



# Summary of the issues and possible solutions

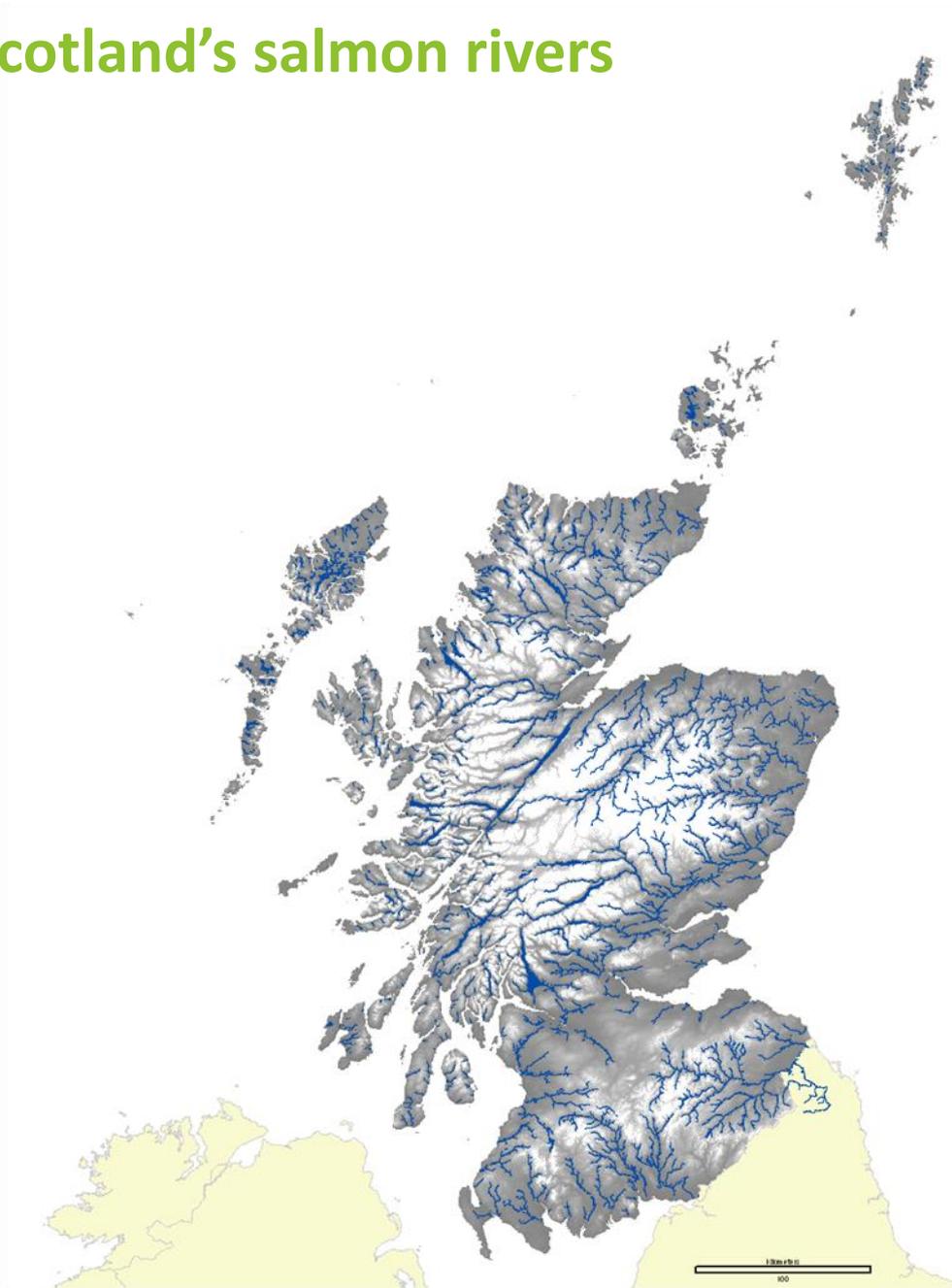
**John Armstrong**

# Scotland's salmon rivers

marinescotland  
science

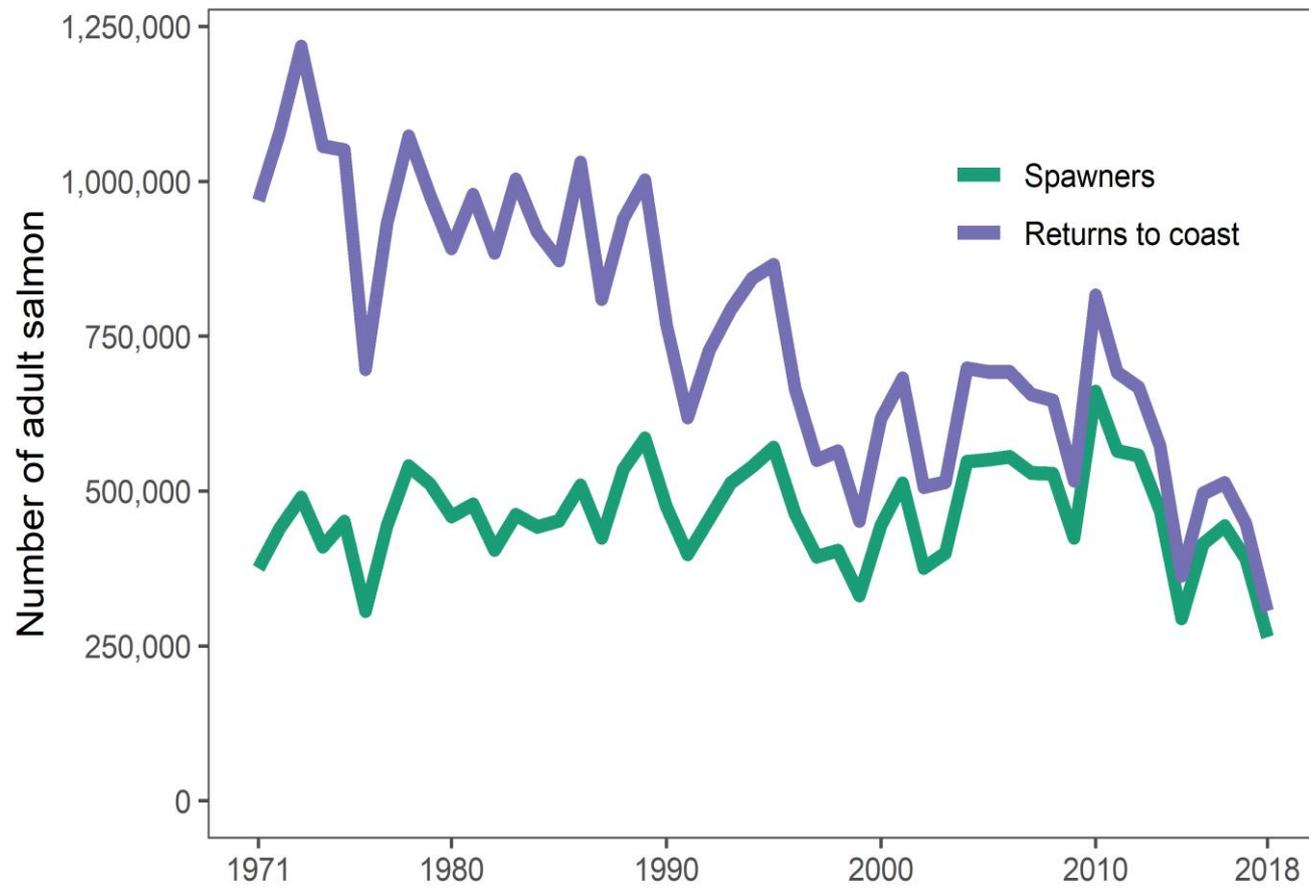
## Salmon Distribution

398 salmon rivers

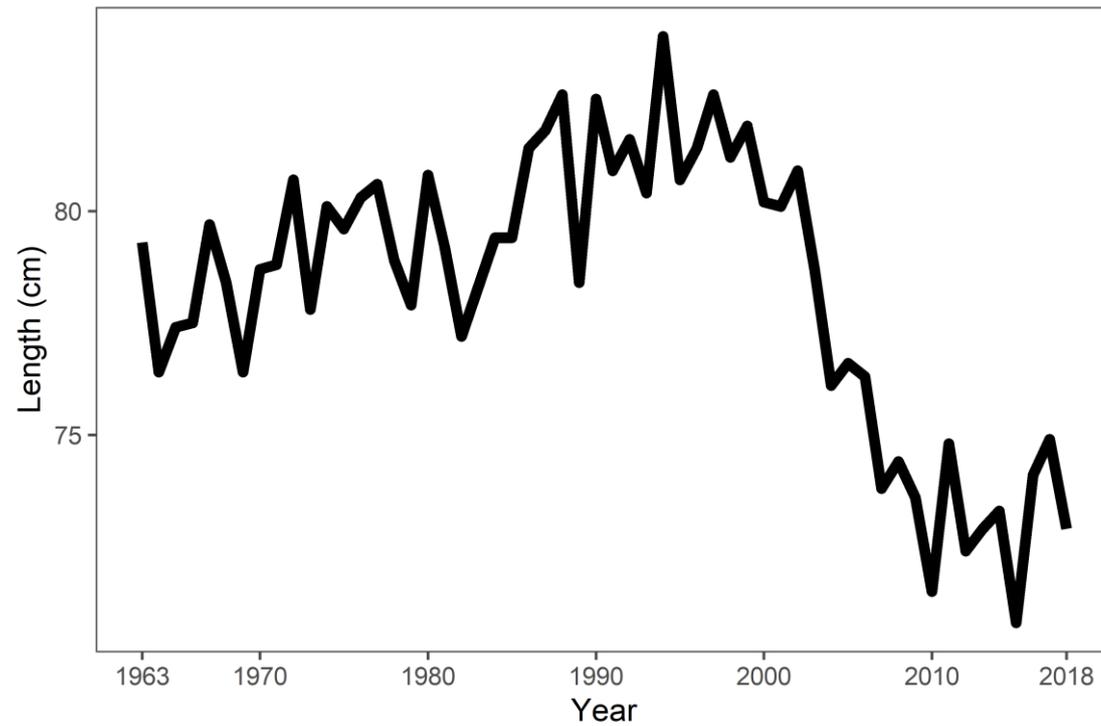


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## Scottish stock status



## Mean length of salmon returning from sea



# Key facts

1. Time may be short to act meaningfully for salmon
2. Climate change seems to be a general driver of decline
3. Multiple other factors affect salmon
4. We may not have identified all factors (eg reduced insect life, effects of agricultural chemicals)

## **Salmon like it cold:**

What hope is there as warming increases?

- Further changes in the marine ecosystem may be more favourable for salmon
- Animals can adapt (evolve) (within limits)
- Climate change may be brought under control
- Perhaps there is a different main driver than climate change

## General strategy

1. Protect and enhance numbers and quality of salmon smolts leaving Scottish waters  
  
(to compensate for decline and buy time)
2. Verify causes of mortality and poor growth on the high seas

## General habitat protection and predator control

1. SEPA- water quantity and quality
2. SNH- licensed bird predation control

## **Additional responses**

1. Protect freshwater habitats from climate change
2. Increase baseline production of salmon in fresh water
3. Reduce losses from predators and parasites

## Protection from climate change:

Trees as living parasols

Scottish River Temperature Monitoring Network- records temperatures

Process and GIS modelling- predicts spatial variation in temperatures

Identify priority areas for tree planting- provides living parasols

### **NEEDS:**

The right trees in the right places next to rivers- coordination and targeting with incentives

Development of skills and infrastructure

Broad scale action

## Increase baseline production of salmon smolts

Nutrient enrichment in upland areas increases growth

Length and condition of smolts increase marine survival

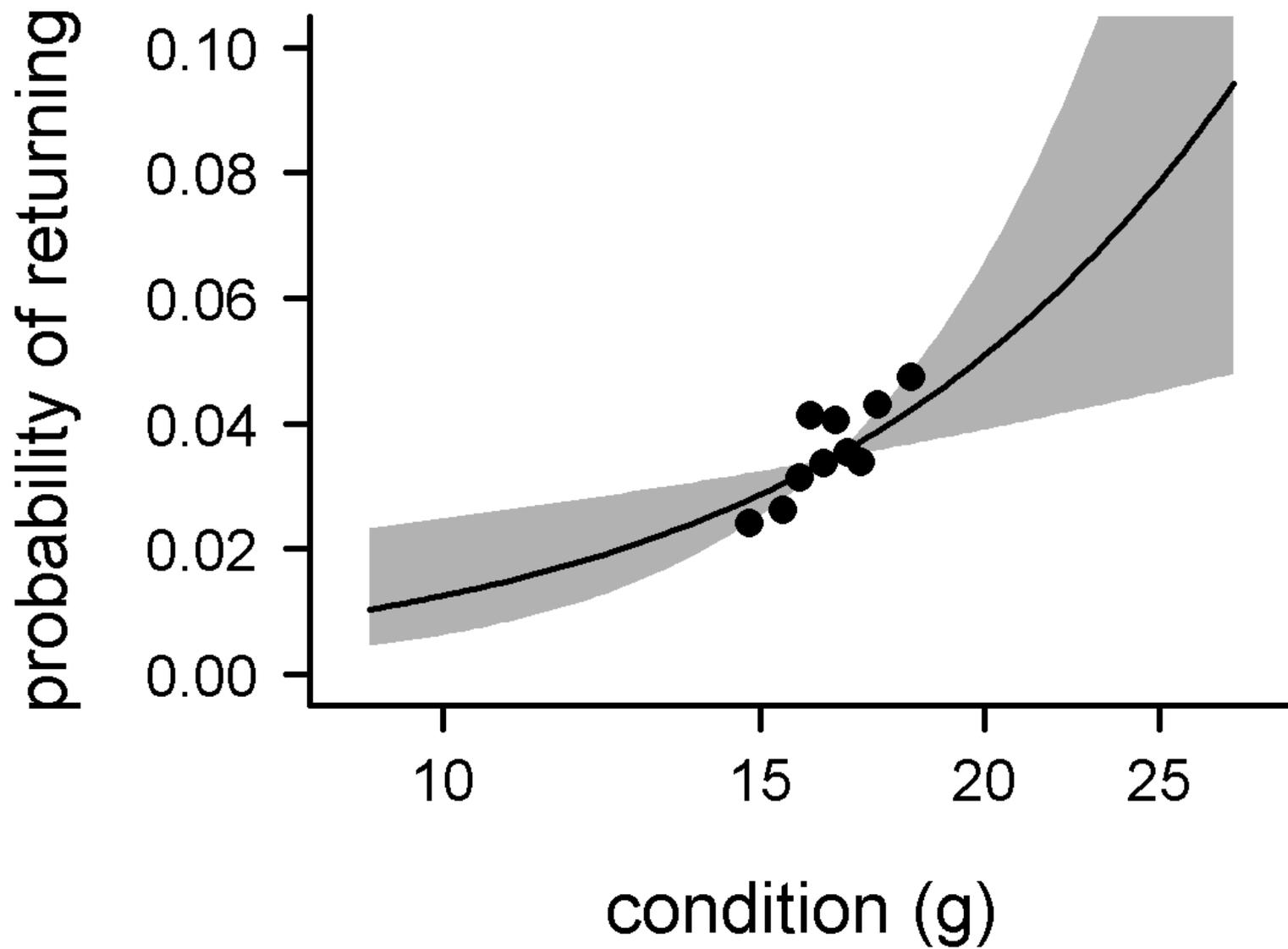
What are the practicalities of nutrient enrichment?

### **NEEDS:**

Co-ordinated teams of scientists, regulators, local biologists

Field trials to develop the best approach

Broad scale action



# Control impacts of predators parasites and pollution (genetic and chemical)

Losses of smolts to predators may be substantial

Losses due to sea lice may be substantial if uncontrolled

Chemical pollution may have a large impact on survival

Genetic pollution (escaped farmed and stocked fish) may weaken wild populations

## **NEEDS:**

Work with aquaculture colleagues to assess and regulate impacts

Find better solutions for reducing predator impacts

Broad scale action