West Sutherland Fisheries Trust

Looking towards Suilven and Canisp (S. Marshall)

2024 Annual Review

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Chairman's Foreword

Simon Jeffreys

A summary of 2023

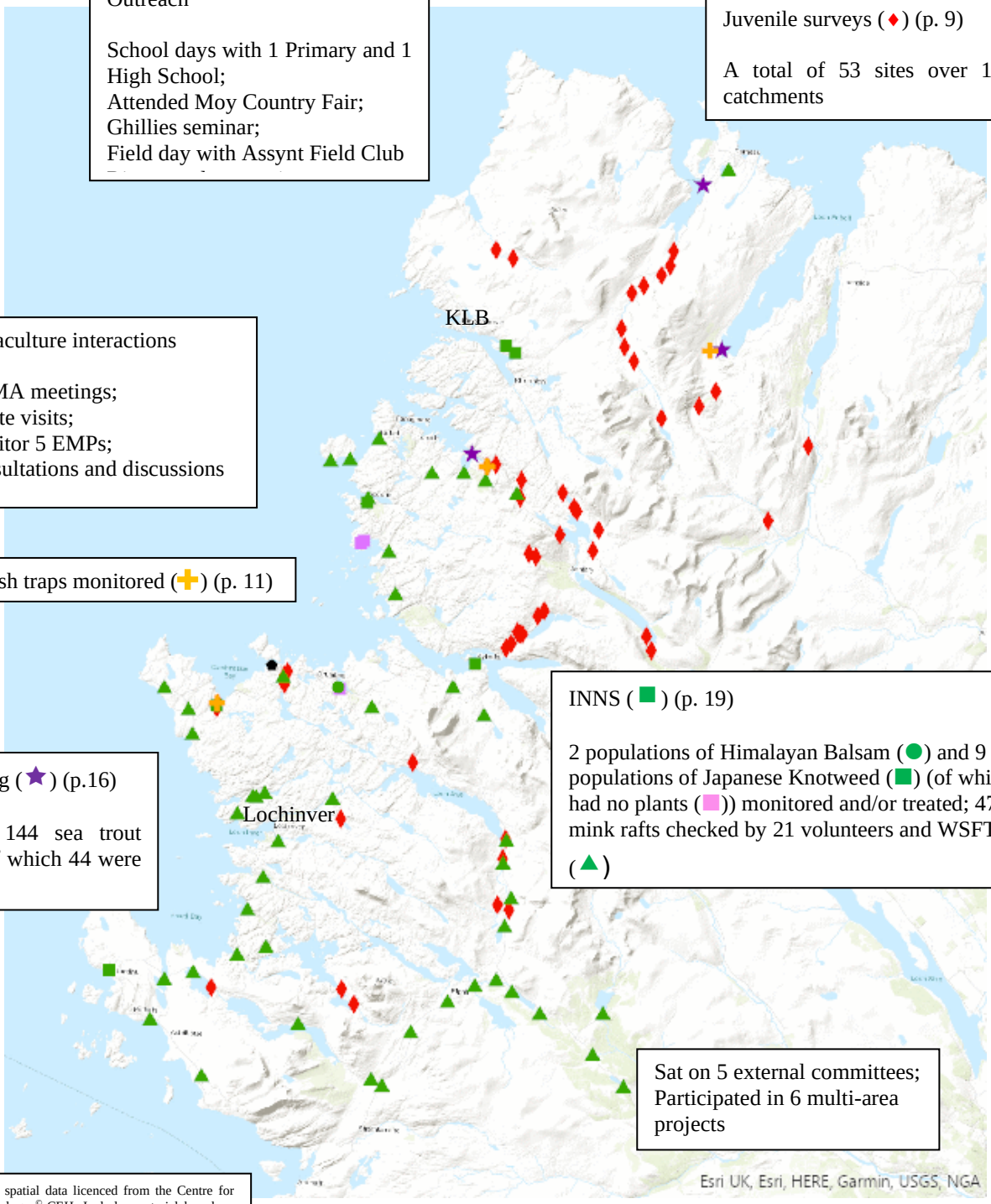
WSFT undertook a range of field work during 2023. In addition, we participated in a number of meetings and outreach events. Further details of the different projects are available in the rest of the document or from the Biologist.

Outreach

School days with 1 Primary and 1 High School;
Attended Moy Country Fair;
Ghillies seminar;
Field day with Assynt Field Club

Juvenile surveys (♦) (p. 9)

A total of 53 sites over 11 catchments



Aquaculture interactions

2 AMA meetings;
35 site visits;
Monitor 5 EMPs;
Consultations and discussions

3 Fish traps monitored (✚) (p. 11)

INNS (■) (p. 19)

2 populations of Himalayan Balsam (●) and 9 populations of Japanese Knotweed (■) (of which 3 had no plants (■)) monitored and/or treated; 47 mink rafts checked by 21 volunteers and WSFT (▲)

Sweep netting (★) (p.16)

A total of 144 sea trout examined, of which 44 were tagged

Sat on 5 external committees;
Participated in 6 multi-area projects

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Introduction

The **West Sutherland Fisheries Trust** continues to work towards the conservation and restoration of fish populations. Now entering its twenty eighth year, the information database for the Trust area continues to grow and provide useful data for owners, managers and policy makers. In addition, the Trust retains strong links with a variety of organisations and individuals throughout Scotland and looks forward to cementing these links in the coming years. These links enable the Trust to move towards the integration of management within the Trust area.

Within the Trust area we are developing projects and practical management tools with a variety of local organisations, including Angling Clubs, the Highlife Highland Ranger Service, the school system, estates and community groups. These collaborative projects not only assist the Trust with its work but also further integrate it into the local communities, while taking us into a range of different habitats. It is to be hoped that the Trust will continue to be seen as a valuable resource within the community – both to managers and the general public – providing helpful advice and educational opportunities that can be called upon at any point.

2023 saw our participation in a wide range of activities, many detailed in this report. The weather was mixed, with rain cancelling play several times, but we still managed to complete some electrofishing (see p. 9) and sweep net (see p. 16) surveys, although not as many as we would have liked.

The West Coast Tracking Project (WCTP) started in 2021. This project is managed by the Atlantic Salmon Trust (AST) and involves a number of Fisheries Trust, including WSFT. Salmon were tagged with acoustic tags from several catchments along the west coast of Scotland with the aim of examining migration routes. Within west Sutherland this included the Laxford. This project finished in 2023 with the addition of another catchment (the Polla) to the WSFT survey programme (see p. 21).

The mink initiative, now part of the Scottish Invasive Species Initiative, continues to operate under the management of the Trust and we are extremely grateful to all our volunteers for making this possible (see p. 19). We have also welcomed Greg Miller to the fold. As part of SISI we have now taken over the management of mink in Wester Ross, with Greg employed as project manager for that area. There have been several sightings reported, particularly in Wester Ross, and it is important that everyone remains vigilant. The volunteers always rally, increasing efforts following sightings and it is to their credit that we remain a relatively mink free area.

The Trust would like to take this opportunity to thank the many individuals who have given time and effort to assist with the work programme. Without these committed individuals we would not have the range of information and data currently existing and would therefore not be in the present position of offering advice and guidance to the many owners and managers within the area. In addition, much of the restoration work and biosecurity actions currently in progress would be much further behind.

Partnerships

The Trust continues to maintain a close relationship with partner organisations in Fisheries Management Scotland (FMS) and the Scottish Fisheries Co-ordination Centre (SFCC), and national organisations such as the Marine Directorate (MD), Scottish Environmental Protection Agency (SEPA) and Nature Scot (NS). This allows the Trust to access a vast wealth of expertise and information as well as enabling the targeting of research to better further our aims.

The Trust also works closely with the local District Salmon Fishery Board and estates, assisting with the management of the area. By providing advice on local issues, as well as assisting with any statutory consultations that arise, we hope to ensure that the fish and their environment are supported and protected. Amongst others, we have provided advice and guidance on stocking, fish farm applications and the Conservation Limits, as well as habitat improvements within the area.

Project Laxford, a collaborative project between Atlantic Salmon Trust and Reay Forest Estate, started in 2021 (see p. 23). This long-term project hopes to establish an index river, testing the impacts of management actions, linking to a network of similar rivers world-wide. The Trust is pleased to support this project, together with the Marine Directorate, and are looking forward to working with Chris now and in the future.

The Future

The WSFT will continue with its current work, maintaining and developing the many datasets and using the data to inform management decisions. It is hoped that we can enlarge the research programme and enhance the many links currently in existence with individuals and organisations. In order to do this, it is reliant on the generosity, both in terms of time and financial aid, of its many supporters, enabling the Trust to move forward with the development of management policies within the area.

Biosecurity remains an important issue for the Trust, in an area that remains relatively free of invasive non-native species (INNS). We hope to keep it like this, operating to decrease the numbers and potentially make the area free of Himalayan Balsam and Japanese Knotweed (see p. 19). With 2023 seeing the start of the Scottish Invasive Species Initiative 2 (SISI), a Nature Restoration Fund funded programme of work managed by NS and involving a number of Trusts throughout Scotland, this work will continue.

The Trust will continue to assist community groups and land managers with practical fisheries management and advice. It is hoped that restoration programmes, as laid out in the Catchment Management Plans, will be developed and progressed. The Trust is always available for discussion and should be contacted if you have any queries or suggestions.

We would also like to further develop the educational aspects of our remit through talks, demonstrations and small "hands on" projects. As in previous years this is likely to involve the Ranger Service and schools, although it is hoped that other groups and individuals will also access this service. Shona is a Science and Engineering Ambassador and therefore can also be accessed through the STEMpoint network. This has the potential to extend our educational remit, and information about the Trust, beyond the local area.

The emphasis will continue to be the wellbeing of native wild fish in the West Sutherland area and the Trust will represent them where required and defend their interests where it is felt that these are being ignored. The WSFT and its representatives feel that all populations are important, irrespective of size, and that their protection and enhancement are vital to the survival of these magnificent species.

Laxford Bay (M. MacKenzie)

Catches within the West Sutherland area

While catch statistics are generally used to determine the trends in salmonid populations, it must be recognised that there are a number of potential inaccuracies and inconsistencies inherent within this method. These include the following:

- The numbers of fish noted within the tables relate only to those fish recorded within the books. If anglers fail to report all or part of their catch then the figures will be an under-estimate of the total.
- Angling effort varies between years and is not recorded. A change in effort, either number of anglers, experience or time spent fishing, will be reflected in changes in the catch statistics.
- Weather and river conditions affect the number of fish within the systems and their catchability. Thus, a low catch in a dry year may not reflect a poor adult run, simply the timing of the run and the ability of the angler to catch fish.

This leads to the view that the relationship between catches and stocks is complex. Catch records do not reflect the number or quality of fish in the system, but rather the angler ability to catch them under the conditions experienced at that time. Catch figures are therefore most valuable when it comes to expressing long-term trends.

2022

The official catch statistics for salmon and sea trout in Scotland have been published (https://data.marine.gov.scot/dataset/salmon-and-sea-trout-fishery-statistics-1952-2022-season-reported-catch-district-and-method) and the data for the West Sutherland area are summarised below (Table 1). These statistics are frequently used to indicate long term trends in populations, by region. By extracting the data relevant to the WSFT area, we can gain a greater understanding of the situation, as represented within this area. The data are given as an amalgamation of several rivers, as previously reported by Marine Directorate (Fig. 1). This is the result of a requirement to mask the catches from individual systems in order to retain the confidential nature of the data.

Table 1 The number of wild fish caught by rod and line, by Fishery district

Fishery Board		Salmon & Grilse	Sea Trout
Hope & Grudie	2022	361	998
	(2021)	(163)	(907)
	5 yr. ave.	*235.2*	*924.8*
Inchard – Kirkaig	2022	409	258
	(2021)	(230)	(218)
	5 yr. ave.	*296.6*	*253.8*

Fig. 1 Map showing the location of the WSFT area and the 2 areas described in the table (pale grey = Hope & Grudie; darker grey = Inchard – Kirkaig)

Total salmon catches within the area showed an increase from the 2021 catches. While this increase is significant, the catches remain low when examined against the long-term trend, with the 14th lowest value since 1952 (Fig. 2). Catches across the area were greater than the 5-year average.

The release rate within the area was slightly lower than in 2021, at 98.3%, but still encouraging. There was 100% release from the Hope & Grudie area, while 97% were released in the southern area. This high release rate is welcomed and hopefully will continue in the future. While it is known that released fish can be re-captured on several occasions, thus influencing the suitability of catch returns to estimate adult runs, it is important at this time of low marine survival to release fish in order to increase the spawning stock. Remember, the fish in the freezer or on the table cannot breed!

Sea trout catches within the area also showed an increase compared to 2021 (Table 1), although smaller in proportion than that observed for the salmon. As with the salmon, no sea trout were retained in the

Hope & Grudie area, while a total of 3 fish (1%) were retained in the Inchard – Kirkaig area. There was an overall total of 99.8% of sea trout released.

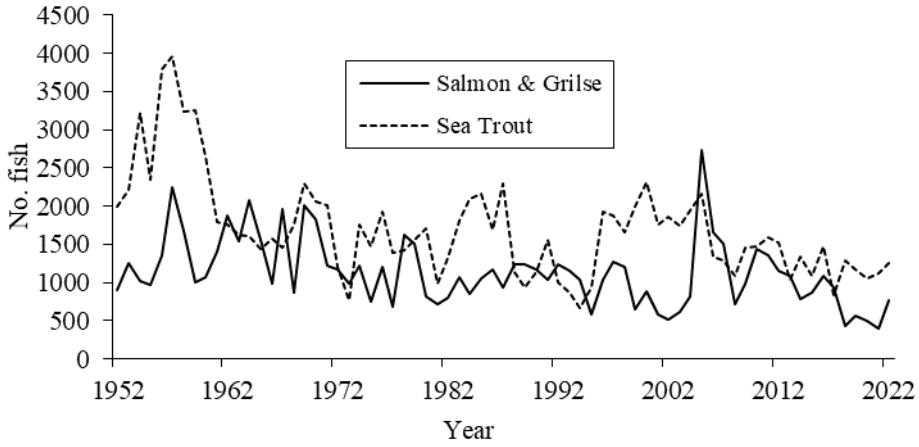


Fig. 2 Rod and line catches within the West Sutherland area, 1952 – 2022

2023

Catch data for the 2023 season are being compiled and will be produced by the Marine Directorate in 2024. However, some information is available from angler logs and fishing books. Reports indicate that, while there were good numbers of fish present in July following the rains, this declined later in the season. However, the fish that were caught were in good condition and of a good size.

Catch and release continues to be an important fisheries management technique within the area and has been adopted by a number of estates. It is to be hoped that this continues to be used, and hopefully retained, by the various estates and their angling clients, adding as it does to efforts throughout the area to improve the situation for fish populations through biosecurity, removal of non-native species and habitat improvements amongst others.

The new conservation limits for the area have been produced, with only Laxford and Glendhu moving category from 3 to 2 (see p. 24). The model has not been altered since 2020, so movement should reflect alterations in catches and a better understanding of the underlying figures within the model. While sea trout are not affected by this legislation, the continuing low levels of catches would suggest that catch and release is of equal importance to this species.

2023 was a year where pink salmon were expected to be entering the rivers. Only one rod caught fish was reported for the area, although there were a further 4 sightings noted. This is lower than that reported in 2021.

All information on the fish populations within lochs and rivers is important when undertaking fisheries management. Any further information that can be provided will be gratefully received, particularly on the brown trout lochs within the area.

Releasing a salmon (K. Dunbar)

A survey of juvenile abundance

Electrofishing surveys are designed to assess the juvenile populations within a system. The equipment operates by creating an electrical field within the water that at first attracts and subsequently stuns them for a brief period, at which point the fish can be netted out and examined under anaesthetic. During 2023 West Sutherland Fisheries Trust again participated in the National Electrofishing Programme for Scotland (NEPS) under contract from the Marine Directorate. This project aims to gather data on salmon populations throughout Scotland and will be trialled for potential use in determining conservation limits for salmon.

The average densities of fish within each catchment are summarised (Table 2). 'NEPS additional sites' is an amalgamation of catchments where there are only 1 or 2 sites surveyed – Hope, Polla, Sandwood, Polly, and Garvie. This allows comparison between the catchments, although it should be noted that temporal changes in density throughout the summer months and habitat differences between catchments are not considered in this table. The timing of sampling is important, with fish moving within the tributaries as a result of water height and temperature, food availability and size. Thus, sampling after a spate may give a low density due to washout, whilst drought may decrease density as fish move into deeper water to avoid predation or desiccation or may increase density as a result of concentration in severe cases. Similarly, densities will be greater shortly after hatching, reducing with time as the fish grow and require a larger territory for survival.

Table 2: Average densities of salmonids per catchment surveyed

	Number of fish per 100m^2			
	Salmon Fry	**Salmon Parr**	**Trout Fry**	**Trout Parr**
Dionard	15.06	7.86	6.56	4.32
Laxford	17.50	8.95	16.94	7.46
Maldie	0.00	0.00	25.08	16.15
Clashnessie	0.00	0.00	10.58	15.42
Oldany	0.00	2.23	15.02	2.72
Inver	27.08	17.37	3.46	4.79
Other NEPS Sites	15.21	4.44	3.62	2.10
West Sutherland Average	**10.69**	**5.84**	**11.61**	**7.56**

There is a good distribution of salmonid species throughout the West Sutherland area with trout present in every system surveyed. Salmon were present in most catchments and would not be expected in the Maldie as a result of natural barriers downstream of the survey area. In addition, Clashnessie is not known as a migratory system, although the occasional salmon has been found indicating that the sand barrier at the mouth can be accessed under specific circumstances. The area average trout densities are greater than salmon densities.

An assessment of all sites surveyed against the SFCC regional classification demonstrates that 50% of all sites were classed as having moderate to excellent salmon fry densities, with salmon parr densities classed as moderate to excellent within 53% of all sites. Trout fry densities were classed as moderate to excellent in 53% of all sites, with 58% of sites containing moderate to excellent trout parr densities.

Discussion

Catchments surveyed during 2023 included 2 trout dominated systems, of which 1 is inaccessible to migratory salmonids. However, the majority are fully accessible and show a good mix of species which would suggest that the area average is a good reflection of the situation within West Sutherland and not dominated by catchment selection. This indicates that trout have the greatest fry densities within the survey, and the greatest overall densities, with trout parr also more numerous than salmon parr. This reflects the sites surveyed and the fact that resident trout will result in a greater age range within the systems and therefore more parr.

Whilst instream habitat characteristics within the West Sutherland area are generally favourable for salmonids, strategic planting of mixed broadleaf trees within riparian zones and the addition of large woody debris to instream areas would undoubtedly improve fish cover, food availability, and bankside

stability. With only around 50% of the sites showing moderate to excellent fish densities for both species and stages, improvements in habitat quality and therefore fish density, would be welcome.

The widespread occurrence of eels throughout the area is encouraging, particularly considering the endangered status of the species. It was especially encouraging to find individuals above the waterfalls in the Maldie, and above the sluice in Loch Assynt. While numbers were not high at most sites, the species was not being targeted and this is likely to have influenced these results. The spread of minnows within the area, in contrast, is of some concern and largely reflects angler practice. Introduced historically as live bait, their spread partly reflects the accessibility of the sites, i.e. proximity to roads, and their relatively high reproductive rate. Where present they can out-compete salmonids, thus impacting on their population.

While undertaking these surveys we also encounter other species within the sites. Trout can be seen to be present in most sites surveyed, present in all sites in the Clashnessie, Maldie and Oldany catchments (Fig. 3). Salmon, in contrast, were only present at all sites in the Dionard. Eels were present in all catchments, but not in all sites, indicating some variability in distribution. Minnows were also widespread throughout the area, but only present in less than 45% of sites in any one catchment. This is likely to reflect the location of the sites and the fact that the minnow is an introduced species and more likely to be patchily distributed. Stickleback were not recorded in any catchments this year.

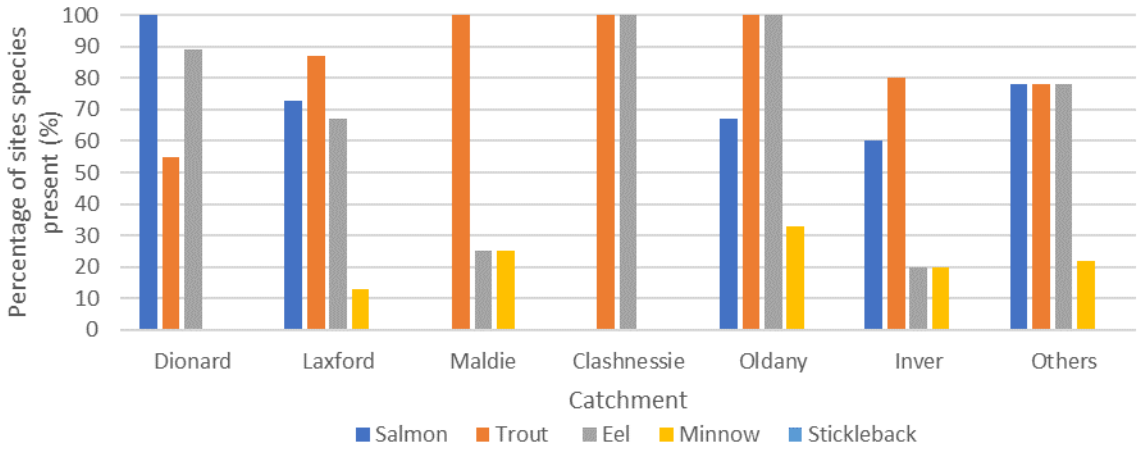


Fig. 3 Species composition and distribution per catchment

Electrofishing site (S. Marshall)

Smolt Traps

Counting the number of smolts leaving the river is a good way of determining the composition and health of the salmon and sea trout populations. Additional information can also be gained on the timing of the run and changes in the size composition.

During 2023 we operated 3 smolt traps within the area. While they were used for different purposes, all gave important information on the fish populations within the catchments.

1 Laxford

A rotary screw trap was operated in the River Laxford from 3.4.23 to 28.4.23. A temperature recorder was placed in the trap, set to record hourly while the trap was installed. The RST operated each day with the exception of 21.4.23 and 23.4.23 when it was raised as there was no one available to check it. All fish captured were removed and the species recorded. In addition, 125 salmon and 50 sea trout kelts were acoustically tagged. The salmon formed part of the West Coast tracking project (see p. 21) while the sea trout were tagged to examine the trout usage of Loch Laxford (see p. 13) as part of Project Laxford (see p. 23).

Sea trout kelts dominated the catches at the start of the sampling period, with salmon dominating the catch for the remainder of the survey period (Fig. 4). Few brown trout were seen. The trap was removed following the completion of the tagging but before the smolt run ended.

The water temperature was relatively stable over the survey period, with a slight increase to the middle before declining again (Fig. 4). Salmonids require a temperature of about 7°C before starting to move, and this temperature was exceeded at most points over this period.

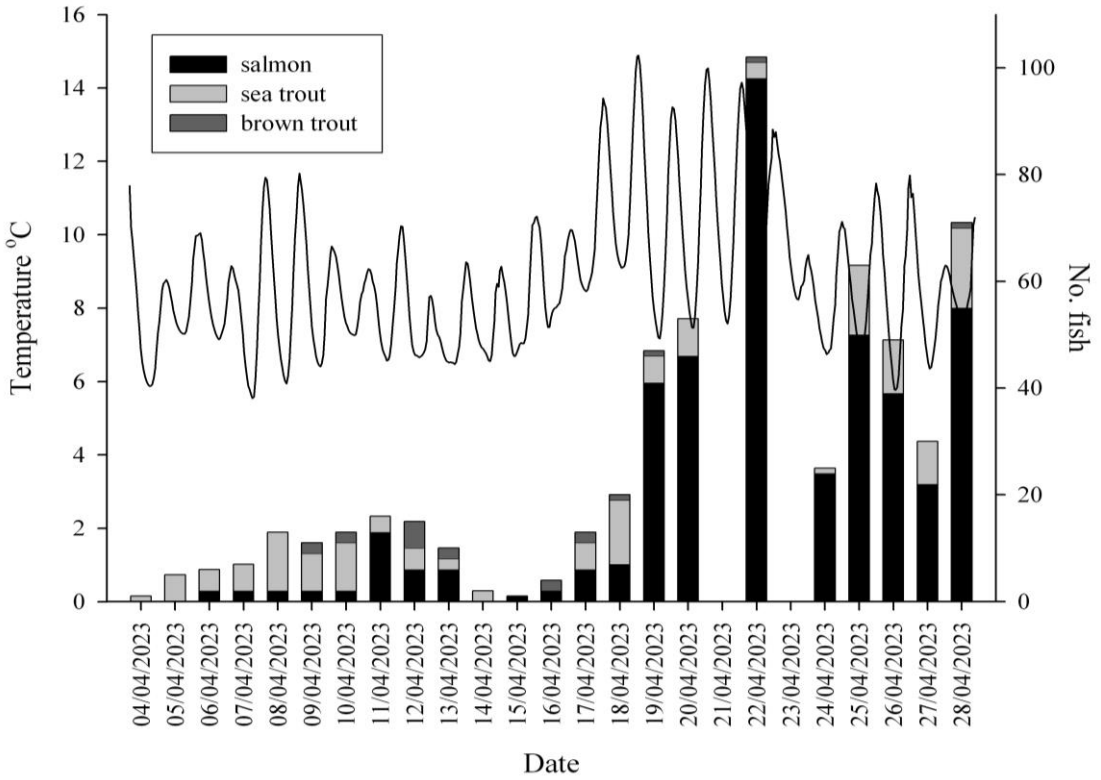


Fig. 4 Showing the temperature regime within the river (line) and no. of fish caught on each day (bar)

2 Polla

A fyke net was operated daily in the River Polla from 17.4.23 to 8.5.23. A temperature recorder was placed in the trap, set to record hourly while the trap was installed. All fish captured were removed, measured and the species recorded. In addition, 3 salmon were acoustically tagged as part of the West Coast Tracking Project (see p. 21).

The water temperature started warm, before declining for a week and then increasing again (Fig. 5). Salmonids require a temperature of about 7ºC before starting to move, and the decline in temperature took it to below this level. In addition to a variable temperature, while the trap was in place there was only one notable rain event which caused the river to rise briefly. For the remainder of the time the river remained exceptionally low.

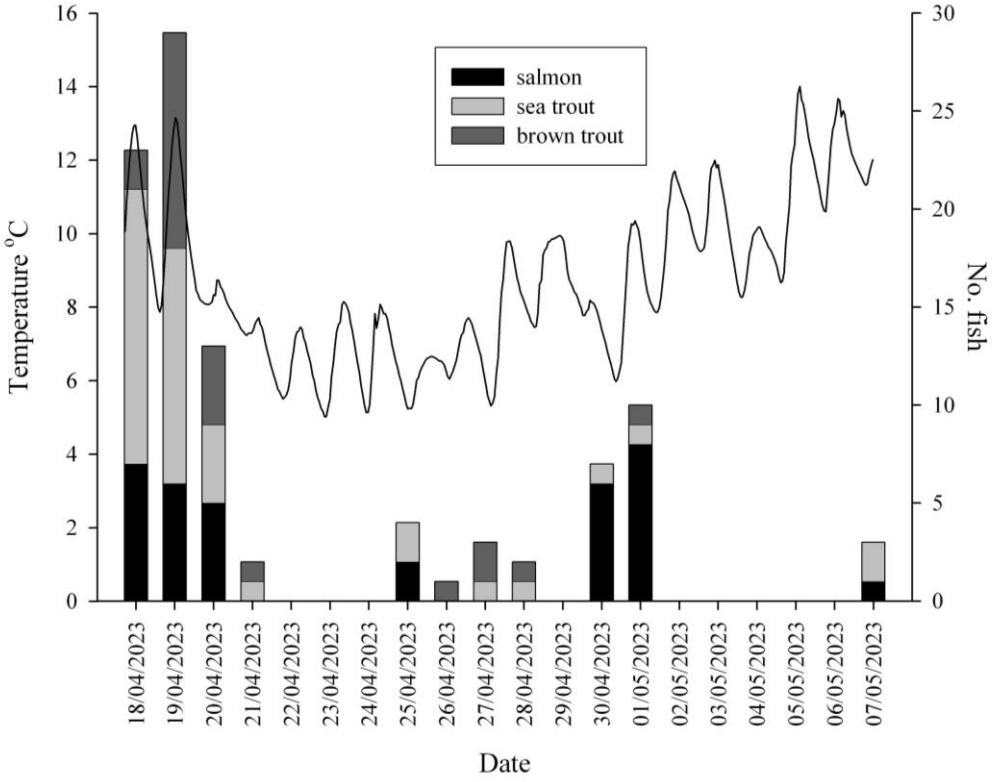


Fig. 5 Showing the temperature regime within the river (line) and no. of fish caught on each day (bar)

3 Clashnessie

A mobile smolt trap was operated in the Clashnessie Burn from 16.4.23 to 30.5.23. The purpose of this trap was to determine the size and nature of the smolt run from this burn, and was operated in conjunction with Loch Duart Ltd.

While operating, a small number of fish were taken within the trap (Fig. 6). Over this period there were 2 sea trout smolts seen. This would suggest that there is no regular migratory salmonid population within the Clashnessie burn and confirms the anecdotal information for the system.

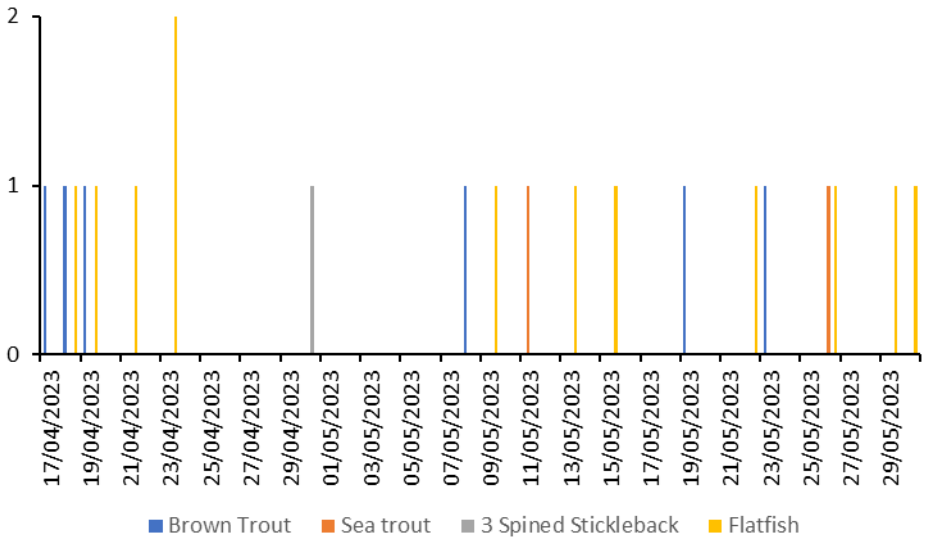
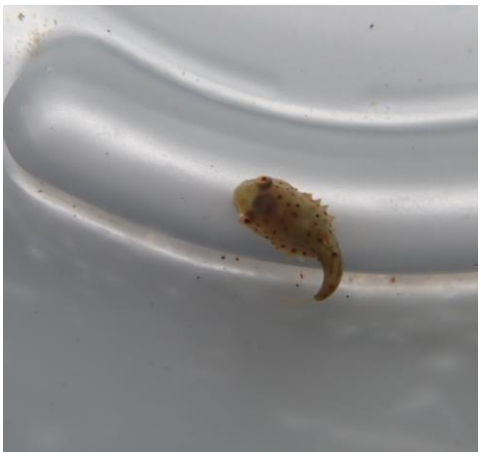


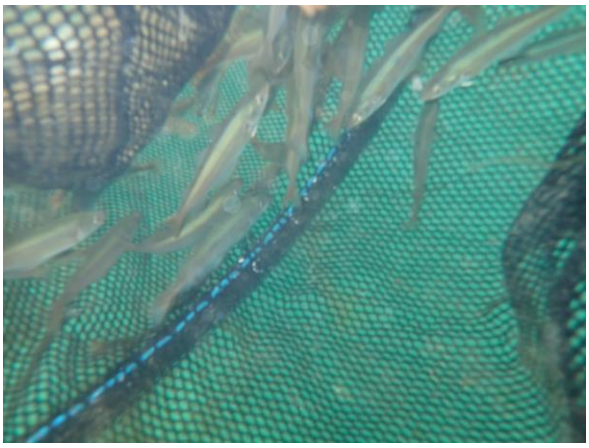
Fig. 6 Fish captures by species and date

The fyke net in position (S. Marshall)



Lumpsucker (M. MacKenzie)

Electrofishing processing (L. Richardson)



Gadoids in the fyke (S. Marshall)

Barrel jellyfish (S. Marshall)

Sweep netting the Laxford (Loch Duart Salmon)

Water beetle (A. Barnes)

The full range of trout (M. MacKenzie)

Stonefly (D. Haines)

Eel in bucket (M. MacKenzie)

Invasives corner… (S. Marshall)

Salmon and trout (D. Haines)

'Toothless' (S. Marshall)

Monitoring of sea trout post-smolts

Introduction

Started in 1997, this project was originally designed to give an indication of the migrations and growth of sea trout within the area. In addition to these data, the numbers of sea lice were also assessed. This has now progressed, such that sea lice counts are the most important part of the project.

Materials & Methods

Two estuaries, Laxford Bay and the Polla estuary were sampled monthly where possible from April to September, at low tide. A total of 144 fish were individually measured and scale samples taken. The fish were also examined for the presence of sea lice, which were counted and staged, and visually examined for gill condition.

Results and Discussion

The fish caught were of varied age and length, reflecting a mixed population structure. The age structure in the estuaries was similar, with a predominant smolt age of 2 years (S2), although there were several S3's also present. In addition, an S1 was observed in both the Polla and Laxford. The length distribution of fish within the estuaries was similar. While post-smolts dominated both estuaries there were several mature fish seen, with the greatest number in the Polla.

The presence of post-smolts at all sites throughout the year indicates a heavy usage of estuaries by this group, presumably for feeding and shelter.

Recaptures

There were 2 recaptures during 2023, both within the Laxford estuary and tagged in 2021. All fish were tagged and re-captured in the same location. This pattern is common to the sampling programme over the past 26 years and demonstrates that the majority of sea trout do not stray far from their home rivers.

Sea Lice Infestations

Sea lice were present to a varying degree in both the Polla and Laxford populations throughout the year, with the exception of the Laxford in April. Both estuaries showed a mixture of lice stages. The highest numbers were seen in the Polla during May. However, the total lice number per sample is dependent on sample size and the use of abundance and intensity data give a better assessment of the situation.

Laxford

Lice were present throughout the year, with the exception of April. Abundance increased to June, before dropping significantly in August. The intensity was greatest in May, while the median value was greater in June. This indicates that the fish with lice had greater numbers in May compared to June but that more fish captured in June had lice. *Caligus* were present in May and June on a small number of fish.

The neighbouring cages were fallowed in June 2023. *Lepeophtheirus* numbers were below 0.5 adult females per fish for the 6 weeks prior to fallow. However, *Caligus* were present throughout.

Polla

Lice were present throughout the year, with abundance decreasing from a high in May. *Caligus* were only present in May.

Within the neighbouring cages, Sian was harvested out in May, while Kempie remained fallow throughout the year. *Lepeophtheirus* numbers were below 0.5 adult females per fish before harvest following treatment in early April.

Gill condition

Gill disease, primarily Amoebic Gill Disease (AGD) and Proliferative Gill Disease (PGD), are becoming increasingly problematic within the aquaculture industry. While not seen as a particular concern within wild fish populations, there is a need for more information. As part of this the decision was taken to visually assess the sea trout gills during this survey.

While both AGD and PGD were identified in both estuaries, this was in a small number of fish. Within the Polla AGD was identified in 4 fish, while PGD was present in 3. Within the Laxford, 6 fish were identified with AGD and 1 with PGD. In all cases, bar 2, the levels were low. In two instances within the Polla the PGD damage to the gills was pronounced.

In addition to the visual checks, Loch Duart undertook gill swabs on 2 of the larger fish from the Laxford in May, checking for *Paramoeba perurans*, *Deszmozoon lepeophtherii* and *Branchiomonas*. Only 2 fish were swabbed due to the size of the other fish. Within these fish only *Branchiomonas* was found, present within both fish. Loch Duart have anecdotal evidence that *Branchiomonas* has a link with AGD infections. It is intracellular so the fish have some level of control of the infection through an immune response and therefore it can be an interesting indicator of the immune health of the fish. However, the level found here would not be considered a problem in a healthy fish (B. Osborne, *pers. comm.*).

A risk assessment of the lice numbers present within the wild trout

Taranger, *et al.* (2014) gives a method to assess the increased mortality risk to salmonid populations based on the number of lice present per gram of fish. This is based on physiological effects determined from laboratory experiments taken from literature, and the use of sentinel cages within fjords.

The data are treated differently depending on fish size and give a potential increased risk of mortality to each fish, with increasing risk as the number of lice increase. In order to determine the likely population effect, the proportion of fish within the population appearing in each band is calculated and a population risk determined. Fig. 7 gives the results by year for each estuary, with the banding indicating whether the risk is low (green), moderate (yellow) or high (red). Within the green zone it can be taken that there is minimal risk to the population, while the yellow and red zones show potentially population altering impacts.

From this, the potential risk in the Laxford for 2023 is low at 7.40% increased risk of mortality. In contrast, the Polla has a high increased risk of mortality at 38.71%. The data do, however, continue to show a biannual pattern in risk, reflecting the stage of production within the farm.

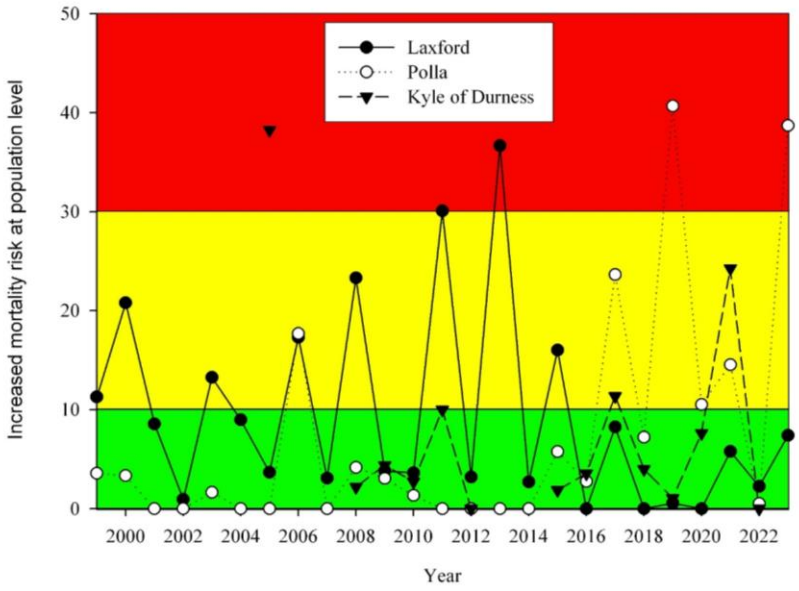


Fig. 7 Showing the increased mortality risk at population level created by sea lice

The full report can be downloaded from the website or obtained by contacting the Biologist. Videos of the sweep netting process are available on Youtube (https://www.youtube.com/user/WSFTrust).

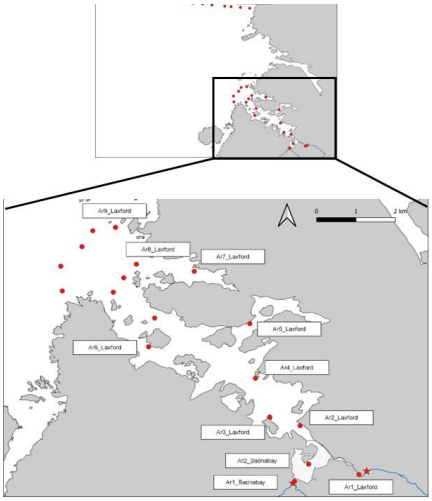
Sea Trout Migrations

Since 2021, while undertaking the West Coast Tracking Project (see p.21) we also tagged a mix of sea trout smolts and adults for Project Laxford (see p. 23). The aim of this was to assess the usage of the sea loch by sea trout, and build on the findings of a similar project carried out by the University of Glasgow in 2018 (https://wsft.org.uk/images/pdf/Laxford_sea_trout_tracking.pdf). The data were analysed by J. Rodgers, AST.

2022

Preliminary results from 2022 have demonstrated that both smolts and adults used all areas of the sea loch, with a high proportion of both leaving the sea loch for coastal waters, although more smolts than adults stayed within the sea loch (62% *cf*. 80%). Sea trout would appear to be highly mobile within the mid-loch, Chadh-Fi and Loch Dùghaill areas, with greatest number of detections but not greatest average residency time.

When leaving the estuary adults spent 3 times longer than smolts, on average, outside the sea loch. A proportion of both smolts and adults did not return to the sea loch during the study period.



Location of acoustic receivers. Red stars are where sea trout were tagged. Red dots are acoustic receivers.

The results of the 2022 survey show a different pattern of migratory behaviour than that observed previously. In 2018 and 2021, sea trout smolts were found to show a preference for the estuary and inner arrays, compared to 2022 where sea trout smolts were detected throughout the study system and a high number of movements between arrays detected. The highest number of detections were within the mid-loch and Loch a' Chadh-fi (60% of all detections were within these areas).

In addition, in 2018 only 5% of sea trout migrated out of the sea loch into open coastal waters and in 2021 this was 9%. Whereas, in 2022, 62% of tagged sea trout smolts were detected in coastal waters. The reason for this difference is unknown but adds yet more intrigue to the sea trout story!

2023

During 2023 50 sea trout kelts were tagged within the River Laxford. Using larger tags, these last up to 1 year and can therefore track the fish as they move through the estuary and back into freshwater for spawning. In addition, 80% also recorded temperature and depth data. Receivers were placed throughout the catchment as well as within Laxford Bay. Results will be available later in the year.

Released sea trout (S. Marshall)

Biosecurity Management

The Trust are partners in the Scottish Invasive Species Initiative (SISI), a partnership project covering an area of over 29,500 km^2 and involving 10 fisheries trusts and boards. Phase 1 of the project, funded by the Heritage Lottery Fund and Nature Scot, is now finished but during 2023 grant funding from the Nature Restoration Fund was secured to extend the project and keep up the good work of INNS eradication. Full details of the project can be found at https://www.invasivespecies.scot/.

Awareness Raising

Most awareness raising of Biosecurity was undertaken through social media, although we also gave a talk at the Ghillies Seminar, raised the matter at the District Salmon Fishery Board meeting and promoted it at the Moy Country Fair. Biosecurity includes the use of the simple 'Check, Clean, Dry' method by anglers, walkers and other water users, something that everyone can practice.

Biosecurity is an important issue within Sutherland as there are few non-native species compared to many other areas within the UK. This can make people blasé to the risks posed and the need for care and vigilance. It is important to prevent the spread of non-native species into the area and it is incumbent on all residents and water users to play their part. Gardens, ponds, fishing tackle and water sports equipment are all routes of infection and ones that should be easy to block if care is taken.

American Mink

A network of rafts and tunnels within the Trust area are monitored by volunteers and Trust staff. During 2023, as part of Phase 2, this has been expanded into Wester Ross with the help of Greg Miller. This will hopefully act as a buffer to west Sutherland. There have been a few sightings reported, with several individuals dispatched in Wester Ross – encouraging given the newness of the network.

WSFT is extremely grateful to all our volunteers for their assistance with this project. Without the time and commitment donated by these individuals we would be less able to protect this area against this invasive species. If you would be able to look after a mink raft, then please contact the Biologist and we'll get you set up. Any mink sightings, or potential sightings, should be reported to the Biologist. This information will then be passed on to the relevant volunteers.

In addition to the mink rafts, WSFT have been using trail cameras to monitor for mink. With camera's covering 2 systems we have thankfully not seen any mink, although have a surfeit of deer and sheep. This provides another means of monitoring in an area with a small human population and could be rolled out in other areas.

Himalayan Balsam, Skunk cabbage and Giant rhubarb

2023 saw the Biologists once again descend on Nedd and Clashnessie to remove any Balsam plants found within the catchments. It is encouraging to see that Nedd remains relatively clear of the plants in the wider area around the 'starter' population. However there appeared to be a large eruption of the plant in parts of Clashnessie. While the starter population remains present then this is likely to keep recurring but is disappointing. This area has been treated since 2010 and it has been good to see the population declining.

Very little treatment of American skunk cabbage was undertaken during 2023, although flowers were removed from some plants and a variety of treatments were trialled within the main population.

Giant rhubarb, *Gunnera manicata*, has been added to the SISI plant list for Phase 2 and Morven could be seen cutting and treating plants around Clashnessie. By using different treatment methods it is hoped to find out the most effective strategy.

Plans for 2024

We will continue to push the issue of biosecurity and the need for everyone to play their part in the prevention of the spread of non-native species. At the same time, we will be monitoring the area for the presence of non-native species and would welcome reports from members of the public.

The mink monitoring network is an important part of the INNS work, and the Trust and our team of volunteers will continue to monitor rafts and respond to sightings. The Trust is a contact point for any

new sightings or the collection of carcasses and is happy to respond to any calls. Carcasses will be examined, and the data provided to Aberdeen University.

With the help of Greg, we will continue to extend the mink network within Wester Ross, an integral part of the SISI programme. Volunteer assistance with all of the INNS work would be gratefully received. If you feel that you could help, then please contact the Biologist.

The Check, Clean and Dry Campaign

Principles

- Non-native species could be spread in any water or material. If you are visiting a water body there is a real risk that you could spread harmful organisms unless you follow good biosecurity practice.
- Biosecurity means taking steps to make sure that good hygiene practices are in place to reduce and minimise the risk of spreading invasive non-native species. A good biosecurity routine is always essential, even if invasive non-native species are not always apparent.

Check, Clean, Dry disinfection procedure

- **Check** - All clothing and equipment should be thoroughly inspected and any visible debris (mud, plant or animal matter) should be removed and left at the water body where it was found. Particular attention must be paid to the seams and seals of boots and waders. Any pockets of pooled water should be emptied.
- **Clean** - Equipment should be hosed down or pressure-washed on site. If facilities are not available equipment should be carefully contained, e.g. in plastic bags, until they can be found. Washings should be left at the water body where the equipment was used, or contained and not allowed to enter any other watercourse or drainage system (i.e. do not put them down the drain or sink). Where possible, clean equipment should be dipped in disinfectant solution (e.g. Virkon) to kill diseases, but note this is unlikely to kill non-native species.
- **Dry** - Thoroughly drying is the best method for disinfecting clothing and equipment. Boots and nets should be hung-up to dry. Equipment should be thoroughly dry for 48 hours before it is used elsewhere. Some non-native species can survive for as many as 15 days in damp conditions and up to 2 days in dry conditions, so the drying process must be thorough.

Further details from: https://secure.fera.defra.gov.uk/nonnativespecies/checkcleandry/

Gunnera in situ (M. MacKenzie)

West Coast Salmon Tracking Project

As anadromous fish, salmon have both a freshwater and a marine part to their life cycle. Relatively speaking, freshwater areas are straightforward to monitor, and much is known about this part of the life cycle. The difficulties come in looking at the marine phase – where salmon are more widespread and the monitoring area significantly larger. Having left the freshwater, the fish migrate through the estuary and coastal waters, heading for their feeding grounds in the Norwegian Sea and around Greenland. This project aims to determine their migration routes through the estuaries and within coastal waters.

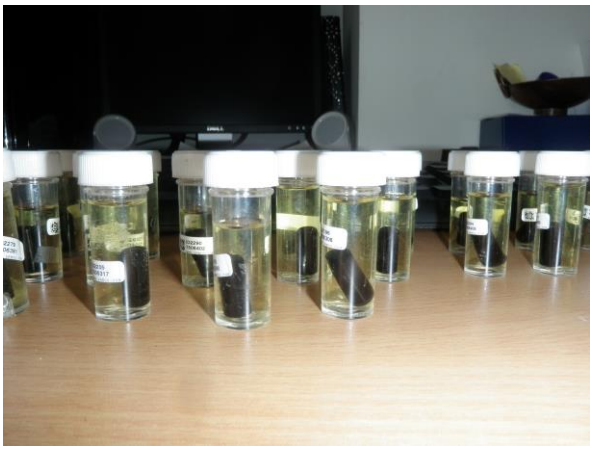
Started in 2021 and running over 3-years, the project is managed and coordinated by the Atlantic Salmon Trust in partnership with FMS and the Marine Directorate (MD). It is being delivered by partners from the Trust and Board network from Galloway to Sutherland. The data collected will ground truth the smolt migration model being developed by MD. Full details of the project can be found at https://atlanticsalmontrust.org/our-work/west-coast-tracking-project/.

This project is starting to indicate migratory patterns and preferences, including how individual smolts move through sea lochs and their speed of travel. This is of particular importance with regards to the new regulatory framework being proposed for the aquaculture industry, with the 'residence time' forming a major part of the analysis of sea lice impacts. Once out of the sea lochs and into the wider marine environment salmon smolts were shown to disperse widely along the west coast and migrate using many different routes.

The design for the 2023 project was shaped and guided by the information gained from Years 1 and 2. Efforts were concentrated on their speed and timings through the sea lochs in order to address the data requirements for the SEPA framework models.

West Sutherland

During 2023, 125 salmon were acoustically tagged within the Laxford system and 3 within the Polla (see p. 11 for details of the traps used). Receivers were placed within Bad na Baighe, River Laxford, River Polla, Loch Eriboll and Loch Laxford, and with a further array of receivers perpendicular to the coast near Oldshoremore. Each tag has a unique code and therefore the receivers will record the passage of individual fish through these areas and provide information on migration timings and routes. In addition, a percentage of the tags will also record depth and temperature data as the fish swim through the sea lochs.



Tags ready to go (S. Marshall)

Education

Education forms a large part of our remit and the WSFT are particularly keen to get involved with schools and colleges within the area, as well as giving talks and demonstration to adult groups. It is considered to be an important link between the Trust, the general public, nature groups and the local community. It is a medium whereby scientific research data can be available to those interested in it.

Ghillies Seminar

The Ghillies Seminar provides an opportunity for the Ghillies, managers and interested anglers within the area to meet and discuss what's happening in their rivers as well as question some experts in the fields of fisheries management and salmonid biology. A platform for those working in the field to discuss issues that affects them directly, it is also a two-way process not only moving information to the workers, but also taking suggestions and ideas to the scientists and policy makers.

This year's seminar was a mix of different topics linking some of the work of the Trust. Sara Harkins started off with an introduction to the Rural Landuse Partnership and NW2045. She was then followed by Beth Osborne, talking about Loch Duart, the challenges faced and the different solutions explored. After lunch Sean Robertson gave an introduction to the Scottish Fisheries Co-ordination Centre and it's reporting apps. We finished with a summary of the tracking projects within the area to date.

There was keen participation and a genuine desire to address issues particular to this area. The meeting was well received, and the notes can be found on the Trust website.

School days

During 2023 we worked with the local primary school to introduce the children to land management and the effects of different activities on the riverine environment. The children showed a good understanding of the impacts – both positive and negative – of the different activities and were very creative in their development of the area.

We also worked with Ullapool High School as part of their Young Ranger programme, introducing monitoring in freshwaters. Unfortunately, the weather was not kind, so the planned field trip was moved indoors, with sampling equipment and a tray of invertebrates – plus one eel – leading to a very involved discussion. The day ended with a walk down the local river to talk about habitat. Despite the change in plan this was a very good event, with engaged and enthusiastic teenagers.

Public events

WSFT joined Assynt Field Club for an exploration of the freshwaters one Sunday. Using electrofishing to look at the fish populations and then kick sampling to examine the invertebrates leading the discussions and examination. Thanks to the AFC for their invitation and an enjoyable and informative day.

Electrofishing demonstration (D. Haines)

Other Open Events

The Trust once again joined our colleagues from the Ness District Salmon Fishery Board and the Beauly District Salmon Fishery Board in a stall at the Moy Country Fair. A great opportunity to meet and talk to members of the public – as well as partners from Police Scotland and the Findhorn Watershed Initiative to name but a couple – and promote the area and the work of the Trust. Thanks must go the individuals who assisted on the day - manning the stall, putting up tents and organising the merchandise. These events are good fun to do and help in the promotion of the Trust and its works to the wider public.

Project Laxford

A partnership between Reay Forest Estate and the Atlantic Salmon Trust, with support from the Marine Directorate, Project Laxford is a 10-year project aimed at restoring wild fish populations through habitat improvement. Starting in October 2021, the project has initiated a number of exciting programmes, all with the aim of establishing restoration projects then monitoring the restoration actions and their impacts on the fish and the environment.

There has been a significant amount of work undertaken within the catchment, aimed at getting a better understanding of the status of the catchment and its fish populations and determining the most appropriate restoration plan. To date, this has included the production of a catchment audit as well as the development of a comprehensive monitoring network. The latter will allow the effects of any restoration activities to be assessed.

Fish counter

Placed in the tidal zone, this will give a count of all the fish entering and leaving the river. By counting the smolts out and the adults in we will have a good indication of the size of the run, together with marine survival.

Aris counter in situ (S. *Marshall)*

PIT array and tagging

Passive Integrated Transponder (PIT) tags are similar to the microchips used in dogs. Inserted in the body cavity of the fish, these uniquely coded tags are identified by special receivers, which record the number, date and time. With no battery, these tags continue to operate through the lifetime of the fish and will give information on freshwater movements for both juveniles and adults as well as information on the timing of the run and marine survival of individual animals. During 2023 a further 2000 salmon parr were tagged, bringing the total tagged to date to just over 3400.

Temperature network

Rising temperatures have been an issue for the salmonid populations for several years throughout Scotland, with water temperatures regularly exceeding levels that impact on salmonid growth and survival. The temperature network will help to assess the effects of restoration actions, such as riparian tree planting, on the catchment. Riparian woodland has many beneficial effects on rivers, from bank stabilisation, food supply, shelter and nutrient provision, to reduced water temperatures as a result of shading.

Environmental DNA (eDNA)

All organisms release genetic material into the water and the use of eDNA allows this to be analysed. Collecting water samples from around the catchment and analysing these for traces of genetic material gives an inventory of the species present and can be used to monitor the effects of restoration activities on invertebrates and fish. eDNA sampling is remote and may identify the presence of rarer individuals within the area, ones not identified from more traditional sampling methods. Further, the method is potentially less labour intensive and destructive.

Riparian woodland

Re-establishing native riparian woodland is key to habitat restoration within the catchment. Aiming to plant up to a million trees near to rivers, burns and streams, this will be supplemented in the long term – perhaps 50 years – by natural regeneration within 3 large restoration enclosures, covering a total area of over 25 km^2. This removal of deer grazing pressure will benefit a wide range of species and habitats including breeding birds, blanket bog, sub-alpine heaths and montane acid grasslands.

For further details on the project visit https://atlanticsalmontrust.org/project-laxford/

Salmon conservation regulations

This policy was introduced during the 2016 season. It implemented a variety of measures, including:

- A ban on the taking of any salmon, by rod or net, before 1 April;
- A ban on fishing outwith estuary limits;
- The classification of rivers based on a model of population estimates, exploitation rates and biological recruitment. (Further information can be found at: http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/fishreform/licence/status)

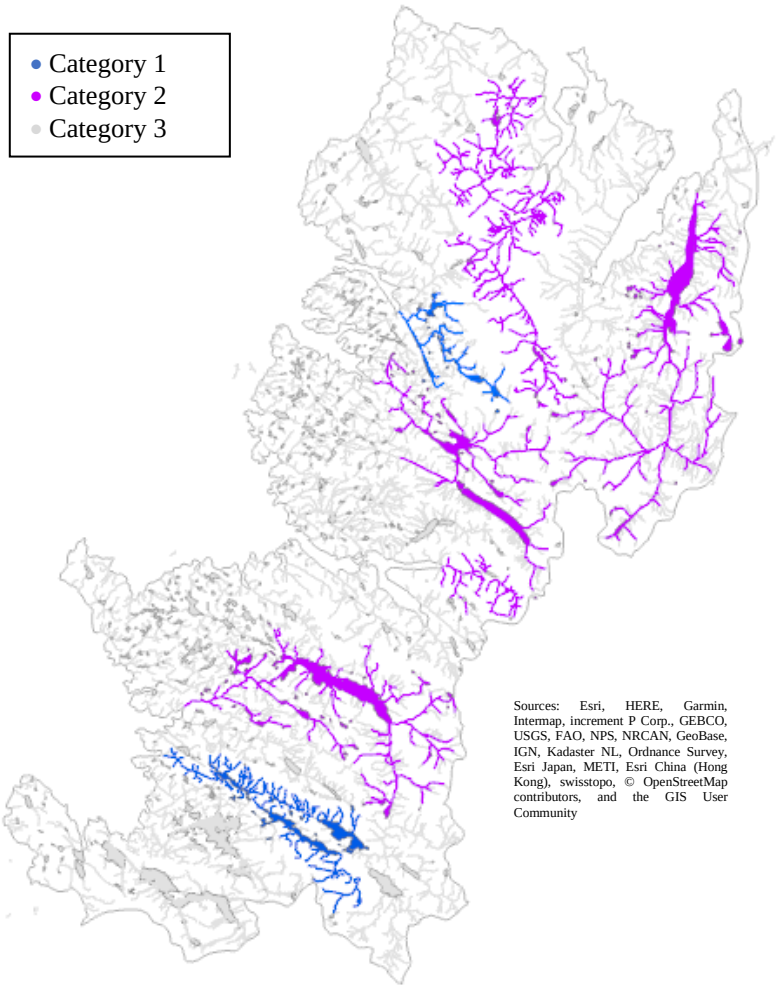
The categories denote the conservation measures required such that, for West Sutherland during 2024:

Category 1 – (Rivers Rhiconich and Kirkaig) where the conservation limit has been met on 4 of the last 5 years, exploitation is sustainable and therefore no additional management action is required.

Category 2 – (Rivers Hope, Grudie, Dionard, Daill, Laxford, Gleann Dubh and Inver) where the conservation limit has been met on 3 out of the past 5 years, meaning that management action is necessary to reduce exploitation. While mandatory catch and release will not be required in the first instance, this will be reviewed annually.

Category 3 – (Rivers Polla, Strath Shinary, Oldshoremore, Duartmore, Polly and Osgaig) where the conservation limit has not been met on 3 out of the past 5 years, meaning that exploitation is unsustainable and management actions are required to reduce exploitation for 1 year i.e. mandatory catch and release (all methods).

All systems not listed above have insufficient data and therefore will be classed as Category 3.



Acknowledgements

The Trust would not be able to function without the assistance of an army of volunteers, many of whom give up substantial amounts of time to the Trust. Similarly, we would like to acknowledge those who support us financially and without whose help we would not be able to operate. Grateful thanks also for the assistance of the various estates. In particular, sincere thanks must be expressed to Reay Forest Estate and Scourie Estate for their donations of accommodation.

A number of other individuals have assisted the Trust with its work programme, some listed below. Apologies to those not mentioned by name, but our grateful thanks all the same.

Catches and Scale Reading

The WSFT acknowledges the assistance of hotels, estates and anglers in compiling catch records and collecting scale samples. In particular to the staff of the Inver & Kirkaig for their assistance with the Adult Sampling Programme.

Monitoring of sea trout post-smolts

This work would not be capable of completion without the assistance of the Reay Forest Estate and Wildland Ltd. Also to Andy, Donald, Keith and Ian for their assistance, together with the staff of Loch Duart Ltd and the Naver Fisheries Board.

Funding for this work comes from a variety of sources. The North & West District Salmon Fishery Board, Scottish Government, estates and individuals.

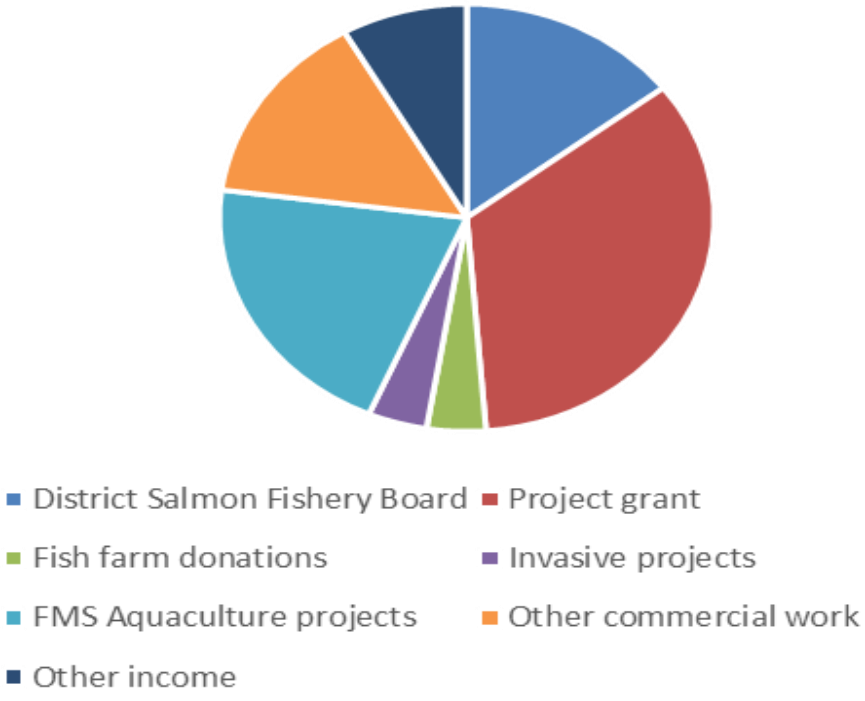
Biosecurity Planning

Funding of the Scottish Invasive Species Initiative Phase 1 by the Heritage Lottery Fund is gratefully acknowledged. Thanks also to Nature Scot for their management of the project.

SISI Phase 2 is grateful for the funding provided by the Nature Restoration Fund, again managed by Nature Scot.

The following Charitable Trusts, Foundations, Estates and organisations have kindly donated funds or provided grant funding towards the West Sutherland Fisheries Trust. Our sincere thanks to all listed, and to the many individuals who will remain anonymous but have donated time and money to the Trust and its activities. Without all of this support we would not be able to operate.

Trusts & Organisations
Assynt Angling Company Ltd
Atlantic Salmon Trust
**Brackloch Trust
Heritage Lottery Fund
Nature Restoration Fund
North & West District Salmon Fishery Board
Scottish Government
Scourie & District Angling Club

Estates
Reay Forest Estate
Scourie Estate
Wildland Ltd

Businesses
Loch Duart Ltd