West Sutherland Fisheries Trust
2022 Electrofishing Surveys

A report to the West Sutherland Fisheries Trust, Report No. 01/23

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1. Introduction:

As part of West Sutherland Fisheries Trust's work programme, established sites in different freshwater catchments are routinely monitored through electrofishing surveys, which are carried out in accordance with Scottish Fisheries Coordination Centre (SFCC) protocol. This provides valuable information on temporal changes within juvenile salmonid densities. Where possible all sites were revisited, but due to natural changes in sites and weather conditions this was not achieved in all catchments.

This report summarises the data for each system surveyed and draws them together into an area-wide summary. Individual reports for each catchment, giving maps and detailing the data, are available on request.

2. Methodology:

Electrofishing equipment operates by creating an electrical field in the water which affects the muscles of the fish, causing them to swim towards the positive electrode (anode) and subsequently immobilises them for a brief period. At this point they can be captured for processing before being released unharmed into the river sections from which they were caught. As the electrical field is restricted in size and the conductivity of the water generally extremely low in most WSFT catchments, the best operating conditions are within shallow water in narrow tributaries. While it is possible to sample large main river stems, the escape rate is higher than that found in the narrower tributaries. Similarly, a high escape rate is found in exceptionally shallow, stony, or weedy areas, where fish can move into the substrate and are thus inaccessible to the nets.

Semi quantitative surveys are conducted in compliance with SFCC protocol. This involves one fishing run of a site in order to calculate a minimum estimate of juvenile salmonid densities. Although semi-quantitative surveys do not calculate absolute densities, they are quicker, enabling more sites to be covered, and give an indication of changes over time. This results in a broad picture of the population status of each catchment which can then be compared from year to year.

Fish densities were assessed using an electracatch backpack supplying smooth direct current (DC). Fish drawn to the hand-held anode were netted into a bucket and were retained until the end of the run for processing. The sites were fished systematically in an upstream direction, applying the same fishing pressure throughout to ensure that all fish had the same probability of capture as far as possible, thus increasing the reliability and accuracy of the minimum estimates of density.

All fish were anaesthetised using Tricaine Pharmaq, identified to species and measured (± 1 mm). Small scale samples were taken from a proportion of each length range for age determination, split into fry (young of the year, 0+ years old) and parr (≥1 years old). The fish were then placed in a bucket before being returned to the survey site upon complete recovery. Densities of fish were calculated as minimum estimates, such that a minimum number of fish present per 100 m^2 could be determined. Water level was not used in the density estimates, although it must be realised that stream conditions will have an impact on the density determined and efficiency of the fishing technique. Fish densities were then categorised using the SFCC salmonid density classification scheme for the Northwest area, which can be seen in table 1.

Bankside and instream characteristics, including substrate type, water flow, and riparian cover, were recorded at each site in accordance with the SFCC habitat survey associated with electrofishing surveys.

Table 1: SFCC salmonid density classification scheme for the Northwest area

		Minimum density per 100m²			
SFCC Class	Descriptor	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
A	Excellent	26.05	13.09	15.80	8.58
B	Good	14.15	8.04	8.25	4.31
C	Moderate	8.00	4.67	4.26	2.72
D	Poor	4.42	2.58	1.99	1.52
E	Very Poor	0.78	0.66	0.44	0.22
U	Unclassified	0	0	0	0

3. Results:

3.1 Hope

Table 3.11 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.12 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.11: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
H1A	247704	957864	30	Allt a'Mhuillin. Just below small falls, 200m upstream from road.
H2A	247381	956926	10	Breasgill, below the road.
H2B	247452	956947	15	Breasgill burn, above road and below sheep dip.
H4A	246173	947722	25	Tributary at shed by Ben Hope path.
H9A	242063	941561	120	Abhainn Strath Coir an Easaidh, 1 mile up the track, just upstream of stone bridge.
H9B	243659	941883	60	Abhainn Strath Coir an Easaidh, by lodge.
H10A	243143	941471	100	Allt a Choire Ghrainde, just below bridge.
H12A	245263	942619	30	By passing place on road to Gober lodge, upstream of bridge.

Table 3.12: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100 m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
H1A	0.00	0.00	5.94	17.82
H2A	40.13	33.44	36.79	6.69
H2B	19.61	15.69	15.69	3.92
H4A	33.71	8.43	87.08	5.62
H9A	0.00	0.00	1.87	3.75
H9B	28.59	16.67	2.38	0.00
H10A	0.00	0.00	16.22	3.60
H12A	21.66	6.50	4.33	0.00

Salmon and trout are widespread throughout the Hope catchment, with salmon only absent from H1A, H9A and H10A. Salmon fry densities were higher than parr in all sites, and trout fry densities were higher than trout parr densities in all sites except H1A and H9A.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.13. This summarises the system and allows direct comparison between all surveyed catchments in the West Sutherland area.

Table 3.13: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	0	40.13	17.96
Salmon Parr	0	16.67	10.09
Trout Fry	1.87	87.08	21.29
Trout Parr	0	17.82	5.18

Figures 3.11 and 3.12 show the temporal fluctuations in the average juvenile salmon and trout densities in the catchment. Figure 3.11 shows a general increase in salmon fry and parr densities since the system was first surveyed, with fry densities peaking in 2022, and parr peaking in 2017. Trout fry densities show a gradually increasing trend over time, with parr remaining consistent and stable at around 5 fish/100m^2.

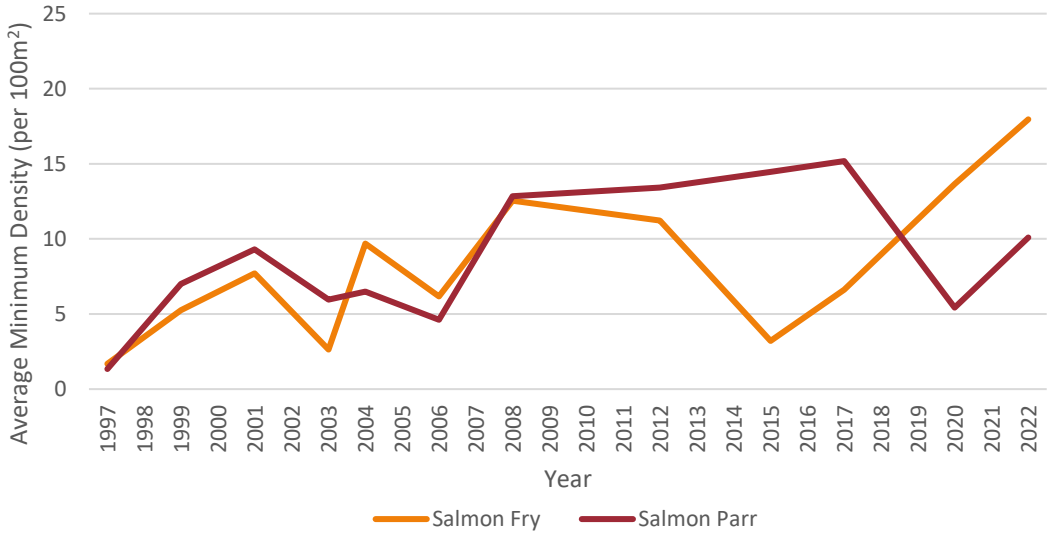

Figure 3.11: Temporal changes in average salmon densities within the Hope catchment.

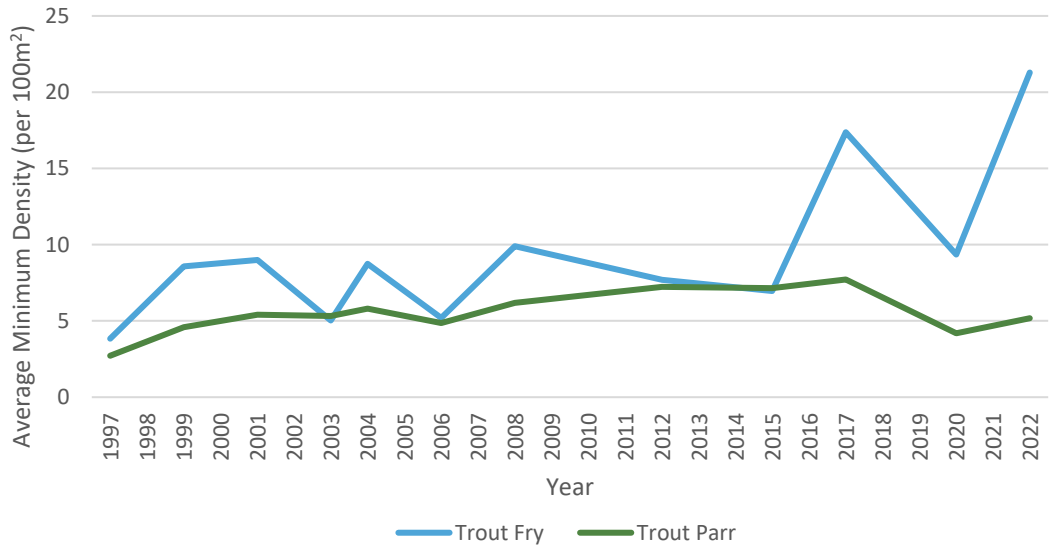

Figure 3.12: Temporal changes in average trout densities within the Hope catchment.

In 2014 Hurricane Bertha caused considerable changes to some of the tributaries along the east shore of Loch Hope. With respect to this survey, H2 and H4A were severely altered in terms of both sediment and riparian areas. Within the Breasgill burn a greater physical change was observed in H2B than H2A, where the burn widened significantly, and the sediment became less stable. However, fish densities are now similar to or better than pre-2014 levels. The channel of the burn has stabilised over time but remains vulnerable to change in exceptionally high spates due to the lack of complex vegetation reinforcing the banks.

Salmon historically form a small component of the salmonid population in H9A, however have not been observed in the site since 2015. This firmly suggests that there has been a change in the burn preventing salmon access.

This catchment could benefit from strategic planting of broadleaf trees in riparian zones, which would improve fish cover, food availability, and bankside stability – overall providing great benefits to fish populations.

3.2 Oldshoremore

Table 3.21 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.22 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.21: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
OM1	221829	958919	55	Allt an Lòin Bhain, near head of Loch Aisir Mòr
OM2A	222249	958671		Allt an Lòin Bhain, with rise on right bank and large boulders in site and in bank
OM3	222825	958249	80	Allt an Lòin Bhain, before glide, at widest part of the channel
OM4	220800	959000	40	Middle braid above mill laid, from start to first main riffle
OM5	220784	958956	40	Below wall, near islands. Large white rock in centre. Island and riffle in centre of site.

Table 3.22: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
OM1	28.63	8.42	30.32	3.37
OM2A	0.00	7.35	7.35	7.35
OM3	0.00	0.00	20.33	4.07
OM4	0.00	0.00	10.33	30.98
OM5	0.00	2.13	9.60	13.86

Trout were present throughout the Oldshoremore system, commonly seen at good and excellent densities, shown in table 3.22. Salmon were only observed in OM1, OM2A and OM5, notably absent from OM3 which is the highest up the system. They have been present in OM3 most years, though the dry conditions in 2021 may have prevented adults from migrating that high in the system, explaining a lack of salmon fry.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.23. This summarises the system and allows direct comparison between all surveyed catchments in the West Sutherland area.

Table 3.23: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	0	28.63	5.73
Salmon Parr	0	8.42	2.64
Trout Fry	7.35	20.33	17.64
Trout Parr	4.07	30.98	13.07

Figures 3.21 and 3.22 show the temporal fluctuations in the average juvenile salmon and trout densities in the catchment. Figure 3.21 shows that fry populations in the system vary greatly year to year, absent from 2004 and 2012 surveys. Salmon parr densities are more stable, remaining at about 5 fish/100m^2 between 2012 and 2020 until dropping in 2022.

In 2022 trout populations in the Oldshoremore catchment were recorded at the highest densities observed since surveying began in 2000. Previously some variation over time was seen for both fry and trout but averaged around 5 fish/100m^2.

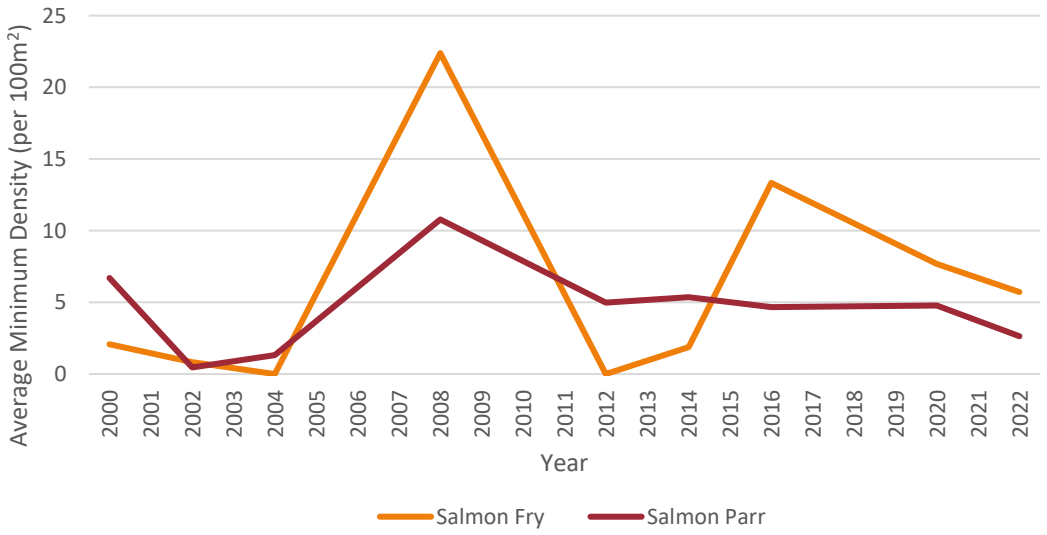

Figure 3.21: Temporal changes in average salmon densities within the Oldshoremore catchment.

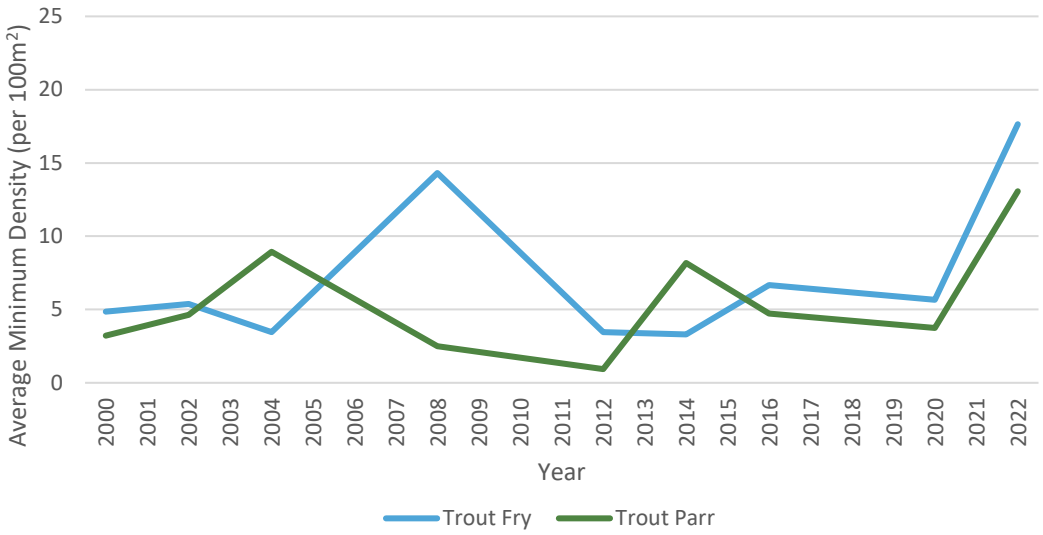

Figure 3.22: Temporal changes in average trout densities within the Oldshoremore catchment.

Salmon are present in much of the catchment but were absent from OM3 and OM4 on this occasion. Trout were seen in all sites, with fry only outnumbering parr in 2 of 5, whereas in 2020 it was observed that fry were at greater densities that parr in most sites. This difference may be due to changes in site habitat, and lasting effects from the exceptionally dry summer in 2021. OM2A is also a new site, with parr type habitat rather than fry.

Despite the fluctuations observed, the 2022 salmon population appears to lie within the range historically observed within the catchment and would suggest a relatively stable population. The trout population is also relatively stable, with growth seen in 2022.

There are construction works on the bank of the burn below Loch Aisir Mòr, and it remains to be seen what impact this will have on the salmonid population downstream.

3.3 Loch Innis na Ba Buidhe

Table 3.31 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.32 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.31: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
LI1	222286	957485	20	Allt Loch na Larach, from 2nd meander through gate
LI2A	223010	956912	50	Cam Alltan, above bedrock falls, just before bend in river
LI2C	222688	956906	15	Cam Alltan, from 20m above the loch to the original channel.
LI3	222643	956966	15	Small tributary close to Cam Alltan. Site is just above the loch

Table 3.32: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
LI1	0.00	0.00	66.99	28.71
LI2A	0.00	0.00	14.81	0.00
LI2C	0.00	0.00	35.21	11.73
LI3	0.00	0.00	102.17	38.31

No salmon were observed in the catchment in 2022, with the last juvenile salmon recorded in 2017. Trout were present in excellent densities in all sites except LI2A, where parr were absent and fry were observed at a good density. LI2 sites have become fry dominated since 2020, which was expected due to the habitat in both sites.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.33. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.33: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	0.00	0.00	0.00
Salmon Parr	0.00	0.00	0.00
Trout Fry	14.81	102.17	54.80
Trout Parr	0.00	38.31	19.69

This system has a healthy trout population, with trout parr densities in recent years rising from <10 fish/100m^2 to 20 fish/100m^2 (figure 5). Fry have been at excellent densities since the catchment surveys began.

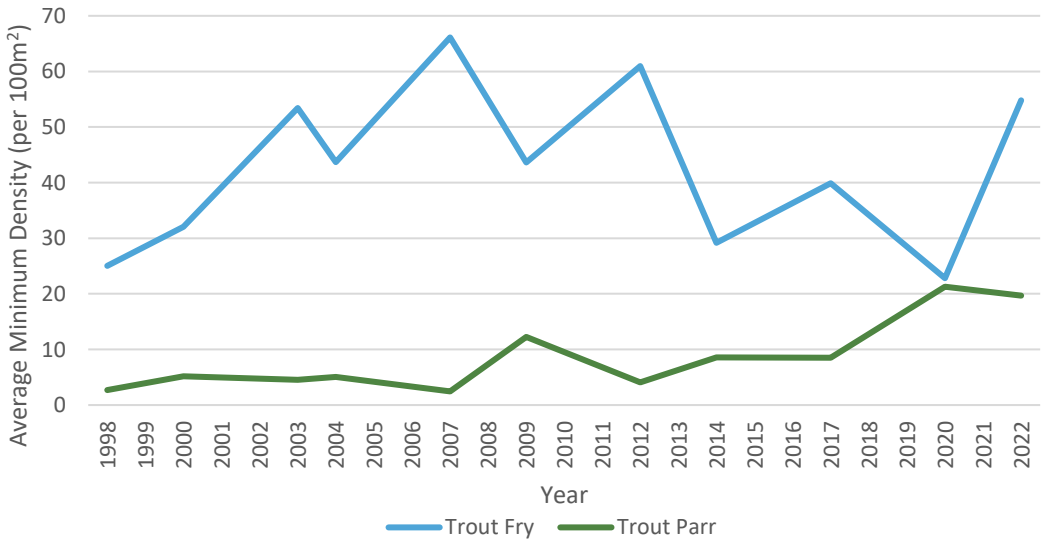

Figure 3.31: Temporal changes in average trout densities within the Loch Innis na Ba Buidhe catchment.

Previously this system has been categorised as a trout system, with a transitory salmon population. The trout population is healthy and stable, with excellent densities throughout the catchment.

It is hypothesised that the mouth and lower reaches of this catchment were previously difficult for migratory fish to navigate, and accessibility was likely flow dependent. No salmon have been observed in recent surveys, indicating the possibility of the system now being inaccessible to migratory salmonids. More monitoring is needed to confirm this.

3.4 Achriesgill

Table 3.41 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.42 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.41: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
GL1	225659	954059	10	In main river, just above bridge
GL2	226572	953063	70	Allt an Easain Ghairbh, downstream of waterworks, across from ruin.
GL3A	227121	953873	40	Halfway between boulder/gorge section of main river and junction with Allt an Easain Ghairbh.
GL5	227806	954410	75	Upstream of burn and rowan tree, main river.

Table 3.42: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
GL1	18.02	12.61	1.80	0.00
GL2	0.00	0.00	9.58	6.84
GL3A	0.00	0.00	7.87	1.31
GL5	0.00	0.00	2.65	2.65

Salmon were only present in GL1, with good numbers of fry and parr observed. Trout were present throughout the catchment, seen in low densities in every site except GL2, where good densities were found.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.43. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area. Due to much of the catchment being inaccessible to salmon, the average density for them is represented as the average of the sites within the accessible reach.

Table 3.43: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	0.00	18.01	18.01
Salmon Parr	0.00	12.61	12.61
Trout Fry	1.80	9.58	5.47
Trout Parr	0.00	6.84	2.70

Figures 3.41 and 3.42 show the temporal fluctuations in the average juvenile salmon and trout densities in the Achriesgill catchment. Trout densities have fluctuated greatly, but show a relatively stable parr density over time, with increases in fry densities since 2006.

Salmon densities have been comparatively low in relation to previous years. This is due to the observation that salmon no longer access the system above the first waterfall -just downstream of the old dam- with the last individuals observed above it in 2014. This is demonstrated by figure 3.43, which shows the average density of juvenile salmon in sites above the waterfall only.

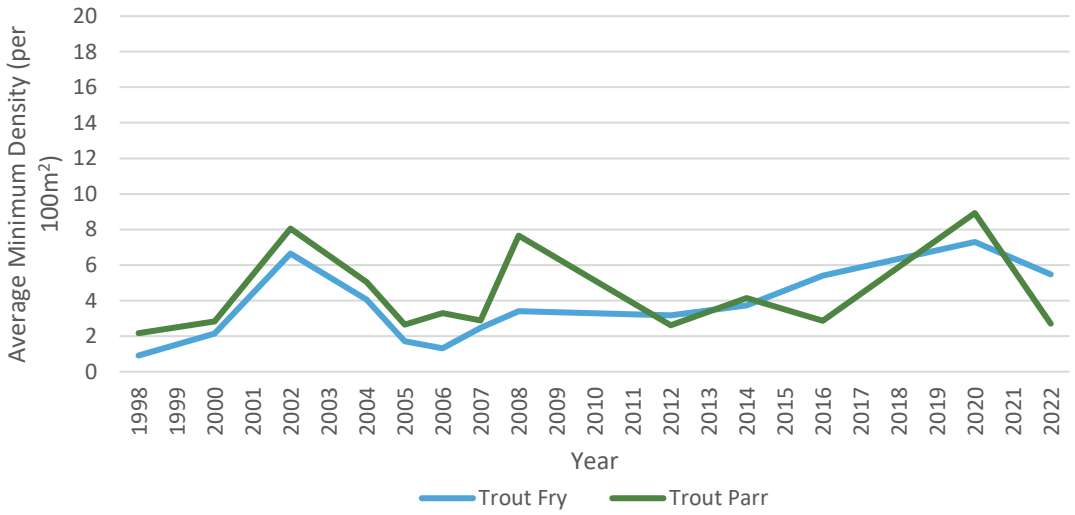

Figure 3.41: Temporal changes in average trout densities within the Achriesgill catchment.

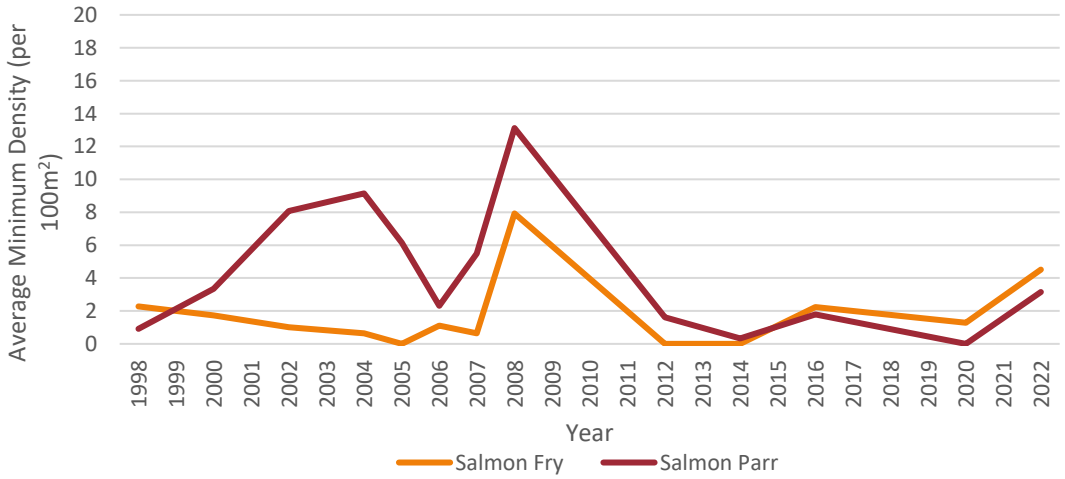

Figure 3.42: Temporal changes in average salmon densities within the Achriesgill catchment.

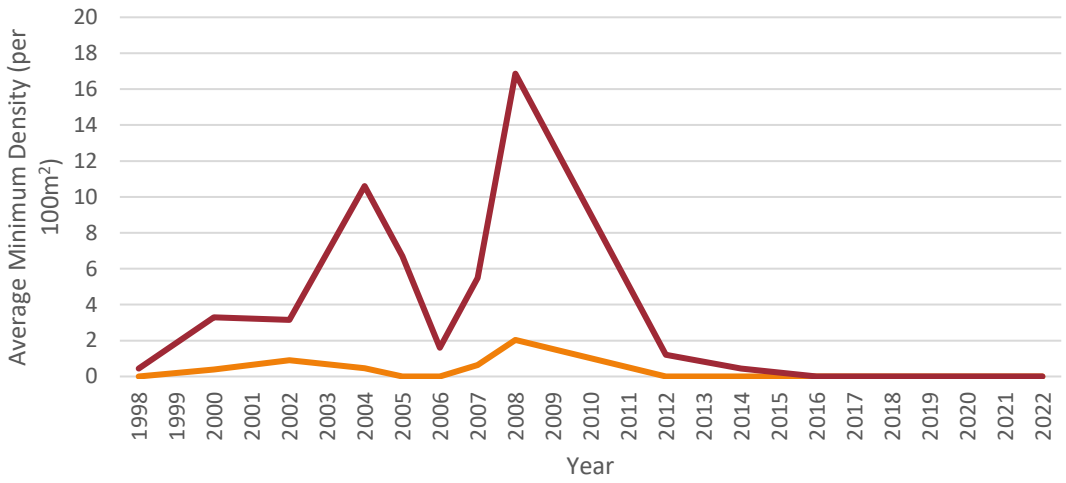

Figure 3.43: Temporal changes in average salmon densities within the upper Achriesgill catchment.

Salmon within the Achriesgill catchment are now restricted to a very small stretch of the main river, with the waterfall now an impassable barrier. This is supported by the absence of salmon from sites upstream of the waterfall since 2014, but the consistent population found in GL1.

The prominance of trout parr in the survey reflects the habitat in the system, with much of it dominated by boulder step falls in steep tributaries, and deep channels elsewhere. GL3A is more suitable fry habitat, but consists of smaller cobble and pebbles with little cover.

The removal of the retaining dam for Generals Loch in late 2004 would not appear to have had a long-term impact on the salmonid populations within the catchment. This is primarily a trout system, again reflecting access and habitat availability. The trout populations appear to be stable, with variations potentially reflecting changes in the river conditions and efficiency of the survey technique between years.

3.5 Loch na Thull

Table 3.51 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per $100m^2$ in each site are presented in table 3.52 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.51: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
NT1	224664	951360	35	Above road bridge.
NT2	224751	951155	45	Below Loch Na-Cailich, by large boulder.
NT3	224553	951542	30	By telegraph poles, between two bends and next to small stream on right.
NT7	224620	951394	35	Below road bridge.

Table 3.52: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
NT1	68.18	4.26	21.31	0.00
NT2	2.18	0.00	0.00	2.18
NT3	102.79	41.96	18.88	6.29
NT7	32.49	36.56	48.74	4.06

Salmon and trout were present throughout the system, with salmon seen in excellent densities in most sites. Trout fry were also observed in excellent densities in most sites, but parr numbers were much lower.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.53. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.53: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	2.18	102.79	51.41
Salmon Parr	0.00	41.96	20.69
Trout Fry	0.00	48.74	22.23
Trout Parr	0.00	6.29	3.13

A look at the annual variations in salmon densities (figure 3.51) indicates that the 2022 fry densities continue the generally increasing population trend. Salmon parr densities do not follow this pattern, seen to peak in 2016 before falling back to levels historically seen. Trout densities, by contrast, were relatively constant until 2020, increasing to the highest recorded average densities of fry (figure 3.52). Trout parr numbers have remained low but consistent throughout the survey timeframe.

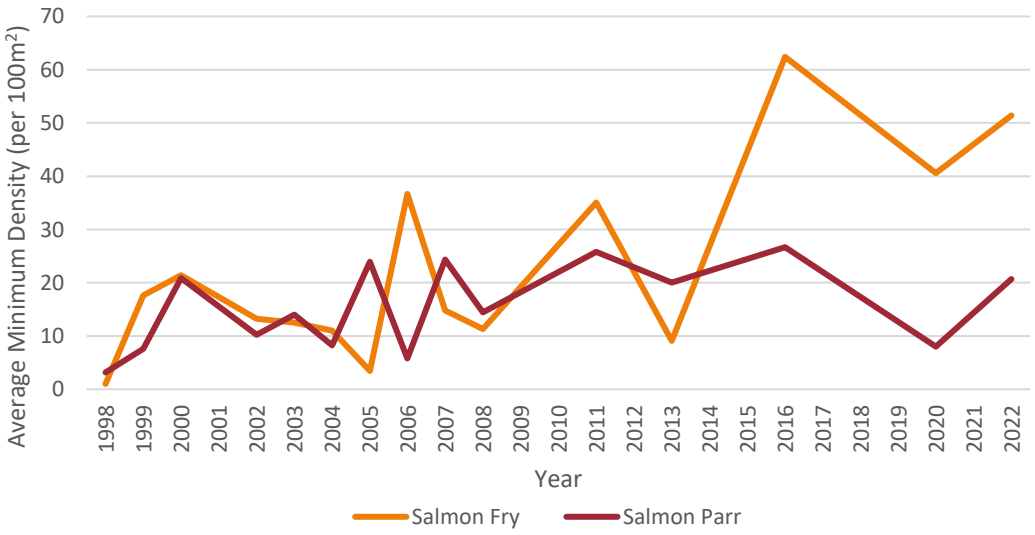

Figure 3.51: Temporal changes in average salmon densities within the Loch na Thull catchment.

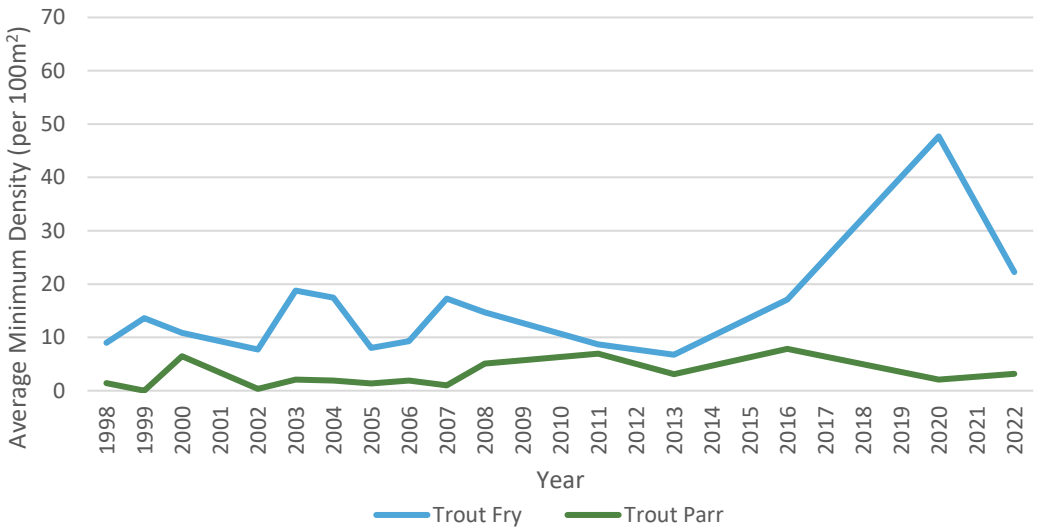

Figure 3.52: Temporal changes in average trout densities within the Loch na Thull catchment

Trout fry and parr densities have fluctuated around the same level since surveys began, with a record high in 2020. In 2022 there are signs that this peak may have just been the product of an exceptional year however, with the observed density dropping back down near levels seen previously. These fluctuations seen in the trout fry densities are likely to be a result of natural ecosystem dynamics. Despite the fluctuations in the trout fry populations the average density of parr has remained stable.

Both salmon fry and parr have declined from their 2016 levels but are still above the average densities for the West Sutherland area and have an increasing trend. Salmonid fry densities are naturally higher than parr in all freshwater systems because of density dependent mortality combined with migration as the parr grow and migrate through the catchment. Whilst this is largely reflected in the surveys within the Loch na Thull catchment, there are certain years where salmonid fry numbers drop below that of parr.

The increase in densities over recent years suggests that there is no major cause for concern regarding instream freshwater habitat, although strategical planting of mixed broadleaf trees in riparian zones would be extremely beneficial as it would provide better fish cover, additional food sources, and bankside stability.

3.6 Laxford

Table 3.61 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per $100m^2$ in each site are presented in table 3.62 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.61: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
L18A	230877	942153	40	Below Bridge on the Lone.
L18B	231350	942248	50	100m downstream of falls on the Lone.
L18C	231176	942411	55	Allt Horn, halfway between the bridge and split rock.
L18D	231309	942619	55	Allt Horn, within conifer corridor.
L19	230724	941765	40	Small burn flowing into old Lone channel/Loch Stack. Site downstream of road.
L20	230613	941628	50	Allt a'Chuilinn. 50m upstream of the trees, from riffle to drop off - deep scour.
L26A	229474	939715	50	Achfary Burn. Below Achfary buildings, riffle below pool with trees.
L36	230943	938149	50	Loch More tributary.
L53	234718	935916	40	Below track into Allt a Reinidh, in Allt an Fhearna Mor.
L59A	234736	934837	50	Kinloch, below the houses, by the trees.
L59B	234779	934393	60	Kinloch, 50m above the bridge.
TS1 LAX	223719	946819	30	Just upstream from Laxford Bridge.
TS2B LAX	224311	946938	30	River Laxford, below wall at Dudley's.
TS4 LAX	225032	946605	30	River Laxford, tail of Rock, left bank.
TS10 LAX	225949	944688	35	River Laxford, Corner Pool, left bank. Downstream of bench
UNBL	229759	943791	50	Uidh nam Balach. 500m downstream from Loch an Nighe Leathad, from large boulder to riffle.
UNBM	229545	944038	60	Uidh nam Balach. 170m downstream of Loch an Nighe Leathad, upstream of meandering stretch of burn.
UNBU	228798	945034	70	Uidh nam Balach. Downstream of track culvert, upstream of Loch an Nighe Leathad.

Table 3.62: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
L18A	47.71	4.19	15.90	0.00
L18B	26.47	6.62	0.00	0.00
L18C	62.27	11.32	2.83	0.00
L18D	9.68	2.42	0.00	0.00
L19	0.00	8.39	177.50	5.59
L20	10.49	0.00	5.25	0.00
L26A	16.95	1.41	4.24	2.82
L36	2.10	0.00	92.24	4.19
L53	0.00	1.70	73.13	27.21
L59A	15.38	6.15	29.23	12.31
L59B	1.44	4.31	4.31	0.00
TS1 LAX	42.44	0.00	7.96	0.00
TS2B LAX	45.91	0.00	2.70	2.70
TS4 LAX	49.42	11.63	0.00	0.00
TS10 LAX	66.67	3.92	0.00	0.00
UNBL	45.57	5.06	0.00	10.13
UNBM	26.04	10.42	5.21	5.21
UNBU	52.57	3.76	3.76	11.27

Salmon were present in every site fished, with excellent fry densities seen in many. Trout were also widespread, with the highest density of fry seen in L19, and are commonly more numerous in sites where salmon are in low densities or not present.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.63. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.63: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	0	62.27	21.88
Salmon Parr	0	11.63	4.14
Trout Fry	0	177.50	24.85
Trout Parr	0	27.21	5.62

Salmon fry densities have varied over time but show an increasing trend overall. In 2005 parr were observed at a higher density than fry, but this has not been seen since. The general increase in density is not reflected in the salmon parr, with a consistent decline since 2017. Trout populations in the catchment have remained variable but stable.

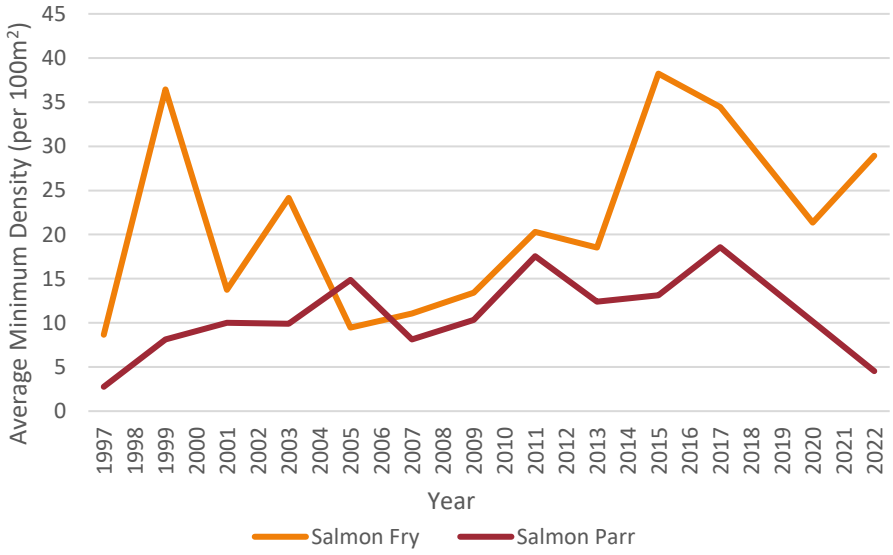

Figure 3.61: Temporal changes in average salmon densities within the Laxford catchment.

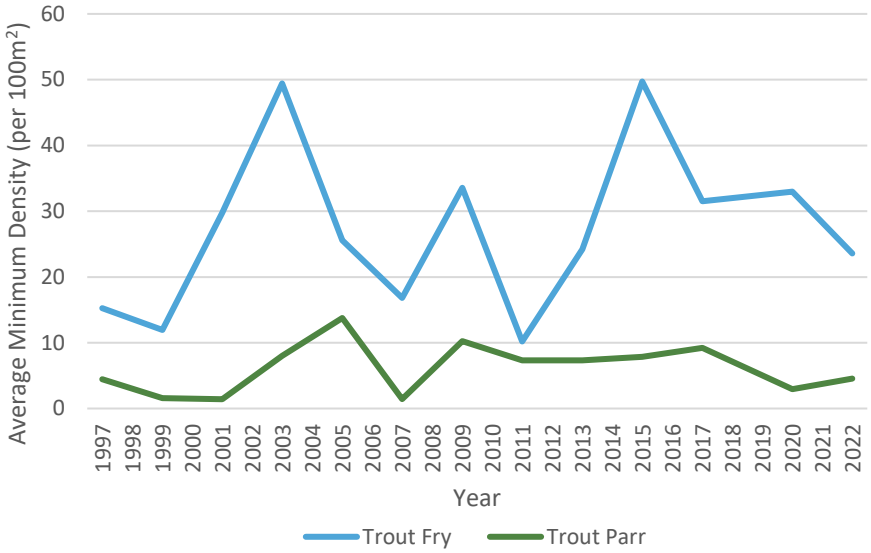

Figure 3.62: Temporal changes in average trout densities within the Laxford catchment.

Within the annual fluctuations observed salmon parr densities are stable across the catchment, peaking in 2017 before dropping to 5 parr/100m^2. This relatively stable population indicates that the catchment is not deteriorating in terms of juveniles, but to see a significant increase in salmon numbers it will require additional management and habitat improvement.

Similarly, the trout populations have remained relatively stable since 1997. This likely reflects the trout burns monitored, their size and the stability of those areas. There will be a downward migration of parr into the lochs, particularly from the small burns – which will be true for salmon also. Within mixed species burns, it should also be noted that salmon will out-complete trout for the optimal habitat, so an expanding salmon population has the potential to impact on trout densities.

This catchment could benefit from strategic planting of broadleaf trees in riparian zones, which would improve fish cover, food availability, and bankside stability – overall providing great benefits to fish populations.

3.7 Badnabay

Table 3.71 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.72 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.71: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
BB1	222064	946483	10	30m from boundary fence
BB3	222727	945977	15	Below loch, a wide shallow run situated above a large pool.
BB4	222485	945397	50	Above falls on way to junctions of 3 tributaries.
BB5	222539	945453	30	Downstream of waterfall, in riffle area.
BB6	222789	945640	25	Deep pool by bend in the burn.
BB7	223000	945600	15	Just above Loch.

Table 3.72: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
BB1	21.84	5.46	8.19	0.00
BB3	2.75	8.24	2.75	2.75
BB4	0.00	0.00	3.88	7.77
BB5	17.24	45.98	0.00	0.00
BB6	13.05	26.10	0.00	2.17
BB7	23.39	17.01	10.63	8.51

Salmon were present in all sites except BB4, which is located above an impassable waterfall. Trout were similarly present in 4 of 5 sites surveyed -only absent from BB5- located just below the impassable falls.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.73. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.73: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	2.75	23.39	15.65
Salmon Parr	5.46	45.98	20.56
Trout Fry	0.00	10.63	4.24
Trout Parr	0.00	8.51	3.53

Salmon densities in the Badnabay system are highly variable over time, ranging from 25 fry/100m^2 and 20 parr/100m^2 to below 5 fish/100m^2 for both fry and parr. Trout densities have remained relatively constant, showing an increase in 2016 before returning to historic levels in 2022.

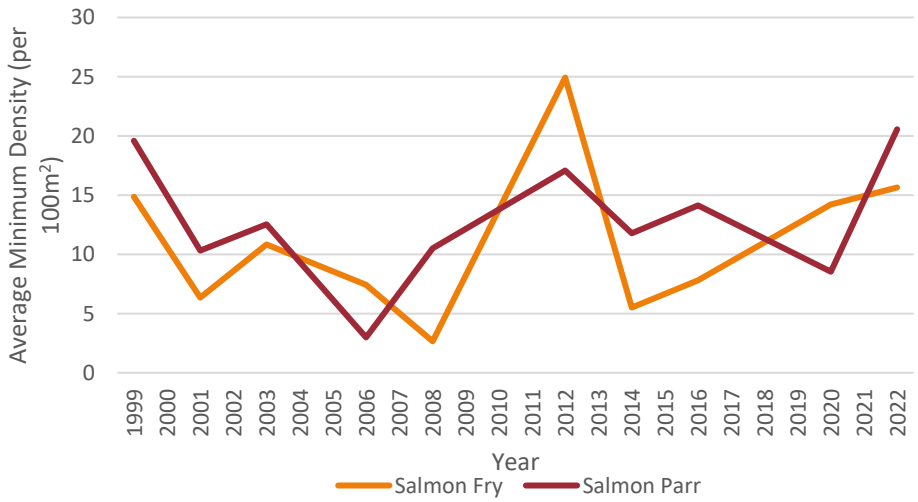

Figure 3.71: Temporal changes in average salmon densities within the Badnabay catchment.

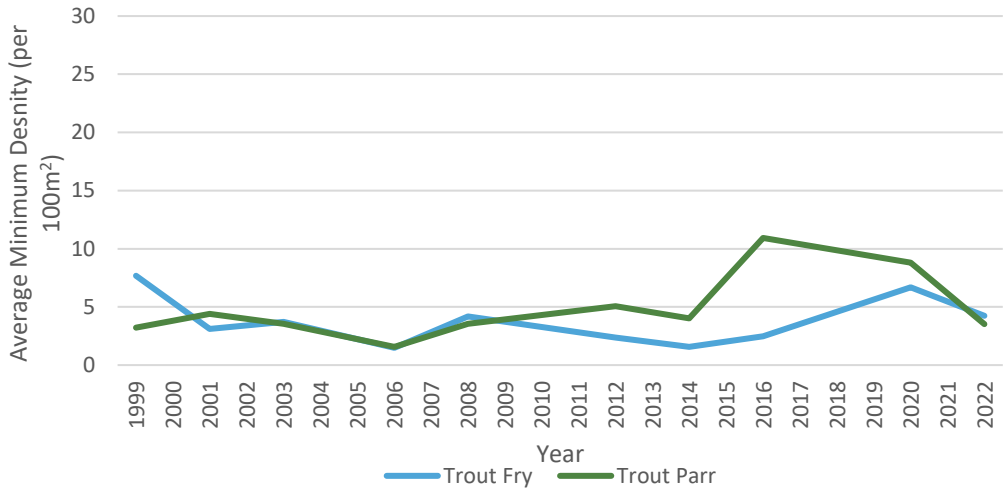

Figure 3.72: Temporal changes in average trout densities within the Badnabay catchment.

Natural fluctuations in juvenile densities with time are to be expected, particularly in fry. These are most obvious within the salmon populations and reflect environmental conditions and survey timing, which has an effect due to the high natural mortality of this stage. This is less apparent in the trout population but still present. Despite this, juvenile salmonid densities have remained relatively stable over the period of this study.

Several the sites show good or excellent densities of juvenile salmonids, varying into moderate and poor in some. It is thought that this is likely due to the habitat surveyed, rather than an issue with the population. This is backed up by the observation of parr commonly outnumbering fry, and the overall stability of the 1+ aged population within the system.

3.8 Clashfern

Table 3.81 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.82 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.81: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
CF03	220668	947689	10	Allt na Clais Feàrna, in the trees, close to the end of the burn, downstream of a bend
CF04	220600	947500	15	Upstream of trees, in a narrow gorge-like section. Downstream of a bend.
Bmain3	220025	946452	50	Just above small falls, near road bridge.
Bmain6	219784	946096	60	Across from house driveway.
Bmain8	219571	945898	60	Just below Loch a'Bhagh Ghaimmhica

Table 3.82: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
Bmain3	5.13	0.00	0.00	0.00
Bmain6	10.67	18.67	0.00	8.00
Bmain8	19.48	0.00	31.46	7.49
CF03	0.00	10.27	0.00	2.57
CF04	0.00	28.20	4.23	9.87

Juvenile salmonid distribution throughout the survey sites is fragmented, with age classes absent from some sites and trout absent entirely from Bmain3. Salmon fry were not observed in any sites below Loch na Claise Feàrna.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.83. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.83: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	0	19.48	7.05
Salmon Parr	0	28.20	11.43
Trout Fry	0	31.46	7.14
Trout Parr	0	9.87	5.59

In 2022 the average salmon parr density for the catchment was observed at its highest since surveying began on this system (figure 3.81). Salmon parr have shown an increase in populations since 1998, though fry densities have remained low and intermittent.

Trout populations in this catchment are stable but variable, with fry found in higher densities than parr each year (figure 3.82). The fluctuations in both fry and parr density follow very similar lines, which suggests that environmental factors such as water level at the time of survey have a significant effect on observed results.

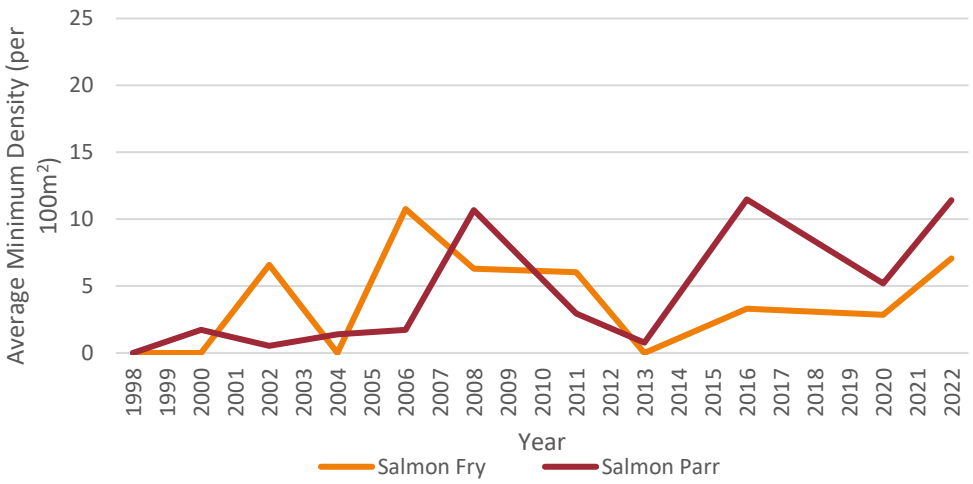

Figure 3.81: Temporal changes in average salmon densities within the Clashfern catchment.

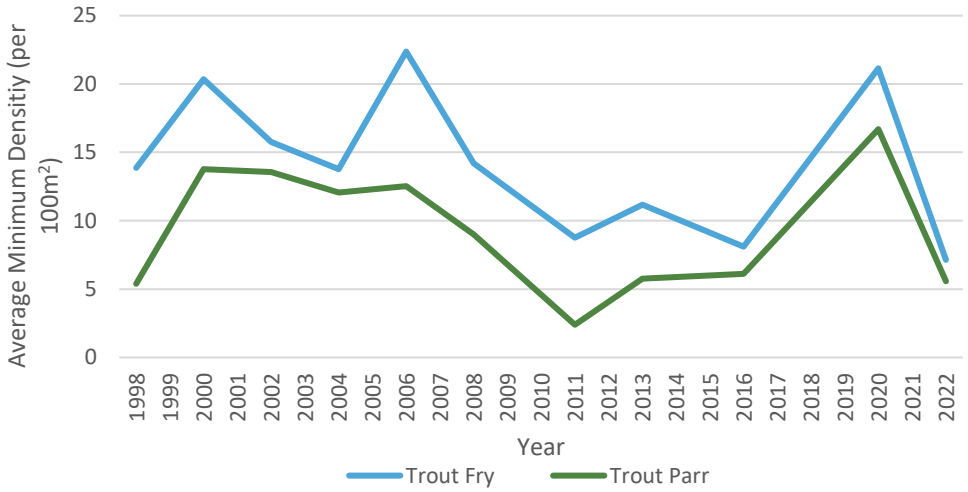

Figure 3.82: Temporal changes in average trout densities within the Clashfern catchment.

The Clashfern catchment is historically dominated by trout, with salmon populations highly variable year to year. The trout population appeared to spike in 2020, with the highest density of parr recorded, and one of the highest fry densities found. This peak does not appear to have influenced the results in 2022 however, as juvenile trout numbers dropped to some of the lowest recorded. Continued monitoring should be carried out in order to determine whether or not this drop in density will continue or if it is simply a poor year for trout.

Conversely, salmon populations showed some small improvement since 2020, with both fry and parr densities increasing since the previous survey. Salmon parr populations appeared to follow an increasing trend since 2006, whereas fry densities have remained low. This is likely due to the habitat within surveyed sites, with very little spawning substrate in many.

The temporal fluctuations in juvenile trout and salmon populations can be attributed to natural ecosystem dynamics along with varying and fluctuating pressures on adult salmon and sea trout, as this is a small catchment consisting of loch systems connected by narrow burns and requires sufficient water levels to allow migratory fish to access spawning habitat. This may further explain the more sporadic appearance of juvenile salmon and missing year classes (largely fry) following seasons when adults have not been able to access the site areas.

3.9 Loch nam Brac

Table 3.91 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.92 and classified in accordance with the SFCC classification scheme (table 1). As Loch nam Brac is inaccessible to migratory salmonids, salmon have been omitted from this catchment summary.

Table 3.91: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
NB1	218207	947138	70	Lochside
NB2	218231	947103	70	Upstream of road culvert
NBA1	218028	948795	70	Between two riffles, just below loch
NBA2	218250	948913	70	Downstream of small waterfall
NBA3	218262	949129	50	Downstream of road culvert

Table 3.92: A summary of the density of trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)	
Site Code	Trout Fry	Trout Parr
NB1	32.72	2.73
NB2	26.09	3.73
NBA1	49.81	7.47
NBA2	37.61	2.21
NBA3	24.10	9.64

Trout fry densities throughout the catchment are excellent, in some sites greatly exceeding the SFCC classification threshold for the area. Parr are found in much lower densities in the system, though this could be due to natural mortality and site habitat.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.93. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.93: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Mean
Trout Fry	24.1	49.81	34.07
Trout Parr	2.21	9.64	5.16

The fluctuations in density over time show that trout fry densities have varied greatly over time, peaking at 70 fry/100m^2 and showing a low of 25 fry/100m^2 (figure 3.91). Despite this parr densities have remained consistent.

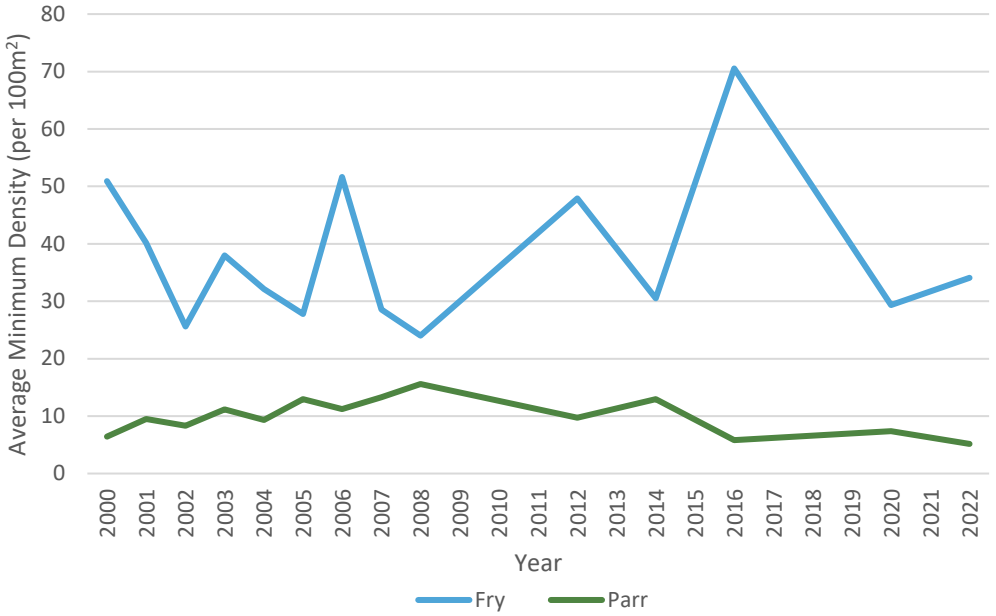

Figure 3.91: Temporal changes in average trout densities within the Loch nam Brac catchment.

Salmonid fry densities are naturally higher than parr in all freshwater catchments resulting from density dependent mortality combined with migration as the parr grow and move into new feeding territories. The result of this survey reflects these migratory tendencies, with the lack of older trout found within the sites indicating the movement of older fish into deeper areas, such as the loch.

Despite the fluctuations observed in the fry densities, the trout population within the catchment would appear to be stable and healthy. The lack of competing salmon combined with the residentiary trout population may provide a more stable system than those where there are marine influences.

3.10 Loch a'Bhadaidh Daraich

Table 3.101 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.102 and classified in accordance with the SFCC classification scheme (table 1). All sites successfully fished in 2022 were upstream of an impassable culvert, so salmon have been omitted from this summary.

Table 3.101: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
BD2	215877	944758	20	Below Loch a' Bhadaidh Daraich.
BD3	216498	944242	25	By the big boulder, 100m above falls in Allt Loch Leathad nan Cruineachd.
BD4	216405	944222	35	Between small rocks and higher barrier (with heather in middle of barrier).
BD5	216265	944055	45	Just below Loch Leathad nan Cruineachd.

Table 3.102: A summary of the density of trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)	
Site Code	Trout Fry	Trout Parr
BD3	10.56	17.59
BD4	6.06	6.06
BD5	23.98	1.50

BD3, 4, and 5 are all located above an impassable culvert just metres above Loch a'Bhadaidh Darach, so all juvenile trout are from individuals resident to the burn or lochs upstream. Trout densities in sites are variable, reflecting the habitat in each.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.103. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.103: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

	Minimum	Maximum	Average
Trout Fry	6.06	23.98	13.53
Trout Parr	1.50	17.59	8.38

Figure 3.101 demonstrates the temporal fluctuations in trout densities within the catchment. In previous years fry density often exceeded 30 fish/100m^2, however fry densities have been observed below 15 fish/100m^2 since 2020. Parr densities have not shown the same decline. The graph does not fully capture the juvenile densities in the catchment in 2022 however, as BD2 was unfishable so there was no data from that site to contribute, which skews the results as it previously produced the highest densities of fry.

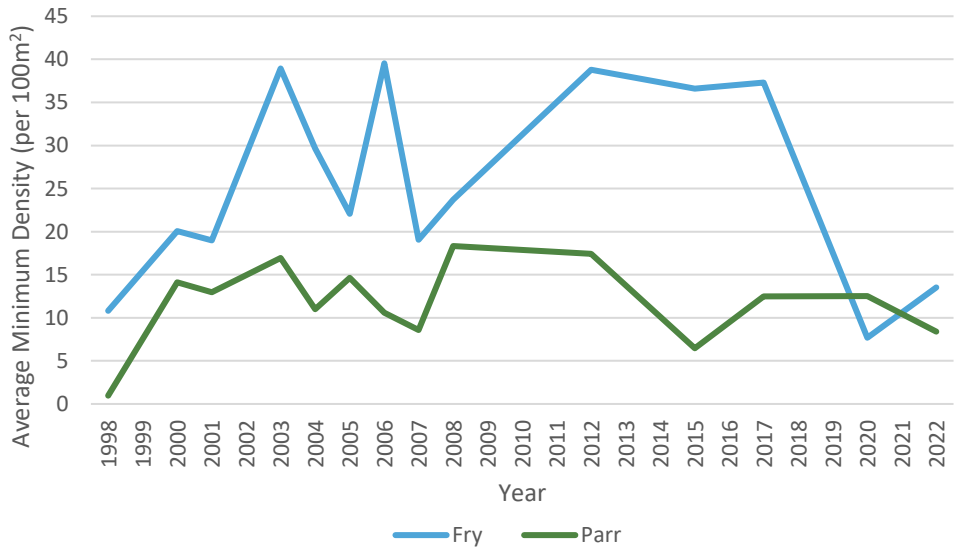

Figure 3.101: Temporal changes in average trout densities within the Loch a'Bhadaidh Daraich catchment.

Within the natural fluctuations observed within fish populations, parr have remained stable since 1998. Given the high level of density dependent mortality operating on fry populations, they are prone to large fluctuations which has been observed in this catchment. The sharp decline in fry densities in 2020 and 2022 is likely linked to large drop in density observed at BD2 in 2020, and the site being unfishable in 2022. There has been major reconstruction of the burn downstream of this site, with the creation of a pool system which over time has deepened making the burn unsuitable for fry and smaller parr. This is a huge loss in spawning habitat for resident trout in Loch a'Bhadaidh Daraich as the other tributaries do not provide suitable spawning habitat, or very little of it due to their gradient and size.

Above Loch a'Bhadaidh Daraich trout populations appear good, though vary greatly in density between sites. Salmonid fry densities are naturally higher than parr because of density dependent mortality combined with migration, as the parr grow and move into new feeding territories. However, parr numbers are particularly low within BD5, which is seen historically in this site though this could be due to the habitat within the site and the proximity to Loch Leathad nan Cruineachd.

Improved fish passage through the catchment -particularly through the lochan at the mouth of the system and the culvert under the A894- would enhance the population dynamics of the system, and potentially allow for the re-establishment of migratory salmonid populations.

3.11 Geisgeil

Table 3.111 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.112 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.111: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
G1	217352	941790	20	Allt Loch na h-Àirigh Slèibhe, just above fenceline to step/falls.
G2	217401	941859	20	Allt Loch na h-Àirigh Slèibhe, just below second fence (reed bed). In island braids.
G3	217401	941613	20	Allt Mòr Gisgil, just above the loch, by fenceline.

Table 3.112: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
G1	0.00	1.33	0.00	1.33
G2	28.92	19.28	4.82	14.46
G3	2.65	7.96	2.65	7.96

Salmonid fry were absent from G1, with only 1 salmon parr and 1 trout parr caught in total in that site. Salmon and trout of both lifestages were caught in G2 and G3, but in very low densities in G3. G2 was the most productive site, with a salmon parr caught that measured in at 169mm – exceptionally large for this area.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.113. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.113: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	0.00	28.92	10.52
Salmon Parr	1.33	19.28	9.52
Trout Fry	0.00	4.82	2.49
Trout Parr	1.33	14.46	7.92

Figures 3.111 and 3.112 show the fluctuations in juvenile salmon and trout over time. Salmon can be seen to vary in density to a greater extent than trout, though were observed at higher levels in 2022, with fry and parr averaging at 9-11 fish/100m^2.

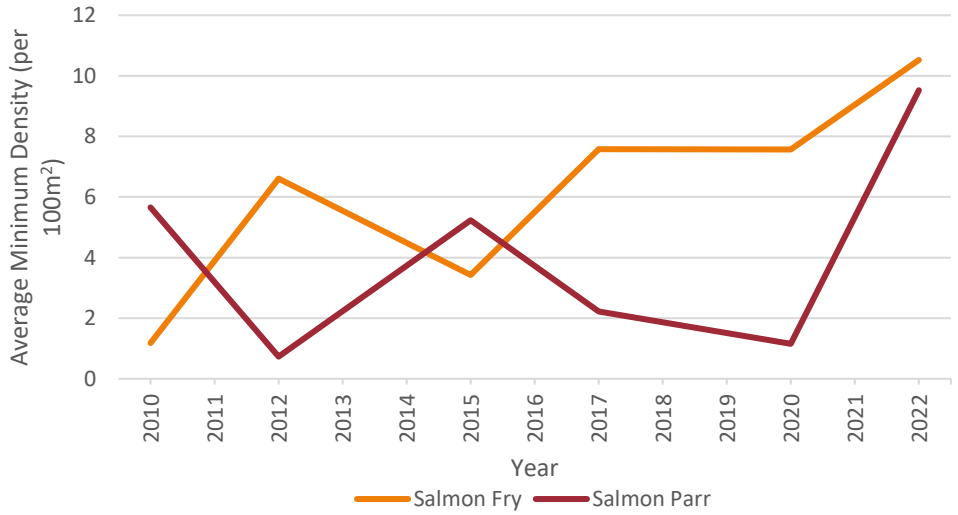

Figure 3.111: Temporal changes in average salmon densities within the Geisgeil catchment.

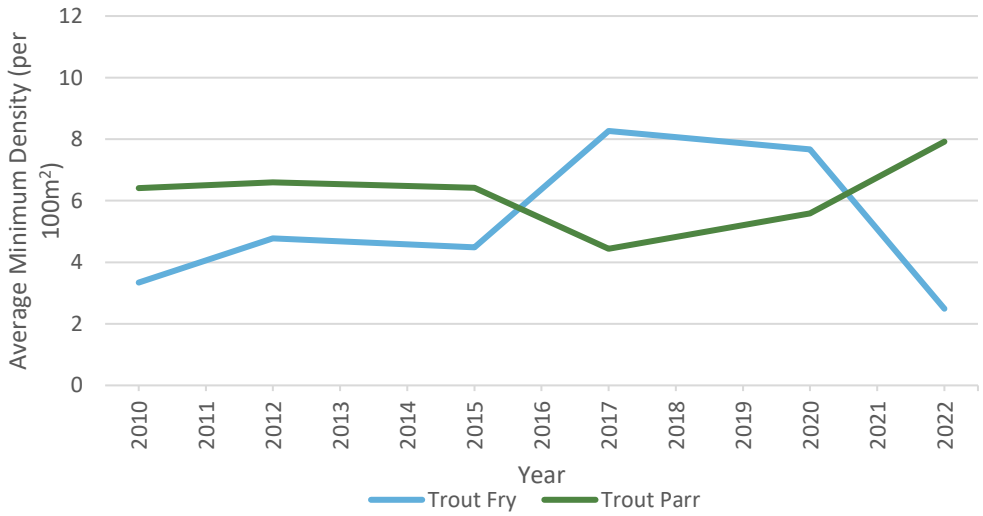

Figure 3.112: Temporal changes in average trout densities within the Geisgeil catchment.

The salmon population in Geisgeil is small, but consistently present throughout the time the system has been surveyed. At present the access to the loch from the sea is flow dependent, making it difficult for returning adults to reach the burns where the sites are present. It is possible that improved access would allow the population to grow.

Due to this, it is primarily a trout system, with trout parr densities remaining very steady and consistent with time. Trout fry densities have decreased, but this could be due to changes in the site habitat, as well as competition with salmon.

Densities of both salmon and trout in this system are much lower than would be expected in terms of the SFCC classification scheme, so it is recommended that habitat improvements are considered.

3.12 Duart

Table 3.121 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.122 and classified in accordance with the SFCC classification scheme (table 1). Sites D2 and D4 were not fished in 2022, due to conditions in the site and water temperature.

Table 3.121: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
D3	218443	937143	50	In riffle, just before bend down to falls. At stepping stones.
D5A	221332	936276	60	Eastern channel of burn, 20m above loch.
D6	221398	936243	60	Above stock fence by loch.
D8	221020	936148	60	Riffle below Loch Allt nan Ramh. Just below bridge.

Table 3.122: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
D3	0.00	0.00	29.01	14.51
D5A	0.00	35.6	0.00	4.45
D6	0.00	23.47	5.87	23.47
D8	0.00	56.82	3.79	7.58

No salmon fry were observed in the Duart system in 2022, which is very concerning. Fry have been found in every survey since they were first carried out in 1998, so this is a new development. Salmon parr were seen in excellent densities throughout the upper catchment, but were absent from the lowest site. Trout parr densities are good throughout the fished sites, with fry in excellent numbers in D3.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.123. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.123: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Mean
Salmon Fry	0.00	0.00	0.00
Salmon Parr	0.00	56.82	28.97
Trout Fry	0.00	29.01	9.67
Trout Parr	4.45	23.47	12.5

Salmon parr densities were stable and consistent historically, until 2015 where densities spiked from around 6 fish/100m^2 to 15 fish/100m^2, continuing to a high in 2022 of 28 fish/100m^2 (figure 3.121). Salmon fry have fluctuated during this time, but notably are absent in 2022.

Trout parr densities have been increasing since 2015, peaking in 2020 and only showing a slight decrease in 2022 (figure 3.122). Trout fry have fluctuated over time, with the highest densities seen in 2013 before dropping back to within the historic range.

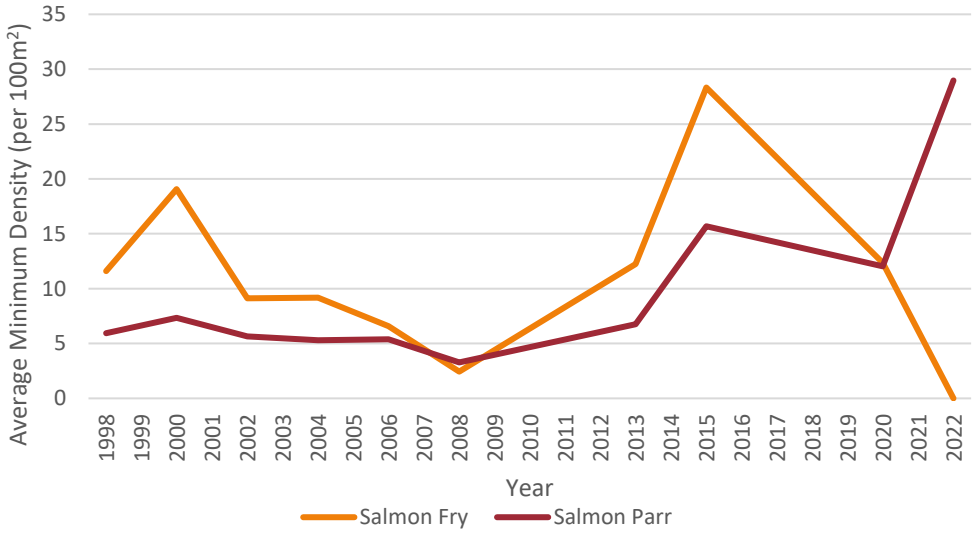

Figure 3.121: Temporal changes in average salmon densities within the Duart catchment.

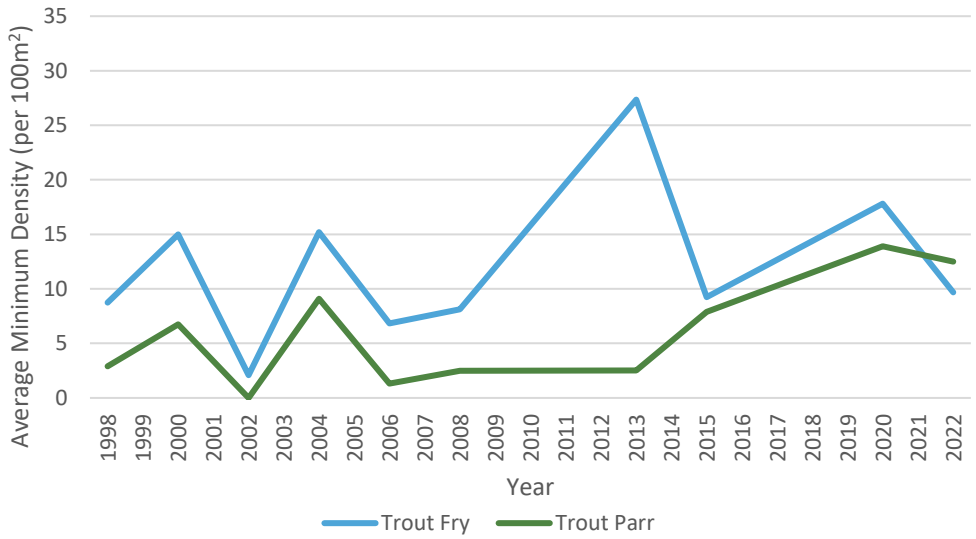

Figure 3.122: Temporal changes in average trout densities within the Duart catchment.

It is hypothesised that due to exceptionally low water in 2021 no adult salmon could pass the waterfall at the mouth of the system, preventing any spawning. This will need to be investigated further with juvenile surveys to determine whether it is a one off or a continuous issue.

The peaks and troughs within trout populations are likely to be a result of natural ecosystem dynamics. The resident trout populations appear to be stable and consistent, with the bonus of sea trout spawning. With the increased pressures possible in the marine environment, it is possible that the population is naturally shifting to a resident state. The costs and benefits of a migratory lifestyle are constantly operating on trout populations, and changes in environmental factors and mortality between the 2 environments will have an impact on the number of migrating individuals.

Considering the above, in the case of both salmon and trout there appears to be no major cause for concern over freshwater habitat regarding instream characteristics, except the waterfall at the mouth of the system. This is a natural barrier, but with recent low summer flows could pose a serious issue for migrating salmonids. Additionally, strategic planting of mixed broadleaf trees within riparian zones would dramatically improve fish cover, food availability, and structural bankside reinforcement.

3.13 Garvie

Table 3.131 shows the grid reference, altitude, and location of each site fished. Minimum density estimates of salmon and trout fry (0+ years) and parr (>1 year) per 100m^2 in each site are presented in table 3.132 and classified in accordance with the SFCC classification scheme (table 1).

Table 3.131: Electrofishing site details.

Site Code	Easting	Northing	Altitude	Situation
G2C	213281	906589	70	Allt Claonaidh, by riffle just below deer fence
G4C	204957	910717	40	Allt Coire Òsgaig. 300m upstream of loch, in small silver birch copse by crooked trees.
G4D	204938	911007	25	Allt Coire Òsgaig. Just above loch to large boulders.
OB1	205231	911837	35	Abhainn Òsgaig. In the braids, small channel in right bank.
OB4	205193	911808	35	Abhainn Òsgaig. Centre braid, glide/run between boulders.
OB5	205215	911749	35	Abhainn Òsgaig. Braid off main river, last braid from the road.

Table 3.132: A summary of the density of salmon and trout fry (0+ years) and parr (greater than 1 year) at each site per 100m^2.

	Minimum Estimated Density (per 100m^2)			
Site Code	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
G2C	3.00	5.01	23.03	1.00
G4C	0.00	0.00	28.72	35.89
G4D	0.00	0.00	12.63	14.21
OB1	5.76	0.00	0.00	5.76
OB4	11.30	8.47	11.30	5.65
OB5	14.10	19.73	2.82	5.64

Salmon and trout are present throughout much of the catchment, with salmon only absent from Allt Coire Òsgaig - sites G4C and G4D. Trout were commonly seen at good densities, whereas salmon were seen mostly at moderate densities.

The minimum, maximum, and mean minimum density estimates for the catchment can be seen in table 3.133. This summarises the system and allows direct comparison between all surveyed systems in the West Sutherland area.

Table 3.133: A summary of the minimum estimate densities determined for all sites surveyed (per 100m^2).

Species/Lifestage	Minimum	Maximum	Average
Salmon Fry	0.00	14.10	5.69
Salmon Parr	0.00	19.73	5.53
Trout Fry	0.00	28.72	13.08
Trout Parr	1.00	35.89	11.36

Figures 3.131 and 3.132 demonstrate the temporal fluctuations in the average salmon and trout densities within the Garvie catchment. Salmon numbers have remained low but stable over time, with the average fry and parr densities for the catchment never exceeding 10 fish/100m^2.

Trout fry numbers have fluctuated greatly over time in the Garvie catchment, showing a declining trend. Conversely trout parr can be seen to be on the increase which suggests a change in site habitat and suitability rather than an issue with the population.

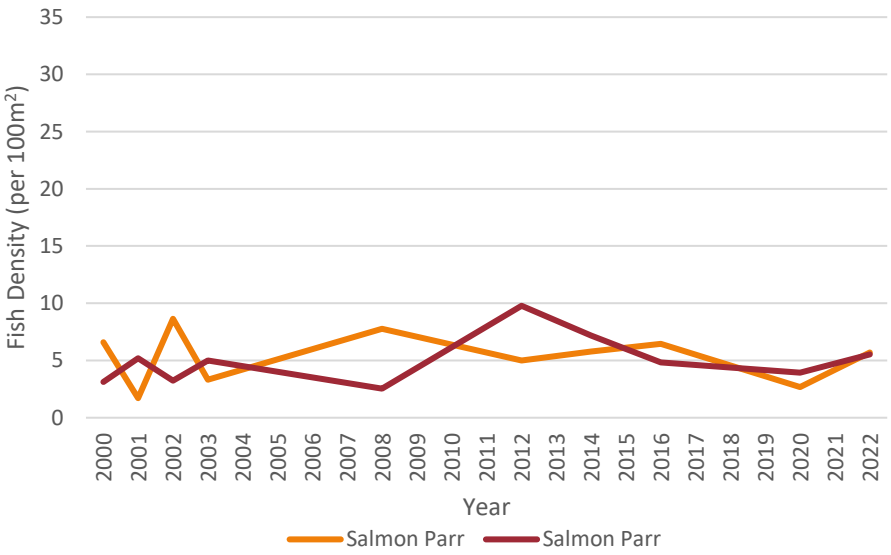

Figure 3.131: Temporal changes in average salmon densities within the Garvie catchment.

Figure 3.132: Temporal changes in average trout densities within the Garvie catchment.

Salmon fry and parr densities can be seen to remain at a low but stable level, with parr often out numbering fry. This is likely due to the habitat within the surveyed sites, with G2C comprised of trout habitat and sites in Abhainn Òsgaig more suited to parr. This is backed up by the parr densities themselves, as due to natural mortality much higher densities of fry are required to support parr numbers.

The temporal fluctuations in juvenile trout and salmon populations can be attributed to natural ecosystem dynamics, fluctuating marine pressures on migratory salmonids, and river conditions affecting the efficiency of the surveys.

In a mixed salmon and trout population, salmon will frequently outcompete trout, though this is not the case in the Garvie catchment. During the 2022 survey trout often outcompete salmon, which reflects the available habitat and supports the view that the Garvie catchment is primarily a trout system, as seen in the catch returns. The Oscaig Woods (Allt Coire Òsgaig) is of great importance to the trout. This is likely to be intensified by the riparian woodlands surrounding the burn which offers shading, cover, bank stability and increased food supply. The preservation of this habitat -and its extension to other parts of the catchment- is highly recommended.

4. Area Summary

The average densities of fish within each catchment are summarised (table 4.1). 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 because of water height and temperature, food availability and size. Thus, sampling after a spate may give a low density as a result of 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 4.1: Average minimum densities of juvenile salmonids per catchment.

	Average Minimum Estimated Density (per 100m^2)			
	Salmon		Trout	
Catchment	Fry	Parr	Fry	Parr
Hope	17.96	10.09	21.29	5.18
Oldshoremore	5.73	2.64	17.64	13.07
Loch Innis na Ba Buidhe	0.00	0.00	54.80	19.69
Achriesgill	18.02	12.61	5.47	2.70
Loch na Thull	51.41	20.69	22.23	3.13
Laxford	28.95	4.52	23.57	4.52
Badnabay	15.65	20.56	4.24	3.53
Clashfern	12.69	11.43	7.14	5.59
Loch nam Brac	0.00	0.00	34.07	5.16
Loch a'Bhadaidh Daraich	0.00	0.00	13.53	8.38
Geisgeil	10.52	9.52	2.49	7.92
Duart	0.00	28.97	9.67	12.50
Garvie	5.69	5.53	13.08	11.36
WSFT Area	**12.82**	**9.74**	**17.63**	**7.90**

From figures 4.1 and 4.2 it can be seen that there is a good distribution of salmonids throughout the West Sutherland area, with trout present in every catchment surveyed. Salmon were not present in Loch nam Brac, Loch a'Bhadaidh Daraich, and Loch Innis na Ba Buidhe, though this was expected. In terms of Loch nam Brac, there is an impassable barrier at the bottom of the system, preventing migratory salmonids access. Loch a'Bhadaidh Daraich and Loch Innis na Ba Buidhe have previously supported salmon populations, but it is thought that changes to the lower reaches of the systems have rendered them impassable for migratory salmonids; heavy plant growth, and complex stream structure respectively.

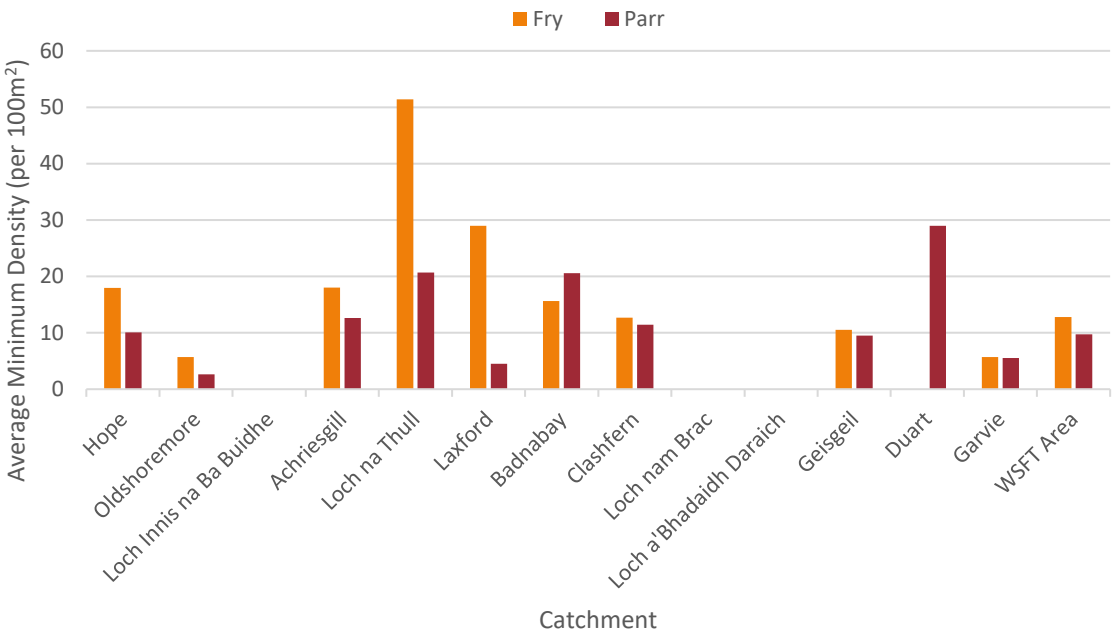

Figure 4.1: Average salmon fry and parr densities within West Sutherland catchments and the West Sutherland area in 2022.

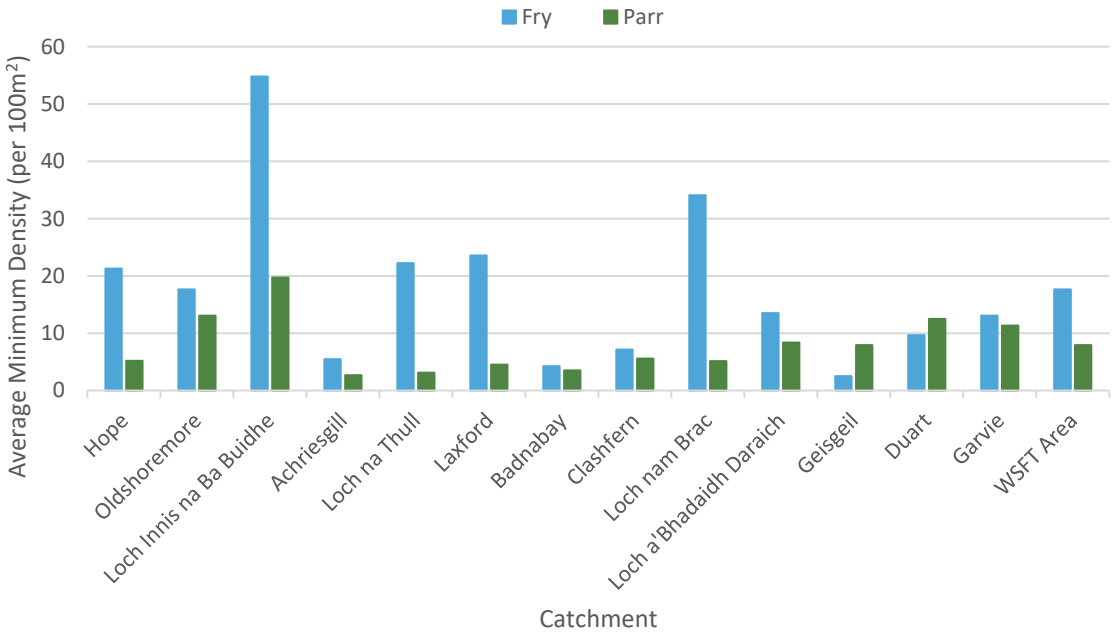

Figure 4.2: Average trout fry and parr densities within West Sutherland catchments and the West Sutherland area in 2022.

Figure 4.3 summarises the classifications of all sites against the SFCC classification scheme for the Northwest area (table 1). 36.0% of all sites support good and excellent densities of salmon fry, with parr classified as good and excellent in 33.3% of sites surveyed. Trout fry densities were seen at excellent and good densities in 46.7% of sites, and 49.3% of sites were found to have good and excellent densities of trout parr.

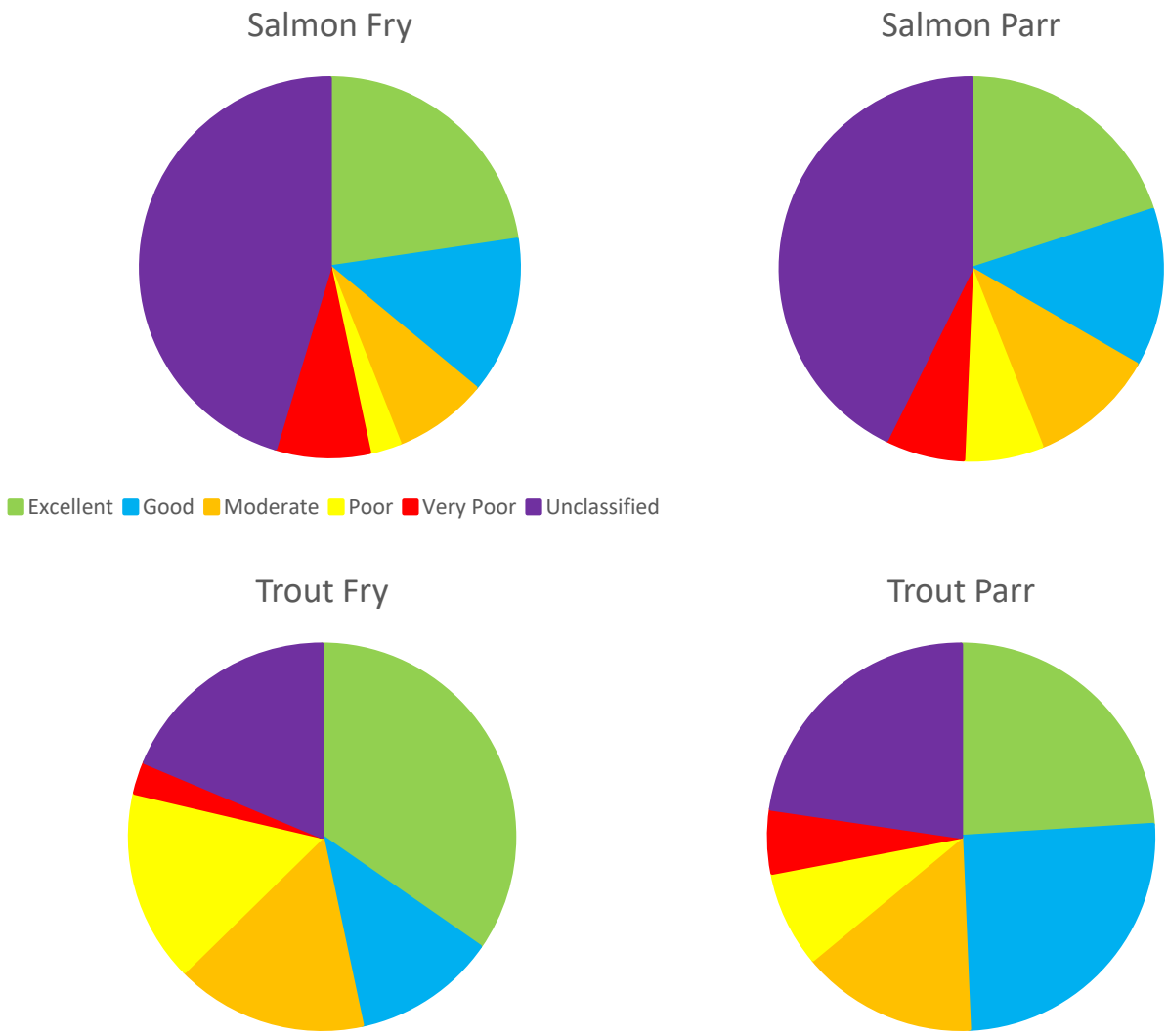

Figure 4.3: West Sutherland area salmonid densities according to the SFCC classification scheme (table 1).

During the catchment surveys other species were found; eels and minnows were seen in varying distributions in many catchments. Eels were observed in every catchment, though were only present in every site in 3 systems. Minnows were seen in 8 of the 13 surveyed catchments, and only seen in every site in the Duart. This is likely to reflect the location of the sites and the fact that the minnow is an introduced species and so more likely to be patchily distributed.

Trout were caught in every surveyed catchment, present in every site in 10 systems. Salmon were not quite as widely distributed, only present in every site in 4 of the 10 catchments they were present in. Sticklebacks were not observed on this occasion.

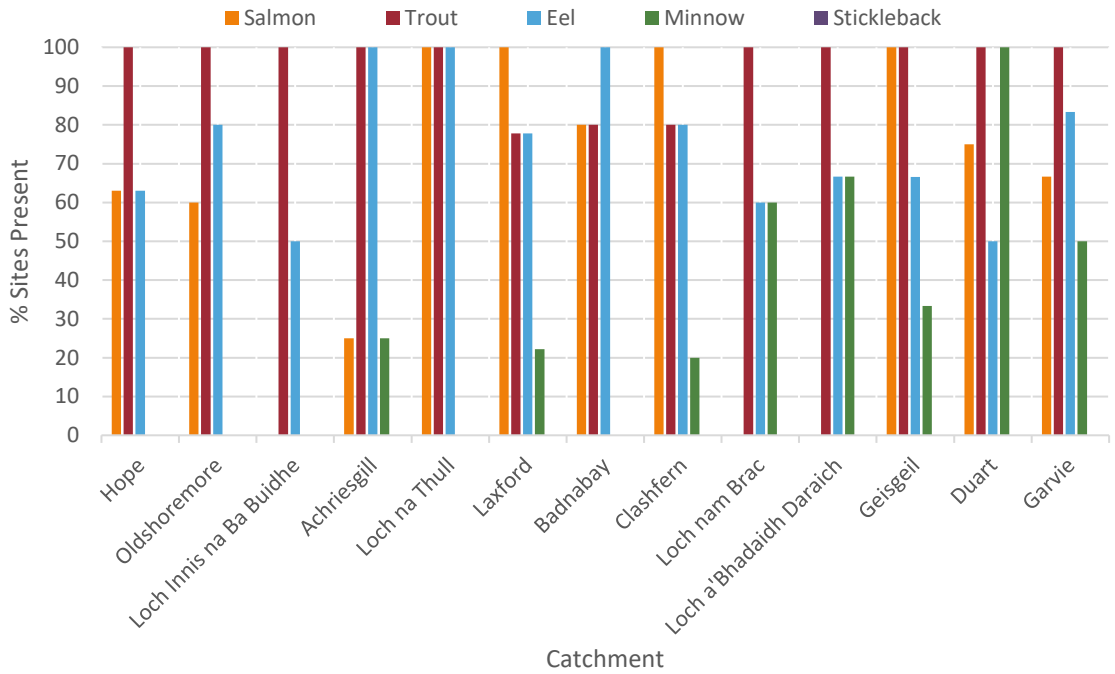

Figure 4.4: Species composition and distribution by catchment.

In 2022 the decision was made for NEPS not to go forward, which allowed a wider ranging assessment of individual catchments within the West Sutherland Fisheries Trust area. Due to weather and time constraints however, not all systems were surveyed - Gleann Leireag and Culag were missed from the 2022 diet.

Catchments surveyed during 2022 included 3 systems where salmon were not present, of which only 1 has historically been inaccessible to migratory fish. Salmon have been intermittently present in the others, but in recent years have failed which suggests a permanent change to the system populations. Larger salmon dominated systems were also surveyed, allowing for a representative snapshot of the West Sutherland area overall.

The results show that neither trout nor salmon are dominant overall in 2022 but that trout fry have had a more successful season than salmon fry (table 4.1). Salmon parr were seen in higher densities than trout parr, which was not seen in 2020 when these systems were last surveyed. Trout being more populous was expected given the nature and scale of the rivers and burns within the area, with a large number of small, coastal burns and a few larger salmon dominated systems. The results in 2022 could be due to changes in the sites sampled, as well as changes in the overall population dynamics.

The spread of minnows within the area is of some concern and reflects angler practice to a large extent. 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, impacting on their population. This should therefore be monitored to ensure that there is no spread to new sites.

Whilst overall instream habitat is favourable for salmonids in the West Sutherland area, it could benefit from strategic planting of broadleaf trees in riparian zones, which would improve cover, food availability, and bankside stability – overall providing great benefits to fish populations.

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