



# Working with Anglers for Sea Trout

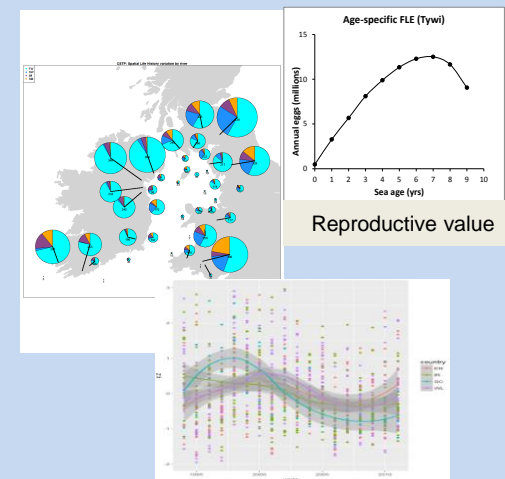
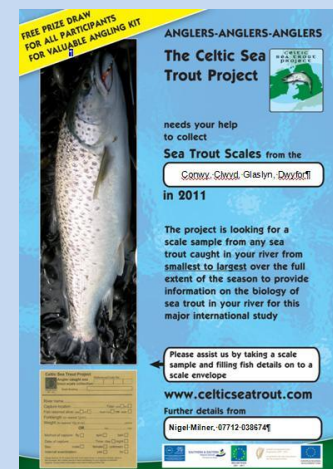


IFI Conference  
Athlone, 17/10/2017



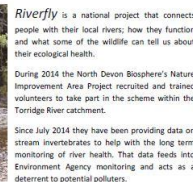
Nigel Milner

APEM Ltd  
and  
Bangor University



The image is a composite. The background is a historical painting depicting a battle scene. In the foreground, there is a modern poster for the 'Celtic Sea Trout Project'. The poster has a blue background and features a large image of a sea trout. Text on the poster includes 'FREE PRIZE DRAW FOR ALL PARTICIPANTS FOR VALUABLE ANGLING KIT', 'ANGLERS-ANGLERS-ANGLERS', 'The Celtic Sea Trout Project', 'needs your help to collect', 'Sea Trout Scales from the', 'Cornwall, Devon, Glaslyn, Duvforn', 'in 2011', and 'The project is looking for a scale sample from any sea trout caught in your river from smallest to largest over the full extent of the season to provide'. There are also logos for 'North Devon Biosphere' and 'Devon Wildlife Trust'.

## Citizen science in action on the Torridge



34 volunteers have been trained  
29 separate sites in the Torridge  
catchment are being sampled  
2 ND-NIA project staff have been  
accredited as Riverfly trainers.



## ANGLERS-ANGLERS-ANGLERS

### Sea Trout Scales from the

in 2011

[www.celticseatrout.com](http://www.celticseatrout.com)

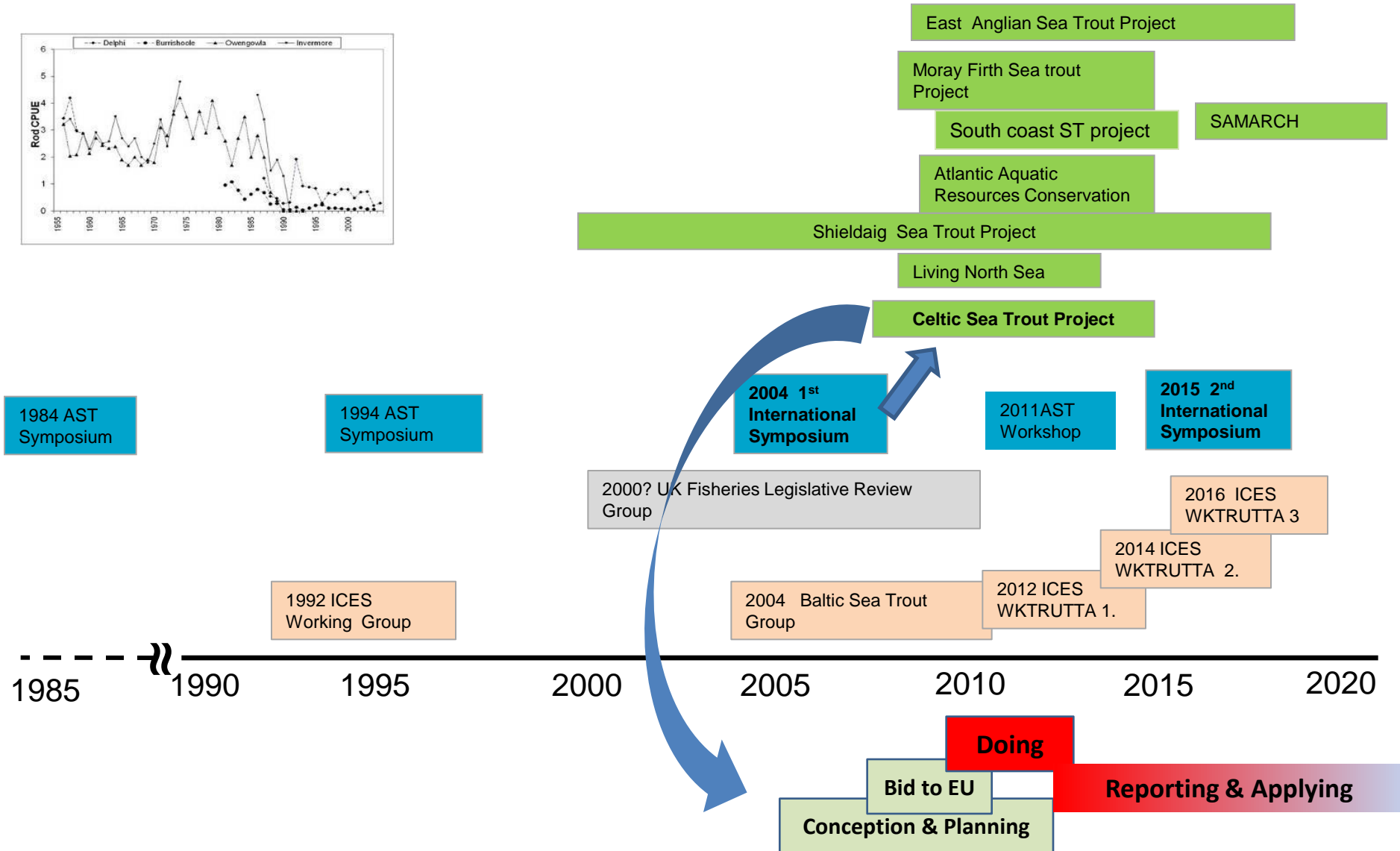
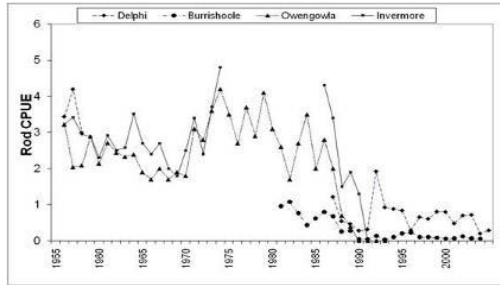
Nigel Milner, 07712-038674



the collection and analysis of data relating to the natural world by members of the general public, typically as part of a collaborative project with professional scientists.



# The Rise of Sea Trout



# Celtic Sea Trout Project

## Aims

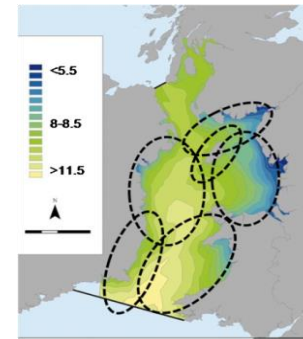
- Marine distribution & ecology
- Stock discreteness & identity
- Life history variation, responses to pressures (climate)
- Long term collaboration & awareness

## Applications

- Better (adequate!) stock assessment
- Response to environmental factors, manage risk
- Bio-indicator role in FW/estuarine/coastal habitats

## Funding (€1.8m, 2009-2012 )

- EU Interreg IVA Ireland –Wales Cross-Border
- Sustainable regeneration , jobs
- Climate impact and resilience
- Negotiated geographical range



SOUTHERN & EASTERN  
Regional Assembly  
Promoting Our Region



IRELAND WALES  
2007 - 2013



Ireland's EU Structural Funds  
Programmes 2007 - 2013  
Co-funded by the Irish Government  
and the European Union



EUROPEAN REGIONAL  
DEVELOPMENT FUND



# Celtic Sea Trout Project Tasks

## Sampling

- Design, season & location,
- Methods & organisation

## Fisheries Inventory

- Distribution, status & trends
- Monitoring and management

## Microchemistry

- Stock discreteness & identity
- Movements and exchange

## Genetics

- Population discreteness & identity
- Movements & exchange

## Production in rivers

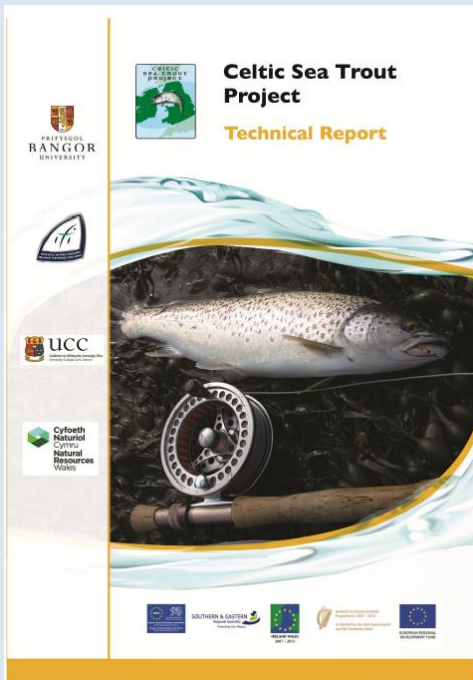
- Environmental factors affecting sea trout production & abundance

## Life Histories, Marine Ecology & Modelling for Management

- Life history variation & causes, population dynamics
- Stock composition & trends
- Feeding, condition and maturation at sea
- Dispersal modelling
- Evaluating responses to pressures, including climate



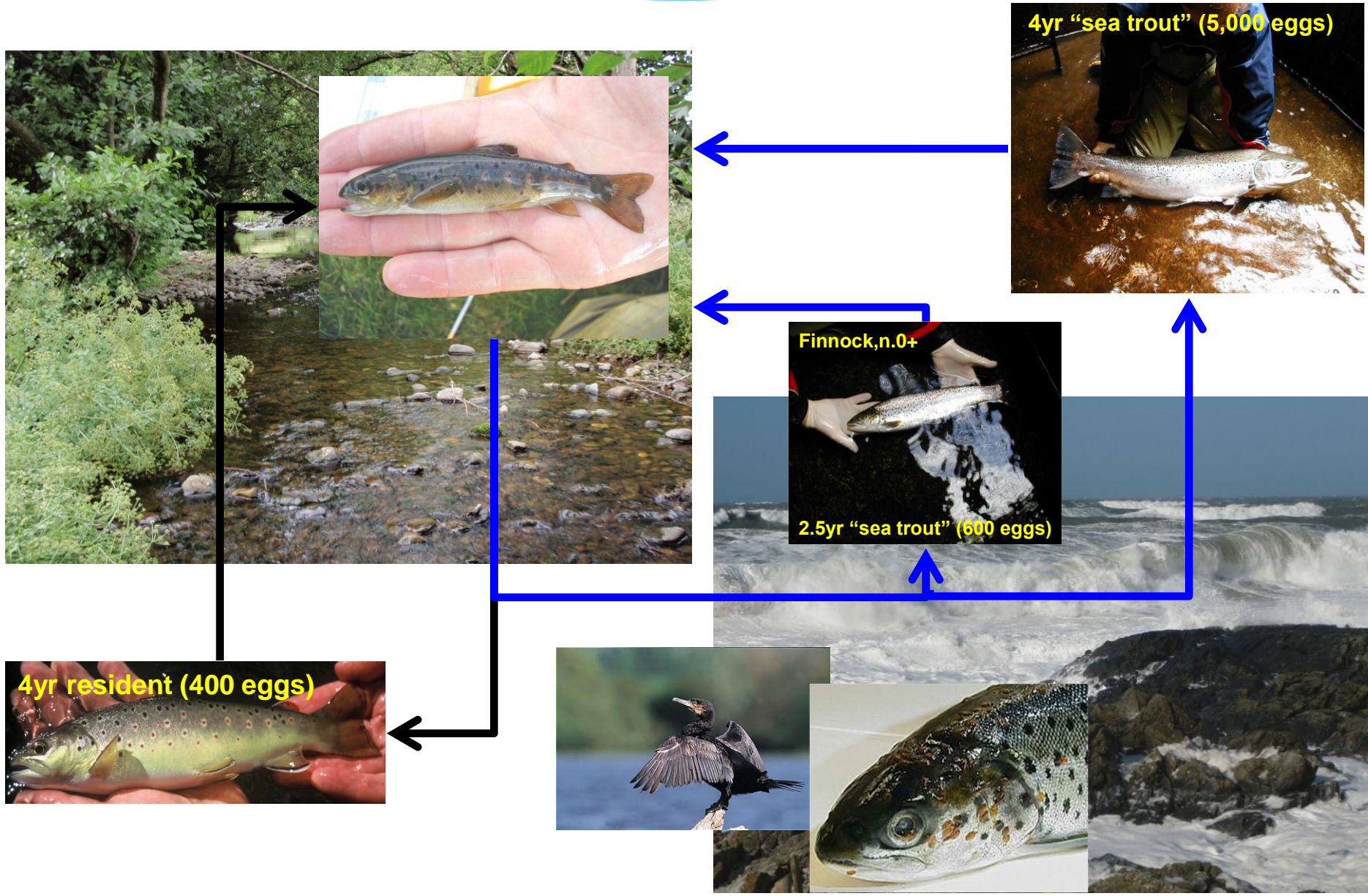
Scales





# Brown trout life history tactics: “Should I stay or should I go?”

**trade-off:** increased **fitness benefits** of growth, eggs & colonisation opportunity vs increased mortality **risks** through long migrations, energy expenditure, predation and pathogens. **Influencing factors:** genes plus freshwater & marine habitats acting on / growth / survival / maturation.



# Why did we need scales?

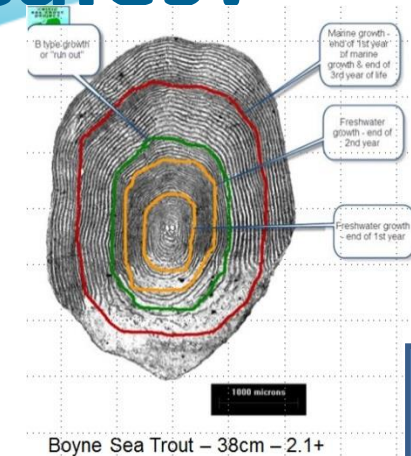
## ➤ Life history analysis...

- Size structure of population
- Age structure of population
- Age at first spawning
- Growth rate
- Mortality rate
- Eggs (fecundity)

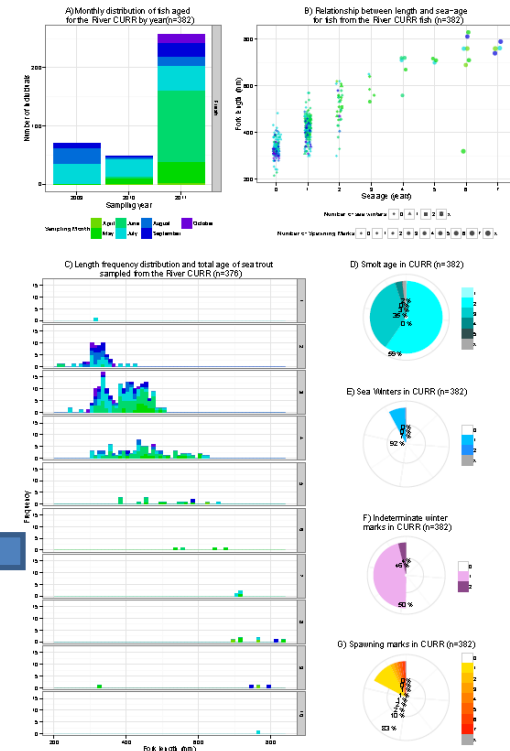
## ➤ Scales: fish diaries



Life tables & population models



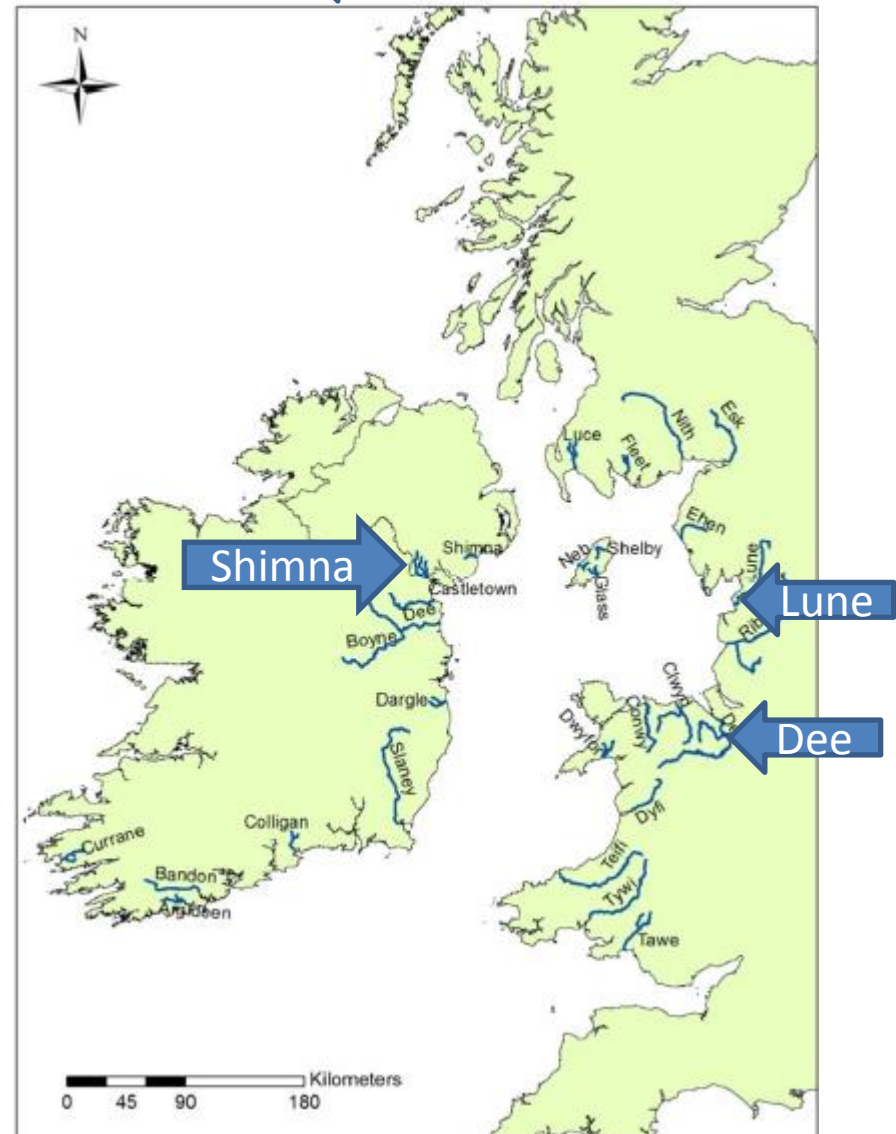
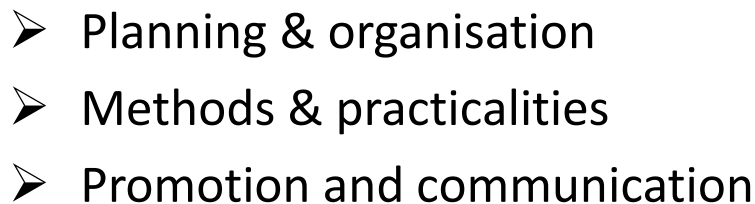
Summary statistics of sea trout scale reading data from the River Curran





Index trap rivers

- ## Anglers!





# Angler input requested

- **Sampling rod caught sea trout in 2010-12**
  - 300+ fish per river
  - **unbiased** through season & across sizes
  - Retained or returned fish
  - Kits & advice supplied
- **Basic information** (on scale packets)
  - date, place
  - 10-15 scales
  - fork length to 0.5cm (Wt to 25g)
  - marks, external parasites



# Promotion and communications

- Getting buy-in
- Explaining what & how, why & benefits
- Extensive meetings and talks
- Lobbying & policy support
- Articles & Website
- Feedback



## Meetings & demonstrations

Participating briefing note, V.7 14/04/2010

HOME PROJECT UPDATES BACKGROUND INFORMATION GET INVOLVED DOWNLOADS CONTACT US

Home > Get Involved

### Get Involved

Public participation is an essential component in collecting sea trout samples & biological data for this project. Angling clubs and individuals, primarily on the 25 priority systems, have been targeted by the project team to provide these data. Experienced commercial netmen (existing and retired) are being engaged to sample in estuaries and the wider marine environment.

Anglers have been requested to provide an unbiased rod catch sample extending over the entire angling season comprising:

- 150 sets of scale samples per annum in 2010 and 2011 from each targeted river
- all relevant capture details include forklength (mm) and weight (g) as per scale packet

Commercial fishers (in the UK only) will be requested to take scale samples and other details from their catch and record these data on specially designed CSTP scale packets.

### COLLECTING SCALE SAMPLES

Find out more about how you can help the Celtic Sea Trout Project by collecting sea trout scale samples...Get Involved: Collecting sea trout scale samples

**THE CELTIC SEA TROUT PROJECT: AN INTRODUCTION FOR ANGLER PARTICIPANTS**

- 1. Aim of this note**

To inform fishermen about the Celtic Sea Trout Project (CSTP) and its aims, to provide information on the project and to encourage participation in the project.
- 2. What is the CSTP?**

The Celtic Sea Trout Project is a ground-breaking, 42 million, multi-agency partnership investigation into the sea trout stocks and fisheries of the river systems of the Celtic Sea. The project is funded by the European Union (EU) through the Interreg IVa programme, which is part of the EU's Regional Development Fund (ERDF). The project is a collaborative effort between the Irish Government, the Welsh Government, and the European Union. The project aims to improve the understanding of sea trout populations, their ecology, and their response to environmental pressures. This will improve their protection and fisheries management.
- 3. Areas of the programme**

The Celtic Sea Trout Programme aims to:

  - To understand and describe sea trout stocks in the river basins in order to enhance their fisheries and strengthen their contribution to quality of life, to rural economies and to national business.
  - To explore the use of sea trout life history analysis to assess and understand the effects of climate change.
- 4. Background**

The sea trout is the sea migratory form of the brown trout and is a popular target of rod and net fisheries of rivers and coastal waters around the Irish Sea. Adult sea trout are typically 1 to 2 years in freshwater before migrating (as smolts) to sea where they feed, breed and return, after varying periods as mature adults, having in the mean time spent in sea to spend the winter. Thus the sea trout life cycle involves good environmental quality in freshwater, abundance and at sea. However, current understanding suggests that the incidence of sea trout and the composition and status of their stocks is sensitive to changes in the environment in which they live. These life history features and the sea trout's widespread occurrence makes it a unique and potentially sensitive indicator of environmental change.

However, there are major uncertainties available in our understanding of sea trout, namely:

  - What is their life cycle and how are their stocks structured and managed?
  - What is their natural ecology, feeding, growth, survival and life history variability?
  - What environmental and other pressures are they exposed to at sea?
  - How do their life histories and thus fishery status respond to environmental variation, including climate change?

## Website

## Guidance

### ORDER SCALE SAMPLES

First Name(s): \*

Last Name: \*

Your Email: \*

Your Address: \*



### CELTIC SEA TROUT PROJECT

Scale envelopes and advice notes available here  
Exonets is a scale sample collection point

#### Do you fish for sea trout in the Conwy and/or Clynwyd?

If so, we would like to ask for your help as part of a major programme on the ecology and life histories of sea trout around the Irish Sea, Funded by the European Regional Development Fund (ERDF) through the Ireland-Wales Programme (INTERREG 4A).

#### What is the purpose of the project?

To understand how sea trout populations grow, where they go at sea, their ecology and how they respond to environmental pressures. This will improve their protection and fisheries management.

#### What can you do to help?

We need anglers to collect scales and length measurements from all sizes of sea trout in the Clynwyd and Conwy, throughout the season. If you want to help, please ask inside for more information, or contact:

(1) Dr Carus Davies (CSTP Project Research Officer). Tel: 01248 388603.  
carusd@celestcstp.co.uk or

(2) Dr Nigel Milner (Clynwyd and Conwy Rivers Trust) Tel: 07732588674.  
n.milner@celestcstp.co.uk

## Invitation



## Policy support



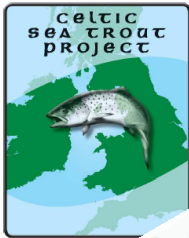
# Communications.....

## fisheries newsletter

South West Wales

Q1 - June 2010/11

### CELTIC SEA TROUT PROJECT (More Fish / Boosting economic benefits)



pressures, including climate change. For the first time the work will extend to studies of the sea trout's marine life, to investigate stock distribution, genetics, ecology and feeding.

Importantly, on certain rivers, we need scale samples and length measurements from rod caught sea trout, ideally from all fish sizes and spread throughout the angling season. Scales can be taken from live or dead fish. Anglers can take scales harmlessly from live fish and with care fish can be measured safely and accurately before being released.

Detailed procedures and equipment are available and the project organisers will be available to give advice and practical support to any individuals or groups who wish to participate.

are of huge cultural and historic importance to rural communities in Wales, but stocks seem to be declining. This project will help us to better manage these rivers and future generations can benefit from them. It's fantastic to make a practical difference to the future of these rivers.

back of the provide as overall



**Celtic Sea Trout Project, Ar...**  
The Celtic Sea Trout Project (CSTP) is a European Union project looking into the status, distribution, genetics and ecology of sea trout in the Celtic Sea. The project is supported by the many helpers and participants in angling clubs, river trusts and technical accounts will be available in due course.



### CELTIC SEA TROUT PROJECT

Scale envelopes and advice notes available from the project website.

Do you fish for sea trout in the Conwy and/or Cwys. If so, we would like to ask for your help as part of a major programme on the ecology and the history of sea trout around the Irish Sea. Funded by the European Regional Development Fund (ERDF) through the Interreg programme (INTERREG IIA).

**What is the purpose of the project?**  
To understand how sea trout populations work, where they go at sea, their ecology and how they respond to environmental pressures. This will improve their protection and fisheries management.

**What can you do to help?**  
We need anglers to collect scales and length measurements from all sizes of sea trout in the Conwy and Cwys, throughout the season. You want to help, please send us inside for more information, or contact:

(1) Dr. David Davies (CSTP Project Research Officer), Tel: 07712 388264, Email: david.davies@swfpa.co.uk  
(2) Dr. Nigel Milner (Cwys and Conwy Rivers Trust), Tel: 07712 388264, Email: nigel.milner@swfpa.co.uk



## The Celtic Sea Trout Project

Sea trout and their behaviour, particularly at sea, are not well understood. That's about to change. SWFPA explains, thanks to a project involving scientists from both sides of the Irish Sea.

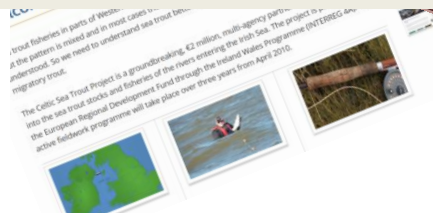
## Result

- 33,000 envelopes sent out
- 6,000 sets of samples returned (12%)
- Thank you!

Celtic Sea Trout Project, January 2012  
Website: <http://www.celticseatrout.com>

**Introduction**  
The Celtic Sea Trout Project (CSTP) is a European Union, Interreg IIA-funded, Ireland-Wales collaborative project on the status, distribution, genetics and ecology of sea trout around the Irish Sea. This project outlines progress in 2011 for the many helpers and participants in angling clubs, river trusts and other organisations. More detailed technical accounts will be available in due course.

**Sampling**  
The CSTP is reliant upon effective field sampling to collect data and material such as scales from fish for the scientific analysis. For example, the genetics and microchemistry analysis, that will tell us about the mixing and distribution of stocks, requires a baseline of measurements to be made in all the principal rivers around the Irish Sea which are likely to contribute to sea trout stocks. River sampling of juvenile trout for the genetics was the focus of the CSTP scientific team's work in 2010 and was completed in 2011, using a large scale electro-fishing programme, taking samples from around 80 rivers.



/imes

as: 17 Headline: Second-fiddle sea trout plays a big role in Irish fishing, says Minister

23.09.2013

## Second-fiddle sea trout plays a big role in Irish fishing, says Minister

### Derek Evans

WHILE the salmon has held its iconic status, the closely related sea trout has been described as a lesser species. However, this perspective has changed and the enigmatic sea trout is now regarded by many anglers as a fish which offers better sport than the salmon, the Minister of State for Natural Resources, Fergus O'Dowd, said at the presentation to hear the findings of the Celtic Sea Trout Project (CSTP) at the Mount Hotel.

The Curran system in Co Kerry was a notable exception with a high proportion of long-lived adult sea trout. A genetic study found nine groups within the six regions, and significant differences in the areas these groups occupied during their marine migration. This was demonstrated by some migrants which were recorded up to 300km from their river of origin.

Sea trout consultant Graeme Harris pointed to the Irish failure to record undersized fish on the licence logbook. He said it left a "massive gap" in showing captures of sea trout

**Sturgeon alert**  
Sea anglers and commercial fishermen are being asked to watch out for one of the most unusual catches they may ever make – a sturgeon. It is one of the most protected fish in the world and the eggs of the beluga species are served as caviar. The alert comes after one of two boys fishing near Pembroke Dock, South Wales, hooked one about a metre long. Records show that since 1792, 133 sturgeon have been captured. The most prolific year was 1972 when 30 were caught and the last reported was nine years ago by a trawler off Port Talbot, South Wales.

**Fishing close to Arley Point**  
on Lough Sheelin last Wednesday, Oliver McCormack and Pat Sweeney managed three trout, two at 1kg and one cracker of 2.6kg (5.75lb) for Oliver on a Cock Robin. **Last week proved fruitful** as ever, with 13 rod days producing 17 salmon, said Kylemore Fisheries manager Nigel Rush. There are now 24 salmon landed for the season and with just one week left, Nigel is



GROUND INFORMATION GET INVOLVED DOWNLOADS CONTACT US

### ORDER SCALE SAMPLES

First Name(s): \*

Last Name: \*

Your Email: \*

Your Address: \*

Address 1 \*

Address 2 \*

Address 3

County \*

Country \*

Postcode \*

Phone No: \* (include areacode)

Select your region: \*

Rep. of Ireland and N.Ireland

all relevant capture details include forklength (mm) and weight (g) as per scale packet

Commercial fishers (in the UK only) will be requested to take scale samples and other details from their catch and record these data on specially designed CSTP scale packets.

### COLLECTING SCALE SAMPLES

Find out more about how you can help the Celtic Sea Trout Project by collecting sea trout scale samples... [Get Involved: Collecting sea trout scale samples](#)



# Incentives....

WIN  
Prizes!

ANGLERS - The Celtic Sea Trout Project ...needs your HELP!

14 prizes for  
scale samplers  
from Priority  
Rivers in 2011

Sample here



## Celtic Sea Trout Project Angler Prize Draw 2011

The Celtic Sea Trout Project (CSTP) is a European Union, Interreg IV-funded, Ireland-Wales collaborative project looking into the status, distribution, genetics and ecology of sea trout around the Irish Sea (<http://www.celticseatrout.com/AboutUs/Programme.aspx>). Several key aspects of the project require scale samples from rod-caught fish within the Irish Sea region, especially from 25 priority river systems.

### The Prizes

As an incentive to anglers to participate in the project, the CSTP project partners are offering several valuable tackle voucher prizes, including:

- A £250 (£300) tackle voucher prize to the angler submitting the most scales from our priority rivers in 2011.
- Three £150 (£180) tackle voucher prizes to each of the three regions who returned the most scales from priority systems in 2011 within each of other three regions: Ireland (inc NI), Scotland and N.W. Wales, or NW England.
- Ten £300 (£116) tackle voucher prizes to be awarded to 10 anglers to be drawn at random from the remaining scale samples submitted. (this includes samples submitted in 2010 as those from a priority river within the project area).

### How to get involved?

In order to have a chance to win all you will need to do is submit scale samples from your fish using one of these CSTP scale envelopes. To find out how to get your sample kits go to <http://www.celticseatrout.com/anglers/scale-samples.html> or contact the relevant people below.

What are the priority rivers? Call us, or go to <http://www.celticseatrout.com/about/location.html>



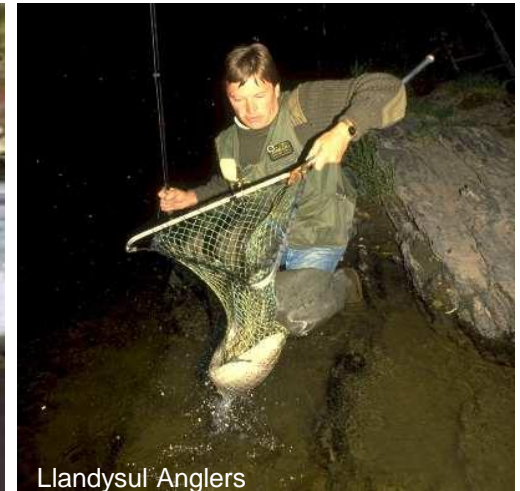
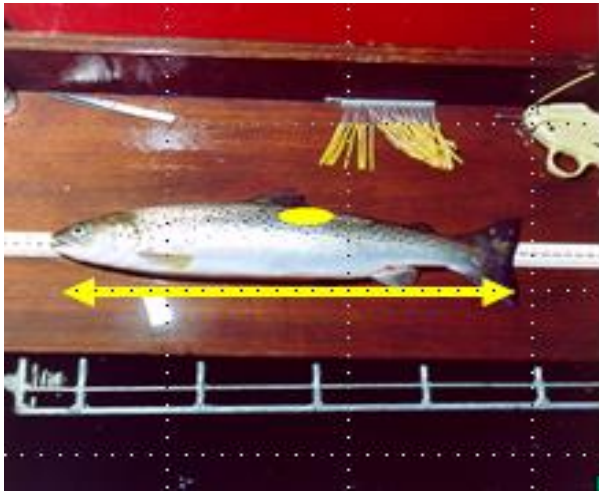
• Vital role for anglers!

• Your fishery is a priority for sea trout research in 2011 & 2012

• CSTP needs YOU to collect scales from all sea trout you catch over the season

• More detail and support at [www.celticseatrout.com](http://www.celticseatrout.com)

# Problems of sampling by angling



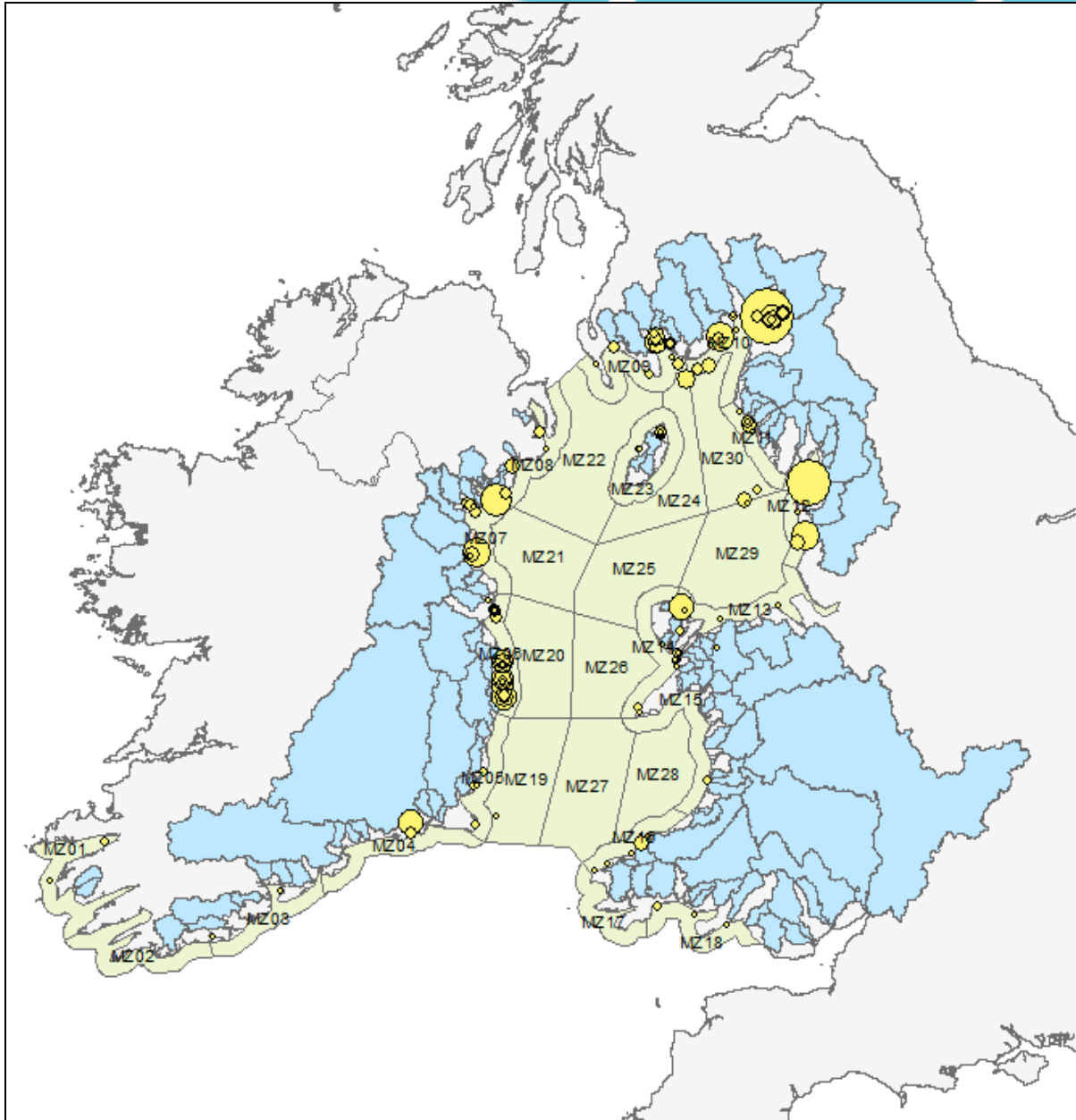
## The ideal

- Willingness to take part
  - Benefits?
  - Intervention, not just observation
  - Difficulty and practicality (night time, solo, time)
  - Fish welfare concerns (handling, sampling, release)
- The importance of individuals
- Scale collection licensing (UK)
- Biases

## Reality



# Marine sampling



## ➤ Scientific sampling

Inshore, offshore,  
estuarine

➤ 1257 fish (92%)



## ➤ Anglers

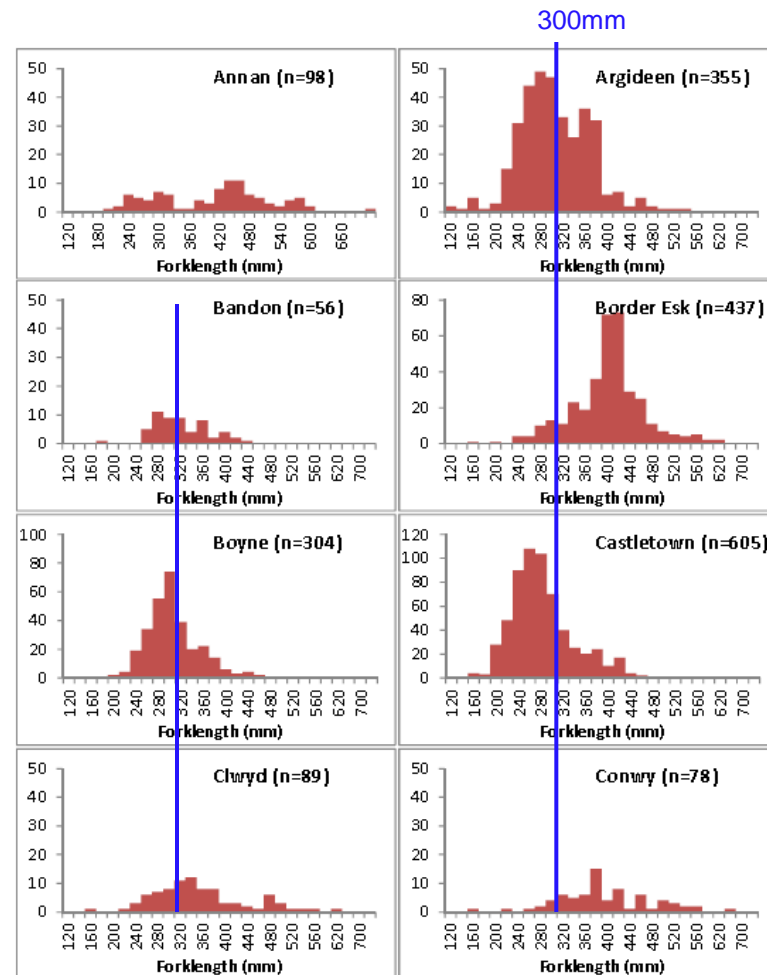
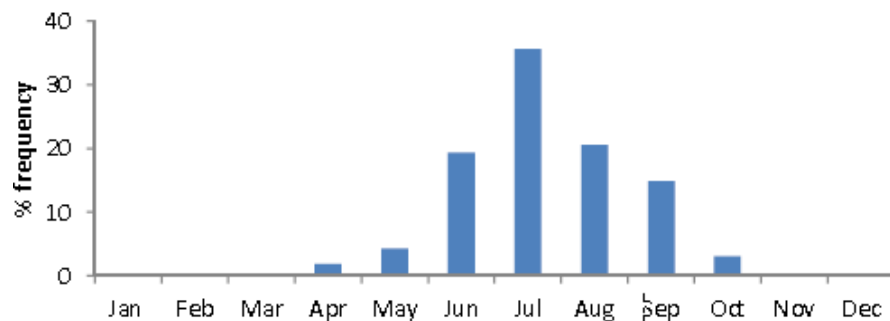
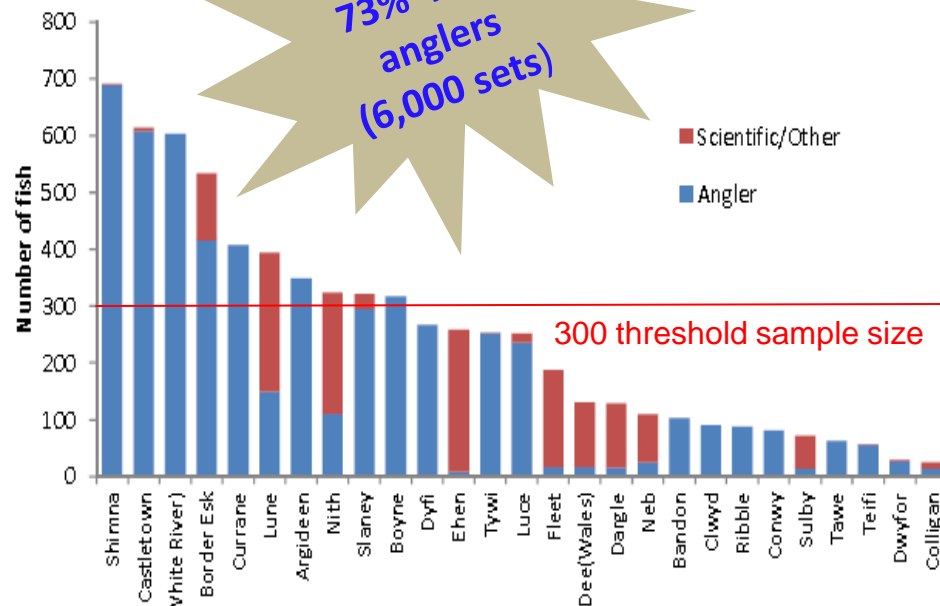
➤ 110 fish (8%)





# River sampling

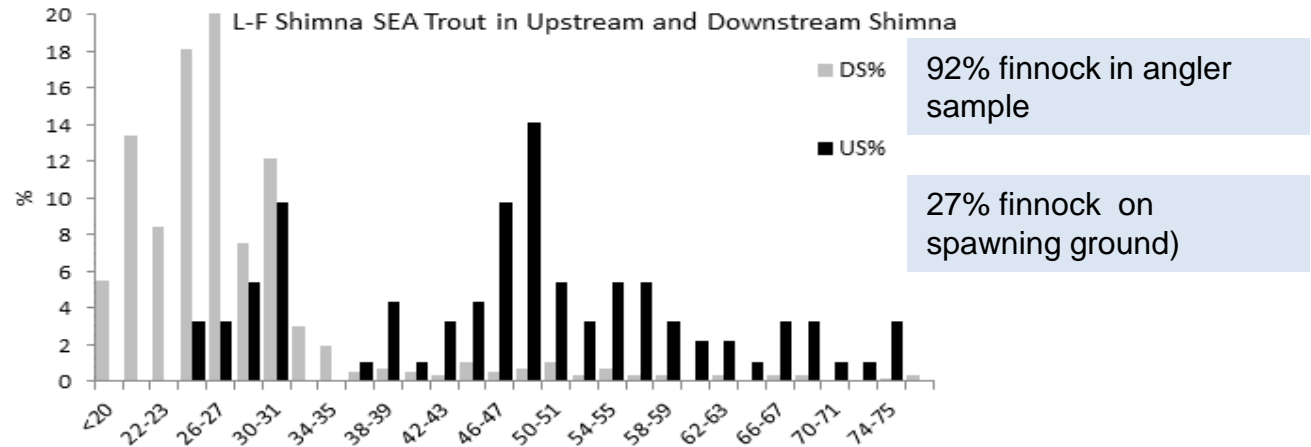
73% from  
anglers  
(6,000 sets)



# Angler sampling bias

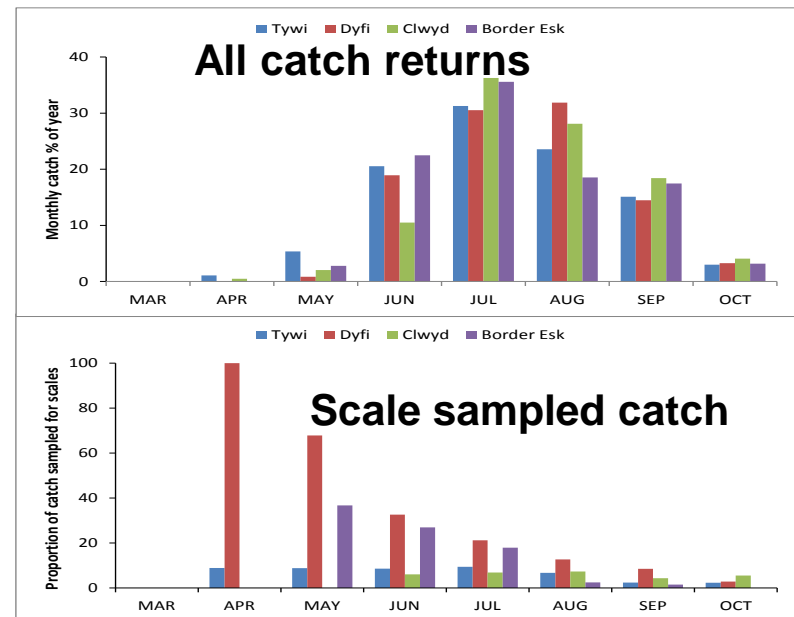
## 1. Location

- Shimna anglers sampled lower river stock

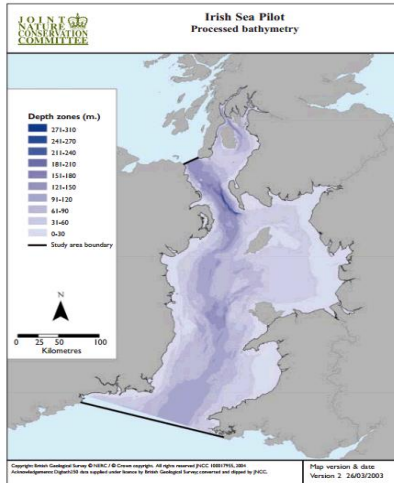


## 2. Season (Harris 2002)

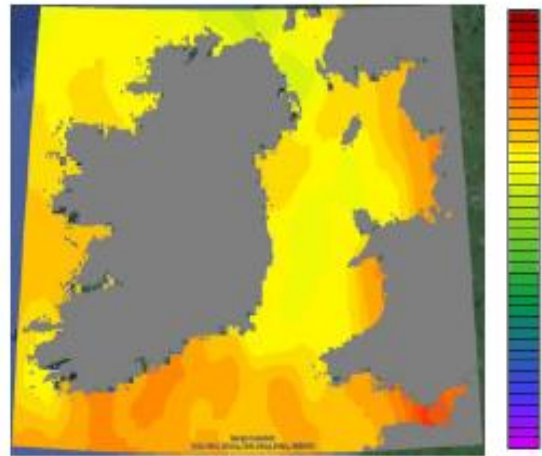
- Good sampling rate, but biased
- Oversample early run,
- Undersample late run
- Runs have different age structures
- Can be corrected, if independent run estimate



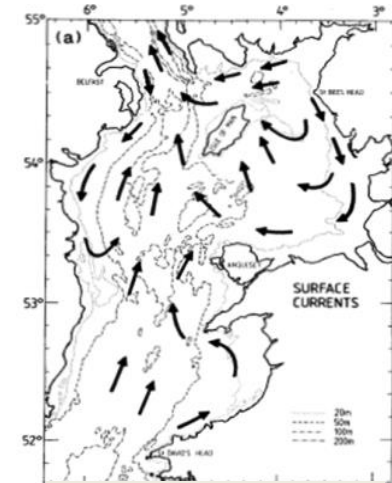
# Marine habitats of Irish Sea



Bathymetry

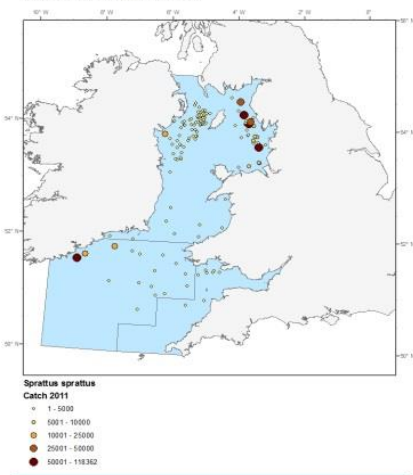


Summer sea temperature

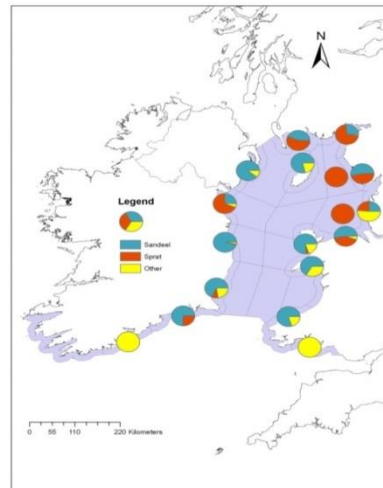


Currents

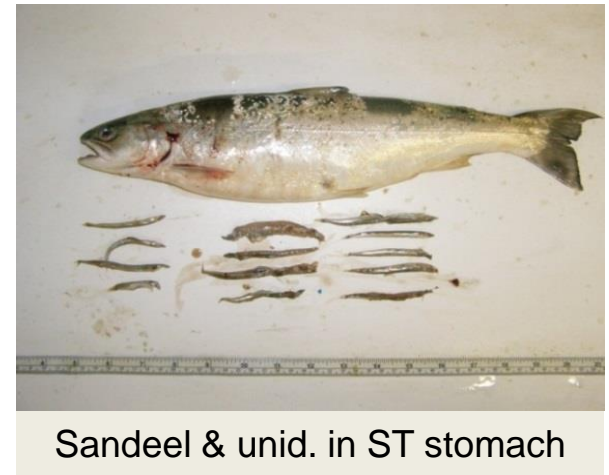
Sprat (*Sprattus sprattus*) distribution in ICES areas VIIa/VIIb/VIIg based on 2011 catch numbers



Prey (sprat) abundance



Sea trout diet spatial variation



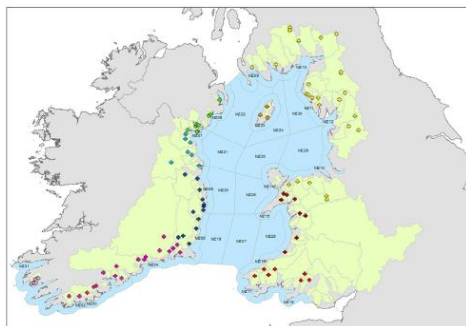
Sandeel & unid. in ST stomach



# Results

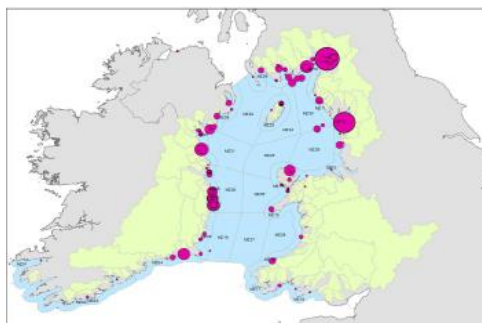
## Stock structuring and mixing (genetics and microchemistry)

- Baseline genetic maps: 9 distinct groupings
- Genetic assignment of marine-caught fish back to groupings
- Mixing evident, more northwards dispersal?
- Functional (breeding) role unclear...but potential mixed stock fisheries

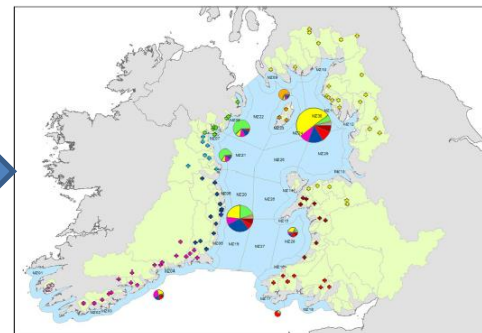


9 genetic groups (baseline  
FW sampling)

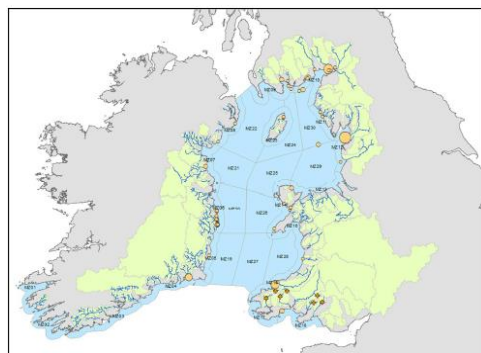
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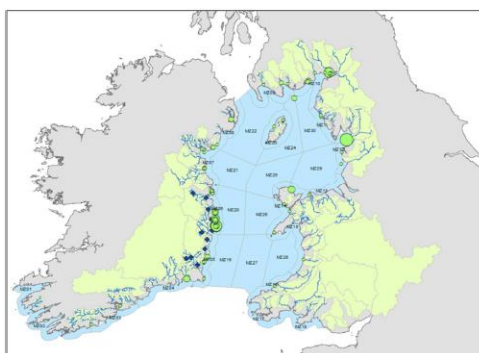
Marine sampling for  
assignment



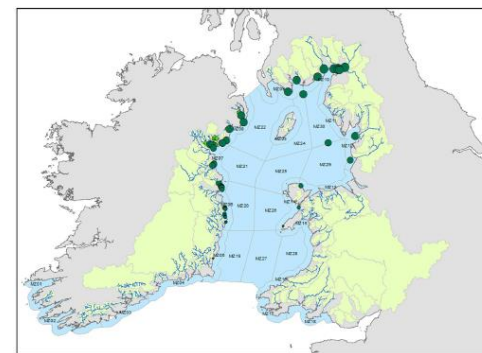
Mixing: Irish E coast fish  
comprise many from E&W&S



Assigned to S wales



Assigned to SE Ireland



Assigned to N Ireland

# Results

## ➤ Spatial variation in age structures

Pie size = N sample

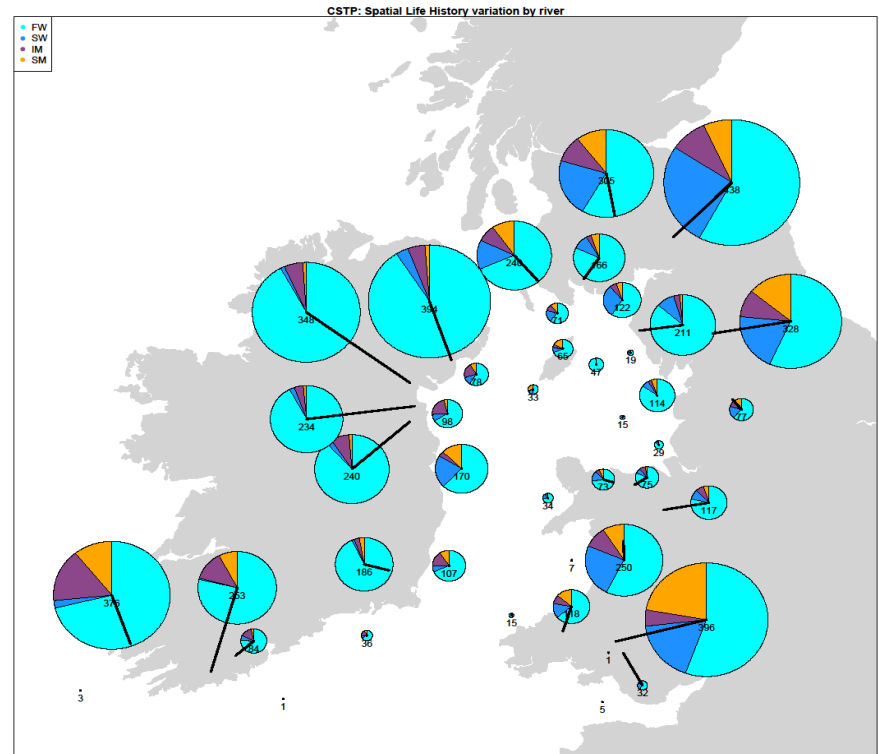
FW age

SW age

IM

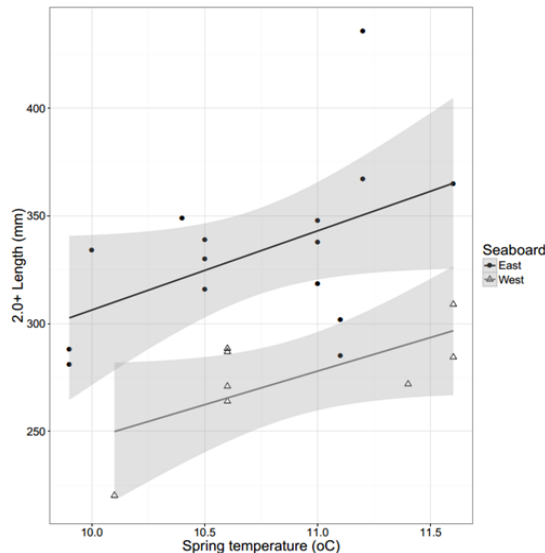
SP

- Prevalence of finnock in SE Ireland
- Multiple spawners on W sea board (E&W&S)
- Currane exception

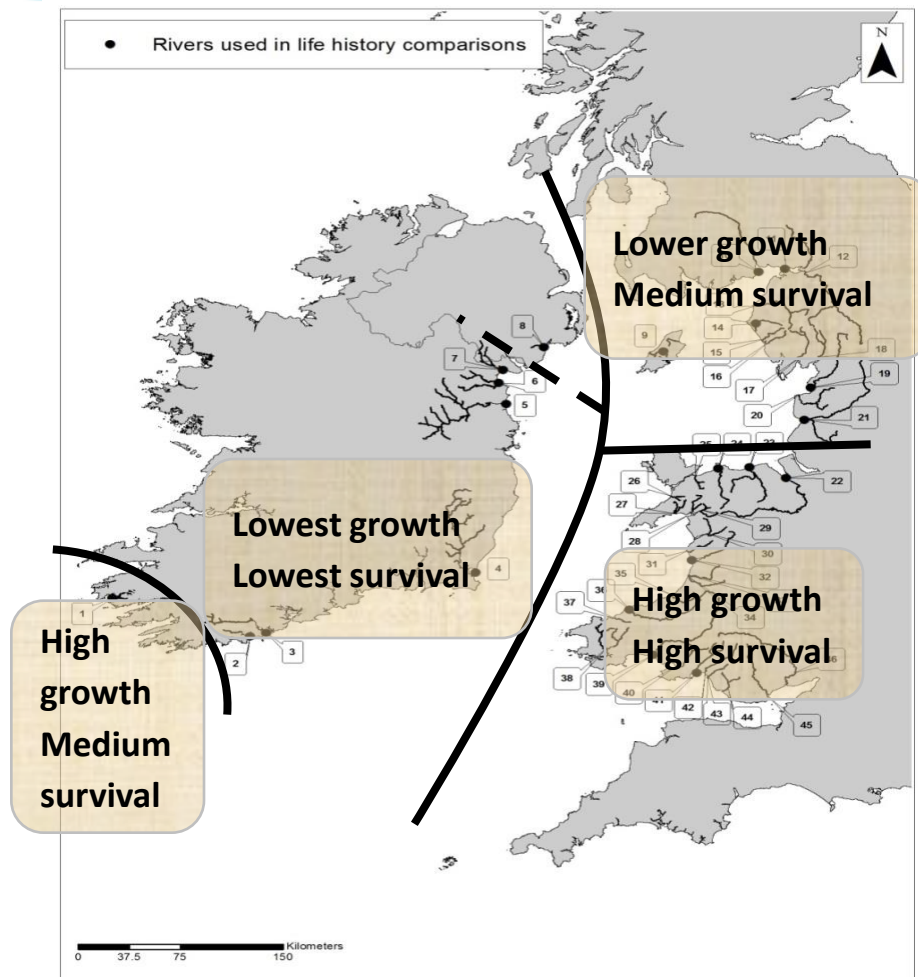


# Results

## ➤ Spatial variation in life history traits



Length increase with SST  
Bigger on eastern seaboard  
(E&W&S)



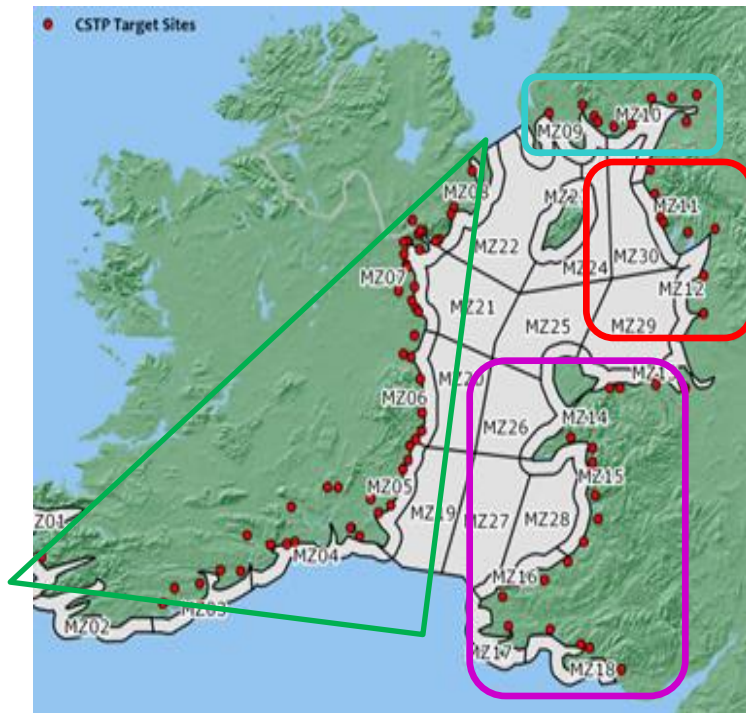
- Growth correlated with sea surface temperature (SST)
- Survival and % n.0+ (maturity index) correlated with size
- W (SE Ireland) seaboard: earlier AFM (1/%n.0+), associated with smaller size and lower survival
- Some exceptions...reflecting local marine and river-specific factors?



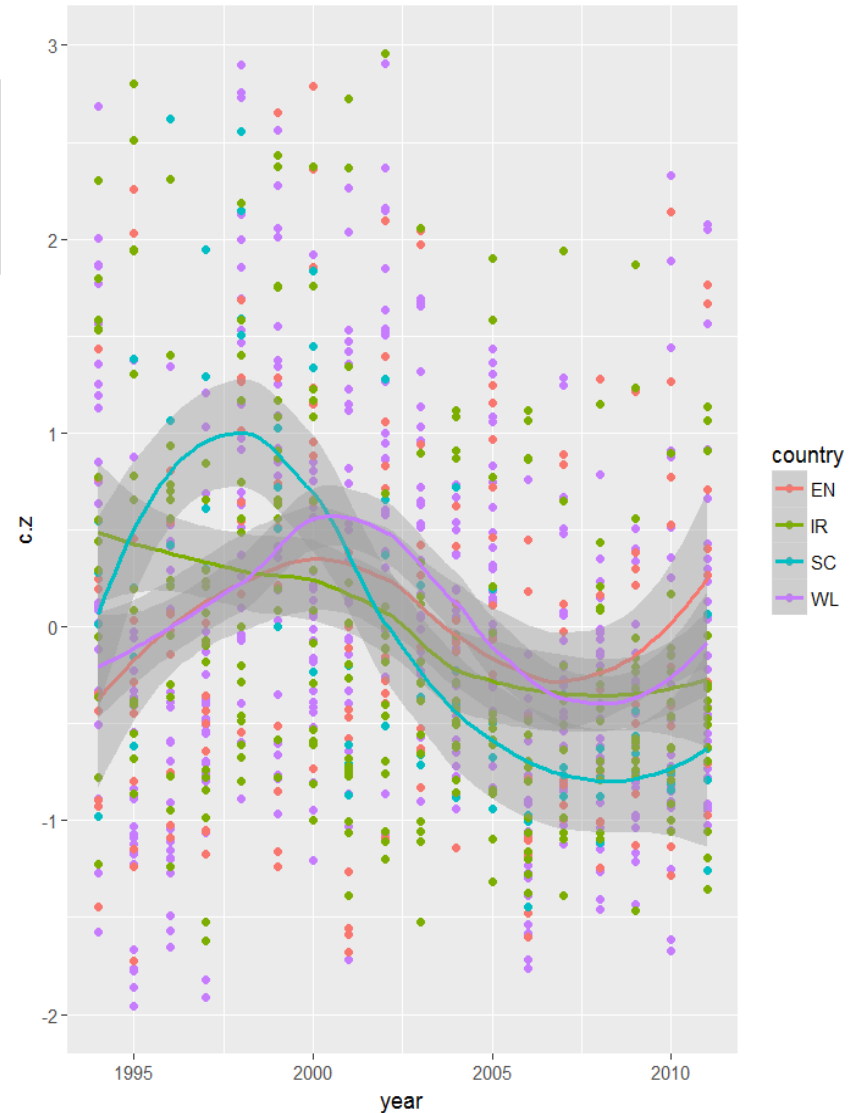
# Results

## ➤ Stock trends 1994-2011

- Mean annual rod catch for country/region
- Strong temporal coherence ( $V_t = 34\%$ )
- Common factors acting on stock?

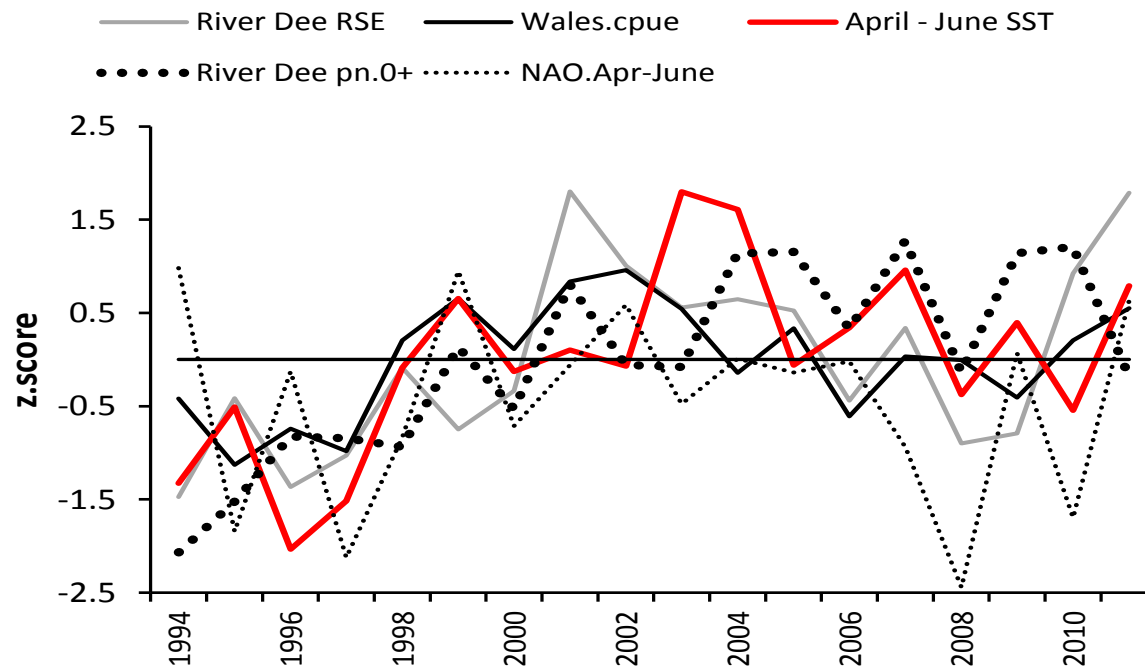


{ISEWR4.R}

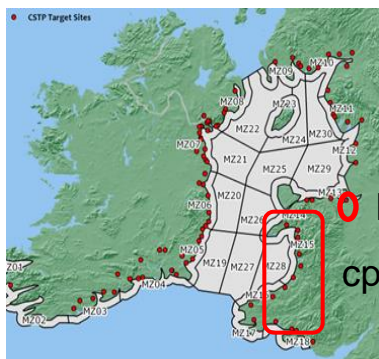


# Results

## ➤ Climate and stock trends 1994-2011

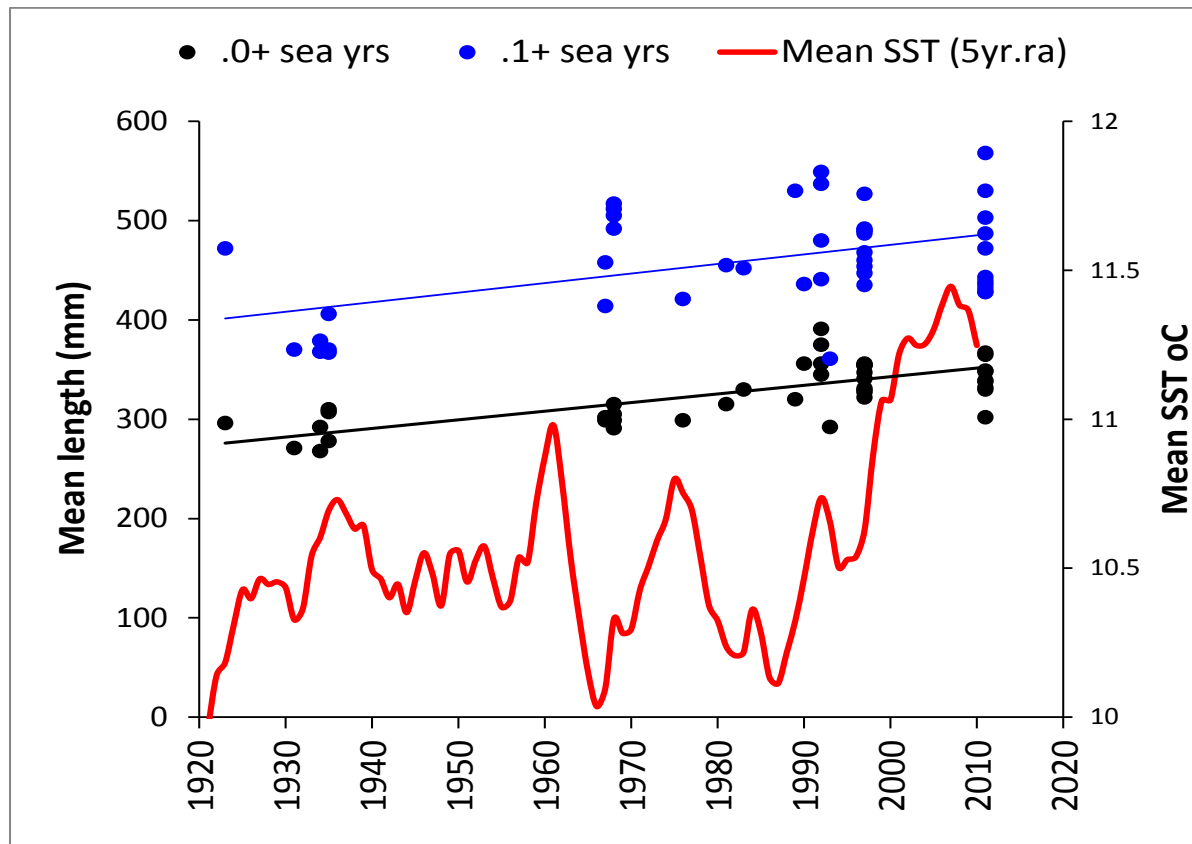
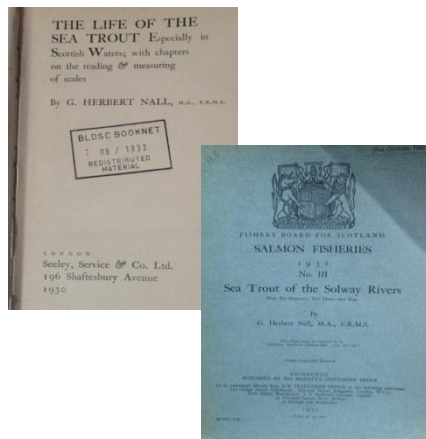


- Of the environmental covariates, spring SST was significant for all stock indicators.
- Corresponds with early post-smolt period



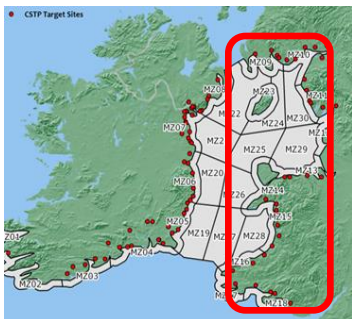
# Results

## ➤ Long term climate and growth trends



### Multiple historical sources:

- Length increase 1930-2010, n.0+ x 25%; n.1+ x 19%
- SST increasing at 0.3°C / decade since 1960

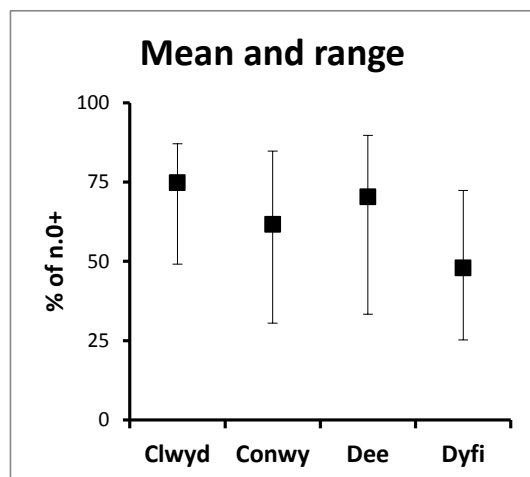
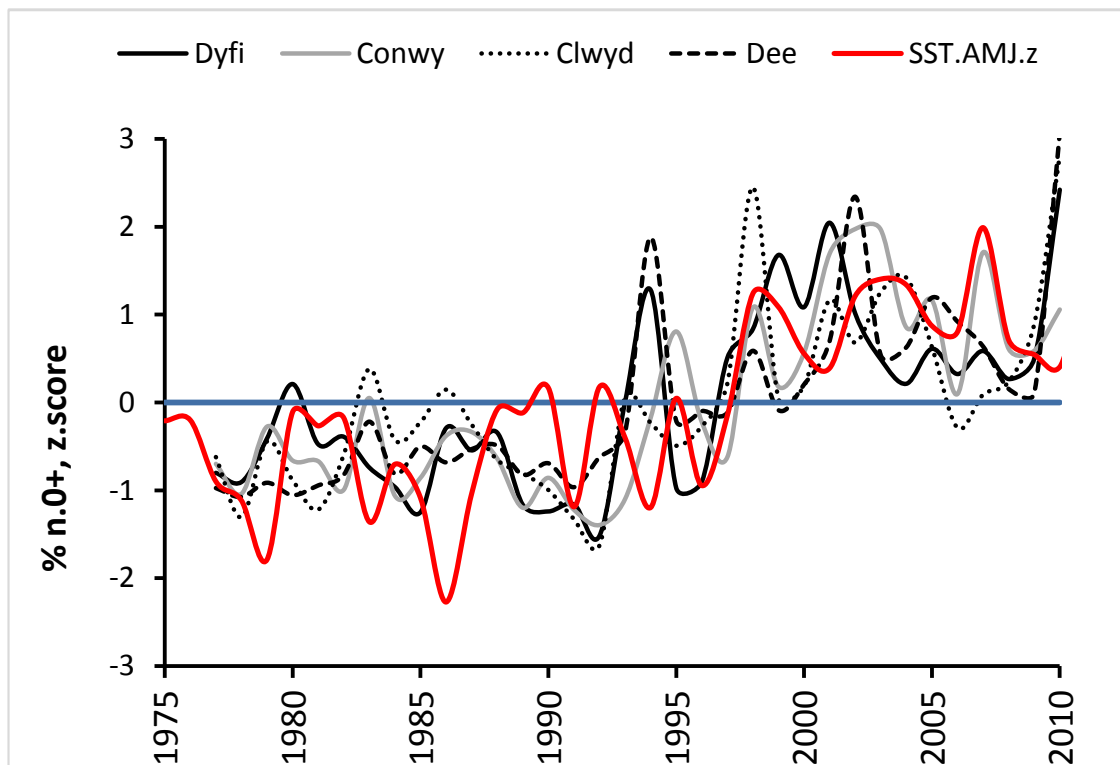




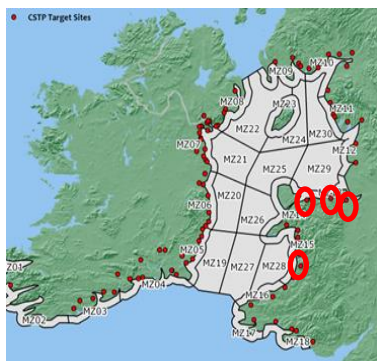
# Results



## ➤ Maturation timing (proprn finnock)change

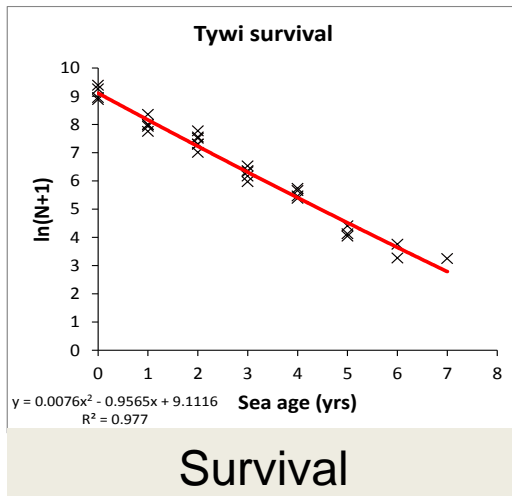


- Based on wt composition of rod catch (>0.8kg = finnock)
- Large increase (+28% to +96% in 35yrs) & synchronicity in **abundance** and **% of n.0+**
- No detectable survival change, so earlier maturation
- Corresponds to LH theory: faster growth - earlier maturation

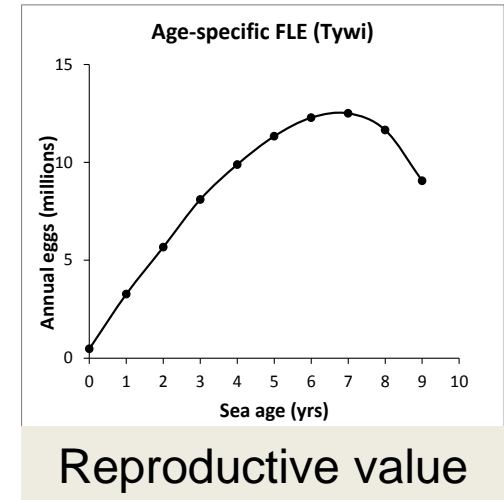
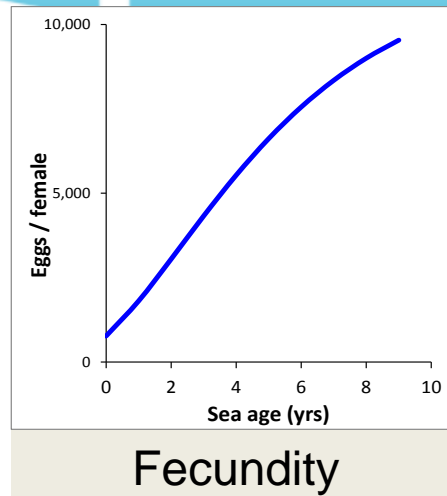


{finnock|proprn}

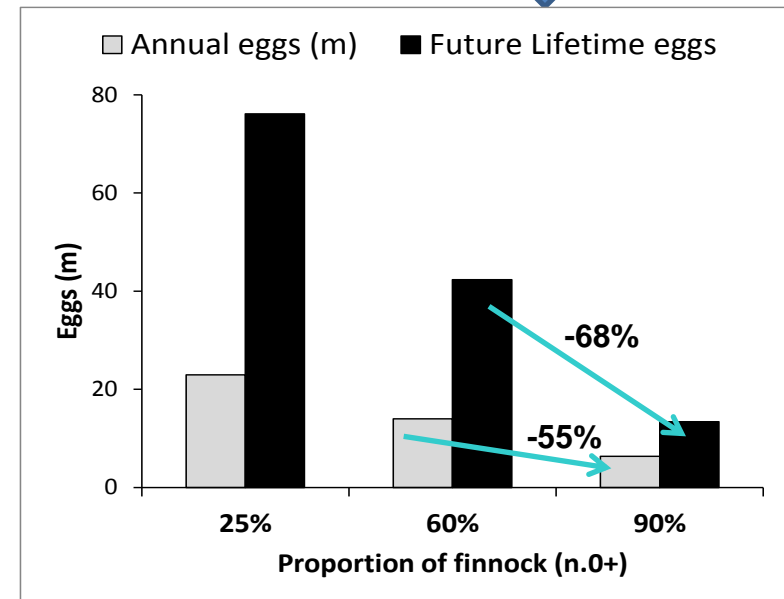
# Example life history effect



X



- A major temporal shift appears to be earlier maturity (AFM)
- Simulation of AFM change indicates substantial effects on reproductive capacity
- e.g. increase in n.0+ from 60% to 90% causes 68% loss of RV and 55% loss of annual eggs
- Speculative: resident effects, compensatory trait effects unknown



# Summary conclusions

## ➤ STOCK MIXING

- **Dispersal and mixing.** Genetics shows 9 reporting groups and mixture of long distance dispersal + (mostly) local marine residency: probably driven by residual currents and food availability

## ➤ LIFE HISTORIES & MARINE ECOLOGY

- Substantial **spatial** variation in age / size structures
- **Marine growth** and **survival** appear linked with broad scale marine hydrographic and environmental factors, modified by river/estuary-specific factors
- Evidence of common **temporal** stock trends + local effects (response to common factor/s?)
- Temporal shifts since 1970s in growth rates and **maturation timing** has affected stock composition and appears linked to climate

## ➤ IMPLICATIONS

- Does the mixing and exchange offer **portfolio effects**, conferring resilience and stability on constituent stocks? NB needs to be functional (breeding straying)
- A degree of common cross-border management (*cf* **mixed stock fisheries**) is indicated
- **Climate change** acting on growth and maturation may affect future resilience
- Life table models (e.g. **future lifetime eggs**) offer complementary ways to compare environmental and fishing effects on populations.





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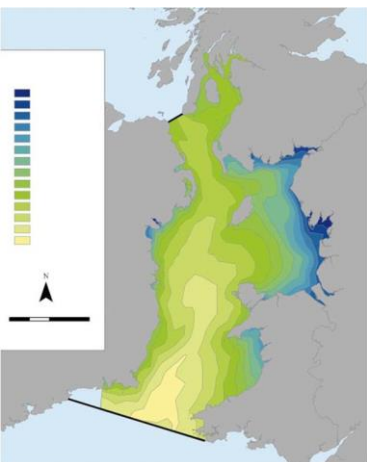
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