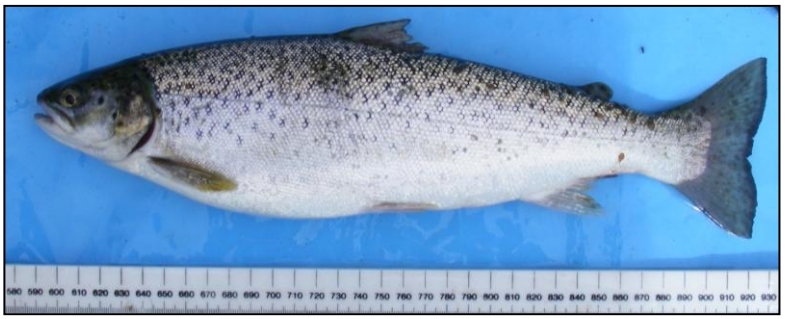
# SKYE & WESTER ROSS FISHERIES TRUST




## REVIEW February 2018

# SKYE &WESTER ROSS FISHERIES TRUST

A Charity Registered in Scotland No. SCO39771 and A Company Registered in Scotland No. SC344382

# REVIEW

by

Peter Cunningham, Isabel Moore and Peter Jarosz

# February 2018

Cover photos (all photos in this report © SWRFT unless stated otherwise)**:**

**[Please note that all the photographs of fish from our surveys in this report are of anaesthetised fish which were kept out of water for typically less than 30 seconds before being transferred into a recovery bucket to wake up prior to release]**

***From top right*** *(clockwise):*

***(1)*** *Alasdair MacDonald and Colin Simpson watching juvenile salmon and trout in the 'recovery' bucket (. . . & the other way round . . ?) by the Dundonnell River, August 2016.*

***(2)*** *Anaesthetised salmon parr, salmon fry and a large stonefly nymph (Perla bipunctata) from the Bruachaig River (R. Ewe system), August 2017. Four new hydropower schemes were constructed in the Bruachaig River catchment during 2016 - 2017.*

***(3)*** *Part of a microfiche reader projection of a scale from a sea trout of about 470mm caught in Loch Maree on 12th August 2017 by Terry Jack. Scale reading indicates that this trout had spent 4 summers at sea and had spawned during the two previous autumns. With an estimated weight of just less than 3lb, this fish was the largest rod caught sea trout reported from Loch Maree in 2017 (photo by Ben Rushbrooke). For the full picture, please see Part 2.1.*

***(4)*** *Isabel Moore, retrieving an acoustic receiver in Loch Greshornish after 4 months underwater. 60 sea trout were tagged and tracked in coastal waters in the north of Skye during the summer of 2017 as part of Isabel's PhD project based at the University of Glasgow.*

***(5)*** *Sea trout of length 335mm, weight 560g, condition factor 1.49; carrying 76 L. salmonis sea lice (48 copepod and chalimus; 22 preadults & adults; and 6 ovigerous female lice) caught in the sweep net in Loch Scresort, Isle of Rum, on 7th July 2017. This is the fattest (highest condition factor) wild sea trout seen to date by the WRFT biologist in 16 years of trout sampling. Isle of Rum anglers reported higher lice levels on sea trout in 2017 than they had seen in previous years. Marine Harvest reported an average gravid female lice count of 0.96 lice per fish for the new 2,500 tonne Isle of Muck salmon farm for June 2017. The Isle of Rum fish survey was carried out to inform an EIA ahead of an application for a similar-sized salmon farm by the Isle of Rum.*

***(6)*** *Returning a bucket of juvenile fish to Loch Clair in the headwaters of the River Ewe system, August 2016. Several large shoals of minnows (Phoxinus phoxinus) were seen in the margins of this loch for the first time; minnows were first reported in Loch Clair in 2012.*

**The SWRFT reserves the right to use information it has collected and analysed in order to meet its aims and objectives. Since the SWRFT is funded in part by income from the public sector, this information may be passed on to other public or charitable bodies involved in fisheries management. It is not the SWRFT's right or intention to use this information for commercial gain.**

*Ben Rushbrooke, measuring one of the grilse taken in the Tournaig trap on the 6th August 2016. There were 21 grilse in the upstream trap that day; a record catch for the trap for a 24 hour period. In contrast, only one adult salmon entered the upstream trap in the whole of 2017.*

# Contacts

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This review covers the activities of the Trust from June 2016 to December 2017.

# Contents

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The Skye & Wester Ross Fisheries Trust has been generously supported by:

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# Preface

This has been an interesting, productive and at times frustrating 18 months for Fisheries Trusts. During the first period of this report, our management activity was constrained by the SNG's ill conceived and ultimately abortive attempt to implement the provisions and structure of the 2006 Wild Fisheries Review (WFR) on the cheap. This caused all the West Coast Trusts and Boards and in particular the Skye Fisheries Trust and Wester Ross Fisheries Trust, who were by then working together, considerable wasted resource in trying to devise and create suitable structures. However, at least this otherwise unproductive effort provided an additional driver to complete the already planned merger between our Trusts, which is why this document comprises the inaugural review of the work of the new Skye and Wester Ross Fisheries Trust (SWRFT).

The content of the review amply demonstrates both the advantages to wild fish management of this merger and how the larger trust will be able to expand its work in areas such as public awareness, the environment and education; in this case, the sum of the new Trust is clearly greater than the sum of the parts.

The Trust obtains substantial funding from our local Boards, but over two thirds of the funds come from discretionary and other charitable sources, and our economic environment is becoming increasingly difficult. At the same time we wish as a matter of policy to extend our existing activities in those areas suggested as targets by the WFR, and which were already in our 5 year plans. This means expanding our resource commitments to Education and to projects which are aimed at supporting the health of the wider environment in which wild fish, of all species, live and prosper.

Major growth areas over the period of this review have been activities consequent on hydro schemes, where the aim is to protect the existing environment for salmonids, and providing assistance to our Boards, who have been particularly active in the planning area during this period.

Over the last few years we have succeeded in carrying out our activities on a cost-neutral basis each year we have managed to balance the books without dipping into reserves, whilst actually expanding the work areas we cover. In large part, we have been able to do so not only because of the skill and experience of our biologists, but because of the vital additional resource we are able to call on from volunteer sources. Many of these helpers are individually named in the report; I am very grateful to all of them.

*Prof Dave Barclay,*

Chair,
Skye and Wester Ross Fisheries Trust

# Part 1 **Introduction**

This review covers the 18 month period from June 2016 to December 2017 during which time the Wester Ross Fisheries Trust and the Skye Fisheries Trust formally merged. The new SWRFT area encompasses the Small Isles, the isles of Skye and Raasay, and the catchment areas of the west-flowing rivers on the Scottish mainland from the River Barrisdale in Knoydart to the River Kanaird north of Ullapool (inclusive).

The area is too big for a single field team to cover at the level required to keep track of fish populations through routine field work; it takes most of three hours to drive to the north of Skye from Gairloch. So an aim of the new Trust is to support two field teams, one based on the mainland and one based on the Isle of Skye, to be able to provide a reasonably consistent level of up-to-date information and support for the management of wild fish populations and fisheries throughout the area.

Over the past 18 months, wild salmon and sea trout fisheries have experienced contrasting fortunes within our area. For salmon, the most productive rod fisheries were mostly in the rivers flowing into the Wester Ross Marine Protected Area, including the rivers Ewe, Little Gruinard River, Gruinard River and the rivers entering Loch Broom and Little Loch Broom (see Part 2.1). However, for many of the mainland rivers from the Loch Torridon area south to Loch Hourn, and in some parts of the Isle of Skye, there is increasing concern for the future of rod fisheries for wild migratory fish, as a result of the cumulative impacts associated with open cage salmon farming.

Very high numbers of sea lice were recorded on sea trout in some of these areas in both 2016 and 2017 (see Part 3). There is growing evidence that wild salmon in salmon farming areas, particularly to the south of Loch Gairloch, have also experienced disproportionately high levels of mortality of smolts at sea. This review also presents a summary of much work carried out by the Wester Ross Area Salmon Fishery Board over the past 18 month, most of which was also focused on responding to events associated with the salmon farming industry (Part 4).

On the Isle of Skye, investigations by Isabel Moore have focused on sea trout including a study of the movements of post-smolt sea trout in sea lochs in the north of the island using acoustic telemetry as part of a PhD studentship based at the University of Glasgow (Part 5). We have also been able to gather useful information about wild fish populations through contract work, including a study of migratory fish populations on the Isle of Rum (Part 6).

For wild resident (non-migratory) brown trout, our area remains a stronghold. We are particularly grateful for the continued support of Dr Steve Kett of Middlesex University and Dr Colin Adams of Glasgow University and their students for their work in learning more about the wild trout populations of the area. The Trust has also carried out much work with schools on both the Isle of Skye and the mainland (see Part 9). We were also delighted to find out that Canadian fish biologist, Dr Paul Vecsei, had chosen to illustrate some of the wild trout from the Wester Ross area for a forthcoming book on wild trout of the World. There is much more to learn about the diversity of wild trout and other wild fish populations of the area; we always welcome those who are keen to help with sampling expeditions whether in coastal waters or to faraway hill lochs.

*A wild brown trout, from one of the many lochs in the hills around Gairloch. The photo was taken during memorable sampling expedition with Dr Steve Kett (Middlesex University), Dr James Close (Gairloch HS Biology teacher) and friends; July 2017*

# Part 2 **Salmon and sea trout stocks**

## 2.1 Rod catches

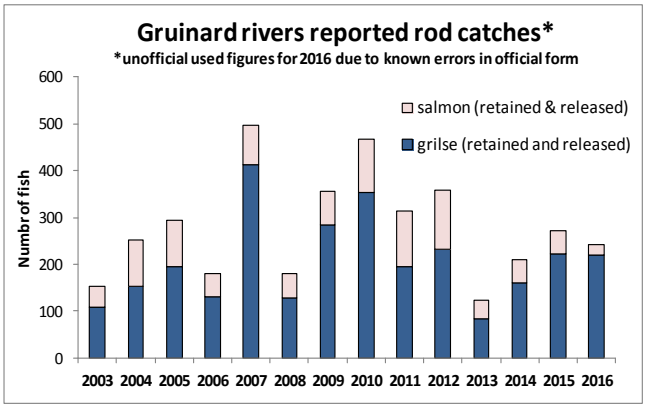
### *Salmon*

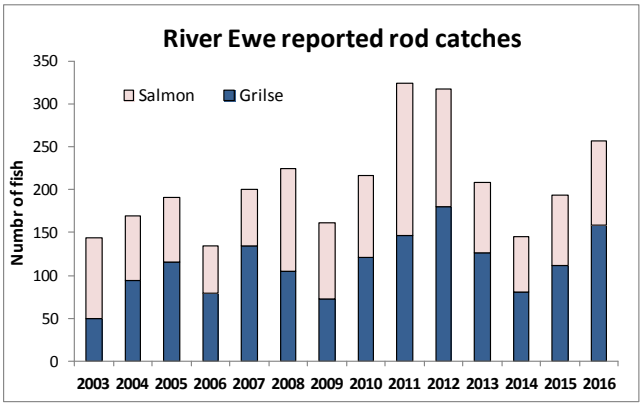
*(right) Alexander MacLean of Gairloch High School, with ghillie Ray Dingwall in support, making the first cast on the River Ewe, on the opening day of the salmon fishing season, 11th February 2017 (photo Jim Buchanan).*

Reported rod catches of salmon and sea trout provide an indication of the relative abundance of adult fish returning from the sea. For some of the smaller more spatey rivers, fishing effort and catch reporting can be irregular, so an interpretation of numbers of spawning adult fish based on catch records alone can be misleading. However, for some of the larger rivers where angling effort and reporting is reasonably consistent from year to year (for example where an experienced ghillie or river manager is present), catch records provide useful data.

*Gruinard rivers and River Ewe*

Graphs for rod catches of salmon for the big Gruinard & Little Gruinard rivers, and for the River Ewe are presented below. These are based on published figures in the Scottish Government's Catch Statistics[1]. Reported catches particularly of multi-sea winter [MSW] salmon in the Gruinards have fallen since 2010. For the Gruinards, grilse greatly out-numbered salmon; however in the River Ewe a higher proportion of the rod catch comprised salmon.



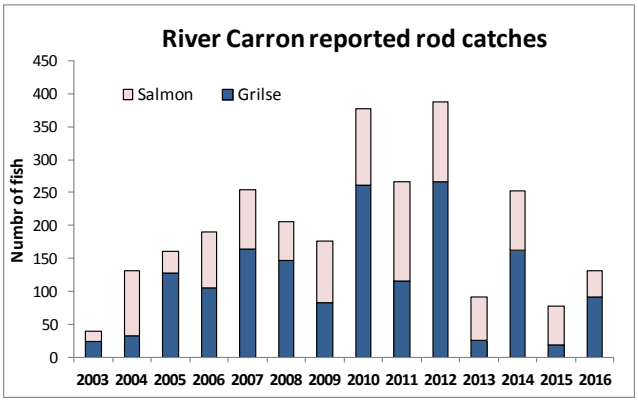

*Male salmon of estimated weight 20lb – 25lb from the Kinlochewe River (River Ewe system), caught and released by Archie Nicoll, on the 21st October 2017.*

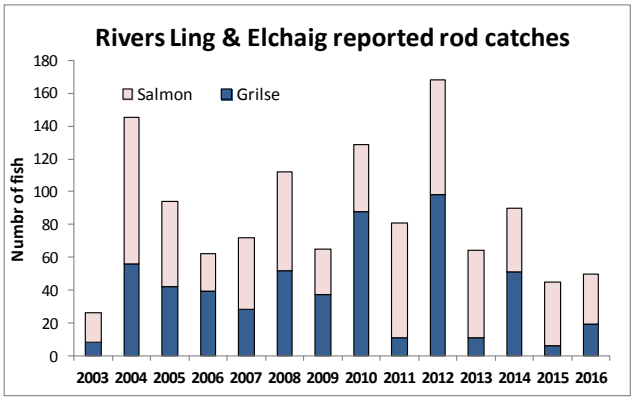
*At the time of writing, unofficial figures indicate a total salmon and grilse catch of over 350 fish for the River Ewe - Loch Maree system for the 2017 season, the highest total since 1992.*

[1] Scottish Government Catch Statistics http://www.gov.scot/Publications/2017/04/5245.

*Rivers Carron, Ling and Elchaig*

Graphs for rod catches of salmon and grilse for the River Carron and for the rivers Ling and Elchaig (Loch Long fishery district) in the southern part of the SWRFT area are shown below.



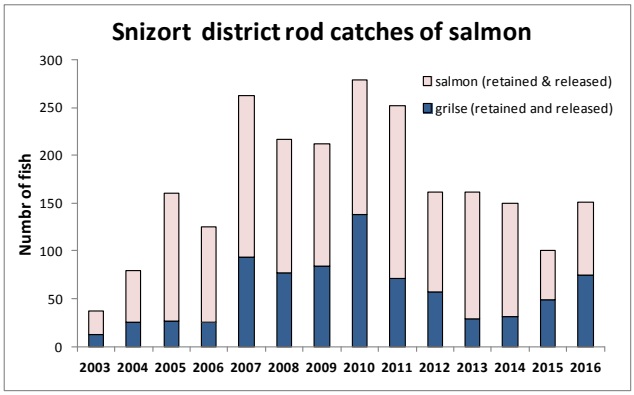




For the nine year period, 2008 – 2016, the overall pattern of catches for both areas is remarkably similar. Since 2009, grilse catches show a 2-year cycle, with relatively high grilse numbers in even years, and low numbers in odd years; 2013 and 2015 were particularly poor years for the numbers of grilse reported.

This pattern is not seen for catch graphs for the two Gruinard Rivers, the River Ewe system or the Snizort fishery district, and therefore suggests a more local explanation. The observed pattern is consistent with the hypothesis (discussed in the WRFT Review May 2016[2]) that smolt year classes migrating out to sea through coastal water in 'even' years experienced higher mortality than during 'odd' years. This is further discussed in Part 3.

*Isle of Skye*

Reported rod catches of salmon and grilse in the Snizort fishery district are presented below. 2007 and 2010 were the best 'grilse years' so far this century (as for the Gruinard River). For MSW salmon (numbers of which exceed those of grilse in most years for the Snizort district), 2011 was the best year as it was in the River Ewe and River Carron, suggesting that the 2009 smolt year-class was particularly successful.



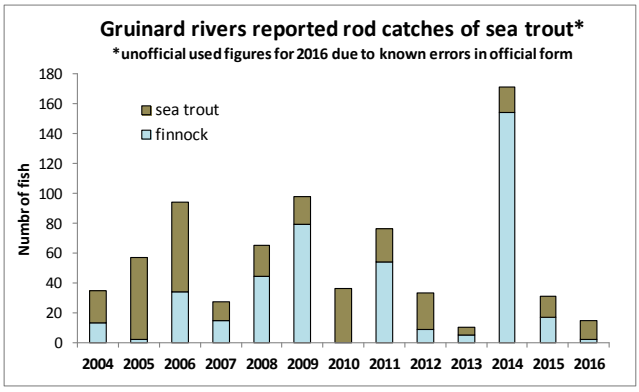

Note: the Snizort Fishery District extends all the way from Sleat in southern Skye, around the west coast, to Rubha Hunish in the north of Skye and includes at least 6 rivers (rivers Hinnisdal, Snizort, Hamara, Ose, Drynoch, and Brittle) where salmon have been regularly caught. As fishing effort and catch reporting is highly variable within this area (for many reasons), catch figures should be interpreted with rather more caution than for fishery districts on the mainland where just one or two adjacent salmon rivers are included.

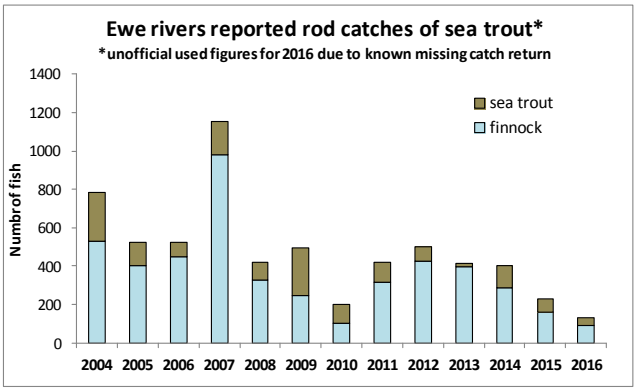
[2] WRFT Review May 2016 http://www.wrft.org.uk/files/WRFT%20Review%20May%202016%20Final.pdf

### *Sea trout*

*Gruinard Rivers and River Ewe*

Graphs for rod catches of sea trout for the Gruinard rivers and for the River Ewe - Loch Maree system are shown below. These graphs start at 2004, when numbers of 'finnock' [sea trout making their first return to fresh water after just a few months at sea] were first included in the Scottish Government's catch statistics.




Sea trout catches in both fishery districts were very low in 2016 compared to catches for earlier years. There were no reports of sea trout in excess of 3lbs from Loch Maree in either 2016 or 2017. The largest sea trout reported from Loch Maree in 2017 was estimated at 2.75lb, a fish that had returned to freshwater after a 4th summer at sea *(left and below)*.

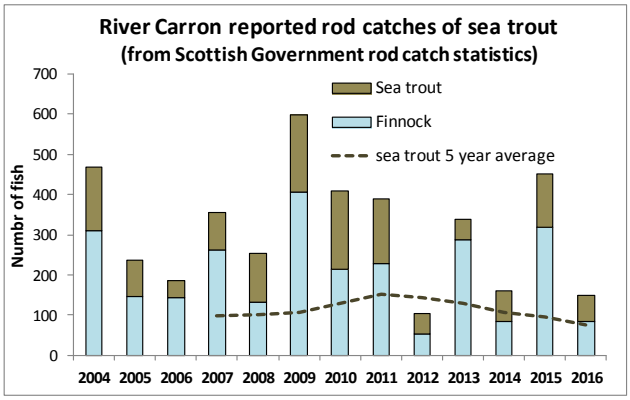


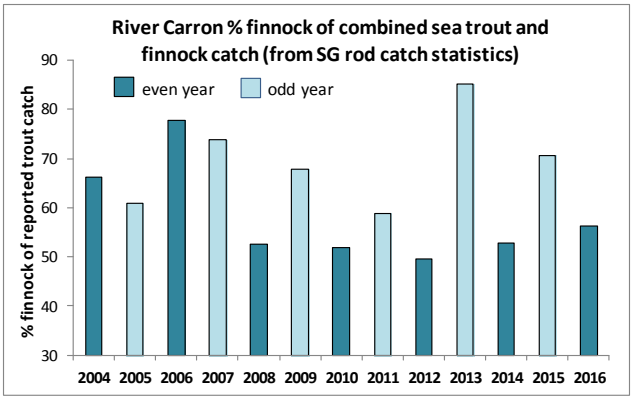
Interpretation of recent sea trout catches for these rivers is complex. This is partly due to inconsistent fishing effort from one year to the next. On Loch Maree, formerly our premier sea trout fishery, there were rarely more than two boats fishing the loch per day in 2016 (or in 2017). In comparison, during the years up until the early 1990s, 15 boats or more fished the loch each day during the best months, and catches of over 600 sea trout per year were often reported from the Loch Maree Hotel beats alone[3]. In both 2016 and 2017 one of the boats at the southern end of Loch Maree reported catches of up to 10 sea trout per day. However, where recorded, brown trout out-numbered sea trout in rod catches, particularly for boats fishing the Loch Maree Hotel beats; this was not the case in the past when sea trout greatly outnumbered resident brown trout[4]. In recent years, the life history traits of trout in both the Gruinard rivers and parts of the Ewe system may have further shifted away from 'anadromy' (migration to the sea and back) to 'resident' as a result of poor marine survival of sea-going trout[5].

[3] Sea trout fisheries in Wester Ross http://www.wrft.org.uk/fisheries/seatrout.cfm
[4] Walker, 2017 https://www.salmon-trout.org/wp-content/uploads/2017/09/Loch-Maree-collapse-A-Walker-report1.pdf
[5] See Thorstad *et al*, 2015 https://www.salmon-trout.org/wp-content/uploads/2017/08/Thorstad-et-al-Effects-of-Salmon-Lice-on-Wild-Sea-Trout-Literature-Review.pdf

*River Carron*

Rod catch graphs for sea trout and finnock for the River Carron fishery district for the years 2004 – 2016 are shown below. These have also been produced from figures published in the Scottish Government's rod catch statistics.



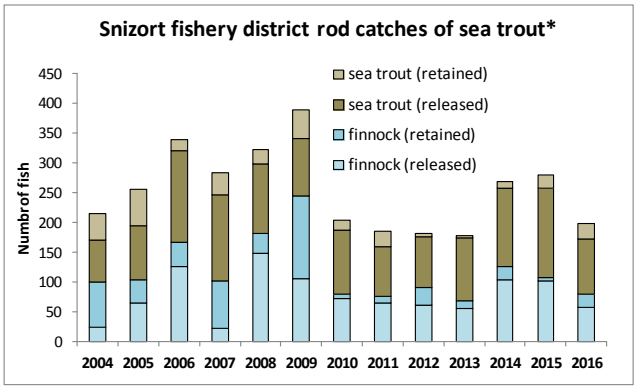




In contrast to the Gruinard rivers and the River Ewe system, parts of the River Carron system were stocked with sea trout progeny (eggs, fry or parr) from 1997 and each year thereafter. Could this have helped to reduce any changes from 'anadromy' to 'resident' in the population (see discussion for Gruinards and Ewe above)?

From 2010, reported catches of finnock alternated between years in much the same way as they did for grilse (reported earlier). The combined catch of finnock and sea trout was lower in 2012, 2014, and 2016 than in intervening years. Furthermore, the graph on the right shows that during the nine year period (2008-2016 inclusive) there was a higher ratio of finnock vs. sea trout in odd years than in even years. This is discussed further in Part 3.3. [At the time of writing, the unofficial catch for 2017 is at least 87 sea trout and 471 finnock (a record for the river this century!)].

*Isle of Skye*

The Scottish Government divides the Isle of Skye into two very large fishery districts: 'Snizort' (see under salmon catches) and 'Sligachan'. Both districts include at least 12 stream systems where sea trout have been caught. The graph below is for the 'Snizort district' which includes several once-prolific stream-loch systems in the south of Skye (the Coruisk, Camasunarie, Strath Mor, Eishort, and Dalavil systems), in addition to many larger river systems further north. During the 1960's, over 1000 rod-caught sea trout were reported from this area in some years.




*(below) Sea trout of about 2lb caught in Loch na Sguabaidh by Duncan Currie, September 2016.*

## 2.2 Juvenile fish surveys on the mainland

**supported by WRASFB & river proprietors**

Electro-fishing surveys, using specially designed equipment, provide the means for monitoring the distribution and relative abundance of juvenile fish within the river systems of the area. Our aim has been to visit all the major river systems within the area that we cover every two years, with the focus on assessing the health of wild salmon populations. We are able to find out where juvenile salmon are present, and to learn about distribution and the relative abundance of different year classes (i.e. fry, 1+ parr, 2++ parr).

From electro-fishing surveys over many years, we have found the greatest changes in fish occurrence between years within the marginal habitat areas. So our approach when visiting a river system has tended to focus initially on marginal areas; if juvenile salmon are abundant in the most difficult parts of a river system for adult salmon to reach, they are nearly always also abundant further downstream.

In 2016, most of the major salmon river systems within the Wester Ross Area Salmon Fishery Board area were surveyed, and also some of the rivers on the mainland to the south of the WRASFB area. In 2017, surveys were carried out at some rivers throughout the mainland as far south as the Barrisdale. (Surveys of Skye rivers will be of high priority in 2018).

*(right) Peter Cunningham and Colin Simpson electro-fishing the Dundonnell River (photo by Alasdair Macdonald.*

*Results*

The recorded distribution of salmon fry and salmon parr at mainland sites is shown in Figures 2.1 and 2.2. Salmon fry and parr were found in the core areas of all the major river systems surveyed. Numbers of fry were particularly high compared to previous surveys in the upper Ullapool River and Tournaig system. However, juvenile salmon were not recorded in the Barrisdale; some year classes (usually fry or 1+ parr) were missing from some smaller river systems (including the Allt Beith, and the upper River Kanaird) or very scarce (e.g. Balgy).

*Table 2.1 Definition of Catch per Unit effort grades as used in the following text.*

| CPUE | Grade |
|---|---|
| 0 | Absent |
| 0.1 – 0.5 fish per minute | Very low |
| 0.6 – 1.0 fish per minute | Low |
| 1.1 – 2.0 fish per minute | Moderate |
| > 2 fish per minute | High |

The following section provides a river system by river system summary of the results of juvenile fish surveys, together with notes relating to stock status and fisheries management opportunities.

*Figure 2.1 Recorded distribution and relative abundance of salmon fry at sites surveyed within the WRFT area in 2016 & 2017. Please see text for further details.*

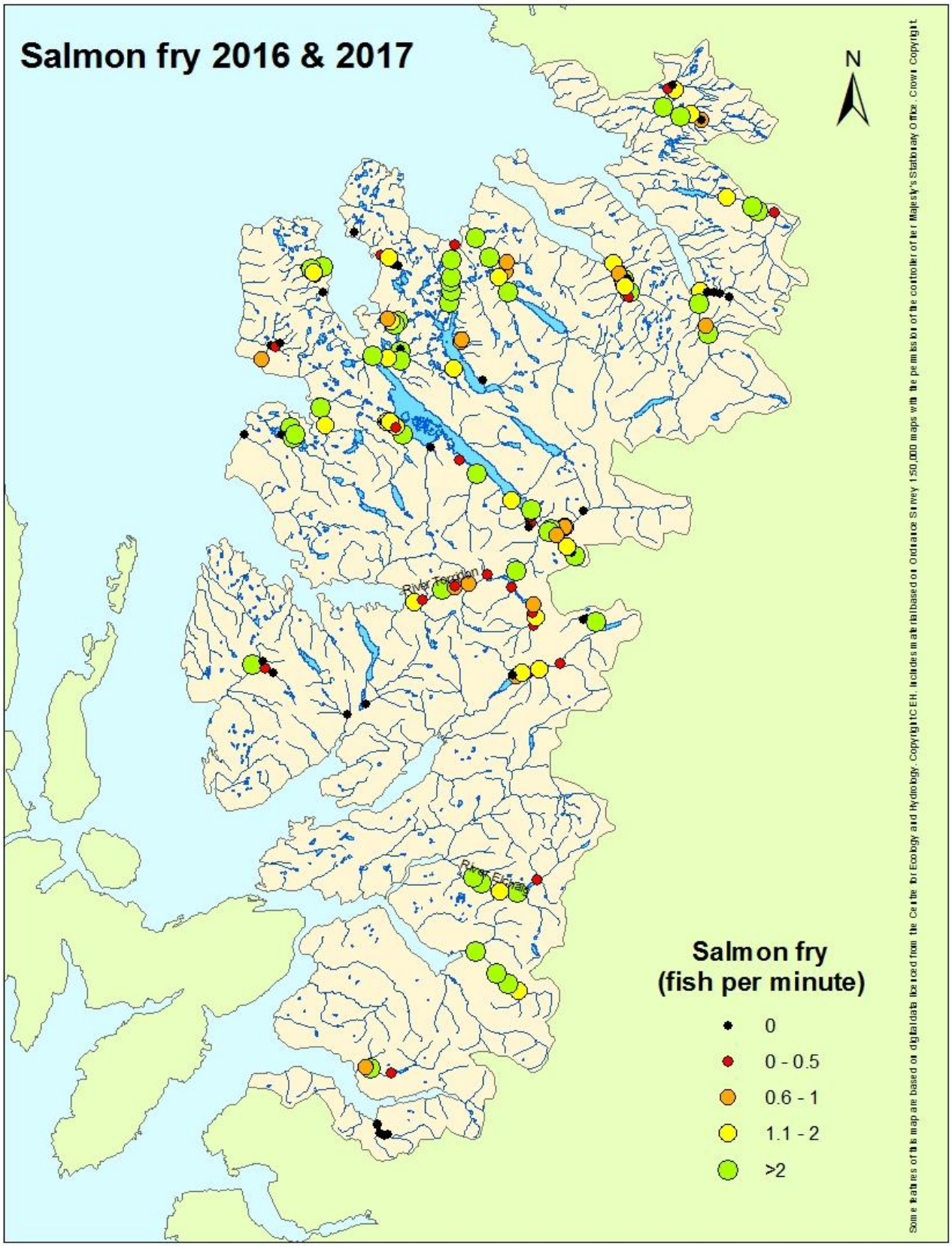
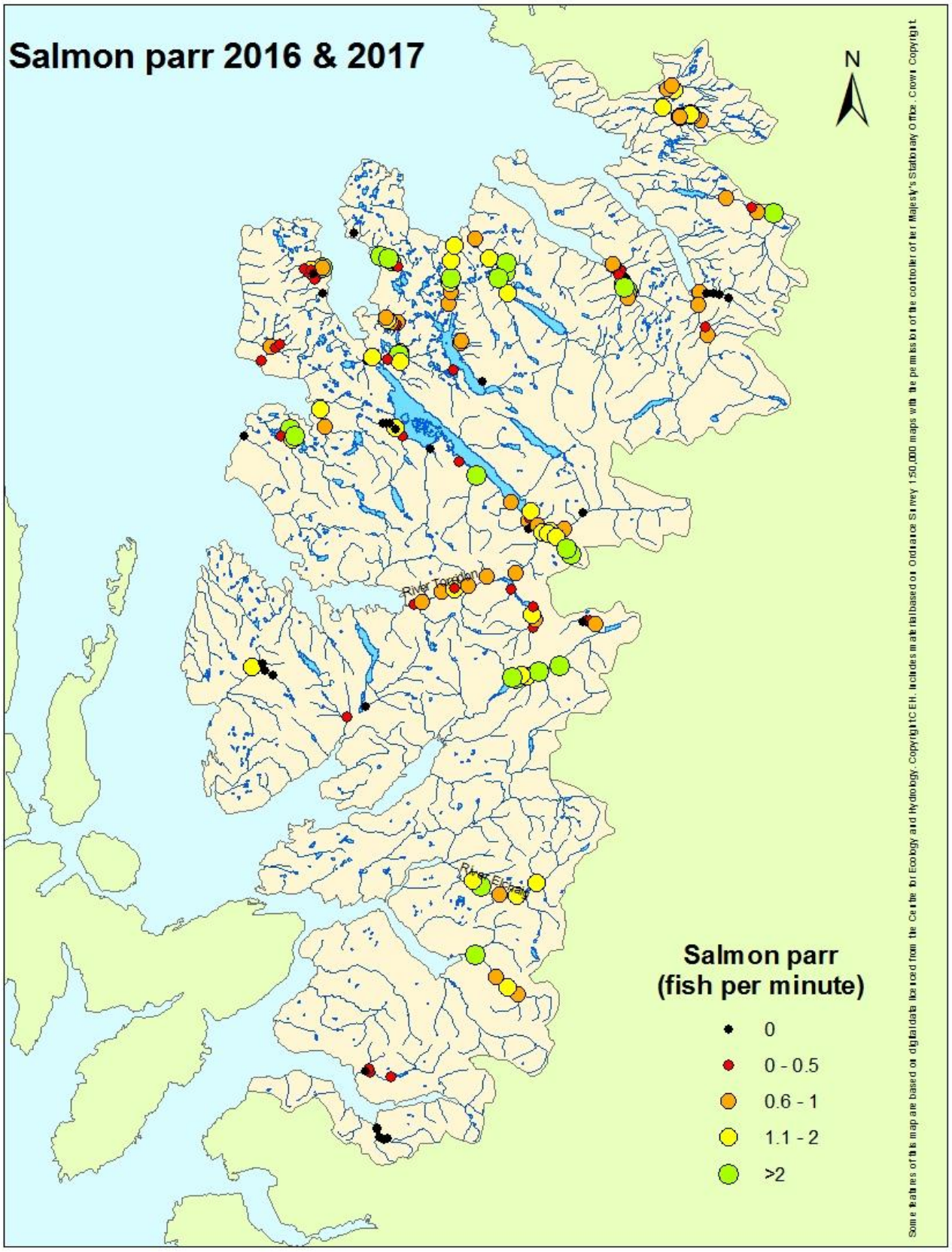


*Figure 2.2 Recorded distribution and relative abundance of salmon parr at sites surveyed within the WRFT area in 2016 & 2017. Please see text for further details.*



## Kanaird (Canaird)

Salmon fry and parr were found at moderate CPUE at sites in the Runie below Drumrunie falls (Aug 16). The largest fry and parr (parr 80mm to 118mm) were found in the new woodland enclosure below the Drumrunie falls demonstrating its value for juvenile fish production; further downstream where the river bank is browsed by deer, juvenile salmon were typically smaller (parr 64mm to 103mm) reflecting more limited food availability.

In the River Canaird near Langwell, four sites were fished in both years (Aug 16 & Sept 17) as part of a contract to provide information for the new Langwell HP scheme which started operating in 2017. At the two sites above the Langwell falls, fry were found only in 2016 and parr only in 2017, both at low CPUE; fry were big for their age. In contrast, at the two sites below the falls, salmon fry and parr were found at moderate to high CPUE in both years. Even prior to the HP scheme, salmon were not always able to ascend the much-modified falls to access a large area of suitable habitat above the falls. A modest intervention to ease passage for salmon over the falls would benefit wild salmon, helping to mitigate for any adverse impacts associated with the new HP scheme. Further downstream, the removal of large amounts of unconsolidated sediment in the artificial river channel through the fields would help to stabilise the river habitat and protect valuable grazing areas, without compromising the productive value of the river for juvenile fish. Win-win solutions?

## Ullapool

In September 2017, salmon fry were found at high CPUE at two sites in the Rhidorroch River near East Rhidorroch for the first time since these sites were first surveyed in 2004. Salmon parr were recorded at high CPUE at the top site below the falls, also for the first time. The survey provided the best results for this major part of the Ullapool river system for many years. In previous surveys, low numbers of juvenile salmon at some sites were thought to be associated with both a lack of egg deposition by adult salmon and washout caused by bedload sediment transportation during major spate events. In 2017, the river bed appeared more stable with a film of green periphyton on the stones and plenty of leaf litter *(right).*

*Not such a big change in the river channel and stream bed as seen in previous years: the picture on the left was taken on the 3rd August 2012; the one on the right on 26 September 2017. Gorse bushes have grown across much of the area where sediment was deposited during the period 2002 to 2009. Our time series of pictures taken from this spot goes back to 2002.*

Lael

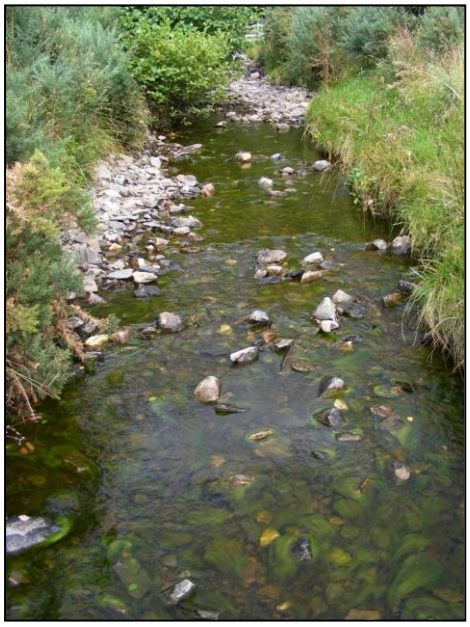
As part of a monitoring contract, sites were surveyed between the hydropower intakes and the powerhouse in 2010, 2012, 2014, and 2016, to fulfil a condition of the CAR licence to Npower to generate electricity here. Juvenile trout (fry and older fish) were recorded at low or very low CPUE at all sites each time, except below the intake in the Allt Mor where no fish have ever been recorded (most obviously due to insurmountable waterfalls immediately downstream of the survey site).

A site has also been fished below the powerhouse between the cattle fields; salmon parr were recorded here each time, and salmon fry in all years except 2012. In September 2016, both fry and parr were recorded at moderate CPUE here (28 and 7 fish per 100m$^2$ respectively). River bank collapse above this site is contributing to an unstable river channel; in 2016 Scottish Water was required to rebury the Ullapool water supply pipeline, partly as a consequence of this. If most of the sediment which builds up behind the Inverlael HP intake weirs during major spate events was removed from the river, rather than put back into the river below the intakes, habitat for fish and other aquatic wildlife further downstream would be more stable, more productive; and the taxpayer could save a lot of money on otherwise unnecessary works to protect public services.

Broom

In September 2016, three sites were fished, one in the main river and in two tributaries. At the main river site below the bridge at Inverbroom, salmon fry were recorded at high CPUE indicating healthy recruitment of juvenile salmon in this core part of the River Broom system. This was despite the river being too deep to fish as effectively with our electro-fishing back-pack equipment as with the generator powered bankside e-fish equipment used in earlier years by teams led by Ross Gardiner of Marine Scotland Science. Further upstream, salmon fry were recorded in the tributary, Allt a' Bhraighe, by the Woodturning Centre at high CPUE for the first time; salmon parr, trout fry and larger trout were also present here.

The most encouraging result was of the number of trout and salmon fry recorded in the Sawmill Burn (Allt a' Mhuilinn). Back in 1998, the WRFT habitat survey found that this burn contained a relatively high proportion of the spawning habitat accessible to sea trout in tributaries within the River Broom system. A small grant was subsequently awarded by SNH towards the cost of fencing off the river banks where the burn crosses the fields to improve riparian habitat here. In July 2011, the burn was subject to a flash flood which deposited new sediment along the channel. However, by September 2016 the riparian habitat was much improved (*below left*) with overhanging vegetation and the streambed was green with filamentous algae on stones providing plenty of cover for small fish and sources of nutrition for stream biota. Trout fry and salmon fry were recorded here at 5 fish and 1 fish per minute respectively which is almost as high as we have recorded in the Wester Ross area (the combined minimum density estimate was over 80 fry per 100m$^2$ of wetted area); and what's more, the fry in this burn were of good average size and condition [compared to many of those in the Gruinard rivers – see Box 2.1]. Thank you to Foich Estate and to SNH for supporting this project; this burn is now a useful example of what a productive sea trout nursery stream looks like (albeit, a semi-natural one!).



*(below) a random selection of aneasthetised salmon fry and trout fry from the Sawmill Burn, River Broom, in September 2016. Can you tell which is which?*

## Dundonnell River

In August 2016, salmon fry and parr were recorded at all main river sites; their relative abundance was variable. The highest salmon fry CPUE was recorded at the tail of the Shepherd's Pool, three-quarters of the way up the system to the waterfall in the gorge above Corrie Hallie above which salmon are unable to ascend. Salmon parr were recorded at high CPUE by Dundonnell House and above the island above the road bridge; but not at sites further downstream. At the lowest site, changes in the river bed associated with spate flows may have contributed to lower fish numbers than in previous years, with river bank collapse in some places. The estate operates a small hatchery to provide salmon fry for stocking into the river to supplement progeny of wild spawned fish; with the aim of being able to partially mitigate against losses associated with redd washout. Juvenile salmon grow relatively quickly in the Dundonnell River (see Box 2.1).

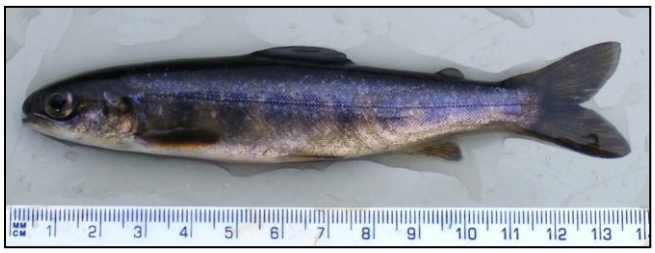
## Gruinard River

*(left) Ian Allison measuring juvenile salmon by a tributary of the Gruinard River.*

Six sites were surveyed on the 26th August 2016. Fry were recorded at high CPUE at all four main river sites, at up to five fish per minute (minimum density of over 40 fish per 100m$^2$). Parr were present at main river sites surveyed mostly at medium CPUE; however habitat including water depths were better suited to fry. Parr were recorded at high CPUE in the tributary fished. Site above Loch na Sealga have not been surveyed for several years, so will be at the top of the 'to do list' for the 2018 field season. In contrast to the Broom and Dundonnell rivers, juvenile salmon grow more slowly in much of the Gruinard River partly due to the limited food availability associated with low fertility and thinly vegetated riparian habitats (see Box 2.1). The amount of food available for juvenile fish (and for deer and other wildlife) could be raised by addressing ecosystem fertility management issues at the catchment scale, and by protecting and restoring riparian woodland habitats. For further information about the ecosystem fertility deficit, please see: http://www.wrft.org.uk/files/FeedtheLand_PeterCunningham%20(min%20size).pdf .

## Little Gruinard River (Special Area of Conservation [SAC] for Atlantic Salmon)

Six sites were surveyed in the main river below the Fionn Loch on 2nd September 2016. Fry were recorded at high CPUE at 5 of the 6 sites; only the lower most site below the Garden Pool scored low CPUE for fry. Parr were typically recorded at medium CPUE at the sites surveyed (habitat was typically better suited for fry). Fry were mostly small (35mm to 55mm), like many of those in the big Gruinard river. Our survey around the Fionn Loch on 12 September 2017 was only partially successful as water levels were too high for 'effective' fishing. We recorded salmon fry in three out of the four burns surveyed (as in previous years); figures showing low CPUE are primarily a result of the difficult fishing conditions. In addition to juvenile salmon, juvenile trout were recorded at in the Carnmore burn; and for the first time, a charr parr was caught by the e-fish team.



*(right) The biggest arctic charr recorded by the e-fish team!*

There has been little change in the recorded distribution and abundance of juvenile salmon in both the mainstem big Gruinard and Little Gruinard rivers below respective lochs since sites were first surveyed in the 1990s. Our results again demonstrate the consistently high densities of juvenile salmon in both of these rivers and their importance as 'strongholds' for wild salmon in this part of Europe. As wild salmon populations show signs of further collapse elsewhere in the west of Scotland including in many of the rivers of Argyll and Lochaber, it becomes even more important to protect the wild salmon populations of the largely unstocked rivers around the Wester Ross MPA area.

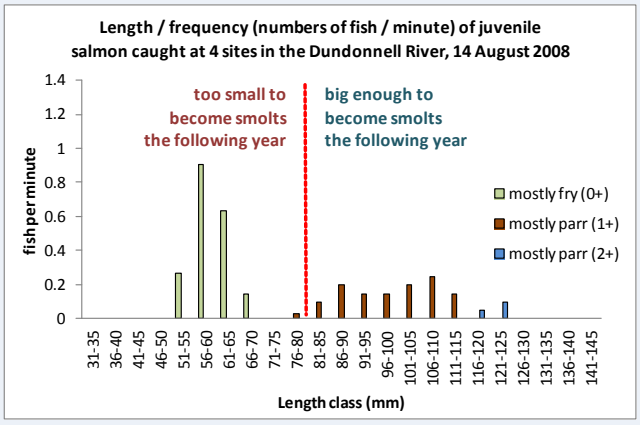
***Box 2.1 Contrasting salmon production: Dundonnell vs. Gruinard rivers.***

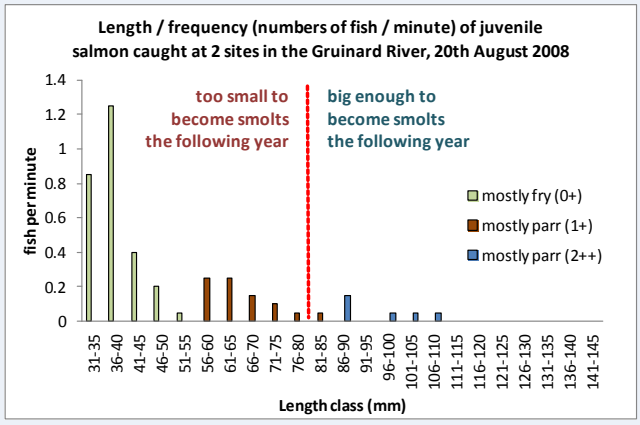
These neighbouring salmon rivers provide contrasting conditions for juvenile salmon**.** The graphs below contrast length - frequency and weight - frequency of juvenile salmon recorded in 2008 and 2016 surveys.

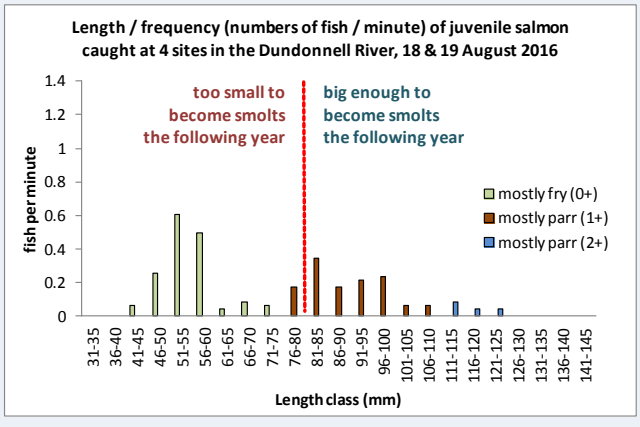
The accessible part of the **Dundonnell River** flows through a well-vegetated corridor with riparian trees for most of the way from the gorge to the sea. Riparian trees provide leaf litter and insects in late summer and autumn. The river also receives run-off from farmland and from several houses within the catchment area. Parts of the river have been unstable in recent years with bank erosion and movement of streambed sediment; it is likely that washout events have reduced egg survival and recruitment of fry in some years.

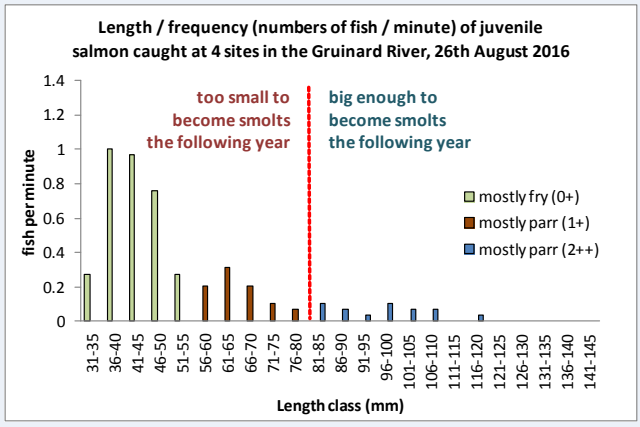
*(below)* ***The Dundonnell River.*** *This salmon parr (right) was somewhat larger than average, even for here!*


Fewer juvenile salmon were recorded in the Dundonnell River than in the Gruinard River per unit effort (fishing time). However in the Dundonnell River the average size of fry and parr was consistently larger than in the Gruinard River. A higher proportion of fish were of 'pre-smolt' size in the Dundonnell River, which may therefore have produced more smolts per unit area of river habitat per year than the Gruinard River.



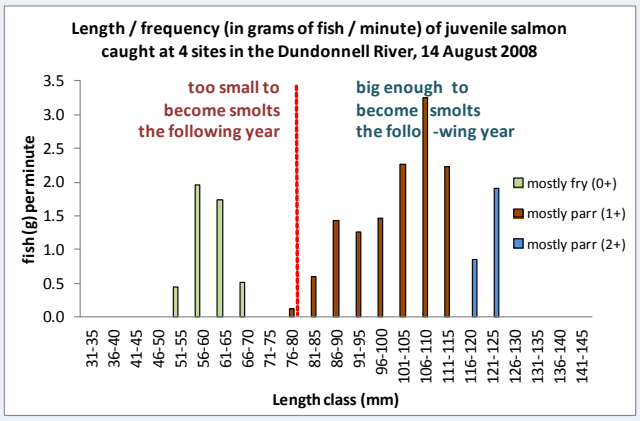



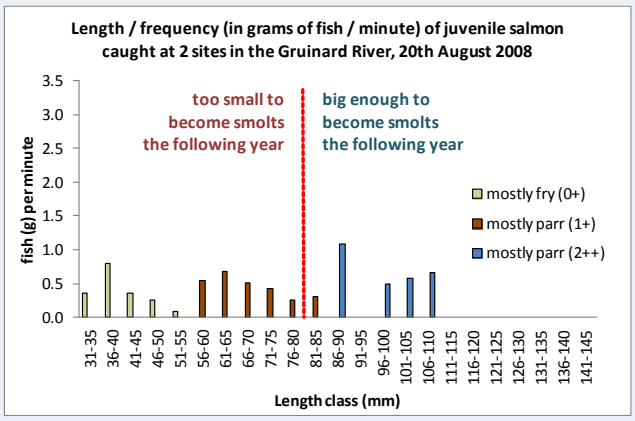
***Box 2.1 (continued) Contrasting salmon production: Dundonnell vs. Gruinard rivers*.**

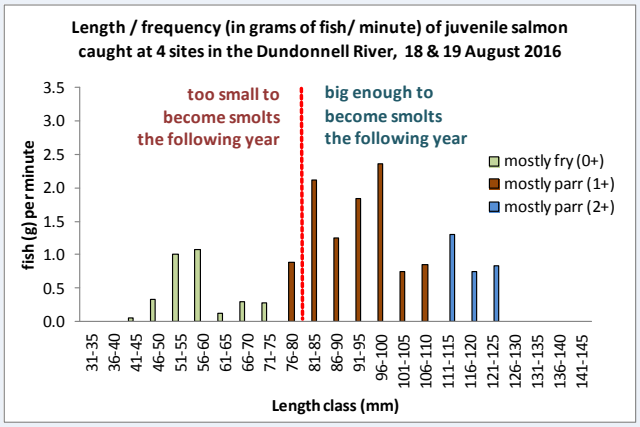
The **Gruinard River** flows through an 'open' valley grazed by red deer. However, below Loch na Sealga the stream bed is very stable; providing some of the best spawning and nursery habitat for salmon of any river within the Wester Ross area, in terms of physical characteristics. There is no human habitation within the catchment area and healthy riparian woodland is scarce. The streambed and riparian areas provide a limited supply of food, perhaps especially during the latter part of the summer and autumn. Juvenile salmon grow slowly in the Gruinard River. Only a small proportion of those that we caught during juvenile fish surveys were big enough to become smolts the following year. Most of the energy is going into juvenile salmon that will need at least one more year in the river before they are big enough to go to sea.

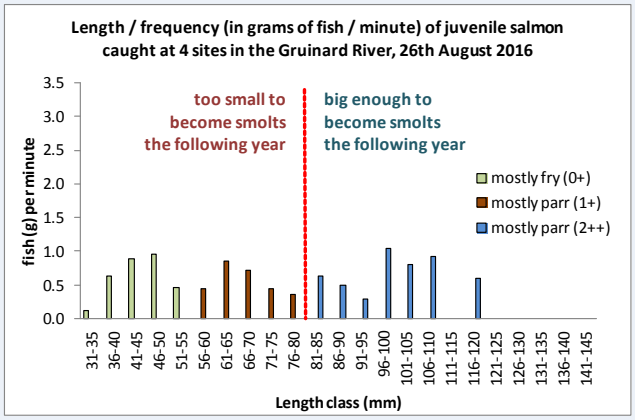
*(below)* ***The Gruinard River.*** *Lots of hungry wee fry, few of which will survive for long enough to smoltify.*

*Compare the proportions and relative amounts of fish that are in the 'pre-smolt' size category in the graphs below and on preceding page. Please contact the SWRFT Biologist if you would like to discuss!*



Allt Beith (Aultbea)

This smaller stream has just about sustained a population of juvenile salmon for as long as we can remember (no parr were recorded in 2005). Juvenile salmon grow well in this stream. Salmon can sometimes ascend to the 'Goose Loch' (Loch a Bhaid Luach-raich) via an old leaky fish ladder and a newer fish pass over the dam. However, in Sept. 2017 only a few large two year old parr were found above the fish ladder; and in core habitat areas further downstream, fewer salmon fry than usual were recorded. There are stories of poaching! If there is support from within the local community to help look after the river and its fish, the Allt Beith has the potential to be developed as a more productive local asset, where local youngsters could learn all about fishing. Interested?

*(left) Wild Allt Beith salmon parr of 162mm; the biggest of 2017.*

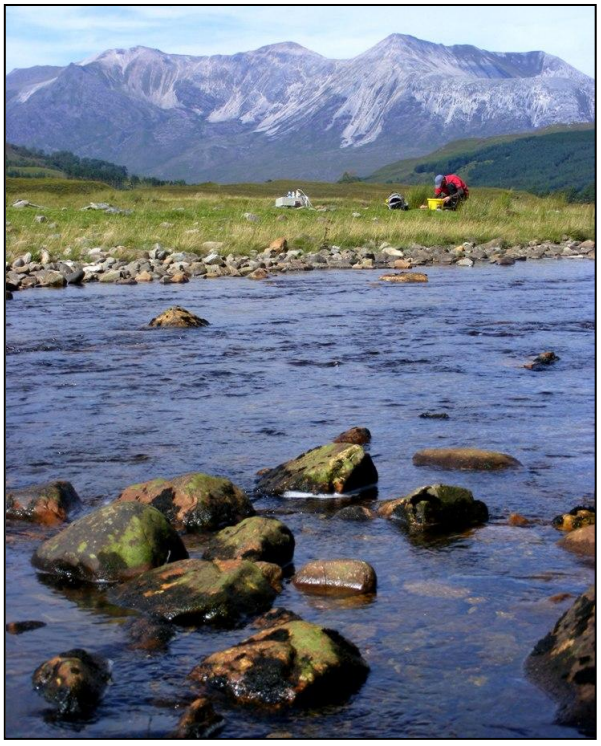
Tournaig & Sguod: please see next section

River Ewe – Loch Maree system

At sites surveyed above Loch Kernsary in July 2016, salmon fry were absent above the waterfall on the Loch Ghuiragarstidh burn, but present at high CPUE at all other sites surveyed.

On 27th September 2017 salmon fry were found further up the Slattadale burn (above Loch Maree) than previously recorded; hybrid trout – salmon fry were found above a waterfall that had been cleared of obstructing debris in the summer of 2016, thus demonstrating that at least one salmon has ascended over the falls (. . . a female?). The numbers of salmon fry recorded at sites in the Kinlochewe River, in the A' Ghiarbhe below Loch Clair and above Loch Coulin in the summer of 2016 are indicative of generally healthy populations. In 2017, salmon fry were recorded at high CPUE at sites downstream from newly constructed HP powerhouses in the Garbhaig river and Grudie river (both of which flow into Loch Maree), and in the Bruachaig River above the mouth of the Docherty burn. This demonstrated that any local increases in the amount of sediment entering the rivers associated with HP construction activity during the winter of 2017 had little adverse impact to salmon eggs buried in the gravels in these rivers and subsequent recruitment. No juvenile salmon were found above the Bruachaig falls in the summer of 2016. At the time of writing (December 2017), a fish pass has just been installed around the intake weir to the Bruachaig falls HP scheme; the possibility that wild salmon will one day recolonise large areas of former nursery habitat above the falls remains.

In the Docherty burn, salmon parr numbers were high (up to 3 per minute) at sites stocked to 'over carrying capacity' with salmon eggs in 2016. The stocking exercise has demonstrated the potential for the upper parts of this burn (difficult for adult salmon to reach) to support high densities of juvenile salmon.



*(right) The Coulin River on 15th August 2016. Because of very low conductivity and high water temperature, many of the salmon fry and parr seen here during the e-fish survey were 'missed'; so the figures recorded (shown in the maps) under-represent the relative abundance of juvenile salmon at sites here. Indeed, because they are wide and largely unshaded, the Coulin River and Abhainn Srath na Sealga (Gruinard system) may be vulnerable to uncomfortably high water temperatures for juvenile salmon especially during periods of low flow in July and early August.*

Badachro

In August 2016, salmon fry and parr were both found at high CPUE at all main river sites. The survey also demonstrated that juvenile salmon populations remained healthy downstream from the new Badachro Hydropower scheme powerhouse which was under construction nearby at the time. A salmon parr was also recorded in the small burn which flows out of Loch Clair (for the second time), where trout fry densities were high; some of these trout may have been progeny of sea trout?

*(below) Juvenile salmon from the Badachro River below the new powerhouse. The fish on the left is a fry (age 0+) and the one on the right is a one year old parr. Note the difference in the size of the eye relative to the rest of the fish. A mix of fast and slow growing fish is often indicative of a juvenile salmon population at close to the carrying capacity of the habitat they occupy; some of the fish grow bigger and require more food, others are left hungry.*


Torridon

The Torridon River was surveyed in August 2016. The survey was 'not effective' so far as being able to estimate relative abundance compared to other rivers; many of the wee fish seen scooted away from the anode without being caught due to very low conductivity (19µS – 35µS) and high water temperature (14.6C – 18.4C). However, our interpretation of the distribution and numbers of fry and parr was remarkably similar to the results of a follow-up quantitative survey by a SEPA electro-fishing team in September 2017. In the SEPA survey, salmon fry were found at highest density of almost 50 fry per $100m^2$ in the core 'flat' section of the Torridon river midway between the sea and Loch an Iasgair. Fry were present at lower densities at other main river sites; parr were recorded at up to 21.5 fish per $100m^2$ in the best habitat, in the upper parts of the main river. Both fry and parr numbers suggest a depleted salmon population in the Abhainn Thrail. Only juvenile trout were recorded in the Feith Ghlas, the principle sea trout spawning burn.

*Clear and shallow but warm with low conductivity: a frustrating day for the electro-fishing team; some of the fry and parr were seen swimming away at high speed before they were within reach of the e-fisher. Torridon River, 18th August 2016.*

Balgy

The most recent survey results for the Balgy are cause for concern. In 2006, 2010 and 2014, the WRFT e-fish team recorded moderate to high numbers of salmon fry and salmon parr in the Abhainn Dearg by Kinlochdamph Lodge (above Loch Damph) and at sites further upstream suggesting a reasonably healthy population of juvenile salmon here at least. However, in August 2017, low densities of salmon fry and parr were recorded by the SEPA team here; juvenile salmon were greatly outnumbered by juvenile trout at the 'core' salmon site by Kinlochdamph Lodge. Both WRFT (in summer 2016) and SEPA team (in Aug 2017) failed to find any juvenile salmon in the spawning stream at Glasnock above Loch an Loin, at the top of the system.

Likely impacts to the native wild Balgy salmon population associated with salmon farming include: (1) genetic introgression as a result of escaped farm-salmon breeding within the system; (2) predation of salmon smolts in Loch Damph where the number of fish-eating trout is likely to be elevated in comparison to lochs where there are no smolt farm cages; (3) sea lice infestation of salmon smolts migrating out to sea through Loch Torridon where salmon farms reported very high numbers of adult female sea lice, particularly in Spring 2015 (see WRFT Review May 2016).

## Applecross River

For the first time in many years, a juvenile fish survey of part of this river system was carried out by the WRFT e-fishing team on the 6th of September 2017. We focussed on the area at the top of the section of river which has been regularly stocked, and further upstream. Salmon fry were recorded at up to high CPUE at our initial sites. However, the majority of these fish may have been stocked (*see below*). Further upstream only juvenile trout were found.

*These anaesthetised salmon fry and parr (below right) were recorded at high to moderate CPUE at this site (left) at the top of the Applecross River. Are any of them progeny of wild fish?*

The Applecross River remains unstable with active landslips which discharge much sediment into the river. Problems with the freshwater habitat coupled with low rates of marine survival currently make the Applecross River a particularly difficult place for a wild salmon population to prosper. If salmon were stocked into areas above the landslip where no juvenile salmon were found rather than further downstream they would: (1) have a better chance of surviving and growing well in the more stable streambed habitat above the landslip; (2) be less likely to compete with the progeny of remaining wild salmon.

*(left) The biggest challenge for the Applecross River: how to stabilise this active landslip area. Possible solution: some redirection of flood-water channels higher up the hill side; a deer fence; willow slips or other deeper rooted vegetation; a little P-rich fertiliser . . .? Or, for a more ambitious and longer lasting catchment-scale ecosystem-revival solution, a programme of actions to restore fertility and nurture the recovery of deeper-rooted plants (trees and scrub) to hold the hill sides together. In the short term, that would require reducing deer numbers. In the longer term, there would be more and better quality food for deer to grow to larger sizes, and more food to enable juvenile salmon and other wildlife to prosper.*

## River Carron

Much of the River Carron has also been stocked with salmon over recent years. Salmon fry were found mostly at low to moderate CPUE at sites above Loch Dughaill (Aug. 16); some of the fry appeared to be stocked fish. At the same sites, parr were recorded mostly at high CPUE suggesting that the recruitment of salmon fry in 2015 had been somewhat higher in this part of the river system than in 2016.

*(right) River Carron above Loch Dughaill on 29th August 2016, and (inset) two of the salmon fry found here (? a wild one and a stocked one).*

River Elchaig

Parts of this river had been stocked with salmon fry prior to our survey on 19th September 2017, including sites above Loch na Leitrich, where salmon fry were recorded at only low CPUE. However, below the loch (above the waterfalls), fry were recorded at high CPUE; these fish were assumed to be mostly of wild origin. At all sites surveyed further downstream, both salmon fry and parr were recorded at moderate to high CPUE, indicating reasonably healthy numbers of juvenile salmon.

*(left) Core habitat for juvenile salmon. On 19th September 2017, salmon fry and parr were both found at high CPUE at this site in the River Elchaig, about 150m downstream from the lowest waterfall. After 12 minutes fishing, our bucket contained 30 of each!*

*The streambed is of mostly cobble-sized sediment and is mostly 'stable'; riparian alder trees provide plenty of leaf litter to feed the river ecosystem.*

River Arnisdale

Water levels were much too high on the day of survey (26th of October 2017) to record useful CPUE data except at one site. This river had been stocked with salmon fry prior to our survey; it's not usually possible to distinguish stocked fish from wild spawned fish in the field. However, samples of salmon fry caught in the main river below the wooden vehicle bridge, and in the Allt Utha (at high CPUE) just above the confluence with the main river were thought to be mostly of wild fish. Because our survey was less than satisfactory and concern was expressed regarding falling numbers of adult fish in the river in recent years, we intend to revisit the area again in 2018 to investigate further.

*(right) Allt Utha, River Arnisdale system, October 2017.*

River Barrisdale

This river was surveyed on the 27th October 2017 for the first time since 2009. Trout and eels were recorded at low to medium CPUE; the highest fish densities were at a site immediately downstream from a septic tank outflow. No juvenile salmon were found at any of the 6 sites surveyed. In previous surveys juvenile salmon occurrence has been patchy in the Barrisdale: only in 2006 were both salmon fry and salmon parr recorded in this river by the WRFT fish survey team; no salmon were recorded in 2004; and just parr in 2009. The Barrisdale is one of several smaller river systems in our area that may only be able to sustain a wild salmon population when all available instream habitat within the accessible area is contributing to smolt production, and when rates of marine survival of salmon smolts are higher than they have been in recent years.

## 2.3 Tournaig trap project

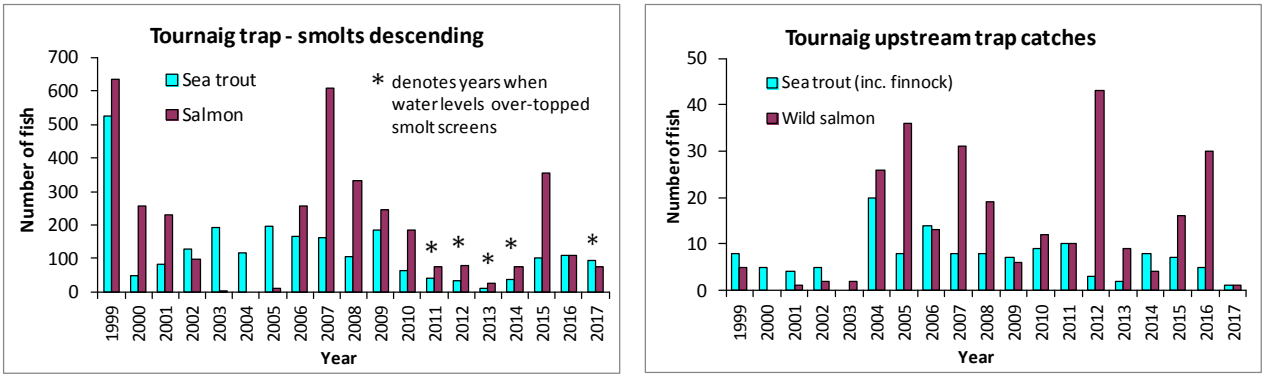
**Supported by Marine Harvest and NTS**

The little Tournaig river system which drains into Loch Ewe is one of the smallest within the SWRFT area to support a wild salmon population. In 1999, an upstream – downstream trap was installed within an old fish ladder near the mouth of the river. Since then it has been operated from the spring to the autumn each year providing records of wild salmon and sea trout smolts migrating out to sea and of adult fish entering the system.

In addition to the fish traps, an annual electro-fishing survey has been carried out in early August primarily to find out about the distribution of juvenile salmon in the principle spawning burn, the Allt na Coille, above Loch nan Dailthean. As the Tournaig system has not been stocked in recent years, the monitoring of wild salmon and trout populations at Tournaig provides useful information about the performance of wild fish in the area, contributing to a clearer understanding of some of the factors that are of concern to fisheries managers.

Upstream and downstream trap catches at Tournaig are shown in Figure 2.3 below.

*Figure 2.3 Trap catches at Tournaig, 1999 to 2017*




*Downstream trap catches*

110 salmon smolts and 111 sea trout smolts were recorded in the downstream trap in 2016; and 93 salmon smolts and 76 sea trout smolts in 2017. Water levels over-topped the smolt screens at Tournaig briefly in mid April 2017; therefore a small proportion of smolts may have been missed that year. In both 2016 and 2017, the period of migration of salmon and sea trout smolts to sea was cut short by low water during May. This is a problem that can also delay or prevent the migration of smolts to the sea from other smaller river systems within the Wester Ross area, including the River Shieldaig system by Loch Torridon where an upstream - downstream fish trap is operated by Marine Scotland Science.

*Upstream trap catches*

In 2016, 30 grilse and 5 sea trout (including finnock) were recorded in the upstream trap. Twenty three of the grilse were found in the trap on the 6th August 2016, a record catch of salmon for a 24 hour period. In contrast, for the whole of the 2017 season, only one salmon and one sea trout were taken in the upstream trap. For much of the summer of 2017 water levels were unusually high, so there is a possibility that some fish were able to ascend the waterfall, by-passing the trap.

*Tournaig juvenile fish survey*

In addition to the operation of the fish traps, an electro-fishing survey has been carried out each year to learn about the distribution and relative abundance of juvenile salmon and trout within the principle spawning stream, the Allt na Coille. In 2016, salmon fry were found at the highest site *(right)* demonstrating that adult salmon had ascended to the top of the accessible part of this stream and spawned successfully for the first time since 2013. In 2017, salmon fry were found at all survey sites within the spawning stream at the highest average CPUE since the Tournaig project started in 1999. The high numbers of salmon fry in the burn in 2017 followed one of the highest recorded catches of adult salmon in the upstream trap in 2016 (see above).

In 2016, trout fry were recorded at the second from top electro-fishing site in the Allt na Coille, at higher CPUE than in any previous year. It's possible that many of these fry were progeny of sea trout. Although there is a resident population of brown trout within Loch nan Dailthean, there are two small waterfalls in the Allt na Coille which may be more difficult for smaller resident trout to ascend than for larger sea trout. In 2015, 4 mature female sea trout were recorded in the upstream trap, more than in previous years. The higher trout fry numbers in 2016 are consistent with a larger spawning run of adult female sea trout into the upper part of the Allt na Coille in 2015 than in previous recent years.

*Tournaig salmon smolt, April 2016 (Photos by Ben Rushbrooke)*

In summary, despite low numbers of salmon and sea trout smolts migrating to sea from the Tournaig system in 2016 and 2017, and very low numbers of salmon and sea trout entering the upstream trap in 2017, populations of salmon fry and juvenile trout (including progeny of sea trout) were close to their highest levels on record in 2017.

Scale reading has shown that salmon smolts from the Tournaig system *(above right)* are mostly 2 years old; sea trout smolts, mostly 3 or 4 years old. So the 2019 and 2020 smolt runs may be particularly interesting ones to record . . .

*(right) Table 2.1. A summary of trap and juvenile survey data for salmon collected at Tournaig. Year-class colouring assumes that a majority of smolts are 2 years old.*

| Year | Adult salmon recorded in upstream trap | Number of sites where salmon fry recorded | Salmon fry average number per minute | Number of sites where salmon parr recorded | Salmon parr average number per minute | Salmon smolts recorded in down-stream trap |
|---|---|---|---|---|---|---|
| 2003 | 2 | 0 | 0.00 | 0 | 0.00 | 0 |
| 2004 | 26 | 4 | 1.81 | 0 | 0.00 | 0 |
| 2005 | 36 | 6 | 1.09 | 6 | 0.55 | 11 |
| 2006 | 13 | 5 | 1.99 | 6 | 0.87 | 257 |
| 2007 | 31 | 6 | 1.07 | 6 | 1.17 | 607 |
| 2008 | 19 | 4 | 0.67 | 6 | 0.74 | 332 |
| 2009 | 6 | 5 | 1.05 | 5 | 0.41 | 246 |
| 2010 | 12 | 5 | 0.88 | 6 | 0.55 | 183 |
| 2011 | 10 | 2 | 0.06 | 5 | 0.24 | 77* |
| 2012 | 43 | 2 | 0.14 | 4 | 0.08 | 78* |
| 2013 | 9 | 5 | 2.61 | 3 | 0.32 | 25* |
| 2014 | 4 | 2 | 0.81 | 6 | 0.81 | 77 |
| 2015 | 16 | 2 | 0.66 | 5 | 0.44 | 354 |
| 2016 | 30 | 5 | 1.73 | 2 | 0.22 | 110 |
| 2017 | 1 | 6 | 3.55 | 6 | 0.63 | 76 |

## 2.4 Trout population investigations

### Loch Sguod river system

Prior to the sea trout collapse in the latter part of the 20th Century, Loch Sguod had a reputation as a sometimes prolific sea trout fishery. Since 2006, an electro-fishing survey has been carried out to record the distribution and relative abundance of juvenile fish in different parts of the system. During the years when the system was stocked with trout fry (2007-2012), juvenile trout CPUE values were not much higher than during subsequent years when all the trout fry were progeny of wild fish. Wild salmon fry and parr were also found in the main river and in all three burns which enter the loch.

*(right) Ben Rushbrooke setting the fyke net (photo Jim Buchanan).*

To gather information about the composition of the spawning trout population, a fyke net was operated in the largest spawning stream in October 2017. Although providing little more than a snapshot, our results are consistent with the hypotheses that there had been a slight increase in the proportion of mature female sea trout relative to female 'resident' brown trout using this spawning burn in 2017 compared to 2012 when a similar fyke net was used at the same location to sample the adult trout population.

### Laide (Sand) burn

With enthusiastic support from local volunteers, efforts were also made in October 2017 to learn more about the composition of the adult trout population within the little Sand burn which enters Gruinard Bay by the campsite at Laide. There were three objectives: (1) to find out whether sea trout were present in the population; this would confirm that the road culvert by the campsite was indeed passable to fish entering from the sea; (2) to learn about the proportions of sea trout vs. 'resident' brown trout in the adult trout population; (3) to consider the possibility of using the Laide burn to monitor wild sea trout within the Gruinard Bay area. Using both electro-fishing equipment and a fyke net, and with special permission from the Scottish Government, samples of trout were obtained from the main river downstream from the Laide Community Woodland, and from one of the tributaries within the woodland.

Two sea trout were caught, confirming that the road culvert was indeed passable. In addition to just one adult female sea trout taken in the fyke net, several mature female resident brown trout were taken from the fyke net and using the e-fishing equipment, the smallest of which was only 155mm long.


*(left) To confirm that this 165mm trout from the Laide burn in October 2017 was indeed a mature female, she was humanely killed in anaesthetic to enable dissection; she contained 78 eggs.*

# Part 3 **Sea trout & sea lice monitoring**

**Supported by WRASFB and the Scottish Government via RAFTS & Fisheries Management Scotland**

## 3.1 Sea trout sampling

Following their migration to the sea, sea trout were sampled from coastal waters or close by, using a variety of methods between April and September in 2016 and 2017 (as in previous years) to learn about their size, condition and levels of infestation by parasitic sea lice (particularly the salmon louse, *Lepeophtheirus salmonis*). Most fish were taken using a sweep net, following SFCC protocol. Prior to examination, sampled fish were anaesthetised; almost all were released back into the waters from where they were caught following a period of recovery. Results are summarised in Table 3.1 and in the following sections. Note: data for Skye is reported in Part 6 & 7.

Table 3.1 Summary of sea trout sampling data, mostly from mainland sites, collected in 2016 and 2017

| Location | Method | Date | Number of sea trout in sample | | Condition factor | *Lepeophtheirus salmonis* all stages | | | Fish with >0.3 lice / per gram | | Lice per gram average | Dorsal fin damage average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Total | Infected | | Prevalence | Abundance | Intensity | number | % | | |
| Kanaird estuary | sweep | 24-Jun-16 | 16 | 9 | 0.94 | 56% | 2.19 | 3.89 | 0 | | 0.05 | 0.00 |
| Kanaird estuary | sweep | 08-Jun-16 | 7 | 5 | 0.96 | 71% | 2.43 | 3.40 | 0 | | 0.01 | 0.07 |
| Kanaird estuary | sweep | 26-May-17 | 40 | 9 | 1.03 | 22% | 0.40 | 1.78 | 0 | | 0.00 | 0.00 |
| Kanaird estuary | sweep | 27-Jun-17 | 13 | 7 | 0.99 | 53% | 7.31 | 13.57 | 1 | 8% | 0.05 | 0.19 |
| Dundonnell estuary | fyke | Jun-16 | 1 | 0 | nr | 0% | 0.00 | 0.00 | 0 | | 0.00 | 0.00 |
| Dundonnell estuary | fyke | Jun-Jul17 | 4 | 4 | 1.18 | 100% | 11.00 | 11.00 | 0 | | 0.04 | 0.63 |
| | | | | | | | | | | | | |
| Boor Bay, L. Ewe | sweep | 06-Jun-16 | 2 | 1 | 0.89 | 50% | 0.50 | 1.00 | 0 | | 0.00 | 0.00 |
| Boor Bay, L. Ewe | sweep | 05-Jul-16 | 2 | 2 | 0.86 | 100% | 5.50 | 5.50 | 0 | | 0.14 | 0.00 |
| Boor Bay, L. Ewe | sweep | 26-Jun-17 | 10 | 10 | 1.06 | 100% | 33.30 | 33.30 | 3 | 30% | 0.20 | 0.10 |
| Boor Bay, L. Ewe | sweep | 11-Jul-17 | 0 | | | | | | | | | |
| River Ewe | rod&line | 21-Jul-17 | 4 | 3 | 1.17 | 75% | 19.50 | 26.00 | 1 | 25% | 0.25 | 0.25 |
| | | | | | | | | | | | | |
| Flowerdale, L. Gairloch | sweep | 22-Jun-16 | 6 | 4 | 0.94 | 67% | 8.83 | 13.25 | 2 | 33% | 0.22 | 0.23 |
| Flowerdale, L. Gairloch | sweep | 07-Jun-16 | 19 | 6 | 0.95 | 32% | 1.05 | 3.33 | 0 | | 0.03 | 0.00 |
| Flowerdale, L. Gairloch | sweep | 07-Jul-16 | 31 | 30 | 1.11 | 97% | 12.19 | 12.60 | 2 | 6% | 0.12 | 0.35 |
| Flowerdale, L. Gairloch | sweep | 01-Sep-16 | 11 | 7 | 1.02 | 64% | 12.91 | 20.29 | 0 | | 0.06 | 0.55 |
| Flowerdale, L. Gairloch | sweep | 20-Sep-16 | 21 | `1 | 0.97 | 62% | 4.10 | 6,62 | 0 | | 0.02 | 0.61 |
| Flowerdale, L. Gairloch | sweep | 27-Apr-17 | 32 | 32 | 0.88 | 100% | 98.09 | 98.09 | 16 | 50% | 0.37 | 0.44 |
| Flowerdale, L. Gairloch | sweep | 26-Jun-17 | 7 | 7 | 1.12 | 100% | 166.86 | 166.86 | 4 | 57% | 0.47 | 1.57 |
| Flowerdale burn | e-fish | 20-Jul-17 | 6 | 3 | 1.09 | 50% | 30.50 | 61.00 | 1 | 17% | 0.26 | 1.00 |
| Flowerdale, L. Gairloch | sweep | 08-Sep-17 | 18 | 8 | 1.05 | 44% | 2.00 | 7.00 | 0 | | 0.02 | 0.64 |
| Flowerdale, L. Gairloch | sweep | 21-Sep-17 | 12 | 4 | 1.03 | 33% | 0.83 | 2.50 | 0 | | 0.00 | 0.79 |
| R. Sand, Gairloch | e-fish | 19-Jul-17 | 7 | 5 | 1.07 | 71% | 23.42 | 32.80 | 1 | 14% | 0.18 | 0.93 |
| | | | | | | | | | | | | |
| Balmacara burn | e-fish | 10-Jun-16 | 8 | 7 | 0.97 | 88% | 77.91 | 89.01 | 3 | 38% | 1.28 | 1.12 |
| Glennan burn, Dornie | e-fish | 30-Jun-16 | 2 | 1 | 0.97 | 50% | 28.00 | 56.00 | 1 | 50% | 0.54 | 0.50 |
| Glenelg estuary | rod&line | 29-Jun-16 | 4 | 4 | 0.92 | 100% | 47.00 | 47.00 | 3 | 75% | 0.79 | 1.12 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| L. Scresort, Rum | sweep | 07-Jul-17 | 3 | 3 | 1.34 | 100% | 53.00 | 53.00 | 1 | 33% | 0.23 | 1.12 |

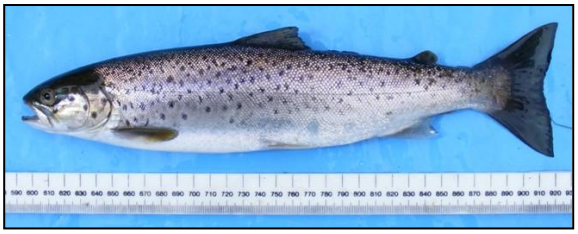
**Notes**: 'Condition factor' K= (weight of fish in grams x $10^5$)/(length of fish in mm)$^3$ ; 'Prevalence' is the % of sea trout in the sample carrying sea lice; 'Abundance' is the average number of lice per sea trout in the sample; and 'Intensity' is the average number of lice on the sea trout that carry sea lice. Sea trout carrying > 0.3 lice per g weight are in Taranger et al 2015's '100% mortality or return prematurely to freshwater' category (please refer to this paper for other categories). 'Dorsal fin damage' is a score for observed damage to a fish's dorsal fin associated with sea lice infestation, where '1' is up to 33% of the dorsal fin is damaged, '2' means between 33% and 66% of the fin is damaged, and '3' means over 66% of the dorsal fin is damaged. Sea lice come off a sea trout over a period of days following return to freshwater; dorsal fin damage can be indicative of previous infestation by high numbers of lice when the lice are no longer present on the fish.

*Kanaird estuary*

In 2016, 25 sea trout were taken over two sweep netting expeditions in June; the lousiest fish carried just 10 lice. In 2017, 53 sea trout were taken over two expeditions, on 26th May and on 27th June; most of these fish carried less than 10 lice; however two of those taken in the June 2017 sample were more heavily liced including one with 45 lice (over 0.3 lice per g bodyweight). Lice levels on samples of sea trout taken at the mouth of the River Kanaird in 2016 and 2017 were lower than on samples in previous years up to 2014.

*(right) Sea trout of about 450mm dropped by an osprey onto the oyster farm near the mouth of the River Kanaird, 15 April 2017. Apart from claw marks, the fish was in good health and condition for the time of year (photo by Ailsa Hayes).*

*(left) The sea trout sampling team on 27th June 2017, and (below) the biggest sea trout caught that day, a fish of 321mm (350g) carrying 38 lice.*



*Dundonnell & Little Loch Broom*

In both 2016 and 2017, a fyke net was set at the mouth of the Dundonnell River to fish over high tides in June – early July, as in previous years (since 1997). One trout was caught in 2016 with no lice; four trout were caught in 2017 carrying up to 16 lice per fish. In previous years the average lice count per fish has sometimes exceeded 100 (most recently in 2013). No sea trout were caught in a sweep netting session nearby on 15th August 2017 despite much effort from youngsters.

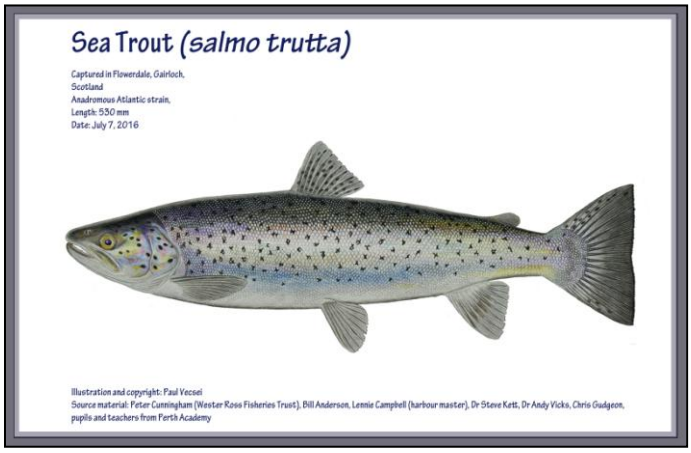
*(right) a sea trout resting in sea weed, Little Loch Broom; note the healthy dorsal fin. (photo by Noel Hawkins, SWT Living Seas Project, taken during the family snorkeling expedition, Camusnagaul, 25th July 2017)*

*Loch Ewe*

At the Boor Bay sweep netting site, only four sea trout were taken during 2016, and none of these carried more than 10 sea lice. However in 2017, several heavily lice-infested sea trout were recorded. The sample of 10 sea trout taken at Boor Bay on 26th June 2017 included a fish of 304mm carrying 156 lice, and two other smaller sea trout were taken each carrying over 0.3 lice per gram bodyweight. In the River Ewe nearby, four finnock were taken using rod and line on 21st July 2017; one of these carried 65 lice.

*Loch Gairloch*

Our sweep netting site in the Flowerdale estuary, in front of the SWRFT office, has consistently provided some of the largest samples of sea trout. In 2016 several adult sea trout were caught at this site, including a fish of over 500mm which was caught on two occasions; this fish was subsequently beautifully illustrated by Canadian Ichthyologist, Paul Vecsei *(right)* [6].




Alas, most of the sea trout sampled in April and June 2017 were heavily infested with sea lice. Two of these fish are shown in Box 3.1. In September 2017, samples of sea trout were taken from the estuary on two occasions; for the first time in 8 years, no larger maturing sea trout were recorded in the autumn. Our combined sample for autumn 2017 is compared with samples taken in the autumn in previous years in Box 3.2.

*(right) An unhappy Flowerdale sweep netting team, 26th June 2017. See why: Box 3.1, overleaf.*

*Loch Alsh area*

Following reports of heavily lice-infested sea trout from the Loch Alsh – Loch Hourn area early in 2016, samples of lice-infested sea trout were subsequently taken from the Balmacara burn and Glennan burn using e-fishing equipment, and from the estuary of the Glenmore River (by Glenelg) using rod and line, in June 2016.

*(right) small copepodid and chalimus sea lice on the pelvic and ventral fins of an early-returned post-smolt sea trout of 157mm, taken in the Balmacara Burn, by Loch Alsh on 10th June 2016.*

[6] Paul Vecsei's flickr page: https://www.flickr.com/photos/fishasart/albums. Click on the 'Fish Art' tab.

***Box 3.1 Two sea trout recaptured in the Flowerdale (Loch Gairloch) estuary in June 2017***

As in previous years, some of the sea trout taken in the Flowerdale estuary by Loch Gairloch were recognized by their spot patterns as fish that had been captured previously. Two of them are shown here:

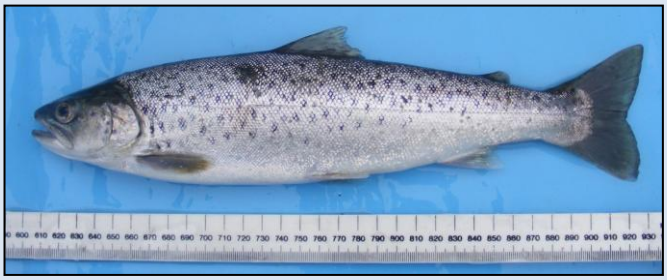
**Fish L**

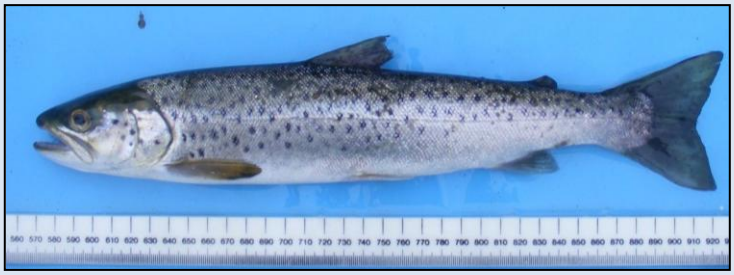
*(top right)* 7 July 2016, 315mm, 385g, (c.f. 1.23), carrying 5 sea lice. Dorsal fin damage score '1'. Fat and fairly healthy!

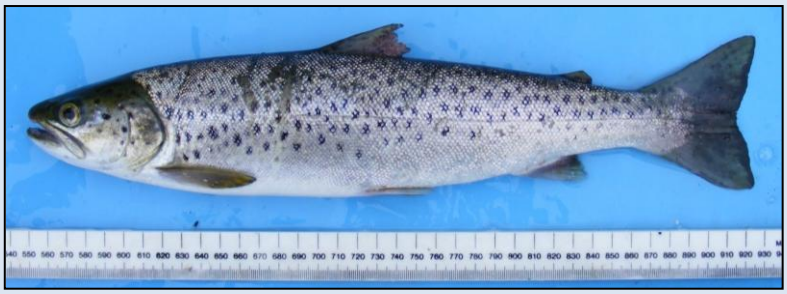
*(middle right)* 27th April 2017, 344mm, 362g (c.f. 0.89), carrying 97 sea lice.

*(lower right)* 26th June 2017 365mm, 541g, (c.f. 1.11), 244 sea lice counted (0.451 lice per gram). Dorsal fin damage 3.

*(below)* some of the sea lice on this fish on 26th June 2017.





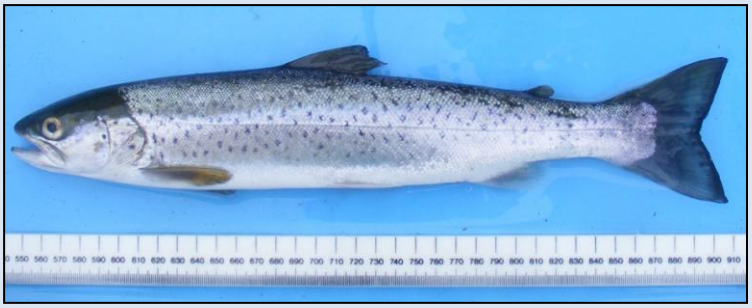


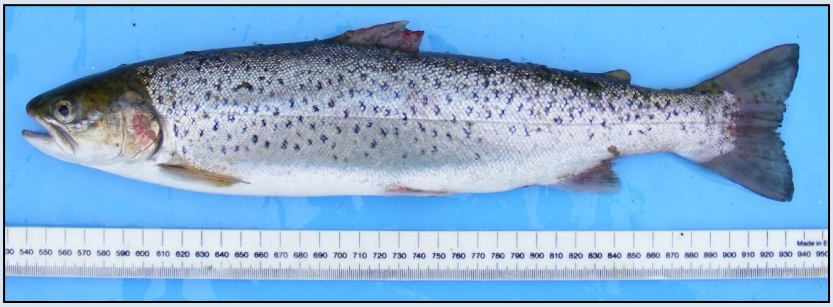
**Fish N**

*(right)* 27th April 2017, 348mm, [not weighed], 200 copepodid & chalimus lice, 7 preadult and adult lice. Dorsal fin damage 0.5.

*(lower right)* 26th June 2017, 395mm, 645g (c.f. 1.05). 500 copepodid & chalimus lice, 11 preadult and adult lice, 9 ovigerous females (0.806 lice per gram). Dorsal fin damage 2.

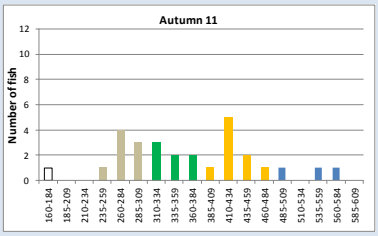
*(below)* some of the sea lice on the dorsal fin.

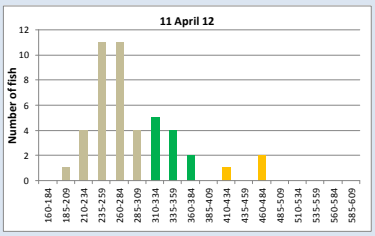




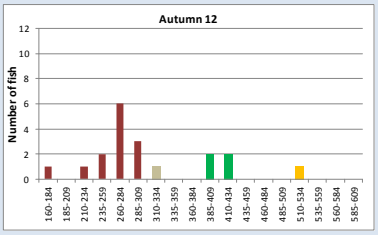
***Box 3.2 Flowerdale (Loch Gairloch) sea trout: where have all the big fish gone?***

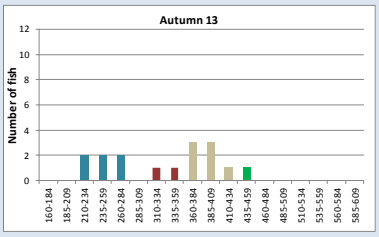
The graphs below present length-frequency data for the sea trout taken in sweep netting samples at Flowerdale, Loch Gairloch, in the autumn and in the late winter – early spring for the years 2011 to 2017 *[To view, please zoom to page width].*

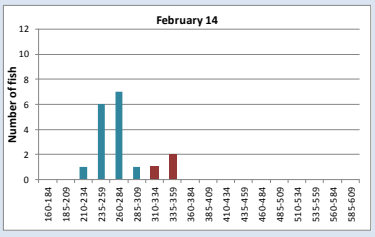


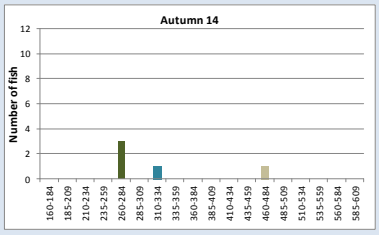




Length classes on 'X' axes are in mm

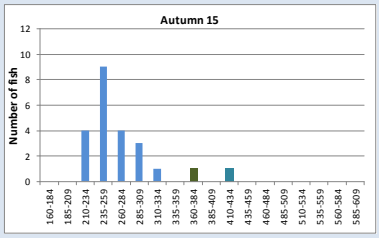


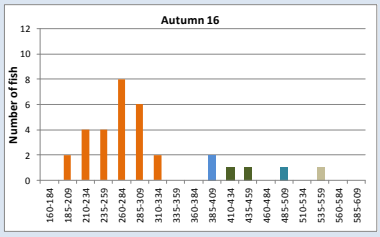



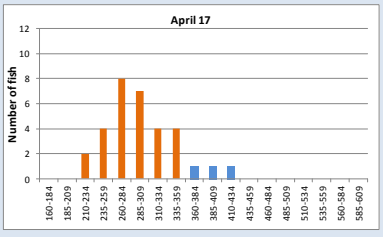



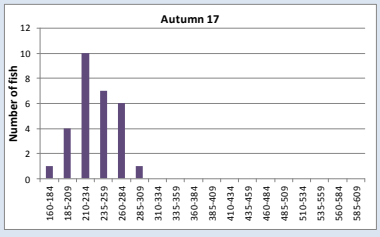








Fish may gather in the Flowerdale estuary for different reasons. Autumn samples typically include maturing fish which run up the nearby Flowerdale burn to spawn. Early spring samples include a mix of over-wintering finnock, and recovering kelts. Sea trout are also known to return 'early' to freshwater if they become heavily infested with parasitic sea lice.

The columns on the graphs have been coloured to indicate different sea trout smolt year-classes, based on scale reading, some recaptures, and inferred growth rates of some fish. Growth of Flowerdale sea trout can be variable; some fish have grown by almost 100mm in length over a year; others by less than 50mm. So, especially for the larger fish, some columns may be incorrectly coloured or may include fish of different sea ages which have grown at different rates.

But that doesn't alter the main point:

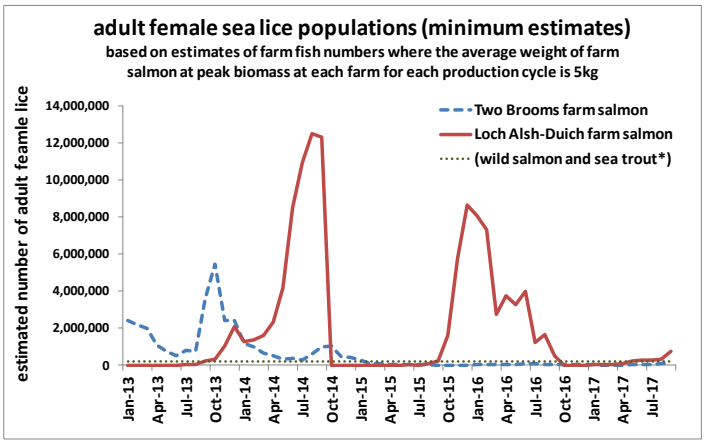
**During the period 2011 – 2017, there was a decline in the relative proportions of older (>310mm) sea trout vs. younger sea trout in sweep net catches at Flowerdale.**

In September 2017, two sweep netting sessions were carried out in the Flowerdale estuary in search of maturing fish. Only smaller sea trout (2017 smolt year-class) were caught. These 'finnock' were smaller for their age than in previous years, despite shoals of herring fry nearby. Following the sea lice epizootic earlier in the year, there was no evidence that any of the older sea trout had survived. Will older fish reappear in sweep netting samples in 2018?

## 3.2 Sea lice, salmon farming and wild fish populations

Research over many years has demonstrated an association between high levels of sea lice (*Lepeophtheirus salmonis*) infestation on wild sea trout and proximity to salmon farms in the west of Scotland. Larval lice including infectious copepodid stages may be present within the water column at elevated concentrations for distances of 40km or more away from their origin, depending on wind and tidal currents[7].

The results of monitoring sea lice levels on wild sea trout around the Loch Torridon area in 2015, when salmon farms in that area had very high numbers of lice, were reported in the last WRFT Review[8]. In 2016, high lice levels were reported by the Scottish Salmon Producers Organisation [SSPO] on salmon farms in the Loch Alsh – Duich area[9]. Information on the numbers of fish stocked at individual fish farms is not published. However, on-farm monthly biomass figures are published by the Scottish Government[10]. Using basic knowledge of the farm production cycle, it is possible to estimate the numbers of fish on each farm; and by multiplying this figure by the 'average' adult female sea lice count for the production area reported by SSPO, to obtain estimates of the adult female sea lice populations within respective production areas.




Conservative estimates for adult sea lice populations on farmed salmon in the Loch Alsh – Duich area are shown in the graph *(left)* together with estimates for populations in the 'Two Broom' (Loch Broom & Summer Isles farms) for the period January 2013 to July 2017.

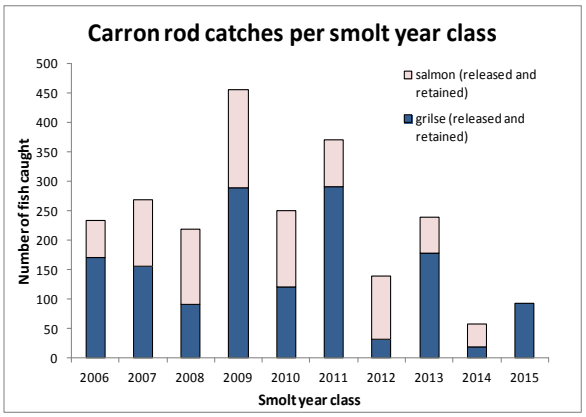
*The estimate of sea lice on wild fish is based on calculation of 20,000 wild fish and 5 adult female lice per fish. It is hard to conceive of a larger adult female sea lice population on wild fish in either of the two farming areas at any time in the year.

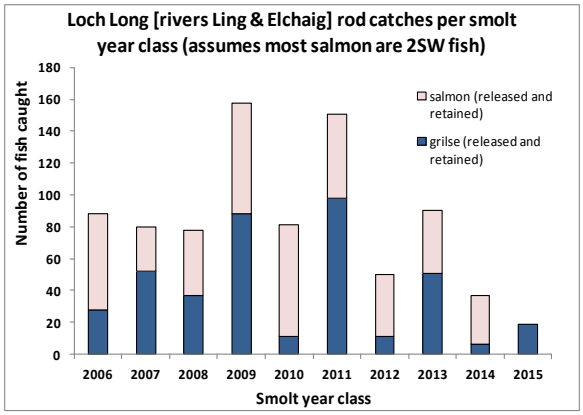
The two main points to note are: (1) The numbers of adult female sea lice within the Loch Alsh Duich area were very high in the springs of 2014 and 2016, but not in the springs of 2013 or 2015. (2) For the years 2014 – 2017 (inclusive), estimated sea lice populations on farmed salmon in the Loch Broom and Little Loch Broom area were low compared to those in the Loch Alsh – Loch Duich area for the same period.

Early in 2017, research was published in Ireland which demonstrated an impact to grilse numbers associated with sea lice from nearby salmon farms[11]. To find out whether or not a similar affect could be seen for any of the salmon fisheries within the SWRFT area, grilse catches for fishery districts around the Loch Alsh-Duich area were compiled from the Scottish Governments catch statistics[12]. Catch graphs presented in Part 2.1 of this review show a clear two-year periodicity for grilse catches for the Carron district and for the rivers of the adjacent Loch Long district (the rivers Ling and Elchaig) but not for the other fishery districts shown (Gruinards, Ewe, Snizort districts). For both the Carron and the Loch Long districts, significantly fewer grilse were reported in rod catches during even years than during odd years (Student's T-test, $p < 0.01$).

[7] See Johnsen *et al* 2016 http://www.int-res.com/abstracts/aei/v8/p99-116/
[8] WRFT Review May 2016 http://www.wrft.org.uk/files/WRFT%20Review%20May%202016%20Final.pdf
[9] SSPO Fish Health Management reports http://scottishsalmon.co.uk/publications/
[10] Scotland's Aquaculture links to data on farm biomass http://aquaculture.scotland.gov.uk/
[11] Shephard and Gargan, 2017 http://www.int-res.com/abstracts/aei/v9/p181-192/
[12] Scottish Government Rod catch statistics http://www.gov.scot/Publications/2017/04/5245.

The graphs below contrast the rod catches of 'salmon' and 'grilse' for these districts, presented as numbers of fish caught for each smolt-year class (compare with graphs in Part 2.1). 'Salmon' were assumed to be mostly 2-sea winter fish, returning to their rivers of origin two years after migrating to sea as smolts. As a proportion of the 'salmon' will be 3 sea-winter fish, the graphs possibly slightly underestimate the differences in the total catches of returning 'salmon' between even years and odd years.




Data for the average numbers of adult female sea lice on salmon farms in Scotland has been published only from 2013. So it is not possible to estimate adult female sea lice populations on salmon farms within the area for earlier years. However, the two year farm salmon production cycles within the two areas (Loch Carron and Loch Kishorn & Loch Alsh – Loch Duich) was synchronized throughout the years from 2008, with the 1st year of the production cycle in odd years and the 2nd year of the production cycle in even years. It is therefore reasonable to assume that sea lice infestation pressures were also higher in even years than in odd years in this area prior to 2013.

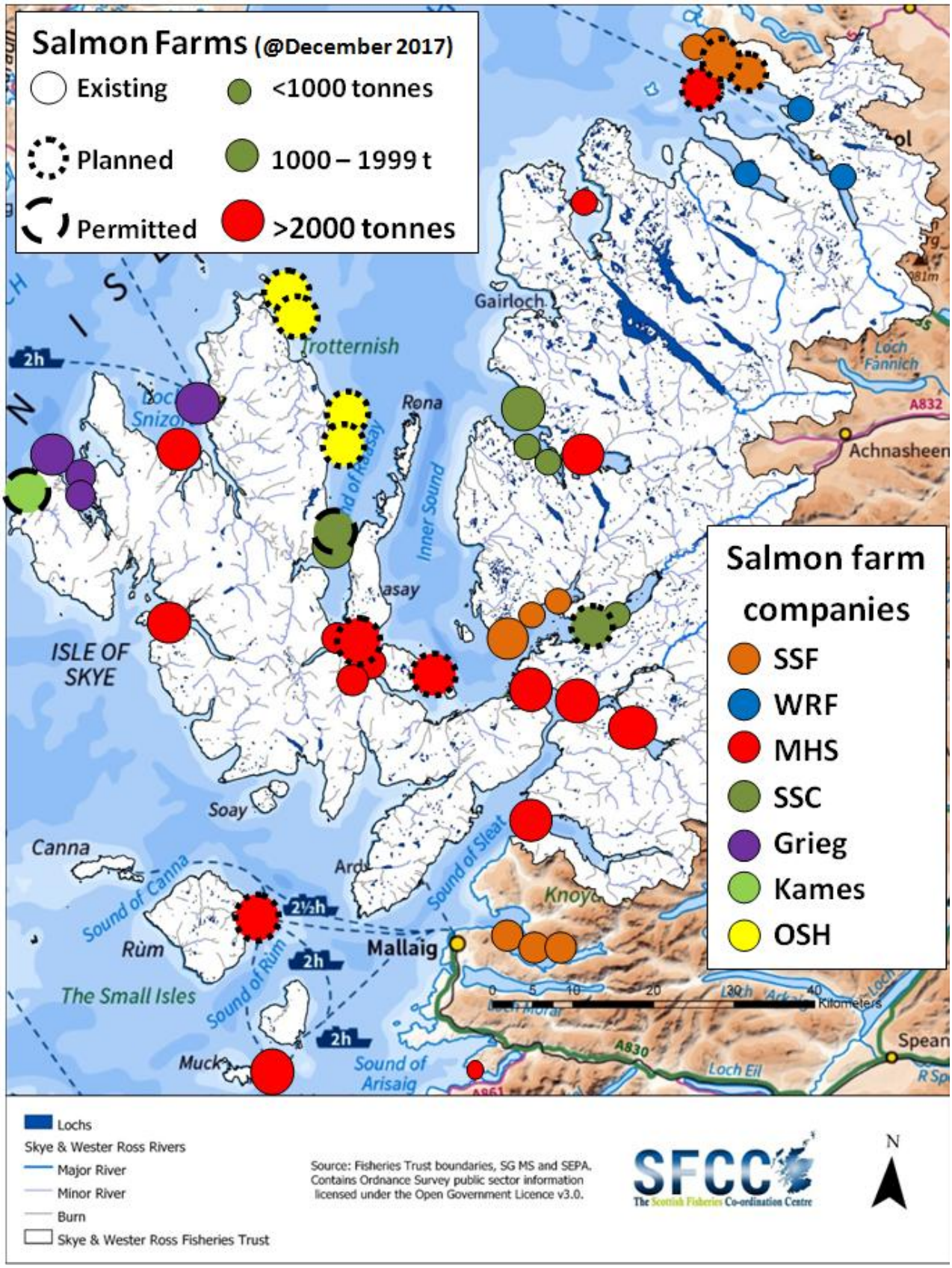
Although there is only a limited amount of sea trout monitoring data for this area for previous years, sea trout carrying very high numbers of sea lice were recorded at the mouth of the River Carron in May 2012 demonstrating high infestation pressure in nearby waters in the spring of 2012 .

*(left) Some of an estimate 400+ sea lice on a sea trout of 395mm taken at the mouth of the River Carron in June 2012. Few grilse were caught in the rivers Carron, Ling & Elchaig the following year (2013).*

In conclusion, there is increasing evidence that the standards for control of sea lice on salmon farms enforced by the Scottish Government and its agencies were inadequate to protect not just wild sea trout but also wild salmon in the waters around parts of Wester Ross during the past 10 years.

Figure 3.1 is a map of existing and proposed new farms. If planning applications for new salmon farms are approved without much more stringent controls of sea lice than have been enforced by the Scottish Government and planning authorities to date, cumulative impacts to wild fish associated with high levels of sea lice on salmon farms will increase, including in areas where the few remaining relatively healthy wild salmon populations can still be found (e.g. the rivers around Wester Ross MPA). At very least, we would recommend adding Atlantic Salmon (*Salmo salar*) and Brown Trout (*Salmo trutta*) to the list of protected features within the Wester Ross MPA.

*Figure 3.1. The Skye and Wester Ross Fisheries Trust area showing the locations of existing, planned and permitted new salmon farms within the area (as at December 2017).*




***Abbreviations**: **SSF**: Scottish Sea Farms; **WRF:** Wester Ross Fisheries; **MHS:** Marine Harvest Scotland; **SSC:** Scottish Salmon Company; **OSH:** Organic Sea Harvest.*

# Part 4 **Wester Ross Area Salmon Fishery Board report**

**supported by Fisheries Management Scotland and Fish Legal**

*Peter Jarosz & Bill Whyte*

The Wester Ross Area Salmon Fishery Board (WRASFB) has continued to work in close co-operation with Skye & Wester Ross Fisheries Trust (SWRFT) over the past three years in two distinct areas of work:

- **Monitoring of fisheries.** Data collected this year by SWRFT (e.g. from sweep netting and electro-fishing surveys) has added to the data bank that the WRASFB requires in performing its remit as the statutory consultee for wild fish. A summary of these surveys can be seen elsewhere within this document.
- **Responding to planning applications.** SWRFT has provided background information for responses to planning applications for fish farm sites both within and outwith the board's area as well as one "run of the river" hydro schemes.

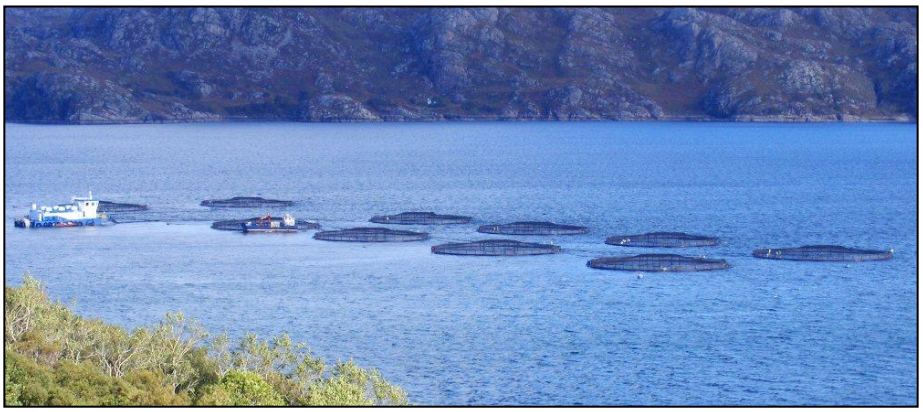
The WRASFB has responded to planning applications for one run of the river hydro schemes within the Board's area over the past eighteen months at Talladale, an application that was in fact refused permission.

*The new intake weir for the Bruachaig falls HP project, near Kinlochewe, 5th October 2017.*

*Parts of a new denil fish pass were being fitted at the far end of the weir as the photograph was taken.*

As far as aquaculture planning applications are concerned, the past eighteen months has witnessed more efforts by the Scottish Salmon Company [SSC], utilizing all the legal processes available to them (including employing expensive lawyers) to have the ten-year term at their farm in Torridon (Sgeir Dughall) replaced with permanent planning consent. This has resulted in the reporter (in this second ruling) granting the new planning permission with the condition that there needs to be an agreed Environmental Management Plan (EMP) in place prior to any commencement under this new (S42) planning consent. Despite WRASFB making the Highland Council Planning Department (HCPD) aware of the legal requirement of the board's involvement in the agreeing of an EMP, to date the Board has not been involved in any discussion on this subject. To our knowledge nor has there been any engagement between the HCPD and SSC on this subject. Apart from this on-going aquaculture planning application at Sgeir Dughall, the Board has also been pursuing another on-going planning issue at Ardessie. To date there is no outcome to report on this particular issue but the Board will continue to press the HCPD for a final decision that, hopefully, favours the responses/arguments presented by the Board.

Alongside these two on-going planning applications, WRASFB has responded, with the help of data/information from the SWRFT, to a number of aquaculture planning application that are outwith the Board area but of a close enough proximity to impact upon the rivers within the Board's area either directly or to the fish migrating from the Board's rivers. These applications include Marine Harvest's Loch Duich (in the south of the Trust's area) and Sconser Quarry (Isle of Skye), Organic Sea Harvest's Invertote (Isle of Skye) and Kames Fish Farming's Loch Poolteil (Isle of Skye).



*Aird Salmon farm in Loch Torridon, October 2016. Earlier in the year, an application by the Scottish Salmon Company to increase biomass consent at this site to 1750 tonnes was approved by SEPA. High levels of sea lice on sea trout were recorded nearby in June 2017.*

There are also two imminent applications within the Board's area from Marine Harvest for Bottle Island and from Scottish Sea Farms for Horse Island. Preliminary screening and scoping applications have been made for these two new sites by both applicants. The WRASFB aided by data from SWRFT is closely monitoring both of these applications in anticipation of the planning applications being submitted to HCDP in the near future.

On less political issues, WRASFB has helped to support the educational projects run by the SWRFT as part of the Board's public awareness remit. Both WRASFB and SWRFT supported the start of 2017 fishing season with the first cast being performed by a Gairloch High School student (Alexander MacLean) on the River Ewe (*see page 7*).

Further information about WRASFB, including copies of responses to planning applications, can be found on the Board's website at http://wrasfb.dsfb.org.uk/ .

### *Conservation Measures to Protect Wild Salmon in and around Skye & Wester Ross in 2018*

The Scottish Government published 'proposed conservation gradings' for rivers and assessment groups for the 2018 fishing season in September 2017, following another assessment. At writing, **all the rivers within the Skye and Wester Ross Fisheries Trust area were to be category 3 for the 2018 season**. This means that all wild salmon should be carefully released following catch and release guidelines[13] wherever they are caught within the Skye and Wester Ross Fisheries Trust area in 2018.

*Frank Buckley carefully returning a rod caught salmon to Loch Maree, August 2017.*

[13] Catch and Release Guidelines http://ness.dsfb.org.uk/files/2017/06/170601-Catch-and-Release-leaflet-2017.pdf

# Part 5 **Fisheries management activities on Skye**

***Isabel Moore***

*This brief review contains information regarding the fisheries management activities carried out on the Isle of Skye over the 2017 calendar year with the help of numerous volunteers and the financial assistance of the University of Glasgow, the Scottish Government, Grieg Seafood, Marine Harvest Scotland, and Kames Fish Farming. The majority of the work reported here forms part of a 3 year PhD programme with the University of Glasgow.*

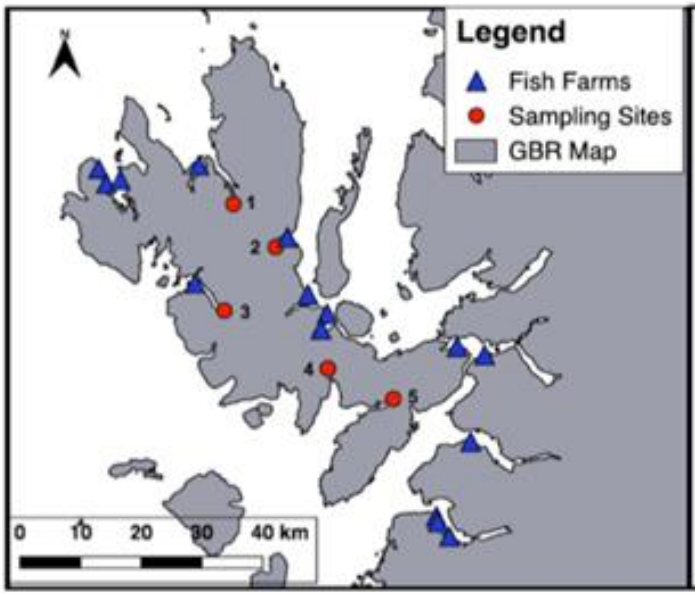
*Please note that the following data cannot be used or replicated without the consent and approval of Isabel Moore (isabelmoore89@gmail.com).*

## 5.1 Salmon lice (*Lepeophtheirus salmonis*) monitoring

*Sea trout sampling in 2016*

Data collected between April and September 2016, on salmon lice abundance in wild sea trout populations from five different sites around Skye have been analysed and the resulting paper has been submitted to a journal for peer review.

Sampling sites were chosen based on their accessibility and proximity to active salmon farms, and included Lochs Snizort, Slapin, Portree, Eishort, and Harport.




*(left) Sampling sites in 2016: 1, Snizort; 2, Portree; 3, Harport; 4, Slapin; and 5, Eishort and the locations of active salmon farms.*

A total of 230 sea trout were captured using a combination of seine and fyke netting techniques in the tidal zones of each sea loch. Visual salmon lice counts were carried out on each fish and the number of lice at each life stage (i.e. Juvenile, Adult, and Ovigerous Female) were recorded.

A summary of data can be found in the table below, as well as a map of the sampled sites and nearby active fish farms. As soon as the paper has been published, copies will be circulated around to Trust members and any other interested parties.

*Summary of salmon lice (Lepeophtheirus salmonis) data for sea trout sampled around the Isle of Skye in 2016.*

| Sea Loch | Corresponding River | Netting Method | Fish Farm Proximity (km) | Total No. of Fish Caught | Avg. Fork Length (mm) | Avg. Total Lice/fish |
|---|---|---|---|---|---|---|
| Harport | Drynoch | Fyke | 8 | 36 | 217.7 | 2.4 |
| Eishort | Eishort | Fkye | 48 | 27 | 236.3 | 7 |
| Slapin | Strathmor | Seine | 46 | 88 | 227.8 | 3.7 |
| Snizort | Snizort | Seine | 13 | 31 | 165.7 | 20.5 |
| Portree | Varagill | Fyke | 3 | 44 | 216.1 | 0.3 |
| **All Sites** | - | - | - | **230** | **216.4** | **5.6** |

*Setting a seine net in Loch Snizort.*

*Sea trout sampling in 2017*

Monitoring of salmon lice numbers continued in 2017 and was carried out at the previously sampled Lochs Slapin and Snizort to maintain long term datasets, while two new sites, Lochs Pooltiel and Greshornish, were added onto the monitoring programme. Unfortunately, Loch Snizort was only sampled twice in 2017 and no fish were caught during the first netting session. The second session yielded only 2 fish. However, it is thought that tides and weather conditions might have had an adverse impact on the netting efforts and therefore this year's results shouldn't be considered a true representation of the fish in the area, especially when considering the numbers of sea trout captured in neighbouring lochs (i.e. Lochs Greshornish and Pooltiel). The raw data from this year's sampling efforts can be found in the table below.

*Summary of salmon lice (Lepeophtheirus salmonis) data for sea trout sampled around the Isle of Skye in 2017.*

| Sea loch | Corresponding River | Netting Method | Total No. of Fish Caught | Avg. Fork Length (mm) | Avg. Weight (g) | Avg. Total Lice/fish |
|---|---|---|---|---|---|---|
| Greshornish | Edinbane | Fyke | 55 | 216 | 117.6 | 30.5 |
| Pooltiel | Hamera | Sweep | 29 | 164.2 | 48.3 | 5.9 |
| Snizort | Haultin | Fyke | 25 | 178.4 | 73 | 4.5 |
| Slapin | Strathmor | Sweep | 20 | 287.5 | 272.2 | 6.3 |
| Snizort | Snizort | Sweep | 2 | 176 | 61 | 1.5 |

*(left) Dorsal damage seen on a sea trout with high numbers of juvenile salmon lice attached to the dorsal fin. (right) Predator damage on a large sea trout captured in Loch Greshornish (photos by Isabel Moore).*

## 5.2 Acoustic telemetry study in the north of Skye

A large portion of work this year was focused on a sea trout smolt tracking project carried out in Lochs Snizort and Greshornish. It is thought that sea trout smolts undergo high levels of mortality during their initial entry into marine environments, however, there is still relatively little information available regarding the causes of this low survivorship. Some acoustic tracking studies have been carried out in Scandinavian waters to examine the movements and behavioural patterns of young sea trout, but no similar study has been carried out in Scotland.

In April 2017, in time with the natural smolt run, 30 sea trout smolts were captured from rivers in both sea loch systems using a combination of fyke netting and electrofishing. All 60 smolts were anesthetised then tagged with a small acoustic tag that was surgically implanted, before being released back into the site they were captured from.

*(left) Isabel setting fyke nets in the River Snizort to catch sea trout smolts for tagging. (right) An anesthetised sea trout smolt with an acoustic tag held above its abdomen for scale.*

Each tag emits a unique acoustic "ping" that can be "heard" by an acoustic receiver up to approximately 200m away. This data can then be used to identify when and where a specific smolt was located during the course of the study. The information is then stored in the receiver until it is downloaded onto a computer.

A total of 40 acoustic telemetry receivers were split between the two sea lochs and placed in strategic lines across the lochs. Several "double curtain" receiver arrays were also used to gather information about swimming speed and directionality. The limiting factor to this study was the battery life of the tags put into the smolts. Unfortunately they only last for an estimated 80 days, so the length of the study was constrained to the period from the end of April until the end of July. Although the data have not yet been fully analysed, an estimated 250,000 detections were recorded between all 40 receivers, and a total of 41 fish of the original 60 were recorded in the marine environment. An initial glimpse has identified several fish that were successfully recorded moving between the two monitored sea lochs, however, the majority of the fish remained in their "natal" sea loch. Once the data analysis has been completed, a paper will be published with the results.

Many thanks to our volunteers who have spent many hours in freezing water, rain, and midge infested environments. We appreciate your help so much! Particular thanks to Ally Mackasill, Sarah Lewis, and the John Muir Trust for their unwavering support during sweep netting season. The sea trout tracking project would not have been successful without the help of Professor Colin Adams, Dr Matt Newton and Dr Han Hokanen from the University of Glasgow, and the staff at Marine Harvest-Greshornish, and Grieg-Dunvegan and Uig.

If you have any questions about our work on the Isle of Skye or would like to get involved with our projects as a volunteer, please contact Isabel Moore by email (isabelmoore89@gmail.com ) or by phone (07825 567765).

# Part 6 **Contracts**

## 6.1 Monitoring fish populations around new hydropower schemes

Many new, mostly run-of-the-river, hydro-electricity schemes were developed within the Trust's area during the period 2015 – 2017 (e.g. headwaters of the rivers Kanaird, Ewe, Carron, and Ling). For most schemes, the then WRFT biologist was able to provide informal advice at different stages of development, thereby helping to minimize possible adverse impacts to wild fish populations, as part of our routine work. Follow-up juvenile fish surveys downstream of some of the new 'run of the river' schemes subsequently indicated that populations of salmon fry were much the same as recorded prior to development.

As a condition of the Controlled Activities Regulations [CAR] operating license, juvenile fish surveys were requested by SEPA to be carried out around HP schemes on the River Lael and the upper River Canaird (Kanaird) to gain a clearer understanding of how the new HP schemes would affect wild fish populations. Some of this work was subcontracted to the SWRFT; these monitoring surveys are on-going (see also Part 2.2).

## 6.2 Survey of glochidia on juvenile salmon and trout

*(left) Parasitic glochidia attached to the gills of an aneasthetised juvenile salmon.*

The freshwater pearl mussel [FWPM], *Margaritifera margaritifera*, is globally endangered. Numbers have declined dramatically in Britain and throughout its range[14]. Only in Scotland is it still widespread; however in many rivers, including some of those in Wester Ross, there is little or no evidence of recent recruitment of juvenile mussels into the population.

The life-cycle of the mussel includes a parasitic stage, where the glochidia are shed from the female mussel and become attached to the gills of juvenile salmonid fish. In some streams trout are the main host for the glochidia, in other rivers juvenile salmon are the main host. To sustain populations of freshwater pearl mussels, healthy populations of host fish may therefore be critical. If populations of host fish (e.g. trout or salmon) are themselves depleted, then there will be even less chance of glochidia finding a suitable host, so the prospects of FWPM population recovery will be even less likely.

In 2016, WRFT participated in a collaborative study to learn more about the occurrence of glochidia on the gills of salmon and trout, as part of a contract funded by Scottish Natural Heritage.

Sampling sites were selected in rivers in the west of Scotland which are designated for the conservation of FWPM. Samples of juvenile fish were caught using electro-fishing equipment, and gills were examined in the field for the presence of glochidia (see picture). Further details will follow publication of the project report.

Thank you to Mary Gibson and SNH Beinn Eighe NNR volunteers for help with field work.

[14] Genetic diversity of freshwater mussel populations in Great Britain http://www.gov.scot/resource/doc/295194/0112370.pdf

## 6.3 A survey of migratory fish on the Isle of Rum

In July 2017, a fish survey was carried out on the Isle of Rum to provide information for an Environment Impact Assessment [EIA] ahead of a planning application by Marine Harvest for a new 2000+ tonne marine salmon farm nearby. The investigation focussed on two rivers, the Kinloch River and the Kilmory River. Electro-fishing sites were surveyed on both rivers on 5th & 6th July with the primary aim of finding out if juvenile salmon were present. On the 7th July, a sweep net was used to sample sea trout in the sea at the head of Loch Scresort.

The two rivers surveyed have been modified historically. Water from the upper catchment of the Kilmory River and a third river, Abhainn Rangaill (Harris), is diverted into an artificial loch, the Long Loch, from where a fish pass directs part of the flow into the Kinloch River (*left*). The modifications date from attempts to improve the Kinloch River as a fishery for salmon and sea trout in the 19th and early 20th Century.

Because of high water flows on 6th of July, only three electro-fishing sites were surveyed, two in the Kinloch River and one in the Kilmory River, rather than the eight sites that had been planned. Many juvenile trout and eels were found in both rivers; no juvenile salmon were found.

Four sea trout were sampled from close to the mouth of the Kinloch River. The two larger fish taken in the sweep net sample were 325mm and 335mm in length; one had a condition factor of 1.49 and is therefore the fattest sea trout seen to date by the SWRFT Biologist (*see cover photo*)! Both fish carried high numbers of parasitic sea lice, *Lepeophtheirus salmonis*, and had dorsal fin damage associated with sea lice infestation.

The fish catch record book in Kinloch Castle was investigated to learn more about the occurrence of salmon on the island. During the period 1894 – 1974, records of only 4 rod caught salmon were found. In contrast there are records of over 2,500 rod caught sea trout during this period, including fish taken from both the Kinloch River, Kilmory River and a few larger sea trout from the Long Loch above the fish pass. Other sea trout, reported elsewhere, were caught around the island during and following this period; SNH catch records were unavailable.

Local anglers reported that sea trout of up to 3.5lb had been caught within the past year in the Kilmory River and Loch Scresort; and that sea lice numbers on sea trout were higher in 2017 than in previous recent years. Marine Harvest reported an average of 0.96 gravid female lice in June 2017 on new Isle of Muck salmon farm nearby.

In conclusion, the two rivers (Kinloch and Kilmory rivers) support populations of trout, sustained by migratory sea trout which live within nearby coastal waters where there is good feeding for them.

Thank you to SNH and to many people on the Isle of Rum for information and for help with the survey, especially the enthusiastic sweep netting team (*right*).

## 6.4 A baseline fish survey of the Hamara River, Isle of Skye

In June and August 2017, surveys were carried out in and around the Hamara River to gather information describing migratory fish populations ahead of the development of a new 2500 tonne salmon farm in Loch Pooltiel nearby.

On 9th June 2017, an estimated total of 40 sea trout were sampled around the mouth of the river using a sweep net with the help of local volunteers and employees of Kames Fish Farm and Grieg Seafood. Bright sunshine and warm water made it unsafe to keep all of the fish until they could be processed, so some were released back into the water, once a subsample of 29 fish had been isolated. Additionally, four grey mullet and seven flounder were captured during the netting session and measured before being released.

Lice levels were generally low. Of the sampled sea trout, the mean length, weight, and total number of lice on an individual fish were 164.2mm, 48.3g, and 5.9 lice per fish. Most fish carried less than 5 sea lice (range 0 to 33 lice per fish). Of the 29 sea trout examined, 22 fish had a total lice count of between 0 and 5 salmon lice; another 3 fish had lice counts of between 6 and 10, and four fish had total lice counts of between 11-15, 16-20, 26-30, and 30-35 respectively.

*(left) Isabel Moore examining one of the sea trout, 9th June 2017.*

A second sweep netting session took place at the same site on the 22nd of August 2017. Twelve sea trout were caught ranging in length from 180mm to 273mm, with condition factors ranging from less than 0.86 (thin) up to 1.29 (quite plump!). Three fish carried 5 lice each; all the other fish carried only one louse or were lice free.

*(right) The sweep netting team on 22nd August 2017.*

On the 23rd of August, an electro-fishing survey of the nearby Hamara River was carried out. Juvenile salmon were found up to a small waterfall approximately 4 km upstream from the sea. At some sites, salmon fry were abundant (up to 8 fish per minute; ≥64 fry per 100m$^2$) and were large for their age (56mm to 88mm) compared to those found in river systems in Wester Ross. The rapid growth of salmon fry in the Hamara River relates to the high conductivity (measured at between 125µS to 155µS) and good feeding. Some of the juvenile salmon may spend only one winter in freshwater before migrating to sea. A further sampling session is proposed for early April 2018 in search of larger sea trout and salmon smolts just before they go to sea.

Thank you very much to Norman MacPherson and family and Lynn Schweisfurth and friends for helping with this survey.

*(left) Anaesthetised large salmon fry from the Hamara River, 23rd August 2017 (photo by Lynn Schweisfurth).*

# Part 7 **Some other marine issues**

## 7.1 An unsustainable wrasse fishery?

In the WRFT Review May 2016[15] we reported how wild caught wrasse had been used successfully to greatly reduce sea lice abundance on salmon farms operated by Wester Ross Fisheries. Subsequently we received anecdotal reports from various sources around and beyond the Wester Ross MPA that wild wrasse populations were being over-fished, indicating that fisheries management regulations were possibly inadequate to protect stocks.

*(right) The wrasse fishery provides jobs.*

As a consequence, in May 2017, a meeting was organized to review the need for improved management and monitoring of catches of the five different wild wrasse species targeted by salmon farming companies. The meeting, which took place in the fisheries office in Ullapool, considered a proposed network of 'voluntary wrasse protection areas' around the coastlines of properties belonging to the conservation NGOs (NTS, RSPB, SWT, Isle Martin Trust) within the Wester Ross MPA, as a precautionary measure to safeguard wrasse populations within the Wester Ross MPA, and thereby help to sustain a wrasse fishery within the area. The meeting was attended by representatives of the Scottish Government, Marine Scotland Science, salmon farming companies, Scottish Salmon Producers Organisation [SSPO], the Isle Martin Trust, NTS and the RSPB.

Despite support from several NGOs with a remit for marine wildlife conservation, neither the Scottish Government nor salmon farming representatives were able to agree to the proposed network of voluntary protection areas for wrasse. Instead, there was some discussion as to whether a series of un-fished 'study areas' located in 'suitable places' might help to inform future management needs. Marine Scotland Science and industry reps argued that any study areas required would need to be 'situated appropriately' and developed in collaboration with the salmon farming industry, and monitored to determine any effects.

MSS agreed to consider how best to progress any future sustainability project and to report back on outline, timing, and likely costs. It was also agreed that given the activity in the wrasse fishing sector and the potential for this escalating, it was important that data gathering and the studies required to improve knowledge and understanding of wrasse distribution, biology and fishing impacts should be implemented and underway with some urgency to provide a baseline. The SSPO and the Scottish Government agreed to look in more detail at industry-wide catches of wrasse with Marine Scotland scientists, and Marine Scotland compliance. Further discussions between SG, Marine Scotland and the SSPO would take place regarding other measures needed to improve knowledge of wrasse fisheries and management requirements.

By the autumn of 2017, virtually no progress had been reported on any of the agreed action points. Increasing wrasse fishing effort was reported from several areas during the summer of 2017 and further reports were received of declining catches of wrasse from some sea lochs.

In November 2017, the matter was raised via a series of questions in the Scottish Parliament. Following discussions with stakeholders, new measures for managing the wrasse fishery are to be developed by the Scottish Government ahead of the 2018 wrasse fishing season[16] . . . .

[15] WRFT Review May 2016 http://www.wrft.org.uk/files/WRFT%20Review%20May%202016%20Final.pdf
[16] Question S5W-12465: Andy Wightman, Lothian, Scottish Green Party, Date Lodged: 06/11/2017

## 7.2 Spring-spawning herring and herring fry

Herring are food for wildlife including sea trout. When interviewed by Sue Pomeroy for WRFT and Two Lochs Radio in previous years, many of the retired fishermen who fished for herring around Wester Ross up until the 1970s said that the seabed to the west of Melvaig was an important spawning ground for herring in March[17].

On 26th March 2017, with bright sunshine and the tide already far out, the then WRFT Biologist set off in his kayak to explore the seabed to the west of Melvaig using an improvised drop-down camera to record the seabed habitat (in his own time!). What was happening closer to the surface was particularly interesting. There was an oily scum with many bubbles on the surface of the water, and millions of tiny fish fry, mostly of around ~8mm in length could be seen sparkling in the sunshine just below the surface. There were also several seals nearby (both common and grey). From time to time thousands of small bubbles came up to the surface all around, as if the kayak was floating on a very large fizzy drink.

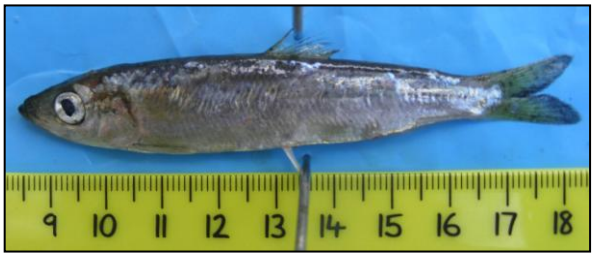
About 1 km away, gannets could be seen diving in. Subsequently, a mackerel was caught using a fishing line (small feather-like lure). Shortly afterwards, a shoal of fish surfaced just behind the kayak; these fish had their mouths open as if filtering-feeding on surface plankton as mackerel often do in the summer time. One of these fish took a lure just beneath the kayak; a mature male herring was landed[18].

*(right) The mackerel and the herring, caught to the west of Melvaig, Wester Ross, on 26th March 2017.*

Requests were made to Marine Scotland to investigate the need for precautionary action to protect a probable spawning ground for Spring spawning herring. However, no action was taken. During the summer of 2017, scallop dredgers from as far away as Kircudbright were seen working the area on several occasions, sometimes with AIS turned-off. The Scottish Government, contrary to ICES advice, were apparently unconcerned.

On 8th September 2017, many 'whitebait' were caught in a sweep net sample at Flowerdale, Loch Gairloch, one of which was regurgitated by one of the 18 small sea trout taken in the sample (see Part 3). Examination of fin positions indicates that a majority of the 'whitebait' were herring fry. Will we see as many herring fry in 2018?

*Herring fry taken in the SWRFT sweep net in the Flowerdale burn estuary, Loch Gairloch on 8th September 2017.*




[17] See WRFT Review 2012: http://www.wrft.org.uk/files/WRFT%20Review%202012.pdf
[18] A more detailed account can be found on the WRFT website http://www.wrft.org.uk/news/newsitem.cfm?id=205

# Part 8 **Invasive species control**

## 8.1 Invasive plant control

### River Broom Japanese Knotweed [JK] control

The WRFT Review May 2016 describes progress following the first year of treatment in 2015. A site assessment in summer 2016 confirmed the exceptional effectiveness of stem injection, especially in healthy, vigorous stands of JK along the riverbank. For most stands, the living above-ground biomass had been reduced to less than 1% from the previous season.

*(left) Rob Dewar (NTS) and John Parrott (Coille Alba) by a stand of knotweed treated in 2015 near the River Broom.*

All knotweed stands were treated again in September 2016 by Wilbur Rundle and Louis Neate of Coille Alba; Chester Hodgekinson of Braemore Square also received specialist training. Operations included repeat visits, and a handful of 'new' stands which had previously been overlooked in gorge sections were also tackled. All plants located were treated by stem injection or spraying, regardless of access difficulties, with only a few exceptions. As in 2015, there were several challenges, especially on sections of the river upstream from Braemore Square, including Corrieshalloch Gorge rock-face, and the upper tributaries where *R. ponticum* is also a major problem. A further round of JK treatment took place in 2017. It is intended that work is carried out each year, supported by trained local volunteers, until JK has been eradicated from the River Broom catchment by around 2020.

### Loch Maree *Rhododendron ponticum* control

In 2017, funding was also secured from ENTRUST for the control of *Rhododendron ponticum* by Loch Maree. *R. ponticum* is the most widespread and troublesome invasive plant species in the Wester Ross area, and this project is designed to complement several larger scale initiatives nearby, to secure a sustainable outcome. This *ponticum* control programme is being carried out by Eamonn Flood and Chantal Awbi of Manta Ecology, both fully qualified and experienced local contractors.

## 8.2 Scottish Invasive Species Initiative [SISI]

This new partnership project led by SNH aims to encourage communities to tackle invasive non-native species in their local area. The four year project, which will start in 2018, received a major financial boost with the award of a grant of £1.59 million from the Heritage Lottery Fund. Thanks to money raised by National Lottery players, the partnership project aims to establish community-based approaches to deal with non-native species within northern Scotland, working with 10 Fisheries Trusts/District Salmon Fisheries Boards and Aberdeen University.

As one of the partners, SWRFT will focus efforts on the control of invasive plants and North American mink on the mainland, as well as organising a series of awareness raising and training events. Please contact the Trust if you have an invasive species problem and / or can help with this big new opportunity!

# Part 9 **Some other research and education**

## 9.1 Wild trout loch studies

*The Brown Trout (Salmo trutta) occurs in a wonderful diversity of forms within the rivers and lochs of the SWRFT area. In some populations, particularly those of certain hill lochs and streams, mature adult trout may grow no bigger than 15cm long. In contrast, sea trout and 'ferox' [large piscivorous trout] may grow to lengths of 70cm or more, and reach weights in excess of 5kg. This variation in the growth and life-history of wild trout populations is determined by both environmental and genetic factors; however there is much still to learn. The following section summarises some recent and on-going research.*

### A study of brown trout and *ferox* from the Loch Maree catchment

Congratulations to Dr Martin Hughes for successfully completing his PhD studentship. The main focus of Martin's research was upon the underlying biological differences between 'ferox' trout and brown trout[19]. One of the most interesting experiments conducted was to investigate the dominance behaviour between juvenile brown trout and ferox trout, progeny of trout caught within the Loch Maree catchment. As juvenile trout form dominance hierarchies in natal streams, with the most dominant individuals enjoying better feeding opportunities, it was postulated that 'ferox' trout would be more dominant than brown trout. The reasoning behind this hypothesis was that in order to feed on other fish, ferox trout must reach a large size quickly. It would therefore be more important for a juvenile ferox trout to reach a large size by acquiring more food than for a juvenile brown trout. Martin's results were 'staggering'; ferox trout were more dominant than brown trout in 90% of the trials (find out more via links below)[20].

### Genetic studies of wild trout diversity in Wester Ross

Dr Steve Kett (Middlesex University) has visited Wester Ross every summer since 2007 in search of wild trout. Currently two of Steve's students are busy writing up their research. Vu Dang, whose undergraduate thesis on the biodiversity of hill lochs and lochans in the Gairloch hills can be found on the WRFT website[21], has been busy in the genetics lab gaining new insights into the genetic diversity of wild trout within the Wester Ross area. Toby Landeryou has been focussing on the genetics of parasite resistance in our wild trout populations. Thanks to everyone from his team!

At the time of writing (January 2018) plans are afoot for a Wester Ross wild trout biodiversity workshop at the end of October 2018. If interested in helping with this or with expeditions into the hills in search of wild trout before then, please get in touch.

*Anaesthetised rod-caught brown trout from the Fionn Loch, September 2017. From one trout population or two?*

[19] Article about 'ferox' by Martin Hughes http://www.wildtrout.org/wttblog/what-makes-apex-predator-ferox-trout

[20] Hughes, M.R., Van Leeuwen, T.E., Cunningham, P.D. and Adams, C.E., 2016. Parentally acquired differences in resource acquisition ability between brown trout from alternative life history parentage. Ecology of Freshwater Fish. https://www.researchgate.net/publication/311087914_Parentally_acquired_differences_in_resource_acquisition_ability_between_brown_trout_from_alternative_life_history_parentage

[21] WRFT Student projects http://www.wrft.org.uk/downloads/files.cfm?id=33

***Box 9.1 A stickleback-eating trout x salmon hybrid from Loch Maree?***

In July 2017, an angler fishing Loch Maree hooked and landed a fish of over 5lb. At the time, the fish was thought to be a grilse and was retained as it failed to recover. However, on subsequent inspection, the angler became concerned that he had inadvertently killed the largest sea trout hooked in Loch Maree for several years, because the fish was spottier than a typical grilse and didn't look quite right. So he contacted the WRFT Biologist for advice.

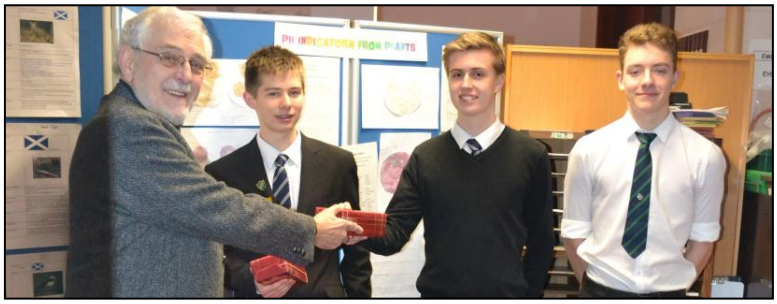

The fish's head, tail and innards were carefully examined. The fish was a maturing female, with developing ovaries. Scale growth *(left)* was typical of a fast-growing grilse. However, the maxillary bone was too long for the fish to be a salmon (it was more like that of a trout). Perhaps most interestingly, 8 freshly eaten three-spine sticklebacks (30mm – 62mm) were retrieved from the fish's stomach by Dr Steve Kett *(right)*.

Steve also obtained the gut contents from 7 of the sticklebacks. These included freshwater cladocerans; one also contained an insect fragment and two others contained a beetle larva and another insect larva respectively. These findings provide reasonable evidence that the salmonid had been feeding in freshwater. Adult Atlantic salmon are not known to normally feed in freshwater.

We think this fish was a trout x salmon hybrid; subsequent analyses of a DNA sample from the fish may clarify this and will be reported in our next review.

## 9.2 Anglers Information Project

In December 2017, Peter Jarosz (SWRFT Administrator) visited Gairloch High School to present three S6 pupils, Roddy Macrae, Jack Wright and Sean Quinn, with OnePlus5 Smartphones (worth approximately £500 each) as a reward for working in their own time to develop an App for the Skye and Wester Ross Fisheries Trust *(right).*



The app is designed to collect data about fish catches and invasive species as well as give the user up to date information about where to go fishing in Wester Ross. The pupils put a lot of time and effort into the project, and have forged links with SWRFT and UHI as a result of their efforts. This has given them an insight into the world of work and app development. The programme is ongoing and may be an opportunity to work with other GHS pupils in the future. Thank you to Dr James Close and Kevin Ginty for providing much help for this project.

## 9.3 Living Lochs Project

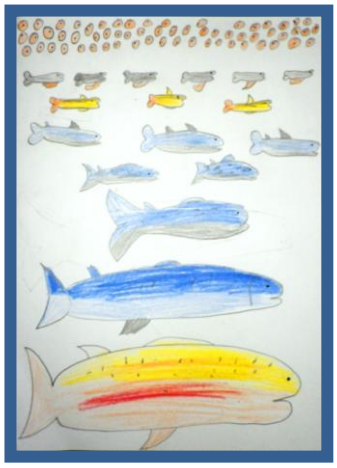
*Dr Lorna Brown & Isabel Moore*

This project took a new direction in 2017 in Wester Ross following discussions with teachers, with the salmon lifecycle becoming more of a focal point than in previous years. As in the past, the project was led by **Dr Lorna Brown**, and started with an afternoon of classroom activities linked to the local ecosystems. Pupils were then responsible for rearing native salmon from eggs within a classroom hatchery.

In November 2016, pupils from Gairloch High school visited Coulin Estate to observe spawning salmon (*right*), and also help strip the salmon eggs that they later raised in their school lab during the winter of 2017. In March 2017, the young salmon were released back at their river of origin, when pupils were also able to compare differences between the estate hatchery and their classroom hatchery.

In late May 2017, two field trips took place to Loch Achall for pupils from Ullapool High school. The morning was spent surveying for fish, otter, water voles, amphibians and birds at the loch and its tributaries. Macroinvertebrates from different habitats were collected and taken back to the school lab for identification during the afternoon. A final team quiz at the end of the project induced a little competition between pupils, and also showed just how much the pupils had taken in over such a short period of time.

Having access to salmon eggs from Dundonnell Estate gave us the opportunity to run the Salmon in the Classroom Project concurrently in Ullapool Primary School. The young salmon were again released back into their river of origin after many weeks of being carefully nurtured by the children; and subsequently an electro-fishing trip allowed the pupils to find out what lived in the local river near the school.



*(left) the different stages of the Atlantic salmon life-cycle from lots of eggs to just two adults, by Caillin (Ullapool Primary School).*

On the Isle of Skye, the SWRFT Living Lochs programme was delivered by **Isabel Moore** at Portree High School for an estimated 60 students in November 2017. The programme focused on raising awareness about the importance of freshwater resources and ecosystems, including the value of indigenous Scottish wildlife, such as brown trout. Students learned about concepts such as biodiversity, food webs and resource management through a series of games and arts and crafts. Additionally, live macroinvertebrate samples were brought into the classroom so that the students could see the wide variety of insects that are found in their local Skye burns.

Thank you to all the teachers who helped in the Living Lochs and Salmon in the Classroom project. The Living Lochs project would not have been possible without the support of the Nineveh Trust and the MacRobert Trust. Many thanks to Neil Morrison of Coulin Estate and Alasdair MacDonald of Dundonnell Estate for allowing the pupils to be so involved in their restocking programmes. Many thanks also to Jenny Scobie of Rhiddoroch Estate for allowing us to base the Ullapool Project at Loch Achall.

## 9.4 Grazing, Trees and Trout workshop

**Aultbea & Mellon Charles, Wester Ross, 24th June 2017**

This workshop considered ways of integrating woodlands with other enterprises to improve the productive value of croftland including land surrounding hill lochs, and to improve the amenity value of townships.

The morning session in the Aultbea village hall included presentations by Peter Cunningham ('Feed the Land'), Donnie Chisholm ('Growing Trees in Wester Ross'), and Iris Glimmerveen ('Woodland Inspirations'). The presentations can all be found via links on the WRFT website[22].

*(right) Iris Glimmerveen describing many ways that woodlands can be of benefit to crofting areas.*

Subsequent discussions focused on some of the grants available to crofters and the need for greater recognition by the Government agencies of the advantages of integrating woodlands with grazing.

Following the indoor session we explored a woodland croft by Mellon Charles. Despite the wild weather outside, the croft woodland was full of life and of bird song. Topics considered were wide ranging and included hazel coppicing, growing apple trees, and how fire can be discouraged from spreading onto woodland by removing heather around the trees.

*(right) Sheltering beneath the trees, with Bernard Planterose, who planted many of the trees 30 years earlier, and woodland crofter, Alastair Mackenzie.*

From the wooded croft we headed up onto the higher ground above Mellon Charles. Where grazing pressure around the hill lochs had been lighter, various plants were found that are more typically associated with scrub-woodland habitats than with open moorland, including honeysuckle, brambles and willows.

Donnie Chisholm (Woodland Trust Croft woodland project officer) outlined plans to develop two areas of woodland within the hill area above Mellon Charles. There was much discussion about how the woodlands will be designed in ways to support livestock management, and how, in future years, they will provide additional shelter and sources of nutrition (e.g. leaf litter and insects) for livestock, trout and other wildlife within the area.

Thank you to the Chisholm family and friends for producing a wonderful lunch, to Alastair Mackenzie and Bernard Planterose for much information about woodland crofts, and to everyone else from near and far for making the event so informative and enjoyable[23].

[22] Links to Grazing, Trees and Trout presentations http://www.wrft.org.uk/downloads/files.cfm?id=42

[23] For further information about croft woodlands, please visit The Woodland Trust Croft Woodland project: http://www.wrft.org.uk/files/Croft%20Woodlands%20leaflet%20May17.pdf and 'Woodland Inspirations' website: http://www.woodlandinspirations.eu/

# Part 10 **Summary -**

This report describes some of the work carried out by the Wester Ross Fisheries Trust [WRFT], the Skye Fisheries Trust [SFT], and following merger of the two trusts in 2017, by the Skye and Wester Ross Fisheries Trust [SWRFT] during the period June 2016 to December 2017.

- Published figures for reported rod catches of salmon and grilse and sea trout were examined. For the Carron fishery district and the Loch Long fishery district, catches of grilse and finnock alternated between even and odd years during the period 2009 to 2016, in contrast to those for the Gruinard, Ewe and Snizort fishery districts.
- The results of juvenile fish surveys were also mixed. CPUE and fish size / frequency data for most core survey sites in the main salmon rivers (e.g. Kanaird, Broom, Gruinard, Little Gruinard, Ewe, Kerry, Balgy, Torridon, Ling, Elchaig) indicated that juvenile salmon populations were reasonably healthy in these rivers. The CPUE numbers of juvenile salmon recorded at sites in the Rhidorroch River (Ullapool River headwaters) were higher than in previous surveys in recent years. In contrast, the densities of juvenile salmon recorded by the SEPA electro-fishing team in the River Balgy were lower than anticipated and cause for concern. Further river-specific details of results and comments are provided.
- The Tournaig trap, operated by Ben Rushbrooke, recorded a record high one-day catch of grilse in August 2016, followed by a record high average CPUE for salmon fry in the principle spawning stream above the fish traps in August 2017. In contrast, only one adult salmon and one sea trout were recorded in the upstream trap during the whole of the 2017 season. Life's ups and downs . . .
- Sea trout were monitored using a sweep net (beach seine net) at sites on both the Isle of Skye and on the mainland. At sites around the Loch Broom area, observed parasitic sea lice levels on sea trout were lower in both 2016 and 2017 than in many previous years up to 2013. In contrast, some of the sea trout sampled in Loch Ewe and many of those sampled at sites further south to Loch Alsh carried in excess of 100 lice per fish. The most heavily sea lice infested fish seen was a sea trout of 395mm taken in the Flowerdale estuary, Loch Gairloch in June 2017, over 25km from the nearest active salmon farm.
- These and other observations are discussed together with published data for salmon farm biomass and numbers of adult female sea lice on salmon farms within the area. It is concluded that there was increasing evidence of a cumulative adverse impact to wild salmon and sea trout from infestations of sea lice, and therefore that the standards for control of sea lice on salmon farms enforced by the Scottish Government and its agencies were inadequate to protect not just wild sea trout, but also wild salmon especially around parts of the mainland south of Gairloch during the 8 year period 2009 – 2016.
- The Wester Ross Area Salmon Fishery Board responded robustly to a succession of planning applications for new, larger salmon farms, because of the high risk of increasing cumulative sea lice infestation pressures affecting areas where wild fish populations were already depleted (e.g. Loch Maree sea trout).
- This report also provides a summary of other activities including those on the Isle of Skye including studies led by Isabel Moore; those relating to the management of other wild fisheries in the marine environment; contracts including those associated with new hydropower and salmon farming developments within the area; non-native invasive species control; and some of the other research and education projects.
- Thanks are extended to all collaborators, supporters and helpers.

# Part 11 **Financial Statement**

Because the Trust is a Company Limited by Guarantee as well as a Charity, its accounts are necessarily comprehensive and complex to read without additional explanatory notes. The Trustees have decided therefore in future to provide only a summary statement within the review itself, but to provide a link to the full accounts.

**2018 Financial Statement from the Chair**

**Background**

The financial position of the new SWRFT following the merger of WRFT and SFT is sound, with total reserves similar to previous recent years. This is primarily because the financially much larger of the two Trusts, WRFT, continued to recover and stabilise its income and expenditure over this reporting period. This followed an earlier operating deficit in 2012-13.

However, nationally the present challenging environment for the Charitable Trusts and other grant sources continues; since these sources represent a majority of our income we are conscious of the need to plan carefully and explore new avenues of funding. A number of additional projects have gained funding from aquaculture sources; whilst this is not always welcomed by proprietors the Trust sees no objection, on the principle of 'polluter pays'.

Summary –

The joint Trusts have successfully absorbed the work required of the abortive SNG initiative, and fulfilled several expanded aims and objectives whilst operating on a cost neutral basis throughout the mid 2016 - end 2017 period.

Different end of financial year dates for the two trusts has caused minor difficulties but the accounts of WRFT and SFT will be formally merged in April 2018 from which time there will be one set of accounts for SWRFT.

The full accounts will be available via this link: http://www.wrft.org.uk/downloads/files.cfm?id=38

*Colin Simpson returning a sample of juvenile salmon and trout to the Bruachaig River in the River Ewe headwaters above Loch Maree, August 2017. Further upstream from this location, four new run-of-the-river hydropower schemes became fully operational during 2017.*

# Acknowledgements

Skye & Wester Ross Fisheries Trust has received a great deal of help and advice over the past 18 months. Thank you to:

Alan McGillivray
Alasdair MacDonald (Dundonnell Estate) and family
Alasdair & Smidgie Macphail
Alex and Ann Gray
Alison Rowe (SNH)
Alastair Pearson
Ally MacAskill (JMT)
Andrew Graham-Stewart
Andy Jackson (Subsea TV)
Dr Andy Vicks
Dr Andy Walker
Anne and Alex Gray
Prof Annie O'G Worsley and family
Antony Watkins (SEPA)
Babs McRitchie & NTS Balmacara team
Prof Barry Blake
Ben, Ron and Lesley Rushbrooke
Bill, Irene and Fraser Anderson
Bill Whyte
Bob Kindness
Brian Fraser (Eilean Darach Estate)
Bruce Walker
Cameron Thomas
Carol Mackintosh (NTS)
Charlie Hill
Dr Chris Horrill (RAFTS)
Chris Gudgeon
Colin Blyth
Colin Simpson
Craig Jackson
Prof Andrew (Dave) Barclay
David Holland
David McDonnell (Barrisdale Estate)
David & Veronica Mullaney
Derek Dowsett (River Snizort ghillie)
Derek Roxborough
Dr Diane Baum (Lochaber FT)
Donald Macleod
Donald Rice
Donnie Chisholm and family
Duncan Currie (Sandbank Studio)
Duncan Donald & family
Duncan Gray & family and friends
Duncan MacKenzie (Gairloch Estate)
Duncan MacLeod
Prof Eric Verspoor (UHI R&LI)
Ewen Ballantyne (Arnisdale Estate)
Frank Buckley
Frank Kalinowski
Fred Robertson
Gary Bulmer
Gerry Moore
Hamish Lawrie
Hugh Richards & Colin Milne (WRF)
Hugh Whittle
Iain Muir
Ian Cross
Ian Dorman
Ian Lindsay
Ian McFadyen (Langwell Estate)
Ian & Jess McWhinney and family
Ian White (Laide)
Isabel Moore
Jackie Anderson (MS Science)
Jake Buckthorpe
Dr James Close (Gairloch High School)
Dr James Merryweather
Jane MacLay
Jenny Grant (HLH Countryside Ranger)
Jenny Scobie and family
Jeremy Fenton
Jim Buchanan
Jim Raffell (MS Shieldaig Field Station)
Jim Sinclair
John Ogle & family and friends
John Mackenzie
John Parrott (Coile Alba)
Julia Partridge (SNH)
Katherine Vine
Keith Dunbar (& Achiltibuie A.C. vols)
Kenny John MacKenzie
Kenneth Knott (FCS)
Kerri Whiteside (Flora & Fauna Int.)
Kevin Ginty
Lennie Campbell
Les Bates
Letterewe Estate
Lizzie and Philip Bacon
Dr Lorna Brown
Loius Neate
Lucilla Noble (& Eilean Iarmain team)
Lucy & Steve Robison
Lynn Schweisfurth
Maddie & Iona Scobie and friends
Dr Mark Coulson (UHI)
Mark Lorimer (Inverbroom Estate)
Mark and Kirsty Williams and family
Mark MacKenzie (Kaenchullish Estate)
Martin Hughes (Inspiring Ecology)
Mary Gibson (SNH)
Matthew Zietz (WRF)
Dr Melanie Smith (UHI R&LI)
Mike Stanners
Neil Morrison (Coulin Estate)
Nicholas Holmes (WRF)
Nick & Liz Sanders
Nigel and Meryl Carr
Noel Hawkins (SWT Living Seas)
Norman MacPherson & family (Glendale)
NTS Inverewe Gardens staff
Doug Bartholomew (SNH)
Paul Hopper & Donnie Maciver (OHFT)
Pat Wilson & family (Kinlochewe Estate)
Prof Peter Maguire
Peter Jarosz
Peter, Berni and Iain Kinloch
Philip Smith (Coulin Estate)
Ray Dingwall (River Ewe Ghillie)
Raymond Gault (Loch Maree Hotel)
Richard Greene
Richard Luxmore (NTS)
Richard Wilson
Rob Adams
Rob Dewar (NTS)
Robin Ade & family
Roderick MacIvor
Roddy Legge & the Kernsary team
Ronnie Buchan (Gairloch Estate)
Russell Robertson
Sara Nasan
Seamus and Ruaraidh MacNally (NTS Torridon)
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Sheila & Jim Henderson
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Simon Stewart (Coulin Estate)
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Stuart and Ian Allison (Eilean Darach Estate)
Stuart MacKenzie (Beinn Eighe NNR)
Dr Steve Kett (Middlesex University)
Sue Pomeroy
Terry Jack & his dad George
Tim Fison
Toby Landeryou
Tom and Liz Forrest (WREN)
Tournaig Estate
Vu Dang
Wilbur Rundle
Willem de With
Willie Inglis

…and all the other anglers, keepers and ghillies, school teachers, schoolchildren and parents, and everybody else who has helped us with our work to support wild fisheries on the Isle of Skye and Wester Ross area.

The **work programme for 2018** includes excursions to sample trout lochs and streams, electro-fishing surveys of many of the rivers on the mainland and on the Isle of Skye, sweep netting for sea trout, river surveys, an anglers information project and much else which may be of interest. There are many opportunities for becoming actively involved with the work of the Skye and Wester Ross Fisheries Trust or for simply coming along for a day in the field to find out what we do. Please contact either of the biologists at info@swrft.org.uk for further details.

**Skye & Wester Ross Fisheries Trust**
*Harbour Centre, Gairloch, Ross-shire, IV21 2BQ*

*Tel: 01445 712 899*
*Email: admin@swrft.org.uk*

**WRFT Registered Charity No:** SCO39771

## 1. Member details

Please complete details

Title: Ms Miss Mrs Mr

First name: _____

Surname: _____

Postal address: _____

_____

_____

_____ Post code: _____

Tel:_____

E-mail: _____

## 2. Renew my membership

| | | Please Tick |
|---|---|---|
| **One year** | **£25** | |
| **Single Life** (1 card) | **£150** | |
| **Joint Life** (2 cards) | **£200** | |

Rates are valid until 31/12/2018

## 3. Payment details

| | |
|---|---|
| Membership Fees (from section 2) | **£** |
| Donation | **£** |
| TOTAL DUE | **£** |

## 4. Method of payment

a. ☐ I enclose a cheque payable to Skye & Wester Ross Fisheries Trust **£**

b. ☐ I would like to pay by Standing Order (please fill in the Standing Order form below – UK bank account holders only)

## 5. Gift Aid

***Use gift aid and you can make your donation worth more. For every pound you give to us, we get an extra 28 pence from the Inland Revenue and it costs you nothing.***

I want all donations I've made since 6 April 2010, and all donations I make in the future, to be Gift Aid until I notify you otherwise.

**To qualify for Gift Aid, what you pay in income tax or capital gains tax must equal the amount we will claim in the tax year.**

***Just tick the box and sign below:*** ☐

Signature Date / /

Please return this completed form to**: Skye & Wester Ross Fisheries Trust, Harbour Centre, Gairloch, IV21 2BQ**

**Data Protection:** The information you provide will be held for processing your membership and for mailing with information about Skye & Wester Ross Fisheries Trust. Your details will only be used by Skye & Wester Ross Fisheries Trust and will not be made available to any other organisation.

## Instruction to your Bank or Building Society to pay Standing Order to:

**Bank Name & Address:** Royal Bank of Scotland – Portree Branch

**Account Name: Skye &** Wester Ross Fisheries Trust **Sort Code:** 83-26-19 **Account No:** 00247763

**PLEASE PAY THE FOLLOWING**

Amount £ In Words

Commencing:

Thereafter: Due Date: Annually On / /

**TO BE DEBITED FROM MY ACCOUNT**

Bank Name: _____

Bank Address _____

_____Postcode _____

Name(s) of account holder(s)

Branch sort code ☐☐-☐☐-☐☐ Bank/ Building Society Account Number ☐☐☐☐☐☐☐☐

SWRFT Ref. No: (office use only)

Instruction to your Bank or Building Society: Please pay Skye & Wester Ross Fisheries Trust Standing Order Mandate from the account detailed in this instruction. I understand that this Instruction may remain with the SWRFT and, if so, details will be passed electronically to my Bank/Building Society. A photo copy may also be kept on file with the SGA.

Please cancel all previous standing order and/or direct debit mandates under Skye & Wester Ross Fisheries Trust.

Signature(s) Date / /

Back cover photos, from top left to bottom right (all are ©SWRFT unless otherwise stated):

*1. Local anglers Duncan Currie (Isle of Skye) and Frank Buckley (Wester Ross) enjoying a day's fishing on Loch Maree in September 2017. Several resident brown trout and a finnock were caught that day; no larger sea trout. At the time of writing, the unofficial sea trout catch for the River Ewe – Loch Maree system for 2017 was 63 sea trout (up to just 2.75lb) and 174 finnock.*

*2. & 3. Sampling expedition to some of the lochs in the headwaters of the Badachro River 17th July 2017 with Dr Steve Kett (Middlesex University), Dr James Close (Gairloch High School Biology teacher) and friends Robin Payne and Radenko Velinov, in search of wild trout. Genetic studies are underway to learn more about the diversity of wild trout populations within Wester Ross which remains a stronghold for Salmo trutta within Europe.*

*4. The sweep netting team by the Kanaird River estuary on 26th May 2017, with Nicholas Holmes (Wester Ross Fisheries [WRF]), Mark MacKenzie (Kaenchullish estate), Iain Muir (Achiltibuie AC [AAC]), Alasdair Macphail, (AAC), Sandy Mackenzie [holding the fish] (Gairloch High School [GHS]), Zander Osborne (GHS), Matthew Zietz (WRF), Smidge Macphail (AAC), Alasdair Macdonald (Dundonnell Estate), & Mike Stanners. 40 trout were caught, mostly small post-smolt sea trout; the largest of which was 415mm long.*

*5. Robin Ade (fish artist) and Dr Steve Kett with a sea trout from the Flowerdale Burn, by Loch Gairloch, 20th July 2017. This fish, together with many of those in samples taken using a sweep net from the Flowerdale estuary nearby in April and June 2017, had carried high numbers of parasitic sea lice (Lepeophtheirus salmonis).*

*6. Volunteers from SNH Beinn Eighe National Nature Reserve sampling macroinvertebrates from the Taagan burn (Allt na Doire-daraich), August 2016. Juvenile salmon and trout were also found in this burn, and several of the other burns on Beinn Eighe NNR. There are many upland streams above waterfalls on Beinn Eighe NNR where trout or salmon are not present. In 2018 we plan to learn more about the distribution of trout and of streams without trout on the reserve.*

*7. Lynn Schweisfurth, Ken MacPherson and Isabel Moore, processing the sweep netting catch taken in the sea by the mouth of the Hamara (Glendale) River in June 2017. Over 40 small sea trout were caught that day, only a few of which carried more than 20 sea lice. In addition to sea trout, several larger mullet were also caught. The sampling expedition was organised to gather baseline data ahead of a new salmon farm to be developed in Loch Poolteil nearby.*

*8. Sea trout of 530mm, taken in the Flowerdale sweep net on 7th July 2016. This fish was subsequently illustrated by Dr Paul Vecsei (see Part 3.1) for a forthcoming book on the diversity of the Brown Trout (Salmon trutta). The rivers and lochs of Wester Ross and the Isle of Skye support many forms of wild brown trout, from large piscivorous 'ferox' which may grow to lengths in excess of 70cm, to little hill stream trout which mature at lengths of less than 15cm.*

*9. SNH Beinn Eighe NNR volunteers (Raffell, Marion, Alexandra, Maddy), Colin and Finn Simpson, Tom Appleby, Noel Hawkins (SWT Living Seas Project Officer) and holiday makers on Gairloch Beach on 20th July 2016. Many fish were caught with the sweep net including Lesser weaver fish (careful!), juvenile cod, sandeels, juvenile gurnards, juvenile herring, juvenile plaice. The low tide lagoon at the far end of the beach is one of the best snorkeling sites in the area and features in the SWT Northwest Highlands Snorkel trail. An assortment of crabs, sea hares, and small fish (many juvenile flatfish and gobies) were seen in the lagoon that day.*

*10. Ben Bulmer, Mark MacKenzie and Colin Simpson inspecting the juvenile fish survey catch, by the River Runie, 23rd August 2016. At least 100 midges remain stuck to the data sheet for that sampling site in the file at the back of the office!*



**The Skye and Wester Ross Fisheries Trust was established in 2017 through the merger of the Skye Fisheries Trust and the Wester Ross Fisheries Trust.** The SWRFT objectives are:

(1) to advance, for public benefit, the conservation of all native species of freshwater fish and other aquatic species and associated environments within the inland and coastal waters of the area;

(2) to advance, through education, a greater awareness and understanding of aquatic ecosystems and the knowledge to be able to manage them carefully and effectively.



**This review presents a summary of activities carried out by the Trust from June 2016 - December 2017 including fish surveys in freshwater and around the coast.**

There are many opportunities for Trust members and other volunteers to get involved with surveys and monitoring work, mostly during the summer and autumn.

For more information, please contact the Trust at info@swrft.org.uk.