Refertilising Scotland (part 1)

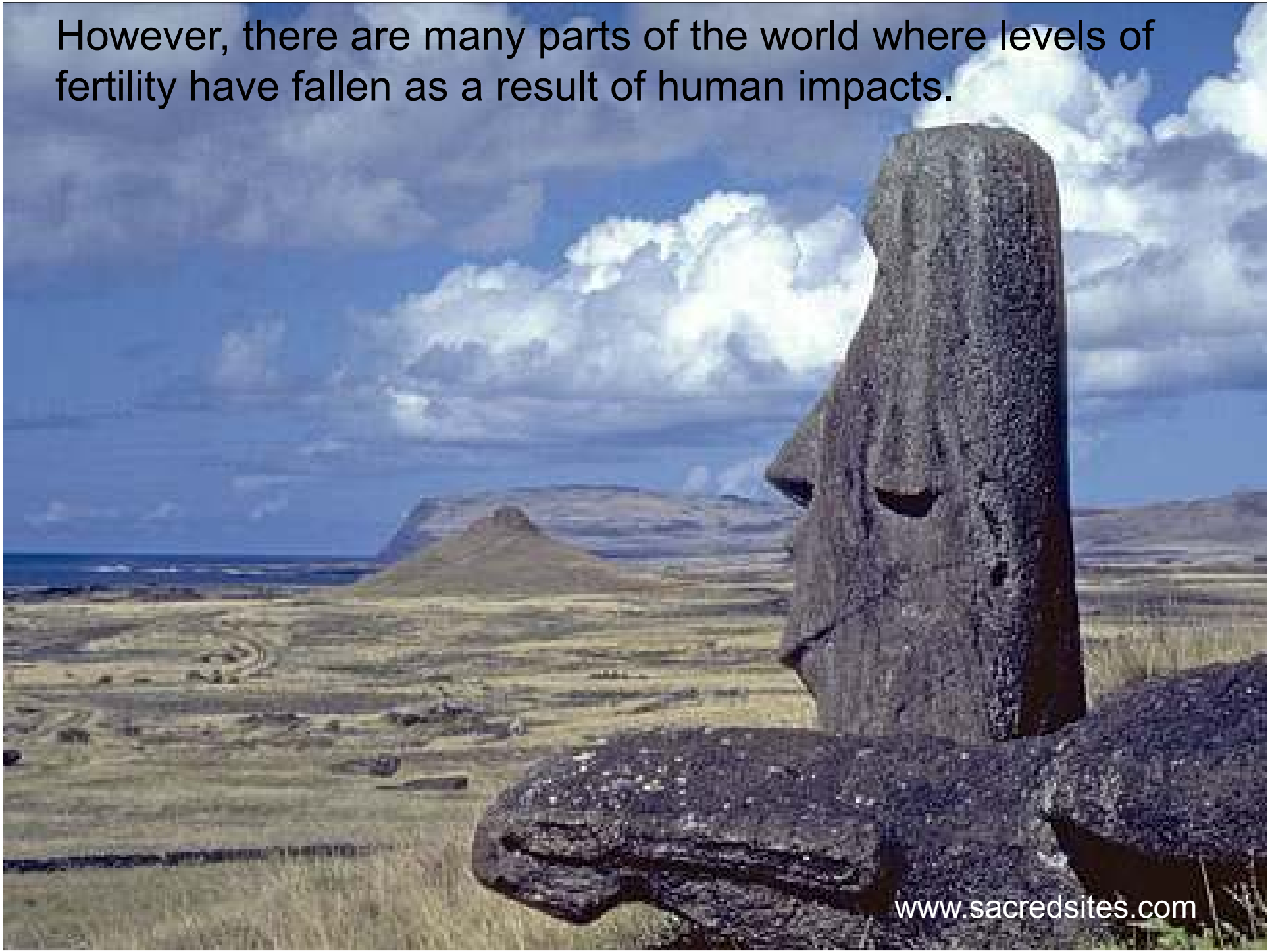
Peter D. Cunningham , info@wrft.org.uk

27 September 2010

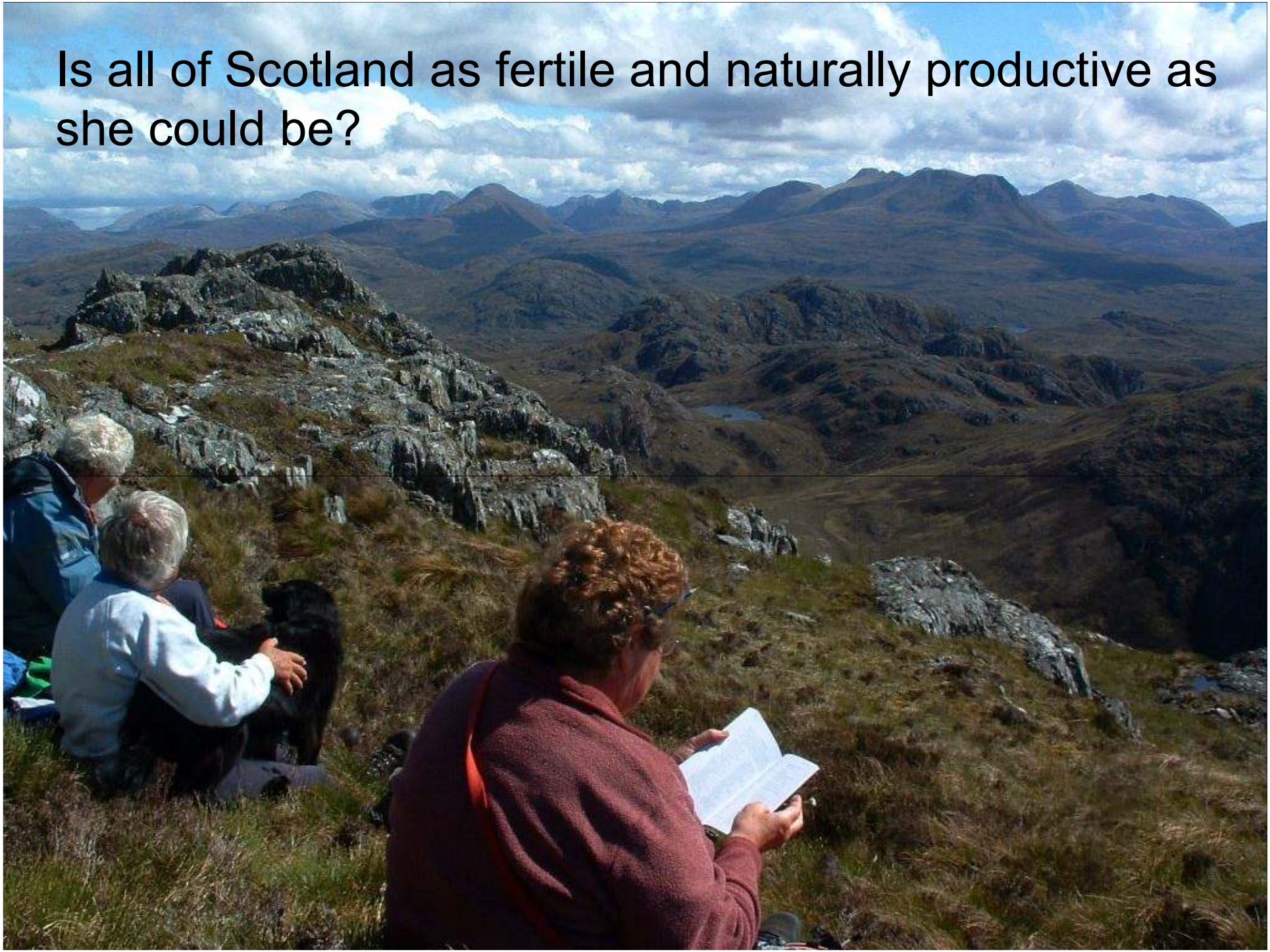
- **for wildlife**
- **for fisheries**
- **for people**

Beinn Eighe N'N'R from Meall Ghuibhais

One of our greatest government-led achievements for the environment, to date, has been the cleaning-up of 'eutrophied' waters.


However, there are many parts of the world where levels of fertility have fallen as a result of human impacts.
www.sacredsites.com

Deforested hills in Madagascar . . .

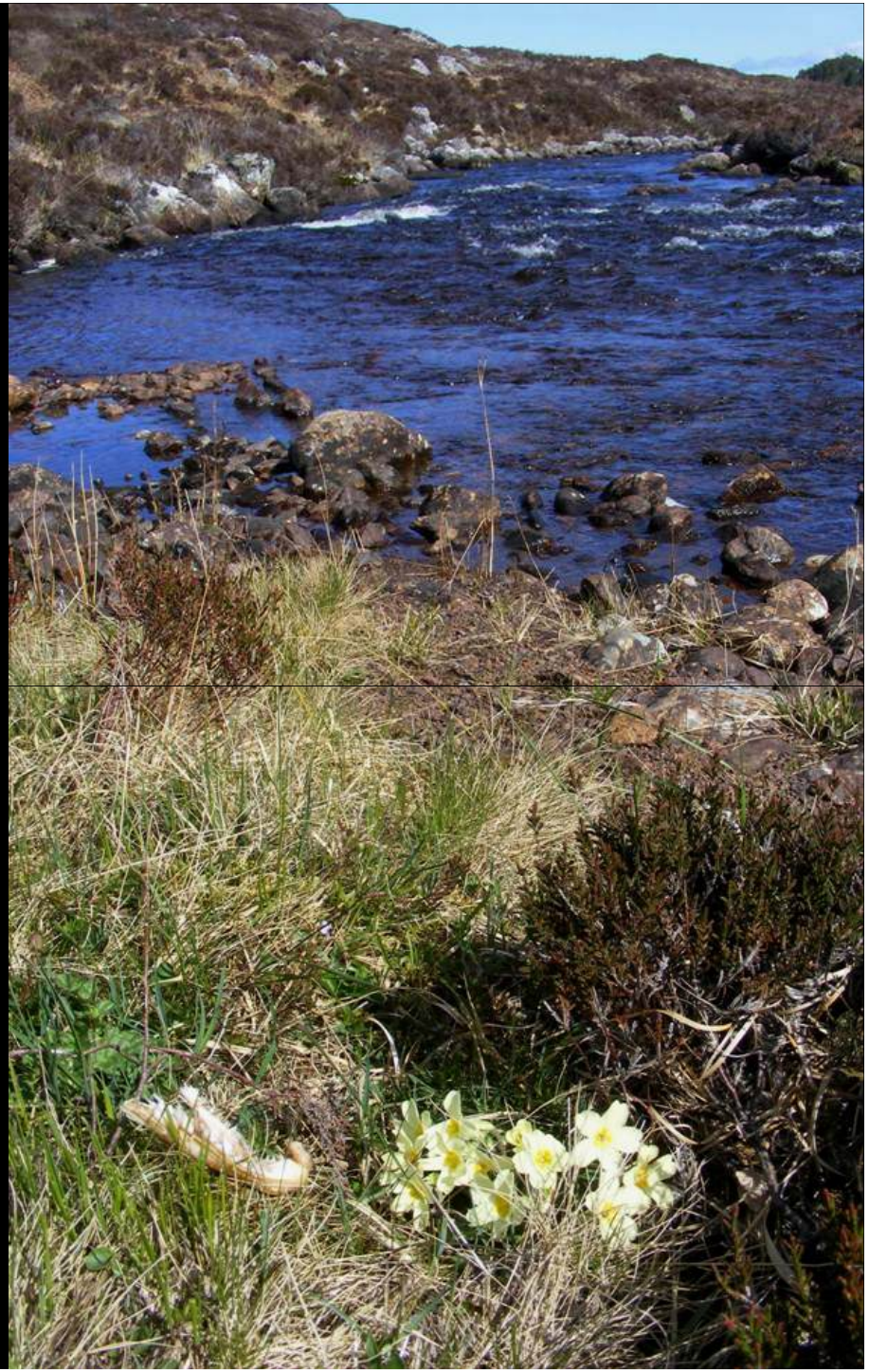

Is all of Scotland as fertile and naturally productive as she could be?

Case study: Wester Ross

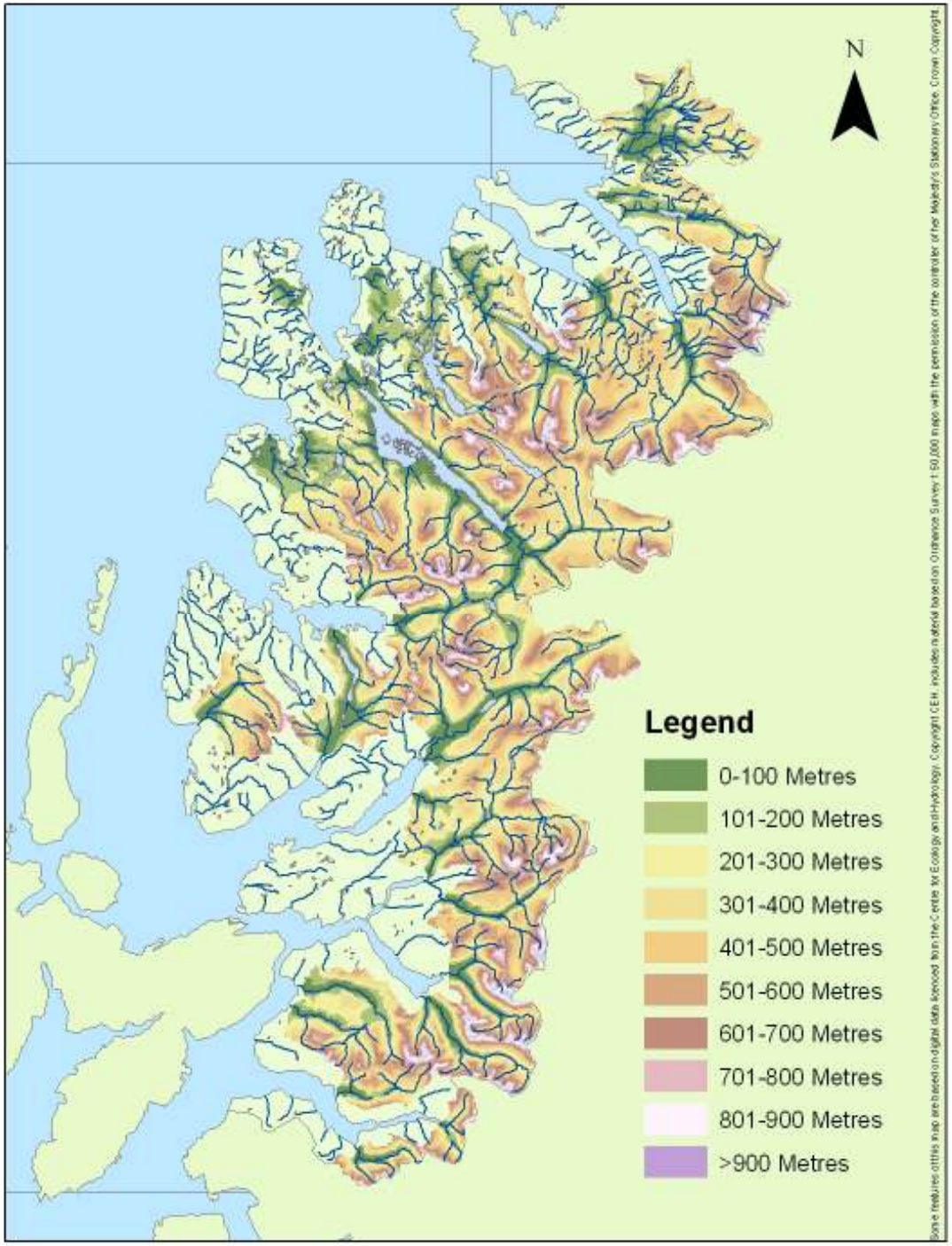
- Geology and landscape
- Ecology and human influence

- break -

- Ecosystem fertility
- Revitalisation



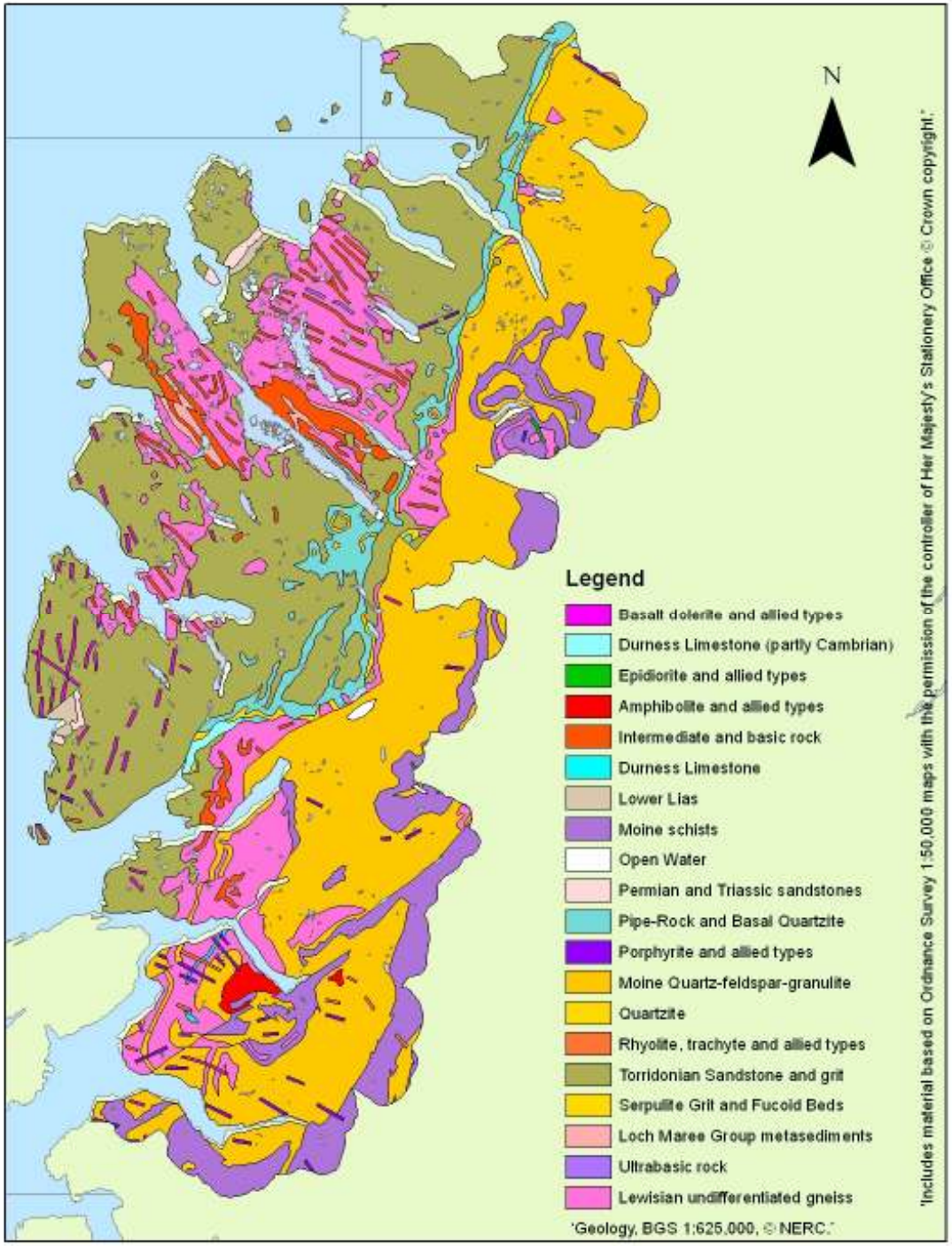
Salmon jaw and primroses, Little Gruinard River , May 2010



Wester Ross

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

Torridon and Liathach by Lulu Strader, Sept 2010

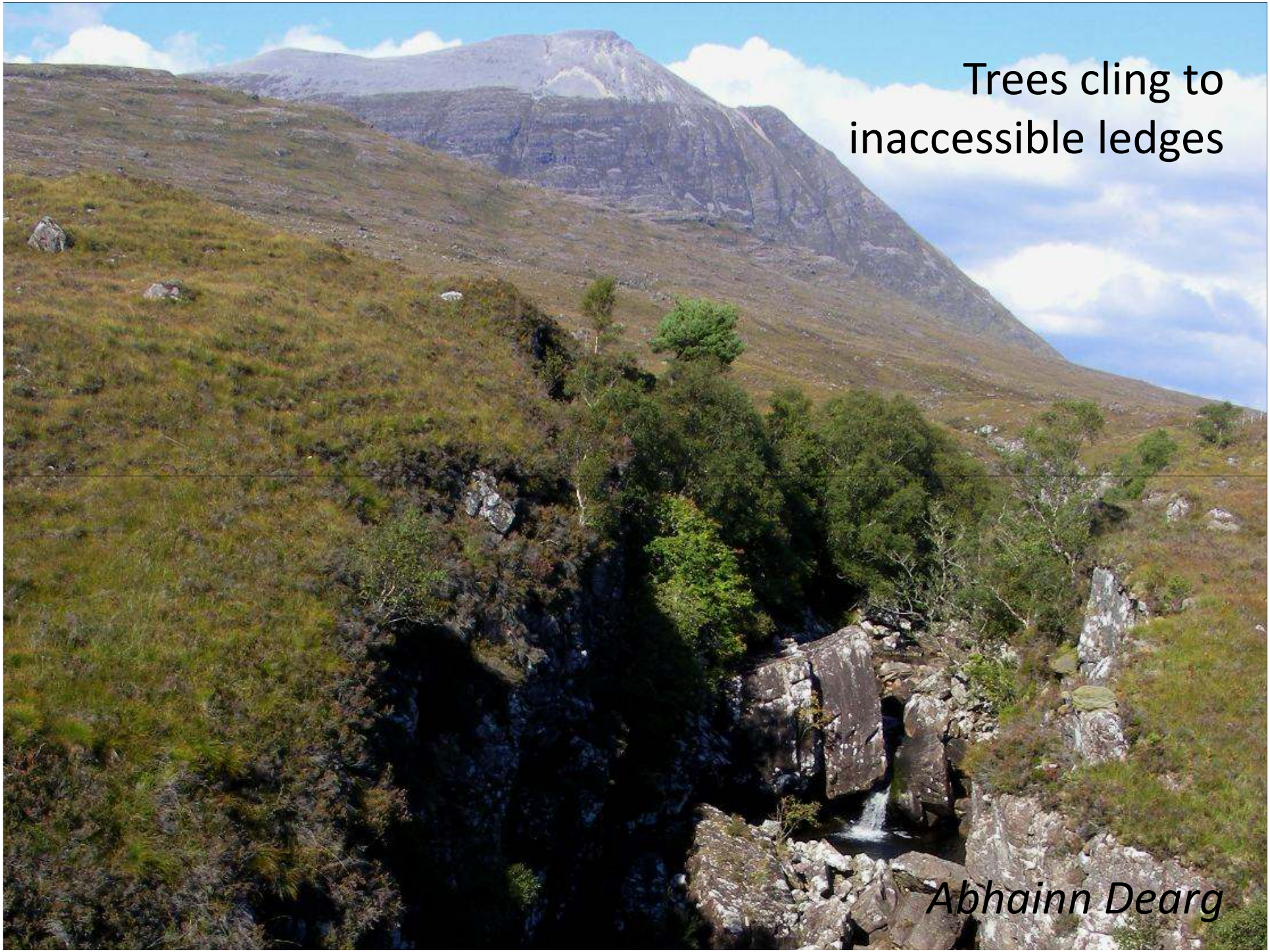


. . . underlain by Torridonian sandstone and Lewisian Gneiss.


Lewisian gneiss and Torridonian sandstone: hard,
resistant to weathering, un-yielding rock.


Barren mountains . . .
Beinn Eighe NNR: how natural?


Sparsely vegetated slopes
Beinn Damh forest: where are the trees?


Trees cling to
inaccessible ledges
Abhainn Dearg

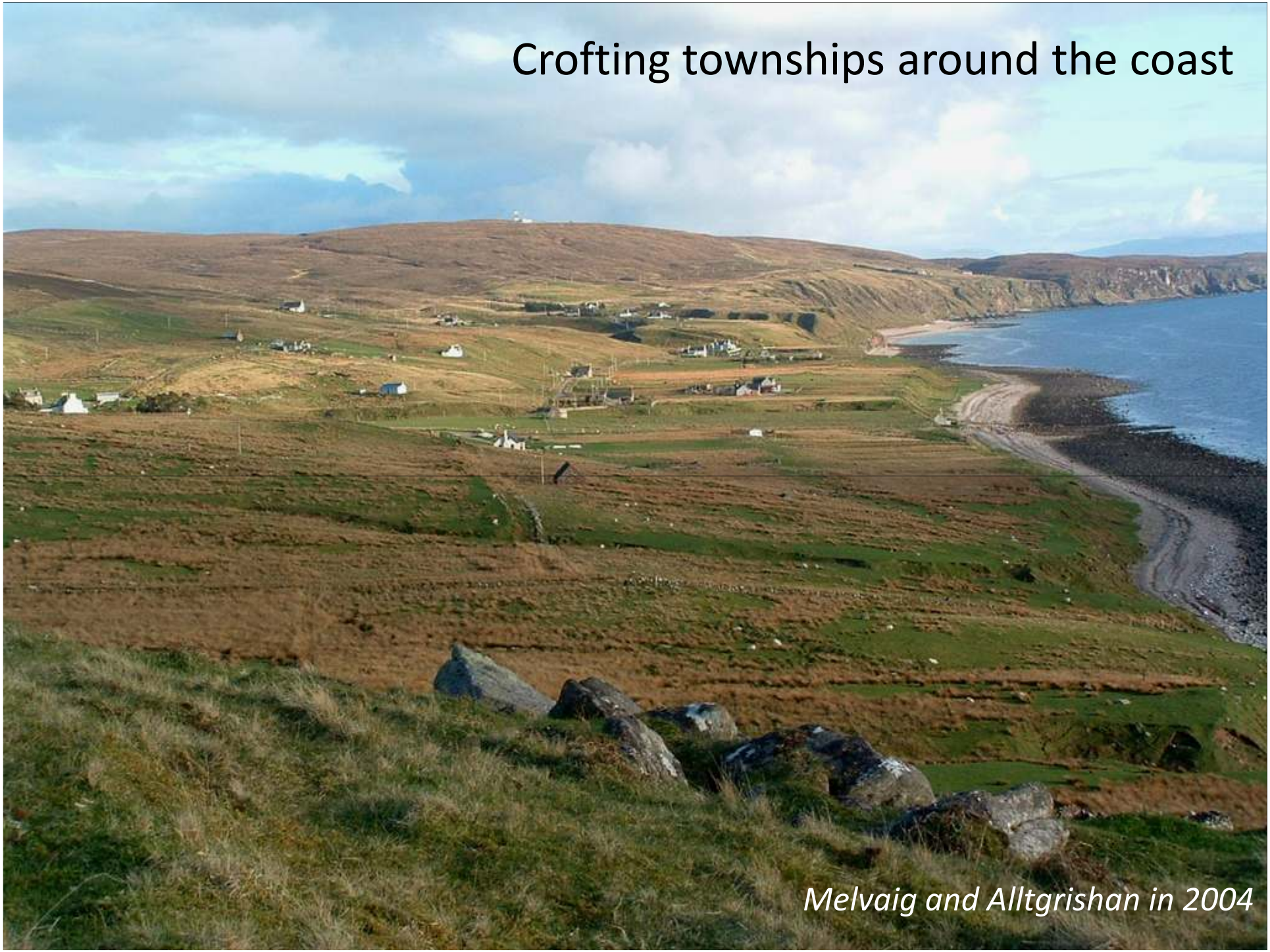
Unstable rivers

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


Uninhabited ‘wilderness’ . . .
Fionn loch and Dubh loch from Beinn Airigh charr


with ‘near pristine’ oligotrophic lochs
Loch Maree . . .

Crofting townships around the coast

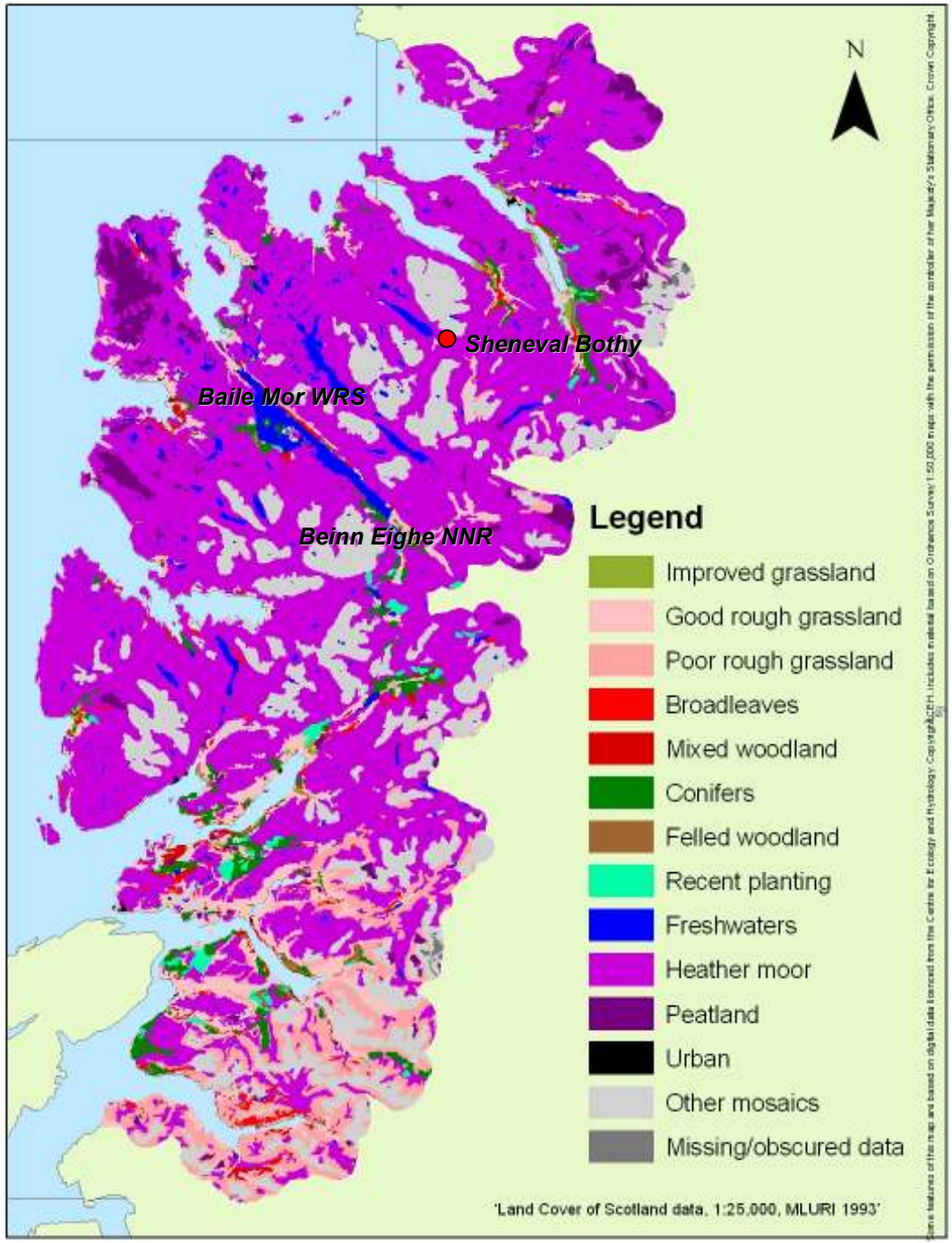


Melvaig and Alltgrishan in 2004

‘Heather moor’ and ‘other mosaics’ [50%+ unvegetated] are the dominant landcover.

There are relatively small areas of semi-natural woodland in valleys and around coast

Landcover map



Bog asphodel

Narthecium ossifragum

"bone breaker "

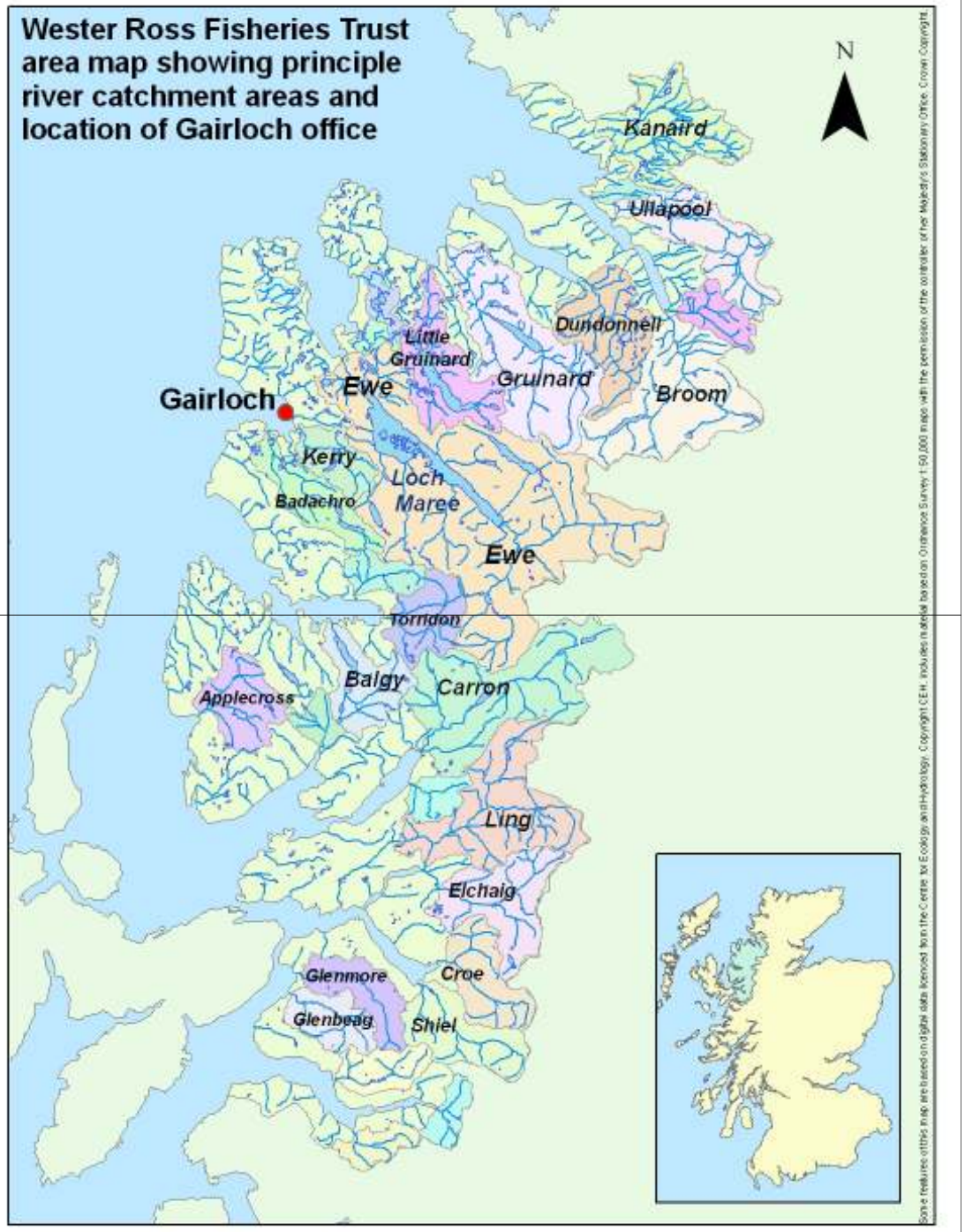
Sundew

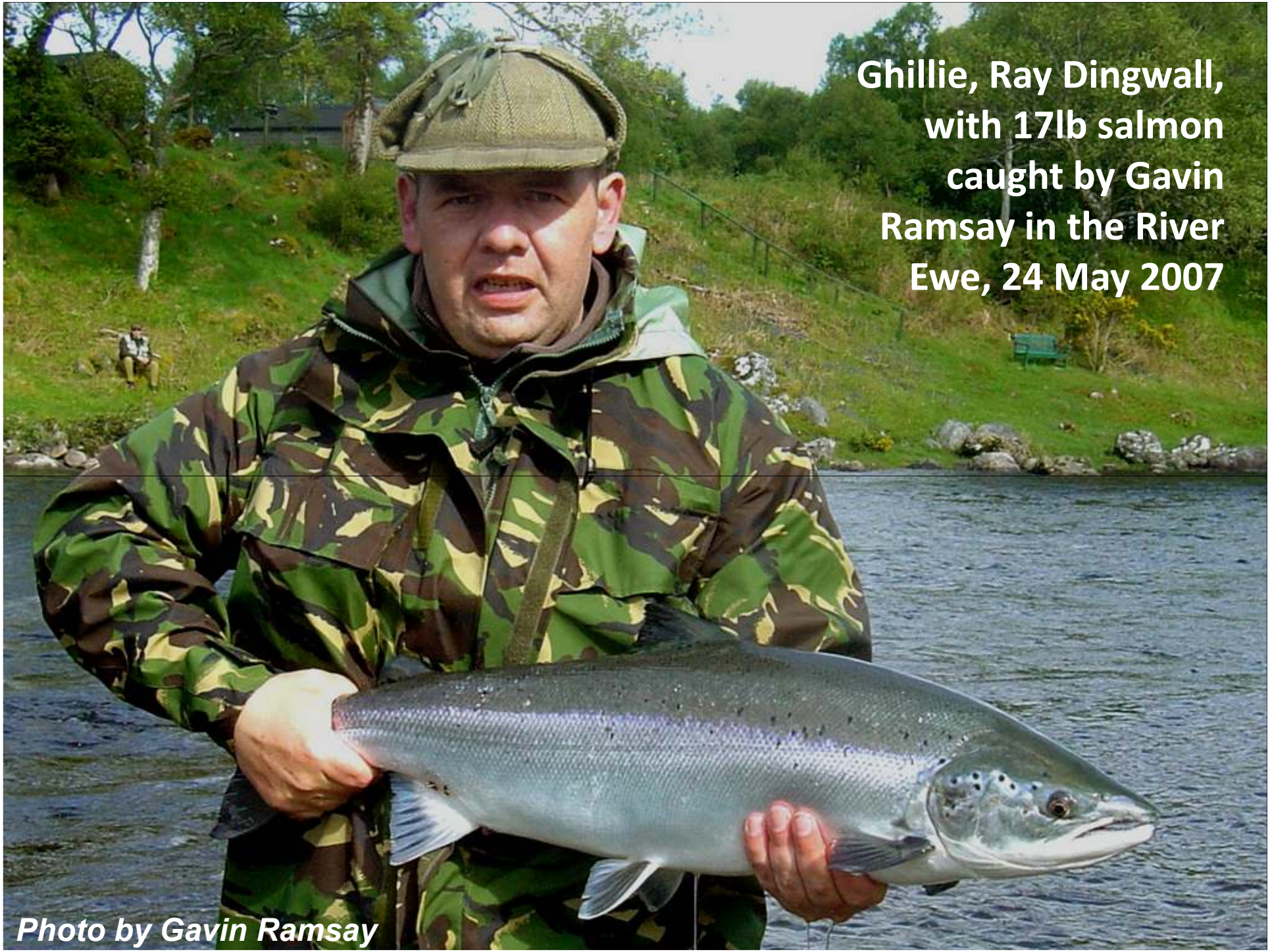
I work for Wester Ross Fisheries Trust

Sweep net catch, Flowerdale estuary, 1st February 2010

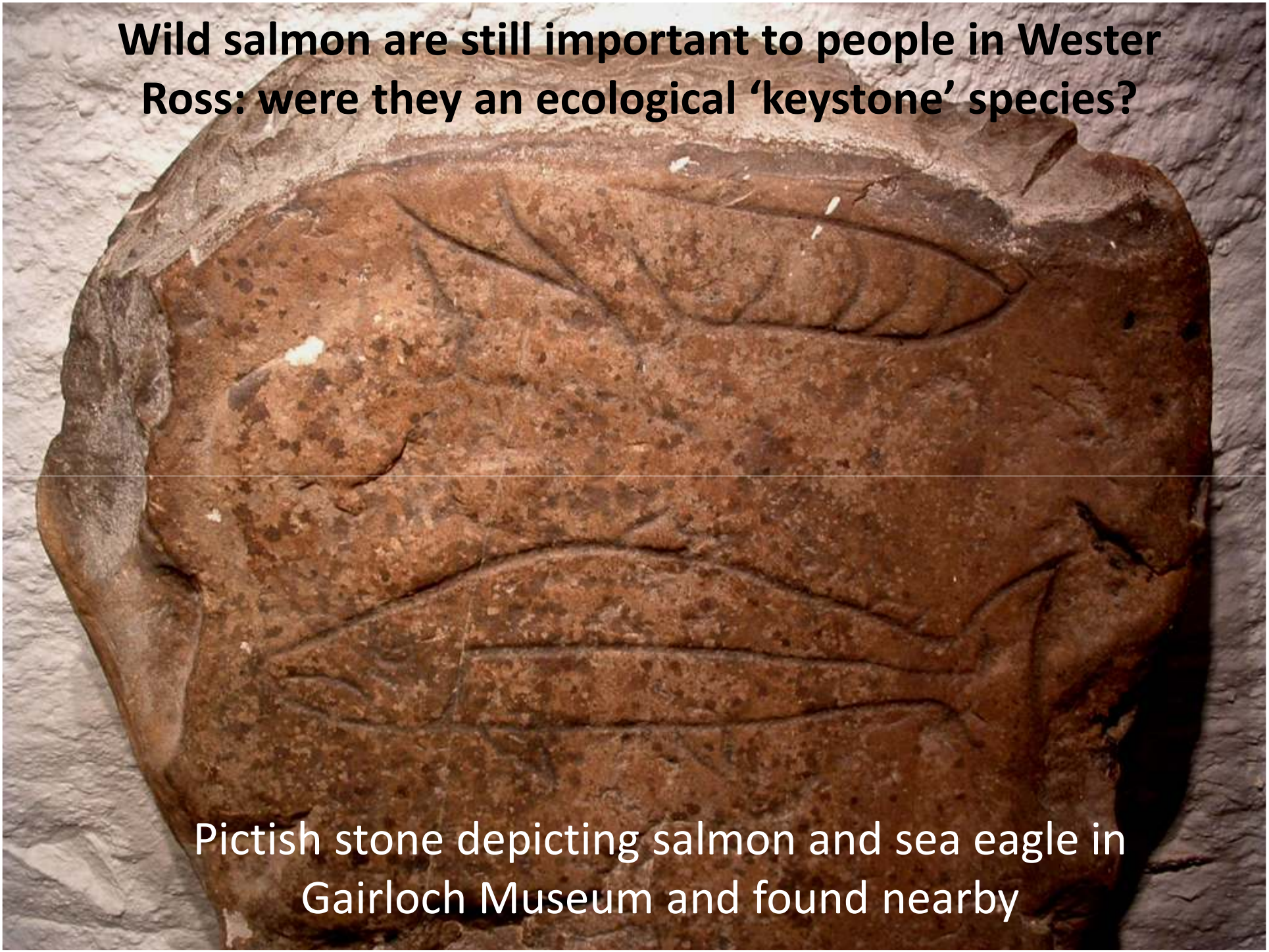
The overall **Purpose** of the Wester Ross Fisheries Trust is:

To maximise and sustain the natural productivity of wild salmonid fisheries in the rivers and lochs of Wester Ross.




Ghillie, Ray Dingwall, with 17lb salmon caught by Gavin Ramsay in the River Ewe, 24 May 2007
Photo by Gavin Ramsay

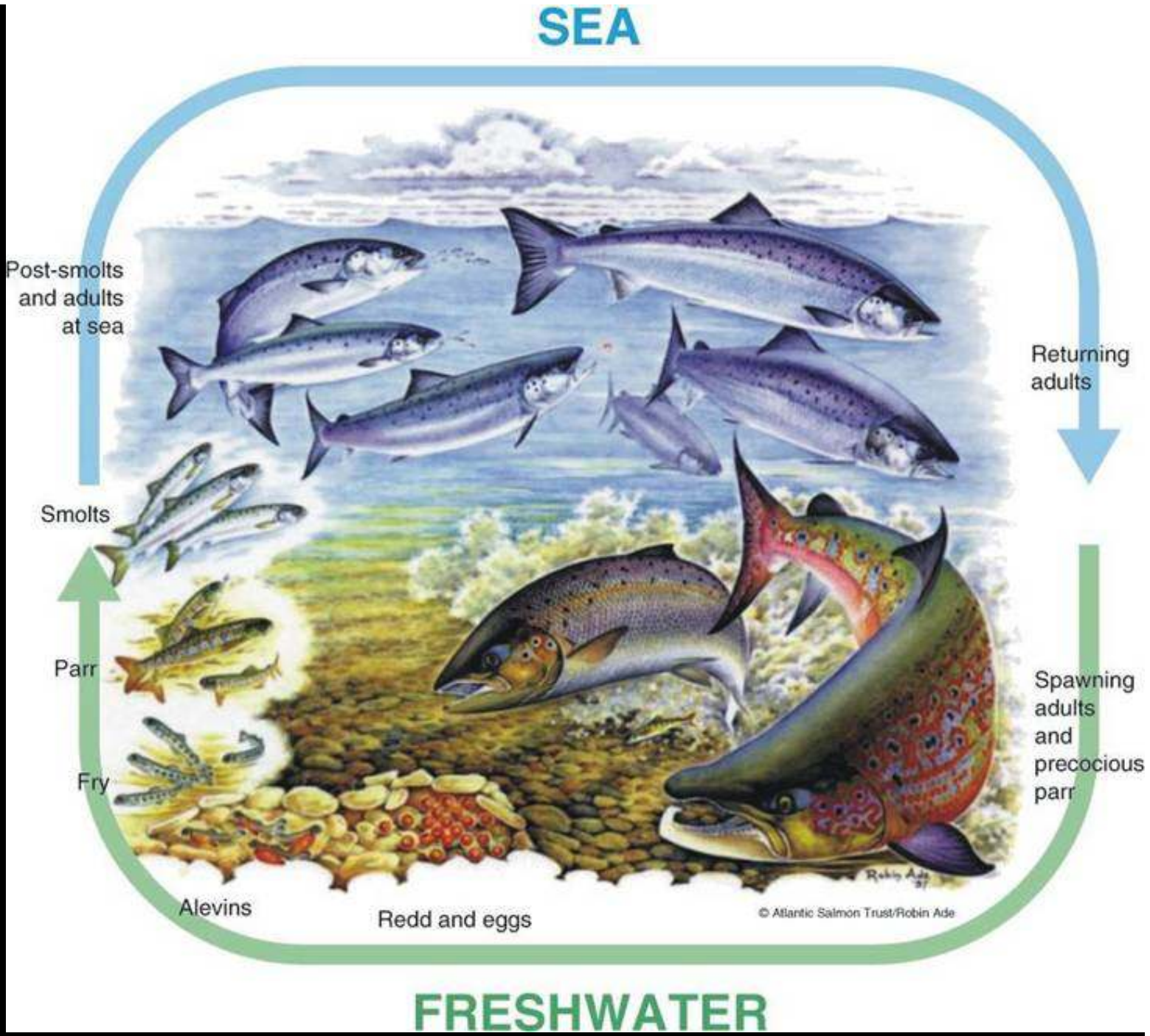
Wild salmon are still important to people in Wester Ross: were they an ecological ‘keystone’ species?



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

What limits salmon production?

Are the waters of Wester Ross producing as many adult fish as they should be?

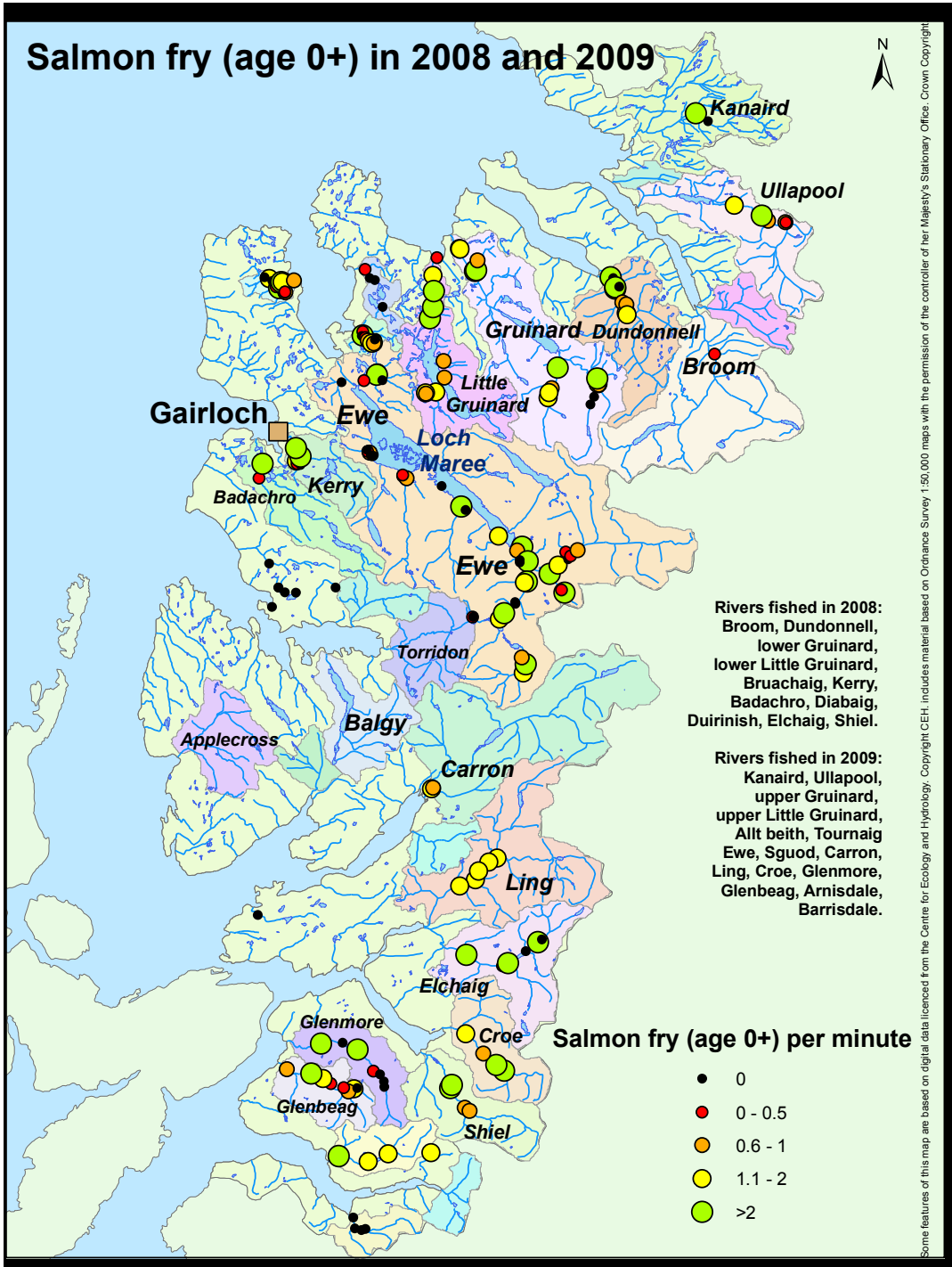


Juvenile fish surveys

Aims

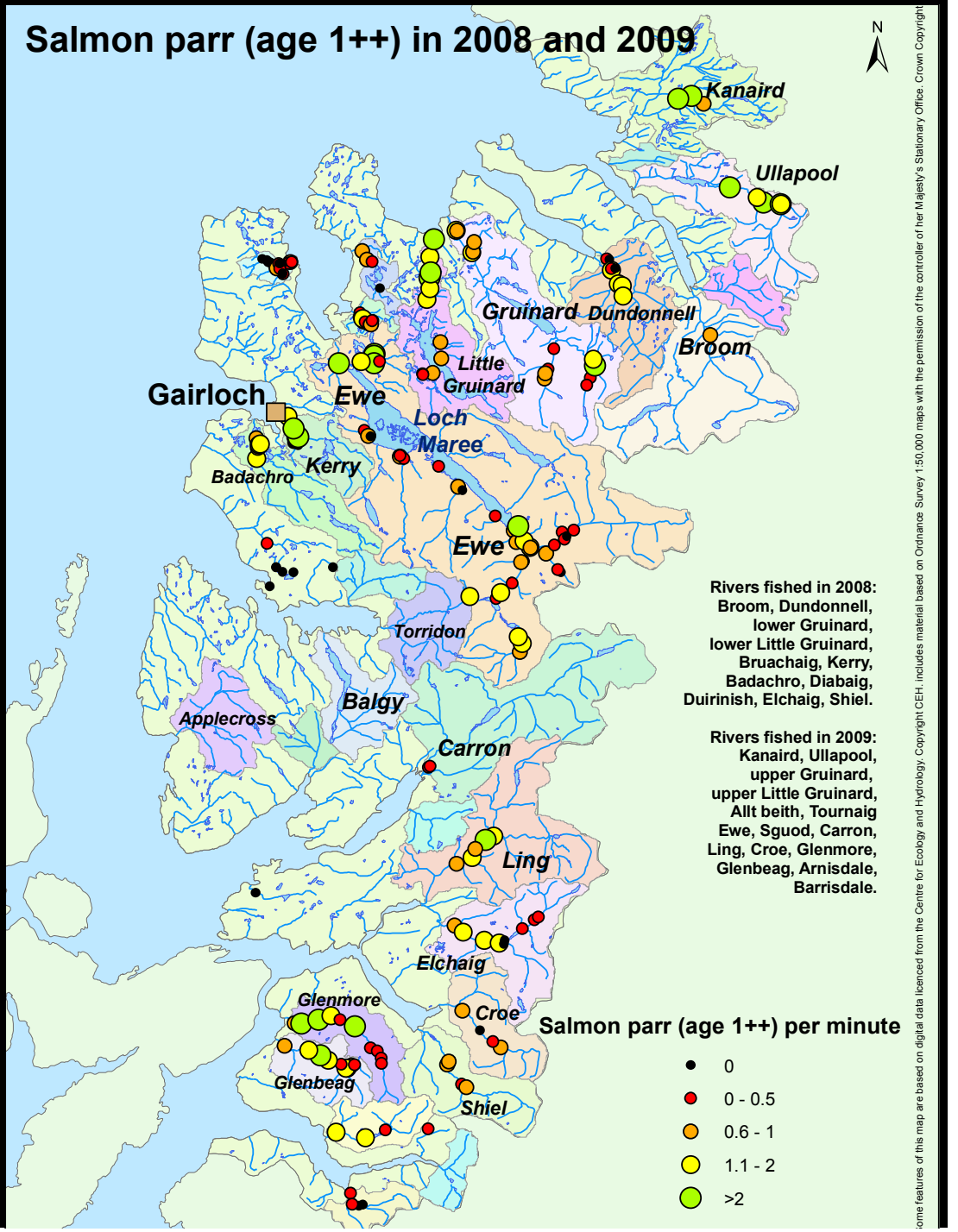
1. To determine the distribution of wild juvenile salmon (trout and eels).
2. To assess the abundance of juvenile fish
3. To inform fisheries proprietors and managers

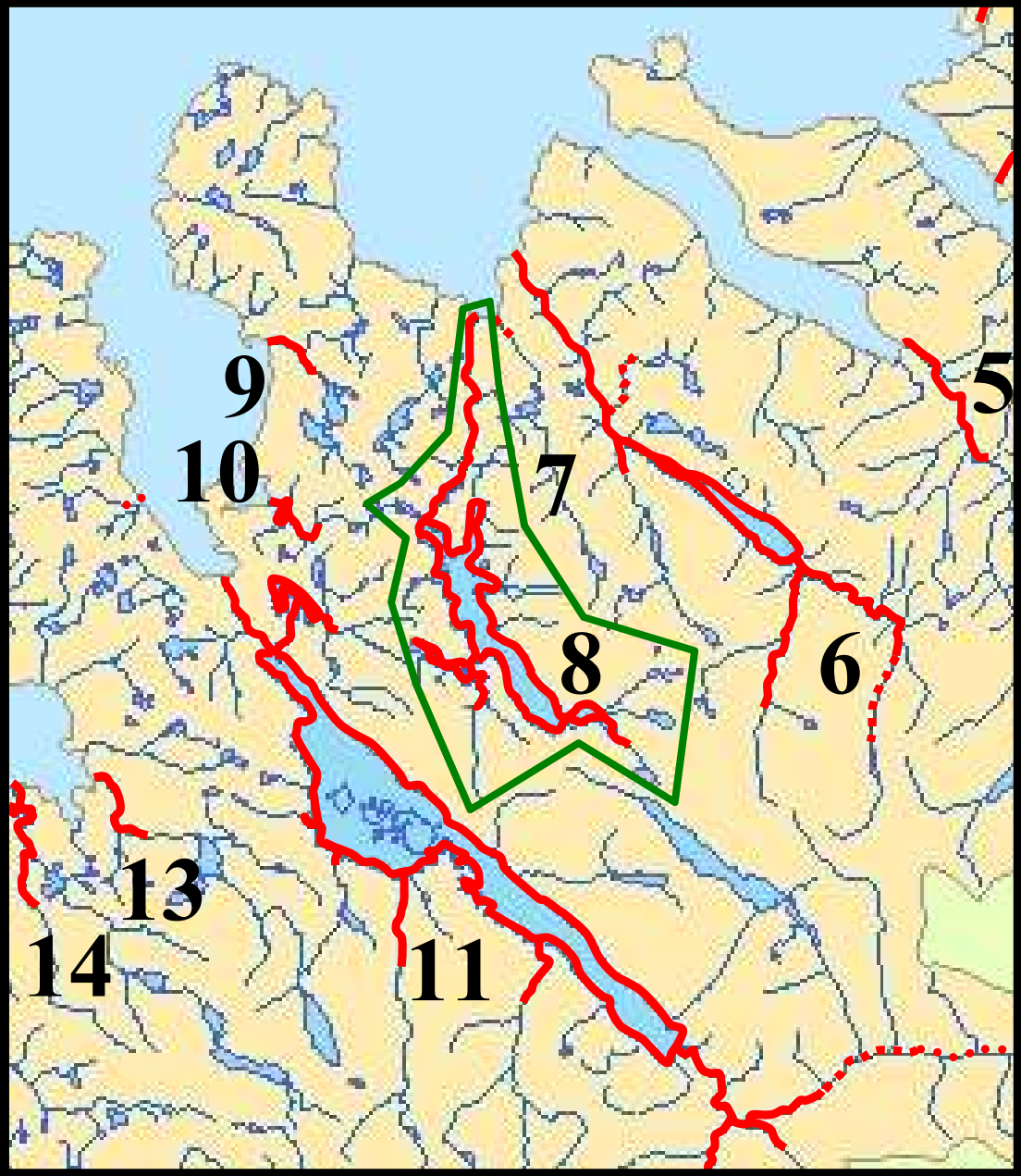

Count and measure
the catch. . .
Which sites are most productive?



Distribution of salmon fry (age 0+ years)

Distribution of salmon parr (age 1++ years)

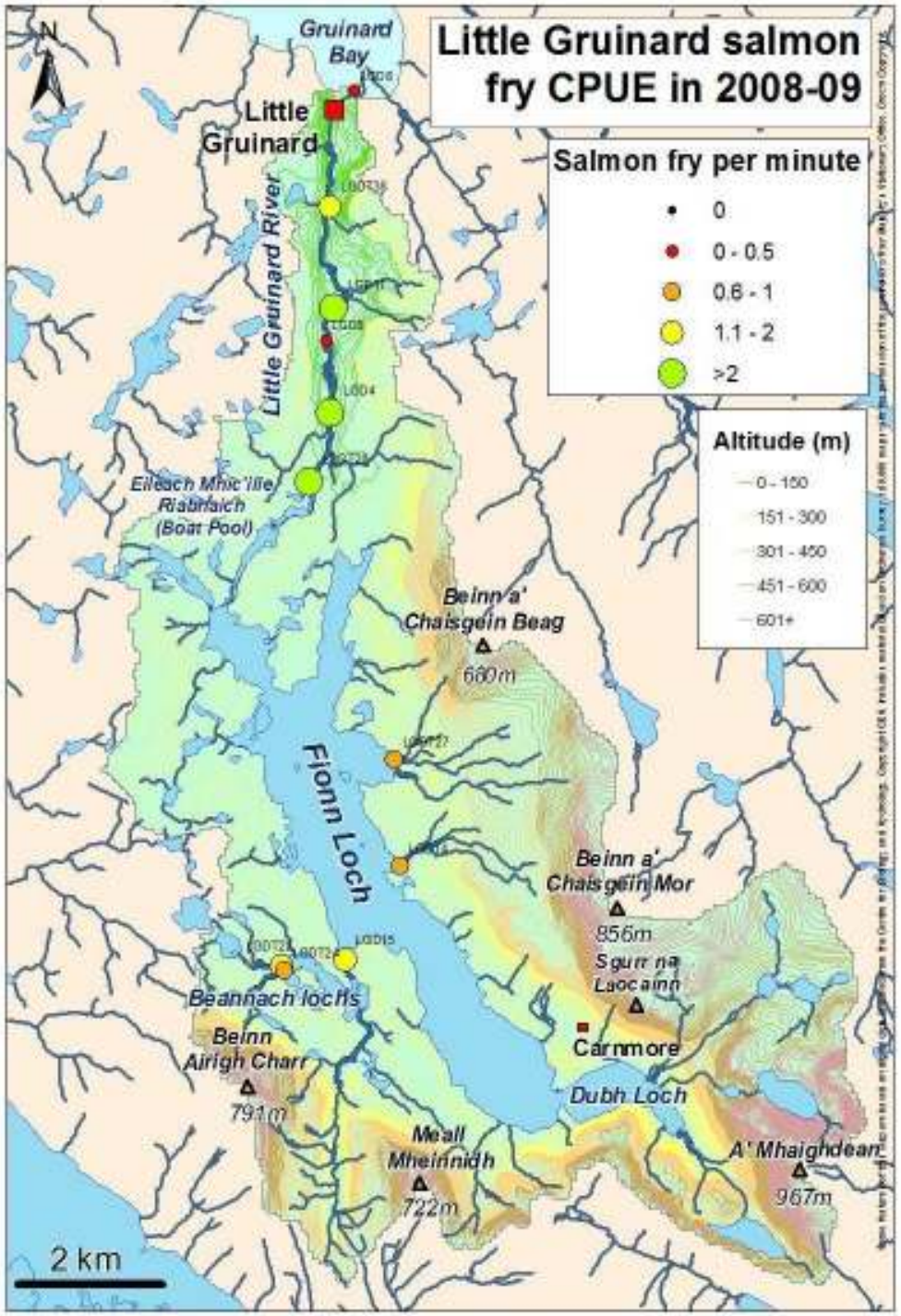




The Little Gruinard River

Special Area of Conservation (SAC) for the Atlantic salmon.

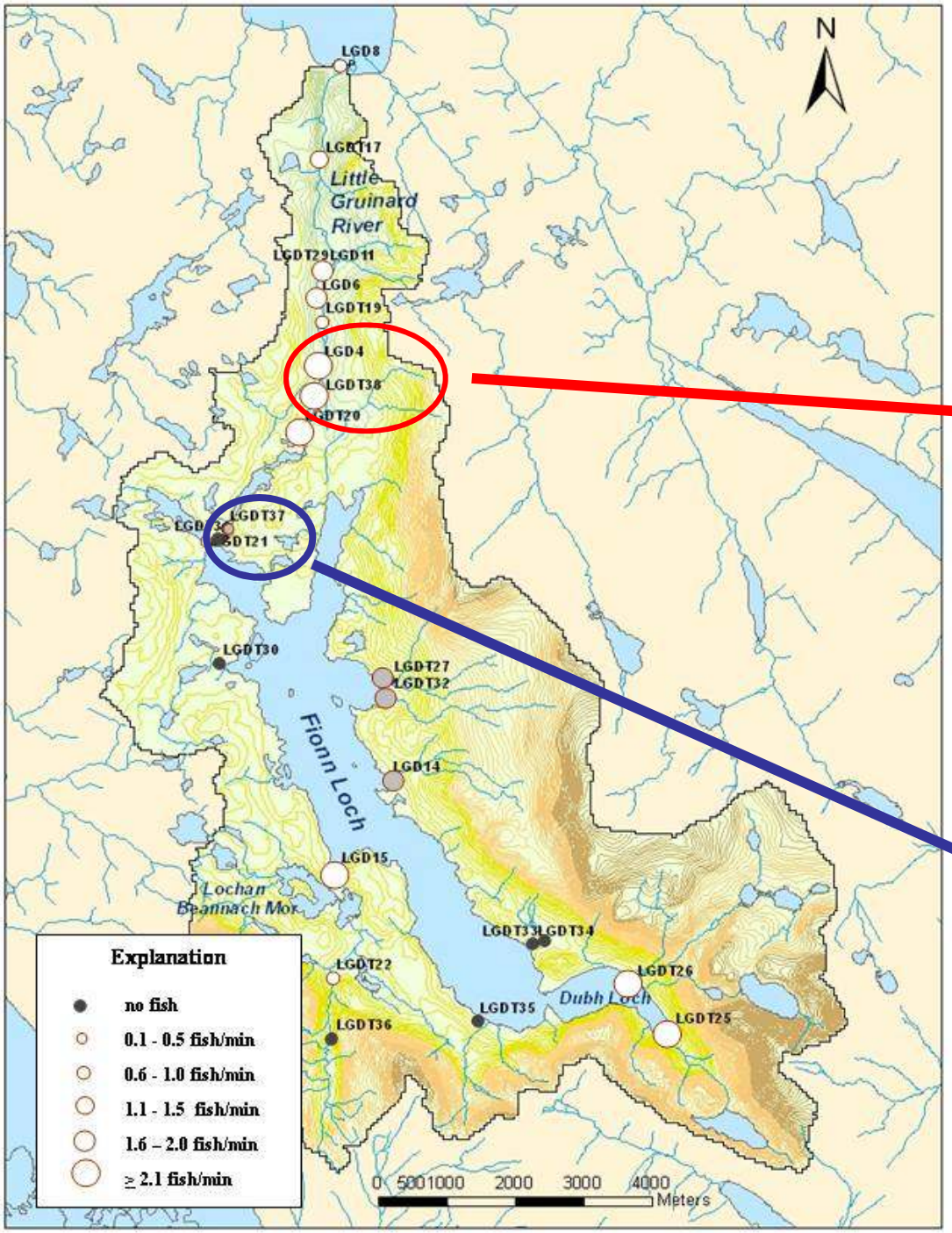

Fionn Loch from Beinn Airigh charr

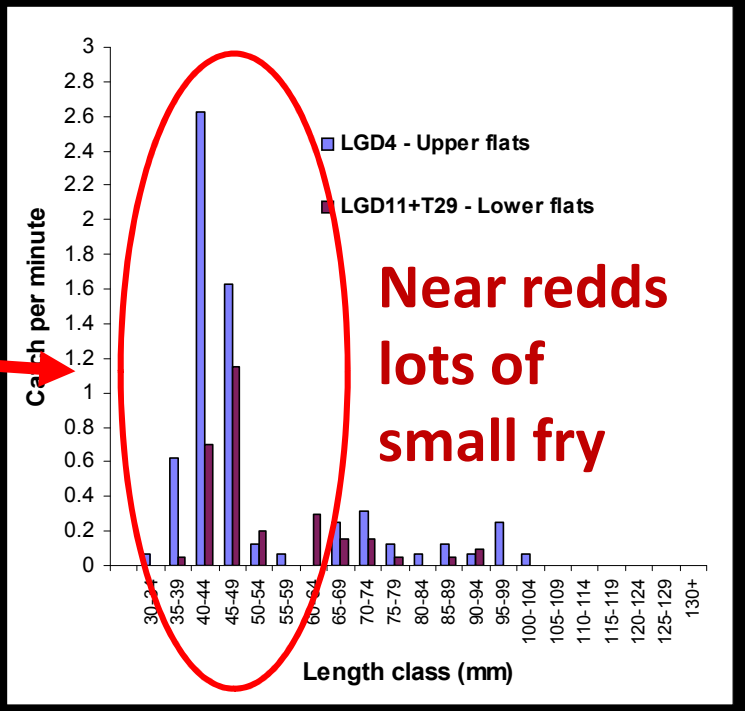


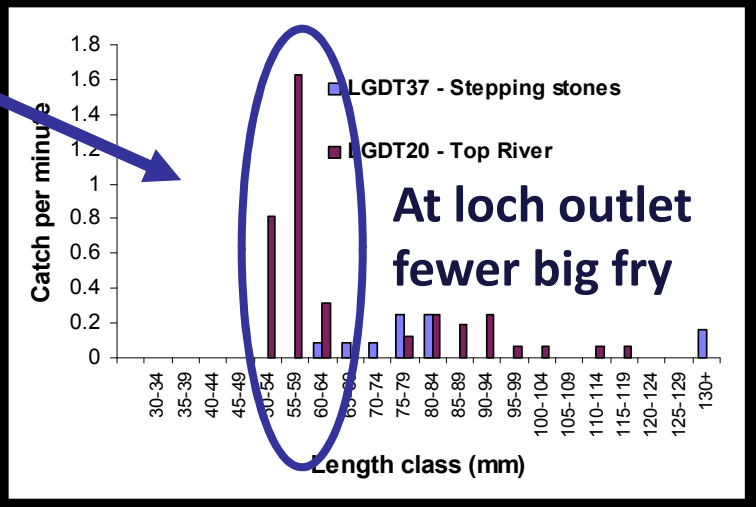
Densities of juvenile salmon are consistently high in the main river . . .

. . . but many of them are very small . . .

Juvenile salmon 2006








Lower Flats of
Little Gruinard

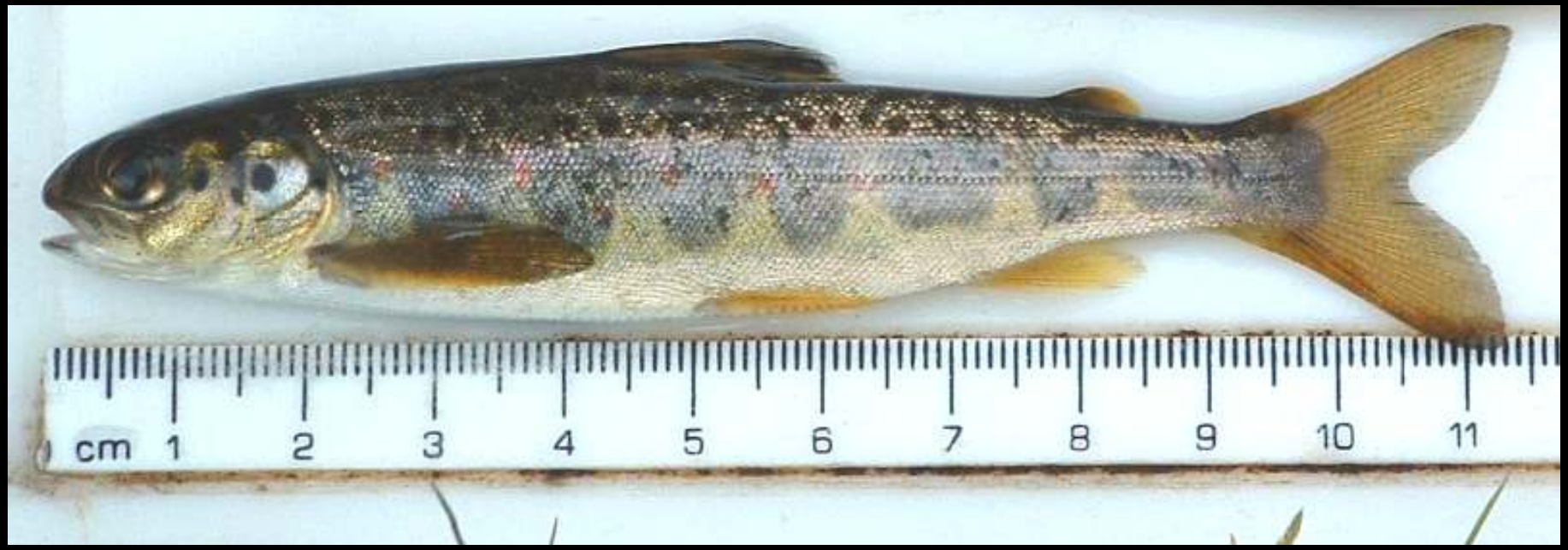

Small fry . . . . . and small parr

Below Fionn Loch outlet

Big, faster growing, one year old parr

- Where juvenile salmon densities are high, growth tends to be slower.

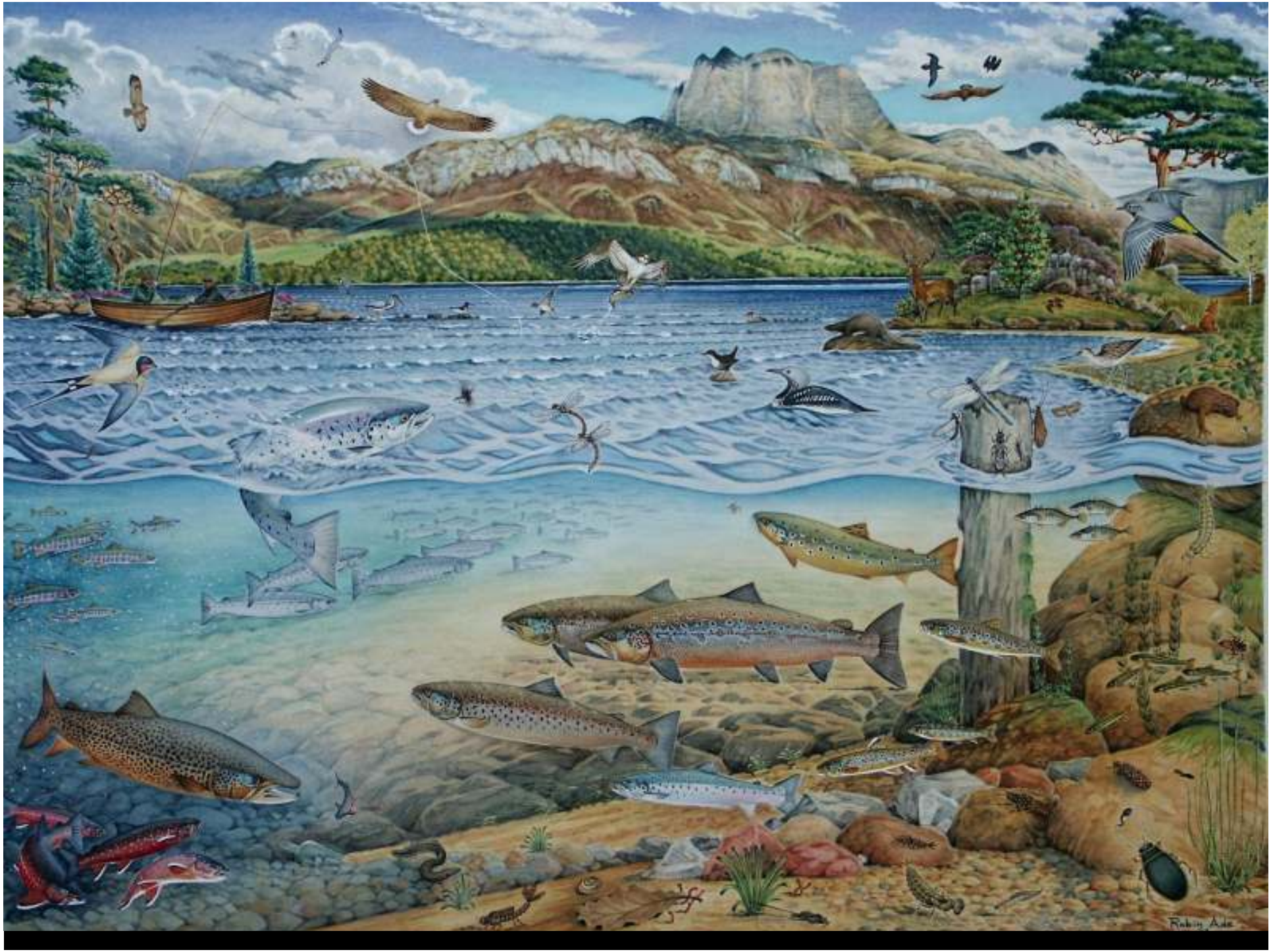
- Where juvenile salmon densities are low, growth tends to be faster.

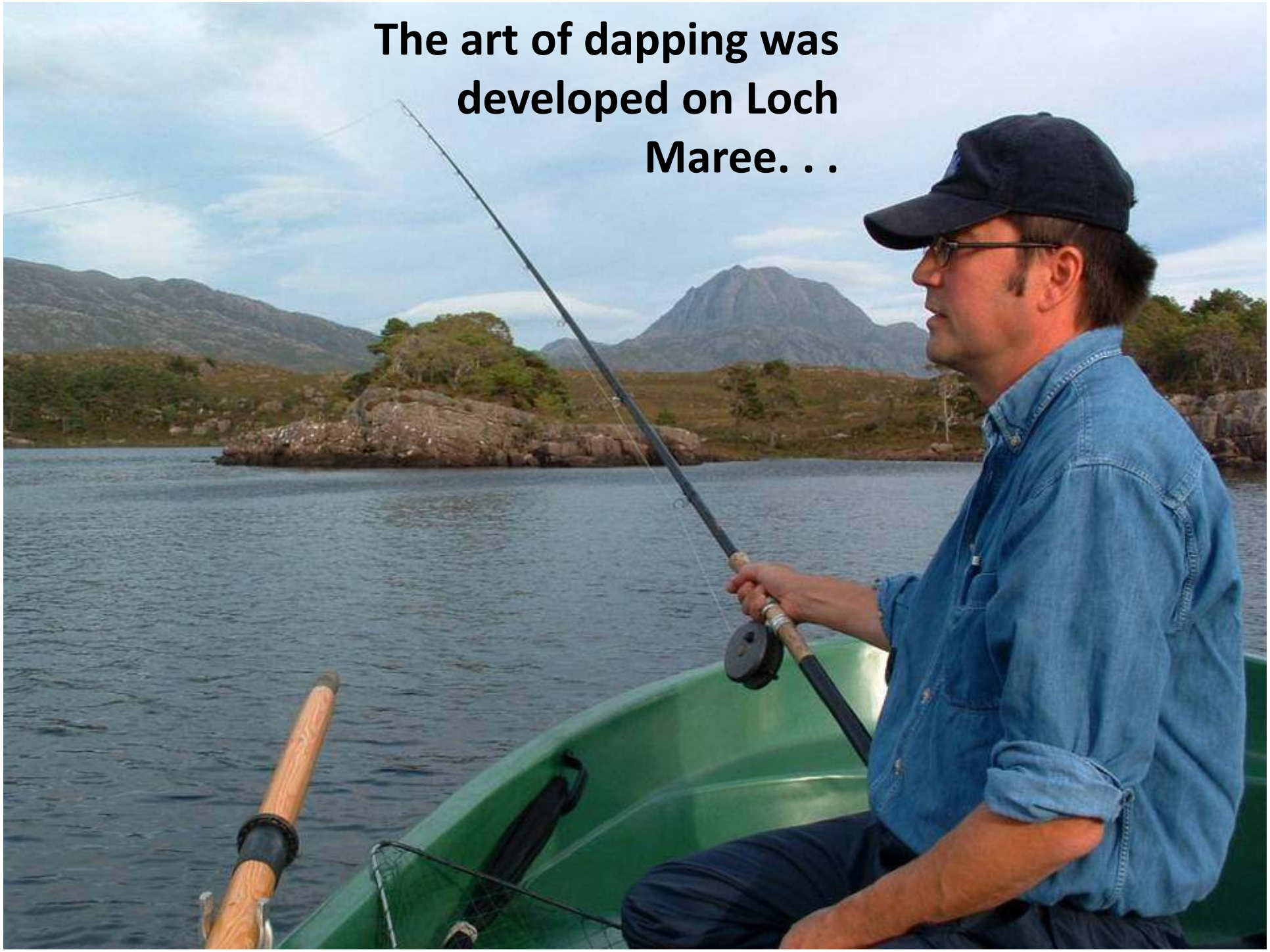


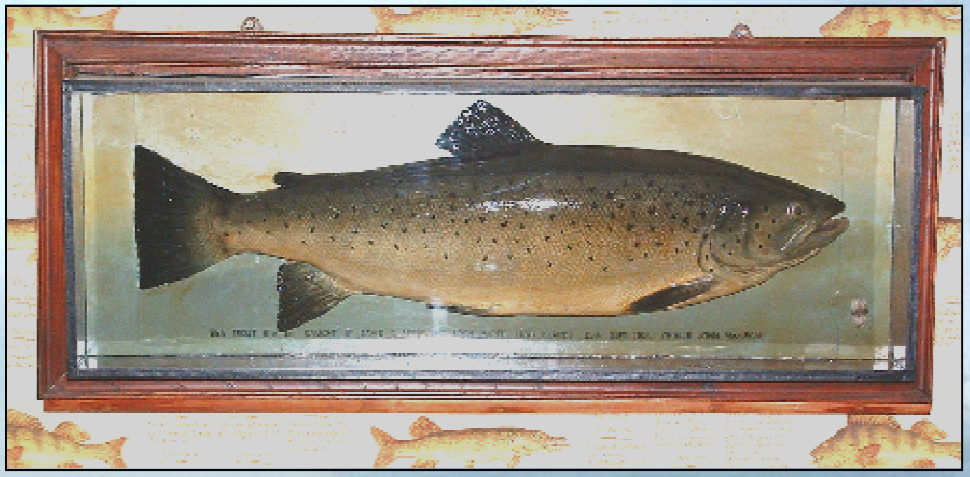
- Juvenile salmon production is determined by habitat area, food availability and stream fertility

Loch Maree Sea trout Fishery

formerly 15+ boats from early July until mid October

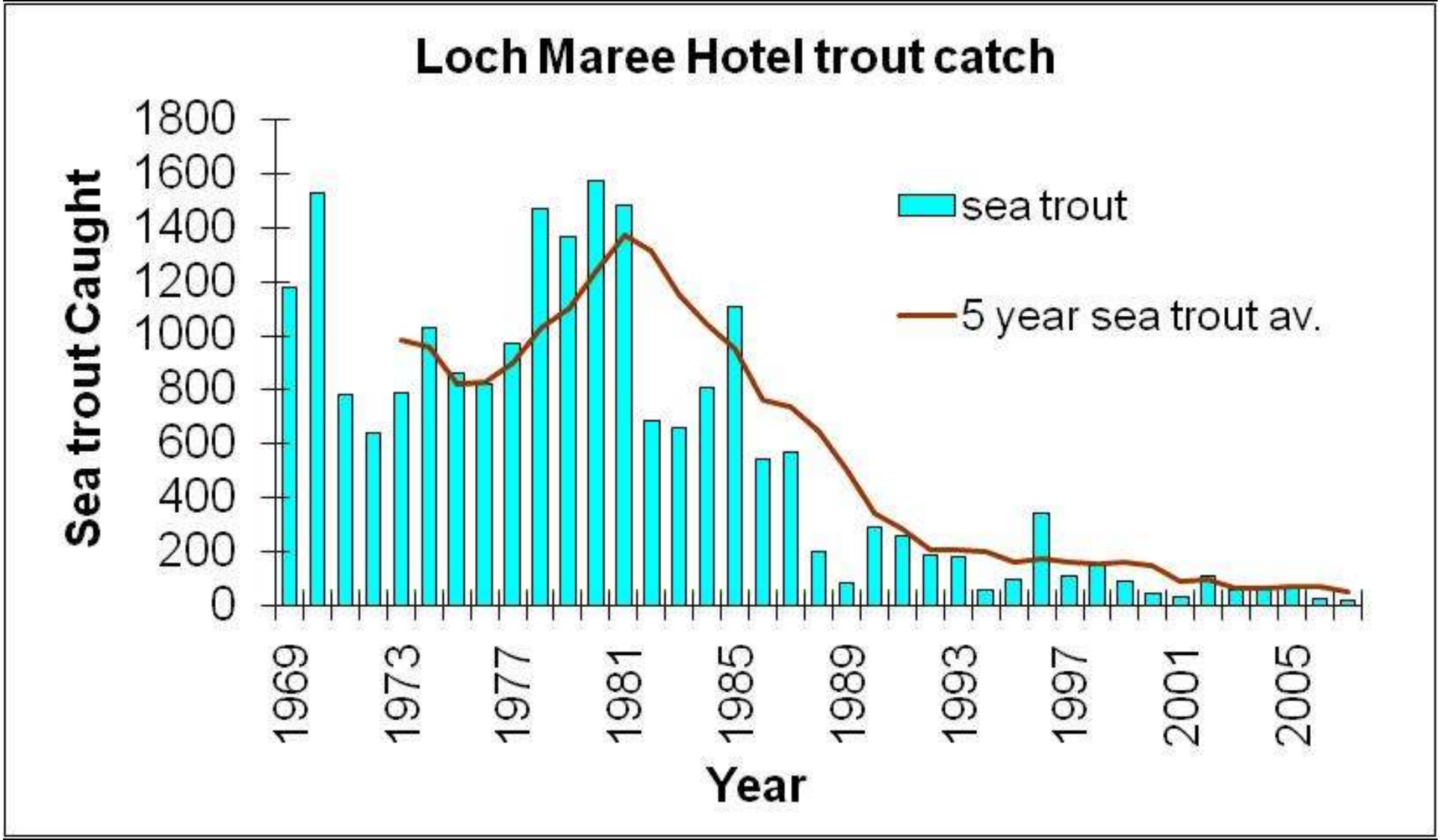



The art of dapping was developed on Loch Maree. . .



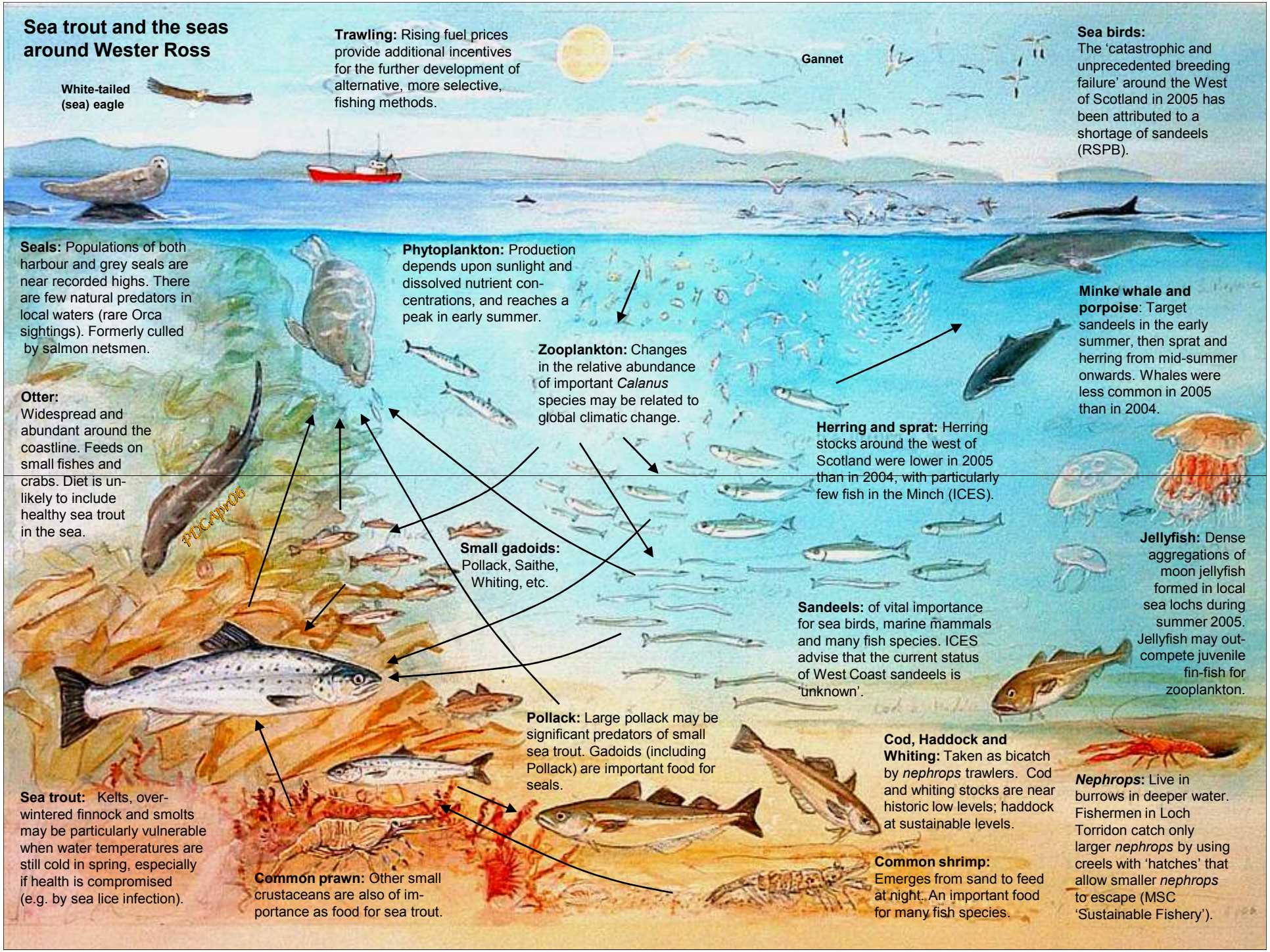
Former British record rod caught sea trout

The fishery collapsed at the end of the 1980s

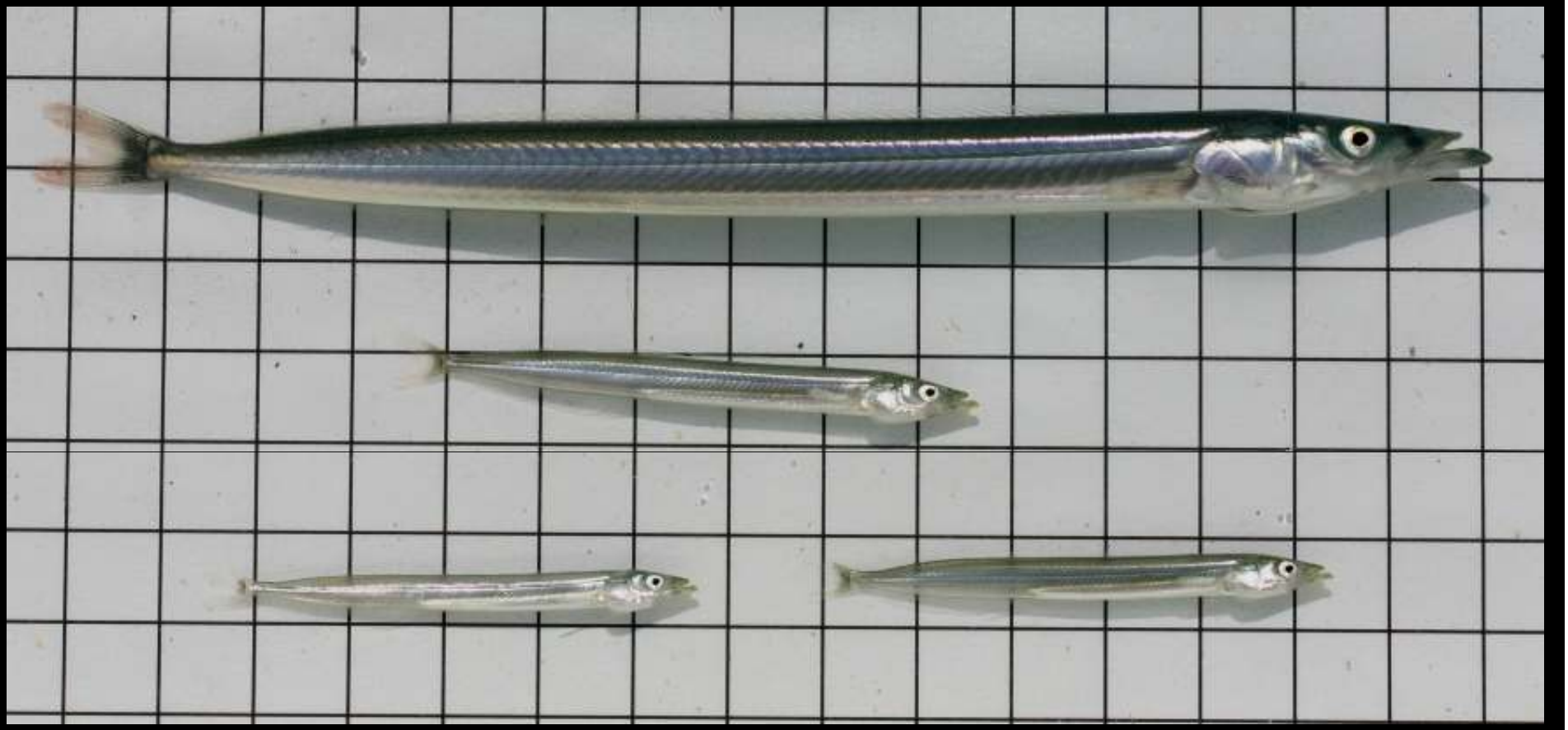


Problems for sea trout in the marine environment include sea lice infection and food availability . . .

Sea trout and the seas around Wester Ross



Sandeels . . .



Sandeel glut, summer 2009

Herrings

Thanks to Roddy MacIver

Salmon also bring back marine nutrients from the ocean . . .


Gruinard River, late November . . .

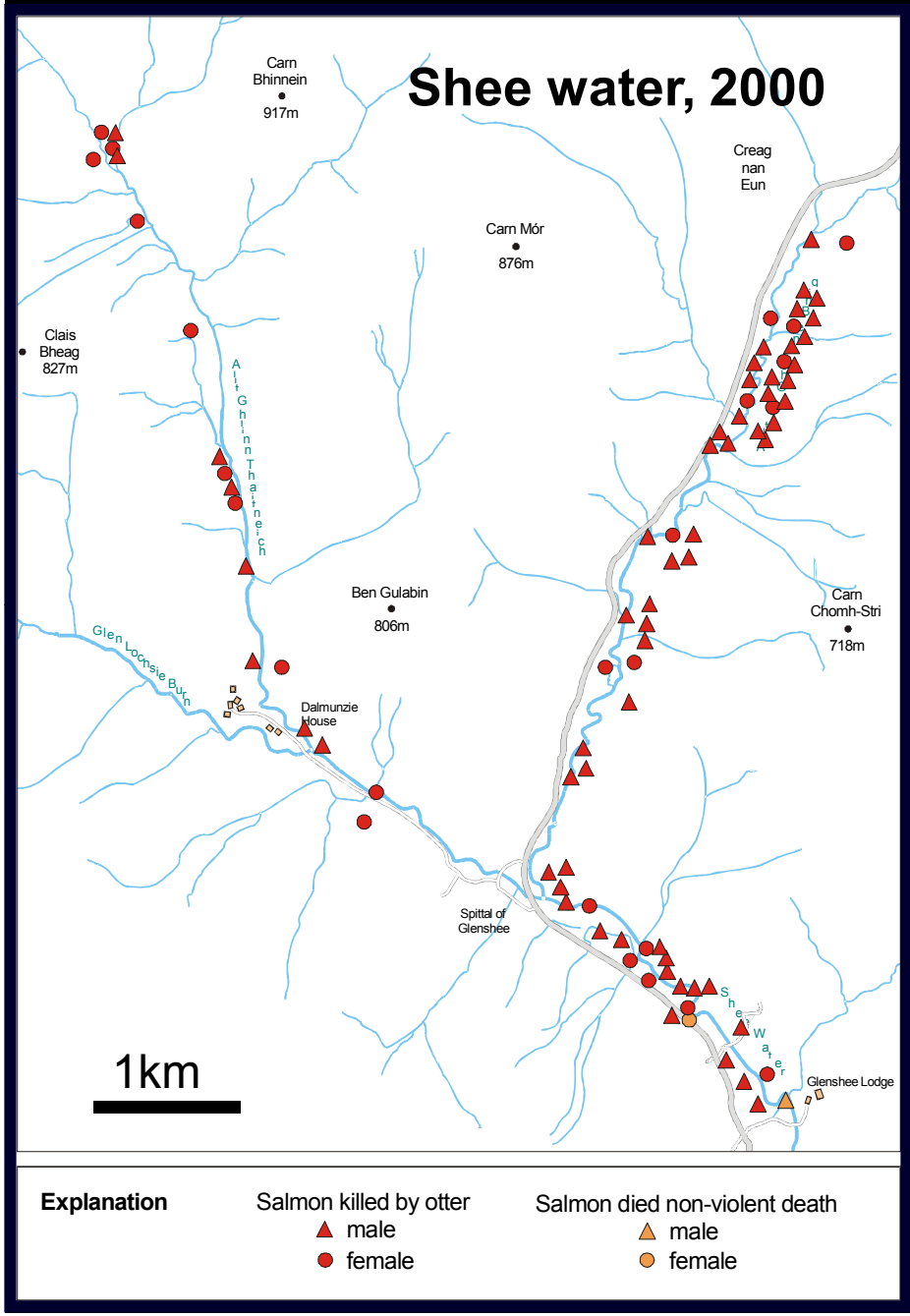
watching cock salmon fighting at spawning time

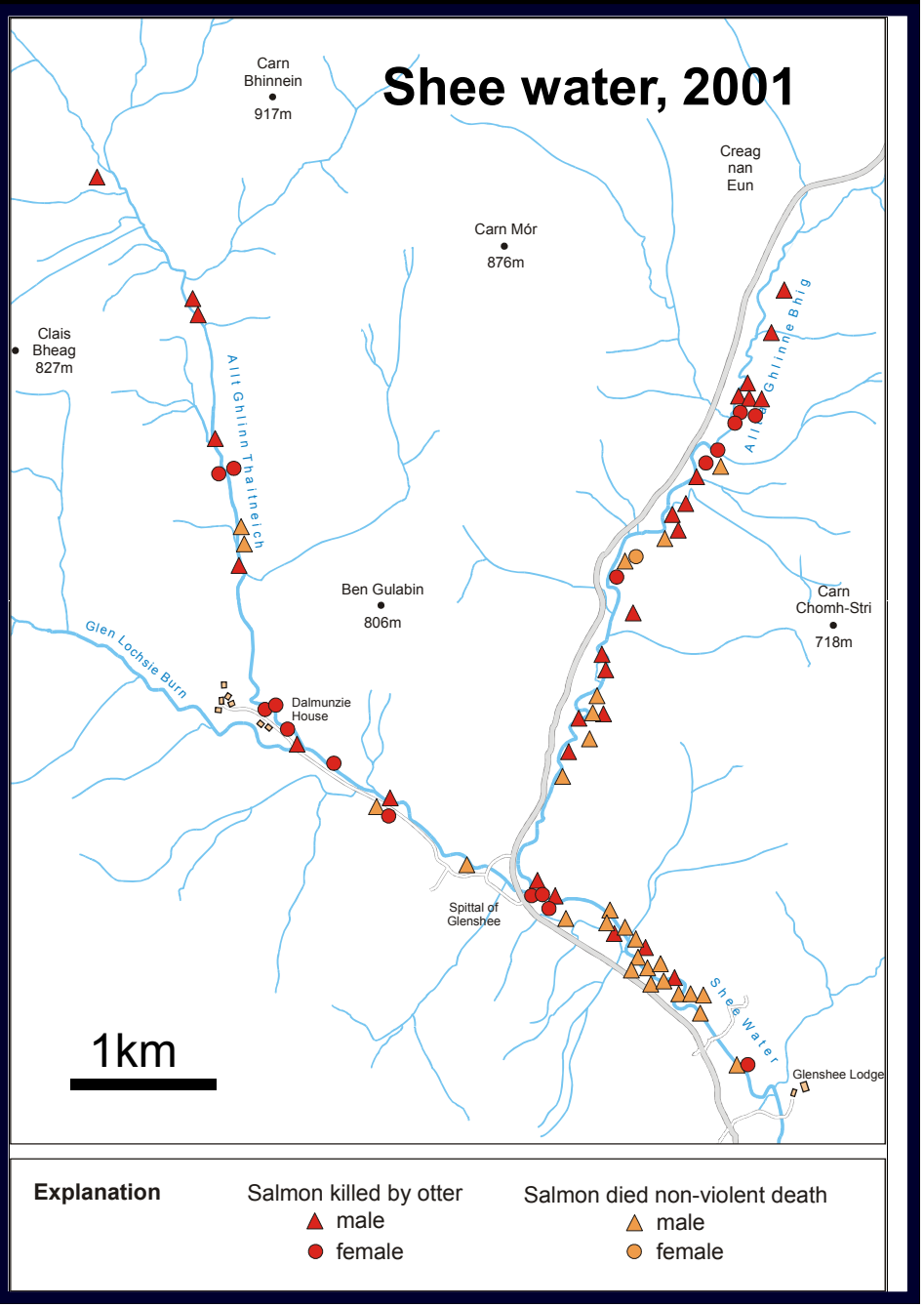
Wild salmon are an important food source for other wildlife

Otter kill, Shee Water, 2001

(Andrew Harwood)

Salmon carcasses found in two week study period in late October early November





Otter

Kills salmon and removes carcasses onto river banks

Pine marten

scavenges carcasses

(self portraits)

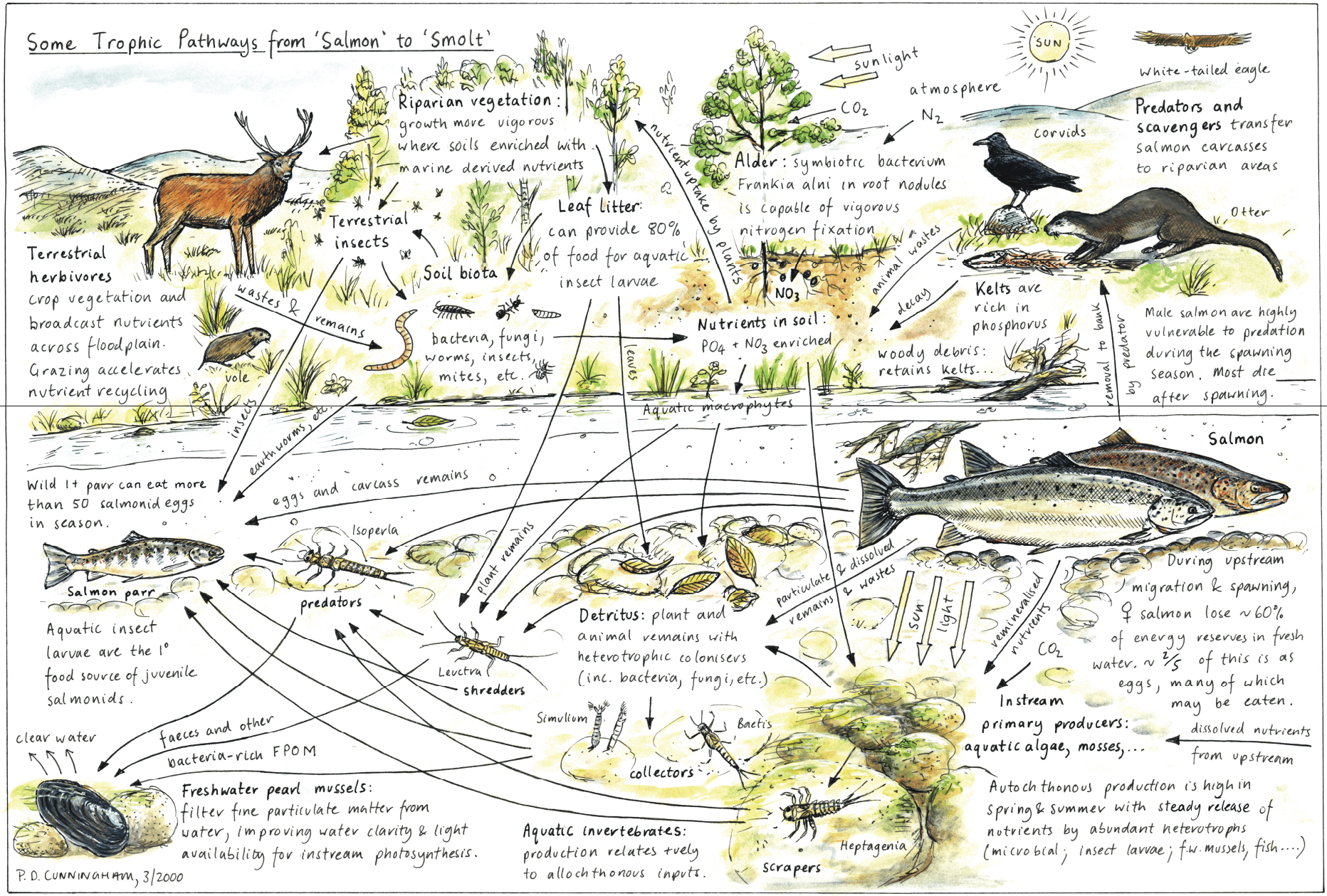

This partly digested grisle was regurgitated by a cormorant at Kinlochewe
photo by Ben Rushbrooke


This little trout had 11 salmon eggs in its stomach.
Possibly its best meal of the year!
8 9 10 11 12 13 14 15 16 17 18 19 20 21
4 5 7 8
photo by Ben Rushrooke


Why is this rock green?


Otter spraint with fish
bones.

Adult salmon provide food for juvenile salmon




In North America adult Pacific salmon return to spawning streams in the forests of Alaska, British Columbia, Washington, Oregon . . . .

All the salmon die . . .

. . . providing food for wildlife and nutrients for riparian forest soils . . .


johncastor.com

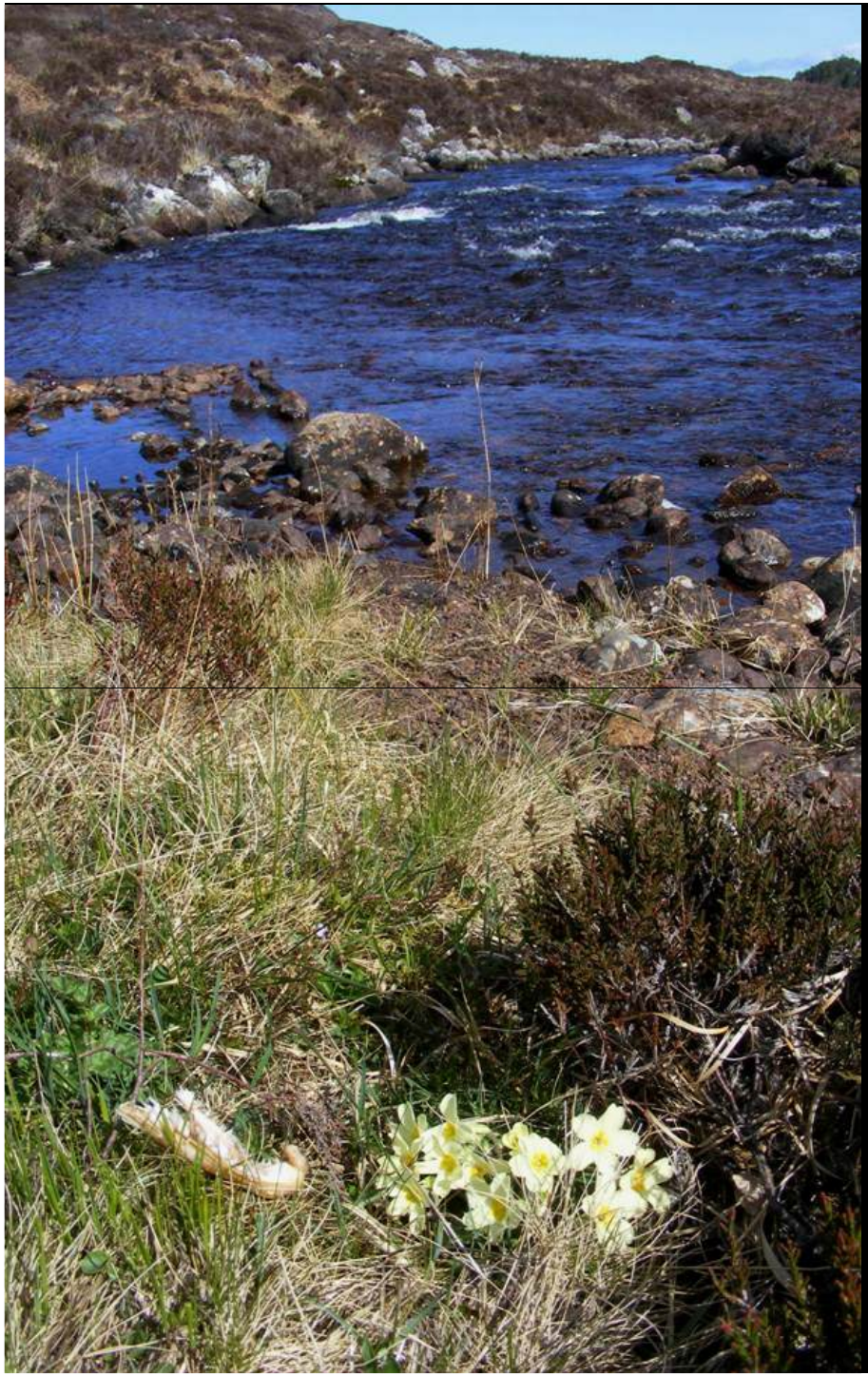
"…what if I told you that the trees are here, in part, because of salmon? That the trees that shelter and feed the fish, that help build the fish, are themselves built by the fish?"

-- Carl Safina, essayist for *Salmon in the Trees*

photos by Amy Gulick


Not all Atlantic salmon die after spawning (though most do) and spawning densities are generally lower than for Pacific salmon rivers, in recent years at least.
Little Gruinard River

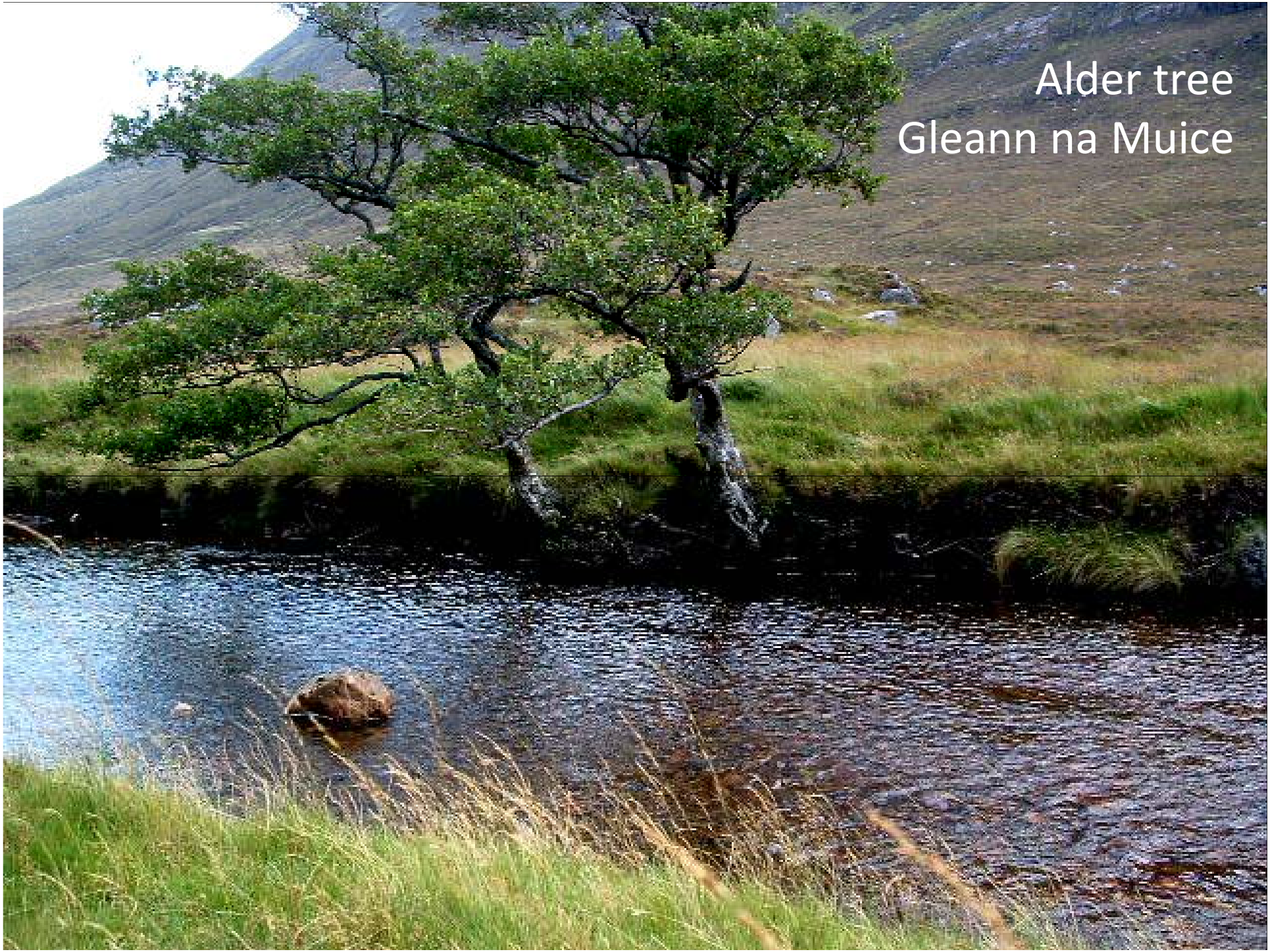

Salmon jaw and primroses,
as found, May 2010



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?

Upper Gruinard catchment Gleann na Muice


Alder tree
Gleann na Muice


Dead alder tree
Gleann na Muice

Break – any questions ?