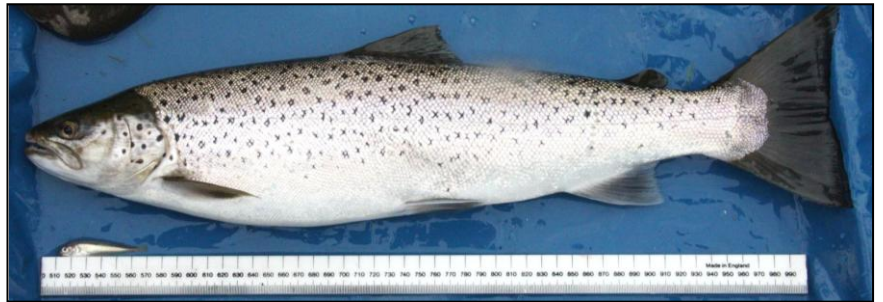




WESTER ROSS FISHERIES TRUST



REVIEW January 2015



WESTER ROSS FISHERIES TRUST

Registered Charity number SCO24787

REVIEW

by

Peter Cunningham, Peter Jarosz and Geoffrey Billier

January 2015

Cover photos (all photos © WRFT unless stated otherwise):

From top right (clockwise):

(1) Sea trout of 525mm, 1580g taken in the sweep net at Boor Bay on 27th June 2014. This is the biggest sea trout taken at this sweep netting site to date; the fish carried just three lice [photo by Ben Rushbrooke].

(2) Carl Forbes, Prof Dave Barclay, Bill Anderson, Prof Mark Everard, Peter Cunningham, Jim Buchanan and Andrew Ramsay pulling in the sweep net at Flowerdale on 8th July 2013. We caught 9 wee sea trout that day [photo by Kataryzna Maykowska].

(3) Highland Biodiversity Seashore Project road show event at Laide by Gruinard Bay, on 7th September 2013. On 24th July 2014, the Scottish Government designated the Wester Ross Marine Protected Area for part of the coastal seas around Wester Ross, including Gruinard Bay from which trawlers and dredgers are to be excluded to foster recovery of maerl beds.

(4) Juvenile fish, but what kind? Go to Part 2.2 to find out!

(5) Male adult salmon; GoPro video-still from a river in the south of the WRFT area, taken in August 2014. I thought I was doing rather well with my GoPro until I saw the videos taken in November 2014 by Andy Jackson . . .

(6) Post-graduate student Martin Hughes with a male 'ferox' trout from a spawning stream in the Loch Maree catchment in October 2013; helpers Kyle McFarlane, Kevin McNeil, Roddy Legge and Ben Rushbrooke look on.

(7) WRFT Biologist, Peter Cunningham in the Leckmelm Burn headwaters in November 2014 [photo by Ben Rushbrooke]. On 11th August 2014, a one in ~100 year rainfall event caused widespread flooding, massive erosion, and mobilized large quantities of large sediment (i.e. boulders) in many coastal streams within the WRFT area. The main road to Ullapool was blocked when the culvert was unable to cope with the quantity of material. Remarkably, some trout had survived; in a pool close to where this picture was taken a mature male and female trout were found together.

The WRFT has the right to use information it has collected and analysed in order to meet its aims and objectives. Since the WRFT 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 WRFT's right or intention to use this information for commercial gain



Post-graduate student Geoffrey Billier by the Little Gruinard River, following an invertebrate sampling expedition on 21st April 2014 (photo by Peter Cunningham).

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Preface

The Trustees and myself are again grateful for the continued enthusiasm of our biologist Peter Cunningham, and for the ability of Peter Jarosz to get (financial) blood out of a stone. In 2014, relations with the Wester Ross Salmon Fishing Board were characterised by active co-operation on shared aims, and our financial relationship with them also stabilised. The Board, under its Chair, Bill Whyte, is particularly active and effective in its efforts to control various aspects of aquaculture and I am pleased that the two Peters have been able to support the Board's efforts as fully as they have.

Our more stable financial position this year means that we are no longer effectively trading at a loss and has enabled us to fulfil all our legal obligations and expand our planned programme of work to support wild fish. This has been facilitated by the very willing help we have received from volunteers (many of whom are pictured in the following pages), Estate owners and staff, and of course our Trustees. I thank you all sincerely.

It is the policy of the Trust to increase our activities in the Wester Ross community. We want to help create a local environment in which the community is concerned about, and actively supports improvements in the wider environmental factors affecting the health of wild fish.

This will mean Trust members forging closer links with local Schools, the Gairloch Museum and supporting individual projects. The review itself includes details of a number of such activities, such as pond dipping at Aultbea & Laide Community Woodland, seashore days etc; the large number of these which Peter Cunningham already supports may come as a surprise. We are currently working with the museum to explore areas of mutual co-operation, in particular in aspects of historic Herring fishery work, and archiving of historic salmonid records from the various Estates in our area.

There are other major projects on the horizon and we are taking an active part in the initial planning of these, with GHS, Forestry Commission, SNH and others in order to create a management structure which is small enough to work effectively. The structure of an Angler's Information Database has been completed, funding has been obtained, and we are in the process of populating it. Of course it is primarily intended to provide information for visiting anglers, but we would like it to be interactive, so we gain information on catches etc from them. The opportunity also exists to make this database of more general interest and value to the community by including information about other aspects of the hill lochs and rivers such as wild flowers, geology and birds. It may even be possible for us to make the database into a research tool by including archival material or links to historic catch records.

WRFT has always had a mutually supportive relationship with the Skye Fisheries Trust, and we are likely to sign a memorandum of understanding to formalise this relationship in the near future.

On a wider political level, there are a number of very major changes imminent, and consultations underway, some of which are discussed in the body of the report. Both the Fisheries Review and other planned legislation affecting land ownership may drastically change the funding and structure of the Trusts. No doubt next year's report will have something substantive to say about this issue!

Prof Dave Barclay, January 2015

Part 1 Introduction

This review covers the 18 months from July 2013 to December 2014, a period of contrasting fortunes for wild salmon and sea trout in the Wester Ross area.

The highest burdens of parasitic sea lice on sea trout were recorded early in the summer of 2013 (see Part 3). Wild salmon fry were found in the upper Bruachaig (Ewe system) in July 2013 for the first time since the 1990s. Juvenile fish surveys were also carried out on several rivers within the south of the WRFT area, and on Skye to provide support for the Skye Fisheries Trust and others concerned about proposals to develop three very large new salmon farms in Loch Slapin and Loch Eishort in the southwest of Skye. During the autumn of 2013, I visited Camasunary to find out more about the formerly prolific sea trout fisheries of the area (see Part 4).

The 2014 field season got underway in February with a sweep netting session in Loch Gairloch, followed by a workshop on sea lice and sea trout at Aultbea with Prof Mark Costello from Auckland University, supported by Tony Andrews and Ivor Llewelyn of the Atlantic Salmon Trust. In addition to sea lice, Mark told us much about the network of Marine Reserves in New Zealand.

Student Geoffrey Billier arrived in February and with much energy and ambition set about a study of freshwater macroinvertebrates in the Little Gruinard River. After three months of hard work, Geoffrey's report is full of new information, and provides a clear explanation of why woodland restoration would increase the amount of food for juvenile salmon (see Part 7).

The spring of 2014 was over 3C warmer than that of 2013. There was more food in the sea for sea trout. In June and July, sea lice levels on sea trout were lower than for respective months in 2013, particularly in Little Loch Broom where the Ardessie salmon farm remained unstocked. Sea trout of over 50cm were taken by sweep netting teams in Loch Ewe and Little Loch Broom. Subsequently several fat sea trout of over 3lb (the largest 5.5lb) were reported in rod catches for the River Ewe - Loch Maree system.

The Wester Ross Marine Protected Area and the Loch Duich – Alsh MPA were designated in July 2014. The MPAs aim to restore maerl beds and flame shell beds, and to protect other important seabed habitats. At the time of writing, a consultation on proposed fisheries management measures is underway (see Part 6).

Between July and November 2014, juvenile fish surveys were carried out at sites in 17 river systems or coastal streams. Surveys were disrupted by a one in ~100 year rainfall event on 11th August 2014, which caused much damage. In some places fish populations were depleted; elsewhere little fish gorged on a variety of food (see Part 2). November was unusually dry and mild; salmon were seen and videoed in spawning areas in several rivers .



*Peter Cunningham with his biggest ever trout!
South Uist, June 2014.*

As part of the Scottish Mink Initiative, we provided support for a network of volunteers with monitoring rafts, tunnels or traps within an area extending from Gairloch to Ullapool (see Part 8); and informed the Wester Ross Area Salmon Fisheries Board's responses to planning applications for hydropower schemes or fish farms.

As ever, our work would not have been possible without support from many individuals and organisations (too many to name here; see later . . .). Thank you all!

Part 2 Salmon and sea trout stocks

2.1 Rod catches

Official catch statistics for 2013 were released by Marine Science Scotland in September 2014¹. They indicated that rod catches of both salmon and sea trout for nearly all the larger river systems in the Wester Ross area were lower than for several years. For Scotland as a whole, the total catch of sea trout was the lowest in the 61 year time-series record. Table 2.1 provides a summary of catches for 2013 for the WRFT area.

Table 2.1 Summary of Scottish Government salmon and sea trout catch figures for 2013 for rivers within the WRFT area. See notes below table.

Fishery area	salmon			grilse			wild salmon and grilse			escaped farm salmon	sea trout			Notes
	released	retained	total	released	retained	total	released	retained	total		released	retained	total	
Kanaird	2	0	2	12	1	13	14	1	15		2	0	2	
Ullapool	8	0	8	12	0	12	20	0	20		4	5	9	
Little Loch Broom	15	1	16	11	1	12	26	2	28		2	0	2	
Gruinard	37	2	39	92	1	93	129	3	132		5	0	5	1
Ewe	79	23	102	104	22	126	183	45	228	1	18	0	18	
Badachro	36	0	36	0	0	0	36	0	36		1	0	1	2
Torridon	62	0	62	46	0	46	108	0	108		124	0	124	3
Balgay	4	3	7	4	3	7	8	6	14		7	0	7	
Applecross	5	0	5	4	0	4	9	0	9		6	0	6	
Carron	66	14	80	26	6	32	92	20	112		50	0	50	
Loch Long	40	13	53	8	3	11	48	16	64		30	15	45	
Croë	0	1	1	2	0	2	2	1	3		0	0	0	
Glenelg	8	1	9	0		0	8	1	9		7	0	7	
Arnisdale	5	0	5	9	1	10	14	1	15	1	8	5	13	

notes:

1. 'Gruinard' includes both the big Gruinard River and the Little Gruinard River. For some of the other fishery areas (e.g. Ullapool) figures are also assumed to be incomplete.
2. 'Badachro' includes the River Kerry. Figures here possibly highlight the difficulty of separating grilse from salmon in catch records as it seems rather unlikely that all the fish were salmon and grilse were completely absent from rod catches.
3. The catch returns for the Torridon River raised a few eyebrows! Of the 108 wild salmon and grilse reported, 17 salmon and 5 grilse were taken in the months March – May. The 124 sea trout caught in the Torridon River weighed 235.6kg, an average weight per sea trout of over 3lb.

Grilse taken in the upstream trap at Tournig on 1st August 2013 (photo by Ben Rushbrooke).



¹ <http://www.scotland.gov.uk/Topics/marine/Publications/stats/SalmonSeaTroutCatches>

Salmon

Provisional figures for the 2014 season are included in the catch graphs below (Figure 2.1). The three most productive salmon rivers within the WRFT area all experienced lower rod catches in 2013 and 2014 than in the years 2010-2012. For the Gruinard and the Carron, 2014 was a better year than 2013.

Figure 2.1 Rod catches of salmon for the Gruinard River, River Ewe, River Carron and River Ling.

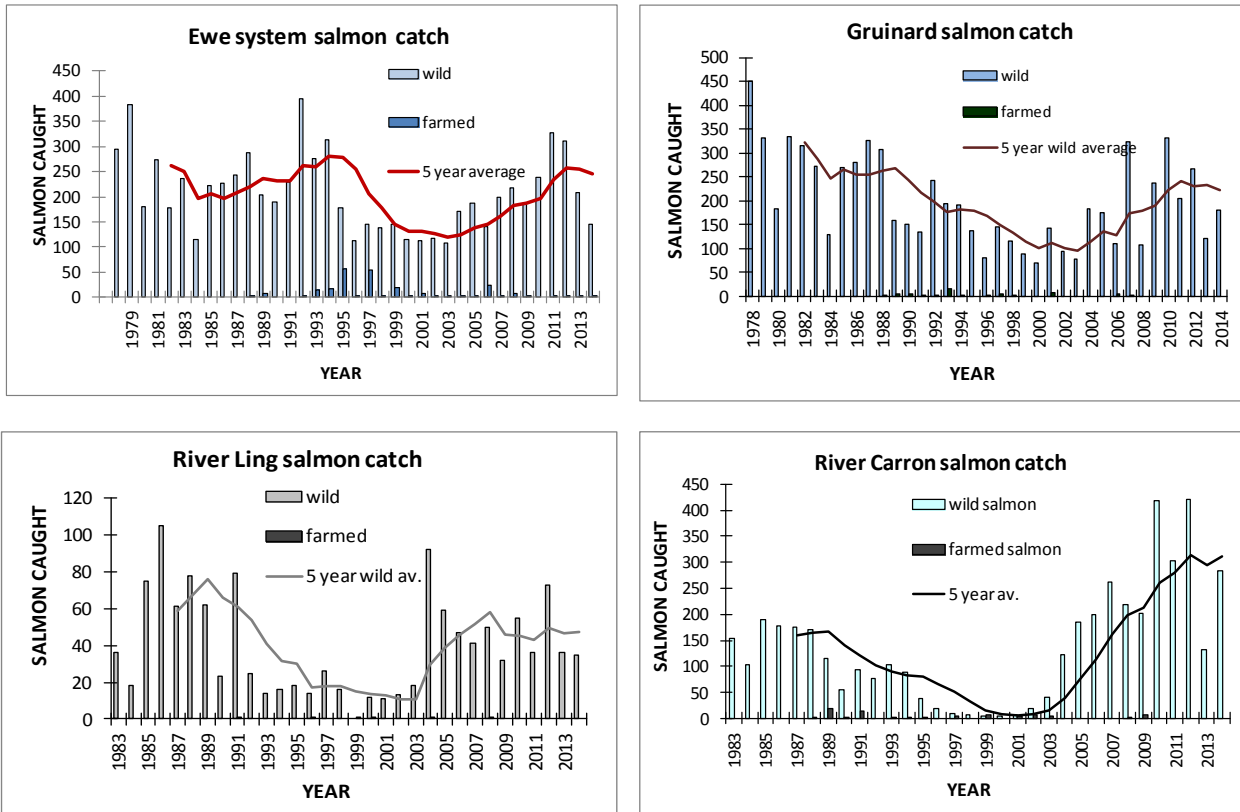
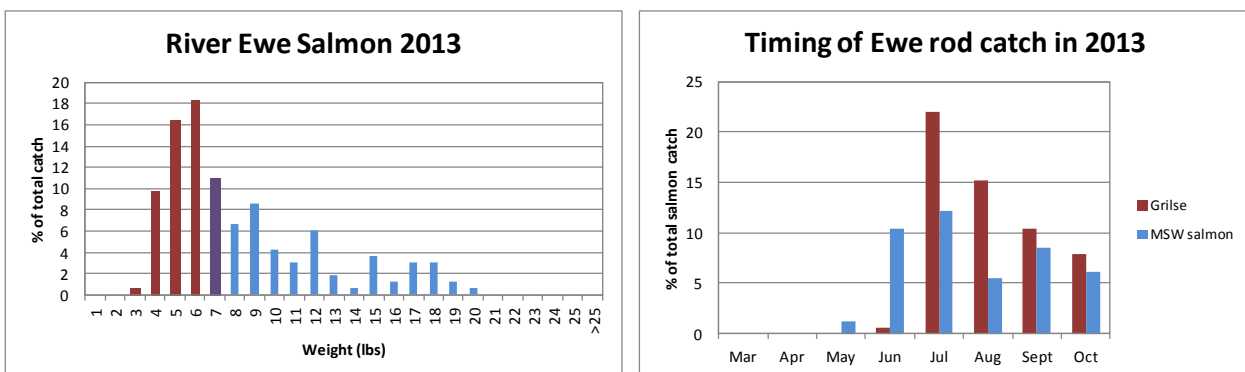


Figure 2.2 shows the timing of salmon taken in the River Ewe for 2013, which had reasonable runs of both salmon and grilse from late May until the end of the season. In 2013 'grilse' (one sea-winter salmon) outnumbered 'salmon' (multi sea-winter salmon) in both the Gruinard and Ewe rod catches.

Figure 2.2 The sizes and timings of salmon taken in the River Ewe in 2013. Thank you to Ray Dingwall for recording and providing this data.



The first rod caught salmon of the 2014 season within the WRFT area was caught and released by keeper Arran Matheson in the River Kanaird on 14th April. Several salmon were caught in the River Ewe in May, and by mid-June, several large salmon had been recorded including a fish of 21lb. Low water prevented salmon from entering other rivers in June and July 2014. Then, in early August it began to rain; the remnants of ‘Hurricane Bertha’ delivered a deluge. After a slow start, catch figures recovered toward the end of the season for several rivers.

Jamie MacKenzie with a fresh 9lb salmon taken in the Dundonnell River on 28th August 2014. Photo by Alasdair MacDonald.



For the River Carron, the **2014 season** was another good one; the third best this century for the total number of salmon and grilse caught. In recent years, grilse numbers have fluctuated. The numbers of grilse caught in 2009, 2011 and 2013 was much lower than in 2010, 2012 and 2014 (Figure 2.3).

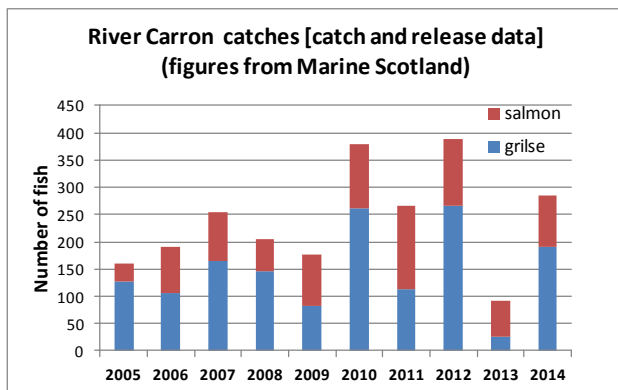


Figure 2.3 Numbers of salmon and grilse caught and released in the River Carron system 2005 to 2014. The Carron is a 100% ‘catch and release’ river (except for relatively small numbers of stocked fish retained for research or hatchery purposes).

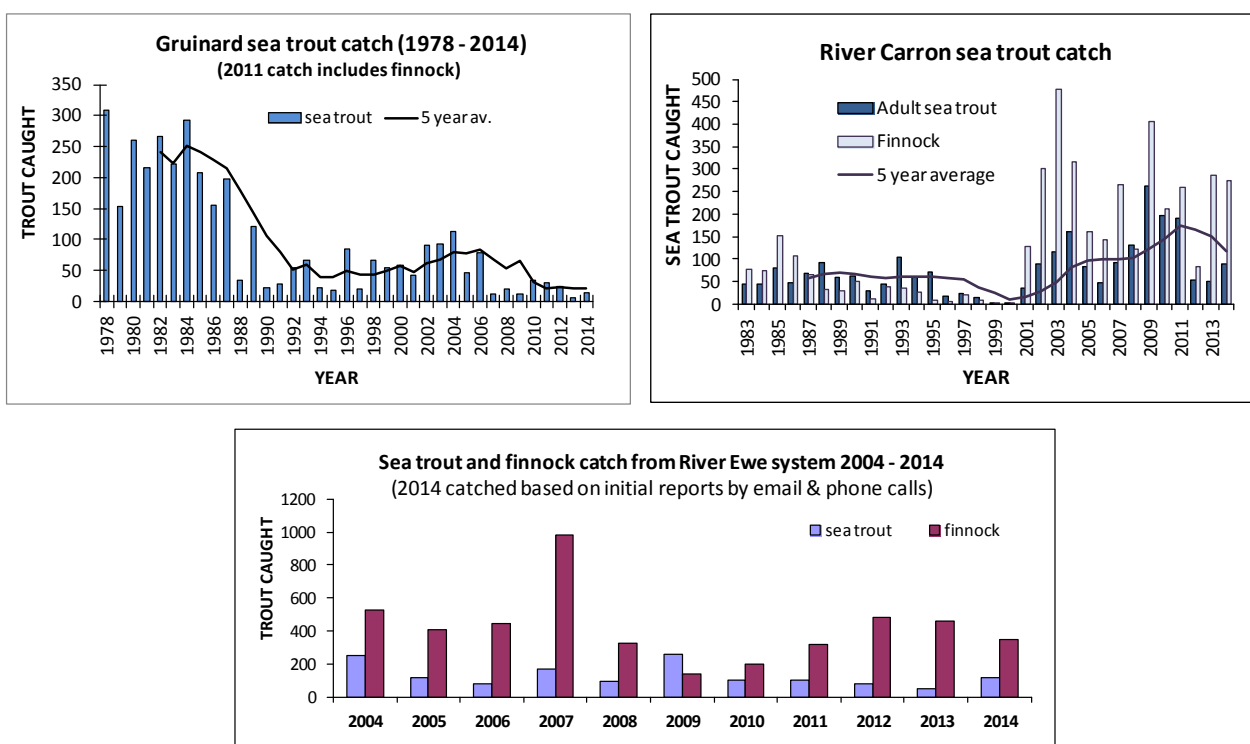
There are several possible explanations. Local factors may have influenced salmon smolt production within the River Carron with higher production of smolts every second year, like some pacific salmon rivers? Alternatively, grilse numbers may have varied according to marine survival rates. One possibility is that grilse numbers were affected by salmon farming in nearby waters. Salmon farms in Loch Carron and Loch Kishorn have operated a 2-year synchronised production cycle for several cycles. Table 3.2 (page 28) shows how on-farm sea lice levels around the WRFT area tended to rise towards the end of production cycles. In 2009, 2011 and 2013 these farms were in their first year of the production cycle. In spring 2010 and 2012 they were approaching the end of respective 2 year production cycles when sea lice levels would have been higher. For the River Carron, the correlation may infer that the marine survival of salmon has been higher during years when smolts emigrated through coastal waters during ‘1st years’ than during ‘2nd years’ of production cycles at nearby farms.

Have similar observations been made for grilse catches in rivers that flow into other synchronised salmon farming areas in the West of Scotland?

Sea trout

The final figures for rod catches of sea trout in 2013 for river systems in Wester Ross were amongst the lowest on record (except those for the Torridon River). The catch figures reflect sea lice epizootics within the area and problems with feeding at sea (see Part 3). Rod catches of sea trout in some other parts of Scotland including the rivers which flow into the Moray Firth were also amongst the lowest in recent records; these were reviewed in a presentation which can be found via links on the WRFT website². For some rivers official figures for sea trout may not reflect actual catches, for various reasons including problems with distinguishing sea trout from brown trout and sea trout from finnock. Figure 2.4 shows sea trout catch graphs for the Gruinard and the Carron; and for the River Ewe – Loch Maree for recent years (following the collapse in the Loch Maree sea trout fishery in the 1990s).

Figure 2.4 Rod catches of sea trout for the Gruinard River, River Carron and River Ewe (& Loch Maree) systems.



Figures received to date for the 2014 season (December 2014) indicate higher catches than in 2013. In the River Ewe – Loch Maree system, sea trout of 5.5lb, 4.5lb and several other fish over 3lb were taken. Several maturing trout were also taken in the Tournairg trap (see Part 2.3) and in the sweep net at Boor Bay, Loch Ewe (see Part 3).



Sea trout of 3.75lb taken in Loch Maree, September 2014 by Terry Jack. Note that its dorsal fin is healthy and there are no signs of sea lice damage; however it has a healed wound from predator damage behind its dorsal fin.

² Some problems for sea trout in Wester Ross presentation:
<http://www.wrft.org.uk/files/Sea%20trout%20presentation%2020%20February%202014%20compressed96dpi1.pdf>

2.2 Juvenile fish surveys

supported by WRASFB and Highland Leader 'River Revival Project'



To find out about the distribution and relative abundance of juvenile salmon within the rivers and streams of the area covered by the Wester Ross Fisheries Trust, surveys were carried out using electro-fishing equipment. The main purpose of the surveys was to provide information about the status of respective fish populations for fisheries managers and for the Wester Ross Area Salmon Fishery Board.

Electro-fishing surveys can be a particularly efficient and informative way of learning about the fish in a river. They have become a core part of the field work programme carried out by the Trust. Their value for fisheries management purposes is highest when those directly involved with looking after the river are able to take an active interest. Opportunities for habitat improvements or for other actions to safeguard or enhance natural production of juvenile salmon or sea trout are often most easily identified, discussed and agreed in the field.

During the period 2013 – 2014 inclusive, sites were surveyed in 14 of the 28 river systems with rod fisheries for salmon or sea trout; and in a further 4 of the 10 smaller coastal streams where juvenile salmon have been found at least once within the past 10 years. The mix of major river systems and smaller streams provided opportunities to find out about juvenile fish populations in both 'core' areas for juvenile salmon production (of greatest importance for fisheries), and also marginal areas where any changes in the overall distribution of wild salmon can be most easily detected.

Sites in three rivers in the south of the area were surveyed during the 2013 field season; other surveys were carried out between July and November 2014.

Results

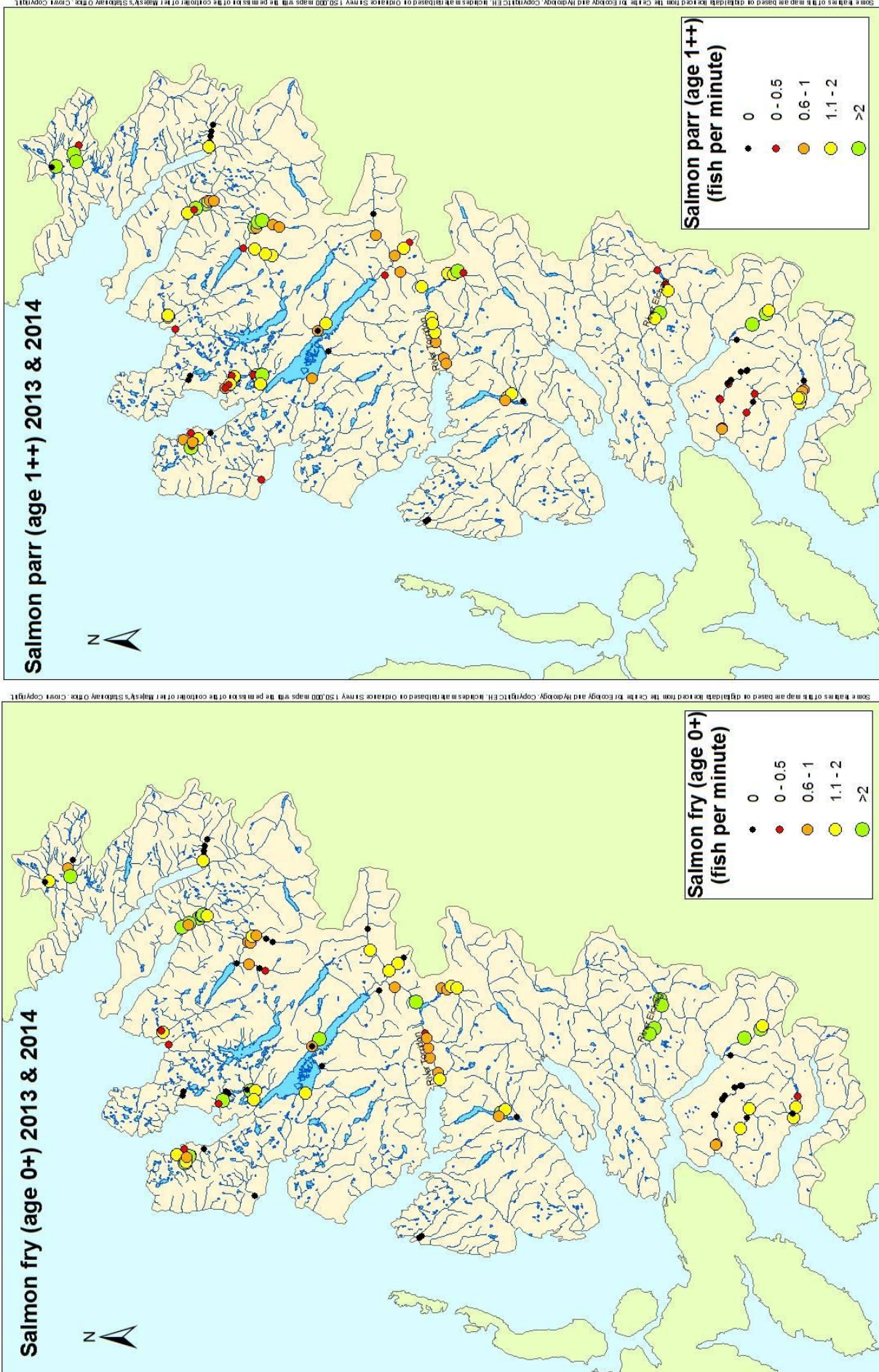
These are also presented in Figures 2.5 – 2.6. Table 2.2 defines the Catch Per Unit Effort (CPUE) grades used in the following text.

Table 2.2 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 main findings were as follows. Salmon fry and parr were found in the core areas of all the major river systems surveyed. However, they were absent or some year classes (usually fry or 1+ parr) were missing from some headwater areas and from some of the smaller coastal streams where juvenile salmon were recorded in 2010 or other recent years. In terms of the overall distribution of salmon within the WRFT area, these results suggest that there has been a decline in the distribution of juvenile fish since 2010.

Figure 2.5 and 2.6 Relative abundance of salmon fry and parr at sites surveyed during 2013 and 2014.



The following section provides further river specific details of juvenile fish surveys:

Kanaird (Sept 2014). Salmon fry and parr were present at high CPUE at sites in the main river near Langwell. However, above the Langwell falls only a few large 2 year old parr were recorded (at low CPUE), with no evidence of spawning by salmon in this part of the river in 2013 or 2012. In the Runie, in the young woodland enclosure below Drumrunie falls, both fry and parr were found. Many of the parr were large for their age reflecting good feeding; big healthy smolts will be produced from this part of the system. Riparian alder woodland is good for salmon! No juvenile salmon were found in the stream above the falls by the road bridge at Tiliathdoire; just trout here.

Arran Matheson in the upper Runie below the Drumrunie falls on 12 Sept 2014. Large salmon parr were found here at high CPUE within the WGS enclosure. Where deer sheep and cattle are kept away from the river bank, there is more plant material to feed the insects which feed the wee fish.



Lael (Sept 2014). [Hydropower scheme fish survey contract]. Trout were found at main river sites between the intake and the powerhouse at similar densities to those recorded in previous years, despite the big spate on 11th August which blocked the hydro intakes. At the site between the fields (below the powerhouse), both salmon fry and 1 year old parr were recorded at moderate CPUE. For their age, the fry and parr were big, and unusually fat. Fat trout were also recorded . . .

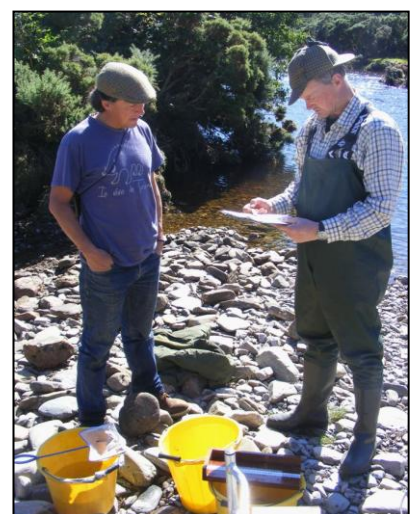


Curiosity got the better of us and a trout was dissected; the fish had been gorging on maggots.

Remarkably fat one year old salmon parr, salmon fry, and regurgitated maggots, from the River Lael 3rd Sept 2014, demonstrating the growth potential of wild juvenile salmon when food is abundant. Deer and livestock were drowned in many rivers by exceptional spate flows on 11th August 2014.

Dundonnell (late Aug-Sept 2014) Salmon fry and parr were found at moderate to very high CPUE at all sites in the main river. Juvenile trout were present at sites in tributary burns despite streambed upheaval and flooding on 11th August. The Dundonnell River catchment area is well-vegetated, fertile and highly productive for its size compared to the Gruinard rivers. Both juvenile salmon and trout grow relatively quickly in the Dundonnell River. Nearby, Little Loch Broom is a good feeding area for sea trout: see Part 3 for the results of sea trout monitoring in the area.

Lorne Armstrong and Alasdair Macdonald by the Dundonnell River on 27 Aug 14, reviewing a remarkable catch of 21 fry and 21 parr taken in 6 minutes.



Gruinard headwaters (Nov 2014). Salmon fry and parr were recorded at low - medium CPUE in the Abhainn Gleann na Muice. Parr were thin. This is one of the finest nursery burns for juvenile salmon in the headwaters of any river within the WRFT in terms of its mix of spawning and fry habitat (pebbly glides at the tail of pools), parr habitat (runs and riffles with cobbles and boulders) and pools where adult fish can find some protection. However, production is limited by declining food availability (see also Part 7). For at least the past 10+ years, riparian alder trees which hold the banks together, protect fertile soil and provide leaf litter which supports salmon food production (aquatic insects), have been dying off one by one.

This burn could be much more productive if riparian trees and other vegetation were protected from damage by deer, and other measures were taken to rebuild soil fertility in the glen (see Box 2.1).



Colin Simpson and Peter Cunningham surveying juvenile fish in the headwaters of the Gruinard River in Gleann na Muice in November 2013. Photo by Ben Rushbrooke.

In the Achneigie burn large parr were found at high CPUE in pool habitat, and smaller parr at moderate CPUE in glide-run-riffle section. In the main river nearby fry and parr were found at lower CPUE. Fry were found in the Allt Eigidh and also parr at high CPUE. However at the two sites fished in the Abhainn Loch an Nid above the Bathing Pool falls, there were no salmon fry or 1+ parr; only large 2 year old parr (98mm-130mm) at low CPUE were found. The size and condition of the parr is another indication of how, when juvenile salmon densities are low, fish are able to grow faster (see also part 2.3).



Assorted trout and 2 year old salmon parr from the Abhainn Loch an Nid, 20th November 2014.

Inverianvie (5 Sep 2014). A salmon fry and three large salmon parr were found at a site just above the road bridge. At the time of the survey, we took this as evidence that salmon had spawned in the Inverianvie in both of the past two years. However, given proximity to the mouth of the Little Gruinard River, another possibility is that some juvenile salmon which were washed down the Little Gruinard into Gruinard Bay by the 11th August spate, survived and ascended the Inverianvie.

Allt Beith (26 Aug 2014) No juvenile salmon were found above the fish ladder by Drumchork, just trout. Salmon fry were last recorded above the fish ladder in 2007. This little river needs a bit of TLC.

Tournaig (Aug 2013 & Aug 2014) Six sites were fished in the Allt na Coile in both 2013 & 2014. In 2013, salmon fry were found at five of the sites at the highest average CPUE on record. However in 2014, salmon fry were only present at the lowest two sites. One year old parr were on average over 10mm longer at the two top sites in the woods than at the site below the lower falls where there are many eels. The faster growth of parr in the woodland site may be due to a combination of lower densities of juvenile salmon, more food (relating to healthy riparian woodland [midgy jungle!]) and less completion by eels. See Part 2.3 for more about the Tournaig project and its salmon and sea trout.

Ewe system. In 2014 sites were fished in the Kernsary area, burns around Loch Maree, Bruachaig, Docherty Burn, A' Ghairbhe River and headwaters above Loch Coulin. Juvenile salmon densities were high in the lower **Kernsary River** on (10th Sep '14). Larger parr were found further upstream in the Loch Thodhoire burn. In the Ghiuragastidh burn, large salmon fry were present at high CPUE at a site below the fall (*below left*), however parr were absent here; above the fall and 2 big 2+ year old parr and ?hybrid fry were found (*below right*).



Juvenile salmon were scarce but relatively fast growing in the **Inveran river** above the bridge (10/9).

Around **Loch Maree**, salmon fry and parr were found in burns at **Slattadale** (25/8/14), **Letterewe** (18/9), though not above the pipe culvert in the Sawmill Burn; but not in the weedy **Loch na Fideil burn** where cows paddle and minnows now predominate (accompanied by sticklebacks, eels, and juvenile trout).

Wild salmon fry were found in the **Bruachaig** by the Heights of Kinlochewe in July 2013. On 9/7/14 fry were found here for the second year in succession. Some salmon caught below the falls the previous year were released above the falls, so it is possible that fry were progeny of these fish rather than of salmon which ascended the falls unassisted. In 2014, fry may have included fish stocked as unfed fry 500m further downstream on 1st May 2014. Salmon fry and parr were found and videoed at sites up to the middle of the **Docherty burn** and in the **Cromasaig Burn** (22/8), except at the top site where just parr were recorded.

Production of juvenile salmon in the **Coulin River** (10/10/14) is food limited and could be higher. In the burn above the Stone Bridge salmon fry were almost 1cm longer on average than those in the much wider river nearer the loch where banks are particularly bare and little leaf litter enters the water. Nearby, in the upper farmhouse burn WGS enclosure the young trees are just about big enough to provide a source of leaves to enhance food production for salmon fry and parr. In the A' Ghairbhe below the Cruive, fry and parr were present at high & moderate CPUE respectively.

Sguod (Aug 2013 & 19th Aug 2014) Sites were fished in the main river and in the three burns which flow into Loch Sguod in both years. Salmon fry and parr were found in all three burns in both years. Juvenile trout and salmon grow quickly. For the third time in the past 10 years, a dead cow was found in the north burn (Allt Mor) this time probably succumbing to the spate on 11th August. In early May, 95 sea trout smolts (most from 160mm to 210mm) and 32 salmon smolts (mostly between 130 and 145mm) were recorded in a fyke net below the loch heading for the sea.

Torrison (Aug 2014) Salmon fry and parr were found at all sites, and at higher CPUE than in some previous years. Fry and parr were larger in the Thrail and in the main river near the Scots Pine woods than in the flatter section above Glen Cottage, as in previous years. Juvenile trout outnumbered juvenile salmon in the Feith Ghlas, an important spawning burn for sea trout.

Balgy (9/9 2014) Fry and parr were large for their age and present at moderate to high CPUE in the Abhainn Dearg and Alltan Eisg. 14 one year old parr taken in the Alltan Eisg in 7 minutes were 102mm – 124mm in length; all big enough to smolt in 2015. The Alltan Eisg drains a young woodland, where fertiliser run off was initially a problem with thick filamentous algae growing on the streambed below the WGS fence (see WRFT Review 2013); nutrient enrichment may have enhanced salmon smolt production here. However, juvenile salmon were absent from the mineral rich Allt a Ghuibhais above Loch an Loin where densities of trout fry were very high.

Cuaig (9/9/14) Two sites were fished above the road. In previous years, juvenile salmon have been recorded here but not this time. Large 1++ [one year old or older] trout were recorded at moderate CPUE.

Elchaig (16/9) Salmon fry were recorded mostly at high CPUE at sites from below the falls to above the loch. At the top site fry were recorded at over 4 per minute and large (50mm – 73mm). Parr were also present, mostly at moderate CPUE. Parts of the river are stocked with salmon fry; and nearby grassy places are fertilised to enhance grass production. Adult salmon (mostly MSW fish) were videoed in several pools.

Shiel (15/9) No juvenile salmon were found in the Allt Udalain above the gorge (surveyed for the first time), just trout. There may be an impassable fall in the gorge. However, at sites in the River Shiel and in the Allt Mhalagain, salmon fry and parr were recorded at mostly high CPUE, and adult salmon were videoed in some of the pools.

Glenmore On 15th June 2013 salmon fry, parr and sticklebacks were recorded at low CPUE near Glenelg (lowest site). The survey explored tributary burns further upstream rather than main river sites that day (note that many of black dots on Figs 2.5 & 2.6 are for sites on tributaries). Juvenile trout were recorded at high CPUE in the Beolary burn, where there were also salmon parr and sticklebacks. On 16th August 2013 above the falls near Bealachasan where salmon parr were found in 2010, juvenile trout were recorded at moderate CPUE, however no salmon were recorded this time.

The electro-fishing team (l-r: Graeme Mitchell, Angus Mitchell, Geoff Mellor, Peter MacDonald, Nick Sanders) by Bealachasan in the headwaters of the Glenmore River on 16th August 2013.



Glen Beag (16 Aug 2013). Salmon fry were recorded at moderate CPUE at the mouth of the Allt Mor at Balvraig and at the confluence at Aodhailean at the top of the river; however at respective sites only one parr was seen. No juvenile salmon were recorded in 8 minutes of fishing boulder run at Toraphresigain. The salmon population in this river remains fragile.

Arnisdale (10 Sept 2013) Salmon fry were present at all main river sites and parr. CPUE were high at the two lowest sites where there is much good spawning habitat. Further upstream into the gorge and below the loch outflow, salmon fry were scarce. Large parr were recorded in the boulder sections below the gorge at low CPUE; there were no parr at the top site.

Box 2. 1 Some priorities for improving habitat for salmon and sea trout production within the WRFT area.

1. Abhainn Gleann na Muice. This is an important salmon spawning stream in the headwaters of the Gruinard River. Riparian alder trees are steadily dying, one by one, leading to loss of fertile soil along the river banks and loss of woody debris (see Part 7). If it is not possible to greatly reduce deer numbers in the area, the riparian corridor in Gleann na Muice should be enclosed by a deer fence.



2. Allt Bad an Luig (near Second Coast). The culvert beneath A832 is impassable to salmon and sea trout. An inaccessible area of habitat includes Loch na h-Uidhe and possibly Loch Fada, plus 15,000m² of river. A solution would be to create a stepped pool below the culvert and to place concrete baffles inside one of the pipes (c. Loch Maree spawning burn culverts beneath A832).



3. Loch na Fideil Burn. Beneath the weed beds and silt, there is a streambed of stones and gravel. The burn could become one of the finest trout and sea trout spawning burns around Loch Maree if de-silted and the amount of fine sediment entering the burn, associated with cattle trampling and poaching [loss of soil] greatly reduced.



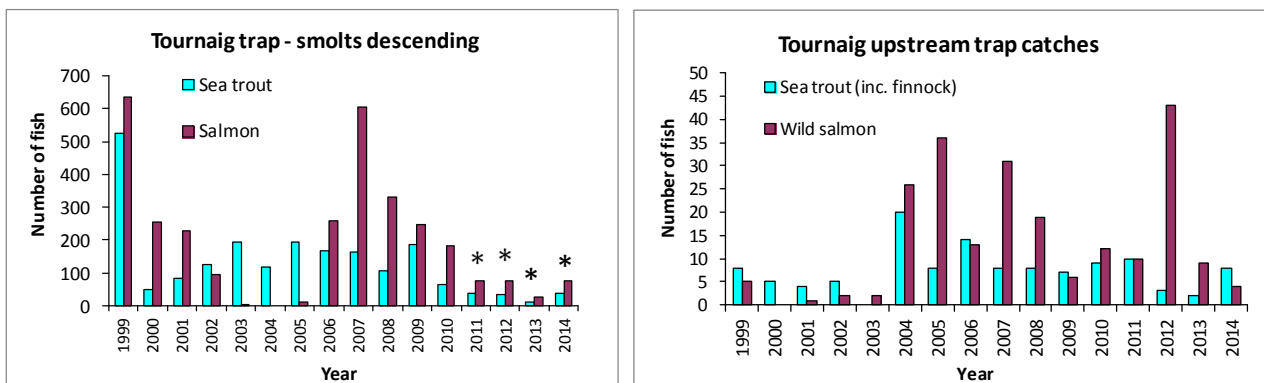
4. Sawmill burn (Allt Folaís) pipe culvert. In 2014, juvenile salmon were recorded below the culvert, but not above the culvert. Another 250m-300m of salmon spawning habitat would be opened up if this culvert was eased to allow passage of adult fish to spawning areas further upstream.

2.3 Tournai trap project



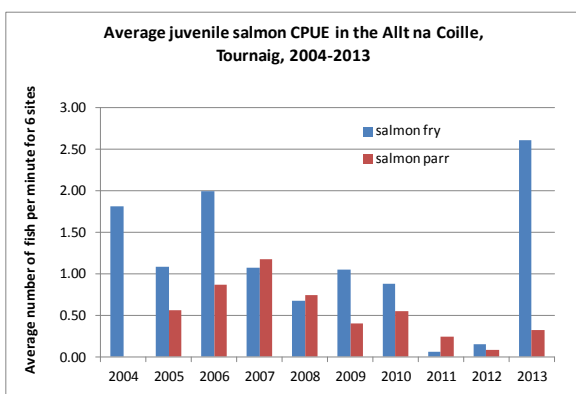
Wester Ross Fisheries Trust has monitored wild salmon and trout populations in the little Tournai river system by Loch Ewe since 1999 (Figure 2.7). Following a record run of salmon into the upstream trap in 2012, numbers of salmon were much lower in 2013 and 2014. However in 2014, six mature sea trout of between 350mm and 450mm entered the upstream trap, the largest catch of mature sea trout for many years.

Figure 2.7 Numbers of salmon and trout recorded in the downstream trap (smolts) and upstream trap (finnock and adult fish) at Tournai. *Note that in the years 2011 – 2014, water levels briefly over topped the smolt diversion screens and numbers recorded represent minimum estimates of the actual numbers of fish leaving the system during these years.



The low number of salmon smolts in 2013 correlated with low numbers for salmon parr recorded at electro-fishing sites within the Tournai catchment in 2012 and 2013 (Figure 2.8).

Figure 2.8 Tournai juvenile salmon survey results, 2004 to 2013.

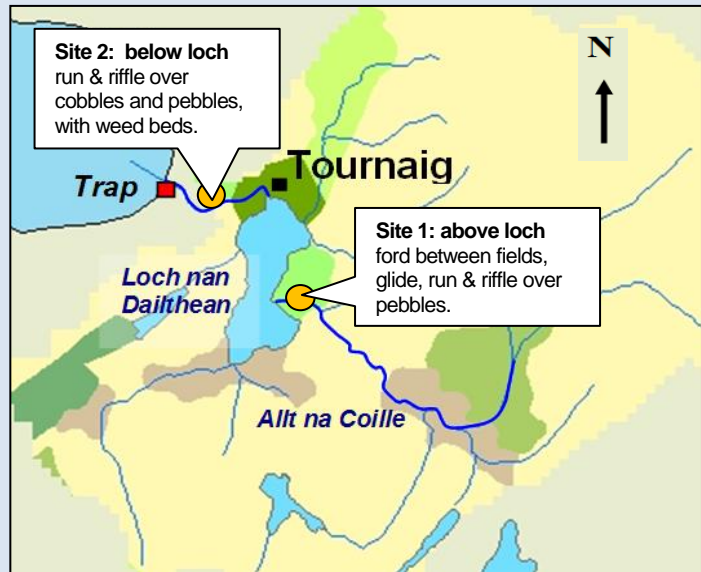


However, following a record number of grilse entering the upstream trap in 2012 (and subsequently released to continue upstream) we recorded our highest average Catch per Unit Effort [CPUE] number for salmon fry for our six electro-fishing sites in the principle spawning stream, the Allt na Coille, since 2003. This survey demonstrated successful spawning by salmon throughout the spawning stream in 2012 and a large population of salmon fry in the system.

On the 26th August 2013 two electro-fishing sites were surveyed, one above the loch, the other below the loch (see Box 2.2). Salmon fry, juvenile trout and minnows were recorded at both sites. The CPUE number for salmon fry above the loch was much higher than below the loch, however the fry below the loch were much larger than at the site above the loch.

Box 2.2 Of small fry and big fry . . .

Biological productivity across much of Wester Ross is limited by the fertility of the land and the availability of food. Production of wild salmon smolts from river systems within the area is dependent not just on the numbers of juvenile fish within any given section of river, but how upon how fast they grow. As we discovered at Tournaiig on 26th August 2013, there can be much variation in growth rates even within a relatively small river system.



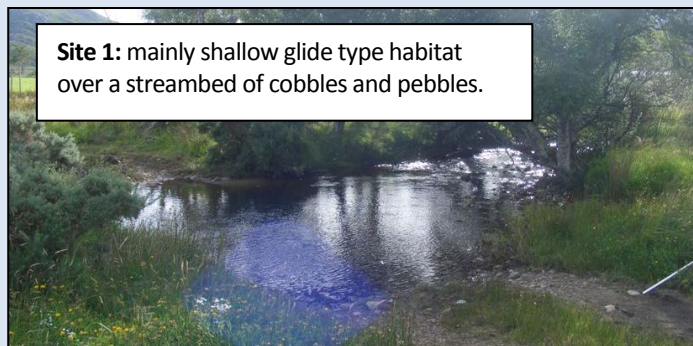
Site 1: ford between fields above Loch nan Dailthean.

We fished here for 6 minutes, covering a wetted area of stream bed of approximately 90m².

Altogether we caught 48 salmon fry, 6 salmon parr, 6 trout fry and 4 minnows.

At 8 salmon fry per minute, the CPUE was very high: reflecting ideal salmon fry habitat, and high fry densities assumed to be near carrying capacity.

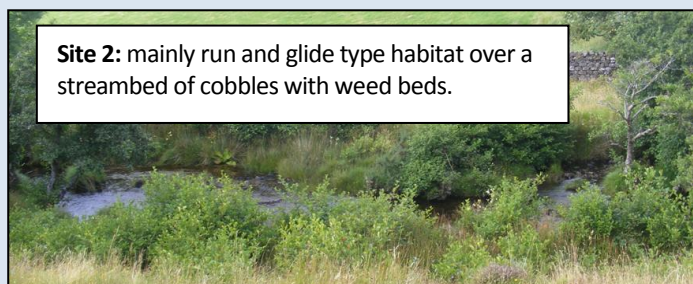
Salmon fry were between 39mm and 55mm in length, with an average length of 45.75mm; they were relatively small.



Site 2: below road bridge below Loch nan Dailthean

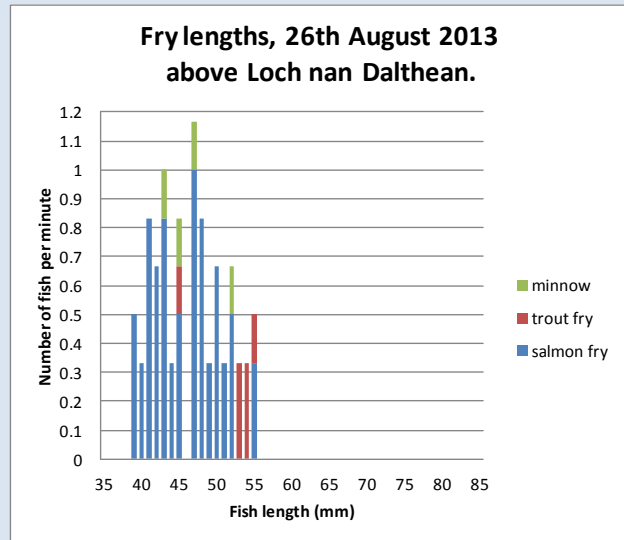
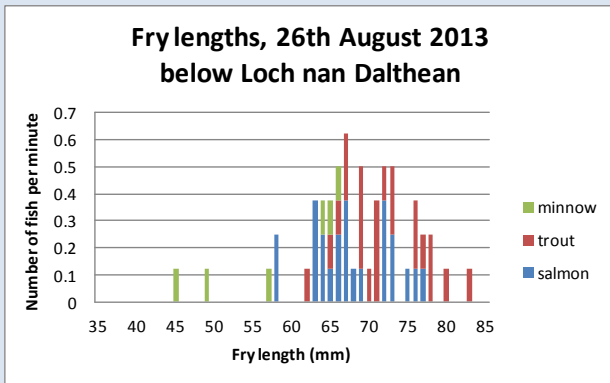
We fished here for 6 minutes, covering a wetted area of stream bed of approximately 90m². Altogether we caught 25 salmon fry, 21 trout fry, 3 larger trout, 6 minnows, 6 eels and a stickleback.

CPUE for both salmon fry and trout fry at over two fish per minute, was also high compared to averages for Wester Ross. Salmon fry were much bigger than those in the stream above the loch at between 58mm and 77mm in length, with an average length of 67.7mm.



Box 2.2 Of small fry and big fry . . . (continued)

The graphs below contrast the relative sizes and frequency of capture of juvenile trout, minnows, and salmon at the two Tournaig electro-fishing sites, below and above the loch.



At least four factors may have contributed to the recorded differences in fry sizes:

- **Water temperature:** at times of sampling: 16.8C at site 1, 18.3C at site 2. Juvenile salmon grow faster at higher water temperatures. Loch nan Dailthean is a shallow loch and during periods of sunny weather during the summer can warm up quickly. Also, perhaps fry hatched earlier below the loch.
- **Stream and flow stability:** the streambed was recorded as ‘stable’ at both sites; however, at site 2 below the loch the weed beds indicated particularly high stability of the streambed. Loch nan Dailthean acts as a settlement pond for sediment carried downstream during big spates, and the site below the loch may retain a relatively higher flow during periods without rainfall.
- **Fish densities:** at site 2 below the loch the lower CPUE indicates that the density of salmon fry was lower than at site 1 above the loch. However, when trout, eels and minnows are also taken into consideration, the overall number of fish is not so different from above the loch; and the total biomass of fish per unit area may be higher below the loch.
- **Food supply and stream fertility:** Loch outflows can provide a steady supply of small insect larvae and zooplankton, more food for small fish than in streams above lochs. In previous years, we’ve also recorded unusually large salmon fry at the top of the Little Gruinard below the outflow from the Fionn Loch, and in the nearby Allt Beith, in the outflow below Loch Bad na Luacharaich (locally known as the ‘Goose Loch’). At Tournaig, nutrient levels are also likely to be higher at site 2 than at site 1, with septic tank effluents entering the stream below the loch.

This example at Tournaig illustrates how the growth of juvenile salmon can vary considerably within Wester Ross. Some headwater streams (in particular) are very short of food for juvenile fish. Refertilisation of phosphorus-depleted catchment ecosystems (restoration of the natural fertility of catchment soils and phosphorus circulated within the plants and animals therein), for example of the Gruinard River catchment area, could substantially increase populations of wild salmon and other wildlife.

Thank you to Tournaig Estate and the National Trust for Scotland for on-going permission to learn about fish at Tournaig and to Marine Harvest for support.

2.4 Summary and conclusions

- Rod catch figures for salmon and particularly for grilse for seasons 2013 and 2014 in Wester Ross varied between rivers. These figures suggest that in addition to factors affecting salmon catches at the regional level (i.e. for the whole of Scotland) rod catches of salmon were influenced by local factors.
- For the River Carron, which recorded the highest total catch of salmon and grilse for any river in the WRFT area in 2014 but not in 2013, alternating good year – bad year grilse catches correlate with salmon farm production cycles within the sea lochs through which Carron smolts migrated to the open ocean (see part 3).
- The numbers of sea trout of 35cm or more in rod catches in the River Ewe – Loch Maree system and in the Tournaig trap were higher in 2014 than in 2013 (see part 3)
- Catch figures, particularly for sea trout, were considered to be unreliable for some rivers. For rod catch data to be of greater use for fisheries management purposes, measures to improve the quality and timeliness of catch recording are required (e.g. on-line submission of catch data throughout the fishing season).
- Electro-fishing survey results indicate healthy populations of juvenile salmon within large parts of the Dundonnell, Kanaird, Ewe, Torridon, Elchaig, Shiel and Arnisdale river systems.
- However, salmon fry and / or parr were not recorded in some areas of marginal habitat, particularly above waterfalls within the upper Kanaird, upper Gruinard, Allt Beith, Tournaig, Glenmore, Glenbeag and Arnisdale rivers. Salmon were not recorded in the Cuaig.
- When compared to previous surveys during years 2010 to 2012, results for 2013 -2014 suggest a slight contraction in the overall distribution of juvenile salmon within the WRFT area.
- Figures for salmon parr CPUE and fish size support hypotheses that river sections with complex riparian habitat that includes mature alder trees and / or some anthropogenic related nutrient input are most productive in terms of smolt output per unit area of streambed. These include parts of the Runie, Dundonnell, Balgy, Elchaig and Shiel.
- Smolt production in the upper reaches of the Gruinard system above Loch na Sealga would be higher if riparian soils and trees were protected and restored.

Part 3 Sea trout monitoring



3.1 Introduction

The Wester Ross Fisheries Trust was set up in 1996, partly in response to the collapse of the Loch Maree sea trout fishery. Since then the Trust has contributed data to a number of scientific studies, some of which have highlighted the association between parasitic sea lice levels (*Lepeophtheirus salmonis*) on sea trout and salmon farming in nearby areas³.

In 2013 and 2014 sea trout were monitored in the seas around Wester Ross to inform all those who remain concerned for the future of wild sea trout within the area, especially the Scottish Government and the Wester Ross Area Salmon Fisheries Board, both of whom provided support for this work. In both years, samples of sea trout were taken in Wester Ross using a sweep net in the Kanaird estuary (by Loch Broom), Boor Bay (Loch Ewe) and in the Flowerdale estuary (Loch Gairloch – in front of the WRFT office). Sweep netting at these sites contributed to the RAFTS post-smolt monitoring programme. At the mouth of the Dundonnell River, a fyke net was set as in previous years (since 1997) to record the occurrence of early-returning sea trout in June and the lice burdens which they carried. Additional samples were taken in both years from the sea pool of the River Ewe using rod and line.

Members of Achiltibuie Angling Club, Peter Cunningham, Alasdair MacDonald and other helpers netting the Kanaird estuary on 16th June 2014 (photo by Keith Dunbar).



³ See Middlemas *et al*, 2013 <http://onlinelibrary.wiley.com/doi/10.1111/fme.12010/abstract>

3.2 Results

Tables 3.1 presents summaries of catches and lice burdens for 2013 and 2014 respectively.

Table 3.1 Summary information for samples of sea trout taken within the WRFT area in 2013 and 2014. Please see text for related discussion.

Date	Location	Method	Sample size (no. of fish)	Number of infected fish	Abundance (= average number of lice per fish)	Average number of copepodid & chalimus	Average number of preadults & adults	Prevalence (% of sample infected with sea lice)	Intensity (= average no. of lice per infected fish)	Comments
11 Jun 13	Kanaird	sweep	32	30	19.78	15.80	3.96	93.75	21.10	longest sea trout 530mm
27 Jun 13	Kanaird	sweep	20	17	33.15	22.50	10.65	85.00	39.00	
26 Jul 13	Broom	r & l	1	1	56.00	48.00	8.00	100.00	56.00	230mm
19 Aug 13	Broom	sweep	6	3	5.33	0.00	0.00	50.00	10.66	
13 Mar 13	Dundonnell	sweep	21	21	30.67	28.90	1.77	100.00	30.67	average length of sea trout 434mm
June 2013	Dundonnell	fyke	62	52	132.82	130.87	1.95	83.87	158.36	
July 2013	Dundonnell	fyke	16	15	142.31	141.37	0.94	93.75	151.80	
10 Jun 13	Boor Bay	sweep	7	0	0	0	0	0	0	thin post smolts
21 Jun 13	Boor Bay	sweep	12	0	0	0	0	0	0	thin post smolts
25 Jun 13	Boor Bay	sweep	15	4	1.47	1.13	0.33	26.67	5.51	
8 Jul 13	River Ewe	r & l	4	4	82.50	72.00	10.50	100.00	82.50	very heavily infected
23 Jul 13	River Ewe	r & l	10	10	20.00	15.90	4.60	100.00	20.00	
7 Jun 13	Flowerdale	sweep	34	6	0.91	0.32	1.24	17.65	5.16	small post-smolts in estuary
8 Jul 13	Flowerdale	sweep	9	0	0	0	0	0	0	
19 Sept 13	Flowerdale	sweep	16	15	26.56	21.69	4.87	93.75	28.33	included larger mature trout

Date	Location	Method	Sample size (no. of fish)	Number of infected fish	Abundance (= average number of lice per fish)	Average number of copepodid & chalimus	Average number of preadults & adults	Prevalence (% of sample infected with sea lice)	Intensity (= average no. of lice per infected fish)	Comments
16 Jun 14	Kanaird	sweep	10	1	0.10	0.10	0.00	10.00	1.00	all <200mm
14 Jul 14	Kanaird	sweep	19	18	27.32	23.15	4.17	94.74	28.84	most between 200 & 250mm
June 2014	Dundonnell	fyke	2	1	0.50	0.00	0.50	50.00	1.00	both post-finnock
July 2014	Dundonnell	fyke	10	6	2.90	0.50	2.40	60.00	4.83	fish of 222mm-480mm
17 Jun 14	Dundonnell	sweep	2	1	3.00	0.00	3.00	50.00	6.00	sea trout of 520 & 530mm
15 Jul 14	Dundonnell	sweep	10	5	18.70	15.80	2.90	50.00	37.40	one trout had 164 lice
13 Jun 14	Boor	sweep	2	2	6.50	0.00	6.50	100.00	6.50	fat trout of 390mm & 395mm
27 Jun 14	Boor	sweep	4	3	0.25	1	1	75	0	385, 395, 482 & 525 mm!
11 Jul 14	Boor	sweep	3	3	8.33	3	5.33	100	8	203, 214, & 328mm
8 Jul 14	Ewe	r & l	11	11	16.54	8.00	8.54	100.00	16.54	fish 206-305mm
19 Feb 14	Flowerdale	sweep	18	2	0.11	0.05	0.05	11.11	0.99	fish of 218mm-345mm
12 Jun 14	Flowerdale	sweep	11	3	0.45	0.27	0.18	27.27	1.65	mostly wee things (<200mm)
28 Jun 14	Flowerdale	sweep	5	0	0.00	0.00	0.00	0.00	0.00	all <200mm
10 Jul 14	Flowerdale	sweep	5	0	0	0	0	0	0.00	all <160mm
15 Aug 14	Flowerdale	sweep	3	2	6.33	2.33	4	66.67	9.50	238mm, 245mm, 250mm
24-Sep-14	Flowerdale	sweep	5	5	9.60	1.20	8.40	100.00	9.60	finnock (260-315mm) & 480mm fem.

The two years provided contrasting results. The numbers of sea trout caught at all three MIAP sweep netting sites and in the Dundonnell fyke were higher in 2013 than in 2014 despite similar levels of fishing effort. Lice levels were higher in 2013 than in 2014 especially at Kanaird and Dundonnell.

This highlights one of the challenges with our sampling programme. When levels of lice infection are high, catching larger samples of sea trout in estuaries in June and early July is relatively easy: infected sea trout return-early to freshwater where they gather together. However, when lice infection levels are lower, sea trout disperse more widely within coastal waters. When parasite numbers are low during the peak feeding period in June and early July, it can be difficult to find places where sufficient numbers of fish have gathered together for a large sample to be caught.

The following section provides some additional information for the main sampling areas.

Kanaird estuary

Fish were caught by the sweep netting team in tidal pools of the river as the water levels dropped. In 2013, a combined total of 52 sea trout were caught on 11th and 27th June. Sea trout in their second or subsequent sea summer were caught on both occasions. 17 fish were 260mm or longer (up to 530mm). On 11th June the most heavily infested sea trout carried 117 lice and four other fish carried over 30 lice. On 27th June, 9 fish carried 30 or more lice, the most heavily infested a fish of 218mm with 110 lice.

In 2014, sweep netting expeditions on 10th June and 14th July caught a combined total of 29 sea trout. All the fish on both occasions were small sea trout of less than 260mm. Fish were particularly small on 16th June (120mm – 198mm) in length and only one louse was seen. By 14th July the average size of the fish was over 200mm; however lice levels had also risen and 10 fish carried more than 20 lice; the most heavily infected fish carried 109 lice.

The nearest salmon farm to this site is Ardmail operated by Wester Ross Fisheries which was stocked in both years.

Dundonnell estuary

Every year since 1997, a fyke net fish trap has been set at the tail of the sea pool of the Dundonnell River in June to intercept early-returning sea trout if they are present. In both 2013 & 2014, the trap fished for at least 12 days and nights during the week (except on Sundays) in June, and for variable amount of time in July. To learn more about sea trout in the area in 2014, two sweep netting expeditions took place nearby at the head of Little Loch Broom, following an initial sweep in March 2013 (reported in WRFT Review 2013).

Results for the two years could hardly have been more contrasting. In June 2013, 62 sea trout were caught in the fyke net in the estuary. Infected fish carried an average of 159 sea lice; two fish each carried an estimated 500 lice. These were the most heavily louse infested fish seen within the WRFT area in recent years; the sample demonstrated a severe sea louse epizootic.

Lice levels remained very high on fish sampled in July 2013. Over 90% of the lice were small copepodid or chalimus stage, indicative of recent infection. Although a majority of sea trout were small post-smolts of less than 250mm, 20 larger trout of up to 530mm were caught. All but two of the larger trout had dorsal fin damage associated with louse infection.

In contrast, in 2014, the fyke net caught only 3 sea trout in June despite fishing effectively for over two weeks. Only one of these fish carried a louse (a pre-adult louse). A further 10 fish were caught in July, carrying an average of 2.9 lice. Several of these fish were fat with condition factors of over 1.25, demonstrating good feeding in nearby waters.

In 2014, to supplement fyke net samples, sweep netting expeditions took place at the head of Little Loch Broom at low tide on 17th June and 15th July. In total 12 sea trout were caught. On 15th July, one of the trout carried 164 lice; of the 9 other sea trout in the sample, only one fish had more than 10 lice.

The salmon farm at Ardessie (operated by Wester Ross Fisheries) is located within 5km of the sea trout sampling sites. In 2013, cages were stocked with salmon in the 2nd year of the production cycle. In 2014, for the first time in five years, the farm remained unstocked.

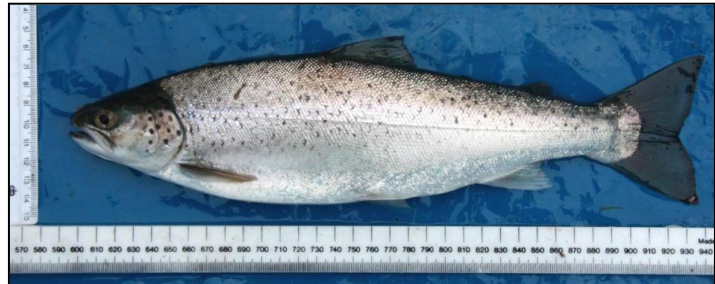
Loch Ewe: Boor Bay and the River Ewe

Samples of sea trout were taken at Boor Bay at high spring tides (when the net is less likely to snag large boulders) using a sweep net set from a boat and pulled up on to the cobble beach. The site is about 1km from the mouth of the River Ewe. Water salinity tends to be closer to fully marine than at the Kanaird or Flowerdale sites, unless the wind is from the east or north when the layer of freshwater above the saltwater can be 30cm or more in thickness. To supplement samples from Boor, samples of sea trout were taken using rod and line from the sea pool of the River Ewe in both years.

In 2013, samples were taken at Boor Bay on 10th, 21st and 25th June. Altogether 37 sea trout were caught, all except 4 of which were less than 260mm. In contrast to Dundonnell and Kanaird, very few lice were seen; the lousiest fish was the biggest sea trout – a fish of 312mm which carried 10 lice on 25th June. However lice levels were much higher on rod caught sea trout taken in the River Ewe nearby on 8th July; all 4 fish carried over 50 lice. On 23rd July, 10 finnock (224mm-249mm) were taken in the River Ewe, 2 of which carried more than 50 lice. These fish had an average condition factor of 1.08.

In 2014, samples were taken at Boor Bay on 13th June, 27th June and 11th July. Only 9 sea trout were caught. However, in contrast to 2013, they included 6 fish of over 350mm larger sea trout in good condition. These fish carried an average of less than 10 lice; and the majority of the lice were pre-adult and adult lice. Five of the fish had condition factors of 1.24 or over. However, on 8th July, 11 finnock (206mm-305mm) were taken in the River Ewe. One of the fish carried 62 lice; another carried 25; others were less than 20. There were slightly more preadult and adult lice than chalimus stage lice on the fish in the sample; suggesting that fish had picked up lice over a period of several weeks.

Trout of condition factor 1.45 from Boor, 11th July 2014.



The sweep netting team with a trout of 525mm at Boor Bay on 27 June 2014. We had three other relatively big sea trout that day! The fish had been feeding; Ben is pointing to a small coalfish regurgitated by the sea trout which Peter is holding.

The Isle Ewe salmon farm is located 8km from the mouth of the River Ewe and operated by Marine Harvest. In 2013, the farm was approaching the end of its 16 month production cycle. In 2014, the farm was within the first six months of the following production cycle.

Loch Gairloch, Flowerdale Bay

Samples of sea trout were taken in the estuary of the Flowerdale burn using a sweep net. The net is set as the tide goes out; water is brackish. If we are successful in catching sea trout, volunteer helpers are offered a choice of soup or ice cream from the Gairloch Pantry nearby (sometimes a bacon roll if I'm feeling particularly generous!).

In 2013, samples were taken on 7th June, 8th July and 19th September. All but three of the 43 fish taken in June and July were small post-smolts of less than 200mm; lice levels were very low. Fish were much larger in the September sample which included 6 trout of over 350mm: mature fish. Two of these fish had over 50 lice; and all but one of the larger fish had damaged dorsal fins associated with earlier louse infection.

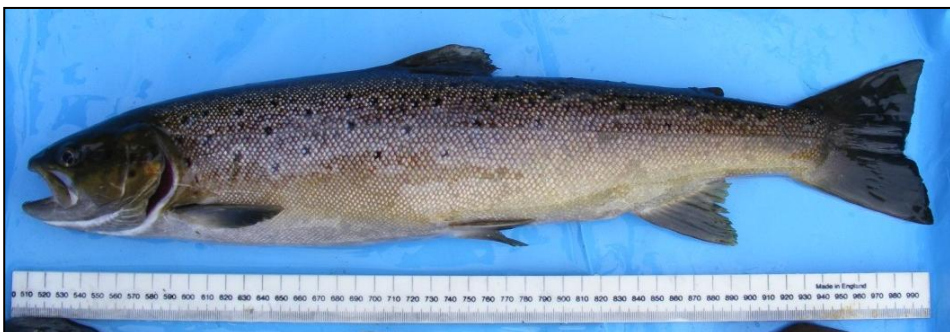
In 2014, samples were taken on 19th February; 12th & 28th June, 10th July, 15th August and 24th September. The February sweep comprised mainly of overwintering 'finnock'; with very few lice. In June, the catch comprised of small post-smolt sea trout with very few lice. The August sample, taken just after a big spate on 11th Aug which altered the channel configuration in the estuary, comprised just three finnock carrying low numbers of lice.

On 24th September 2014, the lousiest fish was a 270mm mm finnock which carried 21 lice. A large female sea trout in the same sample was recognised as a fish previously captured in September 2013 (*see below*). During the intervening 12 months, she gained 12cm in length and put on an estimated 500g in weight: good growth, given that she had been in spawning condition in 2013.

The nearest farms to the Loch Gairloch site are in Loch Torridon, 24km away.



Mature female sea trout fish 19th September 2013, 365mm, 476g.



Mature female sea trout (same fish as above, recognised by spot pattern!) 24th September 2014, 480mm, estimated weight ~1000g.

3.3 Discussion

Dundonnell sea trout and lice levels on nearby salmon farms

In June and early July 2013, sea trout sampled at Kanaird and particularly at Dundonnell carried very high numbers of lice. The large sample of post-smolts at Dundonnell carried an average of 169 lice. At Dundonnell, over 95% of the lice were small attached stage copepodid and chalimus lice indicative of recent infection. In contrast, the average lice count for the 13 sea trout taken in the Dundonnell fyke net in June and July 2014 was 2.9 lice.

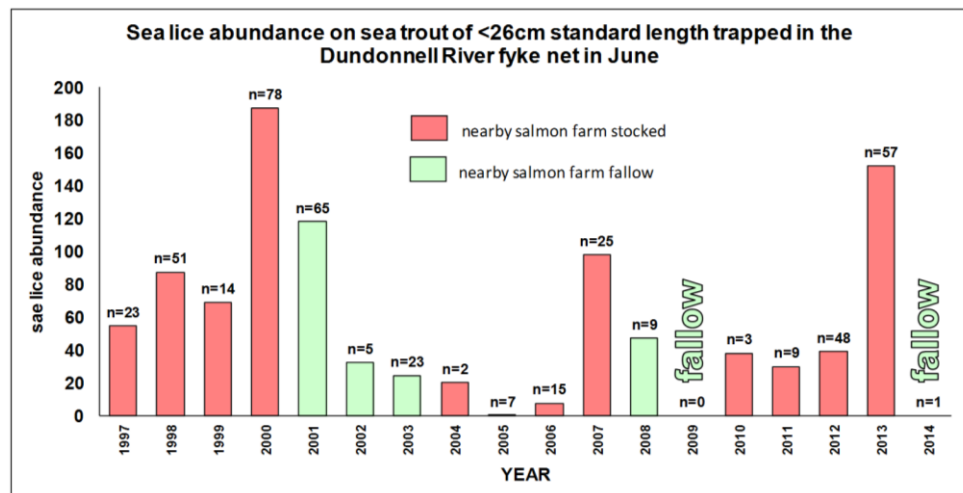
*Part of a sea trout carrying an estimated 500 chalimus lice, taken in the Dundonnell fyke net in July 2013.
Photo by Alasdair MacDonald.*



Why were sea louse levels so different between the two years at Dundonnell?

Figure 3.1 shows how lice levels have varied on small sea trout sampled in the Dundonnell River in June since 1997, in relation to farmed salmon production at the nearby Ardesie salmon farm.

Figure 3.1 sea lice abundance on small sea trout of less than 26cm sampled in the Dundonnell River fyke net in June, in relation to salmon production at the nearby farm.



The most obvious difference between the years was that in 2013, the nearby Ardesie salmon farm was stocked with salmon; and in 2014 the farm was fallow. Not only was the farm stocked with salmon, reported lice figures indicate that during the months prior to the sampling period, average adult female sea lice levels were several times the Scottish Salmon Producer’s Organisation’s Code of Good Practice [CoGP] treatment threshold level of 0.5 average adult female lice per fish. Regional sea louse figures for the sea areas around the WRFT area are published by the Scottish Salmon Producers Organisation⁴ and are shown in Table 3.2.

⁴ SSPO fish health reports <http://scottishsalmon.co.uk/tag/fish-health-management/>

Table 3.2 Reported adult female lice average values for farmed fish in sea areas around the WRFT area in 2013 and 2014. The Code of Good Practice sea louse treatment threshold is 0.5 lice per fish for months February to June.

	Kennart to Gruinard (WRF & SSF farms in Loch Broom, Little Loch Broom & Summer Isles)	Ewe (MH Isle of Ewe farm)	Badachro to Applecross (MH and SSC farms in Loch Torridon)	Kishorn & Carron (SSF & SSC farms in Loch Kishorn and Loch Carron)	Loch Loch and Croe (MH farms in Loch Alsh and Loch Duich)	Skye & Small Isles North (MH, SSC farms to the east of the isle of Skye)
Jan-13	4.19	0.00	0.92	0.00	F	0.07
Feb-13	4.61	0.00	0.57	0.00	F	0.16
Mar-13	4.57	0.00	0.31	0.00	0.00	0.01
Apr-13	2.27	0.00	0.24	0.00	0.00	0.02
May-13	2.56	0.00	0.61	0.00	0.00	0.02
Jun-13	2.09	0.01	0.70	0.00	0.00	0.02
Jul-13	3.13	0.04	0.92	0.01	0.01	0.04
Aug-13	4.80	F	2.24	0.01	0.01	0.20
Sep-13	9.26	F	12.10	0.18	0.16	0.59
Oct-13	10.27	F	5.18	0.43	0.25	1.02
Nov-13	4.87	F	12.60	0.99	0.78	1.44
Dec-13	5.11	F	F	0.97	1.58	1.11
Jan-14	2.76	0.00	F	2.86	0.96	1.68
Feb-14	2.22	0.00	0.00	2.09	1.03	2.17
Mar-14	1.50	0.00	0.00	0.45	1.21	3.15
Apr-14	1.15	0.00	0.00	F	1.74	2.33
May-14	0.74	0.00	0.01	F	3.39	5.35
Jun-14	0.88	0.00	0.08	F	7.10	7.95
Jul-14	0.65	0.00	0.04	F	11.94	7.73
Aug-14	1.39	0.00	0.32	0.00	17.99	14.26
Sep-14	1.81	0.02	0.97	0.00	41.70	F

These tables show how sea louse levels on farmed salmon were too high within the Two Brooms ('Kennart to Gruinard') and in the Loch Torridon areas in 2013. In 2014, lice levels were lower in both areas, however they were still above CoGP treatment threshold levels within the Two Brooms area and were very high on farms in the south of the WRFT area and around the Isle of Skye during the summer.

One problem with these figures, especially for interpretation of infection pressure for *wild* fish in nearby waters, is that they take no account of the numbers of farmed fish within respective areas. To provide a more useful (though still inadequate) index of sea louse infection pressure, adult female louse averages were multiplied by on-farm salmon biomass figures reported by the Scottish Government⁵. These figures are shown in Tables 3.3, 3.4 and 3.5 for sea areas around the WRASFB area.

A larger trout taken in the River Kanaird estuary by rod and line in July 2013. Note the red raw louse-damaged dorsal fin (photo by Iain Muir).



⁵ Respective reported month by month on-farm biomass figures can be found via links at <http://aquaculture.scotland.gov.uk/>

Tables 3.3, 3.4 and 3.5 Monthly sea lice indices for salmon farms in the Two Brooms ('Kennart to Gruinard'); Loch Ewe; and Loch Torridon ('Badachro to Applecross') production areas for 2013 – 2014, using published SSPO and Scottish Government figures. Biomass figures are in tonnes.

	Salmon farm							Farm salmon biomass	Adult female louse average	Two Brooms sea lice index
	Tanera 1	Tanera 2	Fada 1	Kanaird 2	Corry	Ardessie A	Ardessie B			
<i>consented</i>	625	625	600	1050	1050	262	400	4612		
Jan-13	620	621	421	92	719	0	94	2567	4.19	10756
Feb-13	614	624	0	117	701	0	25	2081	4.61	9593
Mar-13	538	569	0	134	654	0	0	1895	4.57	8660
Apr-13	471	573	0	181	587	144	215	2171	2.27	4928
May-13	366	189	0	287	154	146	215	1357	2.56	3474
Jun-13	310	103	0	352	14	137	217	1133	2.09	2368
Jul-13	0	0	0	382	423	154	137	1096	3.13	3430
Aug-13	0	0	0	0	493	152	67	712	4.8	3418
Sep-13	8	8	0	0	568	140	0	724	9.26	6704
Oct-13	10	43	0	30	574	113	0	770	10.27	7908
Nov-13	12	47	0	53	404	82	0	598	4.87	2912
Dec-13	20	71	0	78	333	54	0	556	5.11	2841
Jan-14	34	117	0	96	187	0	0	434	2.76	1198
Feb-14	45	157	0	122	191	0	0	515	2.22	1143
Mar-14	114	122	0	146	208	0	0	590	1.5	885
Apr-14	139	153	0	195	211	0	0	698	1.15	803
May-14	196	199	0	277	210	0	0	882	0.74	653
Jun-14	255	248	0	398	205	0	0	1106	0.88	973

	Isle of Ewe salmon farm	Adult female louse average	Loch Ewe sea lice index	Salmon farm					Farm salmon biomass	Adult female louse average	Loch Torridon sea lice index
				Camas an Eilean	Kenmore	Aird	Sgeir Dughall	Camus an Leim			
<i>consented</i>	1369			250	410	1375	2019	2500	6554		
Jan-13	1257	0.00	0	229	299	299	0	2179	3006	0.92	2766
Feb-13	1322	0.00	0	229	299	773	1029	2270	4600	0.57	2622
Mar-13	1265	0.00	0	0	0	870	1204	2350	4424	0.31	1371
Apr-13	1256	0.00	0	0	0	999	1400	2103	4502	0.24	1080
May-13	1116	0.00	0	0	277	886	1367	2100	4630	0.61	2824
Jun-13	852	0.01	9	0	324	1010	1561	1569	4464	0.7	3125
Jul-13	384	0.04	15	0	355	1143	1726	1634	4858	0.92	4469
Aug-13	0	F	0	0	280	885	1550	1585	4300	2.24	9632
Sep-13	0	F	0	0	280	581	939	1089	2889	12.1	34957
Oct-13	0	F	0	0	0	482	37	505	1024	5.18	5304
Nov-13	0	F	0	0	0	482	0	0	482	12.6	6073
Dec-13	69	F	0	0	0	0	0	0	0	F	0
Jan-14	88	0.00	0	0	0	0	0	0	0	F	0
Feb-14	131	0.00	0	0	0	56	20	58	134	0	0
Mar-14	173	0.00	0	0	0	65	78	79	222	0	0
Apr-14	217	0.00	0	0	0	106	119	131	356	0	0
May-14	272	0.00	0	0	0	172	190	192	554	0.01	6
Jun-14	345	0.00	0	0	0	227	276	238	741	0.08	59

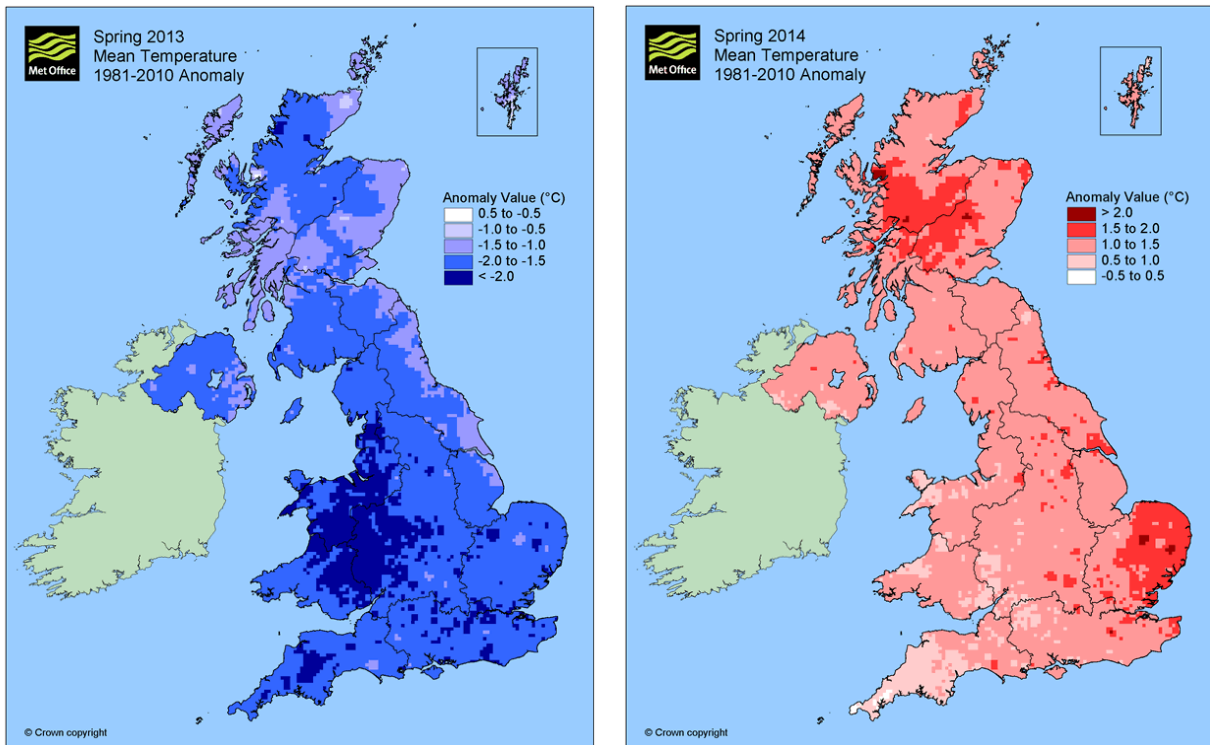
For the Two Brooms area, sea louse indices were five to ten times higher in 2013 than in 2014. Note that lice levels remained low throughout the period at the Isle of Ewe farm where Marine Harvest operated a 16 month production cycle with an extended fallow period following the production cycle.

Estimates of sea louse *populations* for respective sea areas would be more useful than figures for adult female louse averages [per farm fish] to foster clearer understanding of relationships between on-farm sea louse populations, infection pressures for wild sea trout and salmon, and management needs. Minimum estimates of actual adult female louse populations for respective areas and months can be made multiplying respective sea lice index figures by 500, based on an assumption that the average weight of farm fish is no more than 2kg (i.e. not less than 500 fish per tonne farm salmon biomass).

Sea temperatures and food availability

For Wester Ross, mean air temperatures during the spring of 2014 were on average about 3C warmer than in 2013, as shown in Figure 3.2.

Figure 3.2 Met office mean temperature anomaly maps for the UK. These and similar maps can be found on the Met Office website⁶



Corresponding differences in sea temperatures may have affected the availability of food for sea trout and salmon smolts as they headed for the sea in both years.

In June 2013, many thousands of dead sandeels were washed up on beaches around Guinard Bay; possibly because of a toxic algal bloom and / or delay in zooplankton bloom. However, later in the summer of both years, there were many live sprats and sandeels in sea lochs around Wester Ross, and shoals of mackerel chasing them.

Finnock and assorted sprats and sandeels caught in the sweep net at the head of Loch Broom on 19th August 2013.



⁶ Met office actual and anomaly maps for the UK <http://www.metoffice.gov.uk/climate/uk/summaries/anomacts>

3.4 Summary and conclusions

- The average numbers of sea lice on sea trout sampled by WRFT in 2013, particularly within the ‘Two Brooms’ area, were much higher in 2013 than in 2014.
- In 2013, a severe sea louse epizootic was recorded at Dundonnell where the sample of 62 early-returned sea trout carried an average lice burden in excess of 150 lice per fish.
- This epizootic closely correlates with very high on-farm sea louse burdens reported for salmon farms within the local area in 2013. Active salmon farms in the area with fish in the second year of the production cycle included the Ardesie farms, within 5km of the Dundonnell river mouth.
- In contrast, in 2014 the number of early-returned sea trout entering the Dundonnell trap was much lower than in 2013. Nearly all the sea trout sampled using a sweep net in Little Loch Broom nearby carried few lice. In 2014, the Ardesie salmon farms were fallow.
- Sea louse data published on the SSPO website demonstrates that none of the salmon farming companies which operate in the WRFT area have been able to keep on-farm sea louse levels to the treatment threshold levels for sea lice that are recommended within the industry’s own code of good practice [CoGP] guidance.
- Only at Marine Harvest’s Loch Ewe salmon farm, which operated an 18 month (rather than 24 month) production cycle including a 5 month fallow period, were lice levels kept to within CoGP threshold levels throughout the production cycle.
- The failure of other farming areas to adequately control sea lice may relate to increasing resistance of sea lice to pesticides and / or other health issues affecting the success of sea louse treatments, including amoebic gill disease (AGD) for farm fish.
- Based on the foregoing, we conclude that open cage salmon farming has become increasingly incompatible with the recovery of sea trout fisheries, and may also now be affecting wild salmon fisheries in some rivers (see Part 2).

Not all west coast sea trout fisheries have collapsed to the same extent as those in Wester Ross. The sea trout fisheries of northwest Harris and west South Uist continue to provide good fishing for anglers; they are located furthest away from concentrations of active salmon farms. In 2014, over 1000 sea trout were caught in the Outer Hebrides, with several in the 7lb – 10lb class⁷.

For sea trout stocks around Wester Ross to recover, farm salmon producers in nearby waters need to control on-farm sea lice populations to much lower levels than they achieved during the period 2013 – 2014.

Sweep netting team: Louis Neate, Farquhar Renwick, Jim Buchanan, Jamie Renwick and Alasdair MacDonald by Loch Broom, 19th August 2013.



⁷ See Fish Hebrides <http://www.fishpal.com/Scotland/Hebrides/FishOfTheMonth.asp?dom=Hebrides>

Part 4 Report by Wester Ross Area Salmon Fishery Board

supported by the Association of Salmon Fishery Boards [ASFB] and Fish Legal

by Peter Jarosz (Clerk to WRASFB)



The Wester Ross Area Salmon Fishery Board (WRASFB) has worked in close co-operation with Wester Ross Fisheries Trust (WRFT) over the past twelve months in two distinct areas of work:

- **Monitoring of fisheries.** Data collection by WRFT (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.** WRFT has provided background information for responses to planning applications for both fish farm sites and for run of the river hydro schemes.

The WRASFB has responded to planning applications for run of the river hydro schemes on seven rivers within the Board's area over the past 18 months: on the Kanaird, Leckmelm, Dundonnell, Badachro, Grudie, Bruachaig and Coulin. Certain recommendations were made by the Board (following advice from the WRFT biologist) on a number of these schemes and all the recommendations were accepted by the applicants.

As far as aquaculture planning applications are concerned, the past twelve months has seen applications that cover the full spectrum of the planning processes. Planning applications to Highland Council (HC)⁸ have been made for sites at Kanaird (by Loch Broom), Camas an Leim and Sgeir Dughall (both in Loch Torridon) to which the Board responded with robust reasons for the 'precautionary principle' being adhered to when consideration of these applications were made by the HC Planning Department.

These initial applications resulted in ten year terms being attached to the planning consents. For the Sgeir Dughall application submitted by the Scottish Salmon Company [SSC]⁹, the Highland Council issued a decision notice granting planning permission with a condition: *'Condition 5: Planning permission shall be . . . limited to a period of ten years from the date of the decision notice [23 March 2012]. Reason: To allow alternatives to controlling sea lice to be provided within that time in recognition of the ongoing concerns with regard to the impacts on wild fisheries, whilst allowing the operator time to find alternative culture techniques for the site, for example closed containment.'* SSC appealed the '10 year' planning condition to Highland Council. Following an objection from WRASFB, their appeal was withdrawn.

The new farm was developed in 2013, and production commenced with on-farm salmon biomass reaching a peak of 1723 tonnes in July 2013 (see Part 3). However, by the end of the summer that year, average sea lice levels on salmon farms in Loch Torridon greatly exceeded CoGP threshold levels for sea louse treatment (*ibid*).

⁸ Further information on planning applications can be found on the Highland Council's e-planning website. <http://wam.highland.gov.uk/wam/>

⁹ Documents relating to the Sgeir Dughall planning application (including WRASFB response) can be found via links at: <http://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=summary&keyVal=LUV131IH0A000>


In May 2014, an S42 Planning Application, with a request for the ten year condition to be removed, was made by the Scottish Salmon Company for their Sgeir Dughall site¹⁰. After taking legal advice, the Board submitted a similar robust and concise response to this application which was refused permission by the HC Planning committee. The Scottish Salmon Company appealed this decision to the Directorate for Planning and Environmental Appeals (DPEA) and, yet again, the Board submitted responses that were both robust and concise¹¹. In January 2015 the Scottish Government refused the appeal, and refused to grant planning permission to develop the site without compliance with condition 5 of the original Highland Council planning permission.

As well as these three planning processes, a number of Audit & Review¹² processes have also been responded to by WRASFB. These include aquaculture sites at Corry, Tanera 1 & 2, Fada (all in Loch Broom – Summer Isles area), and Kishorn. The Audit & Review process allows all operators of marine fish farms, that were consented by the Crown Estate prior to 1st April 2007 and do not already have planning permission, to make an application (under the Town and Country Planning (Marine Fish Farming) (Scotland) Order 2007) for permanent planning consent through the Scottish Government Audit and Review process. In all these cases the Board's responses were both robust and concise. To date the Tanera 1 & 2 sites remain the only ones not yet decided by this process.

Within the Board's area there are now four marine fish farm sites that each has a ten year term as their conditional planning consent. The ten year terms are specifically in place for the assessment of what impacts fish farms may have on wild salmonids in their vicinity. The Board has been constructing a viable monitoring process that will, effectively, provide the data for valid assessments to be made. To this end the Board has been consulting with those aquaculture companies whose sites have ten year terms as part of their planning consent. Dialogue with these aquaculture companies is positive and progressive and, with the help of additional finance, the Board would wish to implement the commencement of the monitoring process at all four sites before the end of 2015.

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

Wester Ross Area Salmon Fishery Board



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The Wester Ross Salmon Fishery Board encompasses an area of Wester Ross from the River Kanaid in the north to the Applecross river in the south. There are some twenty three catchments in an area whose coast line extends to four hundred and ninety nine kilometres.

District Salmon Fishery Boards

District Salmon Fishery Boards (DSFBs) have their origin in the salmon fisheries acts introduced in the mid-1800s. Their constitution was changed in 1986 with the passing of the 1986 Salmon Act [now consolidated into the Salmon & Freshwater Fisheries (Consolidation) (Scotland) Act 2003].

Role of DSFBs

Salmon fishing rights in Scotland are private heritable titles that are registered separately from land. As such these titles can be bought and sold like any other property. In Scotland, the cost of the local administration, protection and improvement of the fisheries is privately financed by the proprietors.

The district boards finance their work by levying a rate on the salmon fishery owners in the district. Elected representatives of those owners provide the core of the membership of the Board. However, since 1986, the boards are required also to include representatives of salmon anglers and salmon netmen in the district.

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¹⁰ Documents relating to the Sgeir Dughall Section 42 planning application (regarding Condition 5) can be found at: <http://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=summary&keyVal=N5CJKKIH7R000>

¹¹ Documents relating to the Sgeir Dughall Section 42 appeal to the Scottish Government can be found at: <http://www.dpea.scotland.gov.uk/CaseDetails.aspx?id=115376&T=20>

¹² Further information about the Scottish Government's Aquaculture Audit and Review process can be found at <http://www.scotland.gov.uk/Topics/marine/Fish-Shellfish/18716/fish-farm/fish-farm>

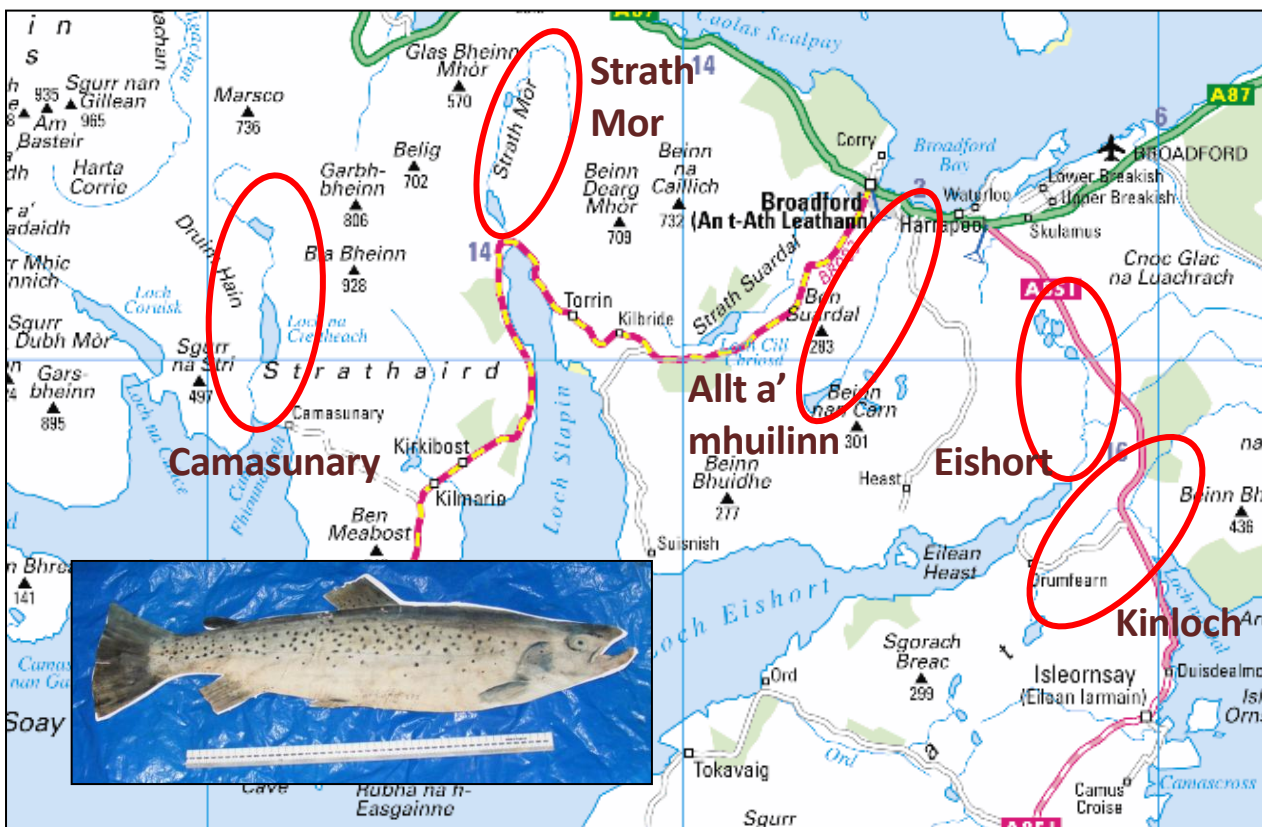
Part 5 Surveys on Skye

WRFT provided field work support for the Skye Fisheries Trust in both 2013 and 2014. In 2013, surveys of habitat and fish populations were carried out on the Kinloch River, the Eishort River and the Camasunary River in the south of Skye. For each river system, the surveys aimed to find out about the area of habitat accessible to salmon and sea trout, to assess the status of fish populations, and to identify constraints to fish production. The following section summaries some of this work; more detailed reports are available from WRFT or Skye FT.

Both juvenile salmon and trout were recorded in the **Kinloch River** in August 2013. However, the number of juvenile salmon was so low that only a few occasional stray fish were likely to have spawned within the river in recent years. For brown trout and sea trout, the system has a large area of suitable habitat for juvenile trout production as far upstream as waterfalls near Drumfearn. At the time of the survey, forestry operations had caused sedimentation of the river. However, the removal of over-shading conifers from river banks should, in time, improve habitat for juvenile salmon and trout production.

The **Eishort River** was initially surveyed in August 2013. This river flows for about 3km from the Black Lochs (Lochain Dubha) by the main Broadford - Armadale road, to the estuary at the head of Loch Eishort. Sea trout have been caught as far upstream as the Black Lochs; and in pools above the road. There are places where salmon could spawn at the tail of deep pools and extensive areas of suitable habitat for juvenile salmon. However no juvenile salmon were found. Several opportunities were identified for restoring and improving habitat for juvenile fish production within the system, many of which could be undertaken by local enthusiasts.

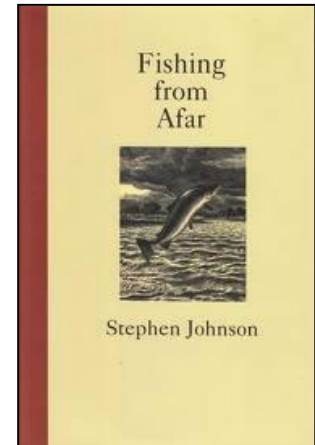
Areas where fish survey work was carried out in 2013 and 2014 by WRFT. Inset, life-size replica of a 'moonie' caught (and painted) by Alan Johnson in Loch Coruisk in 1975 (the ruler is 50cm long) . . .



Sea trout of Camasunary

In October 2013 I visited Camasunary with fisheries owner Alan Johnson and family, and Ally MacAskill, the John Muir Trust's Strathaird property manager, to learn more about its fish populations.

The remarkable sea trout fisheries of the area were described by Stephen Johnson during his time in German prison camps after his mosquito fighter bomber was shot down in December 1942. Stephen's notes were published in 1947 and 'Fishing from Afar' (republished in 2004) remains an angling classic and is one of my favourite fishing books.



With special permission from the Scottish Government and the Skye DFSB, our surveys focussed on recording both juvenile and adult fish. Juvenile trout were found mostly in the nursery stream above Loch an Athain; salmon parr were found in the main river between and below the lochs.

From Loch na Creitheach (*right*), samples of older trout were taken using rod and line and a fyke net. Our catch of 12 trout included four mature male brown trout and six sea trout, the largest was a female sea trout of 348mm. Recent catch records suggest that trout of up to 3lb have been taken in recent years.



From trout fry to 'moonies'

In the past there were many larger fish. The Johnson family tradition is that any angler who catches a sea trout of 8lb or over should paint a life-size replica of the fish to be pasted on the wall inside the lodge. Until the 1980s, these big sea trout, called 'moonies' (after a ghillie had cursed one that got away) were caught at a rate of at least one per year. I measured and photographed 78 'moonies', caught between 1939 and 1983, each the product of a wildlife encounter as exciting and memorable as any other that one might hope for within a lifetime (my largest sea trout to date is a 4lb fish caught when I was just 16!).



For devoted followers of wild trout, Camasunary lodge is like a shrine: the 70 year artistic record on the walls of the lodge of Camasunary and Coruisk's fabulous sea trout provides a reminder of just how wonderful wild sea trout fishing can be.

(left) Alan Johnson and Peter Cunningham with a small sea trout from Loch na Creitheach.

Box 5.1 The spawning run: a seasonal glut for otter and fox

On 26 November 2013 Ally and I set off from the Sligachan Hotel to look for signs of salmon along the river bank. No fresh salmon redds were seen; and only one adult fish was encountered. We found signs that an otter had taken a female salmon; and that a fox had also patrolled the river bank, probably in search of the otter's left-overs! The following pictures tell part of the story; they show fresh footprints of otter and fox in the sand by the side of the river (*left*), an otter spraint site (*middle*), and an otter spraint containing salmon bones and a salmon egg (*right*).

**Protecting sea trout in the south Skye sea lochs**

'Fishing from Afar' describes an abundance of sea trout around Strathaird that has not been seen for several decades. Since the mid 1980s, sea trout have been subject to many pressures, including the collapse of inshore fish populations as a result of increased fishing pressure following the removal of the coastal 'three mile' exclusion zone for trawlers in 1984. For sea trout, infestations by parasitic sea lice associated with growth of the salmon farming industry have been a major cause of the collapse in stocks in the west of Scotland.

The future for Camasunary sea trout and those of other river systems within the South Skye sea lochs area (Loch Scavaig, Loch Slapin and Loch Eishort) is uncertain. The local community has objected strongly to recent planning applications for three huge (2000+ tonne biomass) new salmon farms¹³. If any of these farms are established, there is little prospect of a recovery in sea trout populations, given the salmon farming industry's continuing inability to control sea lice populations (see Part 3)¹⁴.

However, if the area can remain salmon farm free, and other issues are addressed, there is every prospect of sea trout populations making a comeback as the next nearest salmon farms (and major sources of larval sea lice) are 40km away.



¹³ Submissions in response to the proposed Eishort 2 salmon farm can be found on the Highland Council's e-planning website at <http://wam.highland.gov.uk/wam/applicationDetails.do?activeTab=summary&keyVal=N82XXJIH09K00>.

¹⁴ During the summer of 2013, some nearby salmon farming areas had sea lice levels many times higher than the industry's Code of Good Practice threshold levels for sea louse treatment. See <http://scottishsalmon.co.uk/tag/fish-health-management/>.

Predation and poaching

Sea trout are subject to other pressures around Skye. Populations of both the harbour seal and grey seal increased during the 1980s and 1990s in the west of Scotland. The grey seal population remains high; however the harbour seal population has more recently been declining around Scotland¹⁵.

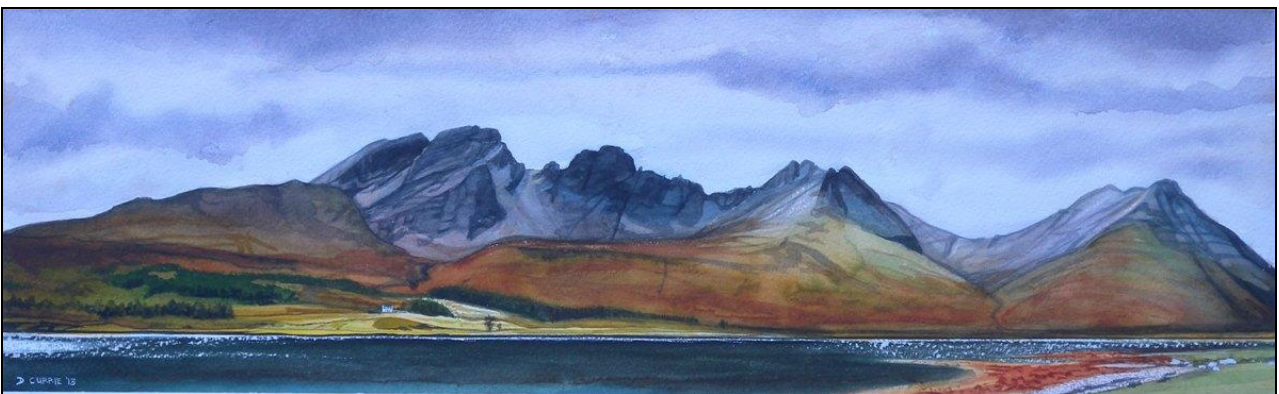
Poaching remains an issue of concern on Skye. When stocks of salmon and sea trout were prolific, losses to poachers had little impact on fish stocks. However, in recent years, the numbers of adult salmon and sea trout entering some of the rivers on Skye and neighbouring parts of the mainland have been barely adequate to produce the next generations of young fish.



This deer (left) was photographed shortly after crossing the Camasunary River near the sea pool on 15th October 2013. It had a monofilament gill net wrapped around its antlers. The following morning the deer was shot. In recent years, gill nets have also been recovered from other rivers in Skye.

Opportunities for a collaborative restoration programme?

Most anglers, including some of those on Skye, routinely practice 'catch and release' where sea trout and salmon are returned to enable them to spawn. A Skye-wide initiative is needed to promote conservation practices for sea trout and salmon, including school-based projects. The current generation of children growing up on the island are missing out on something their forefathers took for granted.



Blaven from Loch Slapin (watercolour by Duncan Currie¹⁶). During the summer of 2014, the Skye Fisheries Trust with support from many volunteers from the local community carried out a programme of sweep netting for sea trout in the sea loch here.

¹⁵ Information on seals in Scotland, see: <http://www.snh.gov.uk/about-scotlands-nature/species/mammals/marine-mammals/seals/>

¹⁶ Duncan is a keen trout fisherman and helped with surveys on Skye in 2013. His gallery is located in Broadford; see <http://www.duncancurrie.net/>

Part 6 Marine Protected Areas designated

On 24th July 2014, the Scottish Government designated two new Marine Protected Areas [MPA] within the coastal seas around Wester Ross¹⁷. The new MPAs are designed to contribute to an 'ecologically coherent network of protected areas' for marine species and habitats of nature conservation importance around Scotland. Both MPAs include areas of importance to wild salmon, sea trout and many other wild fish species.

The **Lochs Duich, Long and Alsh MPA** was designated following discovery of the world's largest flameshell beds. This MPA also aims to protect burrowed mud habitats. **The Wester Ross MPA** (referred to during the consultation stage as the possible Northwest Sea lochs and Summer Isles MPA) was designated to protect and recover areas of maerl and flameshell beds within a larger 'protected' area including Loch Ewe, Gruinard Bay, Loch Broom, Little Loch Broom and the area around the Summer Isles.

However following designation, there were no additional legal powers for the protection for any of the habitats for which the MPAs had been designated. The Scottish Government has plans to develop legally enforceable management measures during the period 2014-2016. A consultation for new 'fisheries measures' to protect sea bed habitats within respective MPAs is currently underway. Proposed restrictions on potentially damaging activities such as scallop dredging will only apply to areas where listed habitats such as maerl beds have been recorded; the precautionary principle is not being applied to areas which remain unsurveyed.

So there is a need to carry out further surveys as fast as possible to fully document the extent and diversity of sea bed habitats and associated wildlife within respective MPAs and in other coastal waters. Since designation, surveys led by the Scottish Wildlife Trust have located previously undocumented maerl beds in some parts of the new Wester Ross MPA. WRFT will continue to push for greater protection of marine wildlife and improved management of coastal fisheries to help recover important stocks of fish.

Some seabed habitats of importance to the ecology of the area may remain unprotected within the Wester Ross MPA. Maerl beds (left) are to be protected. However, vulnerable seagrass beds such as this one in Gruinard Bay (right) have not been included in the list of protected features. [photo credits: left, SNH; right, WRFT]



¹⁷ For more information about the new MPAs, please visit:
<http://www.scotland.gov.uk/Topics/marine/marine-environment/mpanetwork>

Part 7 Little Gruinard invertebrate study



Supported by Eilean Darach Estate

by Geoffrey Billier

Geoffrey Billier, a student of environmental quality and management (specialising in fisheries management) from Ecole Nationale Supérieure Agronomique de Toulouse 'ENSAT', describes (mostly) in his own words his internship with WRFT between February and May 2014.

This project involved studying the benthic macroinvertebrates on the Little Gruinard River to learn more about the river's biodiversity and the availability of food for juvenile salmon. One of the main purposes of the study was to provide baseline information on the aquatic invertebrates of the Little Gruinard River. This inventory provides information on the aquatic macroinvertebrate assemblage at the time of the study, and also a macroinvertebrates database for further analyses (e.g. assessment of water quality).

A project consisting of planting trees within the Little Gruinard River catchment area is planned for 2015. An aim of the tree planting project is to improve the quantity of nutrients in the system and therefore to increase the biodiversity and the productivity of the river. Such a project will affect the macroinvertebrates (composition, number, biodiversity . . .). In order, to assess the effects of this project on the macroinvertebrate communities and more generally on the river, analyses have to be carried out before and after the realisation of the project. My study is therefore the 'pre-study' before the achievement of the tree planting project¹⁸.

Kick net samples were taken from six sites along the river every two weeks from February 22nd to April 21st. On each occasion at each site, two samples were taken, one by the side of the river and one in deeper water.



In total, 6,212 individuals, belonging to 93 morphotaxa in 56 families, of 28 orders of aquatic insect were classified, mostly to genus and species level. Six species contributed 45 % to the total number of invertebrates: *Baetis* sp A & B (Ephemeroptera), *Amphinenua sulcicollis* (Plecoptera), *Hydropsyche* sp. (Trichoptera), *Leuctra hippopus* (Plecoptera), and *Chironomus* sp. (Diptera).

¹⁸ The summary here is taken from Geoffrey's report which can be found in full on WRFT website, via link at <http://www.wrft.org.uk/downloads/files.cfm?id=33>

Overall, the Little Gruinard River has high biodiversity. There was much difference between the sites in terms of diversity and taxon. Average macro-invertebrate density was estimated at 230 individuals / m². Higher abundance and taxon richness appeared to be associated with fast water.

The analysis of the Functional Feeding Group ratio reported that the Little Gruinard River was very heterotrophic depending mainly on allochthonous organic matter [e.g. leaves] from the riparian zone, as indicated by the dominance of shredders and collectors that use detritus as a food resource. The other ratios indicated that the river was healthy although the 'channel stability' might be improved. This confirms that the project of planting trees in the catchment area would be one of the best long-term measures to improve the channel stability, the diversity and therefore the productivity of the river.

Previous studies have recorded high densities of juvenile salmon in the Little Gruinard River, however, for their age they were mostly very small. Juvenile salmon are known to feed both on benthos and in the water column and particularly on the drift food.

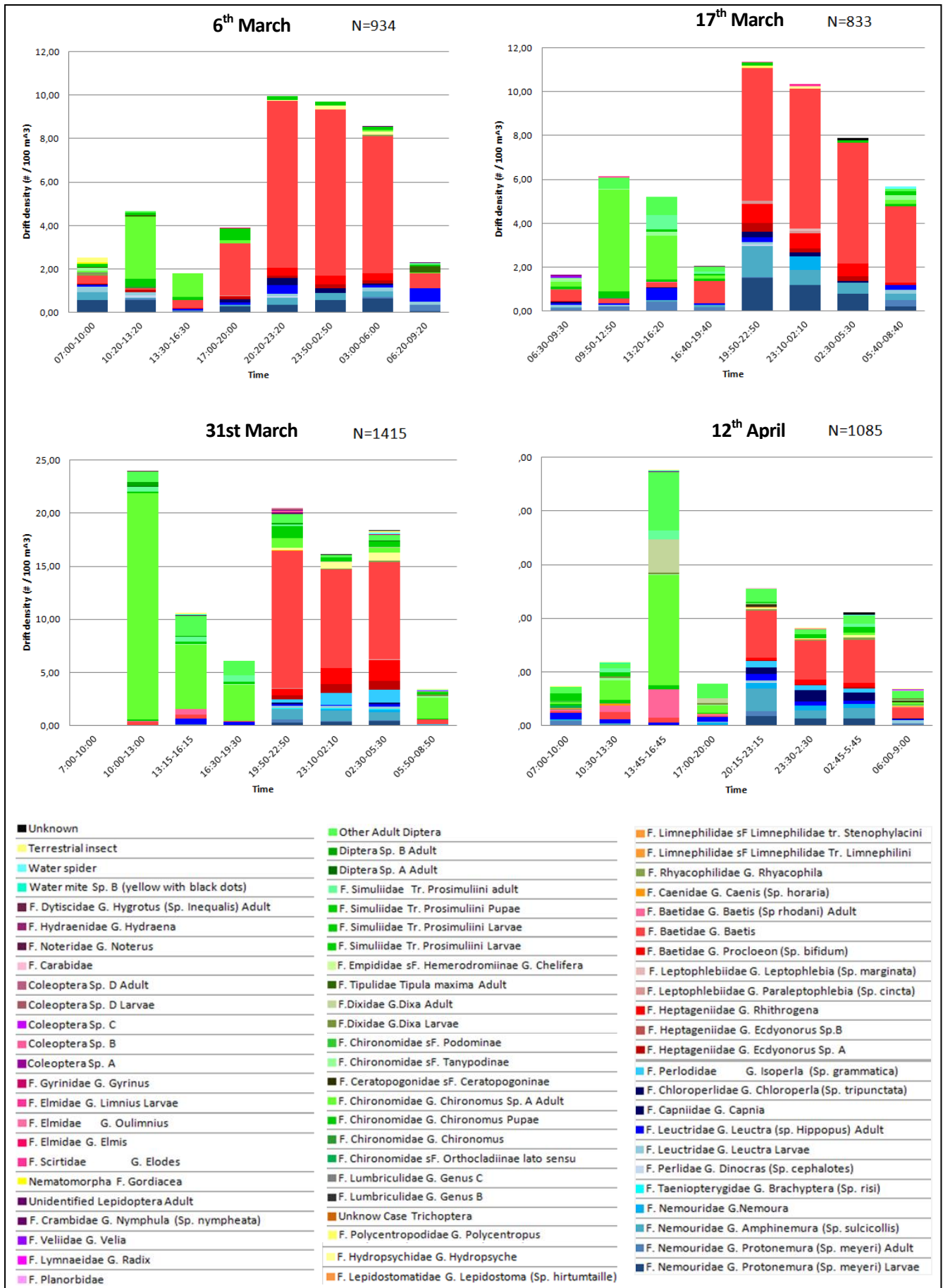
The movement and the dispersal of invertebrates from one area to another is a well known phenomenon which is called '**Invertebrate Drift**'. There are several explanations to the drift movements of invertebrates but they can be classified into two categories, passive drift and active drift. Some invertebrates may passively drift by accidentally being swept away by the current. Other invertebrates may drift 'actively' in search of suitable resources such as food and substratum, to escape from predators or to hatch and emerge, or to avoid unfavourable environmental conditions such as organic pollution.

To learn more about drift, samples were taken over a 26 hour period from nets set below the Garden Pool (*below*), every two weeks (4 times) from March 6th to April 12th (inclusive). During each sampling period, nets were collected every three hours; and invertebrates were analysed within 48 hours after the sampling.



Figure 7.1 shows the diversity of macroinvertebrate taxa and their density within the water column for each of the sampling periods. Overall, 4267 invertebrates were identified and 69 different species in the study of drift. *Baetis* spp. and *Chironomus* sp were by far the most abundant. 32 of the species were active behavioural drifters in the Little Gruinard River. It is a very good food supply for the juvenile salmon. Important differences were recorded during the day and the night in terms of species and numbers.

Figure 7.1 Drift density of the macroinvertebrate taxa in the Little Guinard River (note differences in drift density scales)



To learn about the diet of juvenile salmon, on 28th April samples of juvenile salmon were captured using electro-fishing equipment on 28th April, killed in anesthetic, and their stomach contents were analysed. Six fry, 6 parr and 5 smolts were taken at 6am (for the night diet), and 5 fry, 6 parr and 4 smolts at 6pm (for the day diet).



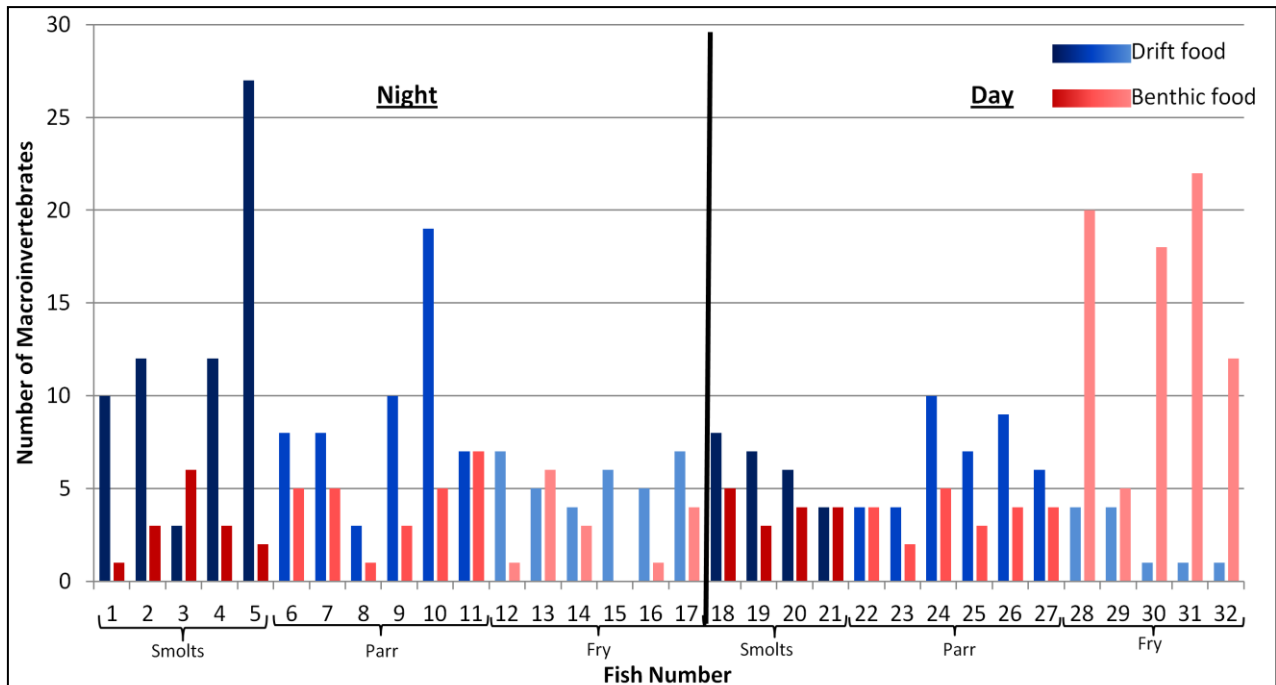
Diet composition for juvenile salmon was different according to the size of the fish and the day/night (Figure 7.2). Juvenile salmon were mainly selective both in terms of prey types and average prey sizes. Salmon smolts

were drift feeders, eating mostly during the night. Large-sized prey types were usually being preferred by the smolts. Salmon parr fed a little more at night and mostly on drift invertebrates. Finally, salmon fry were benthic feeders, feeding mostly during the day.



Overall, this study provides a sound background for future work.

Figure 7.2 Temporal feeding pattern of juvenile salmon: day vs. night. Compare smolts with fry . . .



Thank you to Eilean Darach Estate for permission to carry out this study, and to Brian and Carol Fraser, Stuart Allison and Peter Jarosz for support. The study was designed partly to fulfil an obligation to SNH following receipt of a grant for new equipment.

Part 8 Other work



8.1 Mink monitoring and control in Wester Ross

The Scottish Mink Initiative [SMI] aims to control non-native North American mink across the Scottish Highlands from Wester Ross to Aberdeenshire¹⁹. Mink threaten ground nesting birds, particularly on off-shore islands, and can eradicate water vole populations and damage juvenile fish populations.

In collaboration with a network of volunteers WRFT took on the role of co-ordinating the monitoring and control of mink within part of the SMI area extending from Loch Gairloch to Loch Broom (inclusive) in September 2013. Since then over 20 new volunteers signed up to provide active support for the project by adopting a tunnel or raft to record mink footprints or to help with trapping where mink were recorded.

Although footprint pads and tunnels have so far failed to record the presence of mink over the past year, traps were set following sightings of mink in several areas. During the period April 2014 – November 2014, mink were trapped and dispatched on Isle Ewe (1), at Mellon Charles (2), Aultbea (1), near Opinan (1), by Gruinard Bay (3) and by the River Broom (1). Other mink were seen but have not been caught near Slaggan (1), Laide (1), Little Gruinard inland (1), by Loch Broom (1), and hill lochs above Leckmelm (1).

In July 2014, SMI Mink Project Officer Ann-Marie MacMaster; RSPB Wester Ross & Skye Officer, Alison MacLennan; local SMI volunteer, Sue Pomeroy and Peter Cunningham visited **Gruinard Island** (*below*), where in 2013, several mink were caught. Common gull and oystercatcher chicks were seen on the raised beach spit opposite the mouth of the Gruinard River. However, there was no sign of the rabbits which were formerly numerous on the island; the vegetation had grown tall and rank. Thank you to Bill Whyte and Megan Henderson of Gruinard Estate for providing a ferry service!

Where sea birds nested: looking north from the cairn at the highest point on Gruinard Island, July 2014.



To prevent mink numbers from increasing, it is important that efforts continue to trap mink where they are present and maintain vigilance. Please contact WRFT at info@wrft.org.uk for further information.

¹⁹ The Scottish Mink Initiative website <http://www.scottishmink.org.uk/>

8.2 Invasive plants

Invasive non-native plants continue to spread within the WRFT area, to the detriment of native biodiversity and wildlife including plants and animals which live along the river banks of the area. Government agencies have allocated £100k's on attempting to clear *Rhododendron ponticum* from some areas, including, over the past year, an extensive area around Loch Torridon.

WRFT has a remit for addressing problems associated with invasive species, following development of a Biosecurity Plan in 2010²⁰. However we do not have the resources to challenge land owners, crofters and gardeners when they sometimes still plant invasive plants because of their 'hardiness' or for other reasons. Much more needs to be done to encourage local people to take practical action to remove non-native invasive plants from their land. A major challenge remains the lack of long-term strategic Government support for control programmes and for raising awareness within local communities.

Other NGOs have been active. The National Trust for Scotland has carried out much control work on *R. ponticum* with the local community around properties at Torridon and at Inverewe. However, the *R. ponticum* hedge along the main driveway at NTS Inverewe Gardens is not regarded as a problem; the WRFT biologist believes that some visitors may be misled into thinking that it is OK to plant *R. ponticum* as a shelter belt if it is allowed by NTS to grow in demonstration gardens.

Japanese knotweed is another invasive plant which has spread within several catchment areas. WRFT has supported local efforts within the River Broom catchment to address the problem, including a survey of the distribution and extent of knotweed stands within the catchment, ahead of grant applications in 2015 for funding to control the plant.

(right) NTS Conservation Officer, Rob Dewar by a Japanese knotweed stand on the banks of the River Broom, 8th September 2014.



Other INNS plants which are spreading within Wester Ross to the extent that future action will be needed to control them to protect productive land & / or wildlife, include:

Gaultheria mucronata; *Acaena* (two species); *Cotoneaster* sp or spp.; *Montrbretia* (*Crocasmia* x); Giant rhubarb (*Gunnera*); *Alchemilla mollis* (Lady's mantle); Pampas grass. Please don't encourage these plants to grow on your land!

(left) Giant hogweed growing by the side of the A832 in Glen Docherty in May, 2014. The plant was dispatched.

²⁰ Wester Ross Biosecurity Plan 2010-2015 <http://www.wrft.org.uk/downloads/files.cf?id=22>

8.3 Wild trout studies

During October 2013, we looked for brown trout and sea trout in spawning burns around Loch Maree. With special permission from the Scottish Government, fyke net traps were set in the Slattadale burn and Loch na Fideil burn. A trap was also set in the Taagan burn but was ineffective. In other burns, trout were sampled using electro-fishing equipment. Our aim was to learn more about the trout populations which spawn in respective burns; and to catch samples of trout from which Glasgow University post-graduate



student Martin Hughes (*left, holding trout*) could obtain eggs to learn more about ferox trout in Scotland as part of his research project²¹.

In previous years we have learned about the composition of adult trout in other spawning burns within the Loch Ewe catchment. In 2012 trout were sampled in a spawning burn flowing into Loch Sguod. Sea trout were outnumbered 5 to 1 by mature brown trout which had not been to sea (see WRFT Review, July 2013).

In 2013 efforts to catch adult trout were frustrated by mild weather and high flows. So our samples of trout were rather smaller than anticipated. The trout that we caught were non-migratory brown trout (which had not been to sea).

Like the trout in Loch Sguod, these results suggest that the trout populations which spawn in the burns around Loch Maree are also now dominated by non-migratory trout. Sea trout are known to still spawn with brown trout in the burns around Loch Coulin in the headwaters of the River Ewe system.

There is more work to do to find out about the occurrence of sea trout in other burns and indeed whether any sea trout spawn in some of the burns around Loch Maree. However, one conclusion is becoming inescapable: over recent years the trout which remain in freshwater have lived longer than those which have gone to sea.

For help with catching trout, thank you to Martin Hughes, Roddy Legge, Kevin McNeil, Ben Rushbrooke, Kyle McFarlane, Cory Jones, Oliver Hooker, Dr Jennifer Dodds and the SNH Field Station at Kinlochewe.



Loch Maree trout of 55.5cm, caught and released by Terry Jack, 16 July 2014.

²¹ Follow the progress of the ‘ferox project’ including young trout hatched from the trout eggs from Wester Ross at <https://www.facebook.com/feroxproject> .

Part 9 Education and awareness

The WRFT organised or supported several workshops and awareness raising days over the past 18 months in collaboration with other groups working in or visiting the Wester Ross area.



On 20th February, the Trust held a **Sea trout and Sea lice Workshop** at Aultbea in collaboration with the Atlantic Salmon Trust on²² following the 1st sweep net session of the year at Flowerdale the day before (*left*). Speakers at the workshop included Prof Mark Costello (University of Auckland), Prof Ken Whelan (Burrishoole, Ireland), Tony Andrews and Ivor Llewelyn (Atlantic Salmon Trust), and Keith Dunbar (Achiltibuie).

The **Highland Seashore Project**²³ held a 'roadshow' day by the campsite at Laide in September 2013 (*right*); and festival events at Dundonnell, Gairloch and Poolewe in October 2014 with activities to learn about marine ecology on the shore, and indoors, including a taxonomy workshop and a even seashore ceilidh!



At the annual **Laide Wood Aquatic Beasties Day** on 17th July 2014 (*left*), we were joined by artist Robin Ade (who painted the Loch Maree Wildlife Poster in 2003) and family. We found a wonderful variety of bugs, beetles, dragonflies, amphibians, small trout, sticklebacks and even a few rather slippery eels.

Conditions in November 2014 were ideal for **surveying spawning areas for adult salmon** (*right*). WRFT provided direction for a **video team** recording underwater footage of spawning salmon. The videos provide useful information about the occurrence of spawning salmon within the area, and ecology of spawning areas; some of the footage may appear on TV in 2015 . . .



²² WRFT-AST Aultbea Sea lice workshop report <http://wrft.org.uk/news/newsitem.cfm?id=174>

²³ Highland Seashore project webpage <http://www.highlandbiodiversity.com/highland-seashore-project-news.asp>

Part 10 Summary

- Rod catches of **salmon** were lower in 2013 and 2014 than in the years 2010-2012 for the three largest rivers systems in the WRFT area (Gruinard, Ewe & Carron). Grilse catches in the River Carron were proportionally higher in 2010, 2012 and 2014 than in 2009, 2011, and 2013 (relative to MSW salmon) correlating with salmon farm production cycles at nearby fish farms.
- Catches of **sea trout** for the rivers Gruinard, Ewe and Carron were higher in 2014 than in 2013. The heaviest rod caught sea trout reported from the WRFT area was a 5.5lb fish taken in the River Ewe in 2014; several other fish of over 3lb were taken. For some rivers, official catch figures for sea trout were considered to be unreliable (for example, the Torridon River).
- **Juvenile fish** surveys were carried out in 17 river systems within the WRFT area in 2013 – 2014. Juvenile salmon were recorded in core areas of all the major salmon rivers; however, populations were depleted (missing year classes) or extirpated from some headwater streams and small coastal river systems where juvenile salmon had been recorded in previous years. For some rivers, salmon smolt production would benefit from measures to protect and restore riparian alder woodlands, particularly headwater streams in the Gruinard river catchment area.
- Large numbers of early-returned sea trout carrying very high numbers of **parasitic sea lice** were recorded in the Dundonnell river fyke net in June 2013. However, despite comparable fyke net fishing effort in 2014, very few early-returned trout were caught and sea lice numbers were very low. Sea trout taken in sweep nets in the Kanaird and Flowerdale estuaries in 2013 carried higher numbers of lice than in 2014. Some of the finnock taken by rod and line in the River Ewe in both July 2013 and 2014 carried in excess of 50 lice.
- Figures published by the SSPO indicate that average on-farm sea lice levels far exceeded recommended Code of Good Practice treatment threshold levels in all farming areas around the WRFT area during the period 2013-2014, except Loch Ewe where there is only one salmon farm operating a shorter 18 month production cycle with an extended fallow period.
- Wester Ross Fisheries Trust carried out survey work on river systems in the **south of Skye** in collaboration with the Skye Fisheries Trust, river owners, other organisations (including the John Muir Trust) and local volunteers. The rivers of this area (for example the Camasunary, Strathmore, and Eishort rivers) could produce many sea trout (800+) if measures were taken to protect adult fish, restore productive riparian habitats, and to protect coastal waters from renewed sea lice production.
- The **Wester Ross Marine Protected Area** [MPA] was designated by the Scottish Government in July 2014. This MPA aims to protect sea bed habitats and restore maerl beds and flameshell beds within an area extending from Loch Ewe to the Summer Isles (including Gruinard Bay, Little Loch Broom and Loch Broom). A new MPA was also designated for the Loch Duich – Loch Alsh area.
- WRFT provided support for several students in 2013 and 2014. Geoffrey Billier **study of macro-invertebrates** and the feeding behavior of juvenile salmon in the Little Gruinard River SAC in 2014 provided much new information of value for river and fisheries managers.
- WRFT provided support for a range of other projects in 2013 & 2014 aimed at protecting native wildlife including wild fish populations and raising awareness, including the Scottish **Mink** Initiative, the Highland Seashore Project and the Wester Ross Environment Network.

Part 11 Financial Statement

Because the Trust is 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 OSCR accounts.

2014 Financial Statement from the Chair

Background

Over the last few years there have been wide variations in the income and expenditure of the Trust. These fluctuations were caused primarily by three factors-

1. A previous commitment to UHI in respect of a second biologist.
2. An increasingly challenging environment for the Charitable Trusts and other grant sources, from which approximately two thirds of our income originates.
3. Greatly reduced funding from the WRASFB.

The effect of those factors was to cause the Trust to incur considerable and unsupportable operating losses during 2012 and 2013, which substantially reduced our reserves.

Present Position

Stringent economy measures over the last 18 months and the welcome re-establishment of the previous levels of funding from the WRASFB have rectified this situation.

As at writing (Jan 2015) the Trust has been operating on an at least cost neutral basis throughout the 2014/15 financial year whilst being successful in fulfilling all its aims and objectives as planned. We expect to show a small increase in reserves by at the end of the 2014/15 financial year.

The full accounts are available via this link <http://www.wrft.org.uk/downloads/files.cfm?id=37> .

Acknowledgements

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

Ala MacKenzie	Dundonnell Estate	Lucy & Steve Robison; James & Kitty
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Dr Alan Wells (RAFTS)	Eilean Darach Estate	Marguerite Chartois
Alasdair Macdonald (Dundonnell Estate)	Eoghain Maclean	Dr Mark Coulson (formerly RAFTS Genetics)
Alison Rowe	Eve Alcoumbre	Mark Williams and family
Alan Johnson and family	Prof Eric Verspoor (UHI)	Prof Mark Costello
Alastair Pearson	Farquhar Renwick	Prof Mark Everard
Ally MacAskill	Florestan Bangaim	Mary Gibson (SNH)
Andrew Graham-Stewart	Frank Buckley	Megan Henderson (Gruinard Estate)
Andrew Ramsay	Frank Kalinowski	Dr Melanie Smith
Andrew Slaughter	Gary Bulmer	Neil Campbell
Andy Vicks	Geoffrey Billier	Neil Morrison
Andy Jackson (Subsea TV)	Gregor Cooper	Nick Bengé (Watergems)
Angus Davidson	Harry Hassel	Nick & Liz Sanders
Ann-Marie MacMaster (SMI Officer)	Hugh Richards (WRF)	Nigel Carr
Anne and Alex Gray	Hugh Whittle	NTS Inverewe Gardens staff
Antony Watkins (SEPA)	Hugo van Vredenburg	Paul Bolton
Arran Matheson	Ian Lindsay	Prof Peter Maguire
Barbara MacDonald (Letterewe)	Iain Muir	Peter Jarosz
Prof Barry Blake	Isabel Moore	Peter Otter
Ben, Ron and Lesley Rushbrooke	Prof Ivor Llewelyn	Philip Smith
Bill, Irene and Fraser Anderson	Jackie Anderson (MS Science)	Ray Dingwall
Bill Whyte (Gruinard Estate)	Jackie MacKenize	Raymond Gault
Biro Boiliut	Jake Buckthorpe	Rob Dewar (NTS)
Bob Kindness	Dr James Merryweather	Robin Ade & family
Brian and Carol Fraser	Jamie Renwick	Roderick MacIvor
Carl Forbes	Jane MacLay	Roger McLachlan
Carol MacIntosh (NTS)	Jane Murphy	Ronald Sinclair
Dr Chris Horrill (RAFTS)	Janet Ullman	Ronald Chisholm
Chris Macleod	Jenny Scobie	Ronnie Buchan
Colin Milne (WRF)	Jeremy Fenton	Ruby Neervoort
Colin Simpson	Jim Buchanan	Ruth MacLeod & her dad
Cory Jones	Jim Raffell (MS Shieldaig Field Station)	Russel Robertson
Dr Craig MacIntyre (Argyll FT)	Jim Sinclair	Sally Clements
Dan Ross	Dr John Armstrong (MS Science)	Scott Fraser (Leckmeim)
Prof Andrew (Dave) Barclay	John Ogle & family and friends	Shelagh & Gerry Moore
David Holland	John Mackenzie	Shiela & Jim Henderson
David & Veronica Mullaney	John Murdo Mackenzie	Simon MacKelvey (Cromarty Firth Fisheries Trust)
Derek Roxborough	John MacRae	Simon Stewart (Coulin Estate)
Diane Rivaton	Johnnie Parry	Dr Shona Marshall & Kate Bachelor (WSFT)
Donald Macleod	Jock Chisholm	Steve & Isle Ewe Fish farm team
Donald Nayar	Julia Haig	Stuart Allison
Donald Rice	Katherine Vine	Dr Steve Kett (Middlesex University)
Duncan Currie	Katie Gilham (SNH)	Sue Pomeroy
Duncan Donald & family	Prof Ken Whelan	Terry Jack
Duncan MacKenzie (Gairloch)	Keith Dunbar	Tim Fison
Duncan MacKenzie (Ullapool)	Kenny MacLennan	Tom Forrest (WREN)
	Kenny Nelson (SNH)	Tony Andrews (AST)
	Kerrin Buttenshön	Tony Rawlings
	Kevin Ginty	Tournaig Estate
	Leo Dimouchy	Vu Dang
	Letterewe Estate	Willie Ingles
	Dr Lorna Brown	Will Parry

...and all the other anglers, mink project volunteers, keepers and ghillies, fish farmers, school teachers, schoolchildren and parents, and everybody else who has helped us with our work to support wild fisheries in the Wester Ross area.

The **work programme for 2015** includes excursions to sample trout lochs and streams, electro-fishing surveys of many of the rivers between Ullapool and Knoydart, 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 Trust or for simply coming along for a day in the field to find out what we do. Please contact either of the WRFT Biologists info@wrft.org.uk for further details.



WRFT Registered Charity No: SCO24787

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

Tel: 01445 712 899
Email: admin@wrft.org.uk

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	£20	
Single Life (1 card)	£150	
Joint Life (2 cards)	£200	

Rates are valid until 31st December 2015

3. Payment details

Membership Fees (from section 2)	£
Donation	£
TOTAL DUE	£

4. Method of payment

a. I enclose a cheque payable to Wester Ross Fisheries Trust for £

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 2007, and all donations I make in the future, to be Gift Aid until I notify you otherwise.

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Bank Name & Address: Bank of Scotland – Gairloch Office

Account Name: Wester Ross Fisheries Trust

Sort Code: 80-06-87

Account No: 06000911

PLEASE PAY THE FOLLOWING

Amount £ In Words

Commencing:

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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

- -

WRFT Ref. No: (office use only)

Instruction to your Bank or Building Society: Please pay Wester Ross Fisheries Trust Standing Order Mandate from the account detailed in this instruction. I understand that this Instruction may remain with the WRFT 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 Wester Ross Fisheries Trust.

Signature(s)

Date / /

How big is this salmon?

In November 2014, Andy Jackson ([SubSeaTV](#)) recorded a series of remarkable underwater videos of salmon at spawning time in the Kinlochewe River during an unusually settled period with low water. A female salmon was recorded 'cutting' at the top of a 'run'. Competing for her attentions were several male salmon, including one which was much larger than all the other fish.



Large male salmon in the Kinlochewe River, November 2014. Video still by Andy Jackson.

But how much larger? The female and most of the other males appear to be 2SW salmon; of around 70cm to 80cm. However without anything to measure them against, it is difficult to be sure.

Is it possible to estimate the size of the fish by comparing the diameter of the eye with the size of the head? As fish (and other vertebrates) grow bigger, the size of their eyes relative to the size of their head changes²⁴. The distance from the front of the eye of a salmon parr to the tip of its snout is less than one eye diameter. For our big cock salmon (above), the distance from the front of the eye to the tip of the snout is about 8 eye diameters. For the other male salmon the distance varies from less than 5 (for a small grilse) to about 6.

I have not reached a final conclusion about the size of the big fish yet! However after comparing with pictures of large male salmon on the internet, I think the big male was over 100cm in length; 20lb and possibly close to 25lb: as big as any rod caught salmon in Wester Ross in 2014 . . .? Fingers crossed for an even bigger one in 2015. Tight lines . . . !

Look out for the videos on the [WRFT website](#) later in 2015. Thank you very much to Andy Jackson for permission to use the videos.

²⁴ Howland, H. C., S. Merola, and J. R. Basarab. 2004. The allometry and scaling of the size of vertebrate eyes. *Vision Research* 44:2043–2065. <http://www.sciencedirect.com/science/article/pii/S0042698904001646>



Wester Ross Fisheries Trust was set up in 1996 in response to the collapse of salmon and sea trout fisheries around Wester Ross. Our aim is simple: to support the fisheries and wildlife within the Wester Ross area which depend upon healthy wild fish populations.



This review provides up to date information about our wild salmon and sea trout populations. The review also provides a summary of some of the activities carried out by WRFT over the past 18 months, including sea lice monitoring.



Volunteers are always welcome! In 2014, some enjoyed helping with sea trout sampling using a sweep net in the sea, others joined a juvenile fish survey team to explore headwater streams. We depend upon a network of volunteers to monitor and control North American Mink and to support other activities to control non-native plants.



If you are an angler, please report any fish you catch within the area, especially brown trout and sea trout of over 30cm in length. Please visit the WRFT website for more information:

www.wrft.org.uk

