

Summary of the 2024 Wash intertidal mussel surveys and fishery opportunities

Introduction

The 2024 Wash inter-tidal mussel surveys were conducted between September 16th and October 21st, during which 17 inter-tidal beds, plus the Welland Bank were surveyed. These included two patches of mussels on the Ferrier Sand that were surveyed for the first time this year. Poor weather, however, prevented planned surveys on the Herring Hill and West Mare Tail beds from being conducted. Two other small beds on the Roger and Pandora sands also remained unsurveyed, having previously been removed from the survey programme due to their small stock size and general deterioration. Figure 1 shows the beds surveyed during the 2024 programme in red, plus the Herring Hill and West Mare Tail beds in blue.

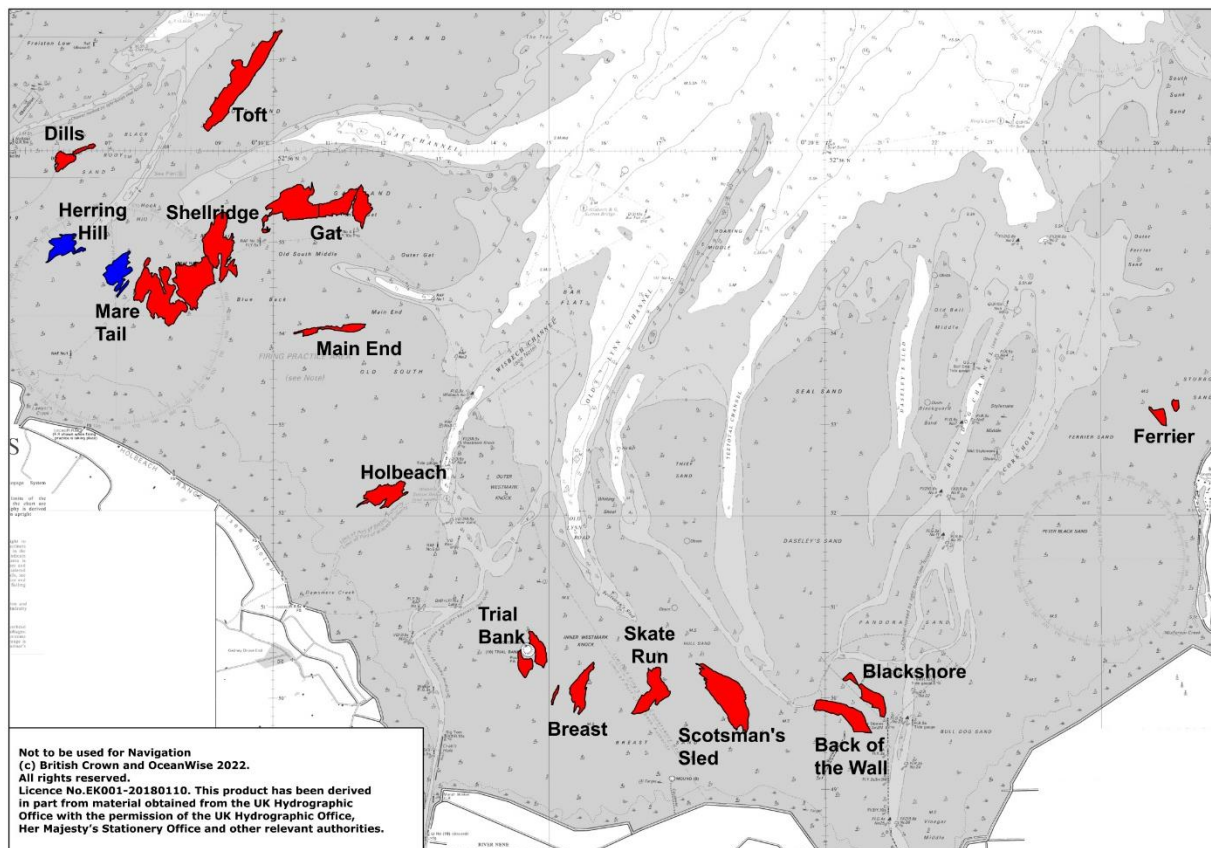


Figure 1 – Mussel beds surveyed during the 2024 inter-tidal surveys (red)

Survey results

Since 2009, the mussels on the intertidal beds in The Wash have been suffering from unusually high levels of mortality and poor recruitment, resulting in a steady deterioration of the beds. In 2023, however, the anticipated die-off did not occur and good growth on the majority of the beds resulted in the stock biomass increasing significantly to its highest level recorded during the period since 2002. The 2024 surveys found the overall biomass on some of the beds had deteriorated since 2023, but good survival and growth on other beds more than compensated for these losses, resulting in a further increase in total mussel biomass from 20,597 tonnes to 23,410 tonnes. These figures do not only represent the highest stocks during the period since 2002, but are also the highest recorded figures since 1945. It should be noted, however, that there were few surveys conducted between 1955 and when the current

programme of annual surveys commenced in the early 1980s. It is possible, therefore, that higher stock levels went unrecorded during that period.

Since the die-offs commenced, occasional good recruitments had produced sufficient juvenile stocks for the total mussel biomass to achieve the 12,000 tonnes threshold required to open occasional relaying seed fisheries. As the populations of 2-3 year-old mussels seemed particularly vulnerable to the die-offs, however, resulting in disproportionate numbers of them dying before they reached the 45mm size at which they would have recruited into the “adult” population, the adult stock biomass had remained below the 7,000 tonnes Conservation Objective target required to open a harvestable fishery. This was still the case in 2023, when despite having had good survival and increase in total biomass, the adult stocks still remained below the 7,000 tonnes threshold. Further good survival and growth during 2024, however, has enabled a good proportion of the juvenile stock to recruit into the adult population, pushing the adult stock biomass to 12,190 tonnes.

Figure 2 shows how the current stocks compare to those from 2002 onwards while Table 1 provides a summary of the stocks present on each of the beds at the time of the surveys.

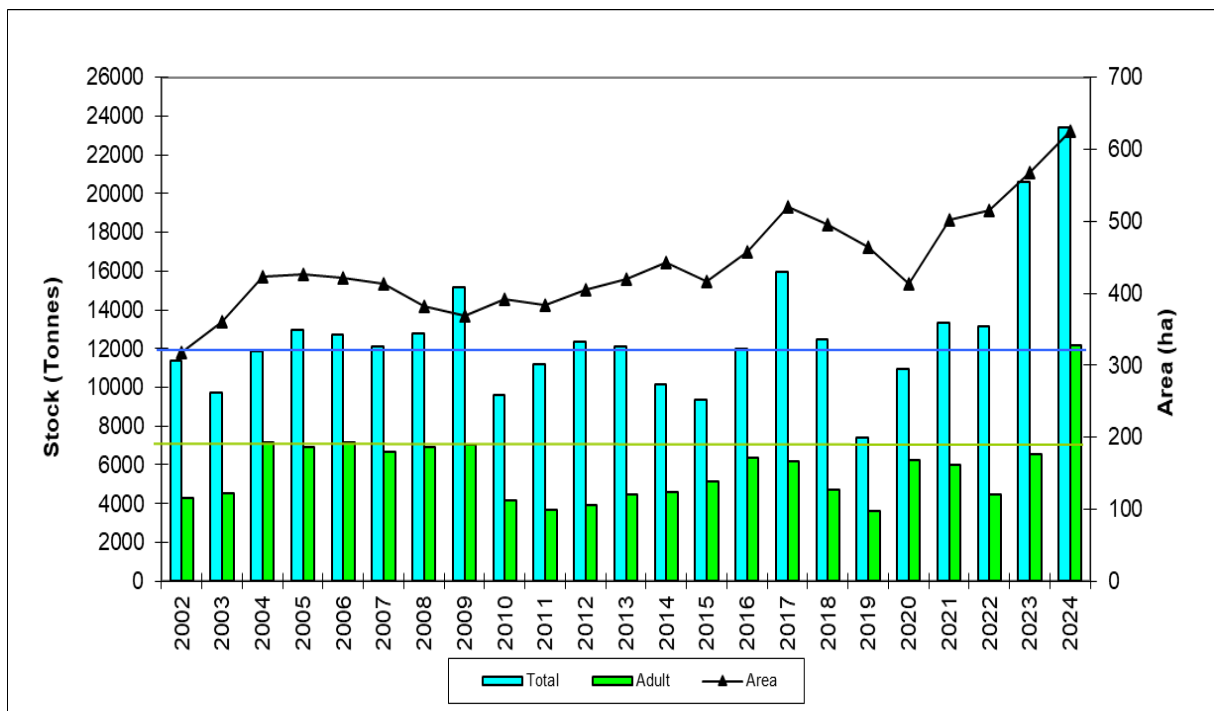


Figure 2 – Intertidal mussel stock levels in The Wash since 2002 and the Conservation Objective targets

Table 1 – Summary of the stocks present on the inter-tidal mussel beds at the time of the 2024 autumn surveys (figures for West Mare Tail and Herring Hill taken from 2023 survey).

Summary of the Wash inter-tidal mussel stocks - 2024					
BED	AREA (ha)	COVERAGE (%)	DENSITY (t/ha)	TOTAL STOCK (tonnes)	STOCK >45MM (tonnes)
Mare Tail North	52	35	0.96	1733	996
Mare Tail Relay	0.5	67	0.72	26	8
Mare Tail South	66.5	23	0.89	1380	508
Mare Tail West	24.9	29	0.79	575	102
Shellridge	50	49	1.18	2865	1858
Dills A	10	13	0.58	76	0
Dills B	3.1	30	1.22	113	13
Toft	69.4	37	1.3	3329	1894
Gat, West	49.5	43	1.06	2245	1567
Gat, Mid	23	32	0.75	551	456
Gat, East	18.6	38	0.75	531	368
Main End	12.8	38	0.7	338	207
Holbeach	26.6	39	1.41	1477	641
Herring Hill	19.8	41	1.13	913	136
Trial Bank	22.9	35	1.24	1009	338
Breast West	1.7	18	0.5	17	1.4
Breast, East	21.2	29	0.5	310	51
Scotsman's Sled, East	63.4	17	1.26	1355	631
Blackshore	18.4	36	1.47	978	483
Back of the Wall	30.9	41	1.82	2295	1271
Skate Run	30.9	24	1.4	1033	520
South Ferrier A	6.6	31	0.87	180	94
South Ferrier B	2.6	24	1.3	81	47
TOTAL	625.3			23410	12190.4
Welland Bank	2.4	70	1.6	268	198

Figure 3 highlights changes in mussel biomass between the 2023 and 2024 surveys. Unlike in 2023, when all but one of the beds had increased in biomass, the 2024 survey found that 7 beds had decreased in total biomass. These tended to be predominantly older beds like those on Mare Tail, the Gat and Scotsman's Sled; ephemeral areas like the Blackshore, plus the Trial Bank, which had been fished following the 2023 survey. The younger beds, and those that had benefitted from spatfalls in 2022 or 2023 had all increased in biomass. The Shellridge bed had performed particularly well between surveys, increasing 22% in area, 58% in mussel coverage and 51% mussel biomass within patches, resulting in the bed almost tripling in biomass.

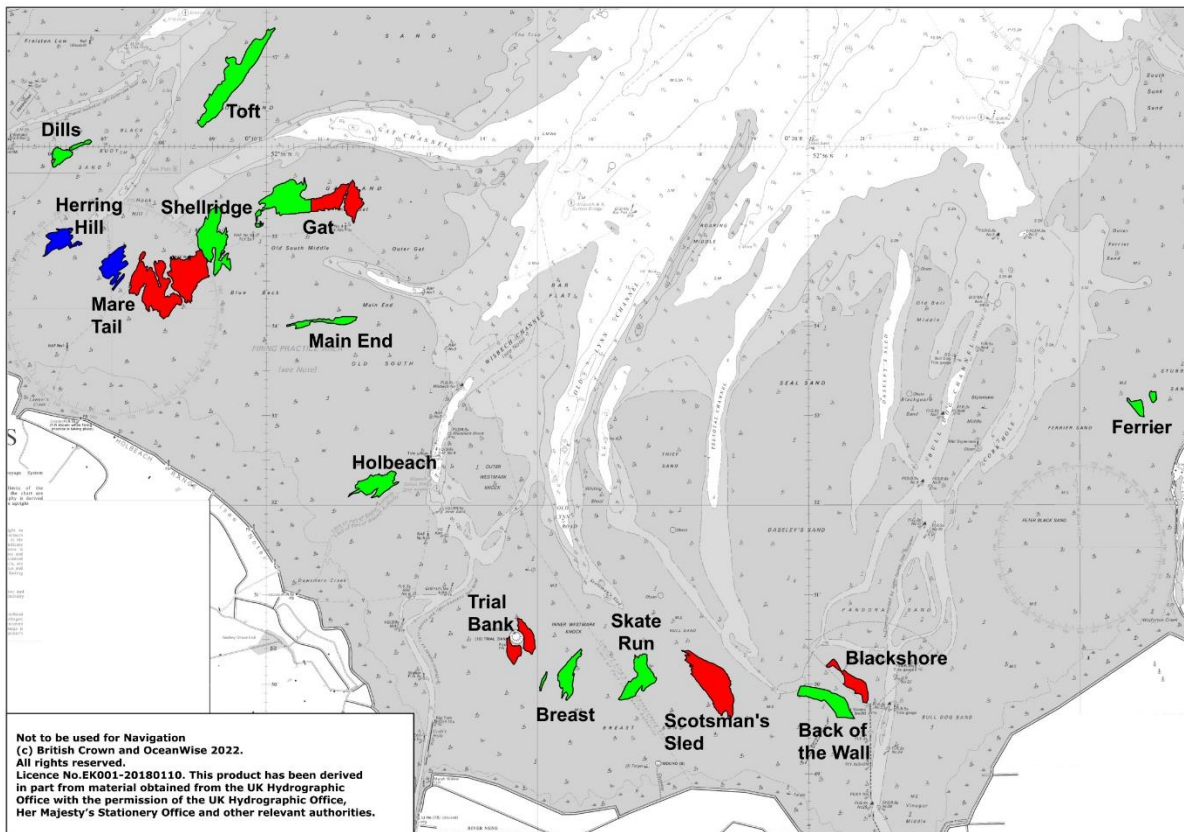


Figure 3 – Changes in mussel biomass found between 2023 and 2024 surveys – Increased biomass (green), decreased biomass (red), unsurveyed (blue)

The long period of high mortalities and poor recruitment had left the majority of the beds in poor condition, typically supporting low densities of barnacle-encrusted mussels amidst lots of dead shell and bare patches. The past two surveys have found survival, particularly among the vulnerable 2-3 year-old mussels, has been greatly improved. This has not only been evident in the stock biomass figures, which have increased significantly, but has been evident within the beds, where the mussel coverage and patch densities have visibly improved. On some of the beds, particularly the younger ones like Back of the Wall and Skate Run, the mussels are mostly clean and appear good quality. On the older, more established beds, however, that had deteriorated more badly to begin with, survival of new settlements have started to rejuvenate the beds but it will require further surviving settlements to properly restore their condition to the quality seen prior to the start of the die-offs.

While the overall condition of the mussel stocks has greatly improved over the past two years, providing optimism for a full recovery in the future, there is concern that these two years might just be an anomaly, preceding further die-offs and another crash. Cefas have been investigating the cause(s) of the die-off for a number of years now, but to date no definite cause has been identified. If a pathogen is involved, it is unlikely that the mussel stocks will have become immune to its effects so suddenly, suggesting other environmental factors are also having an influence. While these may have created suitable conditions for mussel survival over the past two years, they could easily change again, resulting in further losses.

Fishery Opportunities and considerations

*This section sets out areas for consideration during the development of management measures for the fishery and **are not proposals at this time**. Ultimately, the management measures for the fishery will be determined considering a Habitat Regulation Assessment, the 2008 Wash Shellfish Policies, the Authority's main duties and **the views of fishery stakeholders gathered through consultation**.*

2008 Wash Shellfish Policies

When determining appropriate management measures for the mussel fisheries, the stock assessment is considered in the context of the 2008 Wash Shellfish Policies¹ which provides guidance to ensure mussel fisheries are managed within environmental parameters. These include measures that aim to:

- Maintain stocks above the Conservation Objective targets of 12,000 tonnes total stock and 7,000 tonnes adult stock,
- Limit the Total Allowable Catch of the dredged harvestable fishery to 20% of the "adult" stock biomass, and the dredged relaying fishery to 20% of the juvenile stock biomass, with an additional 2% added to each for the hand-worked fisheries.
- Restrict exploitation so that fisheries do not reduce stock densities on individual beds below a minimum density of 25 tonnes/hectare (Note – this measure does not apply to vulnerable/ephemeral beds).
- Protect adult stocks from the relaying fishery and juvenile stocks from the harvestable fishery by opening the most appropriate beds for each fishery based on their stock composition.

Harvestable and relaying fisheries

If the stocks allow, the inter-tidal beds support two fisheries; a harvestable fishery, in which adult (≥ 45 mm length) mussels are landed directly for market, and a relaying fishery, in which seed (< 45 mm length) mussels are re-laid onto private lays for growing-on.

The current stocks are:

Adult mussel – 12,190 tonnes

Juvenile mussel – 11,220 tonnes

Total stock – 23,410 tonnes

Because both the adult stock and the total stock exceed their respective 7,000 tonnes and 12,000 tonnes thresholds, there is an opportunity to open both fisheries.

Total Allowable Catch (TAC) for fisheries

Harvestable Fishery

The biomass of adult mussels was found to be 12,190 tonnes. A TAC based on 20% of this would be **2,438 tonnes** (plus **244 tonnes** for the hand-worked fishery). A harvestable fishery of this size would still allow the 7,000 tonnes Conservation Objective target to be achieved, so would not need to be capped.

¹ https://www.eastern-ifca.gov.uk/wp-content/uploads/2016/03/WFO_Shellfish_management_policies_2008.pdf

Relaying seed fishery

The biomass of juvenile mussels was found to be 11,220 tonnes. A TAC based on 20% of this would be **2,244 tonnes** (plus **224 tonnes** for the hand-worked fishery). A relaying fishery of this size would still allow the 12,000 tonnes Conservation Objective target to be achieved, so would not need to be capped.

If both fisheries were opened to their maximum potential, their combined TAC's would be 5,150 tonnes (including hand-worked components). Even with this quantity of mussels removed, the total mussel biomass would still exceed its 12,000 tonnes Conservation Objective target.

Because both cockles and mussels contribute towards the calculations used in the Bird Food Model when determining food availability for the over-wintering wader populations, many industry members have raised concerns in recent years about the size of the proposed mussel relaying fisheries, fearing they could impact on the size of the subsequent cockle fisheries. It is, therefore, recommended that the size of the TAC for the relaying mussel fishery should only be determined after consultation with the fishing industry.

Beds to be opened to fisheries

To prevent over-fishing occurring on individual beds, average mussel densities should be maintained above 25 tonnes/hectare within each bed. 14 of the beds currently satisfy this criterion and are listed in Table 2. Also listed in table 2 are the maximum permissible TACs that would enable the average density of each bed to remain above 25 tonnes/hectare. Determining how these respective TACs should be allocated between the two fisheries is more complex, however, and requires careful consideration.

The 2008 shellfish policies include the following management measure:

Selection of mussel beds to be opened to the fishery (according to stock composition and bed vulnerability): *Mussel bed areas containing a significant proportion of juvenile stocks will not be opened to the harvestable fishery. Usually, ESFJC requires that mussel beds contain at least 70% adult stock, but this level can be varied where it can be shown to benefit the stock. Beds containing <70% adult stock may be opened to the relaying fishery.*

The above measure provides a cut-off, whereby only the beds supporting $\geq 70\%$ adult mussel biomass can be opened to a harvestable fishery, while all beds with under this amount can be opened to the relaying fishery. Importantly, the measure recognises that this level can be varied when doing so will benefit the stock. Prior to 2008, when these measures were being developed, the beds had not been subjected to a long period of high die-offs, so were in much better condition than post-2009. As such, more of the beds supported high proportions of adult mussels than currently. Since 2009, however, the low stocks of adult mussels have prevented any harvestable fisheries from opening and have required those surviving adults to be protected more stringently from the relaying fisheries. To achieve this greater protection, in recent years the Authority has varied the proportion described above so that the relaying fisheries have only been able to target beds that have been composed predominantly ($>50\%$) of juvenile mussels. With only a relaying fishery to consider, this has been a simple solution. The opportunity to open a harvestable fishery in addition to the relaying

fishery makes the situation more complex this year, for while there are some beds that are >70% either adult or juvenile stock, there are several that are more mixed and could support either fishery. In table 2, therefore, the beds have been divided up into some that are recommended to only be opened to the harvestable fishery, some that are only to be opened to the relaying fishery, and the remaining, more mixed beds, which could be opened to either (or both) fisheries. In the table, the available TAC's for these mixed beds have been divided proportionately by the proportion of the adult and juvenile stocks within each bed, but ultimately, how these beds are managed requires further discussion and consultation from the industry.

Table 2. Beds that could be opened to the 2024 relaying seed fishery and the maximum harvest rates that the policies would allow

Bed	Maximum Relaying - only TAC	Maximum Harvesting- only TAC	Maximum TAC (either fishery)
Relaying Only			
Dills	36		
Holbeach	812		
Herring Hill	418		
Trial Bank	437		
Harvesting Only			
West Gat		1,008	
East Gat		66	
Either fishery			
North Mare Tail	186	247	433
Shellridge	565	1,050	1,615
Tofts	685	909	1,594
Main End	7	11	18
Blackshore	264	254	518
Back of the Wall	684	839	1,523
Skate Run	130	130	260
Ferrier	15	16	31
TOTAL	4,239	4,530	

Consideration should also be given as to what exactly constitutes “harvestable” and “relaying” fisheries. While the term “harvestable” does imply a fishery that lands its harvest directly into port for sale, this is not necessarily what happened to the catches from the most recent harvestable fisheries that occurred up until 2009. Because the quality of the mussels on the inter-tidal beds tended to be too poor to harvest direct to market, the majority of the fishermen relayed them onto their lays instead, to improve their quality before they could be sold. If that is still the case, consideration needs to be given as to how the harvestable and relaying fisheries will operate alongside each other and how their respective TAC's will be determined. One solution could be to ignore the distinction between harvestable and relaying fishery TACs, and consider the TACs in terms of adult and juvenile TACs. Landed mussels would still be subject to the 45mm MLS, but the adult and juvenile TACs could be determined by the proportion of each stock from whichever bed had been fished.

Fishing methods

While both dredging and hand-working methods can be used for prosecuting the mussel fishery, the majority of the fishery is usually targeted using dredges with a minority favouring hand-working. Ordinarily, the TAC for the dredge fisheries has been set at 20% of the stock biomass, with an additional 2% reserved for the hand-worked fisheries. In recent years, however, there has been a preference from those targeting the fishery for a larger hand-worked TAC than the usual 2%. Therefore, the allocation of the TAC between the two fisheries should be determined following consultation with the industry.