# Beatrice Offshore Wind Farm Limited (BOWL)

## Scottish and Southern Electricity (SSE) Renewables & SeaEnergy Renewables

## Salmon and Sea Trout Ecology and Fisheries Technical Report

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# 1.0 Introduction

The following document describes the salmon and sea trout ecology and the salmon and sea trout fisheries baseline assessments for the Beatrice Offshore Wind Farm.

Salmon and sea trout are important both as species of conservation interest, and as a fishery that provides significant socio-economic benefits to Scotland on a local, regional and national level. In lights of this, the following document describes the biological aspect of the species as well as providing a description of the fisheries relevant to the proposed development.

# 2.0 Methodology

There is no standard procedure or guidance for the establishment of salmon and sea trout ecology and fisheries baseline assessments in relation to offshore wind farm developments. In the absence of specific guidance a number of information and data sources have been used.

## 2.1 Data and Information Sources

The principal data and information sources used are as follows:

- Marine Scotland Science (MSS) (Freshwater Laboratory)
- Scottish Natural Heritage (SNH)
- Joint Nature Conservation Committee (JNCC)
- Centre of Environment, Fisheries and Aquaculture Science (CEFAS)
- Association of Salmon Fishery Boards (ASFB)
- Rivers and Fisheries Trusts of Scotland (RAFTS)
- District Salmon Fishery Boards (DSFB)
- Salmon Net Fishing Association of Scotland (SNFAS)
- Atlantic Salmon Trust (AST)
- Scientific papers and other relevant publications

## 2.2 Data & Information Sensitivities, Limitations and Gaps

### 2.2.1 MSS Salmon & Sea Trout Fisheries Catch Statistics

Each fishery in Scotland is required to provide the number and total weight of salmon and grilse and sea trout caught and retained in each month of the fishing season. In this context, the term salmon refers to multi-sea-winter salmon (MSW) whilst grilse refers to one-sea-winter salmon (1SW).

The catch data used for the purposes of this assessment are as reported. Where there are no records of reported catches, it has been assumed that no fish have been caught. It is recognised, however, that there may be a degree of error within the catch dataset due to misclassification of fish between the grilse and salmon categories. In addition, further errors as a result of misreporting of catches may also exist. The data used are as provided by Marine Scotland Science in October 2010.

Rod-and-line fisheries are also required to provide the monthly numbers and total weight of those salmon, grilse and sea trout which were caught and released back into the river, this practice is know a “catch and release”. As a result, MSS catch data for the rod-and-line fishery is broken down into two categories, “rod-and-line” and “catch and release”. Note that the total catch by the rod-and-line fishery is in effect the sum of the catches recorded in both categories. Where appropriate, data from both categories have been combined to give an indication of the total rod-and-line catch. Similarly, the catch by net-and-coble and fixed engines (bag and stake nets) has been combined in some instances to provide an indication of the total catch by the net fishery.

It should be noted that the analysis of fisheries statistics given below is not intended as an assessment of the abundance or state of the stocks, but as an indication of the underlying population trends and relative importance of the fisheries of salmon and sea trout by region and fishery district in Scotland. The critical time for fisheries does not necessarily represent critical times for salmon and sea trout movement and catch data is limited in terms of presenting an accurate baseline of fish populations and fish migration outside of the time of fisheries. This also holds true for rod-and-line catches which do not account for the closed season and give no effort value.

***The catch data used in this report are Crown copyright, used with the permission of Marine Scotland Science. Marine Scotland is not responsible for interpretation of these data by third parties.***

### 2.2.2 Salmon Fishery Regions and Districts

Each salmon fishery district applies its own voluntary or statutory conservation code, closure times, policies and regulations and has in place different management and conservation schemes (e.g hatcheries, fish counters, water quality control and monitoring schemes). In addition, different districts include varying numbers of rivers and tributaries within their jurisdictions and have different catchment areas.

The geographical boundaries and the names of a number of SFDs have changed over time. In the regional study area, for example, catch statistics are collected separately for the Forss, Thurso, Wick, Dunbeath and Berriedale Salmon Fishery Districts, however, these districts were superseded by the Caithness Salmon Fishery District and abolished in 1990 (S.I. 1990/ 324). For the purposes of this assessment the former smaller districts have been used, as they provide a better spatial resolution for analysis of catch data.

The boundaries of the salmon fishery regions and districts could not be provided by MSS as GIS data layers due to third party copyright ownership of these data. The district and region boundaries shown in the charts provided in this report were produced by geo-referencing a raster image and should therefore be taken as approximate and for illustrative purposes only.

### 2.2.3 Data Gaps

There is insufficient information available to date to allow for the migratory routes and patterns of Scottish salmon and sea trout be defined at the spatial resolution ideally required in this assessment. In addition to data gaps in relation to migratory patterns and behaviour, there is no detailed information on the potential for the area of the wind farm and its vicinity to be used by these species in other ways. This is particularly relevant for sea trout as they generally do not undertake long distance migrations and could potentially be using the area of the wind farm or its vicinity for other purposes during prolonged periods of time (e.g. feeding).

It is also recognised that the current knowledge on the ecology and behaviour of salmon exceeds that available for sea trout. As a result, some aspects of the ecology assessment given below have been covered in greater detail for salmon.

## 2.3 Consultation

Consultation questionnaires were circulated to all the District Salmon Fishery Boards (DSFBs) in Scotland through the Association of Salmon Fishery Boards and to netsmen through the Salmon Net Fishing Association of Scotland. At the time of writing a sample of 17 questionnaires has been completed and returned.

In addition to questionnaires, consultation was undertaken with individual DSFBs and associated organisations. A full list of consultees is given in Appendix 01 and a template of the consultation questionnaires used in Appendix 02.

## 2.4 Study Area

The study area has been defined on a local, regional and national scale (Figure 2.1). The local area comprises the zone relevant to the salmon fishery districts located in the immediate vicinity of the wind farm, Wick, Dunbeath and Berriedale, whilst the regional area includes all the salmon fishery districts with rivers flowing into the Moray Firth. Given the migratory behaviour of salmon and sea trout and the importance of their fisheries across the country, a national focus has also been briefly described.

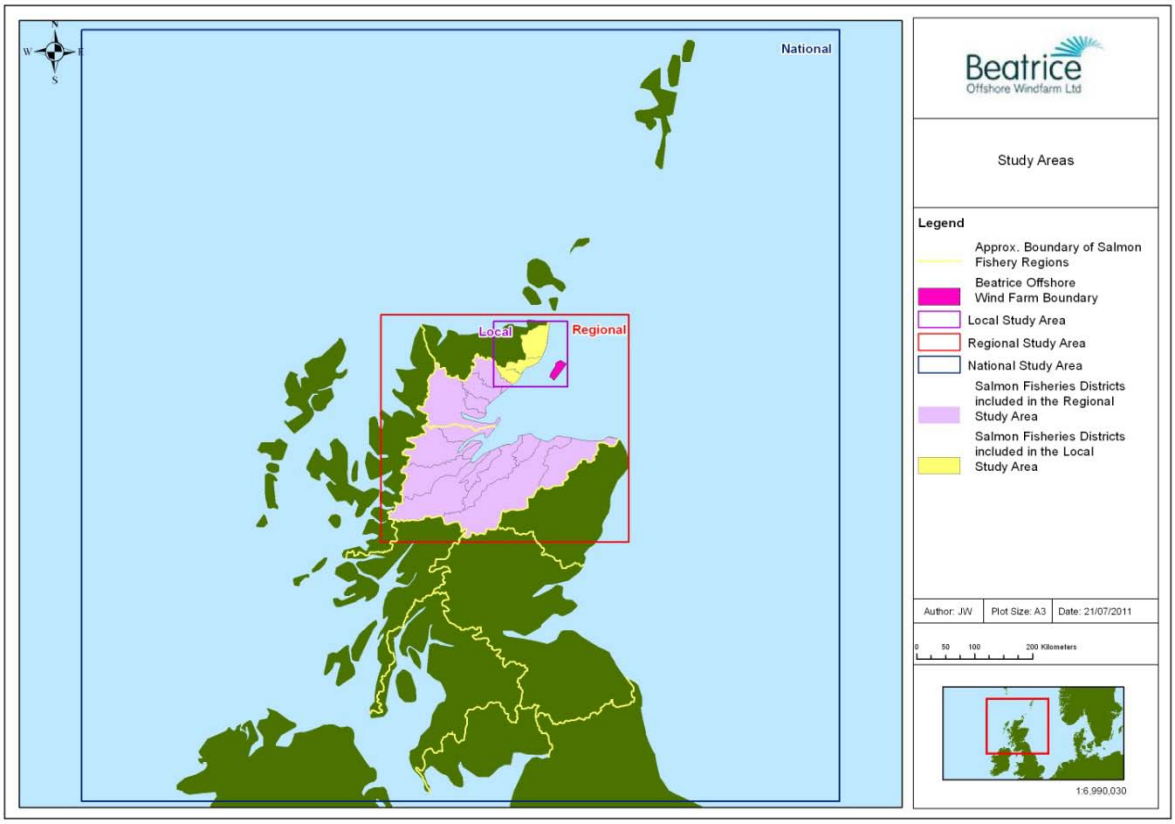



**Figure 2.1 Study Areas**

# 3.0 Salmon & Sea Trout Ecology

## 3.1 Introduction

Atlantic salmon *(Salmo salar)* and sea trout *(Salmo trutta)* are anadromous migratory species which utilise both freshwater and marine habitats during their life cycles. Both are species of the family *Salmonidae*, being commonly referred to as salmonids.

Atlantic salmon is widely distributed within the EU, from Portugal in the south to Sweden and Finland in the north. The UK salmon population, however, comprises a significant proportion of the total European stock, with Scottish rivers being a European stronghold of the species (JNCC, 2010).

Sea trout is the migratory form of the common and widely distributed brown trout. Both forms are recognised as the same species and are present together with Atlantic salmon in many Scottish rivers. The distribution of sea trout in western Europe extends from north Portugal to the White Sea and Cheshkaya Gulf, including Iceland and the Baltic Sea (Elliott, 1994).

## 3.2 Life cycle

### 3.2.1 Salmon

Atlantic salmon spawn in rivers in late autumn. Eggs are deposited in redds (nests excavated by the females in gravelly substrates). The eggs hatch the following early spring.

Newly hatched salmon, known as 'alevins', remain hidden in the riverbed gravels feeding from the attached yolk sac. Once the yolk sac has been depleted the alevins are known as 'fry' and start feeding on small invertebrates. Salmon fry grow quickly during the first year increasing in size to become 'parr'.

Parr remain in the river for one to four or five years, depending on water temperatures and food availability. In Scottish rivers they most commonly stay in the river for two or three years.

In spring, once parr have reached a length of 12-14 cm, they undergo a transformation both externally and internally, which allows them to adapt to salt water. They are then known as 'smolts'. Smolts move down rivers in April to June to start their oceanic migration. Once they enter the sea they are known as post-smolts until the spring of the following year (Malcolm *et al*, 2010).

After one or more years feeding at sea, salmon return to their home rivers to spawn. The amount of time spent at sea prior to the spawning migration varies from one winter for 'grilse' to up to four for 'multi-sea-winter' salmon (MSW).

Once they have spawned salmon are known as "kelts". The majority of kelts (90-95%) die following their first spawning. Some individuals survive and recover condition returning to spawn again. Repeat spawners are predominantly females and return to sea to feed between spawning (Mills *et al*, 2003; Fleming, 1996). The proportion of repeat spawners, whilst generally considered to be low in Scotland, is thought to vary between rivers and change over time (Malcolm *et al*, 2010).

A summary of the basic salmon life-stage terminology is given in Table 3.1 below.

Table 3.1 Basic salmon life-stage terminology (Hendry & Cragg-Hine, 2003)

| Development Stage | | Description |
|---|---|---|
| 1 | Alevin | From hatching to end of dependence on yolk sac for primary nutrition |
| 2 | Fry | From independence of yolk sac to end of first summer |
| 3 | Parr | From end of first summer to migration as smolt |
| 4 | Smolt | Fully silvered juvenile salmon migrating to sea |
| 5 | Post-smolt | From departure from river to end of first winter in the sea |
| 6 | Grilse | Adult salmon after first winter in sea |
| | Multi-sea-winter (MSW) | Adult salmon after more than one winter in sea, commonly referred to as "spring" fish when entering river before June |
| 7 | Kelt | Spent or spawned adult |

### 3.2.2 Sea trout

The life cycle of the sea trout is similar to that of Atlantic salmon. Spawning generally occurs between mid October and January. Smolting takes place in spring once a threshold size is reached. Most sea trout populations in the UK become smolts after two or three years in the river (AST, 2010a). Smolts leave the river around the same time as salmon, between April and early June (SNH, 2010). Female individuals are more likely to become smolts and migrate to sea (MSS, 2010a; SNH, 2010).

Most sea trout return to the rivers after twelve or more months at sea. These can be seen in the rivers between May and October (SNH, 2010) and are often found together in the same redds as brown trout as spawning time approaches in late autumn (MSS, 2010a).

Some immature fish return to the rivers after only a few months at sea, often in July and September (SNH, 2010). These are small fish regionally known as 'finnock', 'herling' or 'whitling' and are found feeding in most Scottish estuaries as they move in and out with the tide (MSS, 2010a). Many gather in larger rivers and lochs, not necessarily in their natal systems, and over-winter in fresh water before returning to the sea in spring.

Unlike salmon, a significant proportion of spent sea trout kelts survive and make their way back to sea to recover and grow (SNH, 2010). Once they start to return they are annual spawners. There is however evidence of alternate year spawning as opposed to annual spawning in some stocks with long distance migrations (Solomon, 2007).

Some individuals return to the sea soon after spawning (mid October-December) whilst others remain in the rivers and estuaries, migrating out in the spring (AST, 2010a).

## 3.3 Migration

A summary of the information currently available on salmon and sea trout migrations, primarily based on the review paper "Review of Migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables", recently published by MSS (Malcolm *et al,* 2010), and a number of other relevant research publications, is given below. The migratory patterns and behaviour of salmon and sea trout in the Moray Firth and, where possible, in the vicinity of the Beatrice Offshore Wind Farm, has been the primary focus.

### 3.3.1 Salmon

#### 3.3.1.1 Smolt and Post-Smolt Migration

The beginning of the down river migration of smolts is thought to be related to environmental factors such as temperature and water flow (McCormick *et al*, 1998). The importance of these factors may however be variable and stimulate migration in different ways (Carlsen *et al*, 2004). Downstream migration within the river is mainly nocturnal and often triggered by increases in flow (Hendry & Cragg-Hine, 2003; Moore *et al.*, 1998a). In addition, social factors, such as the presence of other migrants in the river, may also play a role (Hansen & Jonsson, 1985; Hvidsten *et al*, 1995).

It is believed that salmon smolts use environmental cues in the rivers related to favourable ocean conditions allowing them to arrive at sea at an appropriate time (Hvidsten *et al*, 2009). Smolts from upper tributaries generally start migration earlier than those from lower tributaries, resulting in a synchronised sea entry of smolts from the same watershed (Stewart *et al,* 2006). Timing in the spring migration may therefore play an important role in salmon post-smolt survival at sea (Aas *et al*, 2011).

The main smolt runs within the regional study area have been identified to principally occur from April to June, usually peaking around May. A summary of the timing of the smolt runs by district, as defined by DSFBs during consultation is given in Table 3.2.

**Table 3.2 Timing of Smolt Runs as defined by District Salmon Fishery Boards during Consultation**

| District Salmon Fishery Board | Timing of Smolt Run |
|---|---|
| Spey | April-May (sometimes into early June) |
| Cromarty Firth (Conon and Alness Districts) | May |
| Ness and Beauly | April to June |
| Helmsdale | May |
| Caithness (Berriedale, Dunbeath and Wick Districts) | Mid April to Mid May with some earlier running smolts and a good number through June also |
| Lossie | May, peaking towards the end of the month and finishing in early June |
| Kyle of Sutherland | Spring and Autumn |

The migration of salmon smolts into the marine environment is thought to be a particularly critical stage in the life cycle, as they are especially vulnerable to marine predators, as well as to changes in environmental conditions, which may affect the availability of food (Potter and Dare, 1993). This sensitivity was noted by DSFBs during consultation.

Studies of the movement of Atlantic salmon post-smolts indicate active, directed swimming during migration, rather than passive drifting, with fish generally moving close to the surface (Lacroix *et al*, 2005; Lacroix *et al*, 2004). It seems that no period of acclimation is required when the fish move from fresh to saltwater (Moore *et al*, 1998a; Lacroix and McCurdy, 1996), with post-smolts making limited use of the estuarine habitat and moving rapidly to the open ocean (Marschall *et al*, 1998; Moore *et al*, 1998a, Malcolm *et al*, 2010). Limited existing data suggest that post-smolts usually swim close to the surface (1-3m depth) and make irregular dives down to 6.5m depth (Davidsen *et al,* 2008).

Research undertaken in Norwegian fjords (Thorstad *et al*, 2004) suggests salmon post-smolts do not use the immediate near-shore areas during migration, the mean reported distance to shore being 370m. Similarly, tagging experiments carried out by Finstad *et al* (2005) in the same area, found salmon used the full width of the fjord and travelled rapidly. Further studies undertaken in Canada in

the Bay of Fundy (Lacroix and Knox, 2005), showed that fish travelled near the coast at a distance 2.5-5km from shore.

It should be noted that the current knowledge on salmon post-smolt migration and behaviour is principally based on the results of experiments and research carried out in Canada and Norway which have been summarised above. The lack of data specific to salmon post-smolts originating from Scottish rivers makes predictions of their behaviour in coastal waters difficult and speculative. Scottish coastal waters, especially in the case of the east coast rivers where there are no substantial bays or sea lochs (fjords), differ substantially from the locations where studies have been carried out in Canada and Norway.

In addition, the migratory behaviour of post-smolts may vary depending on river of origin. A recent study undertaken by Plantalech Manel-la *et al* (2011) found differences in early marine migratory behaviour between salmon from two different stocks and it was suggested that the distance salmon travels to reach the open coastline may influence its early marine migratory behaviour and performance.

The information given above, despite its limitations, provides an indication of the likely behaviour of salmon post-smolts during migration. As identified in Malcolm *et al* (2010), the common findings across the research carried out to date can be summarised as follows:

- Post-smolts were observed to migrate rapidly and actively towards open marine areas after leaving their home river.

- Post-smolts did not appear to follow nearby shores closely, although this may occur in areas where coastal currents are substantial.

- Limited information on swimming depths suggests post-smolts generally use shallow depths (generally 1-3m, but up to 6m).

Data and information are also lacking to accurately define the routes followed, the areas used and the behaviour of salmon post-smolts in distant waters. The available information on the distribution and abundance of salmon at sea is principally based on records of tagging experiments from the West Greenland and Faroese fisheries (Shelton *et al*, 1997; Malcolm *et al*, 2010). A summary of relevant available information on salmon distribution at sea and their behaviour is given below.

Post-smolts are thought to move in schools whilst heading off to feeding areas (Shelton *et al*, 1997; Mills *et al*, 2003). The best known feeding locations are in the Norwegian Sea and the waters off southwest Greenland, however, there are believed to be many other sub-arctic feeding areas. MSW salmon undertake longer migrations than grilse, which tend not to travel beyond the Faroe Islands and the southern Norwegian Sea (Mills *et al*, 2003).

The results of tagging experiments of salmon post-smolts suggest they travel rapidly over long distances. Research in the Faroe-Shetland Channel (Shelton *et al*, 1997) found minimum progression rates of 7-30km/day; similarly, data from the North Sea, the Norwegian Sea and the Barents Sea, indicate minimum progression rates of between 6 and 24km/day (Holm *et al*, 2003).

Historic recapture data from smolts tagged in Scottish rivers (Dee, Tay and North Esk), and data from the Girnock Burn (a tributary of the Dee) recorded between 1968 and 1982, suggest that at least some of the Scottish MSW salmon use the north-western Atlantic Area, around West Greenland (Malcolm *et al*, 2010).

Data recorded from the East Greenland and Irminger Sea fisheries suggest these areas are of less importance to Atlantic salmon in general, and Scottish salmon in particular. This should however be taken in the context of the limited data that are available for these areas (Malcolm *et al*, 2010).

Information derived from smolt and adult salmon tagging studies (Jakupsstovu, 1988; Hansen and Jacobsen, 2003) also suggest Scottish salmon make use of sea areas around the Faroes. Hansen and Jacobsen (2003) found Scottish salmon tend to be more prevalent around the Faroes in the autumn rather than in the winter, including fish from the Spey, Brora, Tay, North Esk and Dee. In addition, whilst the Scottish salmon found in West Greenland, East Greenland and Irminger are thought to mainly be MSW fish, studies carried out around the Faroes suggest that both 1SW (grilse) and MSW salmon occur in the area, depending on the zone fished and the time of the year (Malcolm *et al*, 2010).

#### 3.3.1.2 Spawning Migration

The timing and duration of the pre-spawning migration of Atlantic salmon varies from river to river. It depends on the distance from the sea to the spawning areas and the degree of interaction between hydrologic regimes, the geomorphology of the river network and stream temperatures (Tetzlaff *et al*, 2008).

The return migration in adult salmon is, as described for post-smolts, an active process with fish generally being found swimming near the surface (1-5m depth) and occasionally diving to greater depths (Aas *et al*, 2011). There appears not to be a period of acclimation during the transition from salt to fresh water (Hogåsen, 1998) and provided that river conditions are favourable, river entry seems to take place quickly (Thorstad *et al,* 1998).

Studies carried out in Iceland on the migratory pattern of homing Atlantic salmon in coastal waters (Sturlaugsson and Thorisson*,* 1997) found that salmon migrated close to the coast, with some individuals entering estuaries (most often for brief periods), and even into rivers (for up to more than one day) on their way to their natal streams. The depth records suggested that in general salmon migrated in the uppermost few metres of the water column. A diurnal rhythm in vertical movements was also noted, with salmon staying deeper at night and closest to the surface at noon.

The review paper by Malcolm *et al* (2010), suggests a range of potential migratory routes for salmon in Scottish coastal waters, primarily using the results of adult fish tagging studies and the spatial distribution of tag returns from adult fish tagged as smolts as they left Scottish rivers. In this exercise the assumption that fish would return to their river of origin is needed. A summary of the findings of Malcolm *et al* (2010) primarily focused on studies undertaken in the Moray Firth and its vicinity is given below.

A number of tagging experiments have been carried out in coastal areas in the Moray Firth. Calderwood tagged fish in the Black Isle in 1913 and 1914 (Calderwood, 1914), and found fish moving, north, east and south, with low numbers recorded in rivers as distant as the Forth. The majority were however recaptured within 50 miles of the tagging site. The following year Calderwood continued his work further north, tagging fish in netting stations on the coast of Sutherland between Brora and Helmsdale (Calderwood, 1915). This work recorded almost twice as many fish heading north as south, although a wide range of movements were observed. Relatively high recaptures were obtained in coastal areas in the vicinity of the Beatrice Offshore Wind Farm, between Berriedale and Lybster. The results of the Calderwood work in the Moray Firth are shown in Figure 3.1 and Figure 3.2 for the Black Isle and the Sutherland coast tagging experiments respectively, as provided in Malcolm *et al* (2010).

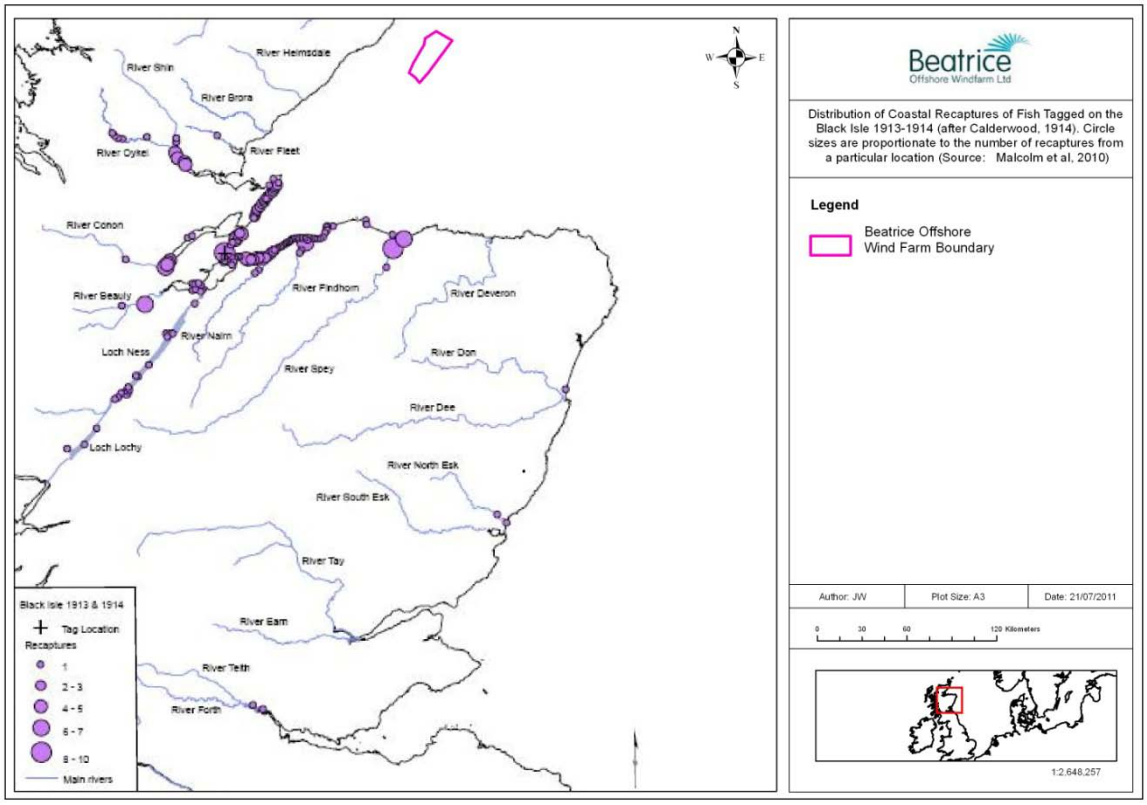



**Figure 3.1 Distribution of Coastal Recaptures of Fish Tagged on the Black Isle 1913-1914 (after Calderwood, 1914). Circle sizes are proportionate to the number of recaptures from a particular location (Source: Malcolm *et al*, 2010)**

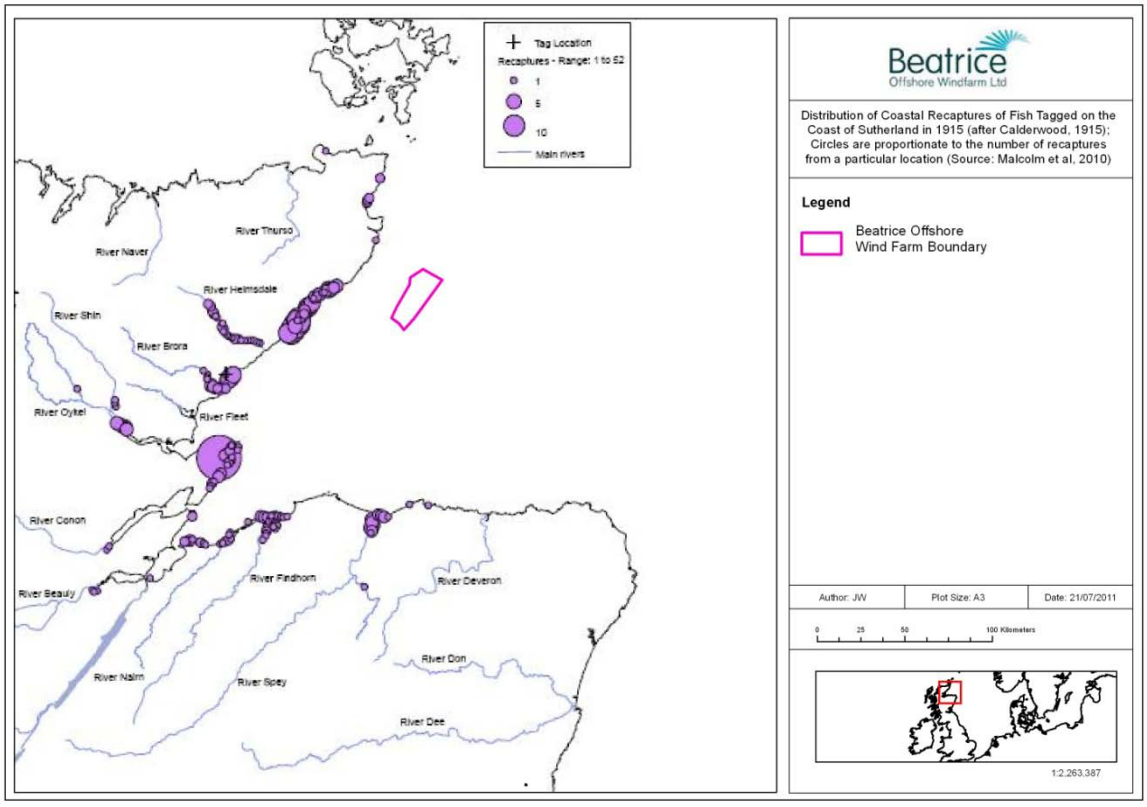



**Figure 3.2 Distribution of Coastal Recaptures of Fish Tagged on the Coast of Sutherland in 1915 (after Calderwood, 1915); Circles are proportionate to the number of recaptures from a particular location (Source: Malcolm *et al*, 2010)**

Tagging experiments undertaken by Menzies on the west coast of Scotland in 1936 and 1937 (fish were tagged at Loch Inchard and Raffin) found fish were more likely to be recaptured north and east of the tagging locations, rather than to the south. Low numbers of fish were recaptured in the Moray Firth area (Malcolm *et al,* 2010).

Based on the information above, it is difficult to draw any firm conclusions on the movements of adult salmon in the Beatrice Offshore Wind Farm and areas in its immediate vicinity. On the Black Isle and Sutherland fish appear to move in both a northerly and southerly direction whilst on the north and extreme northwest coasts fish seems to move both to the east and west, with easterly movements being more common (Malcolm *et al,* 2010).

The geographic distribution of arrival location and natal rivers suggests variable and random directions of movement in a given location making the interpretation of the results difficult in most coastal areas, including the Moray Firth. An exception to this is the east coast, in areas south of Aberdeenshire, where the dominant direction of movement appears to be northerly (Malcolm *et al* 2010).

Based on the results of tagging experiments undertaken to date it still remains uncertain whether salmon adults or post-smolts migrate through the area around Orkney and Shetland or if the Pentland Firth is the preferred or only route used (Malcolm *et al* 2010). In addition to the uncertainties in relation to migration routes for fish originating in rivers flowing into the Moray Firth, there is the potential for fish from other rivers to use the area during their coastal migration. Prevalent travel directions around Scottish coastal waters have been roughly defined in Malcolm *et al* (2010) for grilse and MSW salmon. These are shown in Figure 3.3 below.

Limited information is also available in relation to the distance from shore at which salmon migrate. Research carried out by Smith et al (1981) found that six fish tagged in coastal nets near Montrose rarely approached the shore and travelled at distances of up to 17km offshore. Previous studies however found that fish remained inshore for much of the time (Malcolm *et al,* 2010). Similarly, information on swimming depths is also limited. Malcolm *et al* (2010) concluded based on research undertaken to date (Jakupsstovu, 1986; Holm *et al,* 2005; Starlaugsson, 1995) that in general terms salmon spend most of the time close to the surface although dives to greater depths of up to 280m have often been observed. Dives do not appear restricted to offshore areas, persisting late into the migration on the return to home waters. Early studies (Jakupsstovu, 1986) suggest an association between diving and feeding. This is in line with research by Fraser (1987) which found grilse feeding in western Scottish coastal waters until early July.

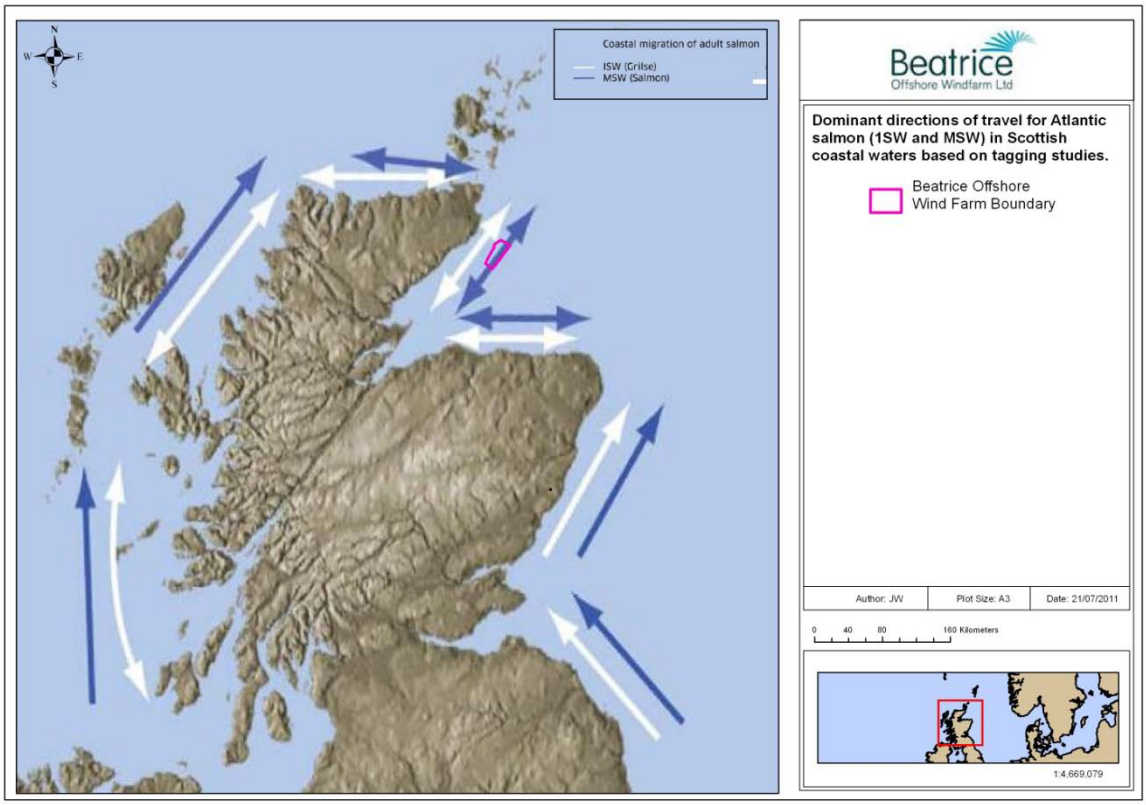



**Figure 3.3 Directions of Travel for Atlantic salmon (1SW and MSW) in Scottish Coastal Waters based on Tagging Studies (Source: Malcolm *et al*, 2010)**

Salmon of different sea-ages tend to return at different times of the year and often spawn in different parts of a river (Potter and Ó Maoiléidigh, 2006). In most countries salmon runs tend to only take place at specific times, normally during late summer and autumn. In Scotland, however, salmon enter rivers throughout the year, resulting in the existence of a range of salmon runs. This is of importance to the salmon fisheries as it provides fishing opportunities over extended periods of time (MSS, 2010b). The timing of MSW salmon and grilse runs is further detailed by district in section 4.5.2 below.

The majority of grilse (1SW salmon) enter the Scottish rivers from early summer until shortly before spawning in autumn and early winter. Many of the MSW salmon also enter rivers over that same period of time, however, for the Scottish MSW salmon class as a whole, river entry occurs over a greater period of time, extending back to the autumn months of the year before spawning (Youngson *et al*, 2002). Based on the time of the year when the fish enter the river, salmon can be broadly classified as winter, spring, summer and autumn salmon. The timing of MSW and grilse runs is further detailed by district in Section 4.5.2.

It should be noted that the perceived importance of salmon to fishermen may vary, depending on the run, with large spring-running MSW salmon being particularly highly prized to fishermen (Potter and Ó Maoiléidigh, 2006). In the past, spring salmon runs made a major contribution to the Scottish fisheries, especially to those of the east coast and its rivers. Concern on the state of this component of the stock has risen in recent years, as it has declined more significantly than other stock components (Potter and Ó Maoiléidigh, 2006; MSS, 2003; Youngson *et al*, 2002; Smith *et al*, 1998).

The timing of river entry is thought to be highly dependent on flow conditions. Research undertaken in the late 1980s in the Fowey estuary, and more recently in the Avon, indicates that fish wait for suitable river conditions, particularly elevated flows, before they enter freshwater and that, provided there are suitable holding areas, fish may remain in the estuary for long periods (Potter and Dare, 2003; Potter, 1988). Studies carried out in the Dee (Smith & Johnstone, 1996) found that fish enter and ascend the river relatively quickly during elevated river flows and that river entry may be delayed during periods of drought. This scenario was also noted by stakeholders during consultation.

### 3.3.2 Sea Trout

#### 3.3.2.1 Smolt and Post-smolt Migration

Seaward migration in sea trout, like in salmon, is thought to be an active process (Thorstad *et al*, 2004; Thorstad *et al*, 2007). Tagging studies carried out in the River Conwy, North Wales (Moore *et al,* 1998b) found sea trout smolts migrating seawards on ebb tides and swimming close to the surface. In addition, the movements in the lower portion of the estuary were found indicative of active directed swimming and it was suggested that there was no apparent period of acclimation when moving from fresh to saltwater.

As mentioned in Section 3.2.2 above, most sea trout smolts are thought to leave the river around April and early June. Information gathered by Pratten and Shearer (1983) in the River North Esk, found the peak of the sea trout smolt migration to occur usually in May or June.

Sea trout differ from Atlantic salmon in that generally they do not venture to distant feeding grounds in the sea, instead, remaining in coastal areas. A range of migratory strategies have however been observed in sea trout stocks, including estuary residence, local coastal movements and extensive open sea migrations (Solomon, 2007).

Detailed tracking studies on the migration of sea trout post-smolts have been carried out in sea lochs in the west coast of Scotland (Pemberton, 1976a; Middlemas *et al,* 2009) and in Norwegian fjords (Finstand *et al*, 2005; Thorstad *et al*, 2007). The results of these studies suggest a relatively local movement with sea trout remaining within sea lochs and fjords during the first couple of months at sea (Malcolm *et al*, 2010).

On the east coast of Scotland, information on sea trout post-smolts is scarce, being principally derived from tagging studies carried out in the North Esk. Studies by Pratten and Shearer (1983) found that the majority of reported recaptures were from the Montrose area, although numerous examples of tagged sea trout travelling appreciable distances (>100 km) along the coast were also found. Furthermore, a low number of fish were recaptured in excess of 500 km from the North Esk, on the Scandinavian coast and the River Barvas, North West Lewis. Further research by Shearer (1990) in the North Esk, concluded that most sea trout post-smolts were probably staying within a short distance of the Esk rivers, although recaptures as far north as the River Spey and as far south as the River Tweed also occurred (Malcolm *et al,* 2010).

#### 3.3.2.2 Spawning Migration

As previously discussed for salmon, timing of river entry in sea trout may also be influenced by river condition (e.g. river flow). It was however noted during consultation that river entry in sea trout may be less restricted than in salmon, with sea trout in some rivers not having to wait for “right” river conditions before starting the upstream migration (Consultation, 2011a).

Based on information gathered through consultation and the analysis of MSS salmon and sea trout catch statistics, it appears that the main sea trout runs in districts within the regional study area

occur in the summer months from May to October, with peak runs varying between rivers. The timing of the principal runs by district is further detailed in Section 4.5.2.

The information available to date, does not allow for common patterns, behaviour or routes, either in general or for particular rivers, to be determined. Whilst tagging studies carried out in the east coast suggest that sea trout generally remain in their local area, it appears that sea trout also exhibit a wide range of migratory patterns (Malcolm *et al*, 2010).

Nall (1935) analysed the findings of tagging studies carried out between 1914 and 1935 along the east coast of Scotland. In the majority of cases, recaptures were made within the local estuarine, river or firth areas, with very few distant recaptures being observed (within 40 miles). As previously explained (Section 3.3.2.1), studies undertaken by Pratten and Shearer (1983) and Shearer (1990) in the Montrose area, found similar patterns, with the majority of fish being found in adjacent rivers, although longer migrations were also observed.

The distribution of sea trout recaptures from tagging programmes in the rivers North Esk, South Esk and Bervie is illustrated in Figure 3.4 as presented in Malcolm *et al* (2010).

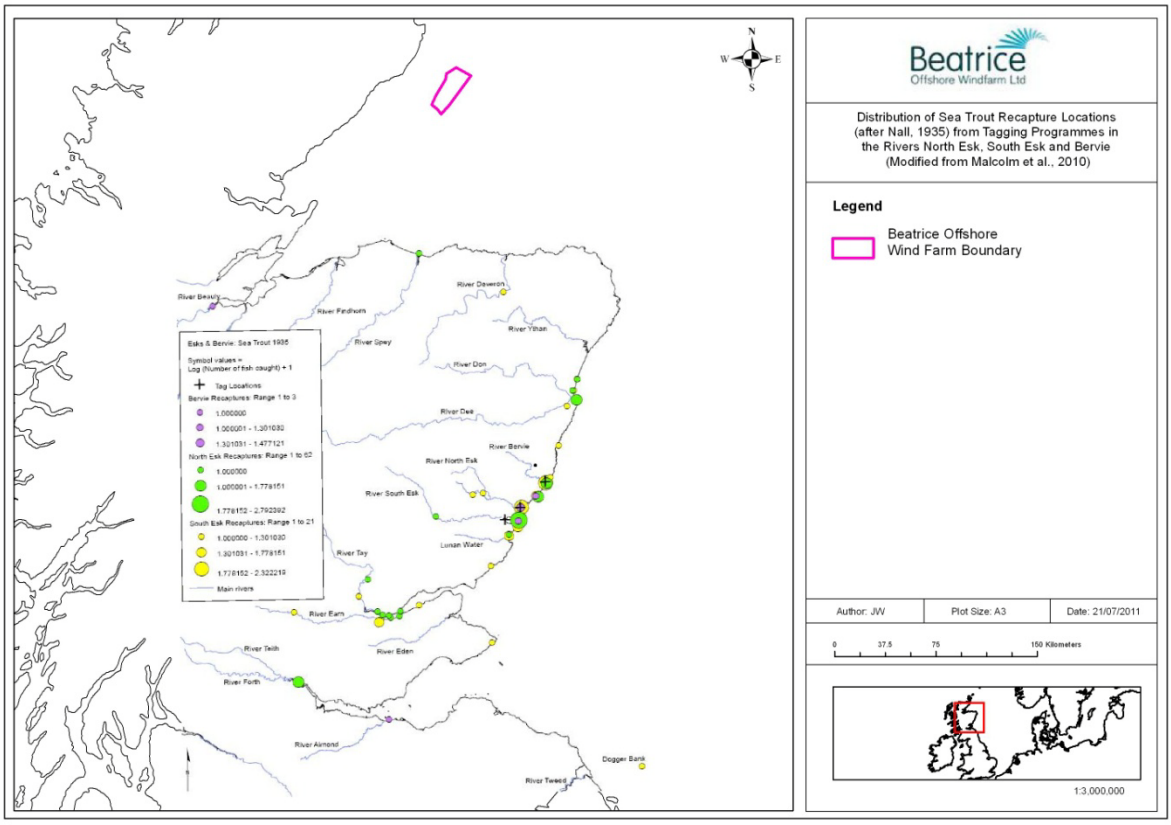



**Figure 3.4 Distribution of Sea Trout Recapture Locations (after Nall, 1935) from Tagging Programmes in the Rivers North Esk, South Esk and Bervie (Modified from Malcolm *et al,* 2010)**

Little is known about the behaviour of sea trout during migration around Scottish coastal and distant waters. Research carried out in Norway indicates a preference for swimming at depths below 3m, however, within the same study, records of sea trout at depths up to 28m were also observed (Rikardsen *et al*, 2007).

## 3.4 Navigation and Orientation

There is limited information in the literature to describe in detail the navigation and orientation mechanisms used by salmon and sea trout during their marine migration. Furthermore comprehensive and robust scientific information specific to salmon and sea trout originating from Scottish rivers is lacking. A summary of available information is given below.

Olfaction is thought to play an important role in the orientation of salmonids and it is widely accepted that the final phase of the spawning migration is primarily governed by olfactory discrimination of home-stream water (Hasler and Scholz, 1983; Døving *et al*, 1985).

In addition to olfactory stimuli, salmonids are known to be capable of sensing magnetic cues during certain types of spatial activity (Chew and Brown, 1989; Taylor, 1986). In Atlantic salmon, biomagnetic particles, particularly associated with the lateral line, which are of a size suitable for magnetoreception are believed to allow them to follow a rough compass heading, facilitating orientation with respect to the geomagnetic field during the oceanic phase of their migration (Potter and Dare, 2003; Lohmann *et al,* 2008a).The presence of magnetoreceptors and the ability to use the geomagnetic field for spatial orientation has also been documented in sea trout (Formicki *et al*, 1997; Formicki *et al,* 2004).

Based on the ability of salmonids to identify olfactory and electromagnetic cues, it has been hypothesised that both mechanisms may play a role in navigation and orientation in salmonids, and that these may function sequentially over different spatial scales (Lohmann *et al*, 2008b).

In line with the above, research carried out in Norway (Hansen *et al,* 1993) suggests the existence of two phases to the homing migration of maturing Atlantic salmon from the feeding areas to their home rivers; a first phase with crude navigation from the feeding areas towards the Norwegian coast and a second phase with more precise navigation in coastal and estuarine waters towards their home rivers. Similarly, research undertaken in Iceland (Sturlaugsson *et al*, 2009) suggests the existence of behavioural differences in salmon orientation in offshore and inshore areas related to increased use of olfactory sense in inshore areas. This study also found that fixed direction all the way from offshore areas to the home fjord area or home estuary could not explain their migration and it was suggested that shoreline orientation is of importance once the shore has been approached. Based on the findings, the authors recommended the spawning migration of salmon at sea to be divided into three phases in relation to the different orientation behaviour in offshore, inshore and estuarine areas.

## 3.5 Feeding

Salmon and sea trout seaward migration is thought to be related to increased growth rates at sea derived from the existence of greater feeding opportunities in the marine environment (Haugland *et al,* 2006; Rikardsen *et al*, 2006). A review of the feeding habits and diet of salmon and sea trout at sea is given below.

### 3.5.1 General

#### 3.5.1.1 Salmon

Atlantic salmon are generalist and opportunistic predators of zooplankton and nekton at the ocean surface (Jacobsen and Hansen, 2001, Lacroix and Knox, 2005, Haugland *et al*, 2006). They feed on a variety of small fish including capelin, herring, sandeels and sprats in addition to other surface-living small components of the zooplankton, principally crustaceans (Mills *et al,* 2003).

Studies carried out in fjords and coastal areas in Norway suggest salmon start to feed on marine organisms immediately after their transition to saltwater and found salmon post-smolts largely feeding on small fish (0-group), with sandeel and herring being of importance as prey items. Blue whiting was found to be of importance as a prey only in the slope current that transports larvae from its spawning areas west of UK into the North and Norwegian Seas (Haugland *et al*, 2006).

Research based on stomach contents of wild and escaped farmed salmon in the North East Atlantic (Jacobsen and Hansen, 2001) found evidence of selective foraging in salmon. Jacobsen and Hansen (2001) results suggest that fish species were preferred over crustaceans and amphipods over euphausiids. In addition, a relation between sea age and food habits was also found, where larger salmon (3+SW) tended to be more piscivorous than smaller fish.

Research carried out in the Baltic Sea (Karlsson *et al,* 1999) also suggests seasonal changes in feeding habits, with salmon primarily feeding on sprat in the winter from January to April, and herring and spined stickleback later in the year.

Jacobsen and Hansen (2001) also found seasonal variations in feeding habits, with amphipods, euphausiids and mesopelagic shrimps being the principal food sources in autumn, whilst in the winter mesopelagic fish were important. It has been suggested (Rikardsen *et al*, 2004) that spatial and temporal differences in prey availability may be related to geographical differences in feeding habits in salmon.

#### 3.5.1.2 Sea Trout

Sea trout at sea feed on a variety of organisms, changing gradually from small crustaceans to small fish such as sandeels and sprat (Potter and Dare, 2003; MSS, 2010a). Food preferences are thought to be dependent on habitat, season and fish size and age (Knutsen *et al*, 2001).

Studies carried out in Mulroy Bay in the Irish Sea suggest that as sea trout increases in fork length their diet tends to include more fish and fewer crustaceans (Fahy, 1985). Similarly, investigations by Pemberton (1976b) in North Argyll sea lochs found that young fish, principally clupeids and sandeels, featured more in the diet of larger trout than in the smaller size range.

Seasonal studies of the feeding of sea trout in fjords in northern Norway (Rikardsen *et al,* 2006) found sea trout feeding on marine crustaceans and polychaetes during early and late winter, whilst in summer and autumn their principal prey items were small fish such as juvenile herring. This is in line with the findings of Pemberton (1976b), which suggest that benthic feeding (crustacean and annelids) was more important in winter, while midwater and surface organisms (young fish and insects) were preferred in the summer. In addition, Pemberton (1976b) suggested a diel feeding pattern, with bottom feeding being greatest during the day and mid-water and surface feeding increasing between sunset and sunrise.

### 3.5.2 Feeding in the Moray Firth

As discussed above there is limited information currently available to be certain of the exact use that salmon and sea trout make of coastal areas around Scotland. Based on the distribution of prey, primarily sandeel, juvenile herring and sprat (See Fish and Shellfish Ecology Technical Report), it is reasonable to assume that the Moray Firth is used as a feeding ground by some components of the salmon and sea trout Scottish populations. This is likely to be of greater relevance to fish originating in rivers flowing into the Moray Firth.

The extent to which salmon may feed in the Moray Firth area is likely to be seasonally limited (e.g. after leaving the rivers as smolts and prior to river entry) and opportunistic, (e.g. depends on the

availability of prey). In the case of sea trout, however, as they generally do not migrate to distant feeding grounds, there is potential for the Moray Firth to be used as a feeding area for extended periods of time during the their marine phase. The main feeding season for sea trout at sea occurs from March to June. Sea trout generally starts returning to the rivers from June onwards with some waiting until October to return (Consultation Meeting, 2011a)

## 3.6 Conservation Status

Atlantic salmon (*Salmo salar*) is listed in Annexes II and V of the EU Habitats Directive as a species of European importance and Annex III of the Bern Convention. The protection given to salmon through the Habitats Directive, however, is restricted to freshwater habitats, as marine and estuarine sites are excluded from selection. Similarly, salmon at sea is not protected under the Bern Convention.

Through the implementation of the Habitats Directive and as a result of the European importance of Scotland's salmon populations, eleven Scottish rivers have been designated as Special Areas of Conservation (SACs), with salmon being a primary reason for the selection of the sites. Of these, two are located in the regional study area, the River Spey and Berriedale and Langwell Waters. It should be noted that the salmon populations of these rivers are of high quality. A high proportion of the rivers is accessible to salmon and support the full range of life-history salmon types with sub-populations of spring, summer salmon and grilse all being present (JNCC, 2010). In the Moray Firth, salmon is also a qualifying feature for selection of the River Oykel and Moriston SACs.

The distribution of salmon SACs is shown in Figure 3.5, including the River Thurso, River Naver and River Borgie in the north coast of Scotland and the River Dee in the Aberdeenshire coast, in addition to the aforementioned SACs.

Further to the protection given under the EC Habitats Directive, Atlantic salmon is listed as a UK Biodiversity Action Plan (BAP) priority species and is protected at the international level by the North Atlantic Salmon Conservation Organization (NASCO), an inter-governmental organisation devoted to the conservation, restoration, enhancement and rational management of wild salmon in the North Atlantic (Curd, 2010).

Sea trout (*Salmo trutta*) is not subject to the same level of protection as salmon in Europe although it is also listed as a UK BAP priority species. In addition, as a result of the definition of the term salmon in the Scottish legislation, sea trout is currently protected at the same level as Atlantic salmon in Scotland. Under the Salmon (Scotland) Act (1986) the terms salmon means: *"all migratory fish of the species Salmo salar and Salmo trutta and commonly known as salmon and sea trout respectively or any part of any such fish"*

In addition to the above, the marine part of the life cycle of both Atlantic salmon and sea trout is included in the draft list of Priority Marine Features (MPF) in Scottish coastal waters recently compiled by the SNH.

It should be noted that the population dynamics of another species of conservation importance, the freshwater pearl mussel (*Margaritifera margaritifera*), is closely linked to the presence of salmonids in the rivers (JNCC 2011). During the larval stage *M. margaritifera* attaches itself to the gills of salmonids in river in mid to late summer. The following spring it drops off its host to settle in the riverbed gravel where the juvenile grows into an adult. Freshwater pearl mussels are protected under the Wildlife and Countryside Act (1981) of Great Britain and listed as UK BAP Priority Species (UKBAP 2011) and also listed on Annexes II and V of the EC Habitats Directive and Appendix III of the Bern Convention (EC 2011, Bern Convention 2011).

Recent declines in freshwater pearl mussel populations have been caused by factors such as pearl-fishing, pollution, acidification, organic enrichment, siltation, river engineering, and declining salmonid stocks (JNCC 2011). Pearl mussel are the primary reason for selection of a number of SACs in the Moray Firth, these are the Evelix, the Oykel, the Moriston and the Spey. In the Spey the population is estimated at several millions and is considered of international significance (JNCC 2011).

In addition, the distribution of sea lamprey (*Petromyzon marinus*) (also a primary reason for selection of the River Spey SAC), is largely dictated by the distribution of their host (Waldman *et al* 2008). At sea, lamprey feed on a variety of marine mammals and fish, including salmon, shad, herring, pollock, cod, haddock, swordfish and basking sharks (Kelly & King, 2001, ter Hofstede *et al* 2008). *P. marinus* is listed as Annex III species in the Bern Convention and Annex II species in the Habitats Directive. Furthermore, the species has been listed as Priority Marine Feature (PMF) in Scottish territorial waters, in the UKBAP priority list and in OSPARs list of threatened and/or declining species and habitats.

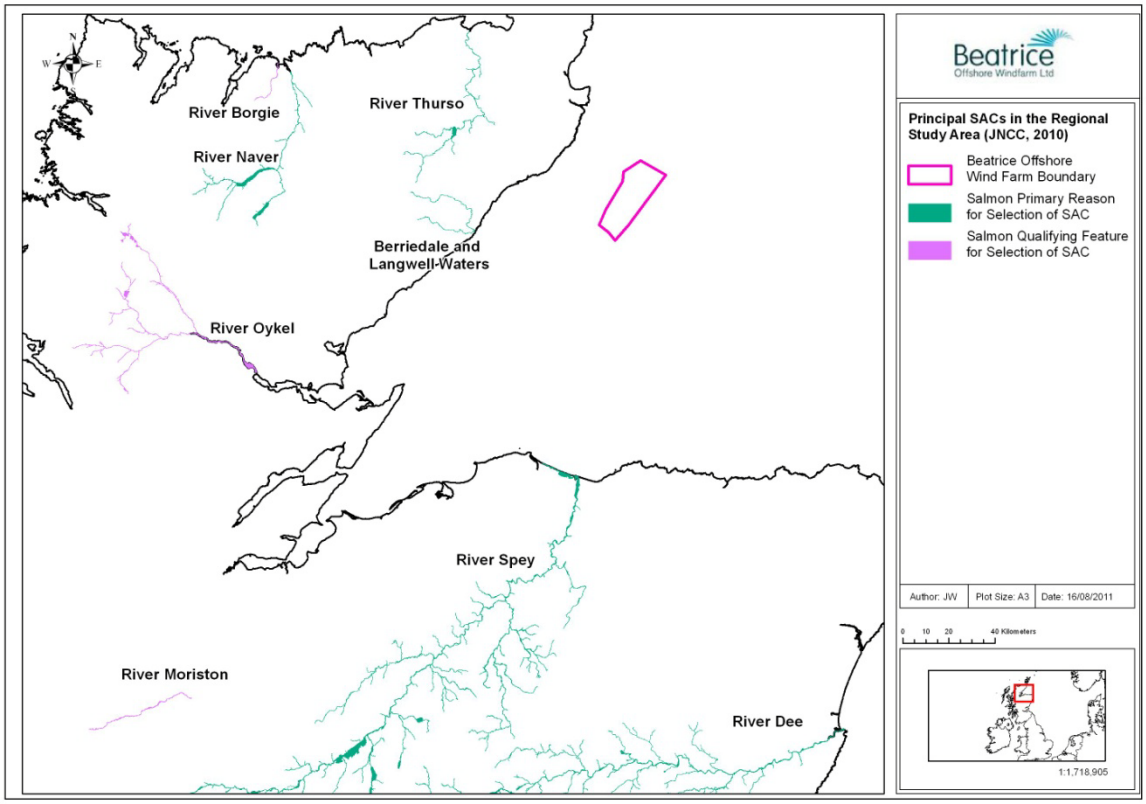



**Figure 3.5 Distribution of Special Areas of Conservation (SACs) for Atlantic Salmon**

## 3.7 Threats to Salmon and Sea Trout

Salmon and sea trout populations are subject to a number of threats in both the freshwater and marine phases. Atlantic salmon stocks are currently considered under threat across their northern hemisphere range and sea trout populations in decline throughout the United Kingdom (Crawley, 2010). In fresh water, degradation of juvenile and spawning habitat, and land use, in particular intensive agriculture, are thought to be having the greatest effect, whilst in the marine phase there

is concern over the recent decline in post-smolt marine survival rates (Hendry and Cragg-Hine 2003, ICES 2009).

A summary of the main threats that salmon and sea trout are exposed to in the rivers, coastal and marine environments is given below (AST, 2010b; Curd, 2010; NASCO, 2009).

Rivers

- Changes to the quantity of water (hydrology) from abstraction and flow regulation created by activities such as power generation, drinking water supply and irrigation for agriculture.
- Changes to the physical habitat (geomorphology) including straightening and deepening of rivers, building of embankments, removal of river bank vegetation and reinforcement of banks.
- Changes to the quality of water through nutrient enrichment and pollution from agriculture and sewage pollution, urban drainage, forestry, mining and quarrying.
- Invasive non-native species predating on juvenile and adult salmon such as American mink (*Mustela vison*) and North American Signal Crayfish (*Pacifastacus leniusculus*).
- Predation by birds
- Disease
- Poor angling practices
- Poachers

On the coast

- Interceptory mixed stock nets
- Fish farms - sea lice, disease and escaped farmed salmon
- Pollution
- Increased predation by seals and other marine mammals

At sea

- Climate changes affecting feeding and survival opportunities (e.g. changes in sea surface temperatures)
- Fishing, including indirectly through over-exploitation of their food resource and directly through unintentional capture when fishing for other species such as herring and mackerel.

The majority of threats to salmon and sea trout in the rivers are being addressed in most salmon districts by DSFBs, generally in conjunction with Trusts and conservation groups, through the implementation of river management and water quality schemes, the removal of obstacles to migration, the establishment of fishing codes of practice and other such initiatives.

Efforts made within the rivers to maintain and conserve salmon and sea trout stocks are however limited in their effectiveness as a result of stock management measures implemented in coastal waters and in the high seas and by changes in the status of the stocks caused by sea mortality and other factors. In this context, two aspects of relevance are the persistence of Multi Stock Fisheries (MSFs) in Scotland, which target fish from more than one stock/river (e.g. coastal netting), and the current trend of increased post-smolt mortality at sea (Hansen and Queen, 1999).

### 3.7.1 Multi Stock Fisheries (MSFs)

The exploitation of salmon and sea trout by MSFs holds particular problems to the implementation of management practices. The fisheries can be damaging because they have potential to intercept any salmon or sea trout in their vicinity, regardless of where those fish are heading or the strength of the population in their natal rivers (Crawley, 2010).

### 3.7.2 Increased Marine Mortality

Increased marine mortalities in post-smolts are thought to be related to climatic variations such as the increase in sea surface temperature (SST) (Beugrand and Reid, 2003; Friedland *et al*, 2009; Friedland *et al,* 2000; Todd *et al*, 2008).

Salmon populations are also of concern due to the sharp decline in growth condition observed in recent years in 1SW salmon (grilse) and 2SW salmon (Todd *et al*, 2008; Davidson and Cove, 2010). The growth reductions are thought to be indicative of recent and large-scale ecological shifts in the Easter North Atlantic epipelagic ecosystem and the likely importance of bottom-up control in the food web (Todd *et al*, 2008).

There is also concern on sea trout populations in relation to low catches and possible marine feeding influences. A study undertaken in the Moray Firth area based on sea trout scales and related data collected in the river Spey (Walker, 2009) suggests a trend to earlier smoltification and maturity in terms of sea age in sea trout. The same study, however, found growth at sea is currently in line with historical values (1920's).

### 3.7.3 Current Research Initiatives

A number of initiatives have been implemented by NASCO and ICES to improve knowledge about the distribution and migration of salmon at sea, which in turn may help to understand mortality of salmon during their marine phase (ICES, 2009). The international co-operative SALSEA programme, adopted in 2004 was designed to improve the understanding of the migration and distribution of salmon at sea in relation to feeding opportunities and predation. In 2008, the SALSEA-Merge project was launched as part of the SALSEA Programme, aiming to advance understanding of stock specific migration and distribution patterns and overall ecology of the marine life of Atlantic salmon and gain an insight into the factors resulting in recent increases in marine mortality, by merging genetic and ecological investigations.

In line with the SALSEA-Merge project, Rivers and Fisheries Trusts of Scotland (RAFTS), the Scottish Government's Marine Scotland Directorate an all the fisheries Trusts around Scotland, have commenced a collaborative programme of genetic work, "Focusing Atlantic Salmon Management on Populations" (FASMOP), with the aim of understanding the structuring of river stocks of Atlantic salmon into breeding populations. In addition, MSS's Research Project "Development of a General Spatial Model of Within River Population Structuring in Scottish Atlantic salmon (POPMOD), using molecular genetic data on salmon information collected by MS, and through SALSEA-Merge and FASMOP, is anticipated to provide a general model which can be used to predict population structuring within any Scottish salmon river and evaluate the potential for using genetic estimates for monitoring the conservation status of breeding populations.

The decline in sea Trout numbers in recent years has been reflected in their numbers from most rivers throughout the Moray Firth and widespread concern about this has led to the formulation of a research project, the Moray Firth Sea Trout Project (MFSP), to identify the reasons behind it. The MFSTP is a three year collaborative project combining the efforts of DSFBs, Fisheries Trusts and Angling Associations around the Moray Firth. The management area extends from the River Deveron in the East right round to the Kyle system in the North and takes in all rivers and coastal streams round the coast.

# 4.0 Salmon & Sea Trout Fisheries

## 4.1 Introduction

Salmon and sea trout form an important part of Scotland's natural heritage. In addition, they support and maintain the existence of commercial and recreational fisheries which are of importance to the Scottish economy. A study undertaken by the Scottish Executive (Radford *et al,* 2004) estimated that game and coarse anglers spent a total of £131m in Scotland of which 65% (£73m) corresponded to salmon and sea trout fishing. A similar study undertaken in the Spey (Riddington *et al*, 2004) calculated that in 2003 the expenditure by salmon anglers generated £11.8 million and supported 367 full-time equivalent jobs in the catchment. Extrapolation of these results to all Moray Firth rivers indicates that angling generated approximately £28.8 million in the area in 2003 (Butler, 2004). In the Kyle of Sutherland, Radford *et al* (2007) estimated that angling related tourism were worth £3.37 million annually to the local economy (KSFT 2007, Consultation Meeting, 2011b).

It should be noted that the definition of salmon under the Salmon Act (1986) includes both Atlantic salmon (*Salmo salar*) and sea trout (*Salmo trutta*). Where applicable, the term may subsequently be used to describe both species.

## 4.2 Salmon Fishing Rights, Administration and Regulations

### 4.2.1 Fishing Rights

The right to fish for salmon in Scotland, whether in inland waters or at sea, is a heritable right. The taking of salmon without the right or written permission to do so is prohibited under the Salmon and Freshwater Fisheries (Protection) (Scotland) Act, 1951.

The rights originally belonged to the Crown, however as with land, the Crown has made grants of salmon fishing to others and ownership is now widely distributed among private individuals, companies, local authorities and others. The rights can be bought, sold or leased independently of land except in Orkney and the Shetlands (Williamson, 1991).

The Crown still owns areas along the coast and in rivers. Since the late 1980s, however, the Crown Estate has supported a policy of conservation by retaining coastal netting stations in hand and unlet. There are therefore, no longer any coastal netting stations let by the Crown and none are actively fished (The Crown Estate, 2010). The existing working netting stations were therefore granted or sold the heritable title by the Crown Estate before the late 1980s (Crawley, 2010).

### 4.2.2 Fisheries Administration

Salmon fisheries in Scotland, both inland and at sea, are managed by their owner or leaseholder under a framework of regulations laid down by central government.

For the purposes of salmon fishery management, Scotland is divided into 54 statutory Salmon Fishery Districts, each with a catchment area including a river or group of rivers (ASFB, 2010). Today, almost without exception, every district has formed a District Salmon Fisheries Board (DSFB) made up of the owners or leaseholders of the fishing rights. These boards manage the rivers and coastal netting zones, being able to appoint bailiffs with the power to enforce regulations and restrictions, as well as establishing other practices for improving and maintaining fish stocks, and monitoring and controlling river conditions. Each salmon fishery in each district has a value, which is calculated by the district assessor. Individual boards are self-financing and generally raise money by taxing rights' owners within their district. This often works on a sliding scale, according to the number of fish caught. In 1999 the government made a revision to the constitution of the boards to allow for wider representation by bodies such as the Scottish Environment Protection Agency (SEPA), Scottish Natural Heritage (SNH) or others such as local angling clubs and associations (ASFB, 2010).

The boundaries of the Scottish salmon fishery districts as formalised by the Salmon Fisheries (Scotland) Acts 1862-1868, are shown in Figure 4.1. As explained in Section 2.2.2 above, some districts have been joined together and superseded by larger districts, resulting in the current 54 districts.

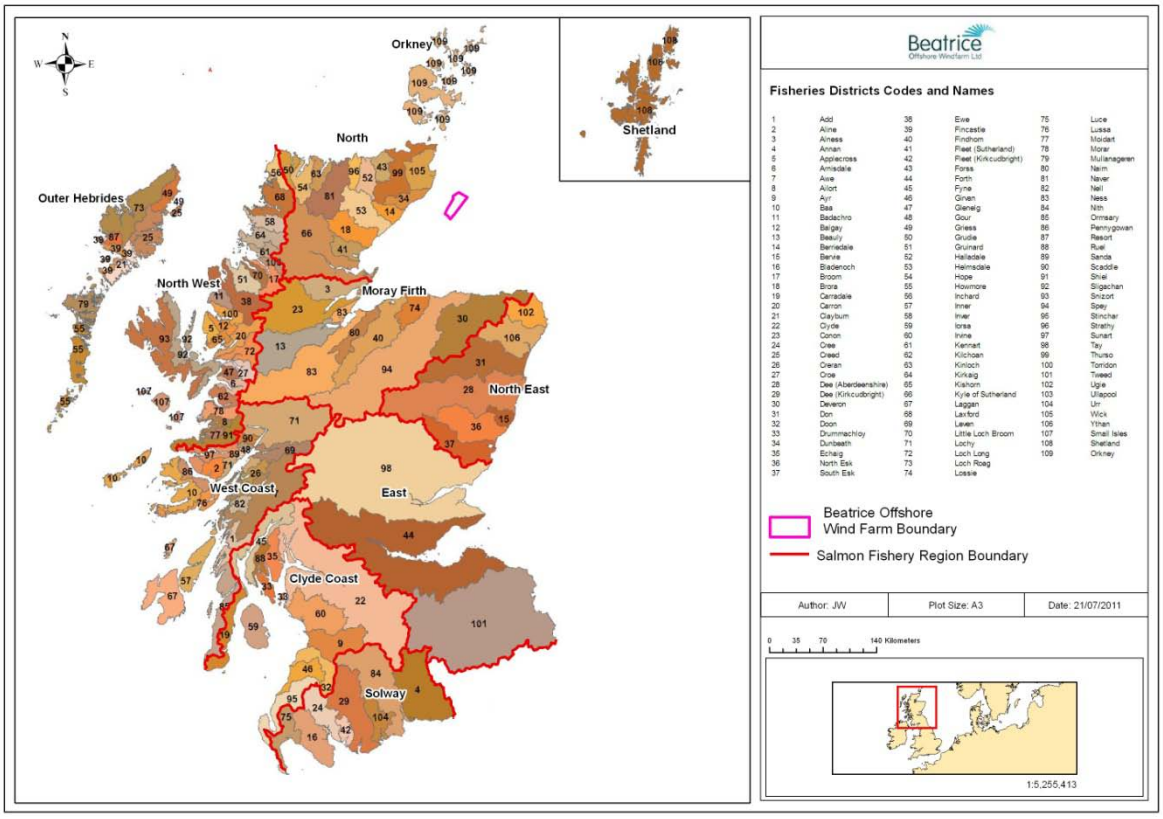



**Figure 4.1 Scottish Salmon Fishery Regions and Districts**

Boards hold powers relating to the introduction of new regulations on the fishery, the purchase of property to acquire rod or net fisheries, the imposition of fishery assessments on the fishery proprietors, etc (SPICe, 2000). Whilst the Boards themselves have no ability to make legal restrictions on fishing, applications are made to Scottish Ministers by the boards for changes and new regulations to be introduced.

In addition to the Boards, Marine Scotland (within the Scottish Government Enterprise and Environment Directive) oversees the fishery as a whole, promoting legislation and making regulations under the various Salmon and Fisheries Acts passed by the devolved government. The Inspector of Salmon and Freshwater Fisheries monitors the effects of legislation and the operation of the fisheries. Marine Scotland Compliance (formerly the Scottish Fisheries Protection Agency) enforces regulations at sea and helps the District Boards with local, coastal enforcement (Williamson, 1991); and Marine Scotland Science's Freshwater Fisheries Laboratory provides scientific advice on salmon and their fisheries.

## 4.3 Fisheries Regulations

### 4.3.1 General

All Scottish salmon fisheries are closed for a minimum of 168 days a year. Actual closure dates may vary but are mostly from late August to mid February, depending upon individual District Board policy. Angling may continue for a few weeks either side of this. Weekly closed times are also nationally enforced, being 24 hours (Sunday) in the case of angling and 60 hours for all other methods. Policies to reduce exploitation of salmon have been introduced in a number of fishery districts in the Moray Firth, where netting stations have voluntarily ceased fishing during February-June to protect the spring-running sub-stocks (Butler, 2004; Butler *et al,* 2008).

It is prohibited to take juvenile salmon (not including trout). There is a minimum mesh size of 90mm for nets, to enable smolts to escape.

There is no limitation on fishing effort within open fishing periods. There are however restrictions in place which act as indirect controls: restrictions imposed on the various fishing methods (discussed in Section 4.4); the exclusive right of the salmon fishermen through ownership or tenancy to decide fishing effort in their fishery; and regulations established and enforced by individual District Boards.

Salmon fisheries are saleable and netsmen or companies may acquire fishing rights over relatively large areas. Coastal heritable rights extend out to the 12nm limit, although coastal salmon fishing is limited by virtue of gear restrictions (Section 4.4). Other interested parties may also purchase rights. For example, the Atlantic Salmon Conservation Trust has historically bought coastal sites to close them down as a conservation measure in order to halt coastal netting activities. Similarly, rod-and-line interests may buy up river netting rights to close them down, often through the District Boards.

### 4.3.2 Inland waters

The only lawful fishing methods in inland waters are rod-and-line and net-and-coble. Fixed nets/engines are prohibited.

### 4.3.3 At sea

It is prohibited to catch fish by enmeshment. Troll or long-lining is also illegal. Effectively the only lawful methods are net-and-coble, fixed engines and rod-and-line.

## 4.4 Fishing Methods

The principal legal methods for catching salmon in Scotland are as follows:

- Fixed Engines (Bag and Skate Nets)
- Net-and- coble
- Rod-and-line

### 4.4.1 Fixed Engines

Bag and stake nets are the most common types of gear used to catch salmon in Scottish coastal waters and are commonly referred to as fixed engines. Salmon fishing using this method is not permitted in inland waters (rivers above the estuary limits).

Bag nets are set to fish just below the surface in rocky coasts where they will not ebb dry at low tide. They may be set singly or in a line extending seawards from the shore. The entire net or line of nets is not permitted to extend more than 1,300m from the mean low water mark, excluding mooring

warps or anchors. The nets must not be operated between 6pm Friday until 6am Monday. Catches are generally removed from the nets at slack tide (Galbraith and Rice, 2004; SI 1992/1974).
No part of the nets may be set with the purpose of catching fish by entanglement. The minimum mesh net size is 90mm. Nets are designed to target fish swimming close to the surface while following the coastline. The gear is made up of two principal elements, the trap and the leader. The trap is approximately 13.5m wide and 4.5 metres deep at the mouth, tapering to about 3m in width and 2.5m in depth at the head. The leader may not exceed 300m in length.

Stake nets are similar in design and operation to the bag nets except that they are set on sandy beaches, supported on stakes driven into the sand, where the receding tide exposes the nets. The maximum allowed leader length and total gear length are similar to those specified for bag nets. The configuration of a typical bag net is shown in Figure 4.2 below.

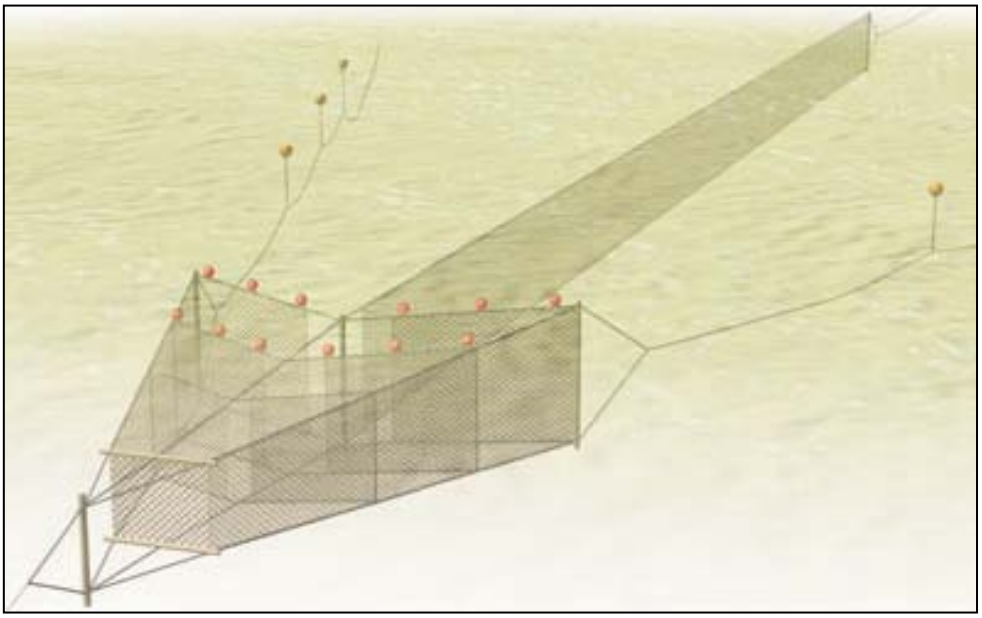


**Figure 4.2 Bag Net showing the Trap, the Leader and Moorings**

### 4.4.2 Net-and-coble

Traditionally nets are operated from cobles, small flat bottomed, open boats with a shore party assisting in operations. A member of the shore party holds the upstream hauling rope and the net is paid out from the stern of the vessel, as shown in Figure 4.3. The net must not be stationary or allowed to drift at any time and must be constantly 'swept', surrounding the fish and drawing them towards the shore. No other objects or obstructions may be used to aid fishing and adjacent netting operations must be at least 50 metres apart (Galbraith and Rice, 2004).

Net-and-cobles are generally operated in estuaries and the lower reaches of rivers, although small numbers are also used in coastal waters (Potter and Ó Maoiléidigh, 2006).

Figure 4.3 Net-and-coble Fishing

### 4.4.3 Rod-and-line

At present, recreational rod-and-line fishing is the most common method of fishing for salmon. The Salmon and Freshwater Fisheries (Consolidation) (Protection) (Scotland) Act 2003, defines rod-and-line as: "*a single rod-and-line (used otherwise than as a set line or by way of pointing, or by striking or dragging for fish) with such bait or lure as is not prohibited".* DSFBs can apply to Scottish Ministers for regulations specifying baits and lures that may not be used for rod-and-line fishing in their district to be made whilst in some cases voluntary restrictions are set by the boards. Usually the restrictions prohibit the use of shrimps, prawns or worms as bait and the use of lures bearing multiple sets of hooks (SPICe, 2000). The use of fish roe, fire or light as bait or lure is also prohibited (Salmon and Freshwater Fisheries (Consolidation) (Protection) (Scotland), 2003).

Salmon and sea trout are generally not caught by rod-and-line at sea, but along river beats. Most DSFBs operate and police a catch and release policy. Due to its popularity, the sport makes a significant contribution to both local and regional economies.

## 4.5 Fisheries Data

The information given in this section is principally based on reported catches of salmon, grilse and sea trout recorded from 1952 to 2009 by salmon fishery region and from 2000 to 2009 by salmon fishery district. In addition, further information gathered through consultation (See Section 2.3) with individual DSFBs, netsmen and other stakeholders is also given.

It should be noted that the analysis of fisheries statistics given below is not intended as an assessment of the abundance or state of the stocks, but as an indication of the underlying population trends and relative importance of the fisheries of salmon and sea trout by region and fishery district in Scotland. The critical time for fisheries does not necessarily represent critical times for salmon and sea trout movement and catch data is limited in terms of presenting an accurate baseline of fish populations and fish migration outside of the time of fisheries. This also holds true for rod-and-line catches which do not account for the closed season and give no effort value (See Section 2.2.1 above).

### 4.5.1 National

#### 4.5.1.1 Historical Data

A review of historical catch data for the rod-and-line (including catch and release) and the net fisheries (fixed engines and net-and-coble) is given in Figure 4.4 and Figure 4.5 respectively. This is based on catch data for all the Scottish salmon fisheries regions combined from 1952 to 2009.

In the rod-and-line fishery salmon catches have fluctuated over the years and clear trends are not apparent. The current catch for this species, however, appears in line with historical levels. For grilse, the trend has been an increase in the total annual catch, especially during the second half of the series, whilst for sea trout there has been a marked decline in catches in the last decade with respect to historical levels (Figure 4.4).

It should be noted that the catch statistics shown below do not take account of fishing effort. The increased popularity of rod-and-line fishing with respect to historical levels may, to some extent, be contributing to the catch values currently recorded by this method.

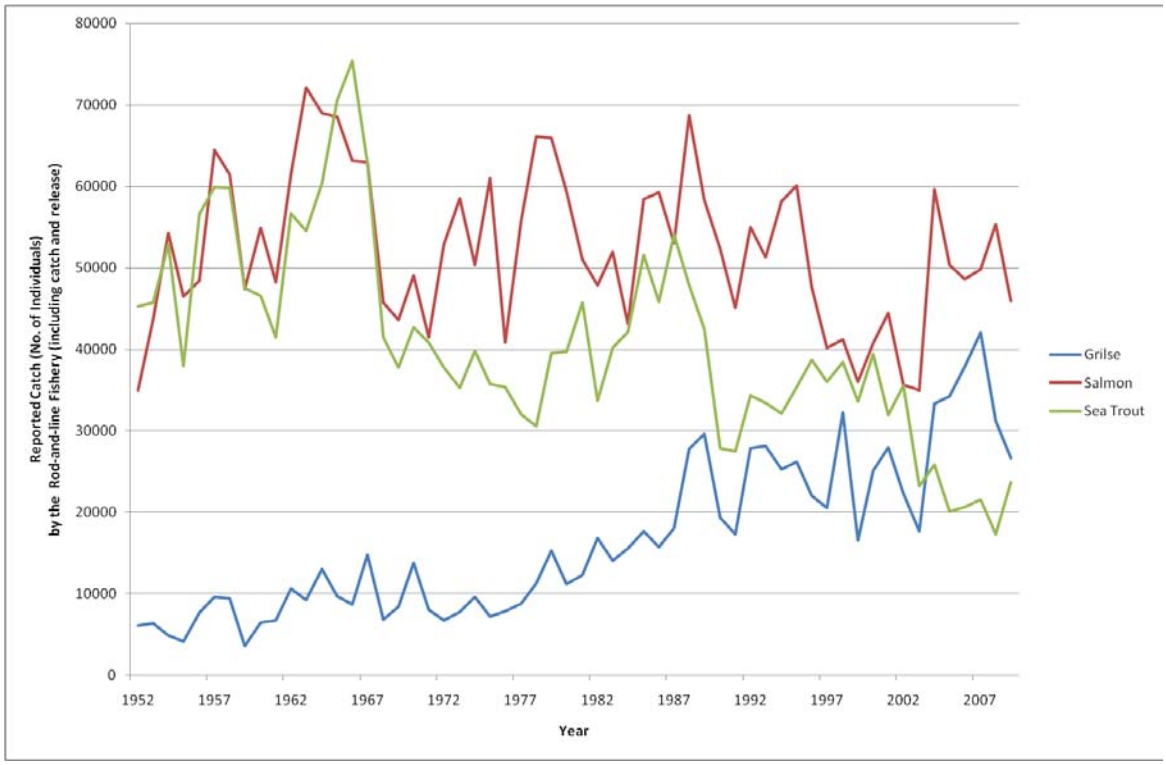



**Figure 4.4 Rod & Line (including Catch & Release) Reported Catches in Scotland (1952-2009)**

The net fishery has shown a strong decline in catches since the late 1960's for salmon, grilse and sea trout, with the last two decades recording the lowest values in the 1952-2009 series (Figure 4.5). This trend is associated to the decline in fishing effort in recent years as a result of the buyout and closure of coastal netting stations, changes in abundance of salmon and the fall in the market price of wild salmon caused by competition from the aquaculture industry, among other factors (MSS, 2008). The decrease in netting effort may, to some extent, also be contributing to the catches currently recorded by the rod-and-line fishery in the rivers.

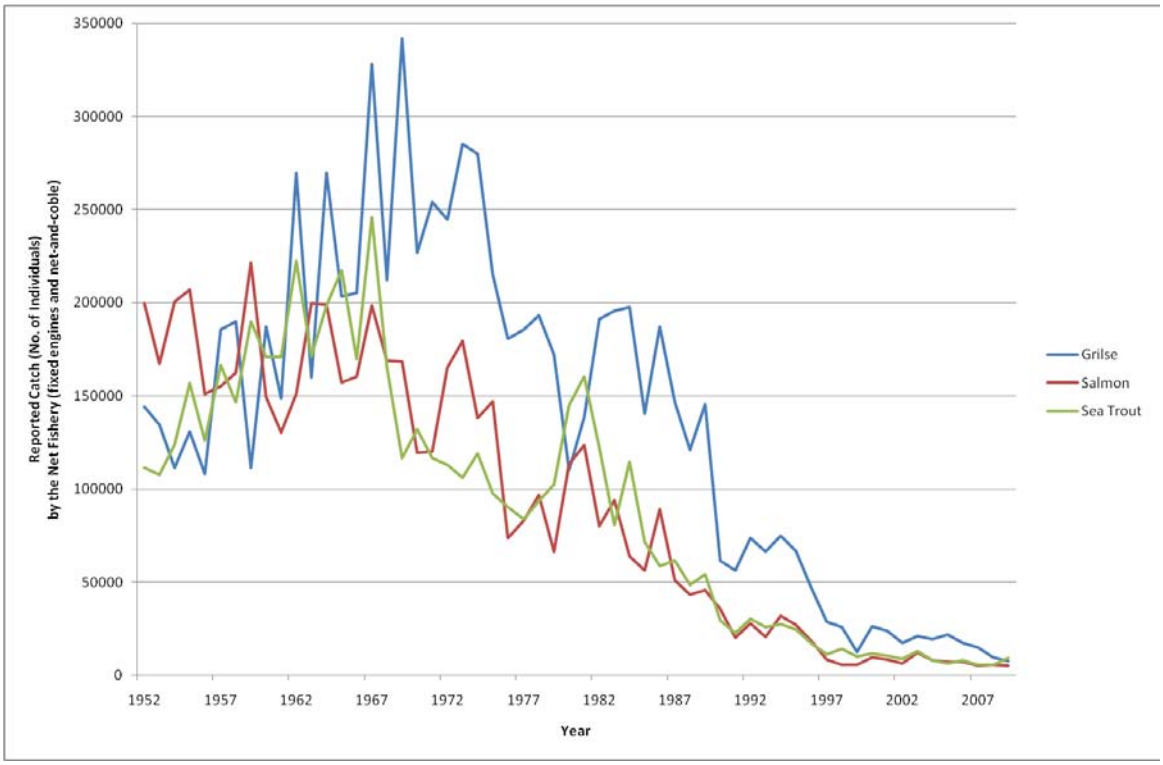



**Figure 4.5 Net Fishery (Fixed engines and Net-and-coble) Reported Catches for Salmon, Grilse and Sea Trout (1952-2009)**

### 4.5.1.2 Recent Trends

An indication of the relative importance of the salmon and sea trout fisheries in Scotland by region is given in Figure 4.6 and Figure 4.7 based on annual reported catches (average 2000-2009) by species and method respectively.

The highest annual catches are recorded in the North East and East salmon fishery regions, followed by the Moray Firth and the North. Catches in the west coast regions are comparatively low.

In general terms, grilse and salmon account for the majority of the annual reported catch in most regions with the exception of the Outer Hebrides, where sea trout represents a high percentage of the annual catch (Figure 4.6).

On a national scale rod-and-line is the principal fishing method, a high percentage of which is by catch and release. Netting is also of relative importance in some regions, especially the North, North East, East and Solway. The Moray Firth region records comparatively low catches by the net fishery (Figure 4.7).

The majority of reported catches from the net fishery are by fixed engines, however net-and-coble is also of relative importance in some regions, principally the North East and the East. The net fishery in Scotland is further discussed in Section 4.5.1.3 below.

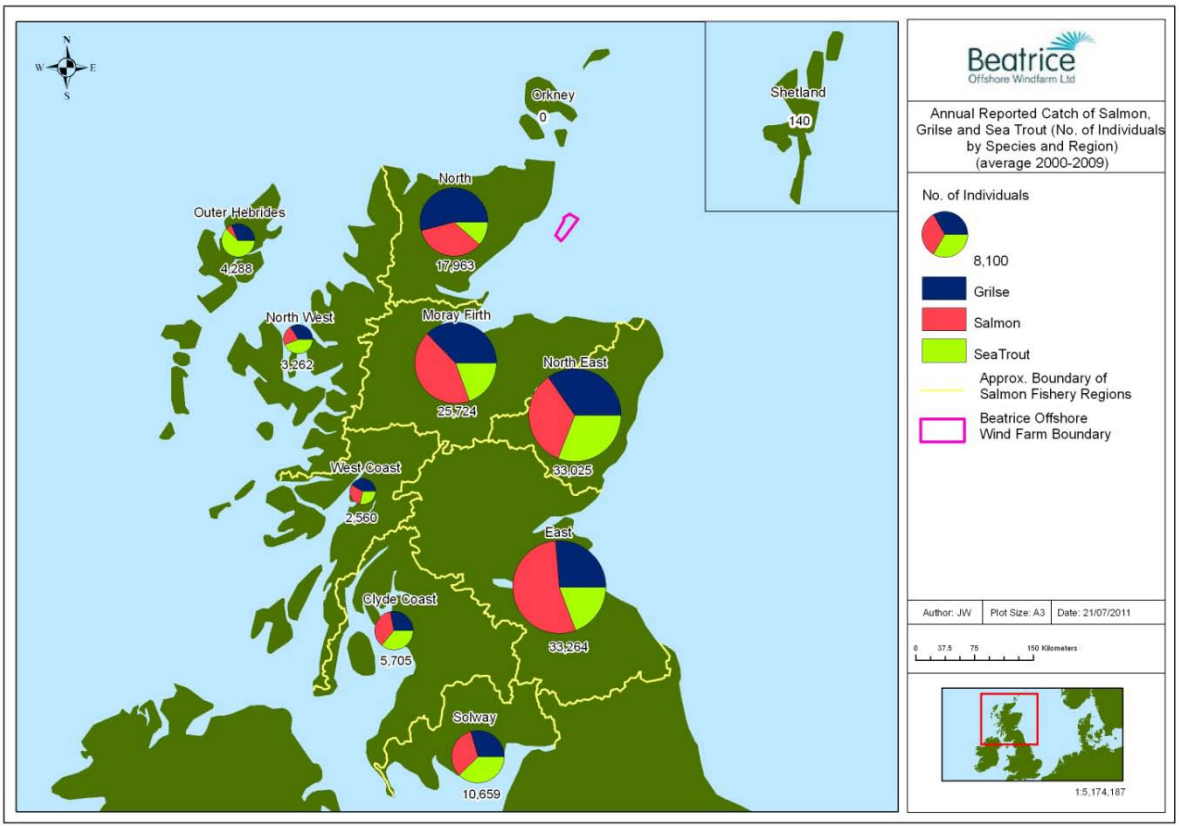



**Figure 4.6 Annual Reported Catch (No. of Individuals) by Species and Region (average 2000-2009)**

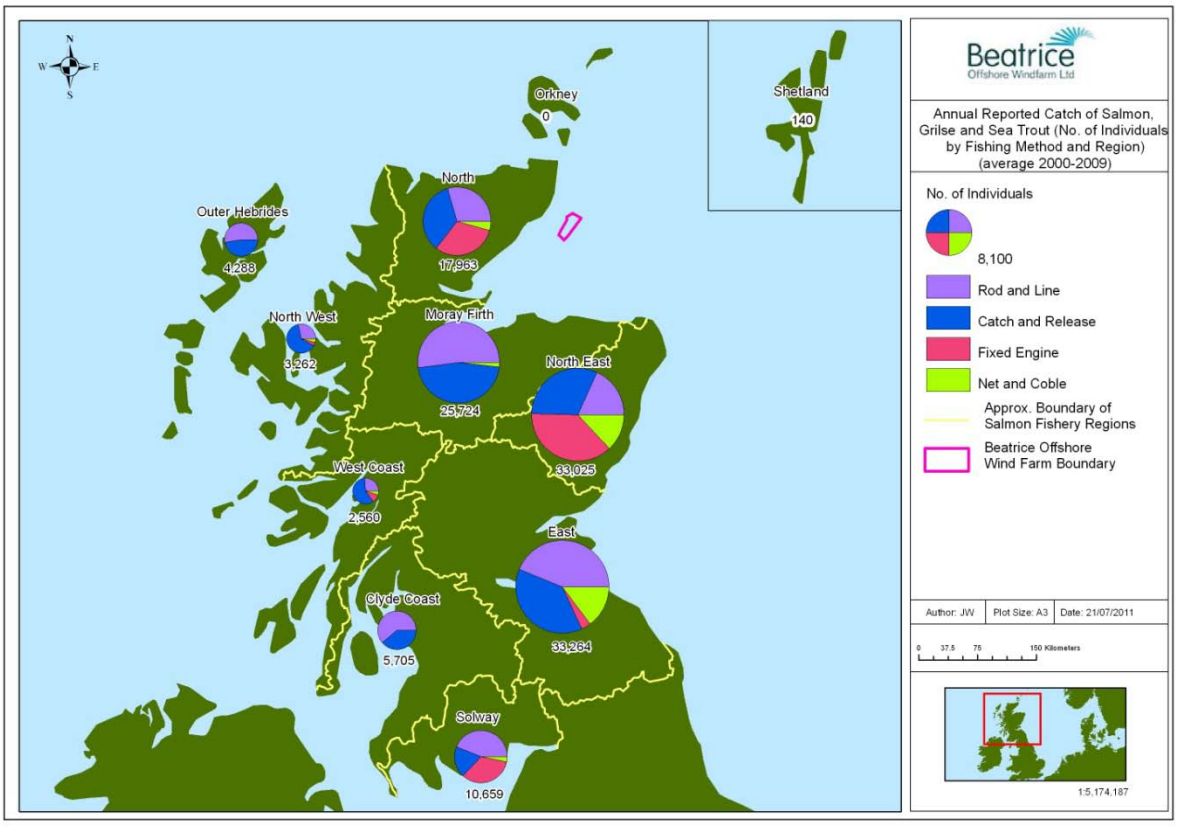



**Figure 4.7 Annual Reported Catch (No. of Individuals) by Method and Region (average 2000-2009)**

### 4.5.1.3 The Net Fishery in Scotland

An indication of the principal netting regions in Scotland based on annual average (2000-2009) reported catches by region and the spatial distribution of active net fisheries in 2009 is given Figure 4.8. Catches in the Moray Firth and North region have been further broken by individual district.

The North East and the North are the principal regions in terms of catches, followed to a lesser extent by the East and the Solway. Catch values by fixed engines are higher than by net-and-coble in most regions with the exception of the East and the Moray Firth region.

In the North region the majority of reported catches come from the districts of Strathy, Halladale and Thurso and, to a lesser extent, the Kyle of Sutherland and Dunbeath. In the Moray Firth region the catches of the netting fishery are comparatively low and only of relative importance in the districts of Conon, Ness, and Lossie.

As previously shown, the national trend is one of a decrease in netting effort. It is therefore likely that the annual values given below (average 2000-2009) will for the most part overestimate the current levels of exploitation of the fishery.

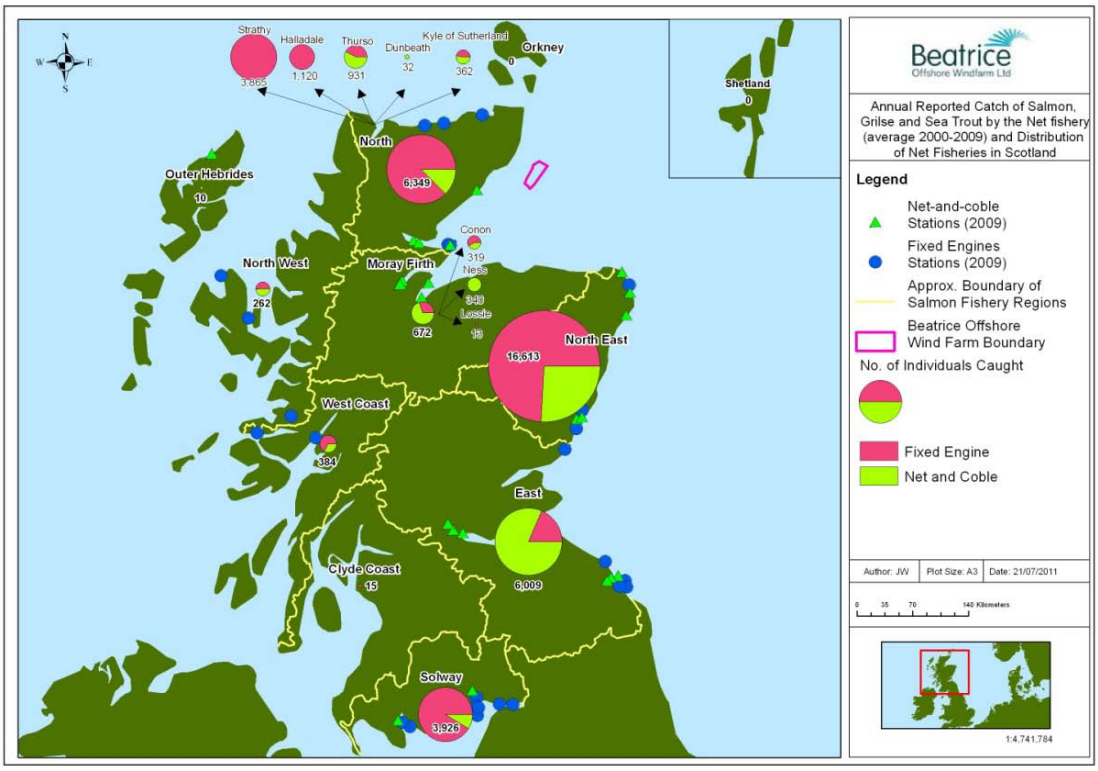



**Figure 4.8 Annual (averaged 2000-2009) Reported Catches by the Net Fishery and Location of Active Net Fisheries in Scotland in 2009 (MSS, 2011)**

### 4.5.2 Regional

#### 4.5.2.1 Overview

The distribution of the annual catch by district (averaged 2000-2009) within the regional study area is shown Figure 4.9 and Figure 4.25 below by species and method respectively.

Most districts are predominantly salmon districts, with grilse and salmon accounting for the majority of the catch. An exception to this is Lossie, where sea trout accounts for a high percentage of the total catch. Sea trout also makes an important contribution to the total catch in the Spey, Deveron and to a lesser extent to other districts (Figure 4.9).

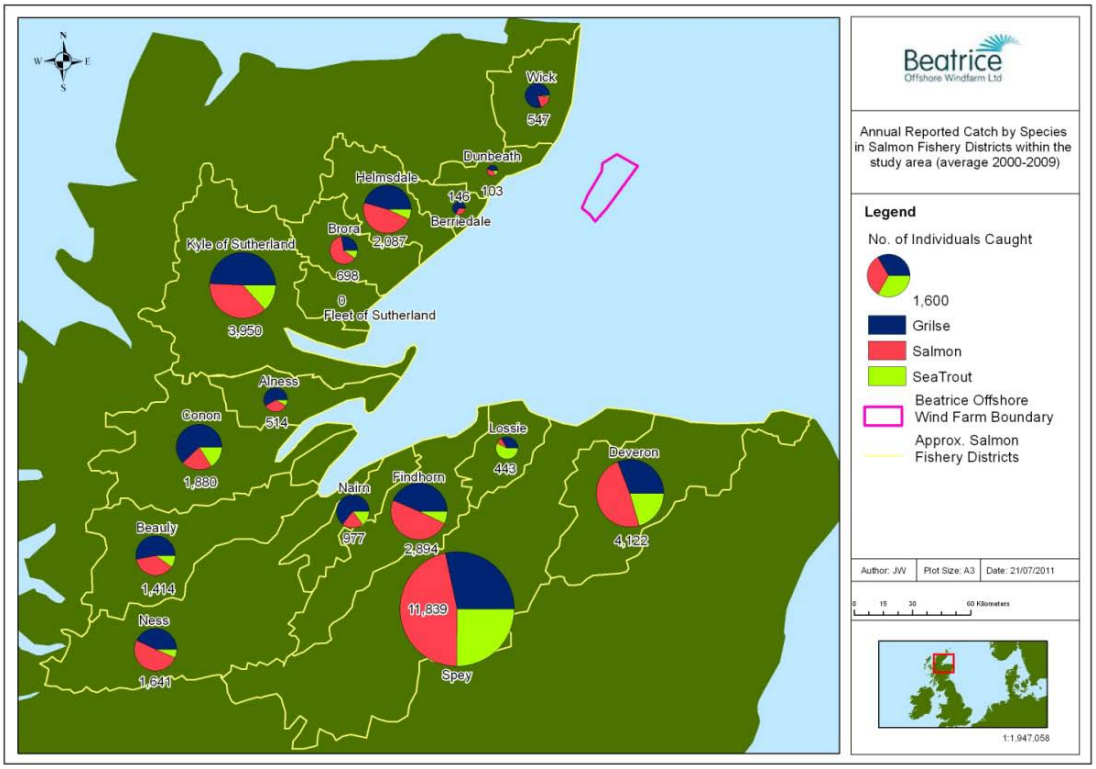
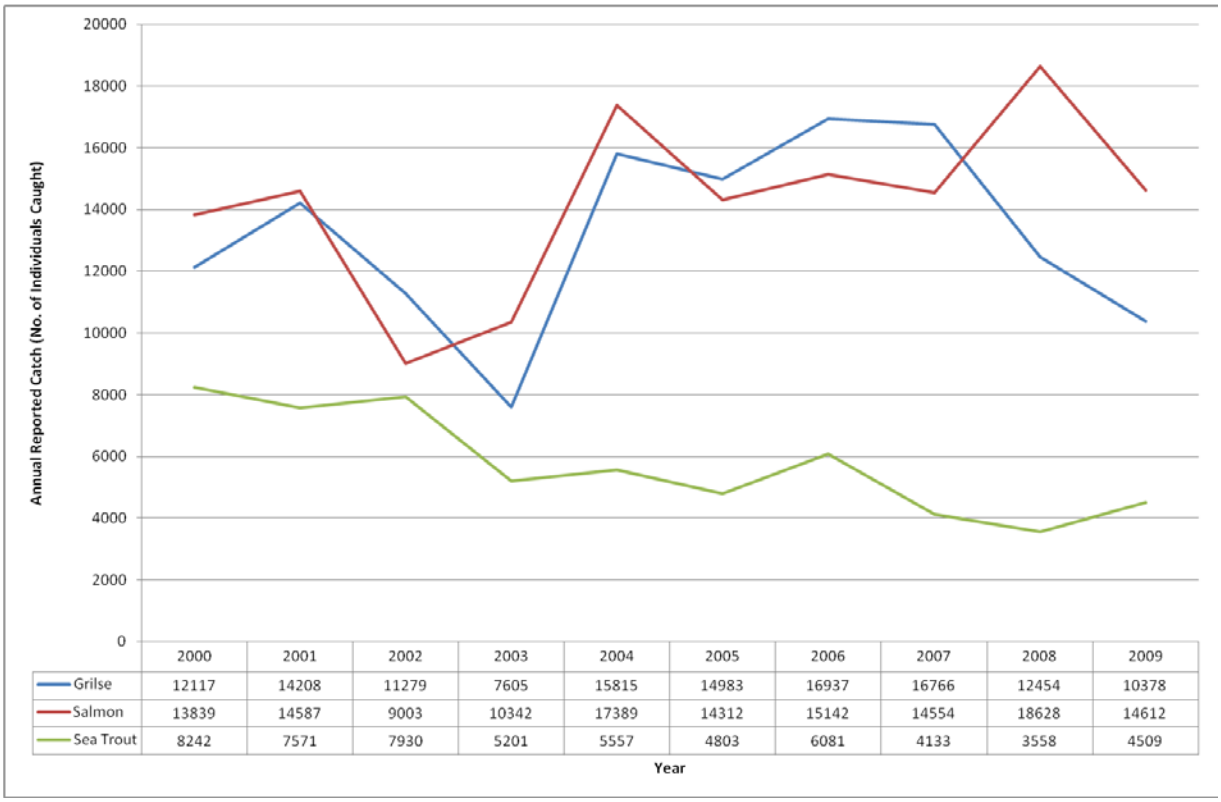



**Figure 4.9 Annual Reported Catch (average 2000-09) by District in the Regional Study Area**

An indication of the annual variation in reported catches by species in the regional study area is given in Figure 4.10 below for the period 2000-2009. The reported catch of salmon and grilse has fluctuated over the years with no clear trends being shown. Low catches for both salmon and grilse were recorded in 2002 and 2003. The following years the trend has been to an increase. In the case of grilse, however, 2008 and 2009 have also recorded relatively low values.




| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Grilse | 12117 | 14208 | 11279 | 7605 | 15815 | 14983 | 16937 | 16766 | 12454 | 10378 |
| Salmon | 13839 | 14587 | 9003 | 10342 | 17389 | 14312 | 15142 | 14554 | 18628 | 14612 |
| Sea Trout | 8242 | 7571 | 7930 | 5201 | 5557 | 4803 | 6081 | 4133 | 3558 | 4509 |

**Figure 4.10 Annual Variation in reported Catches in Salmon Fishery Districts in the Regional Study Area**

A breakdown of the catch by method in districts within the regional study area is given in Figure 4.11. Rod-and-line is the only fishing method used in most districts with catch and release making an important contribution to the total rod-and-line catch. Exceptions to this are the Ness, Conon, Kyle of Sutherland, Berriedale and Dunbeath Districts, where net-and-coble and/or fixed engines are also used although to a limited extent.

The variation in the annual catch in districts within the regional study area by method is shown in Figure 4.12. The catch by the rod-and-line fishery (rod-and-line and catch and release) has fluctuated over the ten year period under consideration. This fishery recorded highest catches in 2004 and 2006 after comparatively low values being recorded in 2002 and 2003. The increasing introduction of catch and release policies is apparent from the figure, particularly since 2005.

The catch by net fisheries, both net-and-coble and fixed engines, has been comparatively low during the ten year period under consideration and shows an overall trend to a decrease in catches. This is consistent with the national trend of a decline in netting effort.

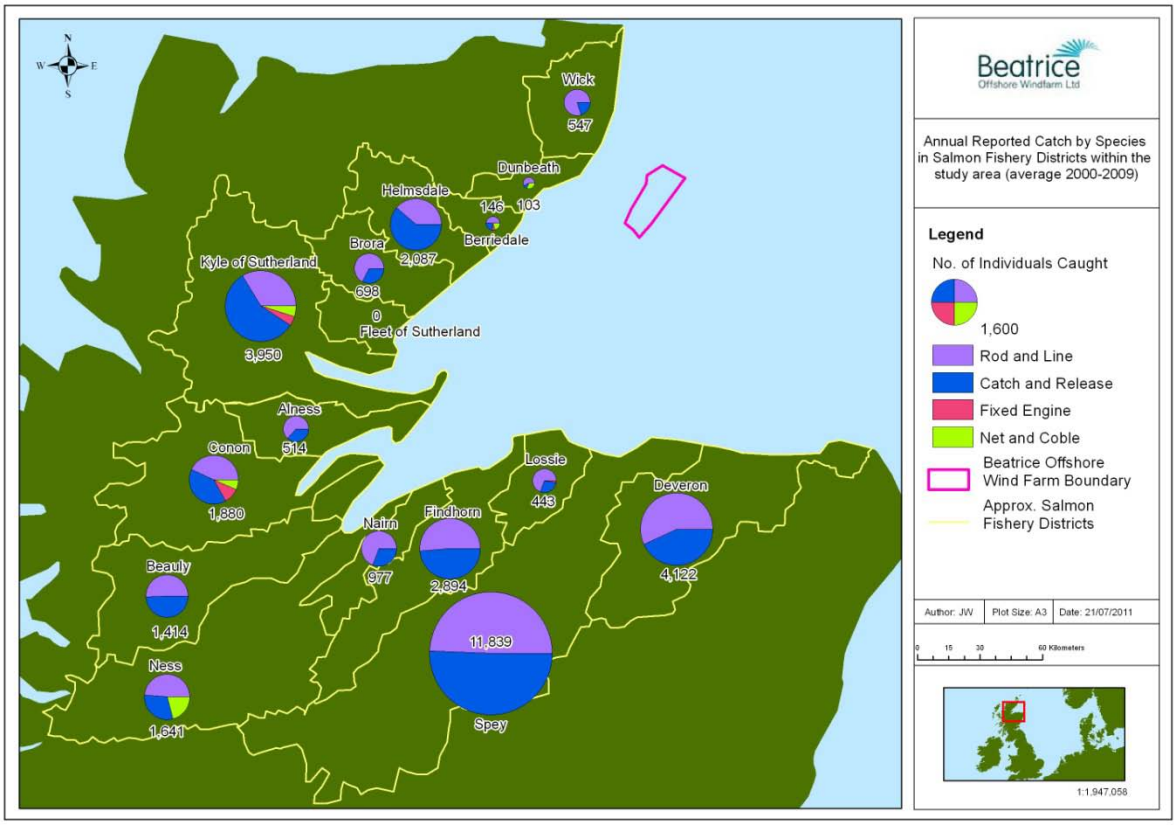
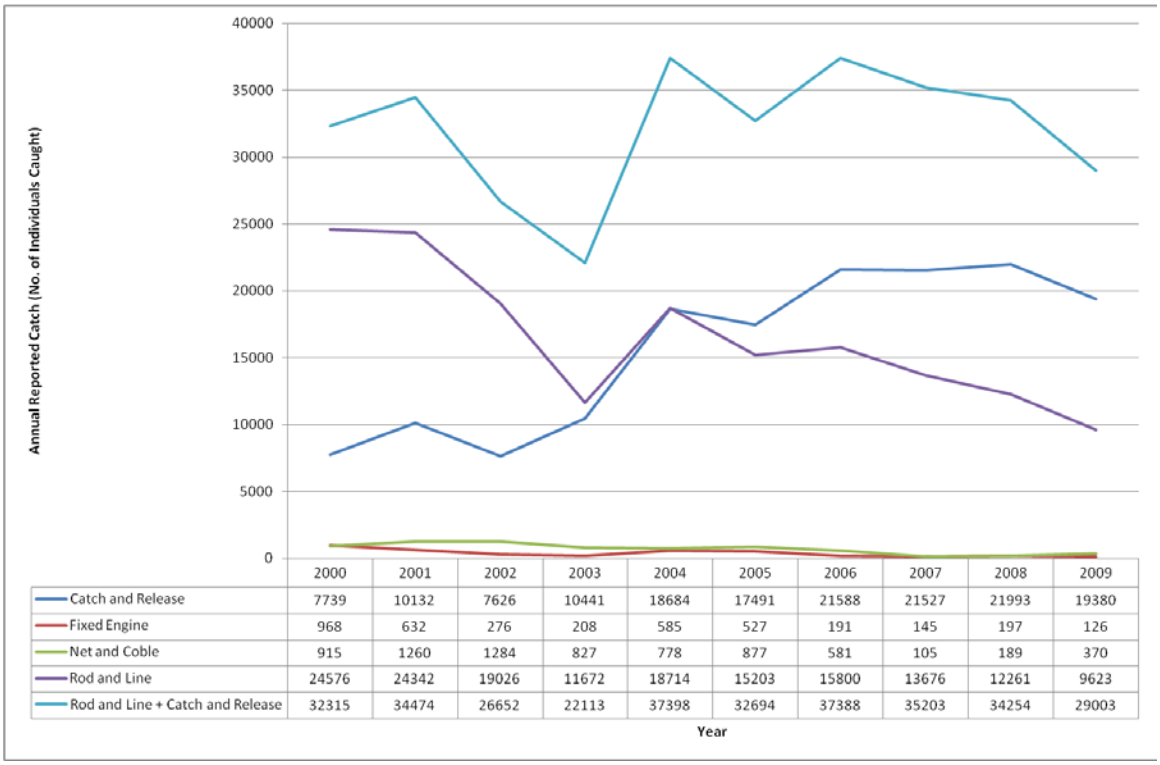



**Figure 4.11 Annual Reported Catch by Method in Districts within the Regional Study Area (average 2000-2009)**




| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Catch and Release | 7739 | 10132 | 7626 | 10441 | 18684 | 17491 | 21588 | 21527 | 21993 | 19380 |
| Fixed Engine | 968 | 632 | 276 | 208 | 585 | 527 | 191 | 145 | 197 | 126 |
| Net and Coble | 915 | 1260 | 1284 | 827 | 778 | 877 | 581 | 105 | 189 | 370 |
| Rod and Line | 24576 | 24342 | 19026 | 11672 | 18714 | 15203 | 15800 | 13676 | 12261 | 9623 |
| Rod and Line + Catch and Release | 32315 | 34474 | 26652 | 22113 | 37398 | 32694 | 37388 | 35203 | 34254 | 29003 |

**Figure 4.12 Annual Variation of Reported Catch by Method in Districts within the Regional Study Area**

### 4.5.2.2 The Salmon and Sea Trout Fishery by District

An indication of the total contribution of each District to the total reported catch in the regional study area is given in Figure 4.13 below. The Spey accounts for the greatest percentage of the total reported catch (35.6%) recording an average (2000-2009) of 11,839 fish caught per year. Following the Spey, the Deveron, Kyle of Sutherland, Findhorn, Helmsdale and Conon account together for 45.0% of the total annual reported catch in the regional study area.

A summary of the salmon and sea trout fishery by individual district is given in the following sections. In some instances more than one district has been addressed, primarily as a result of either the joint responses received from Boards and/or the joint consultation undertaken.

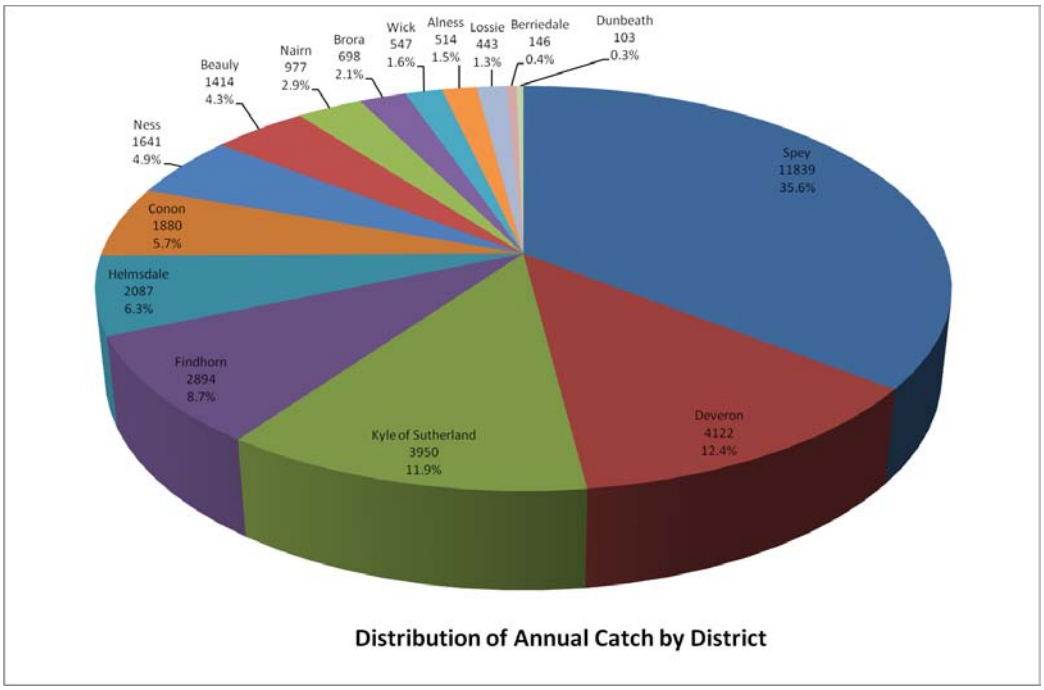


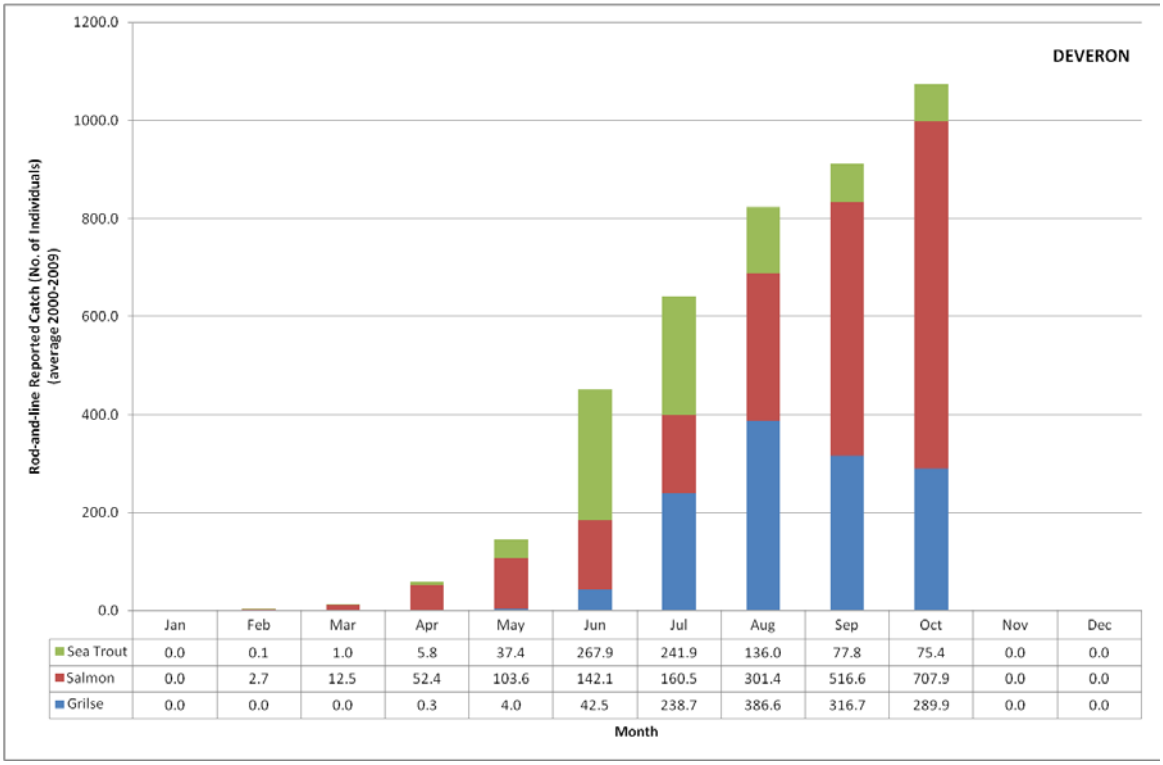

**Figure 4.13 Percentage Distribution of the Annual Total Regional Catch by District (average 2000-2009)**

### The Deveron

The Deveron is mainly a salmon river although sea trout is very important during the summer months (Consultation, 2011a). Rod-and-line is the only method currently used in this district. The nets were bought out by the Board in 1990. There is a clause in place, however, that allows the coastal fisheries to be used for scientific purposes (Consultation Meeting, 2011c).

The salmon and sea trout season is open from 11th February to 31st October (Consultation, 2011a). From the 11th February to 31st May all salmon must be released, after the 31st May two salmon can be kept per day. In the case of sea trout all must be released after the 31st of July. Earlier in the season sea trout over 3 lbs or under 10 inches in length must also be released.

The seasonality of the catch by species is given in Figure 4.14 based on monthly reported catches by species (average 2000-2009). The period from August to October records the highest total catches (all species combined). Sea trout are caught in highest numbers in June and July. Grilse catches peak in August, although July, September and October also record relatively high catches. Salmon are caught throughout the season however comparatively higher catches are recorded in September and October.




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sea Trout | 0.0 | 0.1 | 1.0 | 5.8 | 37.4 | 267.9 | 241.9 | 136.0 | 77.8 | 75.4 | 0.0 | 0.0 |
| Salmon | 0.0 | 2.7 | 12.5 | 52.4 | 103.6 | 142.1 | 160.5 | 301.4 | 516.6 | 707.9 | 0.0 | 0.0 |
| Grilse | 0.0 | 0.0 | 0.0 | 0.3 | 4.0 | 42.5 | 238.7 | 386.6 | 316.7 | 289.9 | 0.0 | 0.0 |

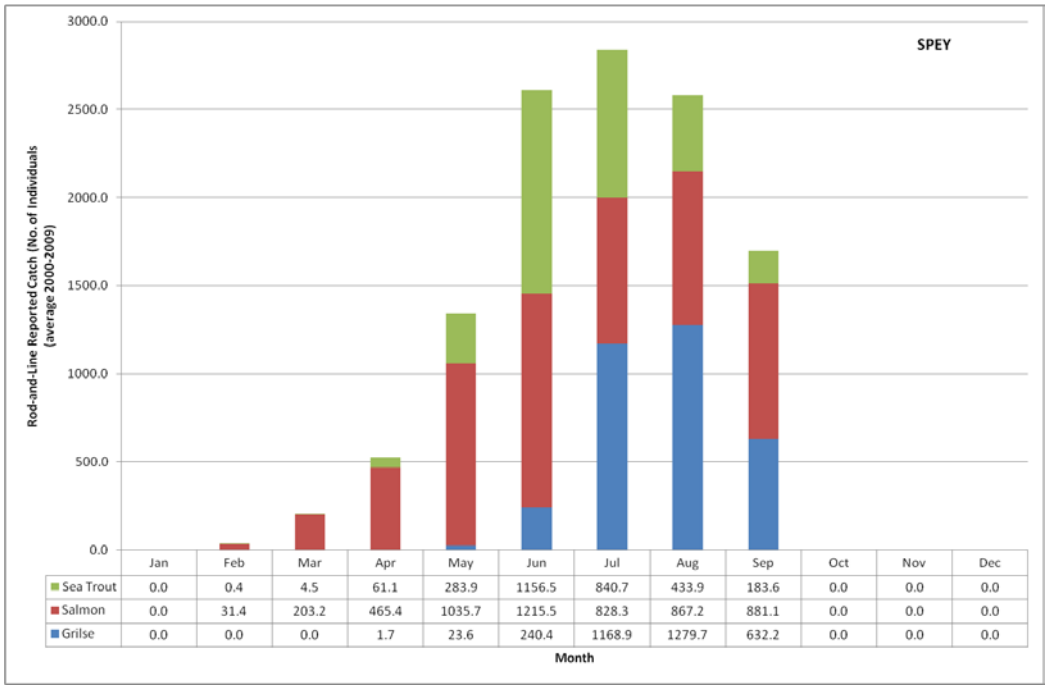
**Figure 4.14 Seasonality of Rod-and-line Reported Catch (average 2000-2009) in the Deveron**

## The Spey

In the Spey, rod-and-line is currently the only fishing method used. There use to be nets at the mouth of the river which the Board bought out in 1993. As a result, there are no operational coastal netting stations in the district. There is a voluntary catch and release policy in place which aims to release 50% of the catch. In 2010, 81% of salmon and 68% of sea trout were released (Consultation, 2011b).

The seasonality of the fishery is shown in Figure 4.15 below, based on averaged monthly catches by species (2000-2009). The salmon rod-and-line fishery runs from 11th February to the 30th September (Consultation Meeting, 2011d). Overall, the highest total catches in the district (all species) are recorded from June to August with May and September also recording relatively high catches.

Salmon are principally caught from May to September. March and April also record relatively high salmon catches reflecting the variety of salmon runs in the district. Grilse catches are highest in July and August. The sea trout season starts on the 30th April and runs until the end of September. The highest sea trout catches are recorded in June and July (Figure 4.15).




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sea Trout | 0.0 | 0.4 | 4.5 | 61.1 | 283.9 | 1156.5 | 840.7 | 433.9 | 183.6 | 0.0 | 0.0 | 0.0 |
| Salmon | 0.0 | 31.4 | 203.2 | 465.4 | 1035.7 | 1215.5 | 828.3 | 867.2 | 881.1 | 0.0 | 0.0 | 0.0 |
| Grilse | 0.0 | 0.0 | 0.0 | 1.7 | 23.6 | 240.4 | 1168.9 | 1279.7 | 632.2 | 0.0 | 0.0 | 0.0 |

**Figure 4.15 Seasonality of Rod-and-line Reported Catch (average 2000-09) in the Spey**

As mentioned in Section Figure 4.16 above, salmon is a primary reason for the selection of the River Spey SAC. The rod-and-line catch in the Spey, separated for the spring, summer and autumn components of the salmon population, is shown in Figure 4.16. Although historically the Spey was a spring salmon river, the spring component of the population has declined significantly in the last decades. The trend in the rod-and-line catch for the summer and autumn components, however, appears to be an overall increase from historical levels.

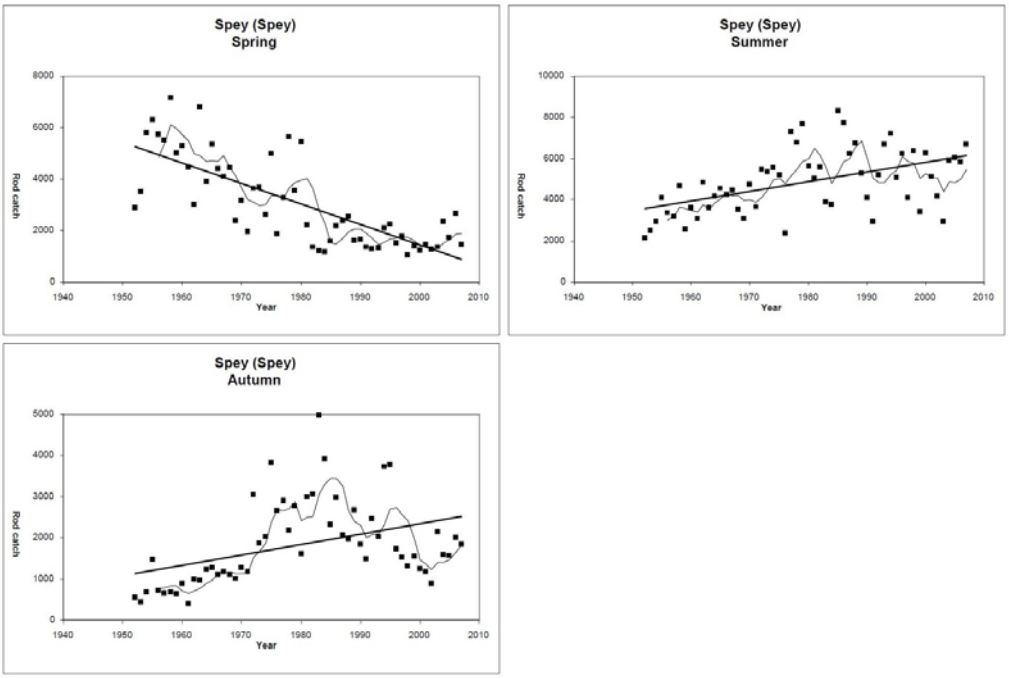



**Figure 4.16 Spey SAC Spring, Summer and Autumn Salmon Rod-and-line Catch (Source: Crawley, 2010)**

### Nairn, Lossie and Findhorn

The management of salmon and sea trout within the Findhorn, Nair and Lossie Districts is the responsibility of their respective DSFBs. These Boards work in close coordination with the Findhorn, Nairn and Lossie Fisheries Trust (FNLFT). Rod-and-line is currently the only fishing method used in the three districts.

In the Nairn the official season for salmon and sea trout runs from the 11th February until 7th October. However, many of the fishing estates and Angling Associations vary the season length within this. The official season for sea trout is 15th March until 7th October and again there are variations within this along the river. A salmon and sea trout fixed engine fishery existed within the Nairn district, however this was closed in 1985 (Laughton, 2010a).

The Lossie is both a salmon and sea trout river. Historically, the runs of sea trout were more prolific than the salmon runs. The only fishing method currently used is rod-and-line. Net-and-coble at the mouth of the rivers has been part bought out by the local angling association and part rented by the Lossie DFB in the interests of conservation. The official salmon season runs from the 25th February to 31st October, however, salmon fishing does not open until the 1st April and closes on the 31st October. The sea trout season opens on the 1st April and generally closes on the 30th September (Consultation, 2011c).

In the Findhorn, the salmon rod-and-line fishery runs from 11th February to 30th September and the sea trout fishery from 15th March to 30th September. Commercial salmon netting (both net-and-coble and fixed engines) was operated within the district for well over one hundred years before ceasing in 1989 and 1993 respectively (Laughton 2009b).

An indication of the seasonality of the fishery within the districts is given in Figure 4.17 below based on monthly reported catches by species (average 2000-2009).

In the Nairn the highest salmon and grilse catches are recorded from July to September. Sea trout are caught in greatest numbers from June to August although relatively lower catches are recorded from March onwards.

In the Lossie sea trout catches are highest from May to October peaking in July and August. Salmon and grilse are principally caught from August to October.

In the Findhorn salmon catches are highest from May to September. Grilse are principally caught from July to September whilst sea trout are caught from June to September.

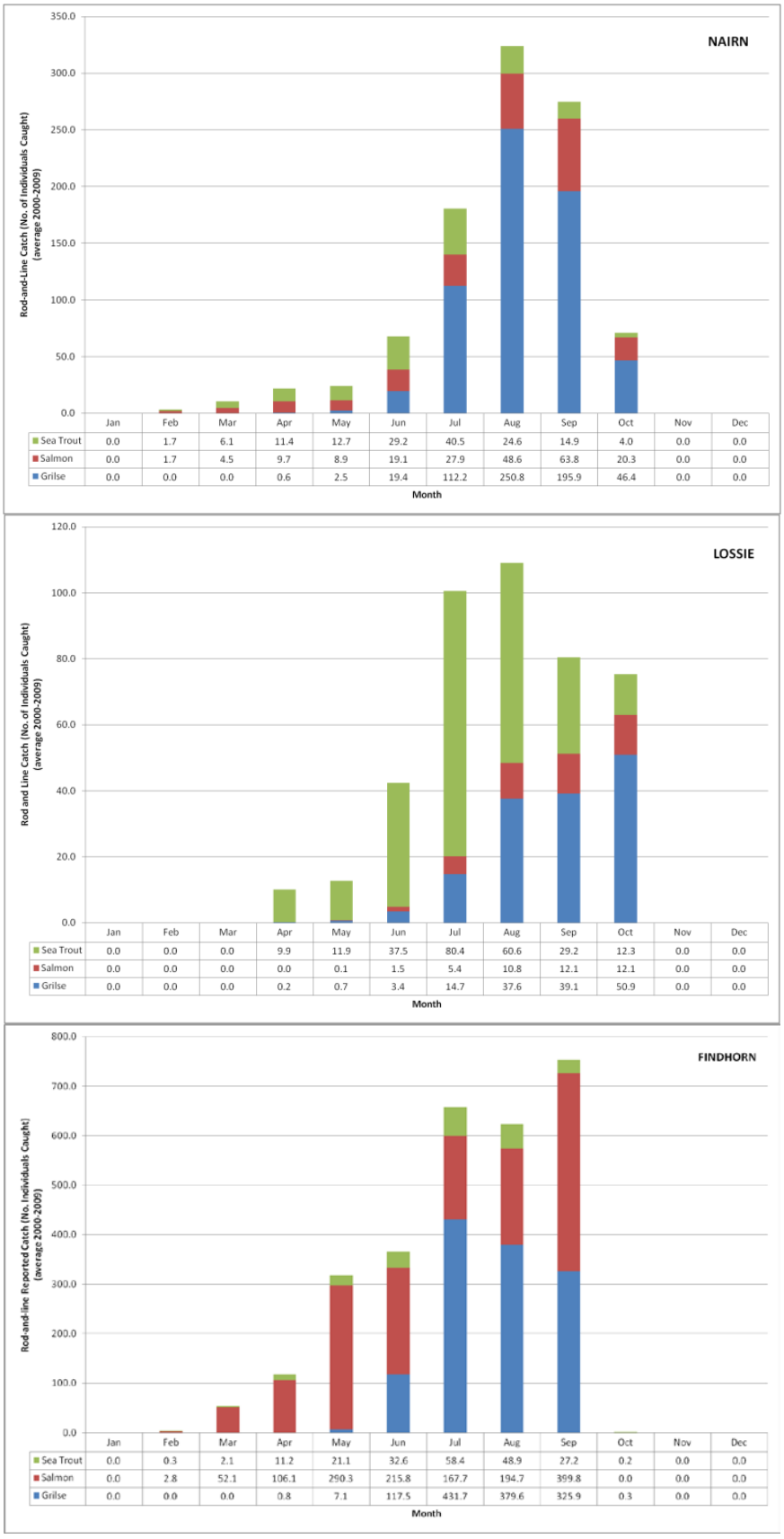



**Figure 4.17 Seasonality of Rod-and-line Catch in the Nairn, Lossie and Findhorn Districts (average 2000-2009)**

## Ness & Beauly

The Ness and Beauly Districts are each managed by their own DSFB (The Ness DSFB and the Beauly DSFB). These work closely with the Ness and Beauly Fisheries Trust.

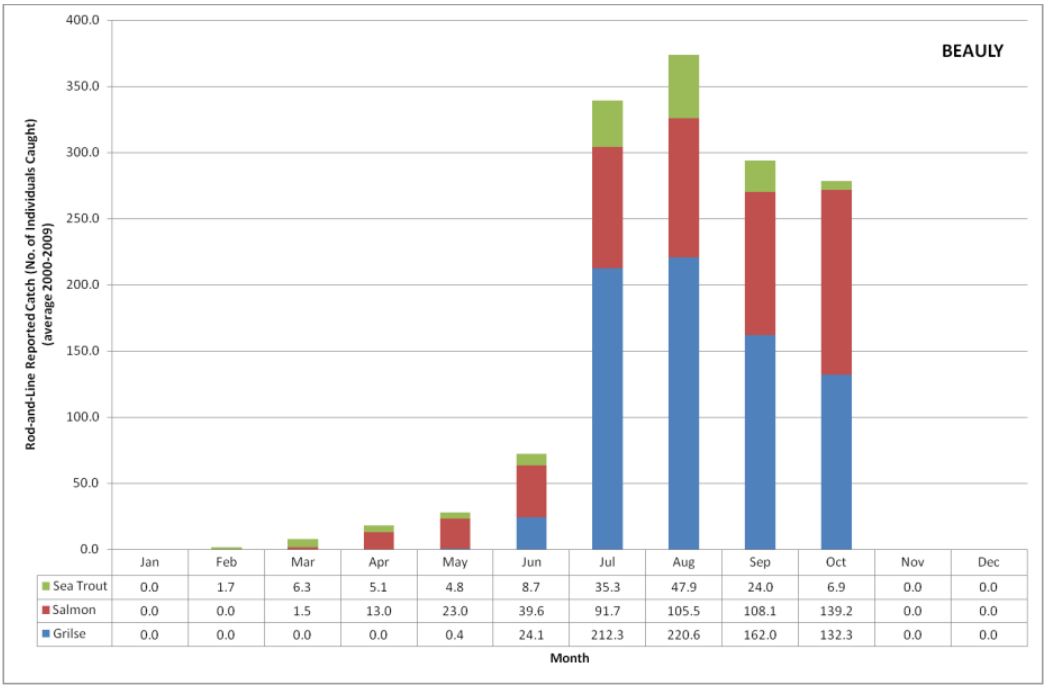
Both districts have important sea trout and salmon fisheries although there has been a marked decline in the sea trout over the past two decades (Consultation, 2011d).

Rod-and-line is the principal method used and is undertaken both in coastal areas and in fresh water. Net-and-coble fisheries take place to a limited extent in coastal areas in the Ness District, whilst rod-and-line is the only fishery currently active in the Beauly.

The rod-and-line season in the Ness runs from 15th January to 15th October and from 15th February to October 15th in the Beauly.

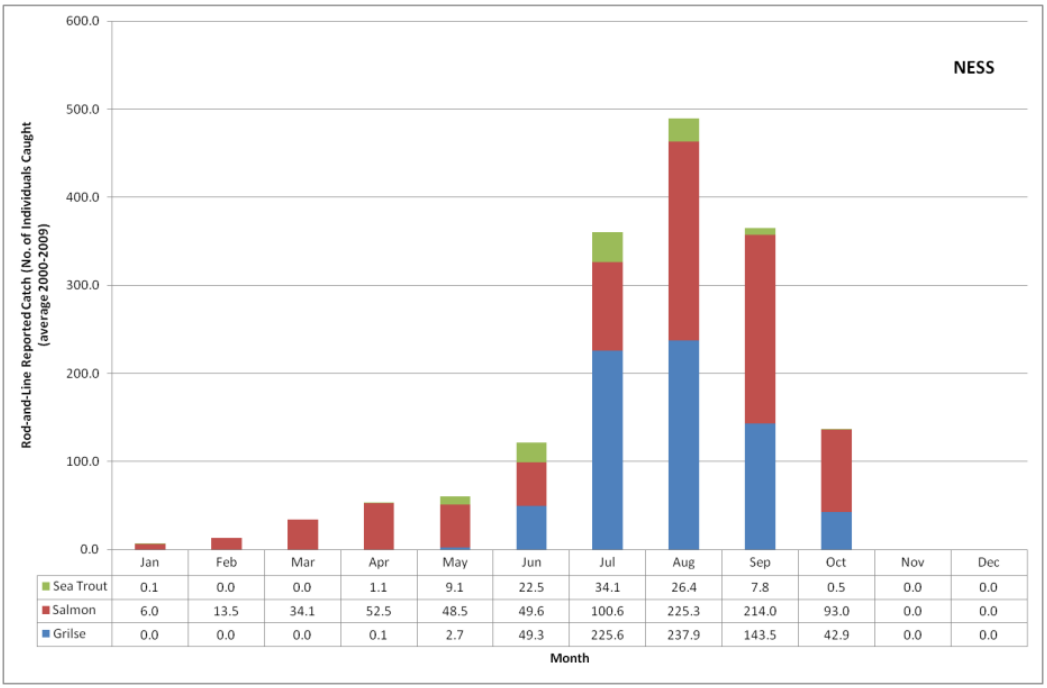
The seasonality of the rod-and-line catch by species in the Beauly and Ness Districts is shown in Figure 4.18 and Figure 4.19 respectively.

Both salmon and grilse are principally caught from July to October in the Beauly and Ness Districts. Salmon are however also caught in relatively high numbers earlier in the season (from April to June in the Beauly and from March to June in the Ness). Sea trout are caught from July to September, being also caught in some numbers earlier in the season generally from March onwards.




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sea Trout | 0.0 | 1.7 | 6.3 | 5.1 | 4.8 | 8.7 | 35.3 | 47.9 | 24.0 | 6.9 | 0.0 | 0.0 |
| Salmon | 0.0 | 0.0 | 1.5 | 13.0 | 23.0 | 39.6 | 91.7 | 105.5 | 108.1 | 139.2 | 0.0 | 0.0 |
| Grilse | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 24.1 | 212.3 | 220.6 | 162.0 | 132.3 | 0.0 | 0.0 |

**Figure 4.18 Seasonality of Reported Catch (No. of Individuals caught) by Species in the Beauly District (average 2000-2009)**




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sea Trout | 0.1 | 0.0 | 0.0 | 1.1 | 9.1 | 22.5 | 34.1 | 26.4 | 7.8 | 0.5 | 0.0 | 0.0 |
| Salmon | 6.0 | 13.5 | 34.1 | 52.5 | 48.5 | 49.6 | 100.6 | 225.3 | 214.0 | 93.0 | 0.0 | 0.0 |
| Grilse | 0.0 | 0.0 | 0.0 | 0.1 | 2.7 | 49.3 | 225.6 | 237.9 | 143.5 | 42.9 | 0.0 | 0.0 |

**Figure 4.19 Seasonality of Reported Catch (No. of Individuals caught) by Species in the Ness District (average 2000-2009)**

The net fishery season runs from 28th February to 26th August (Consultation 2011e). The seasonality of the net fishery in the Ness, where net-and-coble is currently used, is given in Table 4.1 based on monthly averaged (2000-2009) catches. The majority of the catch by this method is recorded from June to August, peaking in July.

**Table 4.1 Seasonality of the Catch (No. of Individuals Caught) by Net-and-coble in the Ness (average 2000-2009)**

| Ness | Month | | | | |
|---|---|---|---|---|---|
| | Apr | May | Jun | Jul | Aug |
| Net-and-coble | 0.5 | 0.9 | 64.5 | 189.7 | 84.5 |

The annual variation in the catch by net-and-coble is shown in Table 4.2 below. As is apparent, the annual catch by this method has fluctuated over the years with no clear trends being shown. Relatively low catches were recorded in 2007 and 2008 (46 and 16 fish in total, respectively).

**Table 4.2 Annual Variation in the Catch (No. of Individuals Caught) by Net-and-coble in the Ness**

| Ness | Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| Net and Coble | 279 | 481 | 514 | 577 | 476 | 477 | 335 | 46 | 16 | 200 |

### Conon and Alness

The salmon and sea trout fishery in the Conon and Alness districts is managed by the Cromarty Firth DSFB. Most rivers within the jurisdiction of the Board have a combination of both salmon and sea trout (Consultation 2011f).

Rod-and-line is the main fishery in these districts. Rod-and-line is used in the river but also in the estuary for sea trout. In the Conon district, fixed engines are used in coastal areas and net-and-coble in the estuary, although to a limited extent.

The rod-and-line fishing season runs from 11th February to 30th September in the Conon and from 11th Feb to 31st October in the Alness. The netting season runs from 11th February to 26th August.

The seasonality of the rod-and-line fishery (including catch and release) is given in Figure 4.20 overleaf, based on average (2000-2009) monthly reported catches by species.

In the Alness salmon are principally caught from July to October. Grilse are caught in highest numbers from August to October whilst sea trout are principally caught from June to August, peaking in July (Figure 4.20).

In the Conon, salmon are caught from May to September peaking around June. Grilse are principally caught from July to September whilst sea trout are caught from June to September, peaking in July (Figure 4.20).

It should be noted that in both districts the spring salmon run (April-June) and the April sea trout run are of relative importance (Consultation 2011f ) (Figure 4.20).

The seasonality of the net fishery in the Conon district is given in Table 4.3 based on monthly catches (averaged 2000-2009) by net-and-coble and fixed engines. Both fixed engines and net-and-coble record highest catches in July.

The annual variation in catches by the net fishery in the Conon is shown in Table 4.4. Whilst catches have fluctuated over time, the general trend, particularly in the case of coastal netting by fixed-engines appears to be one of a decline with 532 fish being caught in 2000 and a maximum annual catch of 165 fish during the period 2005 to 2009.

The remaining active coastal netting stations are located from Tarbat Ness inwards toward the firth. Stations are currently operational off Balintore and Hilton and from Tarbat Ness Lighthouse south to Ballone Castle) (Consultation 2011f, Consultation 2011g).

**Table 4.3 Seasonality of Catch (No. of Individuals Caught) of the Net Fisheries in the Conon District (average 2000-2009)**

| Conon | Month | | | | |
|---|---|---|---|---|---|
| | April | May | June | July | August |
| Fixed Engines | 1.4 | 17.3 | 55.9 | 106.9 | 9.5 |
| Net-and-coble | 0.0 | 0.0 | 5.5 | 110.3 | 11.9 |

**Table 4.4 Annual Variation in the Catch (No. of Individuals Caught) of the Net Fisheries in the Conon District**

| Conon | Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| Fixed Engines | 532 | 451 | 82 | 125 | 351 | 165 | 51 | 0 | 144 | 9 |
| Net-and-coble | 173 | 189 | 260 | 107 | 118 | 167 | 63 | 34 | 62 | 104 |

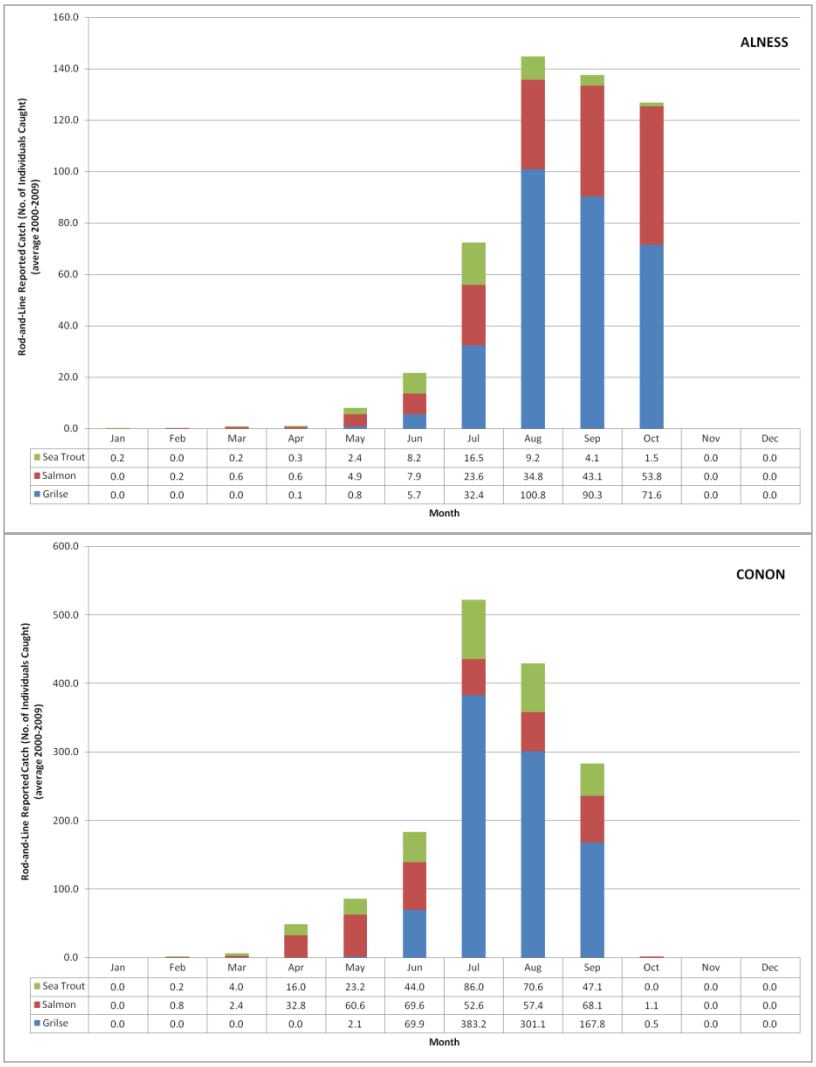



**Figure 4.20 Seasonality of Rod-and-line Reported Catch in the Alness and Conon Districts (average 2000-2009)**

## Kyle of Sutherland

The majority of the catch in the Kyle of Sutherland comes from the rod-and-line fishery although there are a limited number of active net fisheries (both net-and-coble and fixed engines) which account for comparatively low catches.

The fishery is open from the 11th of January to the 30th of September. Under the Board's catch and release policy, all fish caught are to be released until the 15th June and all fish over 65 cm in length are to be released all year. The Board aims to achieve an overall 80% catch and release (Consultation 2001h).

The seasonality of the rod-and-line (including catch and release) based on reported catches by species (averaged 2000-2009) is shown in Figure 4.21. Overall (all species combined), the highest reported catches are recorded from July to September.

Salmon are caught in relatively high numbers from April to September and grilse from July to September. Sea trout are predominantly caught from June to August, peaking in July (Figure 4.21).

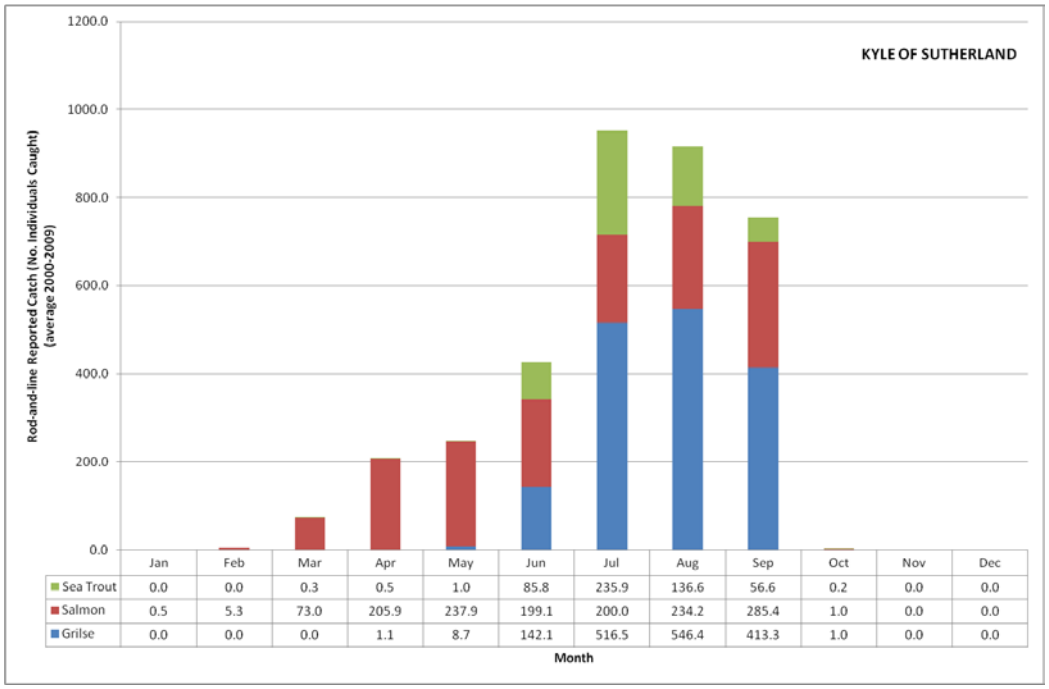



**Figure 4.21 Seasonality of Rod-and-line Reported Catches in the Kyle of Sutherland (average 2000-2009)**

As previously mentioned, the net fishery accounts for a comparatively small percentage of the total catch in the district. During the 2000-2009 period catches by fixed engines and net-and-coble have only been recorded from April to August, with the highest catches by both methods corresponding to the month of July (Table 4.5).

An indication of the annual variation in the catch by fixed engines and net-and-coble is given in Table 4.6. The reported catch by fixed engines has fluctuated over the ten year period, whilst the general trend in net-and-coble catches is one of a decline with 463 fish caught in 2000 and 61 in 2009.

**Table 4.5 Seasonality of the Catch (no. of individuals caught) by Net Fisheries in the Kyle of Sutherland (average 2000-09)**

| Kyle of Sutherland | April | May | June | July | August |
|---|---|---|---|---|---|
| Fixed Engines | 0.6 | 0 | 19.2 | 115.4 | 37.2 |
| Net-and-coble | 1.2 | 4.7 | 63.5 | 107.3 | 12.5 |

**Table 4.6 Annual Variation in the reported catch (no. of individuals caught) by Net Fisheries in the Kyle of Sutherland**

| Kyle of Sutherland | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|---|---|---|---|---|---|
| Fixed Engines | 254 | 181 | 194 | 44 | 234 | 362 | 140 | 145 | 53 | 117 |
| Net-and-coble | 463 | 540 | 455 | 93 | 69 | 53 | 75 | 20 | 63 | 61 |

It should be noted that the Oykel SAC, for which salmon is a qualifying feature for selection of the site (Figure 3.5 above), is within the Kyle of Sutherland district. An indication of the state of the different components of the spring, summer and autumn components of the salmon stock in this SAC is given in Figure 4.22. There has been an increase in the rod-and-line catch of the autumn and summer component of the salmon population whilst the trend in the spring component appears to be one of a decline.

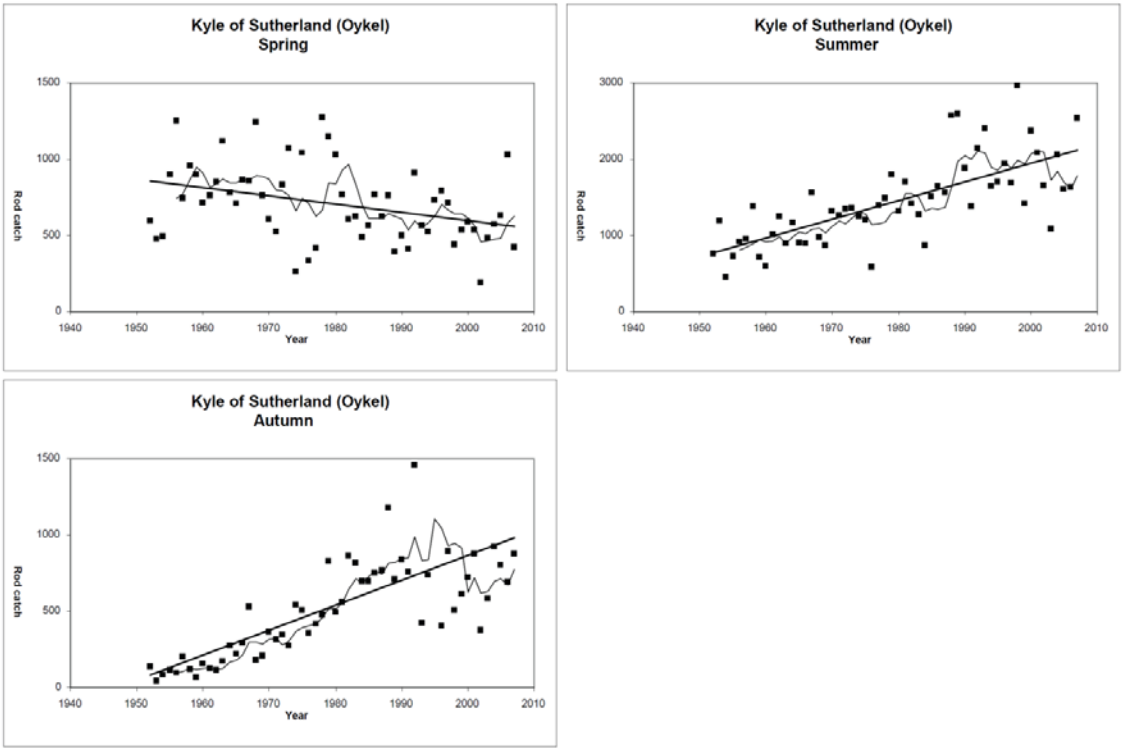


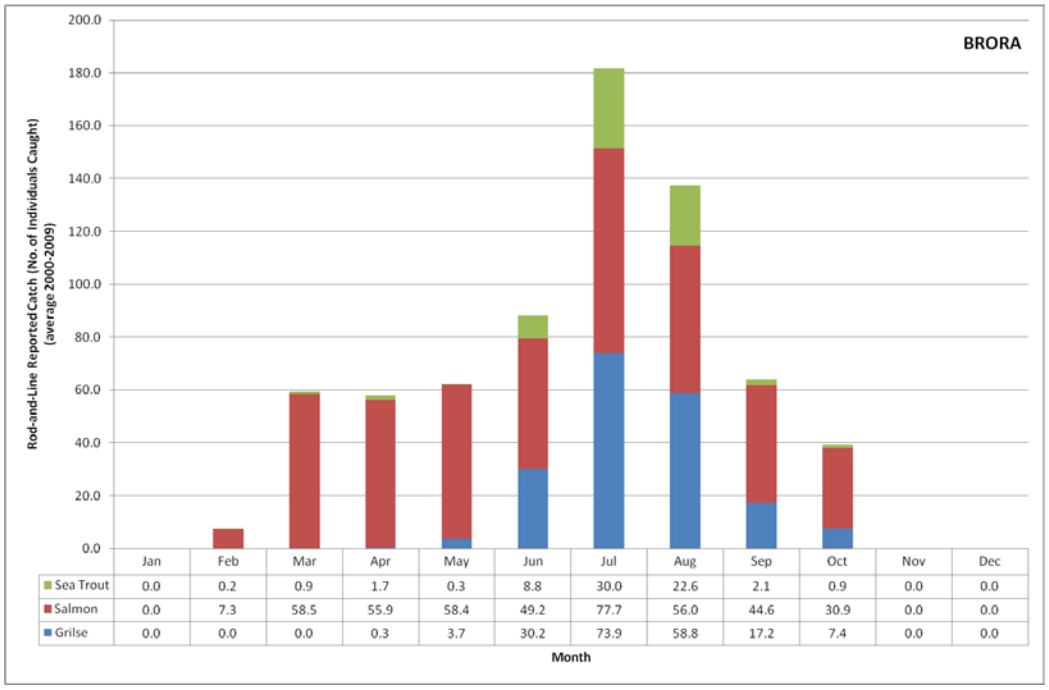

**Figure 4.22 Oykel SAC Spring, Summer and Autumn Salmon Rod-and-line Catch (Source: Crawley, 2010)**

## Brora

The Brora DSFB manages salmon and sea trout fisheries in the River Brora and the River Fleet. Both are primarily salmon rivers (Consultation 2011i).

Rod-and-line is the only fishery used in the district. The season runs from 1st February to 15th October. Netting rights are held by Sutherland Estates at the mouth of the River Brora, however these are no longer exploited. Netting activity stopped in the late 1970's (Consultation 2011i).

An indication of the seasonality of the fishery in the district is given Figure 4.23 below based on monthly catches by species (averaged 2000-2009). Salmon are caught throughout the season principally from March to October. Catches are relatively consistent throughout this period with July recording peak catches. Sea trout are principally caught from June to August peaking in July. Similarly, grilse are caught in greatest numbers from June to August, also peaking in July. Overall, the greatest catches (all species combined) are recorded in July and August (Figure 4.23).




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sea Trout | 0.0 | 0.2 | 0.9 | 1.7 | 0.3 | 8.8 | 30.0 | 22.6 | 2.1 | 0.9 | 0.0 | 0.0 |
| Salmon | 0.0 | 7.3 | 58.5 | 55.9 | 58.4 | 49.2 | 77.7 | 56.0 | 44.6 | 30.9 | 0.0 | 0.0 |
| Grilse | 0.0 | 0.0 | 0.0 | 0.3 | 3.7 | 30.2 | 73.9 | 58.8 | 17.2 | 7.4 | 0.0 | 0.0 |

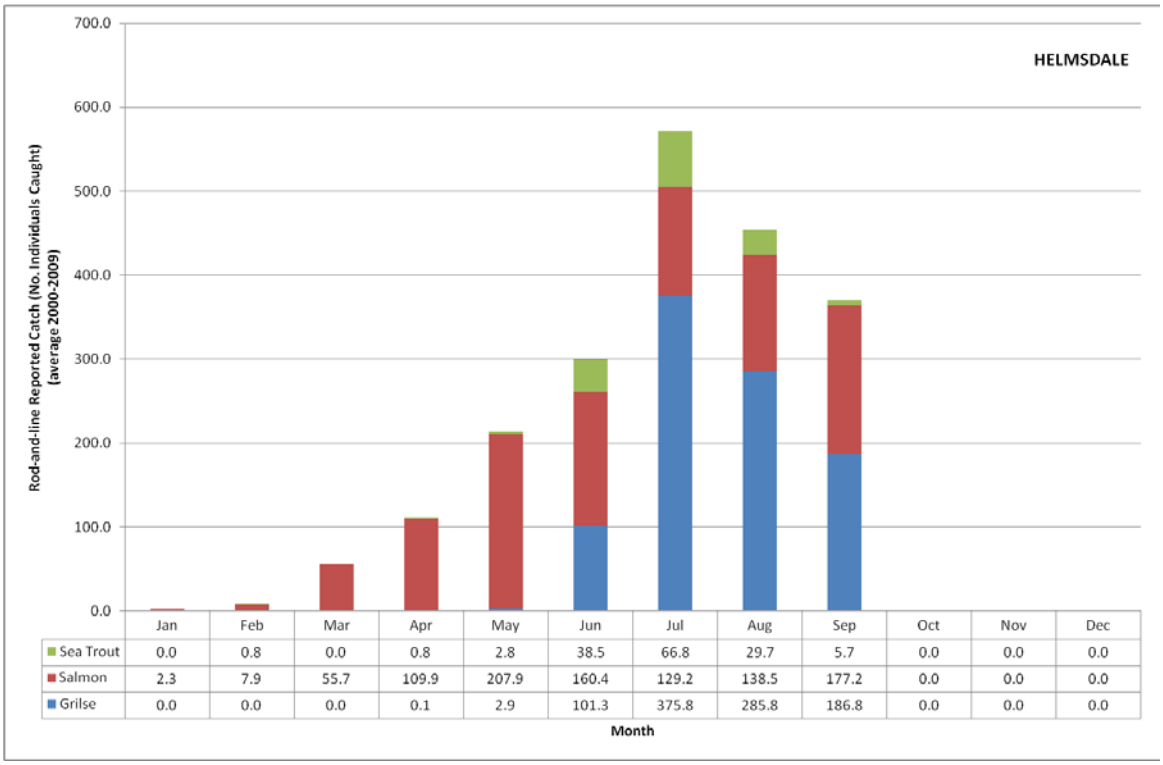
**Figure 4.23 Seasonality of Rod-and-line Reported Catch by Species in the Brora District (2000-2009)**

## Helmsdale

In the Helmsdale District rod-and-line is currently the only method used. Netting activity stopped about 20 years ago (Consultation 2011j). There has been netting in Helmsday Bay, but the netting right has been mothballed by the Helmsdale DSFB (Consultation 2011j). Under the Board's catch and release policy a maximum of two fish can be retained until the end of May and five fish per beat until the end of the season. The return rate is approximately 80% (Consultation 2011j).

The fishing season runs from the 11th January to the end of September. An indication of the seasonality of the fishery is shown in Figure 4.24 based on monthly catches by species (average 2000-2009). Overall (all species combined) the highest catches in the district are recorded in July and August.

Salmon catches are relatively consistent throughout the season with high catches being recorded during the periods April-May, June-August and August-September (Consultation 2011j, Figure 4.24). Grilse are principally caught from June to September with catches peaking in July. Similarly, sea trout are principally caught from June to August also peaking in July (Figure 4.24).




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sea Trout | 0.0 | 0.8 | 0.0 | 0.8 | 2.8 | 38.5 | 66.8 | 29.7 | 5.7 | 0.0 | 0.0 | 0.0 |
| Salmon | 2.3 | 7.9 | 55.7 | 109.9 | 207.9 | 160.4 | 129.2 | 138.5 | 177.2 | 0.0 | 0.0 | 0.0 |
| Grilse | 0.0 | 0.0 | 0.0 | 0.1 | 2.9 | 101.3 | 375.8 | 285.8 | 186.8 | 0.0 | 0.0 | 0.0 |

**Figure 4.24 Seasonality of the Rod-and Line Reported Catches by Species in the Helmsdale District (average 2000-2009)**

### 4.5.3 Local

#### 4.5.3.1 General

The three SFDs located in the immediate vicinity of the Beatrice Offshore Wind farm are Wick, Dunbeath and Berriedale. As previously mentioned (Section 2.2.2), these were superseded by the Caithness district and abolished in 1990. The Berriedale and Langweel Waters SAC, for which salmon is a primary reason for selection of the site, is located in the Berriedale district at a distance of approximately 29 km of the Beatrice Offshore Wind Farm (Figure 4.25).

The Caithness district is primarily a salmon district (Consultation 2011k). The principal method currently used is rod-and-line although a small amount of netting also takes place. Catch and release is practised on a voluntary basis and is generally about 60-70% of the fish caught (Consultation 2011k).

The rod-and-line season opens as early as the 12$^{th}$ January and is closed by the 5$^{th}$ October in most rivers within the district. Net fisheries, whilst determined by the Scottish statutory Close Season, tend to operate only during June, July and August.

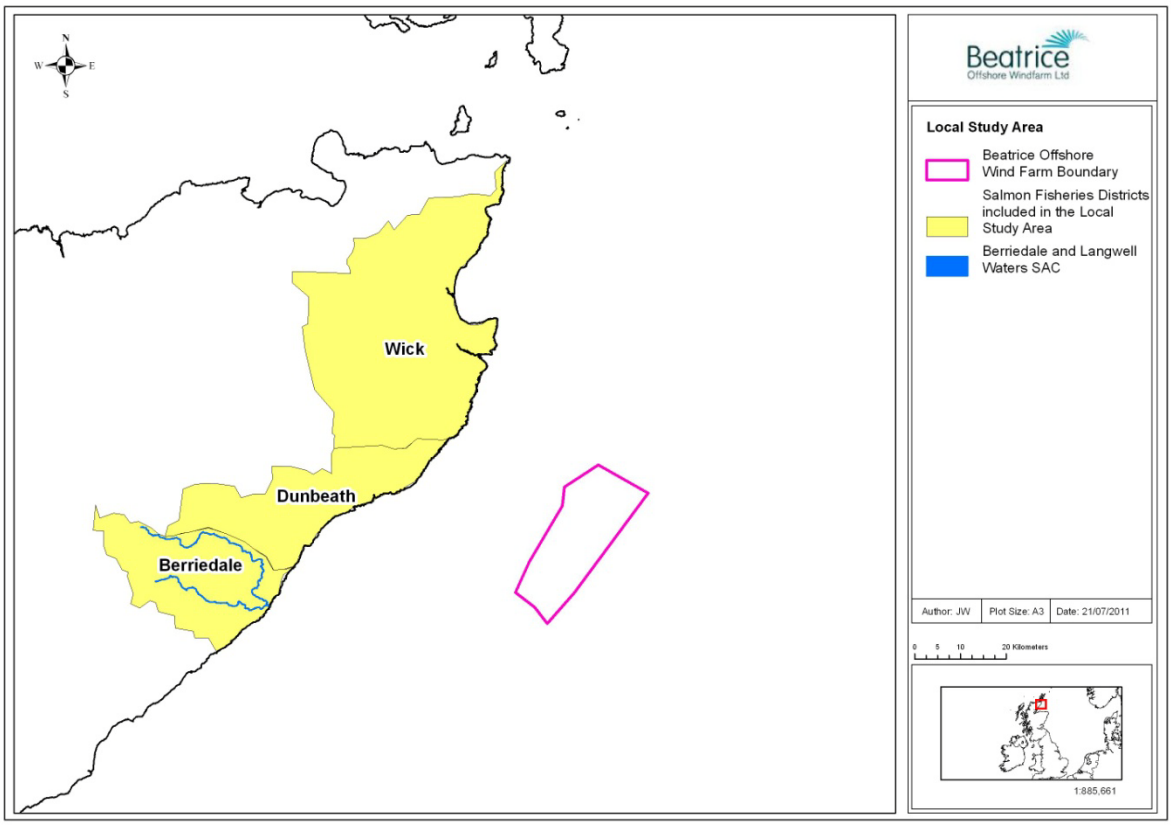



**Figure 4.25 Location of Beatrice Offshore Wind Farm and Distance from Salmon Fishery Districts in the Local Study Area**

### 4.5.3.2 Rod-and Line Fishery

An indication of the seasonality of the rod-and-line fishery (including catch and release) in districts within the local study area is given in Figure 4.26 below. Overall (all species combined), the highest catches are recorded in July and August.

Sea trout catches are comparatively low. The highest catches are recorded from July to September.

Salmon catches are highest from June to September in Wick, July to October in Dunbeath and June to September in Berriedale.

Grilse are principally caught from July to September in Wick, in July and August in Dunbeath and in July in Berriedale.

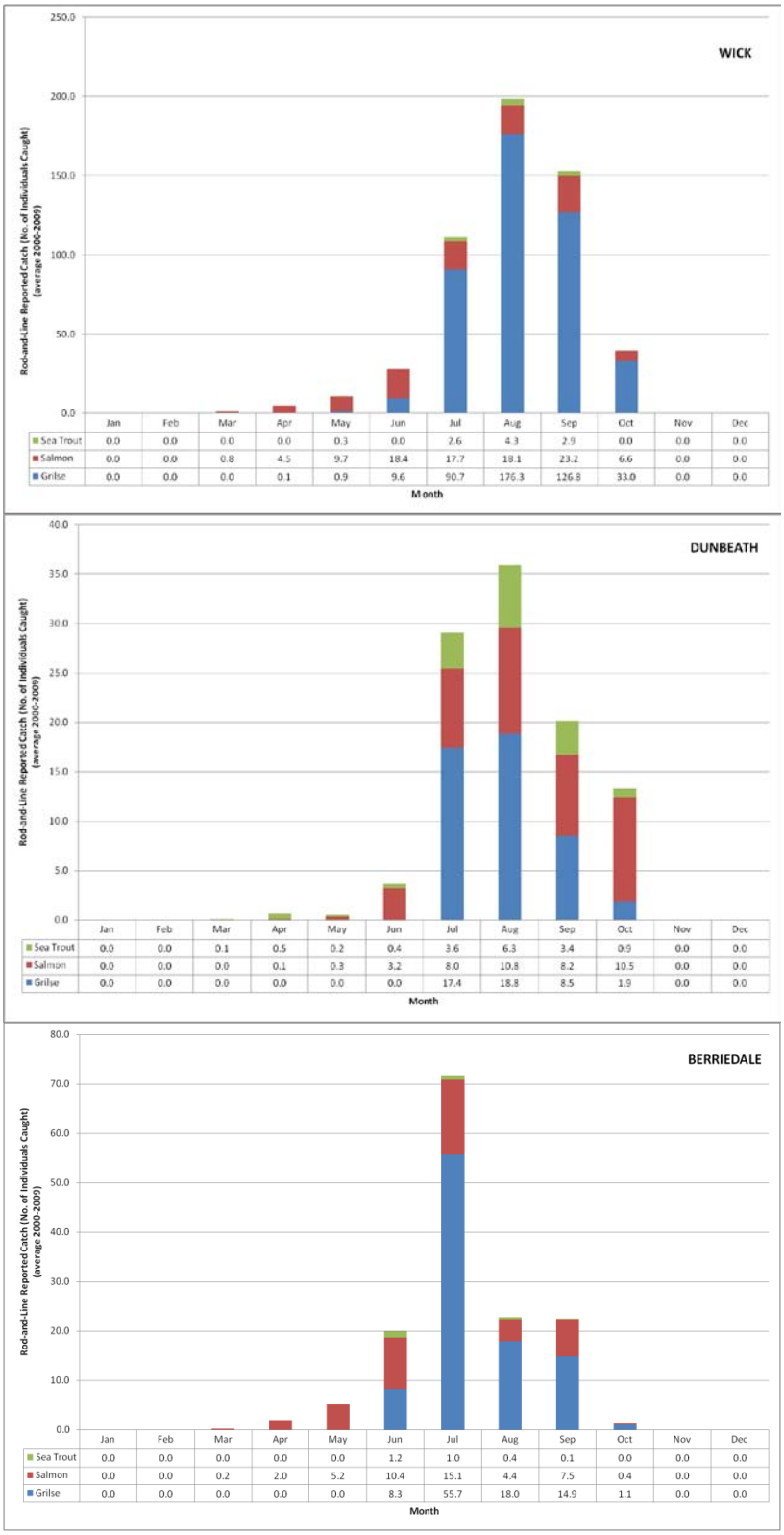



**Figure 4.26 Seasonality of Reported Catches in the Wick, Dunbeath and Berriedale Districts (average 2000-2009)**

### 4.5.3.3 Net Fishery

An indication of the seasonality of the net fishery (net-and-coble and fixed engines) in districts within the local study area is given in Table 4.7. The annual variation in the catch is given in Table 4.8. It should be noted that this fishery has not recorded any catches in Wick during the ten year period under consideration, and hence this district has not been included in the following tables.

In Berriedale catches by both net-and-coble and fixed engines have been recorded during the ten year period under consideration. July records the highest catches by both methods. Catches have fluctuated annually and are comparatively low both by net-and-coble and fixed engines. In the case of fixed engines no fish have been caught since 2003.

In Dunbeath only net-and-coble has been used during the period under consideration. Catches, although comparatively low, are highest in July and August. There has also been a high degree of annual variability with some years not recording any fish caught by net-and-coble at all.

**Table 4.7 Seasonality of Net Fishery Reported Catch in the Berriedale and Dunbeath Districts (average 2000-2009)**

| District | Method | Month | | |
|---|---|---|---|---|
| | | June | July | August |
| Berriedale | Fixed Engine | 0.0 | 9.2 | 0.0 |
| | Net-and-coble | 0.8 | 27.9 | 1.0 |
| Dunbeath | Net-and-coble | 0.0 | 18.3 | 13.6 |

**Table 4.8 Annual Variation in the Reported Catch by Net Fisheries in the Berriedale and Dunbeath Districts (average 2000-2009)**

| District | Method | Year | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
| Berriedale | Fixed Engine | 53 | 0 | 0 | 39 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Net-and-coble | 0 | 50 | 55 | 0 | 35 | 63 | 42 | 5 | 42 | 5 |
| Dunbeath | Net-and-coble | 0 | 0 | 0 | 50 | 80 | 117 | 66 | 0 | 6 | 0 |

### 4.5.3.4 Berriedale and Langwell Waters and Thurso SACs

As shown in Figure 3.5, the Berriedale and Langwell Waters SAC is the closest SAC to the Beatrice Offshore Wind Farm for which salmon is a primary reason for the selection of the site. The River Thurso (also under the management of the Caithness DSFB) is also a designated SAC for which salmon is a primary reason for selection of the site (Figure 3.5).

The catches recorded by rod and line separated for the spring, summer and autumn components of the salmon populations of these two SACs are shown in Figure 4.27 and Figure 4.28 respectively.

In the Berriedale SAC current catches of the spring and autumn components appear to be line with historical levels whilst there appears to have been an overall increase in the catch of summer salmon, especially during the last decade (Figure 4.27).

In the Thurso SAC the overall trend in spring salmon catches is one of a decline, whilst summer and autumn salmon catches appear to be in line with historical levels (Figure 4.28).

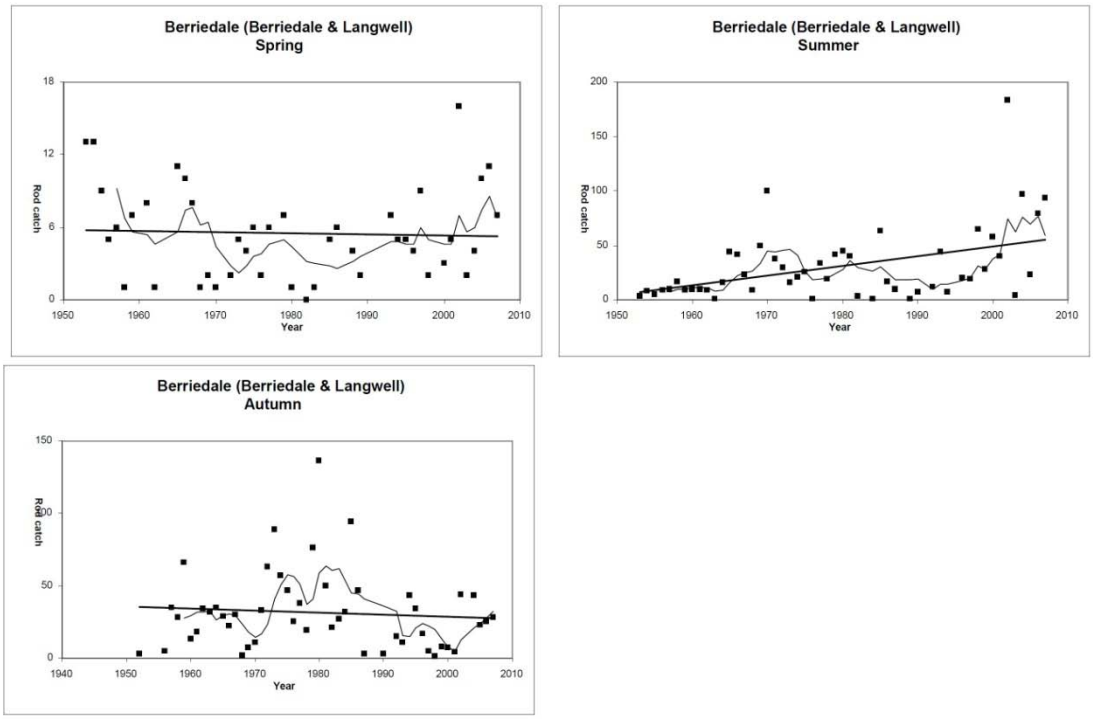



**Figure 4.27 Berriedale SAC Spring, Summer and Autumn Salmon Rod-and-line Catch (Source: Crawley, 2010)**

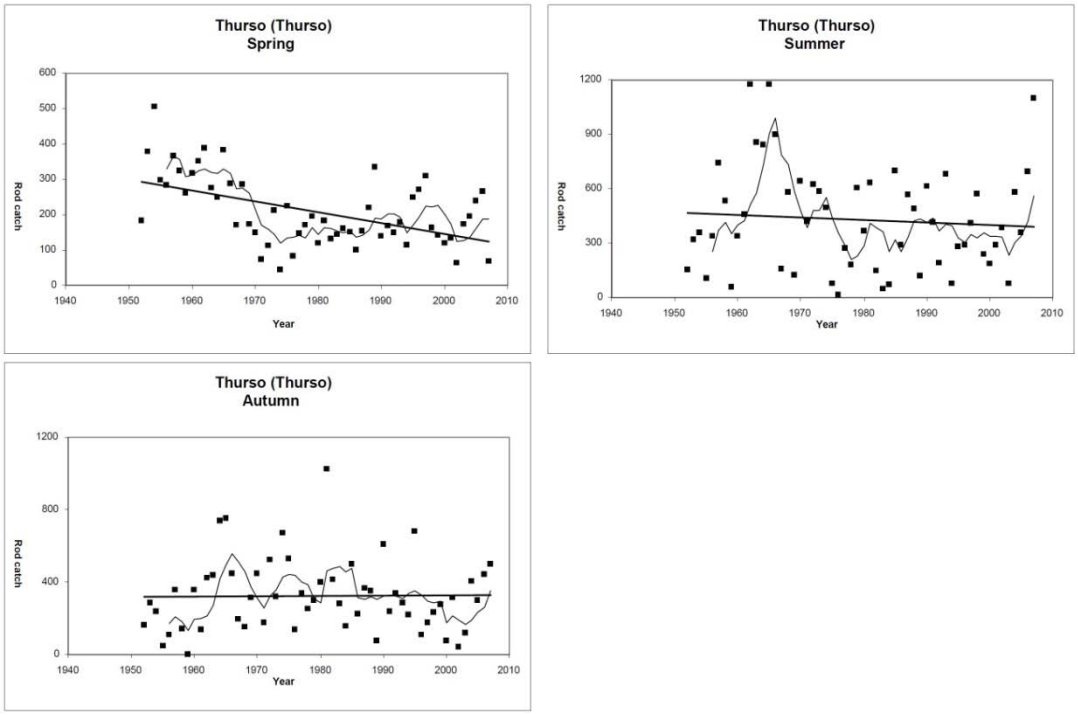



**Figure 4.28 Thurso SAC Spring, Summer and Autumn Salmon Rod and line Catch (Source: Crawley, 2010)**

## 4.6 Future Fisheries

DSFBs throughout Scotland, generally in conjunction with Trusts and conservation groups, are making significant efforts to safeguard the future of salmon and sea trout, implementing programmes to maintain and improve upon the number and quality of salmon and sea trout in their rivers. Catch and release policies are also increasingly closely monitored.

A priority for the majority of the Boards is the maintenance and development of rod-and-line fishing. It is expected that this trend will continue in the future, in line with the joint aims of the ASFB and other organisations. Parallel to the maintenance and development of the rod-and-line fisheries, a decrease in the coastal netting activity in Scotland, as a result of river and conservation interests buying up coastal stations, as well as increasing statutory or voluntary restrictions and policies, has been the trend in the last decade and is likely to continue to be the case in the future.

Scotland, together with England, Norway and Northern Ireland has come under increasing international pressure to establish a policy for managing Multi Stock Fisheries (MSFs). This is of particular sensitivity in Scotland, as fishing is prosecuted under heritable property rights rather than an activity licensed by Government as in most salmon producing countries (Crawley, 2010). International advice is that there should be a presumption against operating Multi Stock Fisheries, such as coastal netting, unless they can be shown not to contravene basic conservation policies (ASFB, AST and S&TA, 2009).

As discussed in Section 3.7, Scottish populations of both salmon and sea trout are subject to a number of threats, particularly in the marine environment. Whilst conservation measures to protect these species have increased in the last decade, specifically in-river and along coastal areas, it is not possible to predict the level of salmon and sea trout returning to rivers in the Moray Firth in the future. Unknown events may affect salmon and sea trout numbers which will in turn affect the fisheries dependent upon the return of the species to their natal rivers.

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# Appendix 01

| List of Stakeholders that Completed and Returned Consultation Questionnaires |
|---|
| Dee DSFB |
| Don DSFB |
| Ythan DSFB |
| Forth DSFB |
| Tweed DSFB |
| Brora DSFB |
| Caithness DSFB |
| Cromarty DSFB |
| Deveron DSFB |
| Helmsdale DSFB |
| Kyle of Sutherland DSFB |
| Lossie DSFB |
| Ness and Beauly DSFB |
| Spey DSFB |
| Wilkhaven and Castle Salmon Fishery, Cromarty Firth |
| The Patience Children Trust (Kincurdy Netting Station, Rosemarkie Beach) Ness |
| Moray Firth Sea Trout Project (MFSTP) |

| List of Consultation Meetings |
|---|
| Findhorn, Nairn and Lossie Fisheries Trust 17/05/2011 |
| Cromarty Firth DSFB, Brora DSFBs and Cromarty Netsman 17/05/2011 |
| Moray Firth Sea Trout Project (MFSTP) 07/02/2011 |
| Ness and Beauly Fisheries Trust, Ness DSFB and Beauly DSFB 18/05/2011 |
| Kyle of Sutherland and Helmsdale DSFBs 06/05/2011 |
| Spey DSFB 30/03/2011 and 23/09/2011 |
| Deveron DSFB 30/03/2011 |
| Marine Scotland Science and Moray and Pentland Firths Salmon Protection Group 01/09/2011 |

## Appendix 02

### a. Consultation Questionnaire Circulated to DSFBs

| General | |
|---|---|
| Name of District Salmon Fisheries Board/ Trust | |
| River(s) within jurisdiction | |
| Is the river(s) considered primarily salmon or sea trout river(s), or a combination of both?<br>Has this changed over the years? | |
| Have any additional Trusts or Associations been set up to help with the management of the river?<br>If yes, please give details. | |
| Please note the current condition of the river, i.e. water quality, fish etc.) | |
| **Current Activities** | |
| What are the principal fishing methods for salmon and sea trout in the district? | |
| What is the current state of salmon and sea trout stocks by river? (e.g. good, improving, declining etc.) | |
| What do you consider to be the main factors that contribute to current river stock status? | |
| What are the current statutory and/or voluntary regulations in place? | |

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| When are the open seasons of the salmon and sea trout fisheries within your district? (i.e. when does the rod and line fishery open and close, when does the netting fishery open and close) | |
| What is the Boards catch and release policy for salmon and sea trout? | |
| What are the most important runs for salmon (by river)? Please state the approximate timing of these runs. | |
| What are the most important runs for grilse (by river)? Please state the approximate timing of these runs. | |
| What are the most important runs for sea trout (by river)? Please state the approximate timing of these runs. | |
| At what time of year do the smolts leave the river? | |
| Please note any observations regarding smolt habits when leaving river(s) for the marine environment. | |
| Please note the habits of returning salmon and sea trout (i.e. time spent at river mouth, etc). | |
| Are there any obstacles to salmonid navigation up river? If yes, please give details. | |

| Historic Practices | |
|---|---|
| Please describe the historic condition of the river, compared with its status today. | |
| Have you noticed any changes in salmon and sea trout catches over the years and what would you attribute these to?<br>Please give details where possible. | |
| Have you noticed any changes in salmon and/or sea trout runs over the years? (e.g. runs now occurring in spring or autumn that haven't previously) | |
| What were the principal historic fishing methods within your district? | |
| **Conservation** | |
| What do you identify as the principal threats to salmon and sea trout within the district? | |
| What do you consider to be the most vulnerable stage for returning fish? Please give reasons. | |
| What do you consider to be the most vulnerable stage for smolts? Please give reasons. | |

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|---|---|
| What do you consider to be the primary factors contributing the high marine mortality rates of salmon and sea trout? | |
| Are there any monitoring programmes or management schemes currently taking place or have taken place in the past? (e.g. electrofishing, hatcheries etc.) Please give details and include what you think the outcome of these schemes will be or was. | |
| Coastal Rights | |
| Please could you provide identification of the rights holders of the coastal salmon netting stations in your district, rights holders, and their locations. | |
| Are any coastal netting stations currently in operation within your jurisdiction?<br>If yes, please state which. | |
| **Concerns** | |
| Please list the principal concerns for salmon and sea trout with regards to the proposed offshore wind farm developments. | |
| Please state any concerns specific to the Moray Firth proposed windfarm developments? | |

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| Please state any concerns specific to the proposed Aberdeen Offshore Wind Farm windfarm development? | |
| Please state any concerns specific to the proposed Firth of Forth Offshore Wind Farm windfarm developments? | |
| **Additional Information** | |
| Do you have or are you aware of any existing research or publications concerning salmon and sea trout behaviour within your district?<br>If yes, please give details. | |
| Are there any other points you would like to note down? (Please continue onto the next sheet, if required). | |

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## b. Consultation Questionnaire Circulated to Netsmen

| General | |
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| Name of Salmon Fishery District | |
| Name of Coastal Netting Right Holder | |
| Name of Coastal Netting Station/s (please provide map or indicate location of the station) | |
| Is the station/s currently fished? | |
| **Fishing Gear** | |
| What are the principal species caught? (salmon, sea trout, both) | |
| What's the fishing gear used in the station/s (bag nets, stake nets, other)? | |
| What are the specifications of the fishing gear used? | |
| Where from and how is the fishing gear operated? (from the beach, rocky shores , lines of nets, etc) | |
| What's the maximum distance from shore that the gear can legally be set? | |
| What's the maximum distance from shore that the gear is normally set? | |
| What other salmon and sea trout fishing methods are used in the vicinity of the station/s (eg. net-and-coble, rod-and-line) | |
| **Catches and Effort** | |
| What is the current state of the catch of salmon and sea trout from the station/s? (increasing, decreasing, in line with historical levels, etc..) Please specify by species | |
| What do you consider to be the main factors that contribute to the numbers of | |

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| salmon and sea trout being currently caught? | |
| Has the fishing effort at the station/s been modified in recent years? | |
| Do the majority of salmon and sea trout individuals caught at the station/s belong to the populations of the rivers within the District? | |
| Are salmon or sea trout from other Districts being caught at the station ?(Please specify from which districts if known) | |
| **Seasonality** | |
| When are the open seasons of the salmon and sea trout netting fishery in the District? | |
| What months record the highest catches? (Please specify for MSW salmon, grilse and sea trout ) | |
| Have you noticed any variations in the timing of MSW salmon, grilse or sea trout runs in recent years? If so, what do you think is the cause of these changes? | |
| **Salmonids Migratory Patterns** | |
| Please note any observations regarding salmon and sea trout smolt habits in coastal waters when leaving rivers | |
| Please note any observations on the habits of returning salmon and sea trout (i.e. time spent at estuary or river mouth, etc). | |
| Please note any observation regarding the distance from the coast of salmon and sea trout migrations | |
| Please provide any further observations regarding the migration patterns of salmon and sea trout that your feel are relevant | |
| **Historic Practices** | |
| Have you noticed any changes in salmon and sea | |

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| trout catches over the years and what would you attribute these to?<br>Please give details where possible. | |
| Have you noticed any changes in salmon and/or sea trout runs over the years? (e.g. runs now occurring in spring or autumn that haven't previously) | |
| What were the principal historic fishing methods within your district? Have they changed over the years? If so, please specify the reasons why | |
| **Conservation** | |
| What do you identify as the principal threats to salmon and sea trout? | |
| What do you consider to be the most vulnerable stage for returning fish? Please give reasons. | |
| What do you consider to be the most vulnerable stage for smolts? Please give reasons. | |
| What do you consider to be the primary factors contributing the high marine mortality rates of salmon and sea trout? | |
| Have you noticed any changes in the quality of the fish been caught over the years? (weight of fish, parasites, etc..) | |
| **Concerns** | |
| Please list the principal concerns for salmon and sea | |

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|---|---|
| trout with regards to the proposed offshore wind farm developments. | |
| Please state any concerns specific to the Moray Firth proposed windfarm developments? | |
| Please state any concerns specific to the proposed Aberdeen Offshore Wind Farm windfarm development? | |
| Please state any concerns specific to the proposed Firth of Forth Offshore Wind Farm windfarm developments? | |
| **Additional Information** | |
| Are there any other points you would like to note down? (Please continue onto the next sheet, if required). | |

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