West Sutherland Fisheries Trust

2019 Electro-fishing Surveys

A report to the West Sutherland Fisheries Trust, Report No. WSFT01/20

January 2020

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1. Introduction

During 2019 West Sutherland Fisheries Trust continued to participate in the National Electrofishing Programme for Scotland (NEPS) under contract from Marine Scotland Science. This aims to gather data on salmon populations throughout Scotland, and will be trialled for potential use in determining conservation limits for salmon. The sites were picked at random across a variety of West Sutherland catchments, in areas accessible to salmon. Ten of these sites were sampled using the protocol for the SFCC fully quantitative survey method, with the remaining 17 surveyed using the semi quantitative method. Due to the large workload of this surveying program in combination with adverse weather conditions, it was only possible to undertake a small number of other sites: one site from the Oldany catchment (LP5) was repeated from previous years, and the Maldie Catchment was surveyed as part of the long term monitoring of the hydro-electric development.

Method

Electro-fishing 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 all 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.

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, using small hand nets 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 fish densities.

All fish were anaesthetised using 2-Phenoxyethanol, identified to species and measured (± 1 mm). Scale samples were taken from parr for age determination, and genetic samples were taken from up to 30 salmon parr during fully quantitative surveys. The fish were then placed in a bucket before being returned to the survey site upon complete recovery.

This report presents the data gathered from these surveys as minimum density estimates per $100m^2$ (e.g. data from the 1^{st} sample run only) in order to present a picture of juvenile salmonid densities across the West Sutherland area for 2019 to allow comparison across all sites. 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. 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.

2. Results

Table 1 gives the grid references, catchment and minimum estimates of density for trout and salmon fry (0 years) and parr (1+ years) per 100 m^2 for each site surveyed. The minimum, maximum and mean densities are given for all sites (Table 2). This summarises the data and allows the sites data to be compared to the West Sutherland area. The data are presented graphically for salmon (Fig. 1) and trout (Fig. 2).

Table 1: *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 Density ($100m^2$)			
Site Code	**Easting**	**Northing**	**Catchment**	**Salmon Fry**	**Salmon Parr**	**Trout Fry**	**Trout Parr**
4560	242623	943123	Hope	3.86	3.09	2.31	0.77
4652	247419	957585	Hope	0.00	4.29	10.00	5.00
4508	237563	950576	Polla	5.77	6.59	5.77	2.47
4524	238803	952534	Polla	8.07	6.92	0.00	1.15
4552	237780	950864	Polla	1.09	3.26	1.09	1.09
4663	238758	954593	Polla	4.94	3.53	1.41	0.71
4507	233697	958499	Dionard	19.11	0.00	0.00	0.00
4523	233918	958868	Dionard	18.13	0.91	0.00	0.00
4510	232752	956005	Dionard	2.41	3.37	0.00	0.96
4530	232975	957216	Dionard	2.01	7.04	0.00	0.00
4551	233771	958619	Dionard	14.94	0.93	0.00	0.00
4555	235782	960183	Dionard	1.83	9.16	1.83	0.00
4558	232701	956263	Dionard	3.04	4.56	0.00	1.52
4502	221093	959261	Oldshoremore	0.00	0.77	0.00	5.42
4556	225493	960759	Sandwood	0.92	8.30	0.92	1.84
4522	229000	939675	Laxford	7.99	19.40	0.00	5.71
4634	234786	934939	Laxford	2.90	3.48	0.58	1.16
4554	222649	936888	Duart	0.00	0.00	25.64	0.00
Site 1	226092	935519	Maldie	0.00	0.00	6.76	9.01
Site 2	225326	934886	Maldie	0.00	0.00	14.29	4.29
Site 3	224990	934596	Maldie	0.00	0.00	0.00	22.28
Site 4	225810	935601	Maldie	0.00	0.00	12.10	24.20
Site 5	225742	935663	Maldie	0.00	0.00	32.96	0.00
Site 6	225960	935523	Maldie	0.00	0.00	10.41	23.42
Site 7	227559	937088	Maldie	0.00	0.00	36.06	0.00
Site 8	227015	937462	Maldie	0.00	0.00	0.00	5.13
Site 9	227118	936733	Maldie	0.00	0.00	38.13	16.34
LP5	210100	932150	Oldany	0.00	9.26	7.40	0.00
4557	215523	924150	Inver	0.00	18.41	0.00	1.53
4529	224757	920384	Inver	42.83	14.90	5.59	1.86
4637	215218	924412	Inver	3.17	14.78	5.28	1.06
4649	224963	918378	Inver	8.38	28.85	4.66	0.00
4661	223650	919488	Inver	0.00	1.78	0.00	3.56
4665	224655	919597	Inver	12.95	8.38	4.57	0.00
4509	208668	913656	Polly	38.26	3.75	0.00	0.00
4525	214322	911143	Polly	6.27	3.13	10.44	1.04
4553	207318	913666	Polly	3.35	7.367	1.34	2.01

Table 2: *A summary of the densities determined for all sites surveyed*

Species/age class	Minimum	Maximum	Mean
Salmon fry	0.00	42.83	5.74
Salmon parr	0.00	28.85	5.30
Trout fry	0.00	38.13	6.47
Trout parr	0.00	24.20	3.88

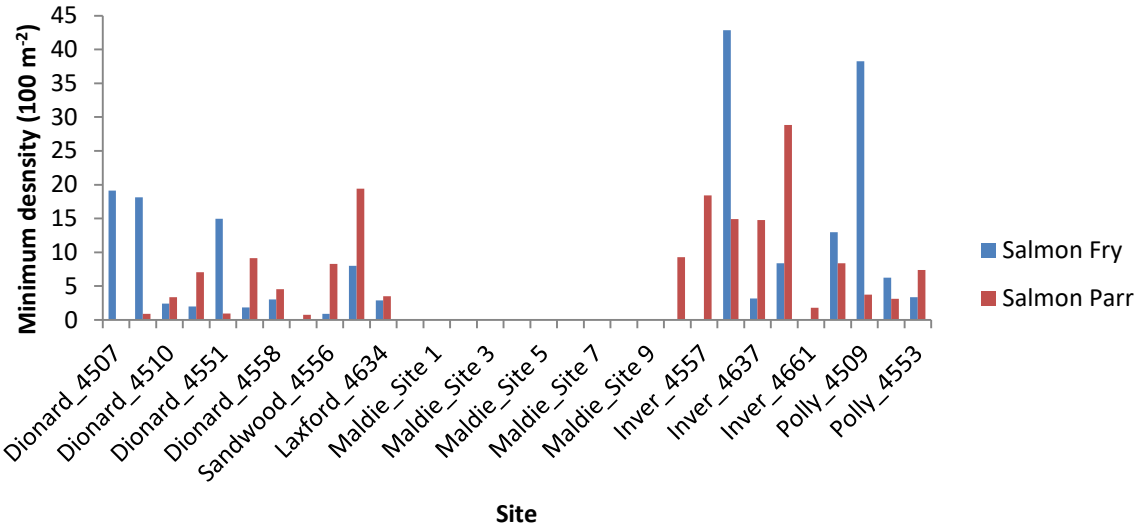

Figure 1: *Juvenile salmon densities by survey site*

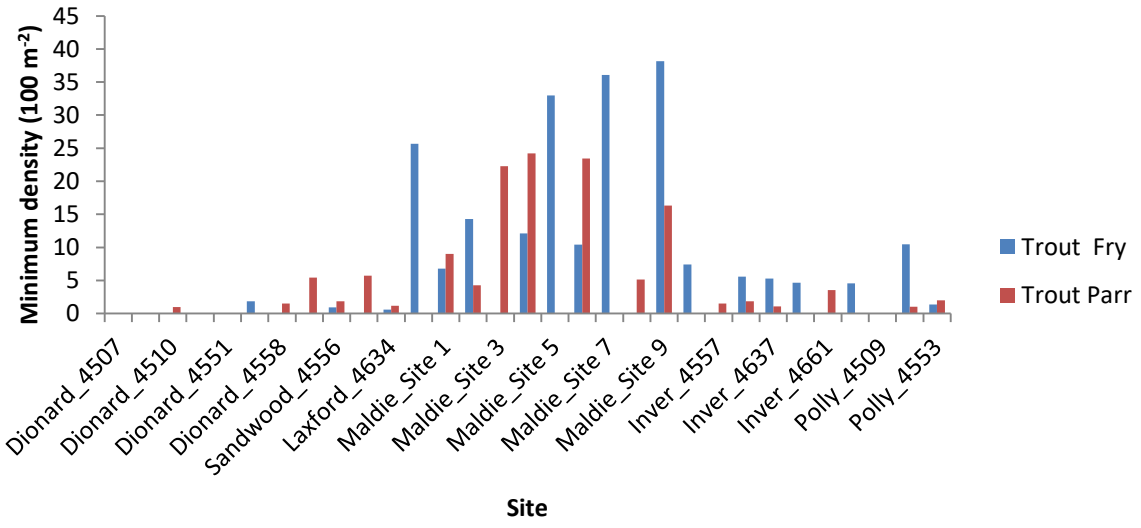

Figure 2: *Juvenile trout densities by survey site*

3. SFCC Classification

The SFCC absolute regional classification scheme, presented in Table 3, was developed so that fish populations could be compared across Scotland, allowing electrofishing results in Sutherland to be presented in a Scottish context. Unlike the relative regional classification scheme, this does not take into account river width which is known to affect salmonid densities with generally more fish present in narrower tributaries. When compared to the SFCC regional classification scheme for the

North West area, salmonid densities range from absent (unclassified) to excellent. Within-catchment variation exists, primarily due to habitat type and accessibility to migratory fish.

		Minimum density per 100m^2			
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	0.00	0.00	0.00	0.00

Table 3: *SFCC salmonid density classification scheme for the North West area*

The percentages of SFCC classifications across the west Sutherland area for 2019 are displayed in Figure 3. 24% of all sites were classed as having moderate to excellent salmon fry densities (5% classed as excellent), with salmon parr densities classed as moderate to excellent within 35% of all sites (14% classed as excellent). Trout fry densities were classed as moderate to excellent in 43% of all sites, (11% classed as excellent), with 30% of sites containing moderate to excellent trout parr densities (14% classed as excellent).

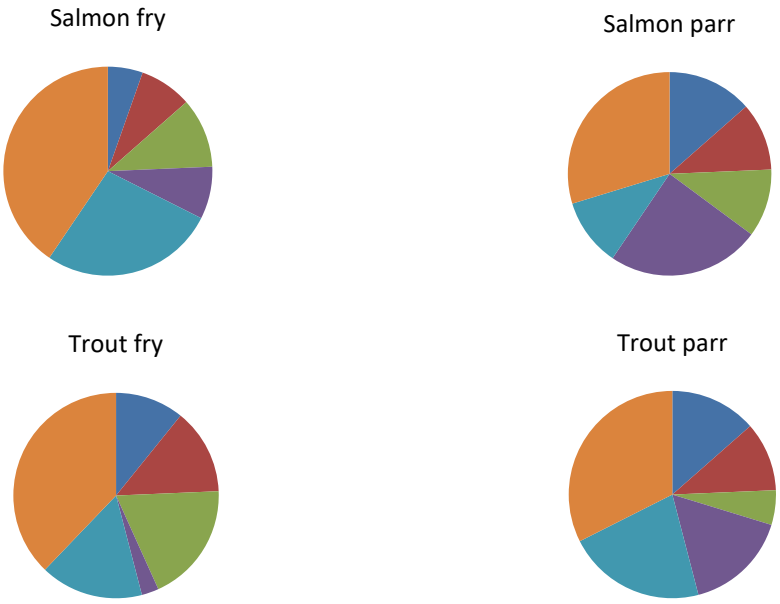

Figure 3: *West Sutherland area salmonid densities according to the SFCC classification scheme*

4. Species distribution

Figure 4 shows that trout were the most commonly occurring species within the 2019 survey within the West Sutherland area, and were present within 89% of the sites. This is followed by salmon, present in 73% of sites. Eels were present in 43% of the survey sites, where minnows and 3-spined sticklebacks were present in 11% of the sites each.

Figure 5 displays species distribution within the catchments across the West Sutherland area by presence/absence.

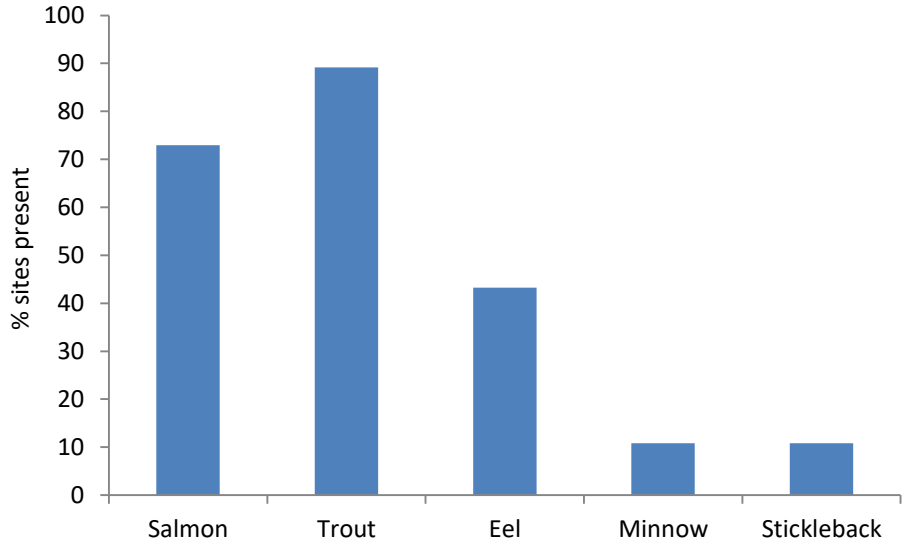

Figure 4: *Species composition within the West Sutherland area*

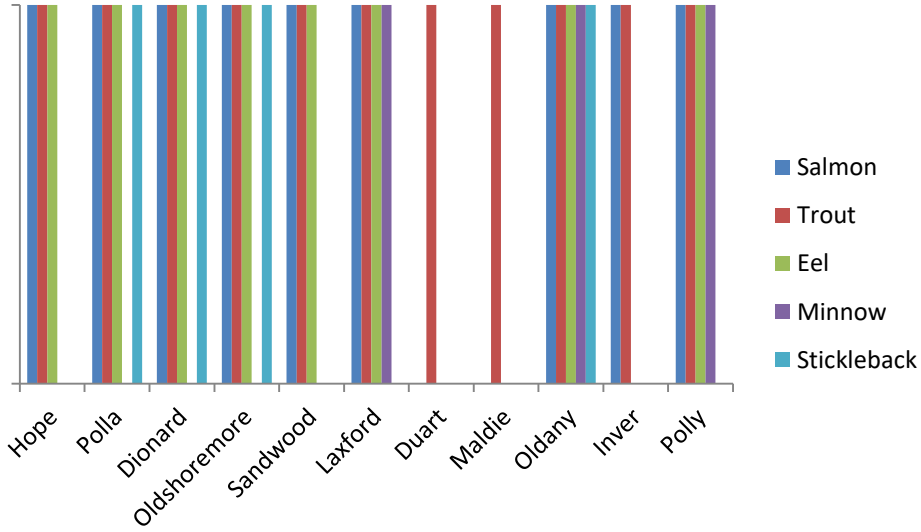

Figure 5: *Species composition by catchment*

5. Discussion

As NEPS has been developed as an addition to the Salmon Conservation Regulations, attempting to bring juvenile densities into the classifications, the sites are selected on the basis of their accessibility to salmon. As such, the presence of salmon at each site is to be expected. The Duart is the only NEPS site where this did not hold true and is likely to reflect the size and location of the site and the potential presence of an unknown barrier downstream. The Maldie, not sampled as NEPS sites, is above an impassable waterfall and as such only trout would be expected. Trout were present in all catchments and this reflects the more generalist nature of the species.

The densities observed at each site are a reflection of the habitat present as well as the status of the fish population p*er se*. Salmon and trout, as well as fry and parr, tend to use different habitats and

this is reflected in the results obtained. Despite the selection of the sites for salmon presence, with the exception of the Maldie, the random nature of the site selection ensured that there was no bias in habitat selection and that the results reflect a broad assessment of the west Sutherland population as opposed to that of individual catchments. There does, however, appear to be relatively healthy salmon and trout populations within the area.

The presence of other species is also noted in these surveys. While not the primary aim of the programme, these data give additional information on the health of the fish populations, and particularly the endangered eel. It is encouraging to note that eels are present in all catchments surveyed, with the exception of the Duart, Maldie and Inver. In the case of the Duart and Maldie this is likely to reflect natural barriers within the systems, particularly as no salmon were found either. However, with the Inver this is more likely to be the result of a man-made barrier within the main river and further assessment and remediation should be considered.

Minnows are not native to the west Sutherland area and as such their presence is the result of historic stocking, primarily by bait fishermen. While no longer legal, this activity has had long term impacts. Minnows have been shown in other areas to have a negative impact on trout populations through competition and as such it was disappointing to find them in the Laxford, Oldany and Polly catchments, although at a low number of sites overall.