Kyle Fisheries Annual Report 2017

By Dr Keith L Williams, Director & Clerk

Kyle of Sutherland District Salmon Fishery Board
Kyle of Sutherland Fisheries Trust

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Kyle of Sutherland Fisheries Trust

Chairman	Richard Sankey
Trustees	Michael Brown John Green Tom Inglis (Resigned October 2017) Gregor Macleod Steven Mackenzie (River Workers Representative) Robbie Douglas Miller

Kyle of Sutherland District Salmon Fisheries Board

Chairman	Richard Sankey, Upper Oykel
Proprietors	John Green, Lower Oykel Nicky Griffiths, Braelangwell Estate Gary Gruber, Skibo Estate Crispian Cook, Mandatory Glencassley Estate Alex Hunter, Dounie Estate Robbie Douglas Miller, Upper & Lower Shin
Co-optees	William Paterson, Netsman Peter Routledge, Kyle of Sutherland Angling Association Ashe Windham, Upper Oykel
Clerk	Dr Keith Williams
Staff	Dr Keith Williams, Director Jacqui Hamblin, Administrator John Audsley, Bailiff Supervisor Iain Gollan, Bailiff Philip Blowers, Bailiff

Chairmans Foreword

In early 2017 the Scottish Government pulled back from the Wild Fisheries Reform process, and rather than doing away with the District Salmon Fishery Board's government instead chose to retain them. It is still far from clear what will be expected of DSFBs in the future but greater responsibilities are likely to be imposed upon Boards, whilst the majority of the authority will be retained by government and its agencies. In some ways the Wild Fisheries Reform process was a useful exercise as it helped to demonstrate to government the complexities and the funding gap issues relating to modern fishery management. It is probably the funding gap issues that in the end focused the mind of government and it is an enormous regret that something more meaningful did not come out of the process.

A decision was made in 2017 by SSE to terminate the 1994 mitigation funding agreement with the KSDSFB. Both SSE and the KSDSFB had long since accepted that the 1994 agreement was outdated and no longer fit for purpose. A new set of mitigation agreements were successfully negotiated and will run for the next 5-years. These new agreements are based on specific schedules of mutually agreed mitigation and remedial activities that the Board will carry out on behalf of SSE.

Much of the very hard work of Kyle Fisheries, and especially that of its director, Dr Keith Williams, goes relatively unnoticed by proprietors and anglers. In particular, actively participating in a wide range of consultations and liaison groups is an essential activity for both Board and Trust. In doing so it provides Kyle Fisheries with the ability to potentially influence outcomes, both locally and nationally. Over the last few years a great deal of time and effort has been put into wider engagement with government agencies and other relevant organisations.

It is reassuring to report that Kyle Fisheries is well positioned to meet its future obligations. In addition to a highly professional and well-resourced enforcement team a new Science and Mitigation team is in place for 2018. The aim is to build on this new team to better monitor and gather evidence about the regions fish and fisheries, and then use this evidence to deliver mitigation and remedial activities that will help to improve fish stocks.

Richard Sankey (Chairman)
Kyle of Sutherland District Salmon Fishery Board
Kyle of Sutherland Fishery Trust

Director's Foreword

Following the announcement by the Minister in February 2017 that the Scottish Government would not be pursuing the replacement of district salmon fishery boards, all staff at Kyle Fisheries refocussed their efforts on ensuring that the fish stocks in this area are protected and enhanced. While core activities such as enforcement were unaffected by the Wild Fisheries Reform process, the lack of clarity in respect of the future operational structures in the fisheries sector severely hampered future planning particularly in terms of monitoring and research. Greater emphasis can now be given to increasing our understanding of issues affecting the catchment and fish stocks.

The smooth running of Kyle Fisheries on a day to day basis is largely dependent on having staff with the appropriate skills and training. During the year a number of changes took place within the team. Firstly, we welcomed Jacqui Hamblin who joined the organisation as our administration officer. Secondly, John Audsley who was previously part of the enforcement team took on more supervisory responsibility. Connor Gilmour also joined as a seasonal member of staff. Both Jacqui and John have tackled their new roles with gusto and have significantly enhanced the capacity of Kyle Fisheries to tackle future challenges. Connor also fitted seamlessly into the enforcement team. Existing members of staff, Iain and Phil continued to work hard during this transitional period and in particular their flexible approach to work tasks has allowed us to work as efficiently as possible

Rod and line catches of salmon in 2017 were up slightly on the previous year but nationally the trend appears to be one of sharply declining catches in some areas. Indeed, our own five year average catch also appears to be declining. As such there is little room for complacency particularly given that on the whole angling conditions were favourable for much of the season in this district. In order to try and increase stocks it is anticipated that the next iteration of the management plan, which will be written in the spring of 2018, will be more ambitious than the 2015-18 plan. The plan will include measures aimed at practical remedial action, monitoring and investigations into the nature of stocks.

A particularly pleasing aspect of compiling this report has been noting some of the important work that has been undertaken by Marine Scotland Science which received assistance or input from Kyle Fisheries. Examples of this include downloading the Oykel temperature loggers as part of the SRTMN project, the use of tissue samples as part of the investigations into the genetic basis of salmon run timing and the deployment of acoustic receivers as part of the Armadale Tracking Programme. This type of collaborative work is delivering information which can be usefully integrated into the management of salmon and other fish stocks in this area.

Keith Williams (Director)
Kyle of Sutherland District Salmon Fishery Board
Kyle of Sutherland Fishery Trust

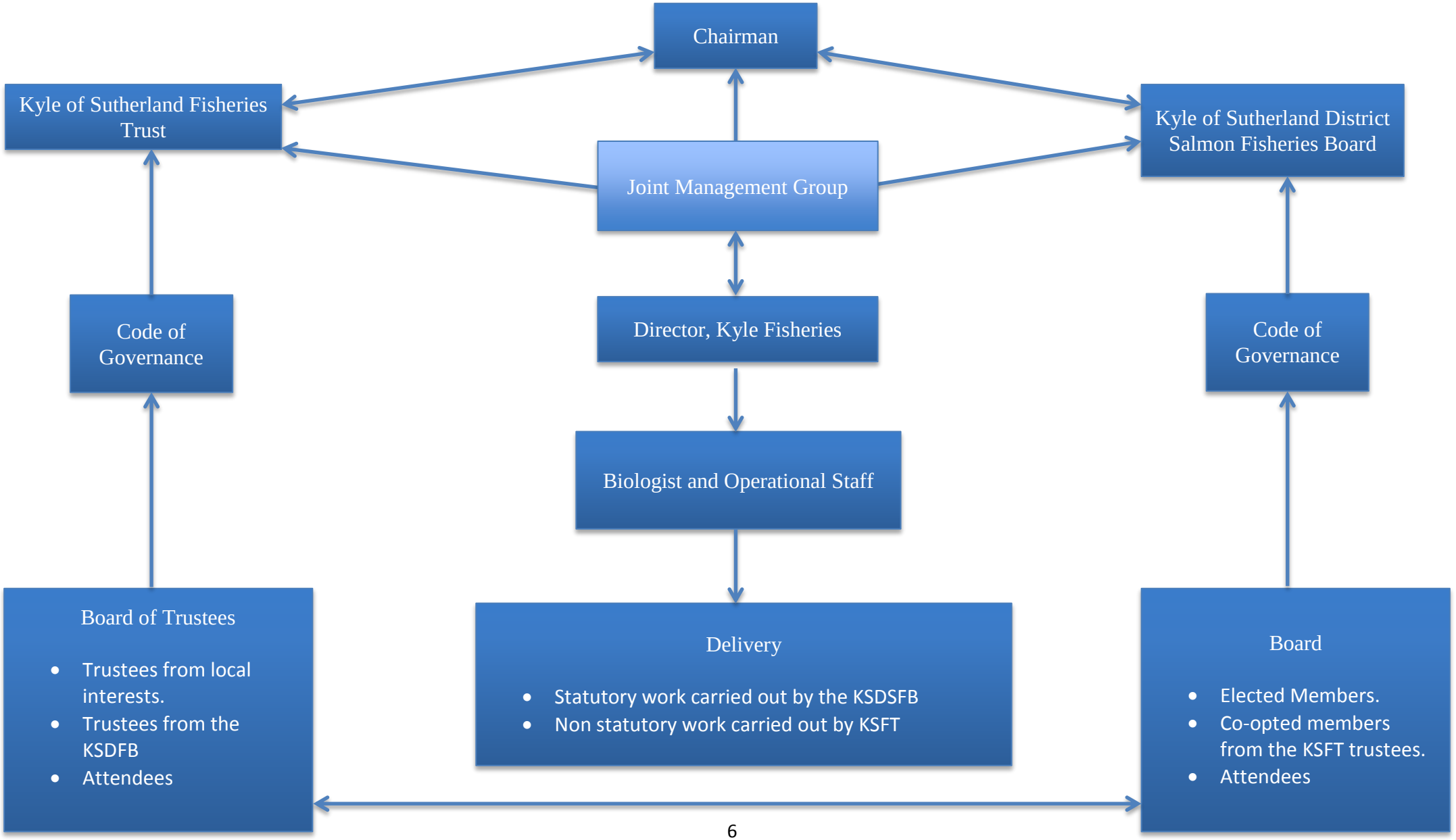
Kyle of Sutherland Fisheries Structure

Kyle of Sutherland Fisheries represents two organisations that work closely together.

The Kyle of Sutherland District Salmon Fishery Board was initially established in the 1860's and has a remit defined by statute. The remit extends to salmon and sea trout only. The original legislation has been amended on various occasions culminating in the Aquaculture and Fisheries (Scotland) Act 2013.

The Kyle of Sutherland Fisheries Trust is a registered charity and a company limited by guarantee with incorporation commencing in 2000. The Trust has a much broader remit than the Board with its sphere of operation encompassing all species of fish and the aquatic environment in general.

The structure of the operation of Kyle Fisheries is explained in the following diagram.

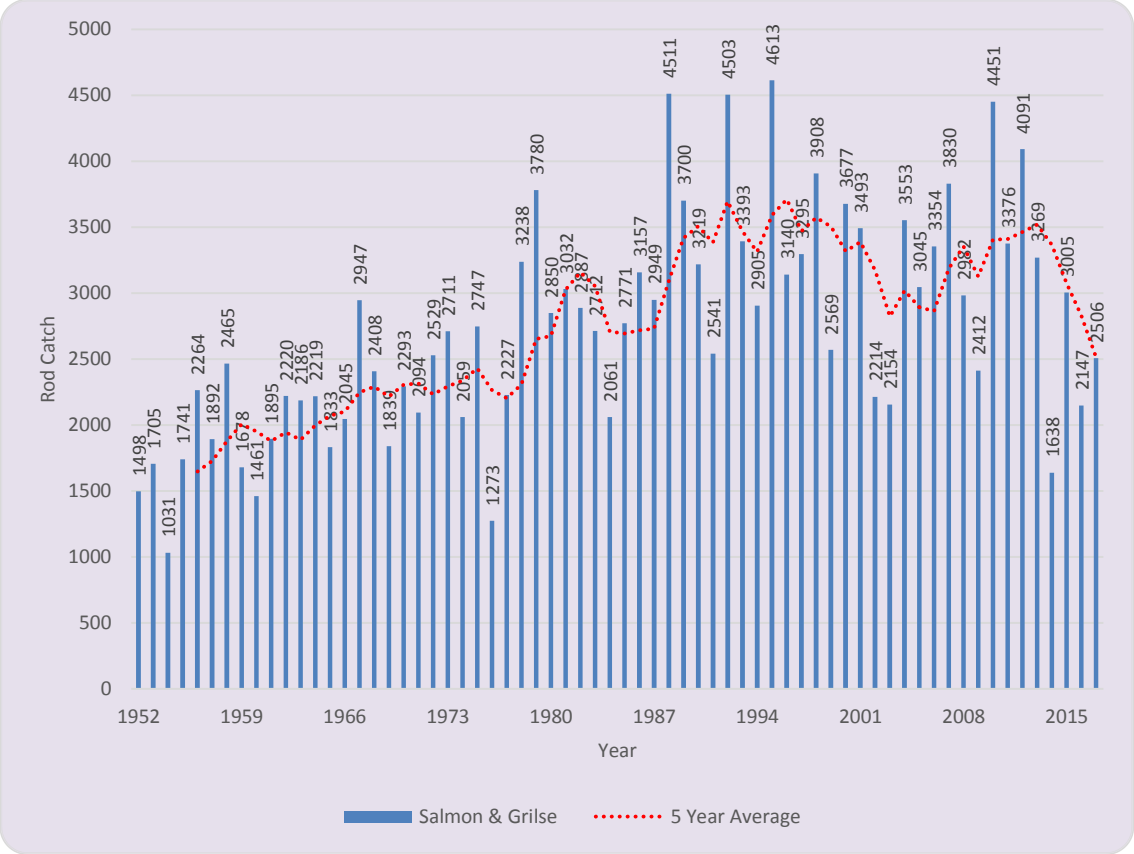

Chairman
Kyle of Sutherland Fisheries Trust
Kyle of Sutherland District Salmon Fisheries Board
Joint Management Group
Code of Governance
Director, Kyle Fisheries
Code of Governance
Biologist and Operational Staff
Board of Trustees
Trustees from local interests.
Trustees from the KSDFB
Attendees
Delivery
Statutory work carried out by the KSDSFB
Non statutory work carried out by KSFT
Board
Elected Members.
Co-opted members from the KSFT trustees.
Attendees

Kyle of Sutherland Fisheries District Salmon Fisheries Board

2017 Fishery Performance

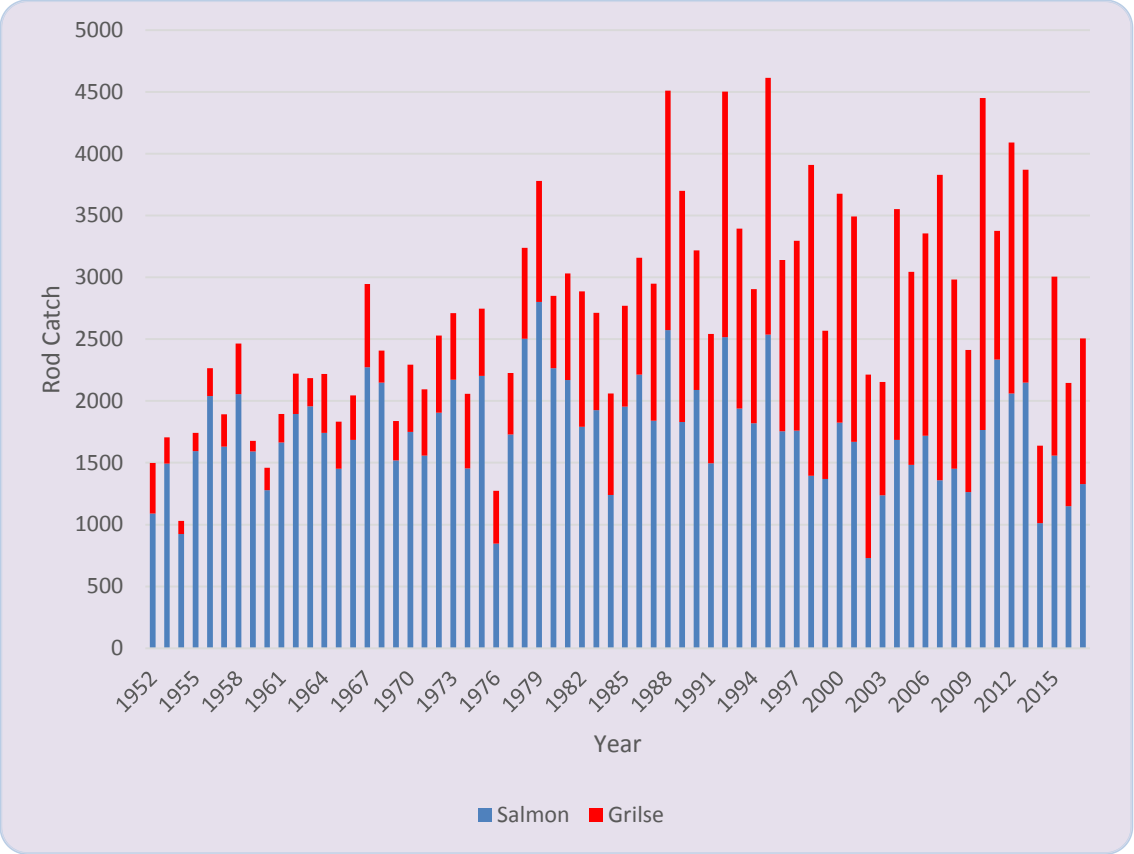
Catch returns received from proprietors suggests that the 2017 rod catch was circa 2,506 salmon and grilse, an increase of 359 salmon and grilse on the total for the 2016 season as recorded by Marine Scotland Science. However, the 2017 salmon and grilse catch total was below the mean figure for the 1952-2016 period of 2,734 and the five year (2012-2016) mean of 2,830. The graphs below place the provisional 2017 data collected by the Board within the historical context of the Marine Scotland Science dataset of catches from 1952-2015. The data used in the following graphs are Crown copyright, used with the permission of MSS, who are not responsible for interpretation of these data by third parties.

Total Salmon and Grilse Catch



Unverified results from fish counters operated by SSE on the River Shin and River Cassley catchments show a mixed picture. Shin counts were somewhat disappointing given the record number of smolts transported from the River Fiag in 2016. Shin counts up until the third week in October totalled 151 against a figure of 236 in 2016 and a five year average of 203. In contrast figures up to the middle of October on the Cassley totalled 359 against 197 in 2016 and a five year average of 251. An almost equal ratio of salmon to grilse contributed to the catches as was the case in the 2015 and 2016 season. Elsewhere in Scotland it would appear that many fisheries are experiencing declines in the catches of grilse, particularly late-running grilse.

Salmon and Grilse Components of Catch

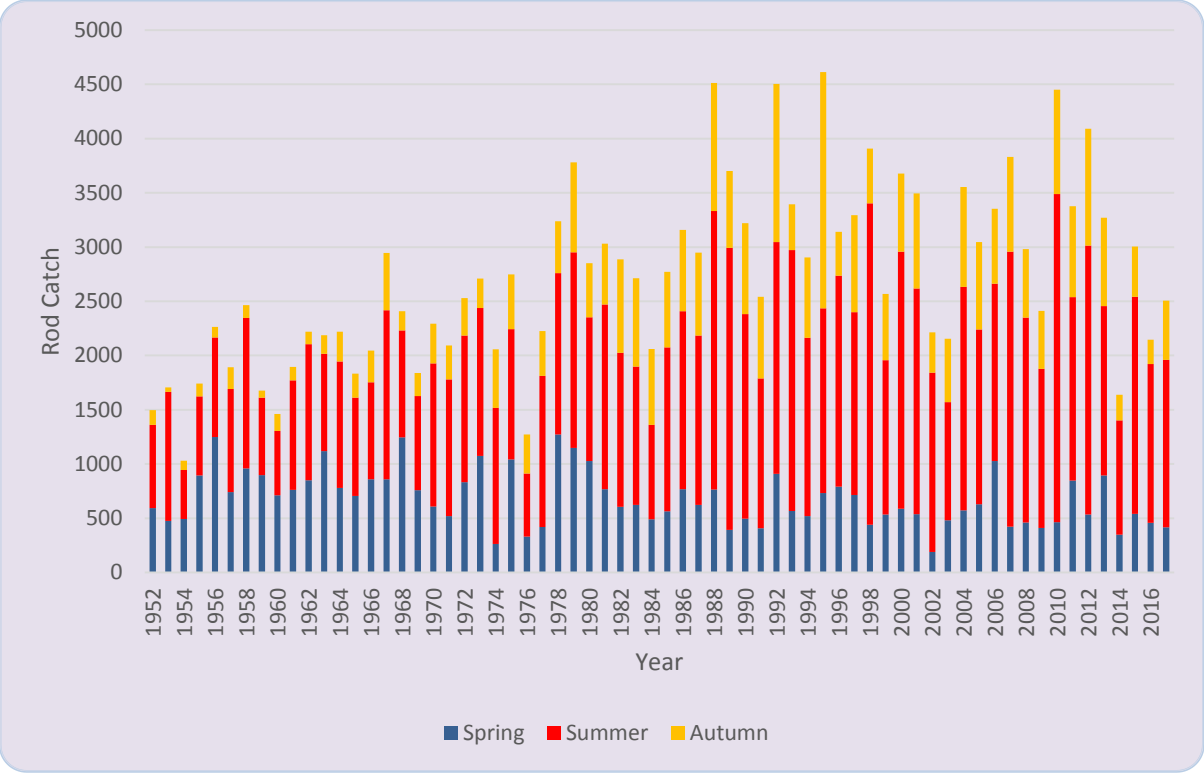


Fishing conditions were generally favourable for the bulk of the season with the noteable exception of a very dry May. In contrast to recent seasons, the month of September was characterised by considerable rainfall. In order to assess if any statistically significant downward trends are detectable in the components of the catch the North Atlantic Salmon Conservation Organisation rod catch tool is utilised. This tool looks at the spring (January-May) summer (June-August) and autumn (September) components of the catch over a twenty year period. Catches are ranked and scrutinised to answer the following questions:

1. Identify the lowest value. Is it also the most recent value over the twenty year period?
2. Identify the lowest three values. Are two or more of these values found in the last three years?
3. Identify the lowest six values. Are four or more of these values found in the last six years?

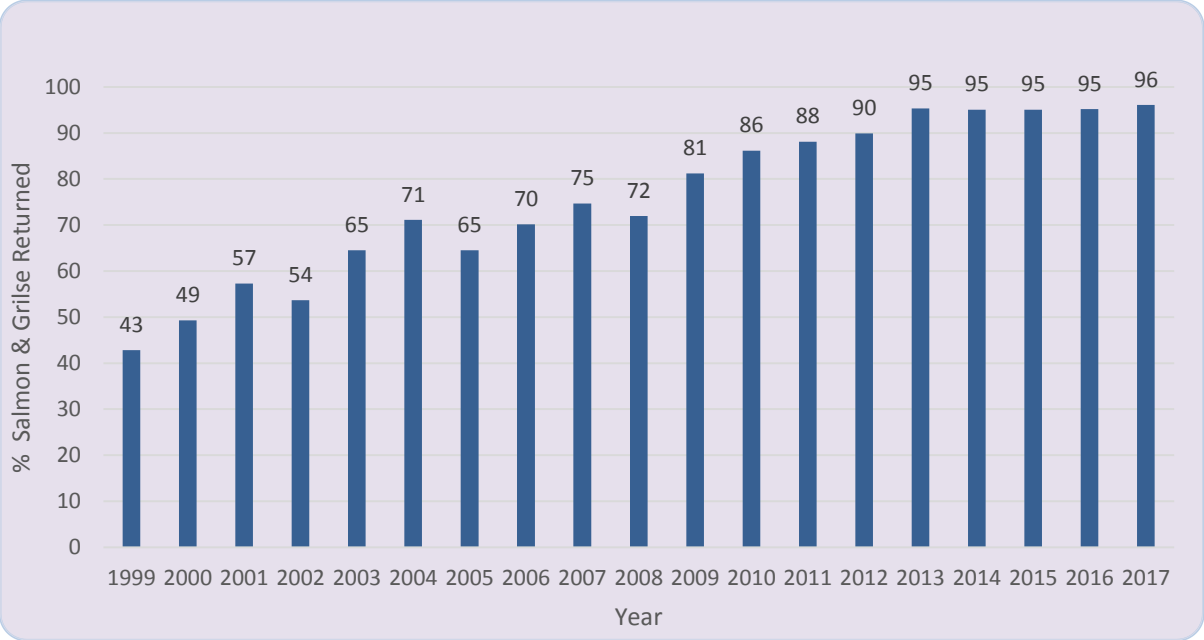
In 2017 the answer to each of the three questions for the district as a whole was no for each of the spring, summer and autumn components. In 2016 the autumn component failed the assessment and in response amendments were made to the voluntary conservation code recommending that all salmon and grilse caught in September were released.

Spring, Summer and Autumn Catch Components

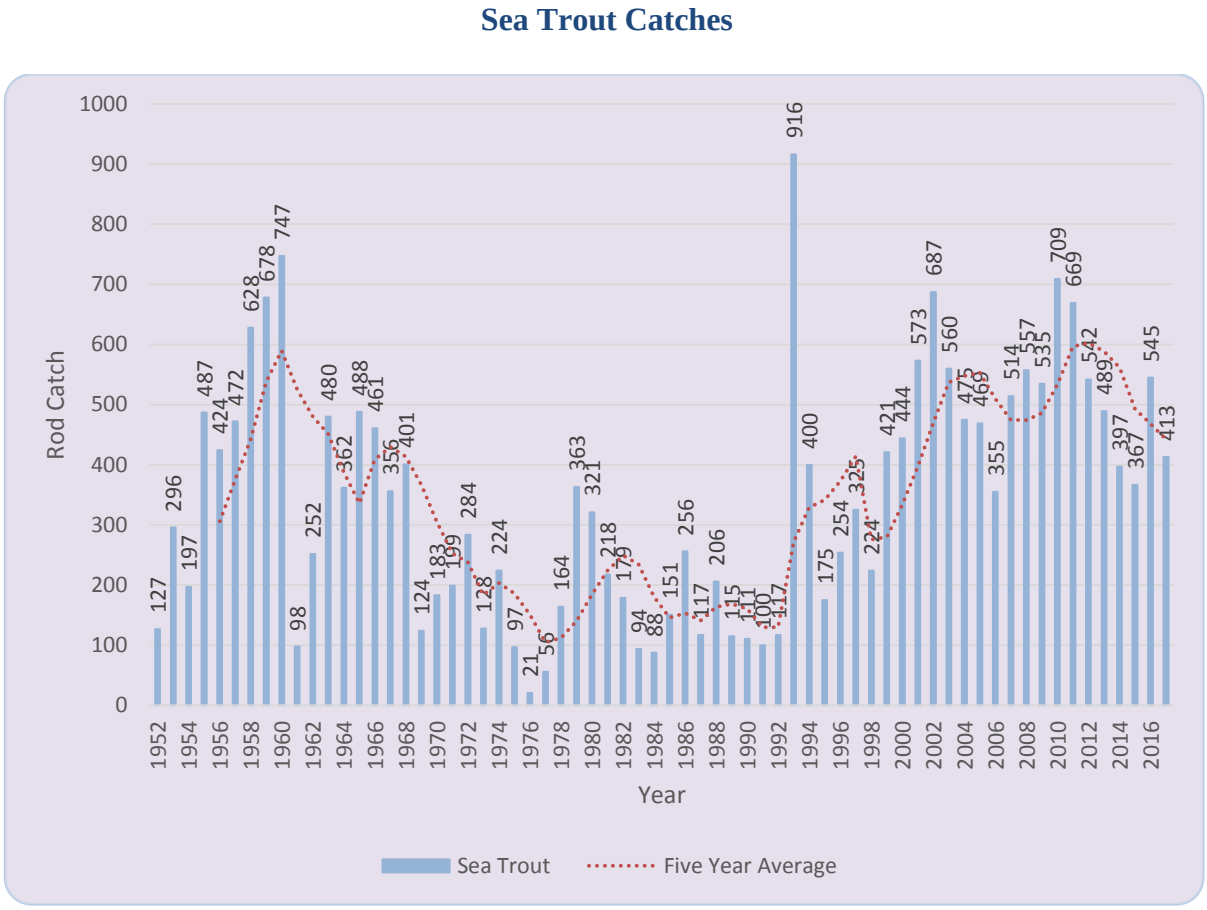


Adherence to the voluntary conservation code remains consistent at around 95-96% of salmon released. This figure has not altered significantly since 2012.

Salmon and Grilse Release Percentage

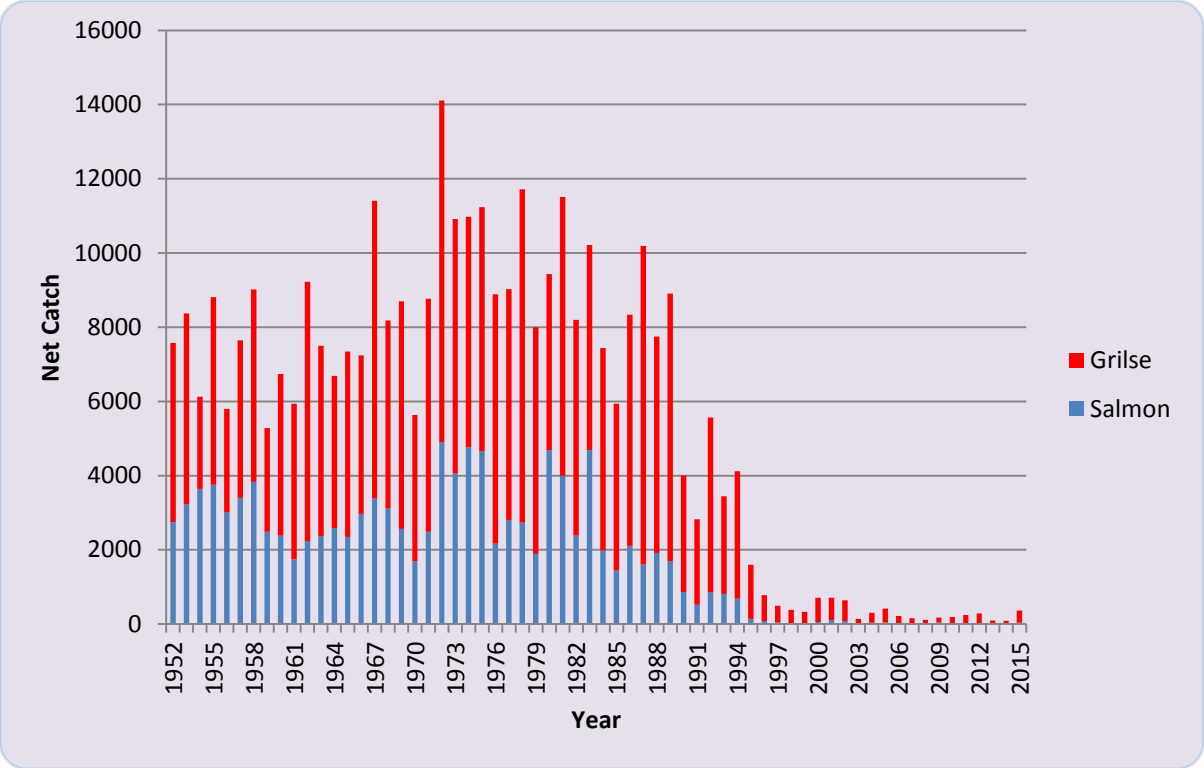


Sea trout returns from proprietors in 2017 at 413 were down on the corresponding figure for the 2016 season. The Kyle of Sutherland Angling Association waters are particularly important in respect of the overall sea trout fishery and it would appear that catches were somewhat disappointing, perhaps as a result of generally wet conditions in the summer months. The graph below places the provisional 2017 data collected by the Board within the historical context of the Marine Scotland Science dataset of catches from 1952-2016.



No salmon were reported from the netting stations in the Kyle of Sutherland fishery district in 2017. By law, netting is currently only permitted within estuary limits in Scotland which precludes the use of fixed engines. However, due to the category three status of the River Evelix, netting by net and coble was also prohibited west of Bonar Bridge. Salmon and grilse numbers captured in netting stations within the fishery district have declined considerably within the 1952-2017 time period as highlighted in the graph below. The decline in catches is largely due to a decline in netting effort, partly as a result of the closure of netting stations subsequent to their purchase by the Kyle of Sutherland District Salmon Fishery Board.

Combined Fixed Engine and Net and Coble Catch



Enforcement by John Audsley, Bailiff Supervisor

The enforcement team were involved in dealing with a number of rod and line incidents in the catchment with suitable advice being given to individuals on a number of occasions. Information was also received in relation to other potential illegal activity all of which were followed up. Canoe patrols were a regular feature of the activities of the team as this method allows a considerable distance to be covered in a relatively short period of time. Patrols of this nature are particularly important during dry spells when salmon and sea trout migration can be significantly delayed. Coastal patrols were also undertaken both on foot and using the RIB.

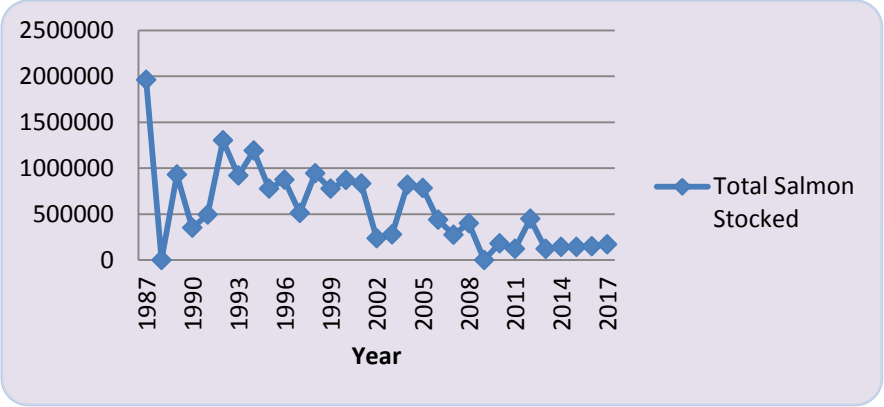
The enforcement team attended an Institute of Fisheries Management course hosted by the Cromarty Firth District Salmon Fishery Board. The course covered rod and line techniques and the scope for illegal use of this method. Additionally, should an offence be committed the collection of evidence was also covered. Bailiffs from many parts of Scotland attended. Advice was given by Dan Sutherland, a member of Police Scotland. Training of this type is particularly useful as it offers practical advice on how to cope with potentially difficult situations.

Hatchery - 2016/2017

Just over 170,000 unfed fry were stocked into the upper reaches of the Tirry near Crask during late April and the first few days of May. Presently the main aim of the stocking exercise is to maintain a smolt run on the River Tirry in order that assessments can be made of the efficiency of the smolt trapping exercise further downstream. A small number of eggs were also utilised for egg box experiments on the River Tirry and its tributaries with control sites on the River Shin. No obvious issues were observed with the exception of high mortality in the Dalchork Burn, presumably resulting from silt entering the egg box.

Numbers of juvenile salmon artificially stocked in the district have been reduced significantly in recent years. The graph below illustrates reduced levels of stocking undertaken. Note that data is not currently available for 1988 and 2009 and that partial data sets only are available for some years. As such numbers quoted should be considered to be minimum values.

Stocked Juvenile Salmon



No broodstock were collected in the autumn of 2017. It is intended that all hatchery facilities will be placed on a full care and maintenance programme in order that the facilities can be utilised in the future as and when required.

Consultations

Requests for a consultation response were received on twenty occasions in 2017. Forestry consultations were the single largest component with eight requests. Three fish farm consultation requests were received from Highland Council, however not for the Kyle district. Two wind farm scoping requests were received with a further five miscellaneous requests received. The latter covered a range of proposed developments such as coastal defence works and electrical transmission line upgrades. The Board aims to respond to all consultations received timeously.

Predator Control

The Board remains an active participant in the Moray Firth Seal Management Plan and also is part of a coalition of Moray Firth fishery boards that collectively applies for a licence to shoot

a limited quantity of piscivorous birds as an aid to scaring. In recent years a licence to shoot a small number of piscivorous birds has been received following the submission of an application to SNH. Counts of birds at a catchment level are undertaken by a combination of Kyle Fisheries staff and river workers in order to provide supporting information. Efforts in terms of scaring birds typically concentrate on the period leading up to and including the smolt run.

Complaints

The Kyle of Sutherland District Salmon Fishery Board has a formal complaints procedure which can be viewed on the website. No complaints were received in 2017.

Compliance

Statutory good governance obligations are placed on district salmon fishery boards as defined in law by section 46 of the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. They comprise the original obligations placed on boards by the 2003 Act together with those introduced through amendments of the 2003 Act by the Aquaculture and Fisheries (Scotland) Act 2013 which came into force on the 16th September 2013. The purpose of the obligations is to enhance openness, transparency and accountability of the management of salmon fisheries by district salmon fishery boards. They bring together existing best practice to ensure that all boards act in a manner consistent with bodies operating in the public sphere. Key activities covered by these obligations include:

- Annual reports and accounts
- Meetings of the board
- Complaints procedures
- Register of member's interests.

In order to comply with these obligations an annual public meeting and annual meeting of the qualified proprietors was held in 2017. Meeting notices and minutes of all meetings held are forwarded to the Scottish Government as is a copy of the Annual Report. Meetings are advertised on the Kyle Fisheries website as well as at the office building in Ardgay. A complaints procedure is included in the policies section of the website and a register of members interests is maintained at the Kyle Fisheries office.

Juvenile Surveys

The number of sites where electro-fishing undertaken in 2017 was increased significantly compared to the 2016 figure. As in previous years emphasis was placed on undertaking surveys in those areas which may require management intervention or where interventions have been undertaken in the past. A review is being undertaken of the electro-fishing programme and it is anticipated that the number of sites fished will again increase significantly in 2018.

Carron

Reports received in the autumn of 2016 suggested that adult salmon had been seen upstream of the SSE diversion dam at Gleann Beag. This is of concern given that there are no smolt passage facilities in the dam that would allow fish to migrate to the sea. Any progeny from salmon spawning in the area would therefore be lost. In order to assess if salmon had indeed accessed spawning areas upstream of the dam, presence/absence surveys were conducted in what was consider good spawning habitat at thirteen sites. At nine sites juvenile trout were captured with three sites producing no fish at all. At two sites juvenile trout were captured but other juveniles bore the hallmarks of being potential hybrids i.e. displayed individual morphological features of both trout and salmon. At one site only juveniles considered to be hybrids were captured. At fry stage identification of hybrids can be difficult, therefore a photograph of a small group of fish captured was shown independently to two experienced field biologists. Both were asked if the fish were salmon or trout and both responded that they were most likely hybrids. Discussions are ongoing with SSE in relation to better preventing salmon accessing areas upstream of the dam in future.

A key site at Deanich was again fished in 2017. Encouragingly, salmon fry were captured at a reasonable density whereas in 2016 no fry were captured at this site (the first time that this has occurred in over a decade). This illustrates that salmon again negotiated Glencalvie Falls and were also able to access the high quality spawning areas at Deanich. As anticipated, parr numbers were lower than the norm due to the lack of fry present in 2016. Electro-fishing was again undertaken in support of ongoing efforts to ease the obstacle to migration at Diebidale. No salmon fry or parr were captured upstream of the obstacle in 2017 as was the case in 2016. Further downstream a further site was fished at which both salmon fry and parr were captured, the latter in healthy numbers. This illustrates the productive potential of this important tributary. A high density of salmon parr were observed on the Blackwater tributary site whereas salmon juveniles were apparently absent in the site fished in the upper reaches of the Allladale.

Table 1 Density of salmon juveniles per 100m2, River Carron. Zippin values used except where* denotes minimum density estimate.

Code	Location	2017		2016		2015	
		Fry	Parr	Fry	Parr	Fry	Parr
CN/D01	Diebidale	0.00	0.00	0.00	0.00	17.98	0.00
CN/D02	Diebidale	28.59	35.14	-	-	-	-
C/GM/01	Glen Mohr	82.43	4.32	0.00	27.64	65.79	11.55
C/BW/01	Blackwater	11.69	42.52	-	-	3.73*	10.58
CN/A02	Alladale	0.00	0.00	-	-	-	-

Table 2 Salmon catch per unit of effort i.e. fish per minute, River Carron.

Code	Location	Trout	Hybrid?
CN/GB/01/PA	Gleann Beag	✓	
CN/GB/02/PA	Gleann Beag		✓
CN/GB/03/PA	Gleann Beag	✓	
CN/GB/04/PA	Gleann Beag	✓	✓
CN/GB/05/PA	Gleann Beag	✓	
CN/GB/06/PA	Gleann Beag	✓	
CN/GB/07/PA	Gleann Beag	✓	✓
CN/GB/08/PA	Gleann Beag		
CN/GB/09/PA	Gleann Beag	✓	
CN/GB/10/PA	Gleann Beag		
CN/GB/11/PA	Gleann Beag		
CN/GB/12/PA	Gleann Beag	✓	
CN/GB/13/PA	Gleann Beag	✓	

Cassley

Further investigations were undertaken on the Allt an Tuir burn which enters the Cassley near Rosehall. A bridge forms a major obstacle to upstream migration and electro-fishing was undertaken at two sites in 2016 to assess juvenile salmon numbers upstream and downstream of the barrier. A small number of juveniles were captured downstream of the bridge but, as anticipated, none upstream. In 2017 a site was fished closer to the confluence with the River Cassley and modest numbers of fry and parr were captured. The Rosail Burn was also electro-fished with encouraging results in relation to salmon parr density in particular. Both fry and parr densities were similar to the last time the site was fished in 2014. More widespread and extensive electro-fishing effort is considered a priority in 2018 for the Cassley catchment.

Table 3 Density of juveniles per 100m2, River Cassley. Zippin values used except where * denotes minimum density estimate.

Code	Location	2017		2016		2015	
		Fry	Parr	Fry	Parr	Fry	Parr
CS/AAT/03	Allt an Tuir	7.63*	1.91*	-	-	-	-
C/RB/01	Allt an Rossail	25.07	27.82	-	-	-	-

Oykel

A wider geographical spread of sites fished was achieved compared to 2016. In particular two sites were fished in the upper reaches of the Mulzie. Results were encouraging in terms of salmon parr. Site OEM/01 is situated upstream of Loch a Choire Mhoir and the capture of fry, albeit in modest numbers, illustrates the high degree of penetration into remote parts of the Oykel catchment by adult salmon. Close to Benmore, a number of burns are surveyed for a variety of reasons. The Stratheasgaich Burn is particularly productive but has extensive afforestation in the uppermost parts of its catchment. Densities for both fry and parr were reasonable in 2017. A potential obstacle to fish migration on a small tributary (Allt na Calliche) in the form of a pipe bridge was retrofitted with a metal chute of Canadian design in the summer of 2017. Electro-fishing from upstream of the bridge has shown that migrating adults are able to pass the obstacle but it is hoped that the innovative chute will make passage as easy as possible. It is intended to monitor the areas up and downstream of the bridge in future years in order to establish if juvenile densities increase. The lower reaches of burns such as Allt Rugaidh Mhor and Allt Rugaidh Beag were again surveyed in light of proposed developments. Results from both suggest that they are currently very productive in terms of juvenile salmon production. A small number of fry were captured on Allt Eileag which provides further evidence that the natural obstacle downstream is passable by adult salmon under certain conditions.

Table 4 Density of juveniles per 100m2, River Oykel. Zippin values used except where * denotes minimum density estimate.

Code	Location	2017		2016		2015	
		Fry	Parr	Fry	Parr	Fry	Parr
ACA/02	Allt na Cailliche	18.62	24.09	62.50*	26.67	124.48	8.30*
ACA/01	Allt na Cailliche	141.62	80.72	-	-	246.65	27.5*
RB/01	Allt Rugaidh Bheag	55.48	35.33	84.50	34.72	98.84	26.04*
RM/01	Allt Rugaidh Mhor	35.63	22.75	27.49	10.48*	17.47*	1.09*
AOS/01	Strathseasgaich	75.34	20.52	63.66	9.31*	133.49	19.04*
AE/03	Eileag	1.26	0.00	0.00	0.00	0.00	0.89*
OEM/01	Mulzie	3.34	15.37	-	-	0.00	12.77
OEM/02	Mulzie	5.17*	23.52	-	-	-	-

Chute retrofitted onto pipe bridge.

Shin

A far more extensive network of sites was fished in 2017 compared to 2017 with particular emphasis on the Tirry and Fiag, the major tributaries of Loch Shin. Electro-fishing was undertaken in order to ascertain if the smolt trap and truck operation on these tributaries (see Trust report) is being successful in terms of juvenile recruitment. This electro-fishing was undertaken by Board staff on behalf of SSE and the data will be passed on to SEPA for river classification purposes.

A total of six sites were fished on the Fiag system including two tributaries of Loch Fiag. Juvenile salmon were captured at five of the six sites. The most favourable habitat for salmon production appears to be restricted to a relatively small section of main stem river sandwiched between habitat of poorer quality. This is reflected in the electrofishing results shown in Table 5. None of the sites had been fished since 2013.

Table 5 Density of juveniles per 100m2, Fiag catchment. Zippin values used except where * denotes minimum density estimate.

		2017		2016		2015	
Code	Location	Fry	Parr	Fry	Parr	Fry	Parr
RFS/06	Fiag	4.49*	3.75	-	-	-	-
RFS/05	Fiag	38.42	21.43	-	-	-	-
RFS/03	Fiag	21.99	50.44	-	-	-	-
RFS/01/A	Fiag	1.40*	3.65	-	-	-	-
S/F/ACM/1	Claise Moire	0	2.58	-	-	-	-
S/F/AT03	Tireidh	0	0	-	-	-	-

On the Tirry catchment salmon fry are stocked into the upper reaches near Crask. Sites ST/06 and STC/09 are fished in order to assess the survival of the stocked juveniles. The 2017 fry densities suggest that the fish stocked in late spring had survived well. Parr densities were in line with expectations. More work is required in order to establish the distribution of salmon fry and parr on the main stem of the Tirry out with the stocked areas as well as tributaries which are not stocked. In order to identify potential sites for an expanded monitoring network, investigative fishings were undertaken in a number of locations (Table 8 and 9) as well as sites on tributaries such as Rhian and Feith Osdail (Table 7). The investigative fishings were typically single pass or presence/absence surveys which do not provide as much detailed information. Fry were found at all the locations fished, albeit at low densities in some areas. Older age classes of fish tended to be conspicuous by their absence despite an abundance of suitable habitat in some areas. Fry were also typically of a size larger than would be considered normal within most of the Kyle of Sutherland District which suggests an absence of competition from older age classes is likely. Scale reading was utilised in order to ensure that juveniles were correctly assigned to age classes.

Large Salmon Fry Captured on River Tirry.

Table 6 Density of juveniles per 100m2, Tirry Catchment. Zippin values used except where * denotes minimum density estimate.

		2017		2016		2015	
Code	Location	Fry	Parr	Fry	Parr	Fry	Parr
ST/06	Tirry	175.92	12.78	61.73	21.42	163.59	0.00
STC/09	Tirry	61.73	4.97	-	-	124.45	2.24
STR/01	Rhian	14.48	0	-	-	-	-
STFO/01	Osdail	40.42	6.11	-	-	-	-

Table 7 Minimum density of juvenile per 100m2, Tirry catchment.

Code	Location	2017		2016		2015	
		Fry	Parr	Fry	Parr	Fry	Parr
ST07	Tirry	14.48	0	-	-	-	-
ST08	Tirry	0.491	0	-	-	-	-

Table 8 Salmon presence/absence survey, Tirry catchment.

Code	Location	Fry	Parr
ST01/PA	Tirry	✓	✓

Three sites were fished on the main stem of the River Shin. Site RS/01 typically shows high levels of fry production but very limited parr productivity and this was again the case in 2017, although fry densities have declined in recent years. RS/06 further downstream has historically been more balanced in terms of fry and parr production and this was evident in 2017. Both fry and parr estimated densities increased modestly on the 2016 figures. A timed fishing was undertaken downstream of Shin falls in order to investigate if spawning continues to take place in the lower reaches of the Shin. Modest numbers of both fry and parr were captured which suggests that spawning does indeed continue to take place in the lower reaches of the Shin.

Table 9 Density of juveniles per 100m2, River Shin. Zippin values used except where * denotes minimum density estimate.

Code	Location	2017		2016		2015	
		Fry	Parr	Fry	Parr	Fry	Parr
RS/01	Shin	113.62	1.50*	187.33	4.92	204.52	1.00*
RS/06	Shin	63.63	40.28	62.90	31.30	-	-

Table 10 Number of juvenile salmon caught per minute , River Shin.

Code	Location	CPUE Fry	CPUE Parr
RS/01/T	Shin	1.3	0.7

Pearls in Peril

The Pearls in Peril project was an EU Life funded project aimed at safeguarding and increasing numbers of pearl mussels in Special Areas of Conservation as well as the species which they rely on to successfully complete their life cycle such as salmon.

This successful project was briefly extended until March of 2017. This allowed extra work to be undertaken by Kyle Fisheries staff. In particular, trees planted on Oykel tributaries as part of the project were revisited in order to ensure that tree stakes and anti-

deer tubes were still in place. It is pleasing to report that the trees planted appear to be growing well. Routine visits will continue to take place going forward to ensure that the trees planted continue to thrive.

Another key activity was the creation of a peatland restoration demonstration site on the Upper Oykel. The area in question has historically been extensively drained. As part of the project Kyle Fisheries staff manually blocked drains on the steeper sections of the site using various methods including plastic sheeting and turf cutting tools. An additional grant was received which allowed extensive mechanical ditch blocking to take place on the site. The work was undertaken by John Mackay who is an expert in this type of restoration The effects of the blocking have been rapid with the area now visibly retaining more water than was previously the case. We are particularly grateful to John Mackay, Iain Sime of SNH, Upper Oykel manager Steven Mackenzie and the Upper Oykel Proprietors for facilitating the completion of this work.

The upper reaches of the majority of the Kyle rivers were extensively drained in the 1950s and 1960s ostensibly to improve the land for livestock production. The likely result of such drainage schemes is increased speed of water run-off after rainfall and damage to peatland areas. The latter has the potential to increase carbon inputs into watercourses which in turn can raise acidity levels in the rivers. Land use remains one of the key threats to the rivers in the area particularly the Oykel catchment and parts of the Cassley. Climate change is likely to exacerbate the situation particularly in light of the apparent increase in high rainfall episodes. A particular concern is the potential for increased redd washout and strandings of juvenile fish and pearl mussels after floods. Grants are currently available for peatland restoration which has the potential to increase natural water storage in such areas.

Plastic sheeting used to block drainage ditch.

Photograph of drainage ditch taken a few minutes after it had been blocked using a 'plug' of peat and vegetation put in place by a digger (above). The depression created when the 'plug was removed will quickly retain water and be colonised by spaghnum moss which is important for peat production.

For more information on the Pearls in Peril project in general see the website:
www.pearlsinperil.org.uk

Floy Tagging

In 2016 the KSDSFB began a floy tagging project using rod and line caught salmon with the assistance of the ghillies on the Shin, Oykel and Carron rivers. The aim of this study was to investigate how many adult salmon are caught more than once by anglers, giving us better insights into how the numbers of rod caught salmon relate to the numbers of fish actually entering the system. However, it must be noted that this study aimed to look at recapture rates, not capture rates of salmon. This is an important distinction.

During the 2016 and 2017 season ghillies tagged a number of salmon caught on rod and line in several of the Kyle rivers. In 2016 a total of 197 fish were tagged across the Carron, Shin and Okyel. A total of 3 salmon were recaptured, all on the Carron at Braelangwell. Two were recaptured in May and one in July. A further salmon tagged on the Shin was recaptured as a kelt (salmon recovering from recent spawning) on the River Oykel in the spring of 2017. In 2017 one fish tagged on a lower Carron beat was recaptured at Braelangwell. Two fish originally captured on the Lower Oykel were subsequently caught again on the Einig system. One fish captured on 8th April by Lilla Rowcliffe was caught again on the Rappach on the 21st June. A second fish caught on 15th May by P. Jordan was caught again on the Mulzie on the 19th August. Across the two years 301 fish were tagged with a combined recapture rate of just under 2%.

We have considered the possibility that Floy tags might detach from salmon over time due to wear and tear or injury to the fish. Studies have examined floy tag failure rates in several species, and in Atlantic salmon failure rates of under 10% have been reported. Other studies have examined the failure rates of these tags in other species such as common octopus (20%) and striped bass (36%). In both the years that this study was undertaken numbers of tagged fish were observed in pools during low water conditions and reported to Kyle Fisheries. This would suggest that high levels of tag loss were not a major issue.

Future work could examine tag retention rates by double tagging or by floy tagging and marking some other way, although any results from such a study examining tag retention may be confounded by the extremely low recapture rates. Other potential sources of error could include non-identification by anglers, death of tagged fish or fish leaving the river. Based on an examination of other studies, we expect the impact of these sources of error to be negligible on the results overall. Other techniques such as radio tracking are also being considered in order to increase the levels of information available.

	2016			2017		
River Catchment	Number Tagged	Number Recaptured	Percentage Recaptured	Number Tagged	Number Recaptured	Percentage Recaptured
Shin	32	0	3.1	6	0	0
Oykel	103	0	0.0	69	2	2.9
Carron	62	3	4.8	29	1	3.4
Total	197	3	1.5	104	3	2.9

Table 11 Totals of tagged fish and recaptures of fish within the same season. Kelts not included.

Pink Salmon

In common with many neighbouring river systems, pink salmon (*Oncorhynchus gorbuscha*) migrated into Kyle of Sutherland rivers during the 2017 season. One pink salmon was caught by an angler fishing the River Oykel (see pictures). Additionally, an image of a migrating pink salmon was captured by a fish counter located within the district. On the River Shin, pink salmon were spotted and trial redds appear to have been dug at one location. Pink

salmon are not native to Scotland as they originate from North America and Asia. It is believed that pink salmon are extending their range after being introduced into Northern Russian rivers. The threat to native fish species being posed by the spread of pink salmon is presently unknown. The carcass of the salmon caught on the Oykel has been provided to University of Highlands and Islands for analyses.

Above: pink salmon captured on the Oykel. Note the distinctive spotted tail and black mouth

Acoustic Tracking

In the summer of 2017 Marine Scotland tagged a number of adult salmon caught in coastal bag nets operating at Armadale on the north coast of Scotland. The aim of the project was to assess the movements of salmon around the Scottish coast and establish the rivers of origin of fish caught in coastal fisheries. In order to assist this project, Kyle fisheries staff deployed three receivers, two in the Kyle of Sutherland and one in Loch Evelix. We await the results of the study. The pictures below show a tag similar to the one used in the study plus a receiver being prepared prior to deployment by Kyle Fisheries staff.

Future Activities

Effective enforcement will remain the core activity of the organisation. Other activities will be undertaken in line with the fisheries management plan.

Kyle of Sutherland Fisheries Trust

Shin Smolt Trapping

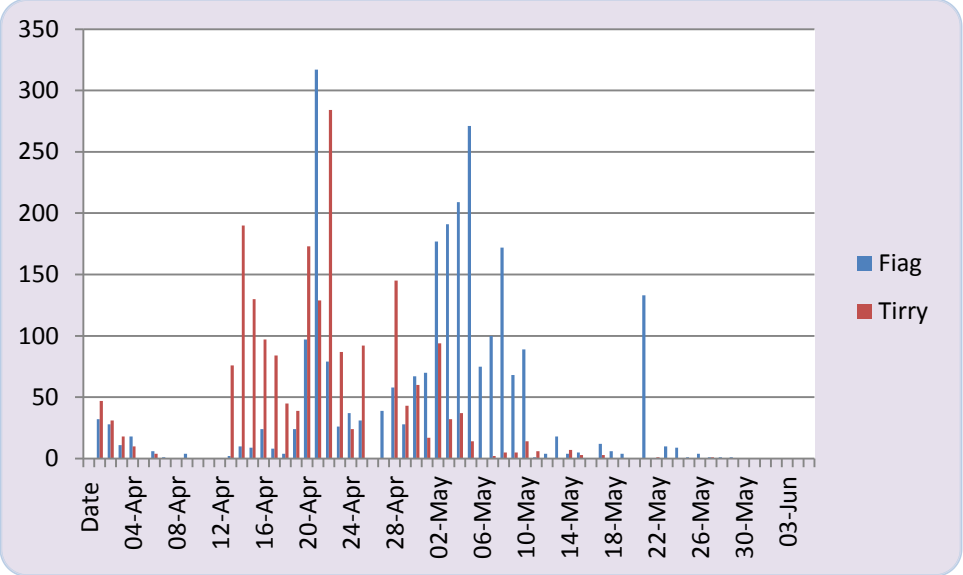
Trapping operations were not conducted by Kyle Fisheries staff in 2017, although the Trust continues to collate the data from the project and undertake the downloads from the PIT tag decoder at Shin Diversion dam. Traps were deployed and operated by SSE at two sites, Tirry and Fiag. Rotary screw traps and box traps were used depending water levels. The combined number of smolts caught on Tirry and Fiag was the second highest in the 2011-2017 time series. Investigations continue with regard to the capture efficiency of the individual traps.

A proportion of the smolts captured in the traps and subsequently released downstream of the dams are also PIT tagged to ensure that transported fish are returning to the headwaters as adults. Adult salmon that have been PIT tagged as smolts are automatically detected as they pass through Shin Diversion Dam. Of the Fiag smolts tagged in 2015 to date 4.1% have been recorded returning as adults. This observed return rate is similar to figures typically observed for PIT tagged fish on the neighbouring Conon system. Of the 2016 smolt cohort tagged in the Fiag 1.9% were recorded returning as one sea-winter fish (grilse) in 2017.

Table 12 Totals of smolts captured in traps 2011-2017.

	Corriekinloch		Merkland		Fiag		Tirry	
Year	Putative Farmed	Wild Smolts	Putative Farmed	Wild Smolts	Putative Farmed	Wild Smolts	Putative Farmed	Wild Smolts
2011	19	24	288	217	9	1924	0	1350
2012	1	42	537	507	2	2149	0	1021
2013	0	12	373	553	4	2523	0	604
2014	0	22	301	262	0	726	0	2351
2015	0	32	144	590	2	2261	0	803
2016	0	21	217	441	11	7240	0	238
2017	-	-	-	-	0	2599	0	2049

Daily Totals of Smolts Captured at Tirry and Fiag by SSE in 2017 (Courtesy of Mr Iain McMyn, SSE)



Another key piece of work that was completed in 2017 was the genetic assignment of putative fish farm escapees captured in Kyle Fisheries traps in 2016 to the farm operation of origin. This was carried out by Marine Scotland Science. The report produced provides strong evidence that fish captured included individuals originating from sites operated by both companies utilising Loch Shin and other associated lochs in the system. The implications of these findings are still being discussed.

Diebidale

A follow-up study to the initial assessment work on the obstruction at Diebidale, a tributary of the River Carron, was completed by AECOM in 2017. This study looked at the potential effects of the complete removal of dam structure. The report is currently being scrutinised by SEPA and others.

Work on the Henry Morrice Collection *by Mathew Curran, Rivers and Lochs Institute*

Henry Morrice was employed by the Kyle of Sutherland District Salmon Fishery Board for many years. The work on cataloguing the material collected by Henry Morrice and presented to the Highland Archive in Inverness is now complete. The process took almost a year working mostly one day a week and generated a catalogue that runs to 43 pages, starting in the 1940's and running to 2001.

Some of the information is continuous across this time while other parts of the material is patchy.

Of particular interest to my thesis (looking at the integration of scientific evidence into fisheries management) are several sets of material that discuss science being used on the river. These include several contemporary papers published by what is now the Freshwater Laboratory in Pitlochry as well as by other academic institutions and notes taken by Henry Morrice on the use of Malachite Green and Rotenone poisoning of trout. Both of these appear to be included with published documents giving best practice for their use.

Early stages of the archiving process

Early stages of the archiving process

The material in the archive includes (but is not limited to) information on egg yields from broodstock (netted wild and hatchery origin), dates of 1st eyed and hatching of ova, lengths of females, smolt numbers (predominantly from the diversions associated with the local dams), catch numbers for netted broodstock, and redd counts. Currently this has been preliminarily catalogued but not examined in detail.

Along with the numerical data collected by Henry Morrice there is also administrative material such as (again not limited to) minutes of board/ trust meetings held within the same time frame, planning permissions for board/ trust buildings and buildings on neighbouring plots, and plans of dams (Shin and Grudie).

Example of how the data appears in the archive

The next stage with regards to the data is to discuss with a Board/Trust representative what material should be examined more closely. With an aim to shedding further light on current issues being considered by the Board/ Trust e.g. Catch sizes or conservation limits. Alongside working up more detailed analyses of the data, I will be developing a biography of Henry Morrice. This will follow his career but with the aim of linking into my thesis, it will probably focus on his collection and use of data

while theorising on the wider impact(s) of the loss of data that can/ might occur when private individuals don't communicate their data.

Documents being bundled

While this case study will be a valuable contribution to my thesis, the wider implication that important knowledge could be lost to the freshwater management community due to it being hoarded or unpublished, and the impact that this may have on the total evidence base for freshwater conservation gives this study potential as a published paper in its own right. Possibly as an opinion piece or letter to (for example) the Journal of Fish Biology.

Examples of finished document bundles

Next steps:

1. Meet with Keith Williams (and other relevant KSDSFB Board/Trust staff) to discuss which archive material can be used most effectively to answer questions most relevant and timely to the Board/Trust.

2. Meet with Mary and Colin Morrice to discuss material in the archive personal to Henry.

3. Develop a biography of Henry Morrice for inclusion in my thesis and potential publication in a peer-reviewed journal such as Journal of Fish Biology.

This project is being partly funded by Kyle of Sutherland Fisheries Trust. We are grateful for donations from Mr Richard Sankey, Mr John Green, Mrs Annie Greenwood, Mr James Greenwood, Mr Alex Hunter, Mr Brian Shaw and Dr Keith Williams.

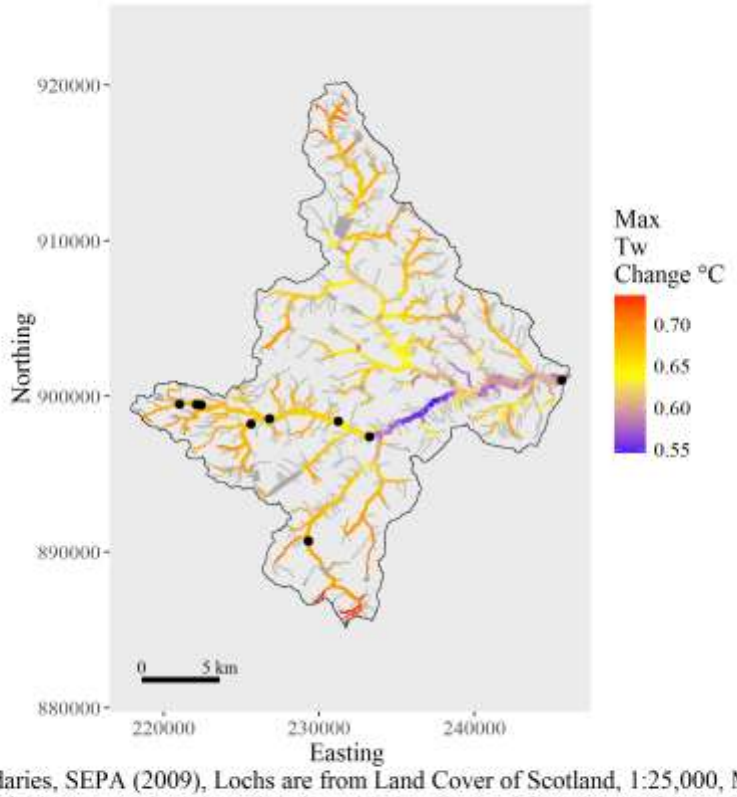
Please contact the Trust if you would like to donate to the project.

Oykel Temperature Network

In the summer of 2015 Kyle Fisheries staff assisted Marine Scotland Science in the deployment of nine temperature recorders in the Oykel catchment as part of the establishment of a national network. Downloads of the loggers by Kyle Fisheries staff have subsequently taken place on a regular basis. The data from the network is increasingly being used by Marine Scotland and others to produce models and tools which can be used for investigating potential effects of climate change, and in turn which areas would potentially benefit from mitigation activities such as tree planting. Many of the projections to date are concerning, particularly for northern areas of Scotland such as the Kyle of Sutherland catchment. As examples, the following illustrate the projected effects of changes in air temperatures and riparian tree cover in the Oykel catchment. More details of the project can be found at:

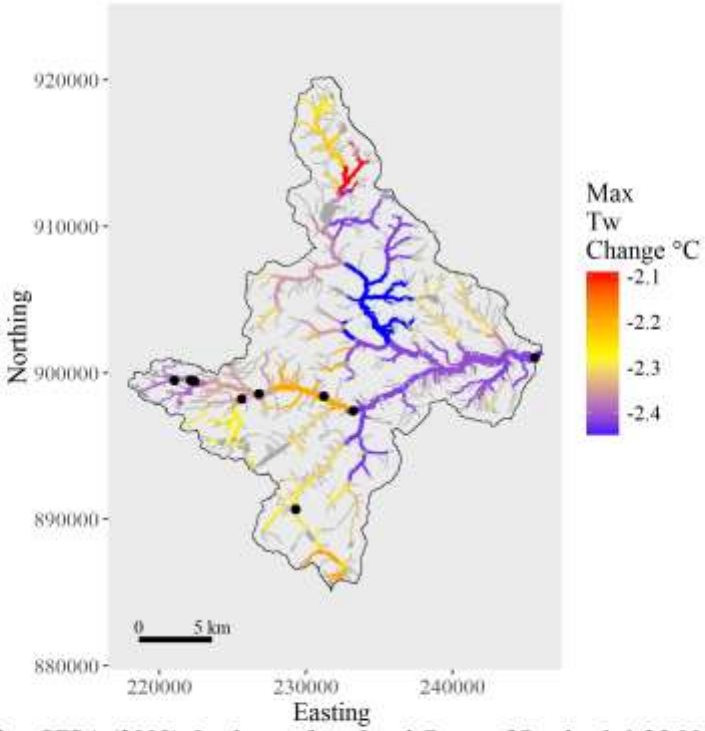
http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Monitoring/temperature

Predictions of the change in river temperature that would result from a 1°C increase in air temperature.



Catchment boundaries, SEPA (2009), Lochs are from Land Cover of Scotland, 1:25,000, MLURI 1993'

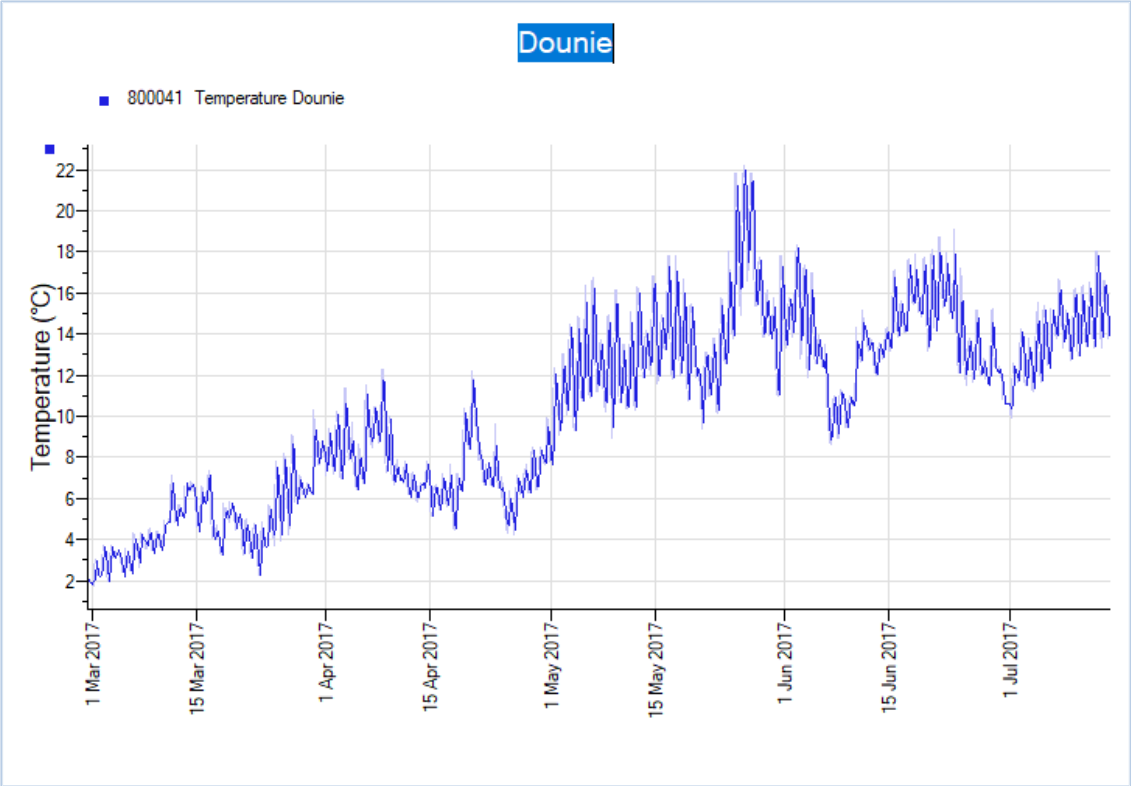
Predictions of the change in river temperature that would result from riparian woodland increasing from 0% to 100%.



Catchment boundaries, SEPA (2009), Lochs are from Land Cover of Scotland, 1:25,000, MLURI 1993'
Some features of this map are based on digital spatial data licensed from Centre for Ecology and Hydrology, NERC.Crown copyright and database right (2017). All rights reserved.Ordnance Survey Licence number 100024655. Scottish Government Marine Scotland, September 2017

Carron Temperature Network

As a collaborative project between the Trust and Carron proprietors, a network of temperature loggers was deployed in 2017. The network is widespread and will potentially yield important information such as temperature differentials in various parts of the catchment. Data is currently being collated, but as an example the graph below shows the water temperatures recorded at Dounie, a middle Carron beat, during spring and summer. It can be seen that the highest temperatures observed were in a hot and dry spell in May. Temperatures during this period were approaching the level at which the survival of juvenile and adult Atlantic salmon becomes a concern. Fortunately, water temperatures subsequently fell to lower levels after this period.



Miscellaneous

Data and material held or owned by the Trust is often used with permission by other organisations such as Marine Scotland Science or universities. Past examples of this have included smolt data and electro-fishing data collected by Kyle Fisheries being utilised by Marine Scotland for various studies and publications. In late 2017 an important academic paper was published which examined the genetics of early-running salmon. Samples collected from adult fish captured on the Oykel were included in this study along with samples from several other major east coast rivers. The study has been able to identify a key part of the salmon genome in relation to the timing of return as an adult. The findings of this study have important ramifications for management, particularly given the high economic and conservation value of early-running salmon in this area. Further details can be found at:

Examination of the genetic basis of the timing of the return migration of Atlantic salmon
http://www.nrcresearchpress.com/doi/abs/10.1139/cjfas-2017-0293#.WquopOjFKUk

Kyle of Sutherland District Salmon Fishery Board
Profit and Loss Account - Year Ending 31st May 2017

		2017		2016
Revenue		**£**		**£**
Turnover		330,676		391,549
		330,676		391,549
Cost of sales				1,503
Gross Profit		**330,676**		390,046
Overheads				
Expenses	329,485		384,012	
	329,485		384,012	
Operating Profit /(Loss)		1,191		6,034
Bank interest receivable		12		10
(Loss) / Profit for year		**1203**		6044

Kyle of Sutherland District Salmon Fishery Board
Balance Sheet - Year Ending 31st May 2017

		2017	2016
		£	**£**
Fixed Assets		**22,090**	124,996
Current Assets			
Debtors	**6,576**		87,944
Bank	**100,569**		19,882
	107,145		107,826
Creditors	**6,582**		111,372
Net current assets/liabilities		**100,563**	(3,546)
Total assets less current liabilities		**122,653**	121,450
Capital & Reserves		**122,653**	121,450

Full Accounts for both Board and Trust are available from www.kylefisheries.org.
Hard copies available on request.

Kyle of Sutherland Fisheries Trust

Statement of Financial Activities - Year Ended 31 May 2017

Income	Unrestricted	Restricted	Total Funds Year to 31 May 2017	Total Funds Period from 1/4/15 to 31/5/16
Voluntary income	34,225	20,953	**55,178**	101,263
Fundraising				
Other	5,247		**5,247**	7,149
	39,472	20,953	**60,425**	108,412
Expenditure				
Costs of generating funds	59	(24,131)	**(24,072)**	(61,566)
Costs of other trading activities	(9,500)		**(9,500)**	(18,423)
Governance	(3,927)		**(3,927)**	(17,158)
Other expenditure	(18,355)	(51)	**(18,406)**	(13,063)
	(31,723)	(24,182)	**(55,905)**	(110,210)
Net Incoming resources for the year	7,749	(3,229)	**4,520**	(1,798)
Reconciliation of funds				
Total funds brought forward	95,439	59,333	**154,772**	156,570
Total funds carried forward	131,201	28,091	**159,292**	154,772

Kyle of Sutherland Fisheries Trust

Balance Sheet - 31 May 2017

		2017	2016
		£	£
Fixed Assets		**71,840**	71,028
Current Assets			
Debtors	**3,369**		2,937
Bank	**92,400**		84,170
	95,769		87,107
Creditors	**(8,317)**		(3,363)
Net current assets		**87,452**	83,744
Total assets less current liabilities		**159,292**	154,772
Funds			
Restricted Income Funds		**28,091**	59,333
Unrestricted Income Funds		**131,201**	95,439
		159,292	154,772