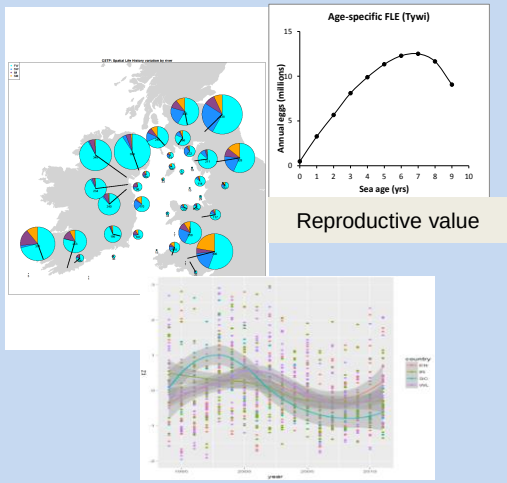
Working with Anglers for Sea Trout

IFI Conference

Athlone, 17/10/2017

Nigel Milner

APEM Ltd
and
Bangor University

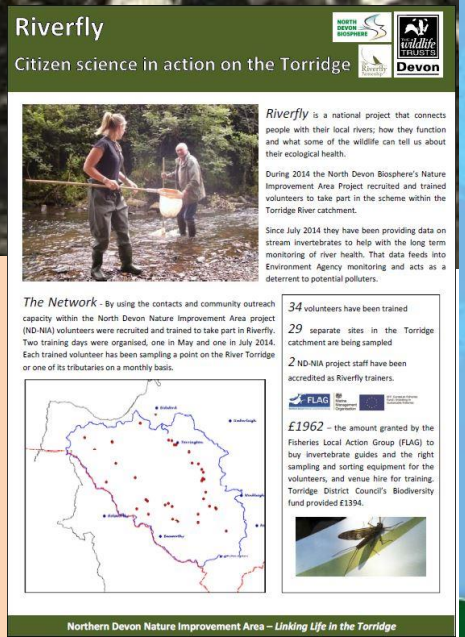


Reproductive value

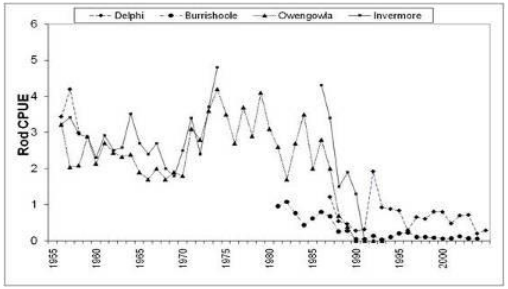
Citizen Science

Citizen Science

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



East Anglian Sea Trout Project

Moray Firth Sea trout Project

South coast ST project

SAMARCH

Atlantic Aquatic Resources Conservation

Shieldaig Sea Trout Project

Living North Sea

Celtic Sea Trout Project

1984 AST Symposium

1994 AST Symposium

2004 1st International Symposium

2011AST Workshop

2015 2nd International Symposium

2000? UK Fisheries Legislative Review Group

2016 ICES WKTRUTTA 3

2014 ICES WKTRUTTA 2.

1992 ICES Working Group

2004 Baltic Sea Trout Group

2012 ICES WKTRUTTA 1.

1985 1990 1995 2000 2005 2010 2015 2020

Doing

Bid to EU

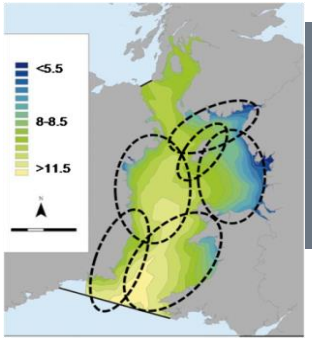
Reporting & Applying

Conception & Planning

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)

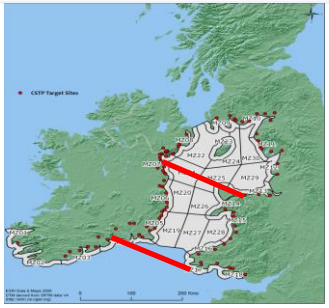
- EU Interreg IVA Ireland –Wales Cross-Border
- Sustainable regeneration , jobs
- Climate impact and resilience
- Negotiated geographical range

SOUTHERN & EASTERN Regional Assembly
Promoting Our Region

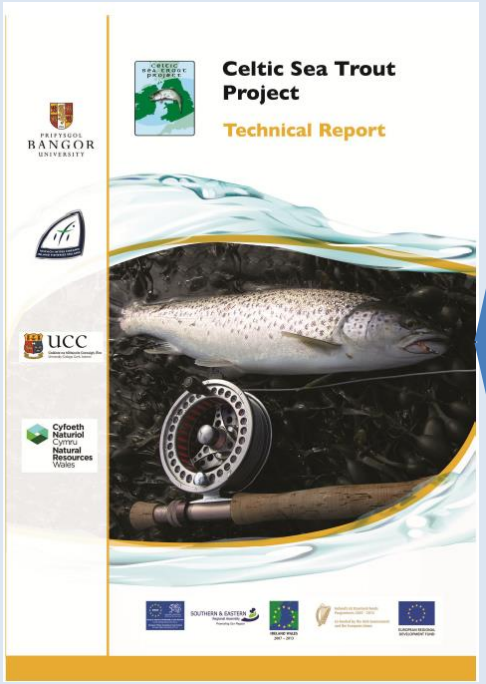
IRELAND WALES 2007 – 2013

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



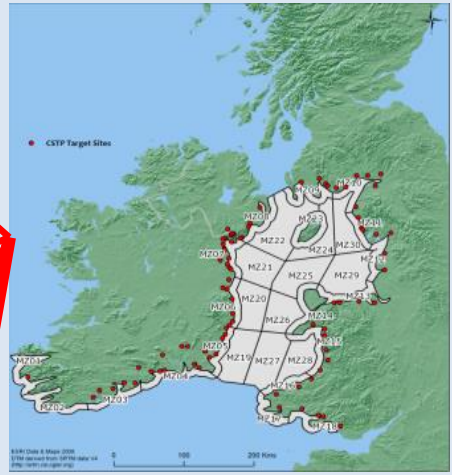
Sampling
- Design, season & location,
- Methods & organisation

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



Scales

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

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

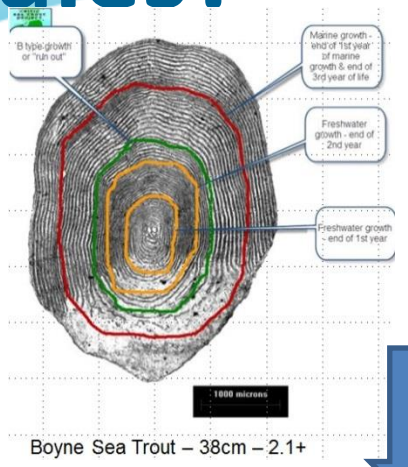
trade-off: increased **fitness benefits** of growth, eggs & colonisation opportunity *vs* increased mortality **risks** through long migrations, energy expenditure, predation and pathogens. **Influencing factors**: genes plus freshwater & marine habitats acting on / growth / survival / maturation.

Why did we need scales?

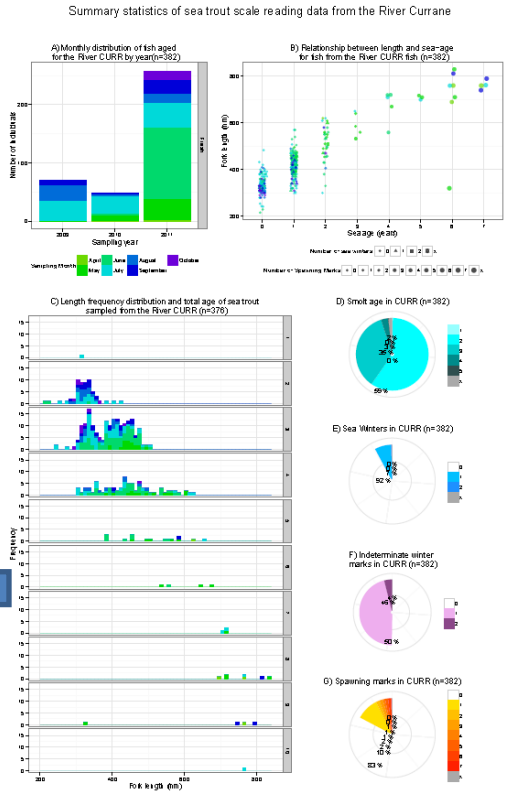
➢ Life history analysis…

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

➢ Scales: fish diaries



Boyne Sea Trout – 38cm – 2.1+



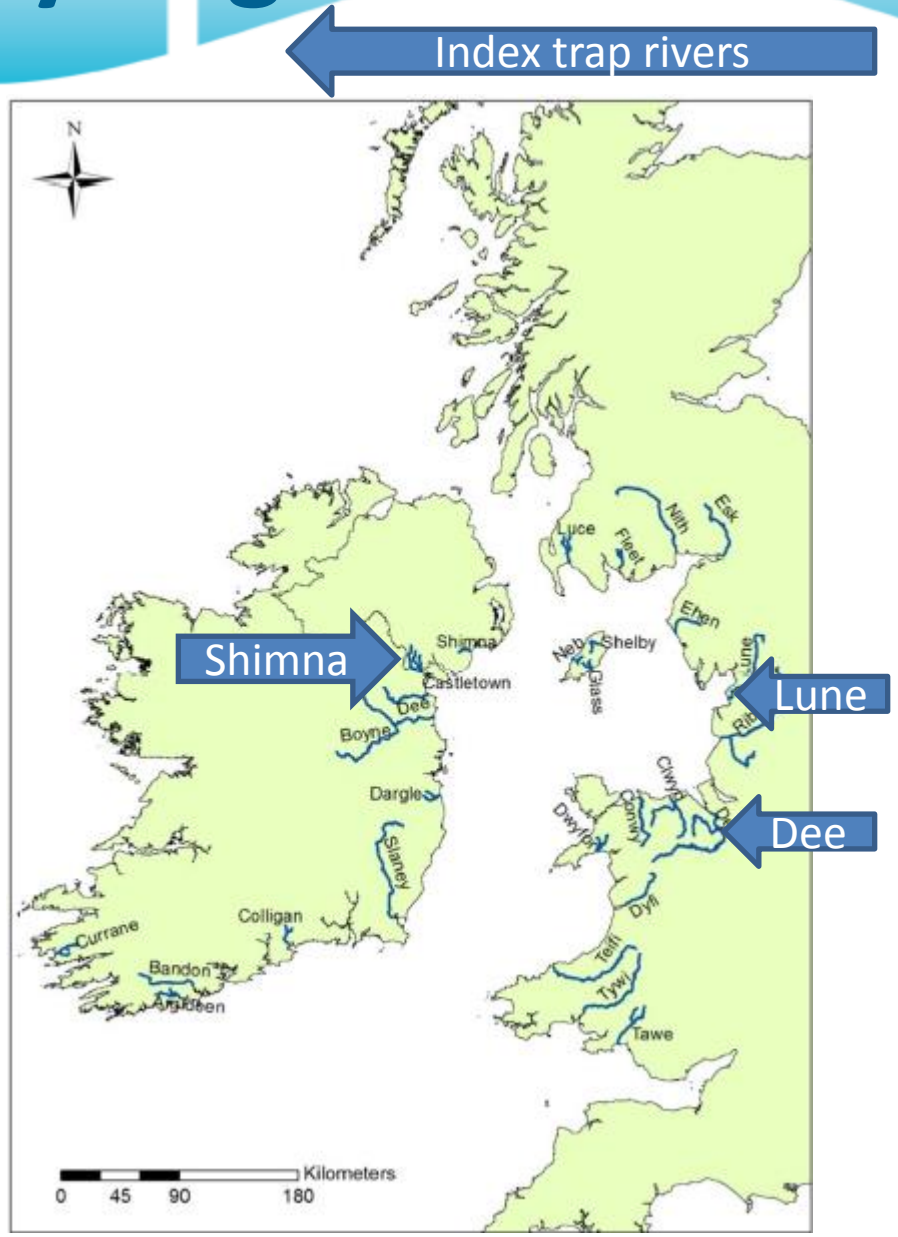
Life tables & population models

Sampling by anglers

- Only 3 index rivers (with traps)
- How to sample cost-effectively 25+ rivers?

Anglers!

- Planning & organisation
- Methods & practicalities
- Promotion and communication



Angler input requested

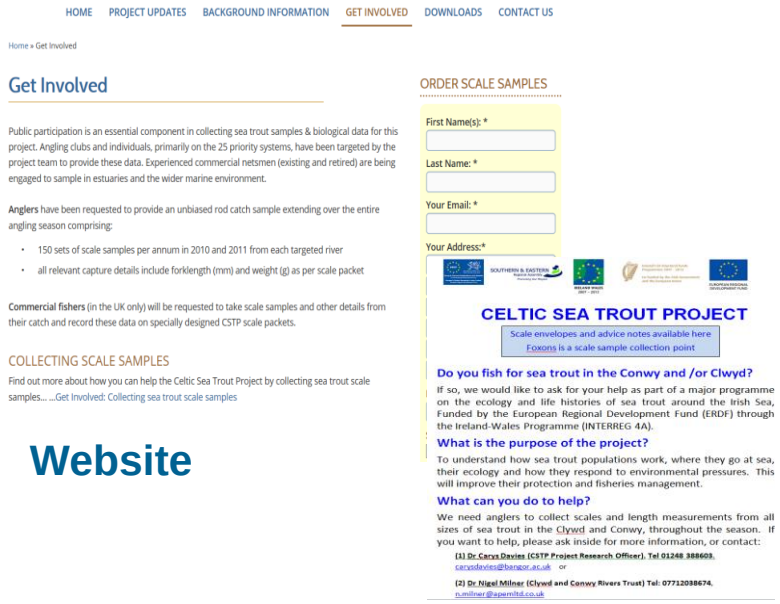
- **Sampling rod caught sea trout in 2010-12**
  - 300+ fish per river
  - **unbiased** through season & across sizes
  - Retained or returned fish
  - Kits & advice supplied
- **Basic information** (on scale packets)
  - date, place
  - 10-15 scales
  - fork length to 0.5cm (Wt to 25g)
  - marks, external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

Promotion and communications

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

Meetings & demonstrations

Guidance



Website

Invitation

Celtic Sea Trout Project, Angler Feedback, January 2011

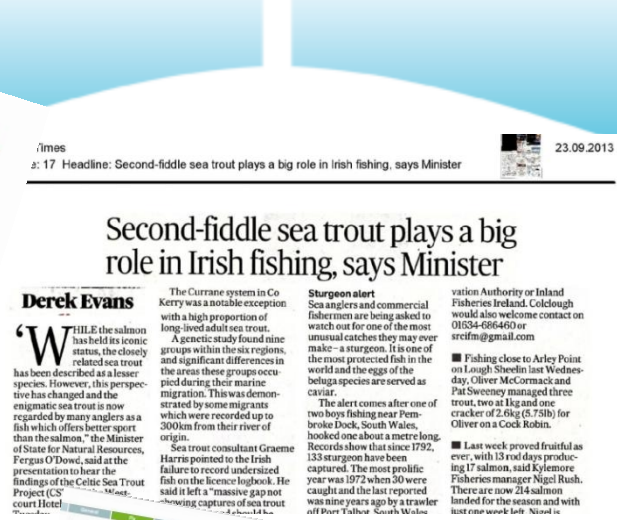
Introduction

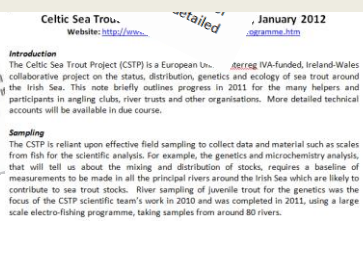
The Celtic Sea Trout Project (CSTP) is a European Union, Interreg IV-funded, Ireland-Wales collaborative project looking into the status, distribution, genetics and ecology of sea trout around the Irish Sea (http://www.celticseatrout.com/about/programme.htm). This note briefly outlines progress in 2010 for the many helpers and participants in angling clubs, river trusts and other organisations. More detailed technical accounts will be available in due course.

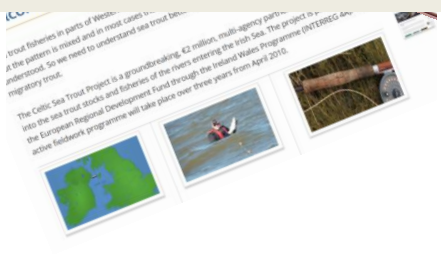
Feedback Newsletters

Policy support

Communications……

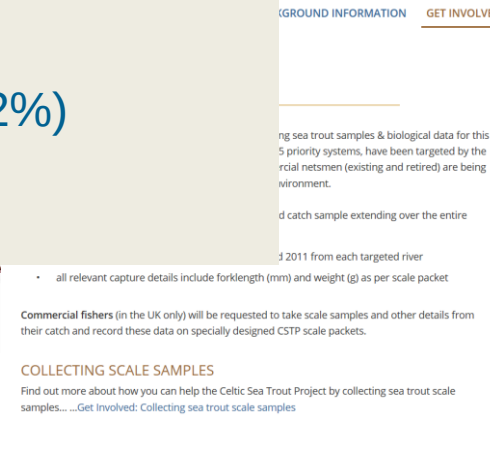






Result

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



Incentives….

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/about/programme.htm). Several key aspects of the project require scales 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:

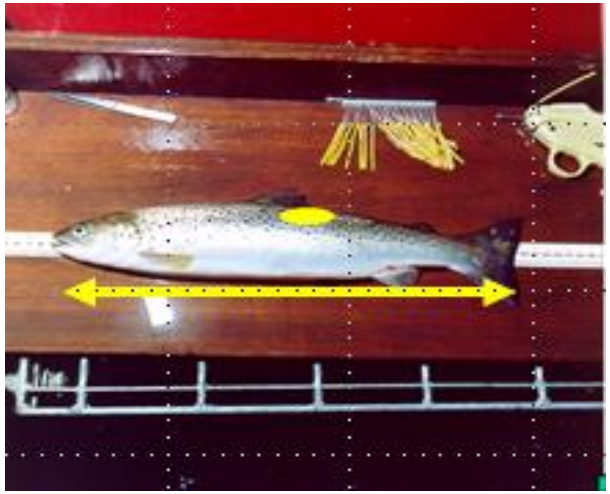
- A £**500 (€582)** tackle voucher prize to the angler submitting the most scales from our priority rivers in 2011.
- Three £**350 (€407)** tackle voucher prizes to each of the three 3 anglers who returned the most scales from priority systems in 2011 within each of other three regions: *Ireland (inc NI), Scotland and IoM, Wales, or NW England.*
- Ten £**100 (€116)** tackle vouchers to be awarded to 10 anglers to be drawn at random from the remaining scale samples submitted. (this includes samples submitted in 2010 and those from non-priority rivers 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.htm) or contact the relevant people below.

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

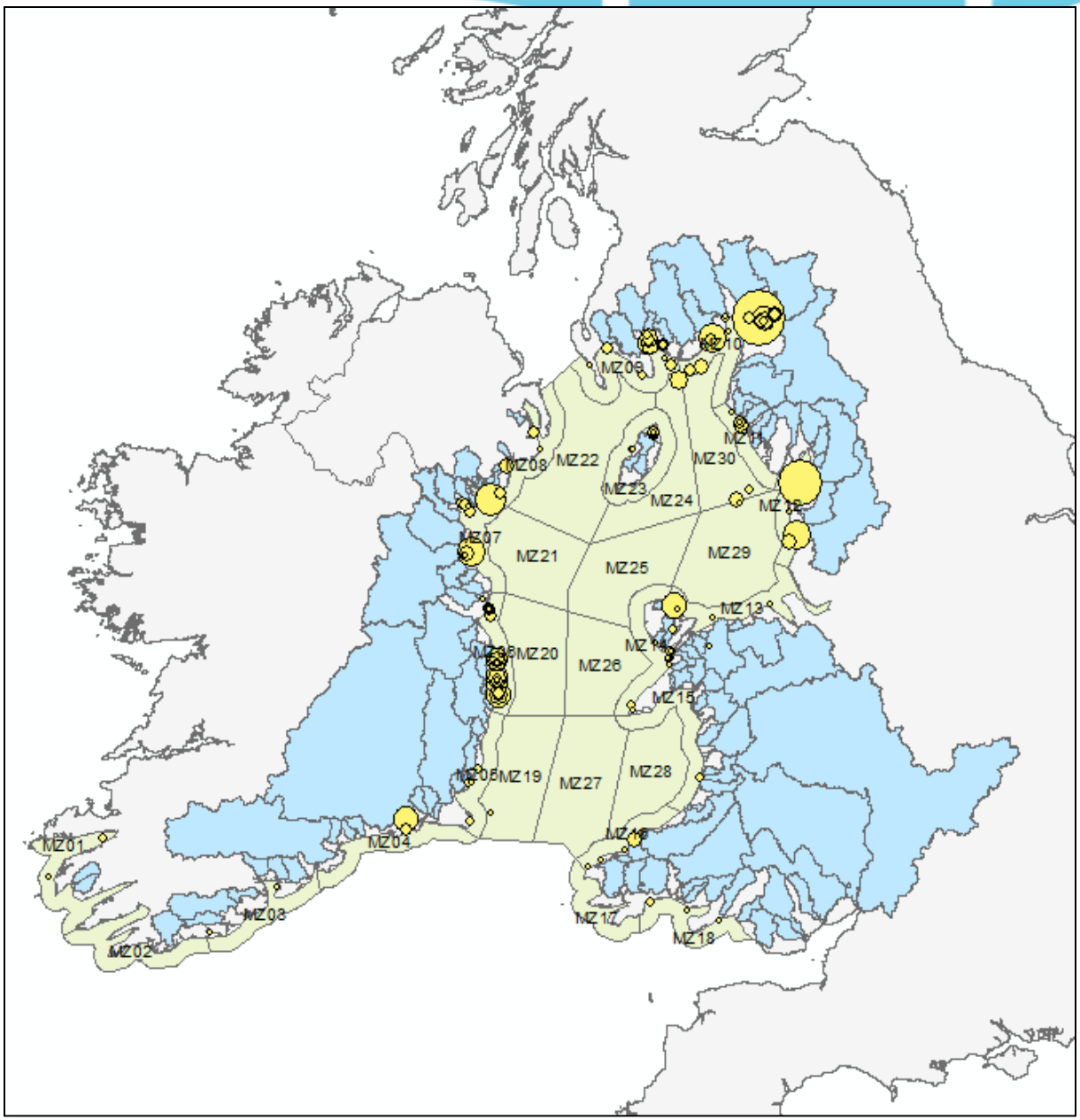
Problems of sampling by angling



The ideal **Reality**

- 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

Marine sampling

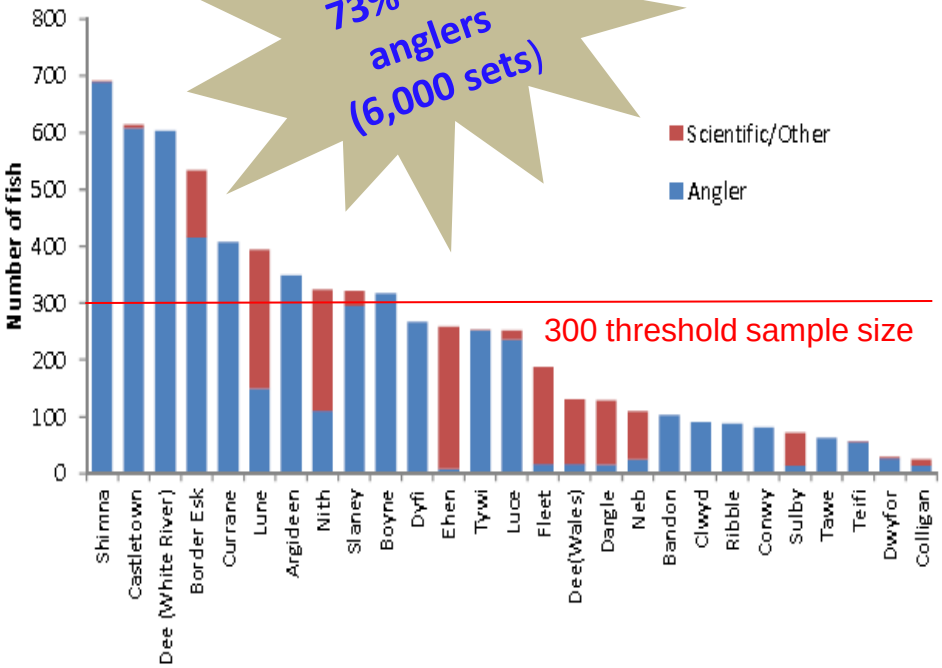


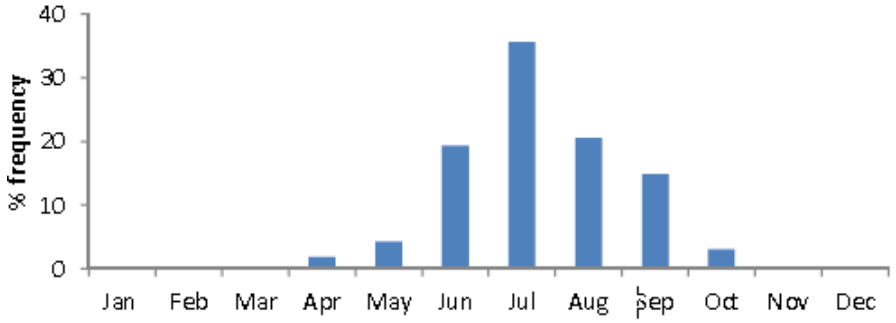
- **Scientific sampling**
  Inshore, offshore, estuarine
- 1257 fish (92%)

- **Anglers**
- 110 fish (8%)

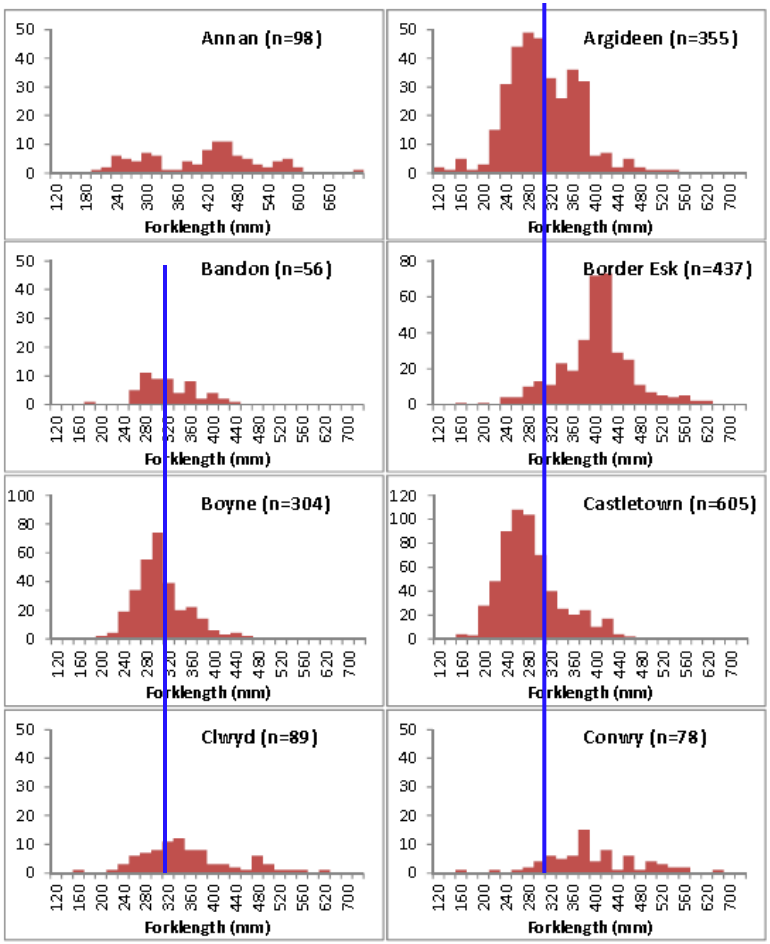
River sampling

73% from anglers (6,000 sets)





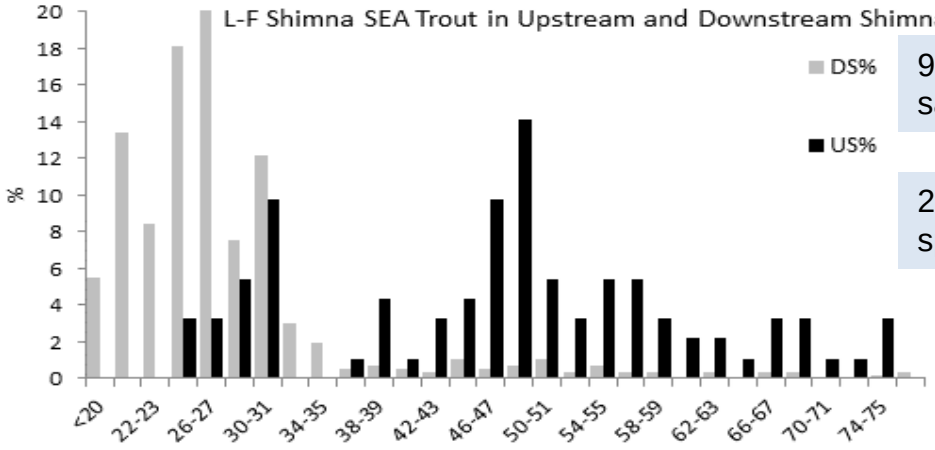
300mm



Angler sampling bias

1. Location

- Shimna anglers sampled lower river stock

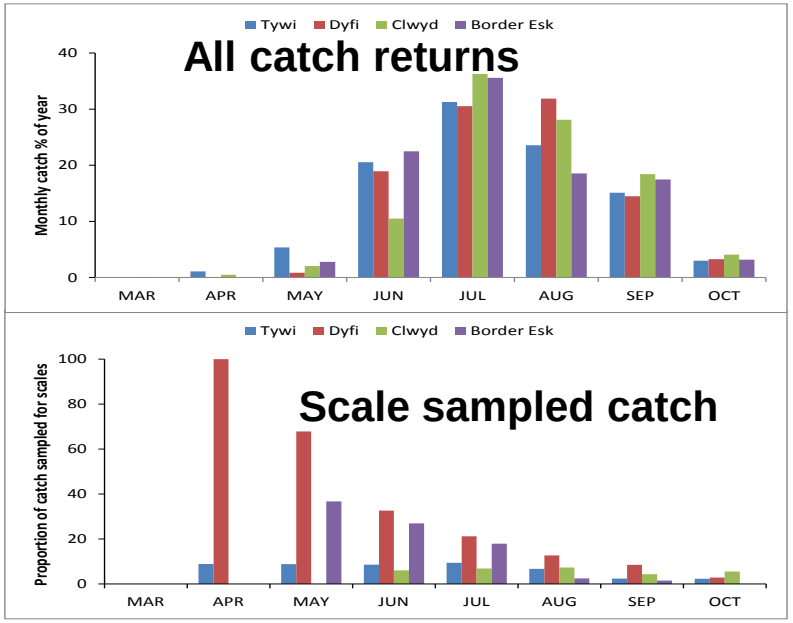


92% finnock in angler sample

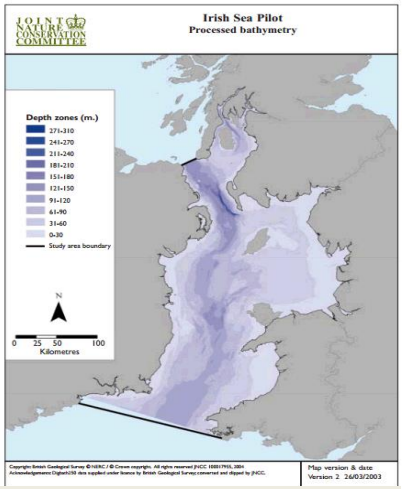
27% finnock on spawning ground)

2. Season (Harris 2002)

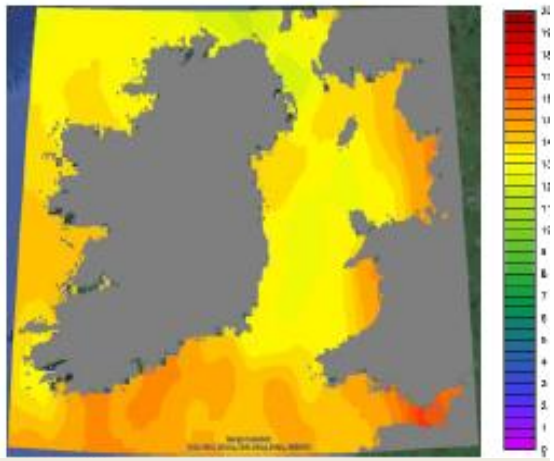
- Good sampling rate, but biased
- Oversample early run,
- Undersample late run
- Runs have different age structures
- Can be corrected, if independent run estimate



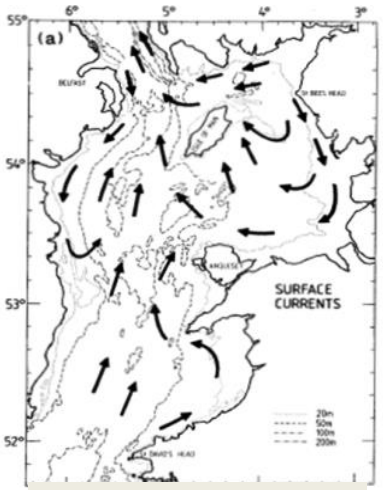
Marine habitats of Irish Sea



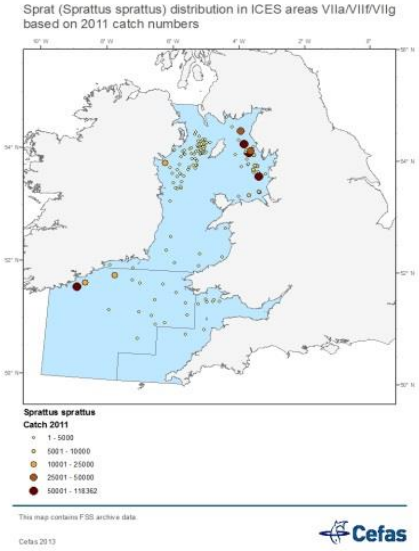
Bathymetry



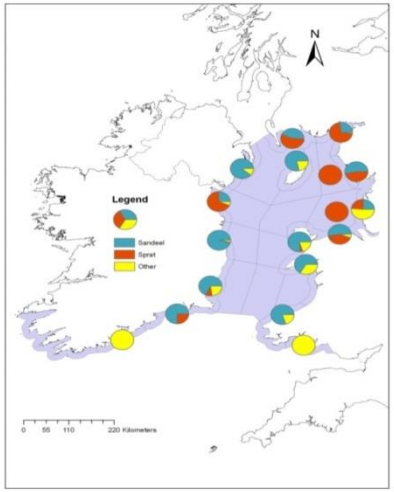
Summer sea temperature



Currents



Prey (sprat) abundance



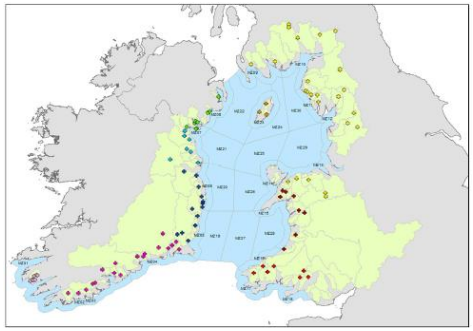
Sea trout diet spatial variation

Sandeel & unid. in ST stomach

Results

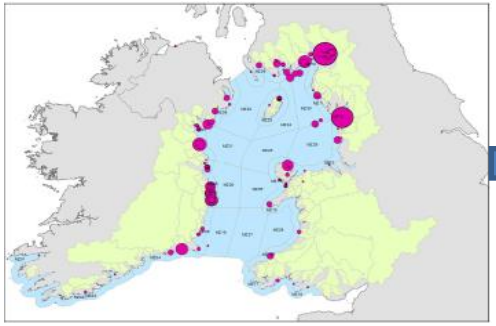
Stock structuring and mixing (genetics and microchemistry)

- 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

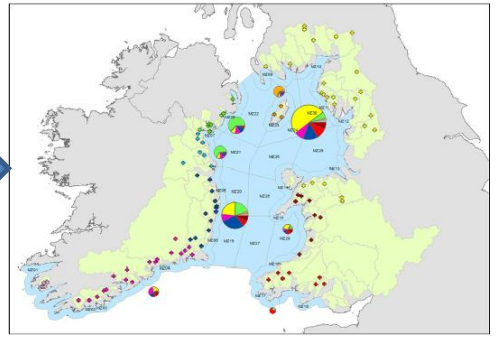


9 genetic groups (baseline FW sampling)

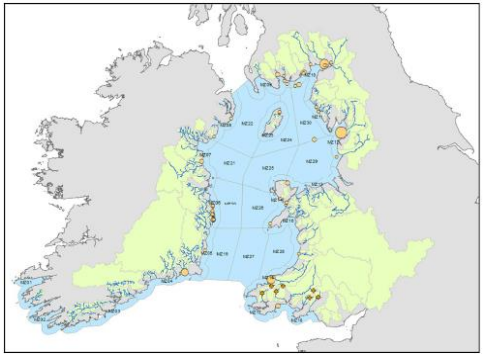
+



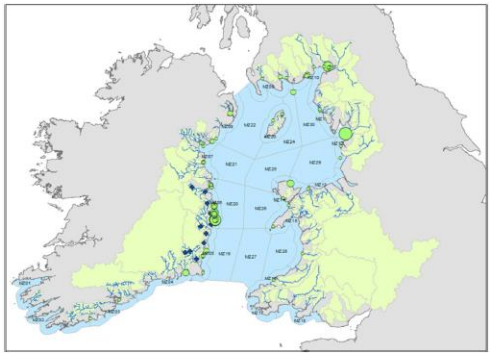
Marine sampling for assignment



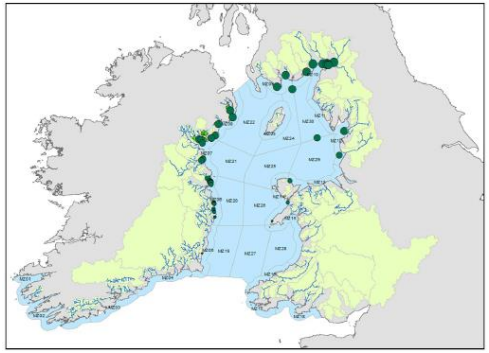
Mixing: Irish E coast fish comprise many from E&W&S



Assigned to S wales



Assigned to SE Ireland



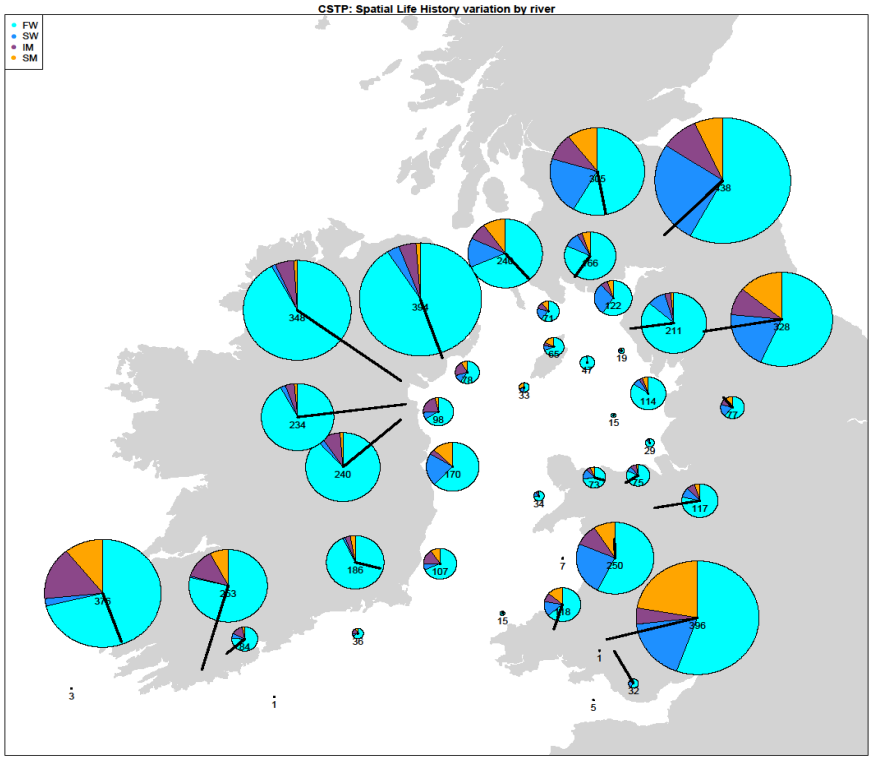
Assigned to N Ireland

Results

- **Spatial variation in age structures**

Pie size = N sample

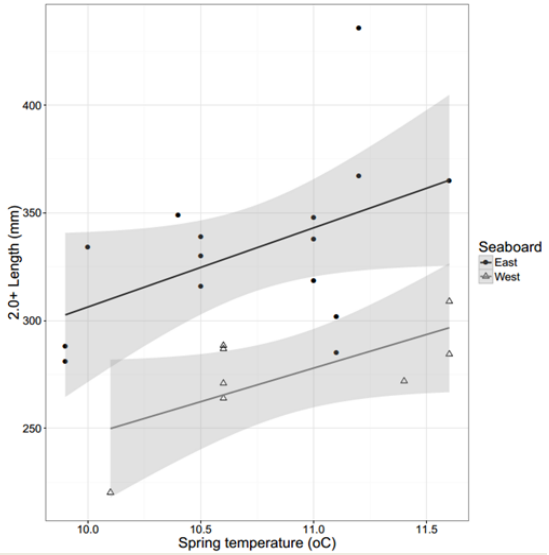
FW age | SW age | IM | SP



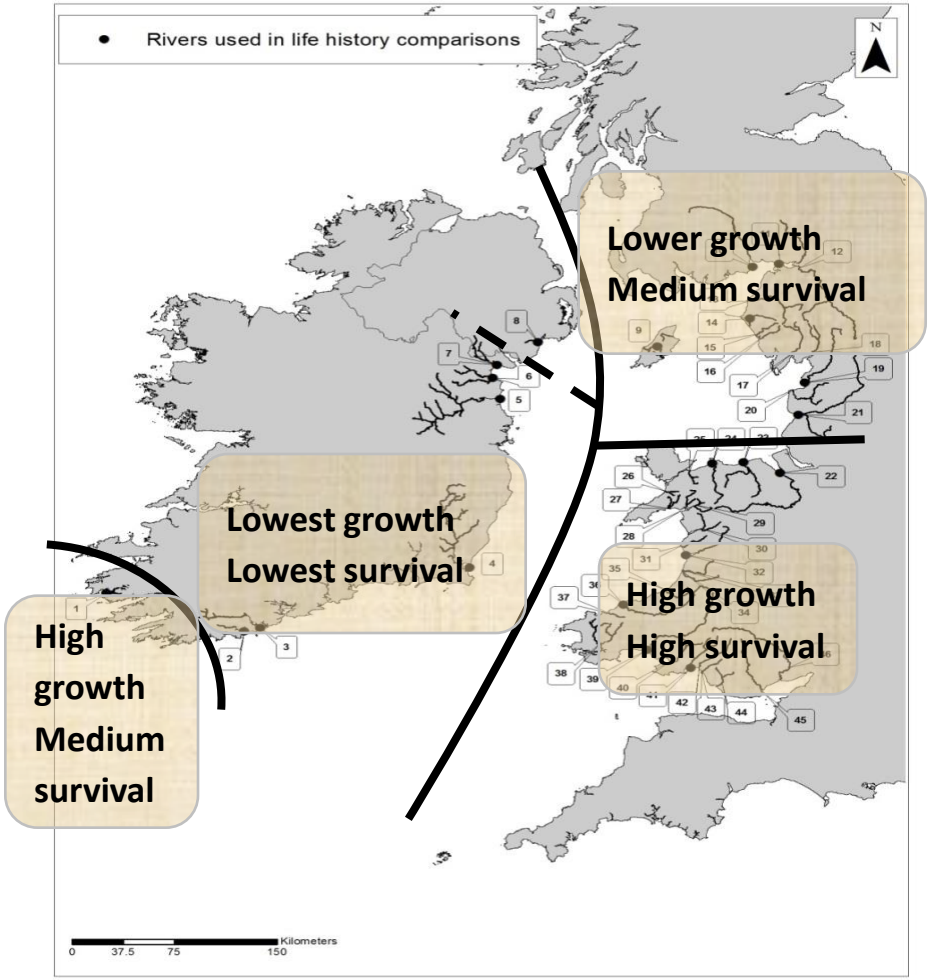
- Prevalence of finnock in SE Ireland
- Multiple spawners on W sea board (E&W&S)
- Currane exception

Results

- **Spatial variation in life history traits**



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

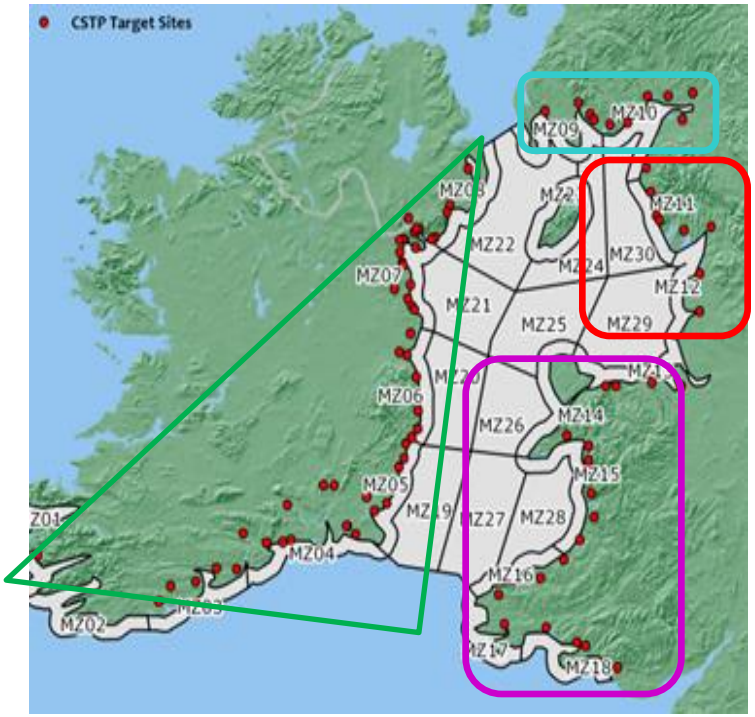


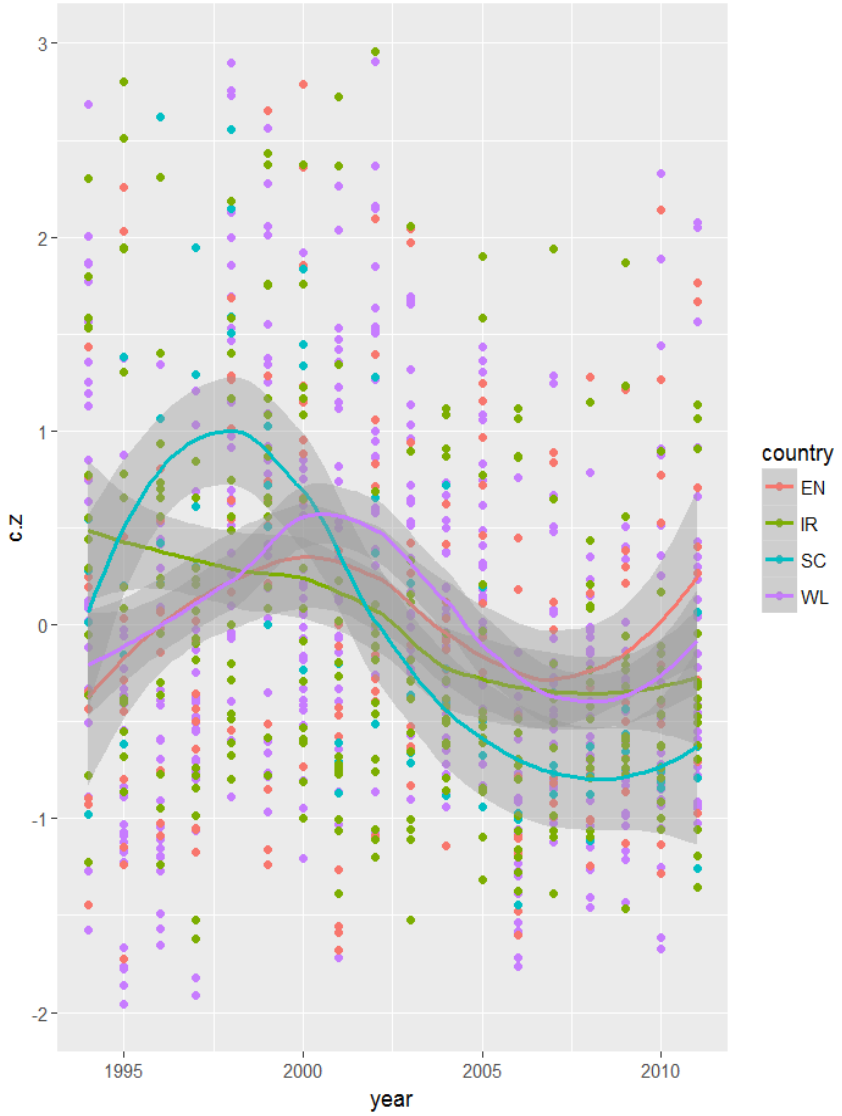
- Growth correlated with sea surface temperature (SST)
- Survival and % n.0+ (maturity index) correlated with size
- W (SE Ireland) seaboard: earlier AFM (1/%n.0+), associated with smaller size and lower survival
- Some exceptions…reflecting local marine and river-specific factors?

Results

- **Stock trends 1994-2011**

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





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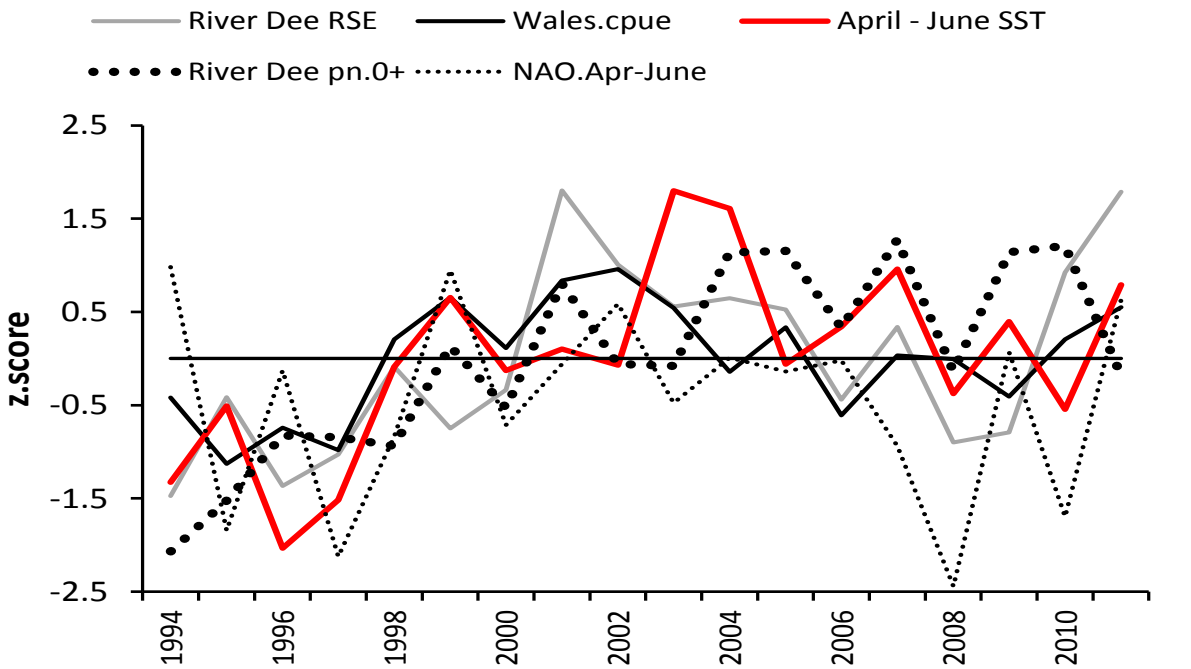
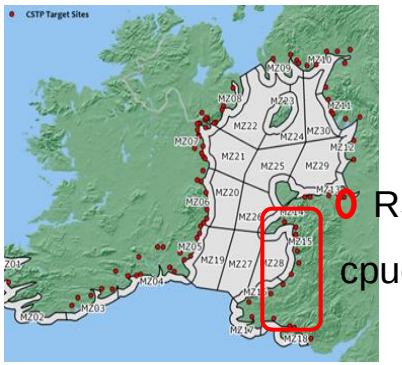
Results

- **Climate and stock trends 1994-2011**



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

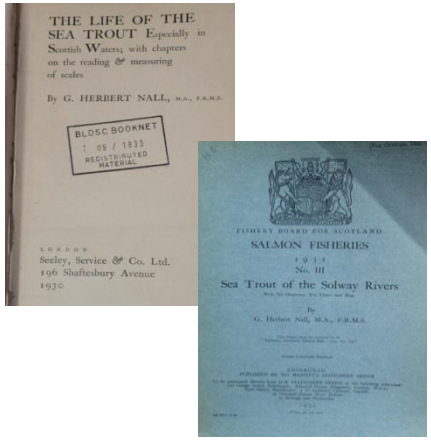


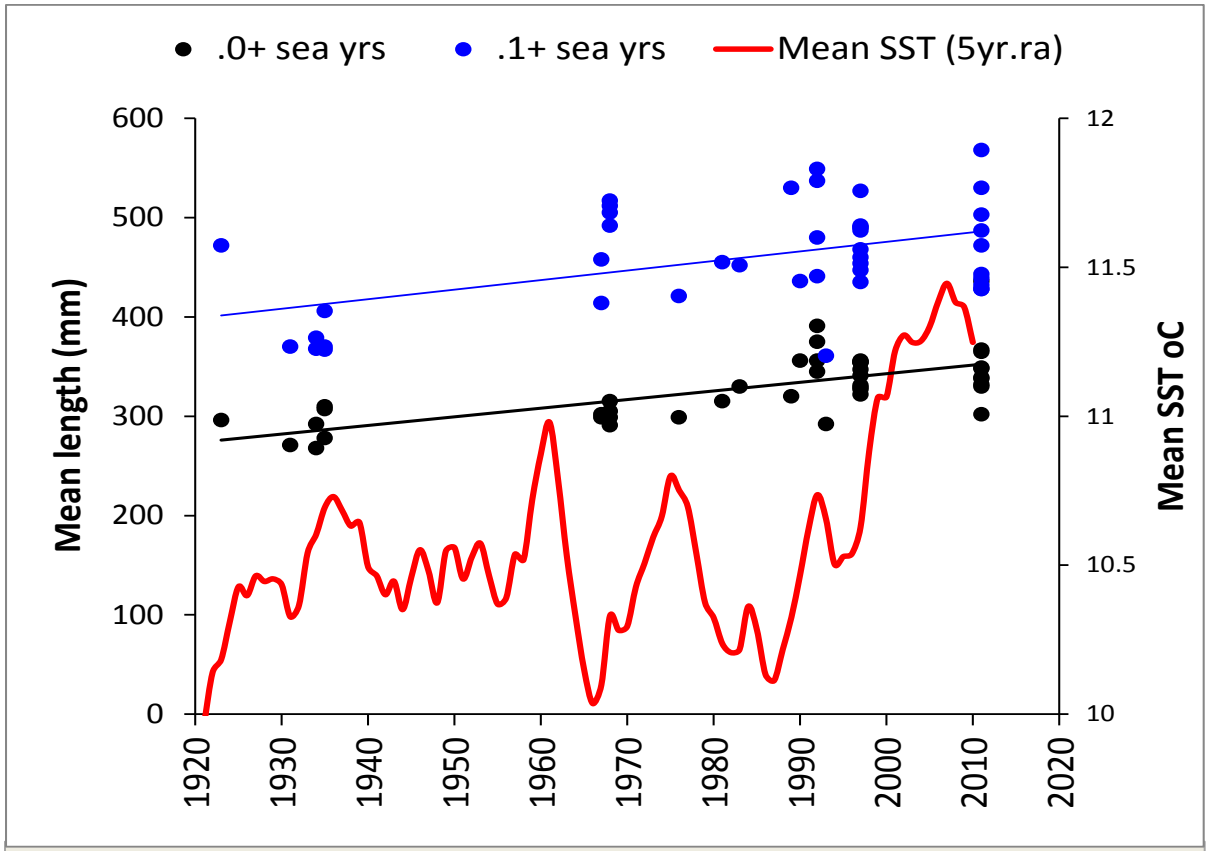
RSE/AFM

cpue

Results

- **Long term climate and growth trends**



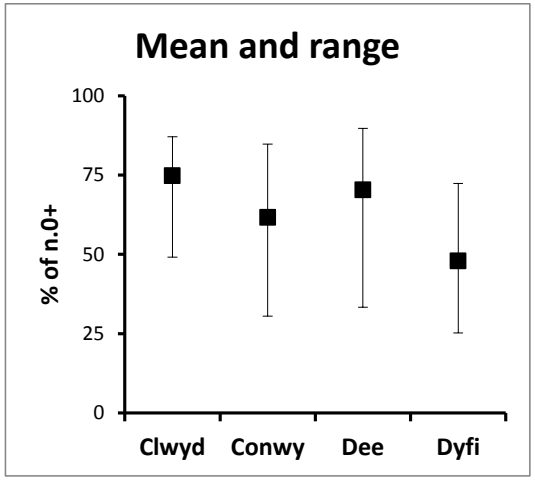


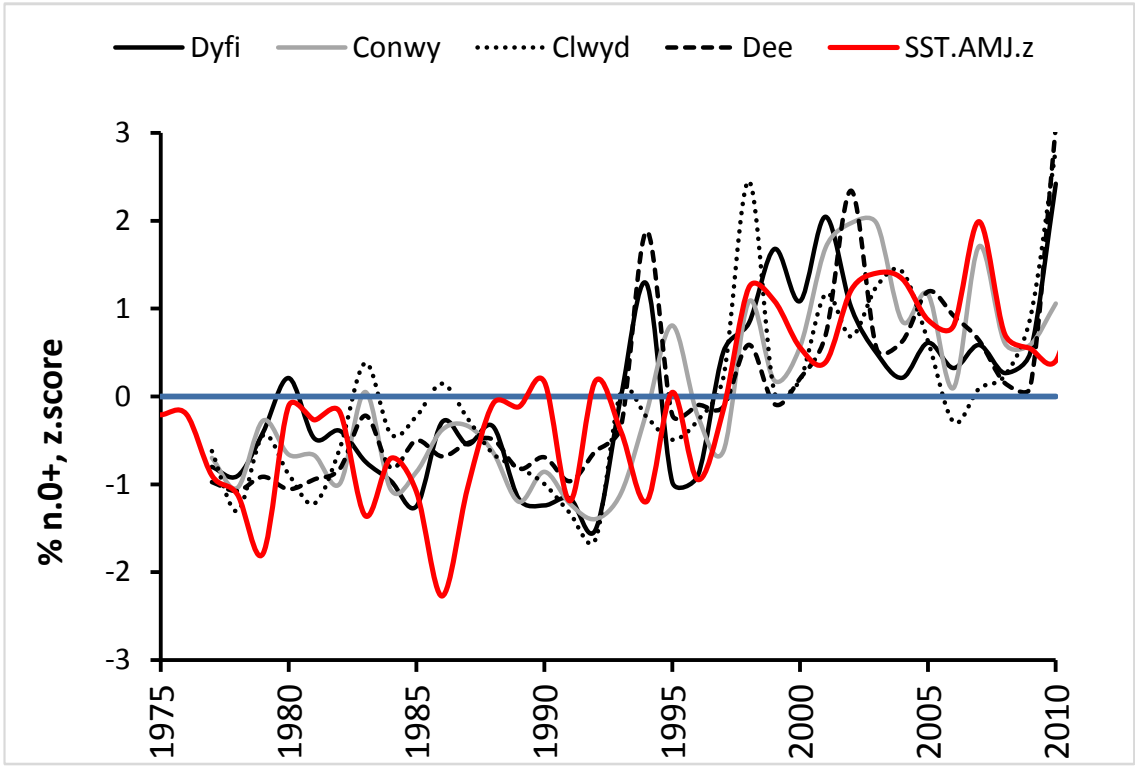
Multiple historical sources:

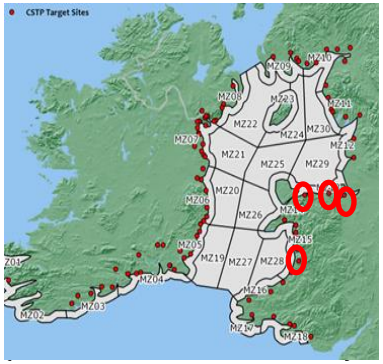
- Length increase 1930-2010, n.0+ x 25%; n.1+ x 19%
- SST increasing at 0.3ºC / decade since 1960

Results

➢ Maturation timing (propn finnock)change



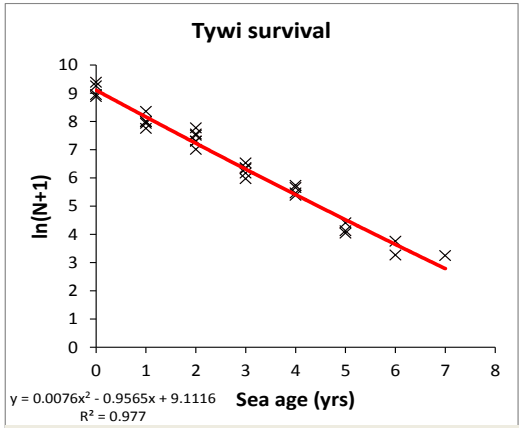




{finnoclpropn}

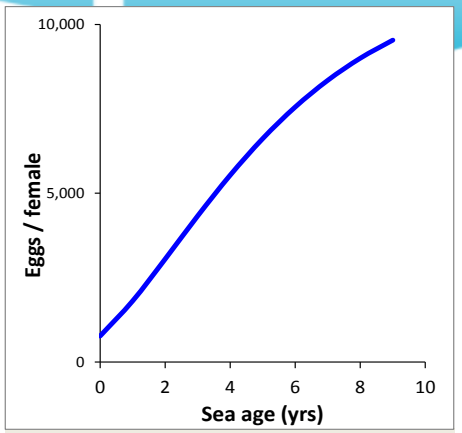
- Based on wt composition of rod catch (>0.8kg = finnock)
- Large increase (+28% to +96% in 35yrs) & synchronicity in **abundance** and **%** of n.0+
- No detectable survival change, so earlier maturation
- Corresponds to LH theory: faster growth - earlier maturation

Example life history effect

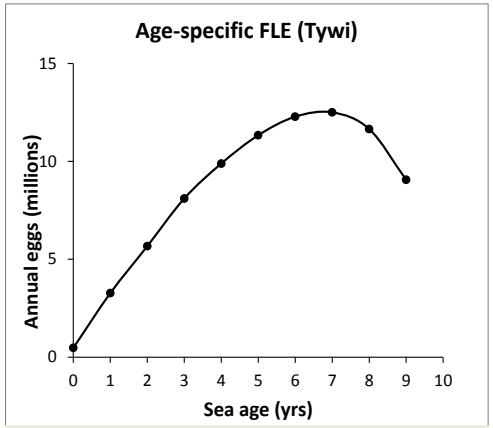


Survival

X

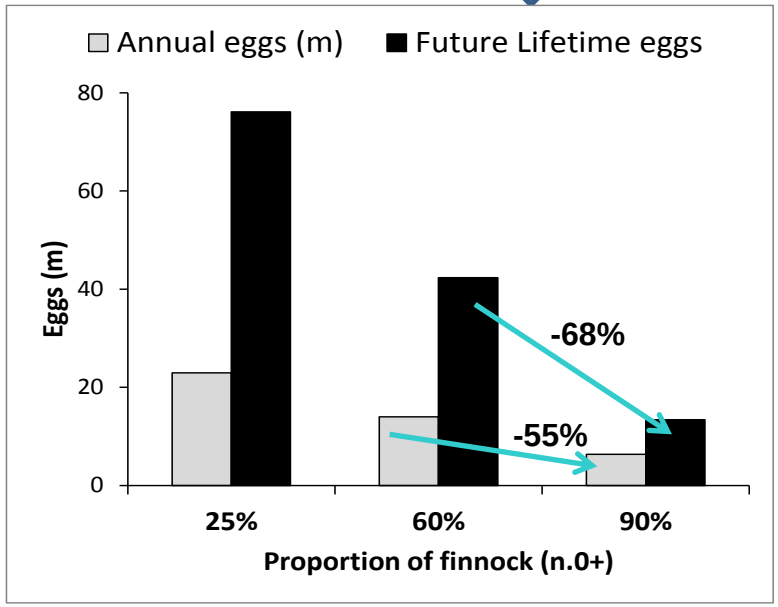


Fecundity



Reproductive value

- 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.

“Thank you” to many sponsors, co-workers and collaborators and all the “Citizen” Anglers