COLLOQUE INTERNATIONAL
SAMARCH 2022

ORGANISÉ PAR **Bretagne Grands Migrateurs** EN COLLABORATION AVEC seinormigr

SAUMON &
TRUITE DE MER :

DES OUTILS SCIENTIFIQUES
AU SERVICE DE LEUR PROTECTION

17 & 18 MAI 2022 - PLÉNEUF VAL ANDRÉ (FR – 22)

AMÉLIORONS LA GESTION
EN ESTUAIRE & EN MER

SAMARCH

Interreg France (Channel Manche) England
SAMARCH
Gestion des salmonidés dans la Manche
Fonds européen de développement régional

FÉDÉRATION NATIONALE PÊCHE

Côtes d'Armor le Département

Région BRETAGNE

Finally Getting to Grips with the Complex Lives of Atlantic salmon at Sea

## Ken Whelan

Atlantic Salmon Trust
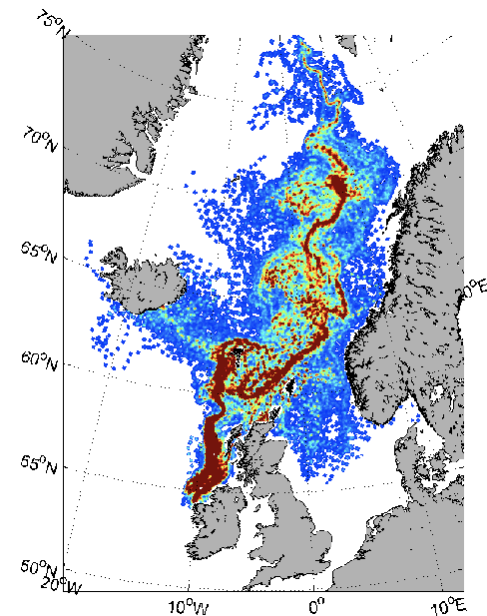
Robin Ade '97

Many Atlantic salmon stocks have suffered from persistent declines in survival at sea since the late 1990s. This raises some important questions:

- Where during the marine phase does most of the mortality take place?

- What are the major causes and how do these vary at different places and different times?

- Why is mortality higher now compared to the 1960s - mid 1990s?

- Can we identify areas where research can be most productive and management can make a difference?

Return rate of R. Bush wild 1SW salmon to the Irish coast
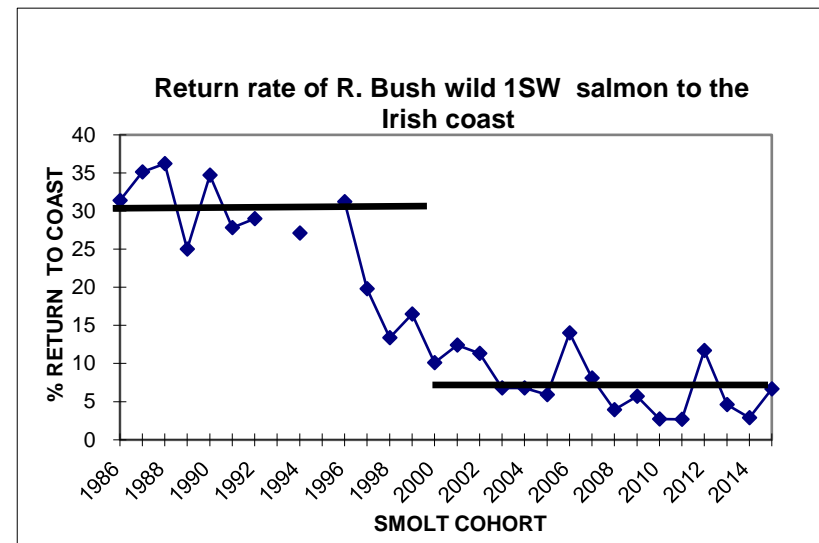
Source, AFBI

Saumon & Truite de mer : Des outils scientifiques au service de leur protection
17 & 18 MAI 2022 - Pléneuf Val André (FR – 22)

Barents Sea

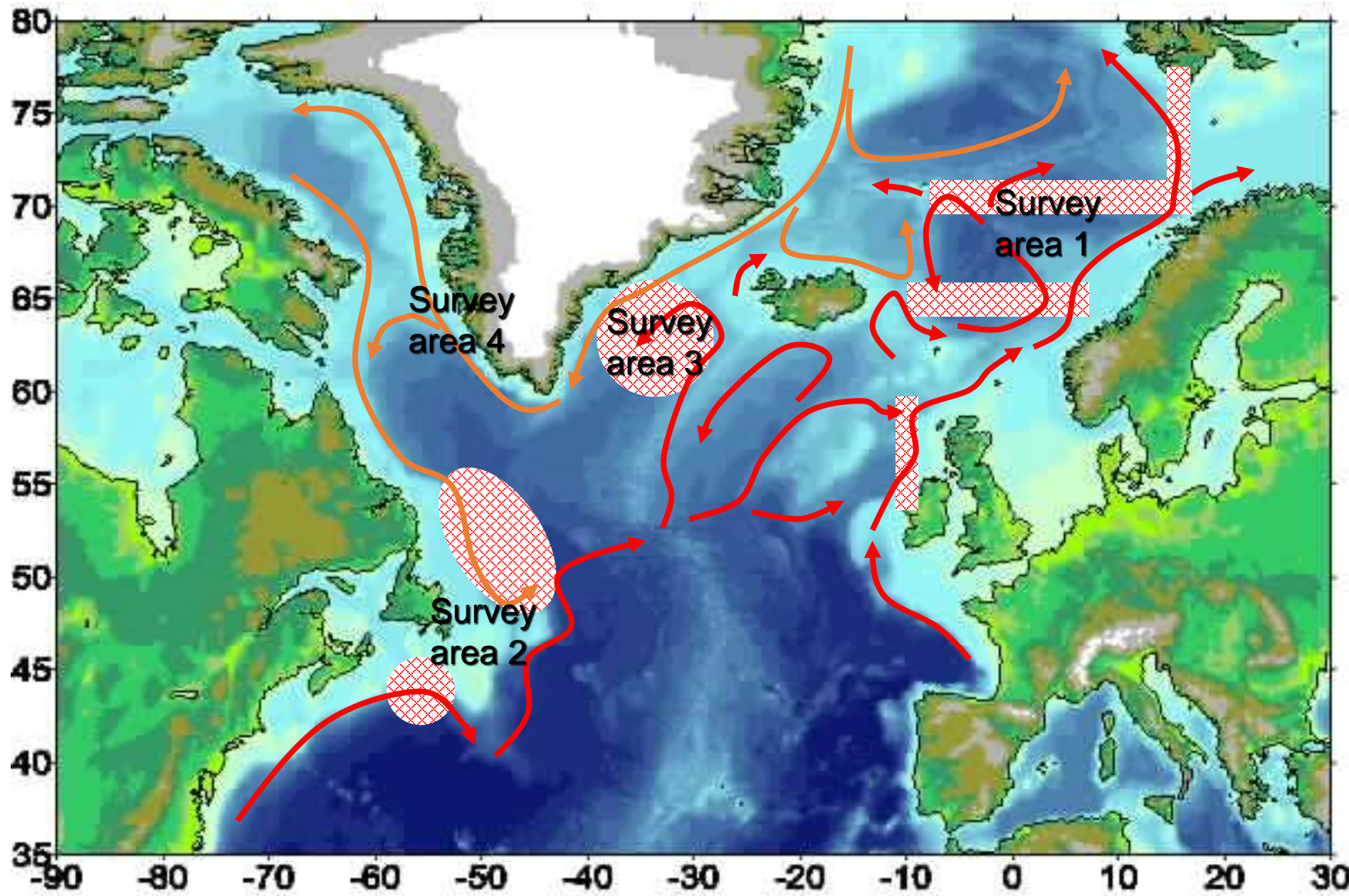Norwegian Sea

Labrador Sea

Irminger Sea

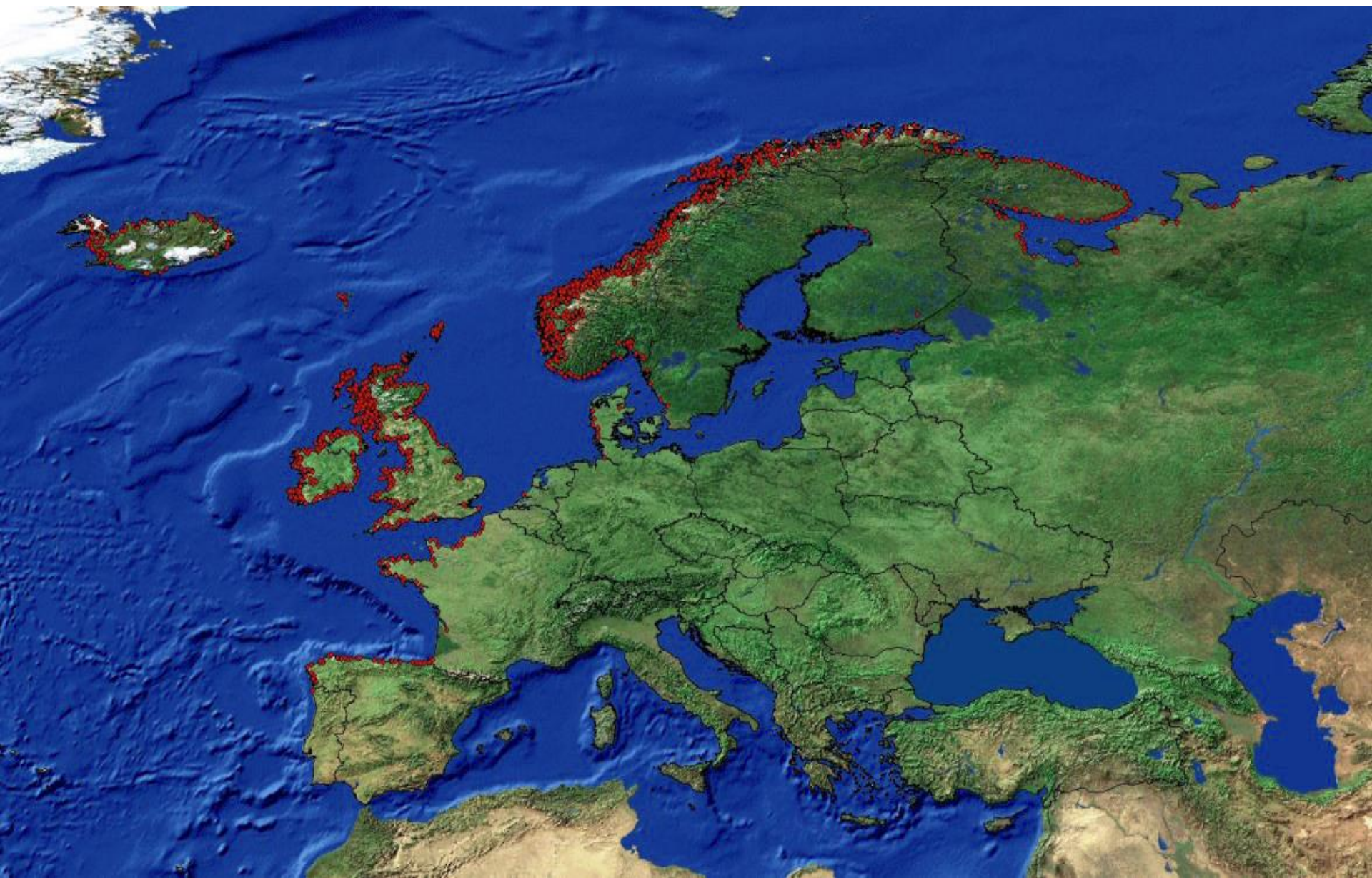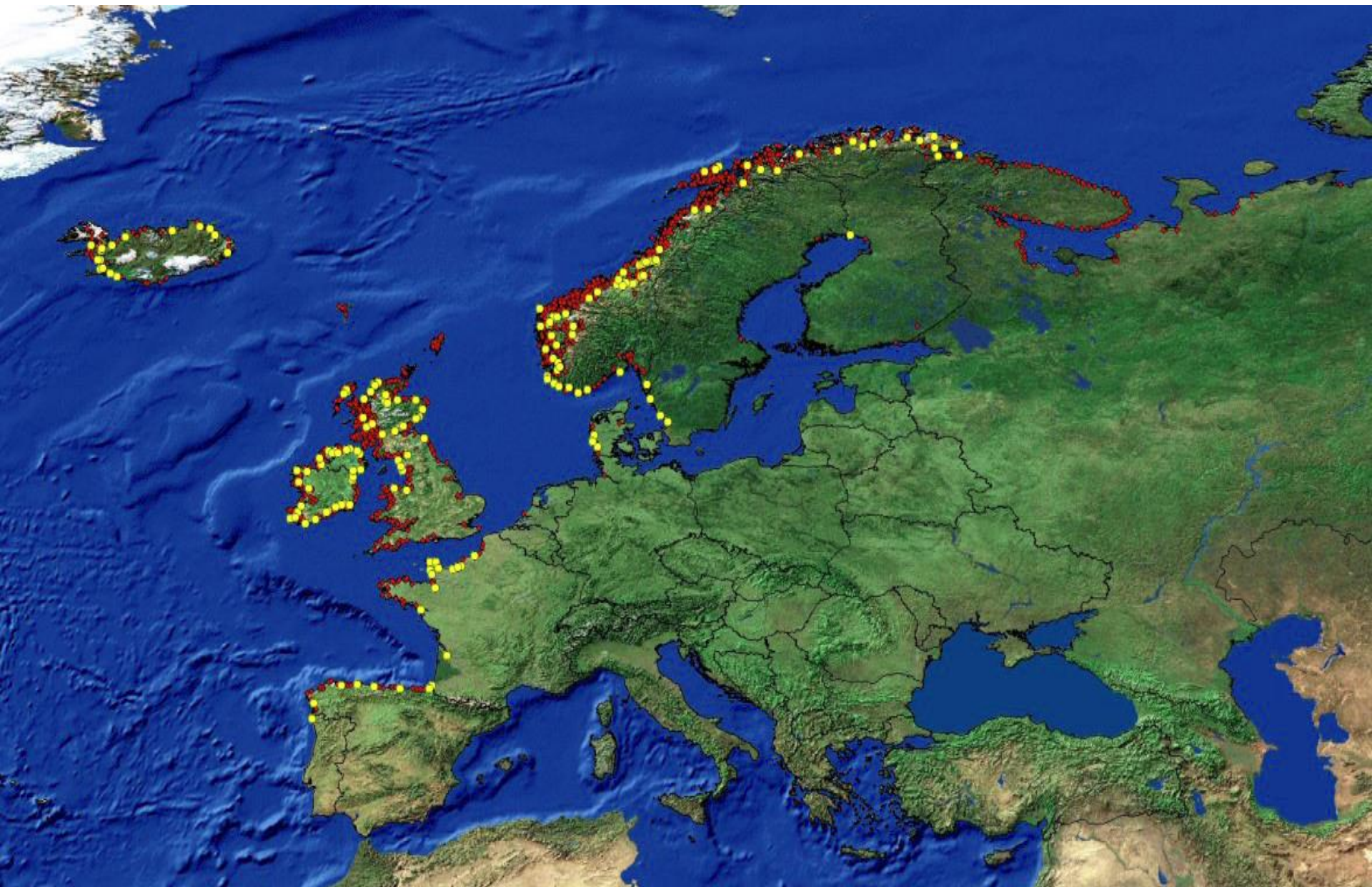Principal postsmolt areas of N. America,
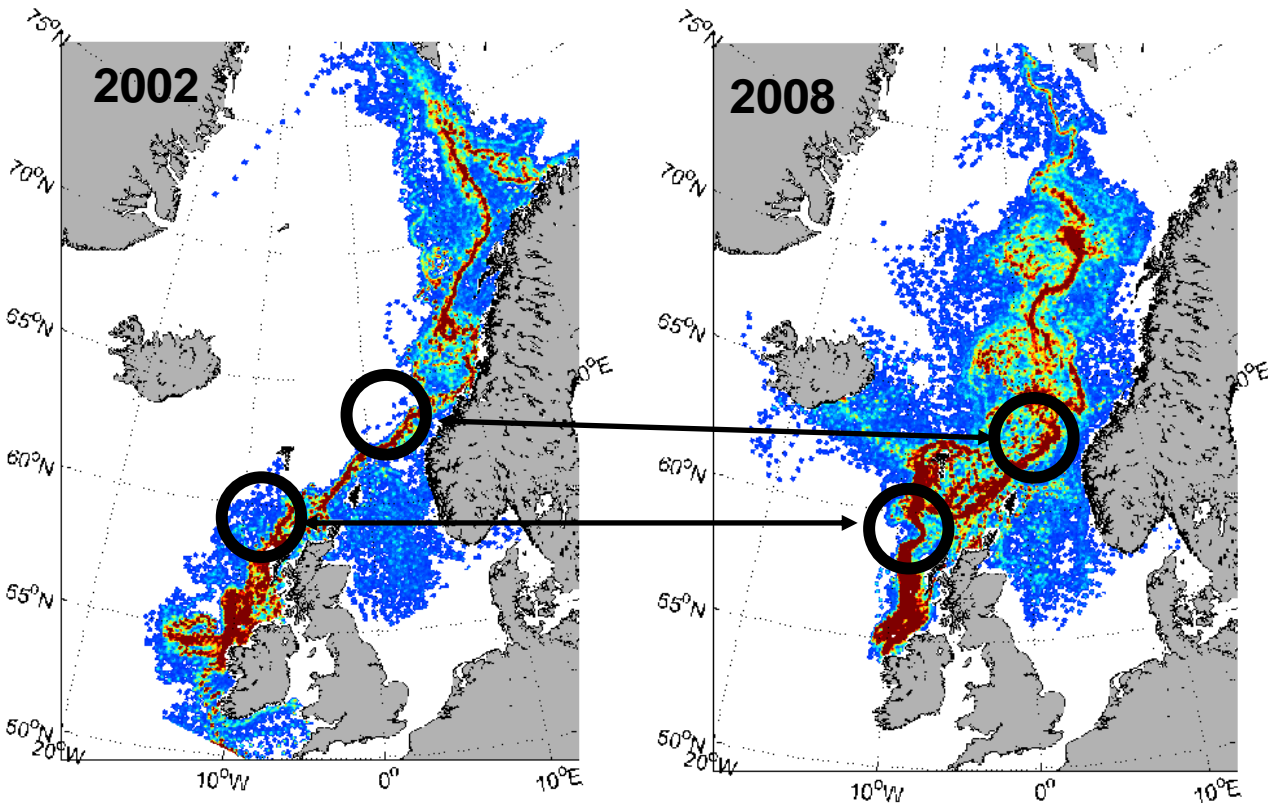W. Iceland, S. Europe and N. Europe

Atlantic Salmon Rivers NEA

Rivers Sampled – Genetic Baselines

Migration routes

2002

2008
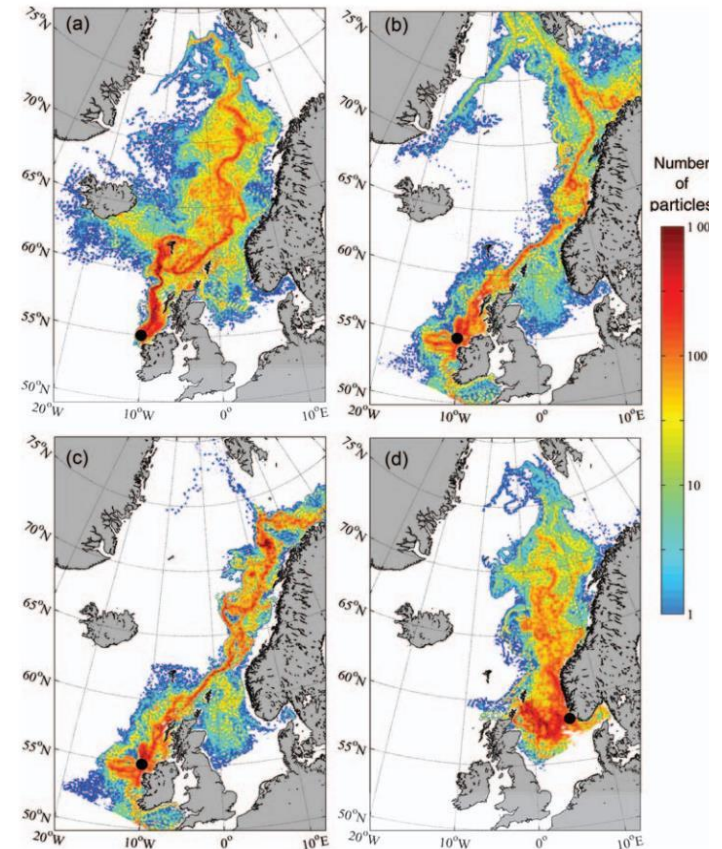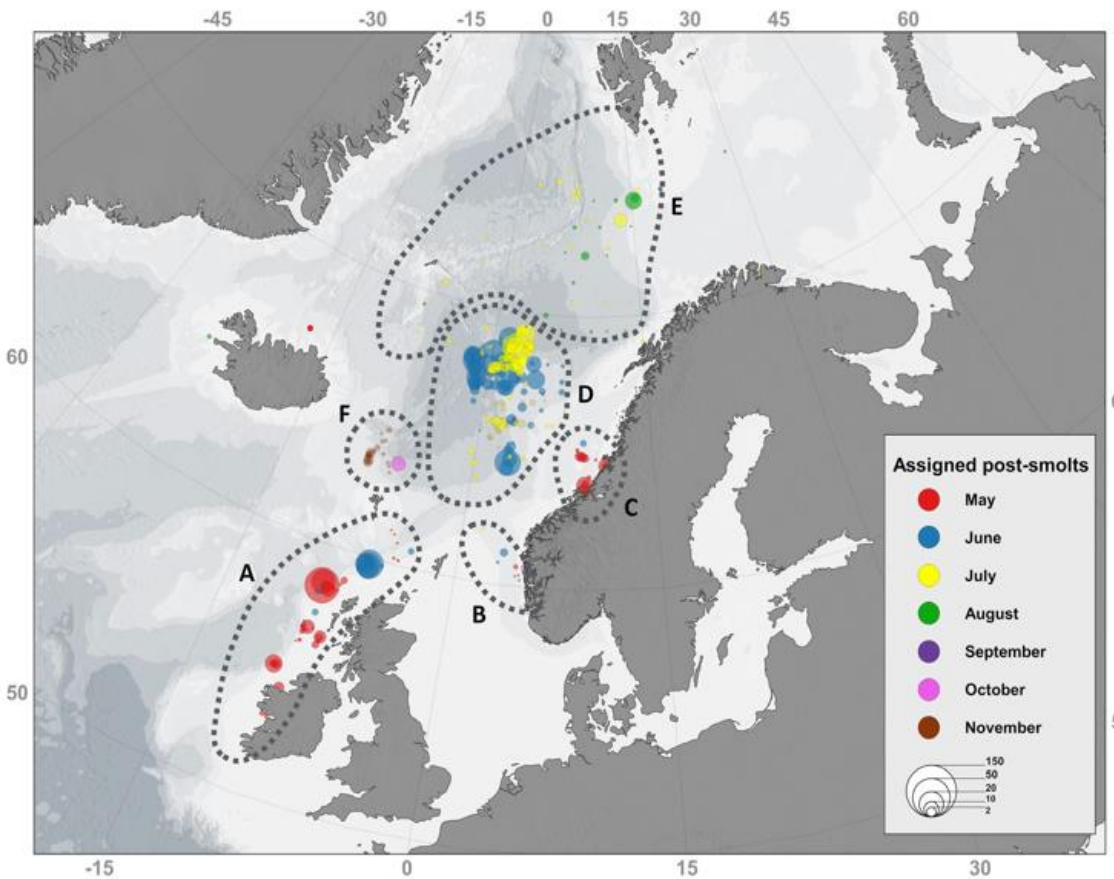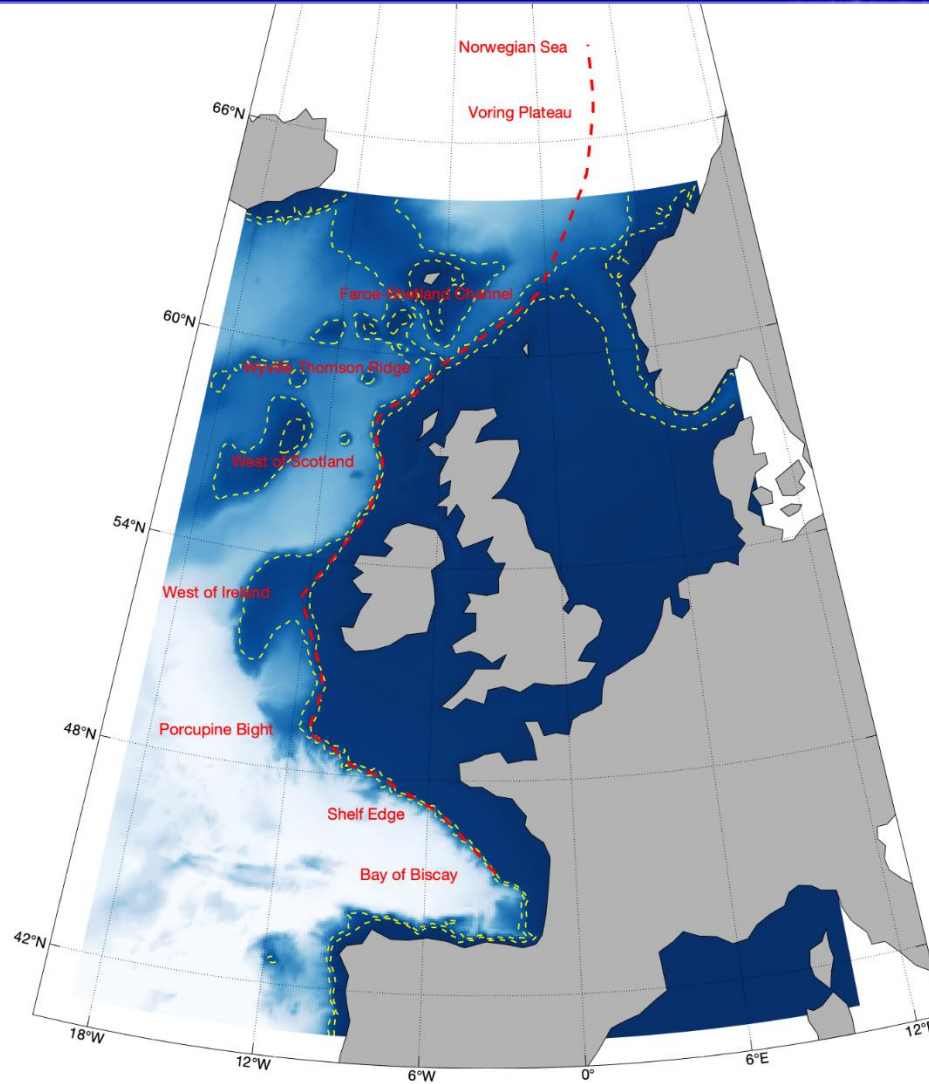
Key areas in the migration routes where shifts in pathways may occur

Importance of the Vøring Plateau
Gilbey et al., 2021

From Mork et al.2012

Spatial synchrony in the response of a long range migratory species (*Salmo salar*) to climate change in the North Atlantic Ocean

Maxime Olmos ✉, Mark R. Payne, Marie Nevoux, Etienne Prévost, Gérald Chaput, Hubert Du Pontavice, Jérôme Guitton, Timothy Sheehan, Katherine Mills, Etienne Rivot ✉

Temporal variations of the post-smolt survival are best explained by the temporal variations of sea surface temperature (SST, negative correlation) and net primary production indices (PP, positive correlation) encountered by salmon in common domains during their marine migration.

Ecological regime shift in the Northeast Atlantic Ocean revealed from the unprecedented reduction in marine growth of Atlantic salmon

Knut Wiik Vollset[1]*, Kurt Urdal[2], Kjell Utne[3], Eva B. Thorstad[4], Harald Sægrov[2], Astrid Raunsgard[4], Øystein Skagseth[3], Robert J. Lennox[1,4], Gunnel M. Østborg[4], Ola Ugedal[4], Arne J. Jensen[4], Geir H. Bolstad[4], Peder Fiske[4]

Historical scale data from 52,384 individual wild Atlantic salmon caught in 180 rivers from 1989 to 2017 reveal that growth of Atlantic salmon across the Northeast Atlantic Ocean abruptly decreased following the year 2004. At the same time, the proportion of early maturing Atlantic salmon decreased.

A hierarchical life cycle model for Atlantic salmon stock assessment at the North Atlantic basin scale

E. Rivot, M. Olmos, +1 author Etienne Pr'evost · Published 5 April 2019 · Environmental Science · arXiv: Applications

We developed an integrated hierarchical Bayesian life cycle model that simultaneously estimates the abundance of post-smolts at sea, post-smolt survival rates, and proportions maturing as 1SW, for all SU in Northern Europe, Southern Europe and North America. The model is an age- and stage-based life cycle model that considers 1SW and 2SW life history strategies and harmonizes the life history dynamics among SU in North America and Europe. The new framework brought a major contribution to... Expand

- The AST organised and led a scoping workshop in Edinburgh in November 2017: **Atlantic salmon mortality at sea, developing an evidence based "Likely Suspects Framework".**

- Workshop partners/sponsors included NASCO, Defra, ASF and NPAFC

- Salmon scientists and modellers from **both the Atlantic and Pacific** areas attended

- It was the first scientific event held under the International Year of the Salmon – AST Blue Book

The Likely Suspects Framework Concept

- In 2017 AST developed a concept that aimed to advise on how future research on salmon survival can be identified and prioritised.

- This has become known as the Likely Suspects Framework:

  - *The objective is: "....**to develop specific testable hypotheses about the factors involved in salmon mortality. Where gaps exist, to target research and further refine the estimates of mortality at each part of the salmon's life".***

THE MISSING SALMON ALLIANCE

2. Hypothesis prioritisation exercise

1. **Freshwater Domain**

2. **Estuarine Domain**

3. **Ocean Domain –near shore** - shallow seas ,inside the "shelf edge"

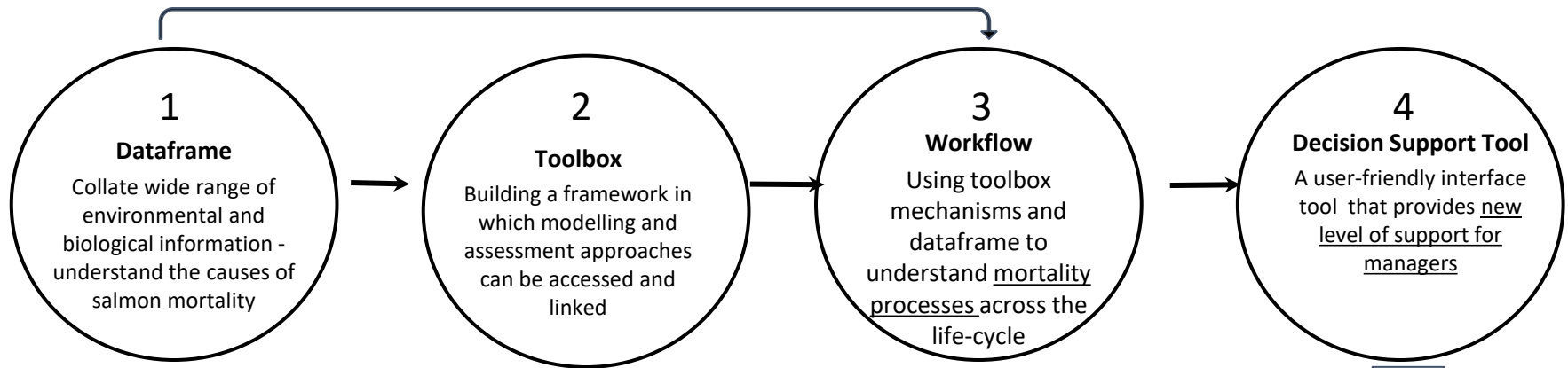4. **Ocean Domain – open ocean feeding**
WKSalmon 1 & 2 – ICES /NASCO

General hypotheses

thought to represent significant mortality factors contributing to the patterns of marine survival in Atlantic salmon

1. Seasonal variation in the physical habitat in freshwater lead to reduced feeding and growth opportunity
2. Latent or carry-over effects originating in the freshwater stage lead to reduced growth or survival in later stages
3. Changes in the rate of survival during smolt migration through freshwaters
4. Changes in the rate of predation during smolt migration through estuaries
5. Interactions with coastal aquaculture in the coastal / nearshore zone
6. Synergistic effects of restricted feeding and the dynamics of predator-prey interactions in the coastal / nearshore zone
7. Seasonal variation in the timing of post-smolt entry to the marine phase and a mismatch with suitable prey
8. Lower survival expectations of smaller-body size smolts during their marine migration
9. Seasonal variation in the physical habitat in shelf seas/ open ocean zones lead to reduced feeding and growth opportunity
10. Synergistic effects of restricted feeding and the dynamics of predator-prey interactions in shelf seas/ open ocean zones
11. Bycatch of salmon by commercial fisheries in shelf seas/ open ocean zones

NERC SCIENCE OF THE ENVIRONMENT

SUPER Scottish Universities Partnership for Environmental Research

University of Strathclyde Glasgow

THE MISSING SALMON ALLIANCE

Game & Wildlife CONSERVATION TRUST — ANGLING TRUST — Fisheries Management Scotland — The Rivers Trust

What is the Likely Suspects Framework?

1

Dataframe

Collate wide range of environmental and biological information - understand the causes of salmon mortality

2

Toolbox

Building a framework in which modelling and assessment approaches can be accessed and linked

3

Workflow

Using toolbox mechanisms and dataframe to understand mortality processes across the life-cycle

4

Decision Support Tool

A user-friendly interface tool that provides new level of support for managers

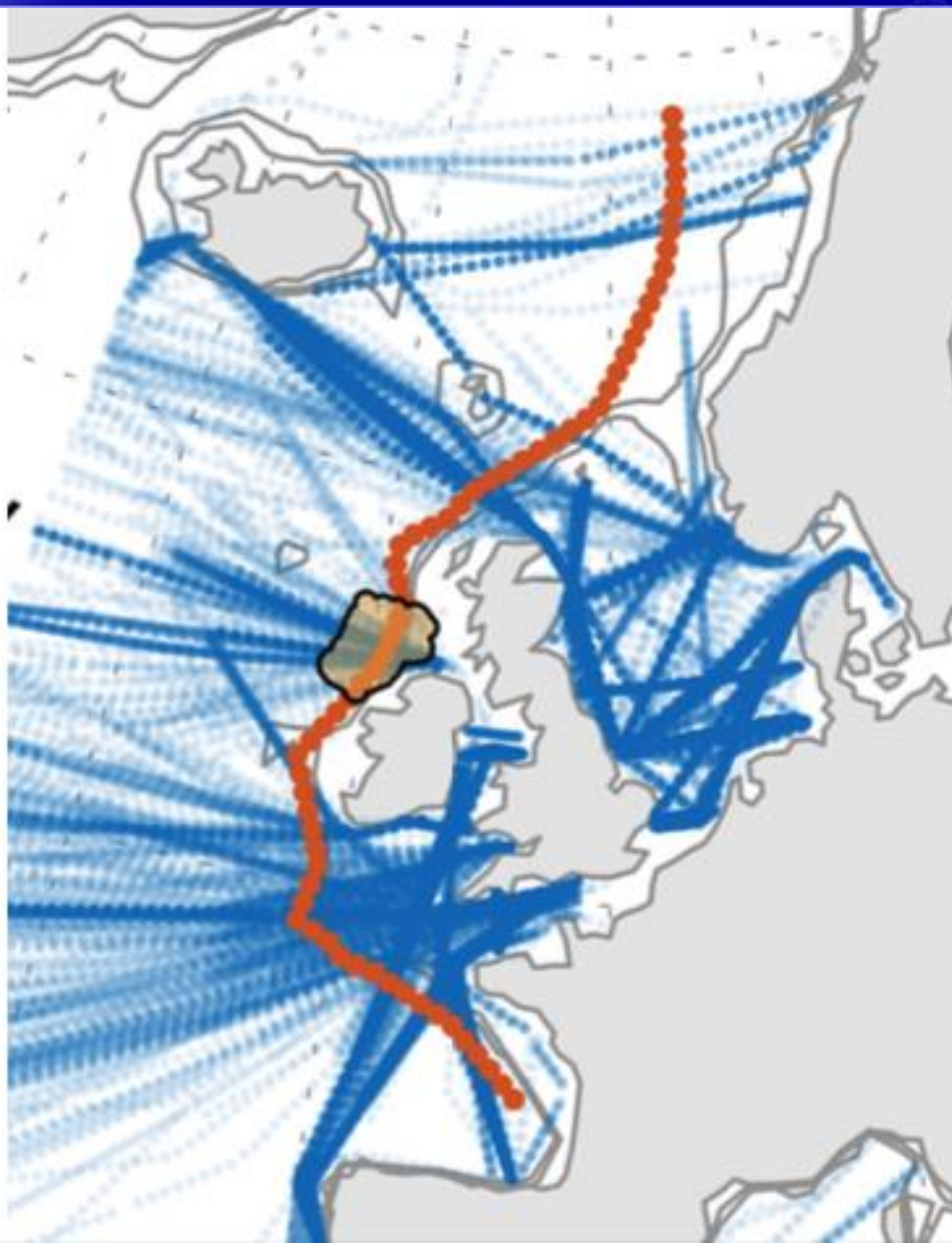**Providing new and improved management outputs**

- New scenario testing and forecasting
- Biologically-relevant, regualrly updated, advice
- Improved assessment of management strategies
- New integration of knowledge from across the life cycle
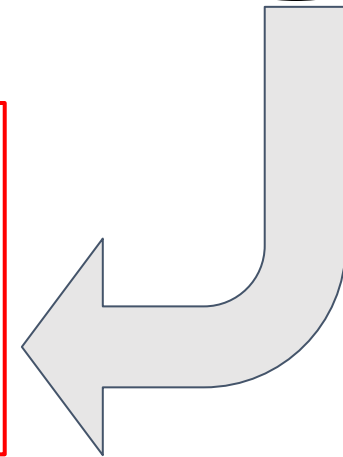
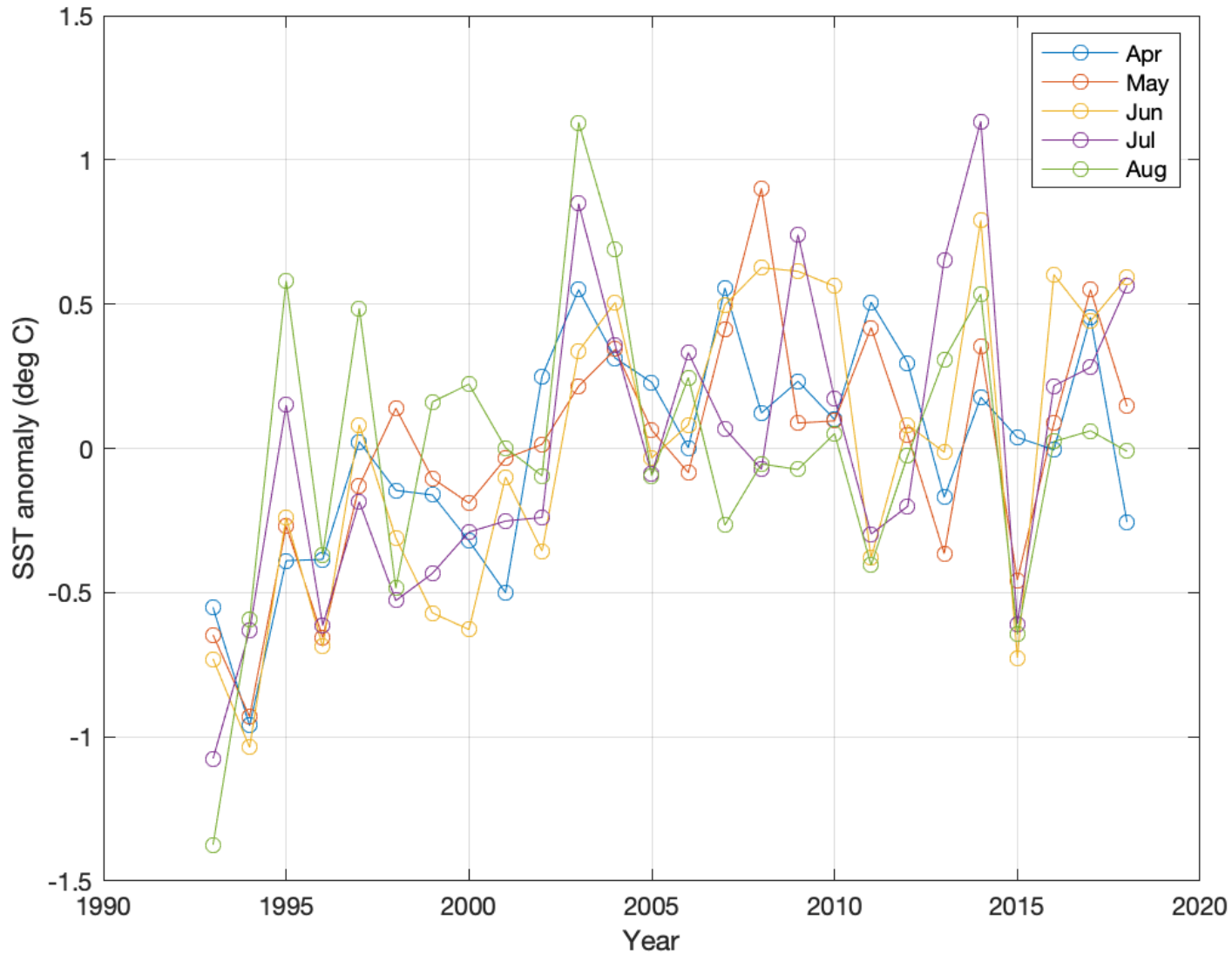**Salmon Data Resource**: https://missingsalmonalliance.org/the-central-data-resource

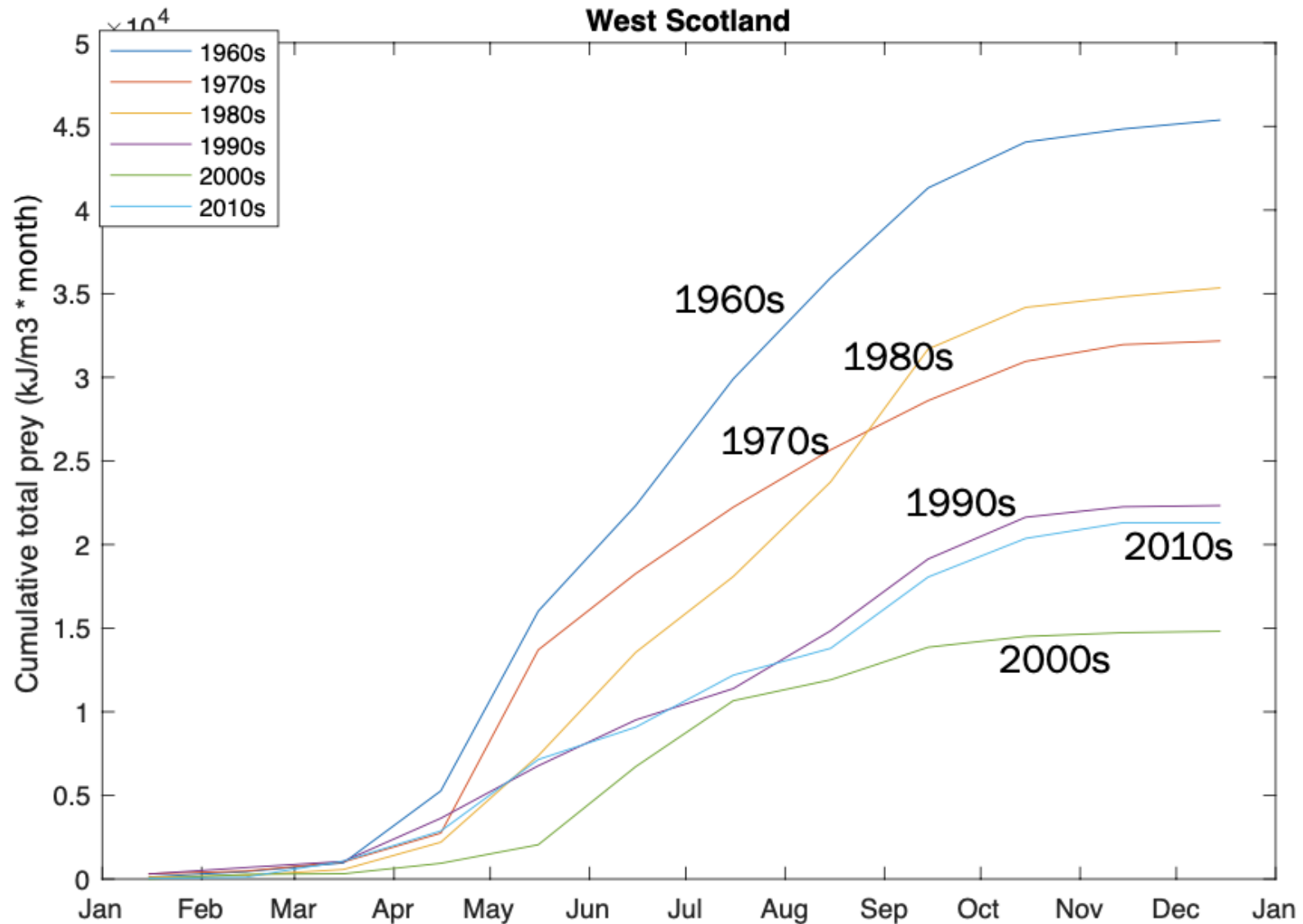**THE MISSING SALMON ALLIANCE**

21

**CPR Tracks
Interrogated**

Sea Surface Temperature Anomaly – West Coast Scotland
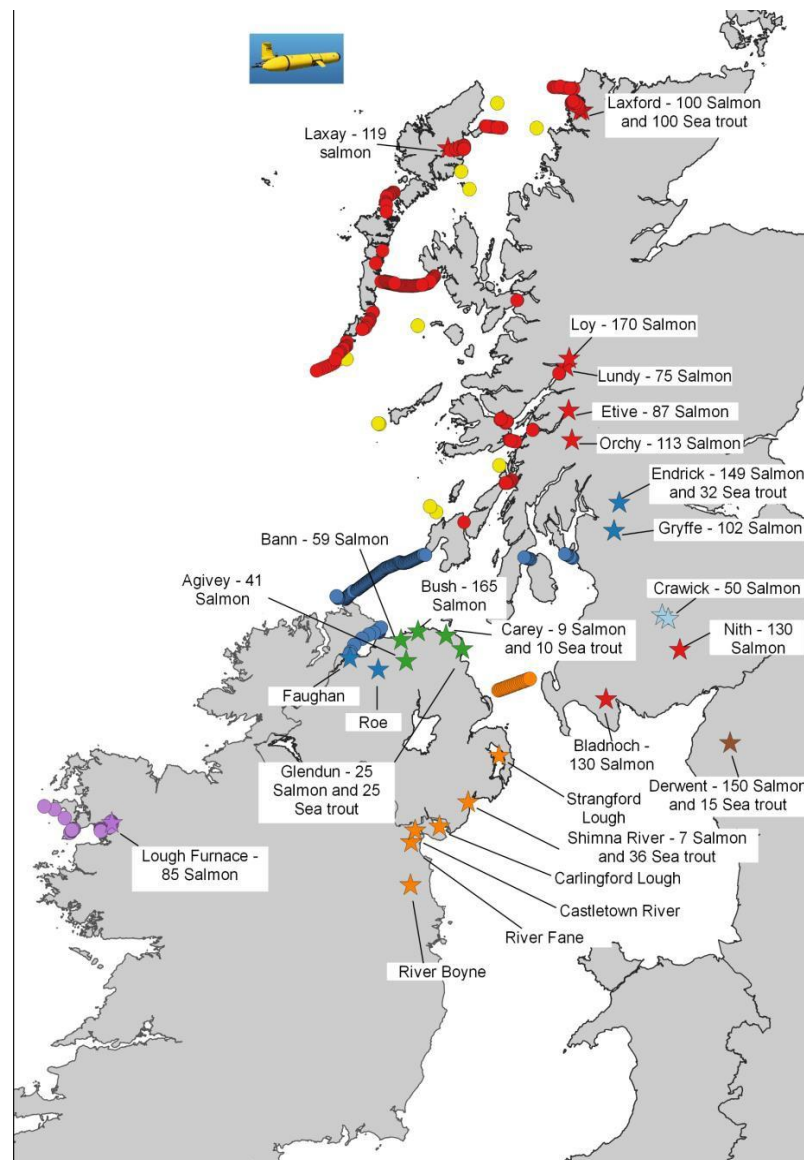
Cumulative Total Prey – Zooplankton

The importance to LSF of cooperative tracking programmes

- AST , MSA, MSS, SeaMonitor, Compass, EA, UK Universities

- Great progress in the last 2-3 years

- More tracking projects running now than ever before

- Tracking the salmon migration pathways in the freshwater and near shore Domains. Conservation & management importance

Laxay - 119 salmon

Laxford - 100 Salmon and 100 Sea trout

Loy - 170 Salmon

Lundy - 75 Salmon

Etive - 87 Salmon

Orchy - 113 Salmon

Endrick - 149 Salmon and 32 Sea trout

Gryffe - 102 Salmon

Bann - 59 Salmon

Agivey - 41 Salmon

Bush - 165 Salmon

Crawick - 50 Salmon

Carey - 9 Salmon and 10 Sea trout

Nith - 130 Salmon

Faughan

Roe

Bladnoch - 130 Salmon

Derwent - 150 Salmon and 15 Sea trout

Glendun - 25 Salmon and 25 Sea trout

Strangford Lough

Shimna River - 7 Salmon and 36 Sea trout

Lough Furnace - 85 Salmon

Carlingford Lough

Castletown River

River Fane

River Boyne

Developing an International Atlantic Salmon Modelling and Management Initiative (ISMMI)

Colin Bull, Walter Crozier, Ken Whelan, Etienne Prévost, Etienne Rivot & Matthieu Buoro

- **Improvement of current engagement with salmon management across scales: assisting with translation and interpretation of new model outputs, leading to better alignment with salmon management outputs via Decision Support Tools (DSTs)**

- **Alignment of existing salmon stock assessment and management models, realising the potential for improving biological realism in existing models.**

- **Work towards an Integrated Ecosystems Assessment based vision for salmon, that integrates existing approaches and guides future modelling work**

➢ **New data mobilisation and workflow development to access comprehensive physical and ecological datasets – WKSalmon2**

➢ **Prioritise and coordinate the work programme around addressing key mortality questions**

➢ **Development of an international funding bid to initiate, develop and support the evolution of ecosystems-based management for Atlantic salmon.**

Key to salmon conservation and adaptation – to provide these magical creatures with space, time and cold, clean water!