ANNUAL REPORT 2019

Kyle of Sutherland Fisheries

KYLE OF SUTHERLAND FISHERIES
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Contents

Kyle of Sutherland Fisheries Trust

Chairman	Richard Sankey
Trustees	Michael Brown John Green Steven Mackenzie (River Workers Representative) Finlay McCulloch Robbie Douglas Miller Ashe Windham

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 Rob Whitson, Mandatory Glencassley Estate Alex Hunter, Dounie Estate Robbie Douglas Miller, Lower Shin William Paterson, Netsman
Co-optees	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 Sean Robertson, Science & Mitigation Officer Iain Gollan, Bailiff Philip Blowers, Bailiff

Chairman's Foreword

The official Scottish 2019 rod catch for salmon was 47,515. This figure was slightly higher than the previous year, however it was still the third worst total since 1952 and continues to reflect the worrying concerns about the status of salmon stocks in Scotland. On a positive note the Kyle of Sutherland rod catch held up well at 2889, which is very similar to last year and is slightly above the 5-year average. Why the Kyle of Sutherland Rivers catches are holding up so well, compared to further south, is not known but we should all be very thankful.

On reading this year's Annual Review it soon becomes apparent that the scale of activities carried out by Kyle Fisheries (KSDSFB & KSFT) staff are considerable and complex. In many ways the KOS catchment is a smaller scale version of the variety of pressures and human impacts on Scotland's rivers and fisheries. The rivers within the KOS region are diverse in the ways they are impacted, and the related management issues. For example, we have rivers with either 'big or small' hydro impacts, each with differing management challenges and solutions. Added to this we have freshwater aquaculture interactions, forestry and a plethora other land use issues, all of which need monitoring to inform management or mitigation. Under statute the DSFB's have a number of obligations and yet have relatively few powers or authority. Most powers that relate to human impacts on rivers and fisheries sit within the Government's own regulators and agencies. Despite often years of evidence gathering by Kyle Fisheries our experience is that the regulators and agencies too often appear to be either unable, or unwilling, to be decisive, or indeed to use the powers vested in them.

During 2019 I took on the role as chairman of Fisheries Management Scotland (FMS), which is the national body that represents the District Salmon Fishery Boards and Fishery & River Trusts. Part of FMS remit is to work closely with the Scottish Government with the aim of influencing policy to the benefit of salmon, seatrout and other wild fish. It is apparent to me that fishery management across Scotland is significantly under-resourced, and this at a time when Salmon and Seatrout are under threat. Locally within the KOS we are reasonably well resourced compared to many other regions, and because of this I believe we are well placed to continue looking after and enhancing the regions wild fish. I would like to take this opportunity to thank our director and all our excellent staff for the very good and dedicated work they undertake throughout the year.

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

April 2019

Director's Foreword

For those working in the fishery management sector the greatest satisfaction is obtained when direct action is taken to immediately improve or safeguard the welfare and abundance of fish stocks. At a local level there have been a number of projects and activities enacted that meet such criteria during 2019. First and foremost, fishery law enforcement remains our most significant activity. If we do not protect those fish that we already have then any potential enhancement projects are unlikely to be of overall benefit. We are fortunate in this district to have a dedicated and conscientious team of water bailiffs who, despite the idiosyncrasies of the somewhat archaic legal framework we are forced to operate under, work tirelessly to protect our fish from wildlife crime.

For the most part, we seek to create the conditions that allow salmon and sea trout to thrive without any intervention, but this is not always possible. The 'trap and truck' exercise on Loch Shin tributaries is a case in point. Research undertaken in conjunction with SSE has clearly demonstrated that only a relatively small percentage of smolts can successfully find their way past the dams, therefore intervention is required. Over 7,000 smolts were trapped and chauffeured to their release point on the River Shin during 2019. All involved continue to try and refine this logistically challenging operation in order to maximise the number and wellbeing of the smolts captured in order that we give them the best chance of returning from the sea as adults.

There are relatively few remaining manmade obstacles and barriers to fish migration left within the Kyle catchment other than on Shin system, but it always positive to see the number reduce further. The removal of the defunct gauging weir by SSE on the Carron was thus supported by us as well as by SEPA. As each obstacle is dealt with, increased focus is placed on those obstacles and barriers that remain.

Looking forward, the benefits of the tree planting projects we are engaged in will take time to be felt, but in my view will prove to be significant in the future. The Biodiversity Challenge Fund grant received for this work highlights the fact that financial support for the right projects can be obtained. Increasingly, our work on habitat improvement is guided by the results of previous monitoring and research projects that we have been involved with, such as the Scottish River Temperature Monitoring Network. Other new research initiatives that we have engaged with such as the 'Missing Salmon Project' will also help guide what actions we take in the future.

As ever, little can be achieved without a team of individuals pulling in the same direction. As such I would like to thank all of my work colleagues at Kyle Fisheries as well as the members of the fishery board and trustees.

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

April 2019

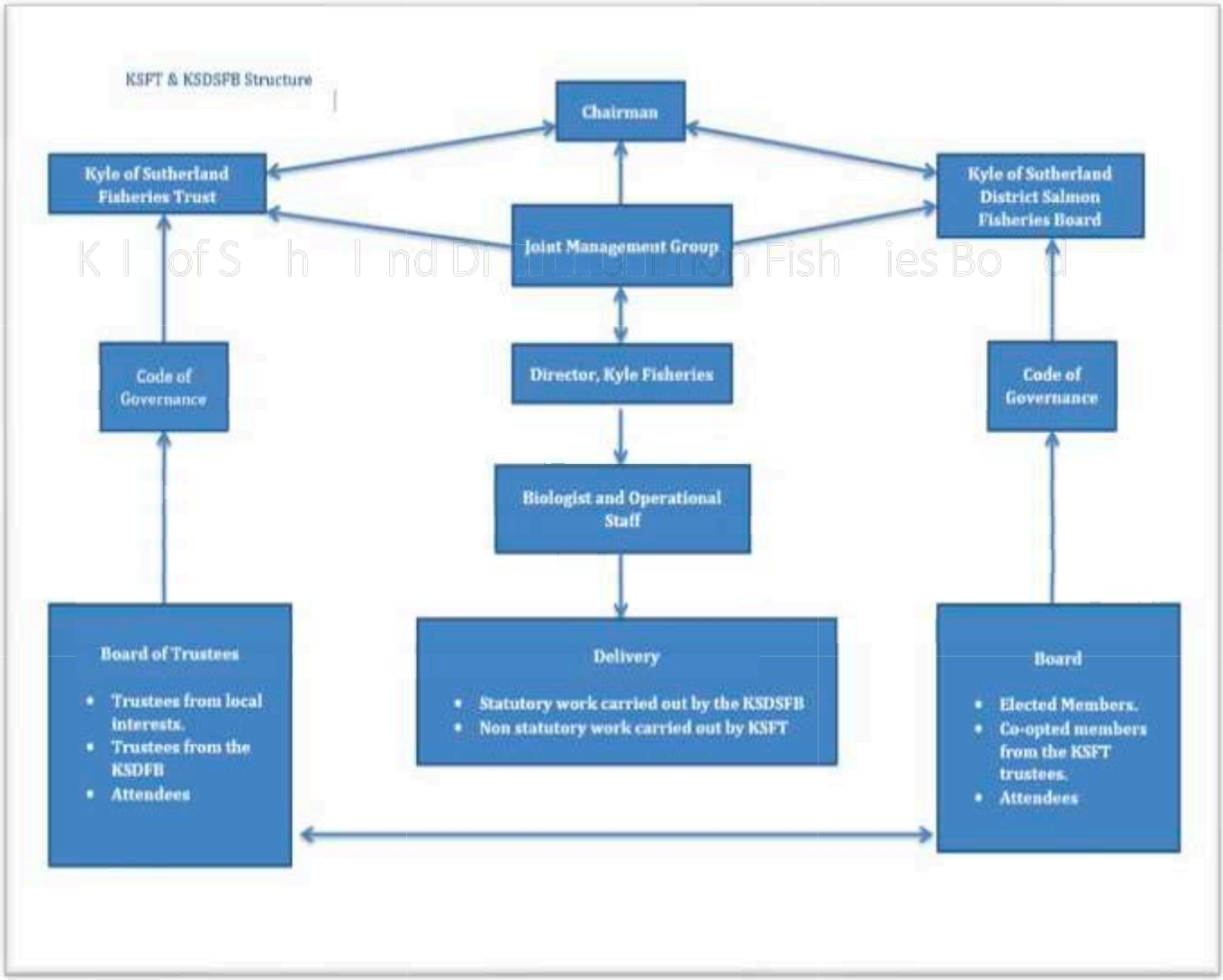
Kyle of Sutherland Fisheries Structure

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.



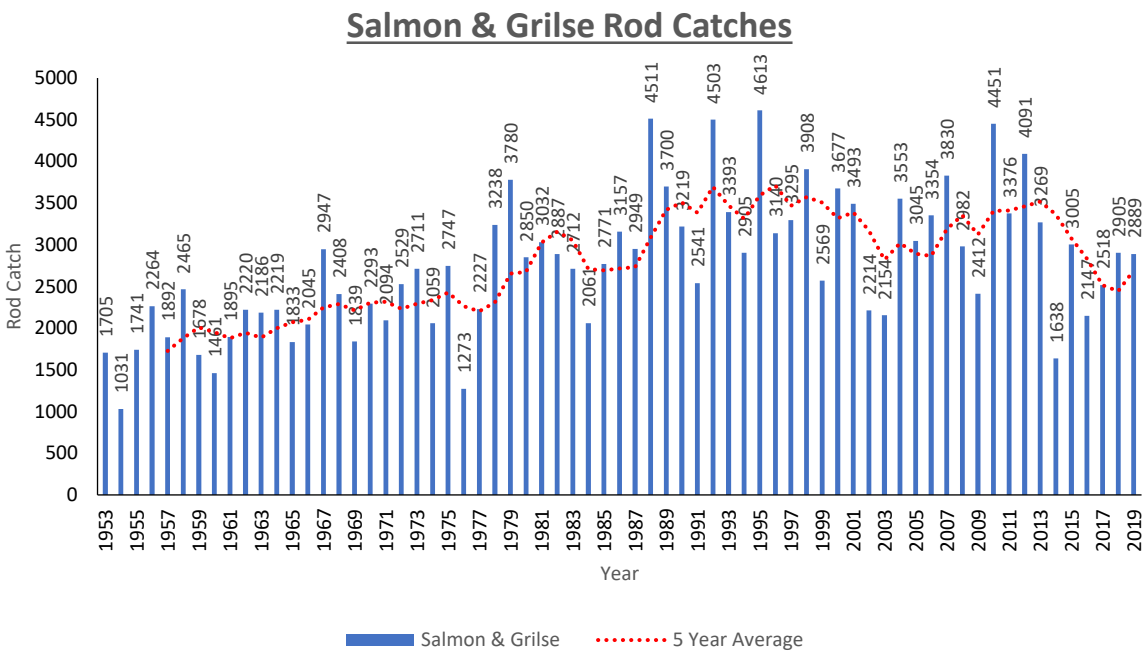


Figure 1. Annual combined salmon and grilse rod and line catches in the kyle of Sutherland District, with the 5-year average.

A feature of the 1952-2019 rod catch data set is that salmon catches appear to have been relatively consistent whereas grilse catches have been far more variable. Presently, grilse catches appear less prolific than was generally the case in some earlier periods but even in the 1980's and 1990's grilse catches were subject to considerable annual variation.

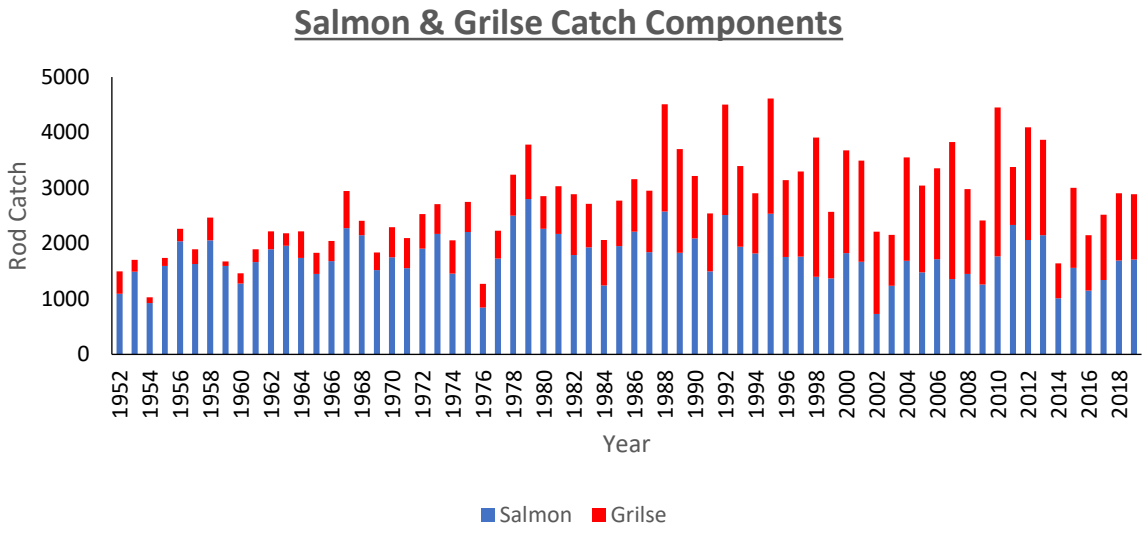


Figure 2. Salmon and grilse catch components of total rod and line catches in the Kyle of Sutherland District.

The total catch has been broken down by individual river in the chart below. The Oykel has been particularly consistent over the last three seasons with a total catch of 1200-1300 salmon and grilse. The river Carron had its most successful season in many years with over nine hundred fish captured.

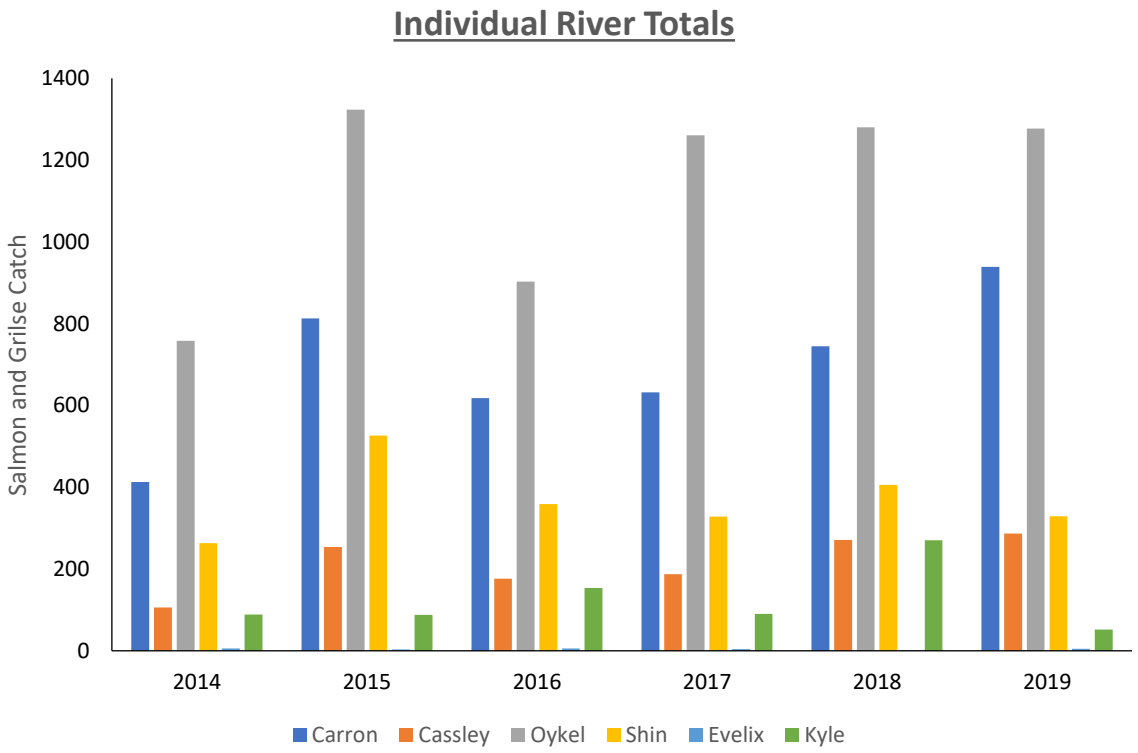


Figure 3. Total combined salmon and grilse catches in the Kyle of Sutherland District split by river.

In order to assess if any statistically significant downward trends are detectable in the components of the total 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 2019 the answer to each of the three questions for the district as a whole is negative for the spring component. However, the summer and autumn stock components failed the assessment. This is the first time the summer component failed since the assessments began as four of the lowest values in the twenty-year data set have occurred in the last six years. A number of proprietors have initiated

further catch and release measures in response to concerns regarding the general abundance of salmon and grilse in Scotland. The situation in the Kyle of Sutherland remains under periodic review by the District Salmon Fishery Board.

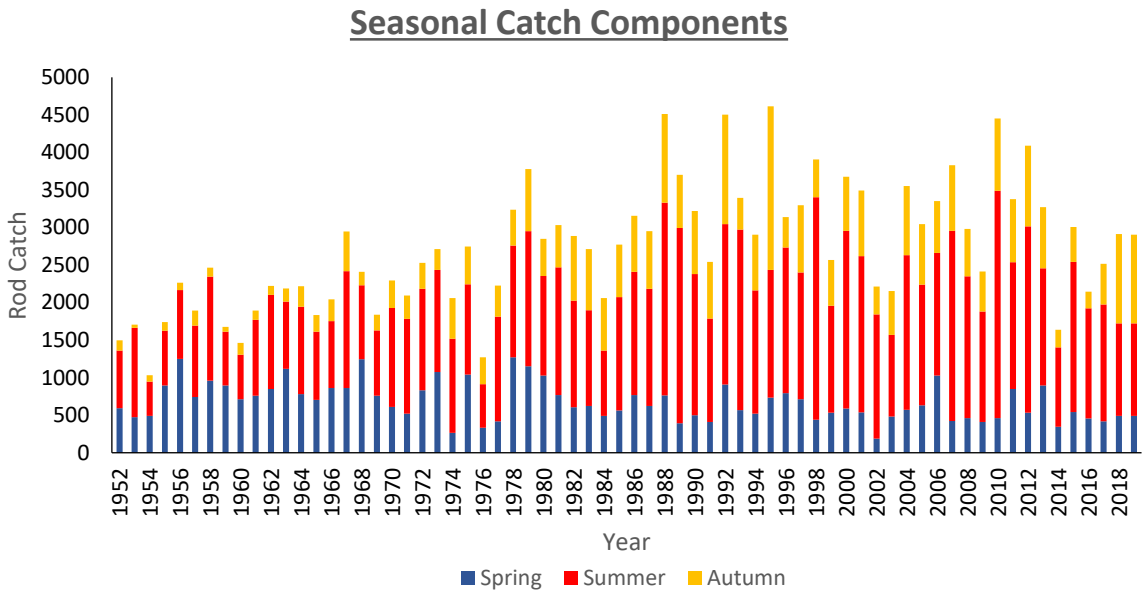


Figure 4. Seasonal catch components of salmon and grilse in the Kyle of Sutherland District.

Adherence to the voluntary conservation code remains very high with the 2019 release percentage of 98% being the highest in the time series.

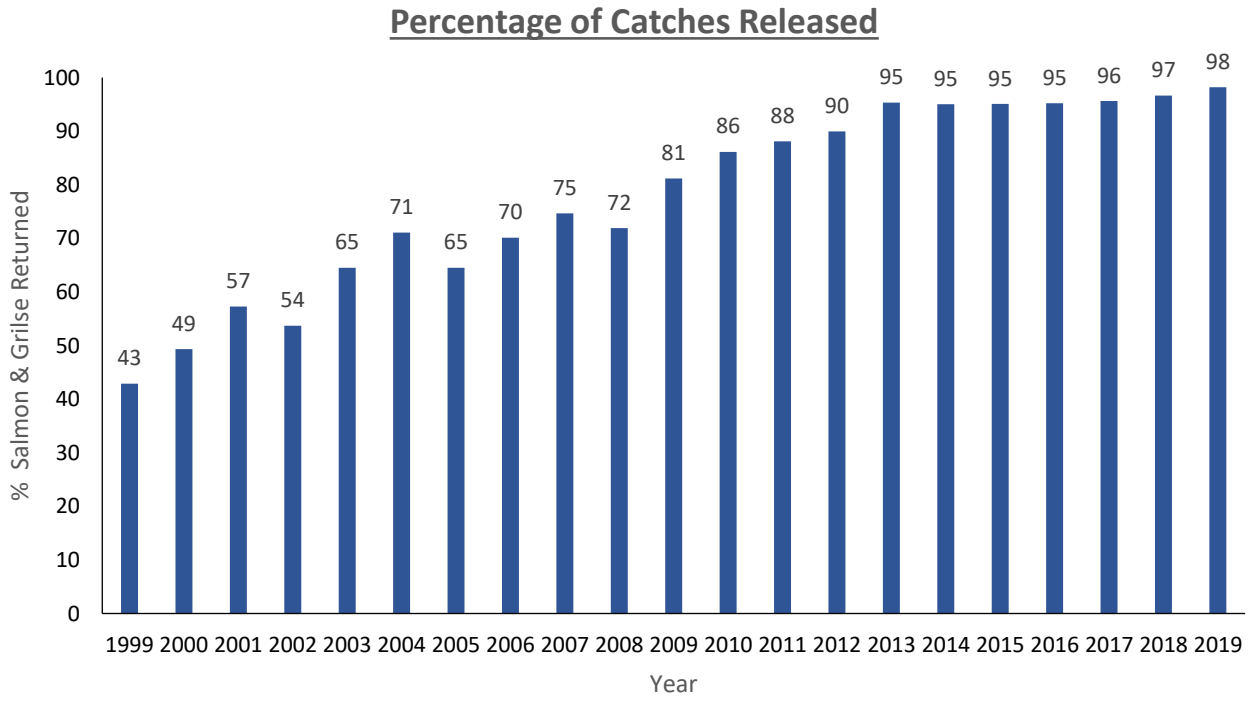


Figure 5. Percentage of salmon and grilse released in the Kyle of Sutherland District.

Sea trout returns from proprietors in 2019 were concerning with catches declining for the fourth season in succession. The 2019 declared catch was the lowest since the early 1990s. The graph below places the provisional 2019 data collected by the Board within the historical context of the Marine Scotland Science dataset of catches from 1952-2018.

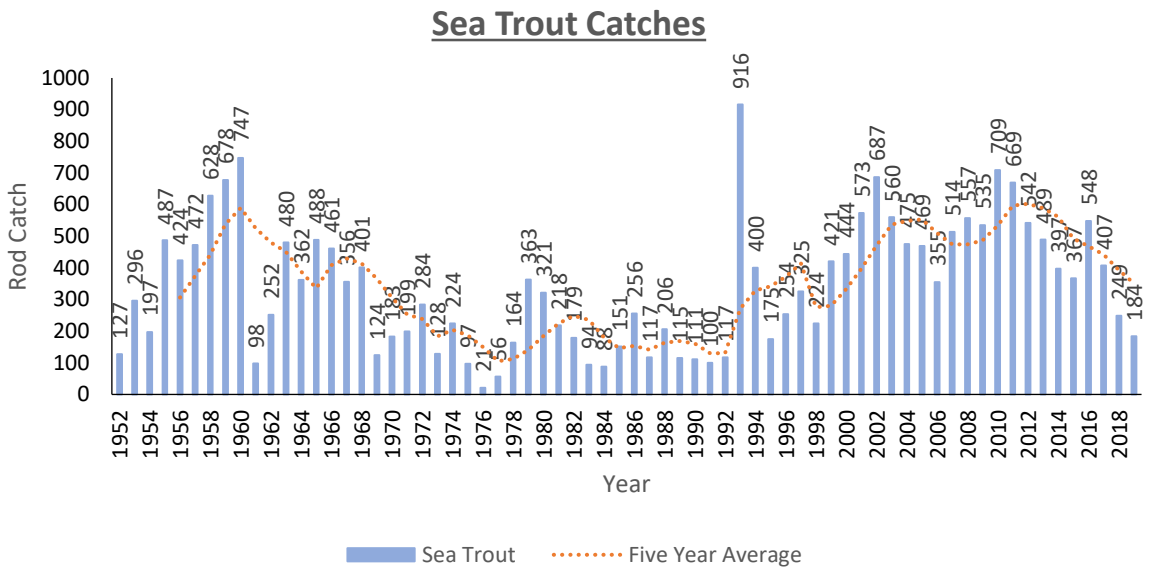


Figure 6. Annual sea trout catches by rod and line in the Kyle of Sutherland District, with the 5-year average

No salmon were reported from the netting stations in the Kyle of Sutherland fishery district in 2019. By law, netting is currently only permitted within estuary limits in Scotland which precludes the use of fixed engines on the coast. However, due to the category three status of the River Evelix, netting by net and coble in 2019 was also prohibited east of Bonar Bridge by Marine Scotland. Salmon and grilse numbers captured in netting stations within the fishery district have declined considerably within the 1952-2019 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.

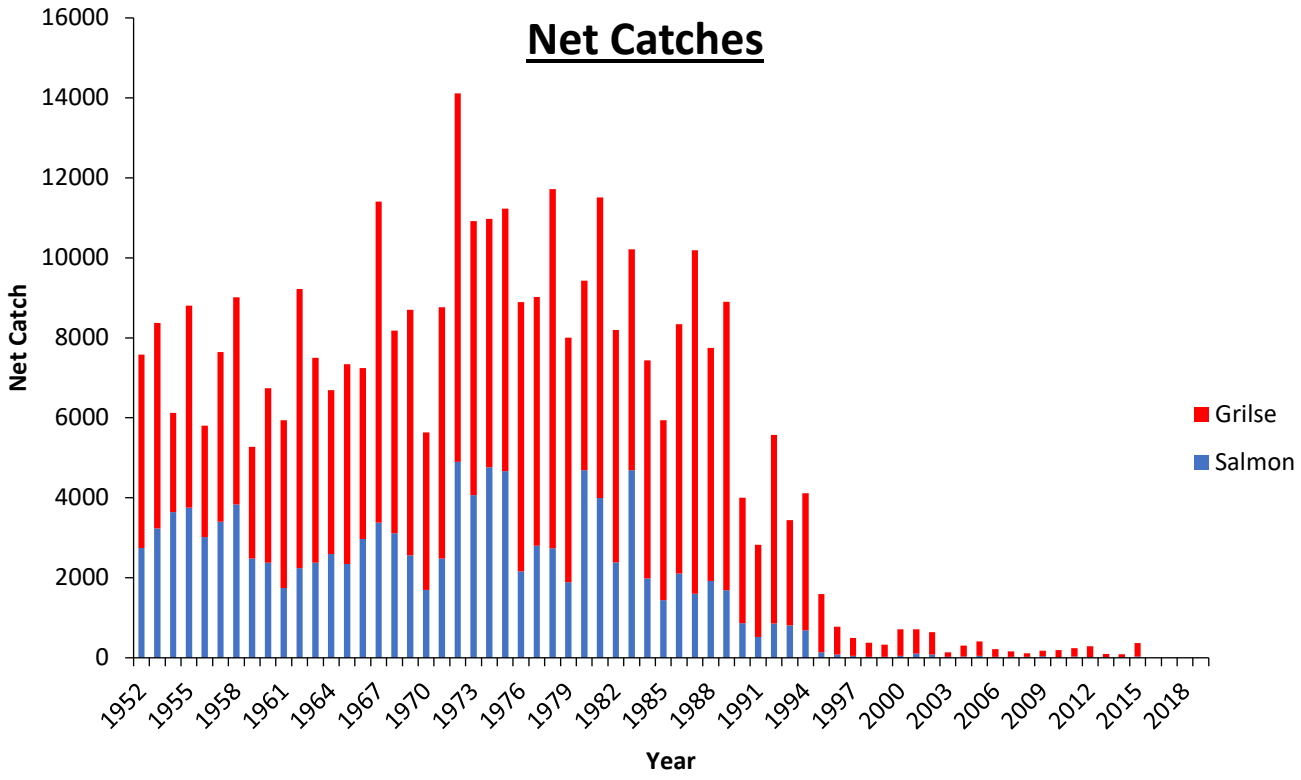


Figure 7. Annual numbers of net caught salmon and grilse within the Kyle of Sutherland District.

1.2 Enforcement Supervisor's Report

The 2019 fishing season was generally very quiet in terms of enforcement. Patrols on foot, by canoe, boat and vehicle were conducted on a regular basis. The vast majority of incidents reported to bailiffs or observed by patrols were rod and line related.

A concern in recent years has been the selling of wild salmon and sea trout in local hotels and restaurants. With the decline in the netting industry, any wild salmon and sea trout being sold can arouse suspicion and is often reported to us. Such reports are always followed up and checks made to ensure the sources are legitimate.

The 2019 enforcement seminar organised by Fisheries Management Scotland was held in Dunkeld and Birnam. This was attended by two members of staff. The seminar was well attended and there was a wide variety of talks presented. A number of useful insights were shared which can be easily incorporated into the enforcement operations at Kyle Fisheries.

Once the salmon and sea trout had spawned bailiff manpower was switched to assisting in the hatchery operations taking place on the Conon catchment and tree planting at Dalchork on the Tirry system.

1.3 Science & Mitigation Officer's Report

We were off to a busy start to the year with preparations for "The Missing Salmon Project", which ran for its first year. A massive effort was undertaken by river workers to assist in the deployment of receivers and locating them. We operated another rotary screw trap on the River Oykel, in addition to our usual trap and truck on the River Shin which added to the workload. We had the second highest number of smolts on record from the River Fiag, whereas the Tirry was at its second lowest. Weather was extremely variable, from a lack of rain causing the rotary screw traps to become non-operational to spate conditions causing the Tirry trap to become submerged.

Figure 8. Releasing a radio tagged salmon at Glencalvie.

Subsequently the Carron Radio Tracking project began. Unfortunately, this was as fish with the "red belly" disease were being caught, and as a result only a small number of fish were fitted with radio tags. An afflicted fish from the Cassley was taken for analysis by Fish Health Inspectorate and although they identified some diseases, they were unable to determine the cause of the ventral hemorrhaging.

Then in June we were joined by Leanne Munro who had a seasonal summer placement with us to aid with the electrofishing for NEPS and some other contract work. Leanne proved to be a great asset and made the field season much easier to cope with, although the NEPS sites still prove challenging with their nature of random selection. Also, in June I undertook CAA approved training for the operation of a drone. As well as the flight school component this included material on aerospace law and was worth the investment to see where we stand legally with regards to its operation. This has already proved useful and is covered later in more detail. Pink salmon redds were identified on a couple of occasions, and carcasses from rod caught pink salmon were provided to Marine Scotland for Otolith analysis. By analyzing chemical isotopes deposited in the otoliths, it is hoped that migration routes can be examined. Later in August, I undertook training in freshwater pearl mussel surveying which then proved useful as some contract work came up which I was then able to perform.

1.4 Hatchery 2018/19

No broodstock were collected in the autumn of 2018 and 2019 and no salmon were stocked during 2019. All hatchery facilities have been placed on a full care and maintenance programme in order that the facilities can be utilised in the future as and when required.

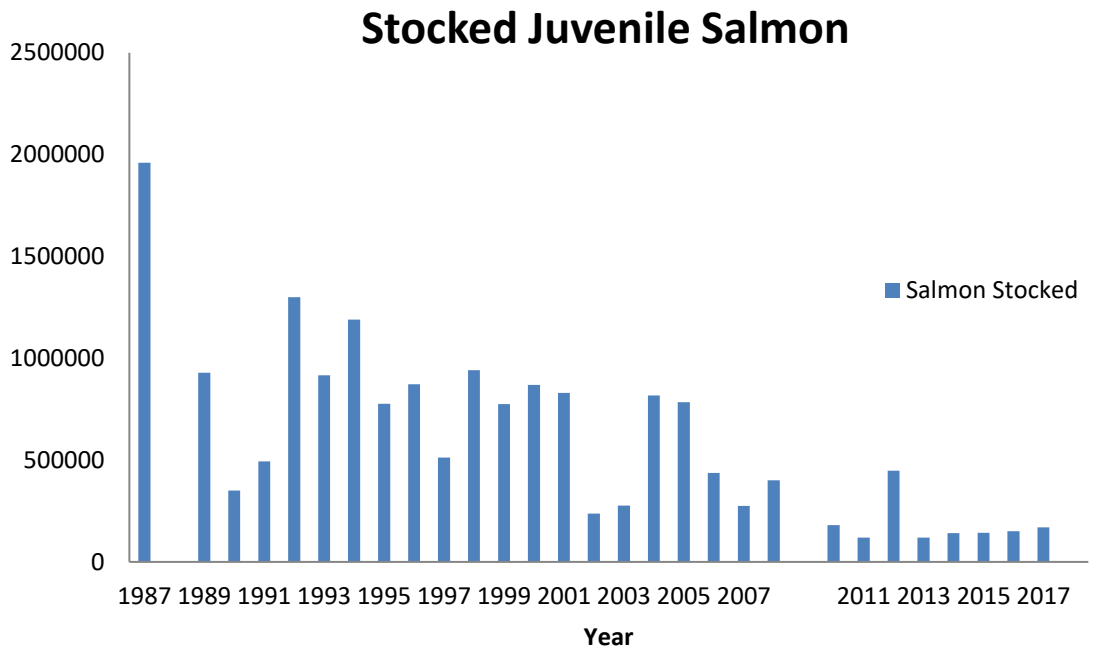


Figure 9. Numbers of juvenile salmon stocked in the Kyle of Sutherland District.

1.5 Consultations

Kyle Fisheries are consulted routinely on proposed developments and other fishery related matters. We aim to respond to all consultations as timeously as possible. In 2018 the consultations received were in the following categories:

- Aquaculture – 4 consultations.
- Forestry – 4 consultations.
- Terrestrial wind farms – 4 consultations.
- Marine wind farms – 1 consultation.
- Other – 2 consultations.

1.6 Predator Control

The Board remains an active participant in the Moray Firth Seal Management Plan and is also 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. An extra bird count was conducted in mid-December in order to examine the number of overwintering birds. Counts have proven to be difficult in respect of timing.

1.7 Complaints

The Kyle of Sutherland District Salmon Fishery Board has a formal complaints procedure which can be viewed at:

https://kylefisheries.org/about-us/board/complaints-procedure

No formal complaints were received in 2019

1.8 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 2019. 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.

1.9 Shin Smolt Trapping

1.9.1 Monitoring Aquaculture Escapes

A box trap was placed in Corriekinloch and a rotary screw trap at the Merkland end of Loch Shin again. A prolonged dry period meant that the rotary screw trap was non-operational for a total of 11 days. In total 15 wild smolts from Corriekinloch were trapped and transported, and a total of 116 wild and 37 putative farmed smolts were caught in the Merkland trap. The putative farmed smolts were euthanised and given to Fish Health Inspectorate for determination of wild or farmed origin, and the wild smolts were released below Shin Diversion Dam. Fish Health Inspectorate are yet to reply with the results from the smolts given to them for analysis, for both the 2018 and 2019 cohort. This trapping was conducted with a financial contribution from both Migdale Smolt and Cooke Aquaculture.

1.9.2 Hydro Mitigation

The “trap and truck” operation took place on the Fiag and Tirry Rivers, in partnership with SSE. Rotary Screw Traps were utilized on the Fiag and Tirry, with the Tirry trialling a chain curtain to attempt to funnel smolts into the trap. This seems to have largely been unsuccessful, with overall capture efficiency being at 30.47%. During spates the trap became submerged, likely the extra weight from the chains did not improve the situation. This will not be repeated in the 2020 trapping season. The Tirry also suffered from a period of drought, which resulted in the box trap being deployed as the rotary screw trap was not operational for a total of 7 days. A total of 811 smolts were caught. A total of 18 Tirry PIT tagged fish were detected returning as adults, 7 from the 2017 cohort and 11 from the 2018 cohort.

Figure 10. The Tirry trap under normal flow conditions.

Figure 11. The Tirry trap under extreme spate conditions in April 2019.

A prolonged dry period also affected how long the traps were operational for on the Fiag. This resulted in the deployment of a wooden box trap. However, the deployment of the box trap resulted in more water being diverted into the drum of the rotary screw trap, which then became operational again. A total of 4 days were lost due to extreme conditions. This resulted in an overall capture efficiency of 59.05%. A total of 6597 smolts were trapped and transported from the Fiag. A total of 59 PIT tagged fish were detected returning, 13 from the 2017 cohort and 46 from the 2018 cohort.

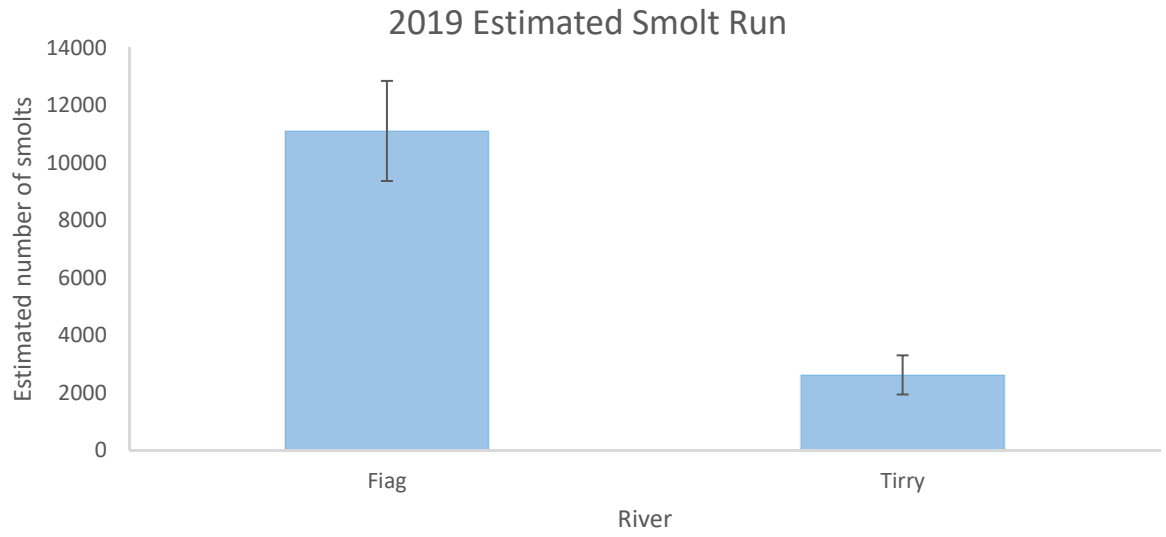


Figure 12. Estimated total size of the smolt run on the Fiag and Tirry Rivers in 2019. Black lines represent confidence intervals.

1.10.1 Juvenile Surveys

In 2019 Kyle Fisheries again participated in the Scottish Governments National Electrofishing Programme for Scotland (NEPS) by fishing 30 sites across the catchment. These sites will be analysed by Marine Scotland and a report will be produced in 2020. Analysis of the NEPS sites fished in 2018 can be found on page 20. The electrofishing carried out by the board was in response to specific management issues and contracting work, which totaled 30 quantitative and 9 presence/absence sites. Funding for this project was received by the Kyle of Sutherland Fisheries Trust from Marine Scotland Science.

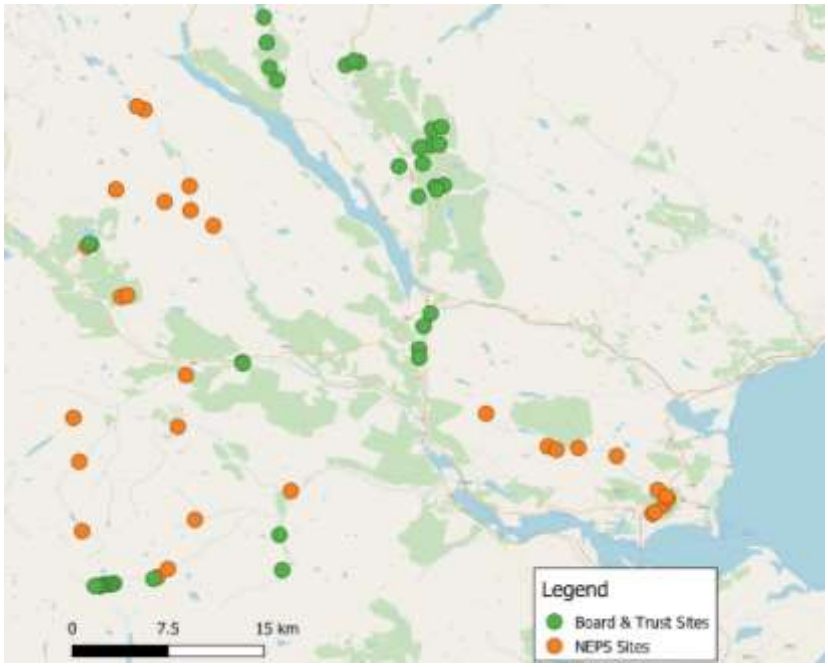


Figure 13. Map of routine monitoring and contract sites undertaken by the Kyle Board and Trust. NEPS sites are also shown.NEPS sites can be attributed to Millidine, K. J., Fryer, R. J., Jackson, F. L., Glover, R. S., & Malcolm, I. A. 2019. Site locations for the National Electrofishing Programme for Scotland (NEPS) and west coast SAC rivers (2019).

Carron

In addition to the NEPS electrofishing on the River Carron, Kyle Fisheries also conducted routine surveys at sites of key interest. Electrofishing took place above the dam at Glean Beag as we have had continuing reports of salmon getting upstream of the dam. 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 effectively lost to production. In order to assess if salmon had indeed accessed spawning areas upstream of the dam, presence/absence surveys were conducted in what was considered good spawning habitat at ten sites. Hybrid or pure salmon were again found above the dam, and a genetic sample was taken from an individual which was believed to be a pure salmon.

A key site at Deanich was again fished in 2019. One of the NEPS sites falling near to this site, although in an area of poorer habitat and this was reflected in the numbers. Fry density at the routine site (C/GM/01) was up from the previous year which likely reflects the anecdotal evidence of good numbers of salmon successfully migrating upstream of Glencalvie Falls in 2018. One of the NEPS sites was circa ~200m downstream of this site and 3 juvenile salmon were captured, up from no fish in 2018. The habitat is extremely poor at this site. Electrofishing was conducted again above and below the dam at Diebidale, with the upstream site (CN/D01) lacking any salmon.

		2019		2018		2017		2016	
Code	Location	Fry	Parr	Fry	Parr	Fry	Parr	Fry	Parr
CN/D01	Diebidale	0	0	0	0	0	0	0	0

CN/D02	Diebidale	15.31	45.9	81	73	28.59	35.14	-	-
C/GM/01	Glen Mohr	74.01	3.17	101	14	82.43	4.32	0	27.64

Table 1. Electrofishing sites Above Diebidale dam (CN/D01), below Diebidale dam (CN/D02) and on Glen Mohr.

Oykel

NEPS sites in the Oykel Catchment again gave quite a good coverage of sites. This was supplemented by our usual monitoring sites at the Allt na Cailliche, and a couple of exploratory electrofishing sites were conducted on the Brae Burn. The first site yielded poor number of salmon, whereas the second site slightly further up yielded better numbers. More Electrofishing is likely to be conducted within the Oykel catchment as part of a proposed long-term monitoring programme on changing land use with Forestry and Land Scotland.

		2019		2018		2017		2016	
Code	Location	Fry	Parr	Fry	Parr	Fry	Parr	Fry	Parr
ACA/01	Allt na Cailliche	54.52	70.74	94.15	17.05	141.62	80.72	-	-
ACA/02	Allt na Cailliche	19.89	21.86*	19.86	10.82	18.62	24.09	62.50*	26.67
O/BB/01	Brae Burn	3.08	1.54						
O/BB/02	Brae Burn	24.21	4.3						

Table 2. Quantitative surveys on Allt na Cailliche. ACA/01 being below the pipe bridge, and ACA/02 above it. Zippin values used except where denotes minimum density estimate.*

Cassley

The NEPS sites on the River Cassley gave good coverage, above and below Duchally dam, and up in Glen Muick. As such, the board had no management concerns which required further electrofishing on the Cassley. However, whilst electrofishing the Glen Muick burn in 2018 a potential obstacle was identified. The NEPS site above this obstacle had salmon parr present, albeit in low numbers. This suggests that the potential obstacle may act as a partial barrier, but salmon are able to ascend it. This is in contrast to when this site was fished in 2018 when only trout were found.

Shin

The Shin is not included in the NEPS monitoring programme. Electrofishing was conducted in the reaches of the upper Shin and on the mainstem. Sites on the River Fiag and River Tirry were completed in order to assess how effective the trap and truck operations have been. Sites on the Fiag had fry densities well above those present in 2018. Parr densities, however, were reduced compared to 2018 levels.

		2019		2018		2017	
Code	Location	Fry	Parr	Fry	Parr	Fry	Parr
RFS/01	Fiag	0	9.535	NA	NA	NA	NA
RFS/03	Fiag	66.86	32.38	40	59	21.99	50.44
RFS/05	Fiag	56.46	18.57	8	40	38.42	21.43
RFS/06	Fiag	35.15	8.39	0	16.5	4.49*	3.75

Table 3. Quantitative electrofishing surveys on the River Fiag. Zippin values used except where denotes minimum density estimate.*

In 2019 five sites in the River Tirry catchment were electrofished. No fry were captured but parr densities were reasonable at most locations. However, more electrofishing sites need to be added in order to get a more thorough understanding of spawning activity on the Tirry.

Code	Location	2019		2018		2017		2016	
		Fry	Parr	Fry	Parr	Fry	Parr	Fry	Parr
ST/06	Tirry	0	17.65	0	25.28*	175.92	12.78	61.73	21.42
ST/09	Tirry	0	3.21	0	17.56	-	-	-	-
ST/10	Tirry			0	2.2*	-	-	-	-
STC/09	Tirry	0	11.148	-	-	61.73	4.97	-	-
STFO/01	Osdail	0	9.044	5.65	8.37	40.42	6.11	-	-
STR/01	Rhian	0	13.35	-	-	14.48	0	-	-

Table 4. Electrofishing Surveys conducted on the River Tirry. Zippin values used except where denotes minimum density estimate.*

Four routine monitoring sites on the mainstem of the Shin were conducted. Fry numbers on RS/01 at Lilley's were the highest since 2015, with parr numbers also higher than normal.

Code	Location	2019		2018		2017		2016	
		Fry	Parr	Fry	Parr	Fry	Parr	Fry	Parr
RS/01	River Shin	303.11	13.25	256.49	3.76*	113.62	1.50*	187.33	4.92
RS/03	River Shin	58.94	32.37	60.61	28.787	-	-	-	-
RS/04	River Shin	114.07	33.41	53.75	16.55	-	-	-	-
RS/06	River Shin	47.79	35.486	101.98	37.06	62.9	31.3	62.9	31.3

Table 5. Electrofishing Surveys conducted on the mainstem of the River Shin. Zippin values used except where denotes minimum density estimate.*

Evelix

There were no pressing concerns on the River Evelix which warranted electrofishing. However, nine NEPS surveys were undertaken on the Evelix, and we felt this gave very good coverage across the catchment.

1.10.2 Comparison against the national "Benchmark"

One of the outputs from Marine Scotland's NEPS project was the development of a model which creates a benchmark for salmon density across Scotland. Marine Scotland have developed an online tool which allows for the comparison of electrofishing data generated by the boards and trusts against this national benchmark. The following two graphs depict salmon parr, and then salmon fry as a percentage of the modelled "benchmark" density

It is interesting to note that some sites are well above the benchmark for fry but well below for parr, or vice versa. An example of this is the site at Deanich, which was below the benchmark for parr but above the benchmark for fry. This is likely due to small scale habitat variability. It would be interesting to note the differences from the benchmark in sites close proximity but of different habitat types.

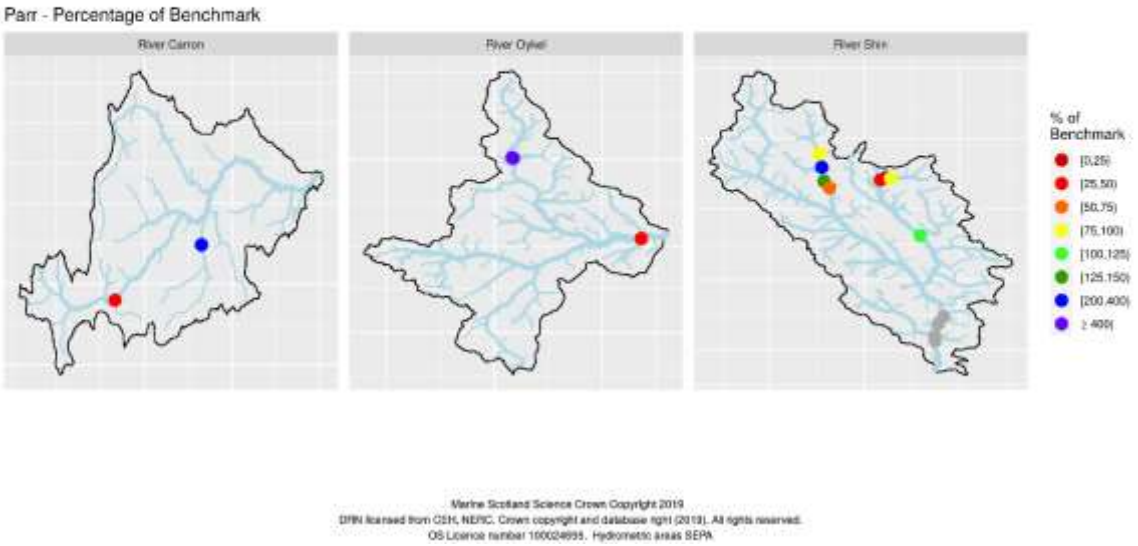


Figure 14. Comparison of observed parr densities from electrofishing sites in 2019 to that of the National benchmark. Data derived from I A Malcolm, K J Millidine, F L Jackson, R S Glover, R J Fryer (2019) Assessing the status of Atlantic salmon (Salmo salar) from juvenile electrofishing data collected under the National Electrofishing Programme for Scotland (NEPS) Scottish Marine and Freshwater Science Vol 10 No 2. Crown Copyright 2019.

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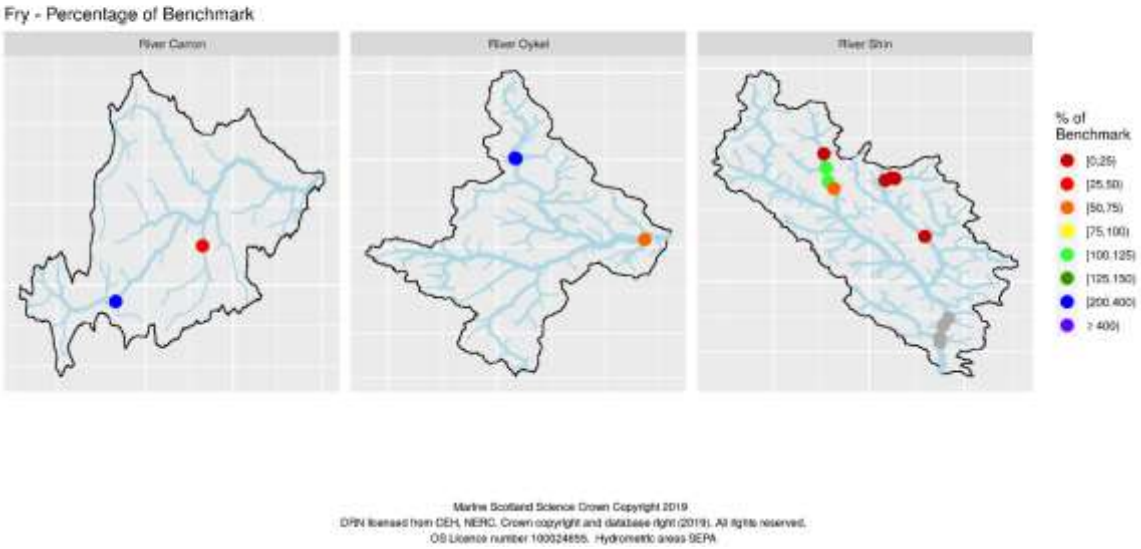

Figure 15. Comparison of observed fry densities from electrofishing sites in 2019 to that of the National benchmark. Data derived from I A Malcolm, K J Millidine, F L Jackson, R S Glover, R J Fryer (2019) Assessing the status of Atlantic salmon (Salmo salar) from juvenile electrofishing data collected under the National Electrofishing Programme for Scotland (NEPS) Scottish Marine and Freshwater Science Vol 10 No 2. Crown Copyright 2019.

1.10.3 2018 Survey Analyses

A report on the 2018 NEPS work has been formally published by Marine Scotland Science, which can be accessed here:

https://www2.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Monitoring/ElectrofishingProgramme.

This webpage has links to a PDF report, but also a "Shiny app" which is a tool for visualising the data at different scales, the comparison between the observed density at electrofishing sites against the modelled "benchmark" and the "conservation limit" that would be assigned to each district. From the fist year's work in 2018 the Kyle District would be placed in a category 2 overall, being a category 3 for fry and a category 2 for parr.

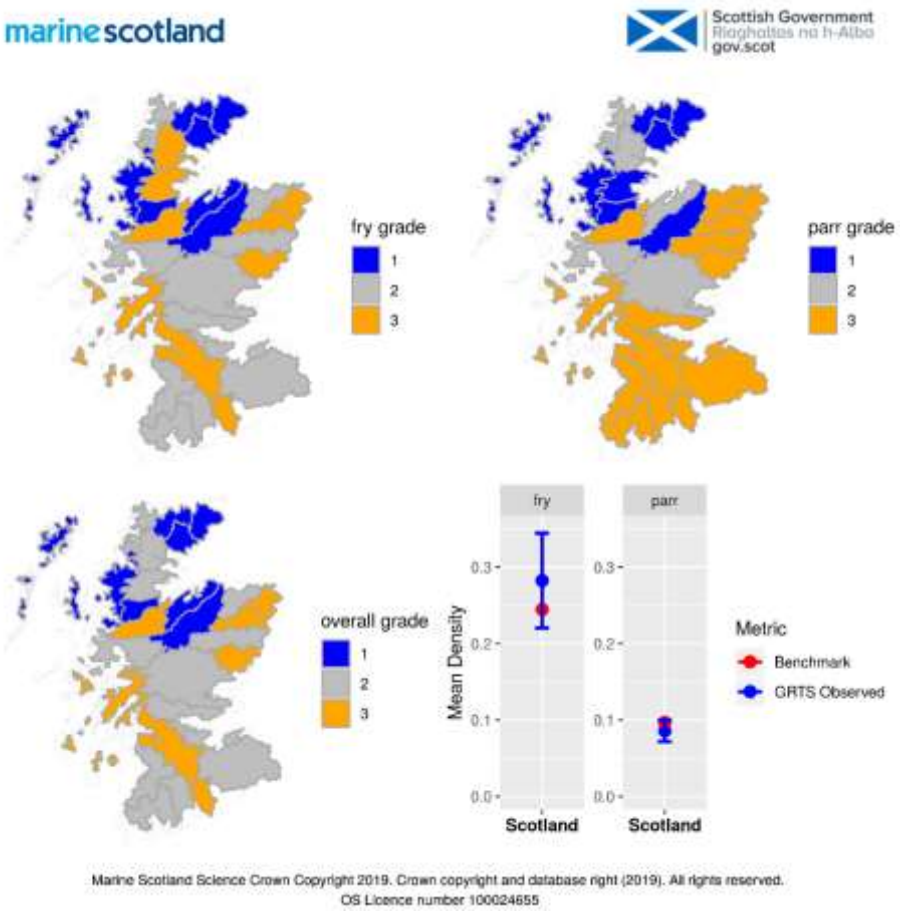

Figure 16. National categorisation of fry and parr densities in comparison to a benchmark. Data derived from I A Malcolm, K J Millidine, F L Jackson, R S Glover, R J Fryer (2019) Assessing the status of Atlantic salmon (Salmo salar) from juvenile electrofishing data collected under the National Electrofishing Programme for Scotland (NEPS) Scottish Marine and Freshwater Science Vol 10 No 2. Crown Copyright 2019.

1.10.4 Carron Radio Tracking

With the aim of exploring adult salmon habitat use and their ability to ascend certain obstacles, a radio tracking project was set up on the River Carron with funding from SSE. Fish were tagged below Glencalvie falls, with the thinking that these fish would be the most likely to ascend the falls, and possibly head up to Gleann Beag to inform about conditions which may allow fish to ascend Gleann Beag dam. This was a pilot year of the project, only 7 fish were tagged.

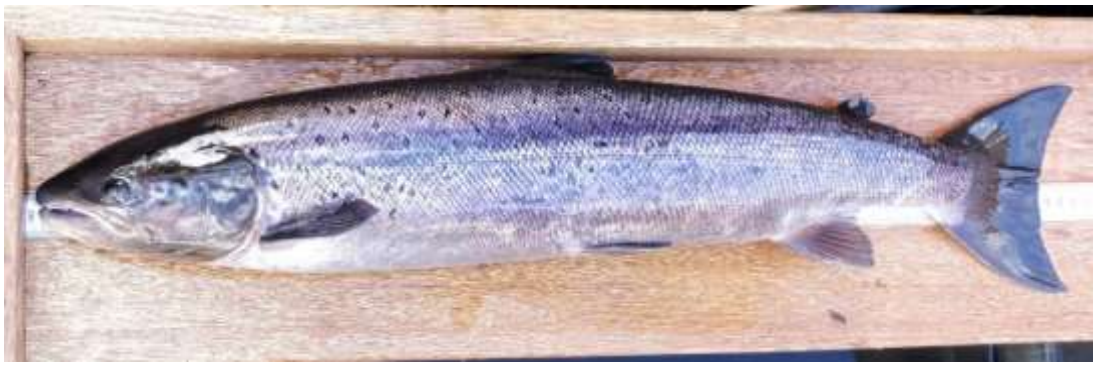

Figure 17. Adult salmon caught at Glencalvie for Radio Tagging.

A report can be found at https://kylefisheries.org/carronradiotracking/

1.10.5 Contract Work

Towards the end of the electrofishing season the board was contacted in regard to completing some contract work at Dalchork within the Tirry catchment. Although resources were limited, time allowed for 10 sites to be completed at the Dalchork site. This data was licensed to the contractor for the project but remains the property of the Kyle of Sutherland District Salmon Fishery Board. A small contract for pearl mussel surveys was also obtained late in the year.

1.11 Disease

In 2019 in a number of rivers across Scotland and further afield, salmon were observed with ventral hemorrhaging, and a number of secondary infections such as *saprolegnia*. It was believed that the ventral hemorrhaging was not a result of fish being affected by low water and had been observed on fresh fish coming into rivers from the sea. Fish Health Inspectorate took samples from affected fish across Scotland, one being from within the Kyle of Sutherland District. Sampling was difficult as fish were required to be alive, which is why only one fish from the district was sampled.

Figure 18. One of the adult Salmon lightly afflicted with the "red belly" disease.

Figure 19. An adult salmon with advanced staged of "red belly" and several secondary infections.

The laboratory work identified several secondary infections; however, the cause of the ventral hemorrhaging is still unknown. One of the popular theories is that it could be related to a deficiency of vitamin B. Such a deficiency has been noted in salmon in the Baltic sea, termed “M74 syndrome”, which adversely affects survival of salmon ova. No evidence to date has been produced which backs up the hemorrhaging being related to a vitamin B deficiency In Scottish fish.

1.12 Cromarty Fishery Board

In the winter of 2019, the Cromarty Fishery Board requested help with their broodstock hatchery operations as understaffing issues would have caused logistical problems. Two members of staff from the Kyle Board staff assisted from Monday-Thursday in late November and December.

Kyle of Sutherland Fisheries Trust

2.1 The Missing Salmon Project

The Kyle of Sutherland Fisheries Trust participated in the first year of the Atlantic Salmon Trust's "Missing Salmon Project". The goal of this project was to fit smolts with acoustic tags and try to determine the areas where the greatest losses occur and migration vectors in the marine environment. The project was at a large scale covering 7 rivers in the Moray Firth, 850 smolts were tagged. 100 were tagged on the River Shin, and 150 were tagged on the River Oykel. The KOS Trust contributed towards the trapping of smolts, and Glasgow University staff performed the tagging.

In addition, a MSc student at Glasgow University, Fraser Brydon, conducted his research project on the River Shin. Three different trials were undertaken with smolts fitted with the acoustic tags. Smolts were released during the day, after sunset, and after being held in a net pen in the river for 24 hours. The aim was to see whether any of these treatments had an impact on survival. This was extremely relevant to the management of the smolts on the River Shin, and if one treatment had significantly increased the survival of smolts we would have adapted our management strategy. Early indications are that the different treatments did not have a significant impact on smolt survival. Additionally, using the historical PIT tag data he modelled environmental variables and the likelihood of smolts naturally escaping Loch Shin through the dams. It is hoped this will be published as a peer-reviewed paper in due course.

The Missing Salmon Project has produced an immense amount of data which will require more time to be analysed. Future years of the project hope to examine predation more in the freshwater environment using a variety of potential methods including eDNA, scat analysis, drones and radio tags.

A box trap was placed upstream of Duchally dam for a shot period in order to determine whether it would be possible to trap smolts of an appropriate length for tagging in 2020. We believe that we may have missed the run however, as we caught small numbers in early April. It is proposed that this work continues in 2020, and a small number of smolts are tagged to assess fish passage through the dam.

The full reports for the Shin and Oykel rivers can be accessed on our website here;
http://kylefisheries.org/projects/reports/

2.2 Aquaculture Interactions Genetics

Towards the end of 2019 UHI produced a report on introgression from sampled smolts in 2017 captured in the Fiag and Tirry rivers. It was determined that up to 1% of fish sampled in the River Fiag may be introgressed, while up to 5% in the River Tirry may be introgressed. Marine Scotland Science are currently working on a similar report on introgression in the Shin system, which includes samples from the River Merkland, Corriekinloch and the main stem of the River Shin. It is hoped that these results will be available at some point in 2020. Early discussions have begun with MSS about the implications of the results of the UHI report for the Shin restoration.

2.3 Biodiversity Challenge Fund

In 2019 Kyle of Sutherland Fisheries Trust made a joint bid with Galloway Fisheries Trust and Argyll Fisheries Trust to SNH's Biodiversity Challenge Fund. In the Kyle of Sutherland district, funds which have been applied for are for the benefit of Freshwater Pearl Mussels at Dalchork. Working with Forestry and Land Scotland, 5,000 trees will be planted in the riparian zone. A mix of locally sourced

tree species has been used, including willow and bird cherry. This work builds on the research by Marine Scotland Science which identifies priority areas to plant trees in order to guard against climate change. This will be of benefit to all aquatic organisms on the tributary but will particularly benefit freshwater pearl mussels in the area.

Figure 20. Bailiffs undertaking tree planting at Dalchork.

2.4 Drone use for Habitat Surveying

In June of 2019 Sean attended a course on the operation of a drone which the fishery board had purchased. The course covered aspects of aerospace law as well as the fundamentals of operating the drone and was well worth attending. Since its purchase the drone had been used to locate pink salmon redds on the Oykel, visually inspect damage to the bridge at Inveran, and work has been done to assess its suitability for habitat mapping. Different software has been tested, as has its use under different environmental conditions. Optimal results are obtained on a clear day with no cloud cover. Burns which are heavily covered in mossy substrate obscures the image, and when the water is coloured with peat stain this worsens the effect. Now that the technique for its use has been identified, more surveying will be undertaken. This has a lot of potential to monitor impacts of changes in land use etc.

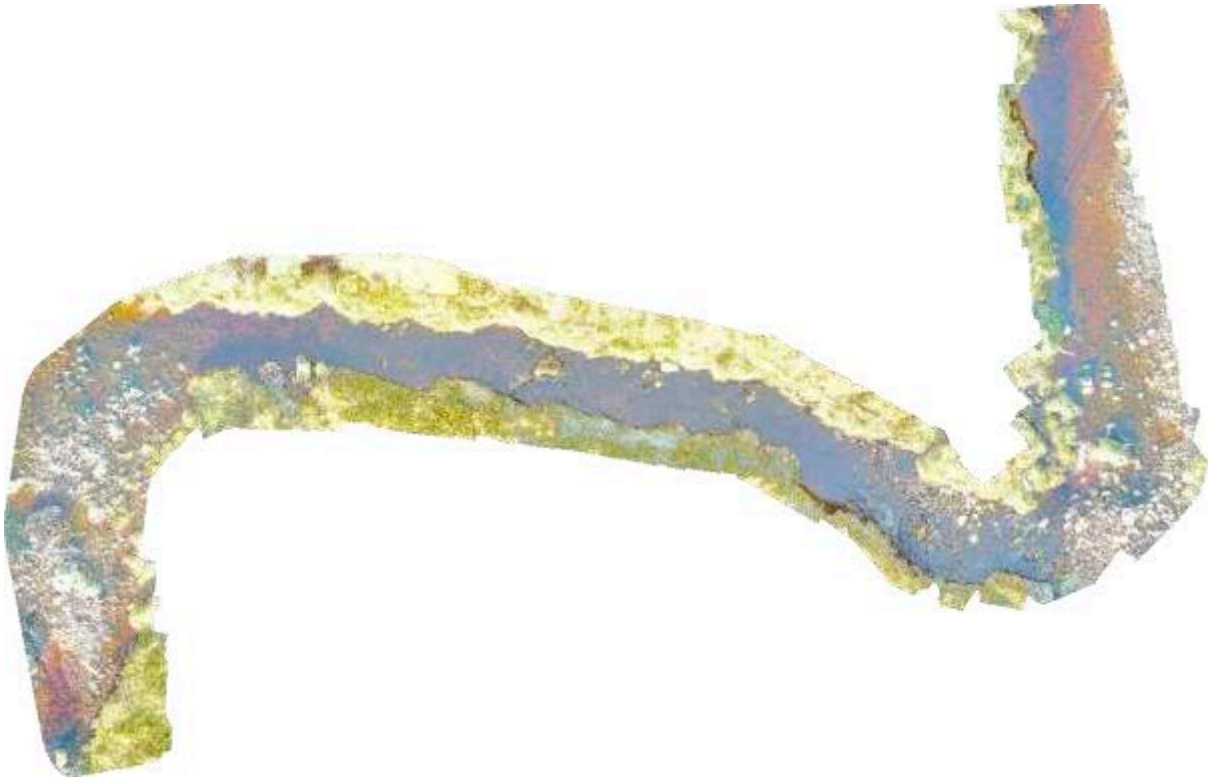

Figure 21. Drone Capture of a section of the Stratheasgaigh burn. Overexposing the image on the bank allows the substrate to be seen clearly.

2.5 Carron Temperature Network

In 2017 temperature loggers were deployed in strategic locations on the River Carron. This was inspired by the Scottish Government's Scottish River Temperature Monitoring Network (SRTMN) project which deployed loggers on the River Oykel as well as on other Rivers across Scotland. This temperature network would allow Kyle Fisheries to monitor for patterns in temperature changes across time and to identify patterns. Additionally, the network would allow for the effect of riparian tree planting to be assessed.

The visualization of this data has previously been an issue, as it can be difficult to gain meaningful data from an annual or a monthly graph. Inspired by the SRTMN a shiny app is currently being developed which should allow users to select data to view per logger, and to select a date range.

2.6 Oykel Temperature Network

The Trust continued to collect data from Marine Scotland's Oykel's temperature network in 2019. With the warm summer, the outputs will hopefully provide some useful information. Marine Scotland Science have made outputs from the project available via a web based app which can be found here; https://scotland.shinyapps.io/sg-srtmn-data/ This shows some standard metrics such as maximum, minimum and mean temperature. However, there are other metrics such as number of days above lethal temperature for salmon, days of optimal temperature for salmon growth, and number of days where temperature would increase the risk of damage to a fish under catch and release.

2.7 Sediment Fingerprinting

Early in 2018 a project was set up with APEM and Plymouth University in order to examine in river sediment in the Oykel catchment, with the aim of identifying sediment sources. Initial sampling took place in early February from areas on the Oykel which had previously been affected by high sediment inputs. However, analysis from the laboratory did not find enough sediment to analyse. With the Oykel having experienced high flow events since the large sediment deposition events in 2016, it is suspected that the worse of the sediment had been since washed out. However, Sean attended the sampling with Steven Mackenzie and was shown how to take samples should a future deposition event take place.

There had been reports of fine sediment on the lower Shin, and therefore the project had been moved. Sampling took place from the bed of the River Shin as well as from surrounding areas to categorise the different land uses. Early indications from analysis show that enough sediment has been gathered to work with, and results are pending. This project was funded via a private donation.

Figure 22. APEM staff collecting sediment samples in the upper reaches of the Grudie burn.

Figure 23. Sediment sample bottles.

2.8 Salmon Pressures Mapping

Towards the end of 2019 Fisheries Management Scotland unveiled a Pressures Mapping Tool for fishery trusts and fishery boards. The aim of this work was for each district to map out various pressures which affect salmon production. This included, but was not limited to, abstraction water temperature, water scarcity, piscivorous birds, disease, barriers to fish passage and aquaculture. The outputs from this are hoped to be useful at a local and national level, as the spatial extent of each pressure has been mapped as well as the severity at which that pressure impacts on salmon production, and the confidence associated with that rating (i.e. whether there is any evidence of an impact). This has been a useful exercise to examine issues that are known, and also potential issues that we have little evidence of whether they are a problem or not.

2.9 Deanich Weir Removal

During late summer the gauging weir at Deanich was removed by SSE. The weir had been in place since the construction of the hydroelectric schemes in the 1950's and 1960's. The weir represented one of three major manmade obstacles/barriers to fish migration on the Carron system. The weir removal was instigated following discussions between the fishery board and representatives of SSE and was subsequently overseen by SEPA. Alladale Estate input into the project was also greatly appreciated, particulalry in terms of access provision.

Figure 24 Final remnants of the weir at Deanich being removed.

Kyle of Sutherland District Salmon Fishery Board
Profit and Loss Account - Year Ending 31st May 2019

		2019		2018
Revenue		**£**		**£**
Turnover		289,609		293,714
		289,609		293,714
Cost of sales		11,149		
Gross Profit		**278.460**		293,714
Overheads				
Expenses	265,988		271,051	
	265,988		271,051	
Operating Profit /(Loss)		12,472		22,663
Bank interest receivable		75		16
(Loss) / Profit for year		**12,547**		22,679

Kyle of Sutherland District Salmon Fishery Board
Balance Sheet - Year Ending 31st May 2019

		2019	2018
		£	**£**
Fixed Assets		**52,018**	45,263
Current Assets			
Debtors	**6,588**		6,926
Bank	**102,081**		98,413
	108,669		105,339
Creditors	**2,808**		5,270
Net current assets/liabilities		**105,861**	100,069
Total assets less current liabilities		**157,879**	145,332
Capital & Reserves		**157,879**	145,332

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 2019

Income	Unrestricted	Restricted	Total Funds Year to 31 May 2019	Total Funds Period from 1/4/17 to 31/5/18
Voluntary income	45,105	50,569	**95,674**	26,054
Fundraising				
Other	6,769	2,500	**9,269**	6,859
	51,874	53,069	**104,943**	32,913
Expenditure				
Costs of generating funds	390	42,629	**43,019**	(10,398)
Costs of other trading activities				
Governance	5,523		**5,522**	(10,807)
Other expenditure	14,418	2,000	**16,418**	(13,022)
	20,331	44,629	**64,959**	(34,227)
Net Incoming resources for the year	31,543	8,440	**39,984**	(1,314)
Reconciliation of funds				
Total funds brought forward	132,156	25,821	**157,977**	159,292
Total funds carried forward	163,619	34,342	**197,962**	157,977

Kyle of Sutherland Fisheries Trust
Balance Sheet - 31 May 2019

		2019	2018
		£	£
Fixed Assets		**70,745**	70,889
Current Assets			
Debtors	**3,678**		3,456
Bank	**124,665**		84,778
	128,343		88,234
Creditors	**(1,126)**		(1,146)
Net current assets		**127,217**	87,088
Total assets less current liabilities		**197,962**	157,977
Funds			
Restricted Income Funds		**34,342**	25,821
Unrestricted Income Funds		**163,619**	132,156
		197,961	157,977

Thanks To

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Forestry and Land Scotland
Coilltearachd agus Fearann Alba

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The Scottish Government

Kyle of Sutherland Development Trust

Cooke AQUACULTURE

Migdale Smolt Ltd

LOOP