South Cumbria Rivers Trust Electrofishing - 2021 Report



A project funded by DEFRA under the Catchment Based Approach



SCRT

Contractor

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1. Introduction

South Cumbria Rivers Trust (SCRT) undertake annual fish surveys across South Cumbria using the electrofishing method. This is an important assessment of juvenile salmonid (salmon and trout) populations to help understand trends over time and help quantify the impacts of projects. It also gathers basic habitat information and is an important engagement tool for people who are interested in learning more about their local becks. Salmonids are key indicators of freshwater health and general catchment functioning. Therefore, this monitoring provides evidence for catchment planning, data to support current projects and is used to inform the development of funding bids to deliver work on the ground. This information is used by the Becks to Bay catchment partnership and other local organisations such as the Environment Agency.

2. Project Aims

- Develop a robust scientific evidence base and on-going monitoring programme
- Investigate the effectiveness of habitat improvement work
- Assess trends in salmonid populations
- Inform the catchment plans and support Water Framework Directive monitoring
- Share data with the Becks to Bay partnership and wider public
- Identify opportunities for future habitat improvement work
- Engage public and partners with the issues facing our rivers

The project aims to undertake fish surveys on a rolling programme across the five catchments covered by South Cumbria Rivers Trust, approximately every 3 years. The programme is a mix of project sites and background sites; this will help to establish a baseline, monitor trends over time and assess the effectiveness of interventions. Fish populations are naturally variable, both within rivers and through time, therefore surveys for population estimates should be viewed at a catchment scale, particularly for migratory species such as salmonids. However, local variability can often be a good indicator of habitat quality.

The programme is run in conjunction with the Environment Agency's monitoring where possible to ensure they are complimentary and do not duplicate effort. The Environment Agency has undertaken fish surveys for several decades and therefore hold a large database of information which is accessible to SCRT. However, over recent years there has been less resource for monitoring, creating an evidence gap which SCRT aim to fill. SCRT have now been running an established electrofishing programme since 2016. Due to limited resource some surveys were undertaken prior to this, however these were on a smaller scale and not in the current programme format; SCRT have some records running back to 2011.





3. Methodology

3.1 Electrofishing Methodology

Electrofishing is a humane, non-lethal means of surveying fish populations. The technique applies a small electric current to the watercourse which acts to cause temporary incapacitation and taxis of the fish towards the operator, thus rendering the fish easier to catch for bankside analysis. At each site an E-fish 500W electrofishing back-pack was used to survey an un-netted 50m reach using a single pass. Sites were fished following a zigzag pattern in an upstream direction, ensuring continuous coverage of the riverbed. Prior to surveying, water quality parameters, including temperature and conductivity were measured. This enabled adjustment of the E-fish backpack to the appropriate settings for each site, to ensure the safety and wellbeing of the fish and operators. The output frequency on the backpack was set to 50hz at all sites as this is the most effective and safe setting for salmonids. Each survey was undertaken by a team consisting of a minimum of three people at each site, one operating the backpack and two people netting the fish using handheld nets. The method used is semi-quantitative as no stop nets are employed and there is only a single pass of the reach. Therefore, it is inevitable that some fish are missed during the survey; this is accounted for when calculating the results. Semi-quantitative surveys can be calibrated against the more detailed, but more time and resource intensive, quantitative surveys (Farooqi & Aprahamian, 1993). The semi-quantitative method is the most resource efficient method, maximizing coverage across the catchment. This is also the recommended method in the UK TAG framework for Water Framework Directive (WFD) monitoring.

Juvenile salmonids are the focus of the surveys. By recording the species and length we can gain an assessment of the size and age structure of the populations. Other fish species are recorded, but not measured; these include eels, bullhead, stone loach, minnow, lampreys, and sticklebacks. Further information on the river and surrounding habitat is also recorded to gain a more holistic picture. This includes details such as vegetation cover, bed substrate, water depth and basic water chemistry. This can then be used to inform the development of habitat improvement projects for fish spawning.

Surveys in this report are undertaken between July and September 2021. They are restricted to this timeframe so as not to disturb fish spawning and are only permitted under licence from the Environment Agency and with permissions from local landowners. Surveys record salmonid fry and parr, which are caught and analysed on site. Fry hatch from eggs spawned in the autumn and then emerge out of gravels during April/ May. Parr are fish which are one year or older; most salmon parr leave the river in spring as smolts when they are around 12cm in length. Trout parr will either migrate down into the main river to become brown trout or undergo smoltification and move out to sea as sea trout. Typically, juvenile salmon and trout spend between 1 and 3 years in freshwater before migrating to the sea as smolts. During the surveys the number of fish are recorded, and the length of each individual is measured to the fork in the tail (to the nearest 0.5cm). All fish are then returned to the water, unharmed. On rare occasions, a very small number of fish do not withstand the process and unfortunately mortalities do occur. South Cumbria Rivers Trust keeps a record of fish mortalities, and this is





reviewed to allow assessments of methods and surveyor technique. To date, fish mortalities have never exceeded 0.5% of the survey catches.

Within England and Wales it is an offence to electro-fish without an appropriate licence from the Environment Agency (EA). All licences from the EA and access permission from riparian landowners and fisheries owners were gained and granted prior to surveying.

3.2 Site Selection

During 2021 SCRT were granted a permit from the EA to undertake surveys across South Cumbria. A programme of sites, see table 1, was established prior to the electrofishing season to incorporate project specific sites and 'generic' baseline sites. However, this year the majority of sites surveyed were related to project work. Sites surveyed during 2021 are highlighted in the table below, the distribution of these across South Cumbria can be seen in Figure 1.

No.	Site Name	Catchment	Grid Reference		
1	Greenholme Lower	Crake	SD28683 89083		
2	Greenholme Upper	Crake	SD28576 89120		
3	Langholme Beck	Crake	SD29079 86462		
4	Yewtree Beck	Crake	SD31833 99761		
5	Yewdale Beck	Crake	SD31602 99711		
6	Rake Beck	Duddon	SD21737 95964		
7	Tarn Beck	Duddon	SD23540 97316		
8	Dubbs Beck	Kent	NY42418 00867		
9	Lambrigg Upper	Kent	SD58150 96253		
10	Lambrigg Lower	Kent	SD58004 96344		
11	Longsleddale –	Kent	NY50637 01718		
12	River Sprint		NW/224.05.02004		
12	Colwith	Leven	NY33185 03094		
13	Farra Grain Gill	Leven	SD33372 92449		
14	Rusland Pool	Minor Catchment	SD33826 88543		
15	Pennington Beck	Minor Catchment	SD25777 77871		
16	Troutbeck	Leven	NY41618 03570		
17	St Sundays	Bela	SD54259 88549		
18	Cockley Beck	Duddon	NY24731 01750		
19	Black Syke Beck	Duddon	SD21116 94767		
20	Old Park Beck	Duddon	SD22015 95870		
21	Poaka Beck	Minor Catchment	SD23328 76099		
22	Ashes Beck	Minor Catchment	SD34568 90134		

Table 1. Full list of sites surveyed by SCRT across South Cumbria in 2021. Sites highlighted in boldwere surveyed during 2021.







Figure 1. Sites surveyed for fish by SCRT during 2021

3.3 Calculating the classification

Fish surveys provide data on the number of fish present within a reach, this can then be converted to a density of fish. Once the density of salmonids per 100m² has been obtained each site can be graded based on the National Fisheries Classification Scheme (NFCS). This scheme has been used by the Environment Agency to classify fish populations since 1997. Following discussions with the Environment Agency the results obtained here have been calibrated and classified using the same method. This involves using a pre-calculated conversion factor to make the fish densities obtained from semi-quantitative surveys comparable to those generated from quantitative surveys (Farooqi & Aprhamian, 1993). These values can then be assigned to one of 6 classes; 5 classes based on quintiles and 1 one for absent, see Table . These are absolute classifications meaning they aren't related to sites with a similar habitat but rather are related to all sites and therefore they only give a broad indication. Prior to calibration against quantitative surveys, semi-quantitative surveys will give a minimum density of fish present at each site. Converting these values to the national system allows for comparison of abundance over a wider geographical area.

Salmonid fry and parr classes were separated based on fish sizes deduced from length abundance graphs. Fish grow at different rates depending on the site conditions, it is therefore difficult to assign one value for all sites. At sites where only a small density of fish is caught it can be difficult to determine the break in age categories, therefore a best estimate based on data and comparison to nearby sites is made.





During surveys, the number of individuals of any other fish species caught are also recorded. These species are not routinely surveyed by the Environment Agency and do not form part of the classification scheme, therefore only broad assumptions on presence/ absence can be deduced. Furthermore, the E-fish backpack is set to be most effective for salmonids and therefore numbers of other species caught may not be entirely representative.

Table 2. Classification boundaries as provided by the Environment Agency

Salmonid abundance

(Values are No. per 100m⁻²)

CLASS						
A→ ←	B → ← (C → ← C) → ← E		F	
38	17	8	3		0	
21	12	5	2		0	
86	45	23	9		0	
19	10	5	3		0	
2	0.5	0.2	0.1		0	
47	28	15	6		0	
36	23	13	5		0	
31	18	11	4		0	
2	0.5	0.2	0.1		0	
62	43	31	18		0	
	$A \rightarrow \leftarrow $ 38 21 86 19 2 47 36 31 2 62	$A \rightarrow \bullet B \rightarrow \bullet \bullet ($ $38 \qquad 17 \\ 21 \qquad 12 \\ 86 \qquad 45 \\ 19 \qquad 10 \\ 2 \qquad 0.5 $ $47 \qquad 28 \\ 36 \qquad 23 \\ 31 \qquad 18 \\ 2 \qquad 0.5 $ $62 \qquad 43$	CLASS $A \rightarrow \leftarrow B \rightarrow \leftarrow C \rightarrow \leftarrow D$ 38 17 8 21 12 5 86 45 23 19 10 5 2 0.5 0.2 47 28 15 36 23 13 31 18 11 2 0.5 0.2	$A \rightarrow \leftarrow B \rightarrow \leftarrow C \rightarrow \leftarrow D \rightarrow \leftarrow E$ $38 17 8 3$ $21 12 5 2$ $86 45 23 9$ $19 10 5 3$ $2 0.5 0.2 0.1$ $47 28 15 6$ $36 23 13 5$ $31 18 11 4$ $2 0.5 0.2 0.1$ $62 43 31 18$	$A \rightarrow \leftarrow B \rightarrow \leftarrow C \rightarrow \leftarrow D \rightarrow \leftarrow E$ $38 17 8 3$ $21 12 5 2$ $86 45 23 9$ $19 10 5 3$ $2 0.5 0.2 0.1$ $47 28 15 6$ $36 23 13 5$ $31 18 11 4$ $2 0.5 0.2 0.1$ $62 43 31 18$	

Table 3. National Fisheries Classification Scheme classes

Grade	Fish Density			
А	Excellent			
В	Good			
С	Fair			
D	Poor			
E	Very Poor			
F	No Fish Present			

NFCS Class boundaries with percentage of sites shown in relation to grade.

F	Е	D	С	В	А
(0% 2	0% 40	0% 60	9% 80)%
Not Present					



4. Results

4.1 Overview

During 2021 a total of 16 sites were surveyed, see **Error! Reference source not found.**, the majority of these were project sites where SCRT had, or are planning to, deliver habitat improvements. Staff resource restricted the number of surveys this year and so these were often prioritised around project sites where the information helps support the evidence base, and our understanding of the effectiveness of the work. To address the issue of resource, SCRT started to explore options to train up further staff to support surveys; training will be undertaken at the start of the 2022 season. It is hoped this will expand the number and scope of fish surveys undertaken. Additionally, August and September saw very little rainfall, and therefore, some surveys were restricted; however, temperatures weren't too high, so SCRT were still able to survey in becks where there was enough water flow.

Results during this survey season were relatively promising. Although this is taken with some caution as results aren't directly comparable between catchments due to the influence of several site-specific factors. Sites often aren't chosen at random and the coverage by SCRT isn't large enough to give a full picture of the status. However, overtime this gives us some good indicators and helps better inform our understanding of the catchments. Several sites recorded relatively good results for salmon, particularly in the Crake catchment which is promising and encouraging as SCRT have been active in the catchment for the past 3 years, carrying out a number of habitat improvement projects, ranging from fencing to paleochannel reconnection. Eels were also noted at several sites; the European eel, *Anguilla anguilla*, is a critically endangered species, therefore recording their presence during surveys is important to help understand populations. However, electrofishing surveys aren't targeted at eels and therefore, the data isn't fully representative.

A summary of the results by catchment is presented in the following pages. Full results can be viewed in Appendix I.







Figure 2. Salmon fry abundance as classified under the National Fisheries Classification Scheme (NFCS) at sites surveyed across South Cumbria in 2021.



Figure 3. Salmon parr abundance as classified under the National Fisheries Classification Scheme (NFCS) at site surveyed across South Cumbria in 2021.







Figure 4. Trout fry abundance as classified under the National Fisheries Classification Scheme (NFCS) for sites surveyed across South Cumbria in 2021.



Figure 5. Trout parr abundance as classified under the National Fisheries Classification Scheme (NFCS) for sites surveyed across South Cumbria in 2021.





Figure 6. Potential barriers to fish migration across South Cumbria

4.2 Duddon

Two sites were surveyed in the Duddon catchment during 2021. More were planned, however, a road closure on the only road through the valley for several weeks made this difficult. Drought conditions once the road reopened meant no further surveys were undertaken this year. Both sites surveyed recorded no or low populations of fish. At Rake Beck, it was believed that this was a consequence of drought earlier in the year. This is a small spawning tributary where fish have frequently been observed by the landowners; it's assumed the fish may have dropped back into the main river during the drought. Follow up surveys in future years will help to confirm this. However, a number of eels were observed, eels are more resilient to drought and low oxygen conditions; as a critically endangered species records of eels in the catchment are always well received. No salmon were recorded at Tarn Beck, however, some trout fry and parr were recorded. The national fisheries classification scheme classes these as poor and very poor respectively. This site was previously surveyed in 2016, when trout populations were classified as 'fair', again no salmon were recorded in 2016. Tarn Beck is a modified system which has been straightened and is embanked, there is limited in river habitat variability; SCRT are investigating options for restoration work along this reach. Under the United Utilities Raw Water project, SCRT will be active in this catchment for the next two years, mainly focussing on water quality however, there are opportunities to also deliver habitat improvement works.





4.3 Coniston & Crake

The results for Coniston and Crake generally reflect a positive picture for the catchment and the work which SCRT has undertaken here over the previous few years. Salmon in particular show promising trends, with all 5 sites surveyed recording the presence of salmon, including some populations classed as good and excellent. Of the 16 sites surveyed across South Cumbria in 2021, salmon were only recorded 6 sites, of which 5 were within the Crake catchment. Greenholme Beck is a good example of the success of restoration efforts; in September 2019 SCRT reconnected Greenholme Beck to its paleochannel, bypassing a weir. In previous surveys only 1 or 2 salmon had been recorded above this barrier, conversely this year 42 salmon fry and 1 salmon parr were recorded, giving a classification of 'good' and 'very poor' respectively. It is assumed that the salmon parr classification is a reflection of limited accessibility in previous years, therefore, it is hoped that this year's salmon fry will return in future years as



Figure 7. Newly restored section of Greenholme Beck, 1 year after restoration.

salmon parr. The new section of beck, in the paleochannel, was also surveyed. This section is evolving with time as pools and riffles continue to develop, however, the results indicate that this is establishing well, with 'excellent' populations of salmon fry and 'good' populations of salmon parr being recorded. Figure 8 shows how trends in populations have changed over time; however, some caution should be taken when viewing this graph as the time periods between surveys differ and initial surveys were taken by the Environment Agency who may use slightly different methods. Despite this the graph gives a good insight into how trends have changed, of note is the increase in salmon fry recorded in 2021, numbers of this level hadn't been recorded since 1993; it is hoped that this cohort will lead to an increased number of salmon parr in future years. Populations of trout have been much more continuous.





Figure 8. Fish population trends in Greenholme Beck (lower) between 1993 and 2021. Note the uneven distribution of surveys across years, additionally the data pre-2012 is from Environment Agency surveys, whereas post 2012 is based on SCRT surveys.

Figure 9 shows that the trend for salmon fry populations has increased over from a low point in 2015, for salmon parr, also appears to be gradually recovering. The increase in salmon parr in 2021 reflects the relatively high populations of salmon fry recorded in 2020. Trout fry populations have fluctuated over the years, being relatively low for the past 2 years, with a particular dip between 2019 and 2020. Under the Conserving Coniston & Crake project SCRT fenced Langholme Beck in 2018 to reduce cattle access and siltation. This also appears to have had positive results, with most populations showing an increase since this time.



Figure 9. Fish population trends in Langholme beck between 1997 and 2021. Note the uneven distribution of surveys across years, additionally the data for 1997 is from Environment Agency surveys, whereas post 2015 is based on SCRT surveys.

Yewtree and Yewdale becks were also surveyed in 2021, again both recorded populations of salmon, although in general Yewdale recorded slightly higher populations of fish. 12 salmon and 62 trout were recorded in Yewdale compared to 2 salmon and 24 trout in Yewtree. Yewdale had a more diverse habitat structure, whereas the section of Yewtree which was surveyed was relatively uniform at the lower end with evident siltation. Towards the upper reaches of this section the beck had cascades and variation in in-river habitat, which has the potential to harbour more fish. However, despite this Yewtree displayed relatively good populations of fish, with trout being classified as 'excellent' and 'poor' for fry and parr respectively. SCRT are currently working on a feasibility study at the upstream end of Yewdale beck to help understand the impacts of the mines and identify potential options for remediation.

4.4 Windermere & Leven

During 2021 2 sites were surveyed in the Windermere and Leven catchment, at Colwith and Troutbeck. Both are sites where SCRT have carried out restoration work. In 2018 the bank at Colwith was reprofiled, coppicing on the right-hand bank was undertaken to let more light in, and trees were planted along a buffer strip on the left-hand bank. Populations of fish at





Colwith were very poor, as in previous years, no salmon were found and only one trout fry. However, other fish species including bullhead, stone loach and minnows were recorded at the site. It is believed this may be a reflection of wider issues within the catchment, very few fish have also been previously recorded at the River Brathay downstream of Skelwith.

In comparison, fish populations were healthier in the site at Troutbeck. At this site SCRT removed an embankment in 2020, tree planting has also been undertaken along the river corridor and there are some good examples of woody debris in the surveyed section. Salmon parr were recorded at low numbers but no salmon fry. Good populations of trout fry were recorded and poor populations of trout parr. A couple of larger fish were also noted within the large woody debris, but the nature of this habitat made them difficult to catch. However, these populations were much lower than the populations recorded in 2019, at a reach slightly further up. In 2019 112 trout and 36 salmon were recorded, comparatively in 2021, 35 trout and 1 salmon were recorded. This could be a reflection of local differences in habitat or droughts experienced earlier in the year. It will be important to undertake further surveys in this beck to assess any changes in the population over time.

4.5 Kent & Winster

Four sites were surveyed on the Kent catchment and none within the Winster catchment. SCRT are still running a project in the Winster and Gilpin catchments and to capture data on previous measures/ projects, sites here will be prioritised for 2022. The sites surveyed in the Kent catchment were all linked to project sites. Dubbs Beck is an area where SCRT delivered some work in 2016 and 2017; the beck here was previously revetted and had very little in river habitat therefore SCRT undertook remediation works to remove the revetment and reprofile the banks. Trees were also planted along the buffer strip, although these would benefit from some further protection. Figure 10 show the trends in fish densities at Dubbs Beck since SCRT started undertaking fish surveys here. The graph shows that the trends here have been relatively stable over the past 5 years, no surveys are available prior to this. Salmon aren't found in this beck due to the barriers and reservoir downstream.



Figure 10. Fish densities per 100m² at Dubbs beck between 2016 and 2021. Note the irregular spacing of surveys.



Lambrigg Beck was surveyed by the Environment Agency in 1993 and 1999, where populations of trout were recorded as 'excellent'. Salmon were absent in the 1999 survey but were present at 'poor' and 'very poor' classifications for fry and parr respectively in 1993. During 2021 SCRT undertook a river restoration project along the beck, including revetment removal and installing large woody debris; pools are now starting to form around the large woody debris where the water is scouring it out. This will provide fantastic fish habitat in the future. However, fish surveys this year were undertaken prior to the works; this was intended to help quantify fish populations



Figure 11. Fish surveys in Lambrigg Beck, prerestoration, with revetted banks evident.

to establish a baseline pre-works and increase understanding of the site. Further surveys will be conducted in future years to help quantify the benefits of the restoration work. Two surveys were undertaken along Lambrigg Beck, above and below the weir. Results show that salmon were absent from both surveys, whereas both sites were classed as 'excellent' for trout fry and 'fair' and 'very poor' for trout parr above and below the weir respectively. As trout can have resident populations (i.e. they don't all migrate) barriers such as a weir will have a lower impact than on migratory species such as salmon. Local habitat factors are more likely to have a greater influence on trout populations, and in this case the beck upstream of the weir exhibited more natural conditions, flowing through woodland habitat with a mixture of pools and riffles. Comparatively, below the weir was relatively uniform, a consequence of the revetted and straightened nature of the beck here.

Longsleddale is a further site where a river restoration project has been undertaken in September 2021 (due for completion in 2022) SCRT. Took the opportunity to carry out fish surveys this summer to gather some additional pre-intervention data on fish populations. Salmon were recorded at this site, the only site outside the Crake catchment surveyed by SCRT during 2021 which also recorded salmon. Salmon fry were 'good' and parr were 'very poor'. Trout were 'good' for fry and 'fair' for parr. It is hoped that the river restoration will create more in-river habitat, supporting healthier populations of fish. Repeat surveys will be conducted in future years.

4.6 Bela

No surveys were undertaken on the Bela catchment during 2021. Surveys were planned for St Sundays in the upper reaches of the catchment, where work had recently been undertaken (project not delivered by SCRT) to diversify in-channel habitat, however, drought conditions prevented the surveys from being undertaken. These sites with be prioritised for 2022.





4.7 Minor Catchments

Several surveys were undertaken on minor catchments, i.e. those outside of the five main catchments in South Cumbria. At Farra Grain, near Seathwaite, SCRT removed a weir in 2020. This is the first survey post removal; however, fish surveys were also completed in 2020 prior to removal. No salmon were found on either occasion, however, post weir removal there has been an increase in trout recorded at the site. In 2020 figures were 7 per 100m² (poor) for trout fry and 5 per 100m² (fair) for trout parr. Comparatively in 2021 this had risen to 152 per 100m² fry (excellent) and 68 parr per 100m² (excellent), which is a great result. It should be noted that water levels were much lower in 2021 and so fish were confined to a smaller width of beck.

Pennington was also surveyed in 2020 and is situated in an area where SCRT are undertaking catchment wide improvements with a particular focus on water quality; this work is funded by United Utilities. Again, no salmon were found on either occasion. However, 46 trout fry per $100m^2$ were recorded, equating to a classification of excellent, and 7 trout parr per $100m^2$ giving a classification of fair. Comparatively in 2020 trout fry were classed as poor (3) and parr (7) were classed as good, so this is a significant increase for trout fry which will hopefully be reflected in trout parr populations in the coming years.

Rusland Pool was a new survey site for SCRT. The high number of eels here was of particular note, this is discussed further in section 7 of this report. No salmon were recorded and trout fry and parr were classified and poor and fair respectively, with the majority of the trout being caught in an area of tree roots, demonstrating the value of tree cover. Lower down the section still had a tidal influence, with a number of marine and brackish species recorded, the habitat also reflected this. For 2022 it is proposed to survey a site further up the system for comparison.



Figure 12. Section of beck surveyed at Rusland Pool.



4.8 Environment Agency Classifications

SCRT work closely with the EA to share data and evidence, this partnership working helps to provide a more holistic picture of fish populations across South Cumbria.

The Environment Agency data for 2021 is not yet available. This report will be updated when it becomes available.

4.9 Sources of Error

Although every effort is made to reduce sources in error it is inevitable that some occur. Firstly, as a small organisation, SCRT are not able to use the same team of people for each electrofishing survey and are reliant on the support of volunteers. There is naturally variation between different people both in terms of experience and technique. Furthermore, there can also be changes over time as surveyors become more used to the technique and potentially better at catching fish/ operating the equipment.

The same backpack and the same set up method are used at every site to help reduce variation in results. However, the conductivity of the water varies naturally, and although the backpack can be adjusted to take this into account, there are several sites across South Cumbria where the conductivity of the water is low, thereby reducing the catch efficiency. Most sites surveyed in 2021 had a relatively good conductivity. Similarly, habitat and flow variation can also impact catch efficiency. Typically overhanging branches and tree roots are good habitat for fish but can also hinder the netting, potentially skewing the data. To minimize this SCRT use a number of different nets appropriate to the stream type, for example a banner net is more practical in faster flowing, deeper sections whereas a small hand net is more appropriate in a small stream with variable bed substrate.

5. Historic Data

South Cumbria Rivers Trust have been undertaking a full electrofishing programme over the 5 main catchments covered by the trust since 2016. Prior to 2016 a number of surveys were done but these were limited in capacity and extent. A full timeseries can be viewed on the SCRT map, this shows all the locations where SCRT have surveyed since 2011, and enables a comparison of trends between years, particularly where sites have been revisited.

You can view a copy of the maps by clicking here.



6. The National Picture

Annual reports on the status of salmon stocks and fisheries in England and Wales have been produced by the Centre for Environment, Fisheries and Aquacultures Science (Cefas) and the EA since 1997. The latest report is from 2020.

The report states a number of practices which have been implemented to help support salmon stocks. Catch and release practices, an angling conservation initiative developed to prevent the overharvesting of fish stocks and support populations, have been increasing. 2021 recorded the highest percentage of salmon released (93%), this is estimated to have contributed more than 21 million eggs to the breeding programme. Furthermore, new regulatory provisions came into force in January 2019; these have substantially reduced the harvesting of salmon.

Furthermore, it was reported than more than three-quarters of the returning stock estimates and counts for rivers were above the values recorded in 2019, supporting evidence that there is an increase in the numbers of returning salmon over the last decade.

The Kent, Leven, Crake and Duddon are all classed as salmon rivers. In England there are 42 salmon rivers, mainly on the west coast, a further 22 can be found in Wales. Of all rivers surveyed, about half (51%) were in the lowest two classes (E, 'Very poor' and F, 'Absent') according to the National Fisheries Classification Scheme; however, during 2020 very few surveys were undertaken due to the coronavirus pandemic and therefore, most of the results remain unchanged since 2019. Figure 13, shows the status of each catchment in terms of how the percentage reaching A – C (excellent – fair) classes. This shows that in the Duddon, Crake and Leven, 25-50% of sites reach a classification of A-C, in the Kent this is 50-75%. The Duddon is classed as 'probably not as risk' whereas the Kent and Leven are 'probably at risk' and the Crake is classed as an 'at risk' river, when assessed against their management objectives (i.e that the conservation limit is met or exceeded in at least 4 out of 5 years, on average).







Figure 13. Juvenile salmon abundance indices for each catchment, presented as a percentage of electrofishing survey sites in classes A (excellent) to C (fair) only. Note, no 2020 is shown because the coronavirus pandemic prevented any monitoring. Credit: CEFAS 2020.





7. Other Species

Native fish including bullhead (*Cottus gobio*), European eels (*Anguilla anguilla*), brook lamprey (*Lampetra planeri*), minnow (*Phoxinus phoxinus*) and stickleback (*Gasterosteidae*) were recorded during the surveys. However, because the electrofishing surveys are targeted at salmonids and the backpack is set to be most effective for these, the results for other fish species may not be a true representation. For example, the frequency the backpack is set to is on the outer edges of the range, which is effective for European eels, meaning catch efficiency is lower. Additionally, the Environment Agency do not hold data on density for 'other fish' species so it is only the salmonid data which can be converted to take into account those missed during a semi-quantitative survey, however, the 'raw' density of fish per 100m² can be recorded. Figure 14 shows the abundance of non-salmonid fish species, this also shows the diversity of the fish populations within some becks; the raw data is also shown in Appendix II. Yewtree and Rusland Pool had relatively high densities of non-salmonid fish, with Yewtree being dominated by minnow and Rusland pool demonstrating a varied composition of fish, including a number of marine species due to the tidal influence on this section of beck.



Figure 14. Abundance of all fish species recorded during 2021 electrofishing surveys. Note this has been adjusted for density, however, it has not been adjusted to take into account that these were semi-quantitative surveys.

7.1 European eel

The European eel is critically endangered on the IUCN Red List of threatened species following a significant decline (90-95% in the last 45 years) in populations over recent years (Jacob & Gollock, 2014). Promisingly eels were recorded at several sites across South Cumbria during 2021; of note is the site at Rusland pool, where 79 (32 per 100m²) eels/elvers were recorded.



This is one of the highest densities recorded by SCRT during an electrofishing survey. No site in the Kent catchment recorded the presence of eels. Furthermore, it should be noted that the frequency of the e-fish backpack isn't' set to be most effective for eels, therefore, these results are indicative only. Eels are also typically hard to catch, evading the nets and residing in nooks and crevices.

7.2 Bullhead

Bullhead are widespread through England and Wales but are less common in Scotland and across Europe. They are found in fast flowing streams and rivers with hard stony substrates. Additionally, as a bottom dwelling fish, bullhead tend to hide under stones and cobbles and therefore have a reduced catch efficiency. However, bullhead were noted at a number of sites. Bullhead were recorded at all sites within the Crake catchment, with Langholme beck and the lower section of Greenholme beck both supporting relatively good numbers. Bullhead are a qualifying feature in the Special Area of Conservation selection for the River Kent, therefore it was good to see bullhead at Lambrigg; bullhead have not been noted at Dubbs beck during any of the surveys.

7.3 Lamprey

Brook and river lamprey are widespread but have declined in recent years; they require clean gravel for spawning and soft marginal silt or sand for the ammocoete larvae (JNCC, 2020). Lamprey were only found at one site during 2021: Rusland Pool. Sea lamprey and river lamprey are migratory, spawning in clean sandy gravels in rivers; therefore, it is likely that given the tidal influence at Rusland Pool, these were river lamprey.

8. Next Steps for 2022

During 2022 SCRT are looking to train up further members of staff to increase the capacity to undertaken fish surveys within house. It is hoped this will help to expand the programme during 2022, including within the catchments where no surveys were undertaken during 2021. This includes the Bela, the Winster & Gilpin catchments and the Eea. Further surveys will also be scheduled for the Duddon and Kent catchments where SCRT are undertaking catchment wide surveys.

9. Acknowledgements

SCRT would like to acknowledge and thank Defra for the support of the CaBA funding which enables this monitoring to take place. Thanks also needs to go to all the volunteers who helped out on these surveys as without volunteers, gathering this wealth of information would not be possible. Similarly, thanks to the Environment Agency for their on-going support and co-ordination through these surveys. Finally, thanks must also go to the landowners who kindly granted us permission to access the becks and rivers on their land.





10.References

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Appendix I

Raw data and national fisheries classification classes by site for electrofishing surveys in 2021.

No.	Site Name	Catchment	Grid Reference	No. Salmon Fry	Total No./ 100m2	Salmon Fry NCFS Classification	No. Salmon Parr	Total No. per 100m2	Salmon Parr NCFS Classification	No. Trout Fry	Total No. per 100m2	Trout Fry NCFS Classification	No. Trout Parr	Total No. per 100m2	Trout Parr NCFS Classification
1	Greenholme Lower	Crake	SD28683 89083	25	143.99	А	3	18.87	В	8	41.42	А	5	24.74	А
2	Greenholme Upper	Crake	SD28576 89120	42	72.57	В	1	1.89	E	25	38.83	А	6	8.90	С
3	Langholme	Crake	SD29079 86462	9	15.55	D	6	11.32	В	19	29.51	В	11	16.33	В
4	Yewtree	Crake	SD31833 99761	2	2.16	E	0	0	F	18	17.48	В	6	5.57	С
5	Yewdale	Crake	SD31602 99711	9	9.72	D	3	3.54	D	59	57.28	А	3	2.78	D
6	Rake Beck	Duddon	SD21737 95964	0	0	F	0	0	F	0	0	F	0	0	F
7	Tarn Beck	Duddon	SD23540 97316	0	0	F	0	0	F	6	5.825	D	2	1.86	E
8	Dubbs Beck	Kent	NY42418 00867	0	0	F	0	0	F	47	121.68	А	3	7.42	С
9	Lambrigg Upper	Kent	SD58150 96253	0	0	F	0	0	F	45	69.90	А	3	4.45	С
10	Lambrigg Lower	Kent	SD58004 96344	0	0	F	0	0	F	57	44.27	А	1	0.74	E
11	Longsleddale - Sprint	Kent	NY50637 01718	60	47.12	В	2	1.72	E	53	37.42	В	12	8.1	С
12	Colwith	Leven	NY33185 03094	0	0	F	0	0	F	1	0.55	Е	0	0	F
13	Farra Grain Gill	Leven	SD33372 92449	0	0	F	0	0	F	49	152.23	А	23	68.27	А
14	Rusland Pool	Minor Catchment	SD33826 88543	0	0	F	0	0	F	5	3.88	D	9	6.68	C
15	Pennington Beck	Minor Catchment	SD25777 77871	0	0	F	0	0	F	30	46.60194	А	5	7.42	С
16	Troutbeck	Leven	NY41618 03570	0	0	F	1	0.86	E	30	21.1827	В	5	3.37	D



Appendix II

Densities (per 100m²) of all fish species caught during the fish surveys. Note these are from semi-quantitative surveys and have not been converted to quantitative.

No.	Site Name	Catchment	Grid Reference	Eel	Lamprey	Minnow	Bullhead	Stoneloach	Marine Species
1	Greenholme Lower	Crake	SD28683 89083	0.00	0.00	0.00	37.33	0.00	
2	Greenholme Upper	Crake	SD28576 89120	1.60	0.00	0.00	12.00	0.00	
3	Langholme	Crake	SD29079 86462	0.80	0.00	0.00	42.40	0.00	
4	Yewtree	Crake	SD31833 99761	0.50	0.00	44.00	15.00	0.00	
5	Yewdale	Crake	SD31602 99711	2.00	0.00	0.50	23.50	0.00	
6	Rake Beck	Duddon	SD21737 95964	6.67	0.00	0.00	0.00	0.00	
7	Tarn Beck	Duddon	SD23540 97316	0.50	0.00	0.00	0.00	0.00	
8	Dubbs Beck	Kent	NY42418 00867	0.00	0.00	0.00	0.00	0.00	
9	Lambrigg Upper	Kent	SD58150 96253	0.00	0.00	0.00	13.60	0.00	
10	Lambrigg Lower	Kent	SD58004 96344	0.00	0.00	0.00	9.60	0.00	
11	Longsleddale - Sprint	Kent	NY50637 01718	0.00	0.00	0.00	0.00	0.00	
12	Colwith	Leven	NY33185 03094	0.29	0.00	0.00	8.57	2.00	
13	Farra Grain Gill	Leven	SD33372 92449	3.20	0.00	0.00	0.00	0.00	
14	Rusland Pool	Minor Catchment	SD33826 88543	31.60	3.60	8.40	0.00	0.00	14.40
15	Pennington Beck	Minor Catchment	SD25777 77871	0.00	0.00	0.00	0.00	0.00	
16	Troutbeck	Leven	NY41618 03570	0.00	0.00	0.00	1.09	0.00	





South Cumbria Rivers Trust is registered in England and Wales as a company limited by guarantee (Company No: 5763380) and a charity (Charity No: 1114682). We established in 2000 with the aim to protect, conserve and rehabilitate the aquatic environments of South Cumbria.

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