BEAULY DISTRICT FISHERIES MANAGEMENT PLAN

2014 – 2020

A joint plan prepared by the Beauly District Fishery Board and the Ness and Beauly Fisheries Trust

Beauly District Fishery Board

Ness & Beauly Fisheries Trust

Contents

1 INTRODUCTION

Fish populations within the Beauly district are not only an important and integral feature of its aquatic ecosystems, but they also present a valuable resource in terms of the local economy. Their full ecological value and economic potential can only be achieved and sustained through careful and sustainable fisheries management.

The following plan has been jointly prepared by the Beauly District Fishery Board (BDFB) and Ness and Beauly Fisheries Trust (NBFT). It sets out the priority actions which have been identified for managing fish populations within the Beauly district.

Previous plans were published for the period 2008 to 2010 and the period 2011 to 2013, with this current plan representing the third iteration of an ongoing planning process. The plan has been published following a wide ranging public consultation with interests including proprietors, anglers and Government and non-Government agencies.

2 AIMS & OBJECTIVES

The overall aim of this fisheries management plan is to provide a framework for the protection and enhancement of fish populations within the Beauly district and to ensure that the exploitation of such populations by either commercial or recreational fisheries is undertaken in a sustainable manner. The plan relates to all native and naturally occurring fish species within the Beauly district area, with a particular focus on salmon and sea trout populations due to their economic importance.

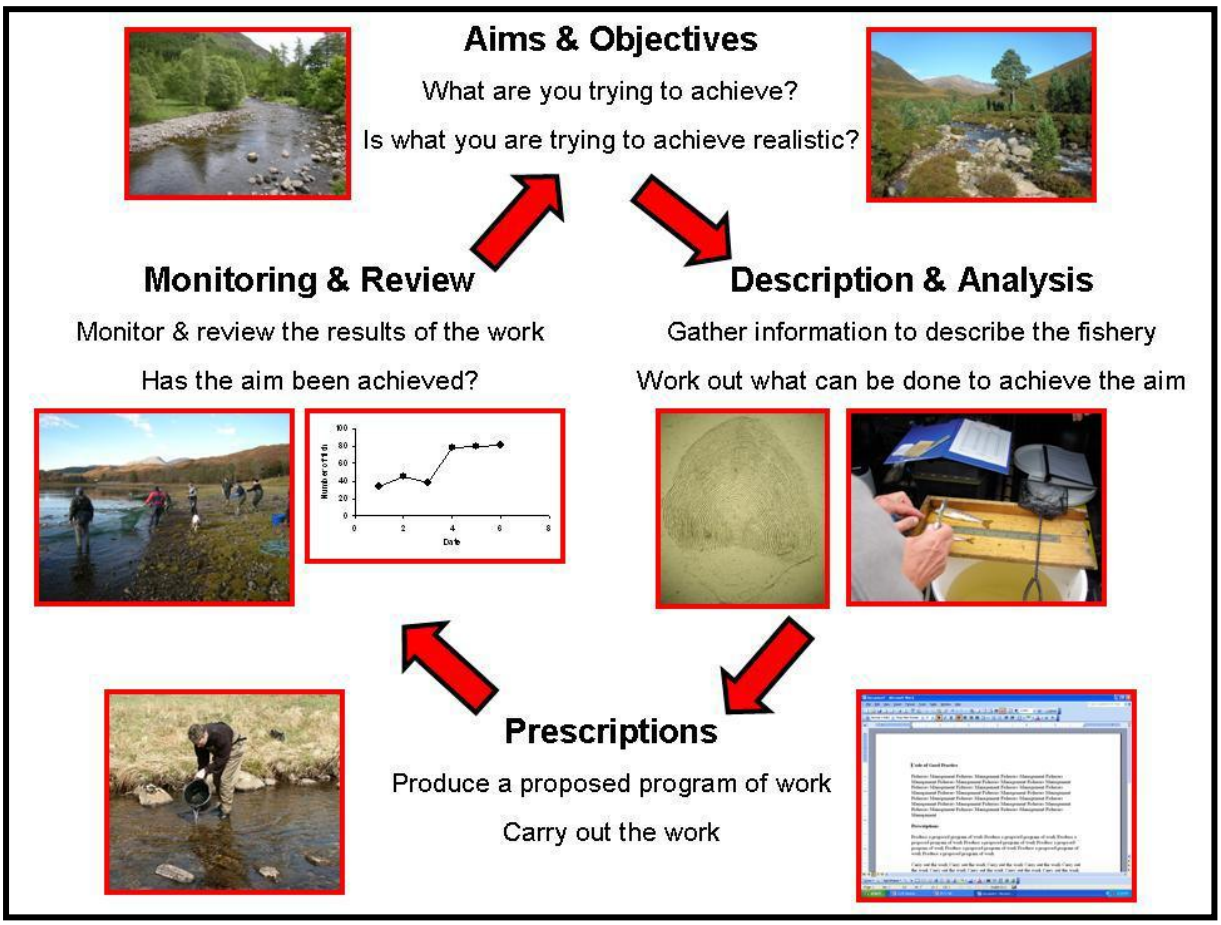
The lifespan of this plan is six years, commencing 30th April 2014 and ending 30th April 2020. The success of the management plan will be evaluated on a regular basis against a set of Specific, Measurable, Attainable, Relevant and Time-bound (SMART) objectives. These objectives relate to the contribution that the plan is making to key life stages of fish and their contribution to local socio-economics, as outlined below:

- Maintain or increase the density and distribution of juvenile fish populations;
- Stabilisation or enhancement of the number of resident or returning adults; and
- An increase in the socio- economic value of fisheries within the Beauly district.

These objectives will be achieved through information gathering, the assessment of the key pressures on particular fish populations and the delivery of priority actions required for mitigating such pressures.

Figure 2.1 below was produced by the Institute of Fisheries Management (2012) and outlines the thought process that leads from gathering information/describing the fishery, through to the production of work programmes and then monitoring to ensure that the aims of the plan are achieved. It also emphasises how the evidence and experience gained during management work feeds back into the process to give continuous improvements to the system.

Figure 2.1 Fishery Management Planning Cycle



There are a number of other related plans and projects in existence or in development that encompass all of part of the Beauly district. These include the Inverness and Nairn Biodiversity Action Plan, the Scottish River Basin Management Plan, the Ness and Beauly Biosecurity Plan. These have been taken into account during the production of this fisheries management plan.

Whilst this plan is intentionally focused on fish, it is intended that the management actions will also benefit the wider biodiversity and communities with the Beauly district. The district has been sub-divided into smaller management units in order that those pressures and associated actions that are generic across the district or more specific in nature can be defined. The BDFB and NBFT are committed to work with all willing partners to deliver this plan.

3 CURRENT FISHERIES MANAGEMENT STRUCTURE

3.1 THE BEAULY DISTRICT FISHERY BOARD (BDFB)

The Beauly District Fishery Board (BDFB) is the statutory body responsible for the protection and enhancement of salmon and sea trout fisheries in the district. It takes its remit from the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 which states that a District Salmon Fishery Board may do such acts, execute such works and incur such expenses as may appear expedient for:

- The protection or improvement of the fisheries within their district;
- The increase of salmon (and sea trout); or
- The stocking of the waters of the district with salmon (and sea trout).

The BDFB finances its work by levying a rate on the salmon fishery owners in the district. This fishery assessment is assessed at such uniform rate as is determined for all fisheries in the district by the board and shall be exigible according to the valuation of a fishery as entered onto the valuation roll.

Elected representatives of those salmon fishery owners provide the core of the membership of the Board, together with representatives of salmon anglers and other parties who may have an interest in salmon stocks or fisheries in the district. It is also usual for salmon nets-men to be represented on a Board; however there are currently no active netting stations within the BDSFB area. Board members are all volunteers and are non-remunerated for their time and effort.

3.2 NESS & BEAULY FISHERIES TRUST (NBFT)

The Ness & Beauly Fisheries Trust (NBFT) is an environmental charity established in 2006 to secure the preservation, protection, development and improvement of both the Rivers Beauly and Ness and the native fish stocks within their catchments. Overall management of the Trust is undertaken by a board of Trustees. The Trust currently employees two full-time members of staff, with seasonal staff employed if required.

The core activities of the Ness & Beauly Fisheries Trust include the collection of data on fish stocks within the area. The gathering of this data facilitates the provision of informed advice to the district salmon fishery boards and other agencies within the Ness & Beauly catchments. Additionally, habitat data is collected to identify, for example, barriers to fish migration that would benefit from remedial action. Collaborative research into key issues such as salmon genetics and the causes of the decline in sea trout abundance is ongoing. A growing activity of the Trust is the provision of education and outreach services. Consultancy services are also provided by Ness & Beauly Fisheries Trust and numerous reports and surveys have been commissioned by various projects, individuals and

companies including European funded projects.

3.3 SCOTTISH NATURAL HERITAGE (SNH)

A number of other bodies are indirectly involved in fisheries management in the Beauly district. Scottish Natural Heritage (SNH) is of particular importance and representatives of this organisation have historically been invitees at meetings of the BDFB.

3.4 SCOTTISH ENVIRONMENT PROTECTION AGENCY (SEPA)

The Scottish Environment Protection Agency's (SEPA) traditional role of maintaining water quality has been augmented by its responsibilities for implementing the provisions of the EU Water Framework Directive. This has given SEPA new powers to regulate abstraction, engineering and other activities and has placed a requirement on SEPA to monitor fish populations.

3.5 MARINE SCOTLAND (MS)

Marine Scotland (MS) is the directorate of Scottish Government (SG) responsible for marine and fisheries issues in Scotland. Marine Scotland Science (MSS), formerly Fisheries Research Services, was established as a division of Marine Scotland on 1 April 2009. Its purpose is to provide expert scientific, economic and technical advice and services on marine and freshwater fisheries, aquaculture, and the aquatic environment and its flora and fauna, in support of the policies and regulatory activities of the Scottish Government.

3.6 OTHERS

Another key body involved in fisheries management in the Beauly district is SSE, the operator of various large scale hydro-electric operations across the district. They employ dedicated fisheries and environmental specialist to ensure the potential negative impacts of their schemes are minimised. Fisheries proprietors and their staff together with Beauly Angling Club (BAC) are also involved in various aspects of fisheries management.

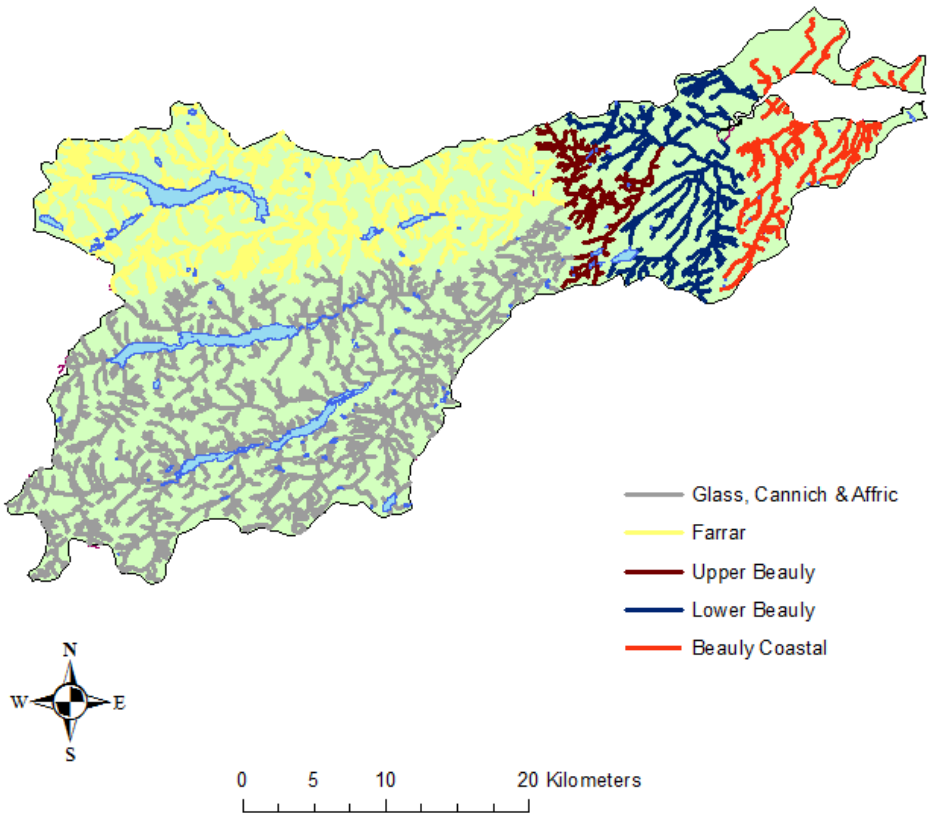
4 THE BEAULY DISTRICT

4.1 INTRODUCTION

The River Beauly drains a catchment of approximately 1000 square kilometres of land thus making it the second largest catchment north of the Great Glen. The catchment extends almost to the west coast with the most westerly tributaries being only approximately 7km east of Loch Duich.

For management purposes the district can be sub-divided into five management units as shown in **Figure 4.1** below. The management units utilised are:

Figure 4.1 Beauly Management Units



The management units utilised for this plan are:

- **Beauly Coastal**
- **Lower Beauly**
- **Upper Beauly**
- **Farrar**
- **Glass, Cannich & Affric**

4.2 TOPOGRAPHY

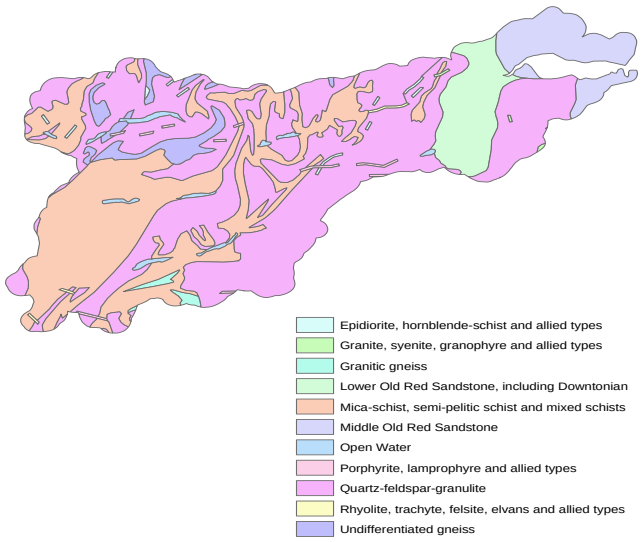
The mean altitude of the catchment is in excess of 385m and several peaks are in excess of 1000m. Steeper gradients and therefore higher flow velocities are typically found in the upper parts of the catchment.

4.3 GEOLOGY

The Mullardoch and Affric regions of the upper catchment comprise largely of metamorphosed sedimentary rocks belonging to the Moine succession. Around Loch Monar there are outcrops of older metamorphic rocks. Strathglass is dominated by quartz-feldspar-granulite. The Farrar catchment contains quartz-feldspar-granulite, schists and gneiss. The lower catchment is dominated by Old Red Sandstone.

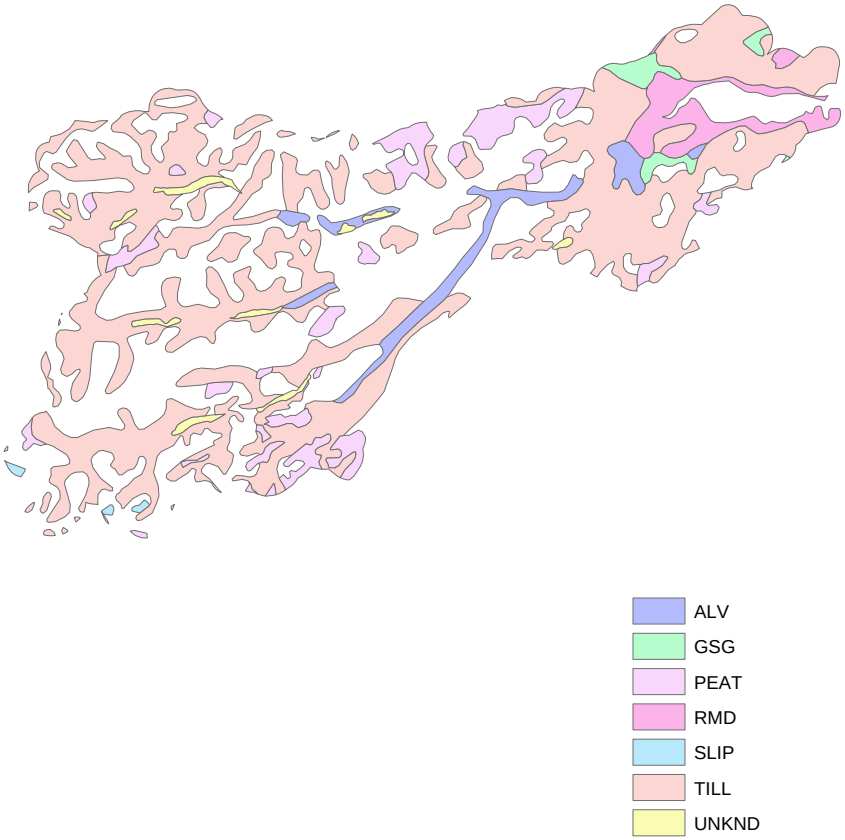
The bedrock geology of the area is illustrated in **Figure 4.2** below.

Figure 4.2 Beauly District Bedrock Geology



Bedrock data, Digital Geological Map of Great Britain 1:625 000 (DiGMapGB-625), British Geological Survey (2003), © and database right NERC.

Figure 4.3 Beauly District Superficial Geology



Superficial Deposits data, Digital Geological Map of Great Britain 1:625,000 (DiGMapGB-625), British Geological Survey (2003), © and database right NERC

Key to Superficial Geology:

ALV = Alluvium
GSG = Glacial Sand and Gravel
Peat = Peat
RMD = Raised Marine Deposits
Slip = Landslip
Till = Till
UNKD = Unknown

4.4 CLIMATE

Given the large geographical area covered by the catchment it may be anticipated there is a widespread variation in climatic conditions. Examination of Met Office 1971-2000 data indicates that the area of the Beauly catchment closest to the Moray Firth has a mean temperature of 7.5-8.5°C, annual rainfall of 500-1200mm and 1100-1200 hours of sunshine per annum. This contrasts with an average mean temperature of 1-5°C, annual rainfall of 2800-4400mm and 750-950 hours of sunshine in the westerly extremes of the catchment.

4.5 HYDROLOGY

The National Rivers Flow Archive contains details of historical flow data at several locations within the Beauly system. SEPA gauging stations currently operate at Erchless (River Glass), Struy (River Farrar) and Red Bridge (River Beauly).

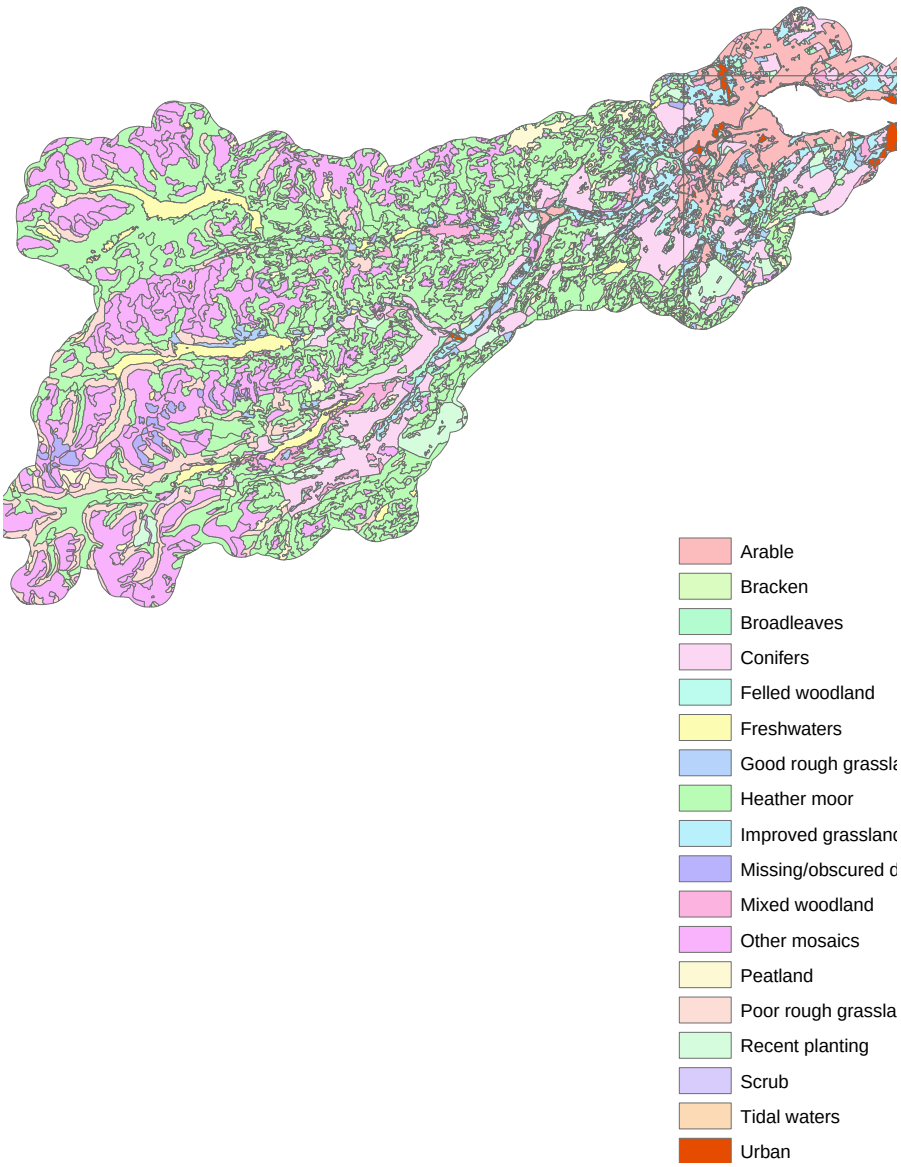
4.6 WATER QUALITY

Examination of SEPAs classifications for the Beauly catchment suggests that water quality is generally of a high standard. Pollution incidents, however, do occur on occasion and NBFT and BDFB remain vigilant in respect of maintaining high water quality standards. Diffuse pollution may also be an issue in some agricultural areas of the catchment.

4.7 LAND USE

Land use within the Beauly is broadly similar to neighbouring catchments with large areas owned by sporting estates and forestry enterprises (often utilised for deer stalking), rough grazing for cattle and sheep and both commercial timber forestry and native woodland. The largest urban conurbation is Beauly, located in the lower reaches of the River Beauly system. Glen Affric contains the third largest remnant of the Caledonian Forest and has been designated as a National Nature Reserve. **Figure 4.4** below illustrates the land use in the Beauly catchment.

Figure 4.4 Land use in the Beauly catchment



Land Cover of Scotland data, 1:25,000, MLURI 1993

5 FISH AND FISHERIES OF THE BEAULY DISTRICT

5.1 INTRODUCTION

Electric fishing surveys within the Beauly catchment provide extensive data in respect of the distribution and abundance of fish species within the main river systems. Surveys undertaken within the coastal district were a key component of the 2008-2010 and 2011-2013 plans and have greatly

improved the understanding of fish distribution in these areas. There remains a relative lack of information regarding the distribution and status of fish stocks in still water habitats within the catchments.

Some information in addition to that available for previous management plans has been obtained from surveys undertaken on Loch Bruicheach, for example. Overall it is recognised by NBFT that the lack of data on still water fish populations still represents a major gap in knowledge. A key aim of future management activities will be to close these gaps in knowledge in order to facilitate the proper management of fish stocks within the respective management units.

The subsections below provide a description of the key fish species known to be present in the Beauly catchment and their known status, distribution and exploitation.

5.2 ATLANTIC SALMON (*SALMO SALAR*)

The Atlantic salmon (Salmon salar) is an 'anadromous' fish, which means that it is born in fresh water, spends part of its lifecycle in the sea, and returns to fresh water to spawn. Salmon are believed to navigate across the open sea using the earth's electromagnetic field and celestial cues. Once in coastal waters they locate their natal river using an acute sense of smell. Salmon return to the river throughout the year, with distinct peaks in numbers referred to as 'runs' when specific 'components' of the salmon population enter the river.

Once in the river adult salmon do not feed and instead live on their fat reserves. The 'spring' component of salmon runs may spend up to a year in freshwater without feeding. After a few weeks they lose their bright silver appearance and develop their breeding colours. The females (known as 'hens') turn a dark grey/brown colour with tinges of blue and purple along their side and gill covers (opercula). The males (known as 'cocks') turn deep orange and red in colour and develop a hooked lower jaw known as a 'kype'.

By late autumn the salmon have reached the area of the river where they were born. Spawning usually takes place sometime between October and January depending on local conditions. The hen fish selects an area with a suitable gravelly substrate and uses her tail to excavate a nest or depression in the bed of the river. She then proceeds to deposit her eggs in to the nest, which are simultaneously fertilised by at least one adult male (and often precocious parr) as they are released. The hen then moves upstream of the nest and uses her tail once again to displace gravel and cover the eggs in what is known as a salmon 'redd'.

Adult fish that survive the spawning process as called 'kelts'. These fish drop back through the river system and return to the sea during the spring. A small proportion of these may return to spawn for a second (or even third) time, many of which will be large females.

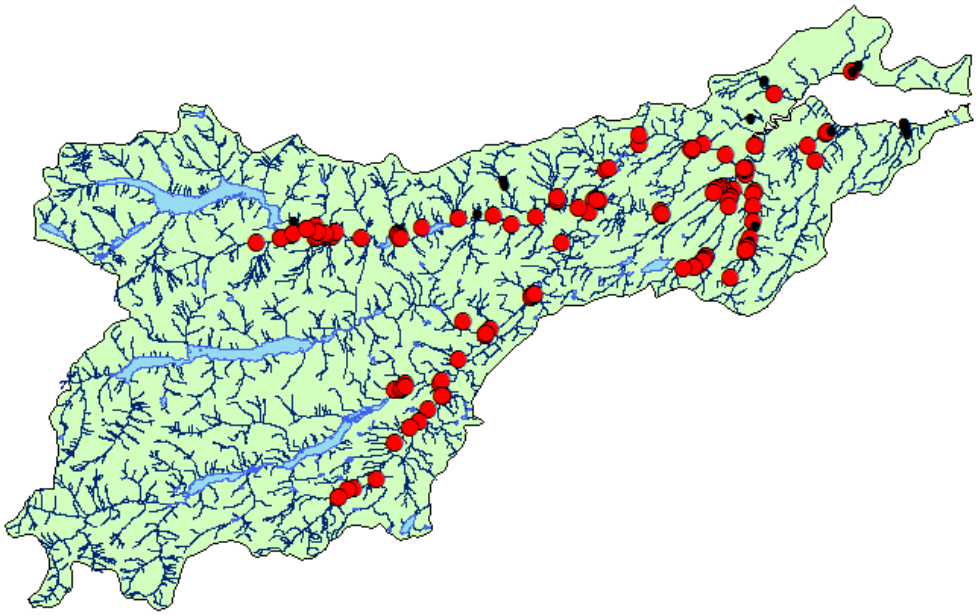
Atlantic salmon are listed on Appendix III of the Bern Convention and Annex II and V of the EC Habitats & Species Directive. The multi-sea-winter component of the Atlantic salmon population is included in the UK Biodiversity Action Plan (UKBAP) Priority Species List. They are the dominant species within the Beauly District and are only absent where impassable barriers exist or where land use practices have removed or destroyed suitable habitat.

5.2.1 Distribution

The current distribution of juvenile salmon within the Beauly system is likely to be very similar to the historical distribution. Exceptions to this are found on the Farrar system where a number of burns are abstracted for electricity generation and do not presently appear to support salmon populations. It should be noted that assessment of juvenile salmon distribution has been rendered difficult in the past due to the practice of stocking parts of the catchment upstream of what were considered barriers or partial barriers to upstream salmon migration. Due to the temporary suspension of hatchery activities for several years, an improved knowledge of natural salmon distribution has been gained by NBFT.

Figure 5.1 A two year old salmon parr captured during a routine electric fishing survey

Figure 5.2 Known distribution of juvenile salmon across the Beauly catchment. Red dots represent sites at which juvenile salmon have been captured, black dots represent sites at which no salmon have been captured.



5.2.2 Exploitation

Salmon are the most economically important of the exploited species of fish in the Beauly District. They have represented a valuable resource for local fisheries for centuries and are well known to many people. Catch returns and fish counter data are the main indicator of adult run size available for the Beauly system. Catch statistics are collected annually by Marine Scotland Science (MSS) for all fishery districts in Scotland.

As a considerable historical data set exists (1952 to 2012), the size of the catch can be used as a measure of its status by comparing the annual catch against a long-term catch. Please note that the data used throughout this section are Crown copyright, used with the permission of MSS, who are not responsible for interpretation of these data by third parties.

5.2.2.1 Net Catches

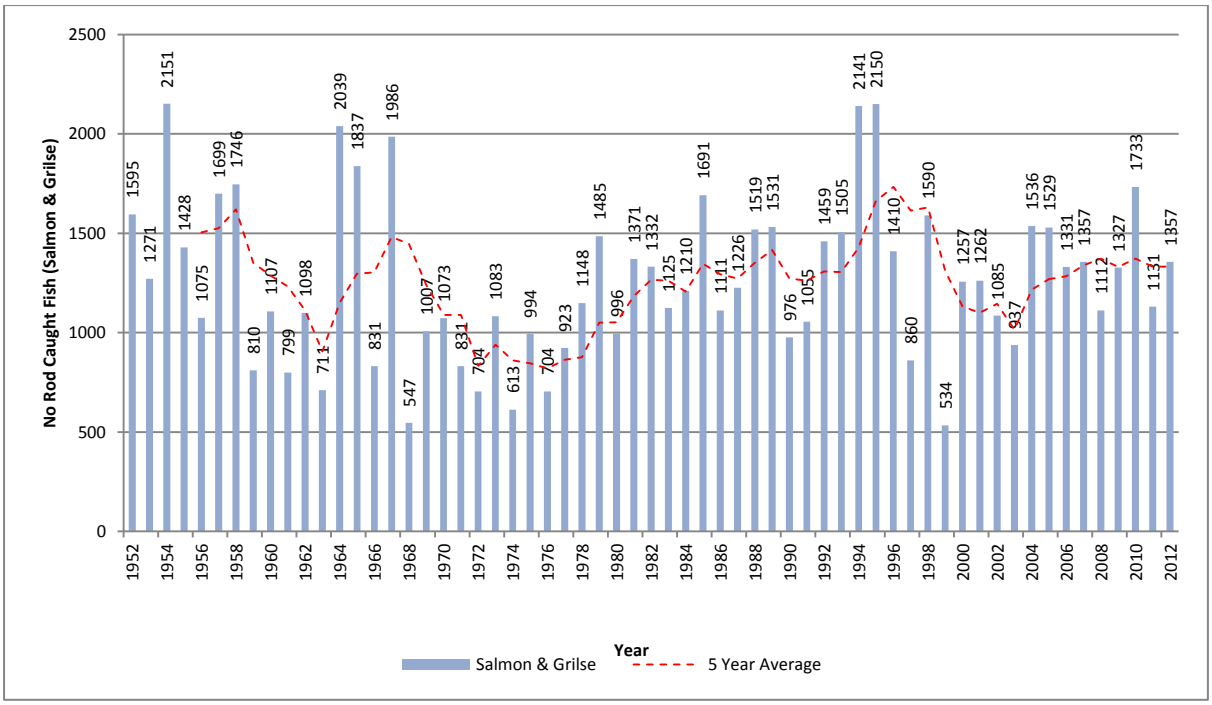
Historically the Beauly District supported significant net fisheries. However, no net fisheries have operated since 1986.

5.2.2.2 Rod Catches

In more recent times, salmon angling has become a popular sport, making a significant contribution to the local economy. Radford *et al* (2004)[1] estimated that anglers spent a total of £73 million on salmon and sea trout angling in Scotland, with anglers in the Highlands accounting for nearly 50% (£35 million) of this total. Further to this, it was estimated that 781 jobs in the Highlands are dependent on salmon and sea trout angling.

The total Beauly District annual rod catches (salmon and grilse combined) over the 61 year period between 1952 and 2012 are presented in **Figure 5.3** below. The mean rod catch for the system within that period is 1360. Provisional data for the 2013 season suggests that the catches will be considerably below the long term average figure, in common with many other Scottish salmon fisheries.

Figure 5.3 Total Beauly District rod salmon catches (salmon and grilse combined) over the last 61 years (1952 to 2012)

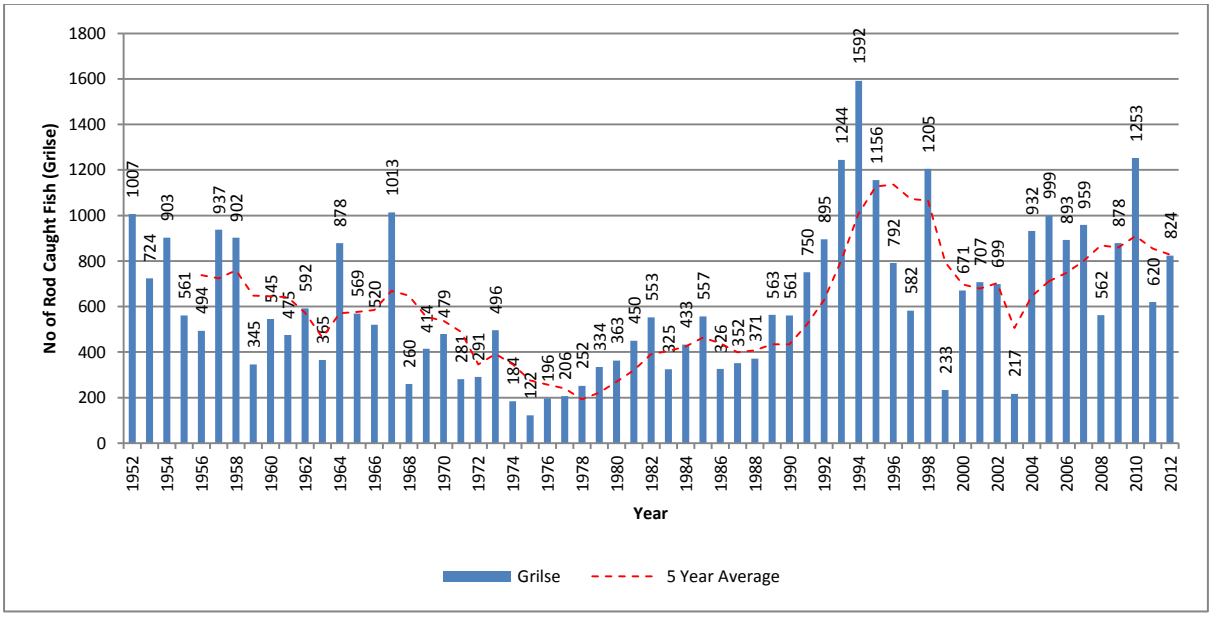


Overall, it would appear that total salmon and grilse catch has remained relatively stable over the period for which official figures are available. The lowest total catch was 534 in 1999 whereas the largest catch was 2151 in 1954.

[1] Radford, A., Riddington, G., Anderson, J. & Gibson, H. (2004) Research Report: The Economic Impact of Game and Coarse Angling in Scotland. Prepared for Scottish Executive Environment and Rural Affairs Department.

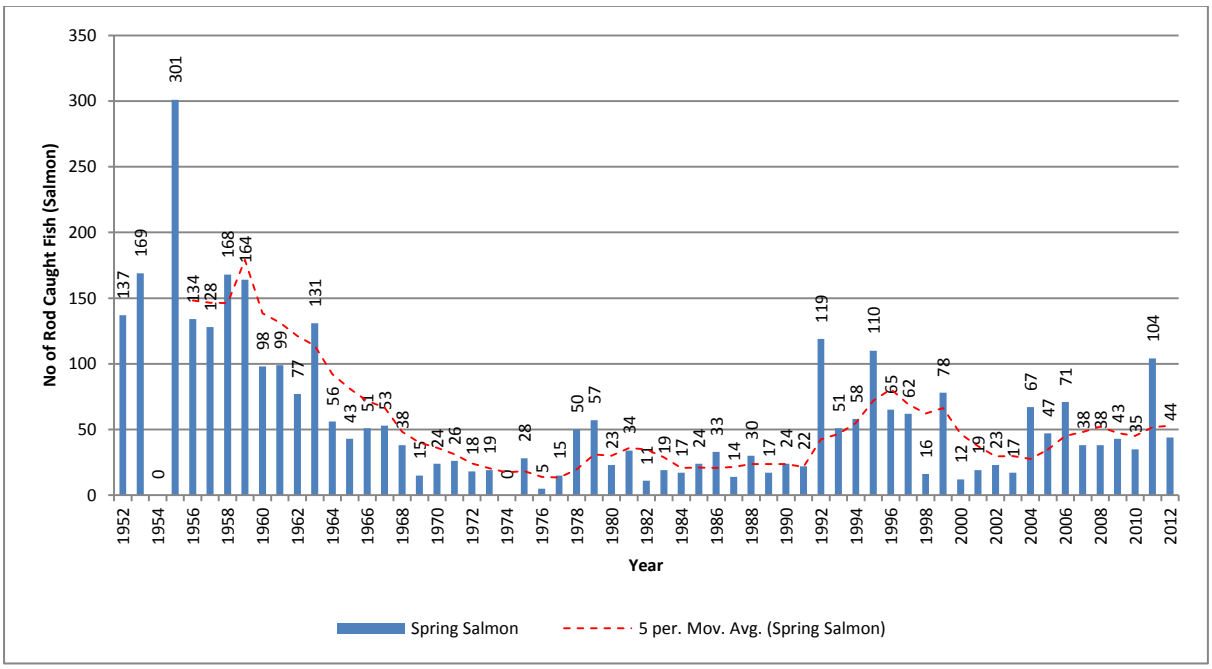
Grilse catches over the 61 year period between 1952 and 2012 are presented in **Figure 5.4** below. It would appear that there is a general trend for increasing grilse within the period for which official figures have been available although there has been considerable variance in annual catches. The lowest grilse catch was 122 in 1975 whereas the highest within the period was 1592 in 1994.

Figure 5.4 Beauly District grilse catches over the last 61 years (1952 to 2012)



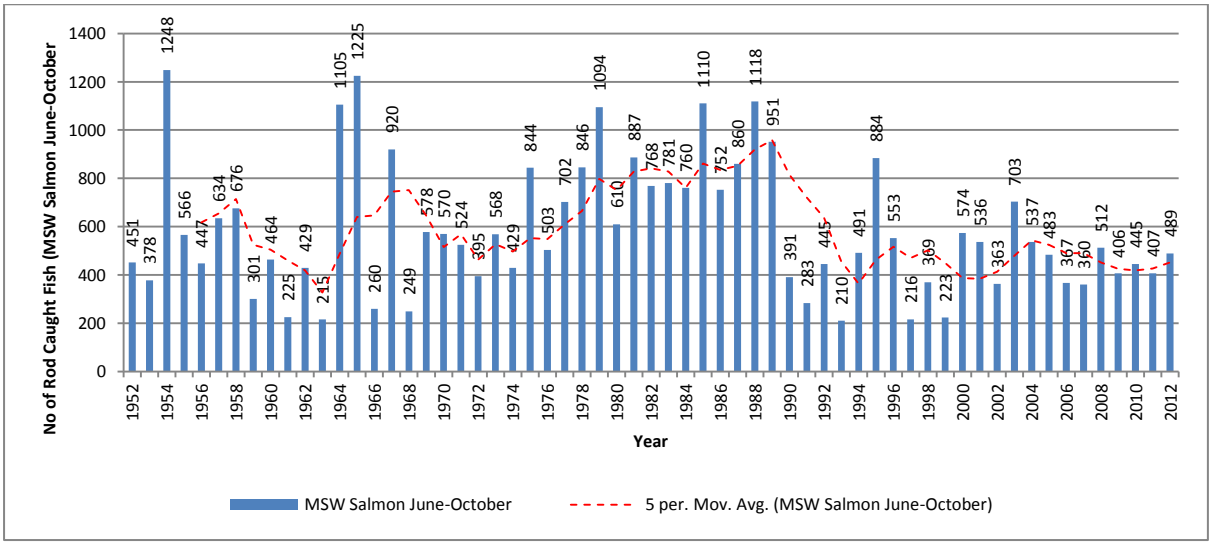
The 'spring' component of a salmon population generally relates to those fish that enter rivers between January and the end of May although typically Marine Scotland use the period until the end of April as the cut-off point for spring catches. Using a 'cut-off' point of the end of May for the purposes of this plan, **Figure 5.5** below presents the Beauly District 'spring' catches over the 61 year period from 1952 to 2012. The highest 'spring' catch was 301 in 1955. There are two zero catches in the time series, namely 1954 and 1974. The mean spring catch for the time series available currently stands at 57. Overall, there was been a general trend for decreasing 'spring' catches on the Beauly system in the time period covered. In recent years there appears to have been a modest improvement in 'spring' catches and provisional catch figures for the 2013 season would suggest that the improvement is continuing.

Figure 5.5 Beauly District 'spring' salmon catches (February to May) over the last 61 years (1952 to 2013)



The Beauly District summer and autumn multi sea winter (MSW) salmon catches over the 61 year period between 1952 and 2012 are presented in **Figure 5.6** below. The highest annual catch of MSW summer and autumn salmon was recorded in 1954 when 1,248 fish were caught. The lowest figure recorded was 210 in 1993. The mean catch for the time series is 585.

Figure 5.6 Beauly District summer and autumn MSW salmon catches (June to October) over the last 61 years (1952 to 2012)

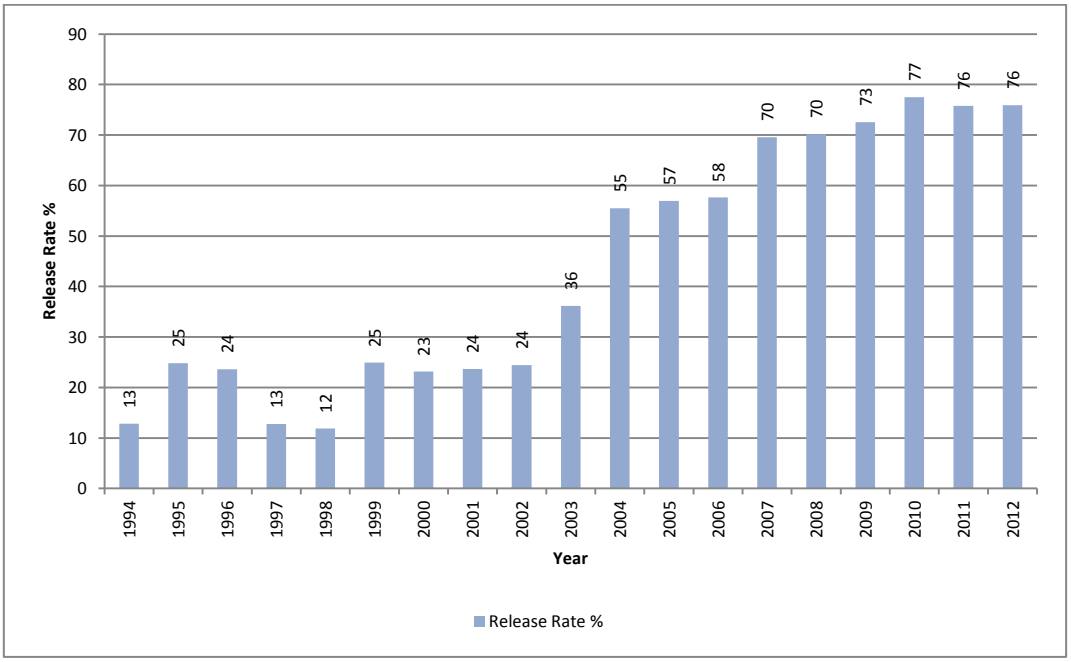


It would appear that the situation with the MSW summer and autumn salmon stock component has displayed a less marked decline in abundance than the 'spring' stock component. In recent years catches appear to have been relatively stable in nature

5.2.2.3 Catch and Release

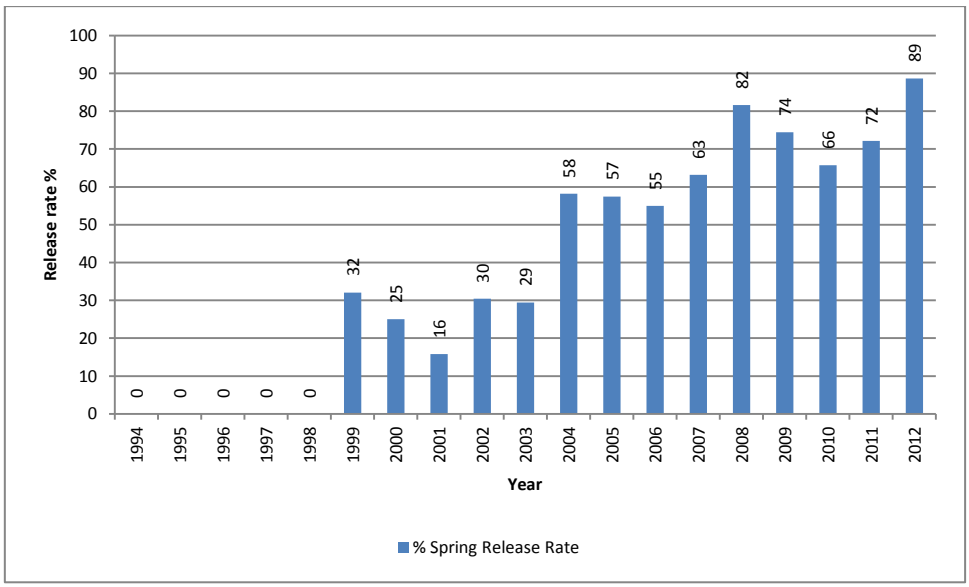
As a management tool the BDFB has implemented a number of measures to promote catch and release as part of its suite of wider conservation measures aimed at maintaining and improving stocks. Catch and release figures are available from 1994 onwards. Cooperation from all beats on the system has resulted in an increase in release rates from just 13% of all salmon and grilse in 1994, to current levels of around 75%. (see **Figure 5.7** below).

Figure 5.7 Proportion of salmon and grilse released on the Beauly System (1994-2013)



Particular effort has gone towards protecting the vulnerable 'spring' component of the salmon populations. These fish are important not only in terms of their conservation value, but also their economic value. Cooperation from all beats on the system has resulted in an increase in 'spring' release rates from 0% in 1994 to 89% in 2012.

Figure 5.8 Proportion of 'spring' salmon released on the Beauly System (1994-2012)



5.2.3 Fish Counter Data

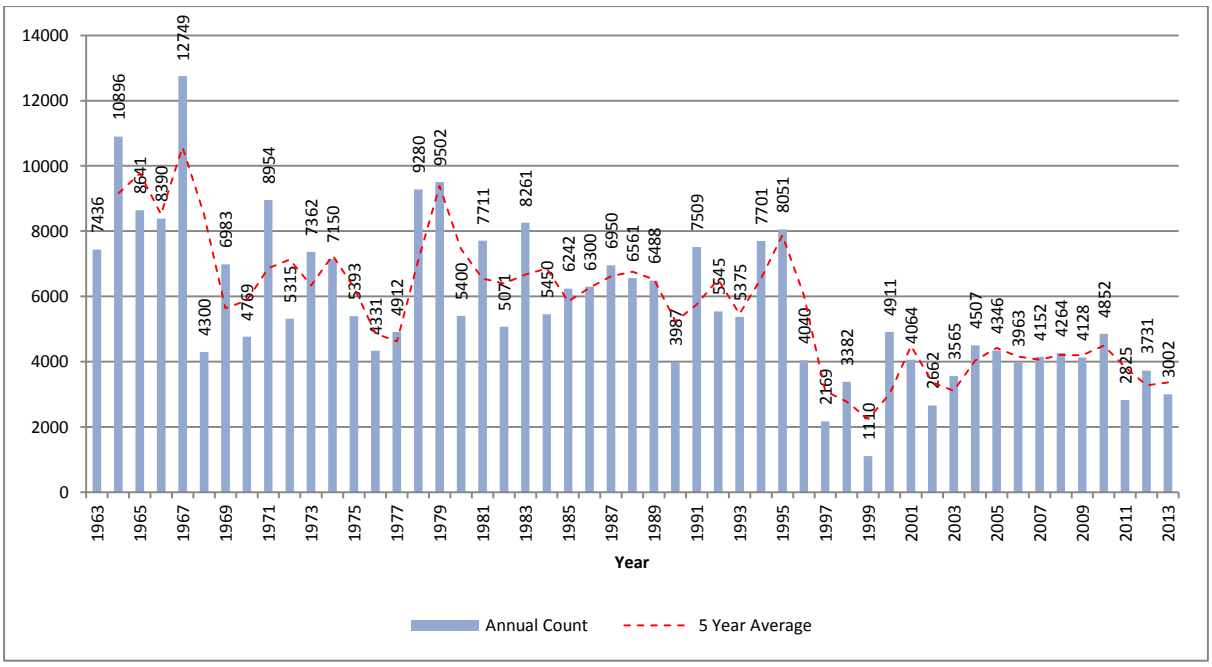
Automatic counters were first developed in the late 1940s to allow fishery managers to assess whether or not fish passes incorporated into hydroelectric dams were successfully facilitating the upstream passage of salmon. Three such counters where installed in the Beauly catchment by the then North of Scotland Hydro-electric Board (now SSE) namely Kilmorack, Aigas and Beannacharan. Data sets for Kilmorack are generally more intermittent than is the case for Beannacharan and Aigas therefore management attention has largely centred on the figures available for the latter two counters.

These resistivity counters have been regularly updated by SSE since their first introduction and operate on the principle that the body of a fish has lower electrical resistance than the surrounding water. Three electrodes are mounted across the flow of a counting channel (see **Figure 5.9** below). The distance between the electrodes determines the length of fish detected and the magnitude of the change in resistance provides an indication of the size of the fish responsible. The direction in which the fish is travelling can be determined by the shape of the signal.

Figure 5.9 Adult salmon passing through the counting flume at Dundreggan Dam, River Moriston, part of the neighbouring Ness system (taken from above)

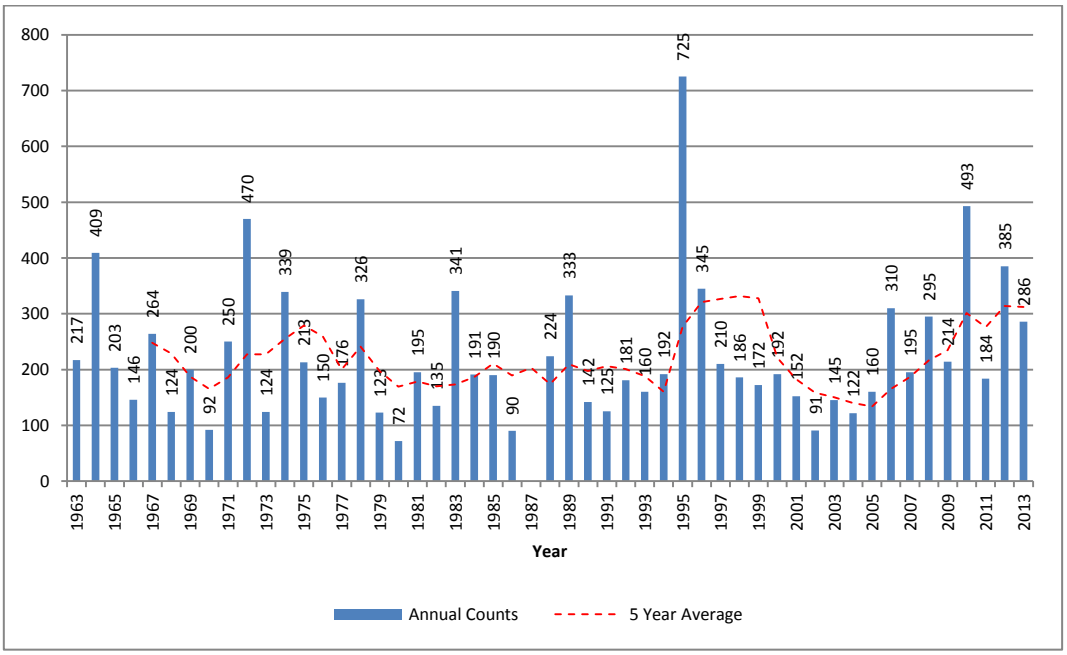
The total annual count and five year averages for the Aigas counter are presented in **Figure 5.10** below. It can be seen that there has been a general trend for decreasing counts during the time series beginning in 1963. Provisional data from the 2013 season has been included in the data set.

Figure 5.10 Total upstream adult salmon counts at Aigas Dam, River Beauly (1963 to 2013)



Figures from the Beannacharan fish counter appear to show a different picture than the Aigas fish counter. Counts appeared relatively stable, albeit at relatively low absolute numbers, for much of the period post 1963. In more recent years there appears to be a modest upward trend in counts as evidenced by increases to the five year average count (see **Figure 5.11** below).

Figure 5.11 Total upstream adult salmon counts at Beannacharan Dam, River Farrar (1963 to 2013)



5.2.4 Summary

Rod catches on the Beauly system appear to have remained relatively stable during the period for which official statistics are available from Marine Scotland. However, caution must be applied to interpretation of the catch figures given that associated fishing effort data is not available. Latterly, known exploitation of salmon stocks within the Beauly District has been limited to the rod and line fishery and netting rights have not been exercised. Fish counter figures from Aigas Dam suggests that there has been a decline in the numbers of fish returning to much of the Beauly system since 1963 although it should be noted that considerable habitat is available downstream of Aigas Dam and no information is available with regards to the total number of salmon returning to the Beauly system as a whole. In contrast to the declining numbers being counted at Aigas, counts at Beannacharan Dam further upstream appear to have increased in recent years. Considerable management effort, for example the adoption of catch and release of salmon, has taken place in an attempt to maximise the numbers of adult salmon able to spawn.

5.3 BROWN/SEA TROUT (*SALMO TRUTTA*)

Brown trout (*Salmon trutta*) are a United Kingdom Biodiversity Action Plan (UKBAP) species and therefore deemed to be of national importance (see **Figure 5.12** below). Sea trout are the sea-running form of the brown trout importance (see **Figure 5.13** below).

Scottish rivers were colonised by sea trout at the end of the last Ice Age, and their descendants form the populations of brown trout and sea trout we know today (both *Salmo trutta*). Of particular conservation value are the original colonisers, i.e. those fish which occupied isolated lochs and streams immediately after the retreat of the ice c.10,000 years ago, the descendents of which can still be identified today.

Figure 5.12 A typical brown trout with its characteristic red and black spots

Neither forms of trout, freshwater resident or sea trout, receive extensive protection within conservation legislation. Some protection in terms of exploitation controls exist within fisheries legislation and sea trout are further protected within fisheries acts relating to the protection of 'salmon'. In 2007, however, both ancestral brown trout forms and sea trout were added to the UK

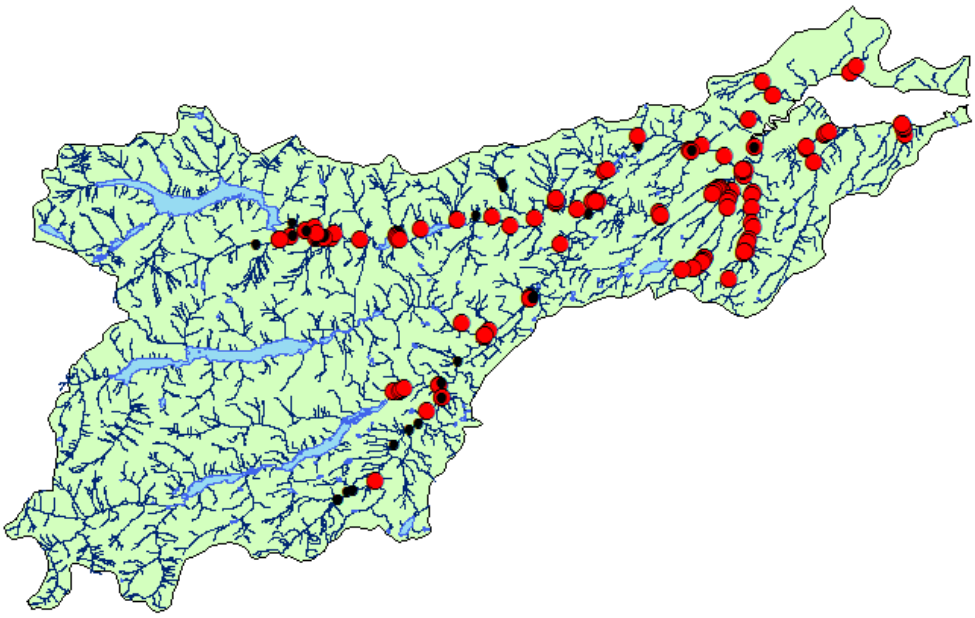
Biodiversity Action Plan Priority Species List.

Figure 5.13 A brace of 3lb Highland sea trout with characteristic silvery bodies and black spots

5.3.1 Distribution

The brown trout is the most widely distributed fish in the Beauly District. It is present in all of the sub-catchments and in many areas inaccessible to salmon (see **Figure 5.14** below for distribution in running water). The distribution of sea trout within the Beauly system is thought to be similar to that of salmon downstream of Kilmorack Dam, although they are known to pass some obstructions more readily than salmon. The degree to which sea trout penetrate the catchment upstream of Kilmorack Dam is presently poorly understood.

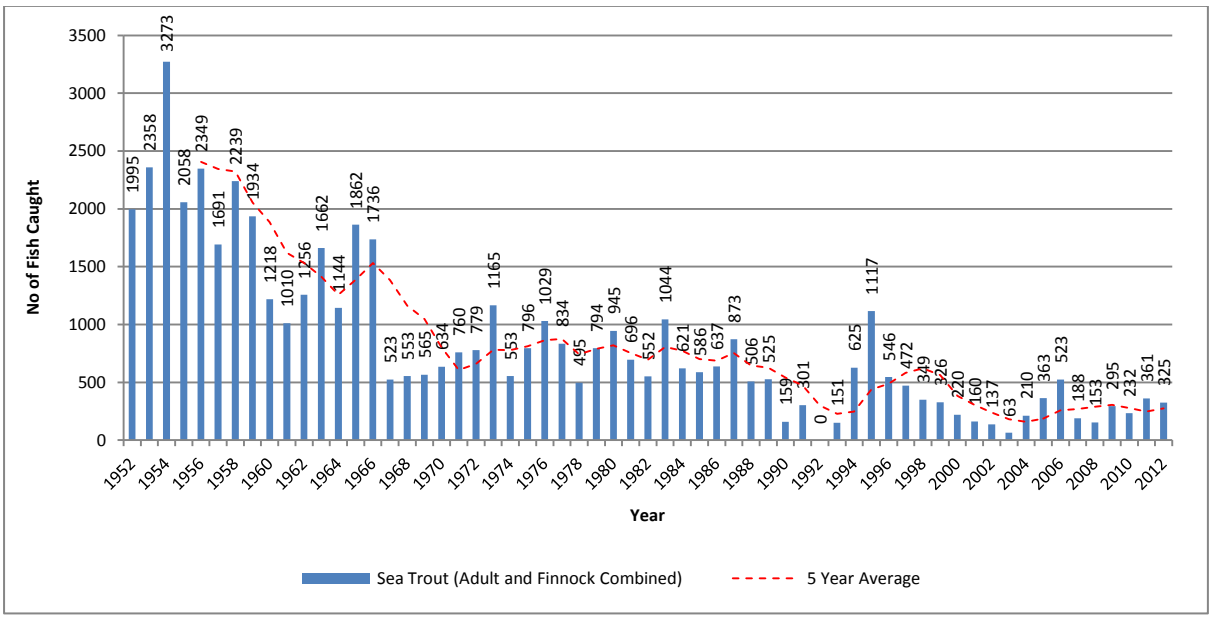
Figure 5.14 Known distribution of juvenile trout across the Beauly catchment



5.3.2 Exploitation

The Moray Firth has historically supported a prolific sea trout rod and line fishery. Over a period of several decades, however, the fishery has undergone a precipitous decline. Catches within both the Beauly system and the neighboring Ness system are currently at very low levels. Marine Scotland catch figures are available for sea trout from 1952 onwards (see **Figure 5.15**). It should be noted that finnock are only included in the official statistics from 2004 onwards and that data for sea trout returned is only available from 1994 onwards.

Figure 5.15 Total Beauly District sea trout catches (adult and finnock combined) over the last 61 years (1952 to 2012)



The BDFB are helping to address declining sea trout catches through involvement with the Moray Firth Trout Initiative (MFTI). This is a collaborative project formed by local fishery trusts from around the Moray Firth to conserve local wild trout populations. The MFTI is working with local fisheries trusts, district salmon fishery boards and community angling associations to protect trout and sea trout through environmental education and the conservation of trout populations and their habitat. Their key aims are:

- The conservation of Moray Firth trout populations;
- Improved education and awareness of trout ecology, freshwater environments and associated threats in the local community;
- A network of community volunteers and river ambassadors;
- A sustainable and locally managed Moray Firth rod and line fishery for trout; and
- The improved understanding and management of Moray Firth trout populations.

Brown trout are widely targeted by rod and line anglers throughout the Beauly District in both still waters and riverine environments. Both brown trout and sea trout support economically important fisheries although there is presently little information available as to the financial value of these fisheries. There is currently no statutory obligation to report brown trout catch returns.

5.4 EELS (*ANGUILLA ANGUILLA*)

The European eel (*Anguilla anguilla*) is a 'catadromous' fish, which means that it lives in fresh water and enters the sea to spawn. It is distributed throughout European estuarine and inland waters, from Scandinavia to North Africa. It spends most of its life cycle in freshwater or coastal environments, but is thought to spawn in the Sargasso Sea off South America (although this is still to be proven).

Figure 5.16 An eel crossing open ground

The leaf-like leptocephalus larvae drift on ocean currents, returning to the European coast up to a year later. As glass eels, they enter estuaries and migrate upstream as elvers. They take residence in rivers and stillwaters, and develop into yellow eel. Between approximately 6 and 20 years later the yellow eel mature into adult silver eel, before migrating downstream and making the return journey to the west Atlantic to complete their complex life cycle.

The European eel is listed as 'critically endangered' on the International Union for Conservation of Nature (IUCN) Red List due a population collapse in the last 30 years. The number of elvers (young eels) migrating into European rivers has fallen to less than 5% of 1980s levels. The exact reason for its decline is not known, but it is likely to be a combination of factors including climate change,

habitat loss and obstruction of waterways. We know very little about the marine stage of the eel's lifecycle.

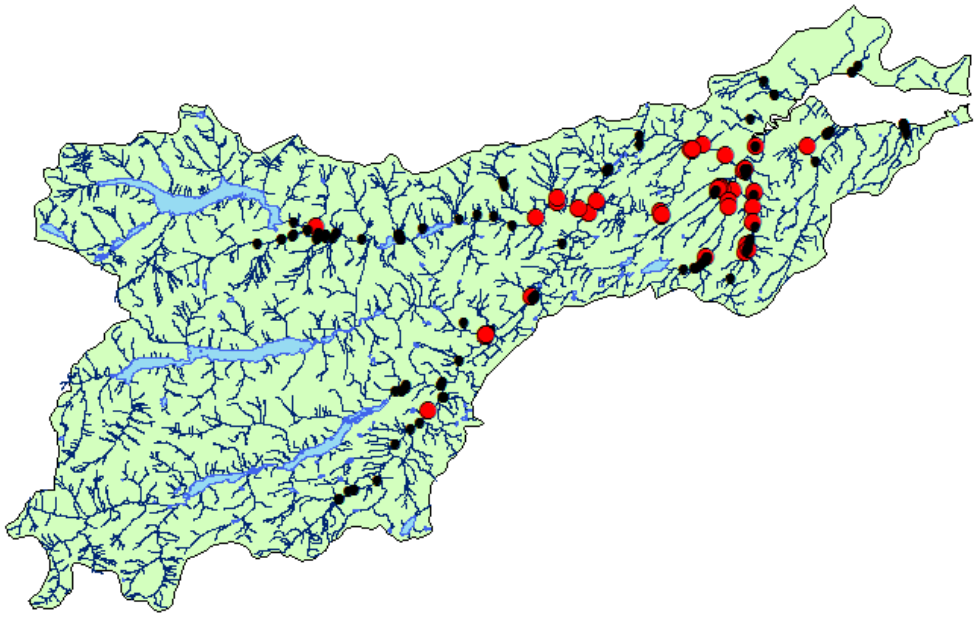
This widespread decline has led the European Commission to develop an Eel Recovery Plan (Council Regulation No 1100/2007). This aims to return European eel stocks to sustainable levels. Each Member State is required to establish national Eel Management Plans, with an Eel Management Plan for Scotland developed by Marine Scotland Science in 2008. The European eel was also added to the UKBAP Priority Species List in 2007.

It is the understanding of NBFT that the Beauly system historically supported an eel fishery utilising eel traps in the lower reaches of the river although information regarding the duration and extent of this fishery is not currently available.

5.4.1 Distribution

Eels are widely distributed throughout the easily accessible areas of the Beauly District. Increased levels of information on eel size have been gathered by NBFT in recent years during routine electric fishing surveys.

Figure 5.17 Known distribution of the European eel across the Beauly catchment



5.4.2 Exploitation

Eels are believed to have been exploited within the Beauly system in the past, although specific details of individual fisheries and their catches are not available. May and Marshall (2008) do however provide a historical summary of the overall Scottish eel fishery.

A small yellow/silver eel fishery was in existence from at least since 1573, though no official records have ever been kept for eels in Scotland. During the 1960s to 1970s eel catches in Scotland were estimated at around 10-40 tonnes per annum. A survey carried out in 1989 showed only 17 eel fisheries in operation, with eel catches ranging from 0.25 to 10.76 tonnes and none providing a sole income. In 2003 the total fishery took 2 to 3 tonnes, with yellow eels dominating the catches. The last of these fisheries (Lunan Burn, Tayside) closed in 2006 after its catch declined to 5% of the original level.

Elver fishing in Scotland started in the 1970's when demand on the continent (and then in Asia in the 1980's) encouraged a few enterprising individuals working rivers in England to look north of the border for new sources of elvers. In Scotland, during the mid to late 1990s there was a short period of exploitation of elver (estimated at 1 to 2 tonnes per annum) in response to the rise in demand and thus prices. Much of the fishing for elver occurred on the West Coast and Western Isles during the 1990's. Elver fishing then declined markedly and extensive government enquiries indicated that no commercial elver fisheries operated in Scotland during 2004 or 2005.

The Scottish Government submitted Scotland's Eel Management Plan to the European Commission in December 2008. This plan aims to help Scotland achieve the objective of the council regulation to protect and ensure the sustainable exploitation of the European eel.

As part of the management arrangements, new management measures to limit (where appropriate) the exploitation of eel stocks in Scotland have been introduced. In January 2009 the Scottish Government, after public consultation, introduced a freshwater fish conservation regulation to prohibit fishing by any method for eels without a licence from Scottish Ministers.

5.5 ARCTIC CHARR (*SALVELINUS ALPINUS*)

The Arctic charr (*Salvelinus alpinus*) was probably among the first fish to re-enter fresh waters when the last ice age ended. They display an unusually high degree of variance in physical characteristics. This variation manifests over a wide range of characteristics including morphology, size, colouration, behaviour and life history (see **Figure 5.18** below).

Arctic charr are closely related to the Atlantic salmon and the brown trout. Like most other salmonids, Arctic charr spawn in autumn or in late winter and early spring, often in gravel areas along loch shores. While they also occasionally spawn in streams flowing into lochs, emerging fry migrate downstream and generally do not form stream populations.

The majority of Arctic charr populations in Scotland occupy still waters and are not found to occupy rivers, although there are exceptions to this. Currently, Arctic charr are a conservation feature in five Sites of Special Scientific Interest (SSSI) and are present in a number of water bodies protected for other purposes, either under the Natura 2000 network or the National Nature Reserve series. The conservation value of Arctic charr within the UK has been further recognised by their addition to the UKBAP Priority Species List in 2007. This considers them as 'threatened or declining in range' due to such factors as global warming, land use changes and species introductions.

Figure 5.18 An Arctic charr captured during a survey of Loch Meadie, Sutherland

5.5.1 Distribution

A database of waters known or believed to support, or have supported Charr, in Scotland is maintained by Professor Peter Maitland. Examination of the database suggests that two lochs have historically supported charr within the Beauly area, namely Loch Bruicheach (part of the Bruiach and Belladrum system) and Loch Sealbhanach (part of the Cannich system). In the case of the former, the continued presence of charr has recently been confirmed by survey.

5.5.2 Exploitation

Arctic charr are a major food and recreational resource in many northern countries. No comparable recreational or commercial fisheries have developed in Scotland. As a result Arctic charr in Scotland have been largely unexploited and until very recently unadulterated, making the Scottish populations unique in Europe. Little information is available regarding catches or their economic importance.

5.6 PIKE (*ESOX LUCIUS*)

The pike is easily recognisable with its elongated mottled olive green body, single dorsal fin set back towards the tail and long jaws full of sharp teeth (see **Figure 5.19** below). They are found generally found in lochs or slower moving areas of rivers. Pike are ambush predators which lie in wait for prey to pass and then exhibit a sudden burst of acceleration as they strike. They will also follow shoals of bait fish such as spawning charr and salmon smolts.

Figure 5.19 A typical example of a large pike

It is not clear whether pike are indigenous to the Beauly District. It is believed that they may have been introduced by man, initially as a food source and more recently for sport although arguments can be made that they have naturally colonised the area.

There is concern that the presence of high densities of pike may be having a negative impact on fish species such as salmon and trout. Salmon smolts are particularly susceptible to pike predation during their downstream migrations through lochs. This is most likely to be a problem in areas where smolt production is low. Any attempt to remove them is likely to be unsuccessful. Studies have shown pike removals to be ineffective. They generally result in the removal of larger, cannibalistic individuals which are replaced by smaller fish which are equally effective predators.

5.6.1 Distribution

Pike are present in many of the lochs in the Beauly catchment including Loch Neaty, Loch Beannacharan and Loch Monar. They have also been recorded in many of the rivers and burns adjoining to these lochs although no pike have yet been captured in NBFT electric fishing surveys.

5.6.2 Exploitation

Whether indigenous to the Beauly system or not, pike are now well established in the Beauly area and pike angling has become popular in a number of locations, although little information is available regarding the numbers caught or the value of the fishery.

5.7 PERCH (*PERCA FLUVIATILIS*)

The perch (*Perca fluviatilis*) is a deep bodied fish marked with dark vertical bars along its green sides (see **Figure 5.20** below). It has a spiny first dorsal fin and non-spiny second dorsal fin. Its ventral and anal fins are red in colour. This predatory fish is common around most of the British Isles although much rarer in Scotland and other mountainous areas as they avoid very acid lakes and rocky rivers.

Figure 5.20 A typical example of a perch

5.7.1 Distribution

It is the understanding of NBFT that several lochans close to the periphery of the catchment contain Perch. To date no perch have been captured by NBFT in electric fishing surveys within the Beauly district.

5.7.2 Exploitation

It is possible that some angling for perch does take place, however there is no information currently available with regards to catches or their economic value.

5.8 LAMPREY SPECIES

The lampreys belong to an ancient order of vertebrates, the Agnathans or 'jawless fishes'. The skeletons of lampreys are of strong flexible cartilage and it is not comprised of bone. A round, sucker-like disc surrounds the mouth which, in adults, carries rasping teeth. Most, but not all, species of lamprey are parasitic on other fish.

Three lamprey species present in UK; brook lamprey (*Lampetra planeri*), river lamprey (*Lampretra fluviatilis*) and sea lamprey (*Petromyzon marinus*). All three species are afforded protection within conservation legislation:

- Brook Lamprey Annex II of the EU Habitats Directive Appendix III of the Bern Convention.
- River Lamprey Annexes II and V of the EU Habitats Directive Appendix III of the Bern Convention and are on the UKBAP Priority List.
- Sea Lamprey Annex II of the EU Habitats Directive Appendix III of the Bern Convention and are on the UKBAP Priority List.

Figure 5.21 A typical adult brook lamprey captured during an electric fishing survey

All three species of lamprey spawn in fresh waters, with the juveniles of all three species, being found within the same catchments, using similar microhabitats, but with varying geographical distribution (Harvey & Cowx, 2003). Sea lampreys are typically found in the lower reaches of rivers, while river and brook lamprey are more closely associated with the middle and upper catchment, where their ranges often overlap (Harvey & Cowx, 2003).

Figure 5.22 A typical adult river lamprey captured during an electric fishing survey

After hatching, the young elongate larvae, known as ammocoetes, swim or are washed downstream by the current to areas of sandy silt in still water where they burrow and spend the next few years in tunnels (Maitland, 2003). The standard methodology for sampling lamprey species involves assessment of populations of these ammocoetes.

Figure 5.23 A typical adult sea lamprey found dead weighing 2lbs and having a length of 97cm

5.8.1 Distribution

All three species of lamprey are present in the Beauly District. The identification of ammocoetes to river or brook lamprey species before transformation is not possible in the field using external characteristics. As a result they are often identified as *Lampetra spp* (i.e. river or brook lamprey) or

sea lamprey. The know distribution of all lamprey species combined (**Figure 5.24**) and river lamprey (**Figure 5.25**) across the Beauly District are presented below.

Figure 5.24 Known distribution of all lamprey species across the Beauly District

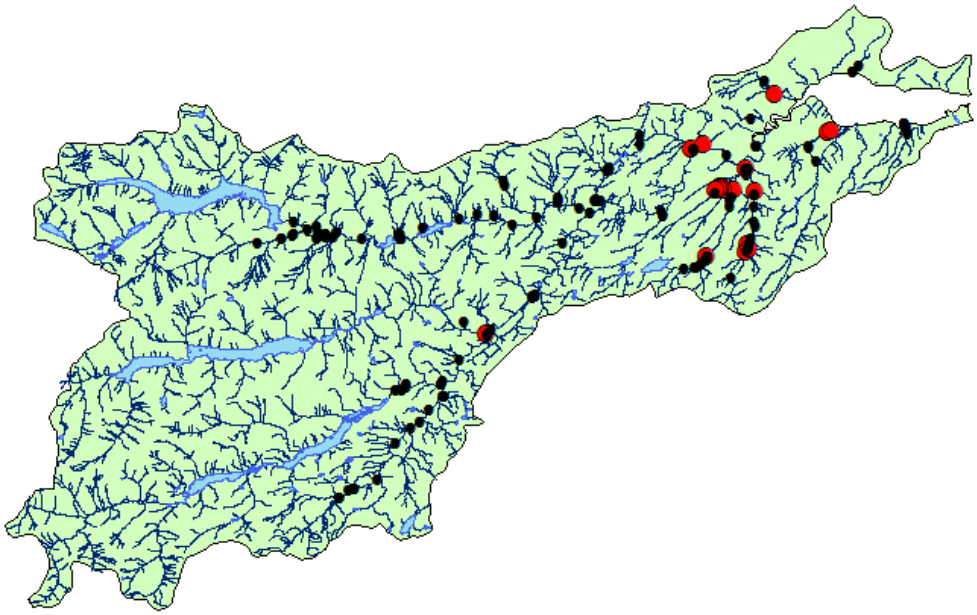
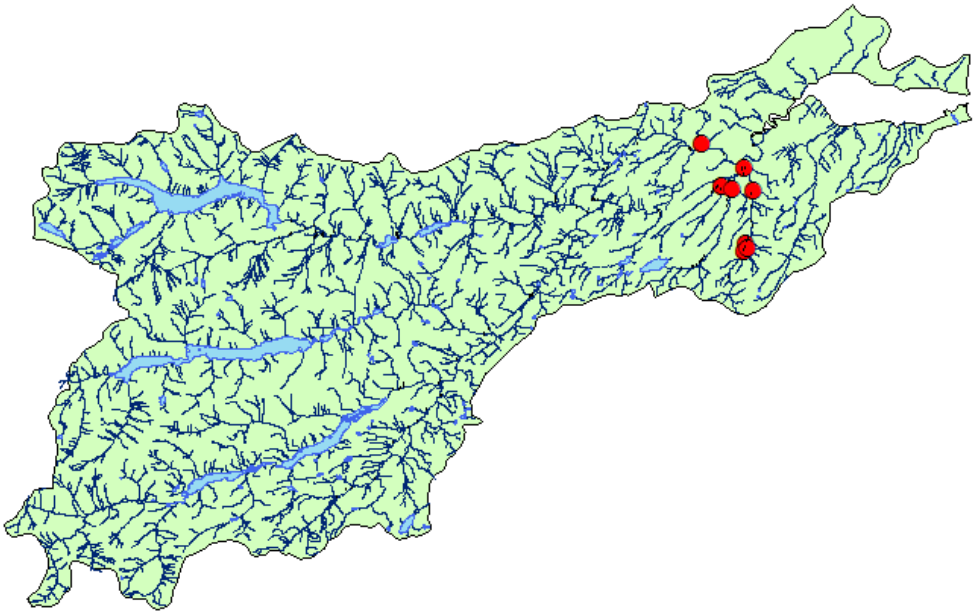


Figure 5.25 Known distribution of river lamprey transformers across the Beauly District



5.8.2 Exploitation

Commercially caught adult lampreys are commonly used as pike bait. However, lampreys are not fished for in any way in the Beauly District. They have low economic value but are of high conservation value.

5.9 MINNOWS (*PHOXINUS PHOXINUS*)

The minnow (*Phoxinus phoxinus*) is the smallest member of the cyprinid family. It is a slender fish with brown and greenish barred back and sides, giving the appearance of a black stripe along the flank (see **Figure 5.26** below). It is found in shoals in lochs, small burns and fast rivers.

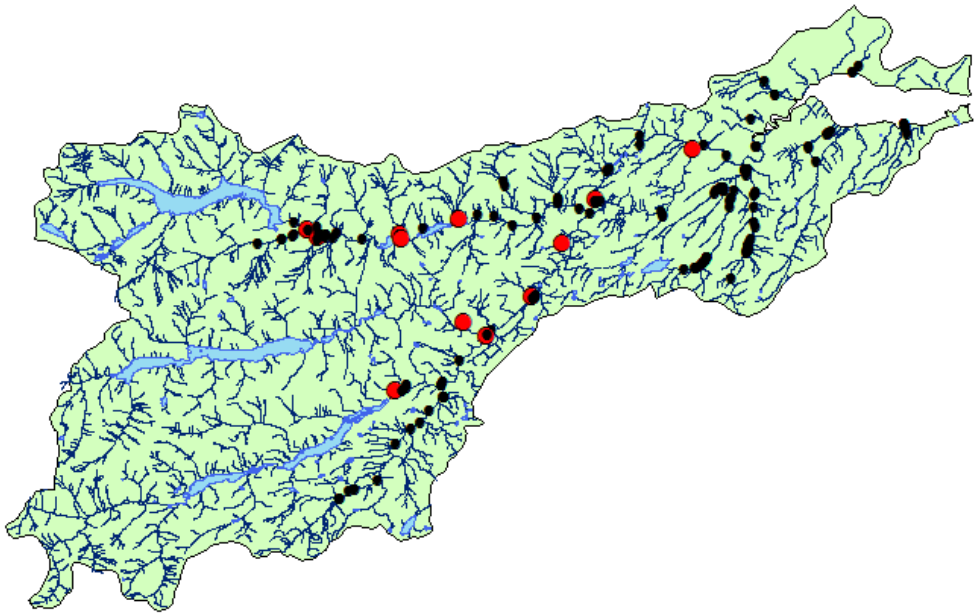
Figure 5.26 A typical example of a minnow

Minnows are believed to be an invasive non-native species (native to England and Wales but not to Scotland) that compete with salmonids for food and space and feed on salmonid eggs and fry. It is thought that they were originally introduced after being used as live bait and then discarded into water bodies. The use of live vertebrates as bait was prohibited by the Aquaculture and Fisheries (Scotland) Act 2007.

5.9.1 Distribution

Minnows are now widely distributed throughout much of the Beauly District. They are found in lowland tributaries, right through to upland rivers and lochs. The known distribution of minnows is presented in **Figure 5.33** below.

Figure 5.27 Known distribution of minnow across the Beauly District



5.9.2 Exploitation

Minnows are not targeted by sport anglers or commercial fishermen. In the past they were sought after for bait for other fish species including pike, trout and salmon which is likely to have been a major factor in their spread. Today the use of live minnow as bait for any fish species is prohibited.

5.10 THREE SPINED STICKLEBACK (*GASTEROSTEUS ACULEATUS*)

The three-spined stickleback (*Gasterosteus aculeatus*) is the smallest of all British freshwater fish. It is easily recognisable by the three large spines on its back, well developed pectoral fins and the ventral fins reduced to spines (see **Figure 5.28** below).

Figure 5.28 A typical example of a three-spined stickleback

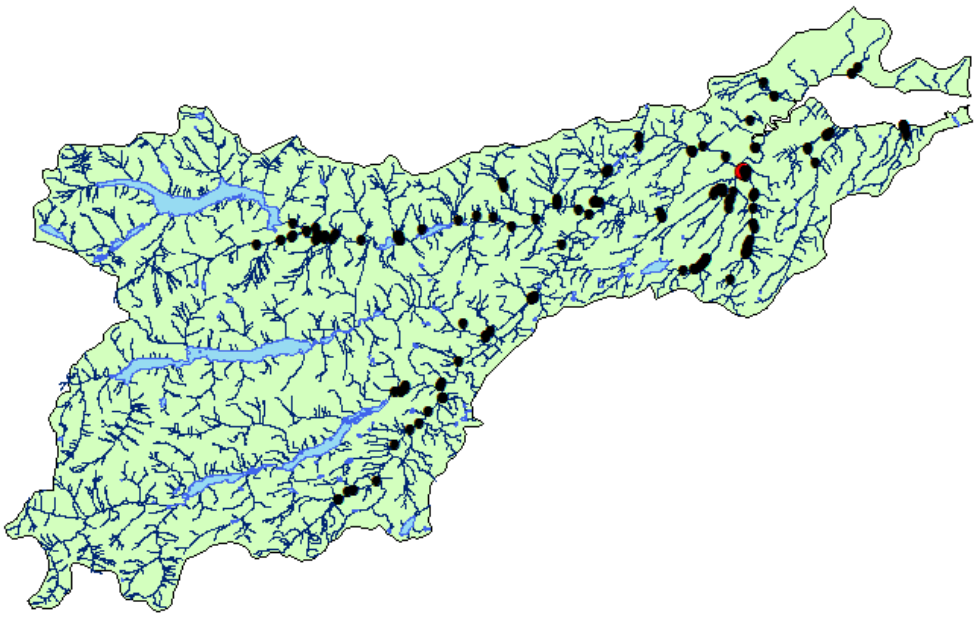
It is a native 'boreo-Arctic' species occurring in fresh water, estuaries and the sea. It is primarily an anadromous species (meaning that it ascends rivers from the sea for breeding), with numerous non-anadromous populations in brackish or pure freshwater. This ability to tolerate a combination of low temperature and high salinity allowed it to colonise the Highland ice sheet melt streams from coastal ice age refugia (Greer & Hammar, 2004)

In the sea it is confined to coastal waters. In freshwater, it prefers to live in small streams but also occurs in a variety of habitats including lakes, lochs and large rivers. It inhabits shallow vegetated areas, usually over mud or sand. Juveniles move to the sea (anadromous populations) or to deeper, larger water bodies such as lochs (freshwater populations) in July-August, forming large feeding schools. They feed on worms, crustaceans, larvae and adult aquatic insects, drowned aerial insects, and small fishes. Eggs are found in nests constructed from plant material.

5.10.1 Distribution

Three-spined sticklebacks are present in the Beauly district. The known distribution presented in **Figure 5.29** below is likely to be a significant underestimate of their actual distribution.

Figure 5.29 Known distribution of the three-spined stickleback across the Beauly District



5.10.2 Exploitation

Three-spined sticklebacks are not targeted by sport anglers or commercial fishermen.

5.11 SUMMARY

The fish species known to be present within each Beauly District management unit based, on the data currently available to the NBFT, is presented **Table 5.1** below. Some information has been supplied by fishery proprietors as an addition to the data held by NBFT.

The Ness & Beauly Fisheries Trust has examined angling literature and has contacted some owners of lochs etc in an attempt to obtain preliminary information on the distribution of fish species in lacustrine environments. Information obtained so far is presented in tabular form in **Table 5.2** below. In the vast majority of cases, however, the presence of species has not been confirmed by survey or thorough examination of estate records.

Table 5.1 Fish species known to be present within each Beauly District management unit

Management Unit	Salmon	Trout	Char	Eel	Lamprey	Stickleback	Minnow	Pike	Perch	Grayling
Lower Beauly	●	●	●	●	●	●			●	●*
Upper Beauly	●	●		●			●	●		
Farrar	●	●		●			●	●		
Glass, Cannich and Affric	●	●	●**	●	●		●	●		
Beauly Coastal	●	●		●	●			●		

** A single grayling was captured by a Galloway Fisheries Trust survey team.*

***Not confirmed by survey.*

Table 5.2 Fish species known to be present in lacustrine environments in the Beauly District

Loch	Salmon	Trout	Char	Eel	Lamprey	Stickleback	Minnow	Pike	Perch
Na Beinne Mor		●							
Na Freumh		●							
Gaoireach		●							
Na Greidil		●							
Na Beinne Bige		●							
Na Luch		●							
Nam Fiodhag		●							
Na Craobhe		●							
Monar		●						●	
Mullardoch		●							
Affric		●					●*		
Beinn A'Mheadhoin		●							
Bruicheach		●	●*						
Beannacharan	●	●							
Loch Fada		●*							
Loch Neaty		●						●	
Loch na Ba Ruaidhe									●

**Confirmed by survey*

6 FACTORS POTENTIALLY LIMITING FISH PRODUCTION

6.1 INTRODUCTION

Fish production in any system is limited by the availability and access to good quality spawning and nursery habitat, together with the impacts of a range of anthropogenic factors. For the purposes of this plan, emphasis will be placed on anthropogenic factors which are likely to have exacerbated natural constraints.

The Beauly District has been subjected to considerable anthropogenic alteration. This is likely to have significantly lowered its productive potential. It is also recognised that many of the fish species present in the Beauly system are migratory in nature (e.g. salmon, trout, lamprey and eels) and therefore factors affecting the marine environment, both natural and anthropogenic, are also an important consideration.

This section of the Fisheries Management Plan identifies and describes key factors having the potential to significantly limit fish production in the Beauly District, alone or in combination.

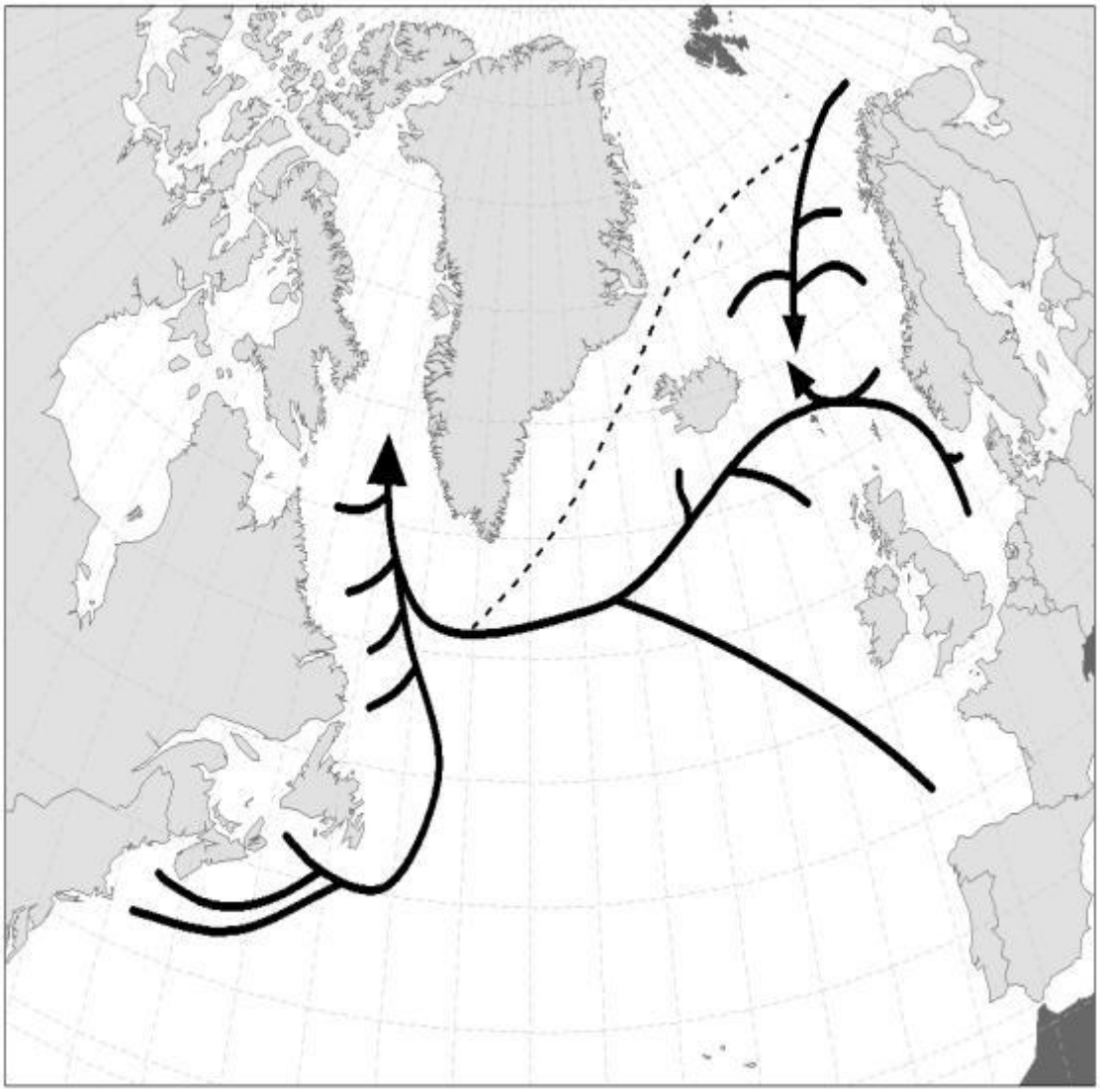
6.2 MARINE MORTALITY

The survival rates of salmon at sea have been on the decline since the 1960's. Recent estimates suggest that current smolt to adult survival rates are in the region of 5% to 10%, compared to perhaps >25% at their peak. This has been accompanied by a decline in growth rate and general condition of returning adults.

Large scale climatic changes in the north Atlantic are thought to be a major contributing factor to the reduced survival. High winds, waves and surface turbulence associated with climate change have a strong influence on currents and sea temperatures in the pelagic zone of the ocean. These changes disrupt the marine food web by impacting on the planktonic ecosystem and on pelagic species of fish. There is also concern that some pelagic fisheries could be having a significant impact on salmon at sea by the removal of their prey items and the taking of salmon as a by catch.

In recent years most salmon fisheries in Scotland have seen a shift in dominance from grilse to multi sea winter salmon. This is thought to be due to lower marine survival in the Norwegian sea (favoured by grilse) to the Greenland seas (favoured by multi sea winter salmon), although this has not been definitively proven (see **Figure 6.1** below).

Figure 6.1 North-west Atlantic salmon feeding areas (Atlantic Salmon Trust)



Removal of netting effort within the Beauly District has likely gone some way to offsetting the impacts of increase marine mortality. It is important however that more is done to reduce the impact of off shore fisheries on salmon.

It is highly likely that climate change and fishing pressures have also been contributing factors to the significant decline in sea trout catches in the Beauly District. One current train of thought is that the sea trout's prey items (herring, sprat and sandeels) have moved further north. This is supported by what seems to by a general improvement in the reported sea trout catches in northern rivers, although this is still to be proven.

6.3 IMPOUNDMENT AND WATER ABSTRACTION

Water impoundment and abstraction is a significant issue in the Beauly District.

6.3.1 Hydro-power

Large scale hydro-electric schemes have been a feature of the Beauly system for many years. Several dams were built in the 1950's. The effect that these schemes have on salmon stocks has been debated over the years. While the factors causing the decline of salmon in the Beauly system are yet to be fully understood, the presence of hydro activities and dams on a river system is widely believed to have a detrimental impact both in the short and longer term. The potential impacts of large scale hydro schemes include:

- Lack of access for migratory fish to historically available habitat.
- Alterations to hydrological regimes;
- Changes in water chemistry and nutrient status;
- Lack of sediment transfer;
- The creation of 'pinch points' for the predation of both migrating juveniles and adults; and
- The transfer of water between rivers which may alter migration patterns.

Small scale hydro power schemes have become increasingly popular over the last decade. One of the main environmental challenges associated with these developments relates to both upstream and downstream fish passage. The presence of several small generating stations on the same river may also induce cumulative impacts.

6.3.2 Public Water Supplies

Scottish Water impounds or abstracts water in a number of locations within the Beauly system with associated effects on river flows, notably the River Bruiach.

6.3.3 Man-made obstructions

Dams, weirs, road culverts, bridge aprons and other constructions can reduce the available habitat for many fish species; particularly those adopting an anadromous or catadromous life history (see **Figure 6.2** below).

Figure 6.2 Former bridge apron at Culburnie

Many of these obstructions/potential obstructions have been identified in habitat surveys. In particular they affect several small burns in the lower reaches of the Beauly catchment.

6.4 PREDATION

Fish species are removed from the Beauly system by a suite of predators. For migratory species predation can occur in both freshwater and marine environments. Predation pressures may well be exacerbated by the presence of structures such as dams etc which create 'pinch points'. Of particular concern is predation on migratory fish during stages of their life cycle after which density dependent compensation for losses is likely to be exhausted e.g. salmon and sea trout smolts and returning adults.

6.4.1 Piscivorous Birds

Significant numbers of goosanders, mergansers, herons and cormorants frequent the Beauly District. These birds predate on a wide range of fish species, with juvenile salmon and trout forming a major component of their diet (see **Figure 6.3** below).

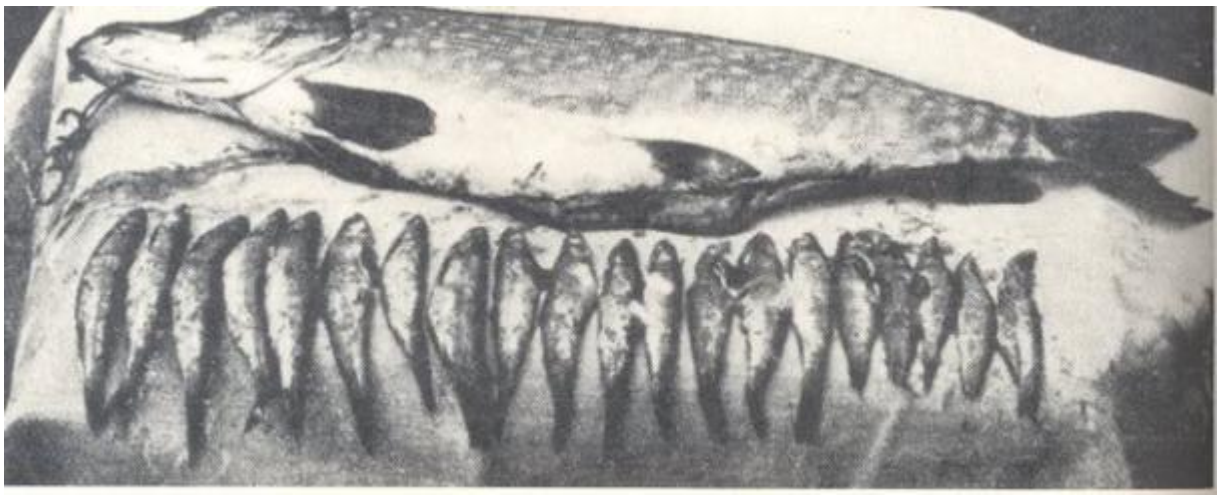
Figure 6.3 Salmon smolt regurgitated by a cormorant showing beak damage

Sawbills are known to take advantage of 'pinch points' or 'bottlenecks' during smolt migrations. Cormorants will take larger prey items than sawbills including adult trout and even small grilse. They are also known to cause damage to larger fish that they attack but are too large to swallow.

6.4.2 Pike

There is concern that the presence of high densities of pike may be having a negative impact on fish species such as salmon and trout. Salmon smolts are particularly susceptible to pike predation during their downstream migrations through lochs (see **Figure 6.4** below).

Figure 6.4 A 6lb pike with twenty smolts in its stomach (Fishing Gazette)



Any attempt to remove them is likely to be unsuccessful. Studies have shown pike removals to be ineffective. They generally result in the removal of larger, cannibalistic individuals which are replaced by smaller fish which are equally effective predators.

6.4.3 Mink

American mink (*Neovison vison*) are a member of the mustelid family whose other members include weasel, otter and badger. They were brought to the UK in the early 20th Century to be bred on farms for their fur. The first farm opened in Scotland in 1938 and in the same year they were recorded in the wild. American mink continued to escape or were intentionally released. The last fur farm closed in the UK in 1993 and in 2003 the industry was made illegal.

Since their introduction America mink have been shown to have negative effects on a broad range of wildlife species of both conservation and economic value including fish species. They are classed as opportunistic, generalist predators able to switch between prey sources when one food source becomes scarce. Because of their high metabolic rate, American mink have to eat approximately one third of their body weight every day to sustain themselves.

Mink are known to be widely distributed across the Beauly District. NBFT is a key partner of the Scottish Mink Initiative which aims to secure multiple adjacent river catchments as areas free of breeding American mink, thus protecting native wildlife such as water voles and ground nesting birds, as well as economically important populations of fish and game birds (see **Figure 6.5** below).

Figure 6.5 A typical mink raft designed to monitor activity and assist trapping

This Initiative is highly collaborative in nature and has input from numerous fishery trusts and boards, SNH, Forestry Commission Scotland, Scottish Wildlife Trust, University of Aberdeen and Oxford University in addition to gamekeepers and members of the public.

6.4.4 Seals

The Moray Firth supports populations of grey seals (*Halichoerus grypus*), common or harbour seals (*Phoca vitulina*) and salmon. The interaction between these well-known protected species causes a conservation and economic dilemma. Although salmon are likely to form a small part of the seal's

overall diet their impacts on salmon stocks has the potential to be significant, particularly at migratory pinch points or 'bottle necks' (see **Figure 6.6** below).

Figure 6.6 A rod caught salmon exhibiting signs that it has been damaged by a seal

Historically there was a great deal of conflict between various interests regarding how best to manage seals in order to protect salmon. In the early 1990's both the number of salmon returning to rivers in the area (particularly the 'spring' component) and harbour seals declined significantly.

Given the presence of SACs for both species in the area and obligations to ensure 'favourable status' of the key interest features, local district salmon fishery boards, the Scottish Executive, Scottish Natural Heritage and other stakeholders negotiated the Moray Firth Seal Management Plan (MFSMP) in 2005. This aimed to restore the favourable conservation status of seal and salmon SACs whilst reducing the shooting of harbour seals and seal predation on salmon.

The MFSMP has led to a greater understanding of seal biology amongst fishery managers and raised awareness of the competing needs of seals, salmon and their importance to the local economy of the Moray Firth. The experience gained also fed into The Marine (Scotland) Act 2011 which was introduced on 31 January 2011. This states that any fishery or fish farm in Scotland that requires to manage seals at any time of year, to prevent serious damage to fisheries or fish farms or to protect the health and welfare of farmed fish, will need an annual Seal Management Licence.

6.4.5 Dolphins

The Moray Firth is famous for its resident populations of bottlenose dolphins (*Tursiops truncates).* These are of importance both in terms of their conservation value (with a large proportion of the Firth designated as a Dolphin SAC) and their economic value in terms of tourism.

Figure 6.7 Cetacean tooth marks on the side of a fresh run salmon

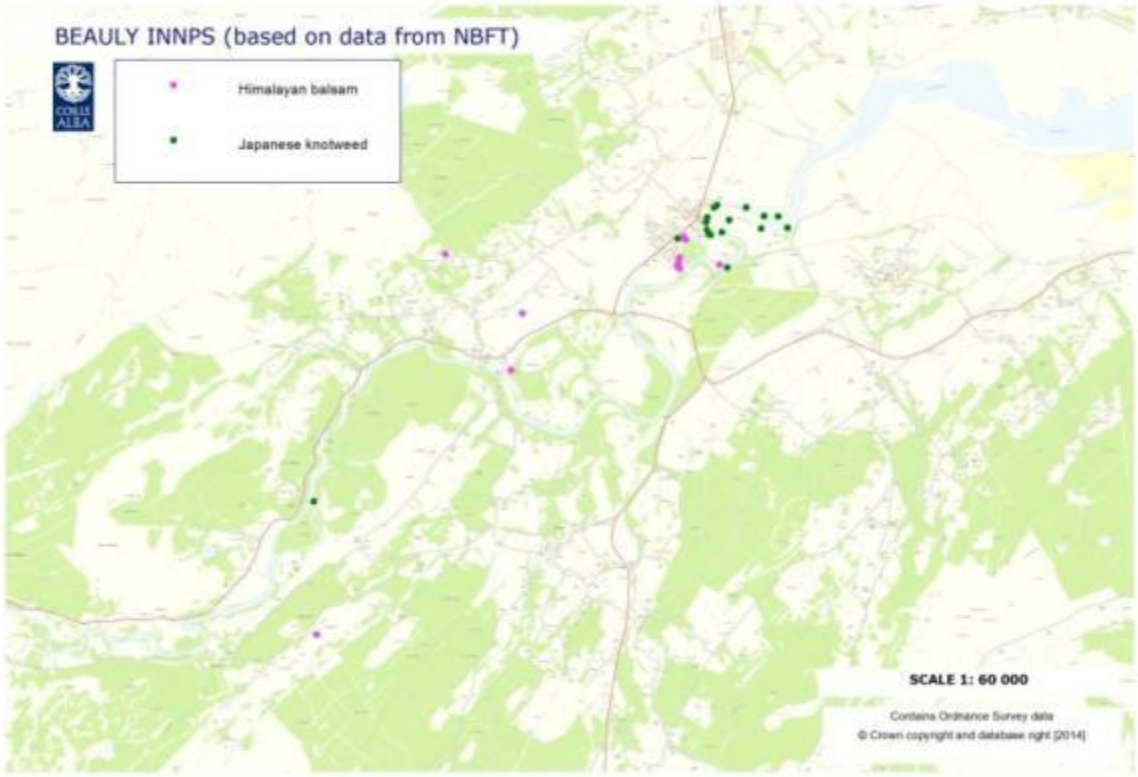
The dolphins are regularly observed catching salmon at Chanonry Point between Fortrose and Rosemarkie on the Black Isle. There is however no information on the scale of impact that they have on salmon stocks. Cetacean tooth marks are occasionally found on salmon caught in the Beauly District (see **Figure 6.7** above).

6.5 NON-NATIVE SPECIES

The Beauly District contains a number of species that are not native to the Highlands of Scotland. This may increase levels of predation (e.g. mink), competition for food and habitat (e.g. minnows) or reduce the quality of available habitat (e.g. Japanese knotweed). In 2013 an extensive survey of non-native plant species for the Beauly system was undertaken by NBFT. In particular, the distribution of Japanese knotweed and Himalayan balsam was established by the survey. Both species are largely

confined to the lower reaches of the system as shown in **Figure 6.8**.

Figure 6.8 Map of Japanese Knotweed and Himalayan balsam distribution in the Beauly area



Giant hogweed was not located in the survey of the Beauly system but is known to have been found in neighbouring catchments. Species such as Japanese knotweed and Himalayan Balsam have been found in coastal burn areas such as the Moniack Burn. Eradication programmes are underway in some locations. It would appear that systematic mapping of non-native plant species in the riparian corridor has not taken place out with the main Beauly system.

6.6 CULTURAL OLIGOTROPHICATION

Evidence from sediment cores in Loch Ness suggests that the nutrient status of the higher reaches of the Ness catchment has altered considerably since the last ice age due to both natural and anthropogenic factors. It is likely that the natural productivity of many upland areas in the Beauly catchment has been lowered as a result of a similar process.

6.7 HUMAN EXPLOITATION

Despite the adoption of catch and release within the Beauly catchment it is likely that some salmon and sea trout populations which are currently numerically depressed are, or have been, over-exploited by fisheries leading to a reduction in the number of adults available for spawning.

6.8 FORESTRY

Large areas of the Beauly catchment contain commercial and non-commercial forestry. Forestry may have both positive and negative impacts on fish production. Negative impacts are likely to include silt inputs, acidification and over-shading of watercourses. Positive impacts include the provision of shade and nutrient inputs. Areas requiring remedial action have been identified during habitat surveys.

6.9 CLIMATE CHANGE

An emerging and episodic influence on fish production is the apparent increase in severe weather conditions, particularly flood episodes. There is an increased probability of redd washout etc as a result of this factor. Linked to this are increased numbers of proposals for hard engineering, gravel removal etc in respect of flood defence schemes all of which have the potential to damage fish stocks.

6.10 POLLUTION

Diffuse and point-source pollution occurs in various locations within the catchment although overall water quality appears to be good.

6.11 AGRICULTURE

Poor agriculture practices are likely to have lowered the quality of habitat in many lowland areas via pollution, increased sediment inputs and inappropriate physical alterations to watercourses.

6.12 ILLEGAL FISHING

Illegal fishing has the potential to reduce the amount of fish available for legitimate fishing and may also reduce the number of adult fish available for spawning. Water bailiffs patrol the Beauly

catchment to try and reduce the impact of illegal fishing and a financial contribution is made to patrols in the marine environment.

7 PROPOSED MANAGEMENT ACTIONS

7.1 INTRODUCTION

The following tables delineate the proposed management actions for each of the management units. It should be noted that management actions will be periodically reviewed during the life of the plan and it is likely that new actions will be added or existing actions altered in response to new information becoming available.

7.2 GENERIC CATCHMENT WIDE ACTIONS

Time limited actions Ongoing actions

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	Timescales 2014	2015	2016	2017	2018	2019	Estimated Cost of Management Action
Marine Survival	Moray Firth		Cooperate with potential research projects on the impacts of marine renewable projects in the Moray and Pentland Firths.	MSS								
Abstraction and Impoundment	Catchment Wide	Smaller fish, eggs and larvae that pass through screens on intakes are said to be 'entrained'. Larger fish that do not pass through and are physically impacted on the screens are 'impinged'. Both can result in significant mortalities of fish, in particular salmon smolts.	Ensure that all intakes (e.g. power station, micro-hydro, drinking water) are known, adequately screened and operated effectively in accordance with legislation. Ensure SSE operate turbines at optimum load for smolt survival.	SEPA, SSE								
Predation	Catchment Wide	Populations of mergansers, goosanders and cormorants predating on salmon parr and smolts.	Maintain accurate piscivorous bird counts to support annual management licence applications									
			Submit annual application for bird licence to Scottish Natural heritage in partnership with the Moray Firth Predator Group		Y							
		Common and grey seals predating on smolts, adult salmon and kelts particularly in the Moray Firth and lower reaches of the Beauly system.	Review, maintain and implement the Moray Firth Seal Management Plan.									
		Dolphins within the Moray Firth predating on salmon and sea trout smolts, adults and kelts.	Work in partnership with Spey Board to assess the impacts of cetacean predation on salmon and sea trout stocks.	SDSFB, SF, WDC, SNH	Y							
Non-Native Species	Catchment Wide	Surveys have indicated that a number of non-native plant species are present in the Beauly District. Remedial actions have commenced on the River Beauly and elsewhere within the District.	Develop and implement a catchment wide eradication programme of key non-native plant species.	Coille Alba								
		Mink remain present and active with	Maintain role of NBFT as									

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	Timescales						Estimated Cost of Management Action
						2014	2015	2016	2017	2018	2019	
		the Beauly system.	Coordinator for the Scottish Mink Initiative in the Beauly Catchment.									
	Catchment Wide	Invasive species are the second greatest threat to biodiversity and their ecological impacts and economic consequences can be devastating.	Maintain high levels of awareness and encourage the development of preventative biosecurity measures for anglers and other river users.									
Illegal Fishing		Illegal fishing deprives fishery owners and management organizations of revenue and is potentially ecologically damaging.	Develop and implement a strategy for the effective policing of the Beauly District.	Ness DSFB, Cromarty Firth DSFB								
Human Exploitation	Catchment Wide	Stocks of fish populations already under pressure are particularly susceptible to human exploitation.	Continue catch and release initiatives. Reduce other exploitation where possible e.g. netting buyouts.	Ness DSFB								
Forestry	Catchment Wide	Forestry has the potential to damage or improve fish populations.	Continue to influence forestry design plans when consulted.	Forestry Commission Scotland, Estates								
Pollution	Catchment Wide	Point source pollution occurs periodically.	Maintain vigilance and report incidents to SEPA	SEPA								
Other	Catchment Wide	There is a general lack of information regarding fish distribution and status in many areas, particularly lochs.	Continue to utilise estate records, SEPA survey data etc to improve understanding.	Estates, SEPA								
	Catchment Wide	Assessment of trends in rod catches is required to inform management decisions.	Utilise NASCO rod catch tool in accordance with ASFB guidance.									

7.3 BEAULY COASTAL

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	Timescales						Estimated Cost of Management Action
						2014	2015	2016	2017	2018	2019	
Human Exploitation	Moray Firth	Mixed Stock Net Fisheries in the Moray Firth.	Negotiate a long-term buyout of remaining netting interests in Moray Firth.	NDSFB		■	■	■	■			
	Moray Firth	Rod and line sea trout fishery	Introduce a voluntary and incentivised sea trout log book scheme to encourage submission of returns from the Firth	IAC,BAC, MFTI, NBFT, NDSFB				■	■	■		
Illegal Fishing	Moray Firth	Historically large scale problems relating to the illegal exploitation of sea and sea trout through the use of set nets.	Maintain overt and covert patrols of coastal areas to deter or detect any illegal fishing activity.			■	■	■	■	■	■	
Man-made obstructions	Redcastle Burn	Access to upper reaches denied by dam structure.	Assess desirability of remedial action.	SEPA			■					

7.4 LOWER BEAULY

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	Timescales						Estimated Cost of Management Action
						2014	2015	2016	2017	2018	2019	
Impoundment & Water Abstraction	Kilmorack and Aigas Dam	Concerns at the numerical differential between the fish counter counts at Kilmorack Dam and Aigas Dam have periodically been raised.	Utilise data provided by SSE to assess accuracy of counts.	SSE								
Barriers to Migration	Culburnie Burn	A former bridge apron appears to be a barrier to fish migration.	Remedial engineering on bridge apron to facilitate salmon migration.	SEPA								
	Bridgend Burn	Culvert periodically causes fish access issues.	Continue to cooperate with Lovat Estate and other partners to keep culvert debris free.	Lovat Estate, Highland Council								
	Black Burn	Sawmill weir no longer in use which prevents fish migration.	Improve fish data for Black Burn to assess desirability of removal of weir	SEPA								
	All Lower Beauly	Debris accumulations have historically caused fish migration issues.	Continue to check for serious accumulations and remove if required	Lower Beauly Fishing Syndicate, BAC								
Agriculture	Belladrum Burn	A number of issues associated with agricultural production such as water gates and damage to riparian habitats by livestock by have been identified.	Liaise with farming community to implement best practice.	SEPA, MFTI, SRDP								
	Bridgend Burn	Silt inputs are an ongoing issue in the lower reaches of the Bridgend Burn.	Liaise with farming community to implement best practice.	SEPA, MFTI, SRDP								
Other	All Lower Beauly	Salmon aquaculture was a historical feature of the Beauly catchment. The legacy of this on the genetic integrity of the native population is unknown.	Consider use of SNP genetic assessment to identify degree of genetic introgression.	RAFTS	Y							
	All Lower Beauly	The destination of the early-running component is currently unknown.	Undertake feasibility exercise to assess potential use of genetic analyses, tagging, tracking etc to improve knowledge of spatial distribution of this stock component.	RAFTS	Y							

7.5 UPPER BEAULY

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	Timescales						Estimated Cost of Management Action
						2014	2015	2016	2017	2018	2019	
Other	Eskadale Burn	Salmon aquaculture was a historical feature of the Beauly catchment. The legacy of this on the genetic integrity of the native wild population is unknown.	Consider use of SNP genetic assessment to identify degree of genetic introgression.	RAFTS	Y							

7.6 FARRAR

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	Timescales						Estimated Cost of Management Action
						2014	2015	2016	2017	2018	2019	
Impoundment & Water Abstraction	Deanie Burn	For reasons unknown the Deanie Burn does not support an established salmon population. Issues relating to flow levels, acidity levels etc have been considered but evidence is currently lacking as to the cause of the issue.	Continue monitoring fish populations. Consider use of egg box experiment.									
	Upper Farrar	Habitat surveys undertaken by NBFT established that two tributaries of the Farrar are currently largely dewatered.	Establish quantity of water required to establish compensation flows on burns and consider this quantity in relation to current Misgeach compensation levels.									
	Farrar Tributary	A recent culvert replacement at a small tributary of the Farrar has the potential to inhibit upstream migration of adult salmon.	Monitor salmon population upstream of culvert.									
Agriculture	Lower Farrar	Fencing of many sections of the Farrar downstream of Loch Beannacharan is currently lacking in many areas. This allows sheep to graze close to the river banks.	Approach Culligran estate to establish if improved fencing is feasible.									
Cultural Oligotrophicati -on	Upper Farrar	Regeneration of native forests is likely to reverse trend of reduction in nutrient levels.	Continue to support Braulin Estate in regeneration efforts.									
Climate Change	Upper Farrar	Regeneration of native forests is likely to help 'climate change proof' Farrar.	Continue to support Braulin Estate in regeneration efforts.									

7.7 GLASS, CANNICH & AFFRIC

Limiting Factor	Location	Description	Proposed Management Action	Potential Partner Organisations	Specific Research Requirement?	Timescales						Estimated Cost of Management Action
						2014	2015	2016	2017	2018	2019	
Barriers to Migration	Burn at Tomich Village	Extensive alterations to the river bed have been made which has destroyed habitat and may be limiting fish migration. A more detailed assessment of the nature of the habitat and fish populations within the burn is required.	Increase understanding of salmon population of burn using electric fishing surveys. Consider geomorphological assessment of damaged area.			■	■					
	River Cannich	Weir close to Mullardoch Dam is preventing trout migration.	Consider options for removal of weir.	Estate		■	■					
Agriculture	River Glass	NBFT habitat surveys have identified areas where improved fencing would reduce 'poaching' of river banks by livestock.	Liaise with farming community to implement best practice.	SEPA, SRDP			■	■				

8 MONITORING AND RESEARCH REQUIREMENTS

8.1 INTRODUCTION

NBFT works in close partnership with the BDFB and other key bodies such as SSE and SEPA to gain a detailed and up to date understanding of the status of fish populations within the District. Key sources of information include:

- Electric fishing survey data;
- SSE fish counter data;
- River habitat survey data;
- Fish barrier assessments;
- Water quality assessments;
- Fish health investigations;
- Population genetic structuring; and
- Analysis of annual catch returns from rod and net fisheries.
- Net surveys of lochs and coastal areas.

The receipt of such information allows informed assessment of the potential impacts of development proposals within the District, assess applications for scientific and other exemptions and to inform fisheries management activities such as stocking, habitat improvement and conservation measures.

Figure 8.1 A healthy two year old salmon parr captured during a routine electric fishing survey

8.2 MONITORING FISH POPULATIONS

8.2.1 Juvenile Salmonid Monitoring Programme

A time series of electric fishing data has been established at a number of sites within the Beauly catchment. Electric fishing was initially undertaken by the Spey Foundation and subsequently Galloway Fisheries Trust prior to the inception of NBFT. Many sites were fished on a rolling basis but since the inception of NBFT in 2006 most sites have been fished on an annual basis. New sites have also been established on the main stem of the River Beauly, however it is suggested that the number of such sites and the frequency with which they are fished requires to be increased.

At all sites the number of salmon and trout and their fork lengths (to the nearest millimetre) are recorded. Scale samples are taken from a representative batch of fish in order to determine their ages and the size range of each year class.

Figure 8.2 Counting and recording the fork length of salmon parr captured during a survey

A detailed habitat survey is performed for each electric fishing site, with information on flow characteristics, depths, substrate type and quality, in-stream, bank and canopy cover and site dimensions being recorded. In addition, photographs and water temperature measurements will be taken.

In addition to the core Index Monitoring sites, additional project specific 'Investigative Surveys' will be completed as required. Contract work will also be considered on a case by case basis and when time allows.

8.2.2 Other fish species

All fish species captured in salmonid habitat surveys are recorded. NBFT routinely measures all fish captured in such surveys with the result that it has established an extensive database relating to species such as eels and lamprey within the Beauly district. The presence of other aquatic fauna such as pearl mussels at sites is also noted. In recent years a capacity to undertake seine net surveys in both lochs and coastal areas has increased the range of species that can be captured, the life stage at which they can be captured and the type of habitat they can be captured within. It is envisaged that this capacity will be developed in future years.

Figure 8.2 Undertaking a seine survey in Beauly Firth

8.2.3 Rod Catch Analysis

NBFT undertakes an annual review of salmon rod catch information available within the Beauly system and utilises the rod catch tool developed by the North Atlantic Salmon Conservation Organisation. The tool is utilised in accordance with the guidance issued by the Association of Salmon Fishery Boards. It is intended that this annual review will continue to be undertaken for the duration of this plan.

9 REVIEW OF PLAN

9.1 ANNUAL REVIEW

A review of the management actions section of the plan will be undertaken on an annual basis. It is not envisaged that the bulk of the information within the plan will be altered on an annual basis.

9.2 THREE YEAR REVIEW

A more thorough review of the plan will be undertaken after a period of three years with all proposed management actions assessed and key information such as fish distribution updated.

References

Institute of Fisheries Management, Scottish Branch (2012). Code of Good Practice for Freshwater Fisheries Management, Part 1: Salmon and Brown Trout.

Harvey, J & Cowx, I (2003). Monitoring the River, Brook and Sea Lamprey, *Lampetra fluviatilis, L. Planeriand Petromyzon marinus*. Conserving Natura 2000 Rivers Monitoring Series No.5, English Nature, Peterborough.

Maitland, P.S. (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Monitoring Series No.5, English Nature, Peterborough.

Greer, R.B. & Hammar, J. (2004). A Fish Inventory of River Spey Lochs using Multiple Mesh Size Gillnets– a first of its kind survey. Spey Fishery Board.