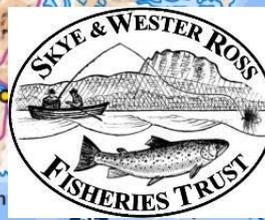


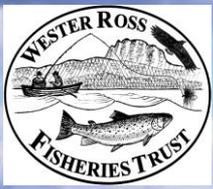
Agenda

?draft logo →



- 11.00 **Welcome and introduction**
Prof Dave Barclay
- 11.15 **Background to the Fisheries Review / FMO process**
Peter Jarosz
- 11:30 **Questions**
- 11:40 **Reviews of some current Skye & WRFT research and monitoring activity**
Peter Cunningham & Isabel Moore
- 12:30 **Lunch**
- 13:15 **Skye & WRFT FMO proposal: how does this best address our rivers?**
Ian Lindsay
- 14:00 **Open Discussion**
(Chaired by Prof Dave Barclay)
- 15:30 **Tea and depart**



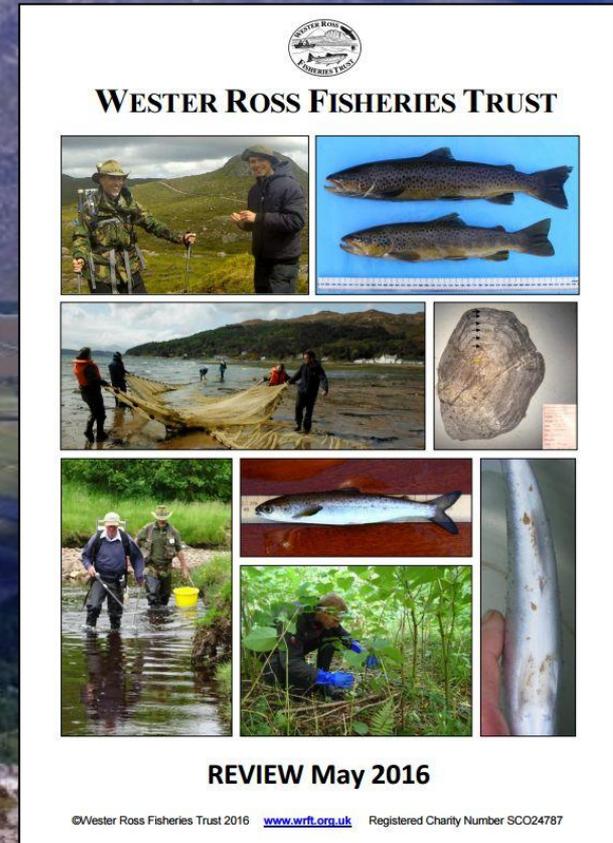


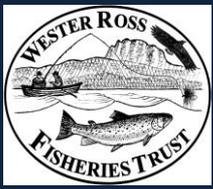
A review of some recent Wester Ross Fisheries Trust activities

Peter D. Cunningham

24th October 2016

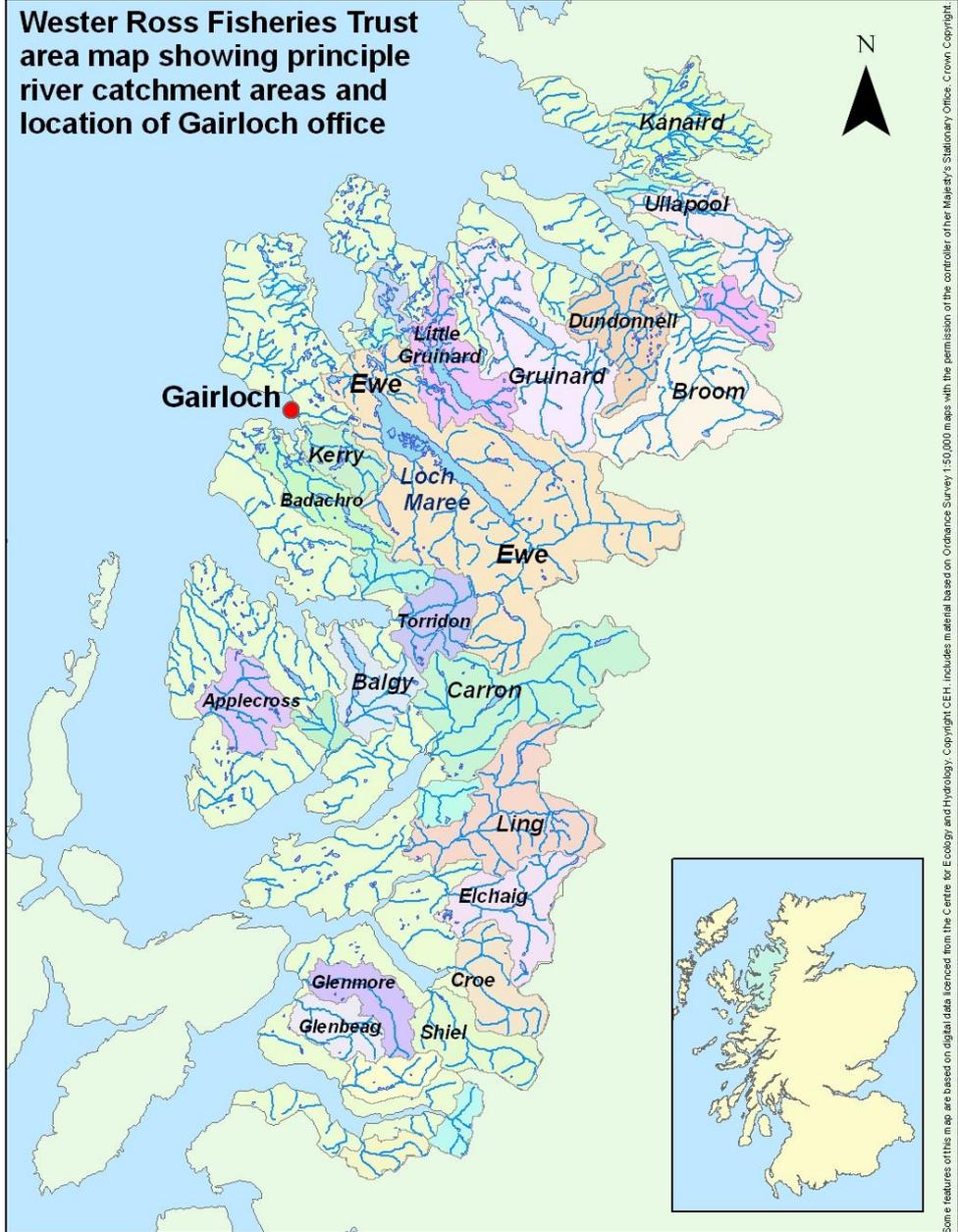
info@wrft.org.uk

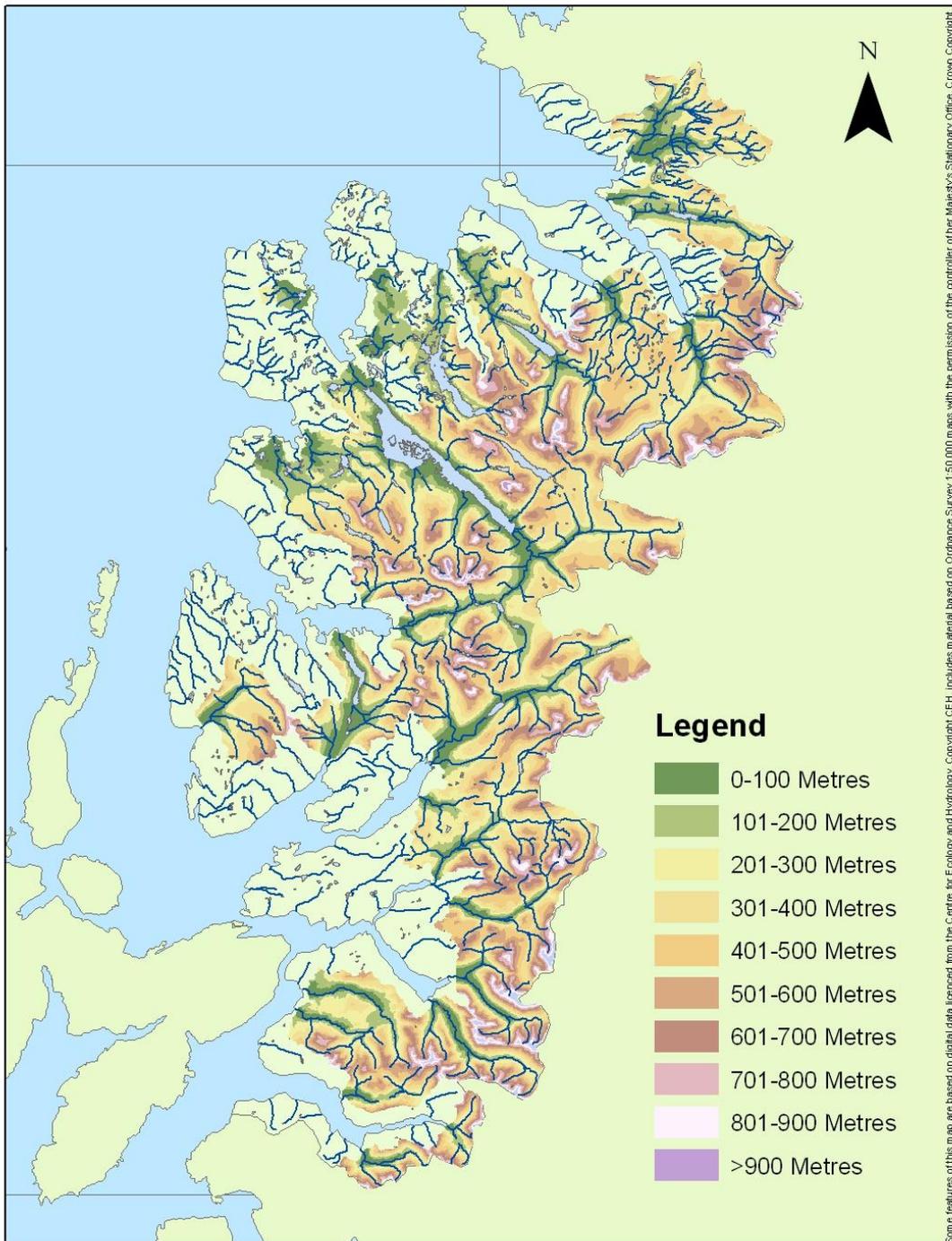




Summary

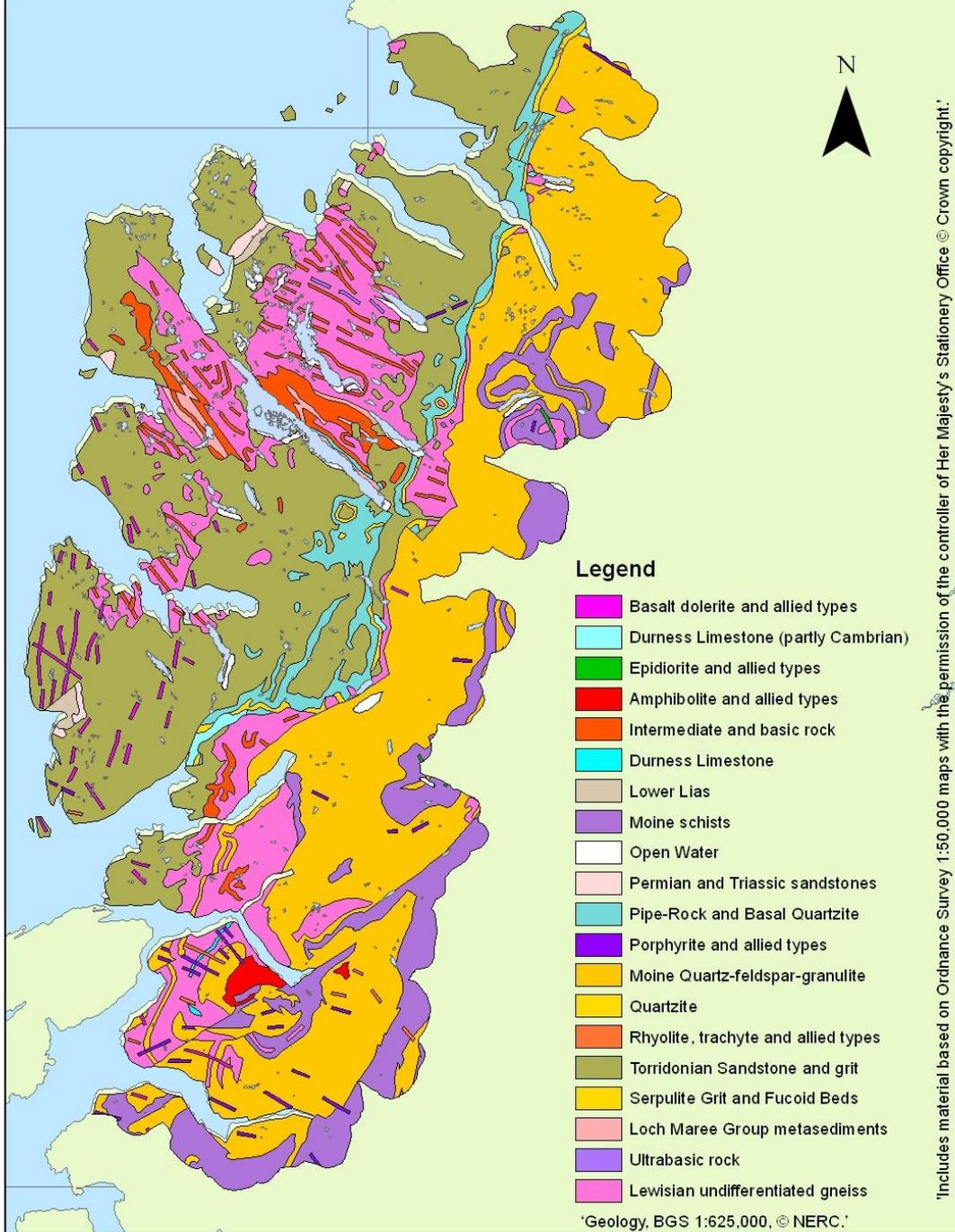
- Fish & fisheries in Wester Ross
- Juvenile salmon monitoring and the freshwater environment
- Sea trout monitoring and coastal seas
- Thank you to volunteers and supporters!





Wester Ross

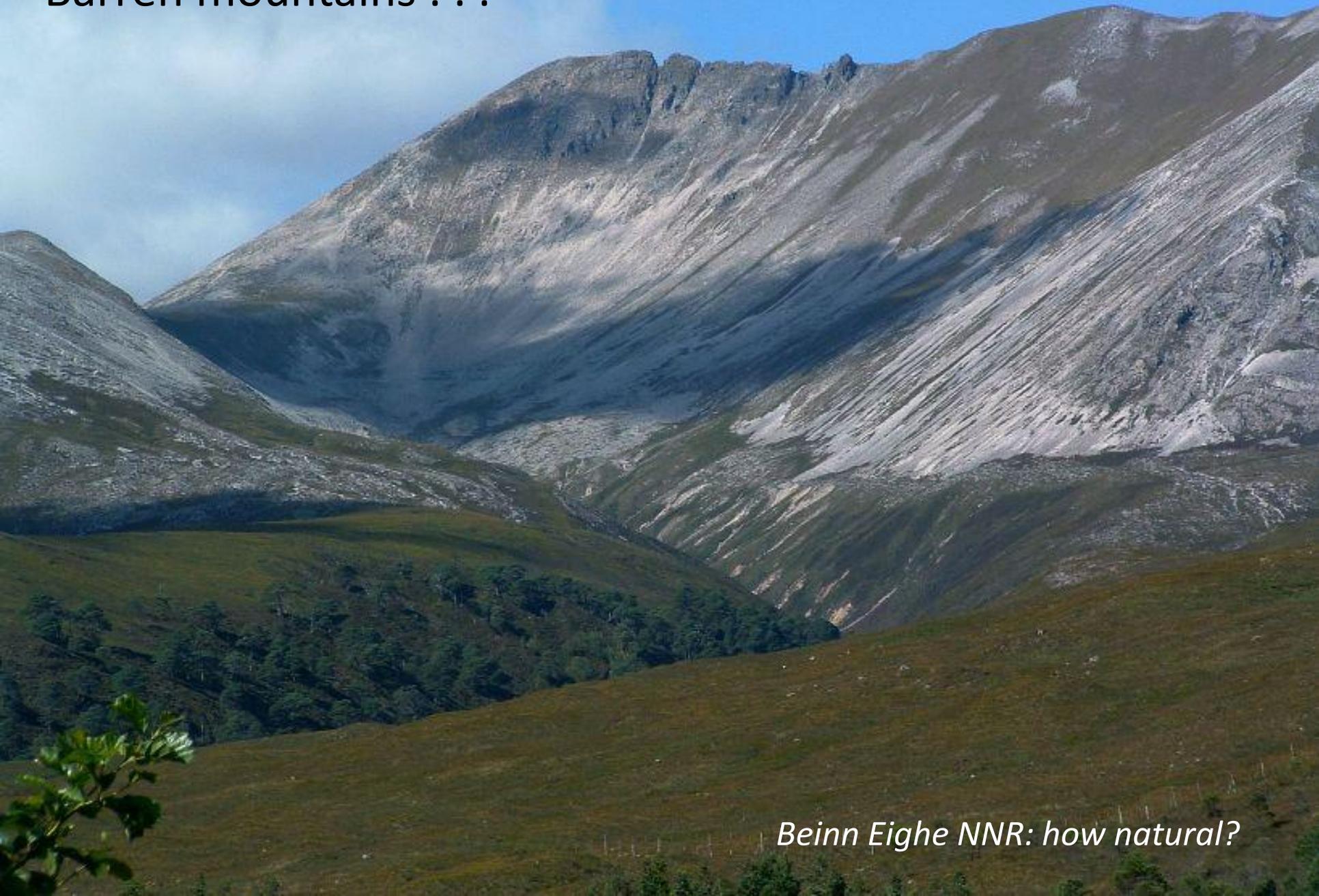
Land of glaciated mountains, lochs and short, swiftly flowing rivers . . .



... underlain by
 Torridonian sandstone
 and Lewisian Gneiss.



Barren mountains . . .



Beinn Eighe NNR: how natural?



Sparsely vegetated slopes

Beinn Damh forest: where are the trees?

Sundew



Bog asphodel

Narthecium ossifragum

"bone breaker "



Unstable rivers



Strath na Sealga, upper Gruinard: note alder woodland along floodplain

A landscape photograph showing a mountain range under a blue sky with scattered white clouds. In the foreground, a rocky stream flows over a waterfall, surrounded by lush green trees and vegetation. The middle ground features a steep, grassy slope with several large, dark rocks. In the background, a large, rounded mountain peak rises against the sky. The overall scene is a natural, rugged landscape.

Trees cling to
inaccessible ledges

Abhainn Dearg

Uninhabited 'wilderness' . . .



*Fionn loch and Dubh loch
from Beinn Airigh charr*

with 'near pristine' oligotrophic lochs



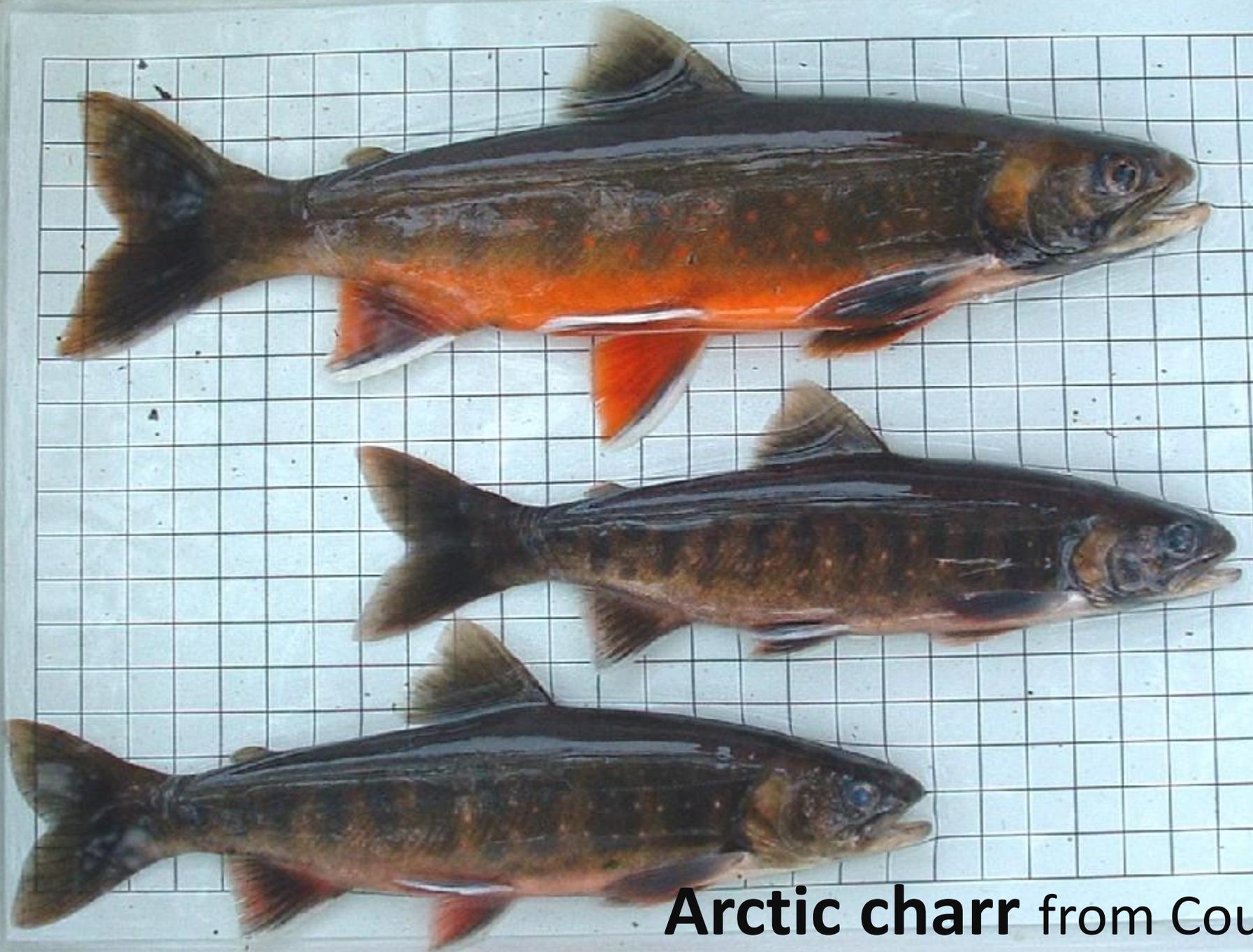
Loch Maree . . .

Loch Maree





Two forms of **Arctic charr** from Loch Maree



Arctic charr from Coulin

Brown trout *Salmo trutta*

Sea trout and brown trout



Atlantic salmon



Ray Dingwall with fresh 17lb cock salmon caught by Gavin Ramsay, May 2007

**Wild salmon were important the people in
Wester Ross in the past**

**Gairloch
Heritage
Museum**



taigh-tasgaidh gheàrrloch

**Pictish stone depicting salmon and sea eagle
in Gairloch Museum and found nearby**



For some people, they are still important

...

Salmon in (and out of) the Classroom

Plockton Primary School Children photo by Nail McKinnon; a few years ago . . .

Salmon life cycle

SEA

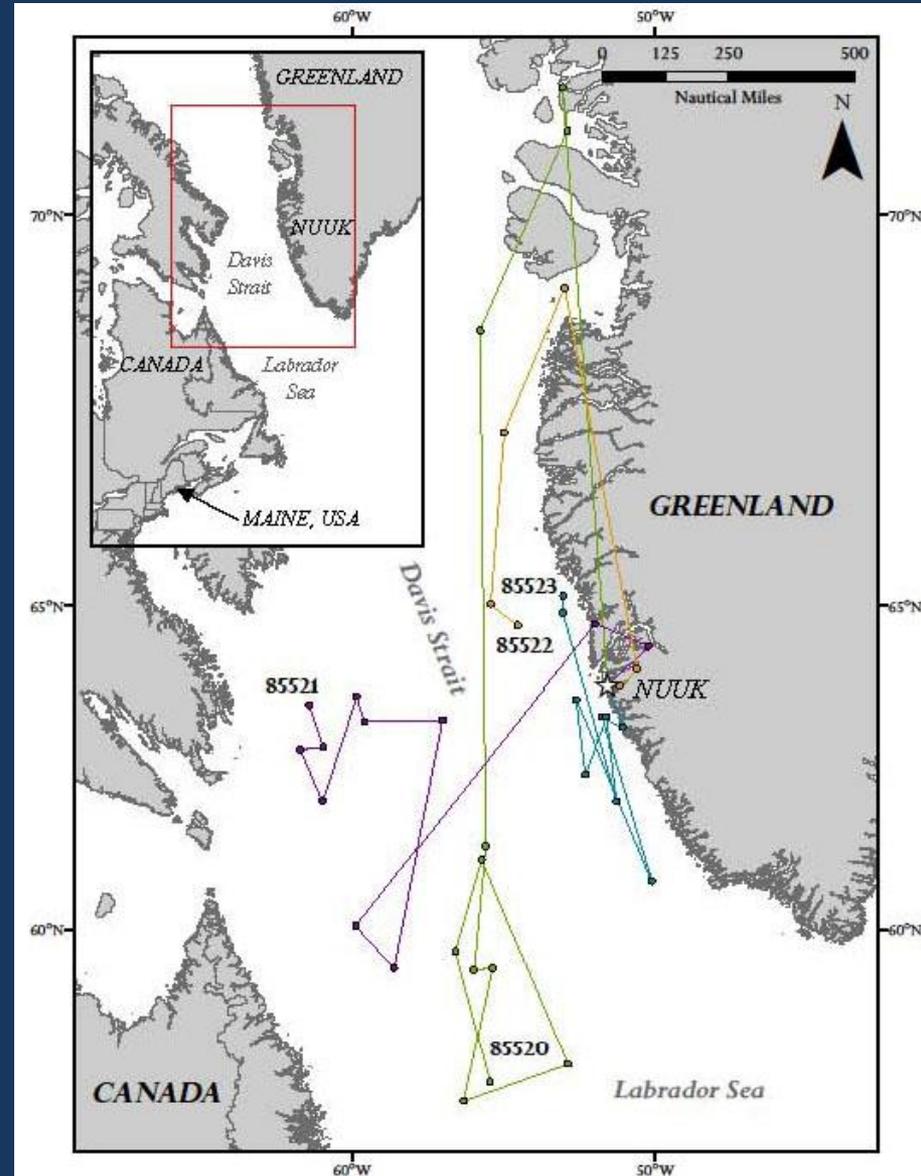


FRESHWATER

© Atlantic Salmon Trust/Robin Ade

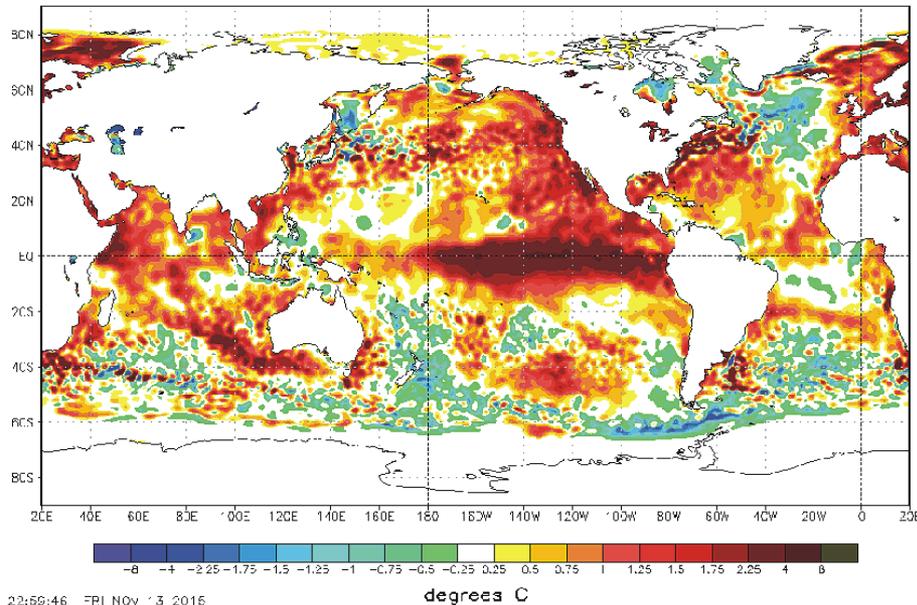
Salmon face many threats and challenges at sea . . .

Coastal netting, Greenland

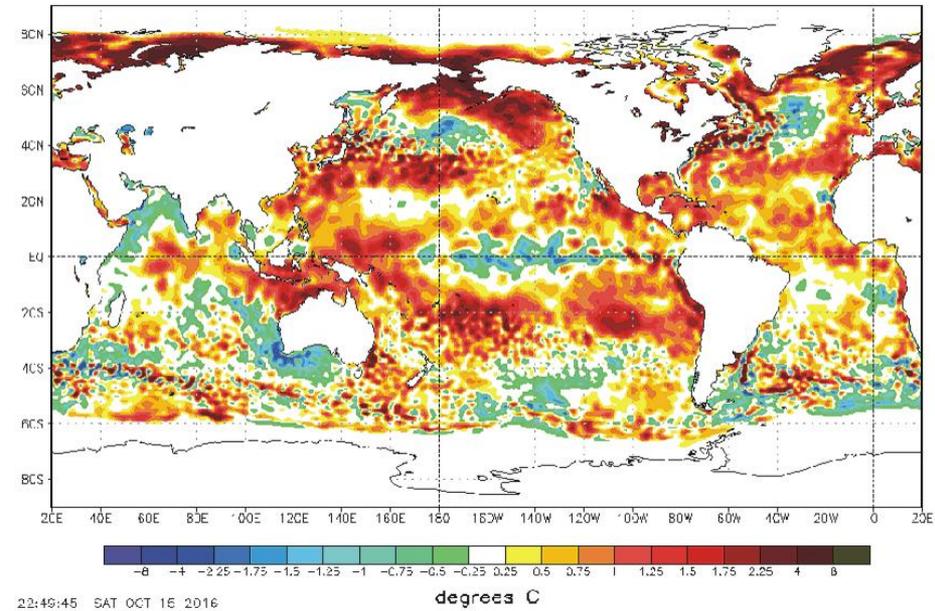


Changing sea temperatures . . .

NOAA/NWS/NCEP/EMC Marine Modeling and Analysis Branch
RTG_SST Anomaly (0.5 deg X 0.5 deg) for 13 Nov 2015

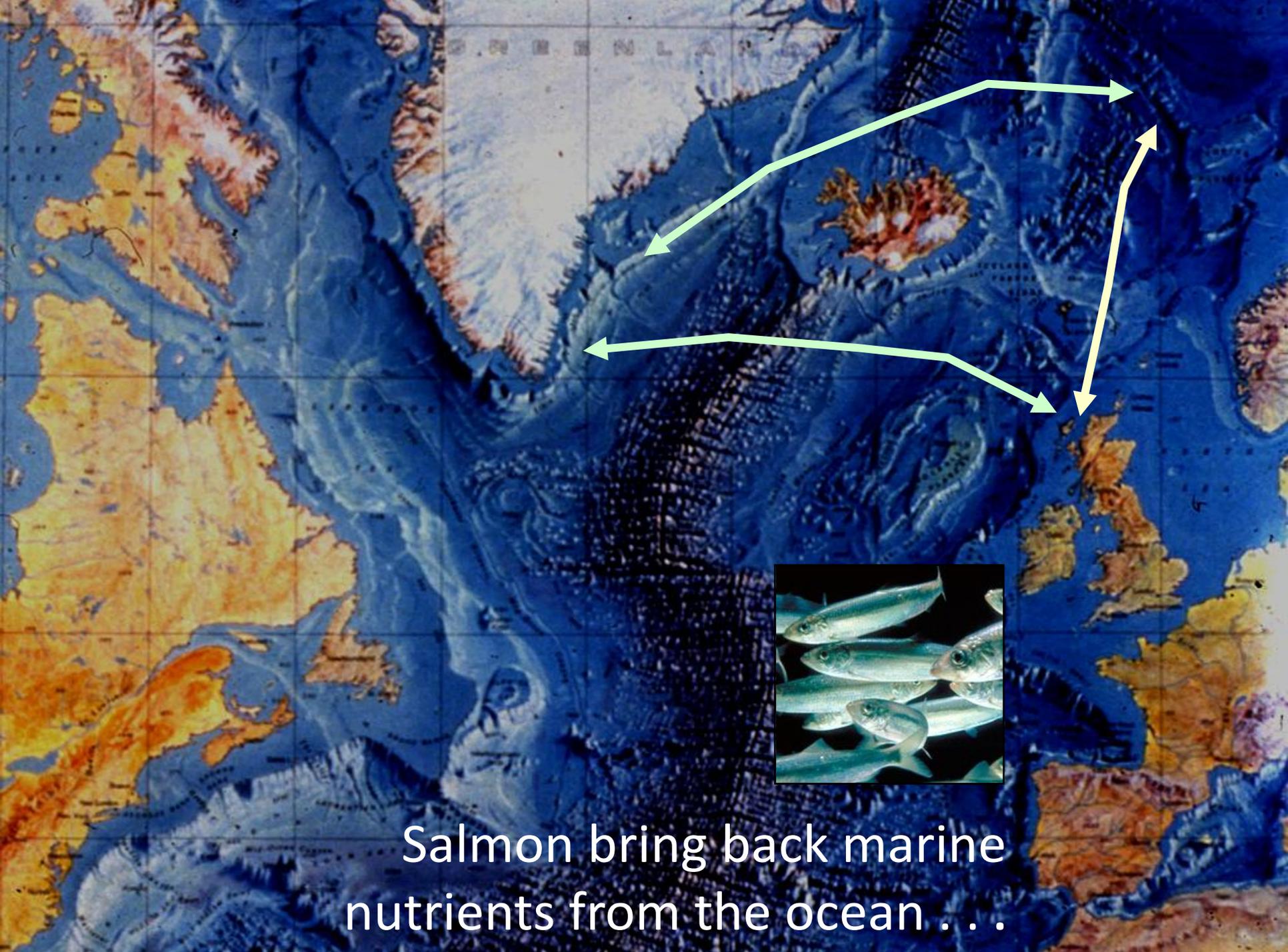


NOAA/NWS/NCEP/EMC Marine Modeling and Analysis Branch
RTG_SST Anomaly (0.5 deg X 0.5 deg) for 15 Oct 2016



Sea temperature anomalies: November 2015 & October 2016

Source <http://www.climate4you.com/SeaTemperatures.htm>



Salmon bring back marine nutrients from the ocean . . .

A local fisheries trust can't do much about problems far across the sea, however much can be done to support fish in fresh and coastal waters.



*Tributary of Gruinard River,
September 2016*



WESTER ROSS FISHERIES TRUST
Fisheries Management Plan 2009+
SUMMARY



© Wester Ross Fisheries Trust 2009



RIVERS & FISHERIES TRUSTS OF SCOTLAND
Safeguarding Scotland's Rivers & Lochs

www.wrft.org.uk



Registered Charity Number SC024787



Comhairle na Gàidhealtachd



SCOTTISH NATURAL HERITAGE

Juvenile fish surveys

SEA

(Supported primarily by
Wester Ross Area
Salmon Fishery Board
& river proprietors)

Post-smolts
and adults
at sea

Returning
adults

Smolts

Parr

Fry

Spawning
adults
and
precocious
parr

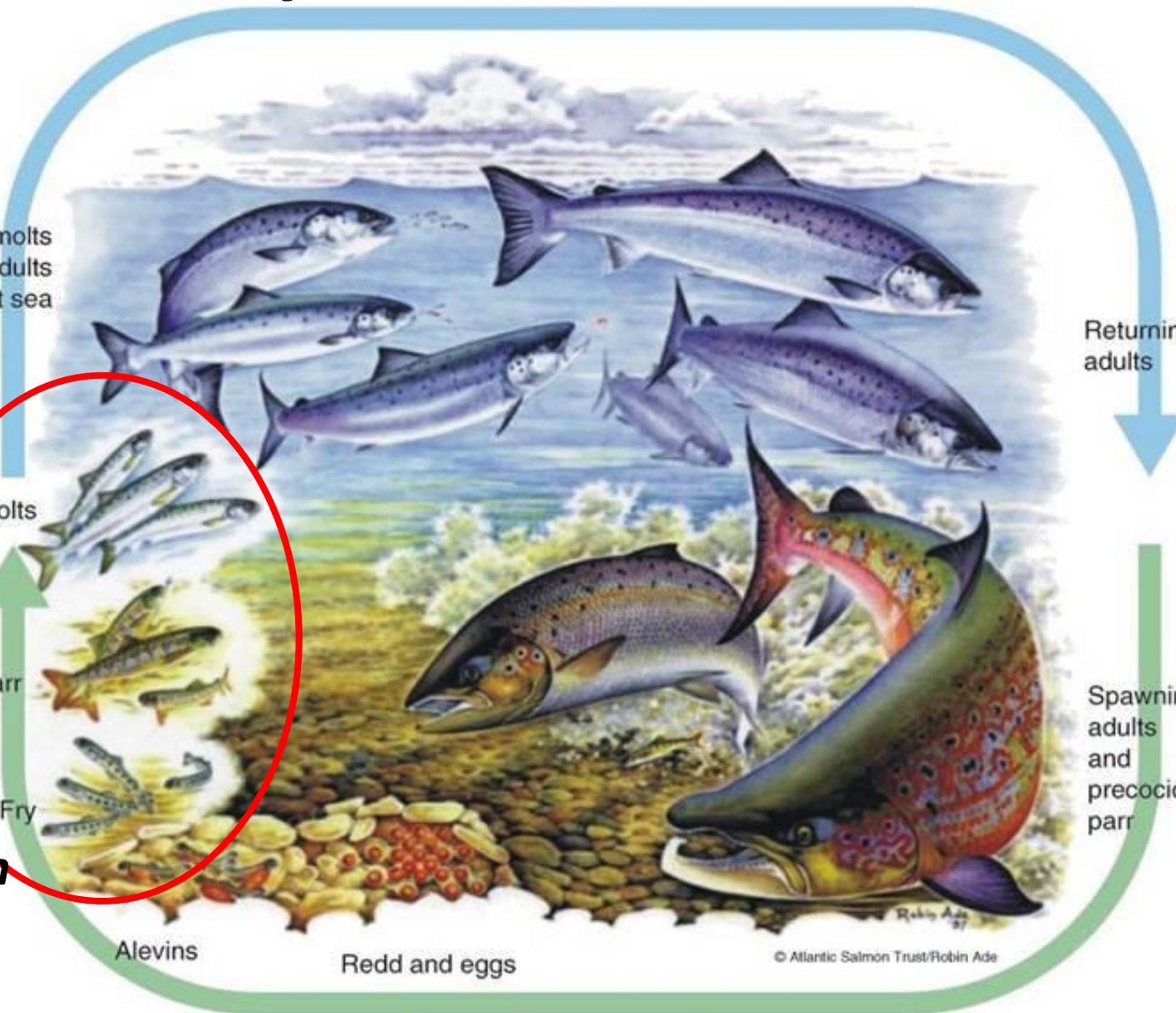
Alevins

Redd and eggs

© Atlantic Salmon Trust/Robin Ade

FRESHWATER

***What limits
juvenile salmon
production in
Wester Ross?***





Juvenile fish surveys

Aims

1. To determine the distribution of wild juvenile salmon (trout and eels) focussing on marginal habitat
2. To assess the abundance of juvenile salmon.
3. To provide information about the status of respective populations and of any management intervention that may (or may not) be required.

Electro-fishing:

- an electric field is passed through the water
- Fish swim towards the anode where they become immobilised
- Fish are transferred to a bucket where they recover . . .

photo by John Macpherson, River Kerry, sometime back



Anaesthetise and measure each fish . . .



*By the River Kerry, with SNH student
volunteers, September 2016*

1. Kanaird
2. Ullapool
3. Lael
4. Broom
5. Dundonnell
6. Gruinard
7. Inverianvie
8. Little Gruinard
9. Allt Beith
10. Tournaig
11. Ewe
12. Sand
13. Kerry
14. Badachro
15. Torridon
16. Balgy
30. Cuaig
17. Applecross
18. Kishorn
19. Carron
20. Attadale
21. Ling
22. Elchaig
23. Croe
24. Shiel
25. Glenmore (Glenelg)
26. Glenbeag
27. Arnisdale
28. Barisdale
29. Kinlochhourn
30. Cuaig
31. Sguod



Rivers where
juvenile salmon
have been
recorded in
WRFT area

To add:

Strath burn

Flowerdale Burn

Shieldaig river

Achmore river

Balmacara river

Nostie Burn

1. Kanaird
2. Ullapool
3. Lael
4. Broom
5. Dundonnell
6. Gruinard
7. Inverianvie
8. Little Gruinard
9. Allt Beith
10. Tournaig
11. Ewe
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24. Shiel
25. Glenmore (Glenelg)
26. Glenbeag
27. Arnisdale
28. Barisdale
29. Kinlochhourn
30. Cuaig
31. Sguod



Rivers where juvenile fish surveys have been carried out in 2014, 2015 and 2016 (to date)

Kanaird and Runie

August & September 2016



Dundonnell River, August 2016



Gruinard River survey, August 2016



River Ewe headwaters, August 2016



Grudie hydropower development



Torrison River survey, August 2016



Sorting aquatic insect larvae, with Beinn Eighe NNR volunteers

August 2016





Little Gruinard invertebrate & juvenile salmon feeding study, 2014

by Geoffrey Billier



supported by
Eilean Darach estate



Kick sampling and invertebrate drift sampling

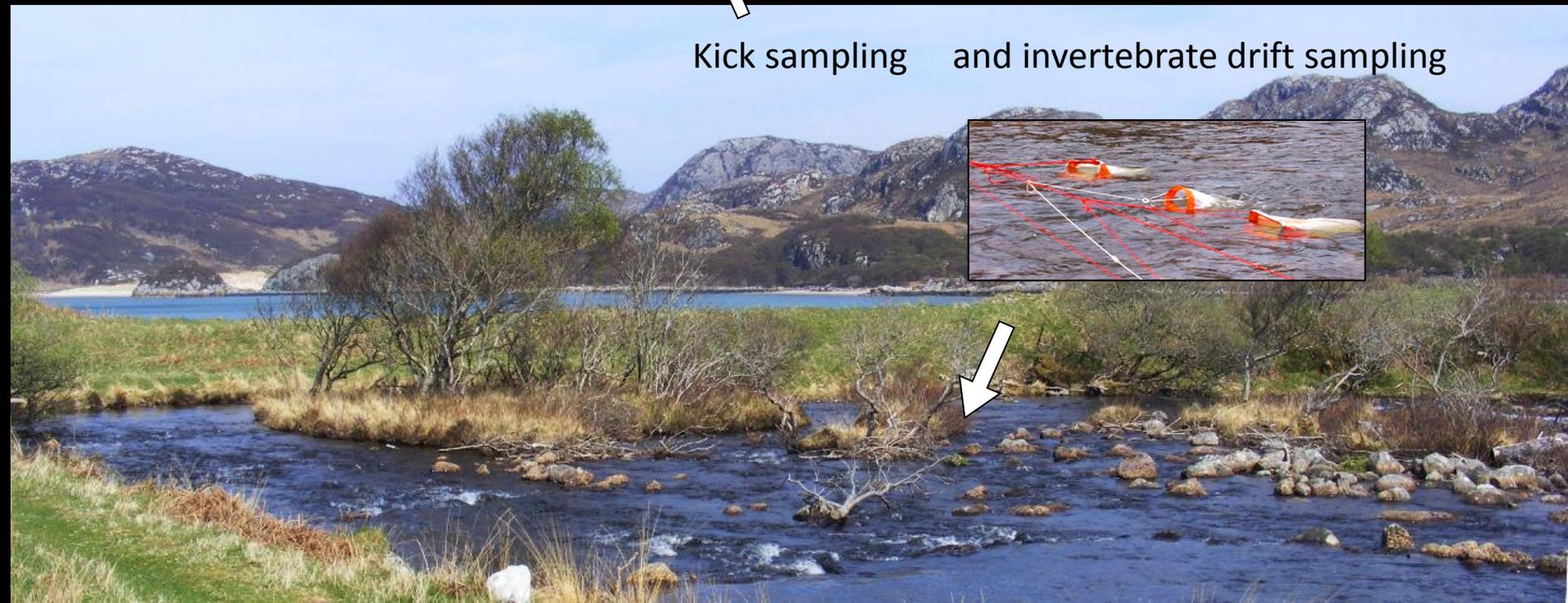
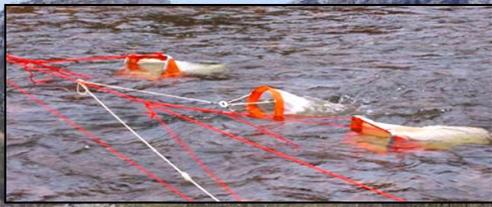
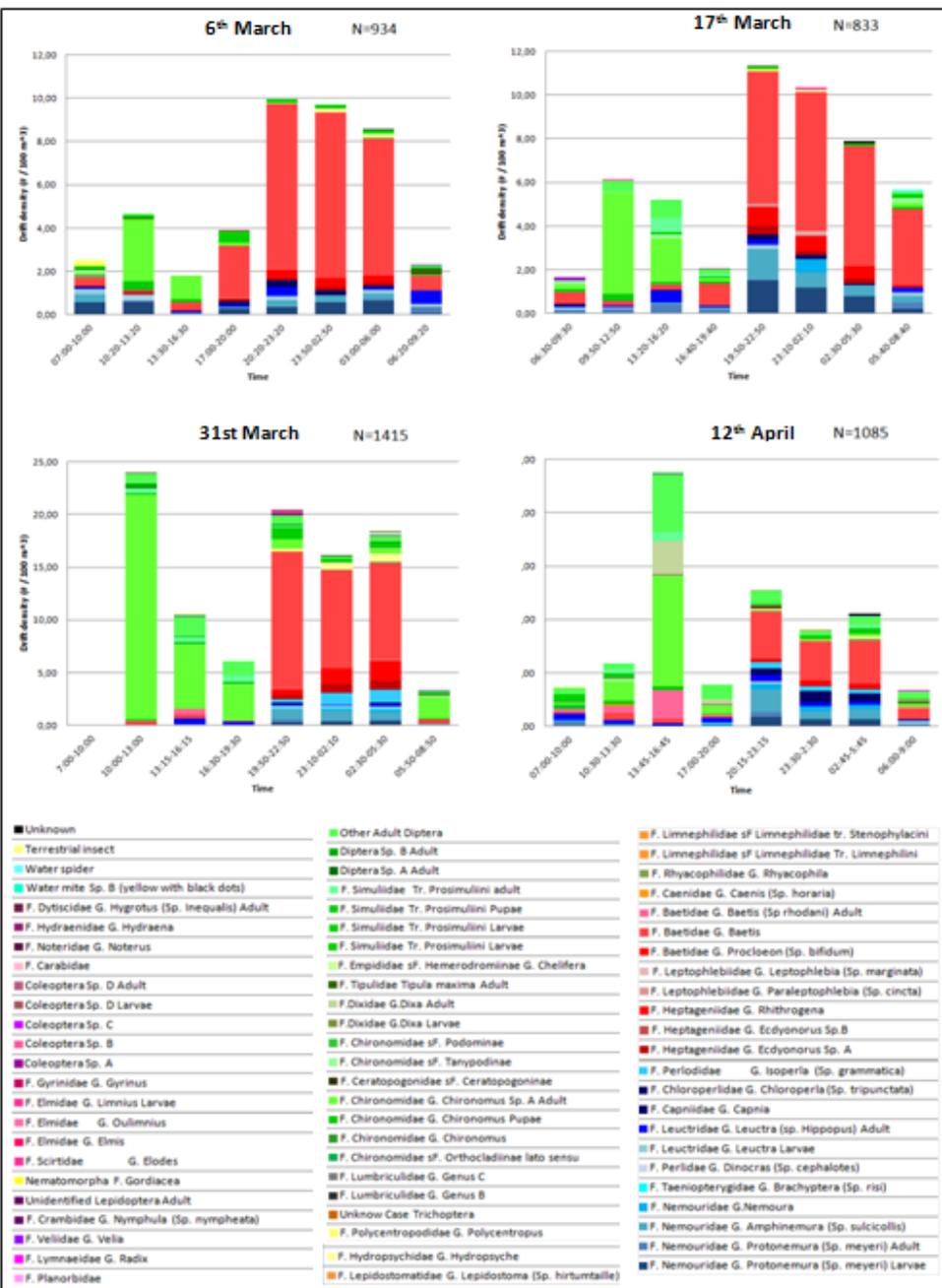


Figure 7.1 Drift density of the macroinvertebrate taxa in the Little Gruinard River (note differences in drift density scales)



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 an anaesthetic, 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).



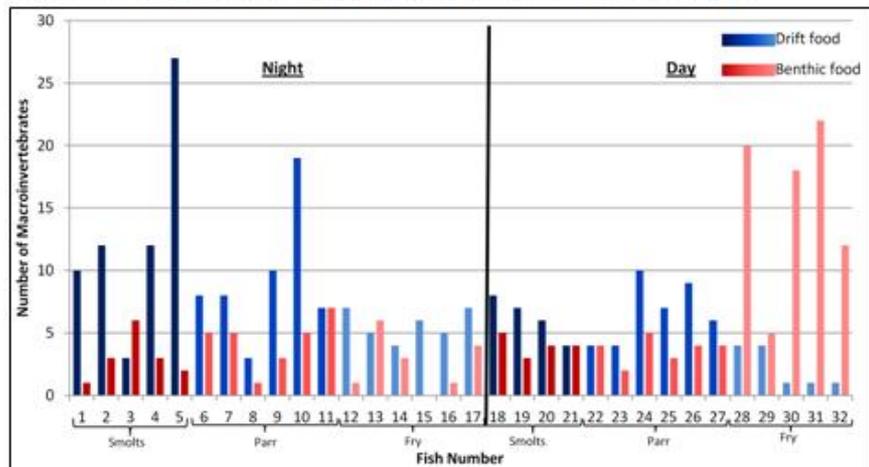
Diet composition for juvenile salmon was different according to the size of the fish and the day/night (Figure 7.2). Juvenile salmon were mainly selective both in terms of prey types and average prey sizes. Salmon smolts



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. . .

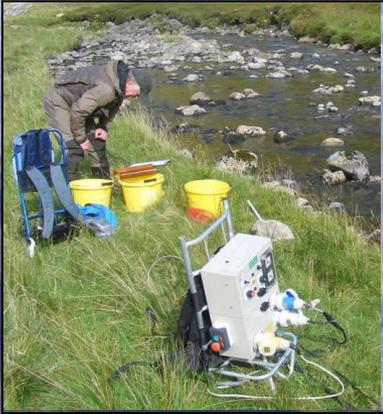


Thank you to Eilan Darach Estate for permission to carry out this study, and to Brian and Carol Fraser, Stuart Allison and Peter Jarosz for support. The study was designed partly to fulfil an obligation to SNH following receipt of a grant for new equipment.

River Croe

September 2016

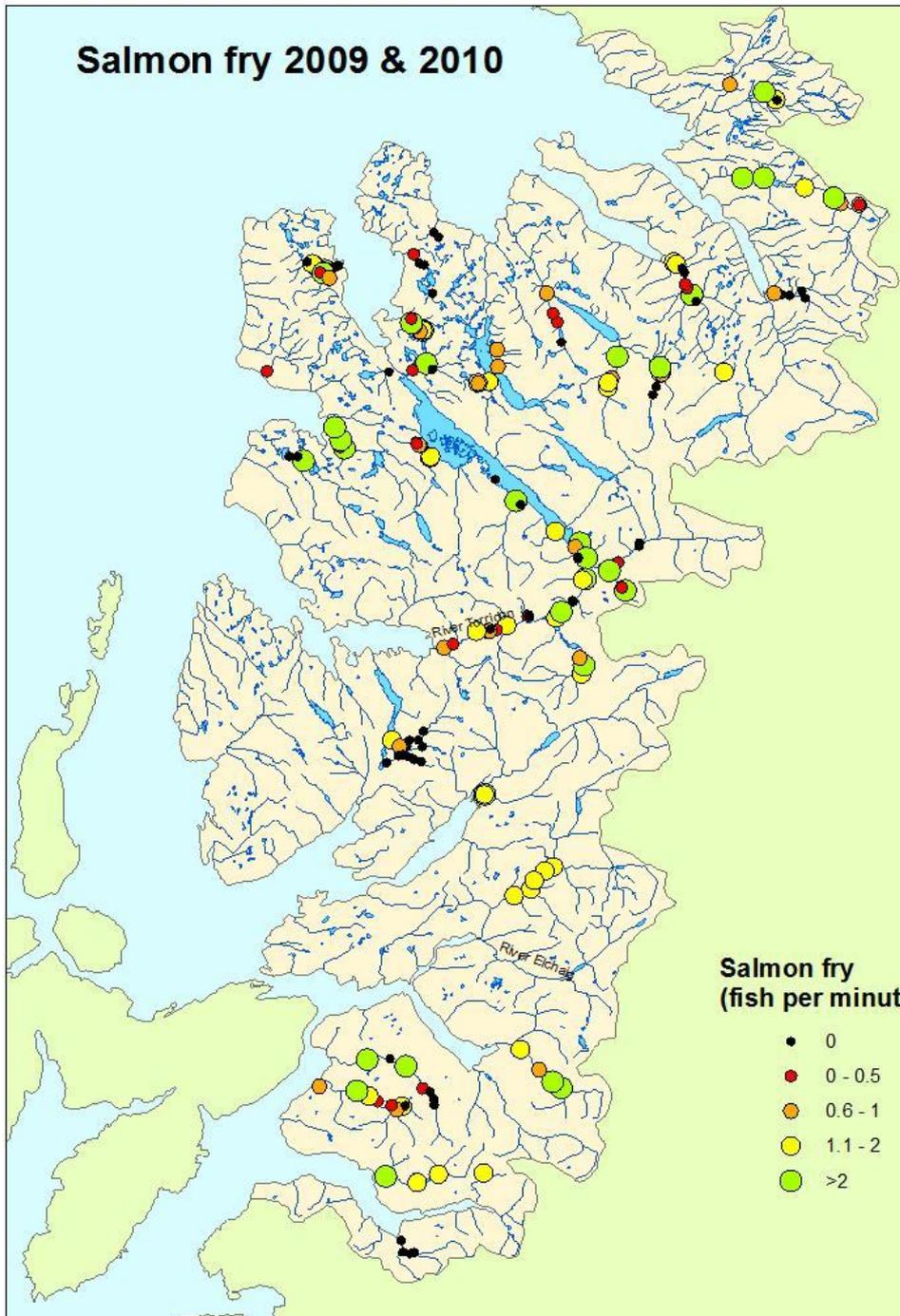
Heavily grazed by cattle,
sheep and deer





Lamprey ammocoetes from
River Croe lowest site,
August 2016

Salmon fry 2009 & 2010



Salmon fry
(fish per minute)

- 0
- 0 - 0.5
- 0.6 - 1
- 1.1 - 2
- >2

Some features of this map are based on digital data derived from the Centre for Ecology and Hydrology. Copyright ICEH. Includes material based on Ordnance Survey 1:50,000 maps with the permission of the controller for Majorca's Statutory Office. Crown Copyright.

Distribution and relative abundance of juvenile salmon



WESTER ROSS FISHERIES TRUST



REVIEW January 2015

Habitat problems:

Abhainn Gleann na Muice, upper Gruinard River system



Alder tree
Gleann na Muice



Dead alder tree
Gleann na Muice



5.3 Riparian habitat protection and restoration

5.3.1 Abhainn Gleann na Muice

Butler (2001) discusses the need to protect riparian habitats. Since then, there has been much re-appraisal of options and discussion both on and off the record particularly with regard to the Abhainn Gleann na Muice. These have focussed on two issues (1) the rate at which riparian habitat is degrading, and (2) the practicalities and potential costs of taking action to protect and restore riparian habitat (including concerns for passage of red deer within respective areas and access to grazing habitat).

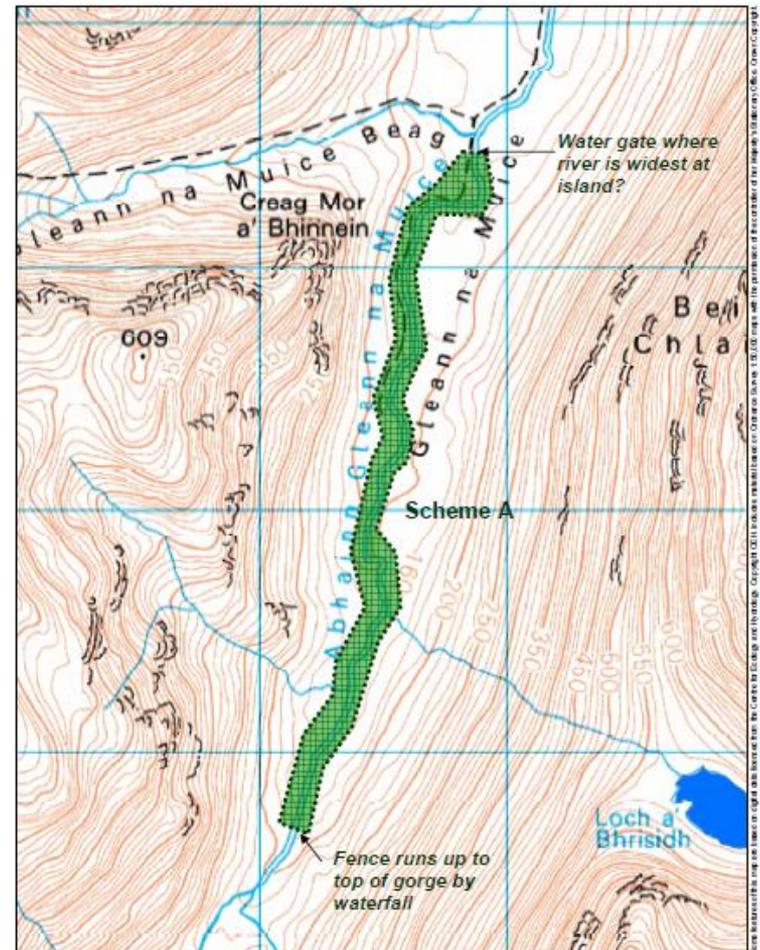


En route to electro-fishing sites in 2207, 2010 and 2011 the WRFT biologist took note of the state of riparian habitats. Here are some pictures from the section upstream from the confluence with the Abhainn Gleann na Muice Beag. All photos were taken on 1st November 2011 by Ben Rushbrooke, except the dead tree (right), which was taken on 23rd September 2009.



... a possible solution?

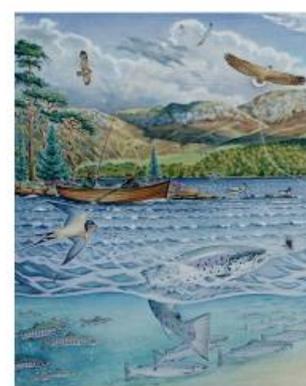
Figure 12. Proposed riparian habitat protection and restoration scheme for Abhainn Gleann na Muice. This scheme ('Scheme A') proposes the establishment of a riparian enclosure to protect remaining alder trees and the soils they support, and to allow regeneration of trees along the Abhainn Gleann na Muice. The existing riparian alder trees are slowly dying off, and there is virtually no regeneration above the confluence with the Abhainn Gleann na Muice Beag. This is potentially one of the most important headwater streams for production of early running 2SW salmon, arguably the most desirable salmon in the Gruinard River system.



TREES FOR FISH . . .

Between June and September each year many thousands of adult salmon and sea trout return from the sea underneath the road bridge at Poolewe and swim up the River Ewe into Loch Maree where the fishery for sea trout was once world famous. By October, many fish have continued their journey back towards their natal streams, some heading up the Kinlochewe and A'Ghairbhe Rivers to Loch Clair and on into Loch Coulin.

This stream, known locally as the 'Farmhouse burn', is one of the most important spawning areas for sea trout, which lay their eggs in river gravels in late October or November. The eggs slowly develop during the cold winter months and little trout fry swim up from between the stones in April or early May in search of food.



To improve the habitat for fish, Coulin Estate with support from the Forestry Commission through the Woodland Grant Scheme (WGS) have established 2 enclosures to restore riparian (stream side) woodlands. This enclosure has been planted with alders, willows, birch, rowan and other species.



Stonefly (2 tails) and mayfly larvae (3 tails) are food for juvenile trout (above) and salmon (below)



Native woodlands also provide habitat for many birds - including Stonechat, warblers and other small song birds. Look for dipper, grey and pied wagtails which also feed on insects along the stream.



Otter, and Black-throated diver, which attempt to breed on several lochs in the area also benefit from healthy populations of trout and salmon.



By restoring more varied habitat, production of insects, earthworms and other small animals will increase. Leaf litter is also a food source for some of the aquatic insect larvae that are also important food items for young fish.

Tree roots, especially those of alder, help to stabilise river banks preventing erosion. Roots also provide additional cover (protection) for small fish, which can hide from larger fish and other predators.



Coulin Estate is committed to the restoration of healthy and productive fisheries for wild sea trout, salmon and other special wildlife. If you meet the keeper, ask him about some of the other projects on the estate.

Wester Ross Fisheries Trust, 2004
tel: 01445 712 899 info@wrft.org.uk

Refertilising Wester Ross, April 2016



With in-kind support from:



Phosphorus budget

P imports



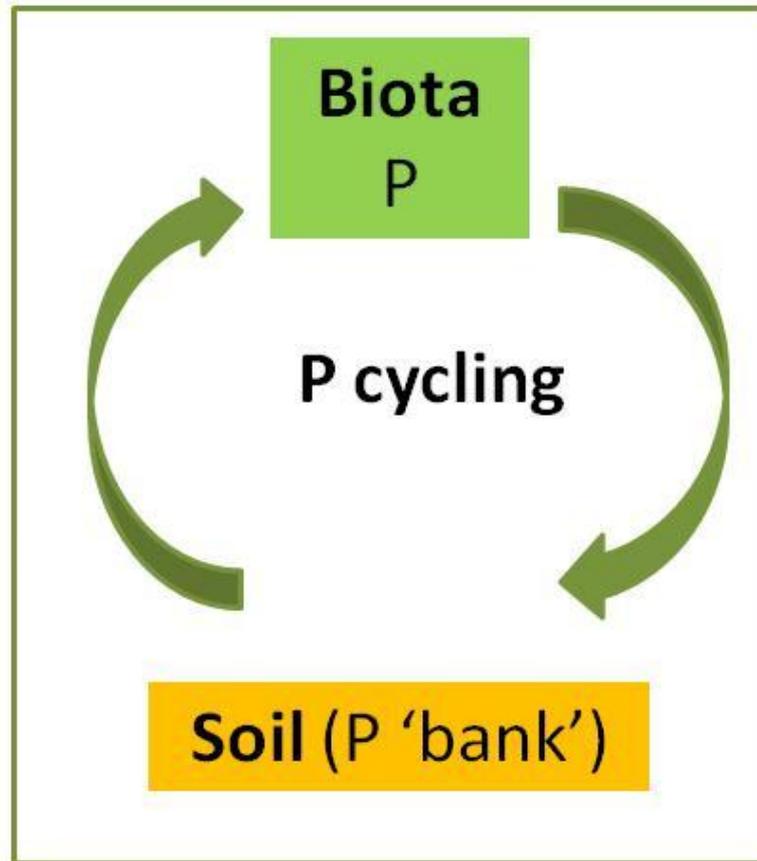
Anthropogenic
(food, fertiliser,
detergents, etc.)



Physical and chemical
(atmospheric deposition,
rock erosion)



Biological (wild)
(wild plant and animal
materials)



P exports



Anthropogenic
(livestock, crops,
timber, effluents, etc.)



Physical and chemical
(erosion and leaching)



Biological (wild)
(wild plant and animal
materials)

Ecosystem



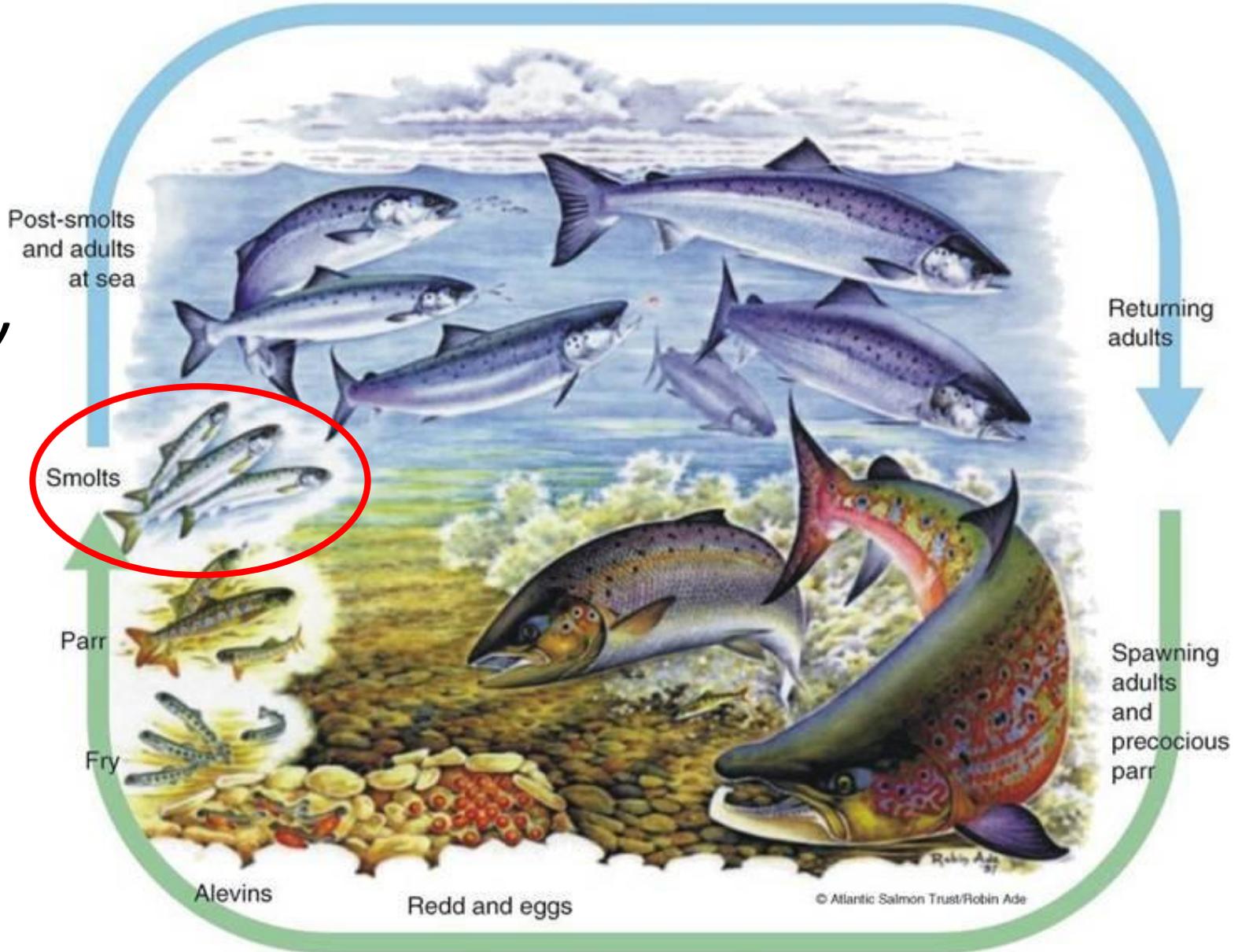
In the past, many more salmon returned to Scottish rivers from the sea each year.

How much marine nutrient was transferred to terrestrial ecosystems in Scotland in the past?

Smolt migration

SEA

How many smolts go to sea?



FRESHWATER

Tournaig trap project

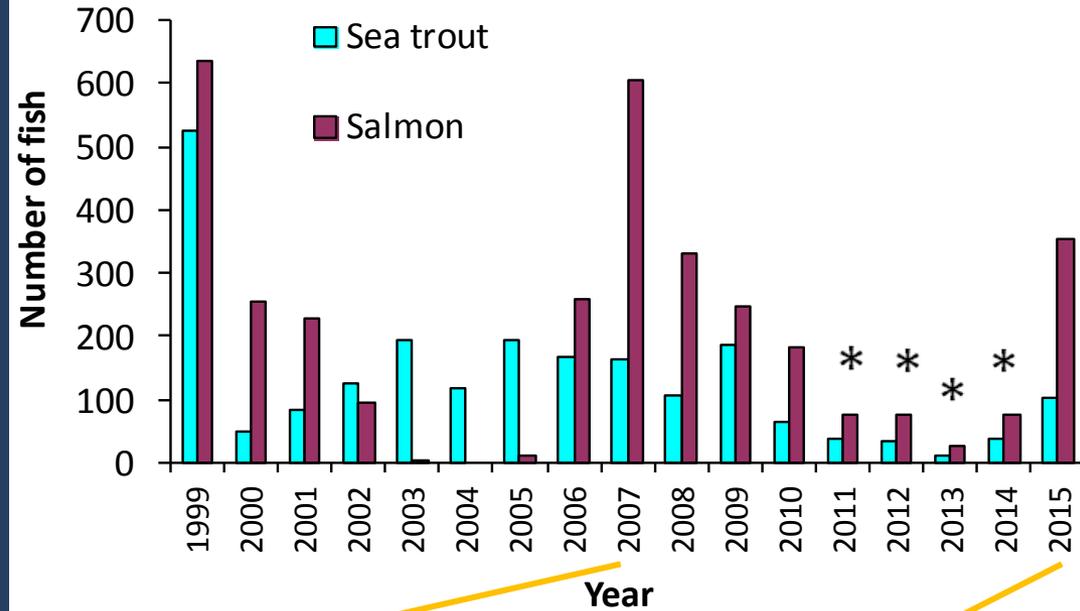


Ben Rushbrooke transferring smolts from downstream trap

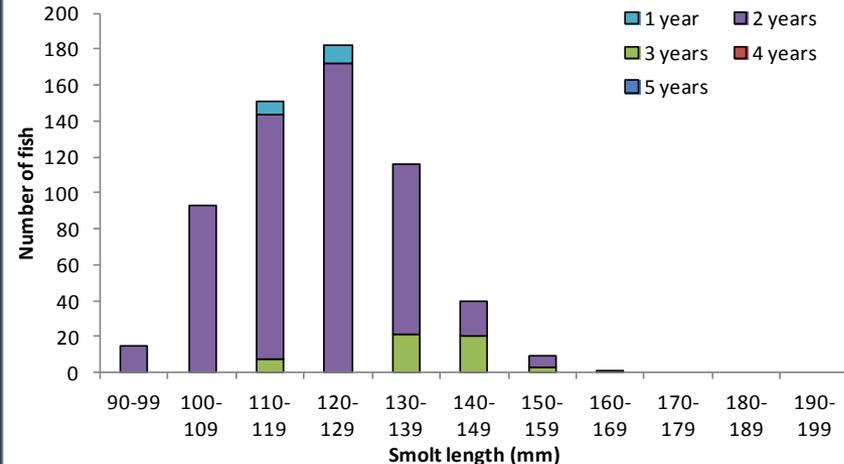
The number of smolts and their sizes varied at Tournaig from year to year . . .



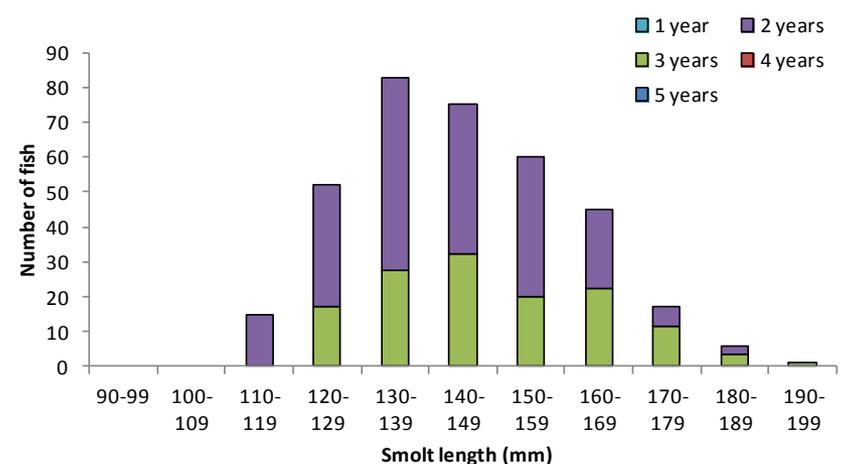
Tournaig trap - smolts descending



Tournaig salmon smolt counts and ages (2007)¹



Tournaig salmon smolt counts and ages (2015)¹



Returning adult salmon

SEA

*How many
salmon
return from
the sea?*

Returning
adults

Spawning
adults
and
precocious
parr

Smolts

Parr

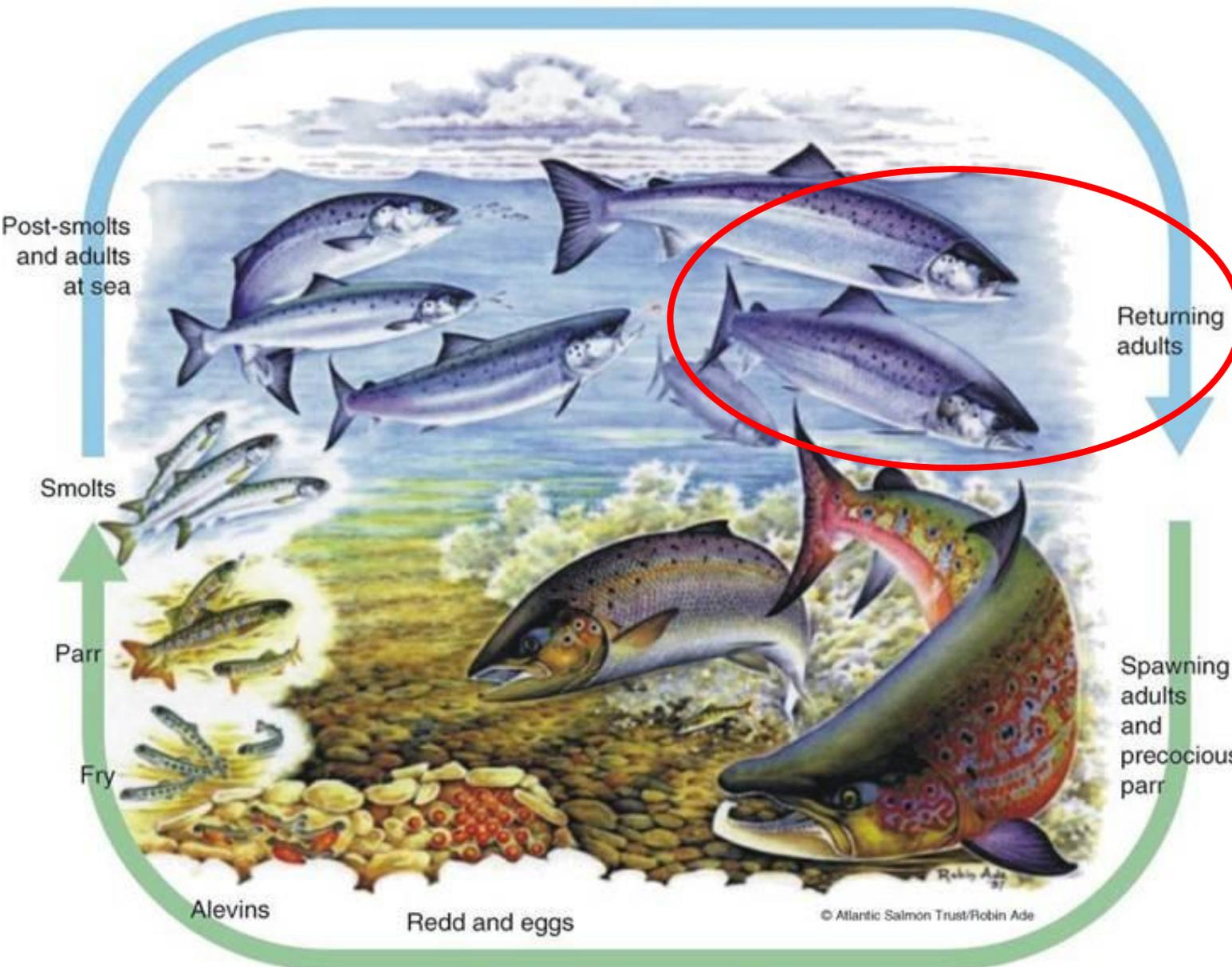
Fry

Alevins

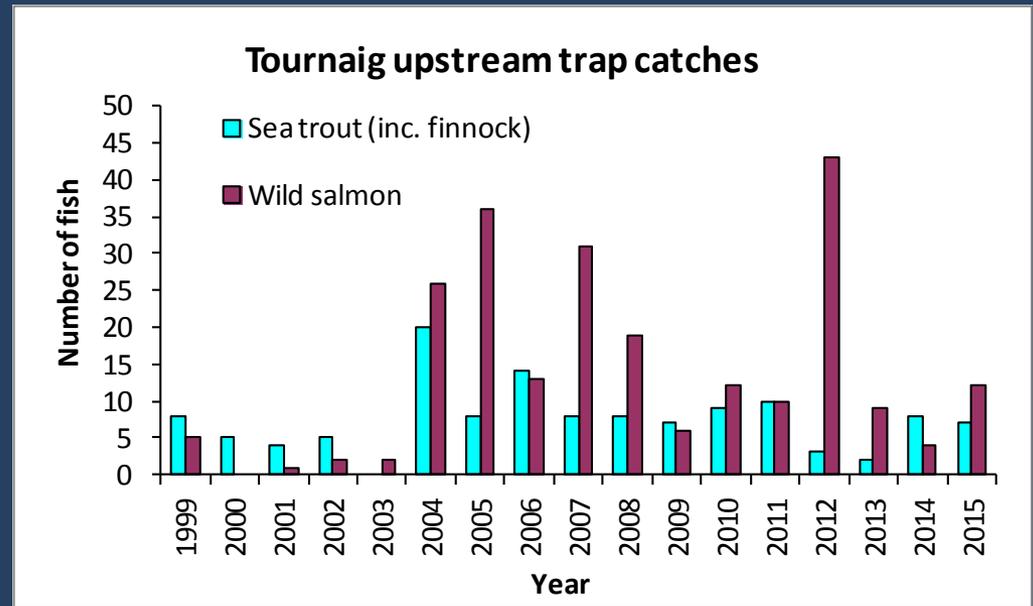
Redd and eggs

© Atlantic Salmon Trust/Robin Ade

FRESHWATER



Tournaig trap upstream catches



(left) Ben with a grilse, 6th August 2016 . . .





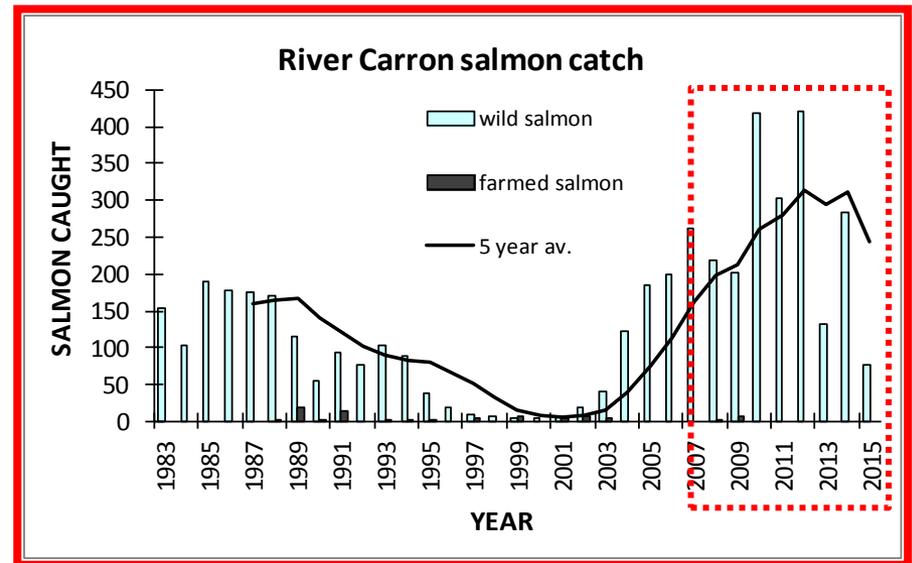
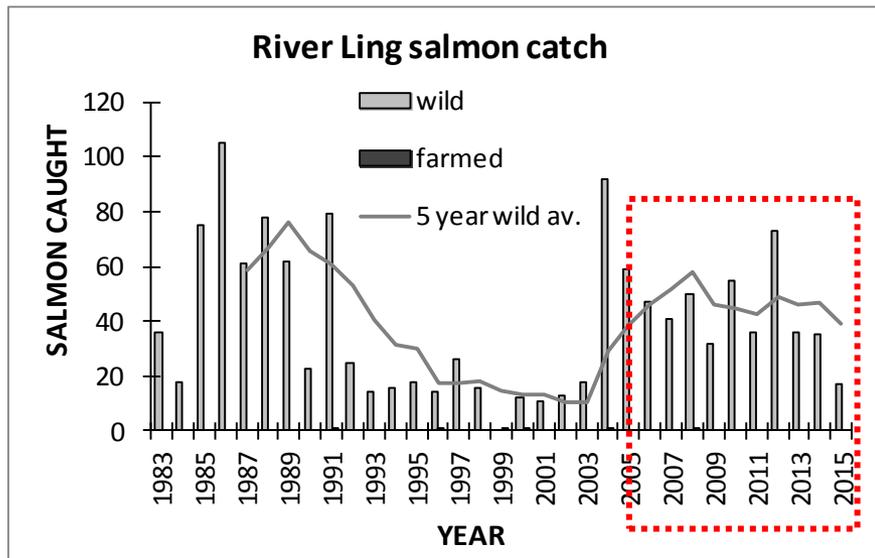
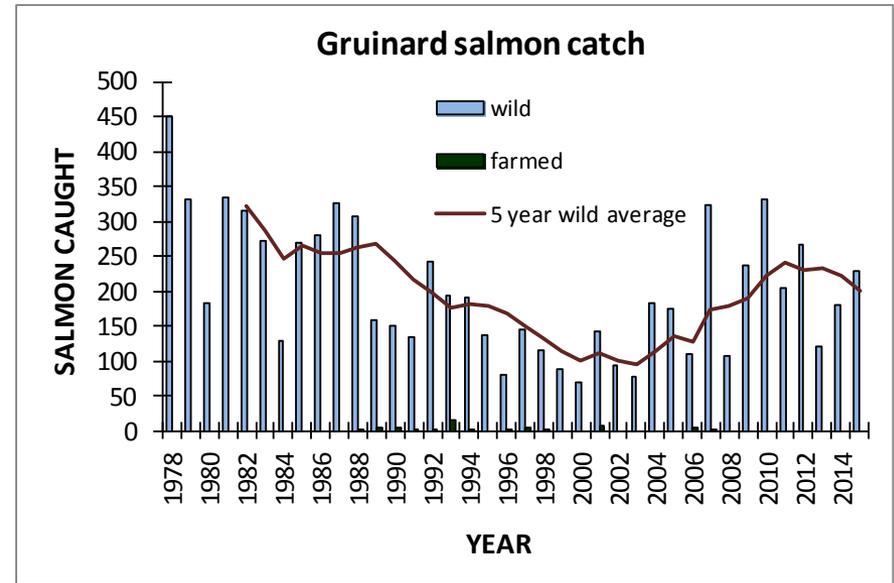
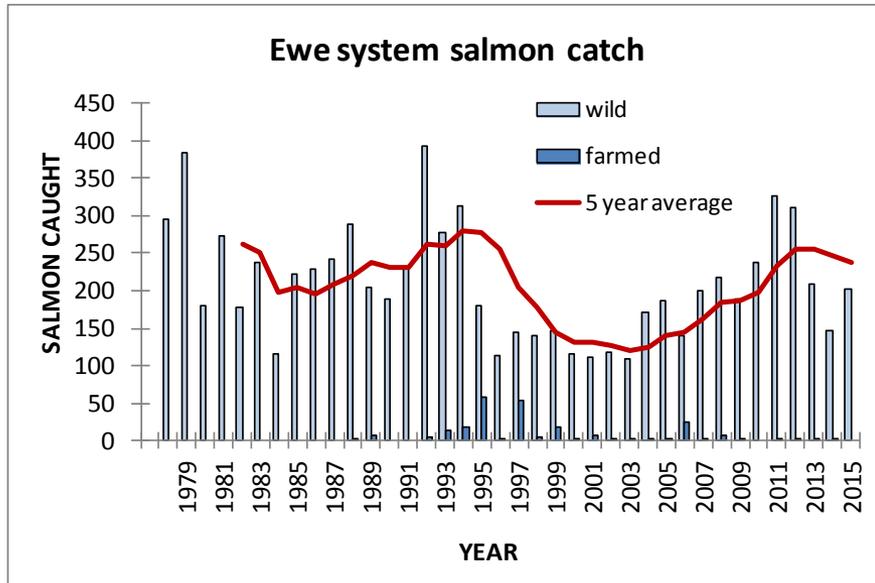
Tournai trap grilse, 2012. Zoom in to examine individual fish.

This mosaic has been put together to show 39 of the 41 grilse taken in the Tournai trap during 2012. All the fish were anaesthetised prior to being measured, photographed and released to continue their journey upstream following recovery. In this mosaic they are shown to scale, details of each fish including length and date of capture are shown in blue in the top left corner of each individual fish photo (I'll redo these when I have time!).

Note the contrasting colouration, predator marks and condition of the fish. For further information about the 2012 grilse at Tournai, please contact the WRF biologist (info@wrft.org.uk).

The Tournai Trap Project was supported by Marine Harvest in 2012. All photos © Ben Rushbro

Rod catches of salmon (including grilse), Wester Ross FT area



Break : any questions?



Male salmon in Kinlochewe River, November 2014 (Andy Jackson)

Brown trout *Salmo trutta*

Sea trout and brown trout



The wild trout of a coastal stream system in Wester Ross

Wild trout diversity in Wester Ross

Loch trout

Burn Trout

Sea trout

TROUT FOOD

Troutless lochan:
Supports a rich diversity of other aquatic wildlife.

Wind-blown insects:
Can represent the main food for trout in summertime.

Caddis (sedge) fly larvae: Food for trout in lochs and streams.

Stoneflies:
Nymphs are found in fast-flowing streams.

Mayflies:
Nymphs and adults are important food for trout.

Juvenile Herring and Sprat (whitebait):
Important food for sea trout.

Sandeels:
Sea trout grow fat when sandeels are plentiful.

Hill loch trout:
Isolated populations live above falls in hill lochs and streams. Some grow to 40cm or more in lochs.

Burn trout:
May grow to no more than 15 cm long, maturing at age of four or five years.

Trout fry:
'Swim up' from the streambed in April and grow quickly if there is plenty of food.

Common Prawn:
Found in the mussel beds in estuaries.

Adult sea trout: Mature after 2+ summers at sea. Overwintering trout were found in Loch Gairloch in 2010 & 2011.

Impassable Waterfall:
Barrier to sea trout.

Trout eggs:
Remain buried in the streambed through the winter.

Sea trout smolts:
Migrate to sea in April and May, usually after 3 or 4 years in freshwater. In drought years, migration may be delayed.

Sea lice:
Lepeophtheirus salmonis is a natural parasite of sea trout, but numbers can be much higher near salmon farms.

Red-throated Diver:
Please don't disturb divers on breeding lochans.

Hill loch: Each loch is different. Lochs at the top of a chain often have larger trout!

Spraint site:
Nutrient-rich oasis.

Otter runs:
Networks of trails through the hills.

Trout spawning:
Trout lay their eggs in gravel in autumn. The female may be a sea trout, the male a burn trout.

Heron:
Feeds along the coast and inland. Small trout are taken in streams and estuaries.

Red-breasted Merganser:
Takes more smolts in dry years when smolt migration is delayed.

Harbour Seal:
Feeds mainly on other fish. Unhealthy sea trout are more likely to be taken by a seal, particularly in winter when the sea is cooler.

PREDATORS

Golden Eagle

Otter: Catches trout in spawning streams in the autumn.

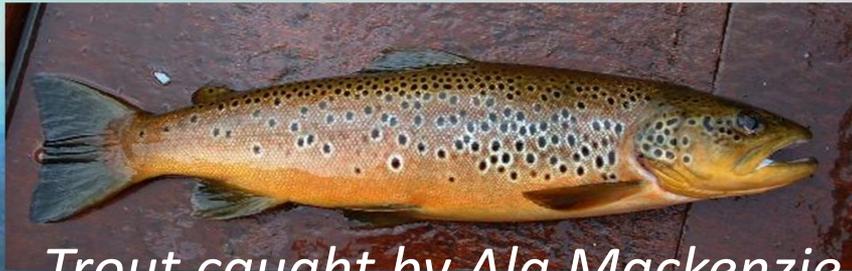
Dipper:
Takes washed-out eggs at spawning time.



Garbhaig falls . . .



Photo by Steve Kett



Trout caught by Ala Mackenzie



Salmon fry & charr fry

Fionn Loch from Beinn Airigh charr



brown trout from a wee lochan in the Gairloch hills!



Loch Maree





**The art of dapping was
developed on Loch
Maree. . .**



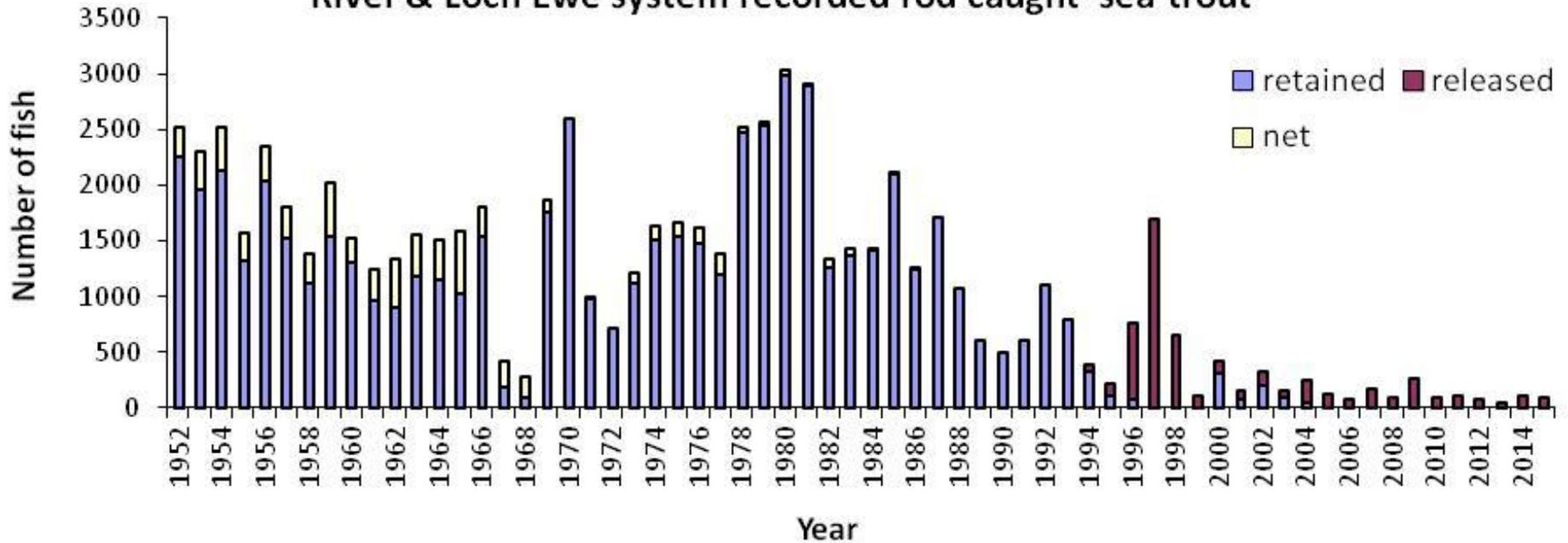


*Former British record
rod caught sea trout*



The Loch Maree sea trout fishery collapsed in the 1990s

River & Loch Ewe system recorded rod caught 'sea trout'



Sea trout monitoring



*Sweep netting Flowerdale Estuary, Loch Gairloch
(photo by Alex Gray)*



Sweep netting Little Loch Broom

Kanaird , 8th June 2016

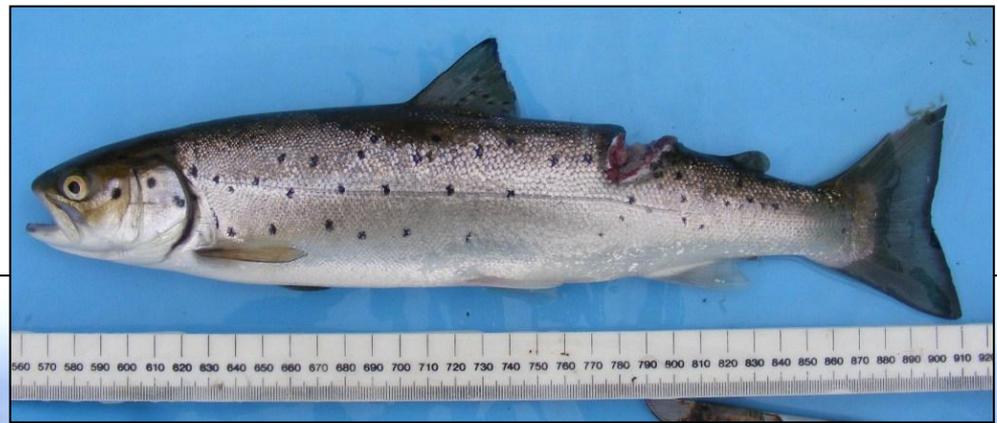
7 sea trout up to 400mm (5 lice)



Kanaird 24th June

12 sea trout mostly < 200mm; largest 405mm.

Max 10 sea lice (mostly <5).



Boor Bay, Loch Ewe, 6th June:
2 sea trout 230mm & 310mm;
1 louse on one fish



Boor Bay, Loch Ewe, 5th July:
2 wee sea trout (151mm and
182mm) max 6 lice per fish



Flowerdale estuary, Loch Gairloch , 6th June:
2 sea trout 230mm & 310mm; 1 louse on one fish



Flowerdale, Gairloch 7 July 2016

31 sea trout, max 41 lice per fish (mostly preadults and adults)



Flowerdale 1st September 2016



Flowerdale, Loch Gairloch 20 September 2016

21 sea trout. Max. 35 lice per fish, mostly <10 lice per fish



Flowerdale 7th July 2016; 530mm,



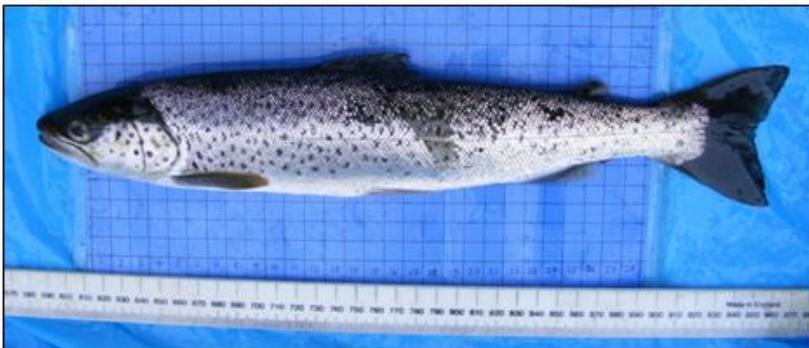
Flowerdale 20 September 2016; 540mm,



Growth of 'Squaretail', a male sea trout caught 5 times by the WRFT sweep netting team in Loch Gairloch, from March 2011 to September 2012

The following pictures are of a wild sea trout that was caught five times with the WRFT sweep net in Loch Gairloch. Each time the fish was caught, it was anaesthetised, a scale sample was taken, a photograph was taken, and the fish was returned to the water following recovery. The fish has been recognised by its spot pattern. When first caught in April 2011, the fish had a damaged pectoral fin and other predator damage ('beak' mark), and dorsal fin damage associated with earlier sea lice infection. The trout survived for at least another 16 months following its initial capture, growing from less than 1lb (455g) in weight to over 3lb (1365g) during this period. The fish suffered further predator damage to its tail between September 2011 and April 2012. Note the changes in colouration from silvery during the spring and early summer to bronze (spawning colouration) by September in both years.

18 Mar 2011: 355mm, 380g; deformed right pectoral fin; note scale loss attributed to beak damage. *Lepeophtheirus salmonis* lice counts: 3 copepodid & chalimus, 5 preadult & adult, 3 ovigerous female; dorsal fin slightly eroded. The scale reading suggests that the trout had already spawned twice (see last page).



27 Sept 2011: 455mm, 933g; *Lepeophtheirus salmonis* 0 c&c, 2 p&a, 0 of.



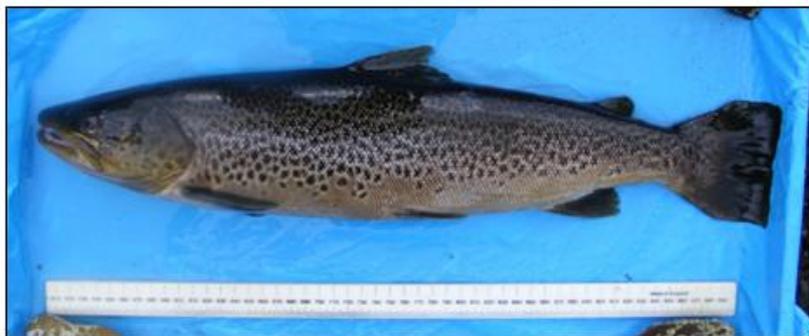
11 Apr 2012: 465mm, 948g; *Lepeophtheirus salmonis* 2 c&c, 0 p&a, 0 of



22 June 2012: 487mm, 1154g; *Lepeophtheirus salmonis* 10 c&c, 3 p&a, 4 of; 4 *Caligus*



17 Sept 2012: 520mm, 1512g; *Lepeophtheirus salmonis* 0 c&c, 4 p&a, 6 of.





Flounder
423mm,
1040 grams
Flowerdale,
20th September
2016



Torridon estuary, 2nd June 2016

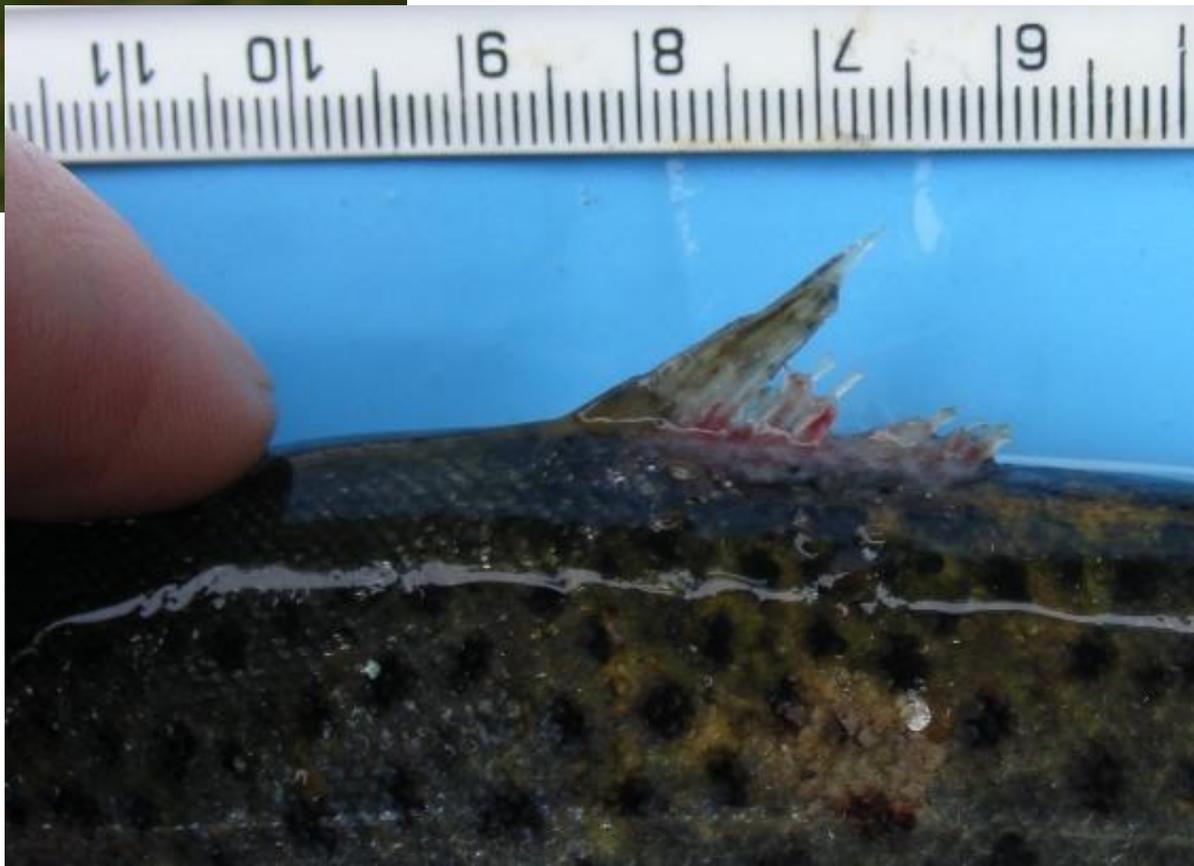




Balmacara, 10th June 2016

8 small sea trout with up to
250+ lice per fish

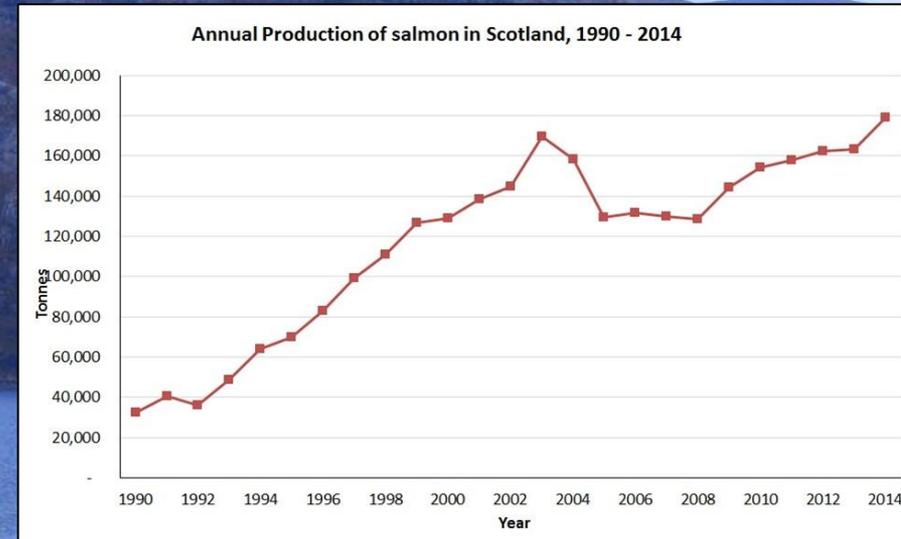
Sea trout, 206mm, 250+ lice
with dorsal fin damage



Glenmore River, Glenelg 29th June 2016



Numbers of farmed salmon have increased greatly providing many more hosts for parasitic sea lice

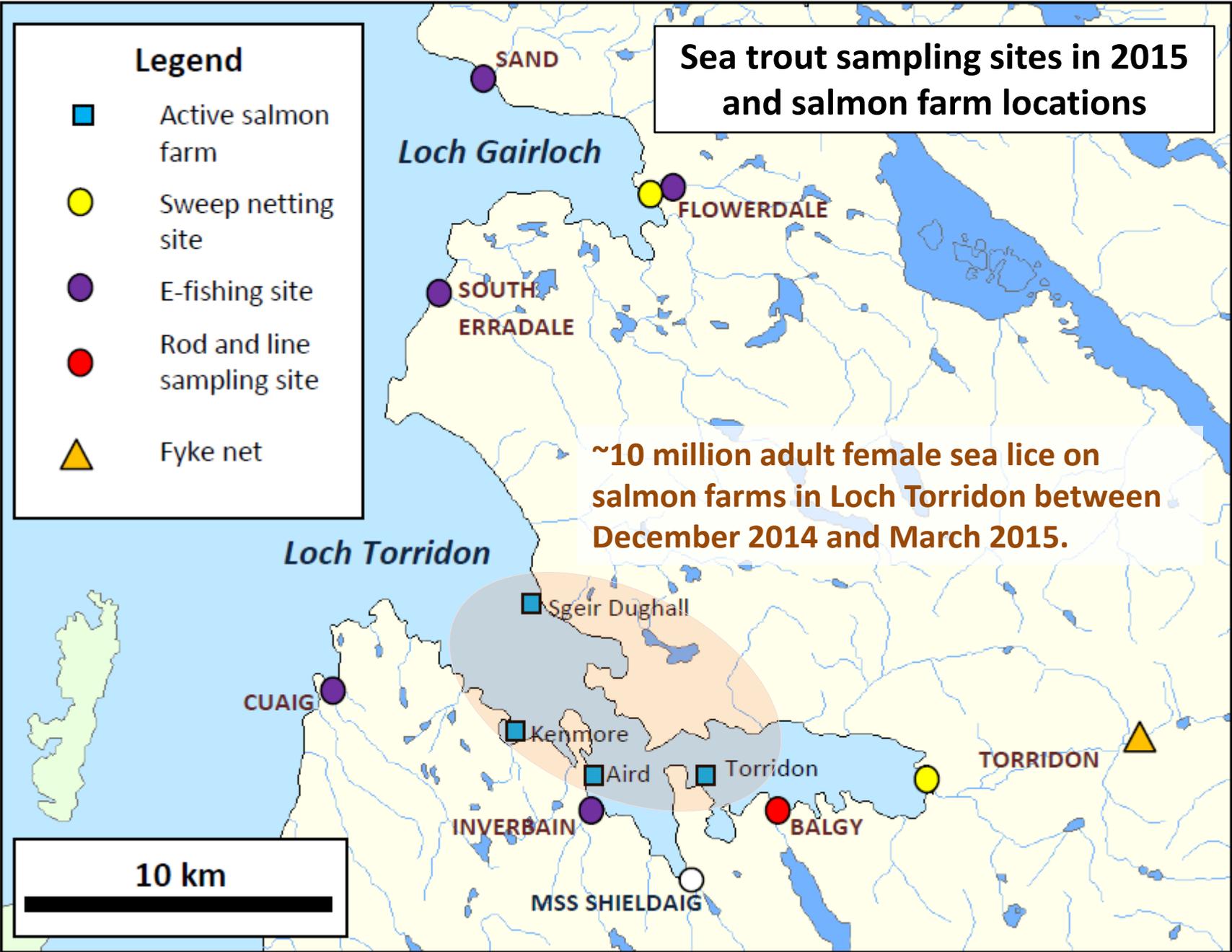


*Aird salmon farm,
Loch Torridon October 2016*

Sea trout sampling sites in 2015 and salmon farm locations

- Legend**
- Active salmon farm
 - Sweep netting site
 - E-fishing site
 - Rod and line sampling site
 - ▲ Fyke net

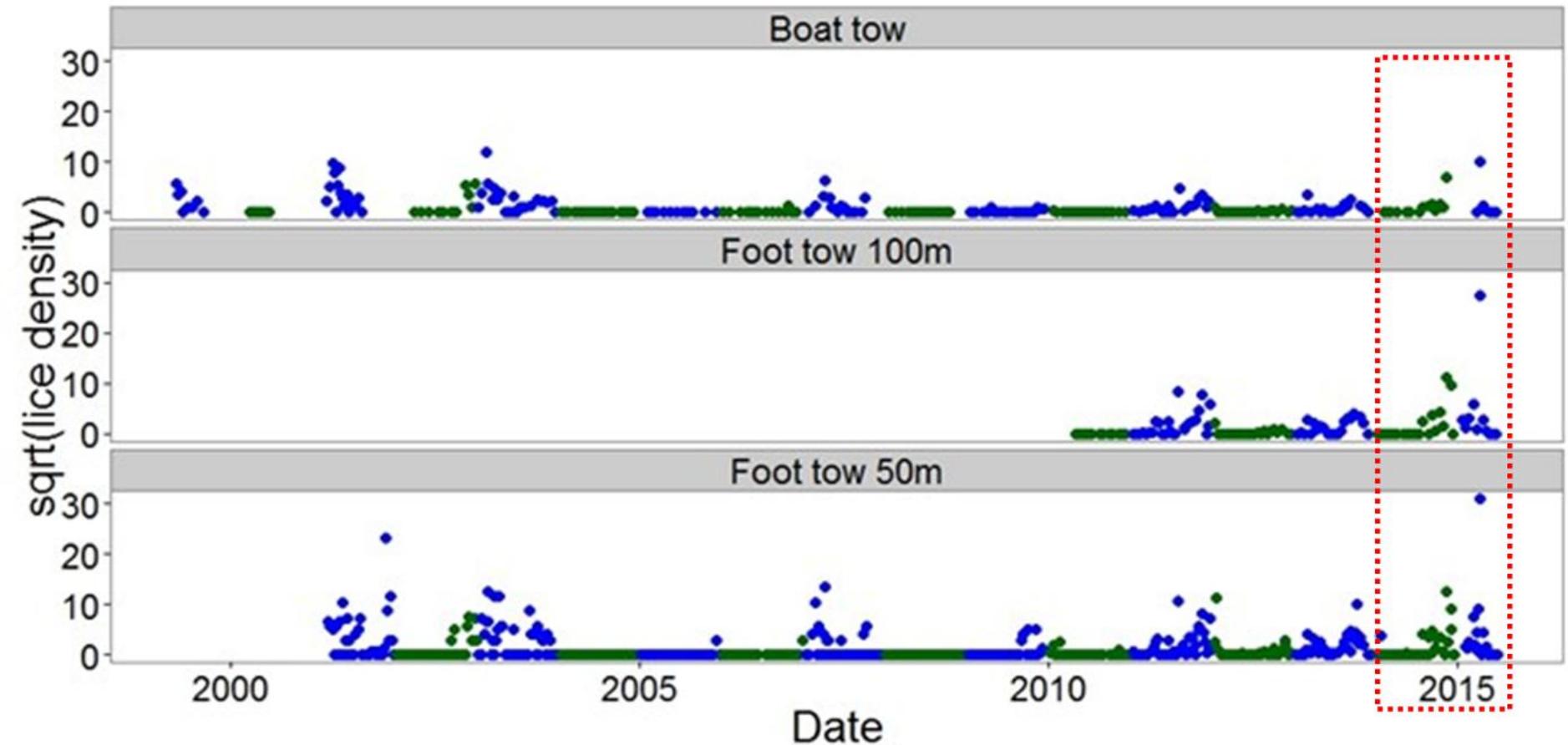
~10 million adult female sea lice on salmon farms in Loch Torridon between December 2014 and March 2015.



Density of sea lice (square root transformed) measuring by plankton tows in Loch Shildaig 1999-2015 (Marine Scotland Science data).

Green points are those in the first year of production, blue are in the second year.
The period January 2014 – June 2015 is indicated by the box outlined in red which has been added to the published graph.

This graph has been reproduced from the Scottish Government's MSS Shildaig Project website.
<http://www.gov.scot/Topics/marine/Salmon-Trout-Coarse/Freshwater/Research/Aqint/Shildaig/LiceLevels>



Question: what was the distribution of heavily lice-infested sea trout?

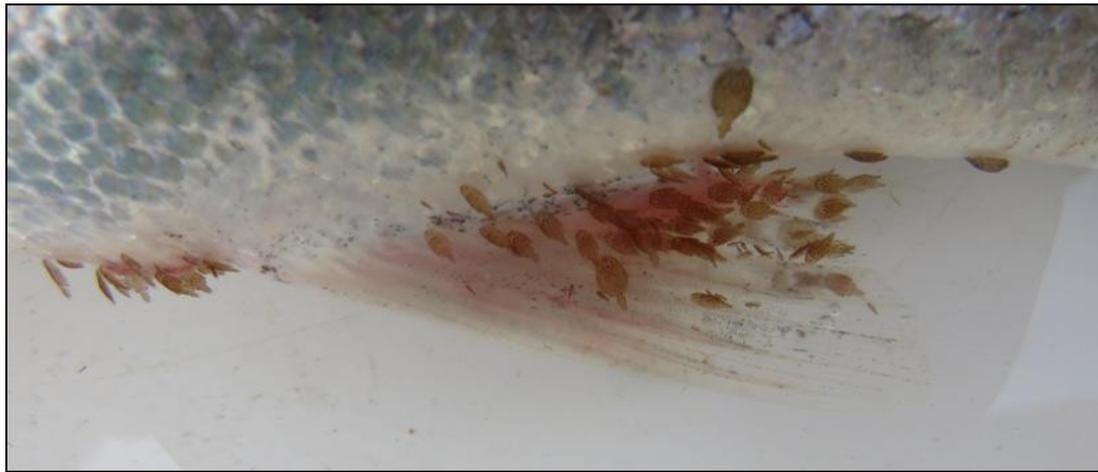
Question: what was the distribution of heavily lice-infested sea trout?



Sweep netting for sea trout **Loch Gairloch**, 19th May 2015



Loch Gairloch Sea trout, 19th May 2015: approximately 500 lice . . .

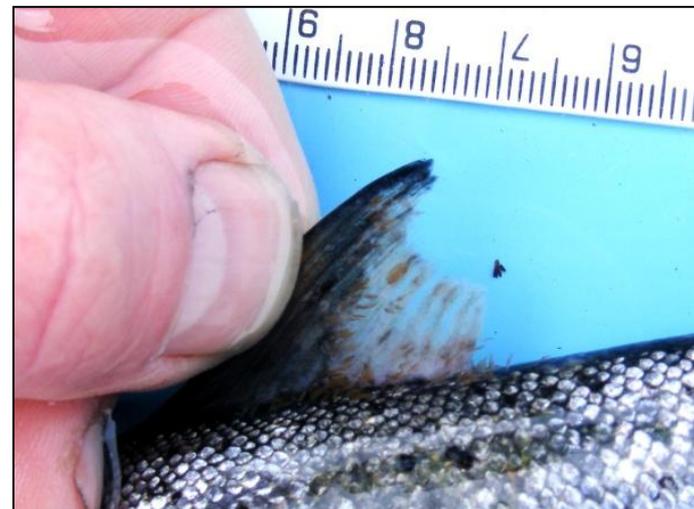
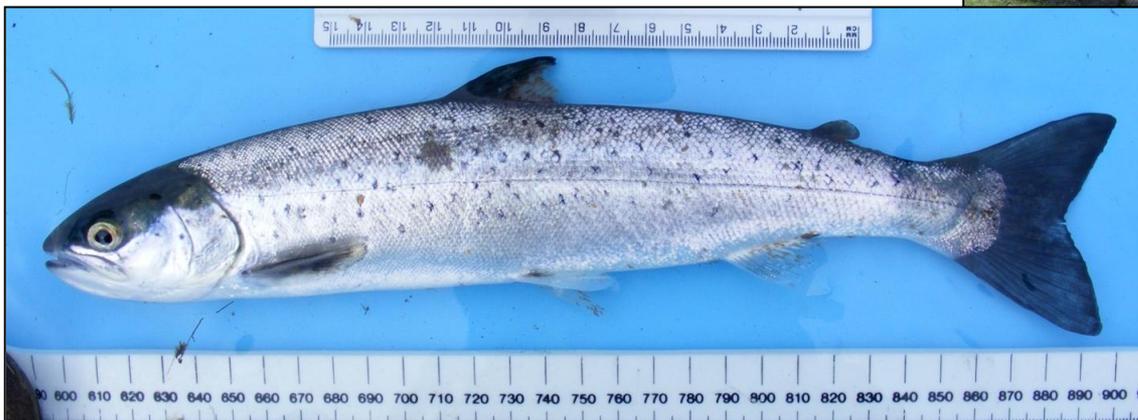
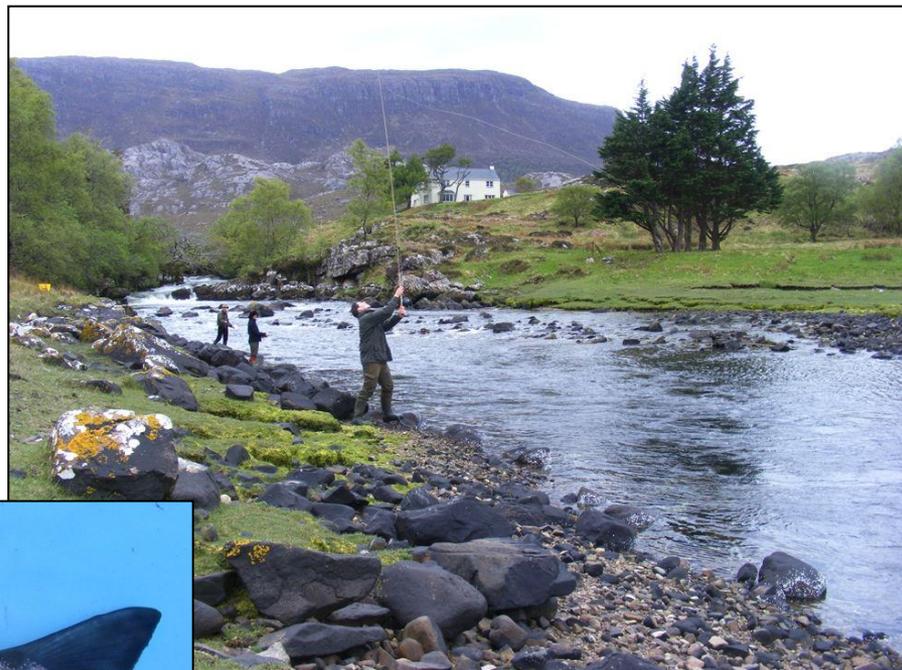


River Balgy sea pool, Loch Torridon

Rod and line sample, 25th May 2015

Total catch **8 sea trout**, av. condition 0.76
sea lice counts per fish: 0, 0, 0, 0, 0, 0, 26, 475+
respectively.

Sea trout 295mm with at least 475+ lice.



River Balgy sea pool, Loch Torridon. Rod and line sample, 25th June 2015

Six sea trout. Average condition factor 1.00 (i.e. the fish are fatter than on 25th May).

Sea lice counts per fish: 20, 74, 80, 43, 43, 175.

Three fish have damaged dorsal fins.

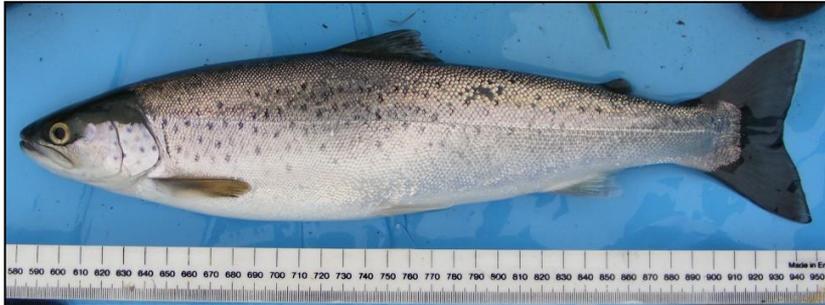


Sweep net sample, **Loch Ewe**, 4th June 2015

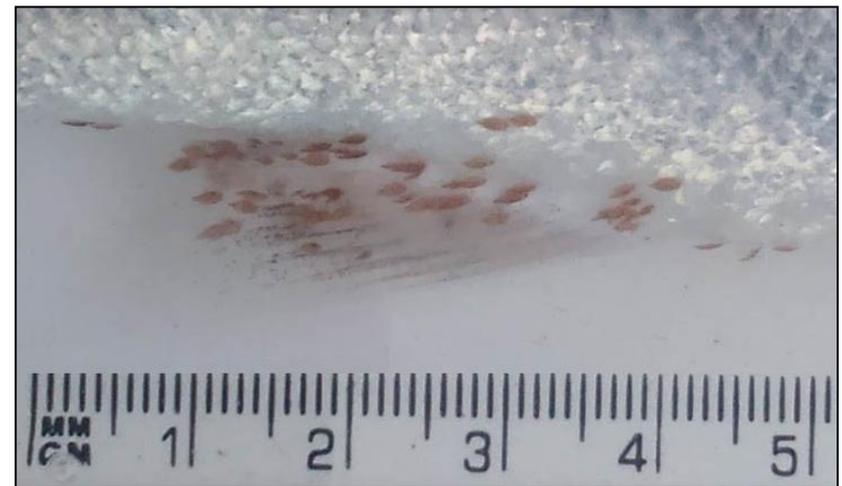
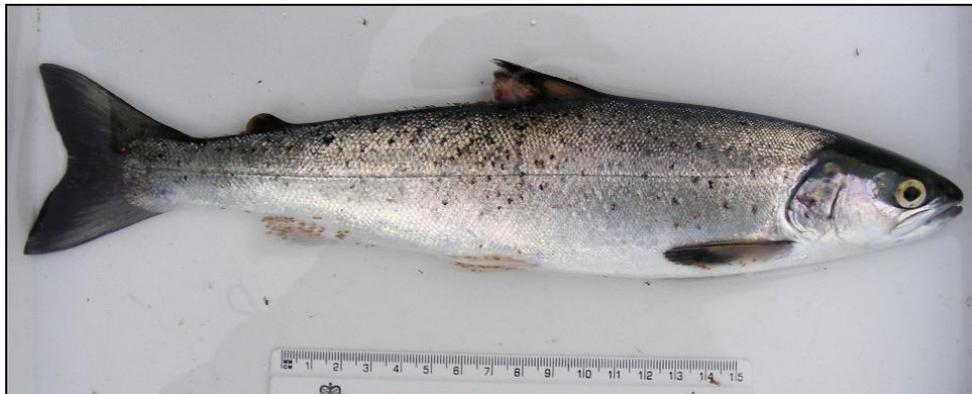
(~55km from nearest Torridon salmon farm)

Total catch: 41 sea trout including 36 post-smolts (<250mm) mostly with <5 lice per fish

This 362mm sea trout with just 10 lice



... and also a 295mm sea trout with 412 lice.



Loch Gairloch, 6th July 2015.

Electro-fishing sample from sea pool of Flowerdale river.

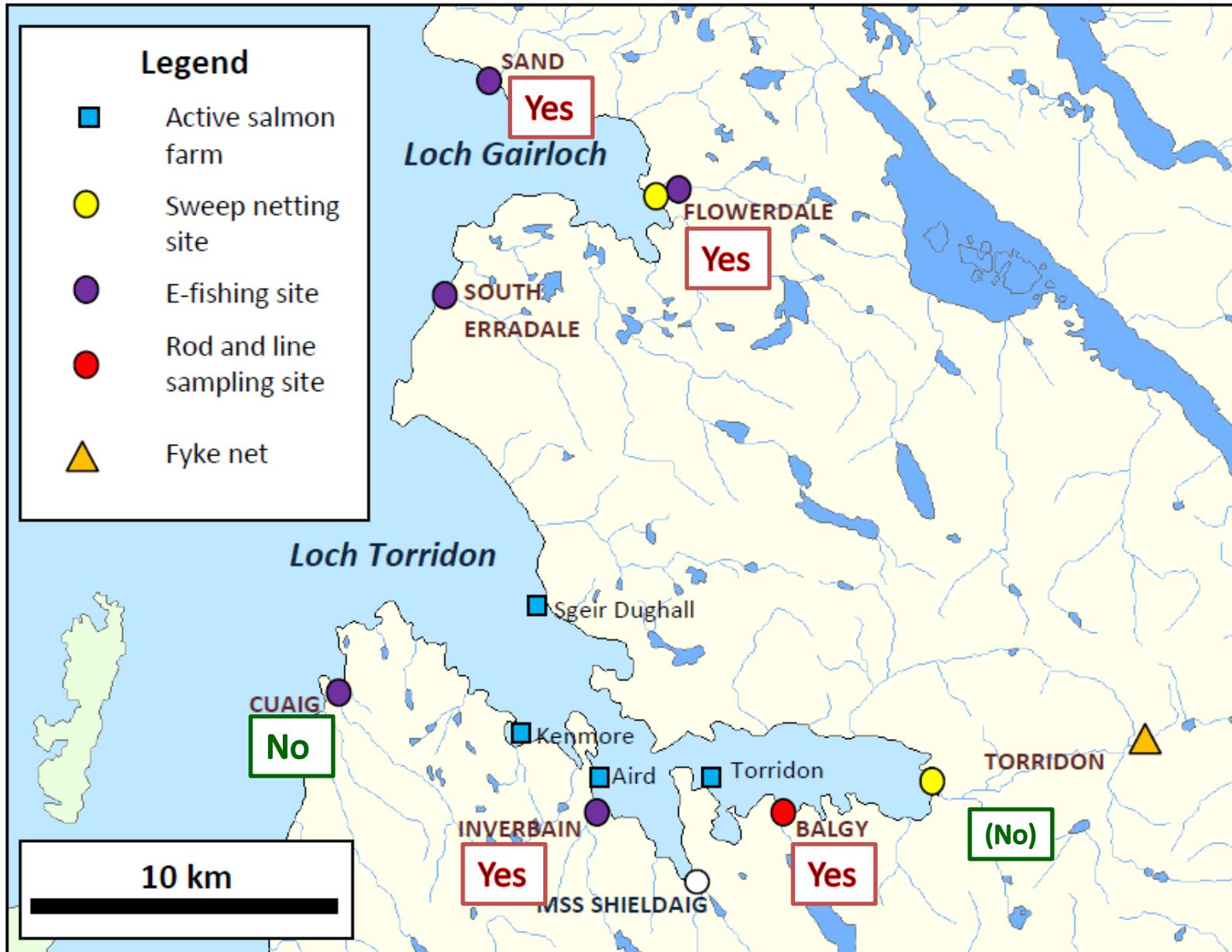
6 sea trout, sea lice counts per fish:
52, 81, 16, 54, 85, 81, 2



Sea trout of 279mm 81 lice on it and a freshly damaged dorsal fin associated with sea louse infestation (photo by Andy Vicks)



Did samples include sea trout with '100% expected mortality' ¹ fish?



¹ (sea trout with >0.3 lice/fish weight, g) Taranger, et al. 2015

No evidence of many sea lice infested sea trout in the north of WRFT area in 2015 & 2016; local salmon farms had low sea lice counts.

Little Loch Broom, 3rd August 2015



Question 2: what was the impact of the sea lice infestation on sea trout populations?

Question 2: what was the impact of the sea lice infestation on sea trout populations?

Three maturing female sea trout taken in the South Erradale burn on 20th August 2015 by the WRFT e-fishing team. The largest fish was 350mm in length and 495g in weight. (no lice)



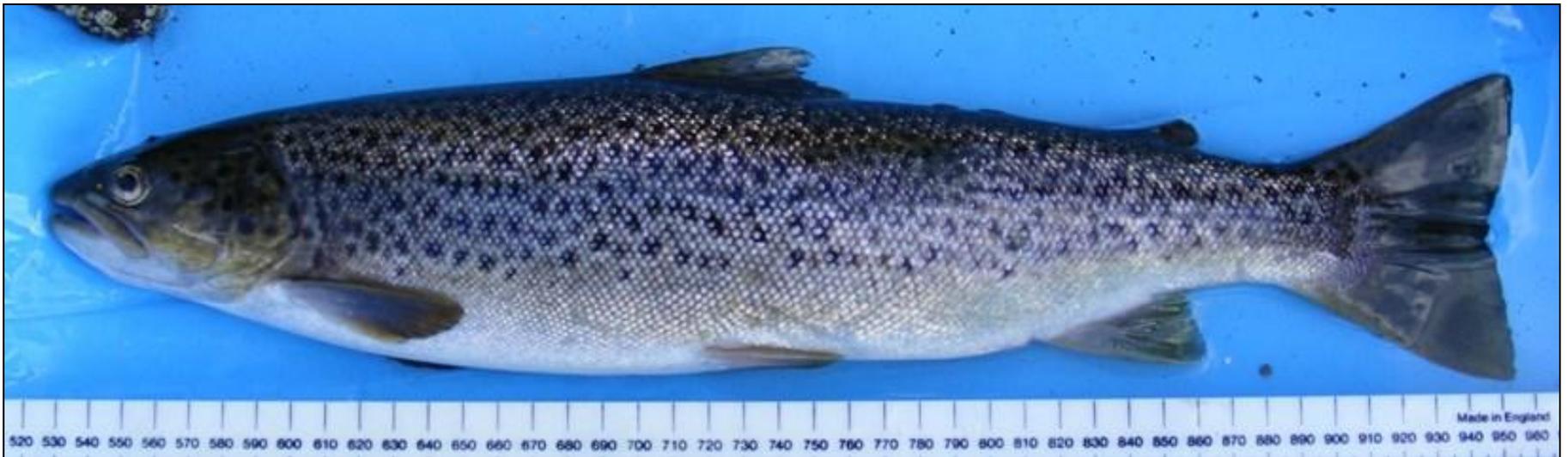
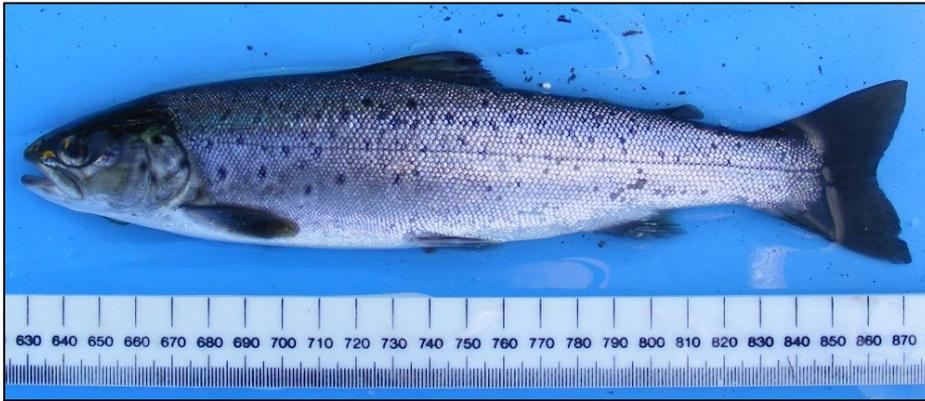
This dorsal fin has been louse-damaged, but is healing



Loch Gairloch, 1st October 2015.

23 sea trout 214mm to 432 mm; >6 lice / fish

Including mature female sea trout of 432mm

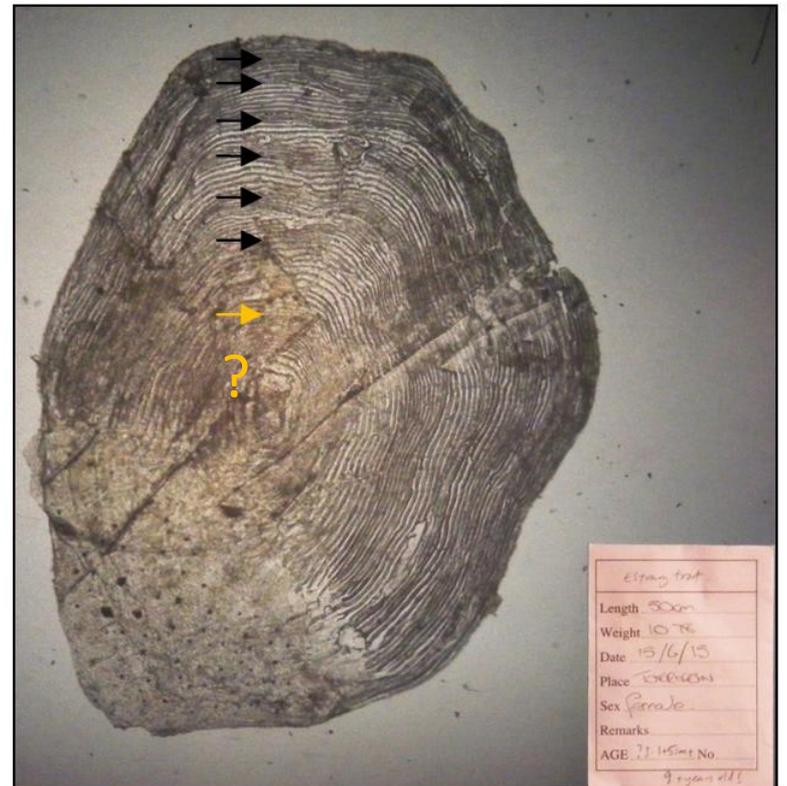


Torridon estuary sweep netting, 15th June 2015

. . . just one sea trout, 500mm , no sea lice.



otolith
Length 500m
Weight 107g
Date 15/6/15
Place TORRIDON
Sex female
Remarks
AGE 21 145m No
9 years old



otolith
Length 500m
Weight 107g
Date 15/6/15
Place TORRIDON
Sex female
Remarks
AGE 21 145m No
9 years old

River Torridon fyke net, set in spawning burn from 13 Oct to 9th Nov

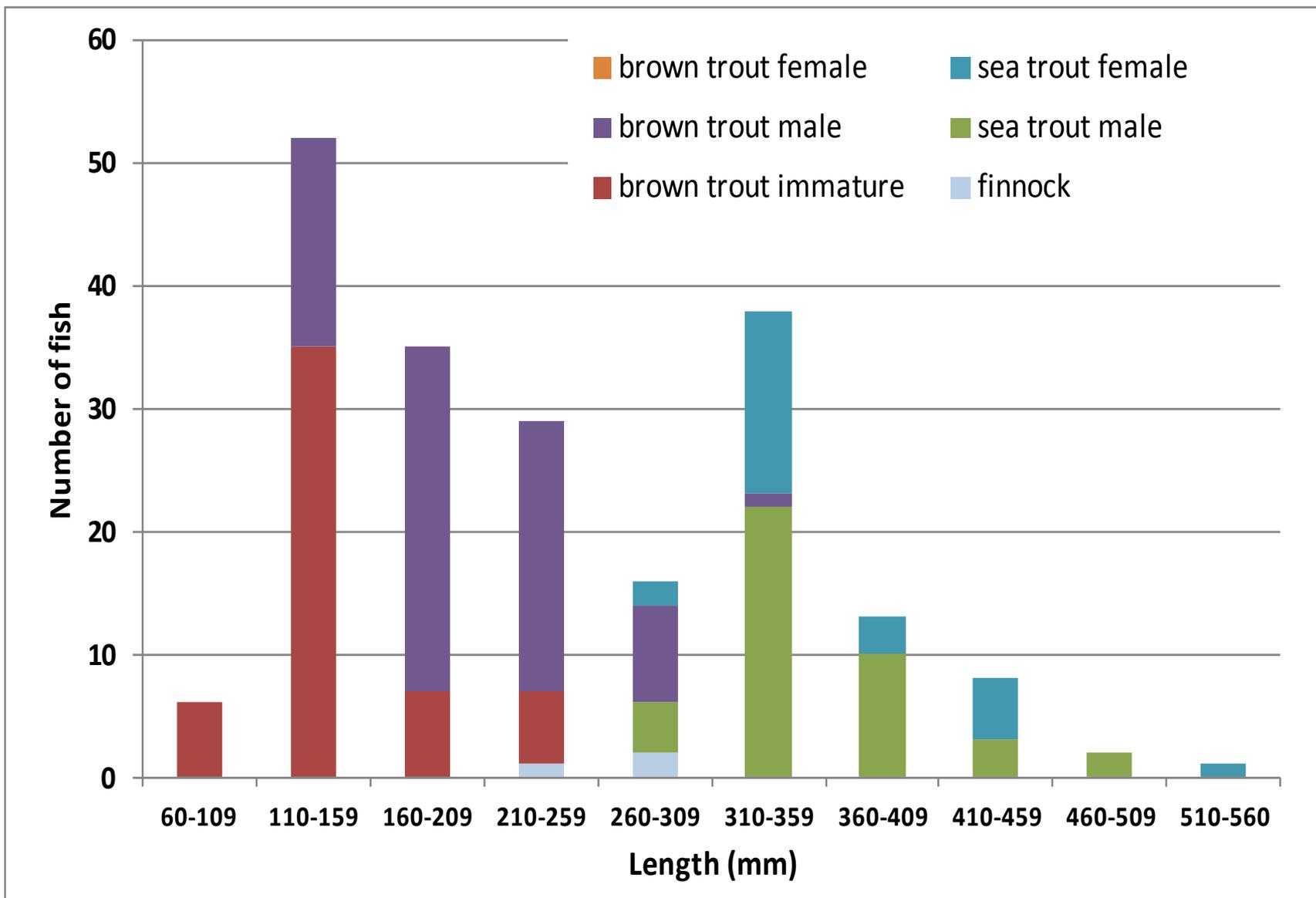


There were 76 'captures' of sea trout in the fyke net . . .

Male and female sea trout from fyke net, 28th October 2015



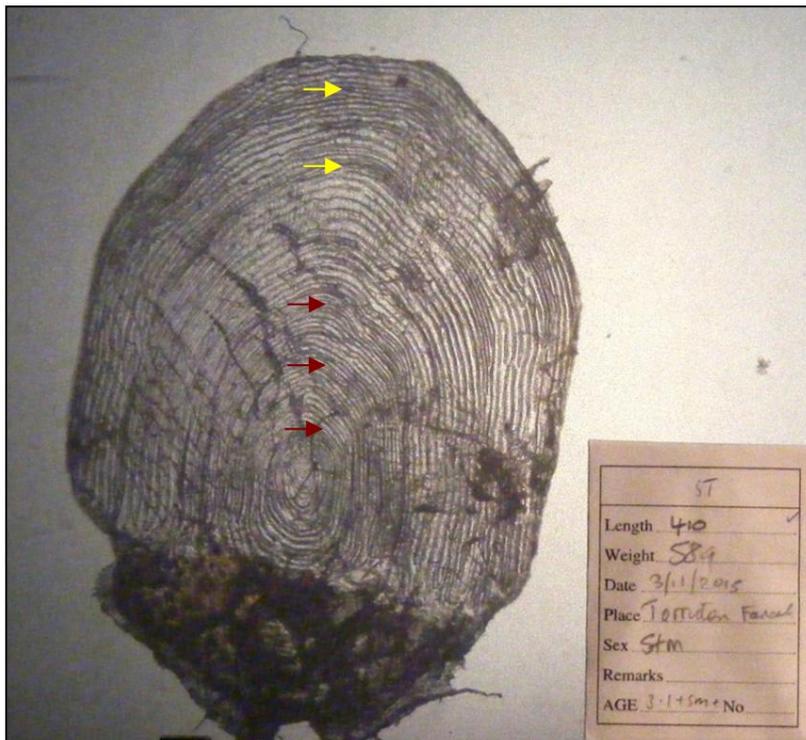
... out of a total of 211 trout captures; the others were a mix of mature male and immature brown trout.



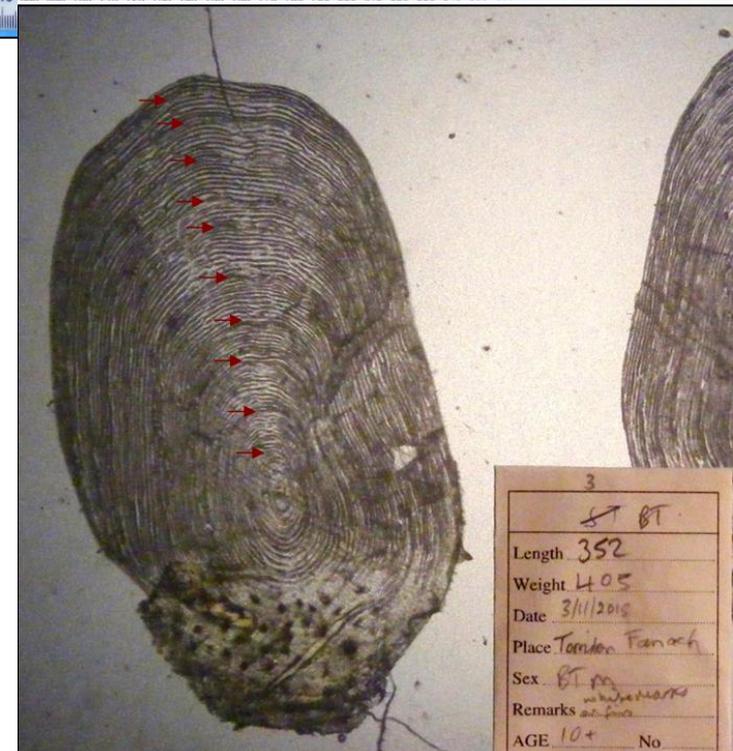
Torridon fyke net 3rd Nov.

(top) 5 year old male sea trout of 410mm (scale bottom right)

(below) 10 year old male brown trout of 352mm



ST
Length 410
Weight 584
Date 3/11/2015
Place Torridon Fannoch
Sex STM
Remarks
AGE 3-1+5m+ No



3
ST BT
Length 352
Weight 405
Date 3/11/2015
Place Torridon Fannoch
Sex BT m
Remarks white marks
AGE 10+ No

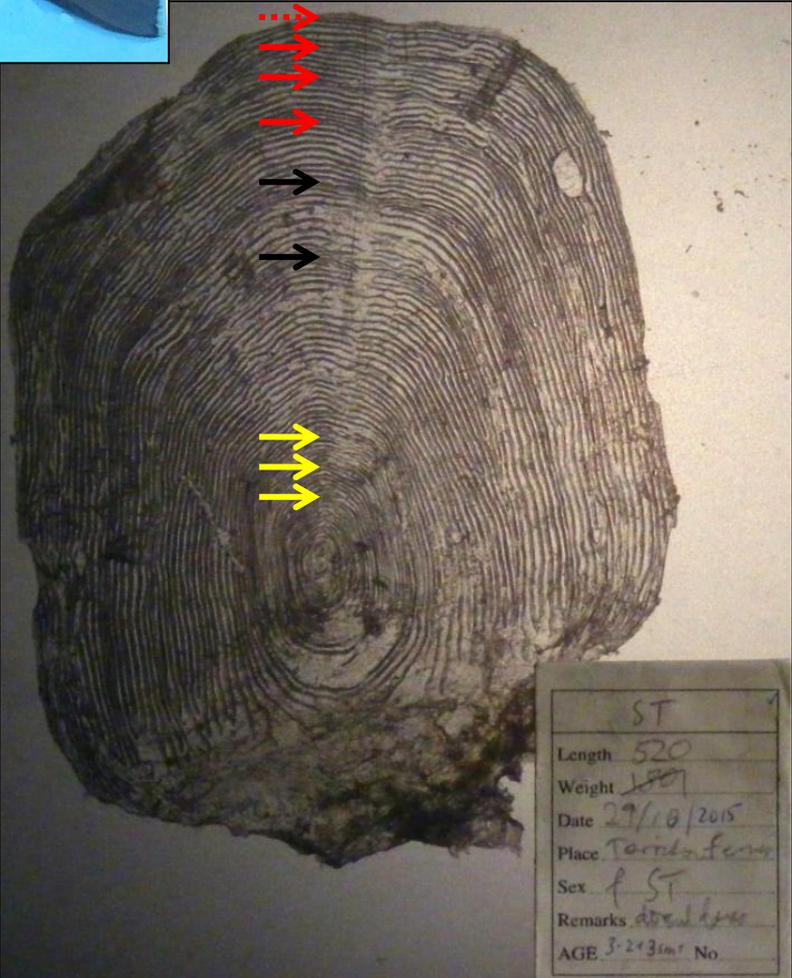
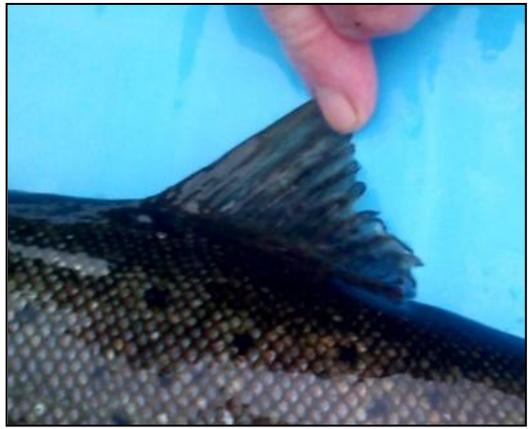
Mature male trout (running milt) Torrison fyke net 3rd November 2015
The top fish is a sea trout, the other three, brown trout.



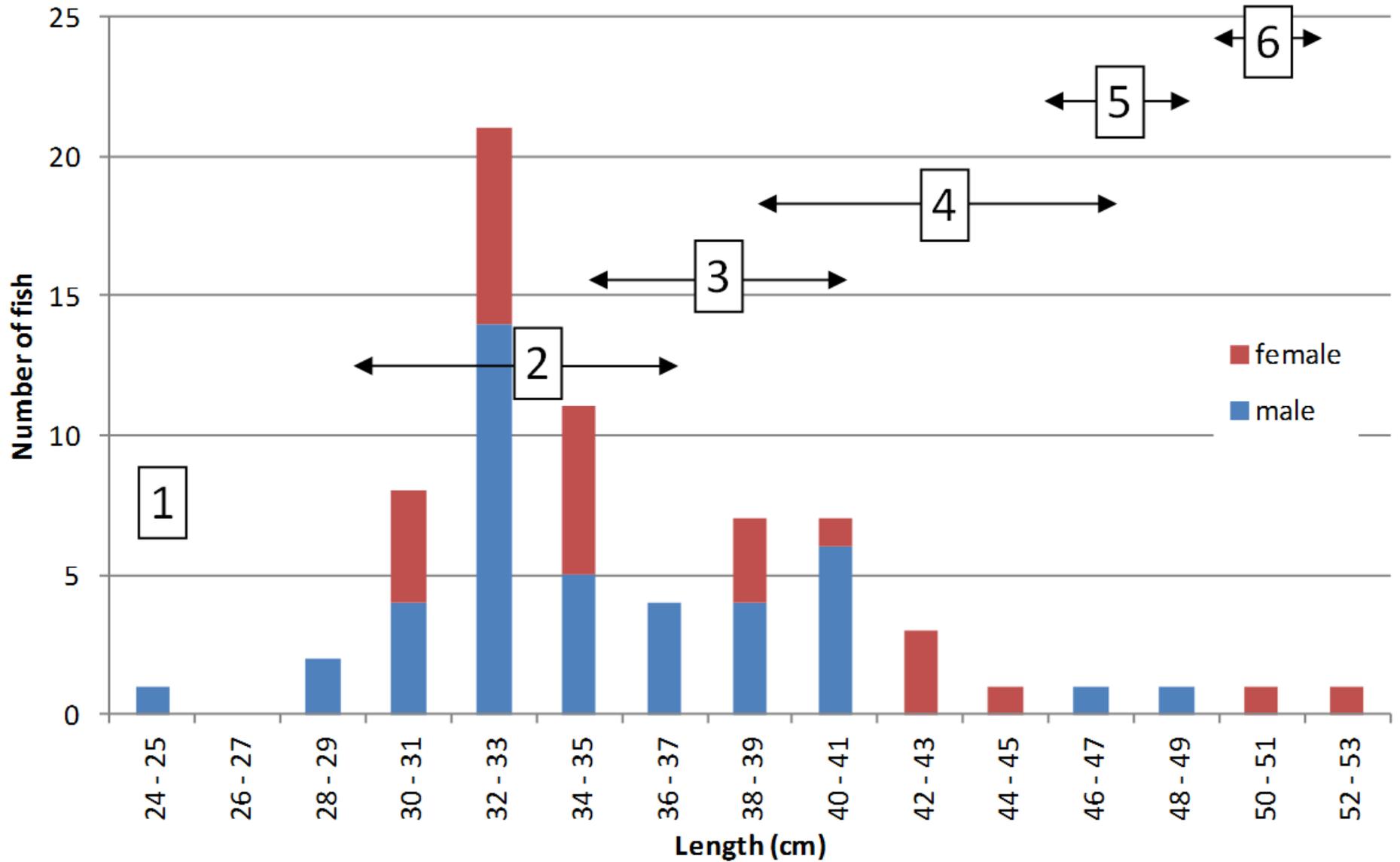
Female sea trout, 520mm Torricon fyke net 29th October 2015



Age 8+ years
at least three spawning marks
6 summers at sea
three years in freshwater



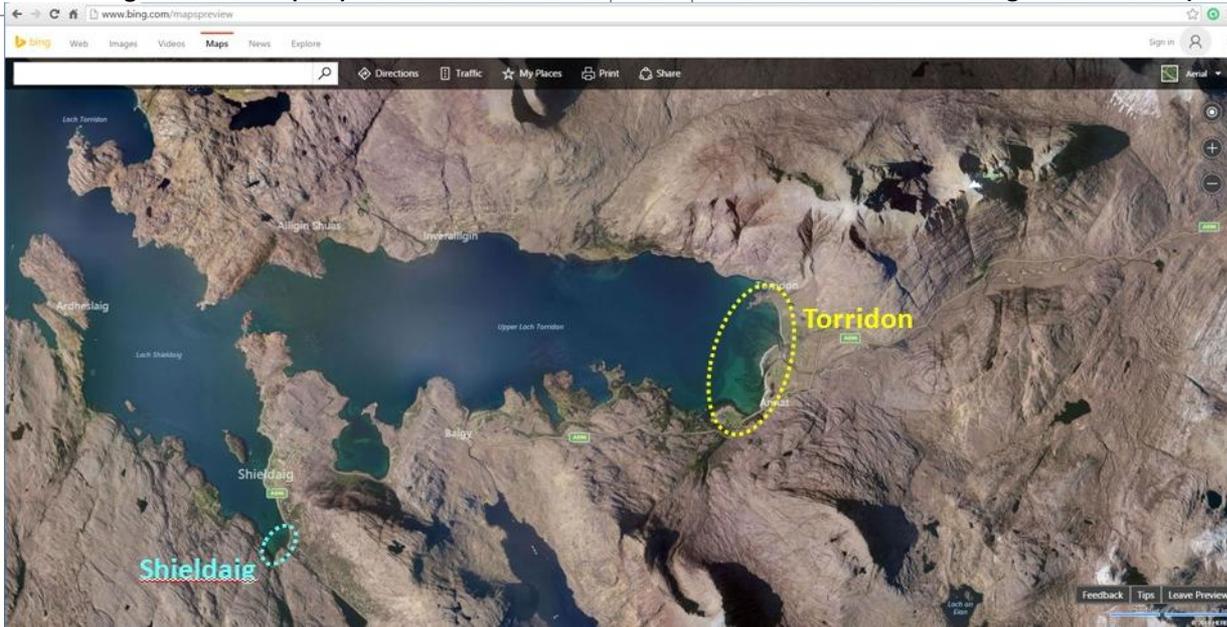
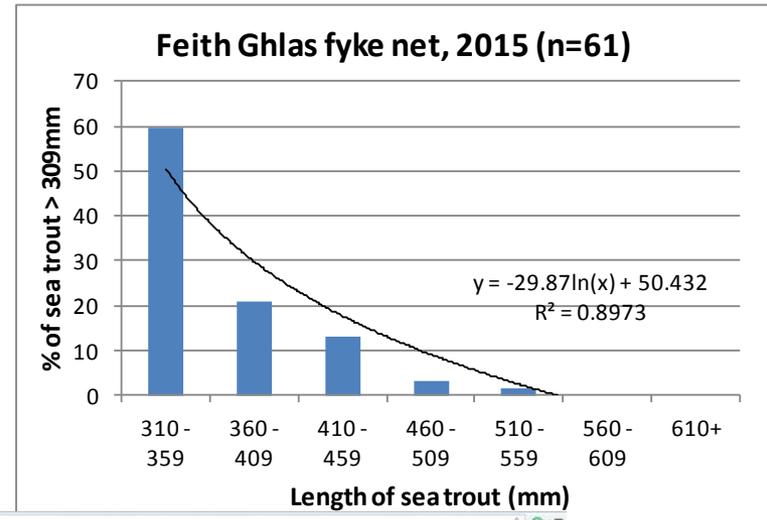
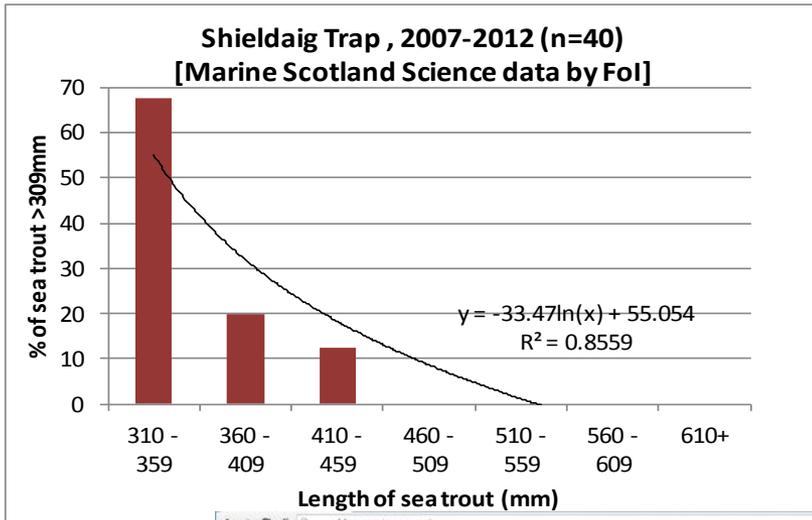
Sea ages of sea trout



Occurrence of larger sea trout in Loch Torridon

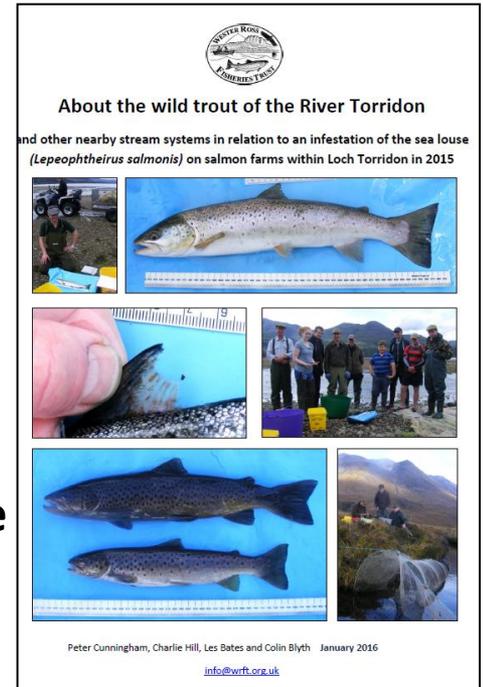
Relative % of sea trout of >310mm in samples from the

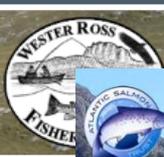
MS Shieldaig trap, 2007 to 2012 (left) . . .and WRFT Torridon fyke net, 2015 (right).



Some conclusions:

- Despite high sea louse infection pressures associated with nearby salmon farms and high lice counts on some fish in some samples, sea trout were able to survive to maturity in some situations.
- In the Torrison river system, trout egg deposition is still dominated by sea trout despite close proximity to salmon farms.
- Longer survival of some River Torrison sea trout may be due to more favourable local geography and hydrology with fresh & brackish water options for evading infective lice and seal predation.
- However, in other situations (e.g. nearby Shildaig River system) lice infested sea trout are evidently more vulnerable?





Sea lice monitoring

The sea louse, *Lepeophtheirus salmonis* is a natural parasite of salmon and sea trout. The natural host - parasite ecology of sea trout with the sea louse *Lepeophtheirus salmonis* is finely balanced. Even prior to the onset of salmon farming, sea trout with 10 or more attached lice were commonly seen around the coasts. However, from the late 1980s much higher levels of lice infestation were found on sea trout, especially closest to fish farming areas. Sea lice epizootics remain one of the biggest problems for sea trout fisheries in Wester Ross.



Sweep netting for sea trout at Kildonan Bay, Little Loch Broom

WRFT has recorded sea lice abundance on sea-trout during the month of June in estuaries at Dundonnell and Poollewe since 1997. Data has also been collected describing sea lice abundance on sea trout at other sites and at other times.

Heavily infected sea trout tend to return prematurely from the sea to freshwater. During years when there are sea lice epizootics, many 'early returned' sea trout ranging in size from post-smolts of less than 25cm to fish which have spent one or more summers at sea previously are recorded. Older sea trout of more than 45cm have rarely been taken in recent years.

Similar monitoring is carried out by scientists working for Fisheries Research Services in Loch Torridon. In 2008, the sea lice monitoring programme will be extended to include a series of sweep nettings in sea lochs throughout the WRFT area. This work is to be funded by the Scottish Government, via the [Tripartite Working Group](#).

Related Downloads

To download a file, right-click over its name and choose [Save Link/Target As...](#)

Costello, Scotland 2014: The problem for sea lice on salmonids: wild and farmed
Presentation given by Prof Mark Costello at the sea lice and sea trout management workshop at Aultbea Village Hall, supported by WRFT and the Atlantic Salmon Trust, on 20th February 2014. The talk summarises knowledge of louse biology, transmission to hosts, methods of control and the persistence of the problem. There is also a section at the end about Marine Reserves in New Zealand. [Posted: 24/02/2014 \(10.68MB\)](#)

Dundonnell fyke net sea trout sea lice results 2008
Spreadsheet with details of lice counts on sea trout taken in the Dundonnell fyke net in June and July 2008, operated by Eilean Darach Estate and Dundonnell Estate. many thanks to respective estates for permissions to post these results. [Posted: 10/09/2008 \(74KB\)](#)

Estuarine trout, Kerry Bay 7 June 2010
This trout, the largest taken in the sea by the WRFT sea lice monitoring team, was taken in the sweep net; and the file shows photographs of scales from which the age has been assessed. [Posted: 07/06/2010 \(508KB\)](#)

Loch Torridon Sea trout report 2015
This report presents some of the results of investigations to gather information about sea trout around the Loch Torridon area in 2015 following reports of exceptionally high concentrations of parasitic sea lice (*Lepeophtheirus salmonis*) on salmon farms within the area during the first six months of 2015. Sea trout were sampled by Wester Ross Fisheries Trust during the period May-July 2015 using sweep netting, rod and line and electro-fishing. In October and early November 2015 a fyke net trap was operated in a tributary of the River Torridon to learn more about the spawning population of trout within that river system. [Posted: 05/01/2016 \(7.75MB\)](#)

Problems for Sea trout in Wester Ross
This presentation has been tidied up from one given at the sea trout and sea lice management workshop at Aultbea Village hall on 20th February 2014. Data for sea lice and other factors affecting sea trout in Wester Ross are summarised. The presentation concludes with an outline for a Scottish Sea Trout Project aimed at improving our understanding of how different factors affect sea trout in different parts of Scotland. [Posted: 21/02/2014 \(6.57MB\)](#)

WRFT sea lice monitoring Report 2007 - 2008
Following a review of sea lice biology and ecology and past studies from a local context, this report presents the results of sea lice monitoring of wild sea trout in the WRFT area in 2007 and 2008 and considers associations with salmon farming. [Posted: 19/11/2009 \(2.29MB\)](#)

WRFT Sea trout monitoring report 2009 - spring 2011
Sea trout sampling in Wester Ross from 2009 to spring 2011. Includes results of sweep net sampling and links to scale reading catalogue. [Posted: 11/04/2011 \(1.95MB\)](#)

WRFT Sea trout Monitoring review 2012
This report presents the results of sea trout and sea lice monitoring in 2012 within the WRFT area, and considers the occurrence of larger sea trout in Wester Ross and other parts of the West of Scotland. [Posted: 12/04/2013 \(6.05MB\)](#)

WRFT Wild Trout Monitoring Report for 2011
This report presents the results of sea lice monitoring of sea trout in the sea around Wester Ross and trout sampling in freshwater in 2011. [Posted: 17/04/2012 \(8.90MB\)](#)

Activities

- Juvenile fish surveys
- Habitat surveys
- Sea lice monitoring
- Fisheries Management P

Latest News

- Slye and Wester Ross Fisheries Trust Open Day (25/08/2016)
- WRFT Review May 2016 (19/05/16)
- Meeting Postponed: Slye and Wester Ross Fisheries Trust Open Day (12/05/16)
- Refertilising Wester Ross Lochs (09/03/16)

News Archive

- Jan-Mar 2016 (3)
- Oct-Dec 2015 (2)
- Jul-Sep 2015 (2)
- Apr-Jun 2015 (2)
- Older (135)

Some problems for Sea trout in and around Wester Ross

Adapted from presentation given at Sea trout and Sea lice Management workshop, Aultbea, 20th February 2014

Peter Cunningham
info@wrft.org.uk

with support from



WRFT Sea Trout Monitoring Report for 2012 On the occurrence of larger sea trout in Wester Ross



report by Peter Cunningham,
March 2013
Wester Ross Fisheries Trust, Harbour Centre, Gairloch, Ross-shire, IV21 2BQ
Tel: 01445 712899
Email: info@wrft.org.uk

Sea trout and the seas around Wester Ross

White-tailed (sea) eagle

Trawling: Rising fuel prices provide additional incentives for the further development of alternative, more selective, fishing methods.

Gannet

Sea birds: The 'catastrophic and unprecedented breeding failure' around the West of Scotland in 2005 has been attributed to a shortage of sandeels (RSPB).

Seals: Populations of both harbour and grey seals are near recorded highs. There are few natural predators in local waters (rare Orca sightings). Formerly culled by salmon netmen.

Otter: Widespread and abundant around the coastline. Feeds on small fishes and crabs. Diet is unlikely to include healthy sea trout in the sea.

PDCApr06

Phytoplankton: Production depends upon sunlight and dissolved nutrient concentrations, and reaches a peak in early summer.

Zooplankton: Changes in the relative abundance of important *Calanus* species may be related to global climatic change.

Herring and sprat: Herring stocks around the west of Scotland were lower in 2005 than in 2004, with particularly few fish in the Minch (ICES).

Minke whale and porpoise: Target sandeels in the early summer, then sprat and herring from mid-summer onwards. Whales were less common in 2005 than in 2004.

Small gadoids: Pollack, Saithe, Whiting, etc.

Sandeels: of vital importance for sea birds, marine mammals and many fish species. ICES advise that the current status of West Coast sandeels is 'unknown'.

Jellyfish: Dense aggregations of moon jellyfish formed in local sea lochs during summer 2005. Jellyfish may out-compete juvenile fin-fish for zooplankton.

Pollack: Large pollack may be significant predators of small sea trout. Gadoids (including Pollack) are important food for seals.

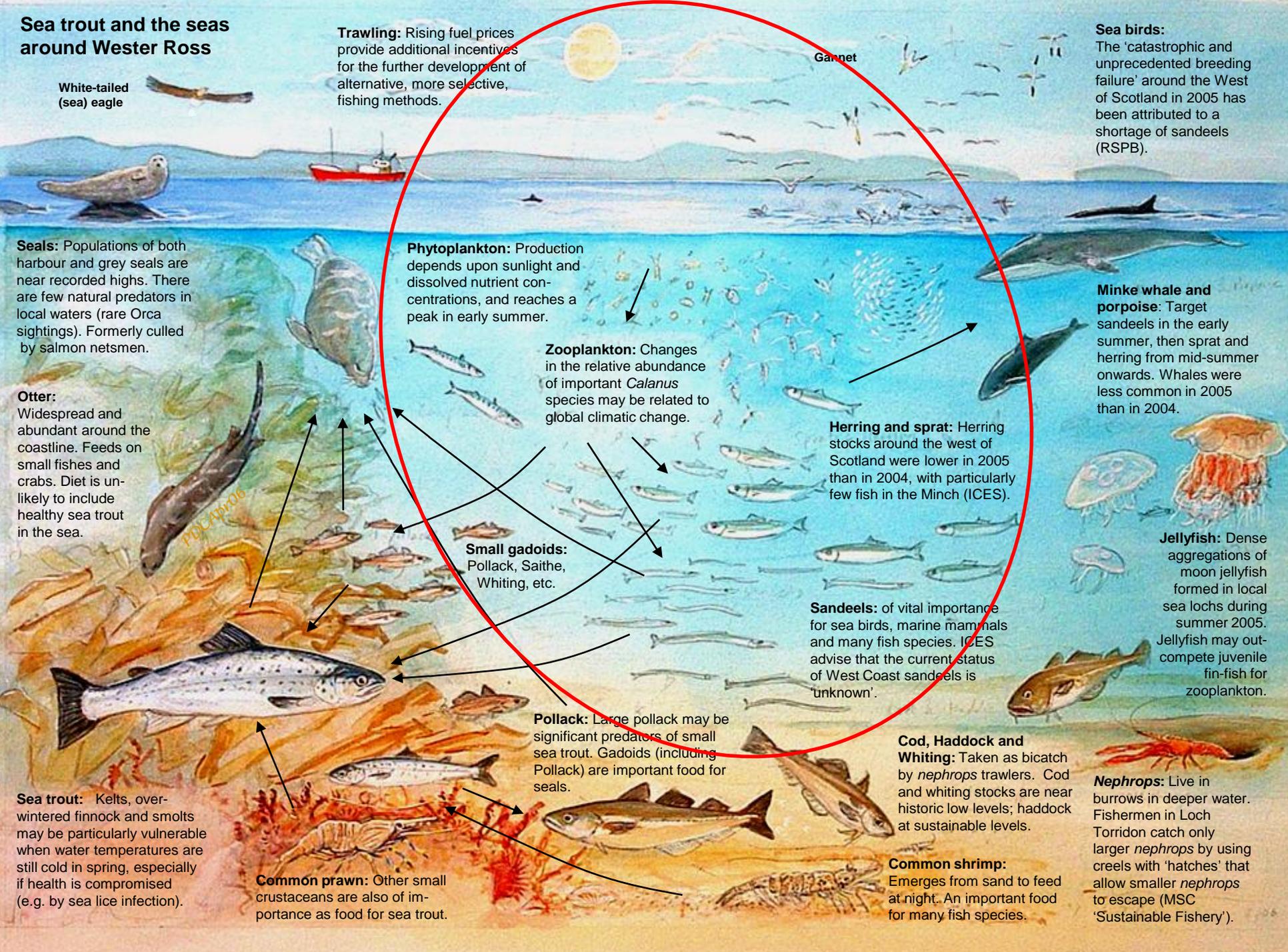
Cod, Haddock and Whiting: Taken as bicatch by *nephrops* trawlers. Cod and whiting stocks are near historic low levels; haddock at sustainable levels.

Nephrops: Live in burrows in deeper water. Fishermen in Loch Torridon catch only larger *nephrops* by using creels with 'hatches' that allow smaller *nephrops* to escape (MSC 'Sustainable Fishery').

Sea trout: Kelts, over-wintered finnock and smolts may be particularly vulnerable when water temperatures are still cold in spring, especially if health is compromised (e.g. by sea lice infection).

Common prawn: Other small crustaceans are also of importance as food for sea trout.

Common shrimp: Emerges from sand to feed at night. An important food for many fish species.

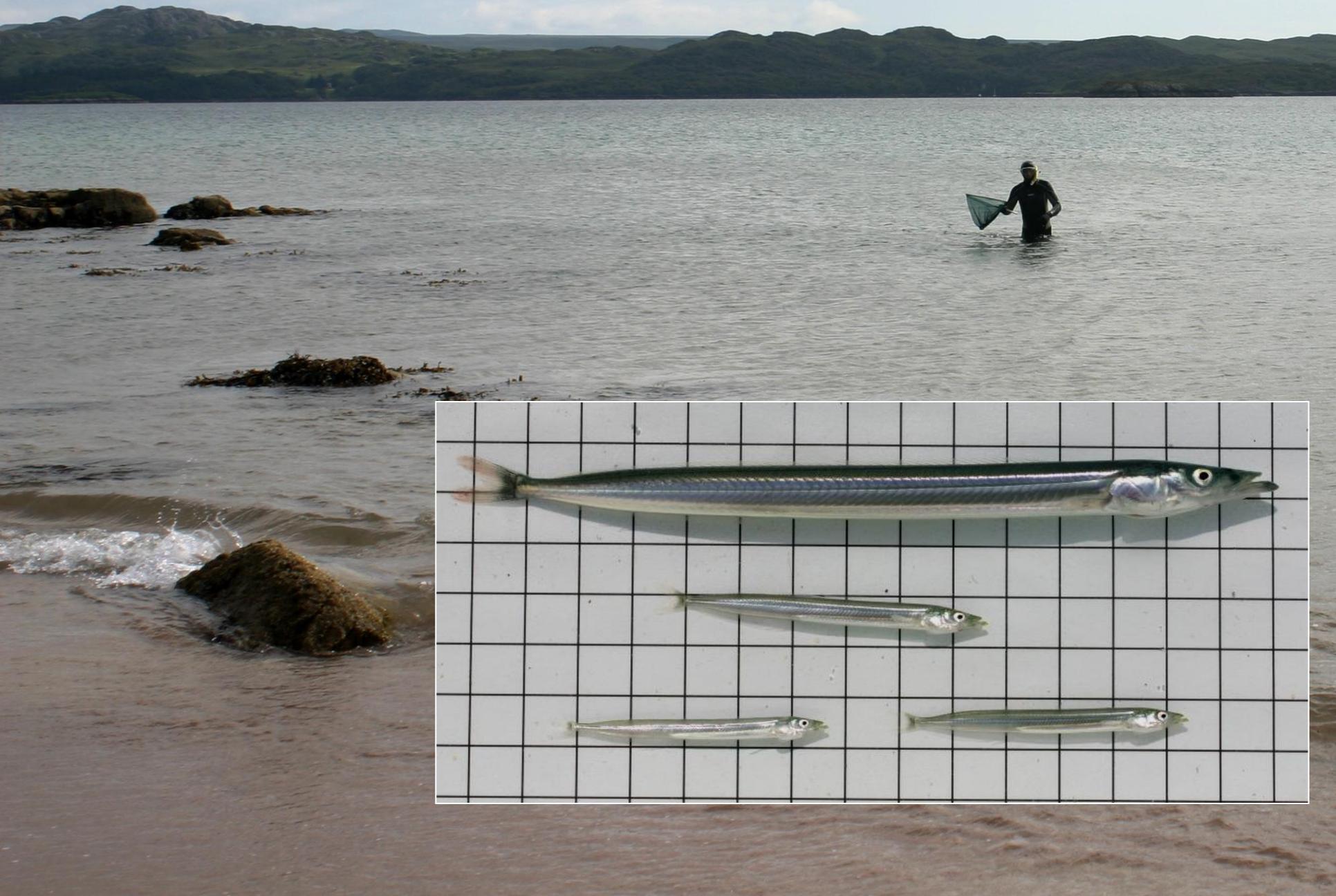


Sea trout condition . . .

2009: a remarkably 'fat' sea trout of 380mm, 800g (condition factor 1.46) taken in the sweep net at Boor Bay on 15th July 2009 (photo Ben Rushbrooke)



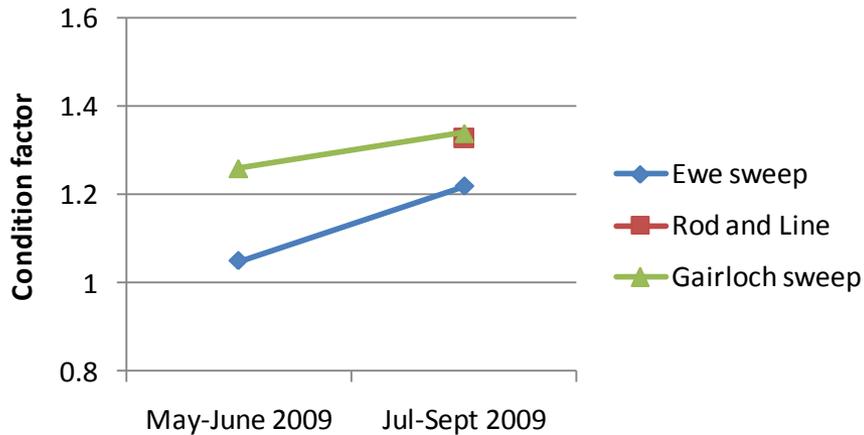
Sandeel 'glut', Gairloch, early July 2009



The sea trout we caught in 2009 were fatter than in 2010 & 2011

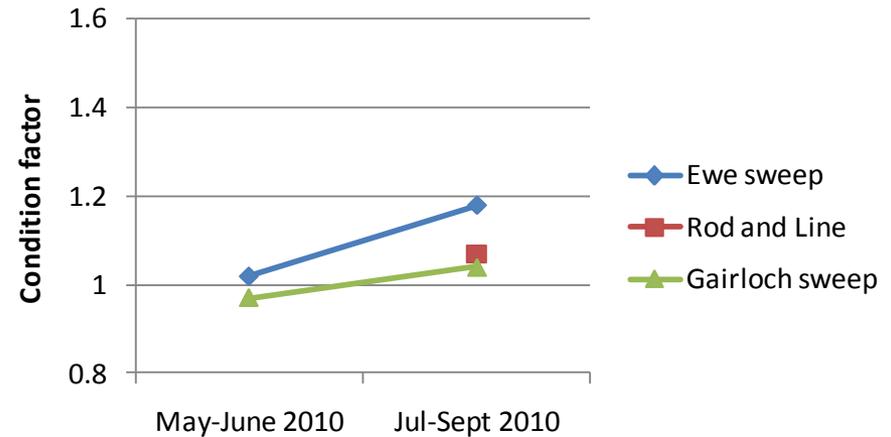
2009

Sea trout condition factor, Summer 2009



2010

Sea trout condition factor, Summer 2010



Sea trout from Kerry Bay, Loch Gairloch, 29th June 2009.



Sea trout from Flowerdale Bay, Loch Gairloch, 29th June 2010



Sea trout also eat juvenile herring

Photo by James Butler

Herring



Herring from Loch Ewe, January 2016



vrije Universiteit amsterdam

Faculty of Earth and Life Science, VU University Amsterdam

The fish that did not get away –

Tales from Herring fishers about the decline of the Wester Ross herring fishery



Student: Ruby Neervoort,
Student number: 1898558
28-06-2013

Supervisors:

Dr. Alison Gilbert - First supervisor
Dr. Clive Fox - external supervisor
Dr. Bert van Hattum - second assessor

8°W

7°W

6°W

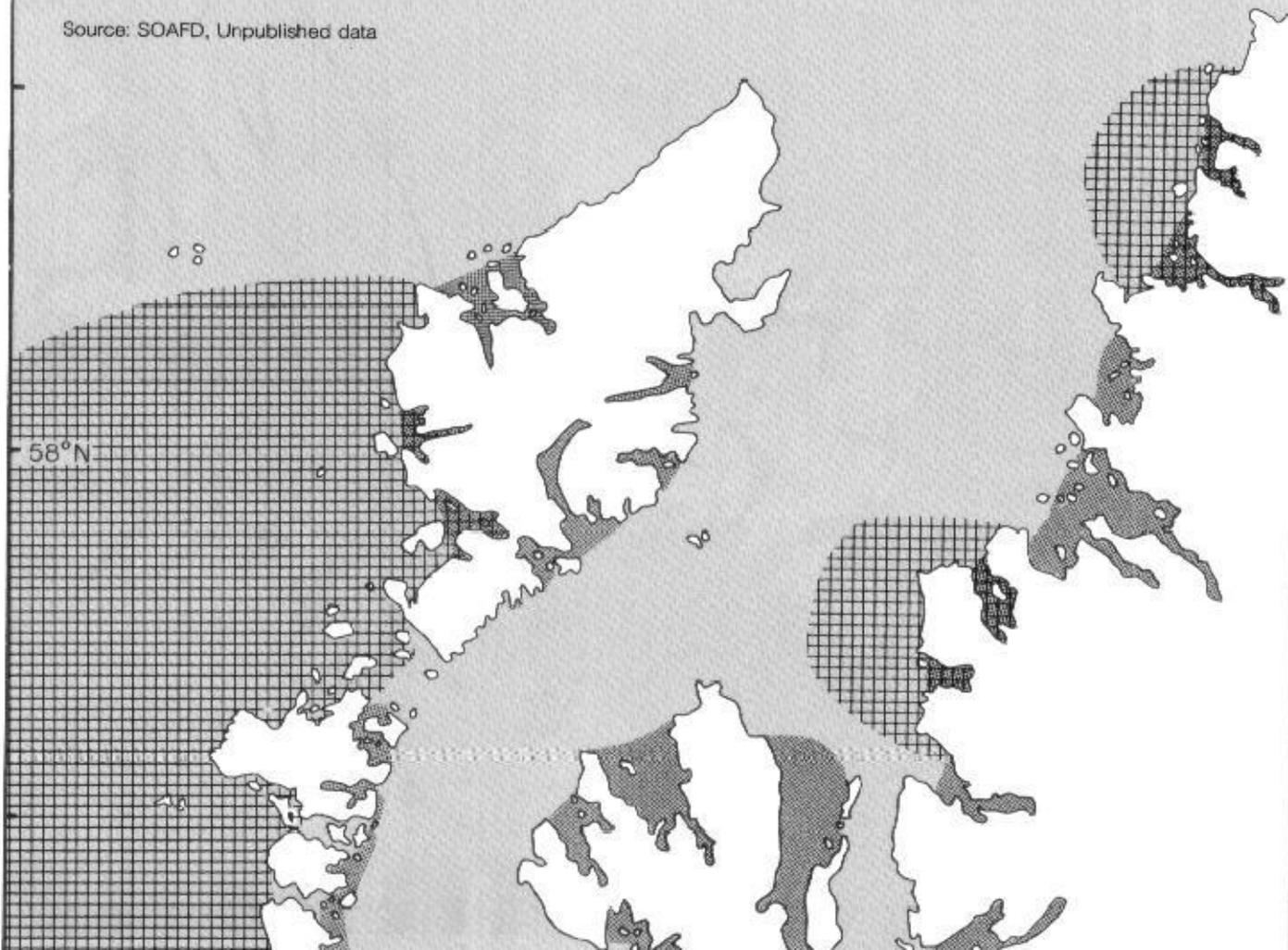
5°W

Figure 12.1 HERRING SPAWNING AND NURSERY GROUNDS

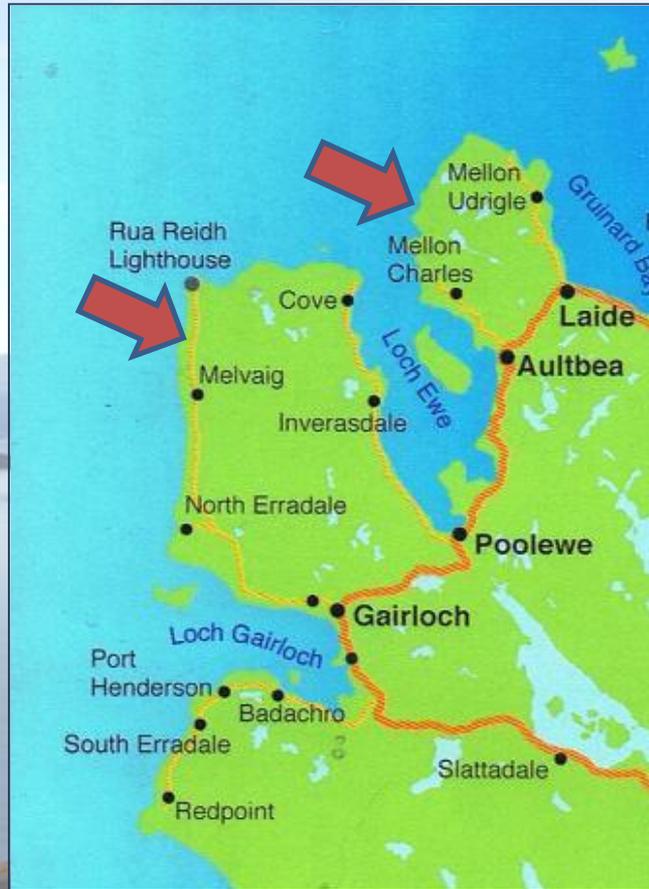
 Spawning Areas

 Nursery Areas

Source: SOAFD, Unpublished data



Places where fishermen say Minch herring spawn(ed) on 'coral' in March



(map from Celtic Fringe magazine.)



Herring in spawning condition, from Loch Ewe, January 2010



Thanks to Roddy MacIver



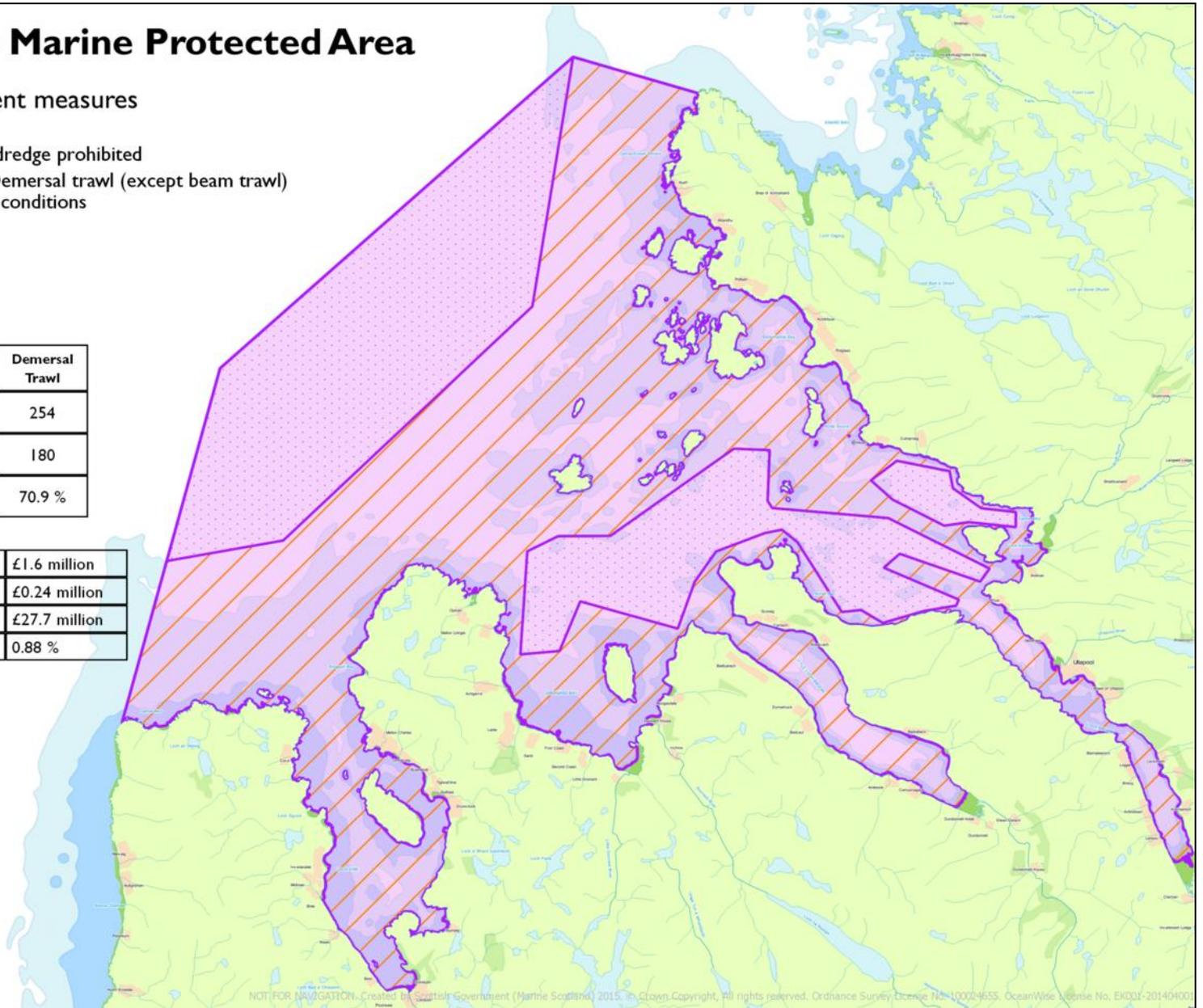
Wester Ross Marine Protected Area

Fisheries management measures

-  Demersal trawl and dredge prohibited
-  Dredge prohibited. Demersal trawl (except beam trawl) permitted subject to conditions
-  Protected area

	Dredge	Demersal Trawl
Fishing grounds before measures (sq km)	32	254
Fishing grounds after measures (sq km)	0	180
Percentage of grounds still available (%)	0.0 %	70.9 %

Annual value of fisheries (£)	£1.6 million
Estimated value affected (£)	£0.24 million
Total revenue of 108 affected vessels (£)	£27.7 million
Overall impact (%)	0.88 %



Ullapool Sea Angling competition, 20th August 2016



Ullapool Sea Angling competition 20th August 2016



Gairloch High School field trip, Slattadale, November 2016



UK Man and the Biosphere Committee



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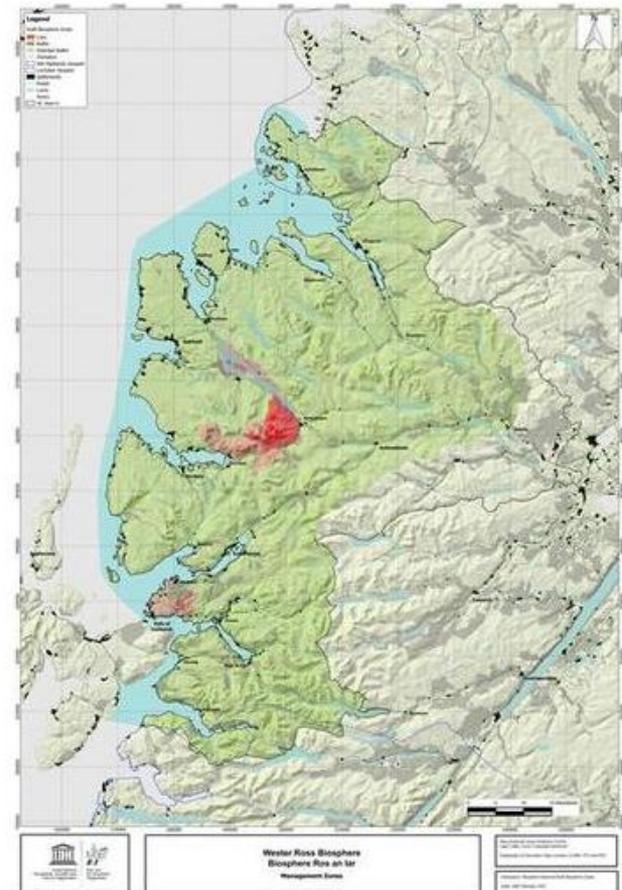
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WRFT Loch Maree ghillies and angling day, September 2016



SCOTTISH
NATURAL
HERITAGE



Loch Coruisk, Isle of Skye

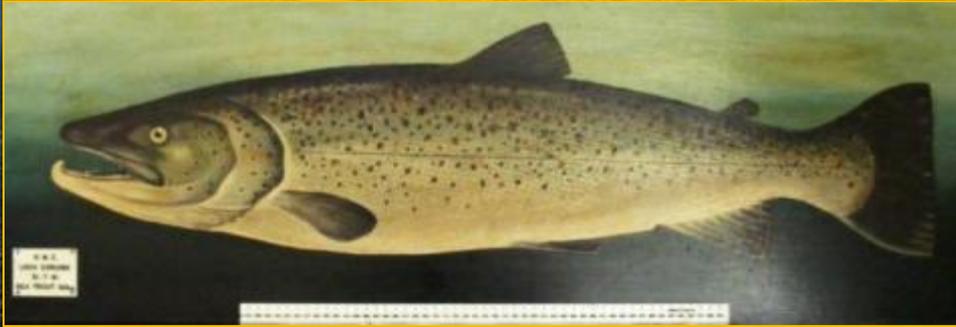


Photo by Piotr Zycki via www.pbase.com

Is there a need to designate some 'special' sea trout systems in Scotland?

For help and support over the past 12 months, thank you to

Christian Gudgeon, Ian MacFadyen, Aaron Matheson, Ben Bulmer, Matt Zeitz, Alan McGillivray, Donald Rice, Alasdair and Sophie Macdonald and friends, Mike Stanners, Brian Fraser, Ian Allison, Stuart Allison, Sue Pomeroy, Bill Whyte, Ben Rushbrooke, Gary Bulmer, John Mackenzie, Duncan MacKenzie, Hugh Whittle and family, Ray Dingwall, Peter Jarosz, Prof Peter Maguire, Fraser Wilson (MI Cables), Fred Robertson, Mark Williams and family and friends, Prof Barry Blake, Prof Dave Barclay, Ala MacKenzie, Derek Roxburgh, Terry Jack, Norman Thomas, Alastair Pearson, Bill Anderson, Fraser Anderson, Terry Jack, John Weir, Doug Bartholomew, SNH Beinn Eighe NNR volunteers, Dr John Ogle family and friends, Frank Kalinowski, Pat Wilson and family, Philip Smith, Neil Morrison, Simon Stewart, Jim Raffell, Les Bates, Colin Blythe, Charlie Hill, Dr Andy Walker, Sue Pomeroy, Dr Steve Kett, Dr Andy Vicks, Vu Dang, Middlesex Uni Students, Ben Rushbrooke, David & Veronica Mullaney, Callum Sinclair, Chris Horrill, SNH Beinn Eighe NNR volunteers, Mark MacKenzie (Kaenchullish Estate, Achiltibuie A.C members, Alastair MacDonald (Dundonnell Estate), Colin Simpson, Nigel Carr, Gary Bulmer, Fred Robertson, Mark Williams and family, Jim Buchanan, Dr James Close, Bill Anderson, Jeremy Fenton, Lennie Campbell, Drew Davies, Mary Gibson, Cameron Thomas, Dr James Merryweather, David Holland, Nick Sanders (Glenelg AC), SNH Beinn Eighe NNR volunteers, Michael Aitchinson, Kathy P. Jones, Noel Hawkins, Sarah Nason, Keith Dunbar, Iain Muir, David Holland, Dr James Merryweather and friends, Roger and Pat Cottis, Duncan Currie, Bill Woodrow, Nick & Lizzie Sanders, . . . and everyone else



Thank you!

