The status of Atlantic salmon (*Salmo salar*) in the North Atlantic

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Cefas

marinescotland

Scottish Government
Riaghaltas na h-Alba
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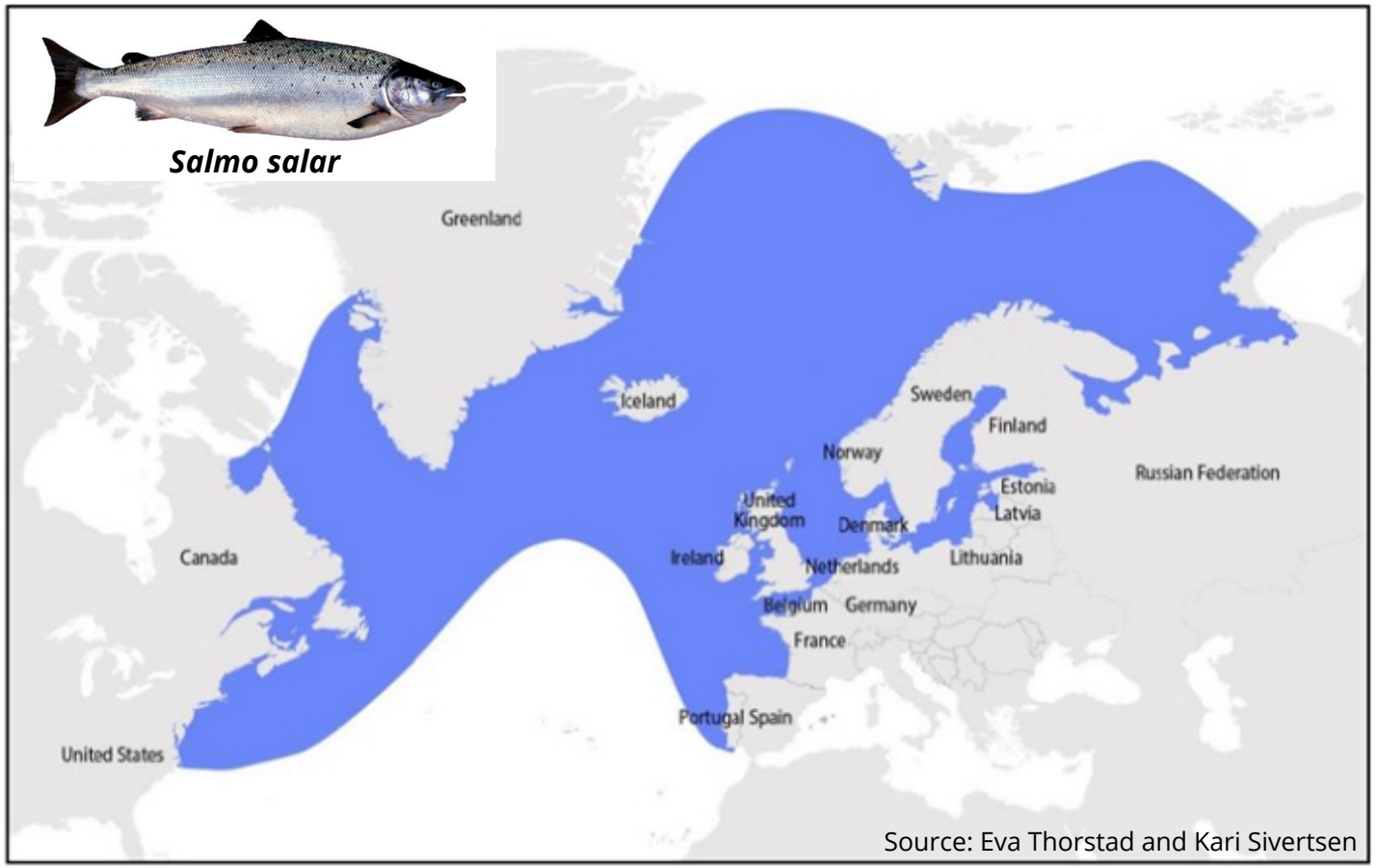
Science – NASCO, ICES WGNAS

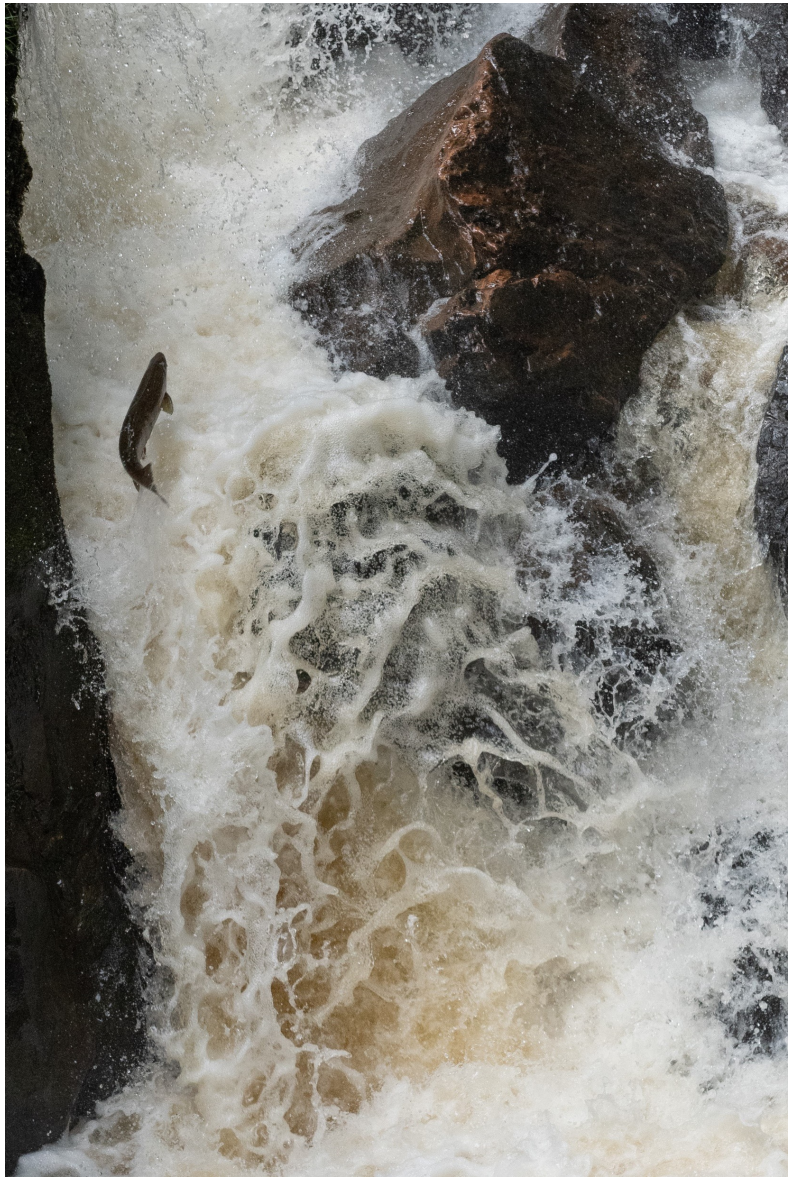
Atlantic salmon

- Widespread throughout the North Atlantic, above 40N
- Cold water adapted
- Plastic life history, e.g ages
- Iteroparous
- Three broad lineages: North America, Europe, and Baltic
- Range projected to contract under climate change



Contents

- Stock assessment purpose
- Assessment methods
- Trends in abundance
- Stock status
  - Trends in life history
- Communication
- Knowledge gaps
- Forward look

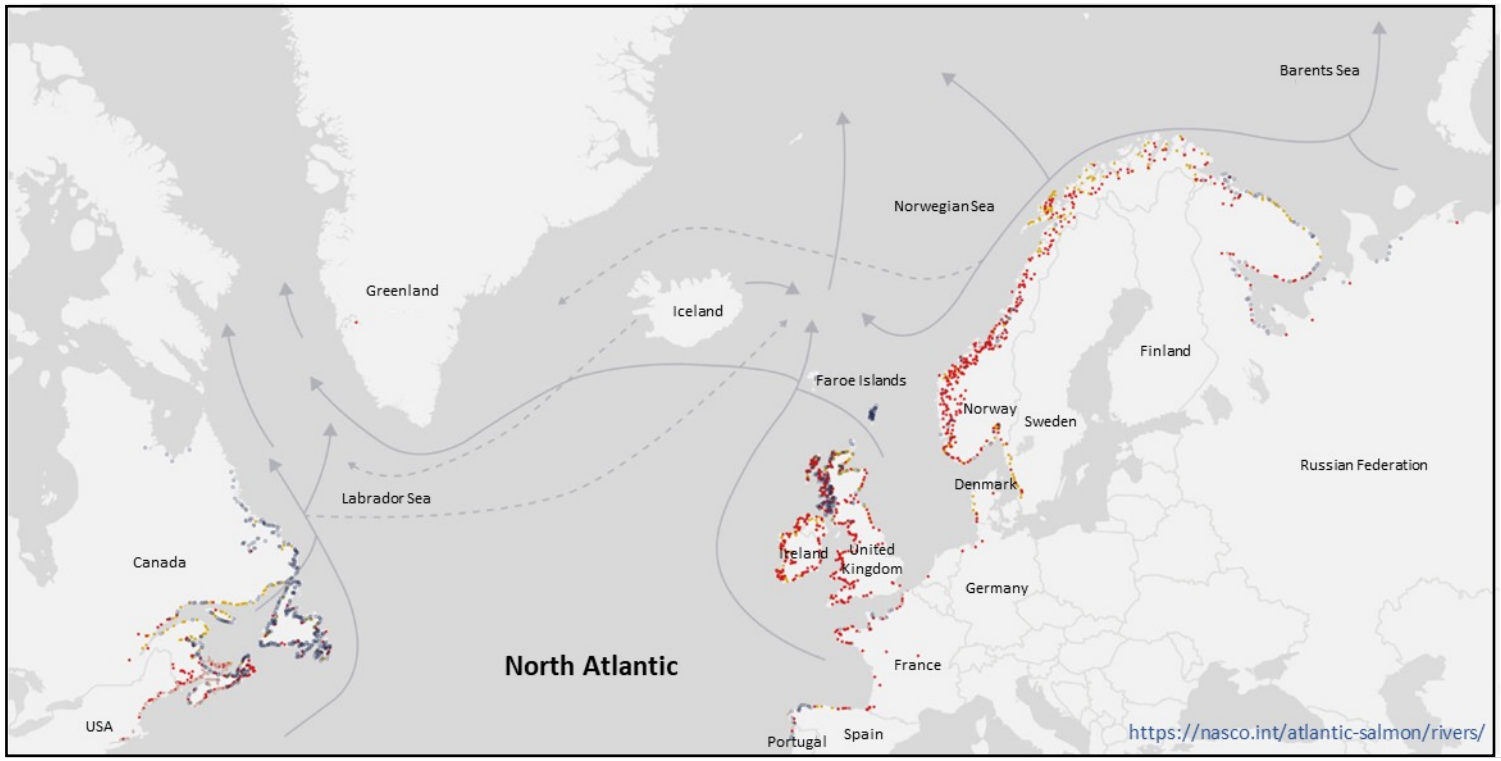


Stock assessment purpose

- Assessments designed to evaluate stock status and provide fisheries management advice, for 2000+ river stocks, scaling up to oceanic regions

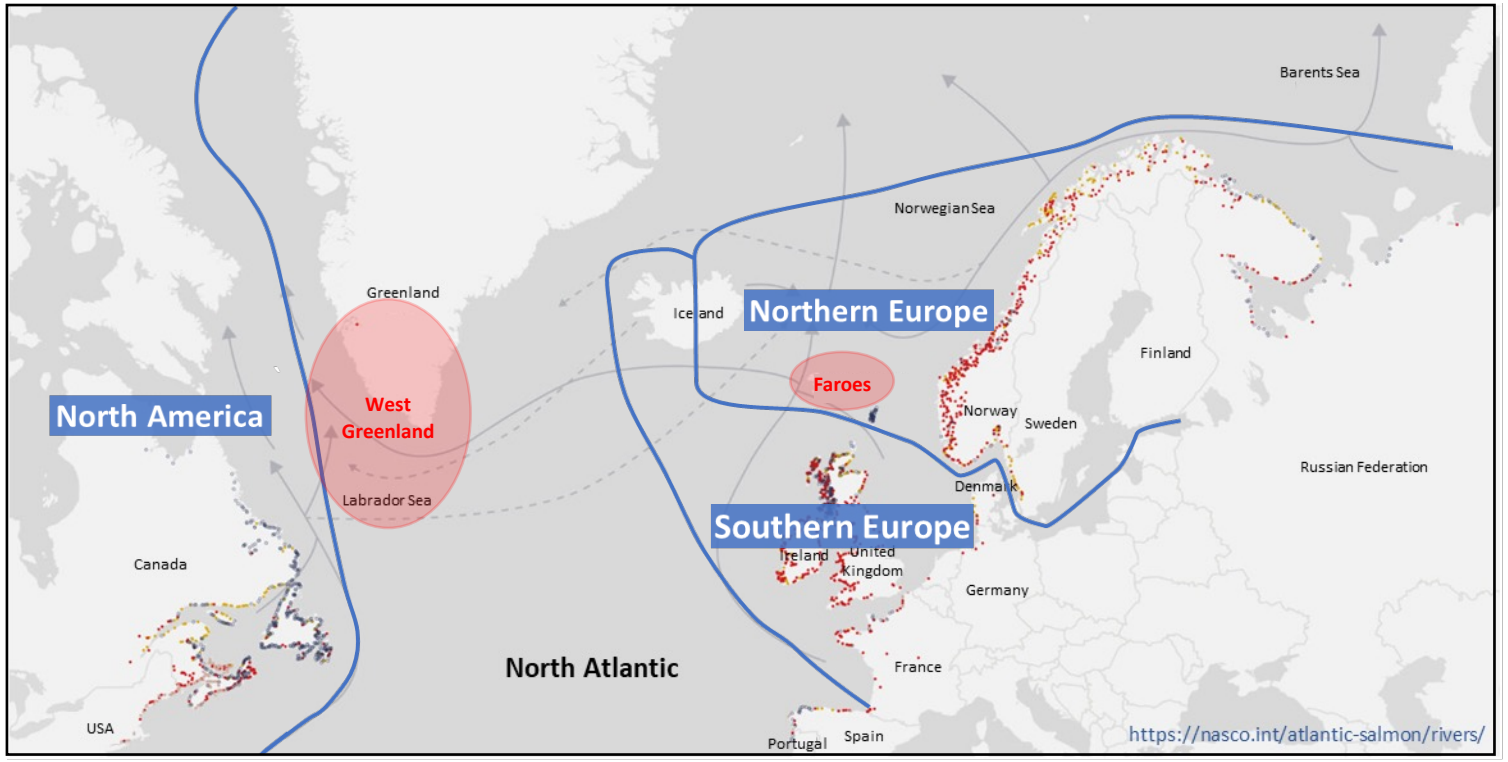
- The spatial and temporal scale of each assessment depends on the purpose

- River-scale: Agencies provide input into river-level assessments to provide local fishery management advice



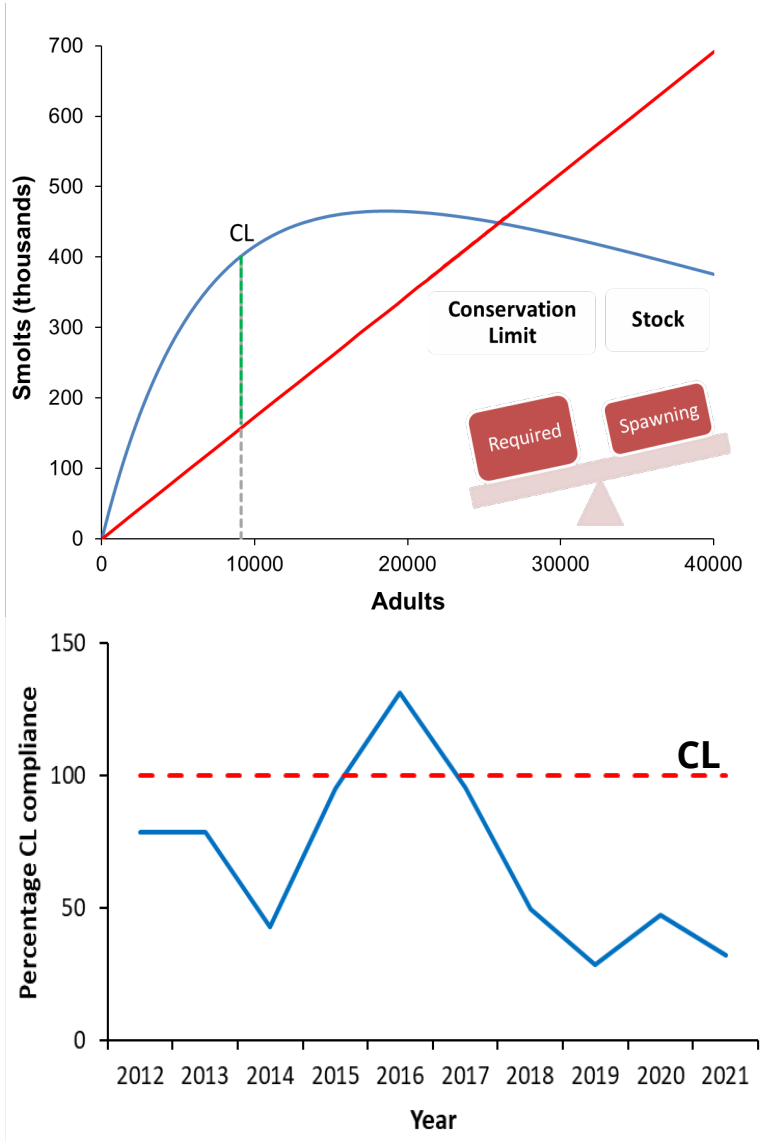
Stock assessment purpose

- International advice for distant-water mixed stock fisheries in Greenland and the Faroes
- ICES Advice to NASCO
- WGNAS assessments for
  - North America
  - Northern Europe, Southern
- **Baltic separate!**



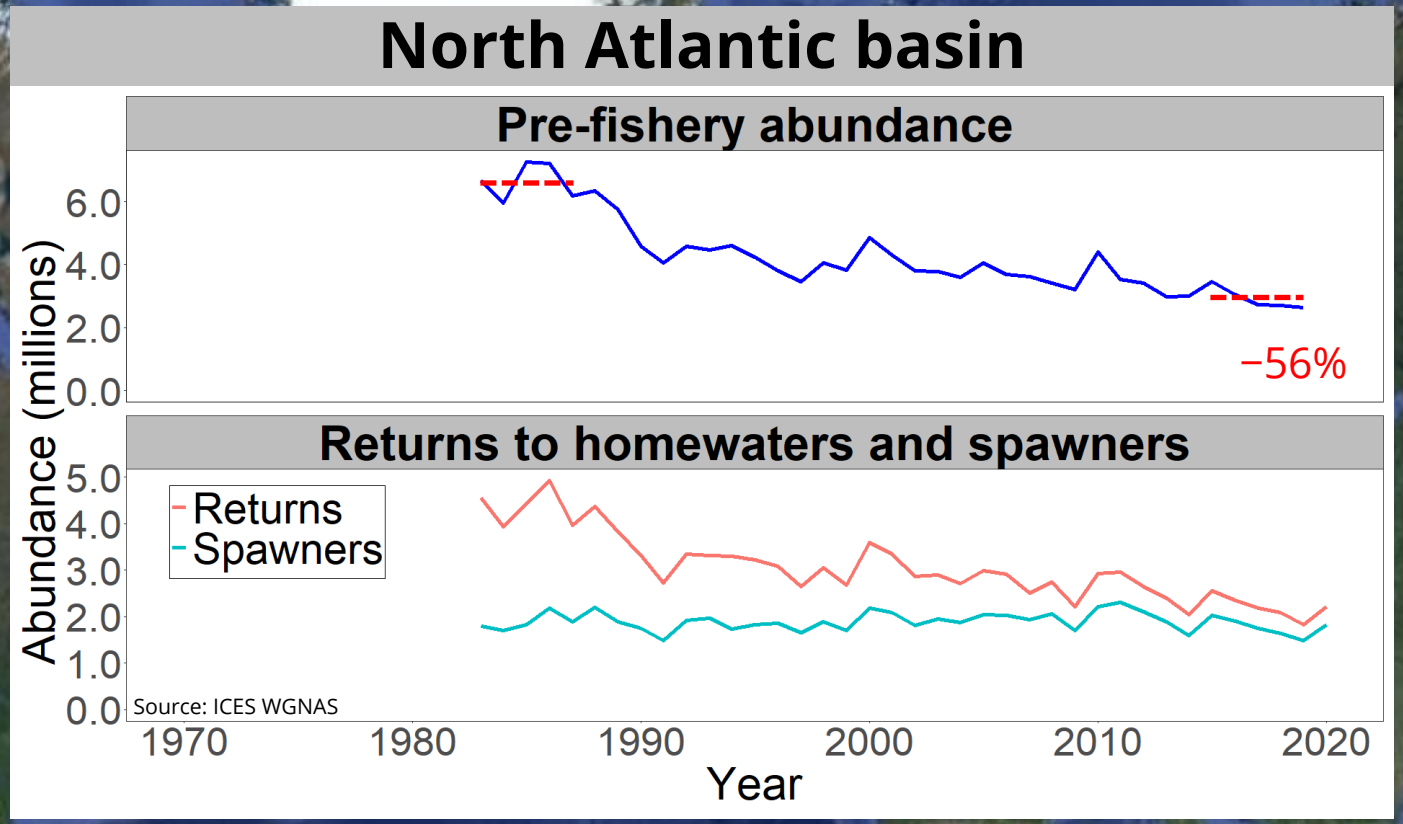
Assessment methods

- Specific procedures vary according to data availability and management frameworks
- Common approach across the North Atlantic
  - NASCO Guidelines & Agreements
  - Conservation Limit (CL) compliance assessment: eggs, spawners
  - Maximum Sustainable Yield (MSY)
- Catch data form the foundation of most stock assessments, along with traps, counters + fishery-independent
- Eggs estimated from biological characteristics



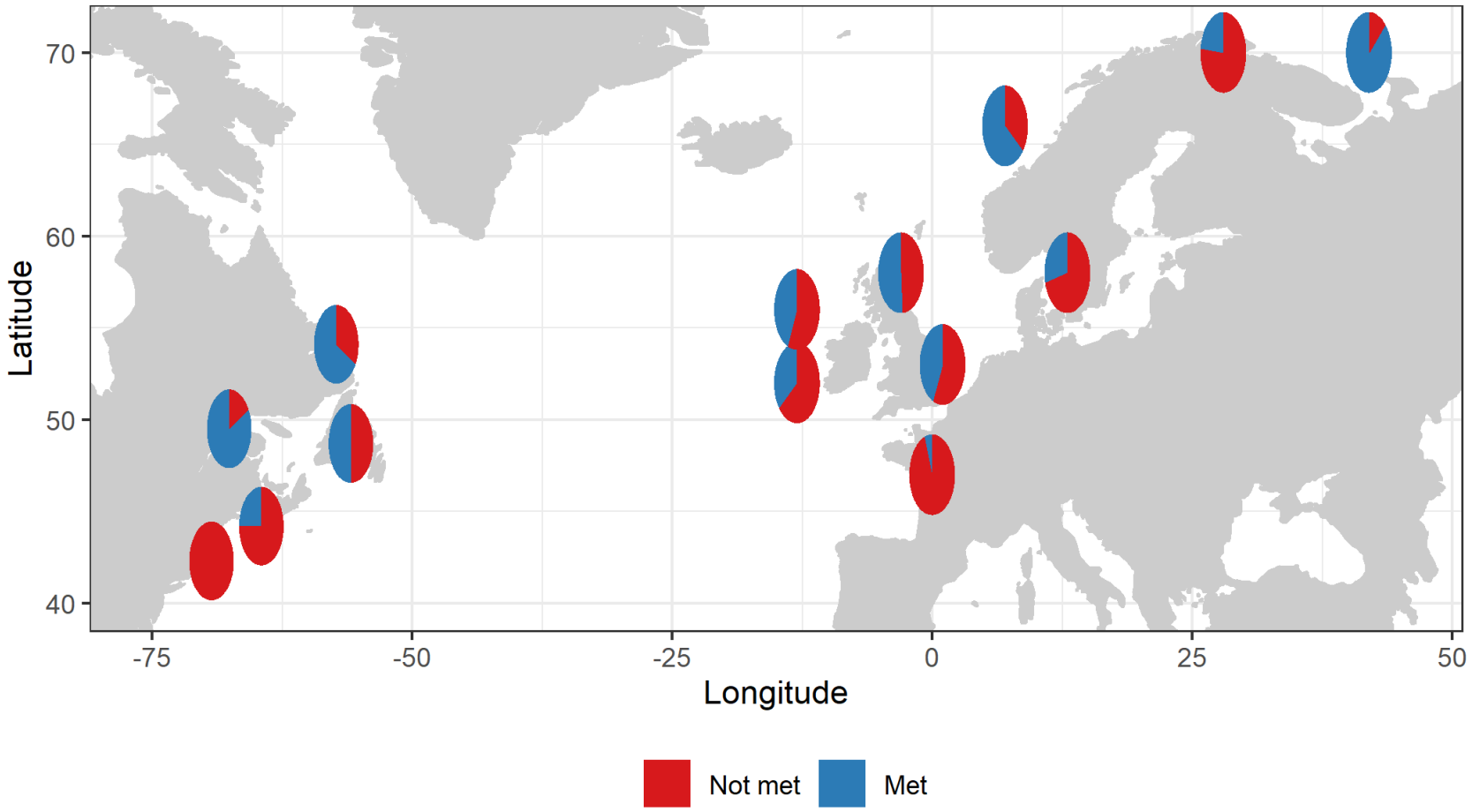
Status: trends in abundance

International scales: PFA: NAC 1 Aug; NEAC 1 Jan



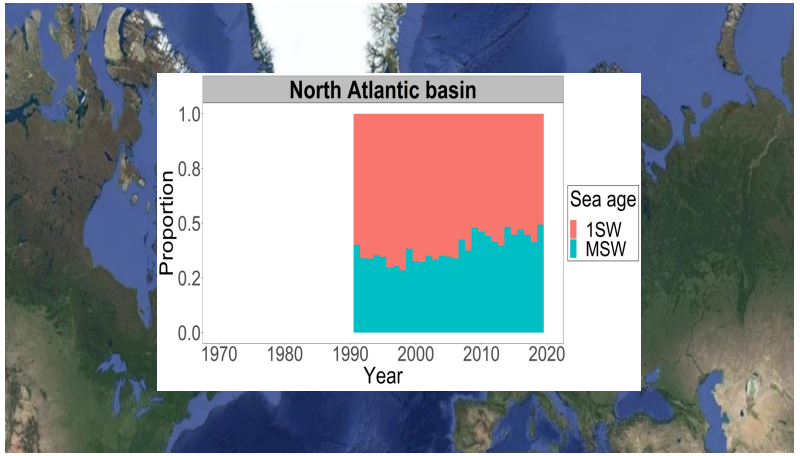
Stock status: river scale

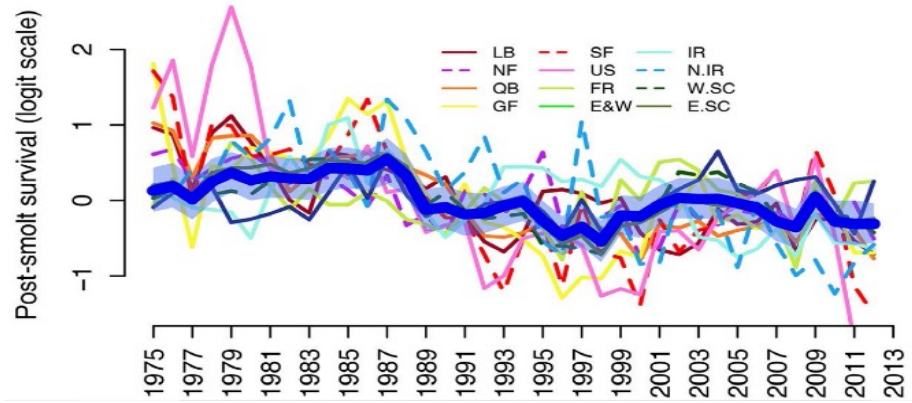
- Broad scale patterns across regions, reflecting large scale influences
- But
- Aggregate-scale declines mask variations between local stocks
- Proportion of stocks assessed as meeting CLs (nb. # assessed changes over time)

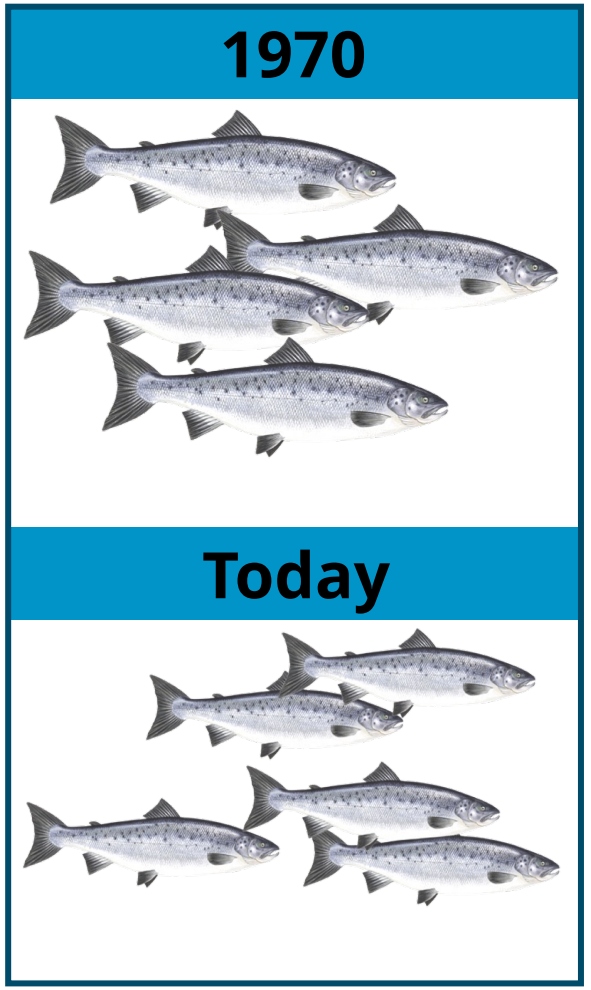


Stock status: trends in life history

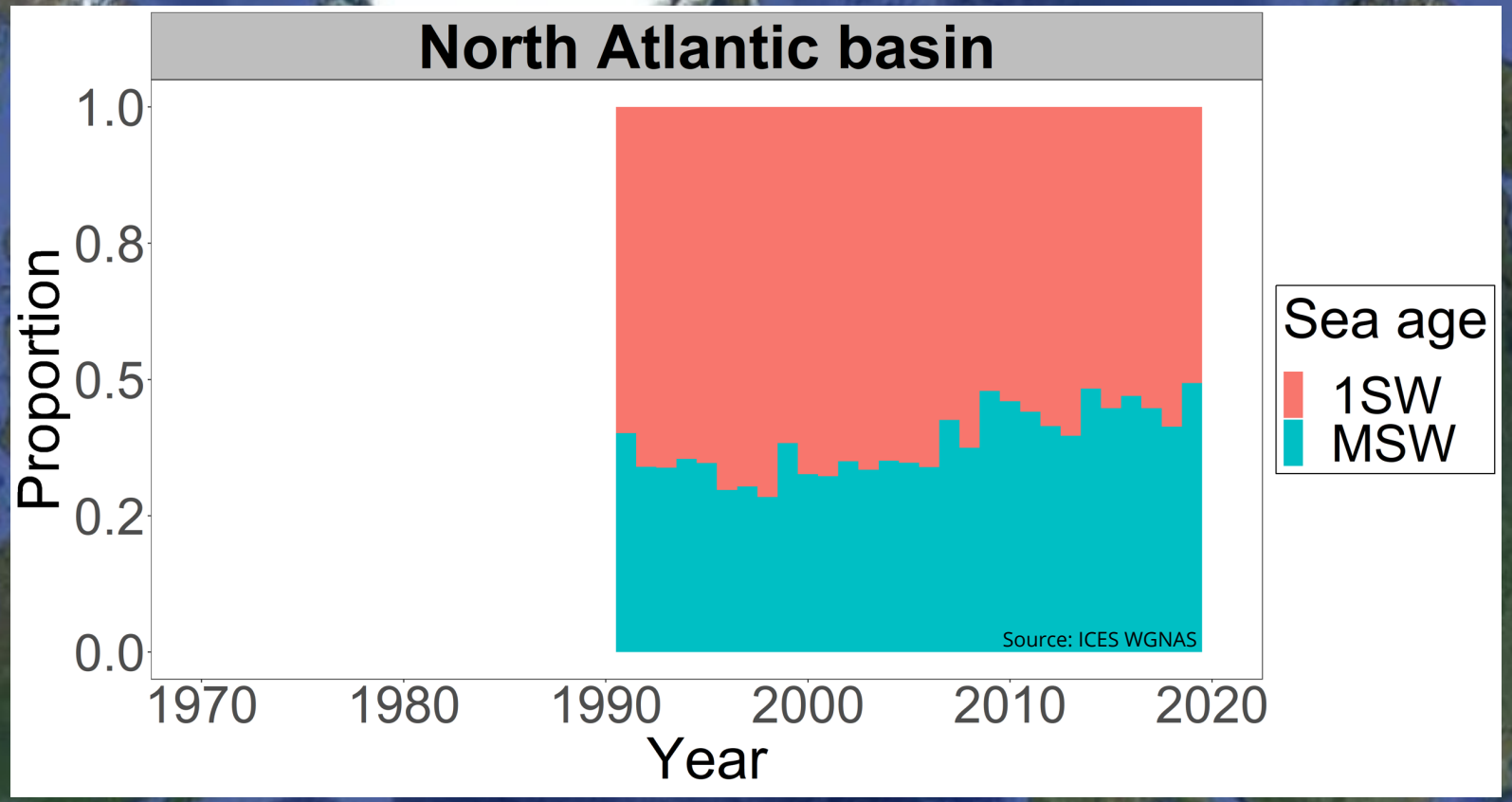
- Sea age composition
- Fecundity
- Marine return rates





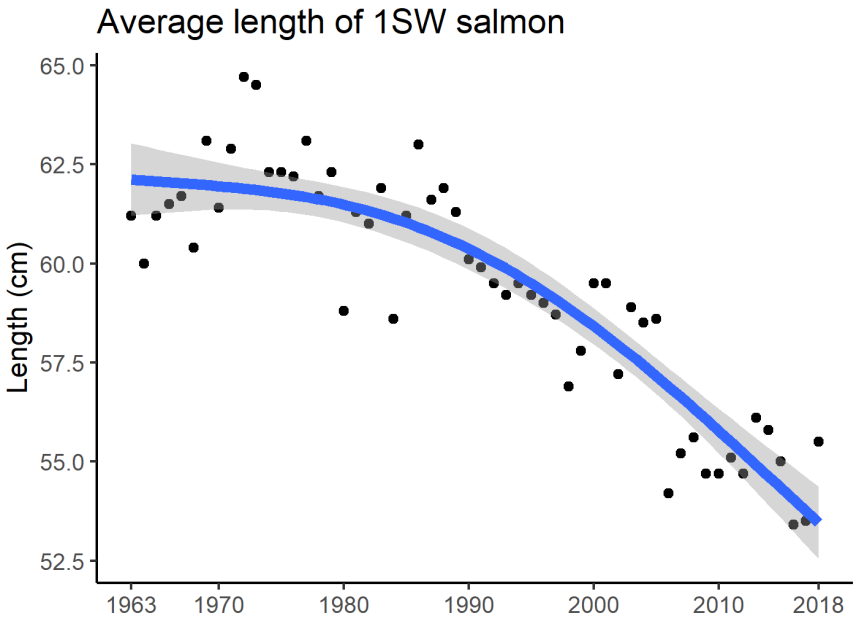


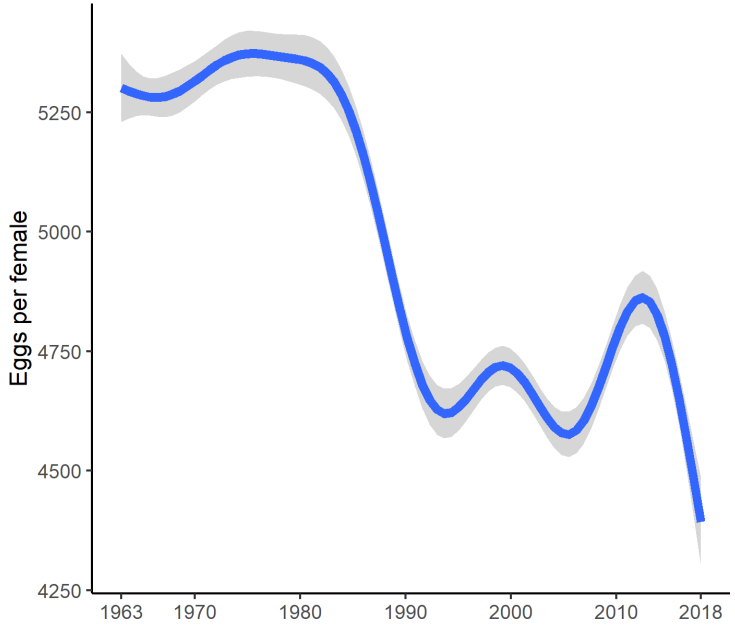
1. Sea age composition

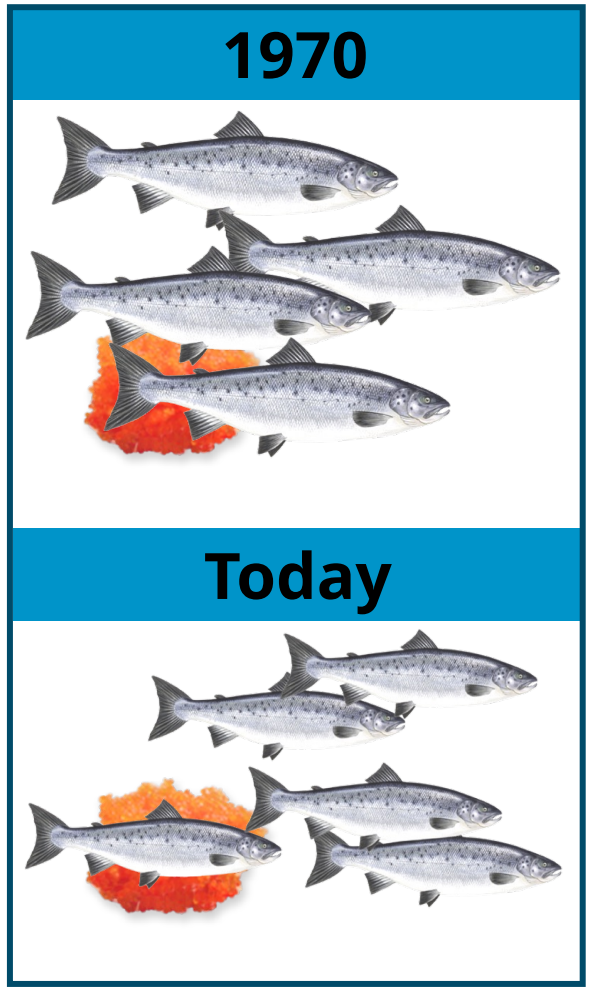


2. Fecundity

- Alongside changes in age-at-maturity over the last five decades, salmon are getting smaller, e.g. North Esk
- Females are producing fewer eggs than in the past
- More salmon needed to produce the same number of eggs



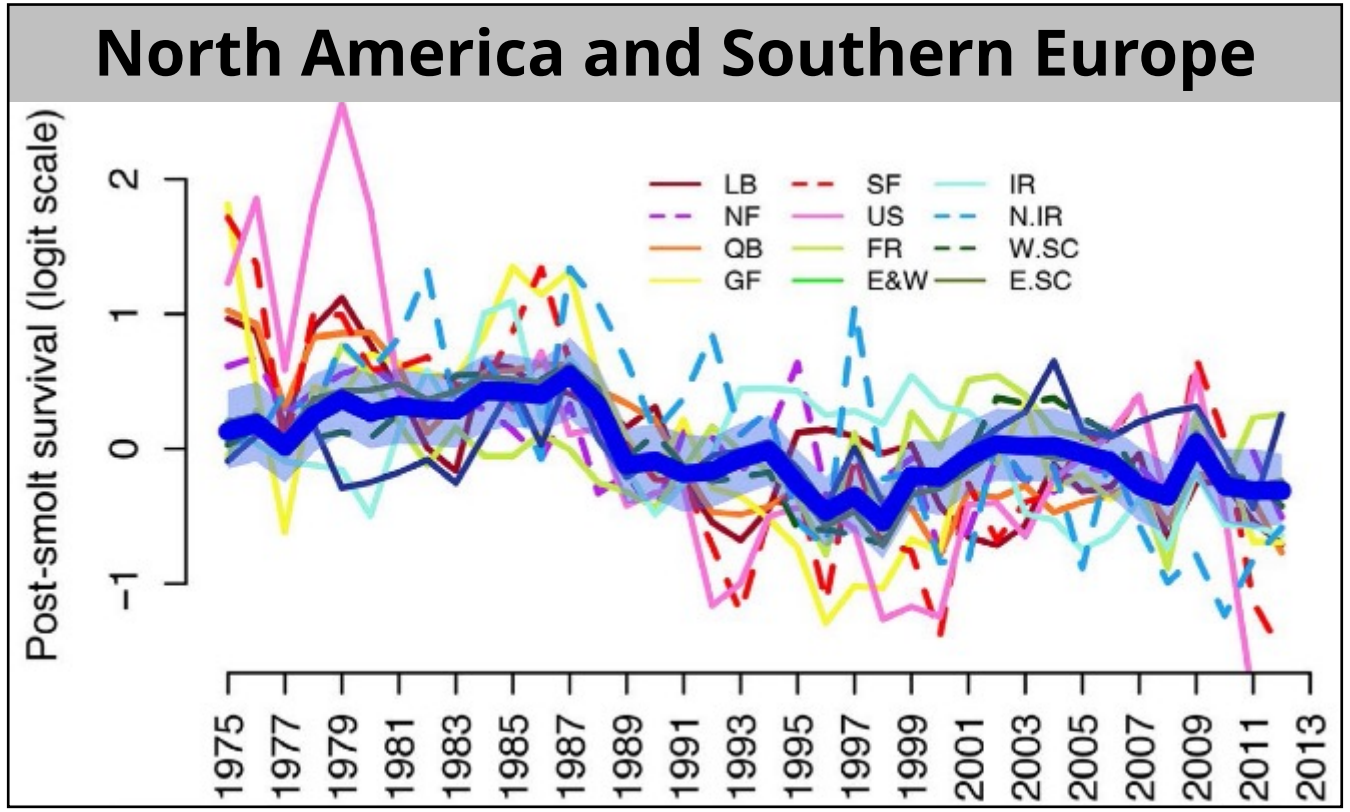




North Esk, Scotland

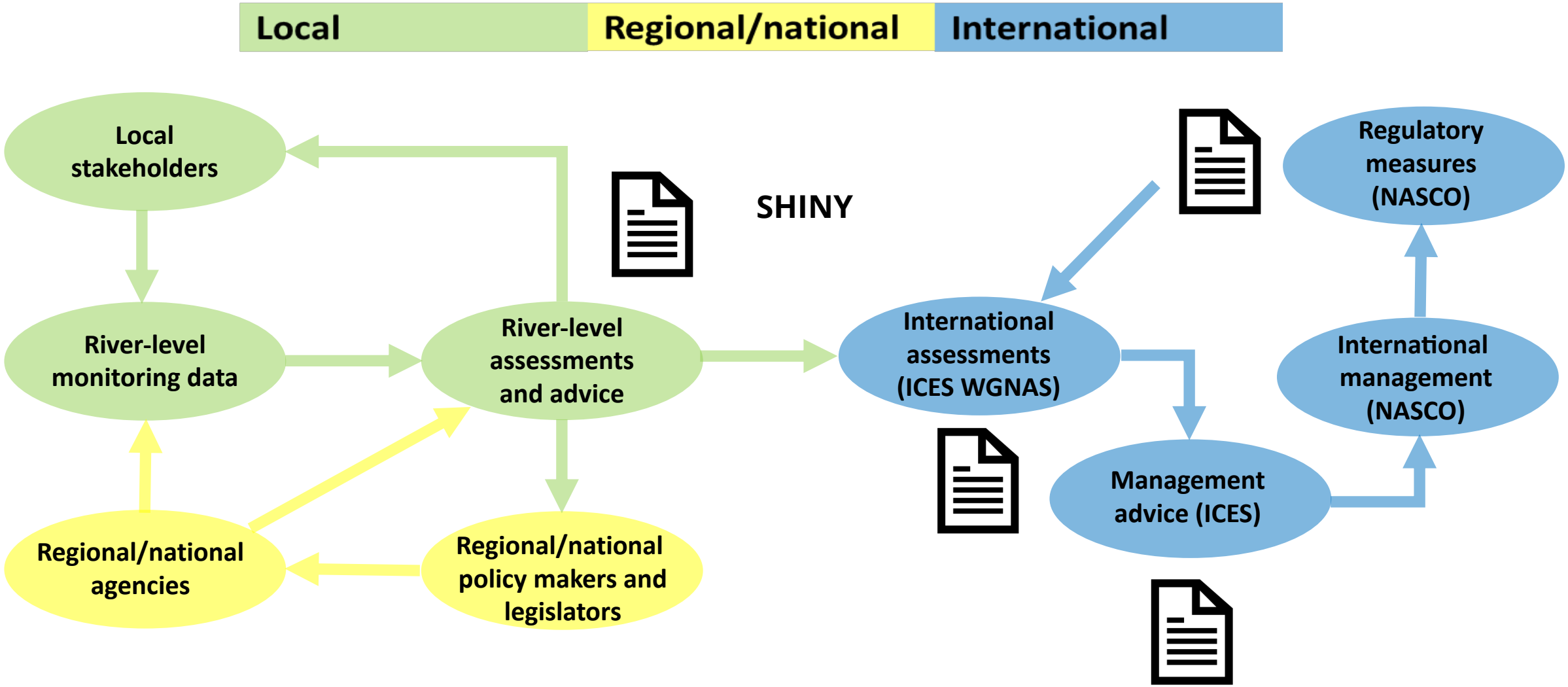
3. Marine return rates

- Return rates have declined since mid-1980s
- ~ < 5% of smolts now surviving
- Important driver of observed declines in abundance in recent decades
- Associated with changes in marine conditions



Olmos *et al*. 2020

Communication



Challenge to describe methods & results in ways understood by all

Knowledge gaps

More robust data and better parameterisation for models

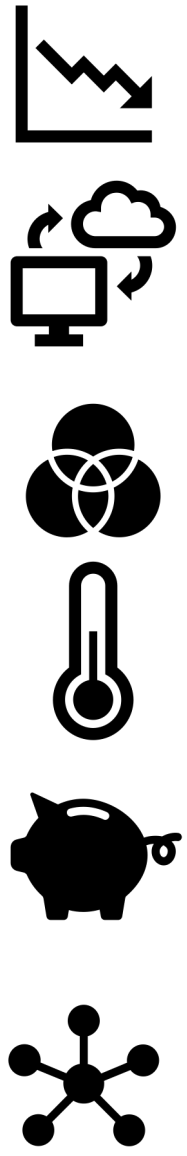
Superior statistical methods with greater biological realism

Improved understanding of non-fishing human factors and natural mortality

Identification of key space and time domains where mortality is greatest to prioritise effective management actions

Forward look

- Continue to invest in monitoring and developing appropriate assessment tools (***Status of salmon*** theme session)
- Mobilise salmon information in FAIR systems together with environmental change data (***Information systems*** theme session)
- Integration of other knowledge systems (***Human dimensions*** theme session)
- Conduct future scenario planning (***Salmon in a changing salmosphere*** theme session)
- Refine where limited resources most effectively channelled (***Salmon in a changing salmosphere*** theme session)
- Feeding into adaptation/transformation of management systems and strategies fit for a rapidly changing world (***Salmon in a changing salmosphere*** theme session)



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Thank you for listening