River Lossie Fisheries
Management Plan 2010 – 2015

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For

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And

The Lossie District Salmon Fishery Board

C/o Fisheries Office, Logie Steading, Dunphail, Forres, Morayshire IV36 2QN

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1. Scope of the Plan

The Lossie Fisheries Management Plan has been prepared by the Spey Foundation on behalf of the Findhorn, Nairn and Lossie Fisheries Trust (FNLFT/Trust) to facilitate the proper management of all fish species in the Lossie Fishery District. It provides a framework within which the Lossie District Salmon Fishery Board (LDSFB) and the Trust can identify target areas for research and apply for specific funding.

Inherent in the drive towards a scientific approach to the management of the Lossie's fish species on a catchment wide basis is the integrated nature of the research and management. Where possible the research proposed in this plan builds on existing data however, given that this is the first Fisheries Management Plan (FMP) for the Lossie the majority of the proposals here are designed to initiate data collection to allow improved management decisions in the future.

This Plan also seeks to encourage close liaison and the development of good working relationships with other organisations that have an interest in the Lossie, these include, Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA), Moray Council, Forestry Commission (FC), Moray Flood Alleviation Scheme and neighbouring Fishery Boards among others.

1.1 Wider Perspective: Water Framework Directive and A Strategic Framework for Scottish Freshwater Fisheries

The fish and their habitats are affected by many factors and so an integrated catchment management approach is desirable for their effective management. The implementation of the Water Framework Directive (WFD) has led to the development of River Basin Management Plans (RBMP). This is led by the Scottish Environment Protection Agency (SEPA) and these river basin management plans (RBMPs) ensure that public sector bodies, businesses and individuals work together to protect the water environment and address significant impacts by co-ordinating all aspects of water management for the next 6 years. The first River Basin Management Plan was published on 22nd December 2009 http://www.sepa.org.uk/water/river_basin_planning.aspx and provides the most up to date picture of the current status of the catchment in terms of the WFD. The actions proposed in this Fishery Management plan can also make a contribution to improving water bodies to good status or preventing deterioration. In particular good datasets are required to underpin the classification process, for example, data from juvenile surveys may prove to be very useful for this process in the future. The Lossie lies within the North Highland Area Advisory Group (AAG) and the RBMP for this area should be consulted regularly. More details can be found at: http://www.sepa.org.uk/water/river_basin_planning/area_advisory_groups/north_highland.aspx

In addition the following key document is also important in the development of this Plan - A Strategic Framework for Scottish Freshwater Fisheries (Scottish Government 2008) http://www.scotland.gov.uk/Publications/2008/06/26110733/15.

2. Lossie Catchment

The River Lossie originates from Loch Trevie, near Carn Kitty (alt 521m) to the southeast of Elgin (NJ 237 704), and flows north and northeast for approx 52km (31miles) to join the sea at Lossiemouth. Its main tributaries are the Auchness Burn, Burn of Yellowbog, Corrhatnich Burn, Leanoch Burn, Gedloch Burn, Linkwood Burn, and Black Burn. The Lhanbryde Burn also joins the Lossie near its mouth. In addition the Spynie Canal joins the river close to Lossiemouth.

A few lochs are present in the catchment including Lochs Trevie and Noir in the headwaters and Loch Spynie between Elgin and Lossiemouth. The Lhanbryde Burn flows from Millbuies Loch and through Loch na Bo. Loch Oire is also within the catchment but does not drain into the burn. However, the two largest lochs are Glenlatterach Reservoir on the Leanoch Burn, which provides the public water supply for Elgin, and Loch Romach, at the head of the Black Burn which has also been used as a reservoir for public water supply.

The geology of the Lossie catchment is dominated by schists and gneisses. Extensive alluvial deposits are also present. Moorland and substantial commercial conifer plantations are present in the headwaters with arable farming more prevalent in the lower reaches.

The river flow is monitored by SEPA at their Sherrifmills gauging station in Elgin and the mean daily flow is $2.7m^3s^{-1}$. The Lossie has seen considerable amount of re-channelling, drainage and piecemeal flood protection works from Cloddach to the sea. These works have affected the structure of the river and also its ecology. Some of this activities may be contributing to the recent series of flooding events in the in the Elgin area which have led to substantial property damage and increasing pressure for more concerted flood alleviation measures. Ensuring that any flood alleviation works are carried out in a manner that is sympathetic to the fish populations in the Lossie is a high

priority. A review of historical riverworks with a view to establishing potential restoration projects may also be beneficial.

The catchment is entirely within the Local Authority administration of Moray Council. The area can be classed as a low population density area although two large settlements are present in the catchment, Elgin (pop 21,000) and Lossiemouth (pop 7,000).

The river Lossie is not currently designated as a Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI) or Nature Reserve. However, one area of the catchment is designated as an SSSI for woodland and heathland at Buinach and Glenlatterach, this area includes part of the mainstem Lossie and the Leonach Burn from the Glenlatterach reservoir to its confluence with the Lossie.

3. Fisheries Management on the Lossie

3.1 Fish species occurring in the Lossie catchment

i. Native species

Atlantic salmon (*Salmo salar*); Brown/sea trout (*Salmo trutta*); Eel (*Anguilla anguilla*); Three-spined stickleback (*Gasterosteus aculeatus*); Brook lamprey (*Lampetra planeri*); Flounder *(Platichthys flesus)*.

ii. Non-native species (Introductions)

Minnows (*Phoxinus phoxinus),* Rainbow trout (*Oncorhynchus mykiss*)

Lamprey species such as, Sea lamprey (*Petromyzon marinus*) and River Lamprey (*Lampetra fluviatilis*) may also be present however recent surveys could not confirm this (Era, 2004).

Thus the Lossie is similar to many Highland rivers supporting only a limited range of fish species and the preservation of this limited fish fauna should be a key management target rather than attempting to broaden the species list through introductions of non-natives.

3.2 Fisheries Management on the Lossie

Management of salmon and sea trout within the River Lossie is the responsibility of the Lossie District Salmon Fishery Board (LDSFB). The Board works in close coordination with the newly established (2009) Findhorn, Nairn and Lossie Fisheries Trust (FNLFT) and is a member of the Association of Salmon Fisheries Board.

The Board was established under the 1860's Salmon Fisheries legislation as subsequently amended and stated in the Salmon Act 1986 and the Salmon Conservation (Scotland) Act 2001. This legislation has recently been streamlined into the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. It is empowered under the legislation to take such acts as considered expedient for the protection, enhancement and conservation of Atlantic salmon and sea trout stocks and fisheries.

Key duties for the LDFSB are to:

1. provide fisheries protection (salmon and sea-trout),
2. set salmon and sea trout rod fishery season,
3. set weekly rod fishery close times (midnight Saturday – midnight Sunday),
4. police the purchase and sale of illegally-caught or unseasonable fish,
5. ensure fish passage over obstructions to migration,
6. protect juvenile fish and spawning redds,
7. regulate the movement and introduction of adults, juveniles and ova.

The official season for salmon and sea trout runs from the 25th February until 31st October. However, many of the fishing estates and Angling Associations vary the season length within this. For example, Elgin and District Angling Association (EDAA) delays the opening on their fishing until the 1st April for salmon and sea trout and closes the season for sea trout on the 30th September. They close the salmon season on the 31st October.

The official season for brown trout is 15th March until 7th October. Again there are variations with in this along the river, for example, the EDAA delay the start of the brown trout season until 1st April and close it early on the 30th September in line with the sea trout season.

The Findhorn, Nairn and Lossie Fisheries Trust (FNLFT) is an independent charity whose objectives are:

- To conserve and restore all species of native freshwater fish and improve their habitats,
- To advance the education and understanding of the river environment and river catchment management.

The Trust has a broad remit and works in close coordination with the District Salmon Fisheries Boards for the Rivers Findhorn, Nairn and Lossie. The Trust also works closely with the angling associations, local councils, SEPA, SNH and other organisations. Both Board and the Elgin Angling Association are also represented on the board of the Findhorn, Nairn and Lossie Fisheries Trust (FNLFT), which is also a member or the Rivers and Fisheries Trusts, Scotland (RAFTS)

3.3 Salmon and sea trout fisheries

A salmon and sea trout net fishery existed within the Lossie District from the 1850 to 2000. Net and coble sweep net fishery was operated at Lossiemouth and an intermittent fixed engine fishery operated on the coast.

Today the Lossie is fished by rod and line along most of the mainstem from the mouth up to Dallas. The Elgin Angling Association operates in the lower 28km of the river. Upstream from Elgin there are a number of estates who offer fishing access along with the Dallas Angling Association.

3.4 Other fisheries

There are a number of loch based fisheries within the Lossie catchment offering trout fishing opportunities, Millbuies, Loch na Bo, Loch Romach and Glenlatterach. In addition put and take fisheries are also operated at Kellas and Wardend fisheries offering stocked rainbow trout and/or brown trout.

4. Fisheries Research in the Lossie

4.1 Catch Data

Adult salmon and sea trout catch data is available from 1952 onward from Marine Scotland Science. Data is available from the rod and line fishery, the net and coble fishery and the coastal fixed engine fishery. The net and coble fishery ceased operation in 1999 and the fixed net fishery only operated intermittently between 1989 and 2000. Yearly catch data for the three fisheries is provided in Appendix 1. Catch data prior to 1952 may also exist in Estate and Angling Club records as well as historical netting records and further investigation may turn up valuable datasets.

In general salmon and grilse catches by rod and line have increased. The net and coble catch was clearly in decline in its latter years but the data indicates that high catches had been obtained in the past notably, 290 salmon in 1967 and 1902 grilse in 1964. This indicates that high numbers of salmon and grilse were returning from sea to the Lossie. Data on smolt to adult survival for the Lossie is not available but data from the North Esk (see Appendix 2) indicates that during the 1960s and 1970s marine survival

often 20% or greater leading too much better adult return rates. Marine survival in recent years has dropped to below 5% meaning many fewer salmon and grilse are returning. The catch data from the for the intermittent fixed engine fishery (Appendix 1) is also included for reference but is likely to be sampling fish destined for several other river rather than just the Lossie .

Data from Appendix 1 indicates that sea trout catches are generally higher than salmon and grilse. However, sea trout catches began to decline towards the end of the net and coble fishery and the trend has continued in the rod fishery from 2000 to 2008.

Figure 1 and Table 1 compares the salmon/grilse and sea trout rod and line catch for the River Lossie from 1952 to 2008. It is clear from Figure 1 that until recently sea trout catches are often considerably higher than for salmon and grilse. It is also evident that sea trout catches fluctuate widely and that there has been a sharp decline in the last decade. There has been little research carried out on sea trout populations in the area so the reasons for these fluctuations and decline are poorly understood. This is also true for other rivers in the Moray Firth area and to address the issues the Moray Firth Sea Trout project (MFSTP) was initiated in 2007. For further details see www.mfstp.co.uk.

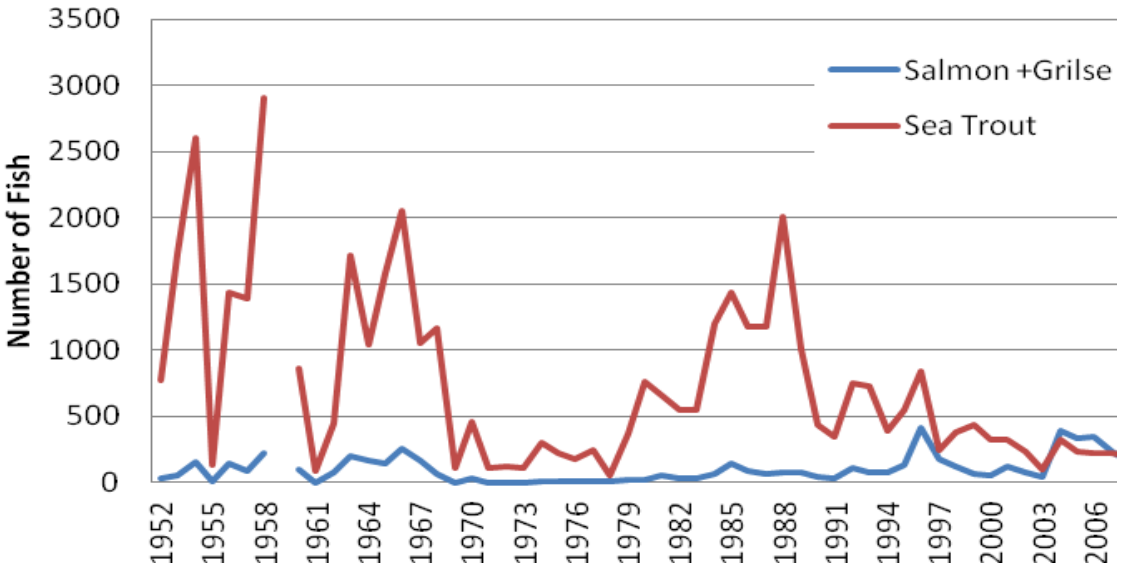

Figure 1: Rod and line catch for the River Lossie 1952 to 2008. (The data used in this figure are Crown copyright, used with the permission of Marine Scotland Science).

Figure 1 indicates that salmon catches in the Lossie have always been fairly low but in the last few years good returns have been reported. Indeed from 2004 to 2007 the salmon and grilse catch exceeded the sea trout one.

Table 1: Long term mean and maximum rod and line catch from the River Lossie 1952 - 08.

	Salmon	Grilse	Salmon and Grilse	Sea Trout
Long-term Mean	32	65	98	731
Maximum Catch (Year)	162 (1958)	344 (2004)	414 (1996)	2911 (1958)

Catch data provides an indication of trends in the fish populations, but data on fishing effort is poor or missing, data on the finnock catch is also poor and work is also required to examine the effects of environmental factors, such as water flow, habitat loss, etc.

Some data on Brown trout catches is also available from Elgin Angling Association records but improving this dataset is desirable. Obtaining any existing data from the loch based fisheries would also be a valuable source of information on brown trout populations.

4.2 Juvenile Salmonid Data

An electro-fishing survey of the juvenile salmon and trout within the Lossie was conducted in 2000 by McRitchie and Laughton (2001). This was the first extended survey of the juvenile fish populations within the river although some earlier data from 1987 is also available from Marine Scotland and some *ad hoc* data collected after a distillery pollution event (Hynd 1997).

In summary their findings indicated that juvenile trout were well distributed throughout the Lossie and its tributaries. Salmon were more limited in their distribution. They were present in the mainstem from Elgin to the falls at Torwhinnie and in the lower reaches of a few burns such as the Linkwood, Corrhatnich and Black. No salmon or trout were found in the heavily modified Tyock Burn although eels and sticklebacks were present. Lamprey and flounders were also recorded within the survey.

A further survey of salmonid populations in the lower mainstem was conducted in 2002 (Laughton and Burns, 2003). This survey confirmed that juvenile salmon populations were good in the mainstem Lossie. A more detailed examination of the mainstem from Elgin to Lossiemouth was conducted in 2006 and 2008 as part of assessment for the proposed Elgin Flood Alleviation Scheme (Era 2006a, Era 2006b, Aquaterra Ecology, 2009a). The findings indicated that salmon spawned throughout the lower mainstem and salmon fry and parr were present in good densities. Juvenile trout were scarce.

An additional survey of the Linkwood Burn (Aquaterra Ecology 2009c and 2009d) was also carried out and indicated good densities of salmon and trout were present along with lampreys.

The Lhanbryde Burn was surveyed in 2001 (Laughton 2001) prior to the development of a flood alleviation scheme. The burn was found to hold good juvenile trout populations throughout much of its length and particularly upstream from Loch na Bo.

Further contract surveys of the Corrhatnich and Yellowbog Burns were completed in 2008 as part of the Rothes wind farm development.

4.3 Other Fish Species

Trout and salmon dominate in the fish fauna of the Lossie but eels, lamprey and sticklebacks have also been reported. Detailed data on the lamprey population is provided by Aquaterra Ecology (2009c) from a survey of the mainstem from Elgin to Lossiemouth. The findings indicated that extensive habitat is available for lampreys in the lower reaches of the Lossie. Electrofishing surveys indicated that the lamprey population is Brook Lamprey (*Lampetra planeri).* Some data for eels, minnows, sticklebacks and flounders distribution is available from existing survey reports.

4.4 Future Data Collection

Good data on for the fish populations in a river is essential to inform management and determine key factors such as, fish species and abundance, stock structure, carrying capacity and spawning targets and essential. Data on available habitat and areas where improvements can be implemented is also desirable.

Each river has a certain carrying capacity based on the accessible area available for spawning adults. By determining this area and calculating the minimum number of eggs required to saturate the area to produce the maximum output of smolts, it is possible to assess from adult fish returns whether the river is reaching its spawning potential. This approach is now recommended by bodies such as NASCO as a simple method of managing salmonid stocks on a river by river basis (Butler 2002). However, to achieve

the good data sets required will take time and they are costly to collect. Despite a limited budget there is already a range of data sets available for the Lossie, particularly on adult catch data and juvenile distribution. Effort needs to be applied to maintaining these datasets and linking them to geographical information system (GIS) to allow better linkage and analysis to other dataset in the future Currently no data on smolt production, spawning distribution, age structure and exploitation rates are available, adult counter data would also be desirable.

Recent genetic analysis of salmon populations in other rivers has indicated that river stocks may be structured on fine scale into multiple distinct breeding populations. For example, salmon breeding above and below waterfalls or other natural features may often be heritably different in ways that affect their behaviour, survival and reproductive success. This can be true of neighbouring tributary populations and key to allowing each to cope with particular environmental conditions than the other. Therefore intermixing of the populations may not be desirable. In large rivers many different populations can potentially exist and an understanding of this population structure is essential for the development of effective stock conservation and management programmes.

This partnership project established in 2009, Focusing Atlantic Salmon Management on Populations (FASMOP) between RAFTS, Marine Scotland (MS) and individual District Salmon Fishery Boards (DSFB) and Fisheries Trusts seeks to combine the financial, management and staff resources of Fisheries Trusts and DSFBs with the scientific and technical genetic analysis expertise and facilities of MS. This project will collect and analyse a databank of tissue samples from river catchments across the length and breadth of Scotland.

The work will inform local management but will also contribute to the work on the genetic character of Scottish salmon stocks as part of the pan European NASCO sponsored and EU funded SALSEA-MERGE project. Funding from this project will cover some of the costs of genetically screening local stocks. The main funding support for genetic screening will come from Scottish Government funding provided to support

local fisheries management activities and from monies raised locally by trusts and boards. This programme of sampling and analysis is currently funded until April 2011. Further information on the FASMOP project see: http://www.rafts.org.uk/projects/geneticsproject.asp and the SALSEA-MERGE see: http://www.nasco.int/sas/salsea.htm. Tissue samples from the Lossie salmon stocks will be collected in the near future for analysis within this initiative.

Opportunities to combine with other monitoring initiatives such as Moray Firth Sea Trout Project (MFSTP) http://mfstp.co.uk/, Moray Firth Seal Control Plan etc, should also be grasped when possible; the development of the Trust will also assist the process. The FNLFT will also play a key role in the development of data collection for the future management of the the fish stocks within the Lossie.

5. Lossie Catchment: Key Issues and Pressures

Many pressures impinge on a river system and affect the performance of the fish stocks. Arguably the greatest factor affecting salmonid stocks at the moment is sea survival. Survival rates for salmon smolts to returning adults are currently very low 5% or less and survival rates for sea trout also seem to be low. Work is underway to improve our understanding of the salmon and sea trout's life at sea but this is highly expensive and beyond the scope of most Fishery Boards. However, with poor survival rates evident at sea it is essential that the natal rivers are kept in good order to maximise the output of natural wild salmon sea trout stocks. Thus this Plan seeks to maintain and where possible improve the habitat and conditions for fish within the Lossie. Selections of key issues are listed below.

5.1 Distilleries

There are currently nine distilleries active within the Lossie catchment. Distilleries require considerable amounts of water for production of whisky and in particular water is

needed to cool the distillate. This warm water is then usually discharged back to the river where it can raise the ambient river temperatures by several degrees. This in turn can affect the wildlife and ecology of the receiving stream for example fish growth rates can be more rapid.

Two burns on the Lossie receive the bulk of this cooling water, the Linkwood Burn and the Black Burn. The Lossie also receives some cooling water from Glen Moray distillery. A considerable amount of monitoring of the Linkwood and Black Burn has been completed and in some instances the uplift temperatures can be high and exceed the 1.5^{O}C uplift above ambient recommended within the Freshwater Fish Directive (78/659/EEC). However, these guidelines are under review and a more realistic uplift level may be applied in the future.

Nonetheless those distilleries which are exceeding this uplift need to progress with methods of reducing their cooling water discharge temperature and are in examining or implementing methods of achieving this. To ensure that the distillers do not continue to breach these uplift regulations is the responsibility of SEPA. However, it is also important that the Board and the Trust maintain good communications with the distilleries.

5.2 Wind farm Development

The Lossie catchment has one existing wind farm development within in its boundary, Rothes Wind Farm. A second development at Berry Burn will also impinge on the upper catchment. Wind farms and the associated network of access roads create considerable disturbance to the surrounding land and this may lead to changes in run off. This in turn could affect the water quality of the rivers and stream draining the area and the fish populations within them.

Plans are in place to expand the Rothes wind farm and this will affect the Corrhatnich Burn and the Yellowbog Burn. Some preliminary investigations of the water quality and

fish populations within these burns has been completed but the development of a monitoring plan to ensure water quality and fish populations are not adversely affected throughout the construction and implementation of the new turbines is essential.

5.3 Flood Alleviation Schemes

Recent years have seen a series of significant floods within the Lossie with many properties in Elgin and Lhanbryde being damaged. A flood alleviation scheme has been implemented on the Lhanbryde Burn and a significant scheme is also proposed for Elgin. The Elgin scheme is under review a public enquiry and a decision on progress will be made in 2010. Until then it is not clear what form the final plan will take in terms of work on the river. However, it is essential that access for fish is maintained and that spawning areas and juvenile habitat is also maintained. Close liaison with the flood alleviation developers and Moray Council is recommended.

5.4 Fish Access

Allowing fish to reach their spawning grounds is fundamental to securing future populations. There a few waterfalls present within the catchment at Torwinnie, upper mainstem, and on the Gedlock Burn. Both restrict access for salmon and sea trout and upstream of the falls a resident brown trout population is present. These are natural features and any attempts to allow fish access above them may have consequences for these brown trout populations. Similarly stocking above the falls with salmonids should be avoided.

There are a number of man-made obstacles on the Lossie and its tributaries and a summary is presented in Table 2. The weirs and Cloddach bridge on the mainstem do allow fish passage as indicated in Table 2, removal would be desirable and this may be achieved through the Flood Alleviation Scheme and through liaison with Moray Council. Opportunities for installation of a fish counter may also arise particularly for at the lower weir.

The dams at Glenlatterach and Romach, are both large scale obstructions. The Glenlatterach dam was constructed around an existing waterfall so although there is a considerable length of stream upstream, it may be costly and unfeasible to allow adult access through this one. The dam at Loch Romach is at the upper end of the Black Burn and improving the structure to allow fish access would be very costly.

The small weir (approx 1.5m height) on the Linkwood Burn is worth discussing with the distillers to provide fish access and the Tumbling Bays could also be removed. A further survey of the Lossie catchment would be helpful to identify any further obstructions to fish passage such as forestry road culverts, weirs etc. The new SNIFFER protocol for assessing barriers should also be applied and an map of the the barrier locations developed using GIS if possible. Opportunities for improvement of fish access can then be determined and the work may be eligible for support through SEPA's restoration fund http://www.sepa.org.uk/water/restoration_fund.aspx.

Table 2: Selection of man-made obstructions present on the River Lossie and tributaries.

River	Type	Location (OS)	Fish Accessibility	Notes
Lossie	Weir (x5)	Kingsmill Old Mills Sherrifmill Bishopmill Deanshaugh	Passable	Weirs passable situated on the Lossie within Elgin. All passable for fish but would be improved by removal. Assessment of options for the weirs underway through flood alleviation scheme. May be possibilities for fish counting.
Lossie	Bridge	Cloddach (320200, 858400)	Passable	Bridge apron under Cloddach bridge has resulted in narrow passage for fish to ascend. Fish often accumulate below bridge leading to poaching issues. Moray Council do have plans to replace bridge.
Linkwood Burn	Weir	Longmorn/ Ben Riach Distillery (322950, 858600)	Impassable	Off take weir for water supply to distillery.
Black Burn	Weirs	Lower Reaches (319200, 860950)	Passable	Series of gabion basket weirs installed to assist field drainage know as Tumbling Bays. Fish can ascend but awkward at low flows.
Black Burn	Dam	Loch Romach (307300, 851900)	Impassable	Large dam no fish passage provision
Leonach Burn	Dam	Glenlatterach Reservoir (319500, 853500)	Impassable	Large dam no fish passage provision

5.5 Land Management

The Lossie is affected by a variety of land use activities within the catchment. Forestry, agriculture and upland land management activities can impinge upon the water quality and quantity of the catchment. For the most part these activities are controlled through a wealth of guidelines and regulations. Furthermore recently the Scottish Government has implemented a new approach to development planning. Rather than a “case by case” approach, they are aiming to have the development plan guide to where development

should, or should not, happen. As part of this new approach SNH is less likely to comment on planning casework which is out with designated sites (which would apply to most of the Lossie), or which is not subject to Environmental Impact Assessment (EIA). Thus it is crucially important that The Board maintain close liaison with Local Authorities regarding “Development Plans” and bodies such as SNH, SEPA, the Forestry Commission, National Farmers Union, and also local proprietors to raise awareness of the requirements for maintaining healthy fish populations and prevent damaging practices.

5.5.1 Current Status of Riparian Habitat

Much of the Lossie still retains reasonable riparian vegetation and instream habitat. However, a range of activities have affected the river over the years. Some habitat surveys of the river have been conducted (Era 2006) and it would be useful to extend these to determine the distribution of key habitat features such as spawning gravel, parr habitat, trout habitat, obstructions and areas of degraded habitat. This would allow a better understanding of the fish distribution within the river but also identify areas where remedial work may be required. Once degrade areas are identified projects to improve the riparian habitat may be designed and implemented and used to demonstrate the benefits of this type of approach.

5.5.2 Agriculture

Agriculture is fairly intensive in the lower reaches of the river and there have been effects through the straightening of channels and grazing. A survey to examine the extent of this problem and possible remedial activities would be worthwhile. In addition water is also used for irrigating crops during the summer and this may affect burns which are already running at low levels. Little information exists on this aspect.

5.5.3 Quarrying

A number of quarries are in operation within the Lossie catchment. Some are close to the river and have had direct effects on the riparian habitat in the past, in addition water from the river is used in the quarrying processes. Although there are controls in place to prevent dirty water from the quarrying process re-entering the river it would be useful to examine the amount of water used and determine if there is any adverse effects on fish population as a result of the industry.

5.5.4 Forestry

Extensive conifer plantations are present in the catchment and there is evidence that these have affected watercourses particularly on some upper burns. Some of this forestry is approaching harvestable age and it is important to develop close links with foresters to ensure new planting methods are adopted to protect watercourses. A survey identifying areas of poor planting practices within the existing conifer forests would also be useful to target areas for riparian restoration.

5.6 Invasive Non Native Species

A major challenge is to maintain the distribution and status of the current fish fauna, and protect the genetic integrity of native fish populations. The protection of fish biodiversity at the inter and intraspecfic level is a key deliverable of this Fisheries Management Plan. Development of a “Biosecurity Plan” to identify and control invasive non native species is a high priority and further details of how to achieve this through a RAFTS project is available from http://www.rafts.org.uk/projects/biosecurityplanningproject.asp.

5.6.1 North American Signal Crayfish

The most serious immediate threat is from the North American signal crayfish, which are established in the nearby River Nairn. The removal of this destructive animal is

unlikely and the most effective control is to ensure it doesn't enter the catchment. All possible efforts to raise awareness of the crayfish and its potential routes into the Lossie catchment must be pursued. Control methods such as disinfecting fishing kit when moving from one catchment to the other should also be implemented. In addition methods for the control and/or eradication of the species from the Nairn should be discussed with the Nairn Fishery Board and others and if possible implemented.

5.6.2 Gyrodactylus salaris

Gyrodactylus salaris (GS) is a highly contagious monogenean ectoparasite of salmon. It originates from the Baltic where it co-exists with salmon populations. However, when it has been transferred to rivers out with the Baltic it has had devastating effects on the salmon populations leading to the complete loss of salmon in many Norwegian rivers. GS is still absent from UK rivers and every effort must be made to ensure the parasite does not establish here. Raising awareness of the threats posed by this parasite and implementing preventative measures are critical to safeguarding the Lossie in the future. Further details on GS and control measures can be found at, http://www.scotland.gov.uk/Topics/marine/Fisheries/Fish-Shellfish/workinggroups/gswg and the Home and Dry campaign http://www.infoscotland.com/gsbug/

5.6.3 Mink

American mink *(Mustela vison)* is present in the Lossie catchment. Mink spread by migration and kill water fowl, small mammals and juvenile salmon and trout. Mink are closely linked to the decline of water voles. A mink eradication project is now underway in the Cairngorms area and this is already showing signs of success. Exploring ways of extending this approach to the Lossie catchment is recommended.

5.6.4 Non Native Plant Species

An additional challenge for riparian management is the increasing abundance of non-native plants such as Giant Hogweed, Japanese Knotweed and Himalayan Balsam. While the plants do not directly affect fish populations they do choke out the native riparian vegetation. This may in turn reduce the range of leaf matter and invertebrates entering the river and so affect the food supplies for juvenile fish. All three are now well established in the lower reaches of the Lossie and although there is some limited control in place an accurate map of their distribution leading to an organised and concerted effort to eradicate the plants is required. There are potential sources of funding to achieve this through SEPA restoration scheme. However, given the density of hogweed infestation, eradication will be costly.

An initial step to deal with non native plants and fish introductions is to develop a "Biosecurity Plan". This concentrates on reviewing the current level of non native species within the catchment and developing practical strategies for their control and removal. It also develops methodology for preventing new unwanted species entering the catchment. Given that many of the problems are also present on neighbouring rivers a Moray Firth based approach may be worth considering. Further information on how to achieve this through a RAFTS project can be found at http://www.rafts.org.uk/projects/biosecurityplanningproject.asp and further information on non native species is available from http://www.nonnativespecies.org.

5.6.5 Non Native Fish

Minnows are already present in the Lossie and may well have been introduced from discarded bait used during "drop minnow" fishing. There are some unsubstantiated reports of perch and pike being present in lochs at Gilston near Spynie and a perch was also reported from the pond in Cooper Park!

Two put and take fisheries operate in the catchment and utilize Rainbow trout. There is potential for Rainbow trout to escape into the river and affect the local native fish stocks and equally as concerning is the possibility of the Rainbow trout coming from a waterbody which contains American signal crayfish leading to the establishment of the species on the Lossie.

Section 35 of the Aquaculture and Fisheries (Scotland) act 2007, which inserts a new section 33A into the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003, makes it an offence for any person to intentionally introduce any live fish or spawn of any fish into inland waters, or possess such with intention of introduction without previous written agreement of the appropriate authority. For salmon and sea trout the appropriate authority is the District Salmon Fishery Board but for other fish species it is Marine Scotland Science. There is the potential that fish could be introduced to the catchment without consultation with the Fishery Board. To improve this, the Board should request Scottish Ministers and Marine Scotland Science to consult with them on any fish stocking activities in the catchment. A review of stocking practices including brown trout and rainbow trout is require to establish current practices and then appropriate stocking policies can be developed.

5.7 Fisheries Protection

Poaching remains a problem to all fishery boards and although the problem is less than a few decades ago it still requires attention. Operating a paid and full trained bailiff team to control poaching is expensive and often beyond smaller Boards such as the Lossie. In this situation river watchers are often utilised who are generally local volunteers who know the river and local anglers well and can often help deter poaching activities. However, river watchers do not usually hold a warrant card so have more limited powers of arrest than a bailiff. They seldom have back up in terms of additional personnel and can only spend a limited amount of time on the river.

Poaching is still a serious issue on the Lossie and neighbouring rivers and it is recommended that a more unified approach to the problem is explored with other neighbouring Moray Firth fishery boards and with the Police.

5.8 Predation

Fish provide a valuable food source for many other animals in the catchment including avian predators such as heron, sawbill ducks, cormorants and osprey, mammals such as otters, seals, dolphins and porpoises. Many of these animals are now afforded protection having been over persecuted in the past. However, there are concerns that species such as goosander, merganser, cormorant and seals may be affecting salmon and trout populations and that controls measures may be required to reduce predation levels.

5.8.1 Avian Predators

Predation on fish by sawbill ducks (goosander and merganser) and cormorants is an issue that concerns many fishery owners and anglers. The smolts provide a valuable food source for sawbills and cormorants. These birds are afforded protection under wildlife legislation and indiscriminate culling is not permissible. A license to control them can be gained through application to Scottish Government Landscapes and Habitats Division. Any application must be supported by good quality data and the applicant must provide evidence that the birds are providing “serious damage” to the fishery.

The impact of predatory birds on fish stocks has not been quantified within the Lossie catchment so more information is needed to develop a sensible management approach to the problem. In essence better bird count data is required along with better data on their dietary habits. There is a developing Moray Firth approach to managing sawbill ducks and cormorants and participation in this process is recommended.

5.8.2 Seals

Both common and grey seals predate on salmon and trout within the Lossie coastal area. The Moray Firth Seal Management Plan was implemented in 2005 with the aim of protecting salmon and sea trout stocks while also maintaining the conservation status of the Dornoch Firth SAC for common seals. The scheme introduced the approach of managing seals and salmon over a large geographical area, the training of nominated marksmen to an agreed standard, and the accurate reporting of all seals shot. The Plan allowed for specific quotas of seals to be culled within river reaches. The Moray Firth Seal Management Plan continued throughout 2008 and it seems likely that this type of approach will be favoured in the future. However, similar to sawbills there is a need for improving data on the presence of seals within and around the Lossie through initiation of a structured counting scheme.

5.9 Fish Disease

No major outbreak of fish disease resulting in significant losses of fish has occurred in recent years but it has happened in the past. Little direct action can be taken to treat the disease outbreaks however, removal of infected fish where possible could prevent further spread. In general outbreaks of fish diseases pose little or no threat to human health. However, red vent syndrome (RVS) which is caused by accumulations of the Anasikis parasite near the salmons vent is transferable to humans through eating raw fish such as sushi. Further information is available from
http://www.marlab.ac.uk/FRS.Web/Uploads/Documents/Red%20vent%20Scotweb.pdf
http://www.food.gov.uk/multimedia/pdfs/guidsalmonanisakis.pdf.

5.10 Sea Survival

In recent years the low abundance of salmon and grilse appears to be related to poor survival at sea (Appendix 2). For some monitored stocks such as the North Esk, marine mortality for salmon smolts is currently twice as high as in the 1970s. Many factors may

affect marine mortality of salmon including environmental changes, diseases and parasites, predation, competition, availability of food, exploitation (including by-catch in pelagic fisheries targeting other species) and factors operating in fresh water which subsequently influence survival in the sea. However, there is a lack of understanding of the marine phase of the salmon's life-cycle due, in part, to the expense of conducting research at sea. This is largely out with local control although the LDSFB and FNLFT should where possible support larger national and international initiatives aimed at improving the understanding marine phase of the salmon and sea trout.

5.11 Education and Publicity

To date the LDSFB has not pursued an active education role. Many other Boards and Trusts in Scotland see this as an essential element of the management and promotion of the river. It is important that all those who might have an effect upon the river or may have access to the river, understand about fish and fisheries management. Furthermore, initiatives such as "Salmon Go To School" have taken a very positive role in promoting awareness of the importance of the salmon resource to the local primary schools and coupled with options such as river visits, fly-tying and fishing days provide local children with a chance to experience the ecology of the river and try the delights of angling. However, to fully promote these tasks requires staff and funding. The establishment of the FNLFT will enable closer working with local anglers and Angling Associations in order to develop these initiatives.

5.12 Establishing Priorities

The Fisheries Management Plan 2010-2015 is intended to provide a framework within which the Lossie District Salmon Fishery Board (LDSFB) and the Findhorn, Nairn and Lossie Fisheries Trust (FNLFT) can identify target areas for research projects and apply specific funding. In any plan it is useful to priorities target areas and this has been attempted here using the following criteria (Table 3). However, this is only a guide and a

flexible approach should to dealing with issues as they arise and developing projects should be maintained.

Table 3: Lossie fisheries management plan priority list.

Priority	Key Issues
1	Fish Access, Migration, Distribution and Population Structure Predation Control, Disease Prevention , Poaching Control, Water Quality and pollution
2	Information Gathering, Habitat Management, Fish Stocking Invasive Non-Natives, Education and Publicity
3	Assisting External/National Projects

The Plan also identifies whether the whether the Board or the Trust should lead on a particular aspect in column 6. Although many items will require a flexible and/or combined approach the led organisation is the upper one in column 6.

6. The Fisheries Management Plan 2010-2015.

1. The Environment

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
1.1 Marine Environment	Currently marine survival for both salmon and sea trout is low leading to poor adult return rates.		Maintain liaison with AST, MS, NASCO, MFSTP regarding the results of marine and wider research programmes.	3	Board Trust
1.2 Freshwater Environment .	Water quality is generally good within the Lossie catchment. Discharges from sewage treatment works may be having an adverse effect on the river habitat and fish populations. Thermal discharges from distilleries may affect salmonid populations. Demand for potable water may be increasing as populations increase within the catchment.	Seek to minimise any reduction in water quality or quantity within the Lossie catchment To ensure that future developments have a minimal negative impact on the river flow and water quality.	Continue to provide expert advice on the requirements of fish with respect to water quantity and quality. Continue to review existing and planned water abstraction operations within the Lossie. Develop close liaison with distillers and SEPA to review cooling water discharges. Ensure that all existing abstraction schemes have effective means of adult access and smolt screening on intakes. Ensure that there is there is little or no loss of fish habitat or access through any proposed new or existing water abstraction schemes.	1 1 1 1 1	Trust Board Trust Board Trust Board Trust Board Trust Board

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
1.3 Land Use	Physical riverworks such as bank repairs, bridge and culvert construction or repair, drainage channels can all affect fish populations. Wind farm developments have raised concerns regarding run-off and potential changes in water quality. Forestry, quarry and agriculture practices can potentially affect the quality and quantity of water entering the Lossie. Further housing and industrial developments are likely within the Lossie catchment.	To ensure that future developments have a minimal negative impact on the riverine and riparian habitat. To strengthen links with SNH, SEPA and Moray Council and ensure that future developments have a minimal negative impact on the river flow, water quality and fish populations. To improve understanding of how riverworks impact on fish and fish habitats.	Provide expert advice to SNH, SEPA and Moray Council during the planning of developments which may affect riverine habitat and fish populations. Develop close liaison with SEPA and SNH and other statutory bodies regarding developments which may affect the river and fish populations. Provide best practice advice to organisations involved in engineering works. Consider adopting or developing a “Code of Good Practice” for riverworks. Encourage the development of water and fish monitoring programmes alongside significant land use developments such as wind farms, flood alleviation schemes etc. Collaborate and contribute to the North Highland Area Advisory Group (AAG) and River Basin Management Plan (RBMP) process. .	1 1 1 1 1	Trust Board Trust Board Trust Board Trust Board Board Trust

2. Adult Salmon and Trout Stocks

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
2.1 Adult Salmon and Trout Escapement, Exploitation And Conservation.	Encourage and promote sustainable angling for salmon and trout in the Lossie catchment. Maintaining sufficient numbers of adults escape to maximise egg deposition. No data on exploitation rates for salmon and trout. Identify man-made obstructions are affecting salmon and trout access.	Continue to raise awareness of the importance of salmon and sea trout fisheries and highlight the need for conservation practices. Regularly review and if necessary implement conservation policies for salmon and sea trout. Maximise the numbers of adult salmon and trout reaching spawning areas and increase egg deposition. Improve data on exploitation rates for adult salmon and trout Improve data on adult salmonid spawning distribution in the Lossie catchment	Regularly re-assess conservation policies in light of catch and return figures. Collect and review all existing data on salmon and trout populations within the Lossie catchment. Identify and map all obstacles to salmonid migration. Assess options for the removal of man-made obstacles or the improvement of fish access. Continue monitoring adult salmonids, using catch data. Identify any opportunities for installing a fish counter. Establish project to identify the sub-population structure of the salmon and trout within the Lossie using genetic marker techniques. Develop survey programme to determine spawning distribution of adult salmonids within the Lossie. Consider developing tagging project to determine on exploitation rates of salmon and sea trout. Develop stock recruitment models.	1 2 1 2 1 1 2 2	Board Trust Board Trust Board Trust Board Trust Board Trust Board Trust Board Trust Board Trust

3. Juvenile Salmon and Trout Stocks

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
3.1 Juvenile Salmon and Trout distribution abundance and stock structure.	Data on juvenile salmon and trout distribution and abundance is required.	Determine distribution and abundance of juvenile salmon and trout. Identify problem areas and target for remedial action.	Conduct electro-fishing surveys to provide better distribution and abundance data for salmon and trout.	1	Trust
	Data on the genetic structure of the Lossie salmon and trout populations is required.	Identify genetic structure of Lossie salmon and trout populations	Contribute to tissue samples to SALSEA-MERGE and if possible FASMOP project to identify the population structure of the salmon and trout within the Lossie using genetic marker techniques.	1	Trust
3.2 Salmon and Trout Smolt Production	No data smolt production is available for Lossie catchment.	To provide better measure of the salmon and trout output from the River Lossie.	Explore funding possibilities for establishing a smolts trap(s) within the catchment.	2	Trust Board
			Identify suitable locations for establishing smolt traps throughout the Lossie.	2	Trust Board

4. Protection of Salmon and Trout Stocks

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust
4.1 Predation of salmon and trout by sawbill ducks, cormorants, seals, otters, mink and other animals is often perceived as a problem by anglers and fishery owners.	The effects of bird and seal predation on salmon and sea trout stocks are not clear and development of acceptable control methods is necessary. Mink predation on juvenile salmonids is reducing smolt output.	Work within the Moray Firth predator management framework, to develop sustainable strategies for managing the impact of predators upon salmonids.	Consider ways of improving sawbill duck, cormorant and seal counts. Contribute to the development of a Moray Firth Sawbill Duck and Cormorant Management Program. Continue participation in the Moray Firth Seal Management Programme. Consider linking to or establishing a mink eradication programme. Investigate other predator control methods.	1 1 1 1 1	Board Trust Board Trust Board Trust Board Trust Board Trust

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
4.2 Non Native species .	Both instream and riparian non native plant species are becoming more abundant and leading loss of native vegetation. Introductions of non-native aquatic species such as American Signal Crayfish, can be detrimental to existing native species and their habitats	Develop bio-security plan/strategy Prevention of further non-native plant species from entering the catchment. Prevention of non-native fish species from entering the catchment .	Develop education strategy and bio-security plan to prevent the further introduction of non-native plants and/or animals to the Lossie catchment. Support the introduction of better controls on the transfer of fish within Scotland to curb the spread of unwanted species and reduce risks to valuable native populations. Map alien plant species distributions and liaise with relevant partner organisations to develop plans for alien plant species eradication. Develop an eradication strategy for the removal of the non-native invasive plants such as Giant hogweed, Japanese knotweed, Himalayan Balsam, from the catchment.	2 2 2 2	Trust Board Trust Board Trust Board Trust Board

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
4.2 Gyrodactylus salaris introduction.	The threat of GS introduction is ever present and strategies need to be put in place to prevent its accidental introduction into the system.	To prevent the arrival of GS within the Lossie catchment.	Raise awareness of the GS threat and inform anglers and fisheries of the methods for preventing GS infection within Scottish waters Encourage stronger controls on anglers including the disinfection of tackle, clothing, etc when the visit Lossie fishing locations.	1 1	Board Trust Board Trust

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
4.4 Illegal Fishing (Poaching)	Illegal fishing is still practised in the Lossie district. Anglers do occasionally fish the Lossie without appropriate fishing permit. Maintaining trained personnel to patrol river is desirable but ~~too~~ costly.	To reduce and if possible eliminate illegal fishing for salmon and sea trout. Maintain/Develop network of river watchers.	Review river watchers roles and duties and provide additional training when required. Develop and improve links with neighbouring Fishery Boards bailiff staff. Maintain close liaison with the Police, particularly Wildlife Crime officers. Where sufficient evidence is collected, pursue convictions of captured poachers.	1 1 1 1	Board Board Board Board

5. Enhancement of Salmon and Trout Stocks

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
5.1 Habitat Management and Enhancement	Some salmonid habitat has been lost and degraded over time due to poor land management practices. Some baseline habitat surveys have been completed for the Lossie but better data is required for spawning distribution, parr habitat etc.	To maintain the good quality habitat that is present in most areas of the Lossie catchment Identify river reaches where fish habitat is degraded and consider improvements. Improve the numbers of juvenile salmonids across the age classes and smolt output through improved habitat management.	Initiate and conduct a suitable habitat survey over the Lossie mainstem and tributaries to identify key fish features (spawning beds, degraded areas etc). Prepare a detailed map of key fish habitat features and degraded areas potentially requiring remedial action for the catchment. Identify any existing habitat improvement areas to show the benefits of improved riparian management. Identify instream habitats which require improving (e.g. canalisation, side-channels) and draw up plans for habitat improvement projects. Encourage best practice, e.g. exclusion zones to prevent access to instream and riparian areas by grazing animals. Initiate new habitat improvement projects in partnership with proprietors, farmers and external organisations.	2 2 2 2 2 2	Trust Board Trust Board Trust Board Trust Board Trust Board Trust Board

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
5.2 Hatchery Stocking	No hatchery is present within the Lossie	Currently no plans to implement artificial stocking program	Review hatchery stocking information from elsewhere regularly.	2	Board Trust

6. Management of Other Fish Species

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
6.1 Other Native Fish Species	Better data on the distribution of the other fish species is required.	To improve data on other native fish species and develop more robust management.	Promote projects to examine the ecology and importance of native fish species.	2	Trust

7. Education and Publicity

Factor	Summary of Issue(s)	Management Aims and Strategy	Action Proposed	Priority	Lead (Board/Trust)
7.1 To educate and publicise fisheries management on the Lossie.	Declining interest in fishing and countryside management.	To promote sustainable angling in the Lossie	Promote the fisheries research and management amongst all those who have access to the river.	2	Trust
		To publicise fisheries research and management on the River Lossie.	Promote the fisheries research and management on the Lossie through regular publications.	2	Trust
			Consider developing fisheries education projects with local schools.	2	Trust
7.2 To contribute to wider National Fisheries Management	Need to improve fisheries management within Scotland.	Seek to improve fisheries management across Scotland through contributing to National management organisations.	Maintain membership and continue to contribute to National Fishery organizations such as ASFB, RAFTS and others.	3	Board Trust
			Continue to maintain strong links with Marine Scotland, SNH and SEPA. In particular continue to contribute to Area Advisory Groups and development of Basin Management Plans.	3	Board Trust
			Continue to develop links with Local Authorities and other relevant Agencies.	3	Board Trust

7. Duration and Review

The lifespan of this plan is six years, commencing 1st January 2010 and ending 31st December 2015. During this time the plan will be regularly reviewed by the Lossie District Salmon Fishery Board and the Findhorn Nairn and Lossie Fisheries Trust. Regular updates will be presented through the Annual Reports, and on http://www.riverfindhorn.org.uk/findhorn_master.html.

8. Consultation

Draft versions of the Lossie Fisheries Management Plan were circulated to the following organisations and the author is grateful for their useful comments, Scottish Natural Heritage, Scottish Environment Protection Agency, and Marine Scotland. A draft copy was also circulated to Moray Council but no comments were received.

Members of the Lossie District Salmon Fishery Board and Seymour Monro (Findhorn, Nairn and Lossie Fisheries Trust) also provided helpful comments.

9. Acknowledgements

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10. References

Aquaterra Ecology 2009a. Elgin Ecological Surveys: Salmonid Fish. Report to Moray Flood Alleviation. February 2009.

Aquaterra Ecology 2009b. Elgin Ecological Surveys: Lampreys. Report to Moray Flood Alleviation. February 2009.

Aquaterra Ecology 2009c. Linkwood Burn Ecological Surveys: Salmonid Fish. Report to Moray Flood Alleviation. February 2009.

Aquaterra Ecology 2009d. Linkwood Burn Ecological Surveys: Lampreys. Report to Moray Flood Alleviation. February 2009.

Butler, J. 2002. River Ewe Fishery Management Plan 2002-2006. Wester Ross Fisheries Trust. 123pp.

Era. 2004. National Survey of Lamprey Phase I Report: Distribution in Scotland and survey of waters with records of lamprey. Report to Scottish Natural Heritage.

Era. 2006a. Elgin upstream ecological surveys: salmonid fish. Report to Moray Flood Alleviation. December 2006.

Era. 2006b. Elgin downstream ecological surveys: salmonid fish. Report to Moray Flood Alleviation. December 2006.

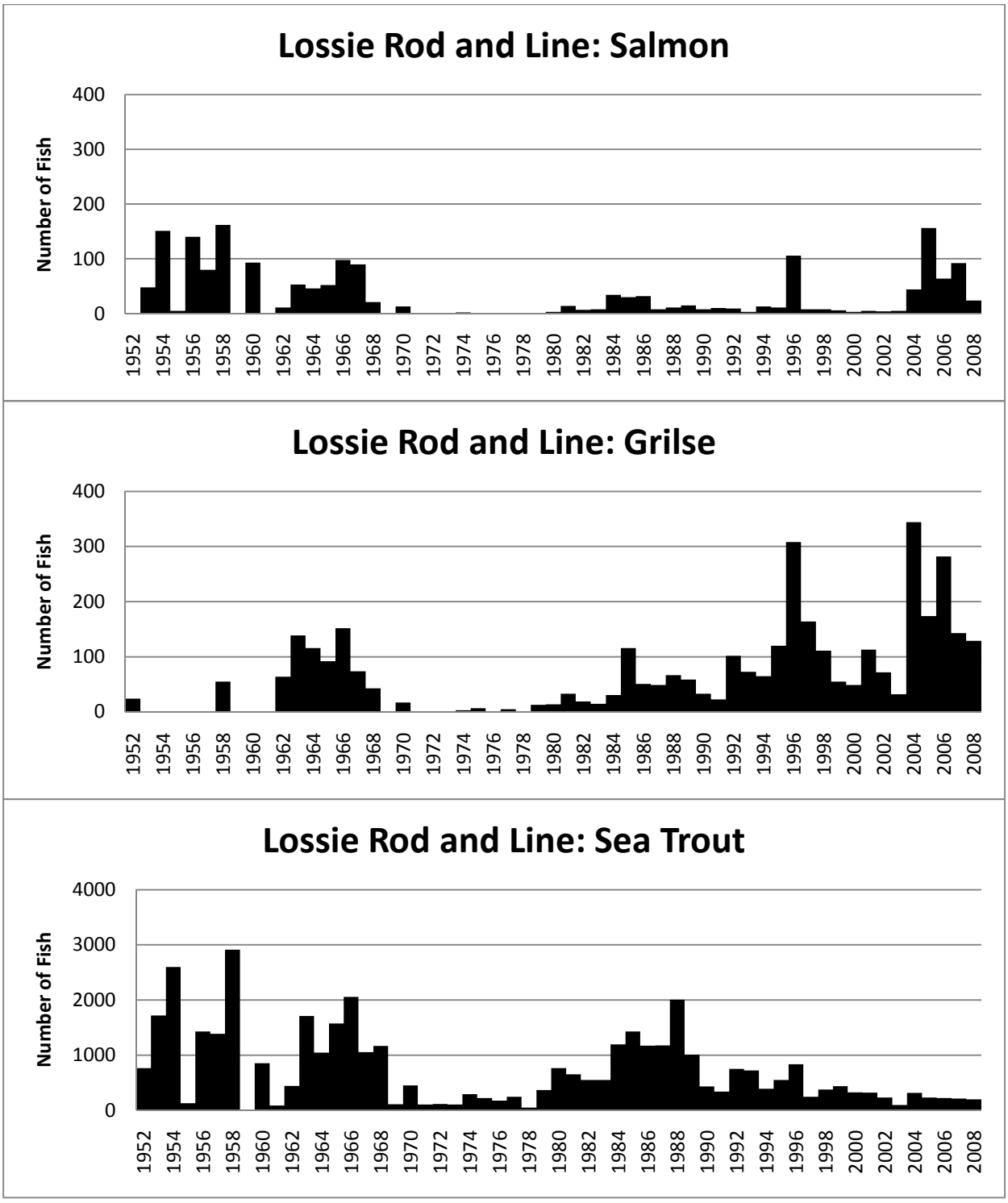
Hynd, I.J.R. 1997. Glenlossie Drk Grains Plant Spillage: Electrical Shocking Survey of Juvenile Salmonids. Report Prepared for United Distillers by Fishwyse Advisory Services.

Laughton, R. 2001. Survey of the juvenile fish in the Lhanbryde Burn 2001. Spey Research Report, 04/01.

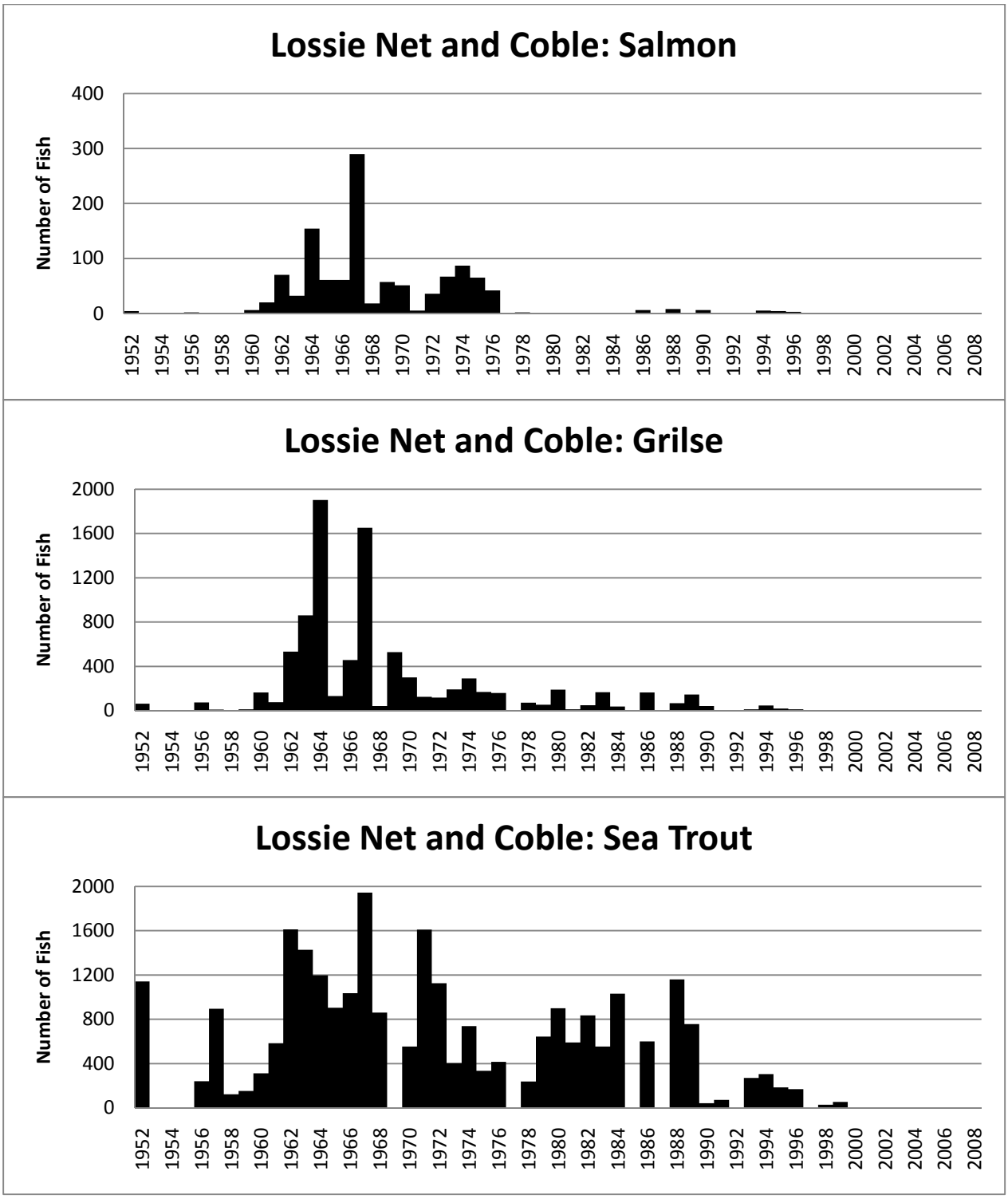
Laughton, R. and Burns, S. 2003. Juvenile Salmon and Trout Populations at Two Sites on the Lower Mainstem River Lossie, 2002. Spey Research Trust Report 01/03.

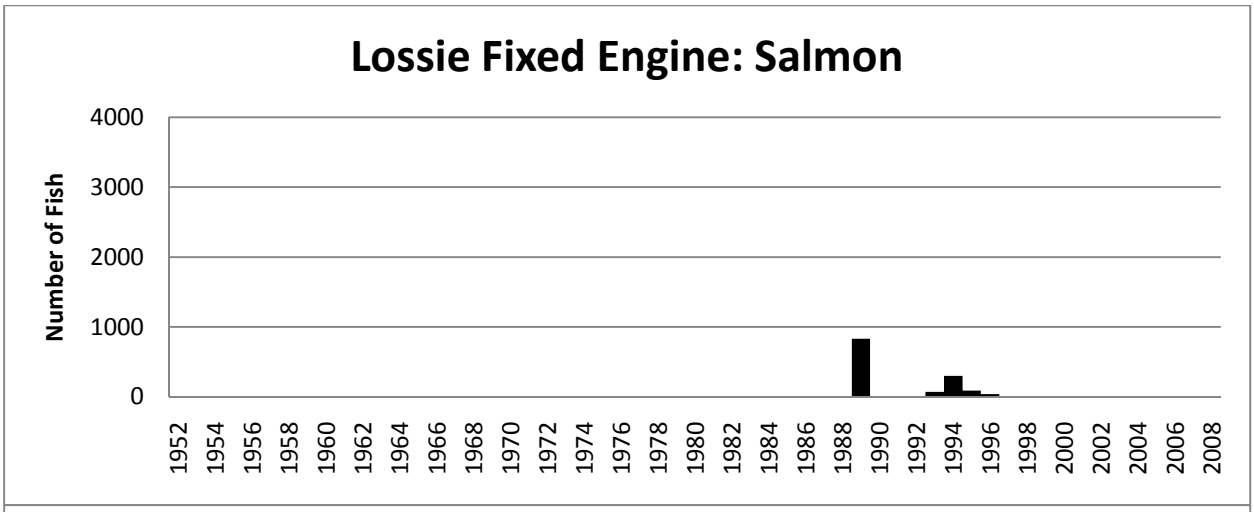
McRitchie, P. and Laughton, R. 2001. R. Lossie Juvenile Survey 2000. Spey Research Report 02/01.

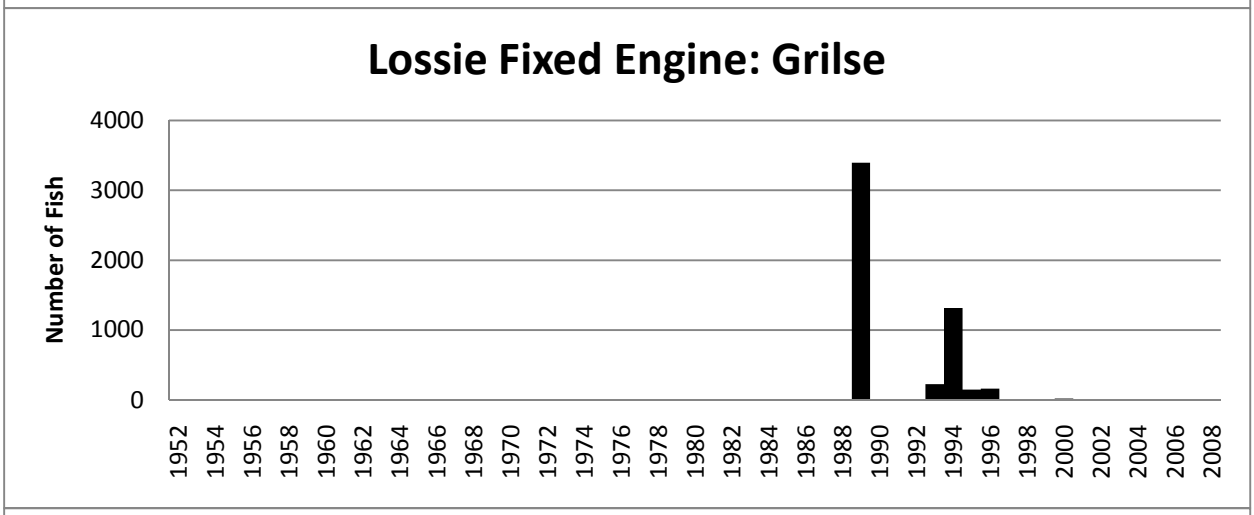
Appendix 1: Catch Data for the River Lossie 1952 to 2008.

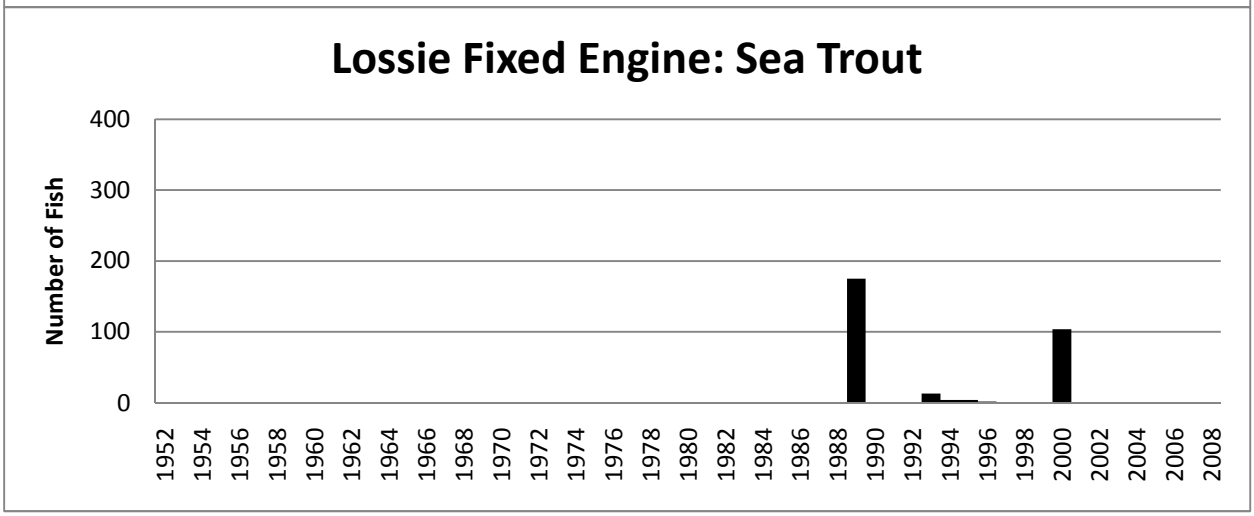


 Data from 2004 onwards include retained and released fish.









Appendix 2: North Esk Marine Survival Rates for Salmon Smolts to Adults.