Baltic salmon situation: historical, current and future

Stefan Palm (SLU Aqua) & Atso Romakkaniemi (Luke)

”Save the salmon 2024”, October 23, 2024

Photo: Åke Forssén

Photo: Åke Forssén

Baltic salmon rivers

- Originally >100 rivers with salmon
- At present, 58 rivers listed by ICES
  - 27 wild
  - 17 reared
  - 14 mixed (wild + reared)

  + potential salmon rivers
- Six assessment units (AUs)

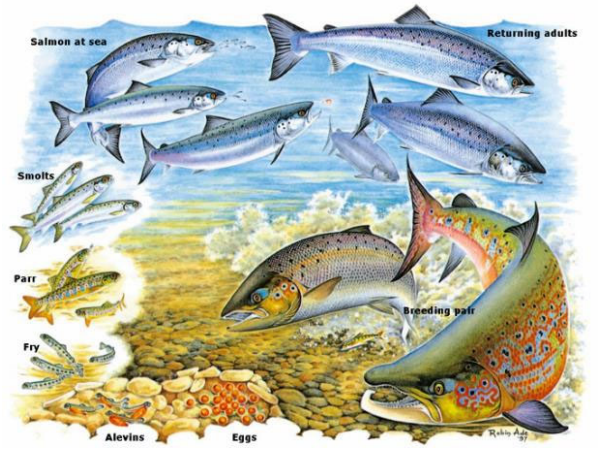
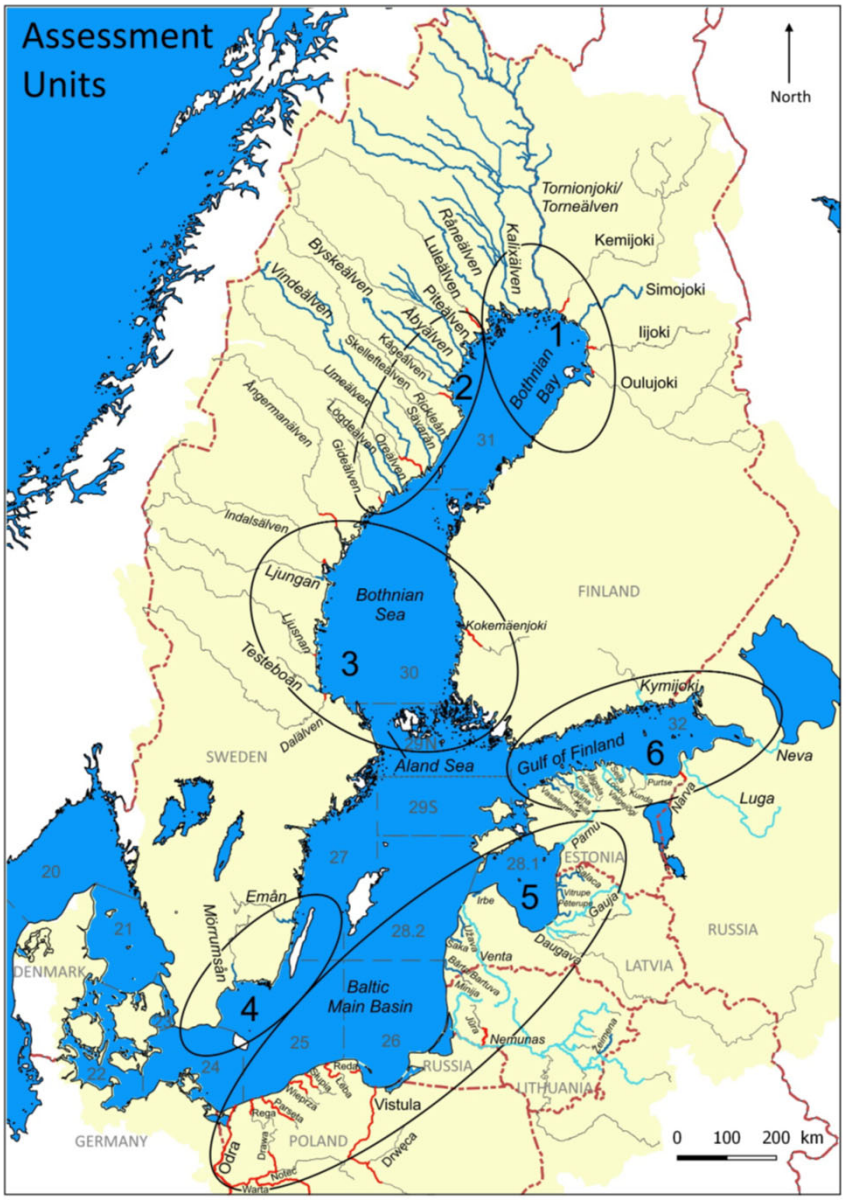
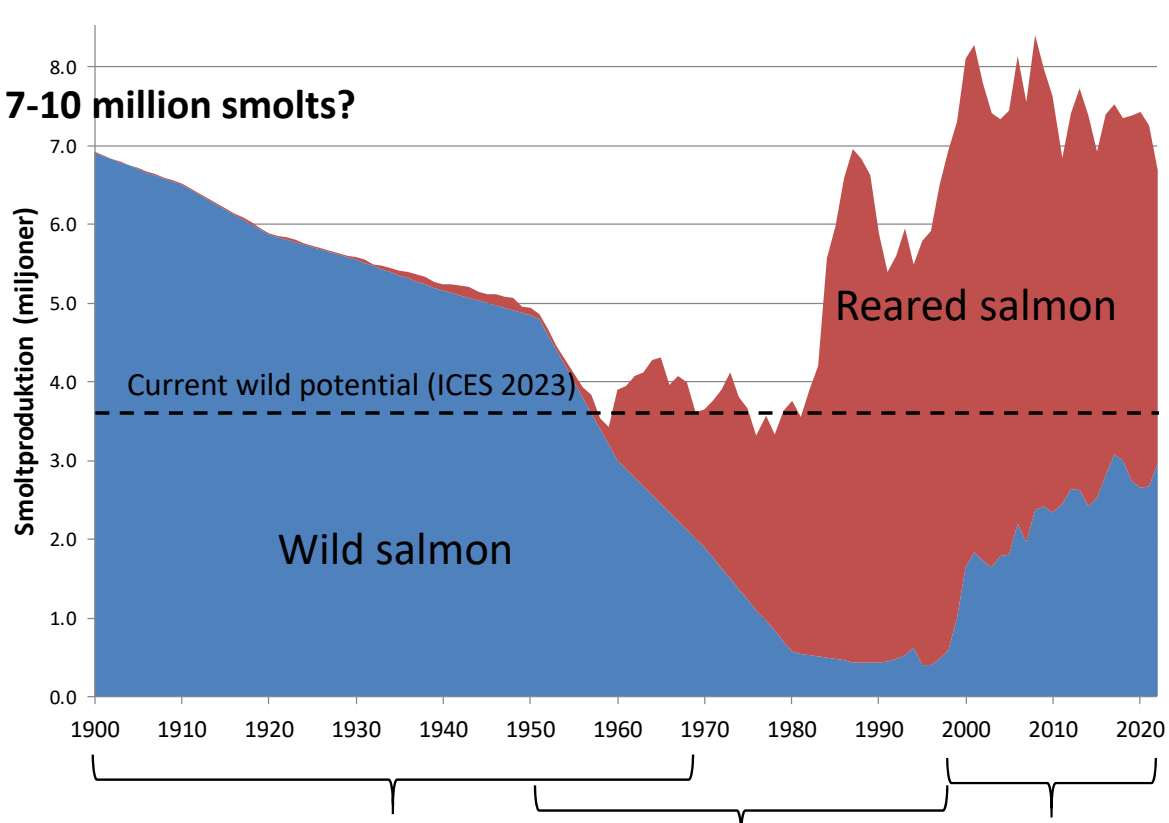


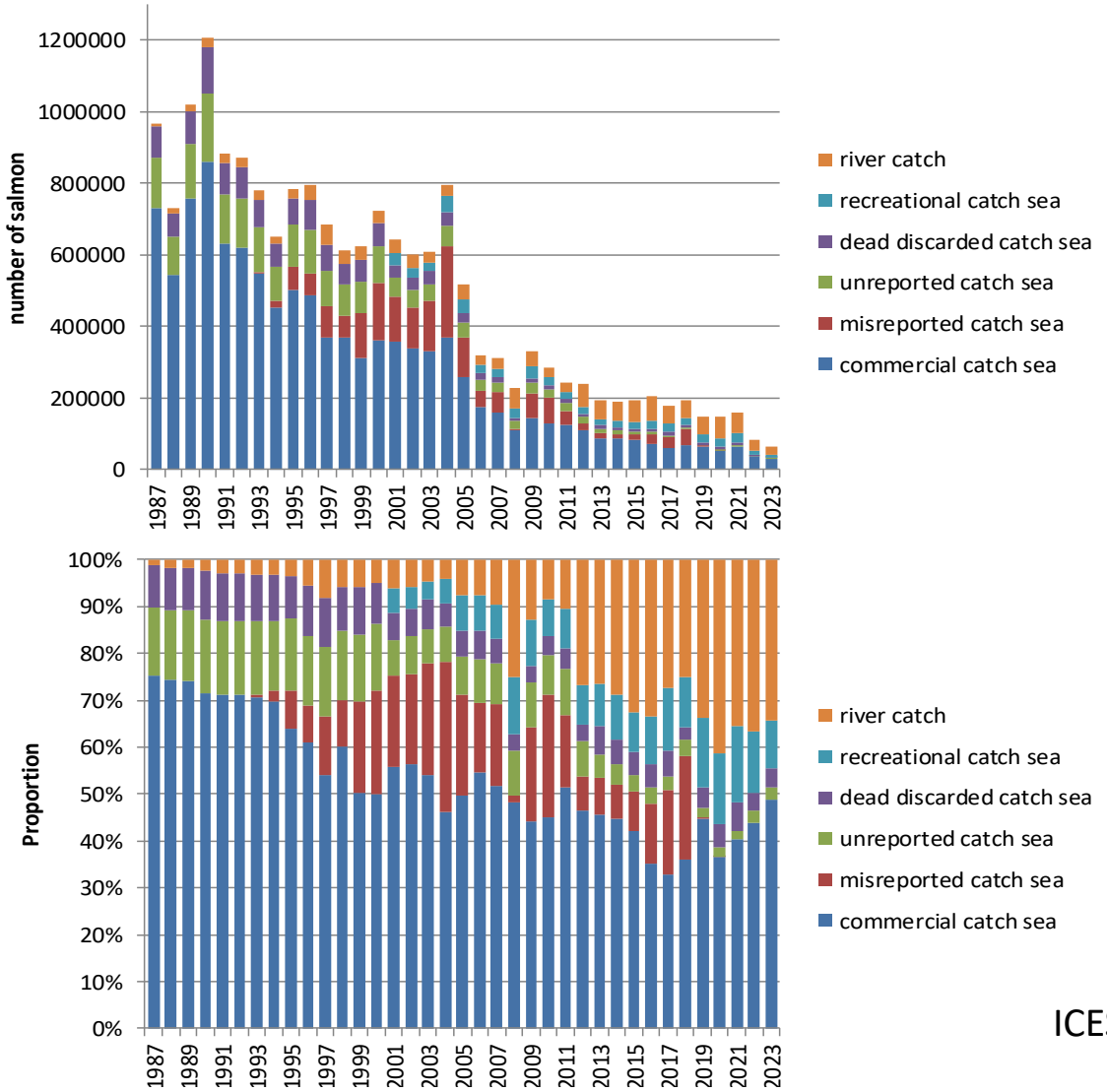
Illustration: Atlantic Salmon Trust



Historic development



Catch development



ICES 2024

Salmon health issues

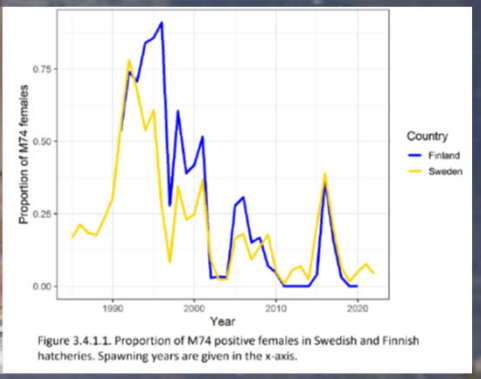


Figure 3.4.1.1. Proportion of M74 positive females in Swedish and Finnish hatcheries. Spawning years are given in the x-axis.

- ”M74” (fry mortality, linked to thiamine deficiency in eggs)
- ”Red skin disease” (RSD), since 2014
  - Mortality among returning adults
  - Variation among years and rivers
  - Some rivers more affected than others (Vindelälven and Ljungan worst off)
  - Lack of data (proportions dying before spawning?)
- Decrepit adults (indirect observations)
  - Tagged salmon in seemingly good physical condition (Vindelälven and Torneälven) leaving the river before spawning (lack of energy?)
- “Zombie salmon” – adults with abnormal behaviour (in river)

Caus(es)? One or several?

Residual effects in offspring from surviving adults?

Photo: Janne Juuso


Current situation?

ICES WGBAST

- ICES Assessment Working Group on Baltic Salmon and Trout
- Around 35 members from all countries around the Baltic Sea
- Experts in (mainly) salmon biology, ecology, population genetics and statistical modelling
- Data collection and data analysis
- Basis for fisheries advice (mainly)

Data collection and stock assessment

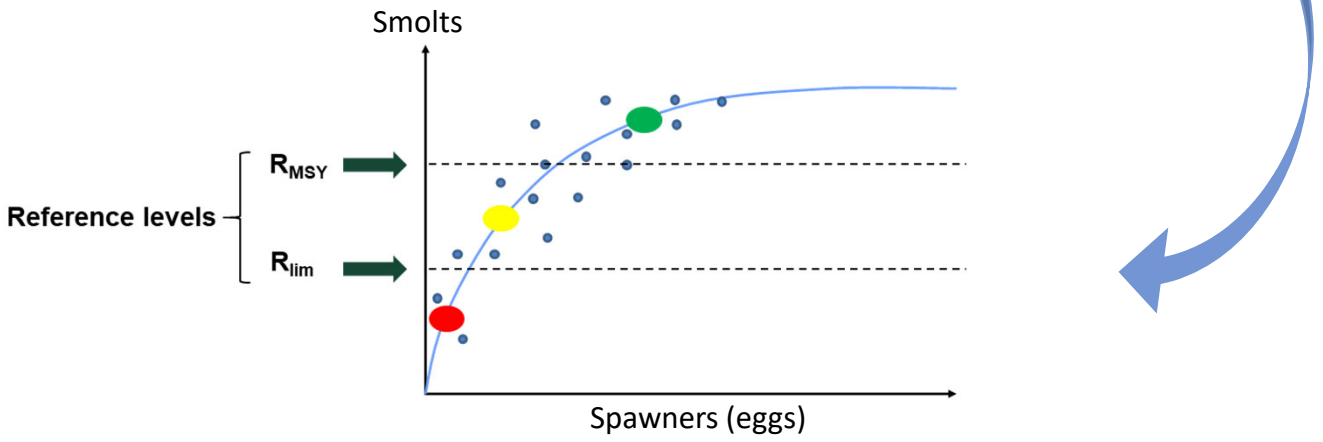
Data

- Literature
- Habitat inventories
- Parr density (electrofishing)
- Smolt abundance
- Spawner counts
- Index rivers
- Releases
- M74
- (Tagging data)
- Fishery statistics
- Sea water temperature

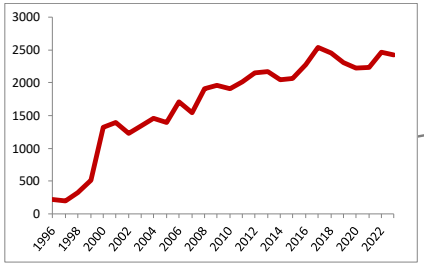
Full life-history model (+ submodels)

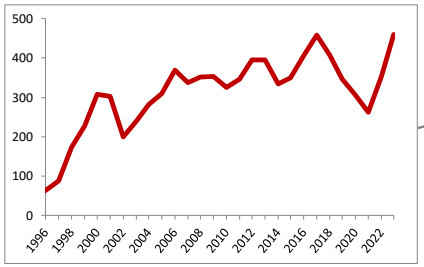
Results

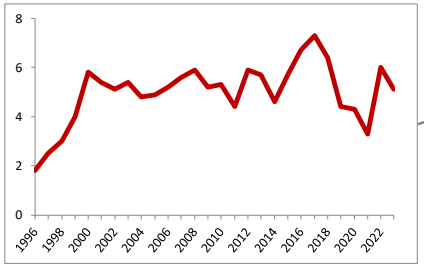
- Natural survival/mortality
- Fishing mortailty
- Smolt production
- Stock-recruit functions
- Stock status

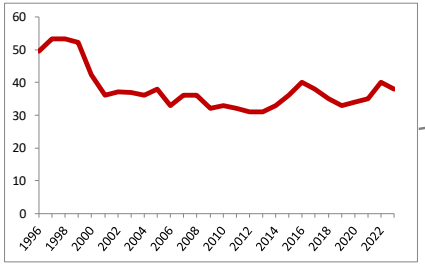


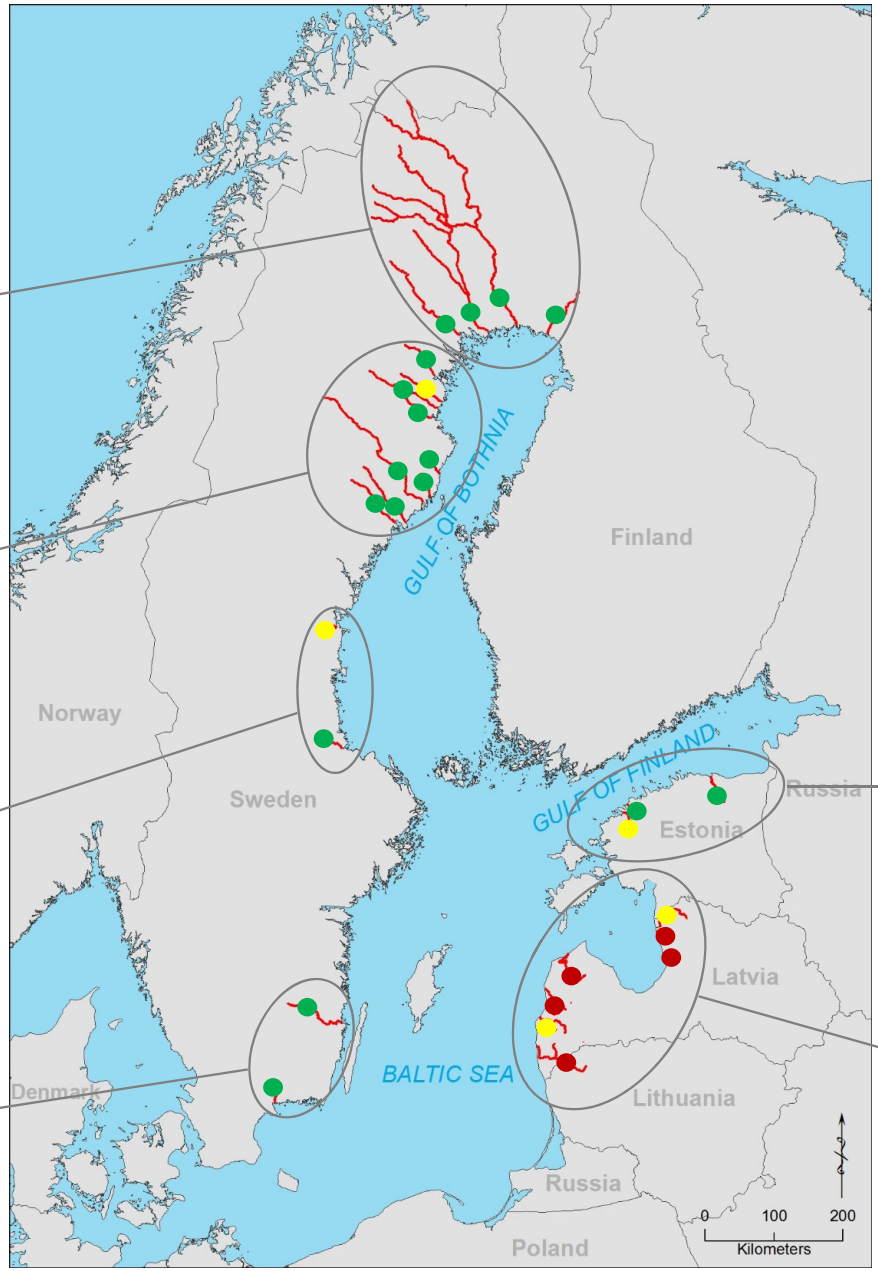
Smolt production
(wild salmon rivers, in 1000s)









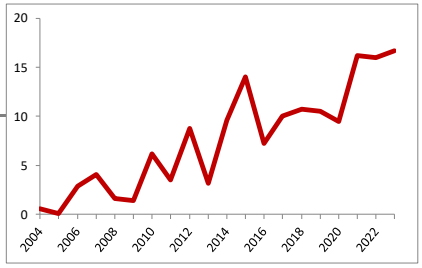


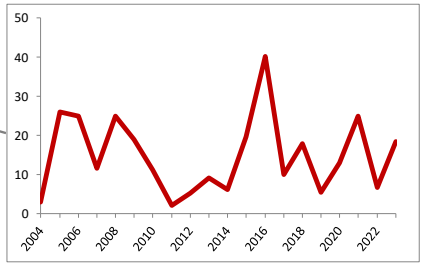
Current status
(2023 smolt production)

- ≥R_{MSY}
- >R_{lim}, <R_{MSY}
- ≤R_{lim}

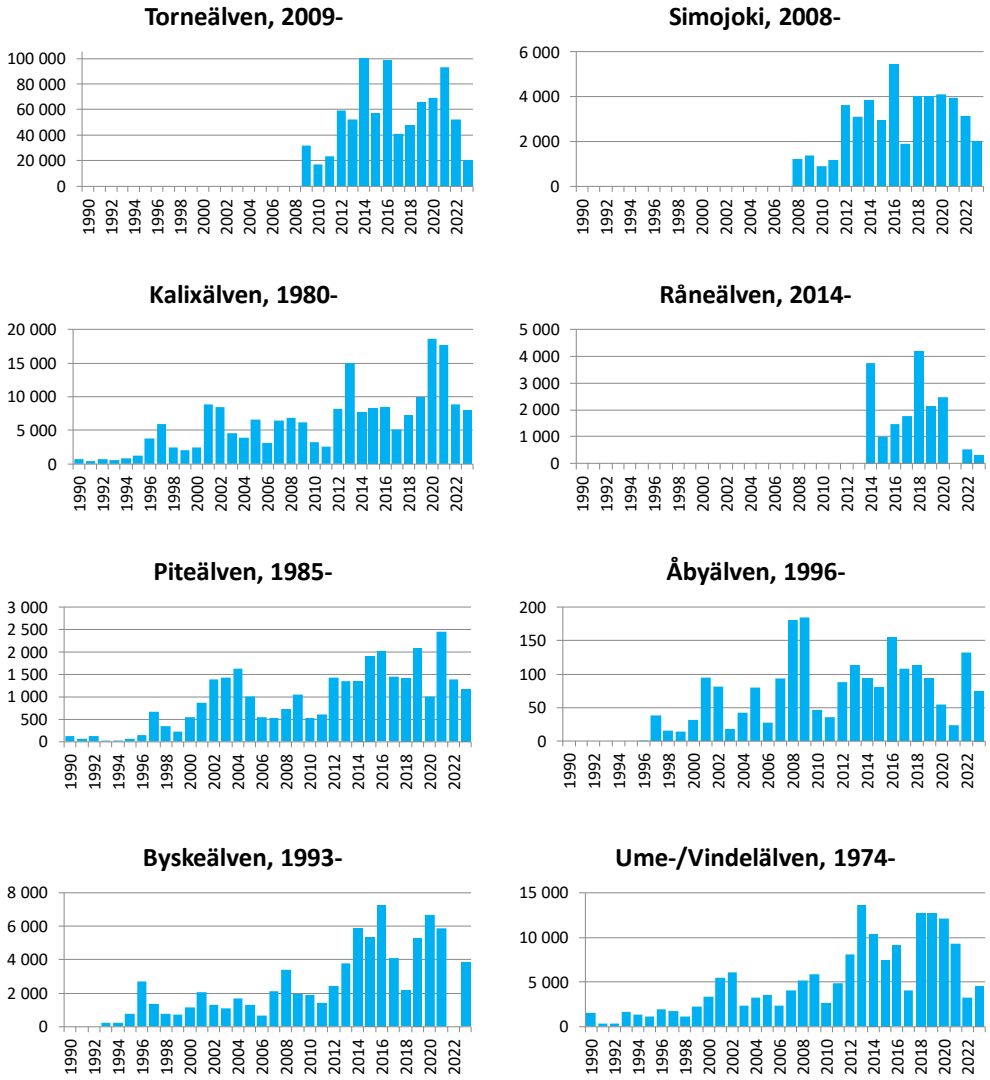
Criteria for fulfilling targets:
Probability >50% (R_{lim}), ≥50% (R_{MSY})

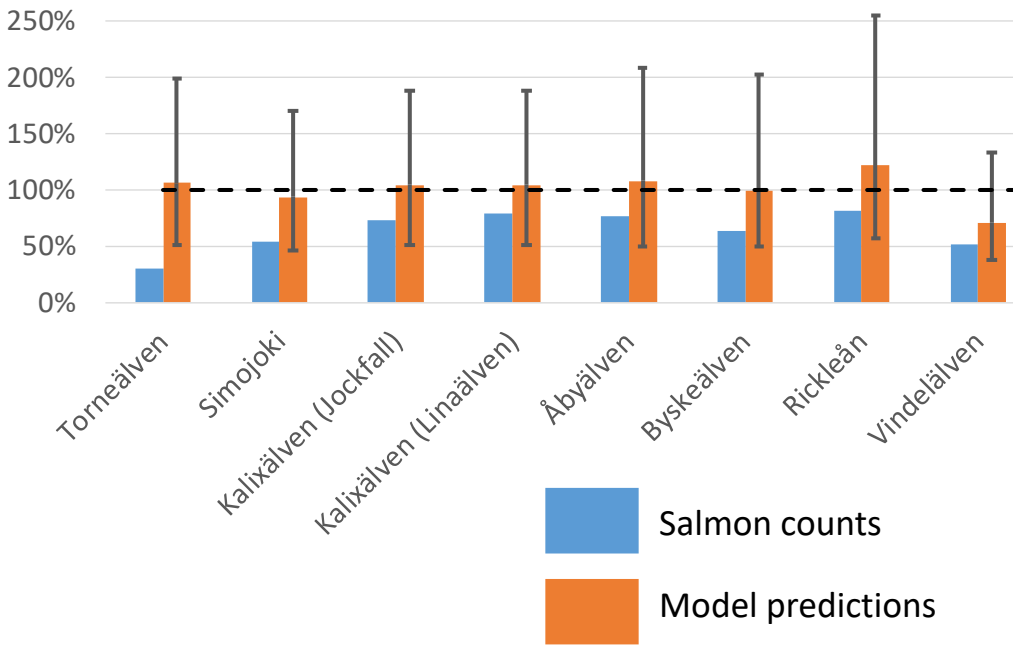
Source: ICES 2024



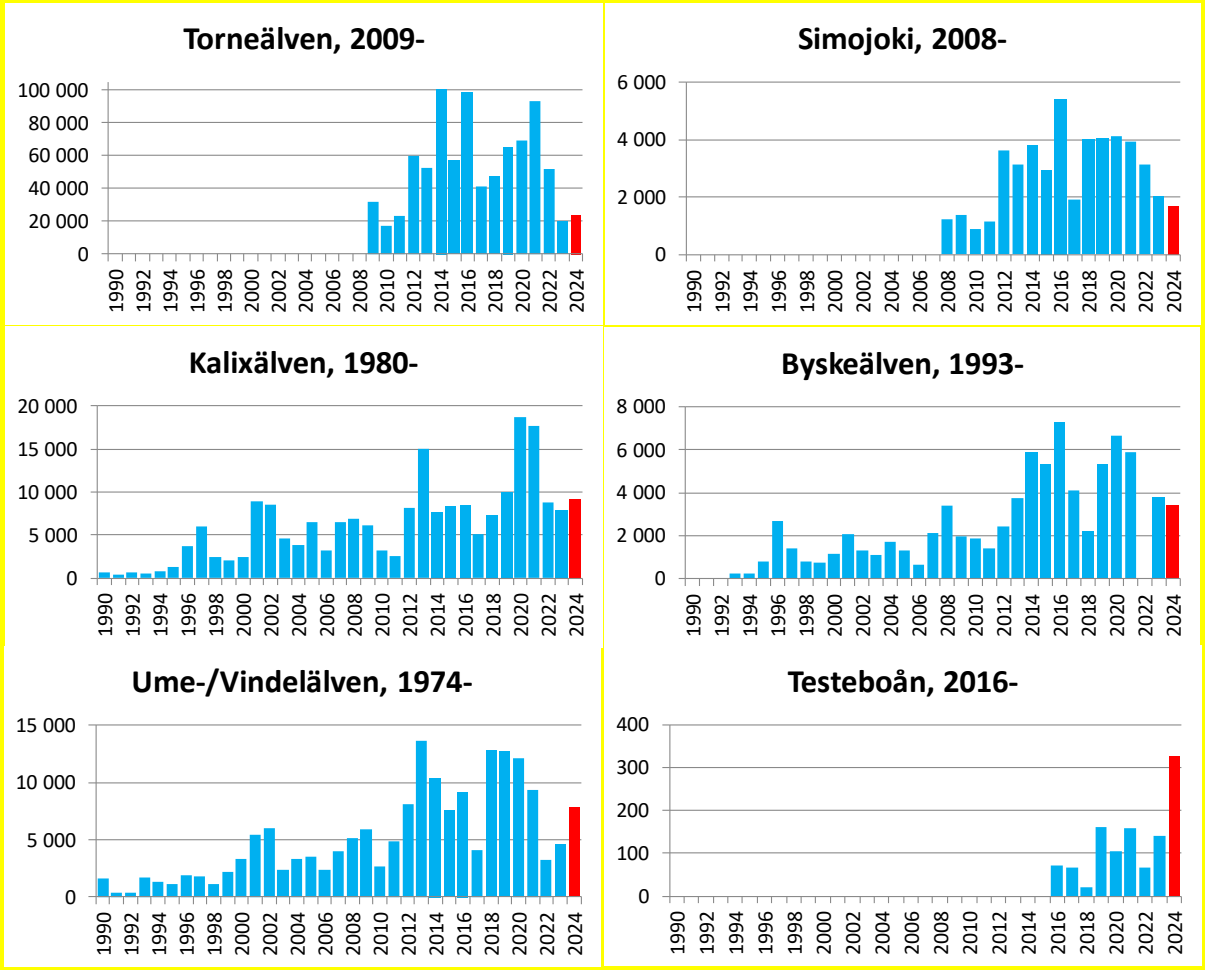


2023 – a weak salmon year in northern salmon rivers





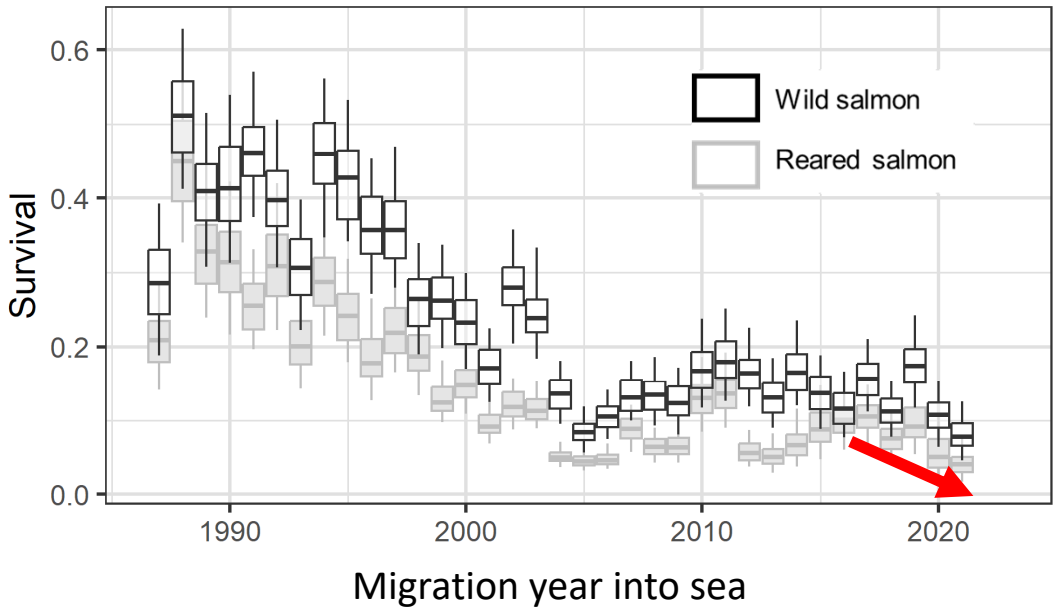
2024: preliminary data from some rivers



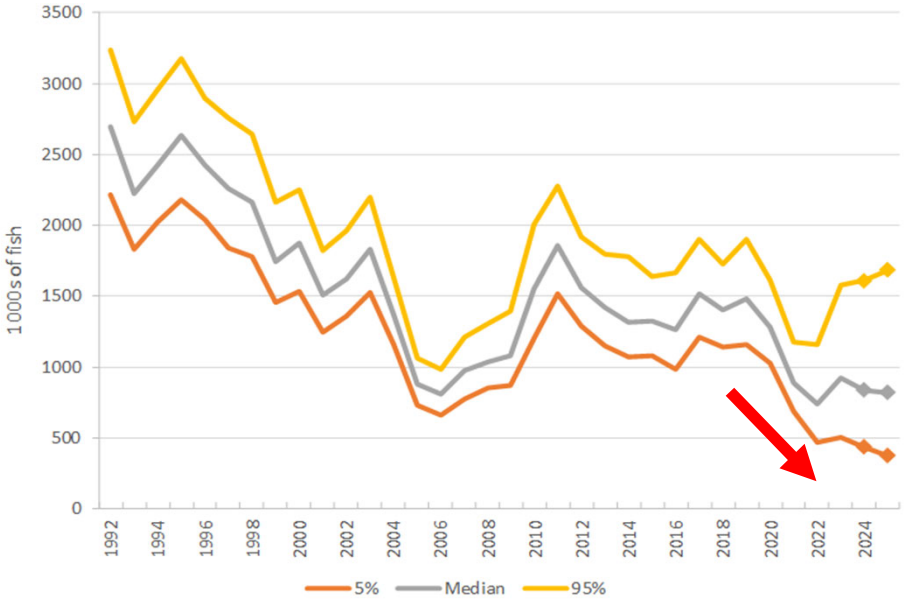
ICES 2024: Survival of post-smolts has decreased in the past years

- The real decrease in survival has likely been even stronger
- Potential differences among river stocks?

Post-smolt survival



Total amount of salmon on feeding grounds

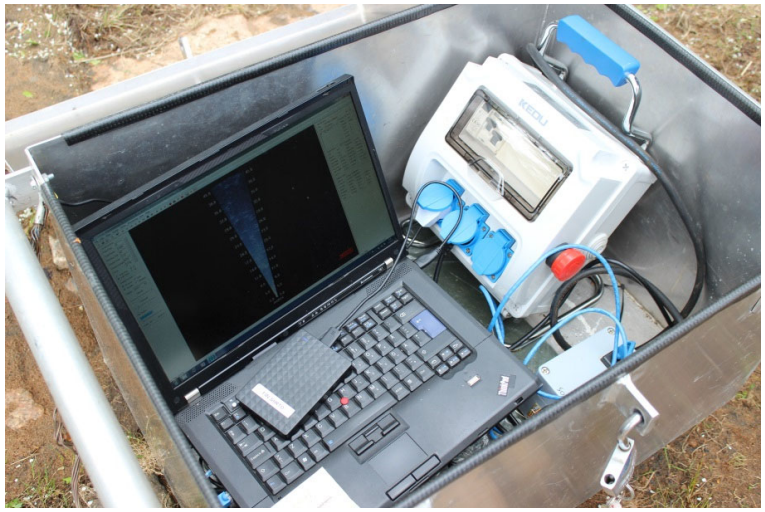


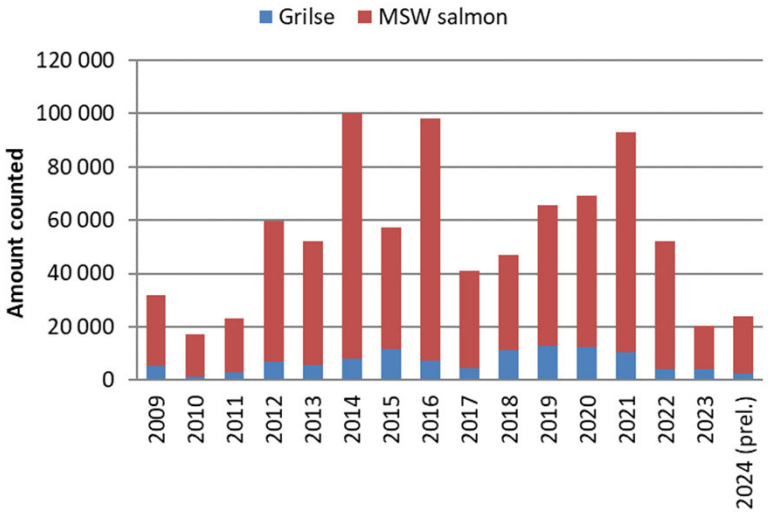
New research project on Baltic salmon sea survival

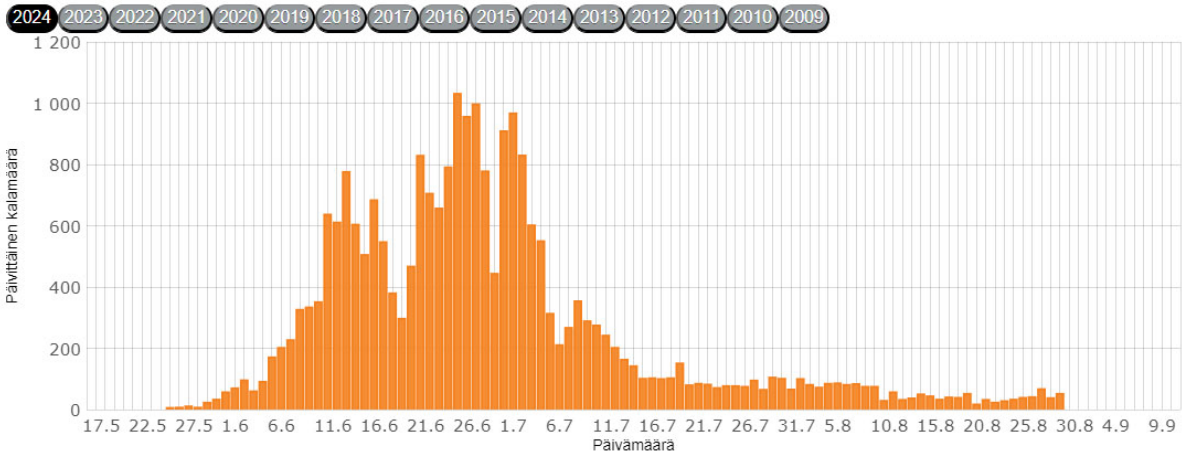
- Planned for 2024-2025 (final reporting in 2026)
- Collaboration Finland (Luke) and Sweden (SLU)
- Existing data, statistical evaluations
- Potential explanatory variables:
  - Food quantity and quality (e.g. young herring in the Gulf of Bothnia)?
  - Abiotic factors, e.g. temperature (climate change)?
  - Natural predators (seals, birds, predatory fish species)?
  - By-catch of salmon in pelagic trawling (targeting herring/sprat)?
  - Health-related issues (e.g. reduced fitness in post-smolts)?
- No results yet…

Salmon in Torneälven/Tornionjoki

Salmon counting, Kattilakoski: 2024 another bad year



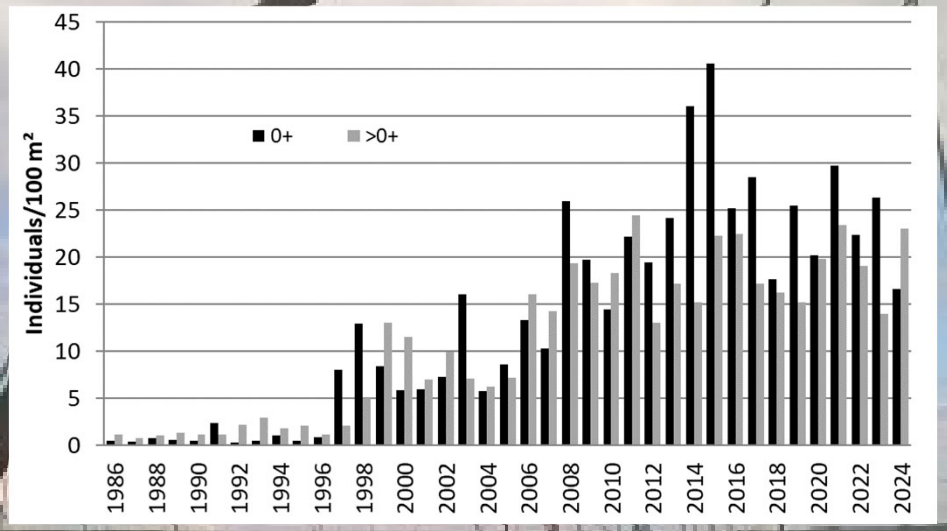




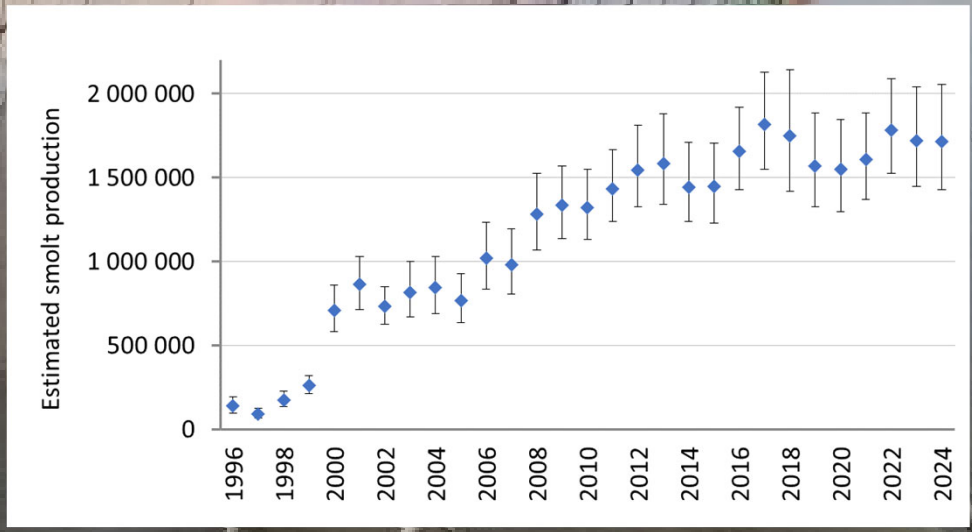
Lähde: Luonnonvarakeskus.

Young salmon (parr and smolts)

Average parr density
(prel. Swedish + Finnish data)

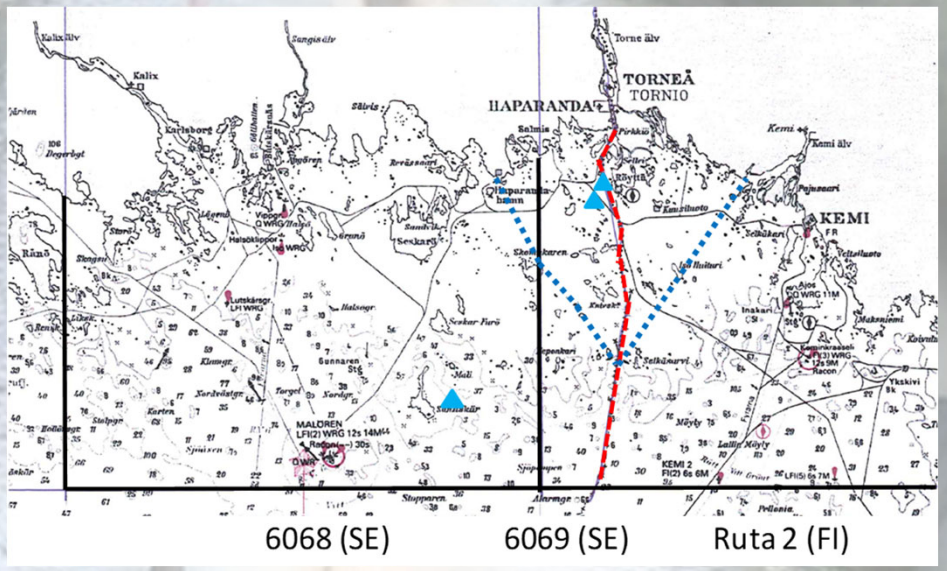


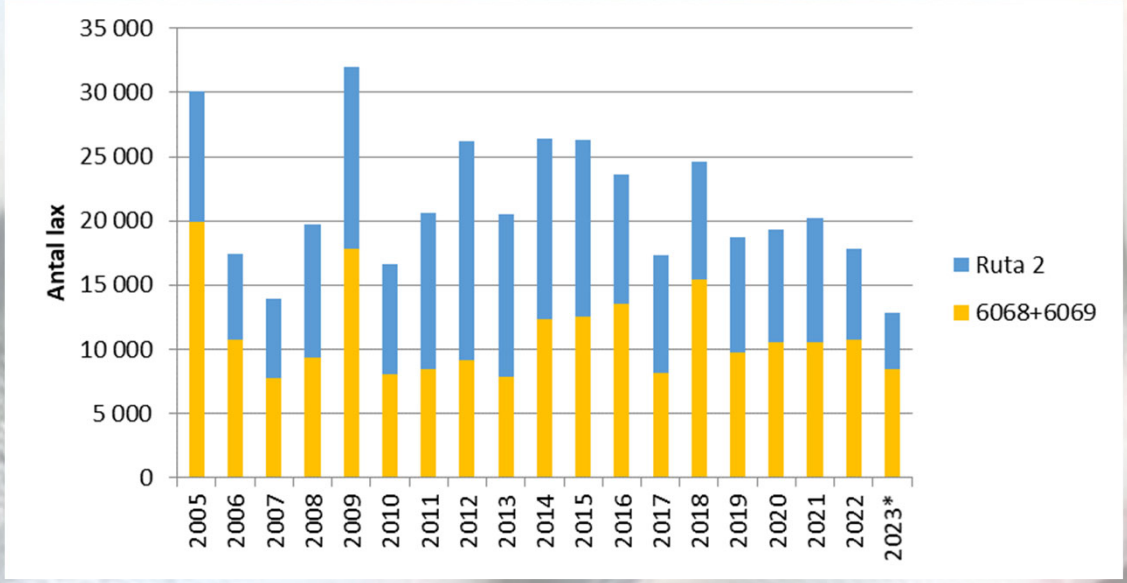
Smolt production
ICES WGBAST (2024)



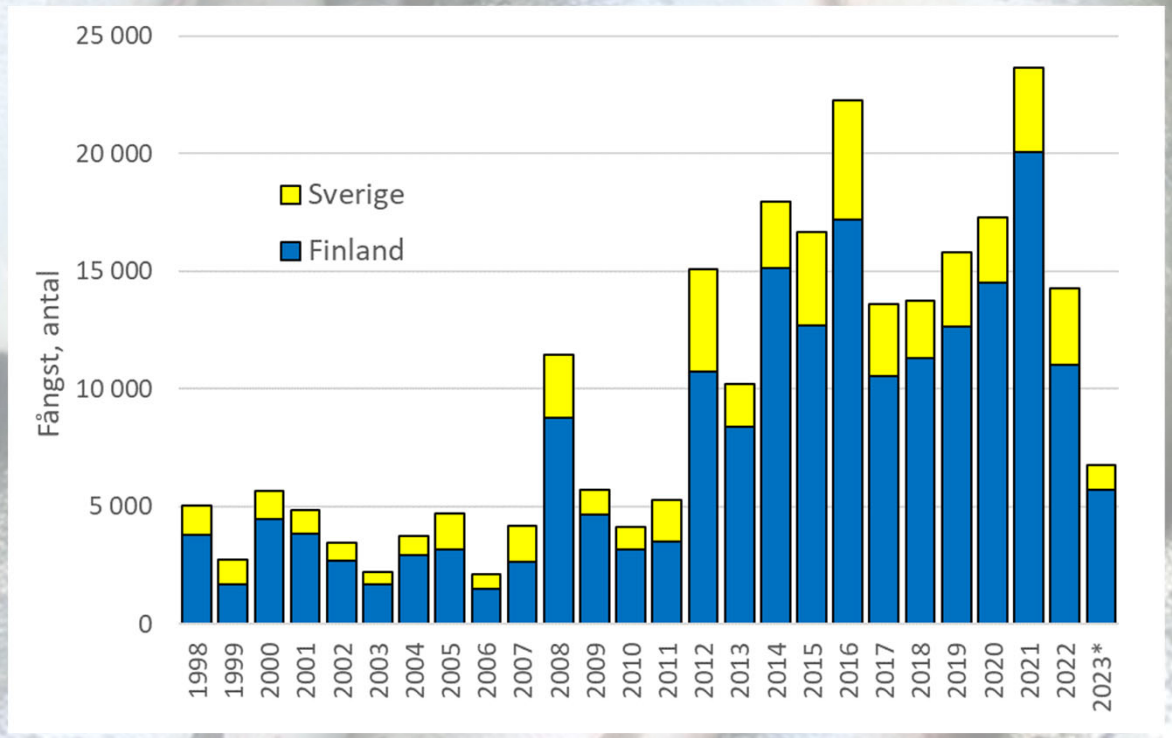
Local salmon fishing – river and river mouth

Swedish and Finnish commercial catches at river mouth, 2005-2023

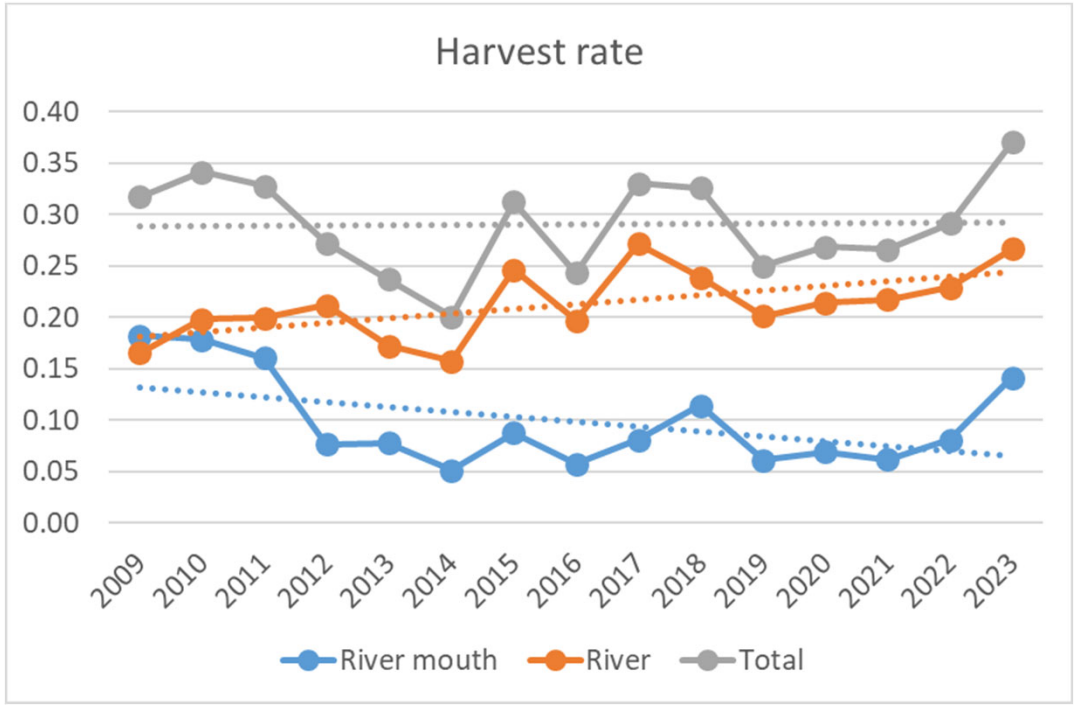


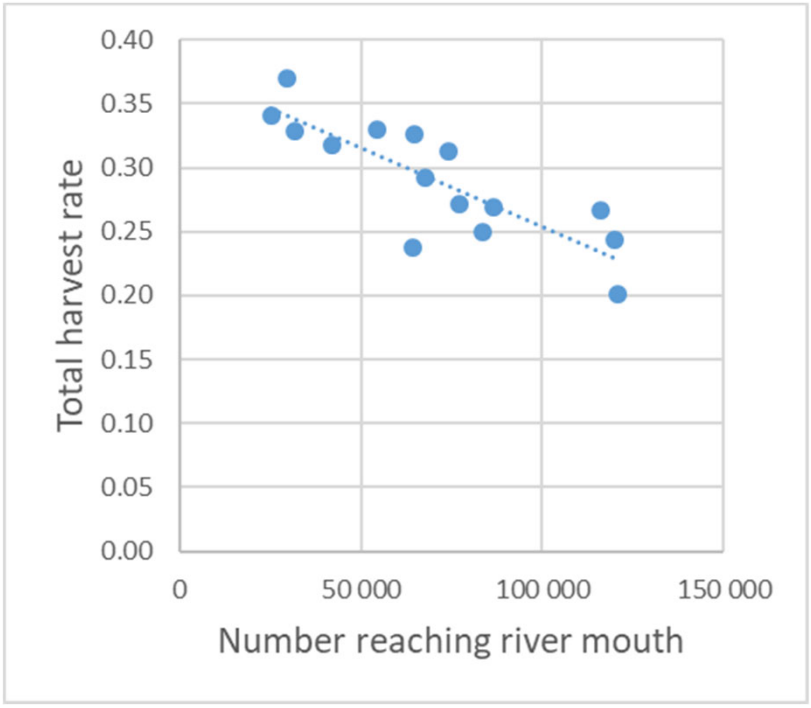


River catches (numbers), 1998-2023

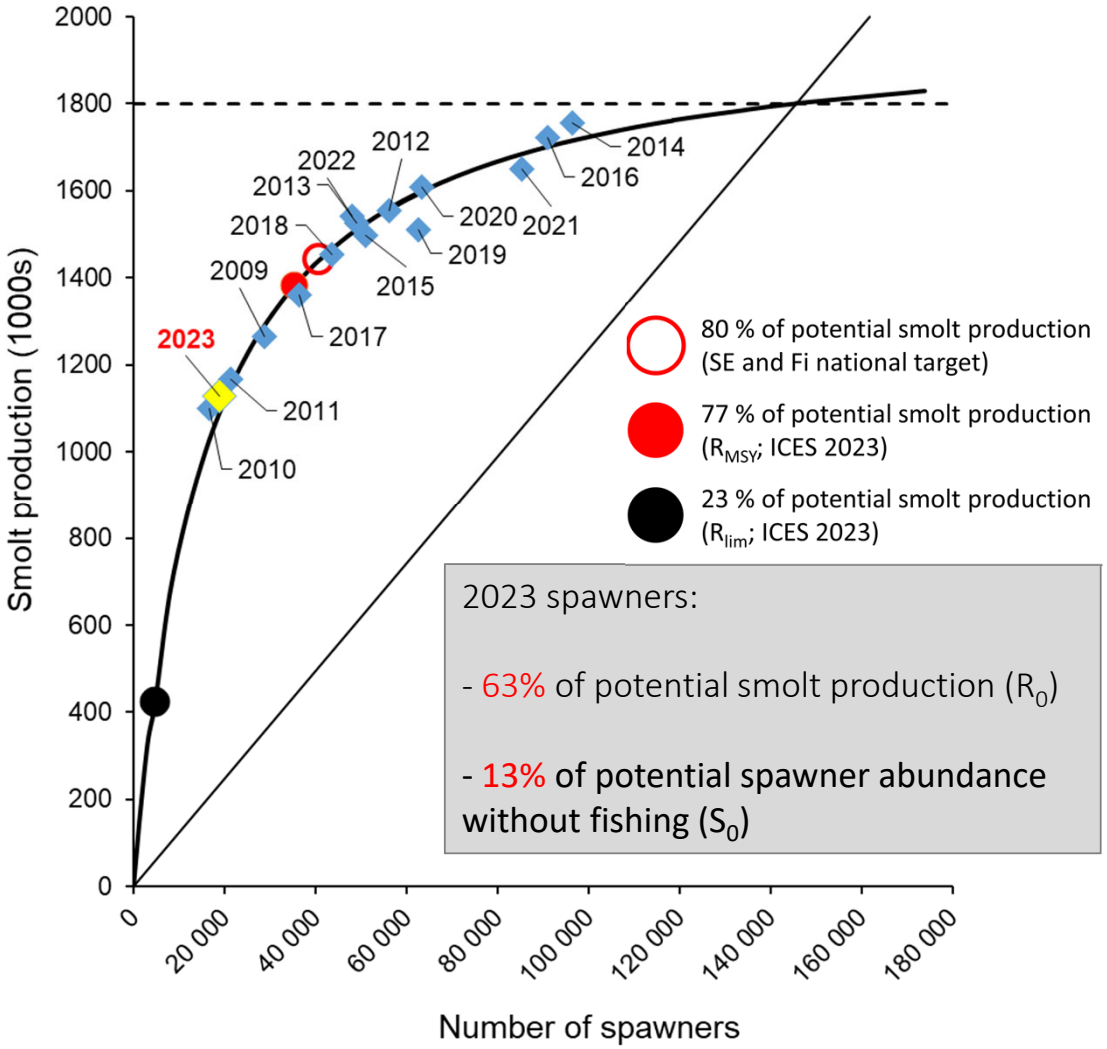


Harvest rates (proportion wild local salmon landed, 2009-2023)





Torneälven/Tornionjoki salmon stock status?



ICES (2023): ~35 000 spawners needed to reach MSY (with 50% probability)

National targets (80 % of potential smolt production) needs 46 000 spawners to reach it with 75 % probability

ICES (2024): revision to the basis of calculating reference points → lower requirements for the number of spawners

Recommendations for local fishing in 2024

To reduce the risk that the 2024 spawning stock should fall below targets, a **reduction in fishing mortality** was recommended


1 (49)

SLU ID: SLU.aqua.2023.5.4-18
Luke ID: 501/11 00 03/2020

Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences
Institutionen för akvatiska resurser

Luke
NATURRESURSINSTITUTET

2024-02-23

Torneälvens bestånd av lax, havsöring och vandringssik – gemensamt svensk-finskt biologiskt underlag för bedömning av lämpliga fiskeregler under 2024

Stefan Palm[1] (SLU), Atso Romakkaniemi[2] (Luke), Johan Dannewitz (SLU), Tapani Pakarinen (Luke), Lari Veneranta (Luke), Ville Vähä (Luke), Andreas Broman (Länsstyrelsen Norrbotten)

[1] stefan.palm@slu.se ,+46 10 478 42 49; [2] atso.romakkaniemi@luke.fi, +358 29 532 74 16

Laxfångst från Torneälven (Foto: Ville Vähä)

Examples of possible measures:

Indirect catch limitations (via reduced fishing effort)

- Delayed start of fishing (river, estuary)?
- Earlier fishing stop (river, to protect larger salmon)?
- More than one fish-free day per week (river)?
- Limit on the number of sold fishing permits?

Direct catch limitations

- Local fishing quotas?
- "Bag limits"?
- Requirement for release (e.g., of female salmon)?
- Maximum size limit (to protect larger salmon)?

Assessment & advice on international vs. bilateral level

Complexities of stock status evaluation and predicting stock development

Photo: Åke Forssén

Assessment - scientific advice – management International level

International Council for the Exploration of the Sea ICES

Scientific advice

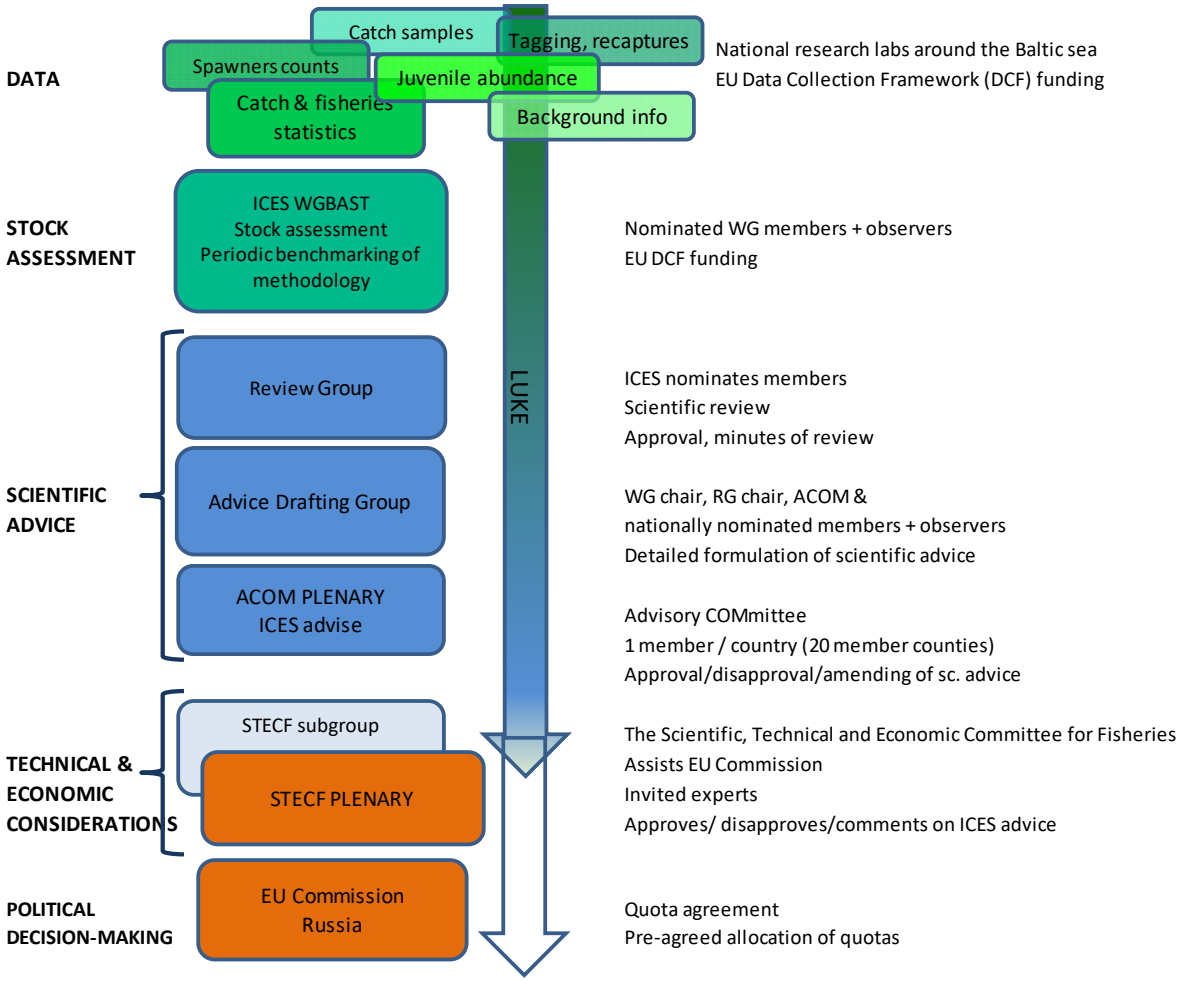
Salmon in Baltic Sea:

European Union

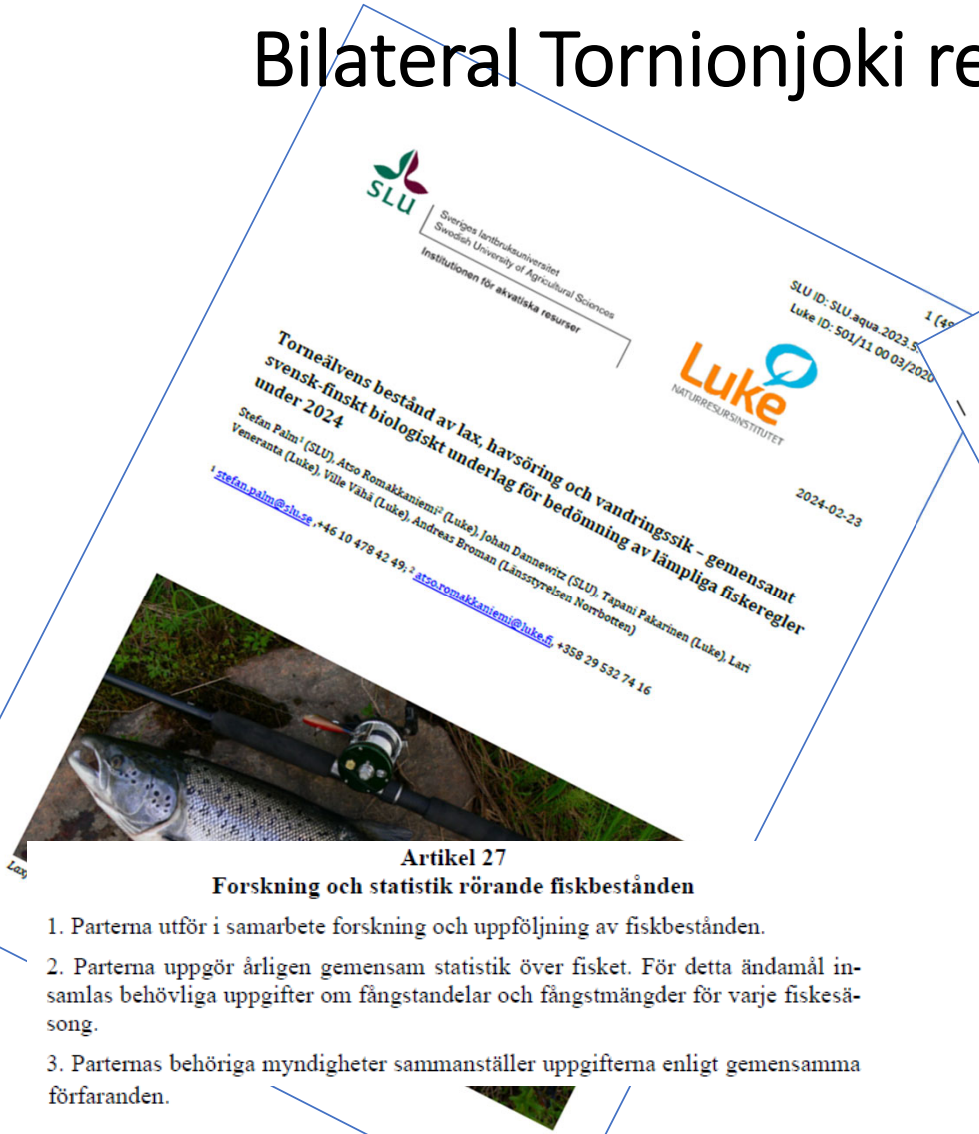
Salmon in N Atlantic ocean:

NASCO
North Atlantic Salmon Conservation Organization

Assessment - scientific advice – management
International level



Bilateral Tornionjoki research & monitoring



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SLU ID: SLU.aqua.2023.5
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Artikel 27
Forskning och statistik rörande fiskbestånden

1. Parterna utför i samarbete forskning och uppföljning av fiskbestånden.

2. Parterna uppgör årligen gemensam statistik över fisket. För detta ändamål insamlas behövliga uppgifter om fångstandelar och fångstmängder för varje fiskesäsong.

3. Parternas behöriga myndigheter sammanställer uppgifterna enligt gemensamma förfaranden.

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Luke
LUONNONVARAKESKUS

2024-02-23
(suomennos 6.3.2024)

Tornionjoen lohi-, meritaimen- ja vaellussiikakannat – yhteinen ruotsalais-suomalainen biologinen selvitys sopivien kalastussääntöjen arvioimiseksi vuodelle 2024

Stefan Palm[1] (SLU), Atso Romakkaniemi[2] (Luke), Johan Dannewitz (SLU), Tapani Pakarinen (Luke), Lari Veneranta (Luke), Ville Vähä (Luke), Andreas Broman (Norrbottenin lääninhallitus)

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27 artikla
Kalakantoja koskeva tutkimus ja tilastointi

1. Sopimuspuolet suorittavat yhteistyössä kalakantojen tutkimusta ja seurantaa.

2. Sopimuspuolet laativat vuosittain yhteisiä kalastustilastoja. Tätä tarkoitusta varten tarvittavat tiedot pyyntiosuuksista ja saalismääristä kerätään kultakin kalastuskaudelta.

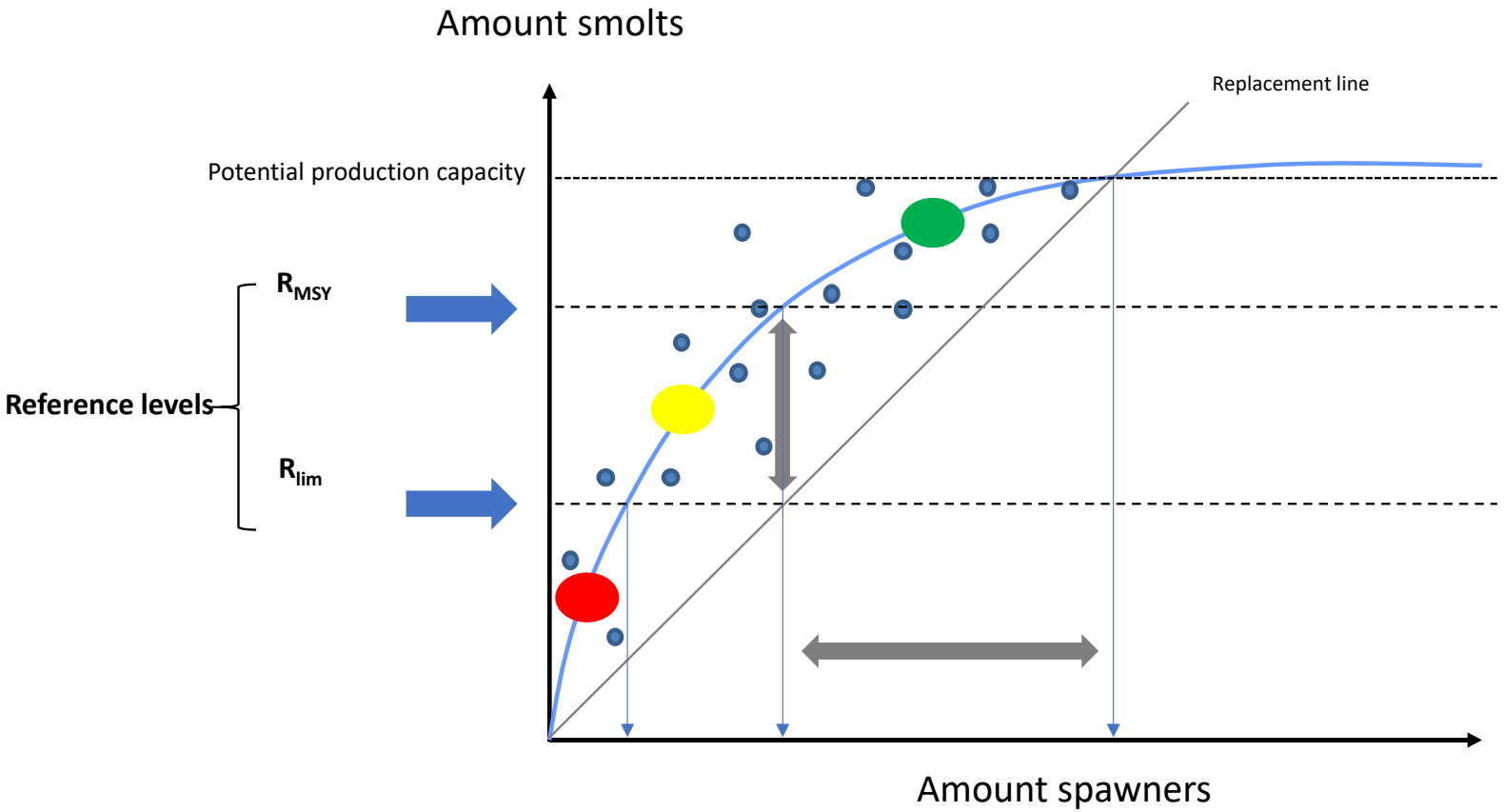
3. Sopimuspuolten asianomaiset viranomaiset kokoavat tiedot yhteisiä menettelytapoja noudattaen.

The approach of status assessment of Tornionjoki salmon

- Focus on data rather than modelling the data: catches, catch composition, parr densities, smolt production, spawner counts etc.
  - Pros: straightforward, easier to understand, up-to-date
  - Cons: Does not consider what data does not tell/'biases' in data, no formal synthesis of data

- Data-driven approach is complemented by some results from ICES assessment
  - Especially in actual status evaluation; how much salmon is (biologically) good/reasonable/bad amount
  - ICES assessment fails to be accurate because of, e.g., not using the latest data
    - For instance, 2023-2024 drops in spawning runs
- Note: A Tornionjoki-specific model version of ICES's model is under work

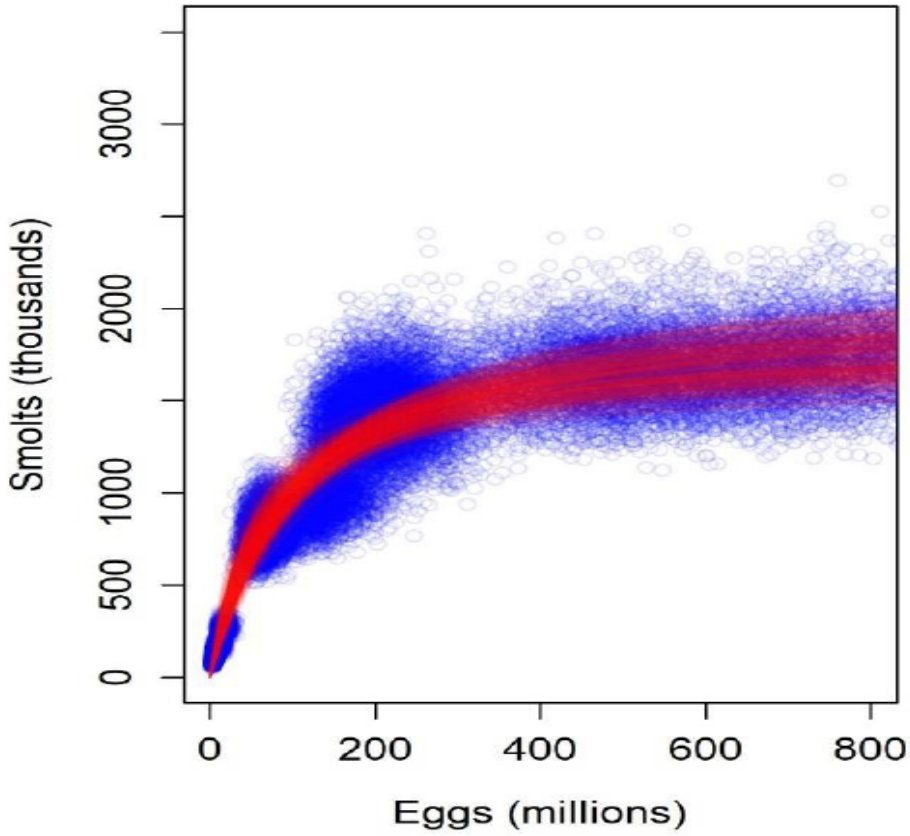
About productivity of salmon stock



Note:
Observations of S/R dynamics are from the latest few decades
→ The relationship displays the CONTEMPORARY situation in the river and the recent RECOVERY PHASE of salmon stock!

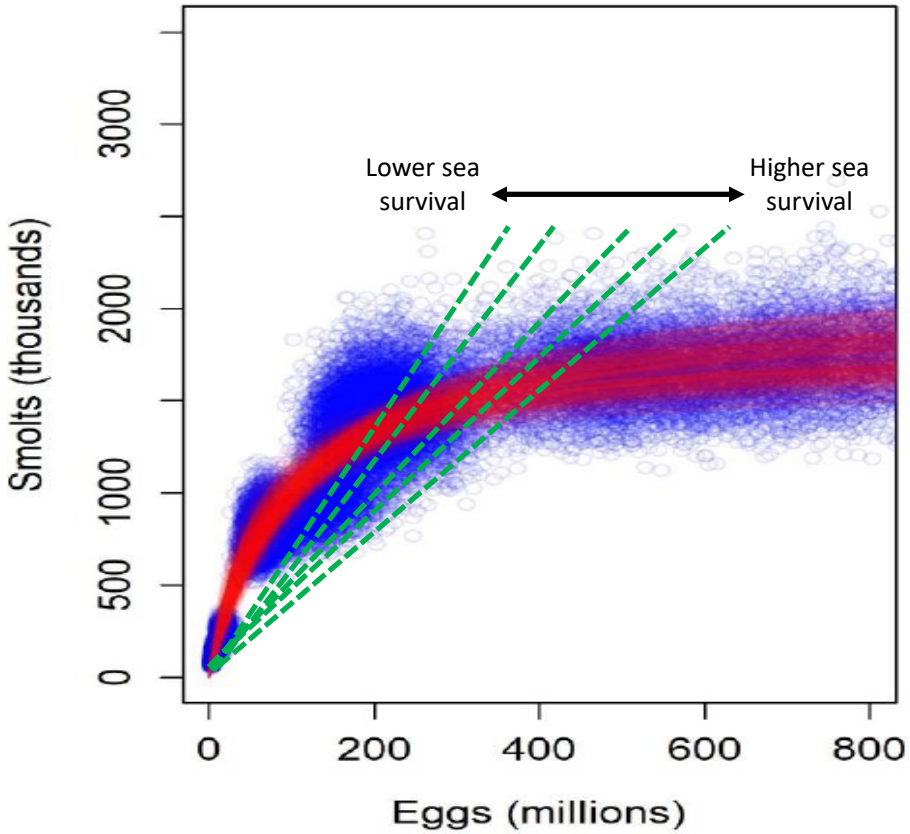
Uncertainties in measurements

- Possible realizations of #eggs vs. #smolts
- Possible realizations of S/R curve

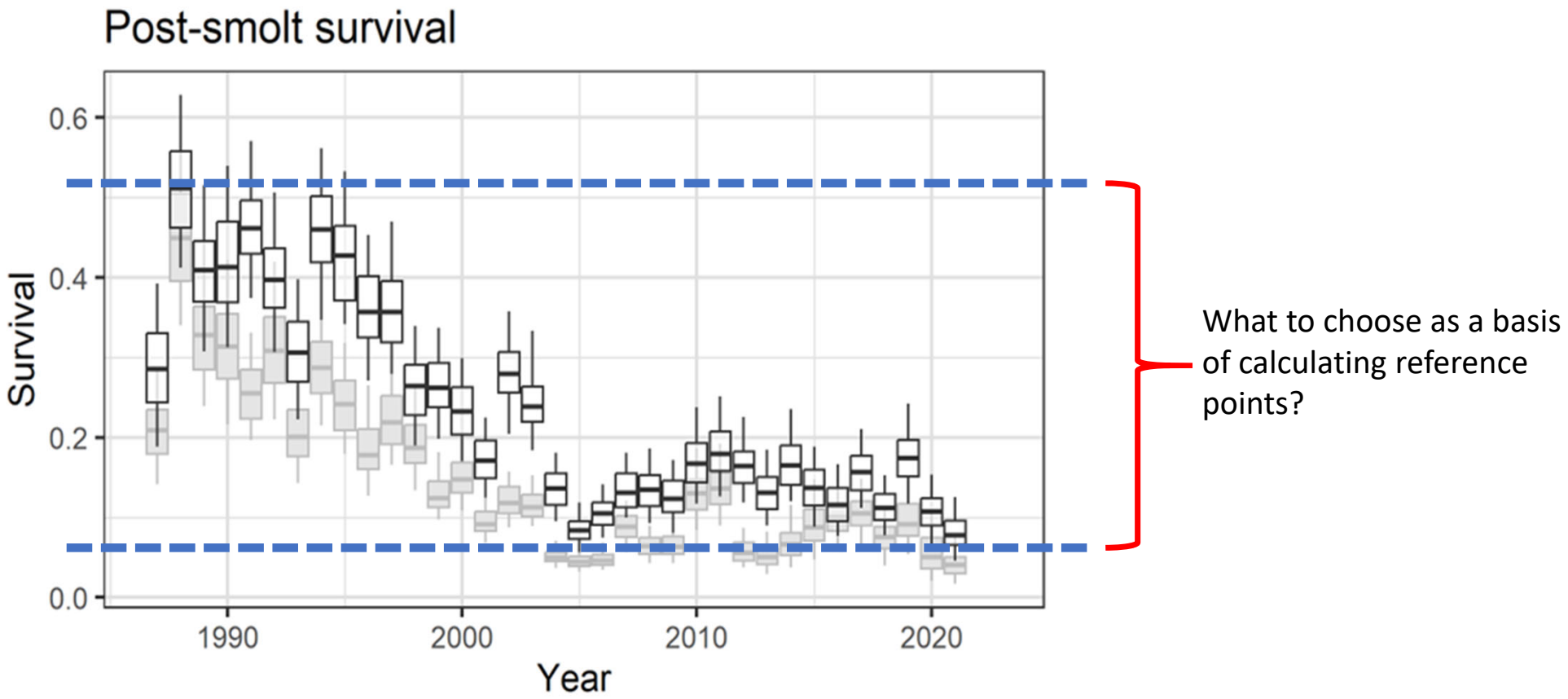


Variations in natural sea survival affects ’potential production’ AND reference points

”Nothing in the nature is static!”



The nasty consequences of the non-static nature

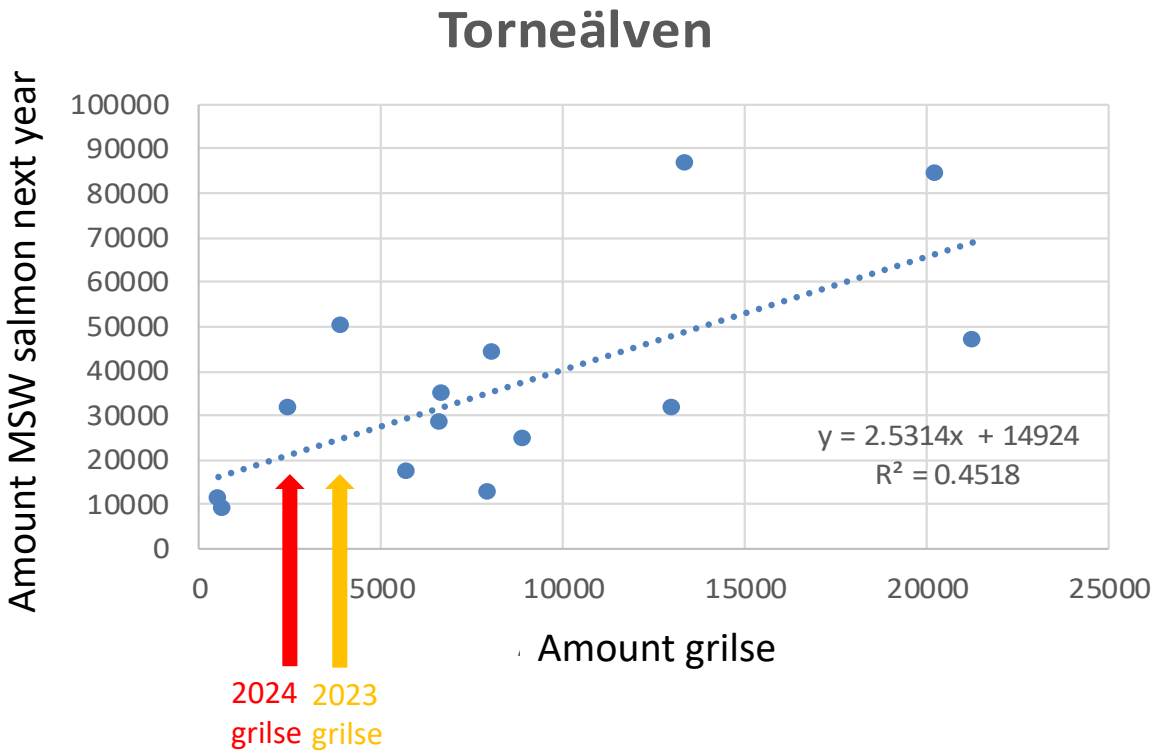


About forecasting – ICES model

- ICES assessment must forecast 2 years ahead
- No other cues for future abundance, but
  - General post-smolt survival level during the past few years
  - Grilse and 2SW abundance estimates 2 years before advice year → 3SW & 4SW abundance in target year
  - No other information used from 'interim year' (i.e. from assessment year), except SST (affecting maturation rates)
- Post-smolt survival is currently the key variable
- IF some biotic or abiotic factors explain post-smolt survival AND that information would be available early enough → better predictions about this survival → more accurate short-term forecasts of abundance

About forecasting – Tornionjoki assessment

- The age composition of the migrating salmon can provide clues about coming salmon run…
- A large number of grilse (one-sea-winter salmon) in year x could indicate a better spawning run in year x+1, and vice versa



About more real-time management – scientific viewpoints

- What tools would be successful to manage fisheries so that the mgmt target would be achieved in reality?
  - This is a problem to be resolved regardless of anything else
- More effective & formal use of previous year's monitoring data for predictions
  - Tornionjoki-specific version of ICES model – could be run with previous year's data
  - Some other approach?
- In-season management
  - Coast: no online information about the amounts of salmon when they are migrating and fished along the coast → mgmt relying on (uncertain) predictions
    - How cautious one should be with coastal fishing?
  - River: spawner counts could be used especially for mgmt of latter part of season
    - How cautious one should be with the early-season river fishing?

Main take-home messages

- Long-term positive development, but..
- Worrying decline in recent years, especially in northern rivers
- Xx
- Yy


Photo: Ville Vähä

Thanks for your attention!

Acknowledgements:

- xx & yy (Luke)
- Johan Dannewitz & Rebecca Whitlock (SLU Aqua)
- Stefan Stridsman & Markku Kilpala (Norrbotten County Board)
- Colleagues in WGBAST and field workers
- yy

Photo: Johan Nilsson