favourable condition target for relevant attribute (including range of natural variation) based on conservation objectives | Adverse effect of proposal alone on attribute and/or feature | Adverse effect of proposal in combination with other plans or projects, on attribute and /or feature | Can adverse effects be avoided? | Adverse effect on integrity; (yes, no or uncertain |
|---|---|---|---|---|---|---|
| Disturbance | Nationally important aggregations: eider | Maintaining:<br>- extent and distribution of the habitats of the qualifying features;<br>- structure and function of the habitats of the qualifying features;<br>- supporting processes on which the habitats of the qualifying features rely;<br>- population of each of the qualifying features;<br>- distribution of the qualifying features within the site. | Potential risk of disturbance to feeding and loafing eiders. | No other fishery anticipated to cause in-combination effect. | Yes. By conditions in the authorisation to:<br><br>restrict the area that will be open to the fishery;<br><br>Natural temporal limitation due to tides that can be fished.<br><br>Adverse effects will also be avoided as other mussel areas in Morecambe Bay will be available and not be fished, including:<br>• Foulney (estimated minimum biomass ~5000 tonnes);<br>• Foulney to oyster frames;<br>• bottom skears at Heysham inaccessible to hand-gatherers and covering ~5.7 ha<br>• Wyre End<br>• Fleetwood beds | No |

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|---|---|---|---|---|---|---|
| Physical removal of mussels | Intertidal boulder and cobble skear communities (including mussel communities) | Subject to natural change, to maintain or restore:<br>- extent and distribution of qualifying natural habitats and habitats of qualifying species;<br>- structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;<br>- supporting processes on which qualifying natural habitats and habitats of qualifying species rely. | Potential risk of damage to and reduction in extent of mussel communities. | Foulney size mussel hand-gathered fishery.<br><br>Heysham Flat hand-gathered fishery due in late summer but on different tides (spring rather than neaps). | Low level of effort only on largest tides, will continue through autumn into winter. Max. anticipated = 40 fishers. In 2015 88 tonnes was removed, which is relatively insignificant when considering tall the resource in the Bay. Removal of mussels can have effect of increasing biomass.<br><br>Both seed mussel fisheries are restricted in effort, temporally and spatially. At Heysham a maximum of 1000 tonnes is likely to be harvested by around 40 hand-gatherers, leaving over 3000 tonnes un-touched and a large area on the bottom skears inaccessible other than for short time period on the largest tides.<br><br>The mussel is likely to be lost in coming weeks by natural processes. Mussels are being heavily predated by starfish. If they survive this pressure they will become loose and unembyssed on deep layer of soft mud and be subject to potentially catastrophic loss by tidal scour. Harvesting of mussels is therefore similar to natural processes.<br><br>No mitigation required | No |

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|---|---|---|---|---|---|---|
| Physical removal of mussels | Subtidal boulder and cobble skear communities (including mussel communities) | Subject to natural change, to maintain or restore:<br>- extent and distribution of qualifying natural habitats and habitats of qualifying species;<br>- structure and function (including typical species) of qualifying natural habitats and habitats of qualifying species;<br>- supporting processes on which qualifying natural habitats and habitats of qualifying species rely. | Potential risk of damage to and reduction in extent of mussel communities. | No other fishery anticipated to cause in-combination effect. | The mussel is likely to be lost in coming weeks by natural processes. Mussels are being heavily predated by starfish. If they survive this pressure they will become loose and unembyssed on deep layer of soft mud and be subject to potentially catastrophic loss by tidal scour. Harvesting of mussels is therefore similar to natural processes.<br><br>No mitigation required | No |
| Physical removal of seed mussels | Migratory species: Herring Gull, Oystercatcher, Knot | Presence and abundance of prey species (including mussels) should not deviate from an established baseline, subject to natural change. | Potential risk that removal of prey resource could negatively affect bird condition and survival through the winter. | Foulney size mussel hand-gathered fishery. | Low level of effort only on largest tides, will continue through autumn into winter. Max. anticipated = 40 fishers. In 2015 88 tonnes was removed, which is relatively insignificant when considering tall the resource in the Bay. Removal of mussels can have effect of increasing biomass. | No |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | Heysham Flat hand-gathered seed mussel fishery. | At Heysham a maximum of 1000 tonnes is likely to be harvested by around 40 hand-gatherers, leaving over 3000 tonnes un-touched and a large area on the bottom skears inaccessible other than for short time period on the largest tides.<br><br>The mussels to be harvested are likely to be lost to these birds within the next few weeks. Thinning of seed mussels and removal by fishing of some of the starfish may enhance the survival of a proportion of the mussels.<br><br>Other mussel areas in Morecambe Bay will be available and not be fished, including:<br>• Foulney (estimated minimum biomass ~5000 tonnes);<br>• Foulney to oyster frames;<br>• bottom skears at Heysham inaccessible to hand-gatherers and covering ~5.7 ha<br>• Wyre End<br>• Fleetwood beds<br><br>No mitigation required | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Physical removal of seed mussels | Nationally important aggregations: eider | Presence and abundance of prey species (including mussels) should not deviate from an established baseline, subject to natural change. | Potential risk that removal of prey resource could negatively affect bird condition and survival through the winter, and subsequent condition prior to breeding. | Heysham Flat hand-gathered fishery | At Heysham a maximum of 1000 tonnes is likely to be harvested by around 40 hand-gatherers, leaving over 3000 tonnes un-touched and a large area on the bottom skears inaccessible other than for short time period on the largest tides.<br><br>The mussels to be harvested are likely to be lost to eiders within the next few weeks. Thinning of seed mussels may enhance the survival of a proportion of the mussels.<br><br>Other mussel areas in Morecambe Bay will be available and not be fished, including:<br>• Foulney (estimated minimum biomass ~5000 tonnes);<br>• Foulney to oyster frames;<br>• bottom skears at Heysham inaccessible to hand-gatherers and covering ~5.7 ha<br>• Wyre End<br>• Fleetwood beds<br><br>No mitigation required | No |

**Can it be ascertained that the plan or project will not adversely affect the integrity of the European Site?**

Yes.

The NWIFCA considers that the proposed harvesting of mussel from the Falklands and South America area has the potential for a likely significant effect on the conservation features and associated habitats of the Morecambe Bay and Duddon Estuary SAC, SPA and Ramsar Site.

An assessment has been carried out to consider in-combination effects of the proposal with on-going size mussel fishing at Foulney, and a hand-gathered seed mussel fishery at Heysham Flat in August.

The NWIFCA concludes that with the proposed mitigation measures in place there will be no adverse effect on the integrity of the Morecambe Bay and Duddon Estuary SAC, SPA and Ramsar site.

MANDY KNOTT
NWIFCA Senior Scientist

11th July 2016

Final Appropriate Assessment Record

This is a record of the appropriate assessment required by Regulation 61 of the Conservation of Habitats and Species Regulations 2010, undertaken by the NWIFCA in respect of the above application, in accordance with the Habitats Directive (Council Directive 92/43/EEC).

Having considered that the application would be likely to have a significant effect on the Morecambe Bay SAC, SPA and Ramsar Site and that the application was not directly connected with or necessary to the management of the site for nature conservation, an Appropriate Assessment has been undertaken of the implications of the proposal in view of the site's conservation objectives.

Natural England was consulted under Regulation 61. The conclusions of this appropriate assessment are in accordance with the advice and recommendations of NE.

The assessment has concluded that the plan or project as proposed has the potential for a likely significant effect on the conservation features and associated habitats of the Morecambe Bay SAC, SPA and Ramsar Site. Mitigation has been considered along with conditions and restrictions on the way the proposal is to be carried out and it is ascertained that the following would avoid adverse effects on the integrity of the site

The mussels shall only be harvested by dredge of a design authorised by the Authority.
The dredge mussel fishery in the Falklands and South America areas be restricted to the area as illustrated on the map attached at Annex B.
The NWIFCA will close the fishery during periods of prolonged cold weather.
The NWIFCA retain the power to revoke the authorisation for environmental reasons if Natural England advise that the activity may have adverse effects on those sites.

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**Annex A: Background to the area and fishery 2010 - 2015**

a) In 2010 and 2011 the area was subject to substantial mussel spat recruitment, with 120ha in 2010, and 104 hectares with estimated biomass of 20,000 – 30,000 tonnes in 2011. Operators under authorisation by the NWIFCA removed 4330 and 7900 tonnes respectively.

b) 2012 saw a significant dredge fishery on the South America and Falklands bed. The area was subject to the densest recruitment that officers and industry can recall, with an estimated biomass of approx. 50,000 tonnes. This coincided with a mass settlement on all the Morecambe Bay skears, of which only Heysham Flat skear was harvested for seed (by hand) with an estimated 250 tonnes fished.

c) 8 boats were issued with authorisations by the NWIFCA to dredge and 6 boats removed 12449 tonnes between 6th August and 31st December 2012. The fishery came to a natural end once the cold weather set in and the remaining mussels dug back into the sand/mud. Operators estimated that around 20 – 25,000 tonnes remained on the bed. Inspections carried out during 2013 on the southern skears would support the assertion that these beds are ephemeral as there was no evidence of any of this mussel having over-wintered.

d) In 2013, the first signs of mussel settlement around Morecambe Bay were observed in April and again appeared to be of a substantial volume. A heli flight in April confirmed a widespread spat settlement across the skears, some scouring. A substantial proportion of the most northern bed held persisting 2012 mussel. Various inspections were made of the beds which revealed that a swathe of sand had covered much of the central skear smothering any mussel that had settled prior to sanding over.

e) Using MapInfo and tracking from handheld GPS used during foot, hovercraft and helicopter inspections, the skears were delineated into four areas holding mussel and estimates of the size of these areas made.

f) It was agreed that the three (smaller) northern areas were left out of the area to be authorised for harvest, and monitored by NWIFCA science officers due to the proximity to intertidal fisheries, and the persistence of some of the mussel overwinter.. The NWIFCA issued authorisations to seven companies to harvest seed mussel by dredge from an area stretching south covering what is known as the Falklands beds. The authorised area covered around 9.842 km².

g) The fishery was prosecuted between 12th August and 26th September 2013 and 5806 tonnes were harvested. Over 50% of the landings were fished by two vessels from the Menai Strait Mussel Fishermens Association who farm mussels with Marine Stewardship Council sustainable fishery accreditation. The majority of the remaining landings were fished by vessels from Northern Ireland and destined to aquaculture businesses mainly in Northern Ireland but with some going to lays in Eire.

h) Interest in Morecambe Bay seed mussel as a resource for the aquaculture industry has grown over the past four years due to a lack of stock in the Irish fisheries. The NWIFCA works with Cefas and DARD NI to ensure that all relevant protocols and reporting are carried out. For example, IFCOs assist Cefas Fish Health Inspectorate in inspecting consignments to be shipped over the Irish Sea, and Officers liaise with DARD officials regarding monitoring for non-native invasive species. In 2013 a regular contact was established to ensure inspections were carried out by means of boardings and landings inspections both in Morecambe Bay and at the site of import into Northern Ireland, with a specific remit to report any content of cobble or stone in the catch.

i) There were no such reports and NWIFCA remains confident that the dredge methods used in this fishery do not impact on the cobble and stone substrate due to the deep layer of

mussel mud on which the seed mussel sits, and the design of the dredges authorised (ie Dutch dredge or Eco-dredge).

j) Sightings of Chinese Mitten Crab (*Eriocheir sinensis*) have been intermittently reported from the Duddon Estuary, north of the South America and Falkands seed mussel beds. It has yet to be ascertained whether there is an established population of CMC in the Duddon, or whether these are rogue adults that have been carried into the estuary by tidal influences. The latest (confirmed) report was from March 2012 where an adult berried female was captured from Millom Pier. This brings the total to 3 sightings in the past 7 years (email correspondence Bekka Corrie-Close. Cumbria Freshwater Invasive Non-Native Species Initiative South Cumbria Rivers Trust).

k) Protocols for screening for Chinese Mitten Crab have been established for seed mussel dredge fisheries in the past – namely an assessment of the Salisbury Bank seed mussel bed (Dee Estuary) in July 2011 (Woolmer, A. 2011 (a, b, c)). A matrix of risk of the presence of CMC throughout its different life-stages was also drawn up for the Dee Estuary (CCW? 2011). These documents have been used to assist previous and current assessment of authorising a seed mussel fishery.

l) Surveys for Chinese Mitten Crab were carried out during June and July 2012 following the above protocols. There was no evidence of adults or juveniles on the bed, or from samples taken back for further screening. Juvenile *Carcinus maenas* were found however.

m) Officers are observant for Chinese Mitten Crab during any inspections carried out on the beds and none have been found.

n) Inspections in 2014 revealed further sanding over of the northern area, with some bare cobble and stone substrate, plus more extensive hard ground suitable for mussel recruitment in the southern area. This also provided more evidence of the ephemeral nature of the beds. Remaining and persisting 2013 mussel in the south west was heavily infested with starfish, predated on by gulls.

o) Further inspections showed only the northern areas were accessible by ATV due to tide and time constraints. The northern beds were very reduced in size due to sand cover. There was a mix of size and spat mussel, with mussel becoming very loose and susceptible to wash out.

p) The more southern beds had 2014 mussel present, extremely loose and un-embyssed lying on soft mud. It was also very small (~15mm) and thin-shelled. There was evidence of scour and a putrid smell suggesting some of the mussel was dying. The south-westerly beds were awash with starfish. There was also a cover of *Corda filum* on beds to the south west corner. Large regions of the central skear area were sanded over.

q) A final heliflight inspection was made in August following a period of high winds. The mussel in the southern zones had persisted and was still affected by the starfish and the *Corda filum*. However it was considered that there was sufficient stock remaining to authorise a fishery, but that the number of boats prosecuting the fishery should be limited.

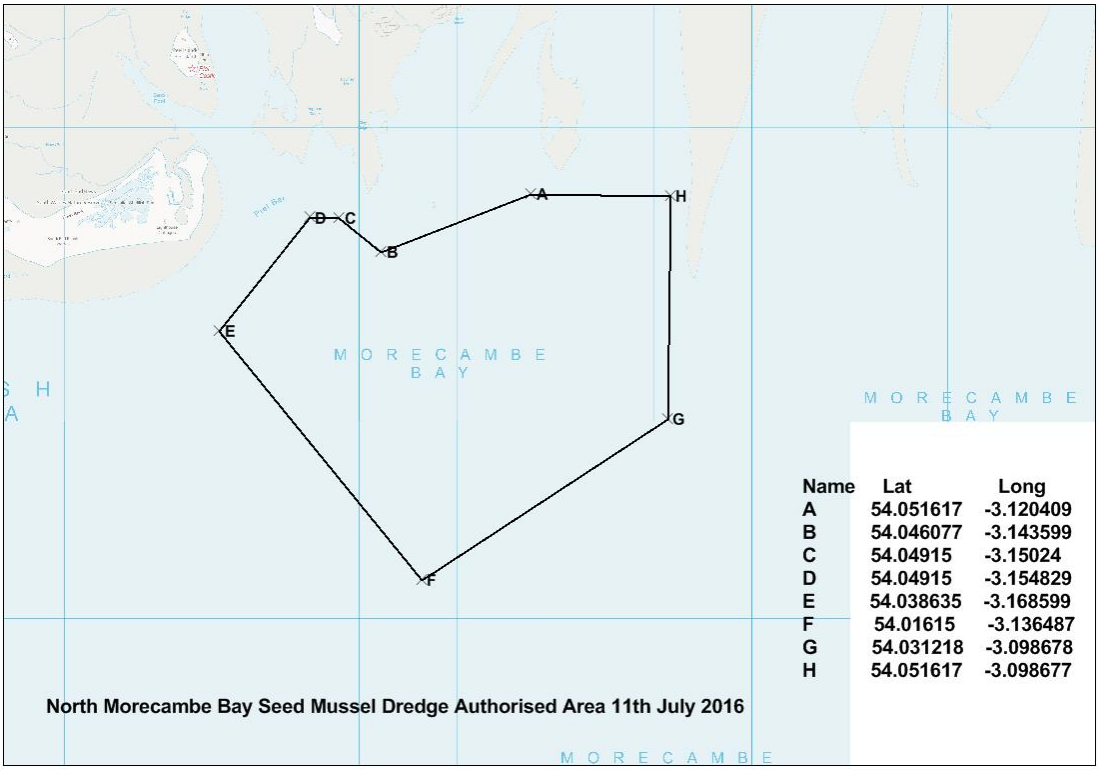
r) The decision was made by NWIFCA Technical, Science and Byelaws sub-committee to authorise four companies for the fishery this year, using historical track record to define which companies would be authorised, and opening the same area as 2013.

s) By the time the fishery opened much of the southern area had scoured out, and an extension was made to the authorised area to the north. Three boats fished in total, removing 1220 tonnes.

t) South America was covered in sand in 2015 and held no mussel. A small area of the Falklands skear held 2014 size mussel – it was subject to a very minor spatfall which did not persist. No fishing occurred.

u) The 2014 size mussel was predated on and wiped out by starfish in early 2016.

**Annex B: Map of Authorised Area**




| Name | Lat | Long |
|---|---|---|
| A | 54.051617 | -3.120409 |
| B | 54.046077 | -3.143599 |
| C | 54.04915 | -3.15024 |
| D | 54.04915 | -3.154829 |
| E | 54.038635 | -3.168599 |
| F | 54.01615 | -3.136487 |
| G | 54.031218 | -3.098678 |
| H | 54.051617 | -3.098677 |

**Annex C: Copy of Authorisation to Dredge**

## NORTH WESTERN INSHORE FISHERIES AND CONSERVATION AUTHORITY

## AUTHORISATON TO REMOVAL UNDERSIZE MUSSELS BY DREDGE

Company Name and Address

Authorisation No:

Date of Issue: 08/07/16
Expiry Date: 31/10/16

is hereby authorised, to remove mussels less than 45mm in length from a defined area in Morecambe Bay under the conditions set out below.

The authorisation gives written permission to fish for mussels less than 45mm in length using a dredge. Fishing for mussels under 45mm is prohibited under NWIFCA Byelaw 3 (Permit to fish for cockles and mussels) outside of the authorised area. Use of an unauthorised dredge is prohibited under NWSFC Byelaw 12, (Restrictions on fishing for bivalve molluscan shellfish paragraph 1.d) and NWIFCA Emergency Byelaw: RESTRICTIONS ON FISHING FOR BIVALVE MOLLUSCAN SHELLFISH 2016

### 1. Conditions

1. The Authorisation is valid for the authorised area only.

2. The Authorisation is valid for the fishing vessel "**Name"** and PLN Number **"Number"** when under the command of **"skipper".**

3. Dredges used must have been approved in writing by the Authority. The 'ecodredge' as used in previous years is the only approved dredge. Details of any other proposed dredge must be sent to NWIFCA.

4. The Authorisation applies and is limited to the authorised area which is formed by a line joining the following positions in order and shown in the diagram at Annex A:

| Name | Lat | Long |
|---|---|---|
| A | 54.05162 | 3.12041 |
| B | 54.04608 | -3.1436 |
| C | 54.04915 | -3.15024 |
| D | 54.04915 | -3.15483 |
| E | 54.03864 | -3.1686 |
| F | 54.01615 | -3.13649 |
| G | 54.03122 | -3.09868 |
| H | 54.05162 | -3.09868 |

5. This Authorisation does not exonerate the holder from any other sea fisheries legislation nor does it prejudice any other consent the holder may need to obtain.

6. It is a condition of this authorisation that vessels are required to report to NWIFCA prior to entering and leaving the authorised box on the following phone number:

    - **07756 579395**

7. Written weekly catch returns are required within 5 days of the end of each block of open tides – inclusive of nil returns for no fishing effort.

8. All vessels issued with an authorisation must be fitted with a functional Automatic Information System (AIS) which identifies the vessel and its location at all times when the vessel is in the authorised area.

9. At all-times the AIS static information must be up to date and correct, inclusive of vessels name, type, dimensions, destination and expected time of arrival the destination.

10. In the event that the AIS unit ceases to transmit due to malfunction while the vessel is in the authorised area, the vessel must cease fishing immediately, take all gear on board and notify NWIFCA.

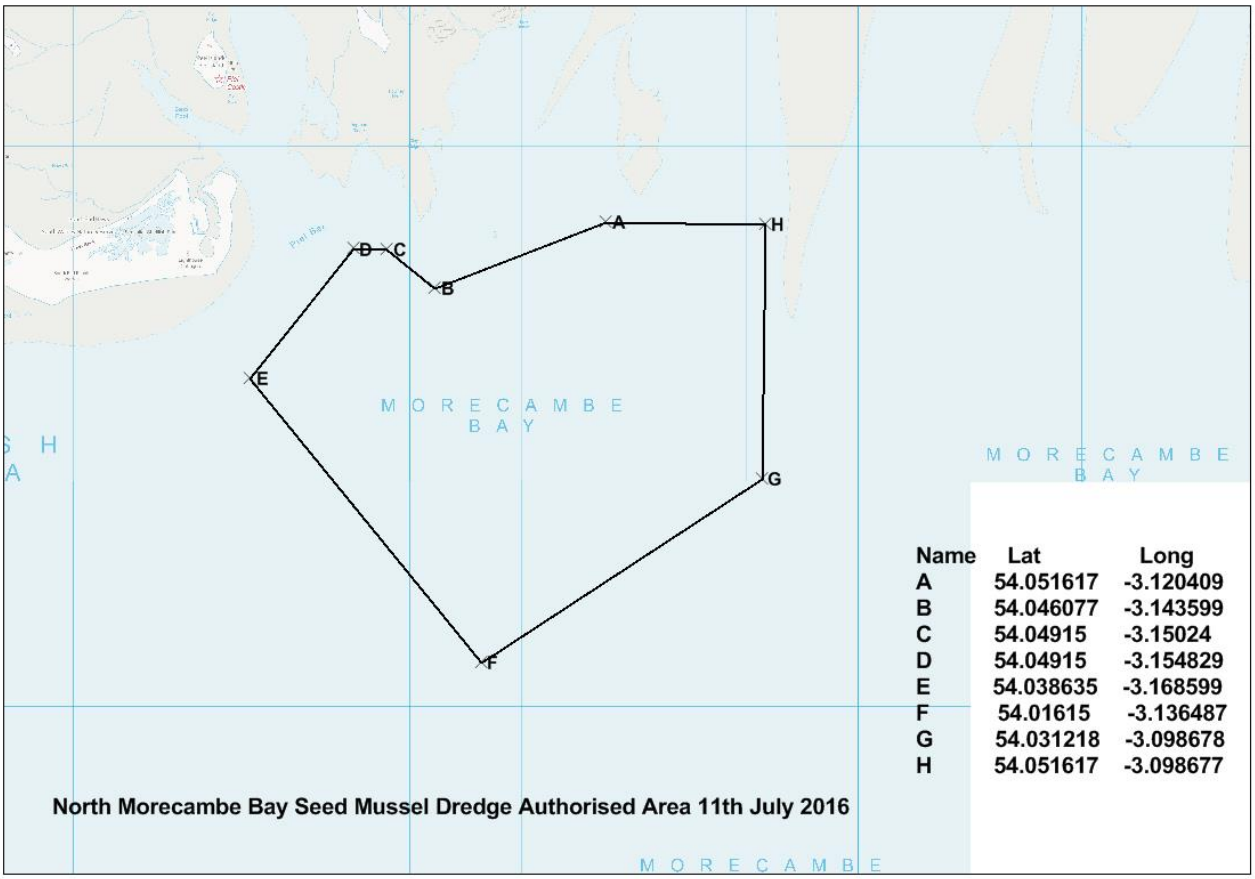
11. Failure to adhere to any of the conditions of this Authorisation may result in this Authorisation being revoked by email with immediate effect. In any such case, any further fishing for undersize mussel will be in breach of NWIFCA byelaws and may lead to prosecution.

12. The fishery may be closed with immediate effect by the NWIFCA if in the opinion of NWIFCA Officers or Scientists, there is a failure to comply with these conditions or there is damage to the beds through over-fishing.

By order of the Authority

STEPHEN ATKINS
Chief Executive

## Annex A: Illustrative Map of Authorised Area 2016




| Name | Lat | Long |
|---|---|---|
| A | 54.051617 | -3.120409 |
| B | 54.046077 | -3.143599 |
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| G | 54.031218 | -3.098678 |
| H | 54.051617 | -3.098677 |

**Natural England Advice received 11th July 2016**

Date: 08 July 2016
Our ref: 189663
Your ref: Seed Mussel Fishery North Morecambe Bay

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CW1 6GJ

T 0300 060 3900

North Western Inshore Fisheries and Conservation Authority (NWIFCA)
Preston Street
Carnforth
Lancashire
LA5 9BY

**BY EMAIL ONLY**

Dear Mandy

**North Morecambe Bay seed mussel dredge fishery**

Thank you for your consultation on the above which was received by Natural England on 21 June 2016.

Natural England is a non-departmental public body. Our statutory purpose is to ensure that the natural environment is conserved, enhanced, and managed for the benefit of present and future generations, thereby contributing to sustainable development.

**THE CONSERVATION OF HABITATS AND SPECIES REGULATIONS 2010 (AS AMENDED)**

The application site is within a European designated site (also commonly referred to as Natura 2000 sites), and therefore has the potential to affect its interest features. European sites are afforded protection under the Conservation of Habitats and Species Regulations 2010, as amended (the 'Habitats Regulations'). The application site is within the Morecambe Bay Special Protection Area (SPA), Morecambe Bay and Duddon Estuary potential SPA (pSPA) and the Morecambe Bay Special Area of Conservation (SAC) which are European sites. The site is also listed as Morecambe Bay Ramsar site[1] and also notified at a national level as Morecambe Bay Site of Special Scientific Interest (SSSI). Please see the subsequent sections of this letter for our advice relating to SSSI features.

In considering the European site interest, Natural England advises that you, as a competent authority under the provisions of the Habitats Regulations, should have regard for any potential impacts that a plan or project may have[2]. The Conservation objectives for each European site explain how the site should be restored and/or maintained and may be helpful in assessing what, if any, potential impacts a plan or project may have.

[1] Listed or proposed Wetlands of International Importance under the Ramsar Convention (Ramsar) sites are protected as a matter of Government policy. Paragraph 118 of the National Planning Policy Framework applies the same protection measures as those in place for European sites.
[2] Requirements are set out within Regulations 61 and 62 of the Habitats Regulations, where a series of steps and tests are followed for plans or projects that could potentially affect a European site. The steps and tests set out within Regulations 61 and 62 are commonly referred to as the 'Habitats Regulations Assessment' process. The Government has produced core guidance for competent authorities and developers to assist with the Habitats Regulations Assessment process. This can be found on the Defra website.
http://www.defra.gov.uk/habitats-review/implementation/process-guidance/guidance/sites/

**No objection**
Natural England notes 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 61 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.

**WILDLIFE AND COUNTRYSIDE ACT 1981 (AS AMENDED)**

**No objection – no conditions requested**
This application is in close proximity to Morecambe Bay Site of Special Scientific Interest (SSSI). Natural England is satisfied that the proposed development being carried out in strict accordance with the details of the application, as submitted, will not damage or destroy the interest features for which the site has been notified. We therefore advise your authority that this SSSI does not represent a constraint in determining this application. Should the details of this application change, Natural England draws your attention to Section 28(I) of the *Wildlife and Countryside Act 1981* (as amended), requiring your authority to re-consult Natural England.

**DETAILED COMMENTS**

The Habitats Regulations Assessment (HRA) does not make use or mention of the bird food requirement model provided by NE 13th May. Although it is accepted that the mussel resource on the South America and Falklands beds is likely to change rapidly, the assessment should ensure that there is sufficient mussel stock available in north Morecambe Bay to meet the predicted needs of elder (5,865 tonnes).

No total allowable catch (TAC) has been proposed however the proposed authorisation states: "the fishery may be closed with immediate effect by the NWIFCA if in the opinion of NWIFCA Officers or Scientists, there is a failure to comply with these conditions or there is damage to the beds through over-fishing". In the absence of a TAC it is suggested that if catch returns exceed that of the 2014 fishery (1,220 tonnes) then the HRA should be reviewed in order to prevent damage through over-fishing.

The mussel resource at Heysham Flat is proposed as an alternative feeding ground for elder, oystercatcher, herring gull and knot. A hand-gathered fishery is also proposed for this area. Should the catch returns of this fishery exceed that of the 2015 fishery (700 tonnes) then the HRA should be reviewed to ensure that sufficient alternative stock remains.

Yours sincerely

Helen Ake
Lead Adviser – Cumbria Area Team