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Radiological Habits Survey: Sellafield Review, 2019

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Radiological Habits Survey: Sellafield Review, 2019

Review of shellfish and fish consumption, and intertidal occupancy

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1. INTRODUCTION

This report describes a review of the public's shellfish and fish consumption, and intertidal occupancy, relating to liquid radioactive waste discharges from the Sellafield Ltd nuclear licensed site in Cumbria. It is also relevant to discharges from the Low Level Waste Repository (LLWR) near Drigg due to the proximity of the site, as well as the proposed Moorside nuclear power station adjacent to the Sellafield site. 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 (e.g. EA, FSA, FSS, NRW, NIEA and SEPA, 2019). The study was funded by the Environment Agency (EA), the Food Standards Agency (FSA) and the Office for Nuclear Regulation (ONR) to support their roles in protecting the public from the effects of radiation.

Radiological protection of the public is 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. This Sellafield Review specifically investigated the consumption of crustaceans, molluscs and fish, and occupancy over intertidal substrates, since these pathways are the major contributors to the dose of the representative person. Reviews are conducted annually, except in years when full surveys are undertaken, because consumption and occupancy rates have been known to vary from year to year, with some people ceasing seafood consumption, shellfish collection or intertidal activities, and new individuals being identified. The last full habits survey (encompassing aquatic, terrestrial and direct radiation pathways) in the vicinity of Sellafield was conducted by the Centre for Environment, Fisheries & Aquaculture Science (Cefas) in 2018 (Moore *et al.*, 2019).

The consumption of fish has historically not been targeted for the Sellafield Reviews because fish have generally been of lower radiological significance around Sellafield than shellfish and intertidal occupancy. However, the people interviewed in relation to shellfish consumption and intertidal occupancy have been asked about their fish consumption. Prior to 2015, these fish consumption rates were used to update the *total dose* assessment of additive exposure but the fish consumption rates from the most recent full Sellafield habits surveys were used for the Sellafield source specific aquatic dose assessments. More recently, the relative contribution to doses arising from fish consumption has increased, and therefore, since 2015, a mean rate for the high-rate group for fish has been presented in these annual Sellafield Reviews, which can be used in the Sellafield source specific aquatic dose assessments. The fish consumption rates will also be used to update the *total dose* assessment. The adequacy of the inclusion of the mean rate for the high-rate group for fish in the Sellafield source specific aquatic dose assessments using the consumption rates from the Sellafield Review will be reviewed in future years.

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 2018 full Sellafield habits survey.

In addition to the habits surveys undertaken in the vicinity of Sellafield, several of the higher rate consumers of shellfish keep a diary of their seafood consumption and intertidal occupancy for a two-week period every three months. These data can be used to check the validity of the interview data if extreme rates are recorded. It was not necessary to use the diaries to check the validity of the 2019 interview data used in this report because no extreme consumption or occupancy rates were recorded.

2. SURVEY AREA

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

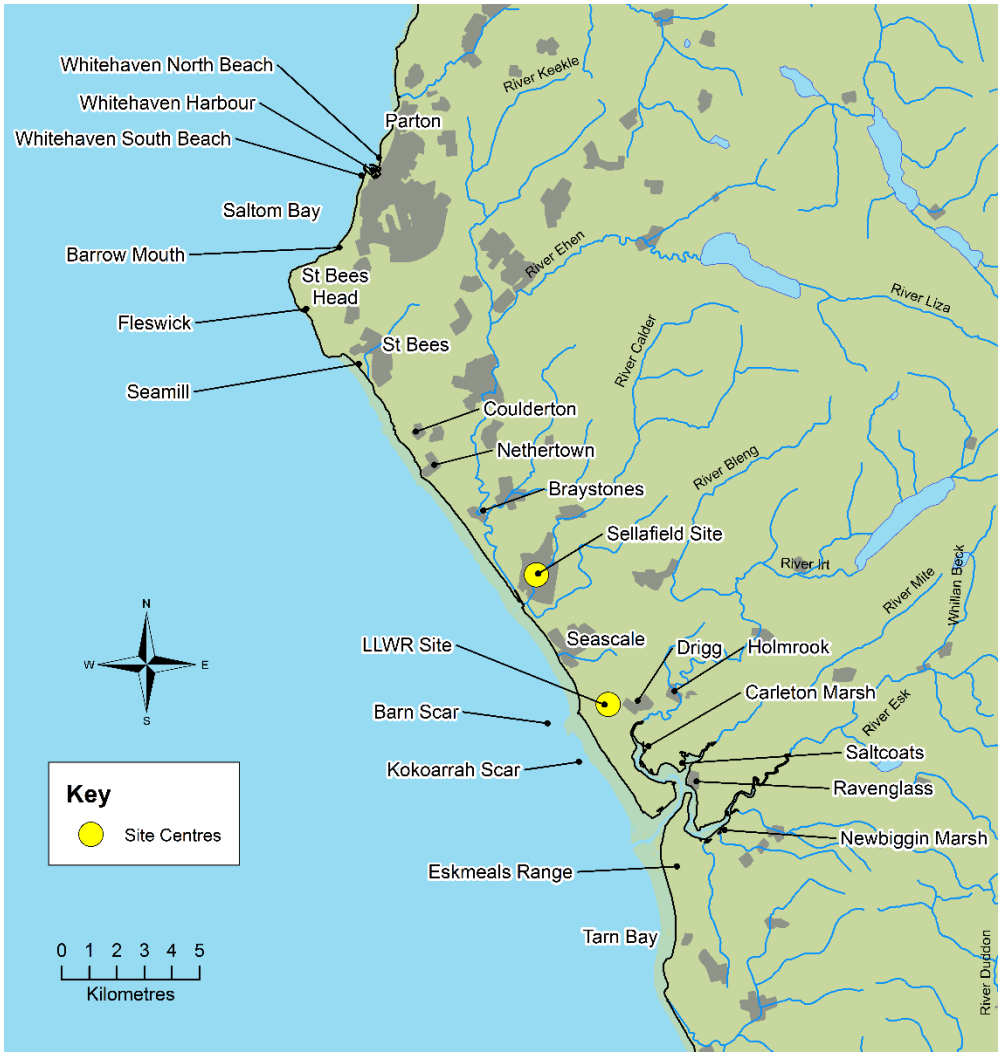

Figure 1. The aquatic survey area

3. CONDUCT OF THE SURVEY

Prior to the fieldwork, individuals identified as having high rates of crustacean, mollusc or fish consumption and/or intertidal occupancy in previous Sellafield habits surveys were contacted and where possible interview times were arranged.

The fieldwork was carried out from 2nd to 6th June 2019, by a team of two people. During the fieldwork, individuals were interviewed and asked to estimate consumption rates for crustaceans, molluscs and 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. Investigations were also carried out in order to identify and interview any previously unknown individuals who might have high rates of fish or shellfish consumption or intertidal occupancy. This included visiting the beaches in the survey area.

Observations for 101 adults were recorded for the 2019 Sellafield Review. No data were recorded for the child or infant age groups.

4. METHODS OF DATA ANALYSIS

4.1 Data recording and presentation

Data collected during the fieldwork were recorded in logbooks. On return to the laboratory, the 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 (e.g. 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 a 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 (i.e. the factors which convert intakes of radioactivity into dose) can apply to different ages. The International Commission on Radiological Protection (ICRP) revised its recommendations for the age groupings to

be used in radiological assessments and these recommendations were adopted in the 2010 and subsequent habits survey reports. Consequently, the age ranges used in the habits survey reports prior to 2010 differ from those used currently. The names used for the age groups, based on the recommendations in ICRP 101 (ICRP, 2007), are shown in Table A below, together with those used in reports prior to 2010, for comparison. Although no data were collected for children or infants in the 2019 Sellafield Review, the description of age groups is retained in this report for consistency within the Sellafield Review series.

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

Age ranges used from 2010 onwards			Age ranges used prior to 2010	
Name of age group[a]	**Age range in group**		**Name of age group**	**Age range in group**
Infant	0 to 5-year-old		3-month-old	Under 1-year-old
			1-year-old	1-year-old
			5-year-old	2-year-old to 6-year-old
Child	6-year-old to 15-year-old		10-year-old	7-year-old to 11-year-old
			15-year-old	12-year-old to 16-year-old
Adult	16-year-old and over		Adult	17-year-old and over

[a] In the 2010 reports only, the infant age group was called the 1-year-old age group and the child age group was called the 10-year-old age group.

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 *et al.* (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. In certain cases, using the 'cut-off' method resulted in only one person being in the high-rate group. In these cases, expert judgement was used to decide whether the high-rate group should remain as one individual or whether others should be included. If others were included, the second highest rate was divided by three and all observations above this were included in the high-rate group.

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 for all groups for adults are presented in Annex 1, with the high-rate group members indicated in bold.

5. INTERNAL EXPOSURE

Consumption data for aquatic foods for adults are presented in Tables 1, 2 and 3. 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. No children or infants were identified consuming seafood.

5.1 Crustaceans, molluscs and fish

The people consuming the greatest quantities of crustaceans, molluscs and fish from the aquatic survey area were commercial and hobby fishermen, shellfish collectors, anglers, and the families of these groups of people. Table B presents a summary of the adults' consumption rates of crustaceans, molluscs and fish. The table includes the mean consumption rates for the high-rate groups and the observed 97.5th percentile rates.

Table B. Summary of consumption rates of foods from the aquatic survey area

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})
Adults						
Crustaceans	17	5	59.1	24.2	36.1	51.8
Molluscs	11	2	17.5	7.3	12.4	14.9
Fish	22	11	59.7	21.9	40.0	59.7

The species of crustaceans consumed by people in the adult high-rate group were brown crab, brown shrimp, common lobster, common prawn and *Nephrops*. The brown crab, common lobster and *Nephrops* were caught offshore throughout the survey area. Brown crabs and common lobsters were also caught at Drigg by hooking them out from amongst the crevices at low water and by setting pots from the beach at Braystones and Seascale. Brown shrimps were caught at Seascale and Drigg by pushing a net through shallow water and in pots that were set from the shore. Small quantities of common prawns were also caught in pots that were set from the shore.

The species of molluscs consumed by people in the adult high-rate group were winkles, mussels and razor shells. Winkles were collected from Nethertown, Coulderton, St Bees, Whitehaven north beach and Parton; mussels were collected from Whitey Rock (at the northern end of Whitehaven north beach) and razor shells were collected from Whitehaven north beach. The following mollusc species were

consumed in small quantities but not by the people in the high-rate group: whelks caught as a by-catch in pots set offshore; limpets collected from the shore at Whitehaven North Beach.

The species of fish consumed by people in the adult high-rate group were bass, cod, Dover sole, flounder, mackerel, plaice, thornback ray and turbot. The fish were caught throughout the survey area. Small quantities of pollack and whiting were also consumed, but not by the people in the high-rate group.

5.2 Composition of the food groups for crustaceans, molluscs and fish, for use in dose assessments, and comparison with 2018 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 comprises winkles and 'other molluscs' and the fish group comprises cod and 'other fish'.

The percentage composition for the predominant shellfish and fish species consumed by the adult high-rate groups from the 2019 Sellafield Review, rounded to the nearest 5% for use in dose assessments, are as follows:

- Crustaceans - 40% common lobster, 20% brown crab, and 40% other crustaceans (including brown shrimps, *Nephrops* and common prawns) (mean consumption rate for the adult high-rate group, 36 kg y^{-1})
- Molluscs - 50% winkles and 50% other molluscs (including mussels and razor shells) (mean consumption rate for the adult high-rate group, 12 kg y^{-1})
- Fish - 30% cod and 70% other fish species (mainly thornback ray, plaice and turbot, with smaller quantities of bass, Dover sole, flounder and mackerel) (mean consumption rate for the adult high-rate group, 40 kg y^{-1})

By comparison, the percentage composition for the predominant shellfish and fish species consumed by the adult high-rate groups from the 2018 Sellafield full survey, used in RIFE-24 (EA, FSA, FSS, NRW, NIEA and SEPA, 2019) for dose assessments, were:

- Crustaceans - 45% common lobster, 40% brown crab and15% other crustaceans (including *Nephrops*, brown shrimps and common prawns) (mean consumption rate for the adult high-rate group, 35 kg y^{-1})
- Molluscs - 75% winkles and 25% other molluscs (including mussels and limpets) (mean consumption rate for the adult high-rate group, 12 kg y^{-1})

- Fish - 60% cod and 40% other fish species (mainly thornback ray and plaice, with smaller quantities of bass, brill, Dover sole, grey mullet, mackerel, pollack, pouting, salmon, sea trout, turbot and whiting) (mean consumption rate for the adult high-rate group, 41 kg y^{-1})

In 2019, compared to 2018, the mean consumption rate for the adult high-rate group for crustaceans increased by 1 kg y^{-1}, and the mean consumption rate for the adult high-rate group for fish decreased by 1 kg y^{-1}. The consumption rate for molluscs was the same in both years.

The main species of crustaceans within the respective high-rate groups were the same in 2019 and 2018. The main species of mollusc within the high-rate groups changed from limpet, mussel and winkle in 2018 to mussel, razor shell and winkle in 2019. The main species of fish within the high-rate groups differed between 2018 and 2019. In 2019, when compared with 2018, there was no brill, grey mullet, pollack, pouting, salmon, sea trout or whiting consumed in the high-rate group. Flounder was consumed in the high-rate group in 2019 but not in 2018.

The percentage breakdown of species changed for crustaceans with a reduction in the percentage contribution of crab, primarily due to a decrease in crab consumption by two individuals in the high-rate group. For molluscs, there was a decrease in the percentage contribution of winkles due to a decrease in the number of high-rate consumers in 2019 and one winkle collector was collecting less frequently. For fish, there was a significant decrease in cod and a significant increase in other fish species. The quantities of cod being consumed in 2019 had decreased and there were reports of a reduced availability of stocks in the local cod fishery.

5.3 Consumption trends

The consumption rates for the adult high-rate groups for crustaceans and molluscs over the previous ten years (2010 - 2019) are shown in Figures 2 and 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 2a. ‘Other crustaceans’ includes *Nephrops*, brown shrimps and common prawns.

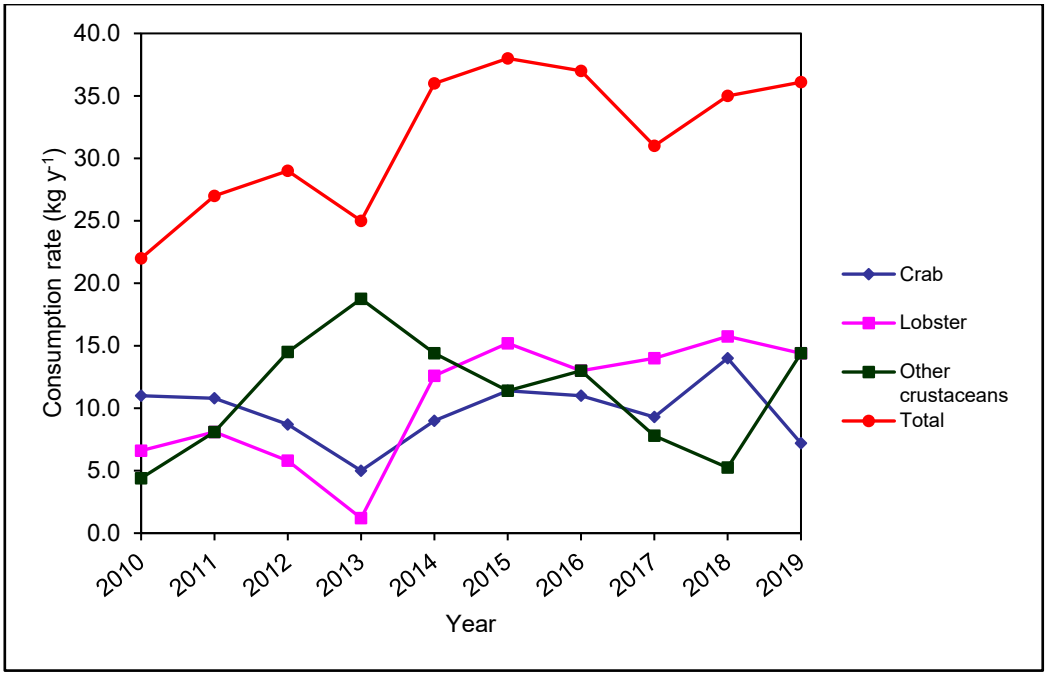

Figure 2. Consumption rates (kg y^{-1}) for the adult high-rate group for crustaceans, 2010 – 2019

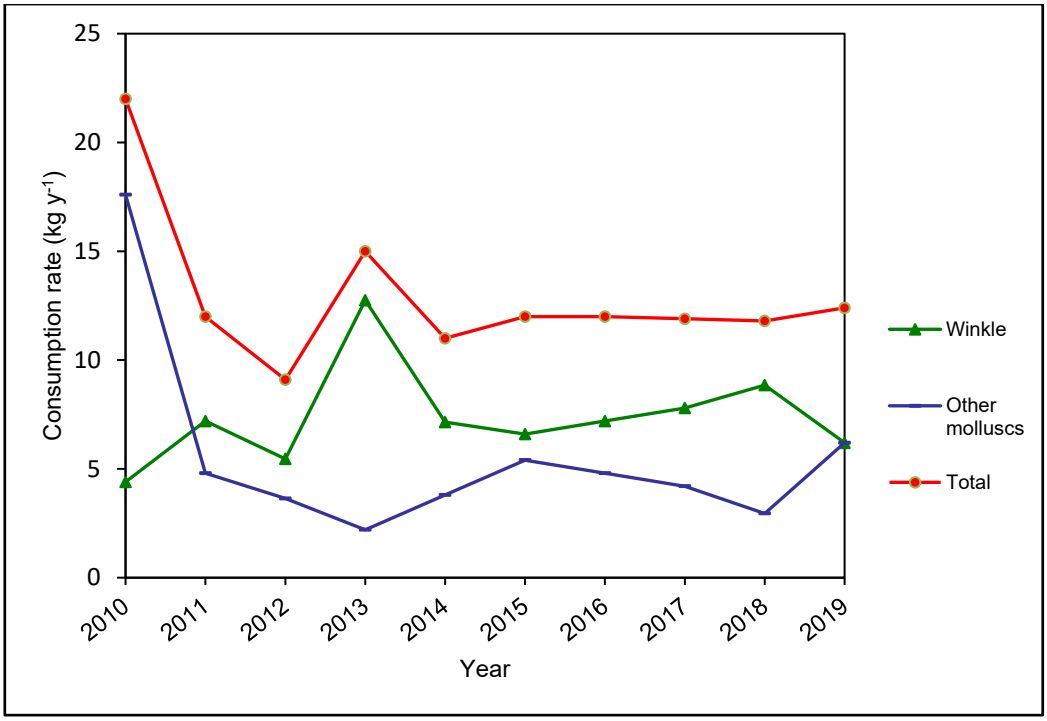

Figure 3. Consumption rates (kg y^{-1}) for the adult high-rate group for molluscs, 2010 – 2019

6. EXTERNAL EXPOSURE

Intertidal occupancy rates for adults are presented in Table 4. 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. There were no children or infants that were undertaking activities in intertidal areas in the families of the interviewees, so no intertidal occupancy rates were obtained for these age groups.

6.1 Intertidal occupancy

Table C presents a summary of the adults' intertidal occupancy rates in the aquatic survey area, by substrate. The table includes the mean occupancy rates for the high-rate groups and the observed 97.5th percentile rates.

Table C. Summary of adults' intertidal occupancy rates

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})
Mud and sand	1	1	24	24	Not applicable
Mud, sand and stones	11	6	548	369	548
Rock	4	2	156	146	155
Salt marsh	9	7	274	188	274
Sand	46	10	1277	673	819
Sand and stones	36	18	480	401	480
Stones	11	9	660	627	660

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

- For mud and sand: bait digging at Whitehaven Outer Harbour
- For mud, sand and stones: dog walking and horse riding in the Ravenglass Estuary; dog walking at Parton
- For rock: angling at Parton; hooking for crab and lobsters at Drigg
- For salt marsh: dog walking and tending livestock at Saltcoats; wildfowling and walking on the banks of the River Esk and Ravenglass Estuary
- For sand: bait digging at Nethertown, Braystones and Drigg; setting nets (including drift nets) at Braystones and Seascale; setting pots at Seascale and Drigg; angling at Braystones, Nethertown, Coulderton and Drigg; dog walking at St Bees, Seascale, Tarn Bay and Drigg; collecting razor shells at Whitehaven north beach

- For sand and stones: dog walking at Coulderton and Whitehaven North Beach; working on the shore at Sellafield and Parton; walking and playing at Coulderton
- For stones: dog walking at Coulderton; working on the shore at St Bees

Brown shrimps were caught using a push net at Drigg and Whitehaven North Beach, but since this involved wading out into shallow water, it was not classed as an intertidal activity. Therefore, this activity does not appear in the intertidal occupancy table. However, in a full Sellafield habits survey, push netting would be considered as an activity in the 'in and on water' occupancy table.

The adults' intertidal occupancy rates from the 2018 Sellafield Review are presented in Table D. A comparison between the 2018 and 2019 mean rates of the high-rate groups for occupancy over each intertidal substrate is shown in Figure 4 (2019 data are from Table C).

Table D. Summary of adults' intertidal occupancy rates from the 2018 Sellafield full survey

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})
Mud	24	1	62	62	34
Mud and sand	5	3	104	104	104
Mud, sand and stones	42	6	730	406	388
Rock	22	5	417	269	335
Salt marsh	11	5	274	210	274
Sand	314	23	1234	657	730
Sand and stones	124	12	576	400	449
Stones	1	1	4	4	Not applicable

In 2019, compared with 2018, there were increases in the following mean intertidal occupancy rates for the high-rate groups (data rounded to two significant figures):

- For sand; from 660 h y^{-1} to 670 h y^{-1}
- For sand and stones; from 400 h y^{-1} to 401 h y^{-1} (unrounded)
- For stones; from 4 h y^{-1} to 630 h y^{-1}

In 2019, compared with 2018, there were decreases in the following mean intertidal occupancy rates for the high-rate groups (data rounded to two significant figures):

- For mud; from 62 h y^{-1} to 0
- For mud and sand; from 100 h y^{-1} to 24 h y^{-1}
- For mud, sand and stones; from 410 h y^{-1} to 370 h y^{-1}
- For rock; from 270 h y^{-1} to 150 h y^{-1}
- For salt marsh; from 210 h y^{-1} to 190 h y^{-1}

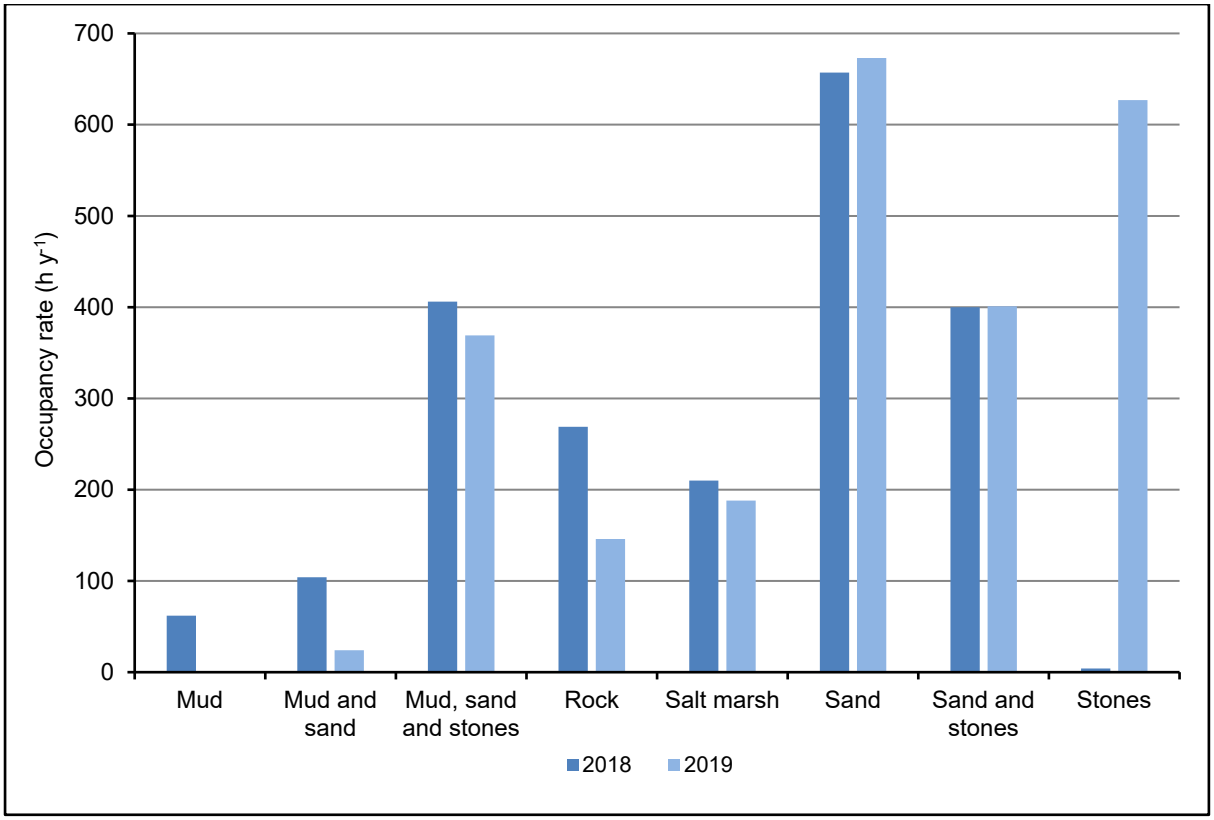

Figure 4. Comparison between the 2018 and 2019 mean rates of the high-rate groups for occupancy over each intertidal substrate

7. USE OF HABITS DATA FOR DOSE ASSESSMENTS

7.1 Aquatic combinations for adults in the Sellafield area

Table 5 presents the consumption rates and occupancy rates for people who appear in at least one of the high-rate groups for fish, crustaceans, molluscs or intertidal substrates. The table shows that several individuals are members of multiple high-rate groups. For example, Person ID number 2843/1/1 is in the high-rate group for fish, crustaceans, molluscs and occupancy over 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) Sellafield Fishing Community assessments for 2019 will be based on combinations of consumption and intertidal occupancy pathways.

As in previous years, since several individuals were undertaking activities over multiple substrates, the occupancy rates over five substrates (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

830 h y^{-1}. For comparison, the mean rate for the high-rate group for the reclassified 'mud and sand' substrate in 2018 was 700 h y^{-1}.

7.2 Habits data for source specific assessments

Annexes 2a and 2b show the historic consumption and occupancy rates, updated with the 2019 data, for use in source specific assessments for the RIFE reports. Annex 2a shows the data for single year assessments and Annex 2b shows the data for the 5-year average assessments.

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 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 fish from the current year's survey, since the relative contribution to doses arising from fish consumption has increased.

7.3 Profiled habits data for *total dose* assessments

The matrix for the 2019 Sellafield adults' profiled habits data is presented in Annex 3. It is based on data from the 2018 Sellafield full habits survey (aquatic, terrestrial and direct radiation pathways), which has been updated with data from the 2019 Sellafield Review. All pathways and observations from the original 2018 profiled habits matrix were retained, and for the subsequent years' profiles, only data asked about during the subsequent years' reviews were updated; that is, intertidal occupancy and consumption of crustaceans, molluscs and 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 previous years had stopped their activity, then their data was deleted. Because the profiles have been created using the data from the 2019 survey, the profiled data shown in Annex 3 are not comparable with the data presented in Annex 1.

8. SUMMARY AND RECOMMENDED DATA FOR USE IN RIFE-25 DOSE ASSESSMENTS

The survey investigated the consumption of shellfish and fish, and intertidal occupancy, relating to liquid discharges from the Sellafield nuclear site. The consumption and occupancy rates in this section are presented to two significant figures.

The mean rates for the adult high-rate groups from the 2019 Sellafield Review are as follows:

- Crustaceans 36 kg y^{-1}
- Molluscs 12 kg y^{-1}
- Fish 40 kg y^{-1}
- Occupancy over mud and sand 24 h y^{-1}
- Occupancy over mud, sand and stones 370 h y^{-1}
- Occupancy over rock 150 h y^{-1}
- Occupancy over salt marsh 190 h y^{-1}
- Occupancy over sand 670 h y^{-1}
- Occupancy over sand and stones 400 h y^{-1}
- Occupancy over stones 630 h y^{-1}

In 2019, compared to 2018, the mean consumption rate for the adult high-rate group for crustaceans increased by 1 kg y^{-1}, and the mean consumption rate for the adult high-rate group for fish decreased by 1 kg y^{-1}. The consumption rate for molluscs was the same in both years. For occupancy over intertidal substrates, the mean rates for the adult high rate groups increased in 2019 compared to 2018 by 10 h y^{-1} for sand, by 1 h y^{-1} for sand and stones, and by 620 h y^{-1} for stones; and decreased by 76 h y^{-1} for mud and sand, by 40 h y^{-1} for mud, sand and stones, by 120 h y^{-1} for rock, and by 20 h y^{-1} for salt marsh.

The following recommendations for data to be used in RIFE-25 dose assessments are for the adult age group only. For the 'Sellafield Fishing Community' dose assessment, the mean consumption rates for the adult high-rate groups and species breakdown are:

- Fish 40 kg y^{-1}, comprising 30% cod and 70% other fish (mainly thornback ray, plaice and turbot, with smaller quantities of bass, Dover sole, flounder and mackerel)
- Crustaceans 36 kg y^{-1}, comprising 40% common lobster, 20% brown crab and 40% other crustaceans (including brown shrimps, *Nephrops* and common prawns)
- Molluscs 12 kg y^{-1}, comprising 50% winkles and 50% other molluscs (including mussels and razor shells)
- Occupancy over an intertidal substrate termed 'mud and sand' (mud and sand; mud, sand and stones; sand; sand and stones; and stones combined) 830 h y^{-1}

For the ‘Sellafield Fishing Community 5-year average’ dose assessments:

- Cod 18 kg y^{-1}
- Other fish 34 kg y^{-1}
- Crabs 11 kg y^{-1}
- Lobsters 14 kg y^{-1}
- Other crustaceans 10 kg y^{-1}
- Winkles 7.3 kg y^{-1}
- Other molluscs 4.7 kg y^{-1}
- Occupancy over an intertidal substrate termed ‘mud and sand’ (mud and sand; mud, sand and stones; sand; sand and stones; and stones combined) 820 h y^{-1}

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

- Handling fishing gear 1400 h y^{-1} (mean rate for the high-rate group retained from the 2018 Sellafield habits survey)

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

- Handling sediment 510 h y^{-1} (mean rate for the high-rate group retained from the 2018 Sellafield habits survey)

9. REFERENCES

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

Person ID number	Brown crab	Brown shrimp	Common lobster	Common prawn	*Nephrops*	Total
2843/1/1	**8.1**	**30.8**	**18.4**	**1.8**	**-**	**59.1**
2843/2/1	**8.1**	**23.6**	**7.5**	**1.8**	**-**	**40.9**
2843/3/1	**8.1**	**8.8**	**14.9**	**-**	**-**	**31.9**
2841/1/1	**7.2**	**-**	**16.8**	**-**	**0.2**	**24.2**
2841/2/1	**7.2**	**-**	**16.8**	**-**	**0.2**	**24.2**
2819/1/1	6.2	-	13.0	-	-	19.2
2819/2/1	6.2	-	13.0	-	-	19.2
2845/1/1	7.2	-	11.2	-	-	18.4
2845/2/1	7.2	-	11.2	-	-	18.4
2845/3/1	7.2	-	11.2	-	-	18.4
2845/4/1	7.2	-	11.2	-	-	18.4
2802/1/1	1.6	-	2.6	-	-	4.2
2802/2/1	1.6	-	2.6	-	-	4.2
2830/1/1	1.6	-	2.6	-	-	4.2
2830/2/1	1.6	-	2.6	-	-	4.2
2825/1/1	3.6	-	-	-	-	3.6
2825/2/1	3.6	-	-	-	-	3.6

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans for adults based on the 5 high-rate consumers is 36.1 kg y^{-1}

The observed 97.5th percentile rate based on 17 observations is 51.8 kg y^{-1}

Table 2. Adults' consumption rates of molluscs from the Sellafield aquatic survey area (kg y^{-1})

Person ID number	Limpet	Mussel	Razor shell	Whelk	Winkle	Total
2843/1/1	**-**	**7.5**	**1.5**	**-**	**8.5**	**17.5**
2843/2/1	**-**	**-**	**3.0**	**-**	**4.3**	**7.3**
2818/2/1	3.0	-	-	-	1.0	4.0
2843/3/1	-	2.5	1.5	-	-	4.0
2821/2/1	-	-	-	-	1.7	1.7
2841/1/1	-	0.4	-	-	0.6	1.0
2818/1/1	0.4	-	-	-	-	0.4
2841/2/1	-	0.4	-	-	-	0.4
2818/3/1	-	-	-	-	0.3	0.3
2819/1/1	-	-	-	0.1	-	0.1
2819/2/1	-	-	-	0.1	-	0.1

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of molluscs for adults based on the 2 high-rate consumers is 12.4 kg y^{-1}

The observed 97.5th percentile rate based on 11 observations is 14.9 kg y^{-1}

Table 3. Adults' consumption rates of fish from the Sellafield aquatic survey area (kg y^{-1})

Person ID number	Bass	Cod	Dover sole	Flounder	Mackerel	Plaice	Pollack	Thornback ray	Turbot	Whiting	Total
2843/1/1	**5.0**	**5.0**	**5.0**	**-**	**-**	**14.9**	**-**	**14.9**	**14.9**	**-**	**59.7**
2843/3/1	**5.0**	**5.0**	**5.0**	**-**	**-**	**14.9**	**-**	**14.9**	**14.9**	**-**	**59.7**
2802/1/1	**-**	**29.6**	**-**	**-**	**-**	**29.6**	**-**	**-**	**-**	**-**	**59.1**
2802/2/1	**-**	**29.6**	**-**	**-**	**-**	**29.6**	**-**	**-**	**-**	**-**	**59.1**
2825/1/1	**-**	**17.7**	**-**	**-**	**-**	**-**	**-**	**17.7**	**-**	**-**	**35.5**
2825/2/1	**-**	**17.7**	**-**	**-**	**-**	**-**	**-**	**17.7**	**-**	**-**	**35.5**
2843/2/1	**2.5**	**2.5**	**2.5**	**-**	**-**	**8.8**	**-**	**8.8**	**8.8**	**-**	**33.9**
2816/1/1	**5.4**	**11.8**	**-**	**5.4**	**-**	**5.4**	**-**	**-**	**-**	**-**	**28.1**
2830/1/1	**-**	**5.9**	**-**	**-**	**5.9**	**5.9**	**-**	**5.9**	**-**	**-**	**23.7**
2830/2/1	**-**	**5.9**	**-**	**-**	**5.9**	**5.9**	**-**	**5.9**	**-**	**-**	**23.7**
2841/1/1	**-**	**3.9**	**-**	**-**	**-**	**1.8**	**-**	**16.2**	**-**	**-**	**21.9**
2846/1/1	-	7.8	-	-	-	-	7.8	-	-	-	15.6
2846/2/1	-	7.8	-	-	-	-	7.8	-	-	-	15.6
2838/1/1	-	7.4	-	-	6.0	-	-	-	-	1.6	15.0
2838/2/1	-	7.4	-	-	6.0	-	-	-	-	1.6	15.0
2827/1/1	-	5.9	-	-	-	5.9	-	-	-	-	11.8
2829/1/1	-	-	-	-	7.6	-	-	-	-	-	7.6
2828/1/1	-	-	-	-	6.0	-	-	-	-	-	6.0
2838/3/1	-	-	-	-	6.0	-	-	-	-	-	6.0
2841/2/1	-	3.9	-	-	-	1.8	-	-	-	-	5.7
2824/1/1	-	-	-	-	4.0	-	-	-	-	-	4.0
2824/2/1	-	-	-	-	4.0	-	-	-	-	-	4.0

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of fish for adults based on the 11 high-rate consumers is 40.0 kg y^{-1}

The observed 97.5th percentile rate based on 22 observations is 59.7 kg y^{-1}

Table 4. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h y^{-1})

Person ID number	Location	Activity	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
2830/1/1	**Whitehaven Outer Harbour**	**Bait digging**	**24**	**-**	**-**	**-**	**-**	**-**	**-**
	Parton	**Angling**	**-**	**-**	**156**	**-**	**-**	**-**	**-**
2817/2/1	**Ravenglass Estuary**	**Dog walking and horse riding**	**-**	**548**	**-**	**-**	**-**	**-**	**-**
	Saltcoats	**Dog walking**	**-**	**-**	**-**	**183**	**-**	**-**	**-**
2817/3/1	**Ravenglass Estuary**	**Dog walking and horse riding**	**-**	**548**	**-**	**-**	**-**	**-**	**-**
	Saltcoats	**Dog walking**	**-**	**-**	**-**	**183**	**-**	**-**	**-**
2817/5/1	**Ravenglass Estuary**	**Horse riding**	**-**	**365**	**-**	**-**	**-**	**-**	**-**
2835/1/1	**Parton**	**Dog walking**	**-**	**365**	**-**	**-**	**-**	**-**	**-**
2815/1/1	**Ravenglass Estuary**	**Dog walking**	**-**	**209**	**-**	**-**	**-**	**-**	**-**
	Seascale and Drigg		**-**	**-**	**-**	**-**	**521**	**-**	**-**
2817/1/1	**Ravenglass Estuary**	**Dog walking**	**-**	**183**	**-**	**-**	**-**	**-**	**-**
	Saltcoats	**Tending livestock**	**-**	**-**	**-**	**274**	**-**	**-**	**-**
	Saltcoats	**Dog walking**	**-**	**-**	**-**	**183**	**-**	**-**	**-**
2832/1/1	Parton	Dog walking	-	182	-	-	-	-	-
2816/1/1	Ravenglass Estuary	Bait digging and collecting seaweed	-	143	-	-	-	-	-
	Nethertown and Drigg	**Angling and bait digging**	**-**	**-**	**-**	**-**	**625**	**-**	**-**
	Nethertown	Collecting seaweed	-	-	-	-	-	-	39
2845/1/1	Ravenglass Estuary	Walking	-	17	-	-	-	-	-
	River Esk and Ravenglass Estuary	**Wildfowling and walking**	**-**	**-**	**-**	**153**	**-**	**-**	**-**
	Seascale	Playing	-	-	-	-	104	-	-
2845/3/1	Ravenglass Estuary	Walking	-	17	-	-	-	-	-
	River Esk and Ravenglass Estuary	**Wildfowling and walking**	**-**	**-**	**-**	**153**	**-**	**-**	**-**
	Seascale	Playing	-	-	-	-	104	-	-
2800/1/1	Ravenglass Estuary	Cycling	-	12	-	-	-	-	-
	Drigg		-	-	-	-	12	-	-
2843/3/1	**Drigg**	**Hooking for crabs and lobsters**	**-**	**-**	**135**	**-**	**-**	**-**	**-**

Table 4. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h y^{-1})

Person ID number	Location	Activity	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
	Whitehaven North Beach	Collecting mussels	-	-	21	-	-	-	-
2843/1/1	**Whitehaven north beach, Braystones, Nethertown, Coulderton, Seascale and Drigg**	**Angling, bait digging, setting nets and pots, setting drift nets and collecting razor shells**	**-**	**-**	**-**	**-**	**832**	-	-
	Whitehaven north beach, St Bees and Nethertown	Collecting winkles and mussels	-	-	-	-	-	17	-
2795/1/1	Parton	Collecting winkles	-	-	6	-	-	-	-
2817/4/1	**Saltcoats**	**Tending livestock**	**-**	**-**	**-**	**274**	-	-	-
2794/1/1	Ravenglass Estuary	Tending livestock and fixing fencing	-	-	-	132	-	-	-
2794/2/1	Ravenglass Estuary	Tending livestock and fixing fencing	-	-	-	132	-	-	-
2792/1/1	**Seascale, Drigg and Tarn Bay**	**Dog walking (professional and leisure)**	**-**	**-**	**-**	**-**	**1277**	-	-
2822/1/1	**St Bees**	**Dog walking**	**-**	**-**	**-**	**-**	**730**	-	-
2797/1/1	**Seascale**	**Dog walking**	**-**	**-**	**-**	**-**	**698**	-	-
2813/2/1	**Seascale and Drigg**	**Dog walking**	**-**	**-**	**-**	**-**	**521**	-	-
2805/1/1	**Tarn Bay**	**Dog walking**	**-**	**-**	**-**	**-**	**457**	-	-
2794/1/1	Drigg	Tending livestock and fixing fencing	-	-	-	-	400	-	-
2794/2/1	Drigg	Tending livestock and fixing fencing	-	-	-	-	400	-	-
2811/1/1	Whitehaven north beach, St Bees, Seascale and Drigg	Dog walking	-	-	-	-	365	-	-
2806/1/1	Tarn Bay	Dog walking	-	-	-	-	365	-	-
2806/2/1	Tarn Bay	Dog walking	-	-	-	-	365	-	-
2808/1/1	Tarn Bay	Dog walking	-	-	-	-	365	-	-
2845/2/1	Drigg To Sellafield	Dog walking	-	-	-	-	365	-	-
2825/2/1	St Bees and Drigg	Angling	-	-	-	-	364	-	-
2796/1/1	Seascale	Dog walking	-	-	-	-	287	-	-
2796/2/1	Seascale	Dog walking	-	-	-	-	287	-	-
2826/1/1	St Bees	Dog walking	-	-	-	-	280	-	-
2805/2/1	Tarn Bay	Dog walking	-	-	-	-	275	-	-
2825/2/1	St Bees and Drigg	Angling	-	-	-	-	261	-	-

Table 4. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h y^{-1})

Person ID number	Location	Activity	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
2804/1/1	Seascale	Dog walking	-	-	-	-	243	-	-
2807/1/1	Tarn Bay	Dog walking	-	-	-	-	243	-	-
2833/1/1	Nethertown and Braystones	Walking	-	-	-	-	235	-	-
2833/2/1	Nethertown and Braystones	Walking	-	-	-	-	235	-	-
2813/1/1	Sellafield and Seascale	Dog walking	-	-	-	-	183	-	-
2805/2/1	Tarn Bay	Dog walking	-	-	-	-	182	-	-
2803/1/1	Tarn Bay	Dog walking	-	-	-	-	156	-	-
2803/2/1	Tarn Bay	Dog walking	-	-	-	-	156	-	-
2798/1/1	Drigg	Dog walking	-	-	-	-	130	-	-
2834/1/1	Parton and St Bees	Dog walking	-	-	-	-	130	-	-
2799/1/1	Drigg	Walking	-	-	-	-	104	-	-
2799/2/1	Drigg	Walking	-	-	-	-	104	-	-
2814/1/1	Seascale	Dog walking	-	-	-	-	104	-	-
2814/2/1	Seascale	Dog walking	-	-	-	-	104	-	-
2845/2/1	Seascale	Playing	-	-	-	-	104	-	-
2793/1/1	Tarn Bay	Dog walking	-	-	-	-	52	-	-
2832/2/1	Seascale	Dog walking	-	-	-	-	52	-	-
2818/1/1	Eskmeals	Bait digging	-	-	-	-	48	-	-
	Nethertown and Coulderton	Collecting winkles	-	-	-	-	-	28	-
2846/1/1	**Coulderton**	Setting nets	-	-	-	-	30	-	-
		Dog walking	**-**	**-**	**-**	**-**	**-**	**365**	**365**
2809/1/1	Drigg	Dog walking	-	-	-	-	6	-	-
2846/2/1	Coulderton	Angling	-	-	-	-	-	-	91
2847/1/1	**Sellafield**	**Working on the shore**	-	-	-	-	-	**480**	-
	St Bees		-	-	-	-	-		**660**
2847/1/2	**Sellafield**	**Working on the shore**	-	-	-	-	-	**480**	-
	St Bees		-	-	-	-	-		**660**
2847/1/3	**Sellafield**	**Working on the shore**	-	-	-	-	-	**480**	-
	St Bees		-	-	-	-	-		**660**
2847/1/4	**Sellafield**	**Working on the shore**	-	-	-	-	-	**480**	-
	St Bees		-	-	-	-	-		**660**
2847/1/5	**Sellafield**	**Working on the shore**	-	-	-	-	-	**480**	-
	St Bees		-	-	-	-	-		**660**
2847/1/6	**Sellafield**	**Working on the shore**	-	-	-	-	-	**480**	-
	St Bees		-	-	-	-	-		**660**

Table 4. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h y^{-1})

Person ID number	Location	Activity	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
2847/1/7	**Sellafield**	**Working on the shore**	-	-	-	-	-	**480**	-
	St Bees		-	-	-	-	-		**660**
2847/1/8	**Sellafield**	**Working on the shore**	-	-	-	-	-	**480**	-
	St Bees		-	-	-	-	-		**660**
2846/2/1	**Coulderton**	**Walking and playing**	-	-	-	-	-	**376**	-
2848/1/1	**Parton**	**Working on the shore**	-	-	-	-	-	**330**	-
2848/1/2	**Parton**	**Working on the shore**	-	-	-	-	-	**330**	-
2848/1/3	**Parton**	**Working on the shore**	-	-	-	-	-	**330**	-
2848/1/4	**Parton**	**Working on the shore**	-	-	-	-	-	**330**	-
2848/1/5	**Parton**	**Working on the shore**	-	-	-	-	-	**330**	-
2848/1/6	**Parton**	**Working on the shore**	-	-	-	-	-	**330**	-
2848/1/7	**Parton**	**Working on the shore**	-	-	-	-	-	**330**	-
2848/1/8	**Parton**	**Working on the shore**	-	-	-	-	-	**330**	-
2836/1/1	Whitehaven north beach	Dog walking	-	-	-	-	-	130	-
2810/1/1	Parton	Playing and litter collecting	-	-	-	-	-	120	-
2838/1/1	Parton	Angling	-	-	-	-	-	77	-
2846/1/1	Coulderton	Setting nets	-	-	-	-	-	30	-
2810/18/1	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2810/18/2	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2810/18/3	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2810/18/4	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2810/18/5	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2810/18/6	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2810/18/7	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2810/18/8	Parton	Playing and litter collecting	-	-	-	-	-	18	-

Table 4. Adults' intertidal occupancy rates in the Sellafield aquatic survey area (h y^{-1})

Person ID number	Location	Activity	Mud and sand	Mud, sand and stones	Rock	Salt marsh	Sand	Sand and stones	Stones
2810/18/9	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2810/18/10	Parton	Playing and litter collecting	-	-	-	-	-	18	-
2821/1/1	St Bees	Collecting winkles	-	-	-	-	-	5	-
2819/1/1	Parton	Collecting winkles	-	-	-	-	-	2	-

Notes

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud and sand for adults based on 1 high-rate observation is 24 h y^{-1}

The observed 97.5th percentile is not applicable for 1 observation

The mean intertidal occupancy rate over mud, sand and stones for adults based on 6 high-rate observations is 369 h y^{-1}

The observed 97.5th percentile rate based on 11 observations is 548 h y^{-1}

The mean intertidal occupancy rate over rock for adults based on 2 high-rate observations is 146 h y^{-1}

The observed 97.5th percentile rate based on 4 observations is 155 h y^{-1}

The mean intertidal occupancy rate over salt marsh for adults based on 6 high-rate observations is 188 h y^{-1}

The observed 97.5th percentile rate based on 9 observations is 274 h y^{-1}

The mean intertidal occupancy rate over sand for adults based on 10 high-rate observations is 673 h y^{-1}

The observed 97.5th percentile rate based on 46 observations is 819 h y^{-1}

The mean intertidal occupancy rate over sand and stones for adults based on 18 high-rate observations is 401 h y^{-1}

The observed 97.5th percentile rate based on 36 observations is 480 h y^{-1}

The mean intertidal occupancy rate over stones for adults based on 9 high-rate observations is 627 h y^{-1}

The observed 97.5th percentile rate based on 11 observations is 660 h y^{-1}

Table 5. Aquatic combinations for adults in the Sellafield aquatic survey area

Person ID number	Consumption rates (kg y^{-1})			Intertidal occupancy rates (h y^{-1})				
	Fish	Crustaceans	Molluscs	Mud and sand	Mud, sand and stones	Sand	Sand and stones	Stones
2843/1/1	**59.7**	**59.1**	**17.5**	-	-	**832**	17	-
2843/3/1	**59.7**	**31.9**	4.0	-	-	-	-	-
2802/1/1	**59.1**	4.2	-	-	-	-	-	-
2802/2/1	**59.1**	4.2	-	-	-	-	-	-
2825/2/1	**35.5**	3.6	-	-	-	**625**	-	-
2825/1/1	**35.5**	3.6	-	-	-	-	-	-
2843/2/1	**33.9**	**40.9**	**7.3**	-	-	-	-	-
2816/1/1	**28.1**	-	-	-	143	**626**	-	39
2830/1/1	**23.7**	4.2	-	**24**	-	-	-	-
2830/2/1	**23.7**	4.2	-	-	-	-	-	-
2841/1/1	**21.9**	**24.2**	1.0	-	-	-	-	-
2846/1/1	15.6	-	-	-	-	30	**365**	**365**
2846/2/1	15.6	-	-	-	-	-	**376**	91
2841/2/1	5.7	**24.2**	0.4	-	-	-	-	-
2845/1/1	-	18.4	-	-	17	104	-	-
2845/3/1	-	18.4	-	-	17	104	-	-
2845/2/1	-	18.4	-	-	-	**469**	-	-
2818/1/1	-	-	0.4	-	-	48	28	-
2817/2/1	-	-	-	-	**548**	-	-	-
2817/3/1	-	-	-	-	**548**	-	-	-
2817/5/1	-	-	-	-	**365**	-	-	-
2835/1/1	-	-	-	-	**365**	-	-	-
2815/1/1	-	-	-	-	**209**	**521**	-	-
2817/1/1	-	-	-	-	**183**	-	-	-
2817/4/1	-	-	-	-	-	-	-	-
2792/1/1	-	-	-	-	-	**1277**	-	-
2822/1/1	-	-	-	-	-	**730**	-	-
2797/1/1	-	-	-	-	-	**698**	-	-
2813/2/1	-	-	-	-	-	**521**	-	-
2805/1/1	-	-	-	-	-	**457**	-	-
2805/2/1	-	-	-	-	-	**457**	-	-
2847/1/1	-	-	-	-	-	-	**480**	**660**
2847/1/2	-	-	-	-	-	-	**480**	**660**
2847/1/3	-	-	-	-	-	-	**480**	**660**
2847/1/4	-	-	-	-	-	-	**480**	**660**
2847/1/5	-	-	-	-	-	-	**480**	**660**
2847/1/6	-	-	-	-	-	-	**480**	**660**
2847/1/7	-	-	-	-	-	-	**480**	**660**
2847/1/8	-	-	-	-	-	-	**480**	**660**
2848/1/1	-	-	-	-	-	-	**330**	-
2848/1/2	-	-	-	-	-	-	**330**	-
2848/1/3	-	-	-	-	-	-	**330**	-
2848/1/4	-	-	-	-	-	-	**330**	-
2848/1/5	-	-	-	-	-	-	**330**	-
2848/1/6	-	-	-	-	-	-	**330**	-
2848/1/7	-	-	-	-	-	-	**330**	-
2848/1/8	-	-	-	-	-	-	**330**	-

Notes

Values in high-rate groups are emboldened

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

Person ID number	Age	Gender	Fish	Crustaceans	Molluscs	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
2792/1/1	**43**	**F**	-	-	-	-	-	-	-	**1277**	-	-
2793/1/1	59	M	-	-	-	-	-	-	-	52	-	-
2794/1/1	69	M	-	-	-	-	-	-	132	400	-	-
2794/2/1	39	M	-	-	-	-	-	-	132	400	-	-
2796/1/1	29	F	-	-	-	-	-	-	-	311	-	-
2796/2/1	22	F	-	-	-	-	-	-	-	311	-	-
2797/1/1	**81**	**F**	-	-	-	-	-	-	-	**698**	-	-
2798/1/1	66	F	-	-	-	-	-	-	-	130	-	-
2799/1/1	35	M	-	-	-	-	-	-	-	104	-	-
2799/2/1	25	M	-	-	-	-	-	-	-	104	-	-
2800/1/1	42	M	-	-	-	-	12	-	-	12	-	-
2802/1/1	**77**	**M**	**59.1**	4.2	-	-	-	-	-	-	-	-
2802/2/1	**45**	**F**	**59.1**	4.2	-	-	-	-	-	-	-	-
2803/1/1	43	M	-	-	-	-	-	-	-	156	-	-
2803/2/1	45	F	-	-	-	-	-	-	-	156	-	-
2804/1/1	72	F	-	-	-	-	-	-	-	243	-	-
2805/1/1	**51**	**M**	-	-	-	-	-	-	-	**457**	-	-
2805/2/1	**47**	**F**	-	-	-	-	-	-	-	**457**	-	-
2806/1/1	57	F	-	-	-	-	-	-	-	365	-	-
2806/2/1	73	M	-	-	-	-	-	-	-	365	-	-
2807/1/1	72	M	-	-	-	-	-	-	-	243	-	-
2808/1/1	63	F	-	-	-	-	-	-	-	365	-	-
2809/1/1	30	M	-	-	-	-	-	-	-	6	-	-

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

Person ID number	Age	Gender	Fish	Crustaceans	Molluscs	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
2810/1/1	47	F	-	-	-	-	-	-	-	-	120	-
2810/18/1	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/2	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/3	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/4	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/5	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/6	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/7	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/8	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/9	U	U	-	-	-	-	-	-	-	-	18	-
2810/18/10	U	U	-	-	-	-	-	-	-	-	18	-
2811/1/1	71	M	-	-	-	-	-	-	-	365	-	-
2813/1/1	72	M	-	-	-	-	-	-	-	183	-	-
2813/2/1	**68**	**F**	-	-	-	-	-	-	-	**521**	-	-
2814/1/1	26	M	-	-	-	-	-	-	-	104	-	-
2814/2/1	25	F	-	-	-	-	-	-	-	104	-	-
2815/1/1	**U**	**F**	-	-	-	-	**209**	-	-	**521**	-	-
2816/1/1	**67**	**M**	**28.1**	-	-	-	143	-	-	**626**	-	39
2817/1/1	**62**	**M**	-	-	-	-	**183**	-	**457**	-	-	-
2817/2/1	**58**	**F**	-	-	-	-	**548**	-	**183**	-	-	-
2817/3/1	**27**	**F**	-	-	-	-	**548**	-	**183**	-	-	-
2817/4/1	**38**	**M**	-	-	-	-	-	-	**274**	-	-	-
2817/5/1	**49**	**F**	-	-	-	-	**365**	-	-	-	-	-

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

Person ID number	Age	Gender	Fish	Crustaceans	Molluscs	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
2818/1/1	U	M	-	-	0.4	-	-	-	-	48	28	-
2818/2/1	U	F	-	-	4.0	-	-	-	-	-	-	-
2818/3/1	U	F	-	-	0.3	-	-	-	-	-	-	-
2819/1/1	54	M	-	19.2	0.1	-	-	-	-	-	2	-
2819/2/1	54	F	-	19.2	0.1	-	-	-	-	-	-	-
2821/1/1	34	M	-	-	-	-	-	-	-	-	5	-
2821/2/1	77	M	-	-	1.7	-	-	-	-	-	-	-
2822/1/1	**68**	**M**	-	-	-	-	-	-	-	**730**	-	-
2824/1/1	78	M	4.0	-	-	-	-	-	-	-	-	-
2824/2/1	78	F	4.0	-	-	-	-	-	-	-	-	-
2825/1/1	**83**	**M**	**35.5**	3.6	-	-	-	-	-	-	-	-
2825/2/1	**60**	**M**	**35.5**	3.6	-	-	-	-	-	**625**	-	-
2826/1/1	61	M	-	-	-	-	-	-	-	280	-	-
2827/1/1	U	M	11.8	-	-	-	-	-	-	-	-	-
2828/1/1	U	F	6.0	-	-	-	-	-	-	-	-	-
2829/1/1	68	M	7.6	-	-	-	-	-	-	-	-	-
2830/1/1	**75**	**M**	**23.7**	4.2	-	**24**	-	**156**	-	-	-	-
2830/2/1	**75**	**F**	**23.7**	4.2	-	-	-	-	-	-	-	-
2832/1/1	28	F	-	-	-	-	182	-	-	-	-	-
2832/2/1	U	M	-	-	-	-	-	-	-	52	-	-
2833/1/1	U	M	-	-	-	-	-	-	-	235	-	-
2833/2/1	U	M	-	-	-	-	-	-	-	235	-	-
2834/1/1	33	F	-	-	-	-	-	-	-	130	-	-

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

Person ID number	Age	Gender	Fish	Crustaceans	Molluscs	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
2835/1/1	**62**	**M**	-	-	-	-	**365**	-	-	-	-	-
2836/1/1	**42**	**M**	-	-	-	-	-	-	-	-	130	-
2838/1/1	71	M	15.0	-	-	-	-	-	-	-	77	-
2838/2/1	71	F	15.0	-	-	-	-	-	-	-	-	-
2838/3/1	U	F	6.0	-	-	-	-	-	-	-	-	-
2841/1/1	**80**	**M**	**21.9**	**24.2**	1.0	-	-	6	-	-	-	-
2841/2/1	**81**	**F**	5.7	**24.2**	0.4	-	-	-	-	-	-	-
2843/1/1	**71**	**M**	**59.7**	**59.1**	**17.5**	-	-	21	-	**832**	17	-
2843/2/1	**70**	**F**	**33.9**	**40.9**	**7.3**	-	-	-	-	-	-	-
2843/3/1	**45**	**M**	**59.7**	**31.9**	4.0	-	-	**135**	-	-	-	-
2845/1/1	**60**	**M**	-	18.4	-	-	17	-	**153**	104	-	-
2845/2/1	**57**	**F**	-	18.4	-	-	-	-	-	**469**	-	-
2845/3/1	**U**	**M**	-	18.4	-	-	17	-	**153**	104	-	-
2845/4/1	U	U	-	18.4	-	-	-	-	-	-	-	-
2846/1/1	**58**	**M**	15.6	-	-	-	-	-	-	30	**365**	**365**
2846/2/1	**30**	**M**	15.6	-	-	-	-	-	-	-	**376**	91
2847/1/1	**U**	**M**	-	-	-	-	-	-	-	-	**480**	**660**
2847/1/2	**U**	**M**	-	-	-	-	-	-	-	-	**480**	**660**
2847/1/3	**U**	**M**	-	-	-	-	-	-	-	-	**480**	**660**
2847/1/4	**U**	**M**	-	-	-	-	-	-	-	-	**480**	**660**
2847/1/5	**U**	**M**	-	-	-	-	-	-	-	-	**480**	**660**
2847/1/6	**U**	**M**	-	-	-	-	-	-	-	-	**480**	**660**
2847/1/7	**U**	**M**	-	-	-	-	-	-	-	-	**480**	**660**

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

Person ID number	Age	Gender	Fish	Crustaceans	Molluscs	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
2847/1/8	**U**	**M**	-	-	-	-	-	-	-	-	**480**	**660**
2848/1/1	**U**	**M**	-	-	-	-	-	-	-	-	**330**	-
2848/1/2	**U**	**M**	-	-	-	-	-	-	-	-	**330**	-
2848/1/3	**U**	**M**	-	-	-	-	-	-	-	-	**330**	-
2848/1/4	**U**	**M**	-	-	-	-	-	-	-	-	**330**	-
2848/1/5	**U**	**M**	-	-	-	-	-	-	-	-	**330**	-
2848/1/6	**U**	**M**	-	-	-	-	-	-	-	-	**330**	-
2848/1/7	**U**	**M**	-	-	-	-	-	-	-	-	**330**	-
2848/1/8	**U**	**M**	-	-	-	-	-	-	-	-	**330**	-

Notes

U = Unknown

Emboldened observations are the high-rate individuals

Annex 2a. Sellafield Fishing Community consumption and intertidal occupancy data reported in AEMR and RIFE (kg y^{-1} and h y^{-1})

Year (report)	FISH					CRUSTACEANS					MOLLUSCS				INTERTIDAL OCCUPANCY		Source of habits data	
	Species Composition	Total	Cod	Plaice	Other fish	Species Composition	Total	Crab	Lobster	*Nephrops or other crustaceans*	Species Composition	Total	Winkles	Other molluscs	Substrate	h y^{-1}	Consumption	Occupancy
1994 (AEMR 45)	Plaice and Cod (50%:50%)	26	13.0	13.0	0	Crabs and Lobsters (65%:35%)	12	7.8	4.2	0	Winkles and other molluscs (85%:15%)	9.7	8.2	1.5	-	0	1993/94 Survey	-
1995 (RIFE 1)	Plaice and Cod (50%:50%)	26	13.0	13.0	0	Crabs and Lobsters (75%:25%)	8.6	6.5	2.2	0	Winkles and other molluscs (50%:50%)	12	6.0	6.0	-	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	Crabs and Lobsters (60%:40%)	12	7.2	4.8	0	Winkles and other molluscs (60%:40%)	12	7.2	4.8	-	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	Crabs, Lobsters and *Nephrops* (50%:40%:10%)	17	8.5	6.8	1.7	Winkles and other molluscs (40%:60%)	4.2	1.7	2.5	-	0	1997 Review	-
1998 (RIFE 4)	Plaice and Cod (50%:50%)	45	22.5	22.5	0	Crabs and Lobsters (85%:15%)	28	23.8	4.2	0	Winkles and other molluscs (30%:70%)	15	4.5	10.5	Sand and mollusc beds	1100	1998 Survey	1998 Survey
1999 (RIFE 5)	Plaice and Cod (50%:50%)	43	21.5	21.5	0	Crabs and Lobsters (80%:20%)	24	19.2	4.8	0	Winkles and other molluscs (50%:50%)	25	12.5	12.5	Sand and mollusc beds	1000	1999 Review	1999 Review
2000 (RIFE 6)	Cod and other fish (40%:60%)	31	12.4	0	18.6	Crabs, Lobsters and *Nephrops* (40%:40%:20%)	20	8.0	8.0	4.0	Winkles and other molluscs (50%:50%)	17	8.5	8.5	Sand and mollusc beds	1000	2000 Review	2000 Review
2001 (RIFE 7)	Cod and other fish (40%:60%)	31	12.4	0	18.6	Crabs, Lobsters and *Nephrops* (40%:40%:20%)	20	8.0	8.0	4.0	Winkles and other molluscs (50%:50%)	17	8.5	8.5	Sand and mollusc beds	900	2000 Review	2000 Review
2002 (RIFE 8)	Cod and other fish (40%:60%)	51	20.4	0	30.6	Crabs, Lobsters and *Nephrops* (50%:30%:20%)	16	8.0	4.8	3.2	Winkles and mussels (60%:40%)	29	17.4	11.6	Mud and sand	1200	2002 Review	2002 Review
2003 (RIFE 9)	Cod and other fish (60%:40%)	41	24.6	0	16.4	Crabs, Lobsters and *Nephrops* (80%:10%:10%)	27	21.6	2.7	2.7	Winkles and other molluscs (40%:60%)	34	13.6	20.4	Mud and sand	870	2003 Survey	2003 Survey
2004 (RIFE 10)	Cod and other fish (60%:40%)	41	24.6	0	16.4	Crabs, Lobsters and *Nephrops* (50%:40%:10%)	25	12.5	10.0	2.5	Winkles and other molluscs (50%:50%)	34	17.0	17.0	Mud and sand	1000	2004 Review (crust and moll) and 2003 Survey (fish)	2004 Review
2005 (RIFE 11)	Cod and other fish (60%:40%)	41	24.6	0	16.4	Crabs, Lobsters and *Nephrops* (60%:20%:20%)	20	12.0	4.0	4.0	Winkles and other molluscs (60%:40%)	33	19.8	13.2	Mud and sand	790	2005 Review (crust and moll) and 2003 Survey (fish)	2005 Review
2006 (RIFE 12)	Cod and other fish (60%:40%)	41	24.6	0	16.4	Crabs, Lobsters and *Nephrops* (50%:20%:30%)	20	10.0	4.0	6.0	Winkles and other molluscs (50%:50%)	40	20.0	20.0	Mud and sand	580	2006 Review (crust and moll) and 2003 Survey (fish)	2006 Review
2007 (RIFE 13)	Cod and other fish (60%:40%)	41	24.6	0	16.4	Crabs, Lobsters and *Nephrops* (50%:30%:20%)	20.4	10.2	6.1	4.1	Winkles and other molluscs (60%:40%)	28.9	17.3	11.6	Mud and sand	830	2007 Review (crust and moll) and 2003 Survey (fish)	2007 Review
2008 (RIFE 14)	Cod and other fish (25%:75%)	40	10.0	0	30.0	Crabs, Lobsters and *Nephrops* (70%:20%:10%)	16.8	11.8	3.4	1.7	Winkles and other molluscs (50%:50%)	31.4	15.7	15.7	Mud and sand	930	2008 Survey	2008 Survey
2009 (RIFE 15)	Cod and other fish (25%:75%)	40	10.0	0	30.0	Crabs, Lobsters and *Nephrops* (30%:50%:20%)	16	4.8	8	3.2	Winkles and other molluscs (60%:40%)	28	16.8	11.2	Mud and sand	960	2009 Review (crust & moll) 2008 Survey (fish)	2009 Review
2010 (RIFE 16)	Cod and other fish (25%:75%)	40	10.0	0	30.0	Crabs, Lobsters and *Nephrops* (50%:30%:20%)	22	11.0	6.6	4.4	Winkles and other molluscs (20%:80%)	22	4.4	17.6	Mud and sand	870	2010 Review (crust & moll) 2008 Survey (fish)	2010 Review
2011 (RIFE 17)	Cod and other fish (25%:75%)	40	10.0	0	30.0	Crabs, Lobsters and *Nephrops* (40%:30%:30%)	27	10.8	8.1	8.1	Winkles and other molluscs (60%:40%)	12	7.2	4.8	Mud and sand	840	2011 Review (crust & moll) 2008 Survey (fish)	2011 Review
2012 (RIFE 18)	Cod and other fish (25%:75%)	37	9.3	0	27.8	Crabs, Lobsters and *Nephrops* (30%:20%:50%)	29	8.7	5.8	14.5	Winkles and other molluscs (60%:40%)	9.1	5.5	3.6	Mud and sand	850	2012 LLWR Habits Survey	2012 LLWR Habits Survey

Annex 2a. Sellafield Fishing Community consumption and intertidal occupancy data reported in AEMR and RIFE (kg y^{-1} and h y^{-1})

Year (report)	FISH					CRUSTACEANS					MOLLUSCS				INTERTIDAL OCCUPANCY		Source of habits data	
	Species Composition	Total	Cod	Plaice	Other fish	Species Composition	Total	Crab	Lobster	*Nephrops or other crustaceans*	Species Composition	Total	Winkles	Other molluscs	Substrate	h y^{-1}	Consumption	Occupancy
2013 (RIFE 19)	Cod and other fish (40%:60%)	56	22.4	0	33.6	Crabs, Lobsters and *Nephrops* (20%:5%:75%)	25	5.0	1.2	18.8	Winkles and other molluscs (85%:15%)	15	12.8	2.2	Mud and sand	760	2013 Survey	2013 Survey
2014 (RIFE 20)	Cod and other fish (40%:60%)	56	22.4	0	33.6	Crabs, Lobsters and other crustaceans (25%:35%:40%)	36	9.0	12.6	14.4	Winkles and other molluscs (65%:35%)	11	7.2	3.8	Mud and sand	1100	2014 Review (crust and moll) 2013 Survey (fish)	2014 Review
2015 (RIFE 21)	Cod and other fish (25%:75%)	64	16.0	0	48.0	Crabs, Lobsters and other crustaceans (30%:40%:30%)	38	11.4	15.2	11.4	Winkles and other molluscs (55%:45%)	12	6.6	5.4	Mud and sand	1000	2015 Review	2015 Review
2016 (RIFE 22)	Cod and other fish (25%:75%)	60	15.0	0	45.0	Crabs, Lobsters and other crustaceans (30%:35%:35%)	37	11.0	13.0	13.0	Winkles and other molluscs (60%:40%)	12	7.2	4.8	Mud and sand	790	2016 Review	2016 Review
2017 (RIFE 23)	Cod and other fish (40%:60%)	54	21.6	0	32.4	Crabs, Lobsters and other crustaceans (30%:45%:25%)	31	9.3	14.0	7.7	Winkles and other molluscs (65%:35%)	12	7.8	4.2	Mud and sand	770	2017 Review	2017 Review
2018 (RIFE 24)	Cod and other fish (60%:40%)	41	24.6	0	16.4	Crabs, Lobsters and other crustaceans (40%:45%:15%)	35	14.0	15.8	5.3	Winkles and other molluscs (75%:25%)	12	9.0	3.0	Mud and sand	700	2018 Survey	2018 Survey
2019 (RIFE 25)	Cod and other fish (30%:70%)	40	12	0	28	Crabs, Lobsters and other crustaceans (20%:40%:40%)	36	7.2	14.4	14.4	Winkles and other molluscs (50%:50%)	12	6.0	6.0	Mud and sand	830	2019 Review	2019 Review

Annex 2b. Sellafield Fishing Community 5-year average consumption and intertidal occupancy rates (kg y^{-1} and h y^{-1})

5-year period	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

Annex 3. Summary of profiles for adults in the Sellafield area for use in the assessment of total dose

Profile Name	Number of individuals	Pathway Name																												
		Crustacea	Direct	Eggs	Fish - Freshwater	Fish - Sea	Fruit - Domestic	Fruit and nuts - Wild	Gamma ext - salt marsh	Gamma ext - sediments	Honey	Marine plants/algae	Meat - Cow	Meat - Game	Meat - Poultry	Meat - Sheep	Meat - Wildfowl	Milk	Mollusca	Mushrooms	Mushrooms grown on salt marsh	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	l	kg	kg	kg	h	h	h	h	h	kg	kg	kg	kg
Crustacean Consumers	**9**	32.6	0.33	-	-	36.6	-	-	-	100	-	-	-	-	-	-	-	-	3.3	-	-	-	43	-	8	13	-	-	0.56	-
Occupants for Direct Radiation	**162**	0.67	1.00	0.54	-	1.0	0.73	0.09	-	57	<0.01	-	1.3	0.05	0.42	0.89	-	3.7	<0.01	0.07	-	<1	11	290	130	1420	0.82	1.4	0.98	1.0
Egg Consumers	**6**	-	0.17	26.9	-	-	6.8	0.15	-	4	-	-	-	-	-	19.8	-	-	-	-	-	-	-	-	1420	-	1.2	5.4	9.5	1.3
Freshwater Fish Consumers	**2**	-	-	-	4.2	-	-	5.0	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5	38.9	10.0	2.5
Sea Fish Consumers	**25**	11.1	0.12	-	-	37.2	0.05	-	-	180	-	-	-	-	0.07	-	-	-	1.3	-	-	-	44	-	3	5	0.13	0.13	0.19	0.15
Domestic Fruit Consumers	**10**	0.09	0.10	1.9	-	0.19	37.7	0.75	-	58	-	-	-	-	0.29	1.1	-	34.6	0.06	0.19	-	-	-	-	-	73	8.4	18.9	16.9	14.3
Wild Fruit and Nut Consumers	**13**	0.61	0.15	0.95	0.65	0.15	10.9	2.9	-	2	0.35	-	7.7	1.3	2.3	8.2	0.10	26.6	0.05	0.32	-	-	-	1210	-	-	2.1	6.4	5.2	4.1
Occupants over Salt marsh	**8**	-	-	-	-	-	-	-	640	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Occupants over Sediment	**43**	1.9	0.16	-	-	5.7	1.9	0.02	9	770	-	-	-	-	0.54	-	-	-	0.70	0.01	-	<1	11	5	2	24	1.1	1.6	0.96	1.3
Honey Consumers	**2**	-	-	-	4.2	-	-	5.0	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5	38.9	10.0	2.5
Consumers of Marine Plants and Algae	**1**	-	-	-	-	-	-	-	-	220	-	0.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cattle Meat Consumers	**12**	-	0.42	2.7	-	-	1.1	0.63	-	2	-	-	33.1	-	0.07	7.5	-	-	-	0.23	-	-	-	2560	-	150	-	0.42	-	0.42
Game Meat Consumers	**1**	7.0	-	-	-	-	-	3.0	-	-	-	-	-	17.4	28.3	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-
Poultry Meat Consumers	**5**	1.4	0.40	3.3	-	2.6	1.8	1.0	2	340	0.18	-	1.0	3.5	20.1	1.0	3.7	-	-	-	-	-	-	-	-	3110	4.2	5.2	4.8	4.9
Sheep Meat Consumers	**14**	-	0.43	6.1	-	1.2	1.6	0.96	-	-	-	-	7.1	-	1.0	23.4	-	-	-	0.19	-	-	2	1120	610	680	0.03	1.9	5.7	0.36
Wildfowl Consumers	**2**	-	-	-	-	-	-	-	5	38	-	-	-	-	5.3	-	28.4	-	-	-	-	-	-	-	-	-	-	-	-	-
Milk Consumers	**15**	-	0.13	1.5	-	-	3.3	0.20	-	<1	0.20	-	-	-	-	-	-	202.1	-	0.19	-	-	-	-	-	350	1.9	3.1	-	0.07
Mollusc Consumers	**3**	33.3	-	-	-	31.2	-	-	-	530	-	-	-	-	-	-	-	-	12.5	-	-	-	8	-	-	-	-	-	-	-
Mushroom Consumers	**11**	-	0.45	1.1	-	0.79	2.8	0.77	-	13	-	-	9.1	-	0.12	3.6	-	35.5	-	1.6	-	<1	-	1430	-	270	2.9	9.4	10.8	4.2
Consumers of mushrooms growing on salt marsh	**5**	-	-	-	-	-	-	-	27	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-
Occupants In Water	**4**	-	-	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	940	3	-	-	-	-	-	-	-
Occupants On Water	**8**	9.2	-	-	-	1.5	-	0.06	38	30	-	-	-	-	-	-	-	-	-	0.13	-	-	1650	-	-	-	-	-	-	-
Local Inhabitants (0 - 0.25km)	**6**	-	1.00	4.3	-	-	1.8	0.83	-	3	-	-	28.7	-	-	8.4	-	-	-	0.45	-	-	-	6080	-	-	-	0.83	-	0.83
Local Inhabitants (0.25 - 0.5km)	**1**	-	1.00	24.2	-	-	-	-	-	-	-	-	-	-	-	39.5	-	-	-	-	-	-	-	-	8510	-	-	-	-	-
Local Inhabitants (0.5 - 1km)	**24**	0.05	1.00	0.68	-	0.68	1.3	0.24	-	25	0.04	-	0.21	0.36	2.6	1.5	-	14.5	<0.01	0.07	-	-	3	-	-	6330	0.89	1.9	0.67	0.20
Green Vegetable Consumers	**15**	-	0.27	0.59	-	1.7	15.8	0.03	-	110	-	-	-	-	1.5	-	-	-	-	0.33	-	-	-	-	-	96	30.5	24.5	45.8	20.0
Other Domestic Vegetable Consumers	**19**	-	0.37	1.8	0.47	1.4	15.5	0.55	-	120	0.24	-	-	-	1.2	-	-	-	-	0.26	-	-	-	-	-	480	14.3	31.1	16.8	16.9
Potato Consumers	**31**	-	0.03	0.29	-	-	6.6	-	-	-	-	-	2.6	-	0.20	1.8	-	10.1	-	0.16	-	-	-	-	-	18	10.6	6.5	86.1	7.6
Root Vegetable Consumers	**18**	0.05	0.33	-	-	1.5	22.1	0.30	-	110	-	-	-	-	1.3	0.59	-	19.2	0.03	0.36	-	-	-	-	-	110	22.6	23.0	35.7	23.4

Notes

1. Expressed as the proportion of the profile members who are exposed to direct radiation.
2. Gamma ext - salt marsh only includes occupancy over salt marsh.
3. Gamma ext - sediments represents occupancy over mud; mud and sand; mud, sand and stones; sand; sand and stones.
4. Game meat includes venison and rabbits/hares.
5. Plume times are the sum of individuals' indoor and outdoor times.

The data used for these profiles is the 2018 Sellafield Habits Survey data updated with the 2019 Sellafield Review data.

The means of the high-rate groups are determined by the 'cut-off' method and are highlighted on the diagonal.

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