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An assessment of aquatic radiation pathways in Ireland, 2008

Environment Report RL 16/08

Conducted on behalf of the Radiological Protection Institute of Ireland

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CONTENTS

SUMMARY

This report provides an assessment of aquatic radiation exposure pathways in Ireland relating to anthropogenic radioactivity in the Irish Sea. It comprises:

- The results of a habits survey undertaken on the north-east coast of Ireland
- A dose assessment using the habits survey data, and 2007 monitoring data provided by the Radiological Protection Institute of Ireland
- Recommendations for changes to the 2007 east coast of Ireland marine monitoring programme conducted by the Radiological Protection Institute of Ireland

A habits survey was conducted in 2008 to obtain seafood consumption rates, intertidal occupancy rates, handling rates of commercial fishing gear and catch, and handling rates of sediment, for members of the public in Ireland. For coastal aquatic pathways, the survey area was defined as Omeath to Clogherhead in Co. Louth, and for fishing ports and harbours, the survey area was defined as Carlingford in Co. Louth to Howth in Co. Dublin. The consumption of seafood from the Irish Sea and Carlingford Lough was included. Interviews were conducted with members of the public and data collected for 535 individuals are presented and discussed.

The mean consumption rates for the adult high-rate groups were:

- Fish 26 kg/y (for 64 high-rate consumers)
- Crustaceans 9.7 kg/y (for 22 high-rate consumers)
- Molluscs 25 kg/y (for 4 high-rate consumers)
- Seaweed 0.50 kg/y (for 1 high-rate consumer)

The species breakdown for each high-rate group, rounded to the nearest 5%, were:

- Fish – 20% mackerel, 15% haddock and 65% other species
- Crustaceans – 35% brown crab, 30% lobster and 30% *Nephrops*
- Molluscs – 75% mussels, 10% Pacific oysters and 10% winkles
- Seaweed – 100% dulse (*Palmaria palmata*)

The mean occupancy rates over intertidal substrates for the adult high-rate groups were:

- 360 h/y over mud (for 15 oyster farmers)
- 520 h/y over mud and sand (for 1 commercial winkle collector)
- 50 h/y over mud, sand and stones (for 1 walker)
- 100 h/y over rock (for 1 angler)
- 410 h/y over sand (for 10 oyster farmers, 7 dog walkers, 1 angler/dog walker, and 1 individual undertaking watersports preparation)
- 640 h/y over sand and stones (for 1 winkle collector, 4 shore anglers and 4 dog walkers)

The mean handling rates of fishing gear and catch, and sediment, for the adult high-rate groups were:

- 2500 h/y handling commercial fishing gear and catch (for 31 fishermen handling trawl gear and catch, and 2 fishermen handling dredge gear and catch)
- 730 h/y handling sediment (for 2 commercial winkle collectors and 15 oyster farmers)

The mean occupancy rates of activities in and on water for the adult high-rate groups were:

- 330 h/y in water (for 16 windsurfers/kayakers, 3 kite-surfers, 3 swimmers and 1 watersports instructor)
- 3100 h/y on water (for 52 commercial fishermen)

Dose assessments were undertaken for two groups of high-rate seafood consumers, Group A and Group B. Group A was assumed to consume 26 kg/y of fish and 10 kg/y of crustaceans, and group B to consume 25 kg/y of molluscs. The dose assessments combined the results of the habits survey with 2007 environmental monitoring data provided by the Radiological Protection Institute of Ireland. The annual committed effective dose for critical group A was calculated as 0.29 μSv, which is less than 0.03% of the annual dose limit to members of the public of 1000 μSv, and the annual committed effective dose for critical group B was 0.47 μSv, or less than 0.05% of the annual dose limit to members of the public of 1000 μSv.

Recommendations for changes to the Radiological Protection Institute of Ireland's marine environment monitoring programme for the east coast of Ireland based on the findings of this survey are:

- Haddock could be substituted for whiting, as it is a similar demersal species but was being consumed in greater amounts.
- Herring samples could be discontinued since herring was consumed in very low quantities and monitoring of pelagic fish species is adequately covered by mackerel.
- It is suggested that the feasibility of adding a lobster sample to the programme is investigated as lobsters were consumed in significant quantities and they are known to bioaccumulate technetium-99.
- It is suggested that the sampling of molluscs is reviewed to investigate the possibility of introducing a sample of winkles to the programme. This recommendation is made because significant consumption of winkles was identified and molluscs tend to contain higher concentrations of radionuclides than crustaceans and fish.
- It may be necessary to re-introduce the monitoring of sediments in intertidal areas since individuals were identified with high intertidal occupancy rates, for example on Greenore and Clogherhead beaches.
- Beta dose rates from fishing gear could be investigated since individuals with high rates of handling fishing gear and catch were identified.

It is considered that all other samples in the current marine monitoring programme are satisfactory and should remain unchanged.

1. INTRODUCTION

The Irish public may be exposed to radiation as a result of anthropogenic radioactivity in the Irish Sea, notably from the Sellafield Limited nuclear reprocessing site in Cumbria, UK. In Ireland, the Radiological Protection Institute of Ireland (RPII) has the statutory responsibility to monitor ionising radioactivity present in the environment and food. A habits survey was undertaken on behalf of the RPII, to provide information about activities carried out by members of the public under everyday circumstances that may influence their exposure to radiation.

The control of radiation exposure via routine discharges from nuclear licensed sites in Ireland (and the UK) is based on advice from the International Commission on Radiological Protection (ICRP). Of relevance are the ICRP 60 Recommendations (ICRP, 1991), which embody the principles of justification of practices, optimisation of protection, and dose limitation. Radiological protection of the public is based on the concept of a 'critical group' of individuals. This group is defined as those people who, because of both their residence and habits, receive the highest radiation dose due to the operations of a nuclear site. It follows that, if the dose to this group is acceptable when compared to relevant dose limits and constraints, other members of the public will receive lower doses, and protection from the effects of radiation is provided to members of the public overall. The ICRP have recommended that the term 'representative person' be used in preference to the term 'critical group' (ICRP, 2007). However, this recommendation has not yet been formally adopted, therefore we continue to use the term 'critical group' in this report.

Dose standards in Ireland are implemented by the RPII and are based on guidance from the International Atomic Energy Agency (IAEA), in the Basic Safety Standards for Radiation Protection (IAEA, 1996) and in European Community legislation in the EU BSS Directive 96/29/Euratom (CEC, 1996). The ICRP recommendation for the dose limit to members of the public from man-made radioactivity is 1 mSv per year and this is accepted internationally.

This report provides quantified habits data for members of the Irish public and identifies high-rate groups so that doses to the public can be assessed in a realistic way. A dose assessment using these data and current RPII marine monitoring data was undertaken to quantify dose rates for the critical groups.

2. THE HABITS SURVEY

2.1 Survey aims

The aim of the survey was to identify aquatic exposure pathways and collect comprehensive information on the habits of the public to enable realistic dose assessments to be calculated.

Specifically, investigations were conducted into the consumption of aquatic foods, the occupancy of intertidal areas, the handling of fishing gear and catch, the handling of sediment, the occupancy in and on water, and any unusual exposure pathways.

2.2 Conduct of the survey

A review of published data on habits, consumption trends and dose assessments relevant to marine exposure pathways in the survey area was conducted. A meeting was held between RPII and Cefas representatives, during which the review of published habits data was presented and the survey areas were agreed. These discussions provided an outline of the main aims of the survey and highlighted issues that required special attention.

As part of the pre-survey preparation, information was gathered relevant to the aquatic exposure pathways in the survey areas. This included contacting people with a local knowledge of the survey area and conducting Internet searches. Information on fisheries and aquaculture in the area was obtained from the Sea Fisheries Protection Authority, the Irish Sea Fisheries Board, the Eastern Regional Fisheries Board, the Central Statistics Office of Ireland, and the Irish Shellfish Association.

The survey fieldwork was carried out between 7th – 15th July 2008 using techniques described by Leonard *et al*. (1982).

During the fieldwork, people were interviewed to obtain information on any aspects relevant to aquatic exposure pathways. The survey team targeted potential high-rate consumers of seafood, and individuals undertaking activities on intertidal areas and at sea. Twenty-one person-days were spent conducting interviews and the habits of 535 individuals were recorded.

3. HABITS DATA RECORDING AND MANIPULATION

3.1 Data recording

Data collected during the fieldwork were recorded in logbooks. On return to the laboratory, the data were examined and any notably high rates were re-examined for authenticity. The raw data were entered into a purpose-built habits survey database where each individual and associated data was given a unique identifier (the observation number) to assist in maintaining data quality.

3.2 Data manipulation

For the purpose of analysis, data were aggregated into groups with broadly similar attributes. For example, when considering aquatic food consumption, all crustacean species were grouped together as 'crustaceans'. For external exposure over intertidal sediments, occupancy over a common substrate (e.g. sand) was chosen.

In addition, data were structured into age groups because different dose coefficients (i.e. the factors which convert intakes of radioactivity into dose) could apply to different ages. The age groups and their relevant age ranges are based on the recommendations in ICRP 72 (ICRP, 1996), and are listed below:

Age group	Age range in group
3-month-old	Under 1-year-old
1-year-old	1-year-old
5-year-old	2-year-old to 6-year-old
10-year-old	7-year-old to 11-year-old
15-year-old	12-year-old to 16-year-old
Adult	17-year-old and over

All consumption and occupancy data in the text of this report are rounded to two significant figures to reflect 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. Consumption rates less than 0.05 kg/y are presented to two decimal places to ensure the values do not appear as 0.0 kg/y. External exposure data are presented as integers.

High rates of consumption, occupancy and handling have been calculated using the 'cut-off' method described by Hunt *et al.* (1982) and the 97.5th percentile rates.

The 'cut-off' method involves taking the arithmetic mean of the maximum observed rate and all observed rates within a factor of 3 of the maximum value (termed the lower threshold value). For ease of presentation in this report, the term 'high-rate' is used to represent the values derived by the cut-off method. A separate high-rate group was calculated for each food group, intertidal substrate and handling pathway identified in the survey. In certain cases, using the cut-off method could result 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.

The 97.5th percentile rates were calculated using the Excel mathematical function for calculating percentiles. The use of percentiles accords with precedents used in risk assessment of the safety of food consumption and is a standard approach adopted by the Food Standards Agency in the UK (Cutts *et al*., 2005).

The high-rate groups and 97.5th percentile rates for adults and children are presented in Tables 1 to 12. The complete data sets for adults and children are presented in Annexes 1 and 2.

4. SURVEY AREAS

The survey covered the north-east coastline of Ireland and the Irish Sea. For coastal aquatic pathways the area was defined as Omeath to Clogherhead in Co. Louth (Figure 1). For fishing ports and harbours, the area was defined as Carlingford in Co. Louth to Howth in Co. Dublin (Figure 2). For fishing grounds, the area covered the Irish Sea, as defined by the International Council for the Exploration of the Sea (ICES) Division VIIa (Figure 3). The survey areas defined in this report were agreed with the RPII prior to the fieldwork.

4.1 Coastal survey area

Overview of the area

Carlingford Lough is an 18 km long sea lough that lies at the northern end of the survey area and the border between the Republic of Ireland and Northern Ireland runs through the lough. The shore of the lough ranges from rocky cliffs in the west to large expanses of mud flats in the east. Near the mouth of the lough, the area is low-lying with sand and shingle beaches, and patches of mud, sand and stones. On the southern side of the Carlingford peninsula there are vast sandy beaches and a sandy bay. Further south, Dundalk Bay is a large expanse of mud flats, sand flats and salt marshes. There are four estuaries that feed into Dundalk Bay, the largest of which is the Castletown Estuary to the north of Dundalk. South of Dundalk Bay, the coastline has two rocky headlands and long sandy beaches. The prominent locations within the coastal survey area are described in more detail below, from the north of the survey area to the south.

Southern shore of Carlingford Lough

Omeath

Omeath is a tourist village located on the south-western shore of Carlingford Lough. At low tide, the shore around Omeath was sand and stones with seaweed, and this area was popular with commercial winkle collectors. There was a jetty from which a passenger ferry operated straight across Carlingford Lough to Northern Ireland. Greer's Quay, which had a slipway and moorings, was situated to the east of Omeath. At the time of the fieldwork, one fishing vessel and several small angling boats were moored there. This was also a watersports location for a local outdoor activity centre.

Carlingford

East of Omeath is Carlingford, a bustling tourist village with numerous fish restaurants selling shellfish from Carlingford Lough. Carlingford was a popular location for water based activities and sailing. There was a marina to the west of Carlingford, and an adventure centre, a sail-training centre and a sailing club in Carlingford. The harbour at Carlingford had two quays, both with slipways. A mussel dredger was moored in the harbour. At low tide, a large area of

mud, sand and stones was exposed. There was a beach to the east of Carlingford that was sand and stones. The shore between Carlingford and Greenore was a popular commercial winkle collecting area and there was also an oyster farm.

Greenore

Greenore is a small village located on a headland at the mouth of Carlingford Lough. General beach activities were observed on the sand and stone beach, and this was an extremely popular location for shore angling, particularly fishing for mackerel. A public notice warned against swimming in this area due to strong currents. There was a privately owned deep-water port next to the village, although no fishing vessels were based there. It was reported that there was a proposed expansion to the port, which may result in loss of public access to the shore at Greenore. Two oyster farms were located to the south of Greenore.

Coastline between the mouth of Carlingford Lough and Dundalk Bay

Ballagan Point

Ballagan Point is the easternmost point of the Carlingford peninsula. It is a remote area accessed by a coast road. The shore of the area around Ballagan Point was predominantly mud, sand and stones, with patches of rock and seaweed. During the survey there was little activity along this shore, however, it was reported to be a popular area for commercial winkle collectors.

Templetown and Shellinghill

Cooley Point is the southernmost point of the Carlingford peninsula. West of Cooley Point, at Templetown and Shellinghill, the shore substrate became extensive sandy beaches backed by sand dunes. Both Templetown and Shellinghill were Blue Flag beaches, and were popular for general beach activities and swimming.

Giles Quay

West of Shellinghill is Giles Quay, a small harbour with a slipway, where one commercial potting vessel was based. There was a sand and stone beach to the east and a large sandy bay to the west which was popular with holidaymakers staying at the caravan park situated on the cliff.

Dundalk Bay

Blue Anchor

Blue Anchor is located on the north shore of the mouth of the Castletown Estuary, where the Castletown River enters Dundalk Bay. The shore around Blue Anchor was mud, sand and stones backed by small areas of salt marsh, and at low tide the substrate was thick mud. The

area of salt marsh to the west of Blue Anchor was a designated wildfowl sanctuary. No one was observed undertaking intertidal activities in this area during the fieldwork. There was an old quay that was used by boat anglers, and small pleasure boats were moored in the estuary.

Dundalk

Dundalk is situated on the south shore of the Castletown Estuary. There is a quay that is used by cargo ships and fishing boats. About 15 cockle-dredging boats were berthed here. The intertidal areas of the estuary were largely inaccessible due to the mud and salt marsh riverbanks, and no one was observed in this area during the fieldwork.

Blackrock

South of Dundalk is Blackrock, a popular seaside town with good road access and parking facilities along the sea wall. There was a wide sandy beach at low tide, with patches of filamentous seaweed and stones on the upper shore. South of Blackrock there were areas of salt marsh and the beach changed to mud, sand and stone.

Annagassan

The upper shore around Annagassan comprised a narrow sand and shingle bar backed by boulders. The mid shore was mud and sand, and the lower shore was mud. The rivers Glyde and Dee joined together about 1 km from the coast and the resulting river flowed through the harbour at Annagassan into Dundalk Bay. The quay at Annagassan was a base for cockle dredgers and about 15 were moored here. From the quay there was access onto the shore.

Salterstown

South-east of Annagassan is Salterstown. The upper shore was sand and stones which was backed by boulders. The mid shore substrate was mud and sand, with rocks which were covered by seaweed, winkles and mussels, and the lower shore was mud and sand. This was reported to be a popular beach for the commercial collection of winkles and seed mussels.

Dunany Point

Dunany Point is the rocky headland at the southern tip of Dundalk Bay. The upper shore was sand, stones and boulders, and the mid and lower shore was sand with patches of stone and rocks. Few people were observed at this location.

South of Dundalk Bay

Port and Lurganboy

Between the headlands of Dunany Point and Clogherhead there was a continuous long beach of sand and stones. The popular Blue Flag bathing beaches of Port and Lurganboy were located in this area.

Clogherhead

The town of Clogherhead is situated on the south side of the small peninsula of Clogher Head while the fishing harbour associated with the town lies on the north side of the peninsula. The harbour is called Port Oriel but it is often referred to simply as Clogherhead. The harbour was a major fishing centre and was the home for over 20 demersal trawlers and a few other fishing boats, although many of the vessels often fished away from home. An angling charter boat and several private pleasure boats suitable for angling were moored here. The outer pier was new and the harbour had an inner basin. There was a fish market and several fish merchants had premises nearby. The pier and rocks around Port Oriel were a popular location for shore anglers. Clogherhead town was a very popular seaside resort frequented by both tourists and locals. There was a caravan park, a lifeboat station, an outdoor activity centre and a lifeguard base. The beach was a large expanse of sand, backed by sand dunes. To the north of the beach, near the headland, there were rocky areas with winkles, limpets and seed mussels, and muddy areas with lug worm casts. Bait digging was identified in this area.

4.2 Ports to the south of the coastal survey area

Drogheda

There is a quay on the River Boyne at Drogheda approximately 4 miles upriver from the open sea. The quay was mainly used by cargo vessels but two inactive fishing boats were moored there at the time of the fieldwork, and small landings of fish and *Nephrops* have been reported previously.

Balbriggan

There is a well-protected fully walled harbour with an inner basin. It was a small but busy fishing port and is home to several small *Nephrops* trawlers and vessels fitted with hydraulic dredges. Two vessels equipped with scallop dredges were seen here at the time of the fieldwork. There were also a few derelict fishing boats and several small pleasure boats. A container on the quay was used for filleting fish.

Skerries

A breakwater/pier had berths on its sheltered landward side and it protected a bay that was used as a mooring area for smaller craft. A few *Nephrops* trawlers, potters, and a hydraulic dredger were based here. Containers on the quay provided storage space for fishing gear and there was a concrete slipway for launching small craft. There was a sailing club and about 30 yachts and 25 small pleasure craft were moored in the bay.

Loughshinny

A small pier provided sheltered berths for 4 potters and a few small pleasure boats.

Rush

Rush has a very small harbour formed by a pier and there is a concrete slipway for launching small craft. Two potters and a few small pleasure craft were observed there.

Malahide

Malahide has a large marina with floating pontoon berths and sheltered moorings in the estuary. There is also a concrete slipway. Around 200 yachts, 50 speedboats and 25 pleasure craft were kept there. No commercial fishing craft were known to use the port.

Howth

Howth is the largest fishing port in the survey area and is a major fishing centre. It has a fish market, ice plant and ship maintenance facilities. The harbour has separate inner basins. It is home to about a dozen demersal trawlers, around 15 potters, approximately 10 hydraulic dredgers, and various other vessels. Vessels from other ports, particularly Clogherhead, often land their catches here. There are several inactive vessels and some others are derelict. Several fish merchants are located here. There is a sailing club and a large marina with floating pontoon berths. Around 200 yachts and pleasure craft were moored there.

5 COMMERCIAL FISHERIES

5.1 Capture fisheries

An explanation of the main fishing methods referred to in this section is provided in the glossary of fishing terms in Annex 3.

Demersal trawling

The main fishing activity taking place from ports in the survey area was demersal otter-trawling. Around 45 trawlers, nearly all greater than 15m in length, were based in the area, mainly at Clogherhead and Howth, with a few operating out of Skerries and Balbriggan (see Figure 2). Most of these vessels fished primarily for prawns (*Nephrops norvegicus*) although they also caught a significant by-catch of mixed demersal fish species. One otter-trawler was identified that specifically targeted fish. Within the Irish Sea the main fishing ground for *Nephrops* was in the north-west area between Ireland and the Isle of Man (Figure 3). Occasionally vessels also fished on the prawn grounds in the north-eastern Irish Sea, in which case catches were sometimes landed to English ports, notably Whitehaven. The larger vessels in the fleet tended to work trips of between three and eight days duration, whereas the smaller vessels, mainly operating out of Balbriggan, worked day trips and returned to port at night. Trawlers did not always land their catches to their home ports and many of the Clogherhead vessels regularly landed their catches at Howth. Most of the larger vessels only fished in the Irish Sea for part of the year and worked grounds to the south and west of Ireland for the rest of the year. These vessels typically spent between three and five months fishing in the Irish Sea, predominantly in the summer season. When fishing outside the Irish Sea vessels usually landed their catches at ports close to the fishing grounds. Catches were then usually transported overland, with the prawns going directly to processing factories and the fish often taken back to the home port.

One beam trawler was identified, docked in Howth. The vessel had not been active for some time and it was probably going to be decommissioned.

Dredging

The main dredge fishery in 2007 was the cockle (*Cerastoderma edule*) fishery in Dundalk Bay. However, Dundalk Bay is both a Special Protection Area (SPA) and a Special Area of Conservation (SAC) and the cockle fishery was closed throughout 2008 owing to issues of compliance with the EU Habitats Directive (European Council Directive 92/43/EEC, 1992). If these issues can be resolved the fishery may open again in 2009. The fishery takes place in very shallow water close to the shore. In 2007 around 30 hydraulic dredge vessels, all under 15m in length, were engaged in the fishery. They operated out of Dundalk and Annagassan. Hand-rakers working on the shore also took part in the fishery in 2007. The fishery was only

open from August until the middle of October in 2007 and it is likely that any future permitted fishery would only be open for a few months each year.

Around 18 other hydraulic dredging vessels, under 15m in length, were based at Balbriggan, Skerries and Howth. These fished primarily for razor clams (*Ensis sp.*) in shallow waters in several areas along the coast between Carlingford Lough and Howth. Although it was possible to fish for razors through most of the year these vessels did not fish continuously because of lack of market demand and several vessels had been laid up for extended periods.

Two vessels fitted with scallop dredges were observed in Balbriggan harbour and it was reported that these were undertaking exploratory fishing for scallops (*Pecten maximus*).

Potting

Just under 30 small potting boats, under 10m in length, operated out of harbours along the coast including Howth, Clogherhead, Skerries, Loughshinny, Rush and Giles Quay. It was reported that a small potting boat operated in Carlingford Lough. The boats worked short day trips and usually fished within 5 miles of their home ports. They fished for lobster (*Homarus gammarus*), brown crab (*Cancer pagurus*) and velvet swimming crab (*Necora puber*), and some also landed whelks (*Buccinum undatum*). Several fishermen only fished during the height of the lobster season, extending from June to October, whilst others fished for most of the year although fishing was often restricted in winter because of bad weather.

Fly-seining

One fly-seine vessel, over 15m in length, was identified that fished from Clogherhead and it was reported that another sometimes fished from Howth. The Clogherhead vessel fished for mixed demersal fish and usually only worked in the Irish Sea for about two months per year. During this time it worked mainly in the north-west Irish Sea but spent a few days in the north-east Irish Sea. The vessel fished mainly in the Celtic Sea for the rest of the year.

Other small scale fisheries

There may be other periodic small-scale inshore fisheries in the area that were not observed at the time of the survey. It is possible that a low level of netting took place and local shrimps were advertised at a restaurant in Howth, which suggests at least one person fished for them.

Visiting vessels

Nephrops trawlers from other parts of Ireland, Northern Ireland and the United Kingdom took part in the summer prawn fishery in the north-west Irish Sea and sometimes landed their catches into Howth.

A few large pelagic trawlers from other parts of Ireland sometimes landed Irish Sea herring into Howth. The fishery usually only lasted for a few weeks each year, although several hundred tonnes of fish might be caught. The fish were sometimes small and if so they were used for fishmeal rather than human consumption.

Occasionally beam trawlers from Belgium that have been fishing for flatfish in the Irish Sea land their catches into Howth. The catches are usually loaded into lorries for transport back to Belgium.

5.2 Aquaculture

The predominant location for aquaculture in the survey area was Carlingford Lough. Figure 4 shows a schematic outline of the areas within the lough where mussels and oysters were farmed.

There were three main mussel companies that were operating bottom cultured blue mussel (*Mytilus edulis*) beds on the Republic of Ireland side of Carlingford Lough. Seed mussels were collected from the east coast of Ireland, some from Dundalk Bay but predominantly from the Wexford area, and laid in Carlingford Lough between Omeath and Greenore. The season for collecting and laying seed mussels was summer, and the mussel harvesting season was between autumn and spring. It was reported that mussels in Carlingford Lough take approximately 18 months to grow and have a high meat content.

Three oyster companies were identified operating in Carlingford Lough. All companies farmed Pacific oysters (*Crassostrea gigas*) and used the bag and trestle method, which involved growing oysters in mesh bags on steel trestles. The oyster farms were located between Carlingford and Greenore, and south of Greenore. The seed oysters were bought from England and France.

A licence had been granted for a Pacific oyster farm to the west of Dunany Point at the south of Dundalk Bay, although it was reported that this was not operating at the time of the survey.

5.3 Hand collection of molluscan shellfish

Several local individuals were identified who collected winkles (*Littorina littorea*) at Omeath and between Carlingford and Greenore. One local individual was identified collecting winkles at Salterstown. It was reported that there were large groups of migrant workers who regularly collected winkles at Omeath, Carlingford, Ballagan Point, Annagassan and Clogherhead.

It was reported that seed mussels were collected by hand along the shores of Dundalk Bay, particularly in the Salterstown and Annagassan area.

It was estimated that over 100 hand-rakers collected cockles in Dundalk Bay in 2007, but this fishery was closed in 2008. Three individuals were identified collecting cockles on a very small-scale near Carlingford.

5.4 Marketing of fish and shellfish

Only a small proportion of the fish and shellfish landed or harvested in the survey area were sold for local consumption. Much of the fish was sold nationally or exported to the UK and Europe. Most of the *Nephrops* were sent to processing factories throughout Ireland or exported to the UK, Holland, or other European countries. Brown crabs, lobsters, velvet swimming crabs and razor clams were mainly exported to Spain and France and most whelks were exported to the UK and the Far East. The majority of oysters were exported to the UK, France, Italy, Holland and Spain. Most mussels were exported to Holland and France and most winkles were exported to France and Spain. When the Dundalk Bay cockle fishery was open in 2007 most of the cockles were sent to Wales for processing for the Dutch market. Conversely, much of the fish and shellfish on sale locally were sourced from other parts of Ireland and around the world. However, locally caught *Nephrops*, brown crabs, lobsters, razor clams and several varieties of fish were on sale at various retail outlets and restaurants, most notably around the harbour at Howth. One restaurant was identified that served locally caught velvet swimming crabs and shrimps. Oysters and mussels from Carlingford Lough were sold at several seafood restaurants in Carlingford and small amount of cockles from the lough were on sale at a stall. Small quantities of fish and shellfish were sold directly to the public at some ports.

6. NON-COMMERCIAL FISHERIES

6.1 Angling

Shore angling was identified at Greenore, Port Oriel, Clogherhead, Templetown, Port, Lurganboy and Ballagan Point. The most popular shore angling location was the beach at Greenore, where anglers were predominantly fishing for mackerel but also caught the occasional sea trout. Interviewees reported that up to 100 anglers have been observed on the beach at Greenore in the height of the mackerel season. Port Oriel was also a popular location for angling. The anglers mainly caught mackerel and also the occasional pollack and mullet from the rocks and pier. A few people were shore angling on the beach at Clogherhead for mackerel, on the beach at Port and Lurganboy for bass, and at Ballagan Point for bass and sea trout. Other reported angling locations in the survey area were Giles Quay, Blackrock, Annagassan and Dunany Point, but no one was observed angling at these places during the fieldwork.

Game fishing for salmon, sea trout and brown trout was identified in the Ryland River, Castletown River, Fane River and the River Glyde/River Dee, the lower reaches of which are located near Omeath, Dundalk, Blackrock and Annagassan, respectively. Several angling clubs owned the rights to fish stretches of these rivers. The game fishing season usually extended from February to September but varied depending on the river.

Boat angling was very popular in the coastal survey area. Private angling boats were operating from Carlingford, Greenore, Blue Anchor and Annagassan. The areas regularly fished by boat anglers were Dundalk Bay, off Annagassan and at the mouth of Carlingford Lough. The species caught included cod, mackerel, pollack, ling, whiting and rays.

One angling charter boat was identified operating out of Port Oriel in the summer and fishing off Clogherhead.

6.2 Hobby fishing

One hobby fisherman was interviewed at Clogherhead and another at Skerries although it is probable that other hobby fishermen operated from these ports and other ports along the coast. The fishermen that were interviewed used small boats to set pots close to port. They caught crabs and lobsters and these were consumed by the fishermen's family and friends.

6.3 Shellfish collection from the shore

A small number of individuals were identified that collected molluscs from the shore in the coastal survey area. One family collected a small amount of winkles from the rocks at Templetown beach, and gave the winkles to their friends. Another individual was collecting wild mussels at Carlingford and cockles at Greenore, both for his own consumption.

7. EXTERNAL EXPOSURE PATHWAYS

7.1 Intertidal activities

The following activities were being undertaken on intertidal areas at the locations specified:

- Angling – Greenore, Ballagan Point, Templetown, Port, Lurganboy, Port Oriel and Clogherhead
- Bait digging – Clogherhead
- Boat maintenance – Annagassan
- Collecting cockles – Omeath and Greenore
- Collecting mussels – Greenore and Salterstown
- Collecting seaweed – Omeath
- Collecting stones and pebbles – Salterstown
- Collecting winkles – between Carlingford and Greenore, and at Templetown and Salterstown
- Dog walking – Carlingford, Greenore, Giles Quay, Blackrock, Annagassan, Dunany Point, Port, Lurganboy, Port Oriel and Clogherhead
- Horse riding – Templetown
- Jogging – Templetown and Clogherhead
- Kite flying – Clogherhead
- Oyster farming – between Carlingford and Greenore, and at Greenore
- Playing – Omeath, Templetown, Giles Quay, Blackrock, Port, Lurganboy and Clogherhead
- RNLI duties – Clogherhead
- Rock pooling – Giles Quay and Clogherhead
- Walking – Omeath, Carlingford, Blackrock, Annagassan, Salterstown, Dunany Point, Port, Lurganboy, Port Oriel and Clogherhead
- Water sports preparation – Carlingford

The most popular beaches within the survey area for both tourists and local people were at Templetown, Shellinghill, Giles Quay, Port, Lurganboy and Clogherhead. It was raining on many of the days during the fieldwork although there were a few sunny periods. The poor weather may have discouraged some beach users but local people reported that this weather was typical of recent summers, and that the beaches were not particularly busy even in good weather. Certain activities such as angling, dog walking and shellfish collecting were undertaken in all weather.

7.2 Activities in and on water

For the purposes of this report, activities where there is a high likelihood of the individual's face submerging under water have been classified as activities 'in water', as they are more likely to lead to ingestion of water. All other water-based activities have been classified as activities 'on water'. The following activities were being undertaken at the locations specified:

Activities in water

- Diving – Port Oriel and Skerries
- Horse training – Templetown
- Kayaking – Carlingford Lough
- Kite-surfing – Blackrock and Annagassan
- Playing on lilo – Greenore
- Surfing – Clogherhead
- Swimming – Carlingford Lough, Greenore, Templetown, Giles Quay, Port, Lurganboy, Port Oriel, and Clogherhead
- Water sports instruction and training in the water – Clogherhead
- Windsurfing – Carlingford Lough

Activities on water

- Boat angling – Carlingford Lough and off Annagassan
- Canoeing – Carlingford and Clogherhead
- Commercial fishing – Irish Sea
- Charter boat fishing – Off Clogherhead
- Paddling – Clogherhead
- Passenger ferry crew – Carlingford Lough
- RNLI duties – Clogherhead
- Sailing – Carlingford Lough and Clogherhead
- Water sports instruction and training on the water – Clogherhead

The most popular location for inshore water activities in the coastal survey area was Carlingford Lough owing to the marina, sailing club and activity centre located at Carlingford. The marina had approximately 200 sailboat berths. A small number of members sailed regularly in Carlingford Lough and some went further afield in the Irish Sea. The sailing club had approximately 200 members, 20 of whom were reported to sail regularly in the lough. The adventure centre and sail-training centre both catered for children and adults. The adventure centre taught windsurfing, canoeing and kayaking, and the sail training centre taught dinghy sailing and keelboat sailing. Another popular location for watersports was

Clogherhead where there was an outdoors activity centre that taught surfing, kayaking and sailing for a wide range of ages.

Sailing and pleasure boating also took place from other harbours to the south of Clogherhead and these are identified in Section 4.2. However, detailed investigations of leisure activities were not undertaken at these harbours since they were outside the coastal survey area.

8. UNUSUAL EXPOSURE PATHWAYS

8.1 Use of seaweed as a fertiliser

Two individuals were identified who collected seaweed, which they believed to be bladder wrack (*Fucus vesiculosus*), from the shore at Omeath. This was used as a fertiliser for shrubs but was not used as a fertiliser for fruit or vegetables.

8.2 Seaweed consumption

One individual was identified who consumed a small amount of dulse (*Palmaria palmata*) from Carlingford Lough. No commercial collection of dulse was identified during the survey.

8.3 Sand extraction

Local golf clubs were contacted and were not using sand for their bunkers from beaches within the survey area. No other sand extraction was identified.

8.4 Livestock grazing on salt marsh

It was reported that sheep grazing occurred on the salt marshes east of Dundalk and near Blue Anchor.

8.5 Wildfowling

It was reported that wildfowling occurred on the salt marsh east of Dundalk, although no one was identified wildfowling during the survey. Dundalk Bay has large areas of mud flats and salt marsh and is an internationally important area for wildfowl. It is a designated Special Protection Area (SPA), a Special Area of Conservation (SAC) and a Ramsar Site. Some locations within Dundalk Bay were designated wildfowl sanctuaries and shooting was prohibited within these areas.

8.6 Dredging navigational channels

The maintenance dredging of several important navigational channels was identified. The channel through Carlingford Lough was dredged every 3-5 years in order to allow large vessels to access Warren Point, a harbour on the north shore of the lough. The silt was dumped offshore of Carlingford Lough. The Castletown Estuary channel leading to Dundalk was dredged every 2 years and the silt was dumped offshore of Dundalk Bay, and the channel at Port Oriel was dredged to a lesser extent. At the time of the fieldwork, there was a

proposal to construct a new port at Greenore, which could result in further dredging in the channel at the mouth of Carlingford Lough.

9. CONSUMPTION AND OCCUPANCY RATES

9.1 Internal exposure.

Consumption data for aquatic foods are presented in Tables 1 to 4 for adults and in Tables 5 and 6 for children. The tables include the mean consumption rates for the high-rate groups calculated as described in Section 3.2, together with the observed 97.5th percentile rates.

9.1.1 Fish consumption

The main consumers of fish were commercial fishermen and anglers and their families.

Mackerel (*Scomber scombrus*) and haddock *(Melanogrammus aeglefinus*) were the main species consumed although a very wide range of other species were eaten including bass (*Dicentrarchus labrax*), cod (*Gadus morhua*), conger eel (*Conger conger*), Dover sole (*Solea solea*), flounder (*Platichthys flesus*), grey mullet (*Chelon labrosus*), herring (*Clupea harengus*), John dory (*Zeus faber*), lemon sole (*Microstomus kitt*), ling (*Molva molva*), monkfish (*Lophius piscatorias*), plaice (*Pleuronectes platessa*), pollack (*Pollachius pollachius*), rays (*Raja sp.*), red mullet (*Mullus surmuletus*), saithe (*Pollachius virens*), salmon (*Salmo salar*), sea trout (*Salmo trutta*), turbot (*Scophthalmus maximus*) and whiting (*Merlangius merlangus*). A small amount of octopus (probably *Eledone cirrhosa*) was also eaten and although this is a mollusc it has been included in the fish group since radiologically it is more akin to fish than other molluscs. The Irish Sea stocks of cod and whiting have collapsed in recent years and the reported consumption rates for these species are relatively low. No doubt this is due to poor availability of these species but also commercial fishermen may have been reluctant to mention these species because of severe restrictions on retaining them.

The crews of commercial fishing vessels, predominantly *Nephrops* trawlers, consumed all the species mentioned above except bass, grey mullet, salmon, and sea trout. The catches from these vessels came mainly from fishing grounds in the north-west Irish Sea with a small amount from the north-east Irish Sea. Many vessels did not fish in the Irish Sea for all of the year and the consumption of fish caught outside the Irish Sea has not been included in the results.

Boat anglers were catching fish around the rocks at the entrance to Carlingford Lough and off Annagassan. The fish consumed from these areas were bass, ling, mackerel, pollack and salmon. Some of these boat anglers were in a syndicate and cooked the fish at sea, while others shared the fish with their families. Shore anglers, who were predominantly fishing from Greenore and Port Oriel, were consuming large amounts of mackerel with a small amount of

sea trout and grey mullet. Mackerel are migratory fish and were abundant along the coast for approximately four months of the year. Due to the ease with which mackerel can be caught, many shore anglers reported that they caught large numbers and shared them with family and friends and froze the fish to consume throughout the year.

Adults

The mean consumption rate of fish for the adult high-rate group was 26 kg/y (64 observations) and the observed 97.5th percentile rate was 42 kg/y (139 observations). The maximum consumption rate was 42 kg/y.

The percentage breakdown of fish species eaten by the adult high-rate group, rounded to the nearest 5%, was 20% mackerel, 15% haddock and 65% other species.

Children

The mean consumption rates of fish for the children's high-rate groups were 7.8 kg/y for the 15-year-old age group (5 observations), 3.4 kg/y for the 10-year-old age group (7 observations), and 4.4 kg/y for the 5-year-old age group (4 observations). The observed 97.5th percentile rates for the 15-year-old, 10-year-old, and the 5-year-old age groups were 12 kg/y (9 observations), 5.0 kg/y (9 observations) and 5.7 kg/y (5 observations), respectively. No consumption of fish was identified for the 1-year-old or the 3-month-old age groups.

The children in the high-rate consumption groups for these age groups were family members of fishing crew and anglers.

9.1.2 Crustacean consumption

The main consumers of crustaceans were commercial fishermen and their families.

Three species of crustaceans were being consumed: brown crab, lobster and *Nephrops*. The crabs and lobsters were caught by local potters within 5 miles of the ports of Giles Quay, Clogherhead, Skerries, Loughshinny and Howth. The *Nephrops* were caught by trawlers, mainly from fishing grounds in the north-west Irish Sea with a small amount from the north-east Irish Sea.

Adults

The mean consumption rate of crustaceans for the adult high-rate group was 9.7 kg/y (22 observations) and the observed 97.5th percentile rate was 18 kg/y (75 observations). The maximum consumption rate was 18 kg/y.

The percentage breakdown of crustacean species eaten by the adult high-rate group, rounded to the nearest 5%, was 35% brown crab, 30% lobster and 30% *Nephrops*.

Children

The mean consumption rates of crustaceans for the children's high-rate groups were 1.1 kg/y for the 15-year-old age group (2 observations), 1.6 kg/y for the 10-year-old age group (4 observations), and 1.3 kg/y for the 5-year-old age group (3 observations). The observed 97.5th percentile rates for the 15-year-old, 10-year-old, and the 5-year-old age groups were 1.1 kg/y (2 observations), 4.4 kg/y (4 observations) and 2.2 kg/y (5 observations), respectively. No consumption of crustaceans was identified for the 1-year-old or the 3-month-old age groups.

The children in the high-rate consumption groups for these age groups were family members of commercial fishermen.

9.1.3 Mollusc consumption

The main consumers of molluscs were oyster and mussel farmers and a commercial winkle collector.

The molluscs consumed were mussels, Pacific oysters, winkles, cockles and clams (probably *Spisula solida*). Farmed and wild mussels, farmed Pacific oysters, winkles and cockles were consumed from Carlingford Lough. Clams were obtained from a fisherman at Giles Quay. It should be noted that the major cockle fishery in Dundalk Bay was closed in 2008 and if this fishery re-opens there may be higher cockle consumption than identified at the time of this survey.

Adults

The mean consumption rate of molluscs for the adult high-rate group was 25 kg/y (4 observations) and the observed 97.5th percentile rate was 35 kg/y (9 observations). The maximum consumption rate was 38 kg/y.

The percentage breakdown of mollusc species eaten by the adult high-rate group, rounded to the nearest 5%, was 75% mussels, 10% Pacific oysters and 10% winkles.

Children

No children were identified consuming molluscs.

9.1.4 Seaweed consumption

The only species of seaweed consumed was dulse (*Palmaria palmata*).

Adults

The consumption rate of seaweed for the adult high-rate group was 0.50 kg/y (1 observation). The observed 97.5th percentile rate is not applicable for 1 observation.

The only consumer of dulse was a commercial winkle collector who collected it from Carlingford Lough at low tide.

Children

No children were identified consuming seaweed.

9.2 External exposure

9.2.1 Intertidal activities

Intertidal occupancy rates for adults and children are presented in Table 7 and Table 8, respectively. Occupancy rates for adults were noted over the following six different types of substrate: mud; mud and sand; mud, sand and stones; rock; sand; and sand and stones. For children, occupancy rates were recorded over the following four substrates: mud and sand; rock; sand; and sand and stones.

Adults

The intertidal activities of the adults in the high-rate groups over the six substrates were oyster farming over mud; collecting winkles commercially over mud and sand; walking over mud, sand and stones; angling over rock; oyster farming, dog walking, angling and water sports preparation over sand; and collecting winkles, angling, and dog walking over sand and stones. Other activities, which were not in the high-rate groups, included collecting cockles, walking, playing and bait digging, and these were occurring over mud and sand, sand, and sand and stones.

The mean occupancy rates over intertidal substrates for the adult high-rate group were 360 h/y for mud (15 observations), 520 h/y for mud and sand (1 observation), 50 h/y for mud, sand and stones (1 observation), 100 h/y for rock (1 observation), 410 h/y for sand (19 observations), and 640 h/y for sand and stones (9 observations). The observed 97.5th percentile rate for mud was 500 h/y (15 observations), for mud and sand was 470 h/y (6

observations), for rock was 94 h/y (4 observations), for sand was 500 h/y (156 observations), and for sand and stones was 1000 h/y (48 observations). The observed 97.5th percentile rate was not applicable for mud, sand and stones as there was only one observation. The maximum occupancy rates for substrates where there were more than one individual in the high-rate group were 500 h/y for mud, 720 h/y for sand, and 1200 h/y for sand and stones.

Children

The intertidal activities of the children in the high-rate groups over the four substrates were collecting winkles and cockles over mud and sand; angling over rock; playing and walking over sand; and angling, playing, walking and dog walking over sand and stones.

For the 15-year-old age group, the mean occupancy rates over intertidal substrates for the high-rate group were 100 h/y for mud and sand (2 observations), 50 h/y for sand (3 observations), and 160 h/y for sand and stones (1 observation). The observed 97.5th percentile rate for mud was 100 h/y (4 observations), for sand was 52 h/y (26 observations), and for sand and stones was 160 h/y (3 observations).

For the 10-year-old age group, the mean occupancy rates over intertidal substrates for the high-rate group were 10 h/y for mud and sand (1 observation), 1.0 h/y for rock (3 observations), 130 h/y for sand (5 observations), and 96 h/y for sand and stones (1 observation). The observed 97.5th percentile rate for rock was 1.0 h/y (3 observations), for sand was 160 h/y (24 observations), and for sand and stones was 78 h/y (12 observations). The observed 97.5th percentile rate was not applicable for mud and sand as there was only one observation.

For the 5-year-old age group, the mean occupancy rates over intertidal substrates for the high-rate group were 150 h/y for sand (4 observations), and 360 h/y for sand and stones (1 observation). The observed 97.5th percentile rate for sand was 180 h/y (26 observations) and for sand and stones was 300 h/y (8 observations).

For the 1-year-old age group, the mean occupancy rate over sand for the high-rate group was 150 h/y (1 observation) and the observed 97.5th percentile rate was 140 h/y (3 observations).

For the 3-month-old age group, the mean occupancy rates over intertidal substrates for the high-rate group were 5.0 h/y for sand (2 observations), and 15 h/y for sand and stones (1 observation). The observed 97.5th percentile rate for sand was 6.0 h/y (2 observations), and for sand and stones is not applicable as there was only 1 observation.

9.2.2 Handling fishing gear, catch and sediment

Handling sediment, or handling commercial fishing gear and catches that may have sediment attached to them, can give rise to skin exposure from beta radiation. This needs consideration even though the annual dose limit for skin is a factor of 50 times higher than that for effective dose. There is also a contribution to effective dose due to skin exposure (ICRP, 1991).

The adults' rates for handling fishing gear, catches and sediment are presented in Table 9, and the children's rates for handling sediment are presented in Table 10. The handling rates for fishing gear and catches are combined together while the handling rates for sediment are considered separately.

Adults

The fishing methods used by the adults in the high-rate group for gear and catch handling were trawling for *Nephrops* in the north-eastern and north-western Irish Sea, and dredging for razor clams close to the coast in areas between Carlingford Lough and Howth. The gear and catch handling rates include handling fishing gear and handling catch while wearing gloves, and a component for mending the fishing gear without gloves. Handling of pots in inshore fisheries was also identified, but these handling rates were not in the high-rate group.

The activities of the adults in the high-rate group for handling sediment were collecting winkles commercially at Salterstown, and between Carlingford and Greenore; collecting cockles non-commercially at Greenore; and oyster farming at Greenore and between Carlingford and Greenore. Oyster farmers usually wore gloves. Other activities, which were not in the high-rate group, included collecting seaweed at Omeath and bait digging at Clogherhead.

The commercial cockle fishery in Dundalk Bay was closed in 2008, but if the fishery opens in the future, individuals operating cockle dredgers will have gear and catch handling rates, and the hand-rakers will have sediment handling rates.

The mean rate for handling fishing gear and catch for the high-rate group was 2500 h/y (33 observations) and the observed 97.5th percentile rate was 4100 h/y (73 observations). The maximum rate was 4100 h/y.

The mean rate for handling sediment for the adult high-rate group was 730 h/y (17 observations) and the observed 97.5th percentile rate was 1100 h/y (23 observations). The maximum rate was 1200 h/y.

Children

The activities of the children in the high-rate group for handling sediment were collecting winkles at Omeath and Templetown, collecting cockles at Carlingford and collecting shore crabs at Giles Quay.

The mean rates for handling sediment for the children's high-rate groups were 100 h/y for the 15-year-old age group (2 observations), 14 h/y for the 10-year-old age group (4 observations), and 7.0 h/y for the 5-year-old age group (1 observation). The observed 97.5th percentile rate for the 15-year-old age group was 100 h/y (4 observations), for the 10-year-old age group was 15 h/y (4 observations), and for the 5-year-old age group was not applicable as there was only one observation.

9.2.3 Activities in and on water

Activities occurring in or on the water can lead to ingestion of water and/or inhalation of spray. These pathways are generally considered to be minor in comparison with other exposure pathways such as the ingestion of foods. For the purposes of this report, activities where there is a high likelihood of the individual's face submerging under water have been classified as activities 'in water', as they are more likely to lead to ingestion of water. All other activities have been classified as activities 'on water'.

Occupancy rates for activities taking place in water and on water in the survey area for adults and children are shown in Table 11 and Table 12, respectively.

Adults

The activities occurring in water for the adults in the high-rate group were windsurfing and kayaking in Carlingford Lough; kite-surfing at Annagassan and Blackrock; and teaching watersports and swimming at Clogherhead. Other activities, which were not in the high-rate group, included diving at Port Oriel and horse training at Templetown. The activities occurring on water for the adults in the high-rate group were commercial trawling in the north-east and north-west Irish Sea and off Balbriggan; fly-seining in the north Irish Sea; and dredging off Skerries. Other activities, which were not in the high-rate group, included dredging for mussels in Carlingford Lough, potting, sailing and boat angling.

The mean occupancy rate for activities in water for the adult high-rate group was 330 h/y (23 observations) and the observed 97.5th percentile rate was 380 h/y (67 observations). The mean occupancy rate for activities on water for the adult high-rate group was 3100 h/y (52 observations) and the observed 97.5th percentile rate was 5800 h/y (183 observations).

Children

The activities occurring in water for the children in the high-rate group were playing on a lilo at Greenore; swimming at Giles Quay, Greenore and Templetown; and surfing at Clogherhead. The activities occurring on water for the children in the high-rate group were watersports training, canoeing and paddling at Clogherhead.

The mean occupancy rates for activities in water for the children's high-rate groups were 9.0 h/y for the 15-year-old age group (3 observations), 35 h/y for the 10-year-old age group (4 observations), and 15 h/y for the 5-year-old age group (2 observations). The observed 97.5th percentile rate for the 15-year-old age group was 10 h/y (11 observations), for the 10-year-old age group was 40 h/y (7 observations), and for the 5-year-old age group was 19 h/y (4 observations).

The mean occupancy rates for activities on water for the children's high-rate groups were 10 h/y for the 15-year-old age group (2 observations), 56 h/y for the 10-year-old age group (1 observation), and 56 h/y for the 5-year-old age group (1 observation). The observed 97.5th percentile rate for the 15-year-old age group was 10 h/y (10 observations), and for the 10-year-old age group was 53 h/y (3 observations). The observed 97.5th percentile rate was not applicable for the 5-year-old age group as there was only 1 observation.

10. DOSE ASSESSMENT

An assessment of dose to members of the public in Ireland was undertaken using the adult seafood consumption data in Section 9. The assessment methodology is the same as that used to calculate critical group doses from aquatic pathways in the Radioactivity in Food and the Environment report series (e.g. EA, EHS, FSA and SEPA, 2008*)*. External pathways were not included in the dose assessments, as recent monitoring data relevant to these pathways (e.g. gamma dose rates on beaches, beta dose rates on fishing gear) were not available.

10.1 Methodology

For seafood consumption pathways, doses were assessed by multiplying seafood consumption rates by the concentration of radioactivity in the seafoods and by a dose per unit intake factor which converts the intake of radioactivity into a committed effective dose. This is represented by the following basic equation:

$$D_G = \sum_{i,j} C_{i,j} R_j F_i$$

where: D_G is the dose to a member of critical group G (mSv y^{-1});
$C_{i,j}$ is the activity concentration of radionuclide i in seafood type j (e.g. fish) (Bq kg^{-1}),
R_j is the consumption rate for seafood type j (kg y^{-1}), and
F_i is the dose per unit intake factor of radionuclide i (mSv Bq^{-1}).

The high-rate seafood consumers were separated into two critical groups, Group A and Group B. Group A was assumed to consume 26 kg/y of fish and 10 kg/y of crustaceans, and group B to consume 25 kg/y of molluscs. These groups were formed due to the significant overlap of the fish and crustacean critical group consumers, and in contrast, the distinct mollusc critical group consumers.

The monitoring data used in the dose calculations were taken from those samples collected as part of the RPII's current routine monitoring programme (Fegan *et al*., 2008).

Prior to calculating the dose, the monitoring data were weighted to reflect relative consumption of different fish and mollusc species, and then normalised to account for the species that are not covered by the monitoring programme. The weighted consumption rates used in the assessments are shown in Table I. Since significant consumption of haddock was identified in the habits survey but no monitoring data were available for this species, the haddock consumption data has been grouped with cod, as these are similar species. Activity concentrations in all crustacean species are represented by the concentrations of radionuclides in prawns (*Nephrops*), as these are the only crustacean monitoring data available. It should be noted that this causes uncertainty in the assessment because there may be differences in the bioaccumulation of certain nuclides between different species of crustaceans. Similarly, the concentration of americium-241 in mussels is assumed to represent that in oysters.

For most fish species and *Nephrops*, the mean of the concentration data from Clogherhead and Howth has been used. This is because the majority of fishing boats landing fish and *Nephrops* at these ports were fishing in the same general sea area (i.e. the north-west Irish Sea). Furthermore, there were consumption data from vessels operating from other ports that also fished in the same general sea area, therefore equal geographical weighting was assigned to Clogherhead and Howth for these consumption data. The exception to this is for mackerel, as it was observed that this species was predominantly caught by anglers in the north of the survey area. Therefore, the Clogherhead monitoring data for mackerel have been used, where available, on the assumption that these fish were caught further north than the mackerel monitored at Howth.

Table I. Weighted consumption rates used in the dose assessment

Species	**Consumption rate (kg)**
Cod/haddock	11
Mackerel	10
Plaice	3.5
Ray	1
Whiting	0.5
Fish[a]	26
Prawns (*Nephrops*)	10
Mussels	20
Oysters	5

[a] Composite fish sample

10.2 Calculated doses

The current annual committed effective dose for critical group A, based on the consumption of 26 kg/y fish and 10 kg/y crustaceans, weighted according to the method described above, has been calculated as 0.29 μSv. This is less than 0.03% of the annual dose limit to members of the public of 1000 μSv. The dominant contributors to this dose are caesium-137 (71%), which is predominantly from fish, and technetium-99 (19%), which is predominantly from crustaceans. A full breakdown of the dose to critical group A is given in Table II.

Critical group B, whose members consume 25 kg/y of molluscs, have been assessed to receive an annual committed effective dose of 0.47 μSv, or less than 0.05% of the annual dose limit to members of the public of 1000 μSv. In this case, the dominant nuclides are plutonium-239/240 (49%) and technetium-99 (19%). A full breakdown of the dose to critical group B is given in Table II.

These dose assessments relate to adults, as there were relatively few children observed in the habits survey. The habits of those children who were interviewed suggested that child seafood consumption rates were sufficiently lower than the corresponding adult rates to counter the effect of higher child dose per unit intake factors. The dose to a prenatal child of members of either of the critical groups described is less than that to the associated adult.

Table II. Committed effective dose to members of the critical groups

	Committed effective dose (μSv)	
Radionuclide	**Critical group A**	**Critical group B**
Technetium-99	0.055	0.090
Caesium-137	0.20	0.036
Plutonium-238	0.0012	0.038
Plutonium-239/240	0.0095	0.23
Americium-241	0.019	0.075
Total	**0.29**	**0.47**

11. COMPARISON WITH OTHER HABITS DATA AND DOSES

11.1 Seafood consumption data

The RPII have previously undertaken dose assessments based on notional seafood consumption rates for typical and heavy consumers. The notional rate for a typical consumer was 40 g/day (15 kg/y) of fish and 5.0 g/day (1.8 kg/y) of shellfish, and the notional rate for a heavy consumer was 200 g/day (73 kg/y) of fish and 20 g/day (7.3 kg/y) of shellfish (Fegan *et al*., 2008). The mean consumption rates identified in this report for the adult high-rate groups are 26 kg/y for fish, 9.7 kg/y for crustaceans, and 25 kg/y for molluscs.

A comparison between the notional consumption rates previously used by RPII, the consumption rates identified in this report and other published habits data (EA, EHS, FSA and SEPA, 2008) is shown in Table III. For fish, the minimum consumption rate for the high-rate group identified in this report is similar to that of the notional typical consumer and the maximum consumption rate is midway between the notional typical and heavy consumers. The maximum consumption rate identified in this report is considerably lower than the notional heavy consumption rate and this may be partly due to the consumption rate in this report being based on fish caught only in the Irish Sea, whereas the notional rate includes fish from other sea areas. For crustaceans and molluscs, the minimum, mean and maximum consumption rates identified in this report are considerably higher than the notional rates for the typical and heavy consumers. This is because there were a number of individuals such as mussel farmers, oyster farmers, winkle collectors and commercial lobster fishermen that operated within the survey area and had high consumption rates of their own locally harvested shellfish. The high-rate group mean consumption rates identified in this report for fish, crustaceans and molluscs are all well within the range of high-rate group means identified in other habits surveys.

Table III. Comparison between consumption rates for fish, crustaceans and molluscs for RPII notional data, Irish data identified in this report and data identified in other habits surveys

	RPII notional consumption rates (kg/y)		**Irish consumption rates as identified in this report (kg/y)**			**Consumption rates identified in other habits surveys (kg/y)**
Food group	Typical consumer	Heavy consumer	Minimum of high-rate group	Mean of high-rate group	Maximum of high-rate group	Range of high-rate group means
Fish	15	73	14	26	42	22 – 99
Crustaceans	0.9[a]	3.7[b]	5.9	9.7	18	3.5 – 34
Molluscs	0.9[a]	3.7[b]	19	25	38	1.7 – 34

[a] The consumption rate of 1.8 kg/y for shellfish for a typical consumer was assumed to be divided equally between crustaceans and molluscs

[b] The consumption rate of 7.3 kg/y shellfish for a heavy consumer was assumed to be divided equally between crustaceans and molluscs

11.2 Doses to seafood consumers

In 2007, the annual committed effective dose calculated by the RPII using notional habits data for a typical consumer was 0.16 μSv and for a heavy consumer was 0.74 μSv (Fegan *et al.*, 2008). This compares with the annual committed effective doses, calculated using the 2008 habits data, of 0.29 μSv for critical group A (fish and crustacean consumers) and 0.47 μSv for critical group B (mollusc consumers).

For comparison, the annual committed effective dose to the UK public in the Sellafield area in 2007, based on fish and shellfish consumption and external exposure in intertidal areas (excluding naturally occurring radionuclides) was 210 μSv (EA, EHS, FSA and SEPA, 2008).

12. RECOMMENDATIONS FOR MONITORING

Current RPII marine monitoring programme

The 2007 RPII marine environment monitoring programme included the following samples and locations:

- Seawater and seaweed (*Fucus vesiculosus*) from Balbriggan, Co. Dublin
- Seawater from Cahore, Co. Wexford
- Shellfish (farmed mussels and farmed oysters) from Carlingford, Co. Louth
- Demersal fish (cod, plaice, ray and whiting), pelagic fish (herring and mackerel), and shellfish (*Nephrops*, farmed mussels and farmed oysters) from Clogherhead, Co. Louth
- Seawater and seaweed (*Fucus vesiculosus*) from Greenore, Co. Louth
- Demersal fish (cod, plaice, ray and whiting), pelagic fish (herring and mackerel) and shellfish (*Nephrops*), from Howth, Co. Dublin
- Demersal fish (cod, plaice, ray and whiting) and pelagic fish (herring and mackerel) from Killybegs, Co. Donegal
- Demersal fish (cod, plaice, ray and whiting) and pelagic fish (herring and mackerel) from Kilmore Quay, Co. Wexford
- Seawater and sediment from the Irish Sea

Recommendations

The following recommendations for changes to the RPII marine environment monitoring programme for the east coast of Ireland are based on consumption, occupancy and handling rates identified in the habits survey. The recommendations for the numbers of samples and the frequency of sampling are based on techniques used by Cefas. It is considered that samples currently monitored which are not listed below, are satisfactory and should remain unchanged in the marine monitoring programme.

- Haddock could be substituted for whiting, as it is a similar demersal species but was being consumed in greater amounts.
- Herring samples could be discontinued since herring was consumed in very low quantities and monitoring of pelagic species is adequately covered by mackerel.
- It is suggested that the feasibility of adding a lobster sample to the programme is investigated. Lobsters were consumed in significant quantities and they are known to bioaccumulate technetium-99. Lobster could also be a good comparison species with the monitoring undertaken around Sellafield. If feasible, it is recommended that a sample of six lobsters should be collected three times per year within the lobster fishing season (June to October). The radionuclides recommended for measurement are caesium-137

and caesium-134 using gamma spectrometry, and technetium-99 using radiochemical analysis.

- It is suggested that the mollusc sampling is reviewed to investigate the possibility of introducing a sample of winkles to the programme. The reason for this recommendation is that significant consumption of winkles was identified and molluscs tend to contain higher concentrations of radionuclides than crustaceans and fish. This would also be a useful species to compare with monitoring undertaken around Sellafield. If a winkle sample is introduced, it is recommended that one sample weighing approximately 5 kg (whole weight) should be collected four times per year to account for seasonal variability in nuclide concentrations in winkles throughout the year. The radionuclides recommended for measurement are caesium-137 and caesium-134 using gamma spectrometry, and technetium-99, plutonium-239/240 and americium-241 using radiochemical analysis.
- The re-introduction of sediment monitoring of intertidal areas could be considered since individuals were identified with high occupancy rates on beaches such as Greenore and Clogherhead. It is believed that there are high levels of natural background radiation in the area, so in order to quantify the contribution of any artificial radionuclides towards the gamma dose rates, a sediment sample from each beach location could be collected and analysed using gamma spectrometry to investigate levels of caesium-137 and other gamma emitters.
- Beta dose rates from fishing gear could be investigated since individuals with high rates of handling fishing gear were identified. This could be accomplished by taking trial measurements on fishing gear, for example *Nephrops* trawls and lobster pots, using a beta dose rate monitor. Significant readings above background levels would indicate the need for regular monitoring.

13. ACKNOWLEDGEMENTS

Thanks are expressed to the representatives of local organisations and companies contacted during the habits survey and to the members of the public who took part. Thanks are also expressed to staff of the RPII for their assistance and guidance in the conduct of the habits survey, and to the Aquaculture Initiative, the Loughs Agency, the Sea Fisheries Protection Authority and the Irish Sea Fisheries Board for the information they provided.

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Figure 1. The coastal survey area.

Figure 2. The coastal survey area and harbours between Carlingford and Howth.

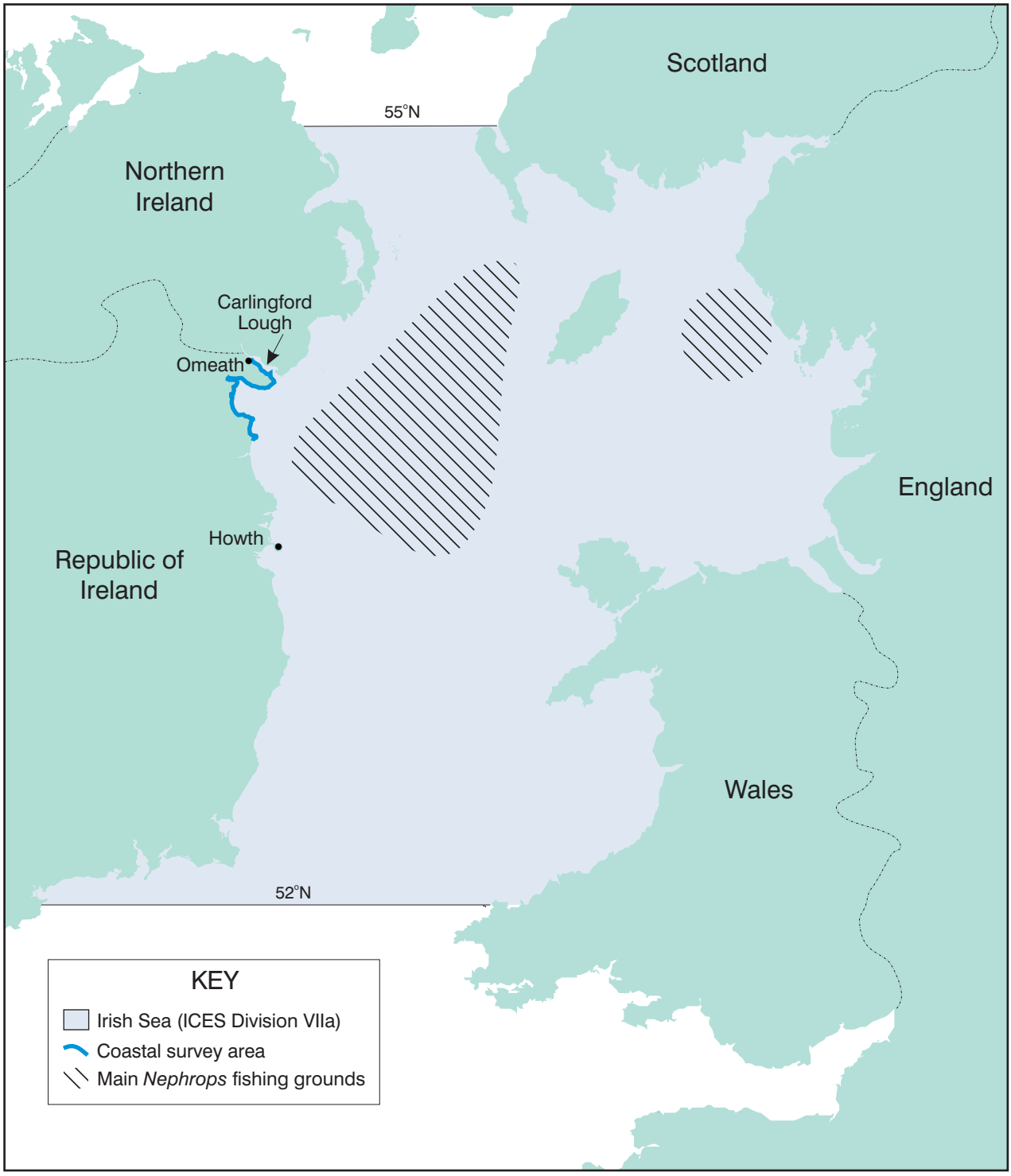

Figure 3. The limits of the Irish Sea (ICES Division VIIa) and the main *Nephrops* fishing grounds.

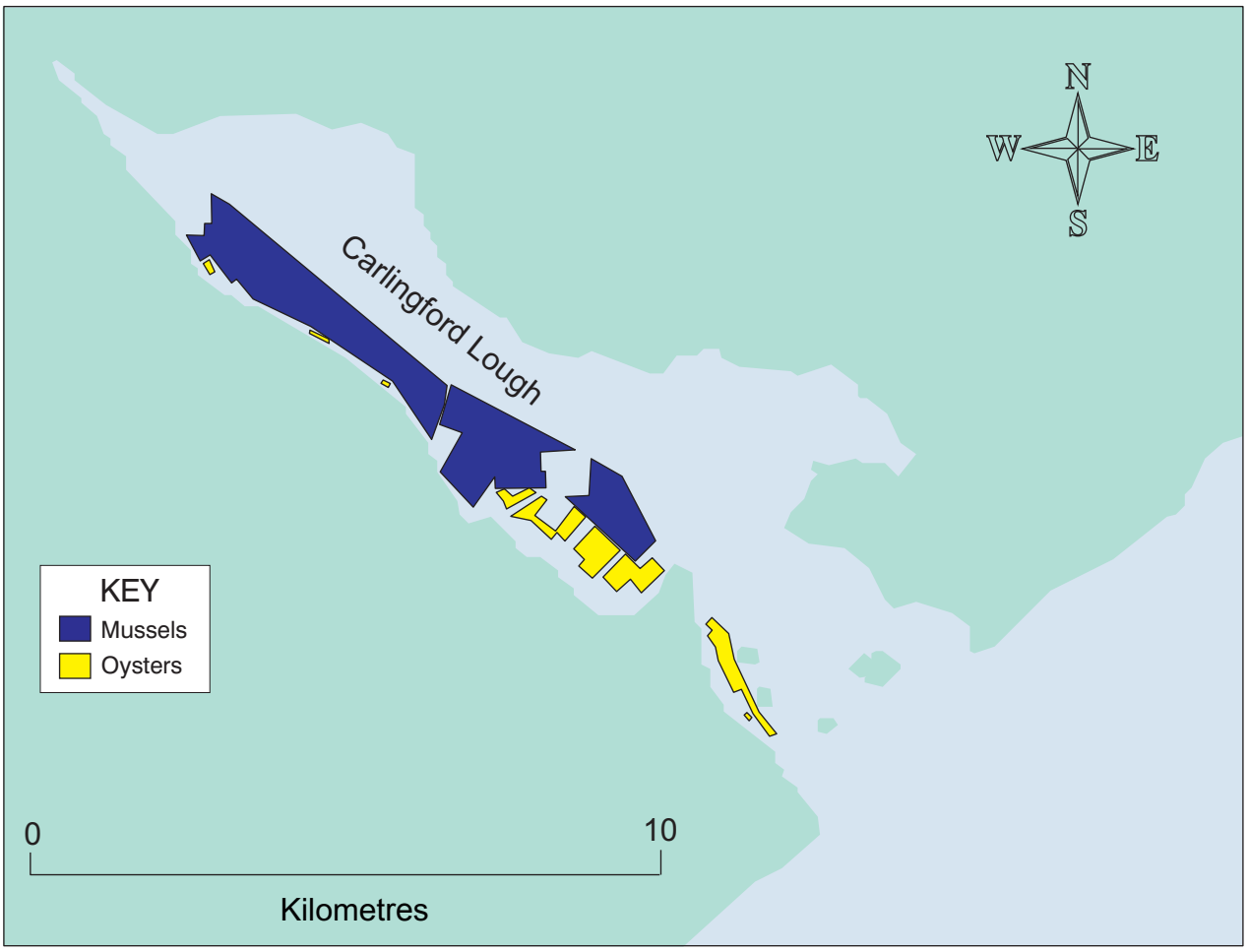

Figure 4. Schematic outline of Republic of Ireland licensed aquaculture areas in Carlingford Lough.

Table 1. Adults' consumption rates of fish in the survey area (kg/y)

Observation number	Bass	Cod	Conger eel	Dover sole	Flounder	Grey mullet	Haddock	Herring	John dory	Lemon sole	Ling	Mackerel	Monkfish	Plaice	Pollack	Rays	Red mullet	Saithe	Salmon	Sea trout	Turbot	Whiting	Octopus*	Total
207	-	2.7	-	2.3	-	-	18.1	1.4	-	2.3	-	1.4	2.3	9.1	-	-	-	-	-	-	2.3	-	-	41.7
208	-	2.7	-	2.3	-	-	18.1	1.4	-	2.3	-	1.4	2.3	9.1	-	-	-	-	-	-	2.3	-	-	41.7
209	-	2.7	-	2.3	-	-	18.1	1.4	-	2.3	-	1.4	2.3	9.1	-	-	-	-	-	-	2.3	-	-	41.7
210	-	2.7	-	2.3	-	-	18.1	1.4	-	2.3	-	1.4	2.3	9.1	-	-	-	-	-	-	2.3	-	-	41.7
32	-	-	-	-	-	-	-	-	-	-	-	36.5	-	-	-	-	-	-	-	4.7	-	-	-	41.2
33	-	-	-	-	-	-	-	-	-	-	-	36.5	-	-	-	-	-	-	-	4.7	-	-	-	41.2
239	-	2.3	1.4	2.3	-	-	5.4	-	1.4	4.5	-	-	4.5	4.5	2.3	-	1.4	1.4	-	-	1.4	1.4	-	34.0
240	-	2.3	1.4	2.3	-	-	5.4	-	1.4	4.5	-	-	4.5	4.5	2.3	-	1.4	1.4	-	-	1.4	1.4	-	34.0
241	-	2.3	1.4	2.3	-	-	5.4	-	1.4	4.5	-	-	4.5	4.5	2.3	-	1.4	1.4	-	-	1.4	1.4	-	34.0
242	-	2.3	1.4	2.3	-	-	5.4	-	1.4	4.5	-	-	4.5	4.5	2.3	-	1.4	1.4	-	-	1.4	1.4	-	34.0
243	-	2.3	1.4	2.3	-	-	5.4	-	1.4	4.5	-	-	4.5	4.5	2.3	-	1.4	1.4	-	-	1.4	1.4	-	34.0
244	-	2.3	1.4	2.3	-	-	5.4	-	1.4	4.5	-	-	4.5	4.5	2.3	-	1.4	1.4	-	-	1.4	1.4	-	34.0
246	-	4.5	-	4.5	-	-	4.5	-	-	2.3	-	-	4.5	2.3	2.3	-	4.5	-	-	-	4.5	-	-	34.0
247	-	4.5	-	4.5	-	-	4.5	-	-	2.3	-	-	4.5	2.3	2.3	-	4.5	-	-	-	4.5	-	-	34.0
248	-	4.5	-	4.5	-	-	4.5	-	-	2.3	-	-	4.5	2.3	2.3	-	4.5	-	-	-	4.5	-	-	34.0
249	-	4.5	-	4.5	-	-	4.5	-	-	2.3	-	-	4.5	2.3	2.3	-	4.5	-	-	-	4.5	-	-	34.0
250	-	4.5	-	4.5	-	-	4.5	-	-	2.3	-	-	4.5	2.3	2.3	-	4.5	-	-	-	4.5	-	-	34.0
261	-	2.3	-	2.3	-	-	11.3	-	1.1	2.3	1.1	-	2.3	2.3	2.3	-	1.1	-	-	-	1.1	1.1	0.2	30.8
262	-	2.3	-	2.3	-	-	11.3	-	1.1	2.3	1.1	-	2.3	2.3	2.3	-	1.1	-	-	-	1.1	1.1	0.2	30.8
263	-	2.3	-	2.3	-	-	11.3	-	1.1	2.3	1.1	-	2.3	2.3	2.3	-	1.1	-	-	-	1.1	1.1	0.2	30.8
264	-	2.3	-	2.3	-	-	11.3	-	1.1	2.3	1.1	-	2.3	2.3	2.3	-	1.1	-	-	-	1.1	1.1	0.2	30.8
265	-	2.3	-	2.3	-	-	11.3	-	1.1	2.3	1.1	-	2.3	2.3	2.3	-	1.1	-	-	-	1.1	1.1	0.2	30.8
266	-	2.3	-	2.3	-	-	11.3	-	1.1	2.3	1.1	-	2.3	2.3	2.3	-	1.1	-	-	-	1.1	1.1	0.2	30.8
267	-	2.3	-	2.3	-	-	11.3	-	1.1	2.3	1.1	-	2.3	2.3	2.3	-	1.1	-	-	-	1.1	1.1	0.2	30.8
268	-	2.3	-	2.3	-	-	11.3	-	1.1	2.3	1.1	-	2.3	2.3	2.3	-	1.1	-	-	-	1.1	1.1	0.2	30.8
386	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4

Table 1. Adults' consumption rates of fish in the survey area (kg/y)

Observation number	Bass	Cod	Conger eel	Dover sole	Flounder	Grey mullet	Haddock	Herring	John dory	Lemon sole	Ling	Mackerel	Monkfish	Plaice	Pollack	Rays	Red mullet	Saithe	Salmon	Sea trout	Turbot	Whiting	Octopus*	Total
387	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4
388	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4
389	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4
390	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4
391	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4
392	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4
393	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4
394	3.4	-	-	-	-	-	-	-	-	-	-	13.5	-	-	-	-	-	-	10.5	-	-	-	-	27.4
180	-	6.8	-	2.3	-	-	6.8	-	-	2.3	-	-	2.3	-	-	6.1	-	-	-	-	-	-	-	26.5
181	-	6.8	-	2.3	-	-	6.8	-	-	2.3	-	-	2.3	-	-	6.1	-	-	-	-	-	-	-	26.5
182	-	6.8	-	2.3	-	-	6.8	-	-	2.3	-	-	2.3	-	-	6.1	-	-	-	-	-	-	-	26.5
183	-	6.8	-	2.3	-	-	6.8	-	-	2.3	-	-	2.3	-	-	6.1	-	-	-	-	-	-	-	26.5
178	-	6.8	-	2.3	-	-	6.8	-	-	2.3	-	-	2.3	-	-	6.1	-	-	-	-	-	-	-	26.5
179	-	6.8	-	2.3	-	-	6.8	-	-	2.3	-	-	2.3	-	-	6.1	-	-	-	-	-	-	-	26.5
245	-	3.4	-	3.4	-	-	3.4	-	-	1.7	-	-	3.4	1.7	1.7	-	3.4	-	-	-	3.4	-	-	25.5
286	-	12.0	-	-	-	-	-	-	-	-	-	-	-	12.0	-	-	-	-	-	-	-	-	-	24.0
407	-	-	-	-	-	-	-	-	-	-	-	21.6	-	-	-	-	-	-	-	-	-	-	-	21.6
410	-	-	-	-	-	-	-	-	-	-	-	21.6	-	-	-	-	-	-	-	-	-	-	-	21.6
475	-	4.8	-	-	-	-	-	-	4.8	-	-	-	-	4.8	-	4.8	-	-	-	-	-	-	-	19.0
334	-	-	-	-	-	-	-	-	-	-	-	18.0	-	-	-	-	-	-	-	-	-	-	-	18.0
101	-	-	-	-	-	-	-	-	-	-	-	17.6	-	-	-	-	-	-	-	-	-	-	-	17.6
201	-	-	-	-	-	3.4	3.4	-	-	3.4	-	-	3.4	3.4	-	-	-	-	-	-	-	-	-	17.0
202	-	-	-	-	-	3.4	3.4	-	-	3.4	-	-	3.4	3.4	-	-	-	-	-	-	-	-	-	17.0
203	-	-	-	-	-	3.4	3.4	-	-	3.4	-	-	3.4	3.4	-	-	-	-	-	-	-	-	-	17.0
204	-	-	-	-	-	3.4	3.4	-	-	3.4	-	-	3.4	3.4	-	-	-	-	-	-	-	-	-	17.0
211	-	1.4	1.4	1.4	-	-	2.7	-	1.4	1.4	1.4	-	1.4	1.4	1.4	-	-	-	-	-	-	-	-	15.0

Table 1. Adults' consumption rates of fish in the survey area (kg/y)

Observation number	Bass	Cod	Conger eel	Dover sole	Flounder	Grey mullet	Haddock	Herring	John dory	Lemon sole	Ling	Mackerel	Monkfish	Plaice	Pollack	Rays	Red mullet	Saithe	Salmon	Sea trout	Turbot	Whiting	Octopus*	Total
213	**-**	**1.4**	**1.4**	**1.4**	**-**	**-**	**2.7**	**-**	**1.4**	**1.4**	**1.4**	**-**	**1.4**	**1.4**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**15.0**
214	**-**	**1.4**	**1.4**	**1.4**	**-**	**-**	**2.7**	**-**	**1.4**	**1.4**	**1.4**	**-**	**1.4**	**1.4**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**15.0**
215	**-**	**1.4**	**1.4**	**1.4**	**-**	**-**	**2.7**	**-**	**1.4**	**1.4**	**1.4**	**-**	**1.4**	**1.4**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**15.0**
212	**-**	**1.4**	**1.4**	**1.4**	**-**	**-**	**2.7**	**-**	**1.4**	**1.4**	**1.4**	**-**	**1.4**	**1.4**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**15.0**
401	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**
405	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**
440	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**
441	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**
442	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.4**
399	**5.1**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**7.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.3**
400	**5.1**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**7.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.3**
95	**-**	**2.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**10.2**	**-**	**-**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**14.1**
31	-	-	-	-	-	-	-	-	-	-	-	11.7	-	-	-	-	-	-	-	-	-	-	-	11.7
227	-	2.6	1.3	-	0.5	-	-	-	1.1	-	1.4	1.8	-	0.4	2.5	-	-	-	-	-	-	-	-	11.7
228	-	2.6	1.3	-	0.5	-	-	-	1.1	-	1.4	1.8	-	0.4	2.5	-	-	-	-	-	-	-	-	11.7
434	-	-	-	-	-	-	-	-	-	-	-	10.8	-	-	-	-	-	-	-	-	-	-	-	10.8
435	-	-	-	-	-	-	-	-	-	-	-	10.8	-	-	-	-	-	-	-	-	-	-	-	10.8
269	-	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5
270	-	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5
271	-	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5
272	-	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5
406	-	-	-	-	-	-	-	-	-	-	-	8.0	-	-	-	-	-	-	-	-	-	-	-	8.0
7	-	-	-	-	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	-	-	-	-	-	7.3
8	-	-	-	-	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	-	-	-	-	-	7.3
9	-	-	-	-	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	-	-	-	-	-	7.3
443	-	-	-	-	-	-	-	-	-	-	-	7.2	-	-	-	-	-	-	-	-	-	-	-	7.2

Table 1. Adults' consumption rates of fish in the survey area (kg/y)

Observation number	Bass	Cod	Conger eel	Dover sole	Flounder	Grey mullet	Haddock	Herring	John dory	Lemon sole	Ling	Mackerel	Monkfish	Plaice	Pollack	Rays	Red mullet	Saithe	Salmon	Sea trout	Turbot	Whiting	Octopus*	Total
324	-	0.8	-	-	-	-	-	-	-	-	-	5.9	-	-	0.5	-	-	-	-	-	-	-	-	7.1
325	-	0.8	-	-	-	-	-	-	-	-	-	5.9	-	-	0.5	-	-	-	-	-	-	-	-	7.1
316	-	-	-	-	-	-	-	-	-	-	-	6.6	-	-	-	-	-	-	-	-	-	-	-	6.6
129	-	2.0	-	-	-	-	-	-	-	-	-	1.8	-	-	-	1.3	-	-	-	-	-	1.3	-	6.4
130	-	2.0	-	-	-	-	-	-	-	-	-	1.8	-	-	-	1.3	-	-	-	-	-	1.3	-	6.4
131	-	2.0	-	-	-	-	-	-	-	-	-	1.8	-	-	-	1.3	-	-	-	-	-	1.3	-	6.4
132	-	2.0	-	-	-	-	-	-	-	-	-	1.8	-	-	-	1.3	-	-	-	-	-	1.3	-	6.4
133	-	2.0	-	-	-	-	-	-	-	-	-	1.8	-	-	-	1.3	-	-	-	-	-	1.3	-	6.4
395	-	0.5	-	-	-	1.7	-	-	-	-	-	2.7	-	-	1.0	-	-	-	-	-	-	-	-	5.9
398	-	0.5	-	-	-	1.7	-	-	-	-	-	2.7	-	-	1.0	-	-	-	-	-	-	-	-	5.9
185	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
188	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
191	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
184	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
186	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
187	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
189	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
190	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
192	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
193	-	1.2	-	0.5	-	-	2.3	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.8
171	-	0.5	-	0.5	-	-	2.7	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.4
172	-	0.5	-	0.5	-	-	2.7	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.4
173	-	0.5	-	0.5	-	-	2.7	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.4
174	-	0.5	-	0.5	-	-	2.7	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.4
175	-	0.5	-	0.5	-	-	2.7	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.4
176	-	0.5	-	0.5	-	-	2.7	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.4

Table 1. Adults' consumption rates of fish in the survey area (kg/y)

Observation number	Bass	Cod	Conger eel	Dover sole	Flounder	Grey mullet	Haddock	Herring	John dory	Lemon sole	Ling	Mackerel	Monkfish	Plaice	Pollack	Rays	Red mullet	Saithe	Salmon	Sea trout	Turbot	Whiting	Octopus*	Total
177	-	0.5	-	0.5	-	-	2.7	-	-	0.5	-	-	0.5	0.5	-	-	-	-	-	-	0.5	-	-	5.4
5	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-	-	-	-	2.5	-	-	-	5.4
251	-	1.7	-	-	-	-	1.0	-	-	-	-	-	1.7	0.7	-	-	-	-	-	-	-	-	-	5.1
254	-	1.7	-	-	-	-	1.0	-	-	-	-	-	1.7	0.7	-	-	-	-	-	-	-	-	-	5.1
255	-	1.7	-	-	-	-	1.0	-	-	-	-	-	1.7	0.7	-	-	-	-	-	-	-	-	-	5.1
10	-	-	-	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	-	-	-	-	-	4.4
58	-	-	-	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	-	-	-	-	-	4.4
117	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3
452	-	-	-	-	-	-	-	-	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-	-	2.7
119	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
120	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
121	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
122	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
123	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
124	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
125	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
126	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
127	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
128	-	0.8	-	-	-	-	-	-	-	-	0.8	0.5	-	-	-	-	-	-	-	-	-	0.4	-	2.5
326	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	2.3
327	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	2.3
328	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	2.3
329	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	2.3
330	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	2.3
331	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	2.3
332	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	2.3

Table 1. Adults' consumption rates of fish in the survey area (kg/y)

Observation number	Bass	Cod	Conger eel	Dover sole	Flounder	Grey mullet	Haddock	Herring	John dory	Lemon sole	Ling	Mackerel	Monkfish	Plaice	Pollack	Rays	Red mullet	Saithe	Salmon	Sea trout	Turbot	Whiting	Octopus*	Total
99	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	-	-	-	1.8
198	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4
199	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4
200	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4
352	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	1.4
140	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	0.9
141	-	-	-	-	-	-	-	-	-	-	-	0.9	-	-	-	-	-	-	-	-	-	-	-	0.9
115	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	0.3
116	-	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-	-	0.3

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of fish based on the 64 high-rate adult consumers is 26.3 kg/y

The observed 97.5th percentile rate based on 139 observations is 41.5 kg/y

*Although octopus are molluscs, radiologicaly they are more akin to fish, so they have been included in the fish group.

Table 2. Adults' consumption rates of crustaceans in the survey area (kg/y)

Observation number	Brown crab	Lobster	*Nephrops*	Total
269	**6.9**	**10.8**	**-**	**17.6**
270	**6.9**	**10.8**	**-**	**17.6**
271	**6.9**	**10.8**	**-**	**17.6**
272	**6.9**	**10.8**	**-**	**17.6**
231	**7.1**	**2.4**	**-**	**9.5**
232	**7.1**	**2.4**	**-**	**9.5**
233	**7.1**	**2.4**	**-**	**9.5**
234	**7.1**	**2.4**	**-**	**9.5**
235	**7.1**	**2.4**	**-**	**9.5**
236	**7.1**	**2.4**	**-**	**9.5**
227	**3.4**	**5.4**	**-**	**8.8**
228	**3.4**	**5.4**	**-**	**8.8**
207	**-**	**-**	**8.2**	**8.2**
208	**-**	**-**	**8.2**	**8.2**
209	**-**	**-**	**8.2**	**8.2**
210	**-**	**-**	**8.2**	**8.2**
178	**-**	**-**	**5.9**	**5.9**
179	**-**	**-**	**5.9**	**5.9**
180	**-**	**-**	**5.9**	**5.9**
181	**-**	**-**	**5.9**	**5.9**
182	**-**	**-**	**5.9**	**5.9**
183	**-**	**-**	**5.9**	**5.9**
475	2.6	-	2.7	5.3
223	3.6	1.3	-	4.9
224	3.6	1.3	-	4.9
225	3.6	1.3	-	4.9
226	3.6	1.3	-	4.9
239	-	-	4.5	4.5
240	-	-	4.5	4.5
241	-	-	4.5	4.5
242	-	-	4.5	4.5
243	-	-	4.5	4.5
244	-	-	4.5	4.5
171	-	-	3.6	3.6
172	-	-	3.6	3.6
173	-	-	3.6	3.6
174	-	-	3.6	3.6
175	-	-	3.6	3.6
176	-	-	3.6	3.6
177	-	-	3.6	3.6
283	3.3	-	-	3.3
194	2.7	-	-	2.7
195	2.7	-	-	2.7
196	2.7	-	-	2.7
197	2.7	-	-	2.7
201	1.6	-	-	1.6
202	1.6	-	-	1.6
203	1.6	-	-	1.6
204	1.6	-	-	1.6
211	0.8	0.6	-	1.5
216	0.8	0.6	-	1.5
217	0.8	0.6	-	1.5

Table 2. Adults' consumption rates of crustaceans in the survey area (kg/y)

Observation number	Brown crab	Lobster	*Nephrops*	Total
218	0.8	0.6	-	1.5
219	0.8	0.6	-	1.5
220	0.8	0.6	-	1.5
221	0.8	0.6	-	1.5
222	0.8	0.6	-	1.5
316	0.8	0.6	-	1.5
245	-	-	1.1	1.1
251	-	-	1.1	1.1
254	-	-	1.1	1.1
255	-	-	1.1	1.1
256	-	-	1.1	1.1
115	0.5	0.5	-	1.1
116	0.5	0.5	-	1.1
184	-	-	0.9	0.9
185	-	-	0.9	0.9
186	-	-	0.9	0.9
187	-	-	0.9	0.9
188	-	-	0.9	0.9
189	-	-	0.9	0.9
190	-	-	0.9	0.9
191	-	-	0.9	0.9
192	-	-	0.9	0.9
193	-	-	0.9	0.9
286	-	-	0.5	0.5

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans based on the 22 high-rate adult consumers is 9.7 kg/y

The observed 97.5th percentile rate based on 75 observations is 17.6 kg/y

Table 3. Adults' consumption rates of molluscs in the survey area (kg/y)

Observation number	Clam	Cockle	Mussel	Pacific oyster	Winkle	Total
21	**-**	**-**	**34.9**	**3.4**	**-**	**38.4**
67	**-**	**2.4**	**9.1**	**-**	**9.9**	**21.4**
13	**-**	**-**	**13.8**	**6.9**	**-**	**20.7**
77	**-**	**-**	**19.2**	**-**	**-**	**19.2**
316	0.02	-	-	1.1	-	1.1
453	-	-	0.5	0.4	-	0.9
454	-	-	0.5	0.4	-	0.9
58	-	-	-	0.4	-	0.4
170	-	-	-	0.4	-	0.4

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of molluscs based on the 4 high-rate adult consumers is 24.9 kg/y

The observed 97.5th percentile rate based on 9 observations is 35.0 kg/y

Table 4. Adults' consumption rates of seaweed in the survey area (kg/y)

Observation number	Dulse	Total
67	**0.5**	**0.5**

Notes

Emboldened observations are the high-rate consumers

The consumption rate of seaweed based on the only adult consumer is 0.5 kg/y

The observed 97.5th percentile rate is not applicable for 1 observation

Table 5. Children's consumption rates of fish in the survey area (kg/y)

15-year-old age group

Observation number	Age (years)	Cod	Grey mullet	Haddock	Lemon sole	Mackerel	Monkfish	Plaice	Pollack	Total
104	**16**					**12.8**				**12.8**
436	**16**	**-**	**-**	**-**	**-**	**10.8**	**-**	**-**	**-**	**10.8**
437	**12**	**-**	**-**	**-**	**-**	**5.4**	**-**	**-**	**-**	**5.4**
256	**15**	**1.7**	**-**	**1.0**	**-**	**-**	**1.7**	**0.7**	**-**	**5.1**
252	**13**	**1.7**	**-**	**1.0**	**-**	**-**	**1.7**	**0.7**	**-**	**5.1**
396	14	0.3	0.9	-	-	0.7	-	-	0.5	2.3
397	12	0.3	0.9	-	-	0.7	-	-	0.5	2.3
142	15	-	-	-	-	0.9	-	-	-	0.9
144	13	-	-	-	-	0.9	-	-	-	0.9

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of fish based on the 5 high-rate 15-year-old age group consumers is 7.8 kg/y

The observed 97.5th percentile rate based on 9 observations is 12.4 kg/y

10-year-old age group

Observation number	Age (years)	Cod	Grey mullet	Haddock	Lemon sole	Mackerel	Monkfish	Plaice	Pollack	Total
408	**9**	**-**	**-**	**-**	**-**	**5.4**	**-**	**-**	**-**	**5.4**
402	**10**	**-**	**-**	**-**	**-**	**3.6**	**-**	**-**	**-**	**3.6**
403	**8**	**-**	**-**	**-**	**-**	**3.6**	**-**	**-**	**-**	**3.6**
404	**7**	**-**	**-**	**-**	**-**	**3.6**	**-**	**-**	**-**	**3.6**
257	**11**	**0.9**	**-**	**0.5**	**-**	**-**	**0.9**	**0.3**	**-**	**2.6**
253	**9**	**0.9**	**-**	**0.5**	**-**	**-**	**0.9**	**0.3**	**-**	**2.6**
258	**8**	**0.9**	**-**	**0.5**	**-**	**-**	**0.9**	**0.3**	**-**	**2.6**
143	8	-	-	-	-	0.9	-	-	-	0.9
333	7	-	-	-	-	0.5	-	-	-	0.5

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of fish based on the 7 high-rate 10-year-old age group consumers is 3.4 kg/y

The observed 97.5th percentile rate based on 9 observations is 5.0 kg/y

Table 5. Children's consumption rates of fish in the survey area (kg/y)

5-year-old age group

Observation number	Age (years)	Cod	Grey mullet	Haddock	Lemon sole	Mackerel	Monkfish	Plaice	Pollack	Total
206	**6**	**-**	**1.1**	**1.1**	**1.1**	**-**	**1.1**	**1.1**	**-**	**5.7**
205	**4**	**-**	**1.1**	**1.1**	**1.1**	**-**	**1.1**	**1.1**	**-**	**5.7**
409	**6**	**-**	**-**	**-**	**-**	**3.6**	**-**	**-**	**-**	**3.6**
259	**6**	**0.9**	**-**	**0.5**	**-**	**-**	**0.9**	**0.3**	**-**	**2.6**
260	3	0.4	-	0.3	-	-	0.4	0.2	-	1.3

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of fish based on the 4 high-rate 5-year-old age group consumers is 4.4 kg/y

The observed 97.5th percentile rate based on 5 observations is 5.7 kg/y

Table 6. Children's consumption rates of crustaceans in the survey area (kg/y)

15-year-old age group

Observation number	Age (years)	Brown crab	Lobster	*Nephrops*	Total
256	**15**	**-**	**-**	**1.1**	**1.1**
252	**13**	**-**	**-**	**1.1**	**1.1**

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans based on the 2 high-rate 15-year-old age group consumers is 1.1 kg/y

The observed 97.5th percentile rate based on 2 observations is 1.1 kg/y

10-year-old age group

Observation number	Age (years)	Brown crab	Lobster	*Nephrops*	Total
237	**10**	**3.6**	**1.2**	**-**	**4.8**
257	**11**	**-**	**-**	**0.6**	**0.6**
253	**9**	**-**	**-**	**0.6**	**0.6**
258	**8**	**-**	**-**	**0.6**	**0.6**

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans based on the 4 high-rate 10-year-old age group consumers is 1.6 kg/y

(Taking the highest consumption rate and dividing by 3 would give a cut-off value for the high-rate group of 1.6 kg/y. However, in this case judgement has been used and the cut-off value has been set by dividing the second highest value, 0.6, by 3 giving a cut-off value of 0.2 kg/y)

The observed 97.5th percentile rate based on 4 observations is 4.4 kg/y

5-year-old age group

Observation number	Age (years)	Brown crab	Lobster	*Nephrops*	Total
238	**6**	**1.8**	**0.6**	**-**	**2.4**
206	**6**	**0.8**	**-**	**-**	**0.8**
205	**4**	**0.8**	**-**	**-**	**0.8**
259	6	**-**	**-**	0.6	0.6
260	3	**-**	**-**	0.3	0.3

Notes

Emboldened observations are the high-rate consumers

The mean consumption rate of crustaceans based on the 3 high-rate 5-year-old age group consumers is 1.3 kg/y

The observed 97.5th percentile rate based on 5 observations is 2.2 kg/y

Table 7. Adults' intertidal occupancy rates in the survey area (h/y)

Observation number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Sand	Sand and stones
22	**Greenore**	**Oyster farming**	**495**	-	-	-	**495**	-
23	**Greenore**	**Oyster farming**	**495**	-	-	-	**495**	-
24	**Greenore**	**Oyster farming**	**495**	-	-	-	**495**	-
25	**Greenore**	**Oyster farming**	**495**	-	-	-	**495**	-
26	**Greenore**	**Oyster farming**	**495**	-	-	-	**495**	-
27	**Greenore**	**Oyster farming**	**495**	-	-	-	**495**	-
19	**Greenore**	**Oyster farming**	**360**	-	-	-	**360**	-
20	**Greenore**	**Oyster farming**	**360**	-	-	-	**360**	-
28	**Greenore**	**Oyster farming**	**248**	-	-	-	**248**	-
29	**Greenore**	**Oyster farming**	**248**	-	-	-	**248**	-
14	**Between Carlingford and Greenore**	**Oyster farming**	**228**	-	-	-	228	-
15	**Between Carlingford and Greenore**	**Oyster farming**	**228**	-	-	-	228	-
16	**Between Carlingford and Greenore**	**Oyster farming**	**228**	-	-	-	228	-
17	**Between Carlingford and Greenore**	**Oyster farming**	**228**	-	-	-	228	-
18	**Between Carlingford and Greenore**	**Oyster farming**	**228**	-	-	-	228	-
67	**Between Carlingford and Greenore**	**Collecting winkles**	-	**520**	-	-	-	-
	Greenore	Collecting cockles	-	**-**	-	-	10	-
109	Carlingford and Omeath	Collecting cockles and winkles	-	100	-	-	-	-
386	North of Annagassan Quay	Boat maintenance	-	10	-	-	-	-
	Salterstown Bay	**Walking**	-	-	**50**	-	-	-
	Clogherhead	Walking	-	-	**-**	-	22	-
140	Templeton	Collecting winkles	-	10	-	-	-	-
	Templeton	Playing	-	-	-	-	35	-
	Templeton	Angling	-	-	-	-	-	20
141	Templeton	Collecting winkles	-	10	-	-	-	-
	Templeton	Playing	-	-	-	-	35	-
387	North of Annagassan Quay	Boat maintenance	-	10	-	-	-	-
334	**Port Oriel**	**Angling**	-	-	-	**100**	-	-
	Clogherhead	Walking	-	-	-	**-**	24	-
410	Clogherhead	Angling	-	-	-	24	-	-
	Clogherhead	Beach occupancy	-	-	-	-	136	-
395	Port Oriel	Angling	-	-	-	12	-	-
401	Port Oriel	Angling	-	-	-	1	-	-
	Greenore	Angling	-	-	-	-	-	14

Table 7. Adults' intertidal occupancy rates in the survey area (h/y)

Observation number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Sand	Sand and stones
323	**Port, Lurganboy and Clogherhead**	**Dog walking**	-	-	-	-	**720**	-
322	**Port and Lurganboy**	**Dog walking**	-	-	-	-	**420**	-
316	**Port and Lurganboy**	**Angling and dog walking**	-	-	-	-	**352**	-
309	**Clogherhead**	**Dog walking**	-	-	-	-	**337**	-
310	**Clogherhead**	**Dog walking**	-	-	-	-	**337**	-
311	**Clogherhead**	**Dog walking**	-	-	-	-	**337**	-
289	**Clogherhead**	**Water sports preparation**	-	-	-	-	**336**	-
308	**Blackrock**	**Dog walking**	-	-	-	-	**336**	-
335	**Clogherhead**	**Dog walking**	-	-	-	-	**336**	-
500	Clogherhead	Dog walking	-	-	-	-	210	-
290	Clogherhead	Water sports preparation	-	-	-	-	190	-
475	Clogherhead	RNLI duties and walking	-	-	-	-	175	-
303	Annnagassan and Blackrock	Water sports preparation	-	-	-	-	174	-
304	Annnagassan and Blackrock	Water sports preparation	-	-	-	-	174	-
305	Annnagassan and Blackrock	Water sports preparation	-	-	-	-	174	-
505	Clogherhead	Walking	-	-	-	-	162	-
63	Giles Quay	Playing	-	-	-	-	150	-
64	Giles Quay	Playing	-	-	-	-	150	-
424	Port and Lurganboy	Dog walking	-	-	-	-	144	-
425	Port and Lurganboy	Dog walking	-	-	-	-	144	-
407	Clogherhead	Beach occupancy	-	-	-	-	136	-
59	Giles Quay	Playing	-	-	-	-	126	-
423	Port and Lurganboy	Walking	-	-	-	-	108	-
421	Port and Lurganboy	Walking	-	-	-	-	100	-
422	Port and Lurganboy	Walking	-	-	-	-	100	-
385	Blackrock	Dog walking	-	-	-	-	96	-
	Carlingford	Dog walking	-	-	-	-	-	96
349	Dunany Point, Clogherhead and Annagassan	Walking	-	-	-	-	96	-
338	Clogherhead	Walking	-	-	-	-	95	-
411	Clogherhead	Walking	-	-	-	-	90	-
	Carlingford	Walking	-	-	-	-	-	6
163	Carlingford	Water sports preparation	-	-	-	-	90	-
164	Carlingford	Water sports preparation	-	-	-	-	90	-
52	Giles Quay	Playing	-	-	-	-	80	-

Table 7. Adults' intertidal occupancy rates in the survey area (h/y)

Observation number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Sand	Sand and stones
53	Giles Quay	Playing	-	-	-	-	80	-
467	Giles Quay	Dog walking	-	-	-	-	72	-
	Annagassan Quay	**Dog walking**	-	-	-	-	-	**504**
337	Clogherhead	Walking	-	-	-	-	72	-
138	Templeton	Playing	-	-	-	-	65	-
139	Templeton	Playing	-	-	-	-	65	-
134	Templeton	Horse riding	-	-	-	-	64	-
135	Templeton	Horse riding	-	-	-	-	64	-
399	Port and Lurganboy	Angling	-	-	-	-	60	-
499	Clogherhead	Dog walking	-	-	-	-	60	-
48	Templeton	Jogging	-	-	-	-	47	-
49	Templeton	Jogging	-	-	-	-	47	-
111	Giles Quay	Playing	-	-	-	-	42	-
449	Clogherhead	Beach occupancy	-	-	-	-	41	-
145	Templeton	Playing	-	-	-	-	40	-
504	Clogherhead	Beach occupancy	-	-	-	-	40	-
464	Port, Lurganboy and Clogherhead	Walking	-	-	-	-	36	-
286	Port Oriel	Dog walking	-	-	-	-	35	-
287	Port Oriel	Dog walking	-	-	-	-	35	-
466	Port and Lurganboy	Dog walking	-	-	-	-	30	-
306	Blackrock	Dog walking	-	-	-	-	24	-
312	Clogherhead	Beach occupancy	-	-	-	-	20	-
	Carlingford	Beach occupancy	-	-	-	-	-	1
313	Clogherhead	Beach occupancy	-	-	-	-	20	-
	Carlingford	Beach occupancy	-	-	-	-	-	1
345	Port, Lurganboy and Clogherhead	Walking	-	-	-	-	18	-
346	Port, Lurganboy and Clogherhead	Walking	-	-	-	-	18	-
452	Blackrock and Clogherhead	Walking	-	-	-	-	18	-
352	Clogherhead	Angling and bait digging	-	-	-	-	15	-
291	Clogherhead	Beach occupancy	-	-	-	-	14	-
324	Clogherhead	Dog walking	-	-	-	-	14	-
418	Port, Lurganboy, Blackrock	Walking	-	-	-	-	13	-
	Carlingford	Walking	-	-	-	-	-	36
419	Port, Lurganboy, Blackrock	Walking	-	-	-	-	13	-
	Carlingford	Walking	-	-	-	-	-	36

Table 7. Adults' intertidal occupancy rates in the survey area (h/y)

Observation number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Sand	Sand and stones
465	Port, Lurganboy and Clogherhead	Walking	-	-	-	-	13	-
54	Giles Quay	Playing	-	-	-	-	10	-
292	Clogherhead	Beach occupancy	-	-	-	-	10	-
293	Clogherhead	Beach occupancy	-	-	-	-	10	-
444	Clogherhead	Walking	-	-	-	-	10	-
445	Clogherhead	Kite flying	-	-	-	-	10	-
300	Clogherhead	Beach occupancy	-	-	-	-	9	-
375	Blackrock	Walking	-	-	-	-	9	-
376	Blackrock	Walking	-	-	-	-	9	-
317	Port and Lurganboy	Beach occupancy	-	-	-	-	8	-
	Carlingford	Beach occupancy	-	-	-	-	-	18
318	Port and Lurganboy	Beach occupancy	-	-	-	-	8	-
	Carlingford	Beach occupancy	-	-	-	-	-	18
426	Port and Lurganboy	Beach occupancy	-	-	-	-	8	-
	Carlingford	Beach occupancy	-	-	-	-	-	18
532	Port, Lurganboy and Clogherhead	Beach occupancy	-	-	-	-	8	-
476	Clogherhead	RNLI duties	-	-	-	-	7	-
477	Clogherhead	RNLI duties	-	-	-	-	7	-
478	Clogherhead	RNLI duties	-	-	-	-	7	-
479	Clogherhead	RNLI duties	-	-	-	-	7	-
480	Clogherhead	RNLI duties	-	-	-	-	7	-
481	Clogherhead	RNLI duties	-	-	-	-	7	-
482	Clogherhead	RNLI duties	-	-	-	-	7	-
483	Clogherhead	RNLI duties	-	-	-	-	7	-
484	Clogherhead	RNLI duties	-	-	-	-	7	-
485	Clogherhead	RNLI duties	-	-	-	-	7	-
486	Clogherhead	RNLI duties	-	-	-	-	7	-
487	Clogherhead	RNLI duties	-	-	-	-	7	-
488	Clogherhead	RNLI duties	-	-	-	-	7	-
489	Clogherhead	RNLI duties	-	-	-	-	7	-
490	Clogherhead	RNLI duties	-	-	-	-	7	-
491	Clogherhead	RNLI duties	-	-	-	-	7	-
492	Clogherhead	RNLI duties	-	-	-	-	7	-
493	Clogherhead	RNLI duties	-	-	-	-	7	-
494	Clogherhead	RNLI duties	-	-	-	-	7	-

Table 7. Adults' intertidal occupancy rates in the survey area (h/y)

Observation number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Sand	Sand and stones
495	Clogherhead	RNLI duties	-	-	-	-	7	-
496	Clogherhead	RNLI duties	-	-	-	-	7	-
497	Clogherhead	RNLI duties	-	-	-	-	7	-
498	Clogherhead	RNLI duties	-	-	-	-	7	-
378	Blackrock	Walking	-	-	-	-	6	-
	Carlingford	Walking	-	-	-	-	-	15
379	Blackrock	Walking	-	-	-	-	6	-
	Carlingford	Walking	-	-	-	-	-	15
470	Blackrock and Annagassan	Walking	-	-	-	-	6	-
	Carlingford	Walking	-	-	-	-	-	1
471	Blackrock and Annagassan	Walking	-	-	-	-	6	-
	Carlingford	Walking	-	-	-	-	-	1
525	Port and Lurganboy	Beach occupancy	-	-	-	-	5	-
526	Port and Lurganboy	Beach occupancy	-	-	-	-	5	-
527	Port and Lurganboy	Beach occupancy	-	-	-	-	5	-
321	Clogherhead	Dog walking	-	-	-	-	4	-
	Dunany Point	Dog walking	-	-	-	-	-	32
458	Port and Lurganboy	Walking	-	-	-	-	4	-
459	Port and Lurganboy	Walking	-	-	-	-	4	-
341	Port and Lurganboy	Walking	-	-	-	-	3	-
342	Port and Lurganboy	Walking	-	-	-	-	3	-
353	Clogherhead	Beach occupancy	-	-	-	-	3	-
354	Clogherhead	Beach occupancy	-	-	-	-	3	-
355	Clogherhead	Beach occupancy	-	-	-	-	3	-
356	Clogherhead	Beach occupancy	-	-	-	-	3	-
357	Clogherhead	Beach occupancy	-	-	-	-	3	-
358	Clogherhead	Beach occupancy	-	-	-	-	3	-
359	Clogherhead	Beach occupancy	-	-	-	-	3	-
360	Clogherhead	Beach occupancy	-	-	-	-	3	-
373	Clogherhead	Beach occupancy	-	-	-	-	3	-
374	Clogherhead	Beach occupancy	-	-	-	-	3	-
501	Clogherhead	Playing	-	-	-	-	3	-
416	Port and Lurganboy	Walking	-	-	-	-	3	-
417	Port and Lurganboy	Walking	-	-	-	-	3	-

Table 7. Adults' intertidal occupancy rates in the survey area (h/y)

Observation number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Sand	Sand and stones
446	Clogherhead	Walking	-	-	-	-	2	-
447	Clogherhead	Walking	-	-	-	-	2	-
453	Port and Lurganboy	Walking	-	-	-	-	2	-
454	Port and Lurganboy	Walking	-	-	-	-	2	-
456	Port and Lurganboy	Walking	-	-	-	-	2	-
457	Port and Lurganboy	Walking	-	-	-	-	2	-
413	Clogherhead	Beach occupancy	-	-	-	-	1	-
	Salterstown Bay	Beach occupancy	-	-	-	-	-	20
339	Port, Lurganboy and Clogherhead	Walking	-	-	-	-	1	-
340	Port, Lurganboy and Clogherhead	Walking	-	-	-	-	1	-
433	Port and Lurganboy	Walking	-	-	-	-	1	-
462	Port and Lurganboy	Walking	-	-	-	-	1	-
463	Port and Lurganboy	Walking	-	-	-	-	1	-
277	**Salterstown Bay**	**Collecting winkles**	-	-	-	-	-	**1160**
30	**Greenore**	**Shore angling**	-	-	-	-	-	**1100**
32	**Greenore**	**Shore angling**	-	-	-	-	-	**780**
7	**Greenore**	**Shore angling**	-	-	-	-	-	**504**
117	**Ballagan Point**	**Shore angling**	-	-	-	-	-	**468**
438	**South of Annagassan**	**Dog walking**	-	-	-	-	-	**444**
472	**South of Annagassan**	**Dog walking**	-	-	-	-	-	**420**
473	**South of Annagassan**	**Dog walking**	-	-	-	-	-	**420**
105	Greenore	Dog walking and playing	-	-	-	-	-	360
4	Greenore	Shore angling	-	-	-	-	-	240
58	Giles Quay	Dog walking	-	-	-	-	-	182
170	Greenore	Dog walking	-	-	-	-	-	182
10	Greenore	Shore angling	-	-	-	-	-	144
101	Greenore	Shore angling	-	-	-	-	-	144
57	Between Carlingford and Annagassan	Walking	-	-	-	-	-	130
6	Greenore	Shore angling	-	-	-	-	-	120
102	Greenore	Shore angling	-	-	-	-	-	112
103	Greenore	Shore angling	-	-	-	-	-	112
99	Greenore	Shore angling	-	-	-	-	-	96
434	South of Annagassan	Walking	-	-	-	-	-	96
11	Greenore	Shore angling	-	-	-	-	-	30

Table 7. Adults' intertidal occupancy rates in the survey area (h/y)

Observation number	Location	Activity	Mud	Mud and sand	Mud, sand and stones	Rock	Sand	Sand and stones
44	Omeath	Playing	-	-	-	-	-	30
45	Omeath	Playing	-	-	-	-	-	30
474	Dunany Point	Dog walking	-	-	-	-	-	22
2	Omeath	Collecting seaweed	-	-	-	-	-	6
3	Omeath	Collecting seaweed	-	-	-	-	-	6
468	Annagassan, Omeath and Carlingford	Walking	-	-	-	-	-	2
469	Annagassan, Omeath and Carlingford	Walking	-	-	-	-	-	2
280	Between Annagassan and Salterstown	Collecting stones	-	-	-	-	-	2
281	Between Annagassan and Salterstown	Collecting stones	-	-	-	-	-	2

Notes

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud based on the 15 high-rate observations is 355 h/y

The observed 97.5th percentile rate based on 15 observations for mud is 495 h/y

The intertidal occupancy rate over mud and sand based on 1 high-rate observation is 520 h/y

The observed 97.5th percentile rate based on 6 observations for mud and sand is 468 h/y

The intertidal occupancy rate over mud, sand and stones based on the only observation is 50 h/y

The observed 97.5th percentile rate is not applicable for 1 observation

The intertidal occupancy rate over rock based on 1 high-rate observation is 100 h/y

The observed 97.5th percentile rate based on 4 observations for rock is 94 h/y

The mean intertidal occupancy rate over sand based on the 19 high-rate observations is 405 h/y

The observed 97.5th percentile rate based on 156 observations for sand is 495 h/y

The mean intertidal occupancy rate over sand and stones based on the 9 high-rate observations is 644 h/y

The observed 97.5th percentile rate based on 48 observations for sand and stones is 1044 h/y

Table 8. Children's intertidal occupancy rates in the survey area (h/y)

15-year-old age group

Observation number	Age (years)	Location	Activity	Mud and sand	Rock	Sand	Sand and stones
107	**14**	**Carlingford and Omeath**	**Collecting cockles and winkles**	**100**	-	-	-
108	**16**	**Carlingford and Omeath**	**Collecting cockles and winkles**	**100**	-	-	-
142	**15**	Templeton	Collecting winkles	10	-	-	-
		Templeton	**Playing**	-	-	**35**	-
144	**13**	Templeton	Collecting winkles	10	-	-	-
		Templeton	**Playing**	-	-	**35**	-
50	**15**	**Giles Quay**	**Playing**	-	-	**80**	-
307	12	Blackrock	Dog walking	-	-	24	-
294	13	Clogherhead	Beach occupancy	-	-	10	-
295	14	Clogherhead	Beach occupancy	-	-	10	-
296	15	Clogherhead	Beach occupancy	-	-	10	-
297	16	Clogherhead	Beach occupancy	-	-	10	-
298	14	Clogherhead	Beach occupancy	-	-	10	-
299	15	Clogherhead	Beach occupancy	-	-	10	-
320	13	Port and Lurganboy	Beach occupancy	-	-	8	-
		Carlingford	Beach occupancy	-	-	-	18
315	15	Clogherhead	Water sports	-	-	3	-
361	13	Clogherhead	Beach occupancy	-	-	3	-
362	13	Clogherhead	Beach occupancy	-	-	3	-
363	13	Clogherhead	Beach occupancy	-	-	3	-
364	14	Clogherhead	Beach occupancy	-	-	3	-
365	14	Clogherhead	Beach occupancy	-	-	3	-
366	14	Clogherhead	Beach occupancy	-	-	3	-
367	15	Clogherhead	Beach occupancy	-	-	3	-
368	15	Clogherhead	Beach occupancy	-	-	3	-
369	15	Clogherhead	Beach occupancy	-	-	3	-
370	16	Clogherhead	Beach occupancy	-	-	3	-
371	16	Clogherhead	Beach occupancy	-	-	3	-
372	16	Clogherhead	Beach occupancy	-	-	3	-
301	14	Clogherhead	Water sports	-	-	1	-
302	12	Clogherhead	Water sports	-	-	1	-
104	**16**	**Greenore**	**Angling**	**-**	-	-	**160**
118	14	Ballagan Point	Sunbathing	-	-	-	54

Notes

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over mud and sand based on the 2 high-rate observations in the 15-year-old age group is 100 h/y

The observed 97.5th percentile rate based on 4 observations for mud and sand is 100 h/y

The mean intertidal occupancy rate over sand based on the 3 high-rate observations in the 15-year-old age group is 50 h/y

The observed 97.5th percentile rate based on 26 observations for sand is 52 h/y

The intertidal occupancy rate over sand and stones based on 1 high-rate observation in the 15-year-old age group is 160 h/y

The observed 97.5th percentile rate based on 3 observations for sand and stones is 155 h/y

Table 8. Children's intertidal occupancy rates in the survey area (h/y)

10-year-old age group

Observation number	Age (years)	Location	Activity	Mud and sand	Rock	Sand	Sand and stones
143	**8**	**Templeton**	**Collecting winkles**	**10**	-	-	-
		Templeton	Playing	**-**	-	35	-
402	**10**	**Port Oriel**	**Angling**	-	**1**	-	-
		Greenore	Angling	-	**-**	-	14
403	**8**	**Port Oriel**	**Angling**	-	**1**	-	-
		Greenore	Angling	-	**-**	-	14
404	**7**	**Port Oriel**	**Angling**	-	**1**	-	-
		Greenore	Angling	-	**-**	-	14
408	**9**	**Clogherhead**	**Beach occupancy**	**-**	**-**	**216**	-
61	**7**	**Giles Quay**	**Playing**	**-**	**-**	**126**	-
62	**10**	**Giles Quay**	**Playing**	**-**	**-**	**126**	-
350	**7**	**Dunany Point, Clogherhead and Annagassan**	**Walking**	**-**	**-**	**96**	-
51	**11**	**Giles Quay**	**Playing**	**-**	**-**	**80**	-
136	7	Templeton	Playing	-	-	65	-
288	10	Port Oriel	Dog walking	-	-	35	-
112	9	Giles Quay	Collecting shore crabs and playing	-	-	30	-
113	9	Giles Quay	Collecting shore crabs and playing	-	-	30	-
114	10	Giles Quay	Collecting shore crabs and playing	-	-	30	-
314	10	Clogherhead	Beach occupancy	-	-	20	-
		Carlingford	Beach occupancy	-	-	-	1
319	11	Port and Lurganboy	Beach occupancy	-	-	8	-
		Carlingford	Beach occupancy	-	-	-	18
431	11	Port and Lurganboy	Playing	-	-	8	-
432	8	Port and Lurganboy	Playing	-	-	8	-
380	7	Blackrock	Walking	-	-	6	-
		Carlingford	Walking	-	-	-	15
381	8	Blackrock	Walking	-	-	6	-
		Carlingford	Walking	-	-	-	15
382	11	Blackrock	Walking	-	-	6	-
		Carlingford	Walking	-	-	-	15
383	10	Blackrock	Walking	-	-	6	-
		Carlingford	Walking	-	-	-	15
530	8	Port and Lurganboy	Beach occupancy	-	-	5	-
531	9	Port and Lurganboy	Beach occupancy	-	-	5	-
460	11	Port and Lurganboy	Walking	-	-	3	-
461	9	Port and Lurganboy	Walking	-	-	3	-
455	8	Port and Lurganboy	Walking	-	-	2	-
100	**8**	**Greenore**	**Angling**	-	-	-	**96**
12	7	Greenore	Playing	-	-	-	30
47	8	Omeath	Playing	-	-	-	30

Notes

Emboldened observations are the high-rate individuals

The intertidal occupancy rate over mud and sand based on the only observation in the 10-year-old age group is 10 h/y

The observed 97.5th percentile rate is not applicable for 1 observation

The mean intertidal occupancy rate over rock based on the 3 high-rate observations in the 10-year-old age group is 1 h/y

The observed 97.5th percentile rate based on 3 observations for rock is 1 h/y

The mean intertidal occupancy rate over sand based on the 5 high-rate observations in the 10-year-old age group is 129 h/y

The observed 97.5th percentile rate based on 24 observations for sand is 164 h/y

The intertidal occupancy rate over sand and stones based on 1 high-rate observation in the 10-year-old age group is 96 h/y

The observed 97.5th percentile rate based on 12 observations for sand and stones is 78 h/y

Table 8. Children's intertidal occupancy rates in the survey area (h/y)

5-year-old age group

Observation number	Age (years)	Location	Activity	Mud and sand	Rock	Sand	Sand and stones
409	**6**	**Clogherhead**	**Beach occupancy**	-	-	**216**	-
65	**3**	**Giles Quay**	**Playing**	-	-	**150**	-
60	**6**	**Giles Quay**	**Playing**	-	-	**126**	-
351	**5**	**Dunany Point, Clogherhead and Annagassan**	**Walking**	-	-	**96**	-
137	5	Templeton	Playing	-	-	65	-
110	4	Giles Quay	Collecting crabs and playing	-	-	42	-
146	4	Templeton	Playing	-	-	40	-
147	6	Templeton	Playing	-	-	40	-
412	2	Clogherhead	Walking	-	-	24	-
348	3	Port, Lurganboy and Clogherhead	Walking	-	-	18	-
420	2	Port, Lurganboy and Blackrock	Walking	-	-	13	-
		Carlingford	Walking	-	-	-	36
55	4	Giles Quay	Playing	-	-	10	-
56	2	Giles Quay	Playing	-	-	10	-
377	3	Blackrock	Walking	-	-	9	-
427	5	Port and Lurganboy	Playing	-	-	8	-
		Carlingford	Playing	-	-	-	8
428	3	Port and Lurganboy	Playing	-	-	8	-
		Carlingford	Playing	-	-	-	8
429	2	Port and Lurganboy	Playing	-	-	8	-
		Carlingford	Playing	-	-	-	8
430	2	Port and Lurganboy	Playing	-	-	8	-
		Carlingford	Playing	-	-	-	8
533	6	Port, Lurganboy and Clogherhead	Beach occupancy	-	-	8	-
534	4	Port, Lurganboy and Clogherhead	Beach occupancy	-	-	8	-
535	3	Port, Lurganboy and Clogherhead	Beach occupancy	-	-	8	-
528	2	Port and Lurganboy	Beach occupancy	-	-	5	-
529	5	Port and Lurganboy	Beach occupancy	-	-	5	-
502	4	Clogherhead	Playing	-	-	3	-
336	4	Clogherhead	Dog walking	-	-	3	-
414	4	Clogherhead	Beach occupancy	-	-	1	-
106	**2**	**Greenore**	**Playing and dog walking**	-	-	**-**	**360**
46	6	Omeath	Playing	-	-	-	30
282	3	Between Annagassan and Salterstown	Collecting stones	-	-	-	2

Notes

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over sand based on the 4 high-rate observations in the 5-year-old age group is 147 h/y

The observed 97.5th percentile rate based on 26 observations for sand is 175 h/y

The intertidal occupancy rate over sand and stones based on 1 high-rate observation in the 5-year-old age group is 360 h/y

The observed 97.5th percentile rate based on 8 observations for sand and stones is 303 h/y

Table 8. Children's intertidal occupancy rates in the survey area (h/y)

1-year-old age group

Observation number	Age (years)	Location	Activity	Mud and sand	Rock	Sand	Sand and stones
66	**1**	**Giles Quay**	**Playing**	-	-	**150**	-
347	1	Port, Lurganboy and Clogherhead	Walking	-	-	18	-
415	1	Clogherhead	Beach occupancy	-	-	1	-

Notes

Emboldened observations are the high-rate individuals

The intertidal occupancy rate over sand based on 1 high-rate observation in the 1-year-old age group is 150 h/y

The observed 97.5th percentile rate based on 3 observations for sand is 143 h/y

3-month-old age group

Observation number	Age (years)	Location	Activity	Mud and sand	Rock	Sand	Sand and stones
384	**0.7**	**Blackrock**	**Walking**	-	-	**6**	-
		Carlingford	**Walking**	-	-	**-**	**15**
503	**0.9**	**Clogherhead**	**Playing**	-	-	**3**	-

Notes

Emboldened observations are the high-rate individuals

The mean intertidal occupancy rate over sand based on the 2 high-rate observations in the 3-month-old age group is 5 h/y

The observed 97.5th percentile rate based on 2 observations for sand is 6 h/y

The intertidal occupancy rate over sand and stones based on the only observation in the 3-month-old age group is 15 h/y

The observed 97.5th percentile rate is not applicable for 1 observation

Table 9. Adults' handling rates of fishing gear and catch, and sediment in the survey area (h/y)

Observation number	Location	Activity	Fishing gear and catch	Sediment
179	**North Irish Sea**	**Handling trawl gear and catch**	**4128**	-
180	**North Irish Sea**	**Handling trawl gear and catch**	**4128**	-
181	**North Irish Sea**	**Handling trawl gear and catch**	**4128**	-
182	**North Irish Sea**	**Handling trawl gear and catch**	**4128**	-
183	**North Irish Sea**	**Handling trawl gear and catch**	**4128**	-
262	**Northwest Irish Sea**	**Handling trawl gear and catch**	**3360**	-
263	**Northwest Irish Sea**	**Handling trawl gear and catch**	**3360**	-
264	**Northwest Irish Sea**	**Handling trawl gear and catch**	**3360**	-
265	**Northwest Irish Sea**	**Handling trawl gear and catch**	**3360**	-
266	**Northwest Irish Sea**	**Handling trawl gear and catch**	**3360**	-
267	**Northwest Irish Sea**	**Handling trawl gear and catch**	**3360**	-
268	**Northwest Irish Sea**	**Handling trawl gear and catch**	**3360**	-
208	**Off Balbriggan**	**Handling trawl gear and catch**	**2352**	-
209	**Off Balbriggan**	**Handling trawl gear and catch**	**2352**	-
210	**Off Balbriggan**	**Handling trawl gear and catch**	**2352**	-
246	**Northwest Irish Sea**	**Handling trawl gear and catch**	**2035**	-
247	**Northwest Irish Sea**	**Handling trawl gear and catch**	**2035**	-
248	**Northwest Irish Sea**	**Handling trawl gear and catch**	**2035**	-
249	**Northwest Irish Sea**	**Handling trawl gear and catch**	**2035**	-
250	**Northwest Irish Sea**	**Handling trawl gear and catch**	**2035**	-
229	**Off Skerries**	**Handling dredge gear and catch**	**1800**	-
230	**Off Skerries**	**Handling dredge gear and catch**	**1800**	-
172	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1504**	-
173	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1504**	-
174	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1504**	-
175	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1504**	-
176	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1504**	-
177	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1504**	-
240	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1496**	-
241	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1496**	-
242	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1496**	-
243	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1496**	-
244	**Northwest Irish Sea**	**Handling trawl gear and catch**	**1496**	-
212	North Irish Sea	Handling fly-seine gear and catch	1315	-
213	North Irish Sea	Handling fly-seine gear and catch	1315	-
214	North Irish Sea	Handling fly-seine gear and catch	1315	-
215	North Irish Sea	Handling fly-seine gear and catch	1315	-
274	Off Balbriggan	Handling trawl gear and catch	1310	-
275	Off Balbriggan	Handling trawl gear and catch	1310	-
276	Off Balbriggan	Handling trawl gear and catch	1310	-
207	Off Balbriggan	Handling trawl gear and catch	1272	-
186	North Irish Sea	Handling trawl gear and catch	1144	-
187	North Irish Sea	Handling trawl gear and catch	1144	-
188	North Irish Sea	Handling trawl gear and catch	1144	-
189	North Irish Sea	Handling trawl gear and catch	1144	-
190	North Irish Sea	Handling trawl gear and catch	1144	-
191	North Irish Sea	Handling trawl gear and catch	1144	-
192	North Irish Sea	Handling trawl gear and catch	1144	-
193	North Irish Sea	Handling trawl gear and catch	1144	-
115	Off Giles Quay	Handling pots	1092	-
116	Off Giles Quay	Handling pots	1092	-
269	Off Howth	Handling pots	1050	-
271	Off Howth	Handling pots	1050	-
199	Off Balbriggan	Handling pots	1040	-
200	Off Balbriggan	Handling pots	1040	-
194	Off Loughshinny	Handling pots	910	-
201	Off Balbriggan	Handling trawl gear and catch	816	-
202	Off Balbriggan	Handling trawl gear and catch	816	-
178	North Irish Sea	Handling trawl gear	768	-

Table 9. Adults' handling rates of fishing gear and catch, and sediment in the survey area (h/y)

Observation number	Location	Activity	Fishing gear and catch	Sediment
273	Off Balbriggan	Handling trawl gear and catch	705	-
231	Off Howth	Handling pots	563	-
235	Off Howth	Handling pots	563	-
198	Off Balbriggan	Handling trawl gear and catch	545	-
227	Off Skerries	Handling pots	484	-
261	Northwest Irish Sea	Handling trawl gear	360	-
171	Northwest Irish Sea	Handling trawl gear	304	-
245	Northwest Irish Sea	Handling trawl gear	160	-
184	North Irish Sea	Handling trawl gear	138	-
185	North Irish Sea	Handling trawl gear	138	-
211	North Irish Sea and Off Clogherhead	Handling fly-seine gear and pots	120	-
239	Northwest Irish Sea	Handling trawl gear	96	-
223	Off Skerries	Handling pots	65	-
216	Off Clogherhead	Handling pots	20	-
277	**Salterstown Bay**	**Collecting winkles**	-	**1160**
22	**Greenore**	**Oyster farming**	-	**990**
23	**Greenore**	**Oyster farming**	-	**990**
24	**Greenore**	**Oyster farming**	-	**990**
25	**Greenore**	**Oyster farming**	-	**990**
26	**Greenore**	**Oyster farming**	-	**990**
27	**Greenore**	**Oyster farming**	-	**990**
19	**Greenore**	**Oyster farming**	-	**720**
20	**Greenore**	**Oyster farming**	-	**720**
67	**Between Carlingford and Greenore**	**Collecting winkles and cockles**	-	**530**
28	**Greenore**	**Oyster farming**	-	**496**
29	**Greenore**	**Oyster farming**	-	**496**
14	**Between Carlingford and Greenore**	**Oyster farming**	-	**456**
15	**Between Carlingford and Greenore**	**Oyster farming**	-	**456**
16	**Between Carlingford and Greenore**	**Oyster farming**	-	**456**
17	**Between Carlingford and Greenore**	**Oyster farming**	-	**456**
18	**Between Carlingford and Greenore**	**Oyster farming**	-	**456**
109	Carlingford and Omeath	Collecting winkles and cockles	-	100
140	Templeton	Collecting winkles	-	10
141	Templeton	Collecting winkles	-	10
2	Omeath	Collecting seaweed	-	6
3	Omeath	Collecting seaweed	-	6
352	Clogherhead	Bait digging	-	3

Notes

Emboldened observations are the high-rate individuals

The mean fishing gear and catch handling rate based on the 33 high-rate observations is 2470 h/y

The observed 97.5th percentile rate based on 73 observations for fishing gear and catch is 4128 h/y

The mean sediment handling rate based on the 17 high-rate observations is 726 h/y

The observed 97.5th percentile rate based on 23 observations for sediment is 1067 h/y

Table 10. Children's handling rates of sediment in the survey area (h/y)

15-year-old age group

Observation number	Age (years)	Location	Activity	Sediment
107	**14**	**Carlingford and Omeath**	**Collecting winkles and cockles**	**100**
108	**16**	**Carlingford and Omeath**	**Collecting winkles and cockles**	**100**
142	15	Templeton	Collecting winkles	10
144	13	Templeton	Collecting winkles	10

Notes

Emboldened observations are the high-rate individuals

The mean sediment handling rate based on the 2 high-rate observations in the 15-year-old age group is 100 h/y

The observed 97.5th percentile rate based on 4 observations for sediment is 100 h/y

10-year-old age group

Observation number	Age (years)	Location	Activity	Sediment
112	**9**	**Giles Quay**	**Collecting crabs**	**15**
113	**9**	**Giles Quay**	**Collecting crabs**	**15**
114	**10**	**Giles Quay**	**Collecting crabs**	**15**
143	**8**	**Templeton**	**Collecting winkles**	**10**

Notes

Emboldened observations are the high-rate individuals

The mean sediment handling rate based on the 4 high-rate observations in the 10-year-old age group is 14 h/y

The observed 97.5th percentile rate based on 4 observations for sediment is 15 h/y

5-year-old age group

Observation number	Age (years)	Location	Activity	Sediment
110	**4**	**Giles Quay**	**Collecting crabs**	**7**

Notes

Emboldened observations are the high-rate individuals

The sediment handling rate based on the only observation in the 5-year-old age group is 7 h/y

The observed 97.5th percentile rate is not applicable for 1 observation

Table 11. Adults' occupancy rates in and on water in the survey area (h/y)

Observation number	Location	Activity	In water	On water
79	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
80	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
81	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
82	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
83	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
84	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
85	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
86	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
87	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
88	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
89	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
90	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
91	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
92	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
93	**Carlingford Lough**	**Windsurfing and kayaking**	**384**	-
	Carlingford Lough	Canoeing	**-**	192
303	**Annnagassan and Blackrock**	**Kite-surfing**	**327**	-
304	**Annnagassan and Blackrock**	**Kite-surfing**	**327**	-
305	**Annnagassan and Blackrock**	**Kite-surfing**	**327**	-
78	**Carlingford Lough**	**Windsurfing and kayaking**	**210**	-
	Carlingford Lough	Canoeing	**-**	210
289	**Clogherhead**	**Water sports instructor**	**168**	-
	Clogherhead	Water sports instructor	**-**	168
283	**Clogherhead**	**Swimming**	**168**	-
284	**Clogherhead**	**Swimming**	**168**	-
285	**Clogherhead**	**Swimming**	**168**	-
290	Clogherhead	Water sports instructor	86	-
	Clogherhead	Water sports instructor	-	86
278	Port and Lurganboy	Swimming	84	-
279	Port and Lurganboy	Swimming	84	-
134	Templeton	Horse training	80	-
135	Templeton	Horse training	80	-
343	Port and Lurganboy	Swimming	80	-
344	Port and Lurganboy	Swimming	80	-
439	Port Oriel	Diving	77	-
506	Port Oriel	Diving	77	-
507	Port Oriel	Diving	77	-
508	Port Oriel	Diving	77	-
509	Port Oriel	Diving	77	-
510	Port Oriel	Diving	77	-

Table 11. Adults' occupancy rates in and on water in the survey area (h/y)

Observation number	Location	Activity	In water	On water
511	Port Oriel	Diving	77	-
512	Port Oriel	Diving	77	-
513	Port Oriel	Diving	77	-
514	Port Oriel	Diving	77	-
515	Port Oriel	Diving	77	-
516	Port Oriel	Diving	77	-
517	Port Oriel	Diving	77	-
518	Port Oriel	Diving	77	-
519	Port Oriel	Diving	77	-
520	Port Oriel	Diving	77	-
521	Port Oriel	Diving	77	-
522	Port Oriel	Diving	77	-
523	Port Oriel	Diving	77	-
524	Port Oriel	Diving	77	-
48	Templeton	Swimming	60	-
49	Templeton	Swimming	60	-
227	Off Skerries	Diving	50	-
	Off Skerries	Potting and boat angling	-	596
138	Templeton	Swimming	20	-
139	Templeton	Swimming	20	-
165	Carlingford Lough	Swimming	20	-
166	Carlingford Lough	Swimming	20	-
167	Carlingford Lough	Swimming	20	-
168	Carlingford Lough	Swimming	20	-
169	Carlingford Lough	Swimming	20	-
52	Giles Quay	Swimming	10	-
53	Giles Quay	Swimming	10	-
334	Port Oriel	Swimming	10	-
59	Giles Quay	Swimming	9	-
145	Templeton	Swimming	3	-
292	Clogherhead	Water sports training	2	-
	Clogherhead	Water sports training	-	2
293	Clogherhead	Water sports training	2	-
	Clogherhead	Water sports training	-	2
178	**North Irish Sea**	**Trawling**	**-**	**5760**
179	**North Irish Sea**	**Trawling**	**-**	**5760**
180	**North Irish Sea**	**Trawling**	**-**	**5760**
181	**North Irish Sea**	**Trawling**	**-**	**5760**
182	**North Irish Sea**	**Trawling**	**-**	**5760**
183	**North Irish Sea**	**Trawling**	**-**	**5760**
261	**Northwest Irish Sea**	**Trawling**	**-**	**4800**
262	**Northwest Irish Sea**	**Trawling**	**-**	**4800**
263	**Northwest Irish Sea**	**Trawling**	**-**	**4800**
264	**Northwest Irish Sea**	**Trawling**	**-**	**4800**
265	**Northwest Irish Sea**	**Trawling**	**-**	**4800**
266	**Northwest Irish Sea**	**Trawling**	**-**	**4800**
267	**Northwest Irish Sea**	**Trawling**	**-**	**4800**
268	**Northwest Irish Sea**	**Trawling**	**-**	**4800**
245	**Northwest Irish Sea**	**Trawling**	**-**	**3000**
246	**Northwest Irish Sea**	**Trawling**	**-**	**3000**
247	**Northwest Irish Sea**	**Trawling**	**-**	**3000**
248	**Northwest Irish Sea**	**Trawling**	**-**	**3000**
249	**Northwest Irish Sea**	**Trawling**	**-**	**3000**
250	**Northwest Irish Sea**	**Trawling**	**-**	**3000**

Table 11. Adults' occupancy rates in and on water in the survey area (h/y)

Observation number	Location	Activity	In water	On water
207	**Off Balbriggan**	**Trawling**	**-**	**2880**
208	**Off Balbriggan**	**Trawling**	**-**	**2880**
209	**Off Balbriggan**	**Trawling**	**-**	**2880**
210	**Off Balbriggan**	**Trawling**	**-**	**2880**
229	**Off Skerries**	**Dredging**	**-**	**2400**
230	**Off Skerries**	**Dredging**	**-**	**2400**
239	**Northwest Irish Sea**	**Trawling**	**-**	**2400**
240	**Northwest Irish Sea**	**Trawling**	**-**	**2400**
241	**Northwest Irish Sea**	**Trawling**	**-**	**2400**
242	**Northwest Irish Sea**	**Trawling**	**-**	**2400**
243	**Northwest Irish Sea**	**Trawling**	**-**	**2400**
244	**Northwest Irish Sea**	**Trawling**	**-**	**2400**
211	**North Irish Sea and off Clogherhead**	**Fly-seining and potting**	**-**	**2186**
212	**North Irish Sea**	**Fly-seining**	**-**	**2160**
213	**North Irish Sea**	**Fly-seining**	**-**	**2160**
214	**North Irish Sea**	**Fly-seining**	**-**	**2160**
215	**North Irish Sea**	**Fly-seining**	**-**	**2160**
171	**Northwest Irish Sea**	**Trawling**	**-**	**1920**
172	**Northwest Irish Sea**	**Trawling**	**-**	**1920**
173	**Northwest Irish Sea**	**Trawling**	**-**	**1920**
174	**Northwest Irish Sea**	**Trawling**	**-**	**1920**
175	**Northwest Irish Sea**	**Trawling**	**-**	**1920**
176	**Northwest Irish Sea**	**Trawling**	**-**	**1920**
177	**Northwest Irish Sea**	**Trawling**	**-**	**1920**
186	**North Irish Sea**	**Trawling**	**-**	**1920**
187	**North Irish Sea**	**Trawling**	**-**	**1920**
188	**North Irish Sea**	**Trawling**	**-**	**1920**
189	**North Irish Sea**	**Trawling**	**-**	**1920**
190	**North Irish Sea**	**Trawling**	**-**	**1920**
191	**North Irish Sea**	**Trawling**	**-**	**1920**
192	**North Irish Sea**	**Trawling**	**-**	**1920**
193	**North Irish Sea**	**Trawling**	**-**	**1920**
273	Off Balbriggan	Trawling	-	1540
274	Off Balbriggan	Trawling	-	1540
275	Off Balbriggan	Trawling	-	1540
276	Off Balbriggan	Trawling	-	1540
184	North Irish Sea	Trawling	-	1440
185	North Irish Sea	Trawling	-	1440
198	Off Balbriggan	Trawling	-	1260
199	Off Balbriggan	Trawling	-	1260
200	Off Balbriggan	Trawling	-	1260
68	Carlingford Lough	Dredging	-	1120
69	Carlingford Lough	Dredging	-	1120
70	Carlingford Lough	Dredging	-	1120
71	Carlingford Lough	Dredging	-	1120
72	Carlingford Lough	Dredging	-	1120
73	Carlingford Lough	Dredging	-	1120
74	Carlingford Lough	Dredging	-	1120
75	Carlingford Lough	Dredging	-	1120
76	Carlingford Lough	Dredging	-	1120
163	Carlingford Lough	Sailing	-	1100
164	Carlingford Lough	Sailing	-	1100
115	Off Giles Quay	Potting	-	1092

Table 11. Adults' occupancy rates in and on water in the survey area (h/y)

Observation number	Location	Activity	In water	On water
116	Off Giles Quay	Potting	-	1092
201	Off Balbriggan	Trawling	-	936
202	Off Balbriggan	Trawling	-	936
269	Off Howth	Potting	-	900
271	Off Howth	Potting	-	900
194	Off Loughshinny	Potting	-	732
231	Off Howth	Potting	-	472
235	Off Howth	Potting	-	472
94	Carlingford Lough	Boat angling	-	364
95	Carlingford Lough	Boat angling	-	364
96	Carlingford Lough	Boat angling	-	364
97	Carlingford Lough	Boat angling	-	364
98	Carlingford Lough	Boat angling	-	364
1	Carlingford Lough	Passenger ferry crew	-	336
2	Carlingford Lough	Passenger ferry crew	-	336
3	Carlingford Lough	Passenger ferry crew	-	336
150	Carlingford Lough	Sailing	-	280
151	Carlingford Lough	Sailing	-	280
152	Carlingford Lough	Sailing	-	280
153	Carlingford Lough	Sailing	-	280
154	Carlingford Lough	Sailing	-	280
155	Carlingford Lough	Sailing	-	280
156	Carlingford Lough	Sailing	-	280
157	Carlingford Lough	Sailing	-	280
158	Carlingford Lough	Sailing	-	280
159	Carlingford Lough	Sailing	-	280
34	Carlingford Lough	Sailing	-	208
35	Carlingford Lough	Sailing	-	208
36	Carlingford Lough	Sailing	-	208
37	Carlingford Lough	Sailing	-	208
38	Carlingford Lough	Sailing	-	208
39	Carlingford Lough	Sailing	-	208
40	Carlingford Lough	Sailing	-	208
41	Carlingford Lough	Sailing	-	208
42	Carlingford Lough	Sailing	-	208
43	Carlingford Lough	Sailing	-	208
129	Dundalk Bay	Boat angling	-	200
130	Dundalk Bay	Boat angling	-	200
131	Dundalk Bay	Boat angling	-	200
132	Dundalk Bay	Boat angling	-	200
133	Dundalk Bay	Boat angling	-	200
160	Carlingford Lough	Sailing	-	200
161	Carlingford Lough	Sailing	-	200
162	Carlingford Lough	Sailing	-	200
119	Dundalk Bay	Boat angling	-	90
120	Dundalk Bay	Boat angling	-	90
121	Dundalk Bay	Boat angling	-	90
122	Dundalk Bay	Boat angling	-	90
123	Dundalk Bay	Boat angling	-	90
124	Dundalk Bay	Boat angling	-	90
125	Dundalk Bay	Boat angling	-	90
126	Dundalk Bay	Boat angling	-	90
127	Dundalk Bay	Boat angling	-	90
128	Dundalk Bay	Boat angling	-	90

Table 11. Adults' occupancy rates in and on water in the survey area (h/y)

Observation number	Location	Activity	In water	On water
386	North of Annagassan Quay	Boat angling	-	80
387	North of Annagassan Quay	Boat angling	-	80
223	Off Skerries	Potting	-	78
324	Off Clogherhead	Charter boat skipper	-	78
406	Carlingford Lough and Port Oriel	Boat angling	-	49
7	Greenore	Rowing	-	48
475	Clogherhead	RNLI duties	-	41
476	Clogherhead	RNLI duties	-	41
477	Clogherhead	RNLI duties	-	41
478	Clogherhead	RNLI duties	-	41
479	Clogherhead	RNLI duties	-	41
480	Clogherhead	RNLI duties	-	41
481	Clogherhead	RNLI duties	-	41
482	Clogherhead	RNLI duties	-	41
483	Clogherhead	RNLI duties	-	41
484	Clogherhead	RNLI duties	-	41
485	Clogherhead	RNLI duties	-	41
486	Clogherhead	RNLI duties	-	41
487	Clogherhead	RNLI duties	-	41
488	Clogherhead	RNLI duties	-	41
489	Clogherhead	RNLI duties	-	41
490	Clogherhead	RNLI duties	-	41
491	Clogherhead	RNLI duties	-	41
492	Clogherhead	RNLI duties	-	41
493	Clogherhead	RNLI duties	-	41
494	Clogherhead	RNLI duties	-	41
495	Clogherhead	RNLI duties	-	41
496	Clogherhead	RNLI duties	-	41
497	Clogherhead	RNLI duties	-	41
498	Clogherhead	RNLI duties	-	41
148	Carlingford Lough	Sailing	-	35
149	Carlingford Lough	Sailing	-	35
216	Off Clogherhead	Potting	-	26
326	Off Clogherhead	Charter boat skipper	-	24
327	Off Clogherhead	Charter boat skipper	-	24

Notes

Emboldened observations are the high-rate individuals

The mean occupancy rate for activities in water based on the 23 high-rate observations is 331 h/y

The observed 97.5th percentile rate based on 67 observations for in water is 384 h/y

The mean occupancy rate for activities on water based on the 52 high-rate observations is 3102 h/y

The observed 97.5th percentile rate based on 183 observations for on water is 5760 h/y

Table 12. Children's occupancy rates in and on water in the survey area (h/y)

15-year-old age group

Observation number	Age (years)	Location	Activity	In water	On water
50	**15**	**Giles Quay**	**Swimming**	**10**	**-**
450	**14**	**Clogherhead**	**Surfing**	**8**	**-**
451	**15**	**Clogherhead**	**Surfing**	**8**	**-**
294	13	Clogherhead	Water sports training	2	-
		Clogherhead	Water sports training	-	2
295	14	Clogherhead	Water sports training	2	-
		Clogherhead	Water sports training	-	2
296	15	Clogherhead	Water sports training	2	-
		Clogherhead	Water sports training	-	2
297	16	Clogherhead	Water sports training	2	-
		Clogherhead	Water sports training	-	2
298	14	Clogherhead	Water sports training	2	-
		Clogherhead	Water sports training	-	2
299	15	Clogherhead	Water sports training	2	-
		Clogherhead	Water sports training	-	2
301	14	Clogherhead	Water sports training	2	-
		Clogherhead	Water sports training	-	2
302	12	Clogherhead	Water sports training	2	-
		Clogherhead	Water sports training	-	2
315	**15**	**Clogherhead**	**Water sports training**	**-**	**10**
448	**14**	**Clogherhead**	**Canoeing**	**-**	**9**

Notes

Emboldened observations are the high-rate individuals

The mean occupancy rate for activities in water based on the 3 high-rate observations in the 15-year-old age group is 9 h/y

The observed 97.5th percentile rate based on 11 observations for in water is 10 h/y

The mean occupancy rate for activities on water based on the 2 high-rate observations in the 15-year-old age group is 10 h/y

The observed 97.5th percentile rate based on 10 observations for on water is 10 h/y

10-year-old age group

Observation number	Age (years)	Location	Activity	In water	On water
402	**10**	**Greenore**	**Swimming/playing on lilo**	**40**	**-**
403	**8**	**Greenore**	**Swimming/playing on lilo**	**40**	**-**
404	**7**	**Greenore**	**Swimming/playing on lilo**	**40**	**-**
136	**7**	**Templeton**	**Swimming**	**20**	**-**
51	11	Giles Quay	Swimming	10	**-**
61	7	Giles Quay	Swimming	9	**-**
62	10	Giles Quay	Swimming	9	**-**
408	**9**	**Clogherhead**	**Paddling**	**-**	**56**
460	11	Port and Lurganboy	Paddling	-	1
461	9	Port and Lurganboy	Paddling	-	1

Notes

Emboldened observations are the high-rate individuals

The mean occupancy rate for activities in water based on the 4 high-rate observations in the 10-year-old age group is 35 h/y

The observed 97.5th percentile rate based on 7 observations for in water is 40 h/y

The occupancy rate for activities on water based on 1 high-rate observation in the 10-year-old age group is 56 h/y

The observed 97.5th percentile rate based on 3 observations for on water is 53h/y

Table 12. Children's occupancy rates in and on water in the survey area (h/y)

5-year-old age group

Observation number	Age (years)	Location	Activity	In water	On water
137	**5**	**Templeton**	**Swimming**	**20**	**-**
60	**6**	**Giles Quay**	**Swimming**	**9**	**-**
146	4	Templeton	Swimming	3	-
147	6	Templeton	Swimming	3	-
409	**6**	**Clogherhead**	**Paddling**	**-**	**56**

Notes

Emboldened observations are the high-rate individuals

The mean occupancy rate for activities in water based on the 2 high-rate observations in the 5-year-old age group is 15 h/y

The observed 97.5th percentile rate based on 4 observations for in water is 19 h/y

The occupancy rate for activities on water based on the only observation in the 5-year-old age group is 56 h/y

The observed 97.5th percentile rate is not applicable for 1 observation

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
1	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	336
2	M	U	-	-	-	-	-	-	-	-	-	6	-	6	-	336
3	F	U	-	-	-	-	-	-	-	-	-	6	-	6	-	336
4	M	42	-	-	-	-	-	-	-	-	-	240	-	-	-	-
5	F	U	5.4	-	-	-	-	-	-	-	-	-	-	-	-	-
6	M	18	-	-	-	-	-	-	-	-	-	120	-	-	-	-
7	M	54	7.3	-	-	-	-	-	-	-	-	**504**	-	-	-	48
8	M	U	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-
9	F	U	7.3	-	-	-	-	-	-	-	-	-	-	-	-	-
10	M	63	4.4	-	-	-	-	-	-	-	-	144	-	-	-	-
11	M	68	-	-	-	-	-	-	-	-	-	30	-	-	-	-
13	M	U	-	-	**20.7**	-	-	-	-	-	-	-	-	-	-	-
14	M	U	-	-	-	-	-	-	**228**	-	228	-	-	**456**	-	-
15	M	U	-	-	-	-	-	-	**228**	-	228	-	-	**456**	-	-
16	M	U	-	-	-	-	-	-	**228**	-	228	-	-	**456**	-	-
17	M	U	-	-	-	-	-	-	**228**	-	228	-	-	**456**	-	-
18	M	U	-	-	-	-	-	-	**228**	-	228	-	-	**456**	-	-
19	M	U	-	-	-	-	-	-	**360**	-	**360**	-	-	**720**	-	-
20	M	U	-	-	-	-	-	-	**360**	-	**360**	-	-	**720**	-	-
21	M	U	-	-	**38.4**	-	-	-	-	-	-	-	-	-	-	-
22	M	U	-	-	-	-	-	-	**495**	-	**495**	-	-	**990**	-	-
23	M	U	-	-	-	-	-	-	**495**	-	**495**	-	-	**990**	-	-
24	M	U	-	-	-	-	-	-	**495**	-	**495**	-	-	**990**	-	-
25	M	U	-	-	-	-	-	-	**495**	-	**495**	-	-	**990**	-	-
26	M	U	-	-	-	-	-	-	**495**	-	**495**	-	-	**990**	-	-
27	M	U	-	-	-	-	-	-	**495**	-	**495**	-	-	**990**	-	-
28	M	U	-	-	-	-	-	-	**248**	-	**248**	-	-	**496**	-	-
29	M	U	-	-	-	-	-	-	**248**	-	**248**	-	-	**496**	-	-
30	M	52	-	-	-	-	-	-	-	-	-	**1100**	-	-	-	-
31	F	U	11.7	-	-	-	-	-	-	-	-	-	-	-	-	-
32	M	47	**41.2**	-	-	-	-	-	-	-	-	**780**	-	-	-	-
33	F	73	**41.2**	-	-	-	-	-	-	-	-	-	-	-	-	-
34	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
35	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
36	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
37	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
38	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
39	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
40	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
41	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
42	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
43	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	208
44	M	U	-	-	-	-	-	-	-	-	-	30	-	-	-	-
45	F	U	-	-	-	-	-	-	-	-	-	30	-	-	-	-
48	F	20	-	-	-	-	-	-	-	-	47	-	-	-	60	-
49	F	21	-	-	-	-	-	-	-	-	47	-	-	-	60	-
52	F	U	-	-	-	-	-	-	-	-	80	-	-	-	10	-
53	M	U	-	-	-	-	-	-	-	-	80	-	-	-	10	-
54	F	32	-	-	-	-	-	-	-	-	10	-	-	-	-	-
57	M	49	-	-	-	-	-	-	-	-	-	130	-	-	-	-
58	F	28	4.4	-	0.4	-	-	-	-	-	-	182	-	-	-	-
59	F	37	-	-	-	-	-	-	-	-	126	-	-	-	9	-
63	M	36	-	-	-	-	-	-	-	-	150	-	-	-	-	-
64	F	35	-	-	-	-	-	-	-	-	150	-	-	-	-	-
67	M	U	-	-	**21.4**	**0.5**	**520**	-	-	-	10	-	-	**530**	-	-
68	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
69	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
70	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
71	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
72	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
73	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
74	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
75	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
76	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	1120
77	M	U	-	-	**19.2**	-	-	-	-	-	-	-	-	-	-	-
78	M	U	-	-	-	-	-	-	-	-	-	-	-	-	**210**	210
79	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
80	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
81	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
82	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
83	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
84	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
85	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
86	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
87	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
88	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
89	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
90	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
91	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
92	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
93	U	U	-	-	-	-	-	-	-	-	-	-	-	-	**384**	192
94	M	50	-	-	-	-	-	-	-	-	-	-	-	-	-	364
95	M	19	**14.1**	-	-	-	-	-	-	-	-	-	-	-	-	364
96	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	364
97	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	364
98	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	364
99	M	24	1.8	-	-	-	-	-	-	-	-	96	-	-	-	-
101	M	30	**17.6**	-	-	-	-	-	-	-	-	144	-	-	-	-
102	M	24	-	-	-	-	-	-	-	-	-	112	-	-	-	-
103	M	25	-	-	-	-	-	-	-	-	-	112	-	-	-	-
105	M	U	-	-	-	-	-	-	-	-	-	360	-	-	-	-
109	M	25	-	-	-	-	100	-	-	-	-	-	-	100	-	-
111	F	25	-	-	-	-	-	-	-	-	42	-	-	-	-	-
115	M	U	0.3	1.1	-	-	-	-	-	-	-	-	1092	-	-	1092
116	F	U	0.3	1.1	-	-	-	-	-	-	-	-	1092	-	-	1092
117	M	58	3.3	-	-	-	-	-	-	-	-	**468**	-	-	-	-
119	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
120	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
121	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
122	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
123	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
124	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
125	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
126	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
127	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
128	M	U	2.5	-	-	-	-	-	-	-	-	-	-	-	-	90
129	M	69	6.4	-	-	-	-	-	-	-	-	-	-	-	-	200
130	M	35	6.4	-	-	-	-	-	-	-	-	-	-	-	-	200

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
131	M	37	6.4	-	-	-	-	-	-	-	-	-	-	-	-	200
132	M	U	6.4	-	-	-	-	-	-	-	-	-	-	-	-	200
133	M	U	6.4	-	-	-	-	-	-	-	-	-	-	-	-	200
134	M	U	-	-	-	-	-	-	-	-	64	-	-	-	80	-
135	F	U	-	-	-	-	-	-	-	-	64	-	-	-	80	-
138	M	44	-	-	-	-	-	-	-	-	65	-	-	-	20	-
139	F	43	-	-	-	-	-	-	-	-	65	-	-	-	20	-
140	M	U	0.9	-	-	-	10	-	-	-	35	20	-	10	-	-
141	F	U	0.9	-	-	-	10	-	-	-	35	-	-	10	-	-
145	M	41	-	-	-	-	-	-	-	-	40	-	-	-	3	-
148	M	40	-	-	-	-	-	-	-	-	-	-	-	-	-	35
149	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	35
150	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
151	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
152	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
153	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
154	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
155	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
156	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
157	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
158	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
159	U	U	-	-	-	-	-	-	-	-	-	-	-	-	-	280
160	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	200
161	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	200
162	M	U	-	-	-	-	-	-	-	-	-	-	-	-	-	200
163	M	U	-	-	-	-	-	-	-	-	90	-	-	-	-	1100
164	M	U	-	-	-	-	-	-	-	-	90	-	-	-	-	1100
165	U	U	-	-	-	-	-	-	-	-	-	-	-	-	20	-
166	U	U	-	-	-	-	-	-	-	-	-	-	-	-	20	-
167	U	U	-	-	-	-	-	-	-	-	-	-	-	-	20	-
168	U	U	-	-	-	-	-	-	-	-	-	-	-	-	20	-
169	U	U	-	-	-	-	-	-	-	-	-	-	-	-	20	-
170	F	U	-	-	0.4	-	-	-	-	-	-	182	-	-	-	-
171	M	U	5.4	3.6	-	-	-	-	-	-	-	-	304	-	-	**1920**
172	M	U	5.4	3.6	-	-	-	-	-	-	-	-	**1504**	-	-	**1920**
173	M	U	5.4	3.6	-	-	-	-	-	-	-	-	**1504**	-	-	**1920**

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
174	M	U	5.4	3.6	-	-	-	-	-	-	-	-	**1504**	-	-	**1920**
175	M	U	5.4	3.6	-	-	-	-	-	-	-	-	**1504**	-	-	**1920**
176	M	U	5.4	3.6	-	-	-	-	-	-	-	-	**1504**	-	-	**1920**
177	M	U	5.4	3.6	-	-	-	-	-	-	-	-	**1504**	-	-	**1920**
178	M	U	**26.5**	**5.9**	-	-	-	-	-	-	-	-	768	-	-	**5760**
179	M	U	**26.5**	**5.9**	-	-	-	-	-	-	-	-	**4128**	-	-	**5760**
180	M	U	**26.5**	**5.9**	-	-	-	-	-	-	-	-	**4128**	-	-	**5760**
181	M	U	**26.5**	**5.9**	-	-	-	-	-	-	-	-	**4128**	-	-	**5760**
182	M	U	**26.5**	**5.9**	-	-	-	-	-	-	-	-	**4128**	-	-	**5760**
183	M	U	**26.5**	**5.9**	-	-	-	-	-	-	-	-	**4128**	-	-	**5760**
184	M	U	5.8	0.9	-	-	-	-	-	-	-	-	138	-	-	1440
185	M	U	5.8	0.9	-	-	-	-	-	-	-	-	138	-	-	1440
186	M	U	5.8	0.9	-	-	-	-	-	-	-	-	1144	-	-	**1920**
187	M	U	5.8	0.9	-	-	-	-	-	-	-	-	1144	-	-	**1920**
188	M	U	5.8	0.9	-	-	-	-	-	-	-	-	1144	-	-	**1920**
189	M	U	5.8	0.9	-	-	-	-	-	-	-	-	1144	-	-	**1920**
190	M	U	5.8	0.9	-	-	-	-	-	-	-	-	1144	-	-	**1920**
191	M	U	5.8	0.9	-	-	-	-	-	-	-	-	1144	-	-	**1920**
192	M	U	5.8	0.9	-	-	-	-	-	-	-	-	1144	-	-	**1920**
193	M	U	5.8	0.9	-	-	-	-	-	-	-	-	1144	-	-	**1920**
194	M	U	-	2.7	-	-	-	-	-	-	-	-	910	-	-	732
195	F	U	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-
196	M	U	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-
197	M	U	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-
198	M	U	1.4	-	-	-	-	-	-	-	-	-	545	-	-	1260
199	M	U	1.4	-	-	-	-	-	-	-	-	-	1040	-	-	1260
200	M	U	1.4	-	-	-	-	-	-	-	-	-	1040	-	-	1260
201	M	U	**17.0**	1.6	-	-	-	-	-	-	-	-	816	-	-	936
202	M	U	**17.0**	1.6	-	-	-	-	-	-	-	-	816	-	-	936
203	F	U	**17.0**	1.6	-	-	-	-	-	-	-	-	-	-	-	-
204	F	U	**17.0**	1.6	-	-	-	-	-	-	-	-	-	-	-	-
207	M	U	**41.7**	**8.2**	-	-	-	-	-	-	-	-	1272	-	-	**2880**
208	M	U	**41.7**	**8.2**	-	-	-	-	-	-	-	-	**2352**	-	-	**2880**
209	M	U	**41.7**	**8.2**	-	-	-	-	-	-	-	-	**2352**	-	-	**2880**
210	M	U	**41.7**	**8.2**	-	-	-	-	-	-	-	-	**2352**	-	-	**2880**
211	M	U	**15.0**	1.5	-	-	-	-	-	-	-	-	120	-	-	**2186**

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
212	M	U	**15.0**	-	-	-	-	-	-	-	-	-	1315	-	-	**2160**
213	M	U	**15.0**	-	-	-	-	-	-	-	-	-	1315	-	-	**2160**
214	M	U	**15.0**	-	-	-	-	-	-	-	-	-	1315	-	-	**2160**
215	M	U	**15.0**	-	-	-	-	-	-	-	-	-	1315	-	-	**2160**
216	M	U	-	1.5	-	-	-	-	-	-	-	-	20	-	-	26
217	M	U	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-
218	F	U	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-
219	M	U	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-
220	F	U	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-
221	M	U	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-
222	F	U	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-
223	M	U	-	4.9	-	-	-	-	-	-	-	-	65	-	-	78
224	F	U	-	4.9	-	-	-	-	-	-	-	-	-	-	-	-
225	M	U	-	4.9	-	-	-	-	-	-	-	-	-	-	-	-
226	F	U	-	4.9	-	-	-	-	-	-	-	-	-	-	-	-
227	M	U	11.7	**8.8**	-	-	-	-	-	-	-	-	484	-	50	596
228	F	U	11.7	**8.8**	-	-	-	-	-	-	-	-	-	-	-	-
229	M	U	-	-	-	-	-	-	-	-	-	-	**1800**	-	-	**2400**
230	M	U	-	-	-	-	-	-	-	-	-	-	**1800**	-	-	**2400**
231	M	U	-	**9.5**	-	-	-	-	-	-	-	-	563	-	-	472
232	F	U	-	**9.5**	-	-	-	-	-	-	-	-	-	-	-	-
233	M	U	-	**9.5**	-	-	-	-	-	-	-	-	-	-	-	-
234	M	U	-	**9.5**	-	-	-	-	-	-	-	-	-	-	-	-
235	M	U	-	**9.5**	-	-	-	-	-	-	-	-	563	-	-	472
236	F	U	-	**9.5**	-	-	-	-	-	-	-	-	-	-	-	-
239	M	U	**34.0**	4.5	-	-	-	-	-	-	-	-	96	-	-	**2400**
240	M	U	**34.0**	4.5	-	-	-	-	-	-	-	-	**1496**	-	-	**2400**
241	M	U	**34.0**	4.5	-	-	-	-	-	-	-	-	**1496**	-	-	**2400**
242	M	U	**34.0**	4.5	-	-	-	-	-	-	-	-	**1496**	-	-	**2400**
243	M	U	**34.0**	4.5	-	-	-	-	-	-	-	-	**1496**	-	-	**2400**
244	M	U	**34.0**	4.5	-	-	-	-	-	-	-	-	**1496**	-	-	**2400**
245	M	U	**25.5**	1.1	-	-	-	-	-	-	-	-	160	-	-	**3000**
246	M	U	**34.0**	-	-	-	-	-	-	-	-	-	**2035**	-	-	**3000**
247	M	U	**34.0**	-	-	-	-	-	-	-	-	-	**2035**	-	-	**3000**
248	M	U	**34.0**	-	-	-	-	-	-	-	-	-	**2035**	-	-	**3000**
249	M	U	**34.0**	-	-	-	-	-	-	-	-	-	**2035**	-	-	**3000**

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
250	M	U	**34.0**	-	-	-	-	-	-	-	-	-	**2035**	-	-	**3000**
251	F	U	5.1	1.1	-	-	-	-	-	-	-	-	-	-	-	-
254	M	U	5.1	1.1	-	-	-	-	-	-	-	-	-	-	-	-
255	F	U	5.1	1.1	-	-	-	-	-	-	-	-	-	-	-	-
261	M	U	**30.8**	-	-	-	-	-	-	-	-	-	360	-	-	**4800**
262	M	U	**30.8**	-	-	-	-	-	-	-	-	-	**3360**	-	-	**4800**
263	M	U	**30.8**	-	-	-	-	-	-	-	-	-	**3360**	-	-	**4800**
264	M	U	**30.8**	-	-	-	-	-	-	-	-	-	**3360**	-	-	**4800**
265	M	U	**30.8**	-	-	-	-	-	-	-	-	-	**3360**	-	-	**4800**
266	M	U	**30.8**	-	-	-	-	-	-	-	-	-	**3360**	-	-	**4800**
267	M	U	**30.8**	-	-	-	-	-	-	-	-	-	**3360**	-	-	**4800**
268	M	U	**30.8**	-	-	-	-	-	-	-	-	-	**3360**	-	-	**4800**
269	M	U	8.5	**17.6**	-	-	-	-	-	-	-	-	1050	-	-	900
270	F	U	8.5	**17.6**	-	-	-	-	-	-	-	-	-	-	-	-
271	M	U	8.5	**17.6**	-	-	-	-	-	-	-	-	1050	-	-	900
272	M	U	8.5	**17.6**	-	-	-	-	-	-	-	-	-	-	-	-
273	M	U	-	-	-	-	-	-	-	-	-	-	705	-	-	1540
274	M	U	-	-	-	-	-	-	-	-	-	-	1310	-	-	1540
275	M	U	-	-	-	-	-	-	-	-	-	-	1310	-	-	1540
276	M	U	-	-	-	-	-	-	-	-	-	-	1310	-	-	1540
277	M	30	-	-	-	-	-	-	-	-	-	**1160**	-	**1160**	-	-
278	M	17	-	-	-	-	-	-	-	-	-	-	-	-	84	-
279	F	20	-	-	-	-	-	-	-	-	-	-	-	-	84	-
280	F	55	-	-	-	-	-	-	-	-	-	2	-	-	-	-
281	M	65	-	-	-	-	-	-	-	-	-	2	-	-	-	-
283	M	20	-	3.3	-	-	-	-	-	-	-	-	-	-	**168**	-
284	M	20	-	-	-	-	-	-	-	-	-	-	-	-	**168**	-
285	F	18	-	-	-	-	-	-	-	-	-	-	-	-	**168**	-
286	F	49	**24.0**	0.5	-	-	-	-	-	-	35	-	-	-	-	-
287	M	49	-	-	-	-	-	-	-	-	35	-	-	-	-	-
289	M	24	-	-	-	-	-	-	-	-	**336**	-	-	-	**168**	168
290	M	30	-	-	-	-	-	-	-	-	190	-	-	-	86	86
291	U	U	-	-	-	-	-	-	-	-	14	-	-	-	-	-
292	U	U	-	-	-	-	-	-	-	-	10	-	-	-	2	2
293	U	U	-	-	-	-	-	-	-	-	10	-	-	-	2	2
300	M	49	-	-	-	-	-	-	-	-	9	-	-	-	-	-

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
303	M	39	-	-	-	-	-	-	-	-	174	-	-	-	**327**	-
304	M	27	-	-	-	-	-	-	-	-	174	-	-	-	**327**	-
305	F	27	-	-	-	-	-	-	-	-	174	-	-	-	**327**	-
306	M	U	-	-	-	-	-	-	-	-	24	-	-	-	-	-
308	M	U	-	-	-	-	-	-	-	-	**336**	-	-	-	-	-
309	F	U	-	-	-	-	-	-	-	-	**337**	-	-	-	-	-
310	F	U	-	-	-	-	-	-	-	-	**337**	-	-	-	-	-
311	M	U	-	-	-	-	-	-	-	-	**337**	-	-	-	-	-
312	M	41	-	-	-	-	-	-	-	-	20	1	-	-	-	-
313	F	41	-	-	-	-	-	-	-	-	20	1	-	-	-	-
316	M	65	6.6	1.5	1.1	-	-	-	-	-	**352**	-	-	-	-	-
317	M	71	-	-	-	-	-	-	-	-	8	18	-	-	-	-
318	F	64	-	-	-	-	-	-	-	-	8	18	-	-	-	-
321	F	U	-	-	-	-	-	-	-	-	4	32	-	-	-	-
322	M	U	-	-	-	-	-	-	-	-	**420**	-	-	-	-	-
323	F	41	-	-	-	-	-	-	-	-	**720**	-	-	-	-	-
324	M	U	7.1	-	-	-	-	-	-	-	14	-	-	-	-	78
325	F	U	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-
326	M	U	2.3	-	-	-	-	-	-	-	-	-	-	-	-	24
327	M	U	2.3	-	-	-	-	-	-	-	-	-	-	-	-	24
328	U	U	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-
329	U	U	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-
330	U	U	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-
331	U	U	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-
332	U	U	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-
334	M	64	**18.0**	-	-	-	-	-	-	**100**	24	-	-	-	10	-
335	F	36	-	-	-	-	-	-	-	-	**336**	-	-	-	-	-
337	F	55	-	-	-	-	-	-	-	-	72	-	-	-	-	-
338	M	U	-	-	-	-	-	-	-	-	95	-	-	-	-	-
339	M	25	-	-	-	-	-	-	-	-	1	-	-	-	-	-
340	F	25	-	-	-	-	-	-	-	-	1	-	-	-	-	-
341	F	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
342	F	33	-	-	-	-	-	-	-	-	3	-	-	-	-	-
343	F	70	-	-	-	-	-	-	-	-	-	-	-	-	80	-
344	F	85	-	-	-	-	-	-	-	-	-	-	-	-	80	-
345	M	29	-	-	-	-	-	-	-	-	18	-	-	-	-	-

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
346	F	29	-	-	-	-	-	-	-	-	18	-	-	-	-	-
349	M	30	-	-	-	-	-	-	-	-	96	-	-	-	-	-
352	M	U	1.4	-	-	-	-	-	-	-	15	-	-	3	-	-
353	U	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
354	U	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
355	U	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
356	U	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
357	U	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
358	U	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
359	U	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
360	U	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
373	U	17	-	-	-	-	-	-	-	-	3	-	-	-	-	-
374	U	17	-	-	-	-	-	-	-	-	3	-	-	-	-	-
375	M	33	-	-	-	-	-	-	-	-	9	-	-	-	-	-
376	F	38	-	-	-	-	-	-	-	-	9	-	-	-	-	-
378	M	U	-	-	-	-	-	-	-	-	6	15	-	-	-	-
379	F	U	-	-	-	-	-	-	-	-	6	15	-	-	-	-
385	M	U	-	-	-	-	-	-	-	-	96	96	-	-	-	-
386	M	40	**27.4**	-	-	-	10	**50**	-	-	22	-	-	-	-	80
387	M	56	**27.4**	-	-	-	10	-	-	-	-	-	-	-	-	80
388	U	U	**27.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
389	U	U	**27.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
390	U	U	**27.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
391	U	U	**27.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
392	U	U	**27.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
393	U	U	**27.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
394	U	U	**27.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
395	M	45	5.9	-	-	-	-	-	-	12	-	-	-	-	-	-
398	F	U	5.9	-	-	-	-	-	-	-	-	-	-	-	-	-
399	M	70	**14.3**	-	-	-	-	-	-	-	60	-	-	-	-	-
400	F	U	**14.3**	-	-	-	-	-	-	-	-	-	-	-	-	-
401	M	36	**14.4**	-	-	-	-	-	-	1	-	14	-	-	-	-
405	F	U	**14.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
406	M	U	8.0	-	-	-	-	-	-	-	-	-	-	-	-	49
407	F	36	**21.6**	-	-	-	-	-	-	-	136	-	-	-	-	-
410	M	43	**21.6**	-	-	-	-	-	-	24	136	-	-	-	-	-

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
411	M	U	-	-	-	-	-	-	-	-	90	6	-	-	-	-
413	F	U	-	-	-	-	-	-	-	-	1	20	-	-	-	-
416	M	30	-	-	-	-	-	-	-	-	3	-	-	-	-	-
417	M	65	-	-	-	-	-	-	-	-	3	-	-	-	-	-
418	F	51	-	-	-	-	-	-	-	-	13	36	-	-	-	-
419	F	27	-	-	-	-	-	-	-	-	13	36	-	-	-	-
421	F	U	-	-	-	-	-	-	-	-	100	-	-	-	-	-
422	F	U	-	-	-	-	-	-	-	-	100	-	-	-	-	-
423	M	52	-	-	-	-	-	-	-	-	108	-	-	-	-	-
424	F	38	-	-	-	-	-	-	-	-	144	-	-	-	-	-
425	M	39	-	-	-	-	-	-	-	-	144	-	-	-	-	-
426	F	32	-	-	-	-	-	-	-	-	8	8	-	-	-	-
433	F	25	-	-	-	-	-	-	-	-	1	-	-	-	-	-
434	M	44	10.8	-	-	-	-	-	-	-	-	96	-	-	-	-
435	F	21	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-
438	M	54	-	-	-	-	-	-	-	-	-	**444**	-	-	-	-
439	M	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
440	M	44	**14.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
441	M	U	**14.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
442	M	U	**14.4**	-	-	-	-	-	-	-	-	-	-	-	-	-
443	M	20	7.2	-	-	-	-	-	-	-	-	-	-	-	-	-
444	F	U	-	-	-	-	-	-	-	-	10	-	-	-	-	-
445	M	U	-	-	-	-	-	-	-	-	10	-	-	-	-	-
446	M	U	-	-	-	-	-	-	-	-	2	-	-	-	-	-
447	F	U	-	-	-	-	-	-	-	-	2	-	-	-	-	-
449	M	U	-	-	-	-	-	-	-	-	41	-	-	-	-	-
452	M	30	2.7	-	-	-	-	-	-	-	18	-	-	-	-	-
453	M	U	-	-	0.9	-	-	-	-	-	2	-	-	-	-	-
454	F	U	-	-	0.9	-	-	-	-	-	2	-	-	-	-	-
456	F	U	-	-	-	-	-	-	-	-	2	-	-	-	-	-
457	F	U	-	-	-	-	-	-	-	-	2	-	-	-	-	-
458	M	U	-	-	-	-	-	-	-	-	4	-	-	-	-	-
459	F	U	-	-	-	-	-	-	-	-	4	-	-	-	-	-
462	F	44	-	-	-	-	-	-	-	-	1	-	-	-	-	-
463	F	46	-	-	-	-	-	-	-	-	1	-	-	-	-	-
464	F	36	-	-	-	-	-	-	-	-	36	-	-	-	-	-

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
465	F	34	-	-	-	-	-	-	-	-	13	-	-	-	-	-
466	M	27	-	-	-	-	-	-	-	-	30	-	-	-	-	-
467	M	U	-	-	-	-	-	-	-	-	72	**504**	-	-	-	-
468	M	U	-	-	-	-	-	-	-	-	-	2	-	-	-	-
469	M	U	-	-	-	-	-	-	-	-	-	2	-	-	-	-
470	M	U	-	-	-	-	-	-	-	-	6	1	-	-	-	-
471	F	U	-	-	-	-	-	-	-	-	6	1	-	-	-	-
472	M	U	-	-	-	-	-	-	-	-	-	**420**	-	-	-	-
473	F	U	-	-	-	-	-	-	-	-	-	**420**	-	-	-	-
474	F	U	-	-	-	-	-	-	-	-	-	22	-	-	-	-
475	M	U	**19.0**	5.3	-	-	-	-	-	-	175	-	-	-	-	41
476	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
477	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
478	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
479	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
480	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
481	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
482	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
483	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
484	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
485	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
486	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
487	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
488	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
489	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
490	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
491	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
492	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
493	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
494	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
495	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
496	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
497	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
498	U	U	-	-	-	-	-	-	-	-	7	-	-	-	-	41
499	M	U	-	-	-	-	-	-	-	-	60	-	-	-	-	-
500	F	U	-	-	-	-	-	-	-	-	210	-	-	-	-	-

Annex 1. Adults' consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Molluscs	Seaweed	Intertidal occupancy over mud and sand	Intertidal occupancy over mud, sand and stones	Intertidal occupancy over mud	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling fishing gear and catch	Handling sediment	Occupancy in water	Occupancy on water
501	M	U	-	-	-	-	-	-	-	-	3	-	-	-	-	-
504	M	U	-	-	-	-	-	-	-	-	40	-	-	-	-	-
505	F	U	-	-	-	-	-	-	-	-	162	-	-	-	-	-
506	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
507	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
508	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
509	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
510	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
511	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
512	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
513	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
514	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
515	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
516	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
517	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
518	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
519	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
520	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
521	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
522	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
523	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
524	U	U	-	-	-	-	-	-	-	-	-	-	-	-	77	-
525	F	U	-	-	-	-	-	-	-	-	5	-	-	-	-	-
526	F	U	-	-	-	-	-	-	-	-	5	-	-	-	-	-
527	F	U	-	-	-	-	-	-	-	-	5	-	-	-	-	-
532	F	U	-	-	-	-	-	-	-	-	8	-	-	-	-	-

Notes

U = Unknown

Emboldened observations are the high-rate individuals

Annex 2. Children's consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling sediment	Occupancy in water	Occupancy on water
15-year-old age group											
50	M	15	-	-	-	-	**80**	-	-	**10**	-
104	M	16	**12.8**	-	-	-	-	**160**	-	-	-
107	M	14	-	-	**100**	-	-	-	**100**	-	-
108	M	16	-	-	**100**	-	-	-	**100**	-	-
118	F	14	-	-	-	-	-	54	-	-	-
142	F	15	0.9	-	10	-	**35**	-	10	-	-
144	M	13	0.9	-	10	-	**35**	-	10	-	-
252	F	13	**5.1**	**1.1**	-	-	-	-	-	-	-
256	U	15	**5.1**	**1.1**	-	-	-	-	-	-	-
294	U	13	-	-	-	-	10	-	-	2	2
295	U	14	-	-	-	-	10	-	-	2	2
296	U	15	-	-	-	-	10	-	-	2	2
297	U	16	-	-	-	-	10	-	-	2	2
298	U	14	-	-	-	-	10	-	-	2	2
299	U	15	-	-	-	-	10	-	-	2	2
301	F	14	-	-	-	-	1	-	-	2	2
302	F	12	-	-	-	-	1	-	-	2	2
307	F	12	-	-	-	-	24	-	-	-	-
315	M	15	-	-	-	-	3	-	-	-	**10**
320	M	13	-	-	-	-	8	18	-	-	-
361	U	13	-	-	-	-	3	-	-	-	-
362	U	13	-	-	-	-	3	-	-	-	-
363	U	13	-	-	-	-	3	-	-	-	-
364	U	14	-	-	-	-	3	-	-	-	-
365	U	14	-	-	-	-	3	-	-	-	-
366	U	14	-	-	-	-	3	-	-	-	-
367	U	15	-	-	-	-	3	-	-	-	-
368	U	15	-	-	-	-	3	-	-	-	-
369	U	15	-	-	-	-	3	-	-	-	-
370	U	16	-	-	-	-	3	-	-	-	-
371	U	16	-	-	-	-	3	-	-	-	-
372	U	16	-	-	-	-	3	-	-	-	-
396	M	14	2.3	-	-	-	-	-	-	-	-
397	M	12	2.3	-	-	-	-	-	-	-	-
436	F	16	**10.8**	-	-	-	-	-	-	-	-
437	F	12	**5.4**	-	-	-	-	-	-	-	-
448	M	14	-	-	-	-	-	-	-	-	**9**
450	M	14	-	-	-	-	-	-	-	**8**	-
451	M	15	-	-	-	-	-	-	-	**8**	-

Annex 2. Children's consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling sediment	Occupancy in water	Occupancy on water
10-year-old age group											
12	F	7	-	-	-	-	-	30	-	-	-
47	F	8	-	-	-	-	-	30	-	-	-
51	F	11	-	-	-	-	**80**	-	-	10	-
61	M	7	-	-	-	-	**126**	-	-	9	-
62	F	10	-	-	-	-	**126**	-	-	9	-
100	M	8	-	-	-	-	-	**96**	-	-	-
112	F	9	-	-	-	-	30	-	**15**	-	-
113	F	9	-	-	-	-	30	-	**15**	-	-
114	M	10	-	-	-	-	30	-	**15**	-	-
136	F	7	-	-	-	-	65	-	-	**20**	-
143	F	8	0.9	-	**10**	-	35	-	**10**	-	-
237	F	10	-	**4.8**	-	-	-	-	-	-	-
253	M	9	**2.6**	**0.6**	-	-	-	-	-	-	-
257	U	11	**2.6**	**0.6**	-	-	-	-	-	-	-
258	U	8	**2.6**	**0.6**	-	-	-	-	-	-	-
288	M	10	-	-	-	-	35	-	-	-	-
314	F	10	-	-	-	-	20	1	-	-	-
319	F	11	-	-	-	-	8	18	-	-	-
333	M	7	0.5	-	-	-	-	-	-	-	-
350	M	7	-	-	-	-	**96**	-	-	-	-
380	F	7	-	-	-	-	6	15	-	-	-
381	F	8	-	-	-	-	6	15	-	-	-
382	F	11	-	-	-	-	6	15	-	-	-
383	M	10	-	-	-	-	6	15	-	-	-
402	M	10	**3.6**	-	-	**1**	-	14	-	**40**	-
403	F	8	**3.6**	-	-	**1**	-	14	-	**40**	-
404	M	7	**3.6**	-	-	**1**	-	14	-	**40**	-
408	F	9	**5.4**	-	-	-	**216**	-	-	-	**56**
431	F	11	-	-	-	-	8	-	-	-	-
432	F	8	-	-	-	-	8	-	-	-	-
455	F	8	-	-	-	-	2	-	-	-	-
460	M	11	-	-	-	-	3	-	-	-	1
461	M	9	-	-	-	-	3	-	-	-	1
530	M	8	-	-	-	-	5	-	-	-	-
531	M	9	-	-	-	-	5	-	-	-	-
5-year-old age group											
46	F	6	-	-	-	-	-	30	-	-	-
55	F	4	-	-	-	-	10	-	-	-	-
56	F	2	-	-	-	-	10	-	-	-	-
60	F	6	-	-	-	-	**126**	-	-	**9**	-

Annex 2. Children's consumption rates (kg/y) and occupancy rates (h/y) in the survey area

Observation number	Sex	Age (years)	Fish	Crustaceans	Intertidal occupancy over mud and sand	Intertidal occupancy over rock	Intertidal occupancy over sand	Intertidal occupancy over sand and stones	Handling sediment	Occupancy in water	Occupancy on water
65	F	3	-	-	-	-	**150**	-	-	-	-
106	F	2	-	-	-	-	-	**360**	-	-	-
110	F	4	-	-	-	-	42	-	**7**	-	-
137	M	5	-	-	-	-	65	-	-	**20**	-
146	F	4	-	-	-	-	40	-	-	3	-
147	F	6	-	-	-	-	40	-	-	3	-
205	M	4	**5.7**	**0.8**	-	-	-	-	-	-	-
206	F	6	**5.7**	**0.8**	-	-	-	-	-	-	-
238	M	6	-	**2.4**	-	-	-	-	-	-	-
259	U	6	**2.6**	0.6	-	-	-	-	-	-	-
260	U	3	1.3	0.3	-	-	-	-	-	-	-
282	F	3	-	-	-	-	-	2	-	-	-
336	M	4	-	-	-	-	3	-	-	-	-
348	M	3	-	-	-	-	18	-	-	-	-
351	F	5	-	-	-	-	**96**	-	-	-	-
377	F	3	-	-	-	-	9	-	-	-	-
409	F	6	**3.6**	-	-	-	**216**	-	-	-	**56**
412	F	2	-	-	-	-	24	-	-	-	-
414	F	4	-	-	-	-	1	-	-	-	-
420	F	2	-	-	-	-	13	36	-	-	-
427	M	5	-	-	-	-	8	8	-	-	-
428	M	3	-	-	-	-	8	8	-	-	-
429	M	2	-	-	-	-	8	8	-	-	-
430	F	2	-	-	-	-	8	8	-	-	-
502	M	4	-	-	-	-	3	-	-	-	-
528	M	2	-	-	-	-	5	-	-	-	-
529	F	5	-	-	-	-	5	-	-	-	-
533	F	6	-	-	-	-	8	-	-	-	-
534	F	4	-	-	-	-	8	-	-	-	-
535	F	3	-	-	-	-	8	-	-	-	-
1-year-old age group											
66	F	1	-	-	-	-	**150**	-	-	-	-
347	F	1	-	-	-	-	18	-	-	-	-
415	M	1	-	-	-	-	1	-	-	-	-
3-month-old age group											
384	M	0.7	-	-	-	-	**6**	**15**	-	-	-
503	M	0.9	-	-	-	-	**3**	-	-	-	-

Notes

U = Unknown

Emboldened observations are the high-rate individuals

Annex 3. Glossary of fishing terms

Beam trawl. A tapered bag shaped net that is towed along the seabed and scoops up fish and other organisms in its path. The top front of the net is attached to a horizontal beam, and a hoop (called a shoe) at either end of the beam holds the net open vertically and keeps the beam off the seabed. They are usually fitted with heavy chains strung between the shoes and these disturb the seabed in front of the net. Beam trawls are used particularly for catching flatfish such as plaice and sole that lie on, or bury into, the seabed, but they will catch a wide range of other species. Vessels usually tow two beams, one on either side of the ship, but they can be used singly, towed over the stern.

Demersal. On, or close to, the seabed. Demersal species of fish are those that are usually found close to the seabed; for example, cod, haddock, whiting, plaice and sole.

Demersal trawl. A general term for a variety of funnel shaped nets that are towed along the seabed.

Demersal otter trawl. A funnel shaped net that is towed along the seabed and collects the fish in its path. The front of the net is kept open vertically by a heavy line at the bottom and floats at the top. The net is kept open horizontally by wooden or metal boards, set at an angle, one on either side of the mouth. These work on the same principle as a kite that flies in the sky. The boards are called ‘otter boards’, hence the name ‘otter trawl’, although they are also known as ‘trawl doors’.

Dredge. A general term for a variety of devices that are dragged along the seabed in order to scrape up organisms that are attached to, or buried in, the substrate. Dredges are used particularly for catching molluscan shellfish such as mussels, cockles, razor clams and scallops.

Fly-seining. A long length of warp (heavy rope) and a funnel shaped net are laid out on the seabed in a teardrop shaped pattern with the net in the middle of the base of the tear drop and the ship at the apex. The vessel then steams ahead slowly and hauls in on the warp. As it does so the teardrop becomes narrower and gets continuously smaller and the net is pulled towards the ship. As the warp is dragged across the seabed it herds the fish into the path of the net and they are scooped up.

Hand-raking. The use of a tool similar to a garden rake to extract cockles from the sediment. The raking is carried out at low water when the cockle beds dry out and can be reached by people on foot or in land vehicles.

Hydraulic dredge. A metal cage with an open mouth that is dragged along the seabed. Water jets at the front of the cage wash shellfish, such as cockles and razor clams, out of the sediment and these are collected in the cage. Normally the cage is hauled to the ship periodically, in order to empty the catch, but a variation called an 'hydraulic suction dredge' has a pipe at the rear of the cage through which the catch can be sucked up to the ship.

Nephrops trawl. A type of demersal otter trawl that is used for fishing for *Nephrops*. It has a smaller mesh size than the nets used where the primary target catch is fish. Smaller meshes are permitted because *Nephrops* are smaller than fish and they would escape through larger meshes. However, Nephrops trawls do also catch a wide range of fish species. Many of the Nephrops trawlers tow two nets side by side and this is known as 'twin rigging'.

Netting. A general term that encompasses many different types of fishing where walls of net are laid out on the seabed or close to the surface. They may be anchored (set-nets) or drifting. Fish swim into the static nets and become entangled.

Pelagic. Away from the seabed, in midwater or close to the surface. Pelagic species of fish are those that are usually found swimming in midwater; for example, herring and mackerel.

Pelagic trawl. A funnel shaped net, that is towed in midwater to catch pelagic fish.

Pots. Also known as creels. Traps made of netting stretched over a rigid frame with one or more funnel shaped entrances that act as one way valves, allowing crabs and lobster to enter but preventing their escape. The pots are baited, usually with fish offal, and laid on the seabed for periods varying from a few hours to a few days. Usually several pots are attached along a line that has another line to a buoy at the surface that is used to haul the pots. A boat usually works a number of lines of pots.

Scallop dredge. A triangular metal towing bracket is attached to a low rectangular metal-framed mouth, the lower side of which is a spring-loaded bar with metal teeth pointing downwards. A bag made of interlocking steel rings on the underside and strong netting on the upper side is attached to the frame. As the dredge is dragged along the seabed the metal teeth rake out scallops from the sediment and they fall back into the bag. Usually several dredges are attached to a beam that has a wheel at either end to raise it off the seabed, and a ship may tow one or two beams.

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