ANNUAL REPORT 2021

KYLE OF SUTHERLAND FISHERIES
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Kyle of Sutherland Fisheries Trust

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

Kyle of Sutherland District Salmon Fisheries Board

Chairman	Ashe Windham, 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	John McCrorie, Kyle of Sutherland Angling Association Richard Sankey, Angler representative
Clerk	Dr Keith Williams
Staff	Dr Keith Williams, Managing Director Jacqui Hamblin, Business Administrator Sean Robertson, Science & Mitigation Officer John Audsley, Bailiff Supervisor Iain Gollan, Bailiff Philip Blowers, Bailiff

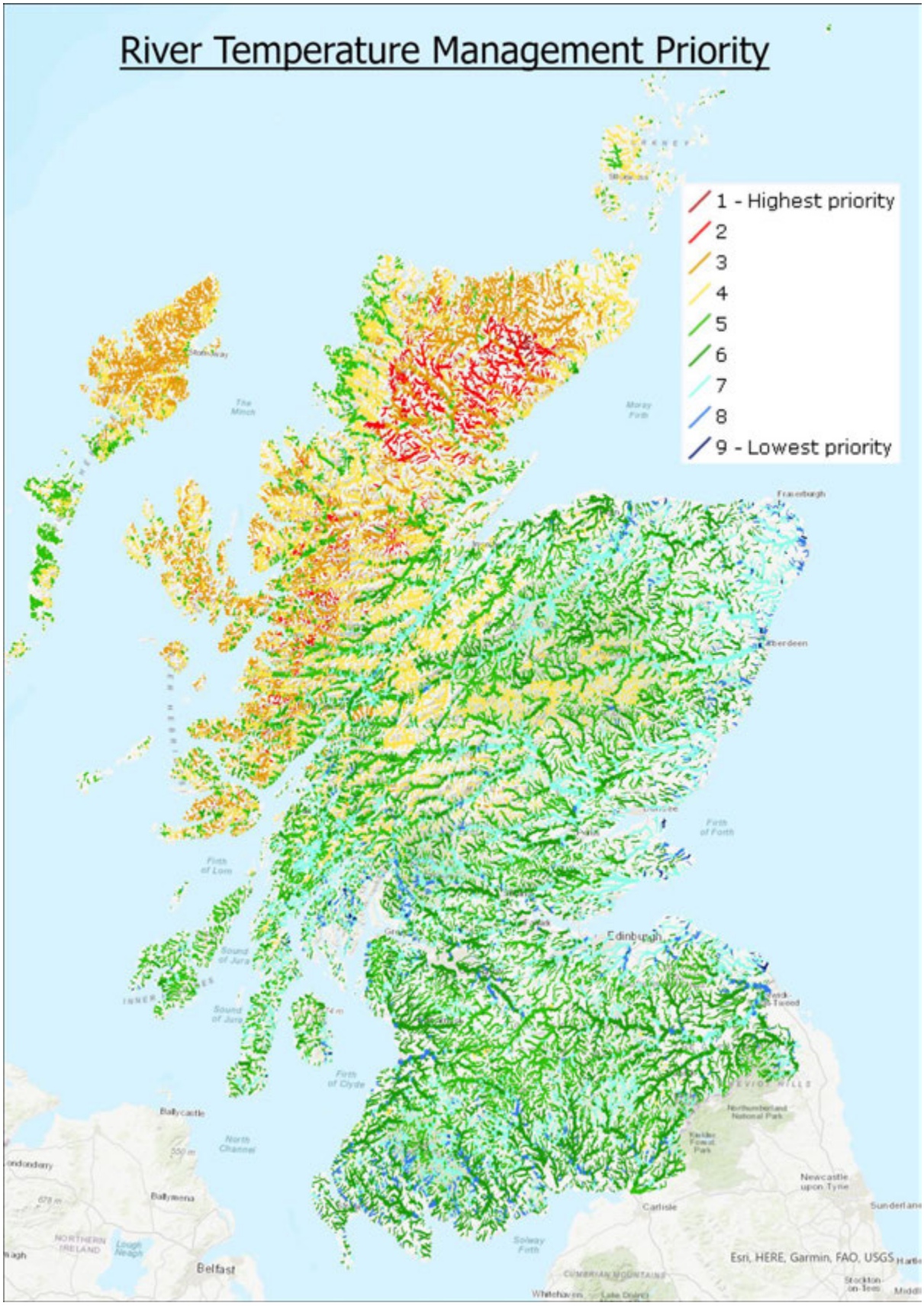
Chairman's Foreword

2021 will possibly be chiefly remembered in the United Kingdom as 'the second year of Covid-19' and whilst by the end of the year there were distinct signs of hope with the vaccine roll out well progressed, at the beginning of the year Covid stalked the land with deadly intent. The Kyle, of course, was not immune from these concerns and our operations were materially disrupted by the virus. Nevertheless, Dr Keith Williams and his team managed a considerable programme of works from a full smolt tagging operation in the Spring in partnership with The Atlantic Salmon Trust (AST) to initiating The Kyle Riverwoods project, whilst always managing to safeguard our salmon stocks through the tireless vigilance of our dedicated team of bailiffs. I should like to begin this report for thanking all those who work for The Kyle of Sutherland District Salmon Fishery Board for their dedication, hard work, perseverance and not least for their good humour.

Covid forced our employees to be ever more resourceful, from coping with working from home to adapting working practices so as to remain socially distanced. As a lean organisation every member of the team is required to be flexible and they rose to the challenge though helping out, sometimes in unfamiliar roles. Given that a number of projects, such as the AST smolt tagging project, and some of our contract work were only given the green light at the last minute it was quite a feat of organisation to ensure that the required staff were in the right place at the correct time.

With the exception of a huge cloudburst on Ben More Assynt on 27th July, which shifted the Oykel Bridge Gauge from -1ft to +6ft overnight and led to a three day salmon fishing bonanza, there was virtually no rain in the district from mid-May to mid-September. Given the Scottish Government restrictions effectively forbade fishing until 16th April 2021, and coupled with the lack of water through most of the season, it was remarkable that salmon catches were actually slightly higher than during the previous year, though at around 2,000 still lower than the five year average. The Kyle rivers bucked the trend in Scotland, where overall catches were down on the previous year. There is more detail on catches elsewhere in this report.

The major development during this past year was in initiating The Kyle Riverwoods Project. Our inaugural Auction in November 2020 raised £7201 for the Kyle of Sutherland Fisheries Trust, under which charity all this work devolves. This money was used to kick start some small planting schemes. In 2021, The Fishmongers' Company Fisheries Director Andrew Wallace donated £15000 to the board, plus additional in-kind support, to employ Hugh Chalmers, latterly of The Tweed Foundation, to help us scope out the scale of the problem and to design some schemes. Why are we doing this? In a nutshell, research from Marine Science Scotland shows the Kyle is in one of the most vulnerable areas of Scotland for heat stress caused by rising summer temperatures as the map on page 5 shows.



Atlantic salmon and brown trout have certain ranges of temperature which are optimum for growth and survival. As fish are ectothermic, lacking the ability to regulate their body temperature, they are unable to cope with extreme temperatures. If the water temperature rises to lethal levels they have

no coping strategies; humans sweat, dogs pant, but fish have no such mechanisms to regulate their temperature. Once river temperatures exceed 23 degrees salmon will become stressed, above 28 degrees for a prolonged period will be lethal, and 33 degrees or above will be instantaneously lethal. On the Oykel, temperature loggers installed by Marine Scotland some 20 years ago have previously recorded highs ranging from 25-27 degrees Celsius. As climate change is predicting further increases, the consequences for aquatic life could be catastrophic. The only practical way of countering these changes is to shade the water with native broadleaves and preferably as high up in the catchments as we can manage. Naturally, these higher tributaries tend to drain ground which is the home of red deer, an important component of upland ecology and a vital income source for the land owner, but lethal to young trees. I would strongly argue that these two interests are not incompatible, for with decent fencing the broadleaves will provide much needed shelter within a decade and within twenty years, it should be possible to give the deer access to the trees, providing shelter and food for them throughout the year, much improving the health and quality of the deer population.

The main expense is not in planting the trees but in the cost of deer fencing. Research shows that the optimal benefit is obtained through thirty metre wide strips, preferably on the south side of the burns, but a five metre wide strip is almost as good, though the trees to fence ratio makes this less economically viable. There are government grants for tree planting and the resulting carbon credits make this a source of potential income for the landowner. Terrestrial invertebrate life, encouraged by trees, will usefully increase the food source for young salmonids, as will leaf litter which provides food and shelter for aquatic invertebrates. We have engaged Linzi Sievewright of Caorann Ecology on an ad hoc basis to help us better understand and manage the interplay between the competing deer and salmon interests.

We are certainly not the first organisation within the catchment to extol the virtues of riparian (river side) planting. Paul Lister at Alladale and James Hall at Croick, amongst others, have been exponents of the benefits for decades, whilst well over 2 million native broadleaf trees have been planted in total on these two estates over the past thirty years. The other element to improving river health is to slow down the run off from precipitation – in simple terms, peat drain blocking and peat hag re-profiling keeps the peat wetter and in the best condition to sequester carbon.

Your Board has moved quickly to address this threat and, with funding assistance from The Fishmongers' Company of London, £20,000 from our second Auction in November 2021 and a £15,000 contribution from Upper and Lower Oykel proprietors, the Trust is employing Sean Dugan from 1st April 2022 in the new post of Climate Resilience and Habitats Officer. It will be Sean's job to help landowners cut through the tangle of red tape to deliver Riverwoods at scale across the District. It's an exciting time and we appear to be in the vanguard of Boards and Trusts addressing this further threat to our threatened salmon populations.

Last, but by no means least, we are facing an emerging threat from Pacific salmon, which were apparently introduced to NW Russia by Stalin to feed the Russian population in the 1930's. By some quirk of nature they only run our rivers in odd years and sure enough there was a record run, mostly up the Oykel, last July. They are an unattractive fish with hump backs and black mouths and they are not even any good to eat! They compete at the edges with our native fish but they tend to spawn in August and migrate as smolts early the following spring. I was told only this morning that a number of 1.5 inch pacific smolts have been caught in the lower Oykel. This threat is pervasive and we are formulating a response to deal with it. A netting by our staff last July, which resulted in one adult being caught, went viral on YouTube, though it does not appear to be a very effective management tool given the time and number of individuals employed to achieve the result!

May I conclude by thanking you for your support, for it means much to the team, and a plea to donate any lots, however quirky, to our Administrator ahead of our Auction, which we are planning on running in October this year.

Director's Foreword

In many respects 2021 can be described as stop-start year which made planning very difficult. Whilst we managed to catch up on many projects postponed in 2020, some workstreams did fall through the cracks to a degree. Hopefully, this can be rectified in 2022. The core staff were joined by a steady stream of seasonal recruits during the year. This can sometimes lead to problems of integrating people new to the organisation with existing personnel, but I am very pleased to say that no such issues arose during the year. Everybody who joined us, be it for a few days or a few months, were enthusiastic and performed their tasks admirably. Indeed, all members of staff went above and beyond what could normally be expected of them, and I would like to express my gratitude for their commitment.

Early in 2022 the Scottish Government published its Wild Salmon Strategy and we await the publication of the implementation element of this approach later in the year. As part of this process, most fishery boards and trusts in Scotland have provided information to Marine Scotland, ranking the multiple pressures that wild salmon face in order of importance based on the data available in their areas. The Kyle of Sutherland has been fully engaged in this process and we have highlighted issues such as aquaculture and problems associated with historic hydroelectric developments. In my opinion, there has long been a lack of political will to properly tackle these long-standing, thorny issues. Sadly, fishery boards in themselves often do not have sufficient powers to effect the changes they would like to see and, for example, we need more commitment from regulatory bodies. It must be hoped that this opportunity to improve matters is not missed and we can move away from the present situation of widespread inertia.

In addition to the long-standing issues previously mentioned, new concerns continue to present themselves. New models and data highlight the risk posed by potentially rising water temperatures to our aquatic communities, particularly in the upper reaches of our catchments. The influx of Pacific salmon into our rivers also raises concerns relating to potential negative interactions with our native species. We will remain vigilant in respect of new issues in our catchments whilst simultaneously maintaining efforts to resolve problems that have been well understood for many years.

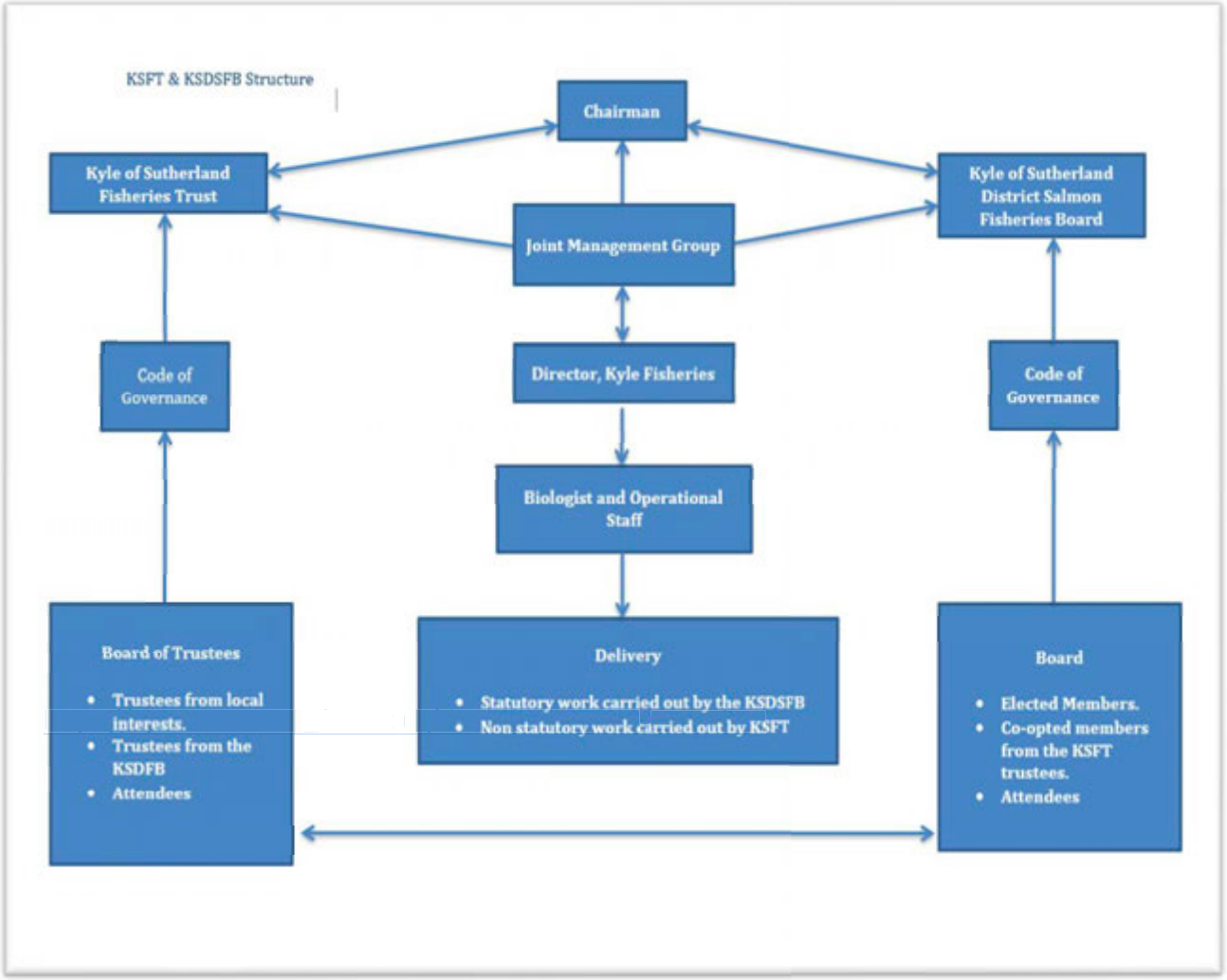
Kyle of Sutherland Fisheries Structure

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.



1.1. Covid

Due to restrictions associated with Covid, meetings during the year took place online. Guidance was followed as issued by Fishery Management Scotland. 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 in the Kyle Chronicle. 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.

1.2. 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 procedure
- Register of member's interests.

1.3. Complaints

No formal complaints were received during 2021.

1.4. 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 addition, some Highland Council planning applications are responded to even if Kyle Fisheries are not directly consulted. In 2021 the consultations received were in the following categories:

- Forestry – 7 consultations.
- Terrestrial wind farms – 3 consultations.
- Other – 11 consultations.

1.5. Disease

In 2021 we received less reports of the red skin disease which had begun to show on a large number of fish in Scottish and Norwegian rivers. This year no live fish with the affliction had been given to us for sampling. Elsewhere across Scotland some reports had been received from other rivers, and fisheries management Scotland continues to collate reports using their online tool.

A Finnish study investigated the theory that red skin disease is linked to a thiamine deficiency. One hundred and sixteen fish were captured at an estuary and PIT tagged. Half of the fish were inoculated with a dose of thiamine, and successful migrant fish were recorded at a PIT tag reader 20km upstream.

More treated grilse were detected than those in the untreated group, however less treated multi-sea-winter (MSW) than untreated MSW salmon were recorded at the upstream PIT tag reader. Therefore, the result of this is somewhat inconclusive. Fish health authorities have still been unable to identify a causative agent of the condition.

1.6. Enforcement Supervisor's Report

Following a year of increased illegal netting activity in 2020, extra efforts were made to increase patrols during the hours of darkness in 2021. Most detected illegal fishing activity, however, was by rod and line. Suitable advice was given, and warnings issued to prevent a reoccurrence of such activity.

In addition to enforcement activities, bailiffs spent considerable time on the riverbanks during the spawning period. A new app was tested to allow sightings of spawning fish to be recorded, along with information such as water temperatures etc.

After the end of the spawning season, activities of enforcement staff switched to tree planting and bankside maintenance.

1.7. Pink Salmon

As an odd numbered year, 2021 saw the return of pink salmon to Scottish Rivers. The Kyle of Sutherland District was no exception, and carcasses of 2 fish were retrieved. One fish was washed up onto a road after a high-water event, and the other was recovered after an attempt to actively net it out.

We rely on reports from river workers and anglers about the presence of these fish, and we are extremely grateful for the information that was shared with us this year. After hearing a report of some fish digging a trial redd, Sean and Leanne went to the Oykel to investigate. Using the drone, they were able to locate a cluster of five male and one female pink salmon. With a decent number of fish being in one spot, it was decided that this would be a good opportunity to try and remove these fish. With the help of ghillies and anglers, board staff were able to attempt to net these fish. A licence had been obtained earlier in the year via Fisheries Management Scotland to undertake operations of this type.

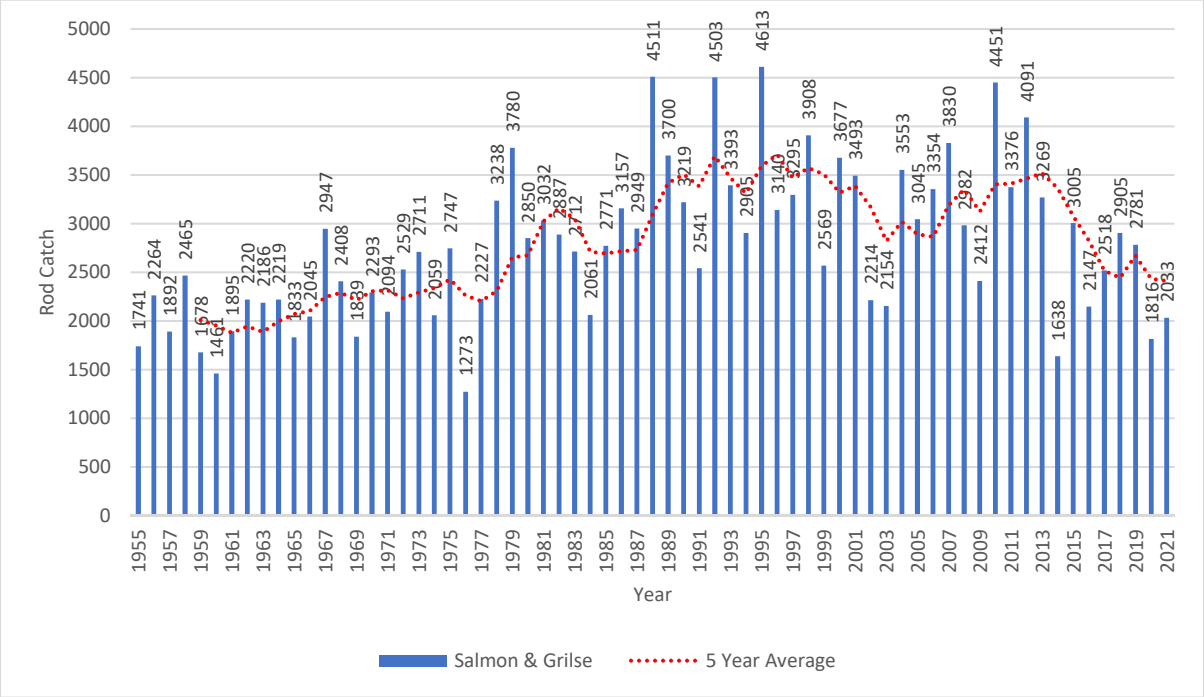
The event was recorded, and video put together with the aim of illustrating how difficult it is to attempt to remove pink salmon. This video was shared on social media and received good engagement. We also shared the video with Fisheries Management Scotland, to then share with other regulatory authorities such as NatureScot and Marine Scotland. FMS are continuing to collate information from different DSFB's and Trusts about methods employed. Either way, we feel that the manpower needed to try and remove every pink salmon that may enter our rivers would be far out with the resources that fishery boards currently have, although when we observe large aggregations we are likely to attempt to remove them where possible.

1.8. Fishery Performance

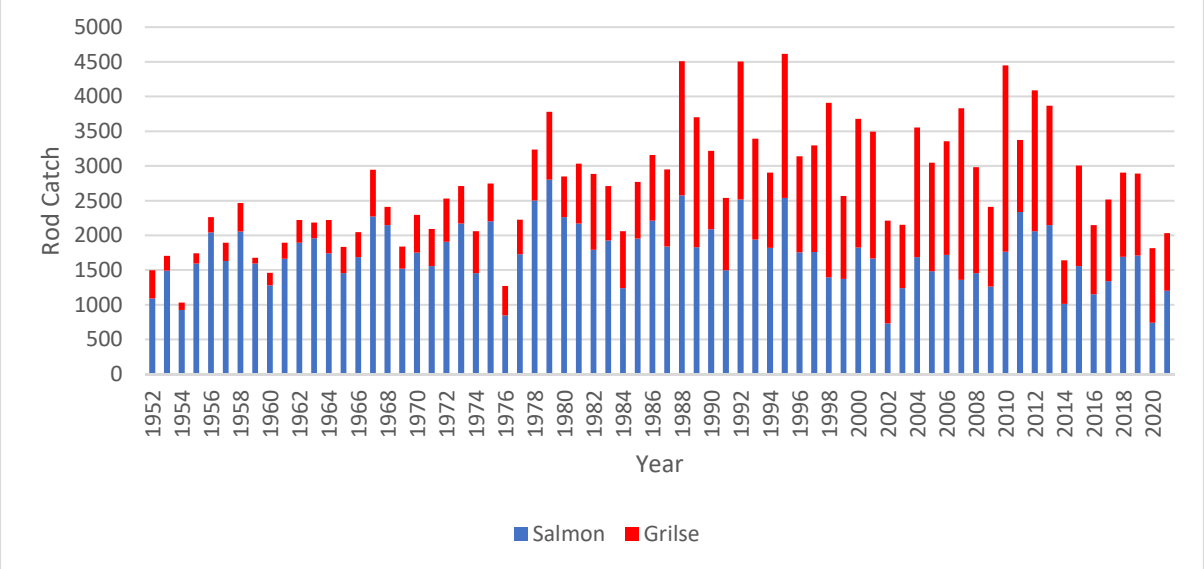
Issues related to Covid again impacted rod effort, but to a lesser extent than in 2020. Generally dry conditions also likely impacted on rod effort, particularly in the summer months. The 2021 overall catch of salmon and grilse on rod and line was a modest improvement from 2020 with a provisional

total of 2033. However, this figure is considerably below the long-term average and the five-year average.

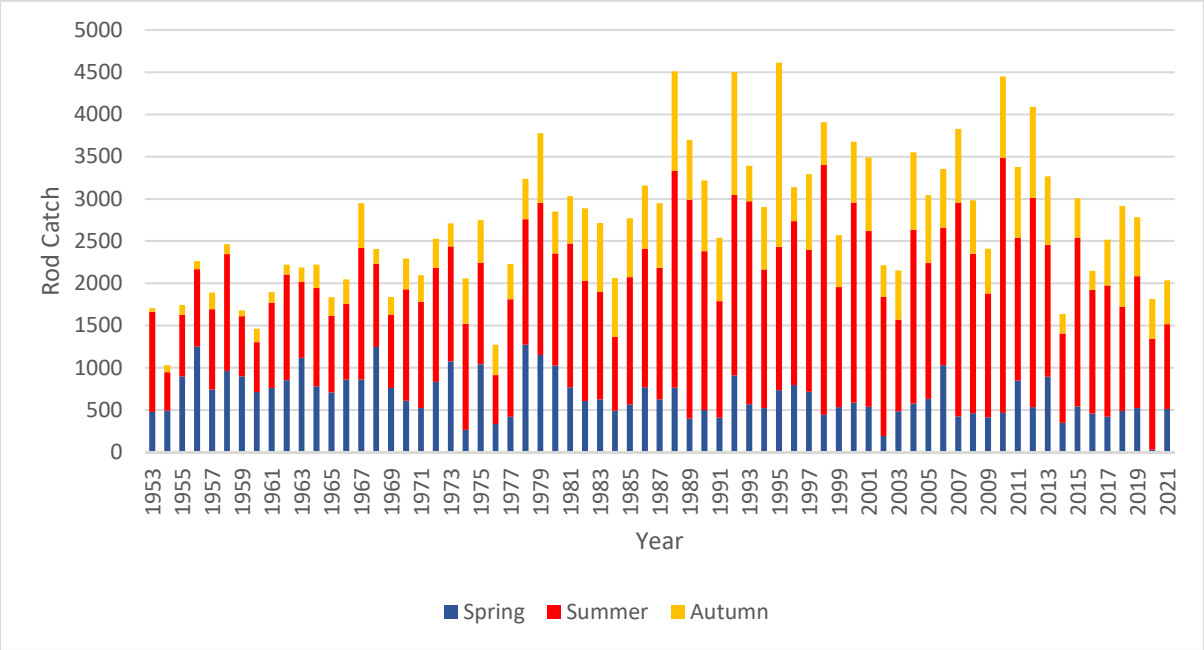
The graphs below place the provisional 2021 data collected by the Board within the historical context of the MSS dataset of catches from 1952-2020. The data used in the following graphs are Crown copyright, used with the permission of MSS, who are not responsible for interpretation of these data by third parties.



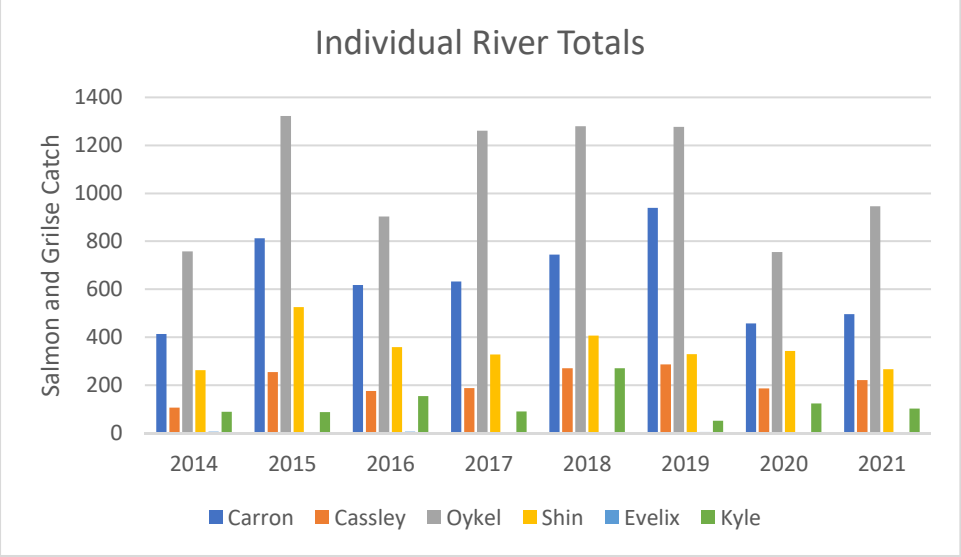
More salmon than grilse were reported in 2021 catches. The relatively low grilse catch is likely to have been influenced by the dry summer weather conditions.



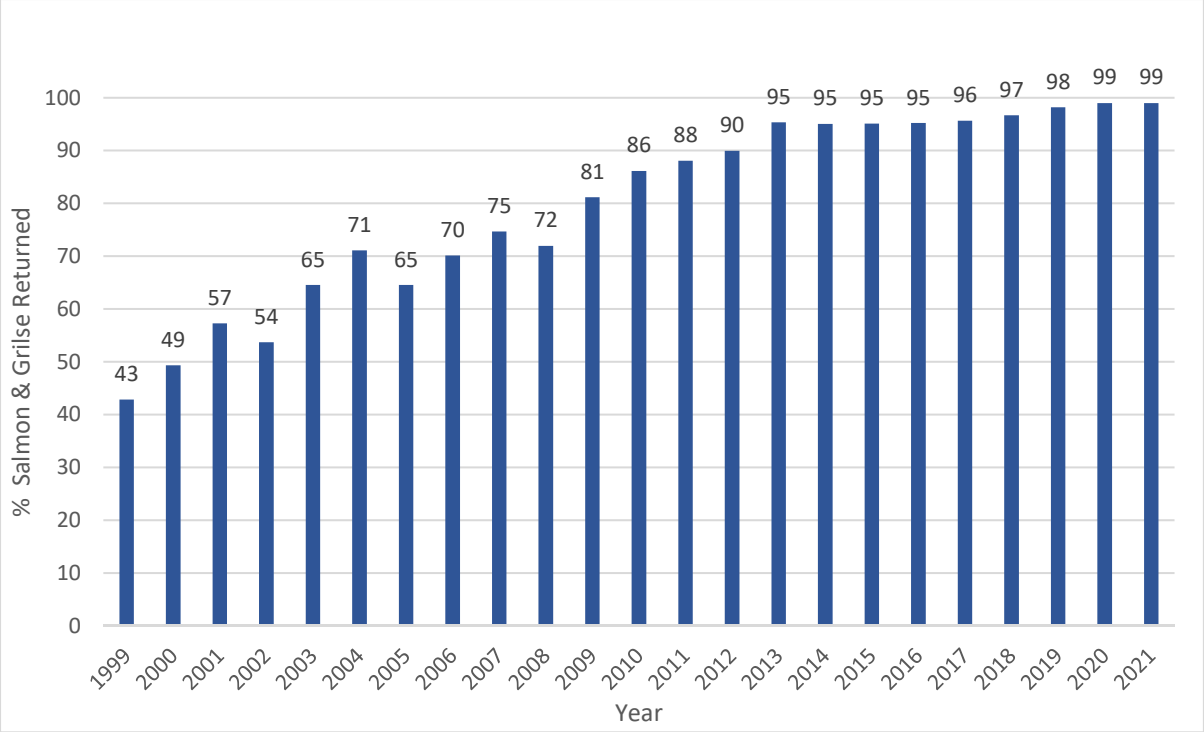
The spring catch in 2021 was similar to recent years with the exception of 2020 when Covid restrictions prevented fishing for extended periods. Despite the drought conditions, the summer period (June-August) remained the most productive part of the season. The September catches are usually reliant on sufficient rainfall. The autumn of 2021 was relatively wet, hence reasonable catches were recorded.



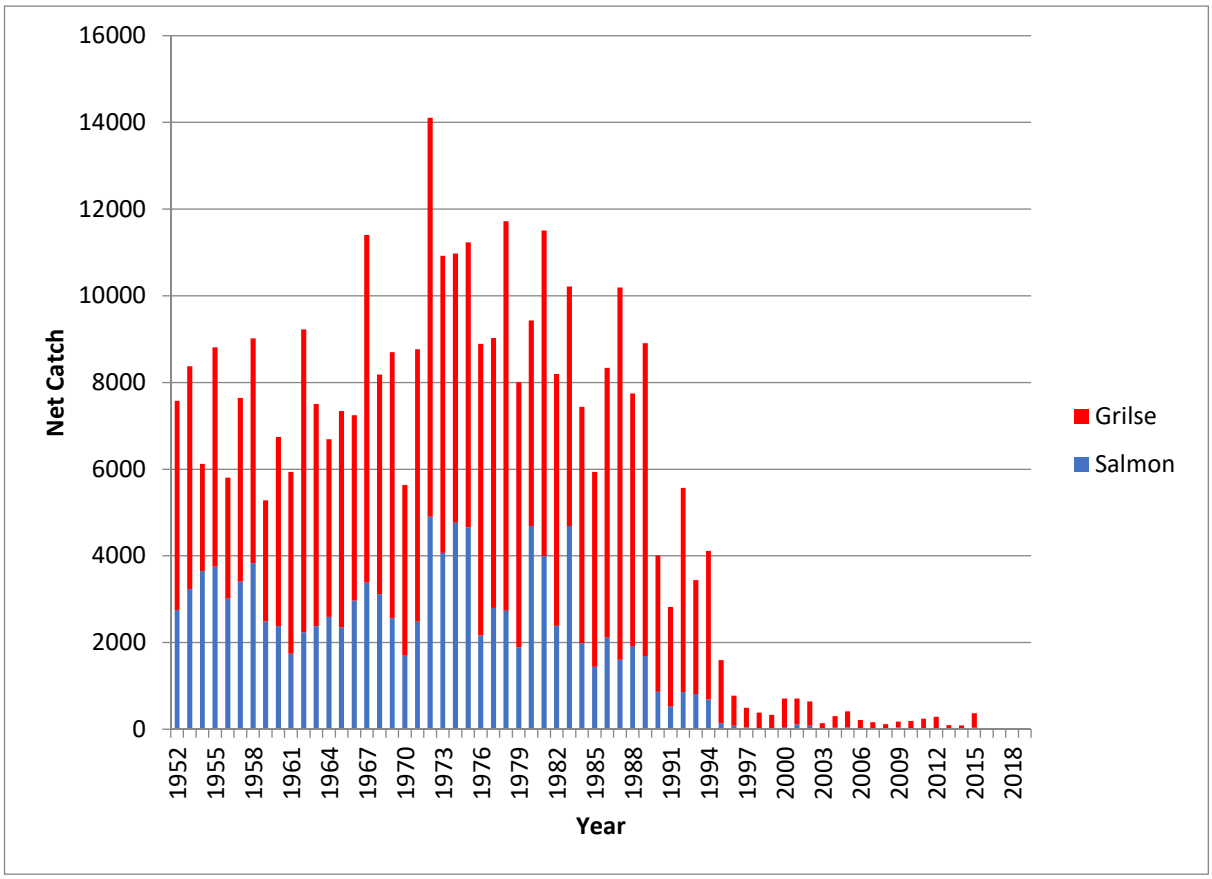
The Oykel had the highest individual river total, as has been the case for a number of years. The River Carron remained the second largest contributor to the overall catch. Smaller contributions from the Cassley, Shin, Evelix and Kyle were recorded.



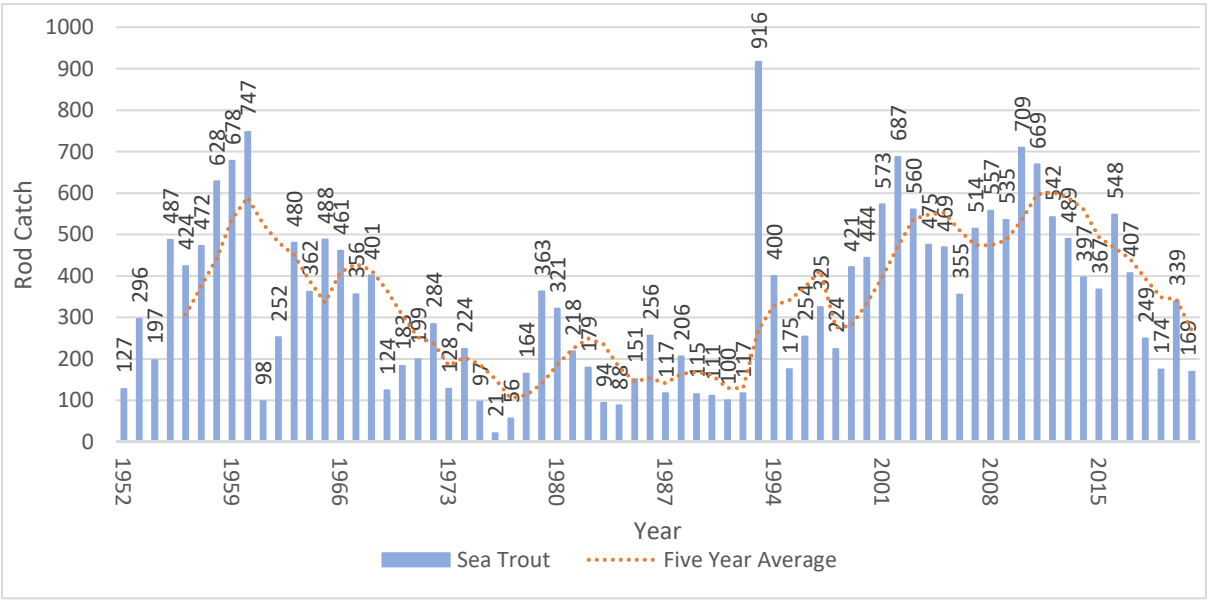
Catch and release percentages within the district are routinely high with 2021 being no exception. Many beats within the district are now catch and release only.



During 2021 one coastal netting station operated for a very short period of time in order that the methods used could be recorded on film. Salmon and sea trout were caught, with all of the former being quickly released from the nets. The figures caught have not been included in the graph below which details net catches within the district from 1952 onwards, as recorded by Marine Scotland.



Sea trout stocks appeared to recover significantly from the late 1990s onwards but catches have again declined in recent years.



1.9. Hatchery 2020/21

No stocking of salmon has taken place for a number of years. 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.

1.10. 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. No licence to shoot seals was received in 2021. In recent years a licence to shoot a small number of piscivorous birds has been received following the submission of an application to NatureScot. 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.

1.11. Science & Mitigation Officer's Report

This year has been far busier for us at the trust than anticipated, with a wide variety of activities covered. At the start of 2021 staff were on furlough, so capacity was somewhat reduced. After being successful with a bid with NatureScot for the biodiversity challenge fund early in the year, we went straight into smolt trapping and tagging. With us being required to fit nearly 250 fish with acoustic tags across the Oykel, Cassley and Shin we had little time for much else! It was a gargantuan effort to cover 6 smolt traps across 3 rivers, in a variety of weather conditions – ranging from weeks of no rain, to heavy precipitation which resulted in large spates. We had wonderful assistants who helped us with this project, Adam Beynon-Jones, Matthew Cook, Tyler Galvao and Marie Stratton. Without the combined efforts of all involved the work would not have been possible. Acoustic tagging is a Home Office regulated procedure and is time consuming to do at the high standards required. Although we obtained some great information from this years tracking, we need to be careful not to overstretch ourselves in future years.

We were then joined by Leanne Munro for the summer sampling season, which included 45 NEPS sites across the catchment as well as our routine monitoring. Warm summer temperatures were particularly challenging, and on a couple of occasions we ceased electrofishing due to high water temperatures (being over 18 degrees Celsius). However, we managed to get the work done in good time. The sampling methodology was slightly altered this year to include river order 5 watercourses, which resulted in some mainstem fishing on the Carron, the Einig and in the upper reaches of the Oykel. In past years NEPS sites seem to largely be located on upland streams, many of which do not have suitable habitat for fish. We felt that including river order 5 streams improved the overall design, and we had more sites in areas we know that fish can utilise.

We also undertook freshwater pearl mussel surveys for the BCF project, and identified a host population for future encystment work after re-gravelling has taken place. The design had to be altered somewhat due to the presence of FWPMs. Additionally, we continued to use the drone for aerial surveys to gain a baseline snapshot of the site for the "before" condition of the stream. This will be useful to compare against after works have been undertaken.

The KOSDSFB has a myriad of old reports and documents which have not been previously catalogued. There are some interesting previous habitat surveys, which will be useful to us and future staff as a baseline for how conditions have been, among other projects and investigations. In the winter months, Leanne took on the arduous task of sifting through and cataloging these documents. We now have a much better understanding of the information we hold.

1.12. Shin Smolt Trapping

Smolt trapping took place on the 4 sites on the Shin catchment, and some smolts from the traps were used in the Atlantic Salmon Trust's Moray Firth Tracking project, which also took place on the Oykel. The trapping season was characterised by low water, and although a decent number of smolts were caught from both the Fiag and Tirry traps we feel that many more would have been caught if the traps were operating at high efficiency over the course of the run. The Fiag trap caught 3936 Salmon smolts with the Tirry trap catching 1416 Salmon smolts. On the Tirry, SSE supplied a new Rotary Screw Trap fitted with a 12v motor, as this would keep the drum turning during low water periods - and it was hoped this would increase trap efficiency. Although initially promising, the motor was not in operation for very long. The zinc housing of the motor was too brittle to cope with the long periods of stress it was under (having to keep the drum turning overnight) and it snapped off. We have also tried using otterboards to divert water into the trap during low flows, however the velocity is not fast enough even with these. Therefore, the trapping situation on the Tirry continues to be inadequate.

On the Fiag, similar problems with low water were experienced despite the unique channel morphology, which usually keeps the trap turning in low water. To combat this, a wooden board was put in place immediately upstream of the trap. This diverts water at just the right angle to keep the drum turning, albeit very slowly. Unfortunately, a spate washed this wooden board into the trap and prevented the drum from turning for a day before it could be safely removed. It would appear that the bulk of the run was migrating at this point, as the most fish to enter the trap in a single day was recorded in this period.

SSE are repairing the trap with the motor for use in the 2022 trapping season. Concurrently SSE are costing up options for installing Wolf traps on the Orrin and Meig in the Cromarty Firth catchment, and will also be costing up a Wolf trap for the River Tirry.

1.13. Aquaculture Monitoring & Introgression

Smolt traps on the Merkland and Corriekinloch rivers were again operated this year for the purpose of detecting direct escapees from aquaculture facilities. However, both traps struggled during low

water periods. As a result, only a small number of wild smolts were caught in each trap. Six smolts caught in the Merkland trap were suspected to be of farmed origin.

In October 2021 Marine Scotland Science released "*A national assessment of the influence of farmed salmon escapes on the genetic integrity of wild Scottish Atlantic salmon populations*". This report examined samples taken from parr during NEPS electrofishing as well as ad-hoc sampling. The main summaries of the report are available on Marine Scotland's R Shiny app, under genetic maps. In the Kyle district ad-hoc sampling was conducted in 2018 in the Shin catchment. From this work, the samples taken from Corriekinloch were classed as "poor" and those at the bottom of the Tirry and the Merkland River were classed as "moderate". However, due to the analysis it is likely that some back crosses and second-generation fish were not detected. Therefore, these results presented should be seen as a minimum of introgression which is present. Additionally, it is likely that more introgression may be found if fry were examined. Due to farmed and hybrid fish being less fit than their wild counterparts, they are less likely to survive and be detected as older parr. These fish should not be discounted, as the introgression of young fish which do not survive contributes to the overall population being depressed in number.

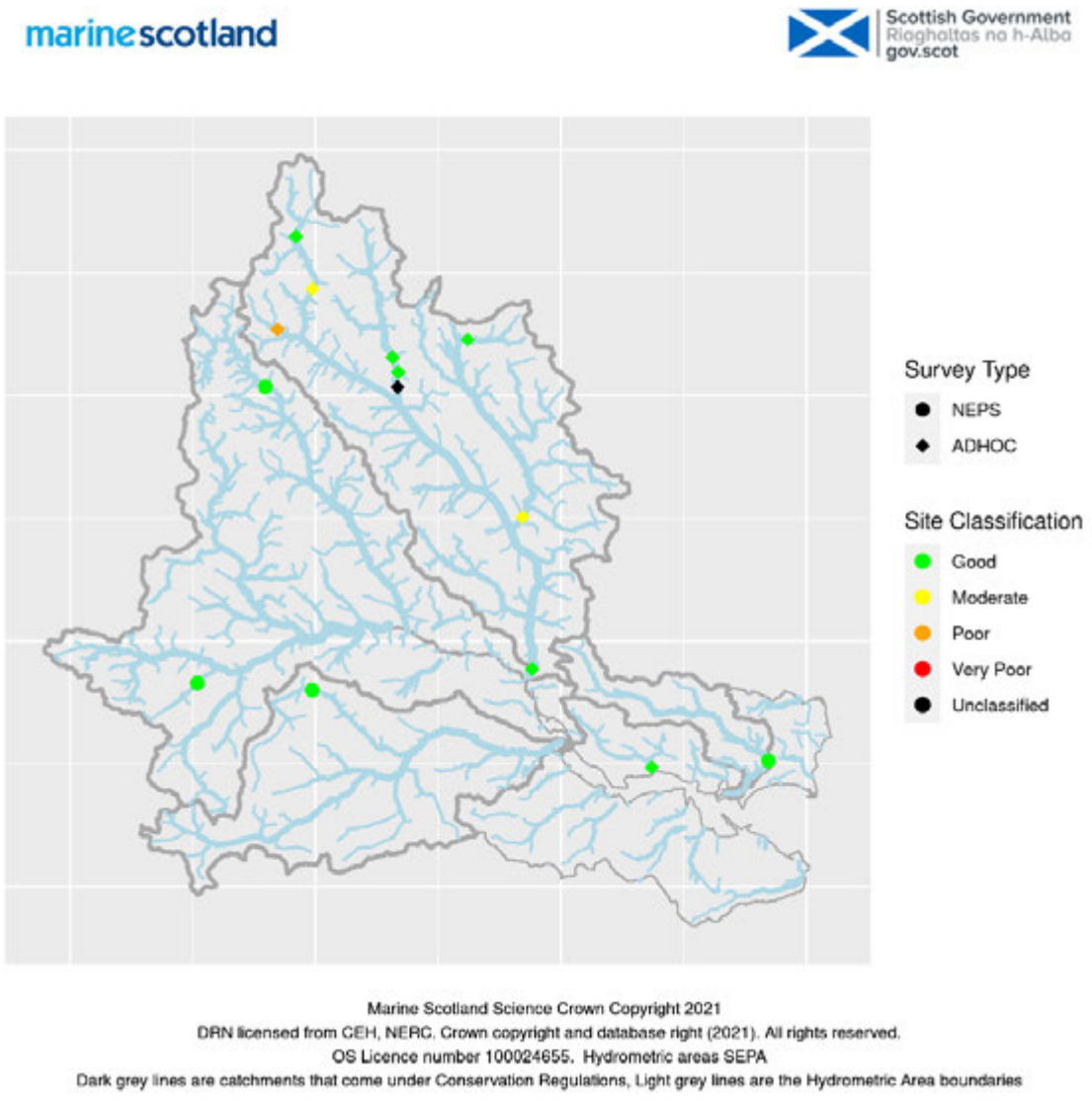


Figure 1. Genetic Status of Salmon parr from across the Kyle region.

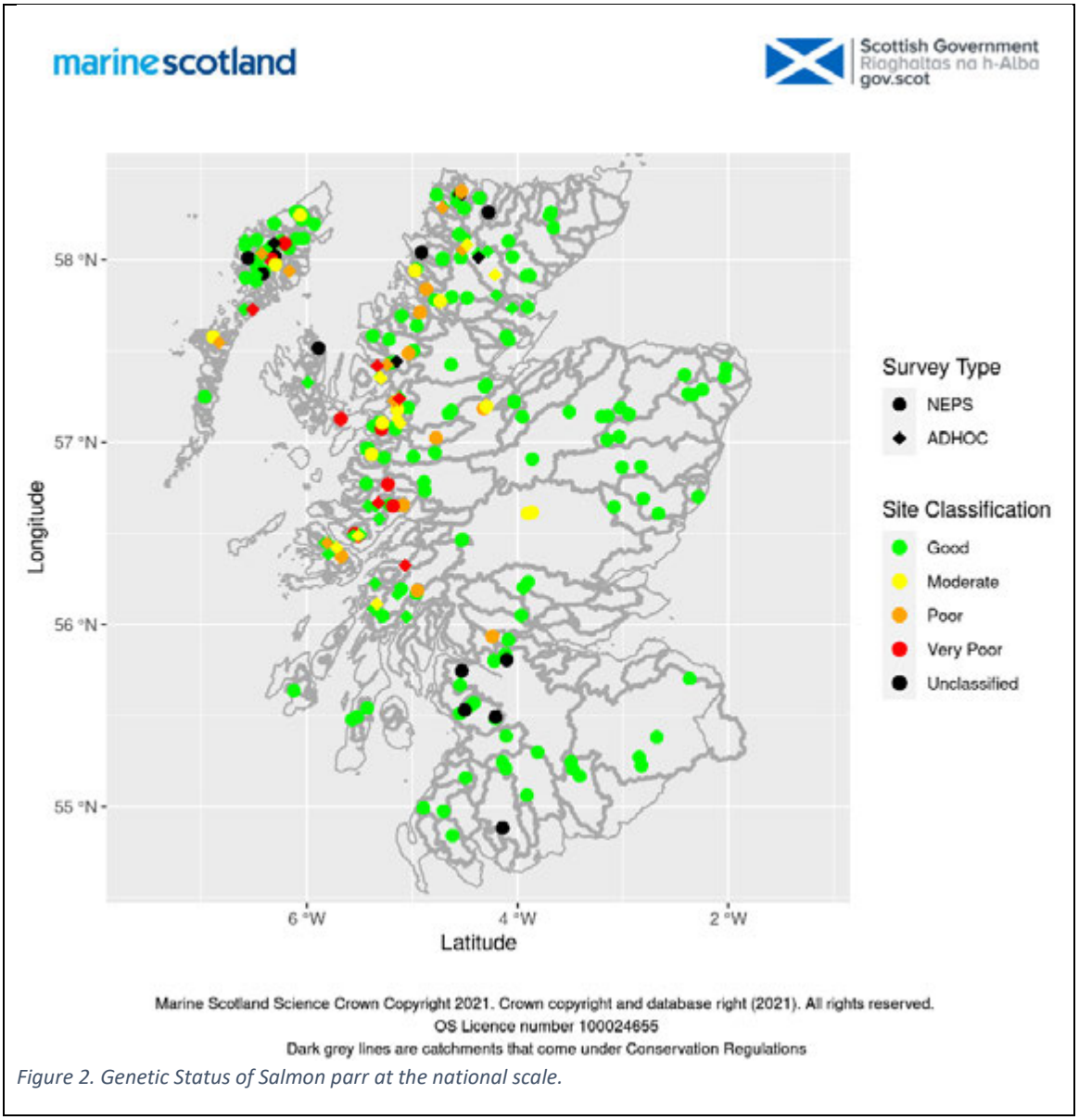


Figure 2. Genetic Status of Salmon parr at the national scale.

1.14. Juvenile Surveys

Due to the high volume of NEPS electrofishing surveys across the catchment, survey effort was limited to areas with specific management purposes. Electrofishing was challenging this year due to low flows and high temperatures. The regular monitoring sites at Benmore were cancelled as water temperature was too high on the day. Electrofishing elsewhere across the catchment was still conducted. Upstream of Glen Beag dam on the Carron no salmon or hybrid salmon/trout were found, although pure trout were caught. However, a small amount of pure salmon eDNA was found upstream of the dam, both before and after the winter plate was changed over.

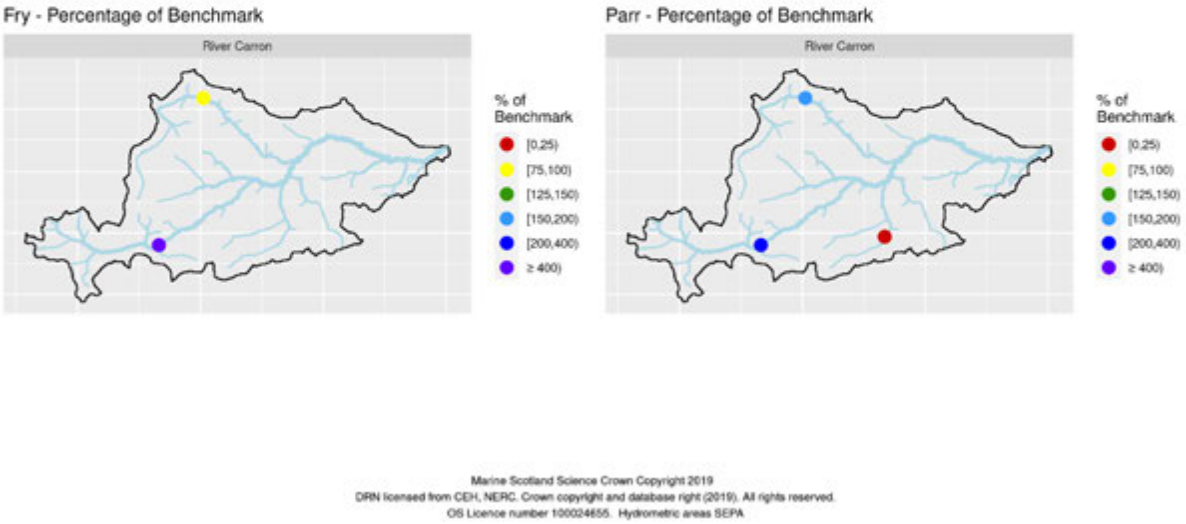


Figure 1. Fry and Parr densities in the Carron Catchment as a percentage of Marine Scotland's benchmark density.

marinescotland
Scottish Government
Riaghaltas na h-Alba
gov.scot

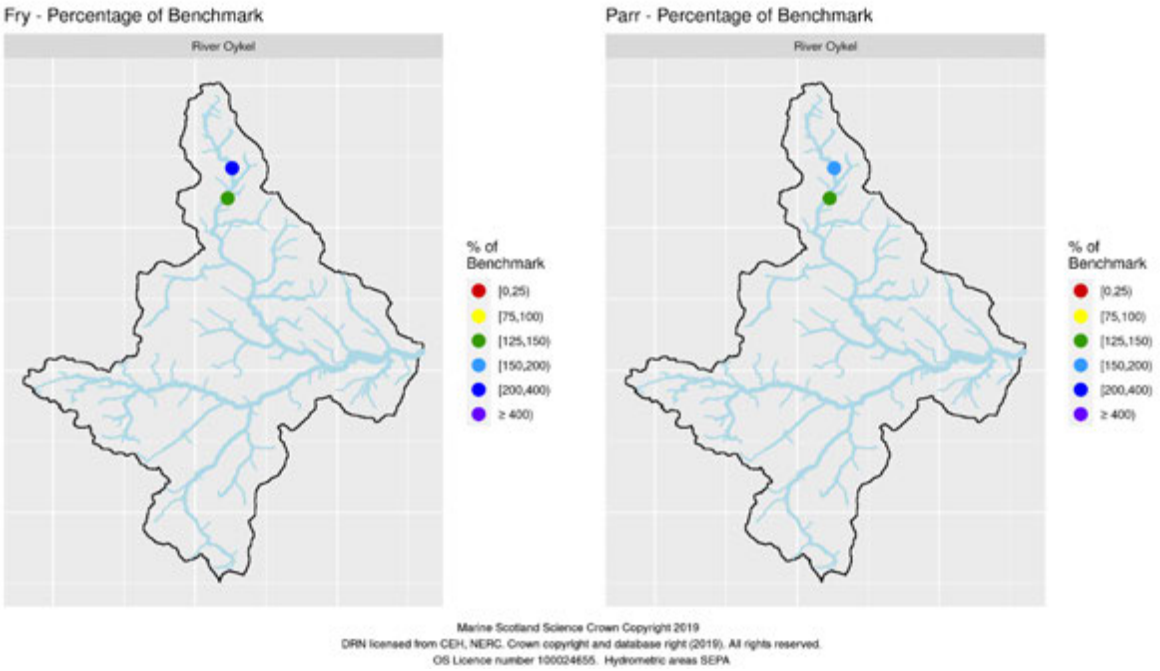


Figure 2. Fry and Parr densities in the Oykel Catchment as a percentage of Marine Scotland's benchmark density.

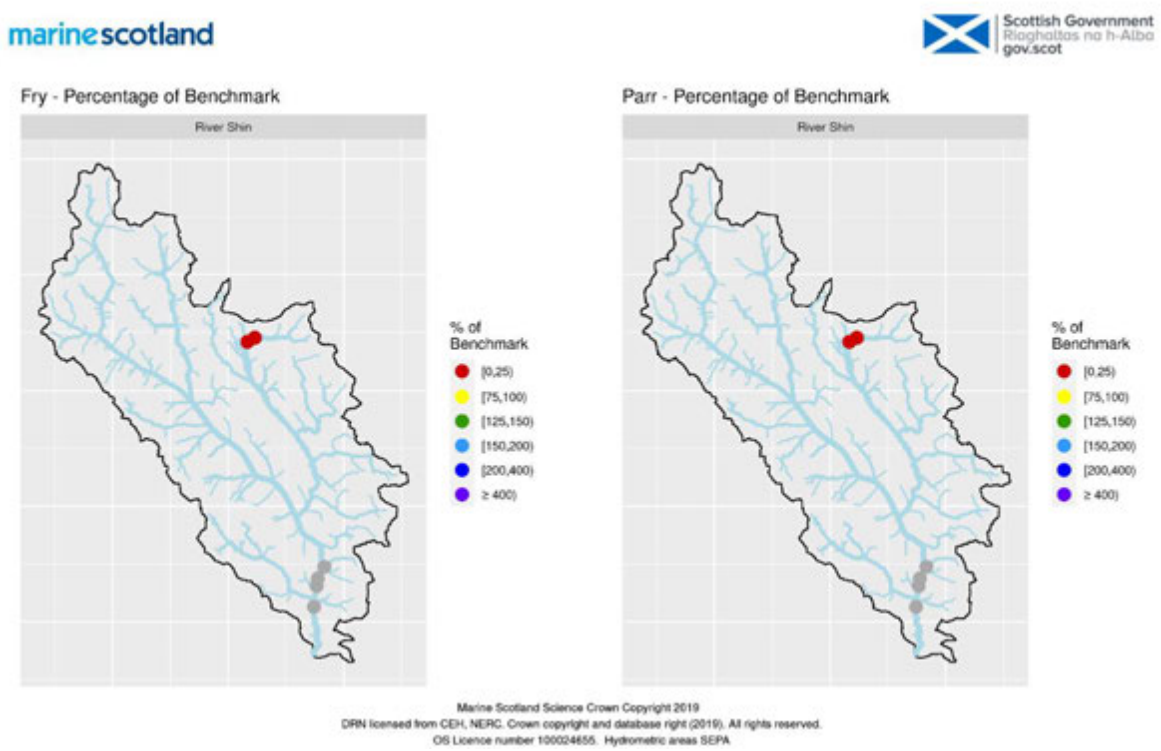
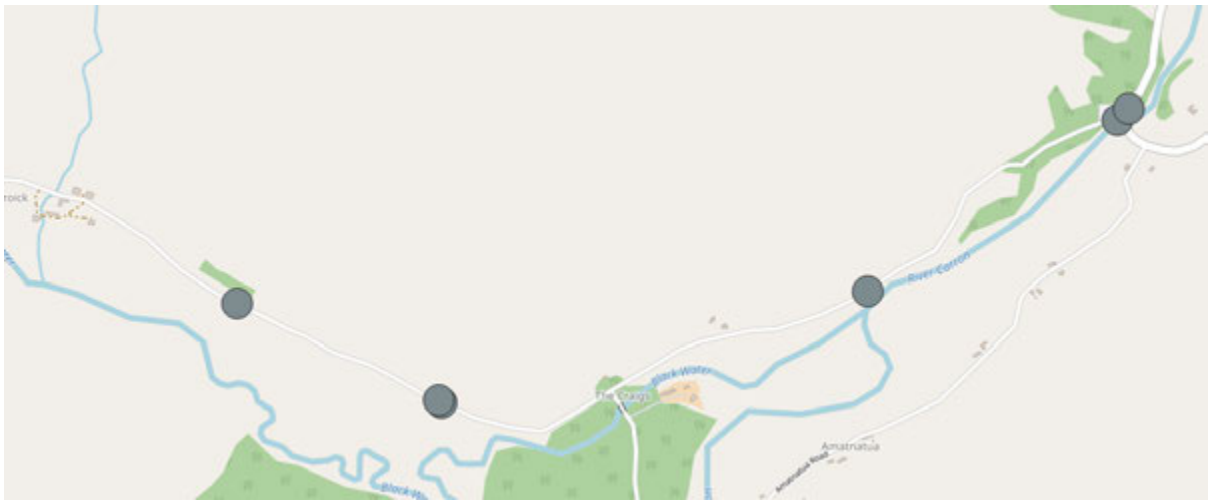


Figure 3. Fry and Parr densities in the Shin Catchment as a percentage of Marine Scotland's benchmark density.

1.15. Carron Radio Tracking

Thirteen spring salmon were tagged on the River Carron and were tracked until the spawning period. The aim of the project is to assess habitat usage in the Gleann Beag area in the upper reaches of the Carron. Adult salmon are presently able to access areas upstream of the dam at Gleann Beag but it is not presently understood how they are able to do so. This was part of a project funded by SSE with additional tags provided by Mossy Earth. The map below shows points at which an individual fish was located on the Carron and Blackwater. A full report will be made available on the website.



2 Kyle of Sutherland Fisheries Trust

2.1 Atlantic Salmon Trust Projects

2.1.1. Moray Firth Tracking Project

2021 was an ambitious year with our participation in the Moray Firth Tracking project. 100 smolts were tagged on the Shin, 100 on the Oykel, and 48 on the Cassley. Fish were implanted with acoustic tags to track their downstream migration, and to compare the results from tagging in 2019. Sean and Keith took on the role of tagging this year, as Atlantic Salmon Trust staff were largely supervising and assisting on west coast rivers. This was in addition to PIT tagging and smolt transport on the Shin, so it was a very busy time of year!

In the case of the Cassley, fish were tagged and released upstream of Duchally dam to examine smolt passage through this obstacle. Smolt passage through the fish pass at Duchally has not been examined in detail until now, and we thought it was necessary to see if there were similar problems to passage as observed on the Shin system. Initial results suggest that around 60% of smolts tagged and released upstream of the dam were detected downstream in the Kyle. This is consistent with other rivers which do not have barriers present.

In the case of the Oykel and Shin, survival was somewhat reversed from the initial tagging in 2019. Fish from the Oykel had a higher survival rate than the first year of the study, whereas the Shin fish had a lower survival rate. This could be down to a great number of variables, and Atlantic Salmon Trust staff are still working through the data. Full reports are expected to be available in 2022 after an initial stakeholder meeting.

2.1.2 Tissue Archiving

During the winter of 2020 heads from deceased kelts were collected for a pilot study led by Essex University and the Atlantic Salmon Trust. The study looks to examine stable isotopes in otoliths and tissue from eye lenses.

A total of 168 heads were obtained in the first year of the study, with around 25 being from the Kyle of Sutherland District. Other samples were from the Deveron, Conon, Spey, Ness, Frome and Burishoole. Initial analysis was undertaken on a small number of heads recovered and was able to investigate issues including differentiating between farmed and wild fish, examining river differences in diet, and individual fish movements.

A separate project with AST and the University of Stirling is looking at gut microbiota in Atlantic salmon smolts. We provided the carcasses of deceased salmon smolts from trapping operations for this project. These samples will be frozen and archived.

2.2 Biodiversity Challenge Fund Project

Funding from NatureScot was awarded to the Kyle of Sutherland Fisheries Trust in 2021 to undertake a river restoration project in the Shin Catchment. An impacted section of river has armoured gravels and habitat quality for freshwater pearl mussels and salmonid fish has degraded over time. The project aims to reintroduce gravel and large wood structures (LWS) which will improve the spawning habitat for salmonid fish and freshwater pearl mussels (FWPM). Once habitat works have been completed,

we aim to undertake artificial encystment in the improved reach to kickstart recovery of the FWPM population in that area. This project was funded by NatureScot, with donations from the River Shin proprietors and in-kind contributions from the Fisheries Trust.

Unfortunately the site design was received at the start of September, which would not have left enough time to complete the project in advance of the spawning season for salmon and trout. NatureScot have allowed for the funding to be carried over into 2022, which will allow for more time to be put into the project. Some FWPM surveys were conducted at the site to make sure that the works will not impact any existing populations.

As part of the project we aim to use aerial survey methods to monitor the success of interventions. We have used the drone to survey a reach of the river pre-intervention, and have purchased software which processes drone images and converts these into maps. Additionally, we have RTK GPS capabilities to ensure accurate maps. This technology will be incredibly useful in monitoring some of the other Trusts activities, and can be used for habitat surveying.

2.2. Riverwoods

The Trust has identified that warming rivers are one of the biggest future threats to aquatic life. This has been largely driven by projections produced by Marine Scotland Science, using data which we have collected for them for the Scottish River Temperature Monitoring Network. With an initial grant from the Fishmonger's Company, we were able to licence the data produced by Marine Scotland Science and create a layer to estimate the total area and number of trees that might be needed to cover the catchment. The Tweed Forum hosted a workshop late in the year to give fisheries managers an introduction to various funding schemes which are available at the moment, such as Forestry Grant Schemes and Carbon Credits. We anticipate that our Climate Resilience and Habitats Officer should be able to give landowners more information on these schemes. This work is being branded under the Scottish Wildlife Trusts Riverwoods project, which aims to create riparian forestry at a national scale.

This work has evolved somewhat, and a dedicated Officer is required to lead this work in the catchment. Following the success of the 2021 Auction, and with additional funding from the Fishmongers' Company and the Upper and Lower Oykel proprietor groups, we have been able to begin the process of hiring a new Climate Resilience and Habitats Officer. They will help to facilitate riparian tree planting in suitable areas and will also engage in peatland restoration – as much of the catchment is peatland and will not be ideal for riparian tree planting. Peatland restoration will improve water quality, reduce flood risk, and increase carbon sequestration, contributing to fighting the climate emergency.

The estate of the late Ian McMullen's, a keen Oykel angler, donated a legacy to the Trust in 2018. Mossy Earth, who are a new project partner on some riparian tree planting schemes, approached us with a donation of trees to plant in the riparian zone. We planted these mixed species on the main stem of the Lower and Upper Oykel, and the legacy donation was used for tree guards and equipment, which Mossy Earth also made a financial contribution to. We feel that using this legacy funding to safeguard future salmon populations is a very worthy cause, and we will refer to these planted areas as McMullen legacy groves on our maps.

2.3 Carron Temperature Network

Temperature loggers on the Carron continued to operate in 2021, collecting data from across the Carron Catchment. In the upper reaches of Glen Beag and at Glencalvie, we swapped to a new type of logger which can connect to mobile devices via Bluetooth. Although the logger still needs to be removed from the water, the advantage is that data can be obtained using any mobile phone, and a specialist device is not required. We also struggle with some of the loggers getting washed out during spates, this can lead to temperature data being corrupted. Usually this is detectable, but it adds time to the quality control of data.

2.4 eDNA

As part of a pilot project conducted by the Trust, eDNA samples were taken from 10 sites across the entire Kyle catchment (Figure 2.). The sampling kits were supplied by NatureMetrics which were then sent off to be analysed through the method of metabarcoding. The sampling technique involves

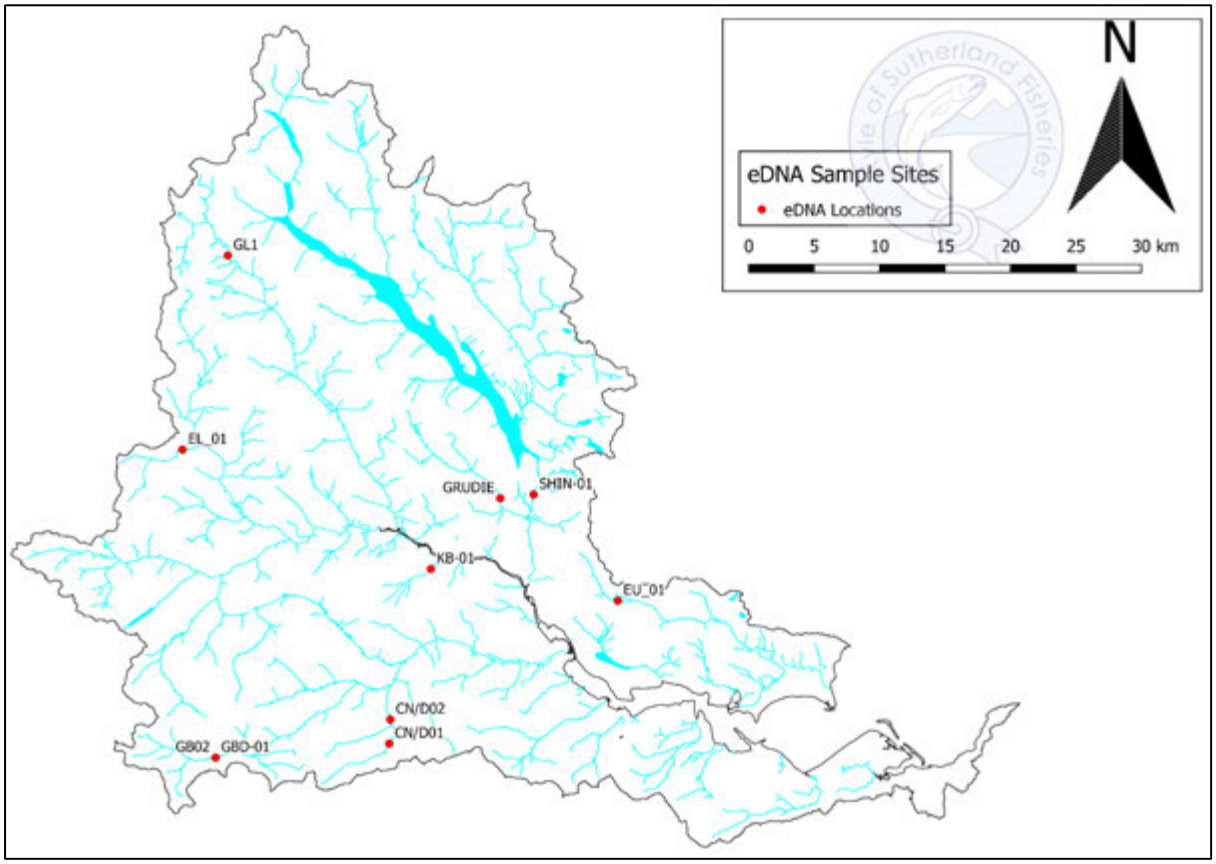


Figure 4. Locations of eDNA samples taken from across the Kyle of Sutherland District.

filtering water at the location of interest and sending the filter to a lab to be analysed to detect the DNA of species which are present at the site.

Some results were unexpected whereas other results were as anticipated. For example, no salmon DNA was found upstream of Diebidale dam, but trout DNA was found. This matches up with our electrofishing results. However, a trace amount of salmon DNA was found in the Grudie burn. This is most unexpected as salmon are unable to access the burn due to the large abstraction dam in the lower reaches of the Grudie. This may be remnant DNA from historical salmon stocking.

Although electrofishing surveys above Gleann Beag dam in 2021 found no salmon or hybrid fish, Atlantic salmon DNA was detected in water samples. Additionally, there were other fish species detected which we do not believe are within the catchment. Among these are Bleak (*Albernus albernus),* Perch (*Perca fluviatilis*) and species of carp. As these species are not known to be present within the catchment we believe that it is possible there was cross contamination with samples from elsewhere in the lab, as it is unlikely that these samples could have been contaminated during our sampling, as Trust staff would have had no contact with these species.

Figure 5. Leanne taking an eDNA sample.

However, early results from the Atlantic Salmon Trust's bird scat DNA analysis have also shown unexpected species to be present in the scat of goosanders, perch being one of them. Therefore, it could be possible that bird scat had imported Perch and Carp DNA into sites. If this was the case, then it would suggest that piscivorous birds migrate between districts more than previously thought, as scat DNA will only show what the bird has been eating in the previous 2-3 days.

2.5 National Adult Salmon Sampling Project

Marine Scotland Science secured funding for an adult salmon sampling project in the summer of 2021. This pilot scheme sought to collect accurate measurements from adult Atlantic salmon, as well as scale samples (which can be read to determine the age of fish, and from which DNA can also be extracted).

Over the past few decades it has become clear that salmon returning to Scotland's rivers are getting smaller. This is important as it is the size, and age, of female salmon that determines how many eggs they produce and therefore how many salmon may be produced in future generations. In order to better manage and protect salmon, additional information on the sizes and ages of salmon in Scotland is required. Historically this information could be obtained from netting stations, but with the moratorium on netting for salmon this is no longer possible.

A short update from MSS was given at the SFCC biologist's meeting and is now available on the FMS website. It is hoped that the project will continue in future years. Age data and high-resolution photographs of each scale will be sent to participating trusts later in 2022. Among some of the scales analysed was one from an Oykel fish which smolted as a 4 year old fish!

Figure 6. A hen fish ready for sampling.

2.6 National Electrofishing Programme for Scotland/National Introgression Programme for Scotland

In 2021 funding for Marine Scotland's National Electrofishing Programme for Scotland (NEPS) was confirmed. Due to coronavirus this project had been put on hold in 2020. Bolted onto this programme of work was the National Introgression Programme for Scotland (NIPS) which aimed to take genetic samples from all sites, not just 3-pass sites as had been done in previous years. Additionally, the upper Shin (waterbodies upstream of Lairg Dam) was treated as its own strata and an extra 15 sites were added to the project in this area. Across the Kyle of Sutherland District 45 sites were fished for NEPS & NIPS. The design differed this year in that River orders 5 were included. These had previously been excluded due to initially being thought of as unfishable, but after consultation with other fisheries biologists Marine Scotland included these in the design for 2021. This resulted in some more main stem sites being included, however the low water during the summer months made these sites fishable. The raw data from these electrofishing sites will be examined by Marine Scotland and published on their Shiny app in due course.

In 2022 we have 30 sites across the Evelix, Cassley, Oykel and Carron, and 15 sites upstream of Shin dam. The Shin panel was requested to aim to examine more the introgression issue which has recently been published. Due to the randomised GRTS design, MSS should be able to obtain an unbiased picture about salmon introgression for the whole catchment, which would be a good monitoring strategy going forward. However, the site design produced this year missed a couple of sites where introgression had previously been recorded, namely on the Merkland and Corriekinloch rivers. Therefore, we feel we will need to further refine this design for future sampling seasons.

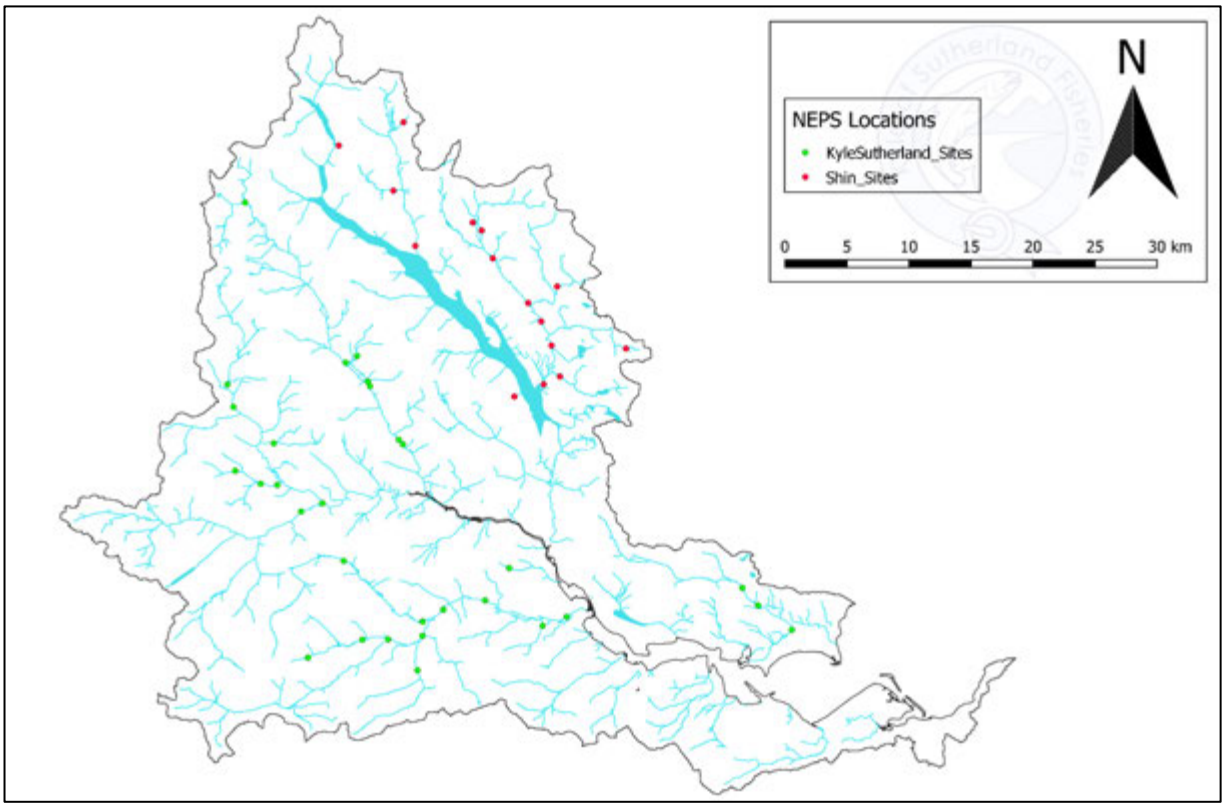


Figure 7. Locations of NEPS 2021 sites (green dots) and NIPS 2021 sites (green dots).

2.7 Online Auction – A Great Success

In 2021 the Trust held a second fundraising auction to raise money for the Kyle catchment Riverwoods Initiative. Over 50 lots were donated in a wide variety of categories, and after costs were deducted a total of £19,101 was raised! This, combined with other donations and grants, has helped to raise almost £50,000 for the first year of us leading Riverwoods in the Kyle of Sutherland. Givergy continues to be a very useful platform to host the online auction, and we feel that although there may be one or two technical glitches the overall experience is worthwhile. We would like to say a massive thank you to all our donors who donated lots to raise money for the auction.

2.8 Scottish River Temperature Monitoring Network (SRTMN)

MSS's SRTMN continues, and in 2021 the project outputs were updated. A new topic sheet and blog are available giving an overview of the tools produced by MSS. New papers have been produced describing the use of spatial statistical river temperature models to understand where rivers are hottest and most sensitive to climate change, and another on the use of process based models to identify where riparian tree planting can be most effective in reducing maximum summer river temperatures.

New mapping layers were also produced which show woodland prioritisation depending on where rivers are (1) hottest (2) most sensitive to climate change and (3) can be effectively cooled by riparian woodland. These three individual criteria are combined in a 4th layer with an equal weight to provide a single riparian woodland prioritisation score that looks to maximise the benefits of riparian tree planting for protecting Scotland's rivers from the adverse effects of climate change. We had access to an early version of this in late 2020/early 2021. The "Riverwoods" page on our website has an interactive map with this new layer, so that anyone interested can investigate the prioritisation of rivers in their area.

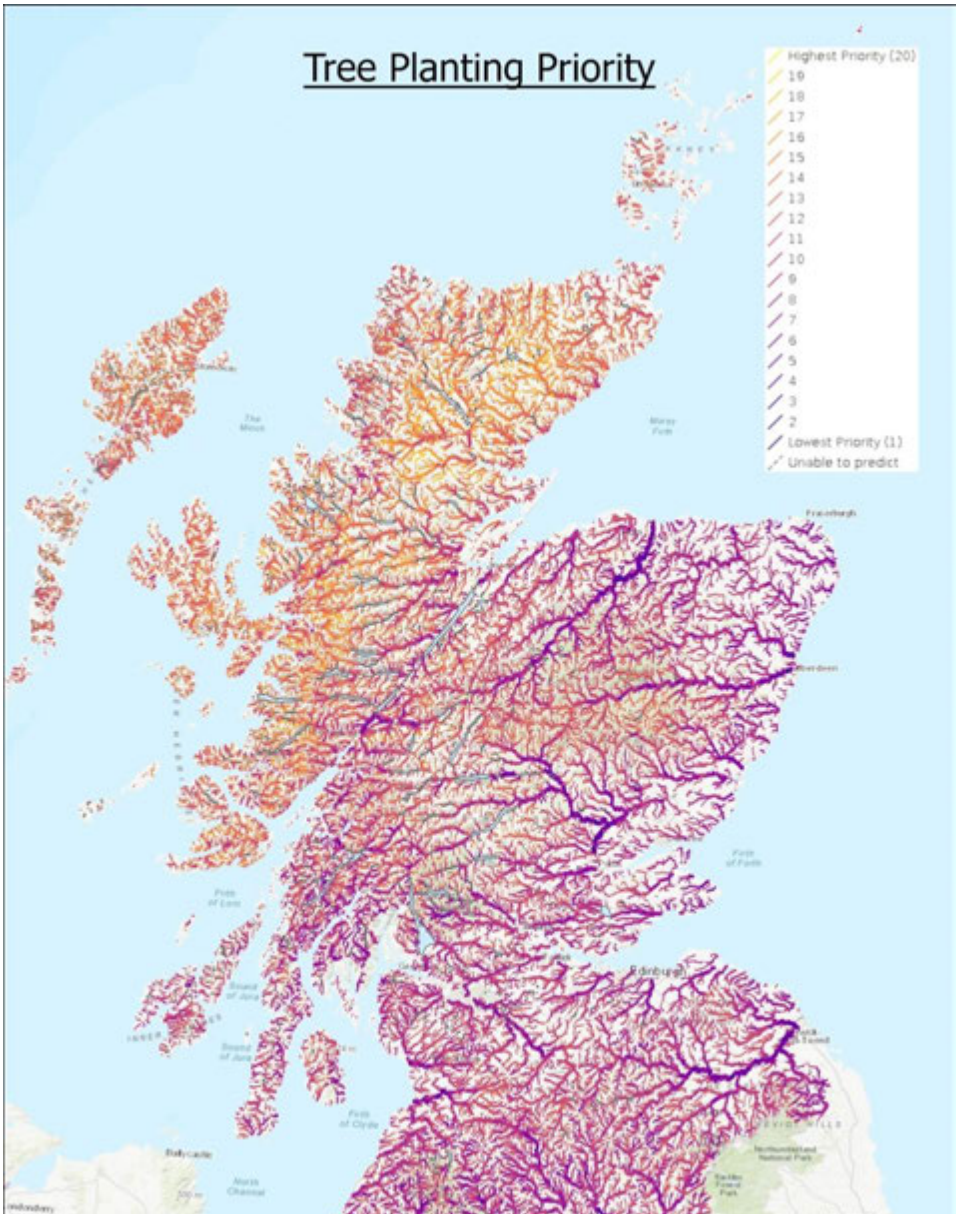


Figure 8. One of the new tree planting priority layers created by Marine Scotland as part of the SRTMN.

Kyle of Sutherland District Salmon Fishery Board – Profit & Loss

Kyle of Sutherland District Salmon Fishery Board
Profit and Loss Account - Year Ending 31st May 2021

		2021		2020
Revenue		**£**		**£**
Turnover		292,119		420,246
		292,119		420,246
Cost of sales		3,568		11,933
Gross Profit		**288,551**		408,413
Overheads				
Expenses	276,415		285,492	
	276,415		285,492	
Operating Profit /(Loss)		12,136		123,921
Bank interest receivable		121		100
(Loss) / Profit for year		**12,015**		124,021

Kyle of Sutherland District Salmon Fishery Board
Balance Sheet - Year Ending 31st May 2021

		2021	2020
		£	**£**
Fixed Assets		**42,424**	42,845
Current Assets			
Debtors	**17,017**		12,348
Bank	**258,896**		250,196
	275,913		262,544
Creditors	**24,442**		23,489
Net current assets/liabilities		**251,491**	239,055
Total assets fixed/current		**293,915**	281,900
Capital & Reserves		**293,915**	281,900

Kyle of Sutherland Fisheries Trust – Statement of financial activities

Kyle of Sutherland Fisheries Trust
Statement of Financial Activities - Year Ended 31 May 2021

Income	Unrestricted	Restricted	Total Funds Year to 31 May 2021	Total Funds Period from 1/6/19 to 31/5/20
Voluntary income	13,310		**13,310**	98,060
Fundraising	13,068	746	**13,814**	
Other	10,009	2,500	**12,509**	12,595
	36,387	3,246	**39,633**	110,655
Expenditure				
Costs of generating funds	5,412		**5,412**	38,169
Costs of other trading activities	16,873		**16,873**	
Governance	1,000		**1,000**	1,705
Other expenditure	8,341	3,426	**11,767**	35,721
	31,678	3,426	**(35,104)**	(75,595)
Net Incoming resources for the year	4,709	(180)	**4,529**	35,060
Reconciliation of funds				
Total funds brought forward	194,249	38,772	**233,021**	197,961
Total funds carried forward	198,958	38,592	**237,550**	233,021

Kyle of Sutherland Fisheries Trust
Balance Sheet - 31 May 2021

		2021 £	2020 £
Fixed Assets		**83,352**	83,611
Current Assets			
Debtors	**1,268**		4,554
Bank	**154,203**		146,056
	155,471		150,610
Creditors	**(1,273)**		(1,200)
Net current assets		**154,198**	149,410
Total assets less current liabilities		**237,550**	233,021
Funds			
Restricted Income Funds		**38,592**	38,772
Unrestricted Income Funds		**198,958**	194,249
		237,550	233,021

Thanks To

Mossy Earth