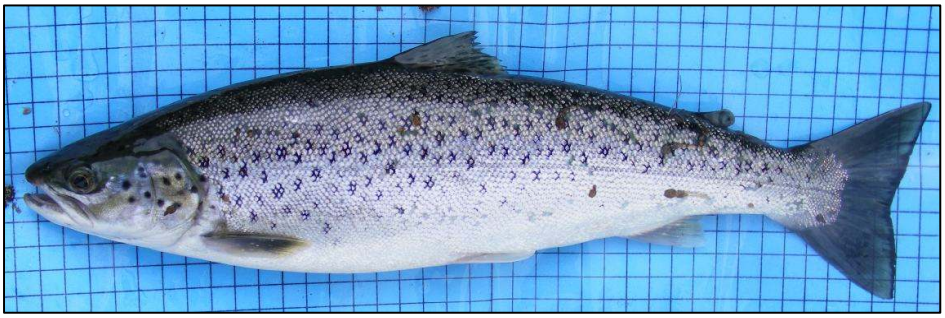
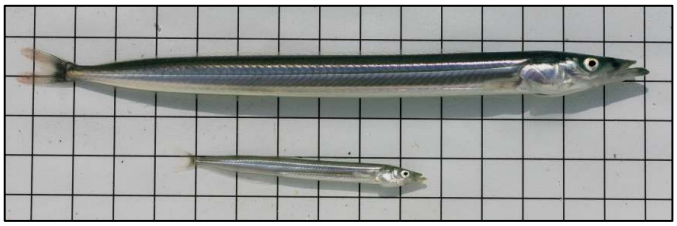
WESTER ROSS FISHERIES TRUST

REVIEW MAY 2010





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REVIEW

by

Peter Cunningham, Bob Kindness and Dr Lorna Brown.

May 2010

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

(clockwise from top left) Dougie, Mark and Kirsty Williams inspecting the catch (July, 2010); Exceptionally well conditioned sea trout taken in the sweep net from Kerry Bay, Loch Gairloch in July 2009; (left-right) Peter Macdonald, Jamie Kugelmann, Anna Macdonald, Colin Macdonald and Billy Kugelmann heading home after a particularly successful expedition to the headwaters of the Glenmore (Glenelg) River: wild juvenile salmon (inset) were found for the first time by the WRFT electro-fishing team; Greater (and ?lesser) sandeels from Loch Gairloch, July 2009 (photo: Steve Kett); Roger McLachlan by Abhainn Gleann na Muice in the headwaters of the Gruinard River (October 2009).

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David Mullaney returning juvenile trout to a spawning burn by Loch Maree, August 2009.

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Preface

The year under review has seen changes in both the activities of the Trust, and the external environment in which it operates. In the immediately preceding years WRFT was able to accumulate a small safety net amidst a generally benevolent financial environment. The work programme was focused largely on the bread and butter issues of wild fish and fisheries. By 2009 the financial climate had worsened, while the Trust's activities began to increase in scope as the need for an ecosystem approach took root amongst like-minded institutions. The combination of these changes, internal and external, resulted in recognition that, despite continuing financial security, we need to take a highly inclusive and collaborative approach to addressing our long-term objectives.

A good example of this approach was the development of the Wester Ross and Lochalsh Biodiversity Action Plan. Under the guidance of RAFTS, the Trust worked with SNH, NTS and WREN to produce and promote a plan that aims to head off, or mitigate, the impact of invasive non-native species in Wester Ross. A further example is the marine seminar held in May 2009, and the follow-up Herring Rediscovery Project. Both initiatives were aimed at better understanding the marine issues that may constrain salmonid fisheries. The writing is writ large on the wall - monitoring fish in freshwater is not enough, and the Trust has had to give considerable thought to where it could, and should go, in the wider ecosystem context. Our cooperation with the River Restoration Centre, SEPA and SNH in assessing the feasibility of improving the Tollie Burn is one product of this line of thought.

Interesting times, but the bread and butter work of the Trust has in no way been neglected. Surveys and catch data analysis suggest that 2009 was, in general, a reasonably encouraging year. The Carron had a record year for sea trout; juvenile salmon were discovered at some new sites and numbers of juvenile salmon in other areas appeared in densities close to the likely optimum. The exciting new study of carrying capacity being carried out in cooperation with Marine Scotland Science and the Cromarty Firth Fisheries Trust, will hopefully provide some answers as to how our survey results relate to the actual fishery potential of particular systems. Again, strategic partnership for shared objectives.

Sea lice continue to be a source of concern. Although there were no epizootics in 2009, we were still sweep netting some fish with substantial lice burdens, and the potential for flare-ups is always with us, subject to the vagaries of marine conditions and to the effectiveness of fish farm husbandry. There are still many unknowns and perhaps more "unprovens".

As ever, enthusiastic field workers have been the backbone of the work programmes whether electro-fishing, sweep netting or supporting events such as the biodiversity awareness day. Financial support from individuals is also of great help to the Trust and the generosity of donors is much appreciated. In fact, enormous thanks are due to all of the Trust's supporters, and their contributions are better acknowledged on pages 5 & 38. The Board of Trustees reached full complement with the appointment of Professor Dave Barclay in October 2009. Dave is both a scientist and a keen trout fisherman with a good local knowledge, and he offers much to the effective operation of the Trust.

Peter Cunningham remains as energetic, enthusiastic and committed as previously reported and he has been ably supported by the considerable efforts of our administrator Peter Jarosz and accountancy whiz Ronnie Mullaney. Ronnie has, with great fortitude, revamped the Trust financial system and Peter Jarosz's role has expanded to focus more on identification and pursuit of project funding opportunities. A task that Peter addresses with much relish! Just as well, since 2010 is likely to see us working hard for the resources to match our ambitions.

Prof Barry Blake (WRFT Vice chair), May 2010

Part 1 **Introduction**

The purpose of Wester Ross Fisheries Trust is '***to maximise and sustain the productivity of wild salmonid fisheries in the rivers and lochs of Wester Ross'***. Over the past 14 years, the Trust has investigated problems affecting fisheries within both the freshwater and marine environment, and developed guidance and recommendations to solve problems and improve fisheries management. The WRFT Fisheries Management Plan 2009+ (see website www.wrft.org.uk) describes the river systems of the area and the fish populations they support, and presents a framework for the management activities that are being taken to address fisheries problems within the Trust's area.

The past year (2009 – 2010) has been a particularly interesting and generally encouraging year. For the first time juvenile salmon were recorded by the WRFT electro-fishing team in the headwaters of the Glenmore and Glenbeag Rivers [see Part 2]. Rod catches were mixed: grilse numbers in 2009 held up well in some rivers in contrast to reports from some other West coast systems. The River Carron experienced a record sea trout catch. The number of salmon and sea trout entering the upstream trap at Tournaig was lower than in other recent years, though this may have been partly due to unusually high water in September, giving fish the opportunity to ascend the normally impassable falls and by-pass the trap.

The most exciting development was in the marine environment. An apparent abundance of sandeels in local sea lochs provided the best feeding for both sea trout and breeding sea birds for many years. There were no reports of sea lice epizootics on the scale of those recorded within the area in 2007 and 2008 [see Part 3]. The marine environment was the focus of a seminar in May. Subsequently, a project was launched to learn more about the occurrence of Herring in local sea lochs, initially with a series of interviews with experienced local fishermen.

To learn more about the 'carrying capacity' of different 'micro' habitats within small streams, a collaborative management trial with the Cromarty Firth Fisheries Trust and Marine Scotland (Freshwater lab) started. The results of this three-year project will enable more useful interpretation of the results of juvenile fish surveys [see Part 4]. Other projects included preparation of a Biosecurity Action Plan for the local area [see Part 5], and a related *Rhododendron ponticum* control workshop and biosecurity debate (to be broadcast on Two Lochs Radio in May 2010). In addition to the 'Salmon in the Classroom' project, Dr Lorna Brown launched the 'Life in Lochs Project' at Gairloch Secondary School, extending awareness, enthusiasm and a sense of responsibility for the future of wild fish populations to the next generation [Part 8].

En route to an electro-fishing site on a spawning stream above Loch Sguod (July 2009)

Part 2 **Salmon and sea trout stocks**

2.1 Juvenile fish surveys

The WRFT juvenile fish survey programme focuses on maintaining an understanding of the occurrence and health of salmon and trout populations within the river systems of the area. Electro-fishing with purposely designed equipment is used to assess the distribution and relative abundance of juvenile salmon. In 2009, electro-fishing surveys were carried out between July and October. The following river systems were surveyed: Kanaird (Langwell area), Ullapool, Broom, Little Gruinard (around Fionn Loch), upper Gruinard (Gleann na Muice, Abhainn Loch na Nid), Allt Beith, Tournaig, Sguod, Ewe (Kernsary, Loch Maree burns, Kinlochewe, Coulin areas), Ling, Croe, Glenmore, Glenbeag, Arnisdale and Barrisdale.

Most sites were surveyed using the SFCC 'semi-quantitative' protocol, where stream sections were fished in a standard way over a timed period, and all fish caught measured and counted. This provides Catch per Unit Effort (CPUE) data, expressed in numbers of fish caught per minute, and provides a good indication of the relative and absolute abundance of different year-classes of salmon and trout at respective sites. Results have to be interpreted with caution: when river levels are very low, fish can be caught more rapidly than when they are higher. However, for management purposes the method is efficient and provides clear indications of areas of river that are well stocked, and areas where the juvenile salmon population is less than what it should be in the context of Wester Ross. In addition, we are able to learn about the relative growth rates of juvenile salmon and trout, prompting questions in relation to the factors that limit production.

To obtain more precise estimates of fish density within a particular part of the river, several 'fully-quantitative' sites were also surveyed, where a section of river between 'stop' nets is fished three times. This method produces a 'depletion curve' from which numbers of fish per unit area can be estimated. Although this method is more time consuming, the figures it produces can be used for more robust comparisons of site-specific variations in fish densities between river systems and from year to year.

The WRFT electro-fishing team also worked in collaboration with the Cromarty Firth Fisheries Trust and Marine Scotland FRS scientists on a management trial to investigate how carrying capacity (the amount of juvenile salmon and other fish that a stream section can support) varies according the type of habitat (see Part 4) .

WRFT Biologist Peter Cunningham electro-fishing in the upper Gruinard river catchment, with the profile of An Teallach in the back ground (picture by Roger McLachlan).

Results

The following section summarises the results of the juvenile fish survey in 2009. Results are also presented in Figures 2.1 – 2.3. Table 1 defines Catch Per Unit Effort (CPUE) grades used in the following text.

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

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

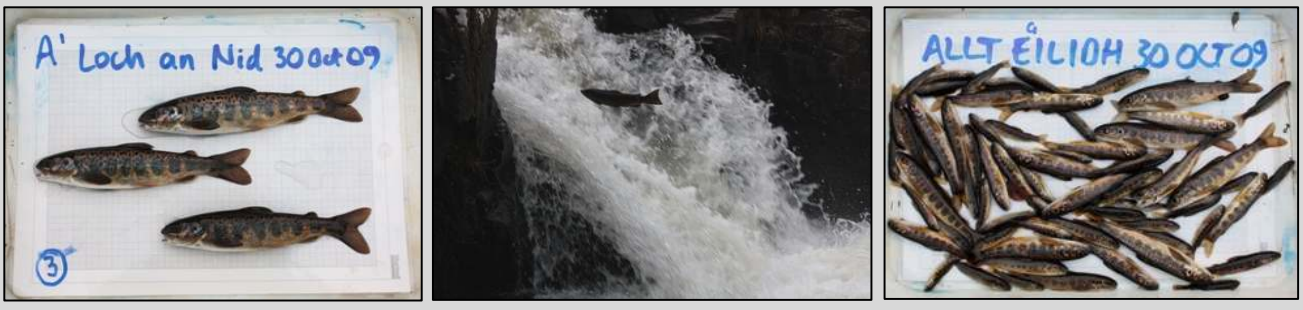
Salmon

In the north of the WRFT area, only 2 year old salmon parr (SL 91mm-121mm) were found in the **upper Kanaird** above the Langwell falls (5 Aug 09). Below the falls CPUE for salmon fry was high and 2 year classes of parr were present, indicating good spawning in both years. In the Rhidorroch River (**Ullapool River** catchment,) salmon fry and parr were found at all sites to the top of the accessible area, at moderate CPUE (7 Aug 09). The Allt Coire Cronaidh fully quantitative site again yielded high densities of salmon fry and parr, and trout. In the **River Broom**, densities were higher in 2009 than in 2008 at the 4 sites surveyed by Ross Gardiner of Marine Scotland (who has been carrying out an e-fishing survey of the river most years since 1990).

Two expeditions set out to survey the upper **Gruinard River** catchment. In the Abhainn Gleann na Muice (23 Sept 09) salmon fry and parr were present at higher CPUE than in previous years at all sites. In the Abhainn Loch an Nid (30 Oct 09) only a few very large 3 year old salmon parr were found above the Bathing Pool falls; below the falls CPUE for fry and parr was high [see Box 2.1].

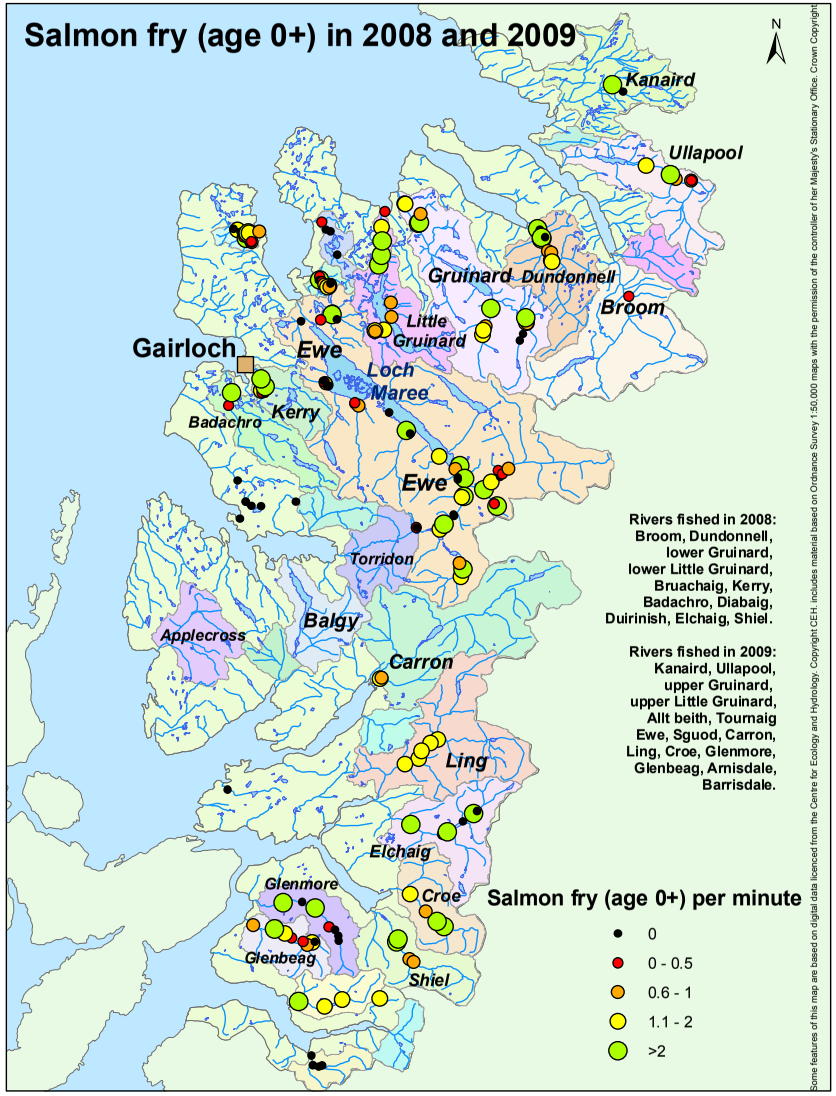
Box 2.1 Waterfalls and salmon populations in marginal habitat (1)

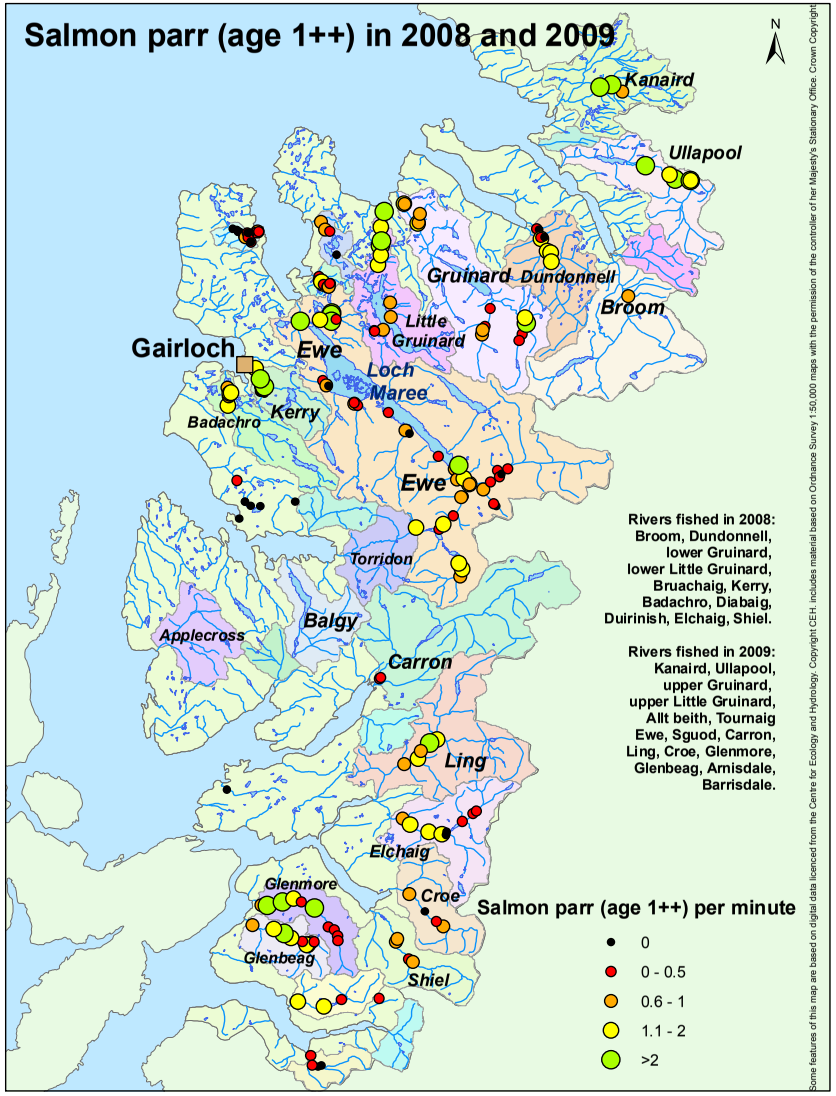
Challenging waterfalls obstruct access to sizable areas of good quality habitat for production of juvenile fish in the headwaters of some Wester Ross rivers. Some of these waterfalls are only occasionally passable to migratory fish, and in some years there is no natural recruitment above them.



On 30th October, salmon and sea trout were jumping at the 'bathing pool' falls of the Abhainn Loch an Nid, in the headwaters of the Gruinard River system (centre); none were seen successfully clearing them. Above the falls (left) only three large 3 year old salmon parr (148 -160mm) were caught in 10 minutes electro-fishing. Below the falls (right), many salmon fry and 1 and 2 year old parr were taken, indicating juvenile salmon densities close to 'carrying capacity' (photos by Ben Rushbrooke).

Figure 2.1 Distribution and relative abundance of salmon fry and salmon parr in the WRFT area in 2008 and 2009





The **Little Gruinard River** is the only designated Atlantic salmon (*Salmo salar*) Special Area of Conservation (SAC) in the NW of mainland Scotland. Water levels were a little higher than anticipated when we surveyed some of the streams around the Fionn Loch at the top of the main river on 28/8/09. Salmon fry and parr were recorded at all sites; however a minnow was also caught, the first for the Little Gruinard system, and a charr fry *(right, below a salmon fry).* Although CPUE at most sites was lower than in previous surveys, this was judged to be primarily a consequence of higher than usual water levels and more difficult fishing conditions than in previous years rather than a cause for any concern about the health of juvenile salmon populations.

The little **Allt Beith** is of interest. A fish pass was installed by Scottish Water several years ago into Loch Bad a' Luachraich (locally known as the 'Goose Loch'). We investigated the burn at the head of the loch for the first time; no juvenile salmon were found, just minnows and trout fry (28/7). Below the fish pass into the loch, large salmon parr were caught, including a whopper of 164 mm (*left*), the biggest salmon parr of the WRFT electro-fishing season.

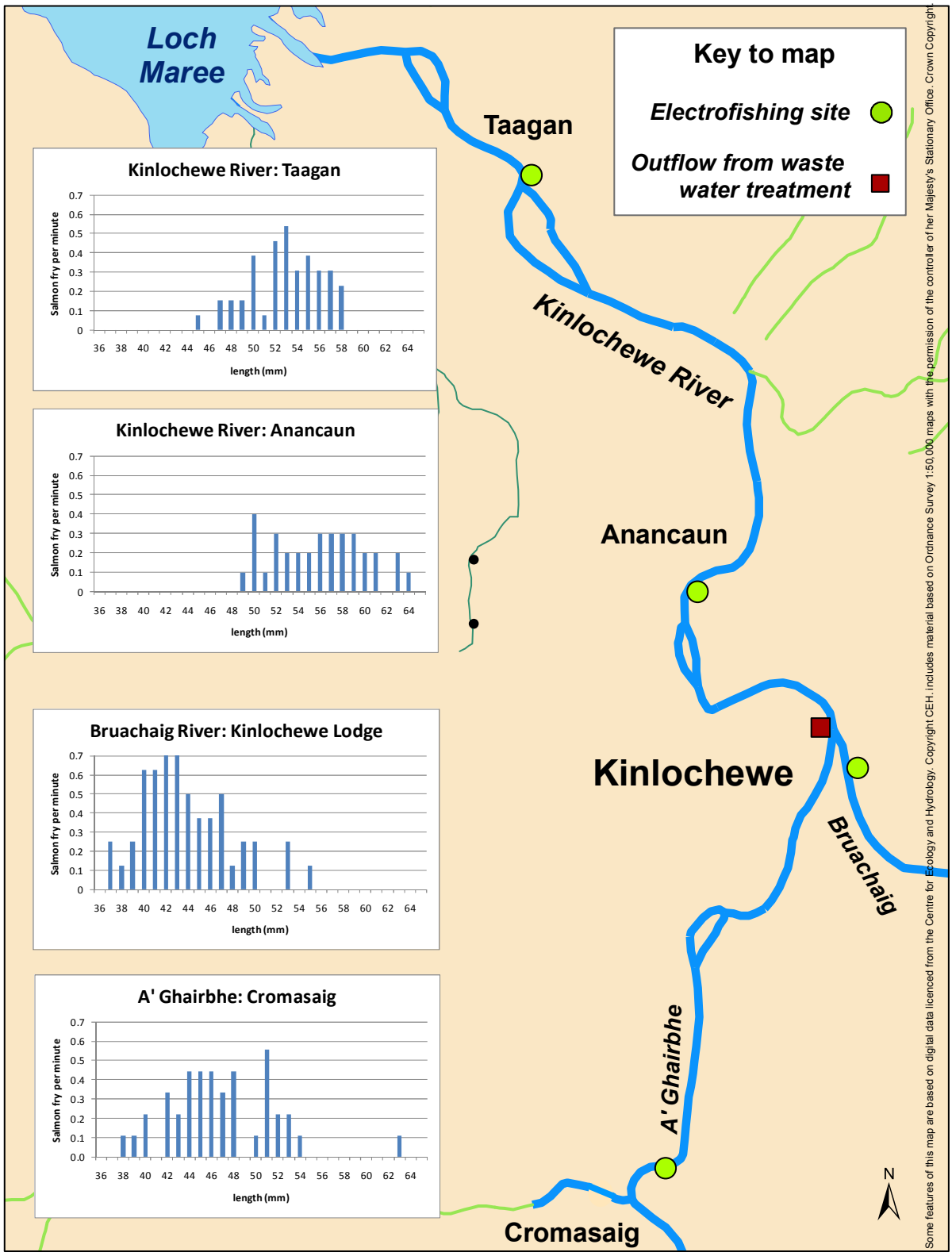
At **Tournaig** (22/7/09), salmon fry and parr were found throughout the accessible area (see Part 2.4); minnows were taken above the '1st falls' for the first time indicating continued spread within the system.

Much of the **River Ewe system** was surveyed in 2009. Densities of salmon fry and parr were high below the waterfalls in the rivers above **Loch Kernsary** (4/8). In the Allt Loch Ghuiragarstidh above the old fish pass, salmon parr were recorded but no fry. At the other end of the Ewe system, salmon fry were found at high CPUE near the top of the **Docherty burn** (17/7); however in 12 minutes fishing at a site only 1km further downstream only one salmon fry was found highlighting the 'hit and miss' patchiness of salmon fry distribution early in the summer. On 12/8, salmon fry were much larger in the **Kinlochewe River** below the waste water treatment works outflow than in nearby sites in the **Bruachaig River** and **A' Ghairbhe** above the outflow, somewhat as anticipated years ago by the late Bill 'Rogie' Brown[1] (Figure 2.2). Higher upstream in the A' Ghairbhe below the Cruive Pool and in rivers above Loch Coulin, salmon fry were found at generally high CPUE and parr at moderate CPUE (14/8); river levels were a little higher than usual the salmon parr CPUE values shown may underestimate abundance. Of note, a little Brook charr *(Salvelinus fontinalis)* was taken at our highest site above Loch Coulin *(below)*. Brook charr were introduced from North America to Lochan Uaine in the 19th Century, and we assume the charr descended from there (. . . several hundred midges are on the field sheets for 14/8 . . . !).

Brook charr and brown trout from the Coulin River headwaters on 14th August 2009.

[1] Bill Brown commented on plans to establish a new waste water treatment plant which discharged into the Kinlochewe River.

Figure 2.2 On 12th August 2009 salmon fry at sites in the Kinlochewe River below the waste water treatment work outflow were almost 1cm larger than those in the Bruachaig river just a short distance further upstream. Fry size varied between nearby sites and may be related to both density and to the amount of food available; a little extra nutrient may have led to faster growth!



In the south of the area salmon parr were found in the **Balmacara Burn** for the first time by WRFT at the NTS Balmacara Open day on 9th May 2009. Salmon fry and parr were found at all sites in the **River Ling** (30/9) fry were small averaging less than 44mm length in mid-river sites. Salmon fry averaged nearer 50mm at two of the four sites fished in the **Croe** (29/09); high river levels reduced CPUE.

Salmon parr were found for the first time by WRFT in the upper **Glenmore River** (08/7/09) above the Bealachasan falls (08/07/09). Both salmon fry and parr were found in the **Glenbeag River** (07/7) including above the 'Dun Grugaig falls' for the first time. For both rivers, CPUE was higher than previously recorded, especially in 'core' areas. Juvenile salmon were found throughout the **Arnisdale River** (26/8)); a few salmon parr (no fry) were found in the lower **Barrisdale River** (23/8); none of which were above the falls.

Box 2.2 Waterfalls and salmon populations in marginal habitat (2)

A: *Local anecdotes suggested that during the 1970s, wild salmon regularly spawned in the headwaters of the* ***Glenmore River****. However, electro-fishing expeditions in 2002, 2004 and 2007 failed to find any juvenile salmon above the falls near Bealachasin. On 8th July 2009, we were therefore delighted to find salmon parr above the 'Gonzalo' falls for the first time by the WRFT e-fishing team; clear evidence of an improvement in the health of the local population (see cover photo!).*

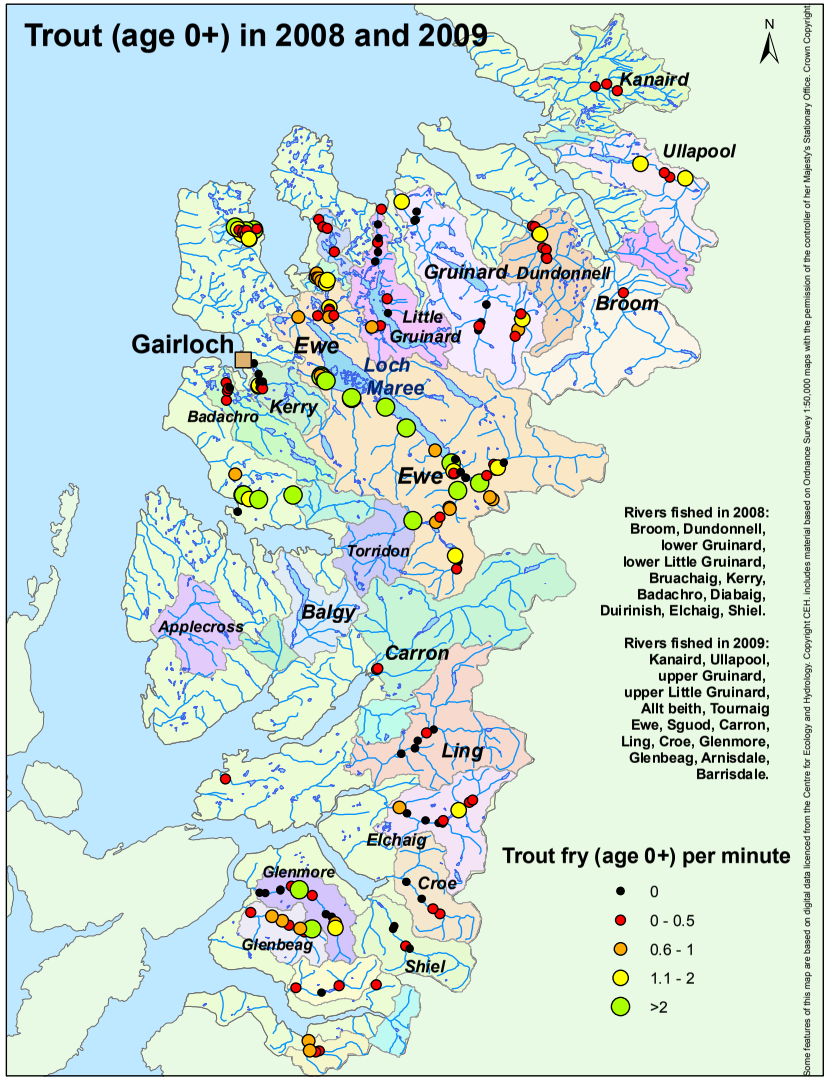
B: *On 7th July 2009 both salmon fry and salmon parr were found above these falls in the gorge below Dun Grugaig in the* ***Glenbeag River.*** *No salmon had been found above the falls on previous surveys, including the 2007 survey when we visited the falls and considered whether a fallen tree at the top of the falls could have been obstructing access for fish (right). The recolonisation of headwaters above these falls, representing some 30% of the area accessible to salmon within the Glenbeag River, may well have been assisted by the removal of this obstruction by Eilanreach estate. Time will tell whether salmon continue to ascend the falls and spawn in Glenbeag River headwaters in future years.*

Trout (Figure 2.3)

As in previous years, most electro-fishing sites surveyed in 2009 were of shallow, swiftly flowing 'salmon fry' habitat rather than slower trout habitat. Trout fry were found at highest CPUE in some of the smaller burns around Loch Maree, in the Beolary Burn (Glenmore River) and the 'Saddle shed Burn' (Glenbeag River).

Thank you to David Mullaney, Roger McLachlan, Garry Bulmer and Colin Macdonald for assisting this year, and to Ewen Scobie, Alan McGillivray, Alan Cameron, Mark Williams and family, Alan Mackenzie, Ewen Ballantyne, Jamie Kuggleman, Alex Day, the SNH Beinn Eighe NNR French student volunteers, Tournaig Estate and other estates for their help and support with electro-fishing surveys in 2009.

Figure 2.3 Distribution and relative abundance of trout fry and older trout at electro-fishing sites in the WRFT area surveyed in 2008 and 2009



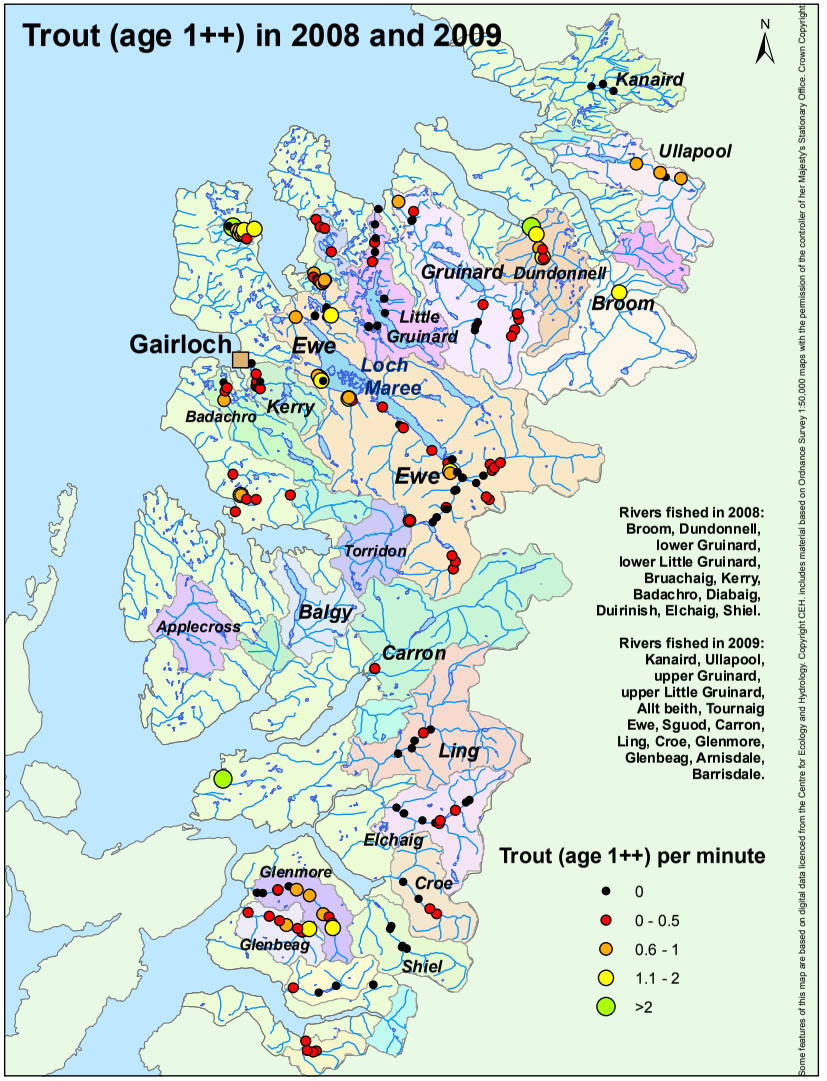
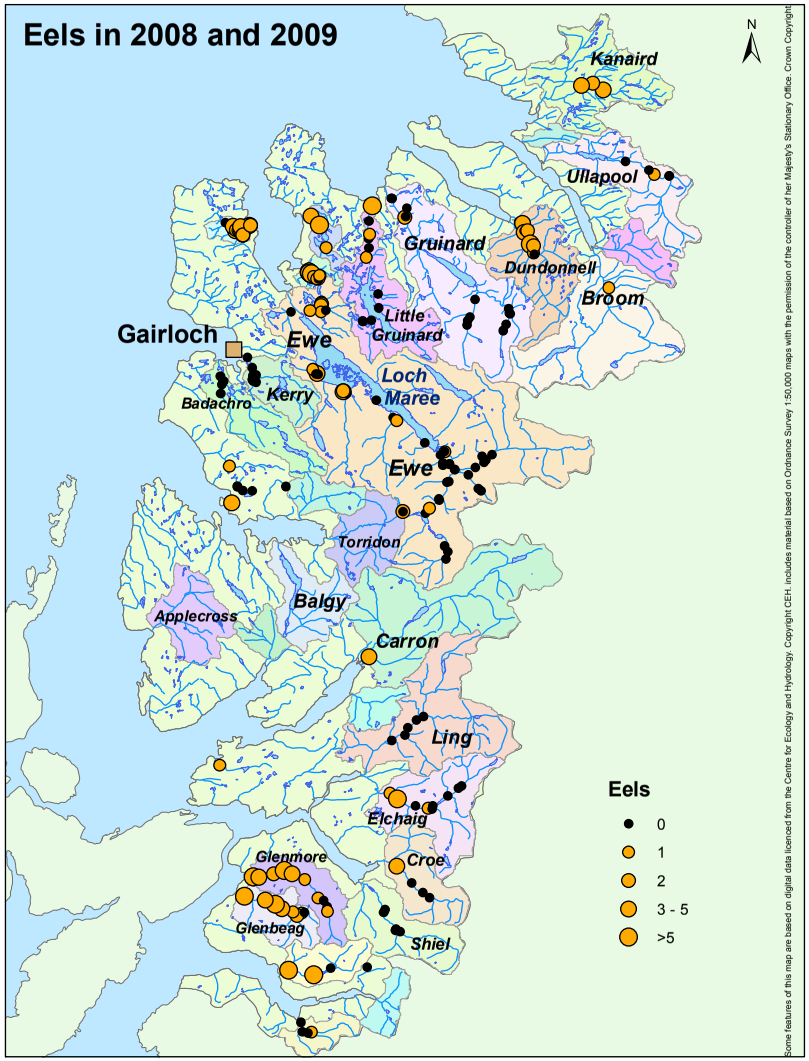
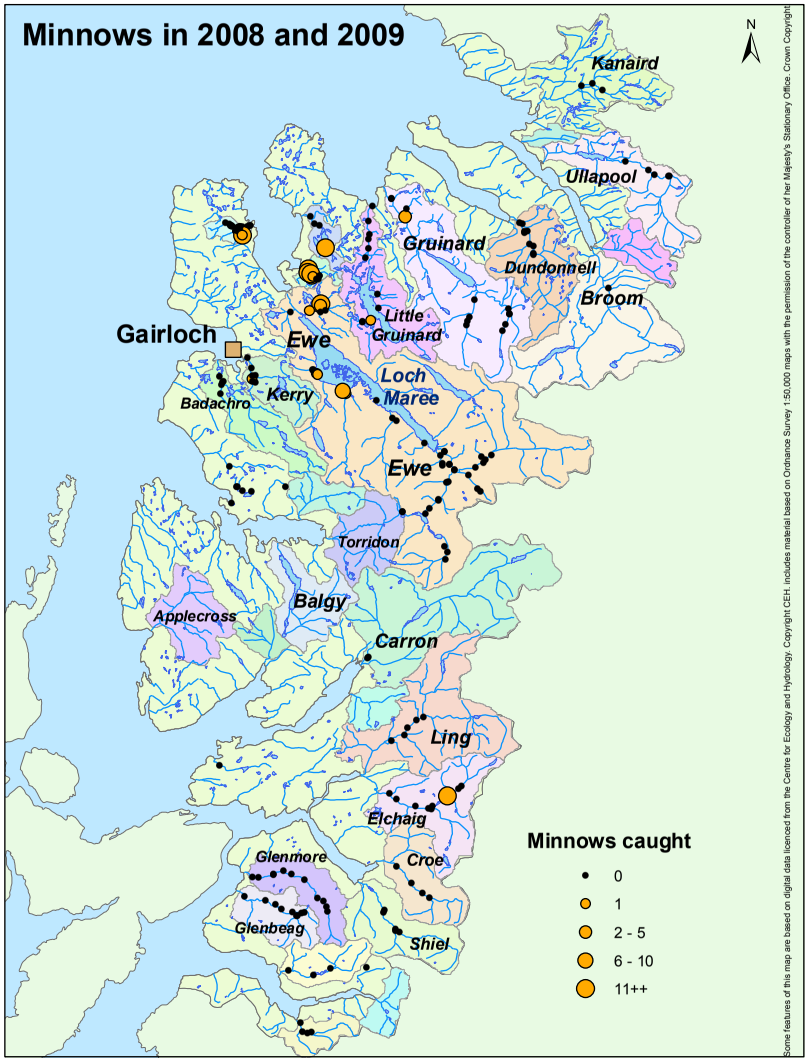


Figure 2.4 Distribution and relative abundance of eels and minnows at sites surveyed in the WRFT area in 2008 and 2009.





2.2 Rod catches

Rod catches provide an indication of the numbers of wild and escaped farmed fish returning to and entering local waters. In the absence of other information, rod catch data has been used to estimate 'spawning escapement' (the number of spawning adult salmon) for management purposes. For rivers in Wester Ross, catches may vary from year to year according to fishing effort, the skill and knowledge of anglers, and to fishing conditions especially river levels. Where 'Catch and Release' is practiced, the same fish may be caught more than once (Kindness, 2009). So far as the health and status of salmon and sea trout populations are concerned, any interpretation based on catch figures needs to take all these factors into account.

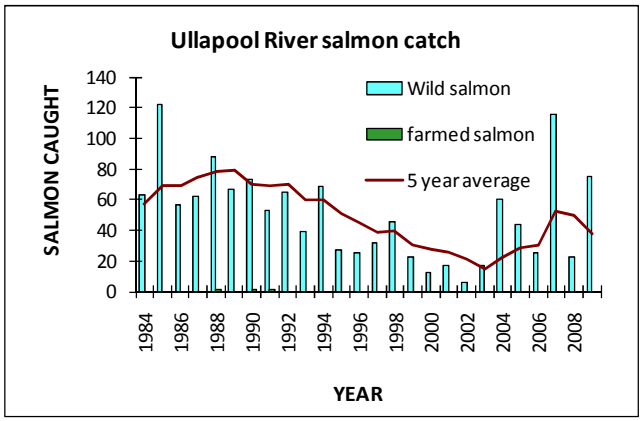
Under the Freedom of Information (Scotland) Act 2002, the Scottish Government's Fisheries Research Services kindly provided WRFT with catch data from the catch returns submitted from rivers in the WRFT area for the 2009 season for fisheries management purposes. This data has been used to prepare the graphs presented below.

Salmon

Catches of salmon were mixed in 2009. Some rivers experienced a good season; others caught fewer fish than in 2008. One comment heard across Scotland was that 2009 was a poor year for grilse. However, in the Gruinard River which experienced one of its best years this century most of the salmon taken were grilse. One explanation for the variable grilse catch in 2009 is that many salmon smolts were delayed from entering the sea in 2008; and that their survival was compromised before or soon after they reached the sea. This is further discussed in part 2.3.

(left) one of the largest salmon from the Little Gruinard River in recent years; this fish of almost 20lb was caught by Gavin Smart on 4th September 2009. In line with the 100% C&R policy, the fish, held by ghillie Graeme Wilson, was released back into the river after the photo was taken.

Figure 2.5 Ullapool River and Gruinard River salmon catches



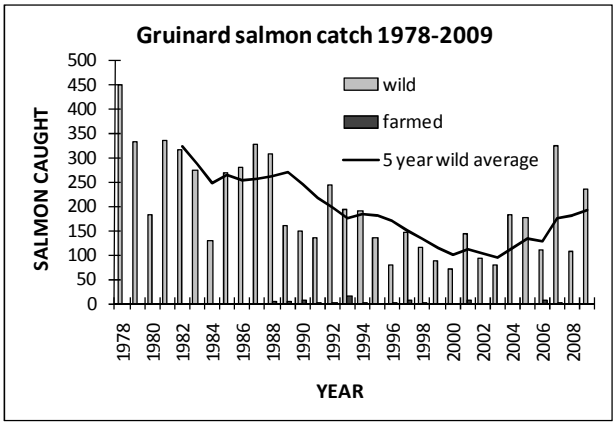
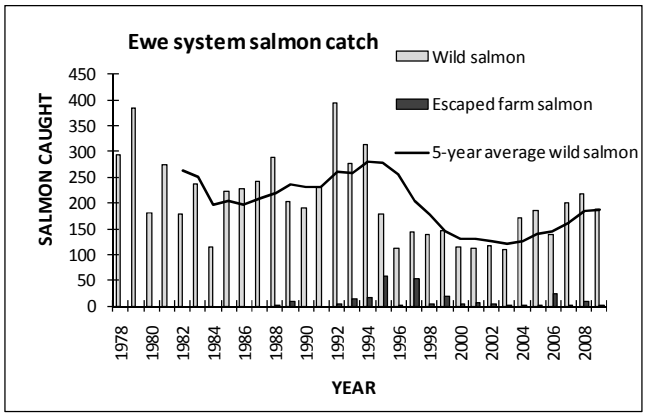
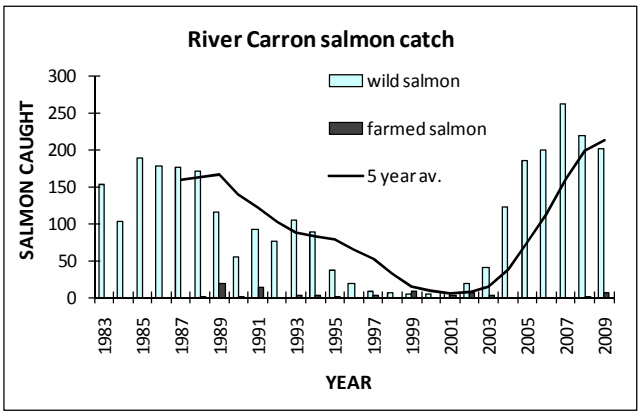
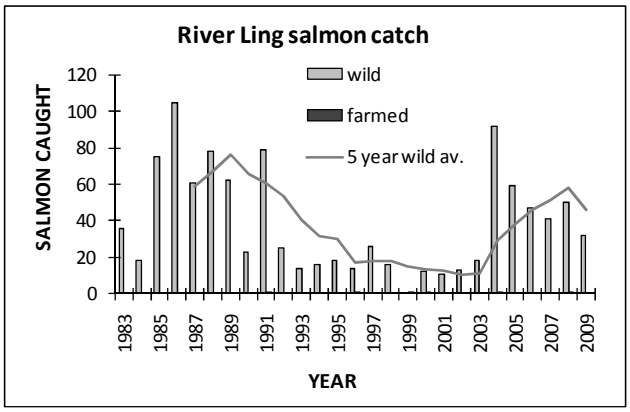


Figure 2.6 River Ewe and River Carron salmon catches





Since 2004 rod catches of salmon from the River Ewe and River Carron have been stable at over 150 fish per year. Both systems have been stocked with salmon. As the River Carron system is stocked from top to bottom each year it has not been possible to assess the relative contributions of stocked fish versus wild fish in the catch, or how one may affect the other. Because electro-fishing surveys consistently demonstrate an abundance of juvenile wild salmon in much of the River Ewe system (the main exception being the upper Bruachaig), stocking programmes have been targeted to those areas where natural recruitment is clearly limited. The River Ling catch was the lowest since 2003 *(right).*



Escaped farm salmon

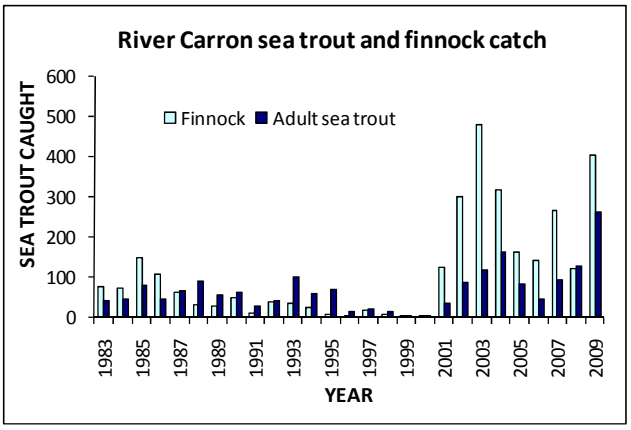
Few escaped farm salmon were reported in rod catches in 2009 and numbers were generally less than in 2007 and 2008. One fish which was caught at the end of the season in the Dundonnell River as part of a broodstock capture programme is shown below. Escaped farm salmon have consistently been found in broodstocks taken at the end of the season, suggesting a late-running tendency.

(left) Anaesthetised male salmon from the Dundonnell River, October 2009. The escaped farm salmon (top) has rounded margins to its fins. There are also more black spots on the farm fish, particularly around the head and base of the tail than on the wild fish, which may be due to genetic differences between native wild salmon and farm salmon. Most salmon grown on fish farms around Scotland are descended from Norwegian fish (photo by Ben Rushbrooke).

Sea trout

Compared to the past, few people have fished specifically for sea trout in Wester Ross in recent years. Most recent catch records therefore provide little indication of sea trout abundance. This has been the case for the once famous Loch Maree Hotel fishery. After the fishery collapsed in the late 1980s, few anglers were prepared to hire a boat and ghillie to fish the loch with little prospect of catching a good fish.

The River Carron has possibly been the most consistently fished water for sea trout in recent years. In 2009, the Carron experienced its best sea trout catch record for many years. That the Carron sea trout population is recovering is further demonstrated by the capture and release of a sea trout of 6lb from the river, caught by Donald MacKenzie, in August 2009 (below). This is the first report a sea trout of 6lb or more from any river within the WRFT area this millennia. Several other large sea trout were taken in the Carron. The Dundonnell River also produced trout of over 3lb.



Sea trout of ~6lb caught by Donald MacKenzie in the River Carron on (photo via Bob Kindness)

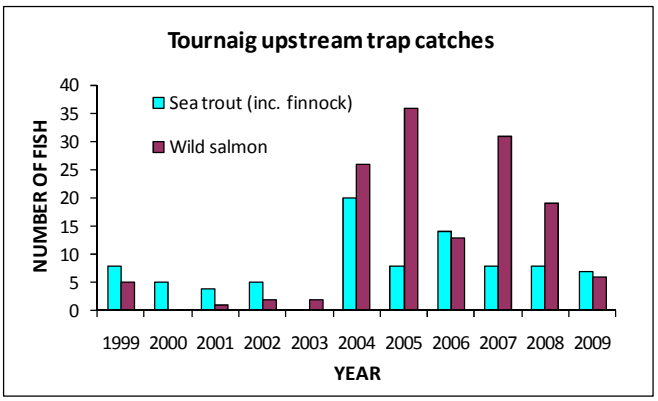
(left) Trout of 3.5lb from the Dundonnell River, caught by Johnnie Parry in August 2009. The golden colouration of this fish may suggest an estuarine rather than fully marine life.

2.3 Tournaig Trap Project Review

Supported in 2009-2010 by Marine Harvest Ltd.

The Tournaig trap project was set up in 1999 to monitor salmon and sea trout populations in the little Tournaig River system near Poolewe. Upstream and downstream traps are situated in a fish ladder built over 100 years ago to provide passage for fish around a waterfall near the mouth of the river. Further background information can be found in the WRFT Review May 2009 (see www.wrft.org.uk).

Upstream catches



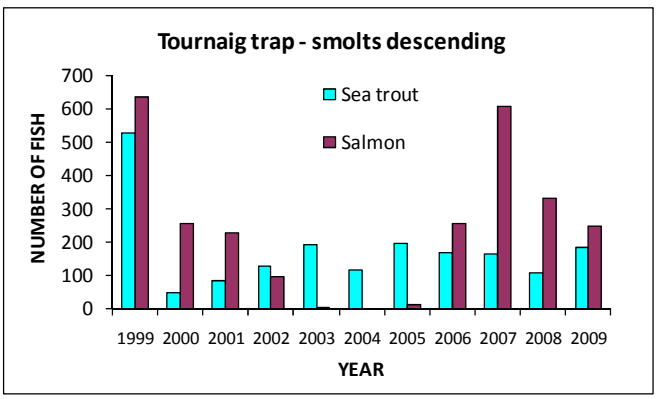
The 2009 season at Tournaig started with much excitement when a salmon was taken in the upstream trap on the 6th May 2009 *(below).* May salmon have been rare in rod catches in recent years, so to get a spring fish at Tournaig was most unusual. The fish was released upstream, but recaptured again the following day in the downstream trap, so was released below the trap to head back out to sea. Thereafter catches in the upstream trap were disappointing, with only 5 grilse and 7 finnock until the end of the season; the lowest totals since 2003.

The lack of grilse indicates poor marine survival of the 2008 salmon smolt run of over 300 fish; in 2008, 50 of the salmon smolts entered the sea late in June, over 1 month later than usual following a period of sustained drought. In 2009, July and August were dry. However, September was unusually wet, with several large spates which may have enabled fish coming in from the sea to ascend the normally insurmountable waterfall.

Downstream catches

The 2009 salmon smolt run was also rather disappointing *(below).* Only 246 salmon smolts were recorded passing through the trap. This may have also been partly due to the same 2008 drought when water levels in the nursery stream became very low. The total of 185 sea trout smolts was closer the average for sea trout smolts leaving the system in recent years.

right: Ben measuring the May salmon; students from Middlesex University look on (photo by Steve Kett).



Part 3 **Marine Environment**

3.1 Sea trout and the Seas around Wester Ross

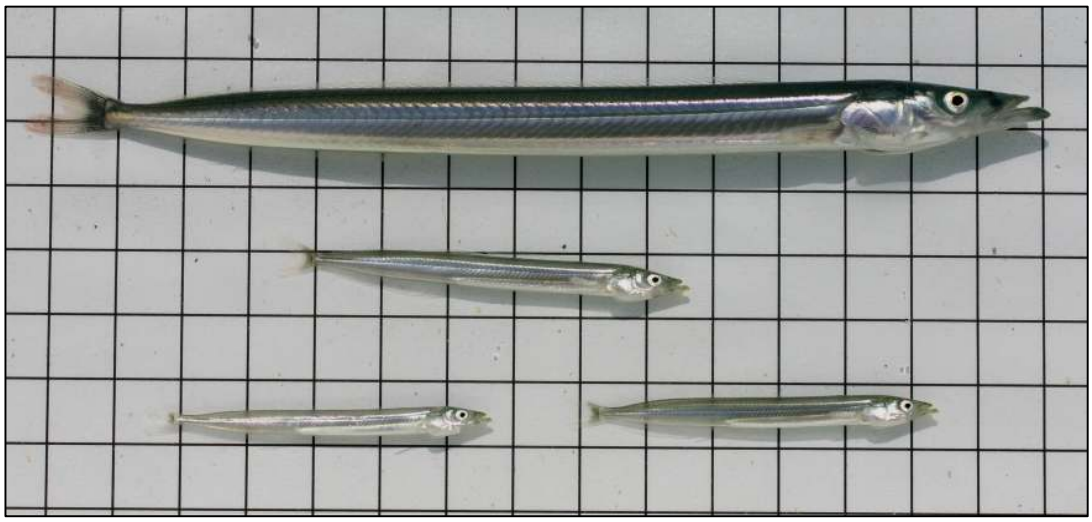
Workshop supported by The Highland Council and The Scottish Government

The production of healthy smolts can be influenced by the management of their freshwater habitat by estate proprietors and managers. However, by working only within the freshwater environment, there is only so much that can be done to support wild salmon and sea trout fisheries. The survival and growth of salmon and sea trout to 'adult' sizes, of value to fisheries, depends upon success at sea. After entering the sea in April and May each year, wild salmon 'post-smolts' are thought to migrate steadily from Scotland to feeding areas beyond the Faroes. From scale reading, we see that from almost the moment they enter salt water, wild salmon grow much faster than during their juvenile life in freshwater. In contrast, sea trout 'post-smolts' linger in coastal waters; tracking studies (e.g. FRS Shieldaig Project, Loch Torridon[2]) indicate that a proportion of them spend the whole of their first summer at sea within the confines of a sea loch.

On 29th May 2009, WRFT held a seminar entitled **'Sea trout and the seas around Wester Ross'** at Poolewe Village hall which brought together scientists representing a wide range of organisations with a shared interest in the health and productivity of our coastal seas.

The meeting adopted an 'ecosystem approach'. The subject matter of presentations ranged from plankton production to cetaceans. When it comes to food availability for sea trout and salmon, the issues are often the same as those that determine the breeding success of sea birds and feeding opportunities for whales and dolphins. A joined-up approach to 'what affects food availability in coastal waters?' may be worthwhile not just in terms of value for money: scientists from different backgrounds can bring together different knowledge, skills and enthusiasm.

*These sandeels were caught by the WRFT Biologist on 10th July 2009 in Strath Bay, Gairloch. The larger one is a **Greater sandeel** (Hyperoplus lanceolatus), the smaller ones possibly **Lesser sandeel** (Ammodytes tobianus). Sandeel populations and sea bird breeding success was higher around Scotland in 2009; possibly in response to lower sea temperatures the previous winter (photo by Steve Kett).*



[2] http://www.marlab.ac.uk/Delivery/Information_resources/information_resources_view_documents.aspx?resourceId=31140&parentId=37&parentName=Reports

Following an introduction by **Cllr Richard Greene**, **Dr Steve Hay** from Marine Scotland described how climate change may be changing **patterns of zooplankton occurrence around Scottish shores**. Long terms monitoring programmes in Loch Ewe and elsewhere demonstrate that *Calinus finmarchicus*, a 'keystone' species at the base of the pelagic food chain is declining as other zooplankton species become more abundant. Although most nutrients supporting primary production were said to come via ocean currents, sea lochs tend to have their own nutrient dynamics. Steve also gave **Dr Emma Hatfield's** (also Marine Scotland) presentation about **inshore fish populations**. Acoustic surveys together with trawls in the sea lochs around the west of Scotland found substantial biomasses of small fishes including Herring, Sprat, Whiting, Pearlsides, sandeels and Northern krill. Most herring contributing to the ICES monitored fisheries were from autumn spawning fish; from otolith examination, juvenile herring in sea lochs were from 'spring spawning origins'. Populations of juvenile fish fluctuated for reasons not usually understood.

One of the highlights of the meeting was a presentation by **Hugh Richards** (Wester Ross Fisheries) on **jellyfish**. After a succinct summary of jellyfish life-cycles and taxonomy, Hugh explained how in some parts of the world, there is a dynamic between jellyfish blooms and the abundance of marine fin-fish. Jellyfish also feed on plankton. When juvenile fish populations are depleted (e.g. Pilchards west of Namibia) jellyfish may bloom to the extent that they may depress the recovery of the fin-fish population. The Black Sea anchovy fishery collapsed when an accidentally introduced non-native jellyfish bloomed. In 2006 and 2007 there were prolific blooms of the Common jellyfish (*Aurelia aurelia*) in some of the sea lochs around Wester Ross, 'mopping up' much of the zooplankton that might otherwise have provided food for small herrings, sandeels and other sea trout food.

Alison MacLennan (RSPB Officer for Skye and Wester Ross) focused on **sea birds** and their feeding requirements. Petrels also feed on zooplankton, mostly along the shelf edge. Priest Island, the outermost of the Summer Isles, supports our local colony for Storm Petrel; formerly they also bred on Longa. Auks (including Puffin) and terns also depend upon sandeels; studies of nesting birds on the Isle of May demonstrate how breeding success depends upon sandeel abundance.

Dr John Armstrong (Marine Scotland) summarised some of the **sea trout tracking work in Loch Torridon**, commenting on rates of mortality and the occurrence of predators (shags, cormorants and seals). **Karen Starr** (Shieldaig Export Ltd.) outlined the history of the ***Nephrops* fishery in Loch Torridon**; the fishery achieved 'Marine Stewardship Council' sustainable fishery status in 2003 for introducing a conservation based code of conduct. The main problem has been that of controlling access to the fishery; boat numbers had doubled and some of the boats were not adopting the voluntary code of conduct.

Sue Scott's (Marine biologist) spectacular presentation and **Aaron Forsyth's** (Wester Ross Marine Reserve Partnership) ROV film footage of the **underwater world around Wester Ross** brought to life some of what is so special about the marine environment around our shores. Compared to terrestrial wildlife habitats and ecosystems, we know very little about the relationships between one species and another in the marine environment, and how fishing pressures and other human activities have influenced wildlife abundance. **Dr Callan Duck** (St Andrews University) described how Grey **seal populations** are at a near all time high; Common seal populations are now declining around the UK, except in the west of Scotland. Finally, **Sarah Doleman** (Whale and Dolphin Conservation Society) described how coastal waters around Wester Ross may be of importance for **cetaceans** including Harbour Porpoise and Minke Whale.

The aim of the workshop was to find out whether there were any issues where a collaborative approach to investigation might provide an appropriate framework for future work. There is much information about the marine environment from fisheries surveys, university studies and other investigations, and much ongoing work. However, access to information about the marine environment is sometimes difficult: the findings of research projects do not always readily filter down to local fishermen or local marine wildlife enthusiasts. The workshop failed to find an easy solution to this problem or to agree a collaborative way forward.

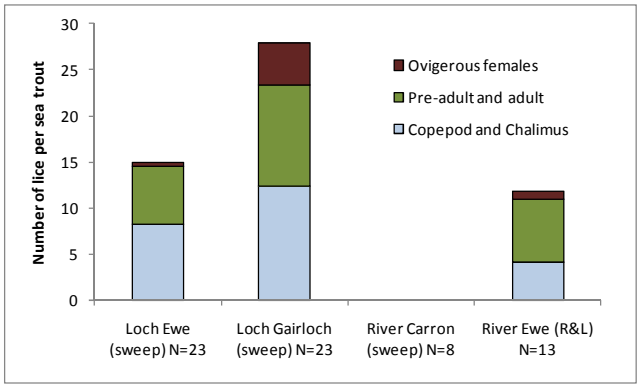
Thank you to all the participants who attended this meeting; there is much to do.

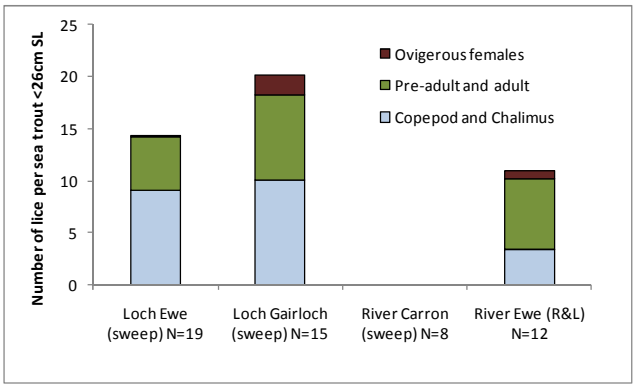
3.2 Sea lice monitoring

Sweep netting programme is supported by the Scottish Government via the TWG

The naturally occurring sea louse *Lepeophtheirus salmonis* remains a cause for much concern to both wild fisheries interests and salmon farmers around Scotland. Sea lice epizootics have been implicated as the primary cause of the collapse of the Loch Maree sea trout fishery and other sea trout fisheries in the west of Scotland and Ireland. From the outset, the Wester Ross Fisheries Trust embarked upon a programme of monitoring to assess the levels of infection by sea trout on wild sea trout. Further background information can be found in Cunningham, 2009[3].

In 2009, WRFT carried out sweep net sampling of sea trout to assess levels of lice infection in Loch Ewe, Loch Gairloch and Loch Carron. Sweep net samples were also taken from sites in Loch Kanaird and the Loch Alsh area by The TWG Northwest Regional Project Officer. No reports have been received of sea lice epizootics within the WRFT area on the scale of those reported in 2007 and 2008.





Loch Ewe

Sampling took place between 22nd May and 19th August. Altogether 23 sea trout, ranging in length from 147mm to 395mm were caught. 15 of these fish were taken in one sweep on the 15th of July. On several occasions no fish were caught. Fish were generally in good condition with an average 'condition factor' of 1.22 (range 0.93 – 1.46). The lousiest fish was a sea trout of 252 mm with 40 lice of which 32 were chalimus stage. In addition to *L salmonis*, *Caligus* lice were seen on 8 of the fish within the sample; the highest count being 6 *Caligus* lice.

Best sweep of the year: setting the net at Boor Bay on 15th July. With a northerly breeze and waves breaking over the stern of the boat conditions for setting the net were touch and go. Were the sea trout gathered on the windward shore? (Photo by Ben Rushbrooke)

[3] http://www.wrft.org.uk/files/WRFT%20Sea%20lice%20monitoring%20report%202007-2008%20for%20web.pdf

Loch Gairloch

There were generally more lice on the fish taken in Loch Gairloch than the other sites in 2009. The lousiest fish was a thin sea trout of 387mm in length but only 360g in weight, with 79 lice (including 25 ovigerous female lice). With an abundance of sandeels in the loch, most fish were in good condition having fed well.

Sea trout of 370mm taken on the 29th June over sand in Kerry Bay, Loch Gairloch. This fish had 36 lice on it, including 11 ovigerous females. Note the dorsal fin damage. Despite lice infection, this fish had fed well and with condition factor of 1.40 was one of the fattest seen. Sandeels were observed escaping from the sweep net by the snorkeler; mackerel were also taken in the same sweep.

Loch Carron

Fewer fish were taken from the River Carron than in 2008; two sweep net sessions were abandoned because of high river flow. There were no lice on any of the 7 fish taken on 20th May; with condition factors ranging from 0.85 – 1.24, some of these fish may have been on their way to sea. A rod caught sea trout taken on 21 July had 26 lice on it.

Other sites

The **Dundonnell River** fyke net was fished for 32 tides between 5th June and 2nd July at its usual site by Alasdair Macdonald of Dundonnell Estate. Only two sea trout were taken; one of which was a fish of 480mm from which a seal had taken a bite; it had 12 lice on it. The trap also caught an assortment of crabs, small gadids and flatfish.

Sites in West Sutherland and at the Kannaird and Lochalsh areas were sampled by the TWG Regional Development Officer. The note below was provided by the new RDO, Dr Donna-Clair Hunter:

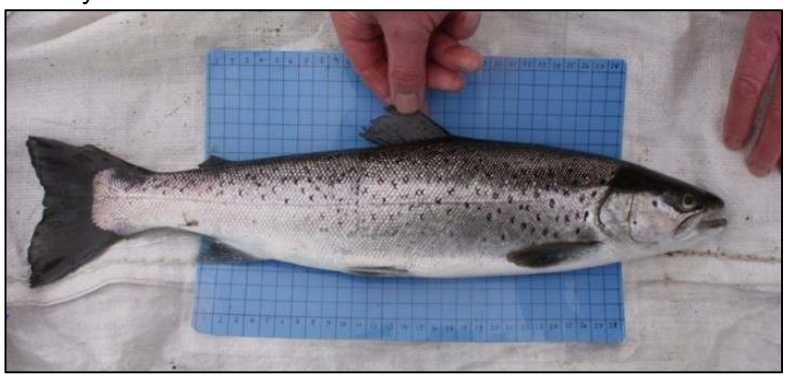
'Due to extremely poor catches at little **Loch Broom** and the **Elchaig** in 2008, 2 new sites were taken up at the Inver and the **Croe**. No fish where caught at the RDO sites of the Inver in May, **Kannaird** in July and **Croe** in July. Total numbers of fish caught at each site was varied.

No sea lice were found on any fish at the three RDO sampling sites [including Kannaird and Croe during the 2009 sampling period]. Weather conditions were similar to those of 2008, though perhaps not quite so dry.

A strategic review of the sites sampled by the RDO has been undertaken and as such 2010 post-smolt sampling will be carried out in the Inver, Kannaird, Elchaig and the Croe. Sites that will not be sampled this year are Kirkaig, River Broom and Little Loch Broom.'

Overwintering sea trout in Loch Gairloch

Having watched, from the WRFT office, sea trout jumping in Flowerdale Bay in January 2010, the decision was made to try to catch some. The sweep net sample, taken in 1st February 2010, was one of the most successful to date and 36 sea trout were anaesthetised for examination. Most of the fish were rather lean (compared to summer months), between 270mm and 370mm in length, with fins in good condition and low numbers of sea lice (average 5 lice per fish). All fish were returned after a period of recovery.



(left [l-r]: Roger McLachlan, Garry Bulmer and Ben Rushbrooke processing the catch of sea trout on 1st February 2010 in front of the WRFT Office in the Harbour Centre; right: one of the larger fish in the sample)

This is the first sample of sea trout taken in the sea by WRFT during winter months, and demonstrates that some Wester Ross sea trout over-winter in the sea. Samples of DNA have been taken to help establish whether the fish belong to a local stream spawning population or whether they have come from further afield (e.g. River Ewe - Loch Maree system).

Data analyses

Sea lice data from samples of wild West coast sea trout have been collected by Fisheries trusts and by Marine Scotland (FRS) scientists for over ten years. Following a meeting in September 2009 at the Lochaber Fisheries Trust office, much of this data has been pooled for analyses by Marine Scotland (Science) in collaboration with fisheries trusts. One of the aims of the analyses is to further clarify relationships between lice infection of wild sea trout and the salmon farming industry, including relationships between infection levels on wild fish and production cycles on nearby farms, and distances to nearby salmon farms. In Norway and Ireland, these relationships have been more fully investigated than here in Scotland.

At a time when the salmon farming industry is pressing the Scottish Government to increase production within the west of Scotland including the WRFT area, the Trust remains concerned that there is still an inadequate understanding at Government level of relationships between salmon farming and sea lice epizootics of wild fish in nearby waters to guide those who are tasked with planning. Unless it can be shown that the salmon farming industry can be compatible with the recovery of healthy populations of sea trout and salmon and the fisheries they sustained, the Trust will continue to argue, based on its own findings and information from many other sources, that very large salmon farms should not be located near the most important rivers for wild salmon and sea because of the threat they pose to fisheries.

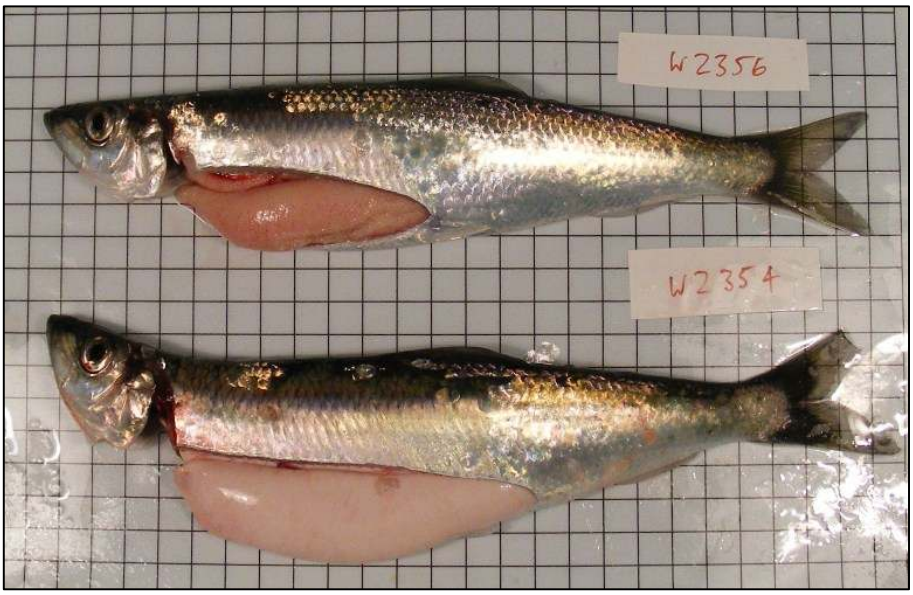
3.3 Herring Rediscovery Project

in collaboration with Two Lochs Radio *(www.2lr.co.uk/)* local fishermen, with support from the Scottish Government via RAFTS

For hundreds of years, herring were fished for by local boats in many of the sea lochs around Wester Ross. Herring were as important as any other fish to the local economy; the town of Ullapool was founded as a base from which to harvest herring. Gairloch harbour, by the WRFT office, was a centre for landing and packing herring caught by drift-net and ring-net fishermen in the Minch. Then everything changed. Following the collapse of stocks in the 1970s, there has been little fishing for herring by local boats. Local people have almost forgotten about them; freshly landed locally-caught herring can no longer be bought for human consumption within the area.

For sea trout, juvenile herring can be an important food (e.g. Pemberton, 2006; Rikardsen and Amundsen, 2004). Herring were (and possibly remain) a 'keystone' species within the coastal ecosystem, providing food for many sea birds, marine cetaceans, and for other fish species including cod and skate. Gairloch and Ullapool are premier marine wildlife tourism centres: the local economy is dependent upon healthy and productive coastal seas.

The **Herring Rediscovery Project** aims to find out more about local herring. A series of conversations between fishermen is being recorded to ensure that information on the past whereabouts of herrings at different times of year is not lost. This information will be used to help guide a future sampling programme to find out what remains. Can anything be done to restore local herring populations to former levels of abundance?



The Gairloch-Loch Ewe area was formerly noted for spawning herring (Bryan, Minch review, 1994). More recently, juvenile herring recorded in local sea lochs were found to be progeny of 'spring spawners' rather than the autumn spawning herring which form the basis of ICES guided herring fisheries further offshore.

Like salmon, herring may 'home' back to natal areas to spawn, thereby maintaining discreet populations.

(above) Wild herring in spawning condition from a local sea loch taken in January 2010: a relict population, or a population which can proliferate once again?

The Herring Rediscovery Project is intended to be initial step in a larger initiative in collaboration with Wester Ross Environment Network, Two Lochs Radio, Marine Scotland Science, The Highland Council and local fishermen to learn more about inshore fish populations and the habitats that support them. For support and enthusiasm to date, many thanks to Cllr Richard Greene, Kenneth Maclean, Alex Gray, Roderick MacIver, and Hector Mackenzie. The project is grant supported by the Scottish Government via RAFTS (Rivers and Fisheries Trusts Scotland). Please contact the WRFT Biologist for more information, or, especially, if you have a story about local herring which you would like to pass on to the next generation.

Part 4 **RAFTS funded Research Projects**

4.1 Focusing Atlantic Salmon Management on Populations (FASMOP): Atlantic salmon Genetic Sampling and Analysis

Supported by The Scottish Government via RAFTS and the Atlantic Salmon Trust

Project Background and Principles

Recent genetic analysis of salmon populations in other rivers in Scotland has indicated that river stocks may be structured on a fine scale into multiple distinct breeding populations . For example, salmon breeding above and below waterfalls or other natural features may often be heritably different in ways that affect their behaviour, survival and reproductive success. This can be true of neighbouring tributary populations and key to allowing each to cope with particular environmental conditions than the other. Therefore intermixing of the populations may not be desirable. In large rivers many different populations can potentially exist and an understanding of this population structure is essential for the development of effective stock conservation and management programmes.

This partnership project between RAFTS, Fisheries Research Services (FRS) Freshwater Laboratory and individual District Salmon Fishery Boards (DSFB) and Fisheries Trusts combines the financial, management and staff resources of Fisheries Trusts and DSFBs with the scientific and technical genetic analysis expertise and facilities of FRS. It will collect and analyse a databank of tissue samples from river catchments across the length and breadth of Scotland. Further background information can be found at: http://www.rafts.org.uk/projects/geneticsproject.asp .

The tissues will be used for molecular genetic screening and the insights gained into local population structuring used to inform and refine local management actions to protect the genetic integrity of our salmon stocks and better manage the economically important fisheries they support. The work, undertaken first and foremost to inform local management, will also contribute to the FRS work on the genetic character of Scottish salmon stocks as part of the pan European NASCO sponsored and EU funded SALSEA-MERGE project.

Progress to date (Mark Coulson, RAFTS Genetics team)

Juvenile Atlantic salmon from various locations throughout the Wester Ross Fishery Trust were sampled for genetic material by the Trust in order to inform fisheries management. Data from 17 genetic markers (microsatellites) were obtained for each fish (fin clip). These samples comprised 9 localities indicated on the map, *Figure 4.1* (note: areas circled were sites which were pooled for the purpose of genetic analysis). Most sites within Wester Ross show genetic differences from one another (*Figure 4.2*). However the degree of differentiation is often small. The Ullapool River shows some of the larger differences to other sites. The Ewe, Ling and Torridon also show some degree of genetic differentiation while the Little Gruinard and Croe Rivers do not show significant differences using the current set of genetic markers.

One application of genetic markers is the potential ability of them to assign fish to location of origin. Given the known sites at which these fish were assigned, average assignments to river (i.e. what proportion of fish sampled in a river are genetically assigned back to that river) was only about 38%.

Further information on the SALSEA project is available at: http://www.nasco.int/sas/salsea.htm

Figure 4.1 Locations of where genetic samples from juvenile salmon were collected for the first year of FASMOP and SALSEA projects.

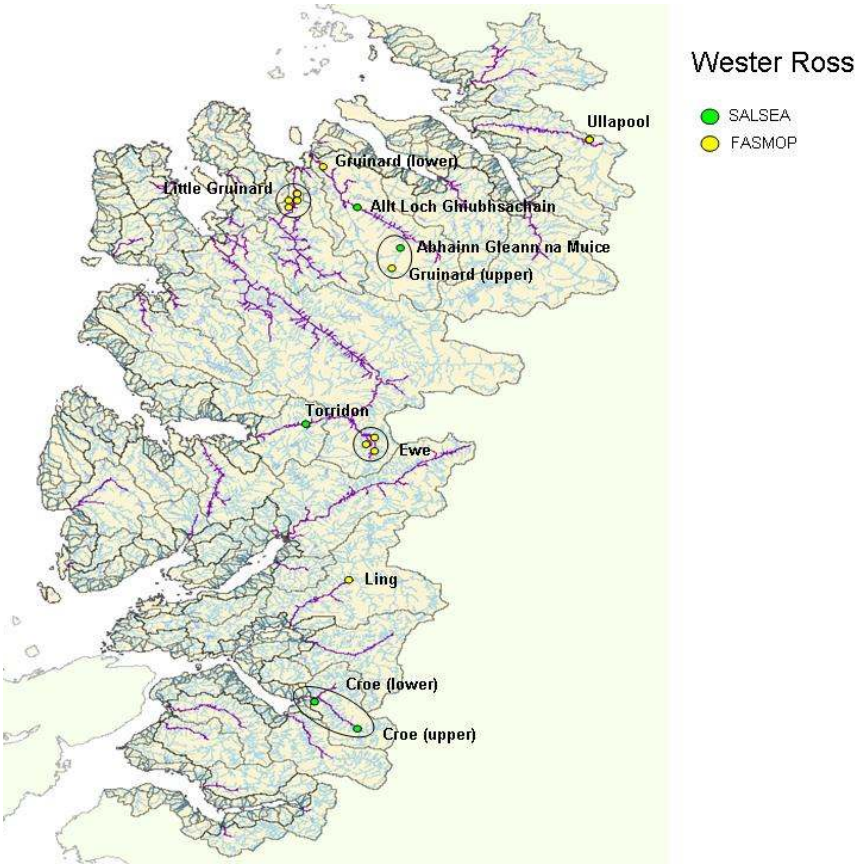
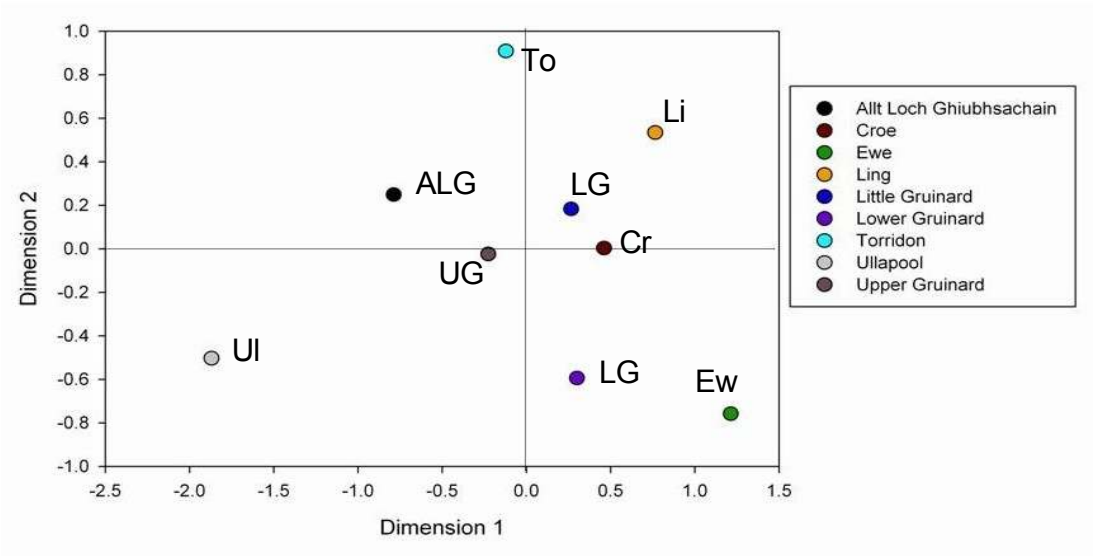


Figure 4.2 Multidimensional scaling plot of genetic distances between the samples analysed to date. Many of the samples group closely together; the most distant from the 'norm' being those from the Ullapool, River Torridon River and River Ewe. WRFT awaits further interpretation of the results of genetic analyses.



4.2 Carrying Capacity Management Trial

With funding from the Scottish Government via RAFTS

Fishery Trust biologists are frequently asked ‘are there as many juvenile fish as there should be?’ when presenting electro-fishing survey results. To interpret juvenile fish survey data in terms of the health of respective fish populations (see Part 2), knowledge of ‘carrying capacity’ is required.

A project is underway to learn more about the numbers of juvenile salmon that can live in different types of WRFT e-fish team carried out fully-quantitative surveys of stream sections which were fully stocked with salmon eggs during the winter 2009. This project is the first phase of a three year programme which will be delivered in partnership with the Cromarty Firth Fishery Board & Trust, Fisheries Research Services (John Armstrong), US Forest Service (Keith Nislow) and Trondheim University (Sigurd Einum).

In the first two years of the project we will establish carrying capacities for habitats within 16 streams in Ross-shire. In year three it is intended to investigate the possible increase in carrying capacity resulting from nutrient restoration and to characterise features of downstream nutrient spiralling and uptake, following studies.

Initial results indicated much higher densities of salmon fry in shallow cobbly riffle type habitat than other habitat types. Salmon fry require substrate with void space (between stones) in which to hide; so these results confirm and quantify what was expected.

In streams around Achnasheen, the carrying capacity densities of salmon fry were highest in ‘shallow cobbly riffle’ habitat (e.g. below); pools (e.g. right) were dominated by larger trout with fewer salmon fry.

Part 5 **Ecosystems and Habitat Management**

5.1 Wester Ross and Lochalsh Biosecurity Plan

Supported by the Scottish Government via RAFTS

Invasive non-native species (INNS) and biosecurity issues are of increasing concern in the Wester Ross and Lochalsh area as they are elsewhere in Scotland. Indeed, INNS are considered along with climate change to be the principle threat to global biodiversity. In response to this, the Wester Ross Fisheries Trust has prepared a biosecurity plan for the local area. The plan focuses on species of concern to freshwater environments and fisheries. The Wester Ross and Lochalsh Biosecurity Plan can be found on the WRFT website[4].

The Plan will be one of a set of 20 biosecurity plans being produced throughout Scotland as part of a national programme of action implemented through the Rivers and Fisheries Trusts of Scotland (RAFTS) with backing and support from the Scottish Government, Scottish Natural Heritage, Scottish Environment Protection Agency, and the Esmeé Fairbairn Foundation. The vision of this plan is: 'To establish a sustainable framework that will lead to the prevention, detection, control and eradication of invasive non-native species within Wester Ross and adjacent areas. This will be undertaken through the application of appropriate management activities, data collection, liaison, education and legislation '.

This vision will be achieved through the realisation of three objectives:

- **Objective 1:** Prevent the introduction and spread of new invasive non-native species and fish diseases within the Wester Ross area
- **Objective 2:** Establish optimum surveillance, detection, monitoring and rapid response systems for the identified invasive non-native species and fish diseases which pose significant threats to local biodiversity and economy
- **Objective 3:** Effective control and eradication programmes for existing invasive non-native species and fish diseases are operational and sustainable.

These objectives are in accordance with established protocols for fish diseases and with the three key elements of the GB Invasive Non Native Species Framework Strategy:

- Prevention;
- Early detection, surveillance, monitoring and rapid response;
- Mitigation, control and eradication.

Priority INNS species already present in the area include *Rhododendron ponticum* which is widespread within the area, Japanese knotweed and North American Mink *(Mustela vison),* Pike *(Essox lucius)* and New Zealand flatworm. Those not already present in the WRFT area which pose a high threat to native wildlife and fisheries include *Gyrodactylus salaris* (parasite of salmon), North American Signal crayfish *(Pacifasticus leniusculus),* Wireweed *(Saragassum muticum),* Australian swamp stonecrop *(Crassula helmsii)* and several INNS fish species.

North West Highlands Mink Control Project

The North West Highlands Mink Control Project has now been running for about 10 months. A 'cordon sanitaire' from the East coast at Dornoch to the West coast at Ullapool was successfully established, comprising mink rafts approximately every 5km in freshwaters and tracking tunnels approximately every 1km on accessible coastal areas. There are plans to extend the control programme to neighbouring areas.

[4] http://www.wrft.org.uk/news/newsitem.cfm?id=105

For further information about the project or if you have seen American mink in the North West Highlands please contact Lois Canham, Mink Project Officer on 07920 589 020.

Rhododendron ponticum control training workshop and biosecurity debate

One of the most invasive non-native species (INNS) in Wester Ross is *Rhododendron ponticum*. *R. ponticum* has been spreading along banks of the Ullapool, Broom, Dundonnell, Little Gruinard, Ewe, Kerry, Torridon and Carron rivers. Over the years, WRFT fisheries management plans, particularly those for the River Broom and River Carron, have highlighted the need to control its spread. By displacing other native plants (e.g. alder, birch, rowan, willow, ling heather . . .) which provide food for many of the insects or insect larvae that juvenile salmon and trout feed on, the continued spread of *ponticum* is bad news for fish populations and other native wildlife.

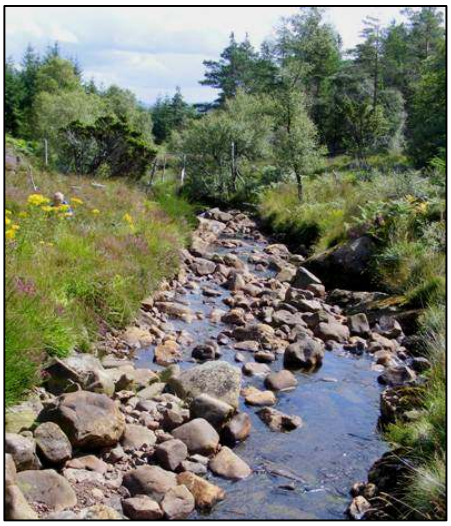
On 21st and 22nd January, 11 participants took part in the first **'Lever and Mulch'** training course, organised by WRFT and the National Trust for Scotland (NTS) at NTS Inverewe Gardens near Poolewe (above). Training was provided by Donald Kennedy and Gordon French of Morvern Community Woodlands, and Rob Dewar of NTS. Trainees included local estate staff, forestry contractors and countryside rangers. Donald and Gordon have developed the 'Lever & Mulch' method for eradicating *ponticum*, which in many situations clearly has advantages over other methods. The complementary 'Stem injection' method (demonstrated by Rob) is particularly effective for larger stands of *ponticum* which are not so readily be uprooted by hand. NTS Inverewe Gardens are famous for their collections of magnificent rhododendrons from across the world. *Ponticum* is the only one that has jumped the garden fence to spread into surrounding land.

Rhododendron ponticum was the main subject of a biosecurity debate at Poolewe Village hall on 21st January. The debate was chaired by Richard Munday (former WRFT chair) and the panel comprised Dr James Fenton, Rob Dewar, Duncan Donald and Donald Kennedy. The debate was recorded for Two Lochs Radio (www.2lr.co.uk) and will be broadcast during International Biodiversity Week in May 2010.

Thank you to Roy Dowcett and Kevin Ball at Inverewe for providing facilities; to Rob, Donald and Gordon for providing training, to Richard for chairing an excellent debate, and to all the participants for supporting the event. The training course was part-funded by RAFTS via a grant from the Scottish Government, Scottish Natural Heritage and Esmee Fairbairn Foundation for production of Biosecurity Plans in Scotland.

5.2 River Ewe system sea trout habitat restoration projects

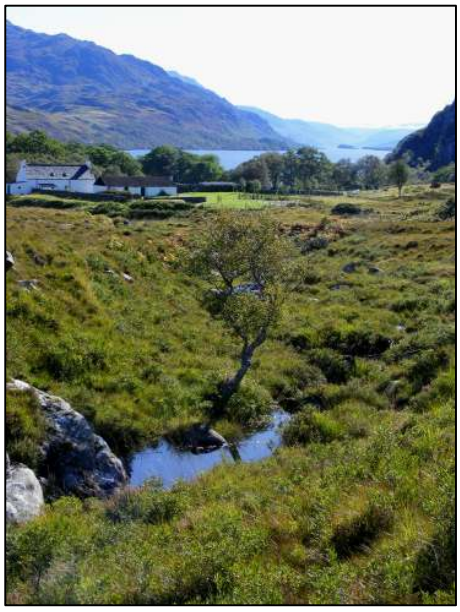
The River Ewe – Loch Maree system is the most important river system for sea trout within the WRFT area and until the 1990s supported the most important fishery. Wild trout spawn in many of the streams around the loch and over the past 10 years the Trust has carried out a series of activities and projects to improve spawning and nursery habitat for sea trout.



The **Slattadale Burn Habitat Restoration Project** *(left),* supported by the Dulverton Trust and Hugh Fraser Foundation, in collaboration with Forestry Commission Scotland, has led to the removal of non-native conifers (and associated shading) from the sides of the burn and restoration of more natural riparian habitat, promoting higher in-stream productivity.

It took several years for brash to break down and native vegetation, including willow, alder and birch trees to become established. In 2009, the Forestry Commission developed a new footpath up the side of the burn from the car park by the Loch Maree shore, adding amenity value to the project. During the summer, Grey wagtails and dragonflies can be seen along the stream. In 2009, the WRFT electro-fishing team recorded high CPUE of trout fry in the burn, and salmon fry were found almost 1km up the burn from the loch.

On 14th September 2009, Dr Jenny Mant and Dr Di Hammond from the River Restoration Centre, together with Angus Tree and Nicola Tallach of Scottish National Heritage visited the Tollie Burn and the Taagan Burn at either end of Loch Maree to consider options for habitat restoration projects.



The **Tollie burn** currently flows steeply down into the River Ewe. However in the past it flowed south along a longer, less steeply sloping course into Tollie Bay, Loch Maree. The old course can still clearly be seen above Tollie farm *(right)* below the point at which it was diverted some 300+ years ago according to local anecdote.

The 'newer' course is now well established. However, redirection of part of the flow down the old channel could lead to the restoration and a net gain of extensive areas of spawning and nursery habitat for sea trout. Further studies are planned to assess the impacts of rediverting part of the flow to the overall ecology of the burn and its plants and animals.

The **Taagan burn** *(left)* flows into the south end of Loch Maree. Over 100 years ago the burn was channelised to improve grazing for livestock. Over the years, however, much sediment has been reworked and settled into the artificial channel, increasing the risk of flooding downstream. During periods of drought, the burn has seeped away through unconsolidated sediment above Loch Maree and fish have been stranded in pools. The challenge is therefore to reduce the threat of damaging flooding and improve spawning and nursery habitat for sea trout and other wildlife.

Part 6 **Monitoring smolt output on the River Carron**

Supported by River Carron Improvement Association, The Highland Council and the Scottish Government via RAFTS

Report contributed by Bob Kindness (Seafield College)

Smolt output from the River Carron was monitored in 2008 with the use of a rotary screw trap positioned at the neck of Brabourne's Pool on the New Kelso beat. The background to this monitoring project, including a description of the trap and details of the trap position and results of fish that were caught, is presented in the WRFT Review May 2009. For the 2009 trapping season, the trap was positioned in the same place and operated in the same way as for the 2008 season. This report presents information gathered during 2009 and make appropriate comparisons with the data collected in 2008.

Trap Catches

Both wild and stocked fish were caught. Fish were caught in the trap from the day it was installed on 2nd April, although numbers were very low during the early part of April. Until the 13th of April most of the smolts caught had not fully smolted but were making their way slowly down the river before leaving. The bulk of the salmon smolts were caught in the trap between 18/04/09 and 13/05/09 while the sea trout smolt numbers peaked between 13/05/09 and 21/05/09. By the time the trap was removed from the river a total of 2,287 un-tagged salmon smolts, 572 tagged salmon smolts and 341 sea trout smolts had been caught. In addition, 294 salmon and 54 sea trout smolts were identified as coming from the release pond (Figure 6.2).

Smolt Lengths

Fork lengths were recorded for a total of 1,313 un-tagged salmon smolts, 363 tagged salmon smolts and 141 sea trout smolts. The distribution of fork lengths is shown in Figure 6.1.

Figure 6.1 Fork lengths of River Carron salmon and sea trout smolts caught in 2009.

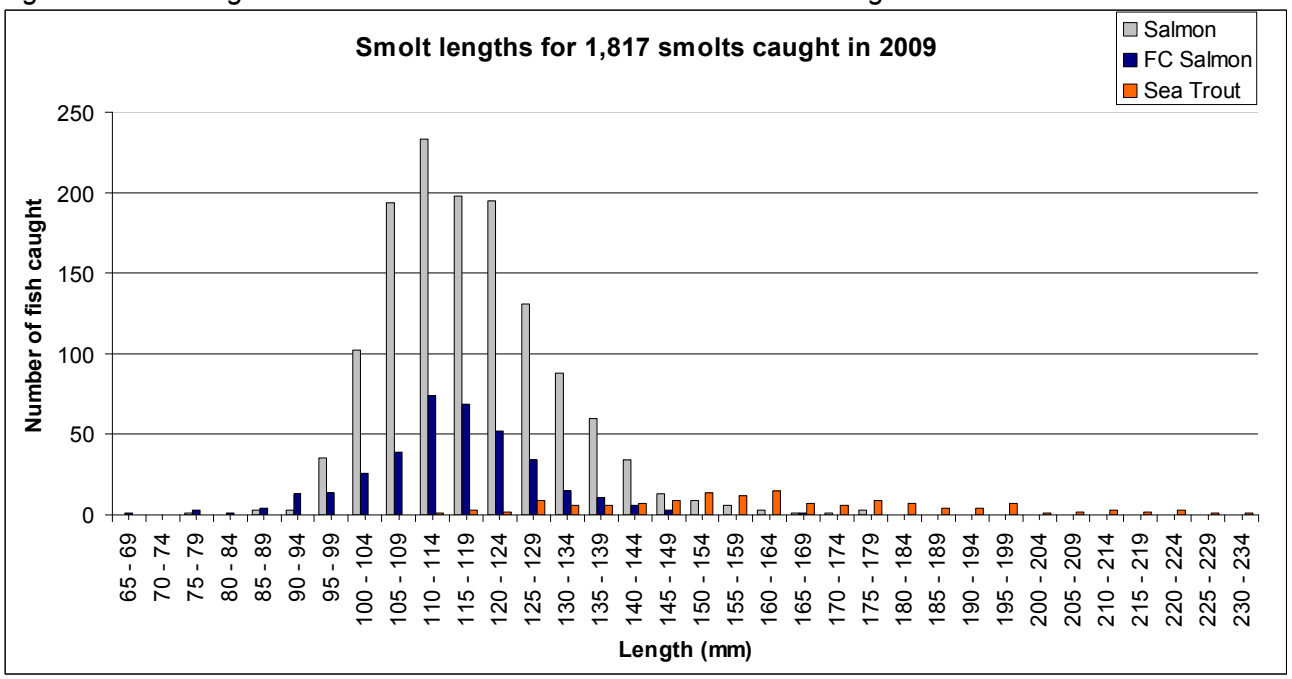
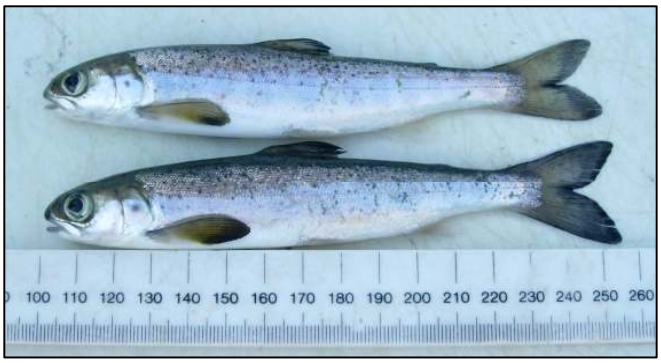


Figure 6.2 (left) Pair of salmon smolts with adipose fins removed: these fish had near perfect tail and dorsal fins and may have been stocked in October 2006 or 2007. (right) Bird damaged smolt.



Estimation of Total Smolt Run

A rotary screw trap samples a proportion of the overall smolt run. The proportion sampled depends on the location of the trap and the height and therefore the flow of the river. A method used to try to estimate the total smolt run is to mark some smolts from the trap, return them to the river in a pool upstream of the trap and then record the number that get caught in the trap again. The percentage re-captured gives an indication of the percentage of smolts descending the river that enter the trap. On the 18th of April, 30 salmon smolts from the trap were marked by applying a blue spot using a panjet to the abdomen, before releasing them at the neck of the House Pool approximately 80 metres above the trap. Eight of these fish appeared back in the trap, 3 the next day, 1 after 2 days, 3 after 3 days and 1 on the 4th day. During this period the river was at a very low level with most of the flow going through the trap.

The marking exercise was repeated on the 12th of May with a further 30 salmon smolts being marked. On this occasion only 3 marked smolts appeared back in the trap, 1 the next day, 1 after 2 days and 1 after 4 days. Unlike the first time, the river was running at a higher level during this period with much of the river flow going past the trap.

Other Fish Caught

In addition to salmon and sea trout smolts, a variety of other fish were caught in the trap, including 104 eels, 12 sticklebacks, 3 sea lampreys and a flounder. Although the trap is set to catch fish migrating down the river on their way to the sea, reasonable numbers of salmon and trout fry were also caught. These fish move around within the pools and find their way into the trap. Of the salmon fry caught, 115 were un-tagged while 89 were tagged when stocked into the river the previous October. It was also encouraging to see the number of over-wintered finnock (108) and sea trout kelts (37) heading back to the sea.

Incidence of Bird Damage

Fish eating ducks (mergansers and goosanders) are often in evidence at the mouth of the River Carron. At least 4 pairs of mergansers have successfully reared young in recent years in different parts of the river and the adult birds have been observed on the river at smolt migration time. All the smolts going through the trap were examined for evidence of bird damage. This would normally be seen as scale loss towards the tail of the fish when a bird has grabbed the fish too far back on the body to keep hold of it. In severe cases, puncture marks and lesions were present on the fish (Figure 6.2). Of the 2,859 salmon smolts caught in the trap, 192 had bird damage in the form of scale loss with 6 of them having open wounds. This represents 6.7% overall but could be considerably higher on individual days e.g. 17.5% on the 13th of May when a total of 189 smolts were caught.

Conclusions

The rotary screw trap proved to be a very useful tool in 2009, as it did in 2008, in providing valuable information on both the fish present in the River Carron and the fish descending the river on their way to the sea. Taken in conjunction with the work being carried out in managing the stocks of sea trout and salmon within the river it helps to evaluate the effectiveness of the restoration programme.

In terms of smolt output, the trap catches seem to indicate healthy numbers of salmon smolts leaving for the sea although it is difficult to obtain an accurate figure for total numbers. This is primarily due to the fact that the efficiency of the trap varied greatly depending on the height of the river. Mark and release exercises showed that the percentages of smolts being caught ranged from 26.7% at low water height to 10% when the river was slightly higher. Once it rose to a high level, no fish were caught and indeed it was necessary to raise the screw to prevent the trap being washed away. Such an exercise had to be performed during the peak of the smolt run when significant numbers of smolts would have been missed. To obtain a meaningful indication of smolt numbers, the river would need to remain at a steady low level throughout the smolt run or more mark and recapture would need to be carried out at times of different heights.

Regarding the timing of the smolt run, the bulk of the salmon smolts descended the river between the middle of April and the middle of May and seemed to happen irrespective of river height as good numbers of fish were caught even when the river was very low. This migration was slightly earlier than in 2008. Once again sea trout smolts ran later than the salmon smolts.

As in 2008, the trap was most valuable in providing information on the performance of tagged salmon smolts and allowing comparisons to be made with un-tagged smolts. These fish were tagged in October 2006 and 2007 as autumn fry and had then spent a considerable time in the river before reaching the smolt stage. Their appearance was identical to un-tagged fish and, from the distribution of fork lengths, they followed the same size range. In terms of numbers, they made a considerable contribution to the overall smolt run at 20%, a figure that clearly demonstrates the success, at least to the smolt stage, of fish stocked out as established fish late in the year.

Once again the operation of the trap helped with the smolt release programme in terms of the timing of the release. These smolts were released from the release pond to coincide with the peak of the wild smolt run towards the end of April. This ensured that all the smolts left the river at the same time, thereby providing safety in numbers in terms of pressure from predators and a combined migration to the North Atlantic. This year the smolts from the release pond were not quite so advanced as in 2008 when they were released. This was in evidence from the fact that more of them were caught in the trap after 2 days in the up position than in 2008 since they were taking longer to move down the river.

In addition to smolts, other stages in the life-cycle of salmon and sea trout were caught. Good numbers of finnock and sea trout kelts were indicative of an improved run of these fish going up the river in 2008 which was certainly in evidence from the rod catches for that year. Of the 204 salmon fry that found their way into the trap, 43.6% of them were tagged (October 2008) which again shows how well these fish were performing. Other species of note were eels, which featured regularly in the catch, and at least one sea lamprey. This particular lamprey, recognisable by a mark on the top of its head, appeared in the trap on the 5th of June and again on the 10th of June.

Finally, by recording the incidence of scale loss indicative of damage caused by fish eating ducks, it was possible to gauge the extent of predatory problems on the Carron as a result of these birds. The number of damaged fish was significant but not too high. However, these were fish that had been caught and managed to escape. An unknown number would have been caught and eaten. Given the high number of these birds that are often seen, particularly on the sea pools, it is likely that they reduce significantly the number of smolts leaving the vicinity of the river.

Part 7 **Education Projects**

Supported by SNH, The Royal Society and The Scottish Government via RAFTS

By Dr Lorna Brown

Last Spring we secured funding from SNH, the Royal Society and RAFTS to develop the Living Lochs Project. Initially we hoped to work with the first year pupils of Gairloch High School in the summer term but a combination of factors led to the fieldtrips taking place in late August. Despite wind, rain and midges the pupils scoured the area for all signs of wildlife, helped out by a variety of wildlife experts including Lindsey Duncan, the Highland Council ranger and Robin Reid of RSPB. The feedback from staff and pupils alike showed that the project was well received and we plan to take the project to Plockton High School in May this year.

This winter has been an extremely problematic one for the Wester Ross river hatcheries. The severe frosts played havoc with water flows and many sleepless nights were spent defrosting pipes to ensure the eggs survived. We are indebted to all those who kept their hatcheries thriving through the depths of winter to provide us with eggs for our project, including Neil Morrison and Coulin Estate, Bob Kindness of Inverness College and Jim Raffell from the Sheildaig Sea trout Project.

This year the Trust purchased another new classroom hatchery system, allowing us to offer the project to five schools - Kinlochewe, Torridon, Sheildaig, Applecross and Lochcarron. When these schools participated in the past tanks had to be placed in an unheated location and icepacks used to keep the tank cool. The use of a cooler system in the new hatcheries allows the pupils to have the tanks in the class close at hand. The general consensus from the teachers was that having the hatchery in the classroom instilled a strong sense of responsibility on the pupils and that they were more inclined to take a very active role in monitoring the eggs.

As in 2009 there were few mortalities and our little fish were ready to release by the Easter holidays. Jim Raffell kindly visited Shieldaig Primary to give a talk and also joined us on the release trip. We were extremely lucky with the weather for all the fieldtrips this spring and we had plenty of time to search for invertebrates after each pupil had released their own little bag of fish.

Lindsey Duncan came along to help with the tricky task of bug identification on two of the trips while Rule Anderson, the Kintail National Trust ranger, joined us at Lochcarron Primary. It was fascinating to visit the Neil Morrison's hatchery at Coulin with the Kinlochewe and Torridon pupils and discover that it had been so cold that the eggs in hatchery had still not hatched, while our school eggs had all developed into small fish ready to release!

(left) High School students sampling a loch near Gairloch

A big thank you to all who enthusiastically contributed and participated in this project, making it a success once again.

Part 8 **Financial Statement**

For the year ended 31 March 2010

	Unrestricted Funds	Restricted Funds	2010	2009 Total
Incoming resources from generated funds	**£**	**£**		
Voluntary income				
WRASFB	23000		**23000**	23500
Membership	520		**520**	1010
Sub Total	**23520**		**23520**	**24510**
Activities for generated funds				
Investment Income	794		**794**	2914
Gift Aid	2240		**2240**	895
Sub Total	**3034**		**3034**	**3809**
Incoming resources from charitable activities				
Inveran Estate (Bruachaig)	2000		2000	2000
Coulin Estate	2000		2000	2000
Kinloch Woodland Trust	0		0	1000
Orrin Trust	0		0	500
Fish Farms	4866		4866	4725
Southern River Proprietors	4972		4972	4394
Rafts Highland Council				792
Rafts Whitley Animal Protection trust	845		845	1425
Individual donations	170		170	150
Sales	1455		1455	22
Contracts	0		0	3365
Other Highland Council	0		0	1185
Sub Total	**16308**	**0**	**16308**	**21558**
Total Voluntary incoming resources	**42862**	**0**	**42862**	**49877**
Incoming resources from charitable activities Restricted.				
Salmon & Trout in the classroom 2009/11		**4408**		**8304**
AMA Seerad completed				**1167**
Sweep netting/sea lice		**16231**		**15275**
Tournaig trap		**2500**		**2857**
Carrying Capacity		**4866**		**0**
Living Lochs		**3025**		**0**
Loch Maree Family day				**1509**
Arctic Charr week				**5052**
Herring Rediscovery		**2626**		**0**
Bruachaig		**436**		**0**
Sea live review meeting		**823**		**0**
Marine Seminar				**1700**
River Ewe RST project				**7284**
Biosecurity plan		**2500**		**2000**
Fisheries Management plan				**8636**
Atlantic salmon				**712**
Other / Meetings				**1417**
Sub Total	**0**	**37415**		**55913**
Total Donations	**42862**	**37415**	**80277**	**105790**
Figures shown in Book keeping	80278			

Financial statement for the year ended 31 March 2010 (continued):

Resources expended	Direct Costs	Support Costs		
Costs of generating funds				
Fundraising trading cost of goods sold				
Charitable activities				
Total resources expended	**0**	**0**		
Costs of activities in furtherance of charity's objectives				
Support Costs				
Wages & Contract labour	15463			12333
Insurance	1514			1708
Telephone	675			880
Heat & Light	669			677
Subscriptions	1241			2017
Training expenses	285			0
Printing/Post / Stationery	2742			1830
Sundry expenses	2599			2793
Comp equipment	0			1302
Maintenance	388			
Sub Total	**25576**	**0**	**25576**	**23540**
Charitable activities direct costs				
Publishing				
Motor vehicle travel & subsistance expenses		4854		4012
Wages ,Soc Security , Pension		38622		34218
Equipment / Hire / repairs		894		491
Equipment new		2202		8221
Governance costs		1631		1573
Depreciation				
RAFTS/FRS Commission		1000		750
Sundry		1265		12
Sub Total	**0**	**50468**	**50468**	**49277**
Charitable activities total costs	**25576**	**50468**	**76044**	**72817**
Figures as shown in book keeping	**76046**			**76046**
IMPORTANT NOTICE				
The 2010 figures are for information only and have				
not been checked or audited.				
The figures have been checked to Book keeping				
However there will be adjustments made by the Accountants				

Acknowledgements

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

Aaron Forsyth
Ailsa McLellan (RDO)
Alasdair Macdonald
Alan McGillivray
Alex Way
Alison MacLennan (RSPB)
Alison Rowe
Alastair Pearson
Andrew Graham-Stewart
Andrew Slaughter
Angus Morrison
Anne and Alex Gray
Prof Barry Blake
Barbara Souter
Ben, Ron and Lesley Rushbrooke
Billy Forbes
Bob Kindness
Brian Fraser
Dr Callan Duck
Callum Sinclair (RAFTS)
Catherine Vine
Dr Chris Horrill (RAFTS Invasive species)
Dr Colin Bean (SNH)
Colin Macdonald
Colin Russel
Prof Andrew (Dave) Barclay
David Dunkley (Scottish Government)
Dave Hargraves
David Stewart (FRS)
Donald Kennedy
Donald Macleod
Donald Rice
Donna-Clare Hunter (RDO)
Dundonnell Estate
Duncan Donald
Eilean Darach Estate
Dr James Fenton
Gordon French
Emma Hatfield (FRS)
Eoghain Maclean
Eric McVicar
Dr Eric Verspoor (FRS)
Ewen and Jenny Scobie
Fergus Mackenzie
Frank Buckley
Frank Kalinowski
Garry Bulmer
Gilpin Bradley
Graeme Wilson
Greg Jeffries
Hamish Lawrie
Hugh Richards
Kenneth Maclean
Kenny Nelson (SNH)
Dr James Merryweather
Jamie Kugelmann and family
Jim Raffell
Dr John Armstrong (FRS)
John Corbyn
John Ogle & family and friends
John Mackenzie,
John Webb
Johnny Parry
Karen Starr
Ken Williamson
Kenny Nelson (SNH)
Kevin Ginty
Letterewe Estate
Lindsey Duncan (HC Countryside Ranger)
Lois Canham (Mink Project Officer)
Dr Lorna Brown
Marcus Simpson
Mark Coulson and Lucy Webster (RAFTS Genetics)
Mark Vincent (Loch Maree Hotel)
Mark Williams and family
Mary Gibson (SNH)
Michael Penston
Neil Morrison
Nick Benge (Watergems)
Nick Sanders (Glenelg AC)
Nick Thomson and family (Loch Maree Hotel)
Nicola Tallach (SNH)
NTS Inverewe Gardens staff
Prof Peter Maguire
Prof Peter Maitland
Philip Smith
Ray Dingwall
Richard Munday
Rob Dewar
Roderick MacIvor
Roger Macdonald
Roger Brook
Roger and Tracy McLachlan
Ron Greer
Ross Gardiner (FRS)
Sarah Doleman (Whale and Dolphin Cons. Soc.)
Dr Steve Hay (FRS)
Dr Steve Kett (Middlesex University)
Sue Scott
Tim Fison
Tournaig Estate (& their ATV – shown below)
Veronica and David Mullaney

…and all the other anglers, keepers and ghillies, fish farmers, school teachers, schoolchildren and parents, and everybody else who has helped us with our work.

Supporting wild fisheries and the Trust's Work

The current work programme for 2010 – 2011 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, a herring 'rediscovery 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 the WRFT Biologist for further details.

Wester Ross Fisheries Trust

Harbour Centre, Gairloch, Ross-shire, IV21 2BQ

Tel: 01445 712 899

Email: admin@wrft.org.uk

WRFT Registered Charity No: SCO24787

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 31/12/2010

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 2000, and all donations I make in the future, to be Gift Aid until I notify you otherwise.

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

Just tick the box and sign below: ☐

Signature Date / /

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

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

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

Bank Name & Address: 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:

Thereafter: Due Date: Annually On / /

TO BE DEBITED FROM MY ACCOUNT

Bank Name: _____

Bank Address _____

_____ Postcode _____

Name(s) of account holder(s)

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

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 / /

Invasive Non-Native Species (INNS) in Wester Ross

2010 is the International Year of Biodiversity. Two of the biggest threats to global biodiversity are climate change and the continued spread of invasive non-native species (INNS). The following INNS are already present in Wester Ross and pose a threat to native wildlife and fisheries should they spread further.

1. ***Rhododendron ponticum*** *(left)* still appears on the cover of tourist brochures; and yet it is the most troublesome INNS in the WRFT area because of its ability to aggressively outcompete native plants, forming a colourful though somewhat toxic monoculture. Highlighted as an issue of fisheries concern in the **WRFT Wester Ross and Lochalsh Biosecurity Plan**, a *ponticum* eradication workshop was organised by WRFT in January 2010 (see page 30).

2. **Japanese knotweed** *(right)* can also outcompete native plants to form a monoculture. It grows along the banks of the River Broom and coastal areas around Lochalsh. It is illegal to move soil in which Japanese knotweed has been growing.

3. **Pike** were introduced to two lochs in the 19th Century *(below)*. Prospects of sea trout fishery recovery could be lost if pike were to be introduced to the river-loch systems where sea trout occur. Their spread would also threaten breeding Black-throated divers.

4. **North American mink** (*left*) have decimated Water vole (*above*) populations in much of the UK, and sea bird colonies near Lochalsh. A collaborative project is to be extended to eradicate mink from the WRFT area (page 31). Please contact WRFT if you find one within the area (tel. **01445 712 899**).

5. The **New Zealand Flatworm** *(right)* is now found in many gardens, crofts and woodlands in Wester Ross. NZFs eat earthworms, sometimes severely reducing earthworm populations, and in some areas may be responsible for the extirpation of moles. Earthworms also provide food for many birds and badgers. However, fields at Tournaig maintain a healthy earthworm population despite the long-time presence of NZ flatworms.

6. A **Minnow** *(left)* was recorded by the WRFT electro-fishing team in the Little Gruinard River catchment for the first time in August 2009. Minnows, native to the south of the areas, have now spread to almost all the major river catchments in Wester Ross (see p15). Minnows compete with trout fry in the shallow margins of lochs. Their impact upon sea trout production and fisheries is not yet fully understood.