Centre for Environment Fisheries & Aquaculture Science

Cefas

Radiological Habits Survey: Sellafield Review, 2024

Review of shellfish and sea fish consumption, and intertidal occupancy

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1. Introduction

A review of shellfish and fish consumption, and intertidal occupancy, is conducted annually in the vicinity of the Sellafield nuclear licensed site, except every fifth year when a full survey (encompassing aquatic, terrestrial and direct radiation pathways) is undertaken. The last full habits survey was conducted by the Centre for Environment, Fisheries & Aquaculture Science (Cefas) in 2023 (Moore and others, 2023). The surveys are undertaken on behalf of the Environment Agency (EA), the Food Standards Agency (FSA) and the Office for Nuclear Regulation (ONR). This supports their roles in protecting the public from the effects of ionising radiation from nuclear licensed sites.

Doses to members of the public are based on the concept of a ‘representative person’. This notional individual is defined as being representative of the more highly exposed members of the population. It follows that, if the dose to the representative person is acceptable when compared to dose limits and optimisation, then other members of the public will receive acceptable doses, and overall protection to the public is provided from the effects of radiation. Habits surveys are undertaken to collect data on the foods that people consume and time they spend in the vicinity of a nuclear site, which are combined with data on the levels of radioactivity found in locally grown or caught foods, and in the environment, to estimate the level of radiation that people may be exposed to.

This Sellafield Review survey specifically investigated the consumption of crustaceans, molluscs and sea fish, and occupancy over intertidal substrates, since these pathways are the major contributors to the dose of the representative person. The dose contribution is dependent upon the consumption and occupancy (habits) data, the radionuclide activity concentrations in seafood, and gamma dose rates over intertidal substrates. The annual review surveys identify any changes in consumption and occupancy rates, new individuals and activities, as well as people who have ceased consuming seafood or undertaking intertidal activities. The information and data in this report are used in radiological dose assessments as reported in the Radioactivity in Food and the Environment (RIFE) series (for example - EA, FSA, FSS, NRW, NIEA and SEPA, 2024) Radioactivity in food and the environment (RIFE) report - GOV.UK.

This survey is also relevant to discharges from the Low Level Waste Repository (LLWR) near Drigg due to the proximity of the site. Additionally, if a new nuclear site is developed in the Sellafield area, for example, the potential Moorside site, the survey would be applicable.

2. Survey area

The aquatic survey area (Figure 1) covered all tidal waters and intertidal areas from Parton to Tarn Bay and extended 11 km offshore.

Figure 1. Aquatic survey area

3. Conduct of the survey

The survey research included Internet and social media searches to identify people who consume crustaceans, molluscs or sea fish, and who undertake activities on intertidal areas in the survey area. A list of interviewees from previous Sellafield habits surveys, including commercial fishermen and hobby fishermen, was collated.

Two members of Cefas staff conducted the survey fieldwork from 3rd to 6th June 2024, alongside desk-based telephone interviews, which were conducted between June and July.

All interviewees were asked to estimate consumption rates for crustaceans, molluscs, and sea fish from the survey area, as well as occupancy rates over intertidal areas within the survey area, for themselves and members of their families. Information was obtained about the origins of the seafood being consumed and locations of intertidal occupancy.

The public response to the survey was positive. Members of the public who were contacted by phone and approached in person by the survey team were happy to take part in the survey and no one declined an interview. In both the telephone and fieldwork interviews, people welcomed the conversation and showed an interest in the survey.

Interview data were collected for 86 adults, 7 children and 4 infants during the 2024 Sellafield Review survey. The activities identified in the 2024 survey were broadly representative of activities identified in previous Sellafield Review surveys.

It should be noted that the Sellafield Review targets high-rate activities (for example, dog walking, commercial/hobby fishing, angling, working on the shore) and seafood consumption, since these pathways are the major contributors to the dose of the representative person. The full habits surveys (encompassing aquatic, terrestrial and direct radiation pathways) include all activities including a wider range of activities undertaken by children, for example, paddling and swimming.

4. Methods of data analysis

4.1. Data recording and presentation

Data collected during the fieldwork and during phone interviews were recorded in logbooks. All data were examined, and any notably high rates were double-checked, where possible, by way of a follow-up phone call. In cases where follow-up phone calls were not possible (for example - interviewees who wished to remain anonymous), the data

were accepted at face value. The raw data were entered into a data capture application and then uploaded to the Cefas habits survey database where each individual for whom information was obtained was given a unique identifier (the Person ID number) to assist in maintaining data quality and traceability.

The consumption and occupancy data in the text of this report are rounded to two significant figures. This method of presentation reflects the authors' judgement on the accuracy of the methods used. In the tables and annexes, the consumption rate data are usually presented to one decimal place. Occasionally, this rounding process causes the computed values (row totals, mean rates and 97.5th percentiles), which are based on un-rounded data, to appear slightly erroneous. External exposure data are quoted as integer number of hours per year.

In habits surveys, data are structured into age groups because different dose coefficients (which are, the factors which convert intakes of radioactivity into dose) can apply to different ages. The names used for the age groups, based on the recommendations in ICRP 103 (ICRP, 2007), are shown in Table 1.

Table 1. Names of age groups and range of ages within each age group

Name of age group	Age range in group
Infant	0 to 5 years old
Child	6 years old to 15 years old
Adult	16 years old and over

4.2. Approaches for the identification of high rates

The habits data have been analysed to identify high rates of consumption and occupancy, which are suitable for use in radiological assessments. Two approaches have been used:

Firstly, the 'cut-off' method described by Hunt and others (1982) was used. With the 'cut-off' method, the appropriate high rate was calculated by taking the arithmetic mean of the values between the maximum observed rate and one third of the maximum observed rate. In this report, the term 'high-rate group' is used to represent the individuals derived by the 'cut-off' method. The mean of the high-rate group was calculated for each aquatic food group and intertidal substrate identified in the survey.

Secondly, the 97.5th percentile rate was calculated for each group. The use of percentiles accords with precedents used in risk assessments of the safety of food consumption. It

should be noted that the interviewees in this study are often selected and, therefore, the calculated percentiles are not based on random data.

The results of the individuals' consumption and occupancy rates collected during the survey were grouped and presented in tables with the high-rate group members indicated in bold and with the calculated mean rates for the high-rate group and 97.5th percentile rates. The consumption rates and occupancy rates are presented with the high-rate group members indicated in bold text, for adults in Annex 1, for children in Annex 2, and for infants in Annex 3.

5. Internal exposure

Consumption data for aquatic foods are presented in Table 4 to Table 6 for adults and Table 7 for infants. No children were identified consuming aquatic foods. The tables include the mean consumption rates for the high-rate groups, calculated as described in Section 4.2, and the observed 97.5th percentile rates.

5.1. Crustaceans, molluscs and sea fish

The people consuming the greatest quantities of crustaceans, molluscs and sea fish from the aquatic survey area were commercial and hobby fishermen, anglers, and the families of these groups of people.

Table 2 presents a summary of the adults' consumption rates of crustaceans, molluscs, and sea fish for the 2024 Sellafield Review alongside the results from the 2023 Sellafield full survey for comparison. The table includes the mean consumption rates for the high-rate groups and the observed 97.5th percentile rates.

Table 2. Summary of the adults' consumption rates of foods from the Sellafield aquatic survey area in 2024 alongside the 2023 results for comparison

Food group	Number of observations		Number of individuals in the high-rate group		Observed maximum for the high-rate group (kg y^{-1})		Observed minimum for the high-rate group (kg y^{-1})		Observed mean for the high-rate group (kg y^{-1})		Observed 97.5th percentile (kg y^{-1})	
	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024
Crustaceans	32	17	9	7	24.6	27.6	8.4	13.2	15.4	22.1	24.6	27.6
Molluscs	10	2	4	2	3.3	0.2	1.5	0.2	2.4	0.2	3.3	0.2
Sea fish	67	23	10	6	50.9	60.9	17.7	26.0	31.0	42.4	39.3	60.9

Note

The Sellafield full survey undertaken in 2023 contains a larger number of individuals due to the increased length of survey dates (9 days) in comparison to the shorter 2024 Sellafield Review survey (4 days).

Data were recorded for the infant age group in the 2024 Sellafield Review with one infant eating sea fish (mackerel). No children were identified consuming sea fish, crustaceans or molluscs. No infants were identified consuming crustaceans or molluscs. In 2023, children were identified consuming sea fish and crustaceans, and infants were identified consuming sea fish.

5.1.1. Seafood species and seafood collection or catch locations identified in 2024

The species of crustaceans consumed by people in the adult high-rate group were brown crab, common lobster and Nephrops, which were caught offshore throughout the survey area.

The only species of molluscs consumed were razor shells which were collected at Coulderton.

The species of sea fish consumed by people in the adult high-rate group were bass, brill, cod, grey mullet, mackerel, plaice, pollack and thornback ray. The sea fish were caught throughout the survey area.

5.1.2. Changes in seafood consumption rates in 2024 compared with 2023

Reviews of shellfish and sea fish consumption, and intertidal occupancy, are conducted annually at Sellafield, except every fifth year when a full survey (encompassing aquatic, terrestrial and direct radiation pathways) is undertaken. Therefore, the number of interviewees in the full survey in 2023 is considerably higher when compared with the 2024 review survey.

Despite a decrease in the number of interviewees consuming crustaceans in 2024 compared with 2023, the maximum consumption rate and the mean rate for the high-rate group increased in 2024.

Over recent years the consumption of molluscs has been in steady decline. In 2024, only 2 individuals were identified consuming very small quantities of molluscs, which had decreased from 10 individuals identified in the 2023 full survey.

The number of interviewees consuming sea fish decreased in 2024 compared with 2023. However, commercial fishermen, hobby fishermen, anglers and their families were eating their catch, and the maximum consumption rate and the mean rate for the high-rate group increased in 2024. The high-rate sea fish consumer was a newly identified hobby fisherman in 2024.

5.2. Composition of the food groups for crustaceans, molluscs and sea fish, for use in dose assessments, and comparison with 2023 data

In the Sellafield Review reports prior to 2014, the adult high-rate crustacean food group comprised crabs, lobsters and Nephrops. Small quantities of brown shrimps and/or common prawns were consumed and for dose assessment purposes were included in the Nephrops group. From 2014 onwards, ‘Nephrops’ was replaced by ‘other crustaceans’ (a group including Nephrops, brown shrimps and common prawns) because brown shrimps represented a significant contribution to the consumption rates. The mollusc food group comprised winkles and ‘other molluscs’ and the sea fish group comprises cod and ‘other fish’.

The percentage composition for the predominant shellfish and sea fish species consumed by the adult high-rate groups from the 2024 Sellafield Review, rounded to the nearest 5% for use in dose assessments, are as follows:

- Crustaceans - 50% common lobster, 45% brown crab and 5% other crustaceans (Nephrops only) (mean consumption rate for the adult high-rate group, 22 kg y^{-1}).

(The Nephrops percentage has been rounded up to the nearest 5% to ensure this is assessed in RIFE-30 using a conservative approach).

- Molluscs – 100% other molluscs (razor shells only) (mean consumption rate for the adult high-rate group, 0.2 kg y^{-1}).
- Sea fish - 45% cod and 55% other sea fish species (mainly brill, bass, pollack and thornback ray, with smaller quantities of grey mullet, mackerel and plaice) (mean consumption rate for the adult high-rate group, 42 kg y^{-1}).

By comparison, the percentage composition for the predominant shellfish and sea fish species consumed by the adult high-rate groups from the 2023 Sellafield full survey, used in RIFE-29 (EA, FSA, FSS, NRW, NIEA and SEPA, 2024) for dose assessments, were:

- Crustaceans - 60% common lobster, 30% brown crab and 15% other crustaceans (Nephrops only) (mean consumption rate for the adult high-rate group, 15 kg y^{-1}) (rounded to the nearest 5% equals 105%).
- Molluscs – 95% winkles and 5% other molluscs (razor shells only) (mean consumption rate for the adult high-rate group, 2.4 kg y^{-1}).
- Sea fish - 25% cod and 75% other sea fish species (mainly bass, brill and thornback ray, with smaller quantities of Dover sole, flounder, herring, mackerel, plaice, pollack and sea trout) (mean consumption rate for the adult high-rate group, 31 kg y^{-1}).

In 2024, compared to 2023, the mean consumption rate for the adult high-rate group for crustaceans increased by 6.7 kg y^{-1}, the mean consumption rate for the adult high-rate group for sea fish increased by 11 kg y^{-1}, and the mean consumption rate for the adult high-rate group for molluscs decreased by 2.2 kg y^{-1}.

The main species of molluscs and sea fish within the respective high-rate groups differed between 2023 and 2024. The main species of crustaceans within the high-rate groups were common lobster, brown crab and Nephrops which remained the same in 2023 and 2024. For molluscs, the main species within the high-rate groups changed from winkles and razor shells in 2023, to only razor shells in 2024. For sea fish species, grey mullet was in the high-rate group in 2024 but not in in 2023, and Dover sole, flounder, herring and sea trout were in the high-rate group in 2023 but not in 2024.

For the percentage breakdown of species in 2024 compared with 2023, there were the following changes:

- Common lobster decreased from 60% in 2023 to 50% in 2024.
- Brown crab increased from 30% in 2023 to 45% in 2024.
- Other crustaceans (Nephrops) decreased from 15% in 2023 to 5% in 2024.
- Winkles were not consumed in 2024.
- Cod and brill increased, and thornback ray and bass decreased.

5.3. Consumption trends

The consumption rates for the adult high-rate groups for crustaceans and molluscs over the previous ten years (2014 - 2024) are shown in Figure 2 and Figure 3, respectively. These figures were plotted using the adult means for the high-rate groups distributed according to the percentage breakdowns as described in Section 5.2. The raw data are presented in Annex 5 and Annex 6.

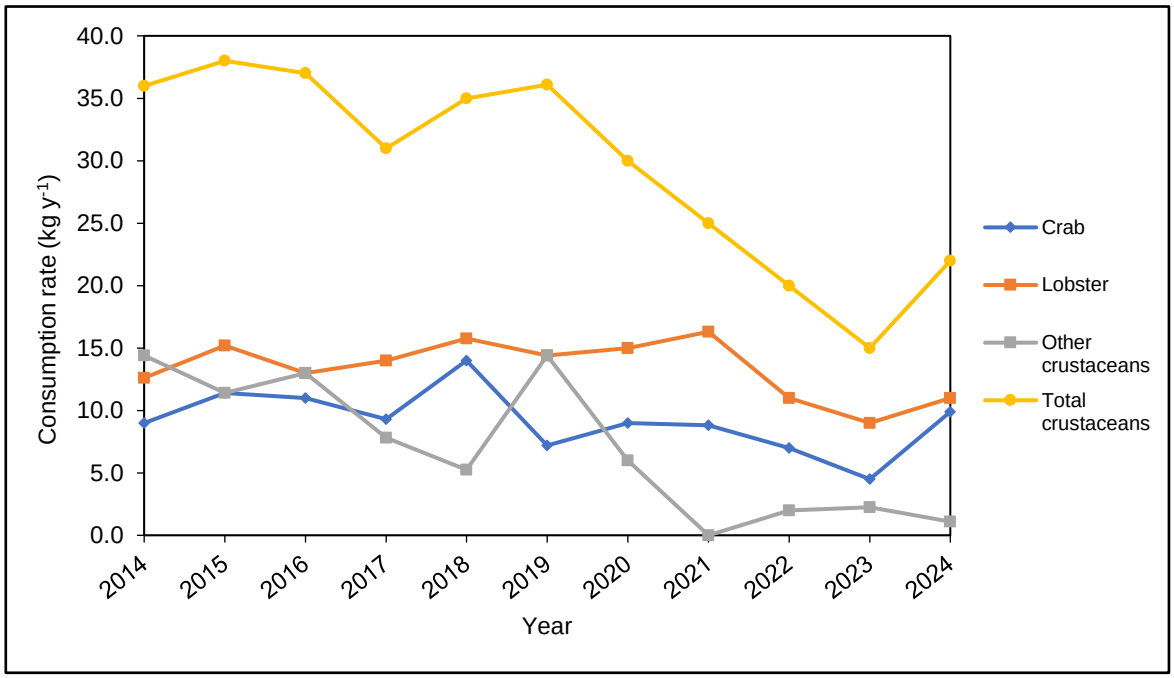

Figure 2. Consumption rates (kg y^{-1}) for the adult high-rate group for crustaceans, 2014 – 2024

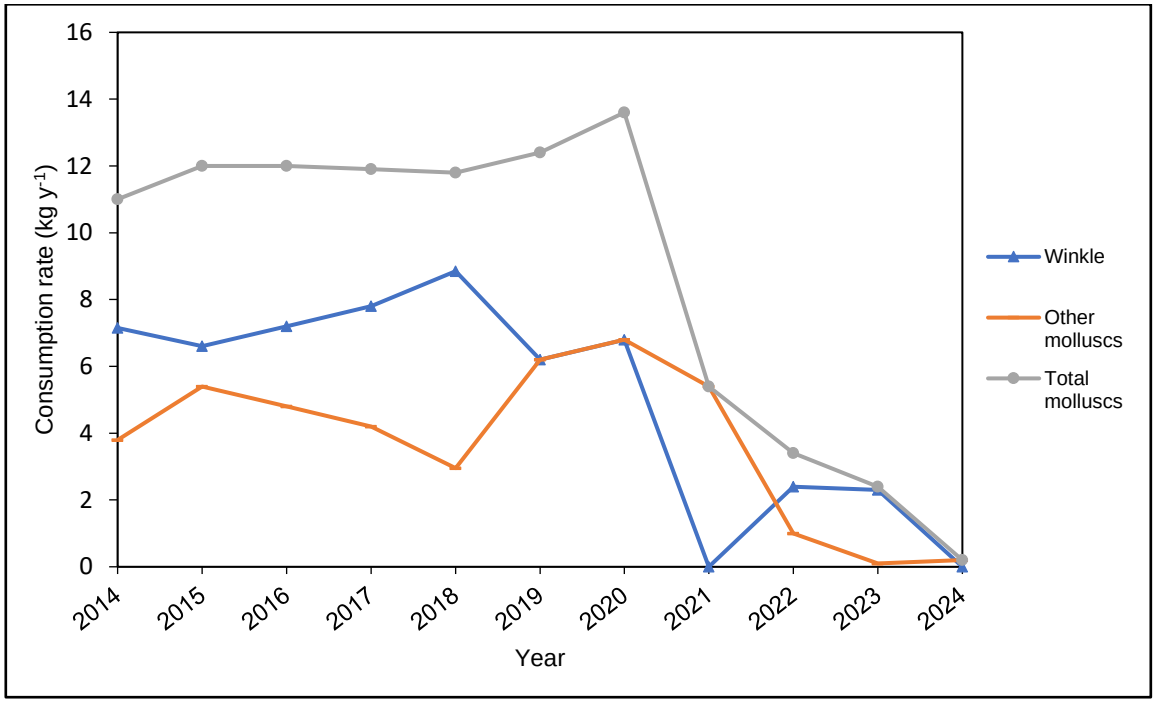

Figure 3. Consumption rates (kg y^{-1}) for the adult high-rate group for molluscs, 2014 – 2024

6. External exposure

Intertidal occupancy rates for adults are presented in Table 8 and intertidal occupancy rates for children and infants are presented in Table 9 and Table 10. It should be noted that there is often more than one substrate at one named location and that substrates at a given location are liable to change over time. Activities were assigned to the predominant substrate over which they were taking place. External exposure data are quoted as integer number of hours per year.

6.1. Intertidal occupancy

Table 3 presents a summary of the 2024 adults' intertidal occupancy rates in the Sellafield aquatic survey area, by substrate. The table includes the mean occupancy rates for the high-rate groups and the observed 97.5th percentile rates. The 2023 Sellafield full survey data are included for comparison. A comparison between the 2023 and 2024 mean rates of the high-rate groups for occupancy over each intertidal substrate is also shown in Figure 4.

Table 3. Summary of adults' intertidal occupancy rates for the 2024 Sellafield Review survey alongside the 2023 results for comparison

Intertidal substrate	Number of observations		Number of people in the high-rate group		Maximum of the high-rate group (h y^{-1})		Mean of the high-rate group (h y^{-1})		97.5th percentile (h y^{-1})	
	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024
Mud	5	1	2	1	131	4	131	4	131	Not applicable
Mud and sand	12	8	3	3	674	104	652	75	674	97
Mud, sand and stones	29	4	9	2	483	730	373	502	483	696
Rock	48	7	1	7	1239	1	1239	1	105	1
Salt marsh	9	7	5	2	546	546	437	546	546	546
Sand	198	46	29	11	1095	959	654	567	875	720
Sand and stones	91	28	14	11	1294	668	813	466	1125	668
Stones	5	4	1	2	313	313	313	313	291	313

The following activities were undertaken by people in the adult high-rate groups for occupancy over intertidal substrates in the 2024 Sellafield Review:

- For mud: wildfowling at Newbiggin.
- For mud and sand: bait digging and dog walking at Whitehaven Outer Harbour.
- For mud, sand and stones: dog walking in the Ravenglass Estuary.
- For rock: rescue duties at Fleswick.
- For salt marsh: tending livestock at Saltcoats.
- For sand: tending livestock at Drigg; angling, bait digging and setting nets between Whitehaven and Eskmeals; bait digging at Sellafield, Seascale, Drigg and Eskmeals; dog walking at St Bees, Drigg, Seascale and Sellafield.
- For sand and stones: dog walking at Parton and Seascale; dog walking, setting nets, playing, beachcombing and rock pooling at Coulderton.
- For stones: angling at Parton.

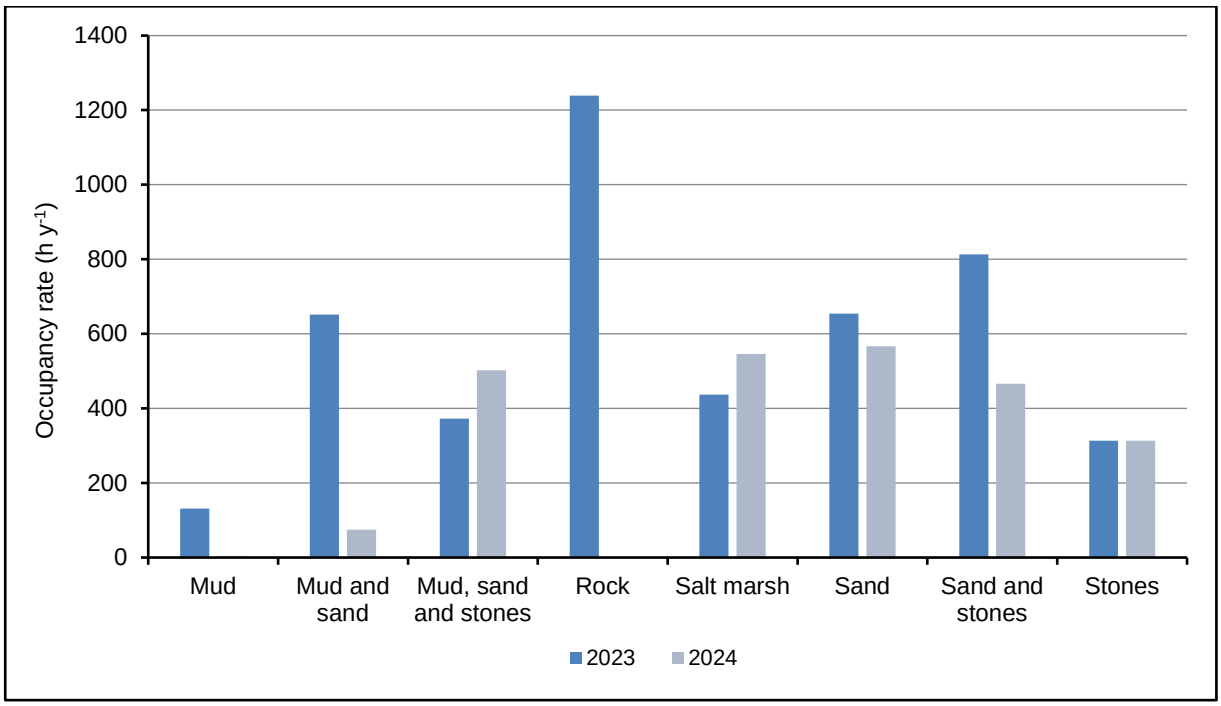

Figure 4. Comparison between the 2023 and 2024 mean rates of the high-rate groups for occupancy over each intertidal substrate

In 2024, compared with 2023, there were increases in the following mean intertidal occupancy rates for the high-rate groups (data rounded to two significant figures):

- For mud, sand and stones: from 370 h y^{-1} to 500 h y^{-1}
- For salt marsh: from 440 h y^{-1} to 550 h y^{-1}

The large increase in occupancy over mud, sand and stones was due to a newly identified individual who was dog walking at Ravenglass Estuary.

In 2024, compared with 2023, there were decreases in the following mean intertidal occupancy rates for the high-rate groups (data rounded to two significant figures):

- For mud: from 130 h y^{-1} to 4 h y^{-1}
- For mud and sand: from 650 h y^{-1} to 75 h y^{-1}
- For rock: from 1200 h y^{-1} to 1 h y^{-1}
- For sand: from 650 h y^{-1} to 570 h y^{-1}
- For sand and stones: 810 h y^{-1} to 470 h y^{-1}

The significant decrease in occupancy over mud was due to a wildfowler who had decreased the amount of time they spent wildfowling since the last survey due to old age. For the substrate mud and sand, in 2023, several dog walkers were spending large amounts of time at Whitehaven Outer Harbour, however, these people were not identified in 2024. There was a significant decrease in the occupancy over rock due to a keen angler that was identified in 2023 but not 2024. The significant decrease in occupancy over sand and stones was due to a high-rate dog walker identified in 2023 that was not identified in 2024.

Occupancy over stones was 310 h y^{-1} in both 2023 and 2024.

Intertidal occupancy data were recorded for both the child and infant age groups in both the 2023 Sellafield full survey and the 2024 Sellafield Review.

7. Use of habits data for dose assessments

7.1. Aquatic combinations for adults in the Sellafield area

Table 11 presents the consumption rates and occupancy rates for people who appear in at least one of the high-rate groups for sea fish, crustaceans, molluscs or intertidal substrates. The table shows that several individuals are members of multiple high-rate groups. For example, Person ID number 4377/1/1 is in the high-rate group for sea fish and crustacean consumption, and occupancy over mud and sand. This supports the continuation of assessing the dose to the representative person based on a combination of internal and external pathways. Therefore, the Radioactivity in Food and the Environment (RIFE) dose assessments for the ‘Cumbrian coastal community’ for 2024 will be based on combinations of consumption and intertidal occupancy pathways. The ‘Cumbrian coastal community’ are described as being potentially exposed to radioactivity resulting from both current and historical discharges from the Sellafield site, the Low Level Waste Repository near Drigg, and naturally occurring radioactivity discharged from the former phosphate processing works at Whitehaven, near Sellafield.

As in previous years, since several individuals were undertaking activities over multiple substrates, the occupancy rates over six substrates (mud; mud and sand; mud, sand and stones; sand; sand and stones; stones) have been combined into a single substrate called ‘mud and sand’. Rock and salt marsh are not included in the combined substrate since rock is not assessed and salt marsh is assessed separately. The mean rate for the high-rate group for the reclassified ‘mud and sand’ substrate is 570 h y^{-1}. For comparison,

the mean rate for the high-rate group for the reclassified ‘mud and sand’ substrate in 2023 was 980 h y^{-1}.

7.2. Habits data for source specific assessments

Annex 4, Annex 5, Annex 6, Annex 7 and Annex 8 show the historic consumption and occupancy rates, updated with the 2024 data, for use in source specific assessments for the RIFE reports. Annex 4, Annex 5, Annex 6 and Annex 7 show the data for use in single year assessments and Annex 8 shows the data for use in the 5-year average assessments. The consumption and occupancy data from these annexes, with the exception of Annex 8, are presented in Figure 5, Figure 6, Figure 7 and Figure 8 for sea fish, crustaceans, molluscs, and intertidal occupancy, respectively.

Prior to 2015, for Sellafield Reviews and full Sellafield habits surveys, the consumption rates of crustaceans and molluscs, and intertidal occupancy rates, were updated annually in these annexes using the Sellafield Review data or full survey data, as applicable. The sea fish consumption rates were only updated when a full habits survey was conducted. However, since 2015, the annexes have been updated with the consumption rates of sea fish from the current year’s survey, since the relative contribution to doses arising from sea fish consumption has increased. Handling rates of sediment and fishing gear are not obtained during Sellafield Reviews. Therefore, for assessments purposes, the mean handling rates for the high-rate groups for fishing gear and sediment will be retained from the 2023 full Sellafield habits survey.

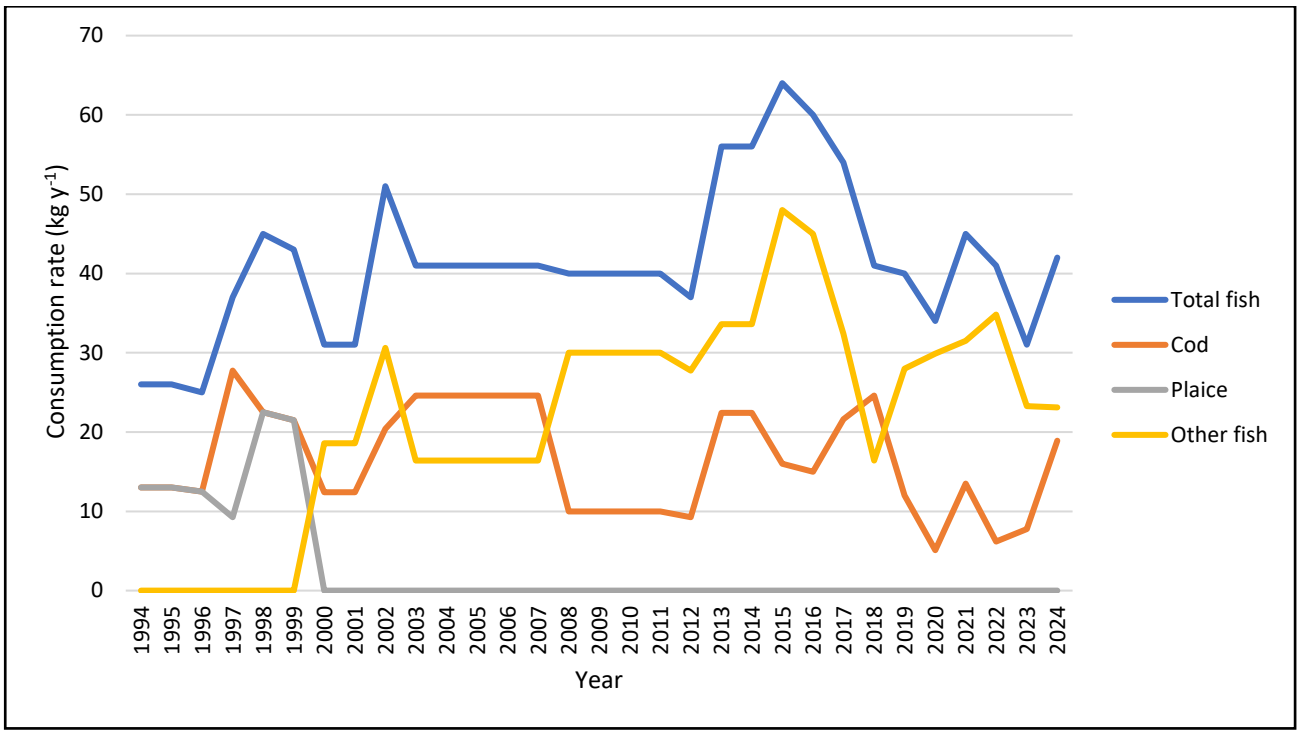

Figure 5. Consumption rates (kg y^{-1}) for the adult high-rate group for sea fish 1994 – 2024

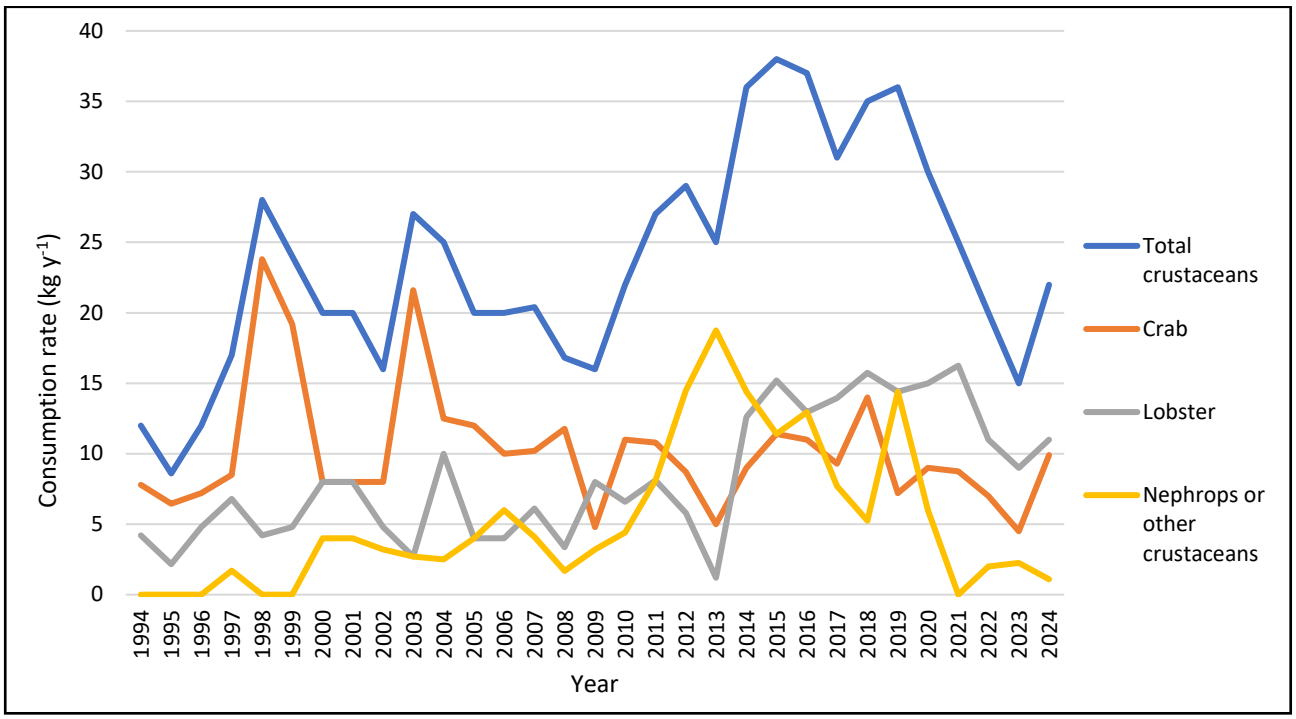

Figure 6. Consumption rates (kg y^{-1}) for the adult high-rate group for crustaceans 1994 – 2024

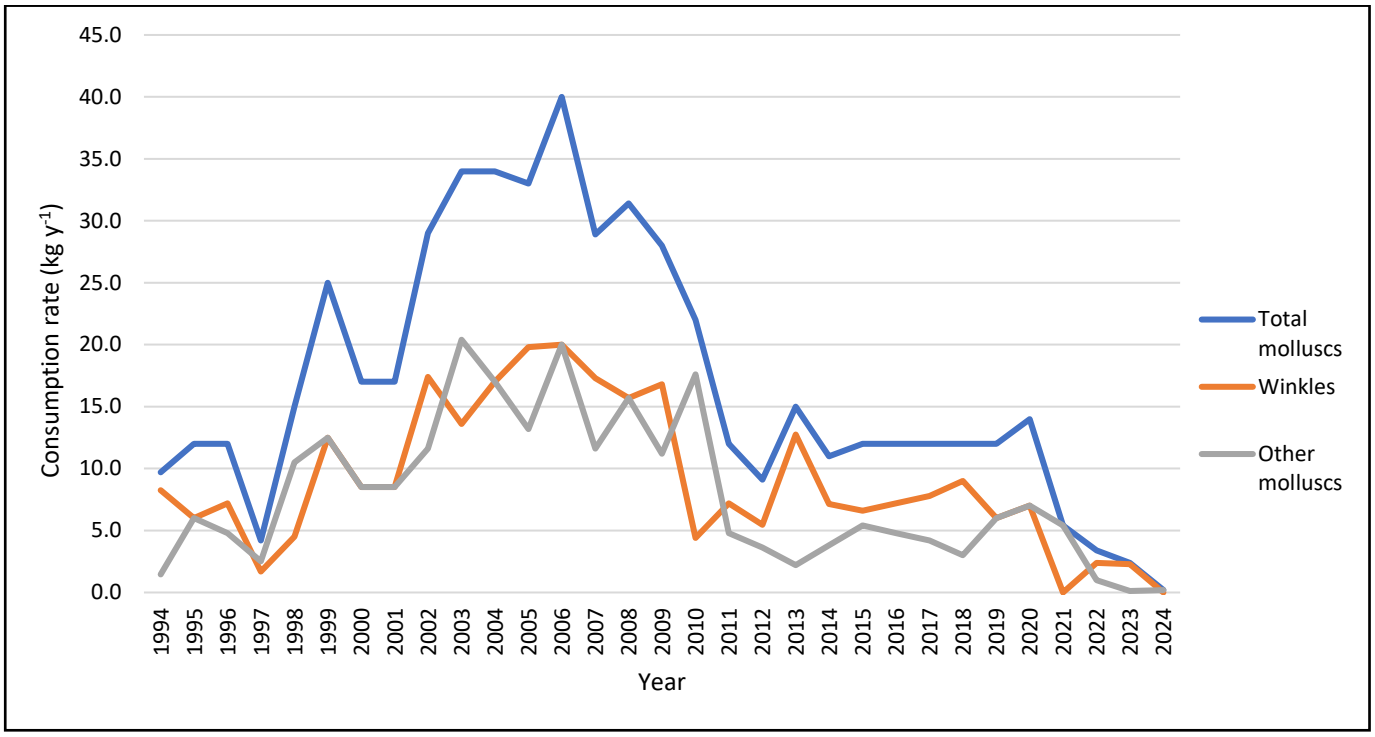

Figure 7. Consumption rates (kg y^{-1}) for the adult high-rate group for molluscs 1994 – 2024

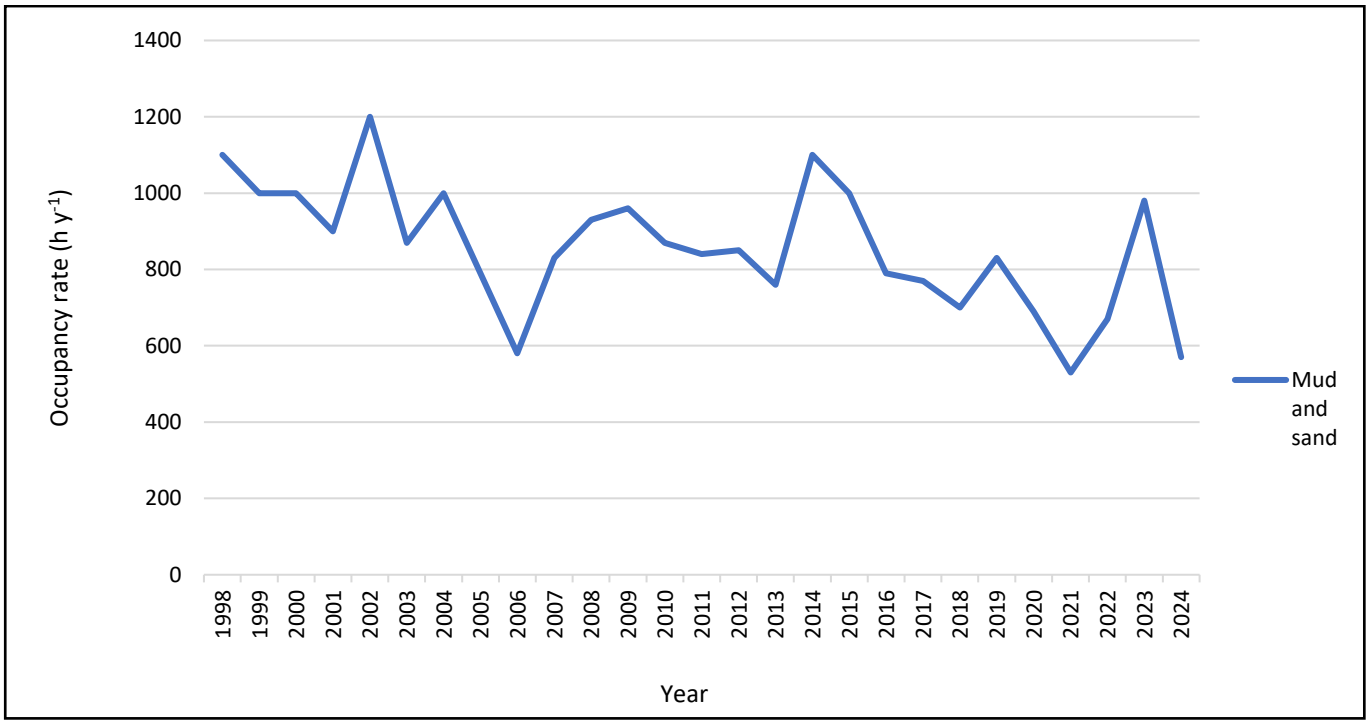

Figure 8. Intertidal occupancy rates (h y^{-1}) for a combined mud and sand substrate 1998 - 2024

7.3. Profiled habits data for total dose assessments

The matrix for the 2024 Sellafield adults' profiled habits data is presented in Annex 9. It is based on data from the 2023 Sellafield full habits survey (aquatic, terrestrial and direct radiation pathways), which has been updated with data from the 2024 annual Sellafield Review. All pathways and observations from the original 2023 profiled habits matrix were retained, and for the 2024 profile, only data asked about during the survey were updated; that is, intertidal occupancy and consumption of crustaceans, molluscs and sea fish. If data were collected for new interviewees, these were added as new observations, and if it was known that an individual who had been interviewed in the previous years had stopped their activity, then their data was deleted. Because the profiles have been created using the data from the 2023 and 2024 surveys, the profiled data shown in Annex 9 are not comparable with the data presented in Annex 1.

8. Summary and recommended data for use in RIFE-30 dose assessments

The survey investigated the consumption of shellfish and sea fish, and intertidal occupancy, relating to liquid discharges from the Sellafield nuclear site.

The proportion of crustacean species that were consumed in 2024 changed slightly compared with the last Sellafield habits survey undertaken in 2023, with a higher proportion of brown crab and a lower proportion of common lobster and Nephrops. Despite fewer individuals in the crustacean high-rate group in 2024, the maximum consumption rate and mean rate for the high-rate group increased. The steady decline in the consumption rate of molluscs since 2020 has continued to the lowest consumption rate since 1994. For the first time since 1994, the consumption of winkles was not identified. The maximum consumption rate of sea fish increased in 2024 due to a newly identified hobby fisherman. The percentage of cod consumed by the high-rate group increased in 2024 and was the highest since the 2018 full Sellafield survey.

The combined 'mud and sand' substrate occupancy rate had decreased significantly compared with the 2023 full Sellafield survey, but the rate was similar to the 2022 Sellafield Review survey.

The consumption and occupancy rates in this section are for adults and are presented to two significant figures. External exposure data are quoted as integer number of hours per year.

The mean rates for the adult high-rate groups from the 2024 Sellafield Review are as follows:

- Crustaceans 22 kg y^{-1}
- Molluscs 0.2 kg y^{-1}
- Sea fish 42 kg y^{-1}
- Occupancy over mud 4 h y^{-1}
- Occupancy over mud and sand 75 h y^{-1}
- Occupancy over mud, sand and stones 500 h y^{-1}
- Occupancy over rock 1 h y^{-1}
- Occupancy over salt marsh 550 h y^{-1}
- Occupancy over sand 570 h y^{-1}
- Occupancy over sand and stones 470 h y^{-1}
- Occupancy over stones 310 h y^{-1}

In 2024, compared to 2023, the mean consumption rate for the adult high-rate group for crustaceans increased by 6.7 kg y^{-1}, the mean consumption rate for the adult high-rate group for molluscs decreased by 2.2 kg y^{-1} and the mean consumption rate for the adult high-rate group for sea fish increased by 11 kg y^{-1}. For occupancy over intertidal substrates, the mean rates for the adult high-rate groups increased in 2024 compared to 2023 by the following: 130 h y^{-1} for mud, sand and stones; and 110 h y^{-1} for salt marsh; and decreased by 130 h y^{-1} for mud; by 580 h y^{-1} for mud and sand; by, by 1200 h y^{-1} for rock; by 87 h y^{-1} for sand; and by 350 h y^{-1} for sand and stones. In 2023 and 2024 the mean occupancy rate over stones remained the same.

The following recommendations for data to be used in RIFE-30 dose assessments are for the adult age group only. For the ‘Cumbrian coastal community’ dose assessment, the mean consumption rates for the adult high-rate groups and species breakdown are:

- Crustaceans 22 kg y^{-1}, comprising 50% common lobster, 45% brown crab and 5% other crustaceans (Nephrops only)
- Molluscs 2.4 kg y^{-1}, comprising 95% winkles and 5% other molluscs (razor shells)

Note: for molluscs, the 2023 data are recommended for use in RIFE-30, as a conservative approach, because winkle consumption was not identified in the 2024 survey, but it was identified in the more extensive 2023 survey.

- Sea fish 42 kg y^{-1}, comprising 45% cod and 55% other sea fish (mainly brill, bass, pollack and thornback ray, with smaller quantities of grey mullet, mackerel and plaice)

- Occupancy over an intertidal substrate termed ‘mud and sand’ (mud; mud and sand; mud, sand and stones; sand; sand and stones; and stones combined) 570 h y^{-1}

For the ‘Cumbrian coastal community 5-year average’ dose assessments:

- Crab 7.8 kg y^{-1}
- Lobster 13 kg y^{-1}
- Other crustaceans 2.3 kg y^{-1}
- Winkles 2.3 kg y^{-1}
- Other molluscs 2.7 kg y^{-1}
- Cod 10 kg y^{-1}
- Other fish 29 kg y^{-1}
- Occupancy over an intertidal substrate termed ‘mud and sand’ (mud; mud and sand; mud, sand and stones; sand; sand and stones; and stones combined) 690 h y^{-1}

For the ‘Fisherman’s Nets and Pots’ dose assessment:

- Handling fishing gear 1900 h y^{-1} (mean rate for the high-rate group retained from the 2023 Sellafield habits survey)

For the ‘Bait Digging and Mollusc Collection’ dose assessment:

- Handling sediment 620 h y^{-1} (mean rate for the high-rate group retained from the 2023 full Sellafield habits survey)

9. References

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Table 4. Adults' consumption rates of crustaceans from the 2024 Sellafield aquatic survey area (kg y^{-1})

Person ID number	Brown crab	Common lobster	Nephrops	Total
4396/1/1	**10.7**	**16.8**	**-**	**27.6**
4396/2/1	**10.7**	**16.8**	**-**	**27.6**
4396/3/1	**10.7**	**16.8**	**-**	**27.6**
4396/4/1	**10.7**	**16.8**	**-**	**27.6**
4377/1/1	**17.9**	**-**	**-**	**17.9**
4395/1/1	**6.2**	**6.5**	**0.4**	**13.2**
4395/2/1	**6.2**	**6.5**	**0.4**	**13.2**
4397/1/1	-	-	7.6	7.6
4397/2/1	-	-	7.6	7.6
4397/3/1	-	-	7.6	7.6
4742/2/1	-	5.2	-	5.2
4455/1/1	1.4	2.2	-	3.5[a]
4742/1/1	3.3	-	-	3.3
4741/1/1	0.6	0.3	-	0.9
4741/2/1	0.6	0.3	-	0.9
4732/1/1	0.4	-	0.1	0.6
4732/2/1	0.4	-	0.1	0.6

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans for adults based on the 7 high-rate consumers is 22.1 kg y^{-1}

The observed 97.5th percentile rate based on 17 observations is 27.6 kg y^{-1}

[a] The total value appears less than the sum of the two columns due to the rounding of the values to one decimal place.

Table 5. Adults' consumption rates of molluscs from the 2024 Sellafield aquatic survey area (kg y^{-1})

Person ID number	Razor shell
4741/1/1	**0.2**
4741/2/1	**0.2**

Notes

Emboldened observation are the high-rate consumers

The mean consumption rate of molluscs for adults based on the 2 high-rate consumers is 0.2 kg y^{-1}

The observed 97.5th percentile rate based on 2 observations is 0.2 kg y^{-1}

Table 6. Adults' consumption rates of sea fish from the 2024 Sellafield aquatic survey area (kg y^{-1})

Person ID number	Bass	Brill	Cod	Grey mullet	Haddock	Lesser spotted dogfish	Mackerel	Plaice	Pollack	Thornback ray	Whiting	Total
4741/1/1	**12.8**	**-**	**33.7**	**-**	**-**	**-**	**1.4**	**0.5**	**8.5**	**4.0**	**-**	**60.9**
4741/2/1	**12.8**	**-**	**33.7**	**-**	**-**	**-**	**1.4**	**0.5**	**8.5**	**4.0**	**-**	**60.9**
4397/1/1	**-**	**32.3**	**7.8**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**40.1**
4397/2/1	**-**	**32.3**	**7.8**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**40.1**
4742/1/1	**3.8**	**-**	**13.5**	**2.9**	**-**	**-**	**-**	**-**	**3.2**	**2.7**	**-**	**26.0**
4742/2/1	**3.8**	**-**	**13.5**	**2.9**	**-**	**-**	**-**	**-**	**3.2**	**2.7**	**-**	**26.0**
4395/1/1	-	-	8.0	-	-	-	-	1.8	-	8.0	-	17.7
4395/2/1	-	-	8.0	-	-	-	-	1.8	-	8.0	-	17.7
4377/1/1	5.4	-	-	-	-	-	-	5.4	-	5.4	-	16.2
4375/2/1	-	-	-	-	-	4.8	7.2	-	-	-	2.4	14.4
4741/3/1	-	-	7.4	-	-	-	-	-	1.9	0.9	-	10.2
4732/1/1	-	-	-	-	8.2	-	-	-	-	1.8	-	10.0
4732/2/1	-	-	-	-	8.2	-	-	-	-	1.8	-	10.0
4397/3/1	-	-	7.8	-	-	-	-	-	-	-	-	7.8
4394/1/1	-	-	0.3	-	-	-	-	5.7	-	-	-	5.9
4394/2/1	-	-	0.3	-	-	-	-	5.7	-	-	-	5.9
4733/1/1	-	-	2.7	-	-	-	-	0.9	-	-	-	3.6
4733/2/1	-	-	2.7	-	-	-	-	0.9	-	-	-	3.6
47381/1	-	-	-	-	-	-	2.5	-	-	-	-	2.5
4738/2/1	-	-	-	-	-	-	2.5	-	-	-	-	2.5
4738/3/1	-	-	-	-	-	-	2.5	-	-	-	-	2.5

Person ID number	Bass	Brill	Cod	Grey mullet	Haddock	Lesser spotted dogfish	Mackerel	Plaice	Pollack	Thornback ray	Whiting	Total
4738/4/1	-	-	-	-	-	-	2.5	-	-	-	-	2.5
4738/5/1	-	-	-	-	-	-	2.5	-	-	-	-	2.5

Notes

Emboldened observations are the high-rate consumers
The mean consumption rate of sea fish for adults based on the 6 high-rate consumers is 42.4 kg y^{-1}
The observed 97.5th percentile rate based on 23 observations is 60.9 kg y^{-1}

Table 7. Infants' consumption rates of sea fish from the 2024 Sellafield aquatic survey area (kg y^{-1})

Person ID number	Mackerel
4401/6/1	**1.2**

Notes

The emboldened observation is the high-rate consumer
The mean consumption rate of sea fish for the infant age group based on the only high-rate consumer is 1.2 kg y^{-1}
The observed 97.5th percentile is not applicable for one observation

Table 8. Adults' intertidal occupancy rates in the 2024 Sellafield aquatic survey area (h y^{-1})

Person ID number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
4398/1/1	**Newbiggin**	**Wildfowling**	**4**	-	-	-	-	-	-	-
			-	-	-	-	4	-	-	-
	Seascale	Dog walking	-	-	-	-	-	156	-	-
4377/1/1	**Whitehaven Outer Harbour**	**Bait digging**	-	**104**	-	-	-	-	-	-
	Seascale and Drigg	Angling	-	-	-	-	-	24	-	-
	Parton		-	-	-	-	-	-	-	12
4376/1/1	**Whitehaven Outer Harbour**	**Dog walking**	-	**61**	-	-	-	-	-	-
	Whitehaven North Beach		-	-	-	-	-	-	61	-
4376/2/1	**Whitehaven Outer Harbour**	**Dog walking**	-	**61**	-	-	-	-	-	-
	Whitehaven North Beach		-	-	-	-	-	-	61	-
4741/1/1	Whitehaven Outer Harbour	Bait digging and collecting seaweed	-	28	-	-	-	-	-	-
	Sellafield and Braystones	Angling	-	-	-	-	-	91	-	-
	Drigg and Coulderton		-	-	-	-	-	-	-	60
4380/1/1	Whitehaven Outer Harbour	Dog walking	-	13	-	-	-	-	-	-
	Parton		-	-	-	-	-	-	130	-
4391/1/1	Whitehaven Outer Harbour	Dog walking	-	13	-	-	-	-	-	-
	Parton		-	-	-	-	-	-	13	-

Person ID number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
4382/1/1	Whitehaven Outer Harbour	Dog walking	-	12	-	-	-	-	-	-
	Whitehaven North Beach		-	-	-	-	-	-	12	-
4382/2/1	Whitehaven Outer Harbour	Dog walking	-	12	-	-	-	-	-	-
	Whitehaven North Beach		-	-	-	-	-	-	12	-
4373/1/1	**Ravenglass Estuary**	**Dog walking**	-	-	**730**	-	-	-	-	-
4373/2/1	Ravenglass Estuary	Dog walking	-	-	274	-	-	-	-	-
4378/1/1	Ravenglass Estuary	**Dog walking**	-	-	36	-	-	-	-	-
	St Bees and Seascale		-	-	-	-	-	72	-	-
	Parton		-	-	-	-	-	-	**620**	-
4378/2/1	Ravenglass Estuary	**Dog walking**	-	-	36	-	-	-	-	-
	St Bees and Seascale		-	-	-	-	-	72	-	-
	Parton		-	-	-	-	-	-	**620**	-
4404/3/1	**Fleswick**	**Rescue duties**	-	-	-	**1**	-	-	-	-
	St Bees	Rescue duties	-	-	-	-	-	12	-	-
4404/3/2	**Fleswick**	**Rescue duties**	-	-	-	**1**	-	-	-	-
	St Bees	Rescue duties	-	-	-	-	-	12	-	-
4404/4/1	**Fleswick**	**Rescue duties**	-	-	-	**1**	-	-	-	-
	St Bees	Rescue duties	-	-	-	-	-	12	-	-
4404/4/2	**Fleswick**	**Rescue duties**	-	-	-	**1**	-	-	-	-
	St Bees	Rescue duties	-	-	-	-	-	12	-	-
4404/4/3	**Fleswick**	**Rescue duties**	-	-	-	**1**	-	-	-	-
	St Bees	Rescue duties	-	-	-	-	-	12	-	-
4404/4/4	**Fleswick**	**Rescue duties**	-	-	-	**1**	-	-	-	-
	St Bees	Rescue duties	-	-	-	-	-	12	-	-

Person ID number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
4404/4/5	**Fleswick**	**Rescue duties**	-	-	-	**1**	-	-	-	-
	St Bees	Rescue duties	-	-	-	-	-	12	-	-
4738/1/1	**Saltcoats**	**Tending livestock**	-	-	-	-	**546**	-	-	-
4738/5/1	**Saltcoats**	**Tending livestock**	-	-	-	-	**546**	-	-	-
4396/1/1	Ravenglass Estuary	Wildfowling	-	-	-	-	153	-	-	-
4396/3/1	Ravenglass Estuary	Wildfowling	-	-	-	-	153	-	-	-
4399/1/1	River Irt	Tending livestock	-	-	-	-	52	-	-	-
	Drigg	**Tending livestock**	-	-	-	-	-	**410**	-	-
4399/2/1	River Irt	Tending livestock	-	-	-	-	52	-	-	-
	Drigg	**Tending livestock**	-	-	-	-	-	**410**	-	-
4735/1/1	**Between Whitehaven and Eskmeals**	**Angling, bait digging and setting nets**	-	-	-	-	-	**959**	-	-
4735/2/1	**Sellafield, Seascale, Drigg and Eskmeals**	**Bait digging**	-	-	-	-	-	**720**	-	-
4735/3/1	**Sellafield, Seascale, Drigg and Eskmeals**	**Bait digging**	-	-	-	-	-	**720**	-	-
4735/4/1	**Sellafield, Seascale, Drigg and Eskmeals**	**Bait digging**	-	-	-	-	-	**720**	-	-
4735/5/1	**Sellafield, Seascale, Drigg and Eskmeals**	**Bait digging**	-	-	-	-	-	**720**	-	-
4390/1/1	**St Bees**	**Dog walking**	-	-	-	-	-	**424**	-	-
4390/2/1	**St Bees**	**Dog walking**	-	-	-	-	-	**424**	-	-
4366/1/1	**Sellafield, Seascale and Drigg**	**Dog walking**	-	-	-	-	-	**365**	-	-

Person ID number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
4396/2/1	**Sellafield, Seascale and Drigg**	**Dog walking**	-	-	-	-	-	**365**	-	-
4371/1/1	Seascale	Dog walking	-	-	-	-	-	243	-	-
4368/1/1	Drigg	Horse riding	-	-	-	-	-	195	-	-
4368/2/1	Drigg	Horse riding	-	-	-	-	-	195	-	-
4389/3/1	St Bees	Dog walking	-	-	-	-	-	156	-	-
4398/2/1	Seascale	Dog walking	-	-	-	-	-	156	-	-
4372/1/1	Seascale and Drigg	Dog walking	-	-	-	-	-	130	-	-
4369/1/1	Seascale	Dog walking	-	-	-	-	-	117	-	-
4365/1/1	Drigg	Dog walking	-	-	-	-	-	104	-	-
4365/2/1	Drigg	Dog walking	-	-	-	-	-	104	-	-
4389/1/1	St Bees	Playing	-	-	-	-	-	15	-	-
4389/1/1	St Bees	Playing	-	-	-	-	-	65	-	-
4388/1/1	St Bees	Walking	-	-	-	-	-	78	-	-
4374/1/1	Tarn Bay	Litter collecting	-	-	-	-	-	52	-	-
4369/2/1	Seascale	Dog walking	-	-	-	-	-	39	-	-
4742/1/1	Drigg	Angling	-	-	-	-	-	36	-	-
	Coulderton	**Dog walking and setting nets**	-	-	-	-	-	-	**565**	-
4379/1/1	St Bees	Walking	-	-	-	-	-	26	-	-
	Parton		-	-	-	-	-	-	52	-
4743/1/1	St Bees and Seascale	Walking	-	-	-	-	-	24	-	-
	Coulderton	**Playing and rock pooling**	**-**	**-**	**-**	**-**	**-**	**-**	**295**	-

Person ID number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
4743/2/1	St Bees and Seascale	Walking	-	-	-	-	-	24	-	-
	Coulderton	**Playing and rock pooling**	**-**	**-**	**-**	**-**	**-**	**-**	**295**	-
4374/2/1	Tarn Bay	Litter collecting	-	-	-	-	-	24	-	-
4374/3/1	Tarn Bay	Litter collecting	-	-	-	-	-	24	-	-
4393/1/1	Drigg and St Bees	Dog walking	-	-	-	-	-	5	-	-
	Parton and Whitehaven North Beach		-	-	-	-	-	-	6	-
4393/2/1	Drigg and St Bees	Dog walking	-	-	-	-	-	5	-	-
	Parton and Whitehaven North Beach		-	-	-	-	-	-	6	-
4367/1/1	Tarn Bay	Bait digging	-	-	-	-	-	2	-	-
4381/1/1	**Parton and Seascale**	**Dog walking**	-	-	-	-	-	-	**668**	-
4381/2/1	**Parton and Seascale**	**Dog walking**	-	-	-	-	-	-	**668**	-
4733/1/1	**Coulderton**	**Dog walking**	-	-	-	-	-	-	**365**	-
4733/2/1	**Coulderton**	**Beachcombing**	-	-	-	-	-	-	**365**	-
4737/1/1	**Parton**	**Dog walking**	-	-	-	-	-	-	**365**	-
4743/7/1	**Coulderton**	**Playing and rock pooling**	-	-	-	-	-	-	**295**	-
4384/1/1	Braystones	Dog walking	-	-	-	-	-	-	182	-
4742/2/1	Coulderton	Dog walking	-	-	-	-	-	-	182	-
4383/1/1	Parton	Beachcombing	-	-	-	-	-	-	98	-
4737/2/1	Parton	Dog walking	-	-	-	-	-	-	26	-
4737/3/1	Parton	Dog walking	-	-	-	-	-	-	26	-
4379/3/1	Parton	Walking	-	-	-	-	-	-	13	-
4733/5/1	Coulderton	Angling and playing	-	-	-	-	-	-	12	-

Person ID number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
4733/6/1	Coulderton	Playing	-	-	-	-	-	-	4	-
4375/1/1	**Parton**	**Angling**	-	-	-	-	-	-	-	**313**
4375/2/1	**Parton**	**Angling**	-	-	-	-	-	-	-	**313**

Notes

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud for adults based on 1 high-rate observation is 4 h y^{-1}

The observed 97.5th percentile is not applicable for 1 observation

The mean intertidal occupancy rate over mud and sand for adults based on 3 high-rate observations is 75 h y^{-1}

The observed 97.5th percentile rate based on 8 observations is 97 h y^{-1}

The mean intertidal occupancy rate over mud, sand and stones for adults based on 2 high-rate observations is 502 h y^{-1}

The observed 97.5th percentile rate based on 4 observations is 696 h y^{-1}

The mean intertidal occupancy rate over rock for adults based on 7 high-rate observations is 1 h y^{-1}

The observed 97.5th percentile rate based on 7 observations is 1 h y^{-1}

The mean intertidal occupancy rate over salt marsh for adults based on 2 high-rate observations is 546 h y^{-1}

The observed 97.5th percentile rate based on 7 observations is 546 h y^{-1}

The mean intertidal occupancy rate over sand for adults based on 11 high-rate observations is 567 h y^{-1}

The observed 97.5th percentile rate based on 46 observations is 720 h y^{-1}

The mean intertidal occupancy rate over sand and stones for adults based on 11 high-rate observations is 466 h y^{-1}

The observed 97.5th percentile rate based on 28 observations is 668 h y^{-1}

The mean intertidal occupancy rate over stones for adults based on 2 high-rate observations is 313 h y^{-1}

The observed 97.5th percentile rate based on 4 observations is 313 h y^{-1}

Table 9. Children's' intertidal occupancy rates in the 2024 Sellafield aquatic survey area (h y^{-1})

Person ID number	Location	Activity	Sand	Sand and stones
4379/4/1	**St Bees**	**Walking**	**7**	-
	Parton		-	20
4743/3/1	**Coulderton**	**Playing and rock pooling**	**-**	**295**
4743/4/1	**Coulderton**	**Playing and rock pooling**	**-**	**295**
4743/5/1	**Coulderton**	**Playing and rock pooling**	**-**	**295**
4743/6/1	**Coulderton**	**Playing and rock pooling**	**-**	**295**
4733/3/1	Coulderton	Playing	-	4
4733/4/1	Coulderton	Playing	-	4

Notes

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over sand for the child age group based on 1 high-rate observation is 7 h y^{-1}

The observed 97.5th percentile is not applicable for 1 observation

The mean intertidal occupancy rate over sand and stones for the child age group based on 4 high-rate observations is 295 h y^{-1}

The observed 97.5th percentile rate based on 7 observations is 295 h y^{-1}

Table 10. Infants' intertidal occupancy rates in the 2024 Sellafield aquatic survey area (h y^{-1})

Person ID number	Location	Activity	Mud and sand	Sand	Sand and stones
4391/2/1	**Whitehaven Outer Harbour**	**Dog walking**	**13**	-	-
	Parton		-	-	13
4389/2/1	**St Bees**	**Playing**	**-**	**80**	-
4379/2/1	St Bees	**Walking**	-	26	-
	Parton		-	-	**52**

Notes

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud and sand for the infant age group based on the only high-rate observation is 13 h y^{-1}

The observed 97.5th percentile is not applicable for 1 observation

The mean intertidal occupancy rate over sand for the infant age group based on the only high-rate observation is 80 h y^{-1}

The observed 97.5th percentile rate based on 2 observations is 51 h y^{-1}

The mean intertidal occupancy rate over sand and stones for the infant age group based on the only high-rate observation is 52 h y^{-1}

The observed 97.5th percentile rate based on 2 observations is 51 h y^{-1}

Table 11. Aquatic combinations for adults in the 2024 Sellafield aquatic survey area

Person ID number	Consumption rates (kg y^{-1})			Intertidal occupancy rates (h y^{-1})					
	Sea fish	Crustaceans	Molluscs	Mud	Mud and sand	Mud, sand and stones	Sand	Sand and stones	Stones
4376/1/1	-	-	-	-	-	61	-	-	61
4377/1/1	**16.2**	**17.9**	-	-	**104**	-	24	-	12
4378/1/1	-	-	-	-	-	36	72	**620**	-
4398/1/1	-	-	-	**4**	-	-	156	-	-
4733/2/1	3.6	-	-	-	-	-	-	**365**	-
4741/1/1	60.9	0.9	**0.2**	-	28	-	91	-	61
4742/1/1	**26.0**	3.3	-	-	-	-	36	**565**	-

Notes

Values in high-rate groups are emboldened

Annex 1. Adults' consumption rates (kg y^{-1}) and occupancy rates (h y^{-1}) in the 2024 Sellafield aquatic area

Person ID number	Sea fish	Crustaceans	Molluscs	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones
4365/1/1	-	-	-	-	-	-	-	-	104	-	-
4365/2/1	-	-	-	-	-	-	-	-	104	-	-
4366/1/1	-	-	-	-	-	-	-	-	**365**	-	-
4367/1/1	-	-	-	-	-	-	-	-	2	-	-
4368/1/1	-	-	-	-	-	-	-	-	196	-	-
4368/2/1	-	-	-	-	-	-	-	-	196	-	-
4369/1/1	-	-	-	-	-	-	-	-	117	-	-
4369/2/1	-	-	-	-	-	-	-	-	39	-	-
4371/1/1	-	-	-	-	-	-	-	-	243	-	-
4372/1/1	-	-	-	-	-	-	-	-	130	-	-
4373/1/1	-	-	-	-	-	**730**	-	-	-	-	-
4373/2/1	-	-	-	-	-	**274**	-	-	-	-	-
4374/1/1	-	-	-	-	-	-	-	-	52	-	-
4374/2/1	-	-	-	-	-	-	-	-	24	-	-
4374/3/1	-	-	-	-	-	-	-	-	24	-	-
4375/1/1	-	-	-	-	-	-	-	-	-	-	**313**
4375/2/1	**14.4**	-	-	-	-	-	-	-	-	-	**313**
4376/1/1	-	-	-	-	**61**	-	-	-	-	61	-
4376/2/1	-	-	-	-	**61**	-	-	-	-	61	-
4377/1/1	**16.2**	**17.9**	-	-	**104**	-	-	-	24	-	12
4378/1/1	-	-	-	-	-	36	-	-	72	**620**	-
4378/2/1	-	-	-	-	-	36	-	-	72	**620**	-
4379/1/1	-	-	-	-	-	-	-	-	26	52	-
4379/3/1	-	-	-	-	-	-	-	-	-	13	-
4380/1/1	-	-	-	-	13	-	-	-	-	130	-
4381/1/1	-	-	-	-	-	-	-	-	-	**668**	-
4381/2/1	-	-	-	-	-	-	-	-	-	**668**	-
4382/1/1	-	-	-	-	12	-	-	-	-	12	-

Person ID number	Sea fish	Crustaceans	Molluscs	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones
4382/2/1	-	-	-	-	12	-	-	-	-	12	-
4383/1/1	-	-	-	-	-	-	-	-	-	98	-
4384/1/1	-	-	-	-	-	-	-	-	-	182	-
4388/1/1	-	-	-	-	-	-	-	-	78	-	-
4389/1/1	-	-	-	-	-	-	-	-	80	-	-
4389/3/1	-	-	-	-	-	-	-	-	156	-	-
4390/1/1	-	-	-	-	-	-	-	-	**424**	-	-
4390/2/1	-	-	-	-	-	-	-	-	**424**	-	-
4391/1/1	-	-	-	-	13	-	-	-	-	13	-
4393/1/1	-	-	-	-	-	-	-	-	5	6	-
4393/2/1	-	-	-	-	-	-	-	-	5	6	-
4394/1/1	5.9	-	-	-	-	-	-	-	-	-	-
4394/2/1	5.9	-	-	-	-	-	-	-	-	-	-
4395/1/1	**17.7**	**13.2**	-	-	-	-	-	-	-	-	-
4395/2/1	**17.7**	**13.2**	-	-	-	-	-	-	-	-	-
4396/1/1	-	**27.6**	-	-	-	-	-	**153**	-	-	-
4396/2/1	-	**27.6**	-	-	-	-	-	-	**365**	-	-
4396/3/1	-	**27.6**	-	-	-	-	-	**153**	-	-	-
4396/4/1	-	**27.6**	-	-	-	-	-	-	-	-	-
4397/1/1	**40.1**	7.6	-	-	-	-	-	-	-	-	-
4397/2/1	**40.1**	7.6	-	-	-	-	-	-	-	-	-
4397/3/1	7.8	7.6	-	-	-	-	-	-	-	-	-
4398/1/1	-	-	-	**4**	-	-	-	4	156	-	-
4398/2/1	-	-	-	-	-	-	-	-	156	-	-
4399/1/1	-	-	-	-	-	-	-	**52**	**410**	-	-
4399/2/1	-	-	-	-	-	-	-	**52**	**410**	-	-
4404/3/1	-	-	-	-	-	-	**1**	-	12	-	-
4404/3/2	-	-	-	-	-	-	**1**	-	12	-	-
4404/4/1	-	-	-	-	-	-	**1**	-	12	-	-
4404/4/2	-	-	-	-	-	-	**1**	-	12	-	-
4404/4/3	-	-	-	-	-	-	**1**	-	12	-	-
4404/4/4	-	-	-	-	-	-	**1**	-	12	-	-

Person ID number	Sea fish	Crustaceans	Molluscs	Intertidal occupancy over mud	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over rock	Intertidal occupancy over salt marsh	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Intertidal occupancy over stones
4404/4/5	-	-	-	-	-	-	**1**	-	12	-	-
4733/1/1	3.6	-	-	-	-	-	-	-	-	**365**	-
4733/2/1	3.6	-	-	-	-	-	-	-	-	**365**	-
4733/5/1	-	-	-	-	-	-	-	-	-	12	-
4733/6/1	-	-	-	-	-	-	-	-	-	4	-
4735/1/1	-	3.5	-	-	-	-	-	-	**959**	-	-
4735/2/1	-	-	-	-	-	-	-	-	**720**	-	-
4735/3/1	-	-	-	-	-	-	-	-	**720**	-	-
4735/4/1	-	-	-	-	-	-	-	-	**720**	-	-
4735/5/1	-	-	-	-	-	-	-	-	**720**	-	-
4737/1/1	-	-	-	-	-	-	-	-	-	**365**	-
4737/2/1	-	-	-	-	-	-	-	-	-	26	-
4737/3/1	-	-	-	-	-	-	-	-	-	26	-
4738/1/1	2.5	-	-	-	-	-	-	**546**	-	-	-
4738/2/1	2.5	-	-	-	-	-	-	-	-	-	-
4738/3/1	2.5	-	-	-	-	-	-	-	-	-	-
4738/4/1	2.5	-	-	-	-	-	-	-	-	-	-
4738/5/1	2.5	-	-	-	-	-	-	**546**	-	-	-
4741/1/1	**60.9**	0.9	**0.2**	-	28	-	-	-	91	-	61
4741/2/1	**60.9**	0.9	**0.2**	-	-	-	-	-	-	-	-
4741/3/1	10.2	-	-	-	-	-	-	-	-	-	-
4742/1/1	**26.0**	3.3	-	-	-	-	-	-	36	**565**	-
4742/2/1	**26.0**	5.2	-	-	-	-	-	-	-	182	-
4743/1/1	10.0	0.6	-	-	-	-	-	-	24	**295**	-
4743/2/1	10.0	0.6	-	-	-	-	-	-	24	**295**	-
4743/7/1	-	-	-	-	-	-	-	-	-	**295**	-

Notes

U = Unknown

Emboldened observations are the high-rate individuals

Annex 2. Children's consumption rates (kg y^{-1}) and occupancy rates (h y^{-1}) in the 2024 Sellafield aquatic area

Person ID number	Intertidal occupancy over sand	Intertidal occupancy over sand and stones
4379/4/1	**7**	20
4733/3/1	-	4
4733/4/1	-	4
4743/3/1	-	**295**
4743/4/1	-	**295**
4743/5/1	-	**295**
4743/6/1	-	**295**

Notes
Emboldened observations are the high-rate individuals

Annex 3. Infants' consumption rates (kg y^{-1}) and occupancy rates (h y^{-1}) in the 2024 Sellafield aquatic area

Person ID number	Fish	Intertidal occupancy over mud and sand	Intertidal occupancy over sand	Intertidal occupancy over sand and stones
4379/2/1	-	-	26	**52**
4389/2/1	-	-	**80**	-
4391/2/1	-	**13**	-	13
4738/6/1	**1.2**	-	-	-

Notes
Emboldened observations are the high-rate individuals

Annex 4. Cumbrian Coastal Community fish consumption data reported in the Aquatic and Environmental Monitoring Report (AEMR) and RIFE reports (kg y^{-1})

Year (report)	SEA FISH					
	Species Composition	Total	Cod	Plaice	Other fish	Source of habits data
1994 (AEMR 45)	Plaice and Cod (50%:50%)	26	13.0	13.0	0	1993/94 Survey
1995 (RIFE 1)	Plaice and Cod (50%:50%)	26	13.0	13.0	0	1995 Review (crust and moll) and 1993/4 survey (fish)
1996 (RIFE 2)	Plaice and Cod (50%:50%)	25	12.5	12.5	0	1995 Review (crust and moll) and 1996 logging data (fish)
1997 (RIFE 3)	Plaice and Cod (25%:75%)	37	27.8	9.3	0	1997 Review
1998 (RIFE 4)	Plaice and Cod (50%:50%)	45	22.5	22.5	0	1998 Survey
1999 (RIFE 5)	Plaice and Cod (50%:50%)	43	21.5	21.5	0	1999 Review
2000 (RIFE 6)	Cod and other fish (40%:60%)	31	12.4	0	18.6	2000 Review
2001 (RIFE 7)	Cod and other fish (40%:60%)	31	12.4	0	18.6	2001 Review
2002 (RIFE 8)	Cod and other fish (40%:60%)	51	20.4	0	30.6	2002 Review
2003 (RIFE 9)	Cod and other fish (60%:40%)	41	24.6	0	16.4	2003 Survey
2004 (RIFE 10)	Cod and other fish (60%:40%)	41	24.6	0	16.4	2004 Review (crust and moll) and 2003 Survey (fish)

Year (report)	SEA FISH					
	Species Composition	Total	Cod	Plaice	Other fish	Source of habits data
2005 (RIFE 11)	Cod and other fish (60%:40%)	41	24.6	0	16.4	2005 Review (crust and moll) and 2003 Survey (fish)
2006 (RIFE 12)	Cod and other fish (60%:40%)	41	24.6	0	16.4	2006 Review (crust and moll) and 2003 Survey (fish)
2007 (RIFE 13)	Cod and other fish (60%:40%)	41	24.6	0	16.4	2007 Review (crust and moll) and 2003 Survey (fish)
2008 (RIFE 14)	Cod and other fish (25%:75%)	40	10.0	0	30.0	2008 Survey
2009 (RIFE 15)	Cod and other fish (25%:75%)	40	10.0	0	30.0	2009 Review (crust & moll) 2008 Survey (fish)
2010 (RIFE 16)	Cod and other fish (25%:75%)	40	10.0	0	30.0	2010 Review (crust & moll) 2008 Survey (fish)
2011 (RIFE 17)	Cod and other fish (25%:75%)	40	10.0	0	30.0	2011 Review (crust & moll) 2008 Survey (fish)
2012 (RIFE 18)	Cod and other fish (25%:75%)	37	9.3	0	27.8	2012 LLWR Habits Survey
2013 (RIFE 19)	Cod and other fish (40%:60%)	56	22.4	0	33.6	2013 Survey
2014 (RIFE 20)	Cod and other fish (40%:60%)	56	22.4	0	33.6	2014 Review (crust and moll) 2013 Survey (fish)
2015 (RIFE 21)	Cod and other fish (25%:75%)	64	16.0	0	48.0	2015 Review
2016 (RIFE 22)	Cod and other fish (25%:75%)	60	15.0	0	45.0	2016 Review
2017 (RIFE 23)	Cod and other fish (40%:60%)	54	21.6	0	32.4	2017 Review

Year (report)	SEA FISH					
	Species Composition	Total	Cod	Plaice	Other fish	Source of habits data
2018 (RIFE 24)	Cod and other fish (60%:40%)	41	24.6	0	16.4	2018 Survey
2019 (RIFE 25)	Cod and other fish (30%:70%)	40	12.0	0	28.0	2019 Review
2020 (RIFE 26)	Cod and other fish (15%:85%)	34	5.1	0	28.9	2020 Review
2021 (RIFE 27)	Cod and other fish (30%:70%)	45	13.5	0	31.5	2021 Review
2022 (RIFE 28)	Cod and other fish (15%:85%)	41	6.2	0	34.8	2022 Review
2023 (RIFE 29)	Cod and other fish (25%:75%)	31	7.8	0	23.3	2023 Survey
2024 (RIFE 30)	Cod and other fish (45%:55%)	42	18.9	0	23.1	2024 Review

Annex 5. Cumbrian Coastal Community crustacean consumption data reported in AEMR and RIFE (kg y^{-1})

Year (report)	CRUSTACEANS					
	Species Composition	Total	Crab	Lobster	Nephrops or other crustaceans	Source of habits data
1994 (AEMR 45)	Crabs and Lobsters (65%:35%)	12	7.8	4.2	0	1993/94 Survey
1995 (RIFE 1)	Crabs and Lobsters (75%:25%)	8.6	6.5	2.2	0	1995 Review (crust and moll) and 1993/4 survey (fish)

Year (report)	CRUSTACEANS					
	Species Composition	Total	Crab	Lobster	Nephrops or other crustaceans	Source of habits data
1996 (RIFE 2)	Crabs and Lobsters (60%:40%)	12	7.2	4.8	0	1995 Review (crust and moll) and 1996 logging data (fish)
1997 (RIFE 3)	Crabs, Lobsters and Nephrops (50%:40%:10%)	17	8.5	6.8	1.7	1997 Review
1998 (RIFE 4)	Crabs and Lobsters (85%:15%)	28	23.8	4.2	0	1998 Survey
1999 (RIFE 5)	Crabs and Lobsters (80%:20%)	24	19.2	4.8	0	1999 Review
2000 (RIFE 6)	Crabs, Lobsters and Nephrops (40%:40%:20%)	20	8.0	8.0	4.0	2000 Review
2001 (RIFE 7)	Crabs, Lobsters and Nephrops (40%:40%:20%)	20	8.0	8.0	4.0	2001 Review
2002 (RIFE 8)	Crabs, Lobsters and Nephrops (50%:30%:20%)	16	8.0	4.8	3.2	2002 Review
2003 (RIFE 9)	Crabs, Lobsters and Nephrops (80%:10%:10%)	27	21.6	2.7	2.7	2003 Survey
2004 (RIFE 10)	Crabs, Lobsters and Nephrops (50%:40%:10%)	25	12.5	10.0	2.5	2004 Review (crust and moll) and 2003 Survey (fish)

Year (report)	CRUSTACEANS					
	Species Composition	Total	Crab	Lobster	Nephrops or other crustaceans	Source of habits data
2005 (RIFE 11)	Crabs, Lobsters and Nephrops (60%:20%:20%)	20	12.0	4.0	4.0	2005 Review (crust and moll) and 2003 Survey (fish)
2006 (RIFE 12)	Crabs, Lobsters and Nephrops (50%:20%:30%)	20	10.0	4.0	6.0	2006 Review (crust and moll) and 2003 Survey (fish)
2007 (RIFE 13)	Crabs, Lobsters and Nephrops (50%:30%:20%)	20.4	10.2	6.1	4.1	2007 Review (crust and moll) and 2003 Survey (fish)
2008 (RIFE 14)	Crabs, Lobsters and Nephrops (70%:20%:10%)	16.8	11.8	3.4	1.7	2008 Survey
2009 (RIFE 15)	Crabs, Lobsters and Nephrops (30%:50%:20%)	16	4.8	8	3.2	2009 Review (crust & moll) 2008 Survey (fish)
2010 (RIFE 16)	Crabs, Lobsters and Nephrops (50%:30%:20%)	22	11.0	6.6	4.4	2010 Review (crust & moll) 2008 Survey (fish)
2011 (RIFE 17)	Crabs, Lobsters and Nephrops (40%:30%:30%)	27	10.8	8.1	8.1	2011 Review (crust & moll) 2008 Survey (fish)
2012 (RIFE 18)	Crabs, Lobsters and Nephrops (30%:20%:50%)	29	8.7	5.8	14.5	2012 LLWR Habits Survey
2013 (RIFE 19)	Crabs, Lobsters and Nephrops (20%:5%:75%)	25	5.0	1.2	18.8	2013 Survey

Year (report)	CRUSTACEANS					
	Species Composition	Total	Crab	Lobster	Nephrops or other crustaceans	Source of habits data
2014 (RIFE 20)	Crabs, Lobsters and other crustaceans (25%:35%:40%)	36	9.0	12.6	14.4	2014 Review (crust and moll) 2013 Survey (fish)
2015 (RIFE 21)	Crabs, Lobsters and other crustaceans (30%:40%:30%)	38	11.4	15.2	11.4	2015 Review
2016 (RIFE 22)	Crabs, Lobsters and other crustaceans (30%:35%:35%)	37	11.0	13.0	13.0	2016 Review
2017 (RIFE 23)	Crabs, Lobsters and other crustaceans (30%:45%:25%)	31	9.3	14.0	7.7	2017 Review
2018 (RIFE 24)	Crabs, Lobsters and other crustaceans (40%:45%:15%)	35	14.0	15.8	5.3	2018 Survey
2019 (RIFE 25)	Crabs, Lobsters and other crustaceans (20%:40%:40%)	36	7.2	14.4	14.4	2019 Review
2020 (RIFE 26)	Crabs, Lobsters and other crustaceans (30%:50%:20%)	30	9.0	15.0	6.0	2020 Review
2021 (RIFE 27)	Crabs, Lobsters and other crustaceans (35%:65%:0%)	25	8.8	16.2	0.0	2021 Review
2022 (RIFE 28)	Crabs, Lobsters and other crustaceans (35%:55%:10%)	20	7.0	11.0	2.0	2022 Review

Year (report)	CRUSTACEANS					
	Species Composition	Total	Crab	Lobster	Nephrops or other crustaceans	Source of habits data
2023 (RIFE 29)	Crabs, Lobsters and other crustaceans (30%:60%:15%)[a]	15	4.5	9.0[b]	2.3	2023 Survey
2024 (RIFE 30)	Crabs, Lobsters and other crustaceans (45%:50%:5%[c])	22	9.9	11.0	1.1	2024 Review

Notes

[a] Each species composition is rounded to the nearest 5%, and in this case, due to rounding this equals 105%.

[b] Actual value is 8.3 but due to rounding of the percentage species composition it appears as 9.0.

[c] The 'other crustaceans' percentage has been rounded up to the nearest 5% to ensure this is assessed in RIFE-30 using a conservative approach.

Annex 6. Cumbrian Coastal Community mollusc consumption data reported in AEMR and RIFE (kg y^{-1})

Year (report)	MOLLUSCS				
	Species Composition	Total	Winkles	Other molluscs	Source of habits data
1994 (AEMR 45)	Winkles and other molluscs (85%:15%)	9.7	8.2	1.5	1993/94 Survey
1995 (RIFE 1)	Winkles and other molluscs (50%:50%)	12	6.0	6.0	1995 Review (crust and moll) and 1993/4 survey (fish)
1996 (RIFE 2)	Winkles and other molluscs (60%:40%)	12	7.2	4.8	1995 Review (crust and moll) and 1996 logging data (fish)
1997 (RIFE 3)	Winkles and other molluscs (40%:60%)	4.2	1.7	2.5	1997 Review
1998 (RIFE 4)	Winkles and other molluscs (30%:70%)	15	4.5	10.5	1998 Survey
1999 (RIFE 5)	Winkles and other molluscs (50%:50%)	25	12.5	12.5	1999 Review
2000 (RIFE 6)	Winkles and other molluscs (50%:50%)	17	8.5	8.5	2000 Review
2001 (RIFE 7)	Winkles and other molluscs (50%:50%)	17	8.5	8.5	2001 Review
2002 (RIFE 8)	Winkles and mussels (60%:40%)	29	17.4	11.6	2002 Review
2003 (RIFE 9)	Winkles and other molluscs (40%:60%)	34	13.6	20.4	2003 Survey
2004 (RIFE 10)	Winkles and other molluscs (50%:50%)	34	17.0	17.0	2004 Review (crust and moll) and 2003 Survey (fish)
2005 (RIFE 11)	Winkles and other molluscs (60%:40%)	33	19.8	13.2	2005 Review (crust and moll) and 2003 Survey (fish)
2006 (RIFE 12)	Winkles and other molluscs (50%:50%)	40	20.0	20.0	2006 Review (crust and moll) and 2003 Survey (fish)
2007 (RIFE 13)	Winkles and other molluscs (60%:40%)	28.9	17.3	11.6	2007 Review (crust and moll) and 2003 Survey (fish)
2008 (RIFE 14)	Winkles and other molluscs (50%:50%)	31.4	15.7	15.7	2008 Survey
2009 (RIFE 15)	Winkles and other molluscs (60%:40%)	28	16.8	11.2	2009 Review (crust & moll) 2008 Survey (fish)
2010 (RIFE 16)	Winkles and other molluscs (20%:80%)	22	4.4	17.6	2010 Review (crust & moll) 2008 Survey (fish)
2011 (RIFE 17)	Winkles and other molluscs (60%:40%)	12	7.2	4.8	2011 Review (crust & moll) 2008 Survey (fish)

Year (report)	MOLLUSCS				
	Species Composition	Total	Winkles	Other molluscs	Source of habits data
2012 (RIFE 18)	Winkles and other molluscs (60%:40%)	9.1	5.5	3.6	2012 LLWR Habits Survey
2013 (RIFE 19)	Winkles and other molluscs (85%:15%)	15	12.8	2.2	2013 Survey
2014 (RIFE 20)	Winkles and other molluscs (65%:35%)	11	7.2	3.8	2014 Review (crust and moll) 2013 Survey (fish)
2015 (RIFE 21)	Winkles and other molluscs (55%:45%)	12	6.6	5.4	2015 Review
2016 (RIFE 22)	Winkles and other molluscs (60%:40%)	12	7.2	4.8	2016 Review
2017 (RIFE 23)	Winkles and other molluscs (65%:35%)	12	7.8	4.2	2017 Review
2018 (RIFE 24)	Winkles and other molluscs (75%:25%)	12	9.0	3.0	2018 Survey
2019 (RIFE 25)	Winkles and other molluscs (50%:50%)	12	6.0	6.0	2019 Review
2020 (RIFE 26)	Winkles and other molluscs (50%:50%)	14	7.0	7.0	2020 Review
2021 (RIFE 27)	Winkles and other molluscs (0%:100%)	5.4	0.0	5.4	2021 Review
2022 (RIFE 28)	Winkles and other molluscs (70%:30%)	3.4	2.4	1.0	2022 Review
2023 (RIFE 29)	Winkles and other molluscs (95%:5%)	2.4	2.3	0.1	2023 Survey
2024 (RIFE 30)	Winkles and other molluscs (0%:100%)	0.2	0.0	0.2	2024 Review

Annex 7. Cumbrian Coastal Community intertidal occupancy data reported in AEMR and RIFE (h y^{-1})

Year (report)	INTERTIDAL OCCUPANCY		
	Substrate	h y^{-1}	Source of habits data
1994 (AEMR 45)	-	-	-
1995 (RIFE 1)	-	-	-
1996 (RIFE 2)	-	-	-
1997 (RIFE 3)	-	-	-
1998 (RIFE 4)	Sand and mollusc beds	1100	1998 Survey
1999 (RIFE 5)	Sand and mollusc beds	1000	1999 Review
2000 (RIFE 6)	Sand and mollusc beds	1000	2000 Review

Year (report)	INTERTIDAL OCCUPANCY		
	Substrate	h y^{-1}	Source of habits data
2001 (RIFE 7)	Sand and mollusc beds	900	2001 Review
2002 (RIFE 8)	Mud and sand	1200	2002 Review
2003 (RIFE 9)	Mud and sand	870	2003 Survey
2004 (RIFE 10)	Mud and sand	1000	2004 Review
2005 (RIFE 11)	Mud and sand	790	2005 Review
2006 (RIFE 12)	Mud and sand	580	2006 Review
2007 (RIFE 13)	Mud and sand	830	2007 Review
2008 (RIFE 14)	Mud and sand	930	2008 Survey
2009 (RIFE 15)	Mud and sand	960	2009 Review
2010 (RIFE 16)	Mud and sand	870	2010 Review
2011 (RIFE 17)	Mud and sand	840	2011 Review
2012 (RIFE 18)	Mud and sand	850	2012 LLWR Habits Survey
2013 (RIFE 19)	Mud and sand	760	2013 Survey
2014 (RIFE 20)	Mud and sand	1100	2014 Review
2015 (RIFE 21)	Mud and sand	1000	2015 Review
2016 (RIFE 22)	Mud and sand	790	2016 Review
2017 (RIFE 23)	Mud and sand	770	2017 Review
2018 (RIFE 24)	Mud and sand	700	2018 Survey
2019 (RIFE 25)	Mud and sand	830	2019 Review
2020 (RIFE 26)	Mud and sand	690	2020 Review
2021 (RIFE 27)	Mud and sand	530	2021 Review
2022 (RIFE 28)	Mud and sand	670	2022 Review
2023 (RIFE 29)	Mud and sand	980	2023 Survey
2024 (RIFE 30)	Mud and sand	570	2024 Review

Annex 8. Cumbrian Coastal Community 5-year average consumption and intertidal occupancy rates (kg y^{-1} and h y^{-1})

5-year period	SEA FISH				CRUSTACEANS				MOLLUSCS			EXTERNAL
	Total fish	Cod	Plaice	Other fish	Total crustaceans	Crab	Lobster	*Nephrops* or other crustaceans	Total molluscs	Winkles	Other molluscs	Intertidal occupancy
1994-98	31.8	17.8	14.1	0.0	15.5	10.8	4.4	0.3	10.6	5.5	5.1	1100
1995-99	35.2	19.5	15.8	0.0	17.9	13.0	4.6	0.3	13.6	6.4	7.3	1050
1996-00	36.2	19.3	13.2	3.7	20.2	13.3	5.7	1.1	14.6	6.9	7.8	1033
1997-01	37.4	19.3	10.7	7.4	21.8	13.5	6.4	1.9	15.6	7.1	8.5	1000
1998-02	40.2	17.8	8.8	13.6	21.6	13.4	6.0	2.2	20.6	10.3	10.3	1040
1999-03	39.4	18.3	4.3	16.8	21.4	13.0	5.7	2.8	24.4	12.1	12.3	994
2000-04	39.0	18.9	0.0	20.1	21.6	11.6	6.7	3.3	26.2	13.0	13.2	994
2001-05	41.0	21.3	0.0	19.7	21.6	12.4	5.9	3.3	29.4	15.3	14.1	952
2002-06	43.0	23.8	0.0	19.2	21.6	12.8	5.1	3.7	34.0	17.6	16.4	888
2003-07	41.0	24.6	0.0	16.4	22.5	13.3	5.4	3.9	34.0	17.5	16.4	814
2004-08	40.8	21.7	0.0	19.1	20.4	11.3	5.5	3.7	33.5	18.0	15.5	826
2005-09	40.6	18.8	0.0	21.8	18.6	9.8	5.1	3.8	32.3	17.9	14.3	818
2006-10	40.4	15.8	0.0	24.6	19.0	9.6	5.6	3.9	30.1	14.8	15.2	834
2007-11	40.2	12.9	0.0	27.3	20.4	9.7	6.4	4.3	24.5	12.3	12.2	886
2008-12	39.4	9.9	0.0	29.6	22.2	9.4	6.4	6.4	20.5	9.9	10.6	890
2009-13	42.6	12.3	0.0	30.3	23.8	8.1	5.9	9.8	17.2	9.3	7.9	856
2010-14	45.8	14.8	0.0	31.0	27.8	8.9	6.9	12.0	13.8	7.4	6.4	884
2011-15	50.6	16.0	0.0	34.6	31.0	9.0	8.6	13.4	11.8	7.8	4.0	910
2012-16	54.6	17.0	0.0	37.6	33.0	9.0	9.6	14.4	11.8	7.8	4.0	900
2013-17	58.0	19.5	0.0	38.5	33.4	9.1	11.2	13.0	12.4	8.3	4.1	884
2014-18	55.0	19.9	0.0	35.1	35.4	10.9	14.1	10.3	11.8	7.6	4.2	872
2015-19	51.8	17.8	0.0	34.0	35.4	10.6	14.5	10.3	12.0	7.3	4.7	818

5-year period	SEA FISH				CRUSTACEANS				MOLLUSCS			EXTERNAL
	Total fish	Cod	Plaice	Other fish	Total crustaceans	Crab	Lobster	*Nephrops* or other crustaceans	Total molluscs	Winkles	Other molluscs	Intertidal occupancy
2016-20	45.8	15.7	0.0	30.3	33.8	10.1	14.4	9.3	12.4	7.4	5.0	756
2017-21	42.8	15.4	0.0	27.4	31.4	9.7	15.1	6.7	11.1	6.0	5.1	704
2018-22	40.2	12.3	0.0	28.1	29.2	9.2	14.5	5.5	9.4	4.9	4.5	684
2019-23	38.2	8.9	0.0	29.5	25.2	7.3	13.1	4.9	7.4	3.5	3.9	740
2020-24	38.6	10.3	0.0	28.5	22.4	7.8	12.5	2.3	5.1	2.3	2.7	688

Annex 9. Summary of profiles for adults in the Sellafield area for use in the assessment of total dose

Profile Name	Pathway Name / Number of Individuals		Crustacea	Direct	Eggs	Fish - Fresh	Fish - Sea	Fruit - Domestic	Fruit and nuts - Wild	Gamma external – Salt Marsh	Gamma external - Sediments	Honey	Marine plants/algae	Meat - Cow	Meat - Game	Meat - Poultry	Meat - Salt Marsh Grazed Cow	Meat - Salt Marsh Grazed Sheep	Meat - Sheep	Meat - Wildfowl	Milk	Milk - Salt Marsh Grazed	Mollusca	Mushrooms	Occupancy IN water	Occupancy ON water	Plume (IN; 0-0.25 km)	Plume (MID; 0.25-0.5 km)	Plume (OUT; 0.5-1 km)	Vegetables - Green	Vegetables - Other Domestic	*Vegetables - Potatoes*	*Vegetables - Root*
		Notes		1						2	3				4											5	5	5				
		Units	kg	-	kg	kg	kg	kg	kg	h	h	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	l	l	kg	kg	h	h	h	h	h	kg	kg	kg	kg
Crustacean Consumers	12		**20.0**	0.08	5.9	-	7.6	-	-	26	60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	660	2	-	-	-	-	-	-
Occupants for Direct Radiation	118		0.26	**1**	3	0.01	0.84	1.5	0.25	-	100	-	-	1.1	-	0.28	-	-	0.58	-	11.6	-	0.01	0.04	3	3	240	460	1160	1.2	1.6	1.8	1.8
Egg Consumers	15		7.4	0.67	**27.9**	-	0.21	7.2	1.2	20	28	-	-	5	-	0.09	-	-	5.4	-	55.6	-	0.03	0.04	-	510	1090	1670	3	1.4	2.4	2.9	2.9
Freshwater Fish Consumers	1		-	1	-	**1.4**	50.9	0.91	-	-	890	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	87	10.9	24.2	31.9	31.9
Sea Fish Consumers	12		4.9	0.08	-	0.12	**37.9**	0.08	-	-	350	-	-	-	-	-	-	-	-	-	-	-	0.03	-	4	75	-	-	7	0.91	2	2.7	2.7
Domestic Fruit Consumers	14		-	0.43	10.3	-	0.23	**18.4**	2.5	-	5	0.06	-	-	-	0.93	-	-	3.6	-	48.4	-	0.03	0.13	-	-	11	9	55	5.6	5.4	6.8	6.8
Wild Fruit and Nut Consumers	22		0.21	0.45	9.7	-	0.2	11.2	**2.5**	-	5	-	-	5.4	0.68	0.7	-	-	9.1	-	47.4	-	0.02	0.14	-	-	750	640	19	2.5	2.8	2.4	2.4
Occupants over Salt marsh	5		-	-	-	-	1	-	-	**440**	160	-	0.03	-	-	-	7.5	5	-	-	-	82.9	-	-	-	4	-	-	-	-	-	-	-
Occupants over Sediment	34		0.1	0.29	0.7	0.04	3	0.03	-	-	**940**	-	-	-	-	-	-	-	-	-	-	-	0.2	-	7	1	67	-	3	0.32	0.71	0.94	0.94
Honey Consumers	8		-	-	-	-	-	4.2	-	-	6	**2.9**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.7	7.6	5.7	5.7
Consumers of Marine Plants and Algae	6		-	-	-	-	2.1	-	-	180	2	-	**0.1**	-	-	-	-	-	-	-	-	-	-	-	1	5	-	-	-	-	-	-	-
Cattle Meat Consumers	7		-	0.57	8.8	-	-	2.7	1.3	-	-	-	-	**25.6**	-	0.19	-	-	2.2	-	52.1	-	-	0.09	-	-	2640	-	-	-	-	-	-	-
Game Meat Consumers	1		2.2	-	-	-	12	-	-	-	20	-	-	-	**27.1**	12	-	-	-	-	-	-	-	-	-	40	-	-	-	-	-	-	-
Poultry Meat Consumers	5		0.43	0.6	1.4	-	2.4	3.2	0.45	-	35	-	-	-	7.1	**8.7**	-	-	1	-	-	-	-	-	-	8	-	3290	83	2	2.6	-	-
Consumers of Meat From Salt Marsh Grazed Cattle	3		-	-	-	-	-	-	-	240	270	-	-	-	-	-	**18.7**	16.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Consumers of Salt Marsh Grazed Sheep	2		-	-	-	-	-	-	-	180	210	-	-	-	-	-	18.7	**25.0**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sheep Meat Consumers	5		0.1	0.2	15.6	-	0.86	15.8	2.5	-	1	-	-	-	3	0.18	-	-	**34.2**	-	109.5	-	0.08	0.09	-	-	-	26	-	2.3	4	5.7	5.7
Wildfowl Consumers	2		-	-	-	-	-	-	-	2	160	-	-	-	-	-	-	-	-	**4.6**	-	-	-	-	-	-	-	-	-	-	-	-	-
Milk Consumers	17		-	0.47	8.2	-	0.19	5.5	0.82	-	3	-	-	2.6	-	-	-	-	2.9	-	**171.2**	-	0.02	-	-	-	-	750	12	1.5	2.5	2.6	2.6
Milk Consumers (salt marsh grazed cattle)	2		-	-	-	-	-	-	-	190	-	-	-	-	-	-	-	-	-	-	-	**311.0**	-	-	-	-	-	-	-	-	-	-	-
Mollusc Consumers	4		1.5	-	-	-	4.7	-	-	-	480	-	-	-	-	-	-	-	-	-	-	-	**2.4**	-	-	-	-	-	-	-	-	-	-
Mushroom Consumers	2		-	1	-	-	-	4.4	-	-	180	-	-	-	-	-	-	-	-	-	-	-	-	**1.5**	-	-	-	-	5470	-	7.8	8.4	8.4
Occupants In Water	3		-	0.33	3.9	-	-	-	-	-	550	-	-	-	-	-	-	-	-	-	-	-	-	-	**310**	-	180	-	-	-	-	-	-
Occupants On Water	6		15.1	-	8.8	-	6.7	-	-	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**2230**	-	-	-	-	-	-	-
Local Inhabitants (0 - 0.25 km)	2		-	1	26.7	-	-	7.3	2.5	-	-	-	-	37.5	-	0.67	-	-	3.8	-	-	-	-	0.3	-	-	**8140**	-	-	-	-	-	-	-
Local Inhabitants (0.25 - 0.5 km)	6		-	1	15.8	-	-	1.6	0.45	-	35	-	-	-	-	1.7	-	-	3.5	-	34.6	-	-	-	-	-	-	**7790**	-	1.7	1.7	-	-
Local Inhabitants (0.5 - 1 km)	15		-	1	1.5	-	-	3	0.13	-	62	-	-	-	-	0.54	-	-	-	-	-	-	-	0.2	3	-	-	-	**7040**	4.1	3.4	3.6	3.6
Green Vegetable Consumers	11		-	0.36	-	0.13	4.6	5.6	-	-	82	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1480	**17.4**	11.1	17.1	17.1
Other Domestic Vegetable Consumers	13		-	0.62	8.4	0.11	4.2	9.7	0.81	-	73	0.52	-	-	-	-	-	-	3.8	-	52.1	-	0.03	-	-	-	-	10	1870	9.5	**15.1**	18	18
Potato Consumers	22		-	0.58	9.1	0.12	4.5	10.2	0.88	-	76	-	-	-	-	-	-	-	4.2	-	56.5	-	-	-	-	-	-	11	1380	9.8	3.4	**51.2**	4.3
Root Vegetable Consumers	12		-	0.58	9.1	0.12	4.5	10.2	0.88	-	76	-	-	-	-	-	-	-	4.2	-	56.5	-	0.03	-	-	-	-	11	1380	9.8	13.3	29.4	**22.1**

Notes for Annex 9

This annex is based on data from the 2023 Sellafield full habits survey (aquatic, terrestrial and direct radiation pathways), which has been updated with data from the 2024 annual Sellafield Review.

1. Direct radiation is expressed as proportion of group who are present within 1 km of site perimeter.
2. Gamma external - Salt Marsh represents occupancy over salt marsh only.
3. Gamma external - Sediments represents occupancy over all substrates except rock and salt marsh.
4. Meat - Game includes consumption of venison and rabbits/hares.
5. Plume times are the sum of individuals' indoor and outdoor times.

The means of the high-rate groups are determined by the ‘cut-off’ method and are emboldened on the diagonal.

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