Presentation of all ICES Advice on North Atlantic Salmon Stocks to the Council

CNL(23)73

ICES Advice Highlights

Photo by Nick Hawkins

sal.oth.all

North Atlantic Salmon Stocks

Photo by Nick Hawkins

ICES CIEM

ToR 1.1 Reported Catch

- Reported whole weight of fish caught and retained (harvest)
- Released fish not included

2021: 630 t　　　　**2022:** 700 t

from Table 1: *sal.oth.all*

Year	2019	2020	2021	2022
NEAC	756	761	487	568
NAC	101	105	100	101
WGC	29	32	43	31
Total	886	898	630	700

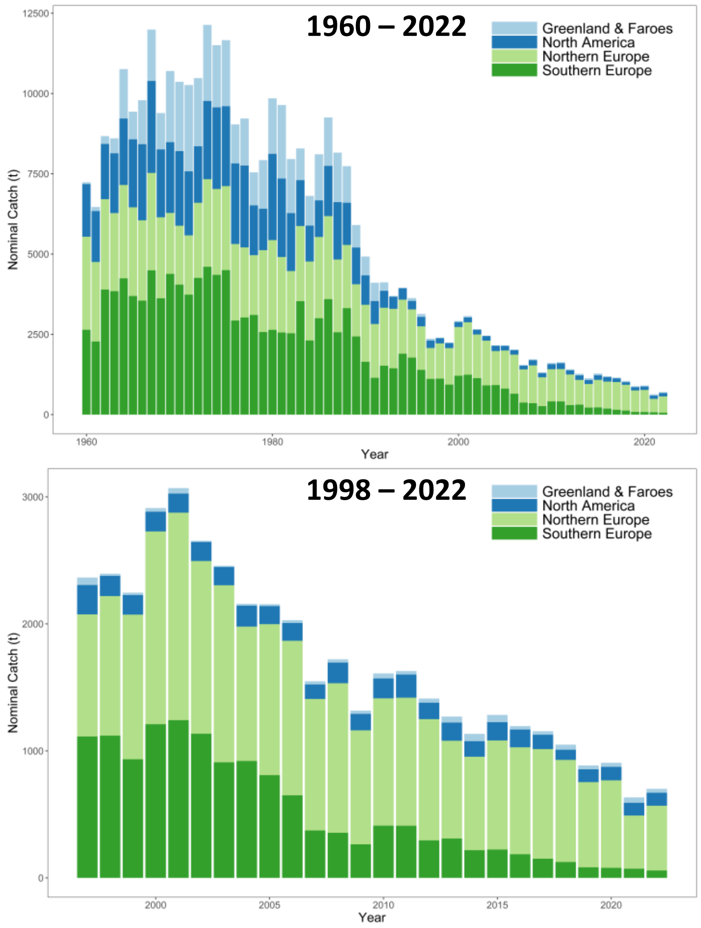


Figure 1: *sal.oth.all*

ToR 1.1 Location of Catches

Coastal Catches

- N-NEAC: 30% - 40% since 2008
- S-NEAC: 0% since 2021
- NAC: 7% (< 10% since 2007)

- Figure 3: *sal.oth.all*
  - location of catches by jurisdiction

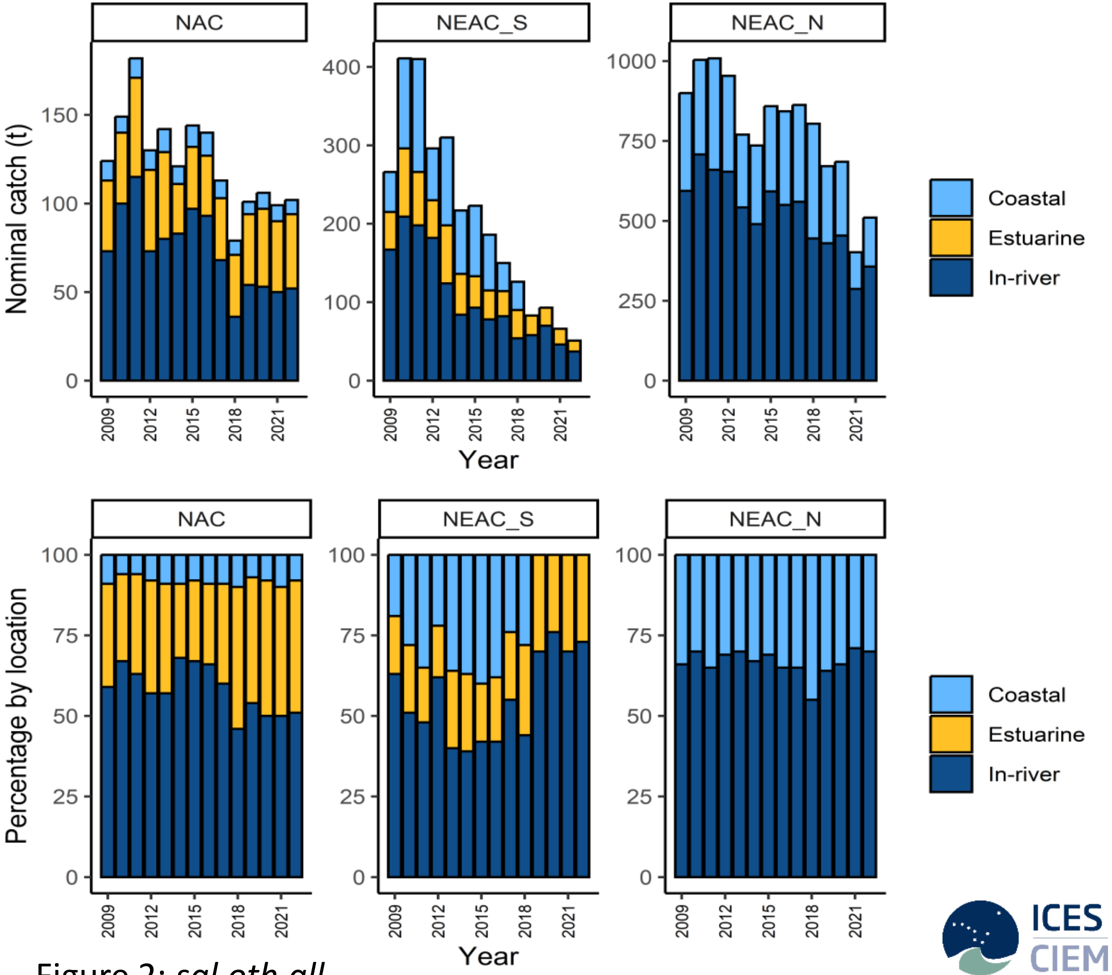


Figure 2: *sal.oth.all*

ToR 1.1 Unreported Catches

- Legal under-reporting, non-reporting and illegal catch

2021: 163 t   **2022:** 202 t

from Table 3: *sal.oth.all*

Area	2021	2022
NEAC	134	174
NAC	19	18
WGC	10	10
Total	163	202

ToR 1.1 Catch-and-Release (C&R)


Photo by Tom Cheney

- > 172 000 salmon released in 2021 and 2022
- Percentage released ranged from:
  - 2021: 4% in France to 93% UK (England & Wales)
  - 2022: 5% in France to 96% UK (England & Wales; Scotland)
- Reflects varying management practices and angler attitudes.
- Practice of C&R generally increasing.

ICES CIEM

ToR 1.1 Farming and Sea Ranching

Farmed

- North Atlantic area - **<u>2021:</u>** <u>2,003,000 t</u>; **<u>2022:</u>** <u>1,951,000 t</u>
  - Norway (77%) and UK (Scotland) (10%)
- Worldwide - > 2.9 million tonnes

Ranched

- North Atlantic area - **<u>2021:</u>** <u>20 t</u>; **<u>2022:</u>** <u>23 t</u>
  - Icealand (80% in 2021 and 93% in 2022)

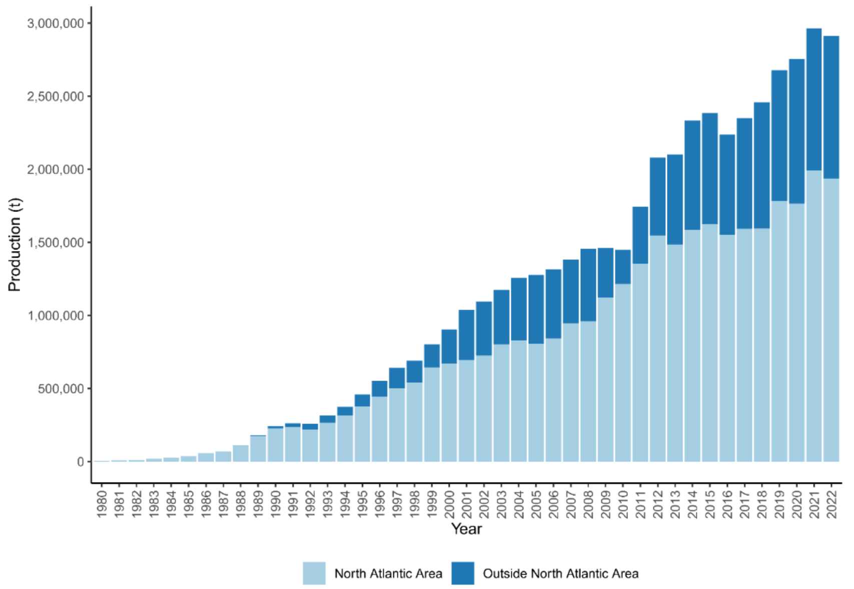


Figure 4: *sal.oth.all*

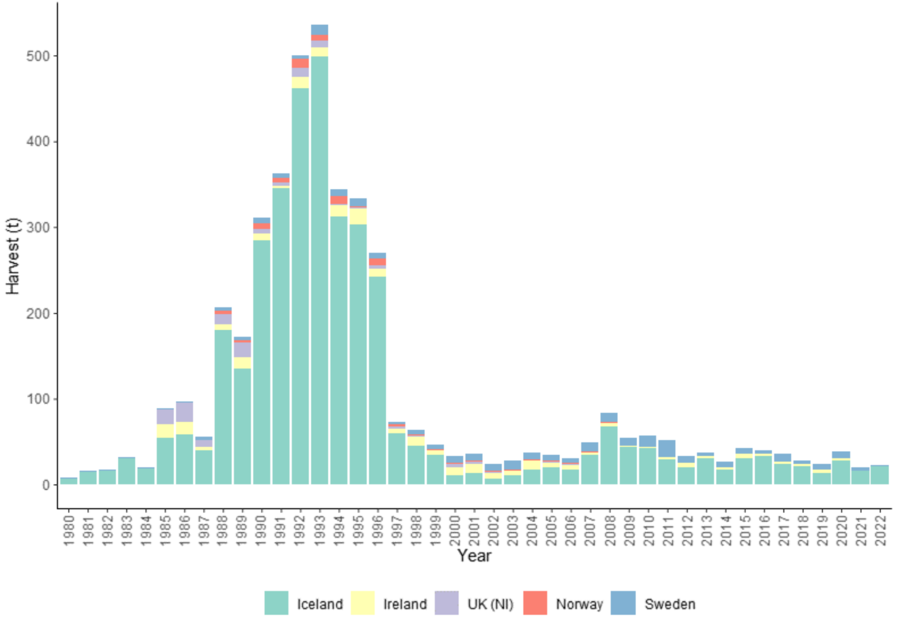


Figure 5: *sal.oth.all*

ToR 1.2 Emerging Threats and Opportunities

Threats

- Infectious Salmon Anaemia (ISA) (Iceland)
- Sea Lice (Norway)
- Offshore fish farming (Norway)
- Red Skin Disease (RSD)
- *Gyrodactylus salaris (Norway)*

Opportunities

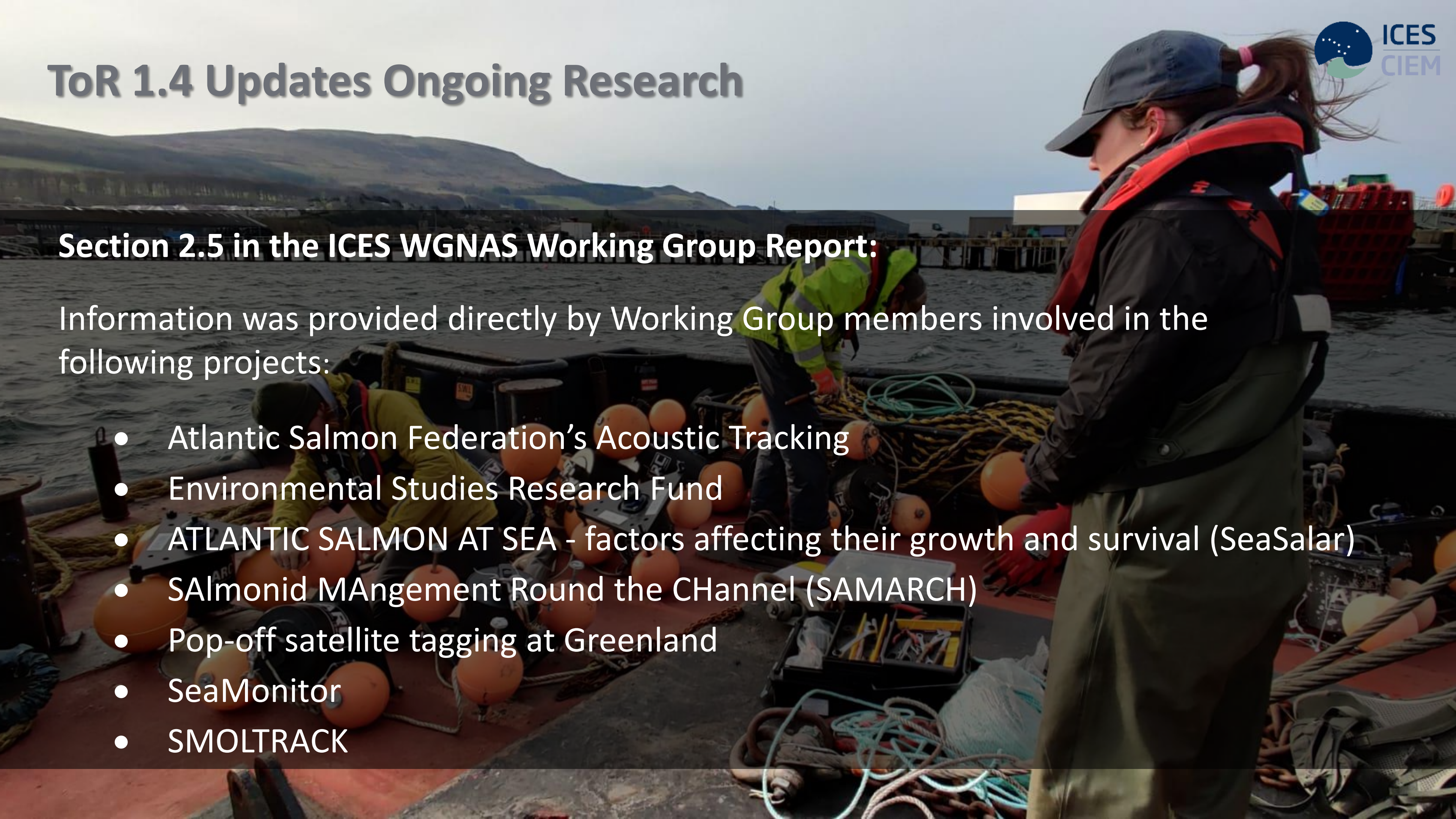
- New treatment *Gyrodactylus salaris in Norway*
- New model to estimate homewater catches and returns in France
- New project investigating the effect of catch and release and temperature on reproductive success in Canada

ToR 1.3 Causes of Variability in Return Rates

Marine survival can be influenced by a range of factors associated with:

- individual outmigrating smolt characteristics (e.g. size, condition, genetics)
- rearing environment of the juveniles (natural versus captive)
- local and broad-scale ecosystem conditions, including prey and predator communities
- diverse anthropogenic stressors which differ across the species distribution range
- monitoring locations often include freshwater & estuaries with diverse pressures

A number of factors at local, regional, and continental scales – all of which potentially fluctuate over time – can result in variations in return rates from monitored rivers within and among regions assessed by ICES.



ToR 1.4 Updates Ongoing Research

ICES CIEM

Section 2.5 in the ICES WGNAS Working Group Report:

Information was provided directly by Working Group members involved in the following projects:

- Atlantic Salmon Federation’s Acoustic Tracking
- Environmental Studies Research Fund
- ATLANTIC SALMON AT SEA - factors affecting their growth and survival (SeaSalar)
- SAlmonid MAngement Round the CHannel (SAMARCH)
- Pop-off satellite tagging at Greenland
- SeaMonitor
- SMOLTRACK

ToR 1.5 Marine Predation by Cormorants

Conclusions

- Areas where cormorants have increased and/or declines have occurred in other cormorant prey species abundances, there is a higher likelihood that salmon will be predated upon.

- Cormorant predation can have substantial impacts on salmon populations, particularly in areas where salmon populations are already threatened or endangered; but further and more statistically robust studies are required to determine local and widespread impacts on salmon populations.

- When considering predation as a threat to salmon, ICES notes that there are many other fish, bird, and mammalian predators.

ToR 1.6 Tag Releases

Data on tagged or marked salmon are compiled as a separate report (ICES, 2023)

Summary in Table 4a and 4b: *sal.oth.all*

- **2021: 1.5 million** **2022: 1.1 million**
- >92% hatchery juveniles, mainly adipose fin clips
- ~70,000 wild juveniles and ~14,000 wild adults

ToR 1.7 Data Deficiencies, Monitoring Needs, and Research Requirements

List provided in report

New PIT tag database searchable online

ICES Benchmark of the status assessment and catch advice process


sal.neac.all
Atlantic salmon from Northeast Atlantic
ICES
CIEM

ToR 2.1 NEAC Catch

- No significant changes in the gear types used
- No fishery Faroes since 2000

- NEAC reported nominal catch in 2021 was the lowest in time series
  - Southern NEAC (~60% 1SW)
  - Northern NEAC (~46% 1SW)

Table 1a,b: *sal.neac.all*

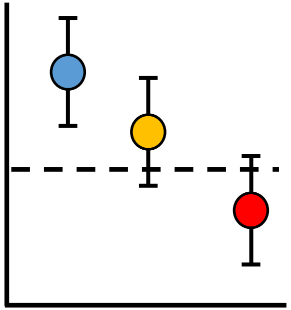
2021	Southern NEAC	Northern NEAC	Total NEAC
Catch (t)	**72**	**415**	**487**
Catch as % of NEAC total	15%	85%	
Unreported catch			**134**
Location of catches			
% in-river	69%	72%	72%
% in estuaries	31%	0%	4%
% coastal	0%	28%	**24%**

2022	Southern NEAC	Northern NEAC	Total NEAC
Catch (t)	**58**	**510**	**568**
Catch as % of NEAC total	10%	90%	
Unreported catch			**174**
Location of catches			
% in-river	72%	70%	70%
% in estuaries	28%	0%	3%
% coastal	0%	30%	**27%**

ToR 2.3 Status of Stocks: Risk Assessment Framework

- Pre-Fishery Abundance (PFA) : abundance at 1 January of first winter at sea
  - by sea age group (maturing 1SW and non-maturing 1SW (MSW) salmon)
  - by stock complex (Northern NEAC and Southern NEAC) and individual country/jurisdiction
- PFA relative to SER (Spawner Escapement Reserve: CLs adjusted for natural mortality at sea, 3% per month)
- After returning to rivers, Spawner estimates compared against CLs

- **Full Reproductive Capacity**
  - lower bound of the 90% confidence interval of the estimate above reference point
  - equivalent to a probability of at least 95% of meeting reference point
- **At Risk of Suffering Reduced Reproductive Capacity**
  - lower bound of the confidence interval is below reference point, but the midpoint is above
- **Suffering Reduced Reproductive Capacity**
  - midpoint is below reference point



ToR 2.3 Stock Status:

PFA N-NEAC:

- Declining trend
- PFA > SER
- Both complexes at full reproductive capacity

PFA S-NEAC:

- Declining trend
- 1SW PFA < SER
- MSW PFA > SER

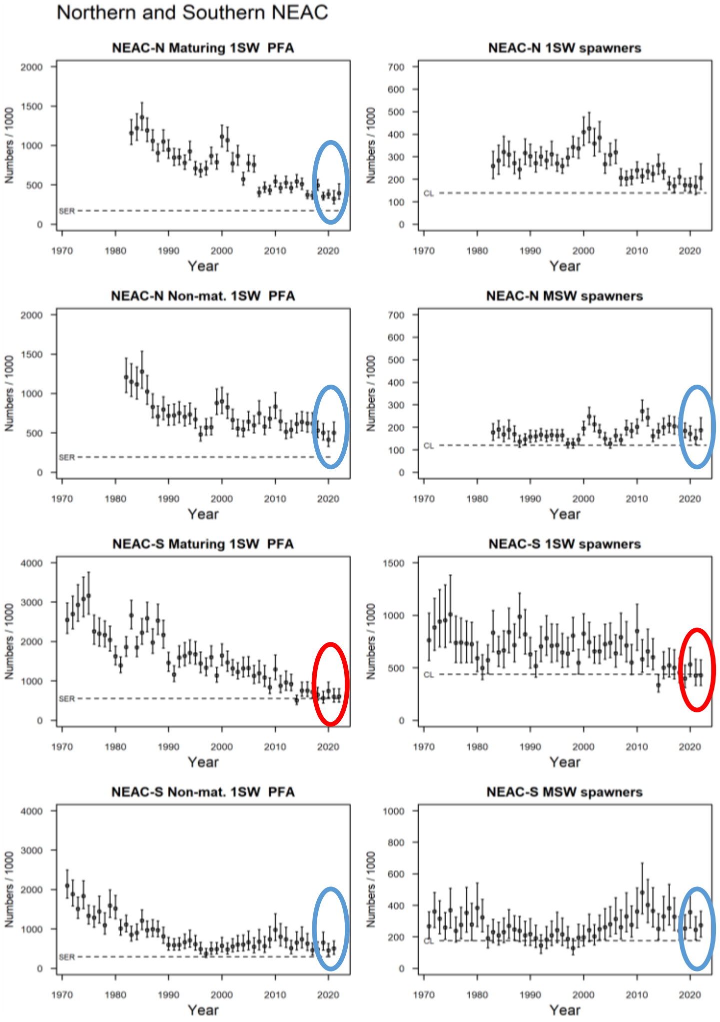


Figure 5: *sal.neac.all*

Spawners N-NEAC:

1SW Spawners:

- 2021 < CL 2022 > CL

MSW Spawners:

- Both years > CL
- Both complexes at full reproductive capacity in 2022

Spawners S-NEAC:

1SW Spawners:

- Both years < CL
- declining trend since 2016

MSW Spawners:

- Both years > CL

ICES CIEM

ToR 2.3 Stock Status: 2022 PFA by Jurisdiction

Northern NEAC PFA

Mat. 1SW:
- full reproductive capacity Norway and Sweden
- Except Russia and Tana/Teno

Non-mat., destined to be MSW returns:
- full reproductive capacity except Tana/Teno

Southern NEAC PFA

Mat. 1SW:
- full reproductive capacity in UK (Scotland)
- others at risk or suffering

Non-mat., destined to be MSW returns:
- full reproductive capacity in UK (E&W) & UK (Scotland)
- others at risk or suffering

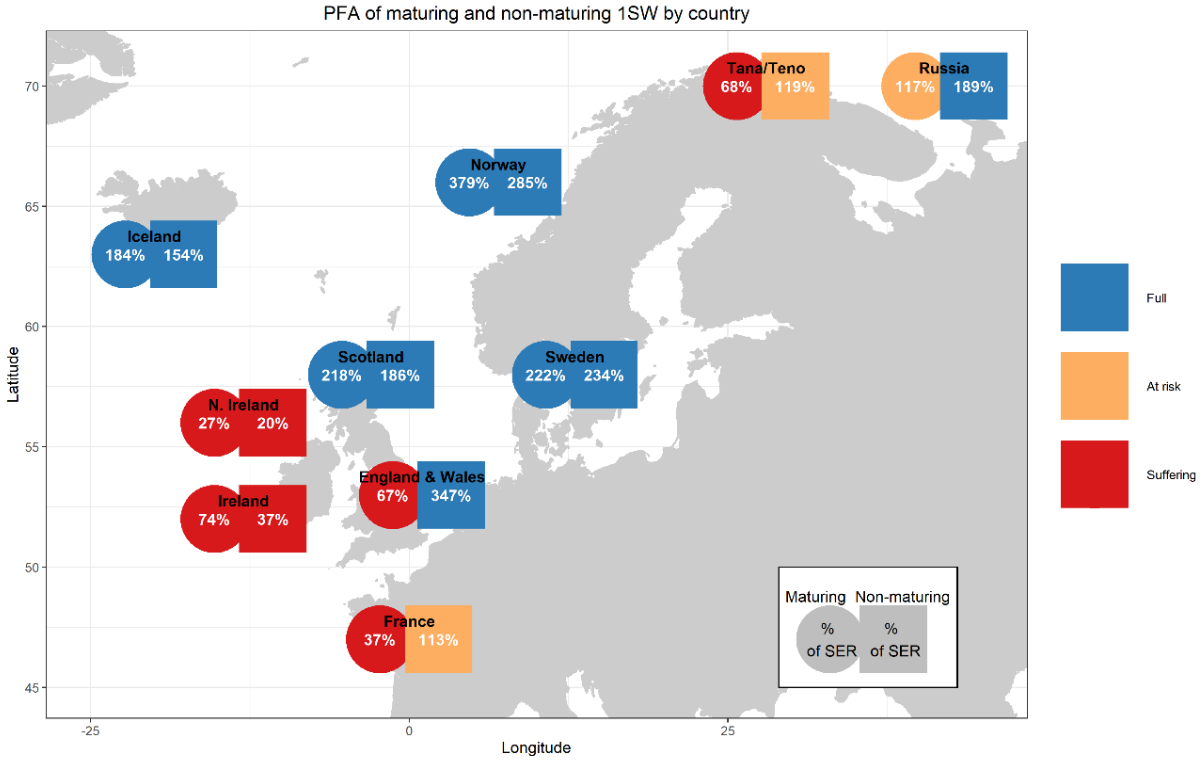


Figure 6: *sal.neac.all*

ToR 2.3 Stock Status: Trends in Rivers Meeting CLs

Table 4: *sal.neac.all*

2022 Spawners assessed against CLs

Country /Jurisdiction	Number with CLs	Number assessed	Number attaining CL	% attaining CL	Trend statement
Northern NEAC					
Russia					
Norway/Finland (Tana/Teno)	25	8	1	12	Decreasing
Norway	439	174	144	82	Increasing
Sweden	24	24	4	17	Minor increase
Southern NEAC					
UK (Scotland)	173				
UK (Northern Ireland)	19	15	2	13	Decreasing
UK (England and Wales)	64	59	7	12	Decreasing
Ireland	143	144	48	33	Minor Decrease
France	35	35	0	0	Decreasing

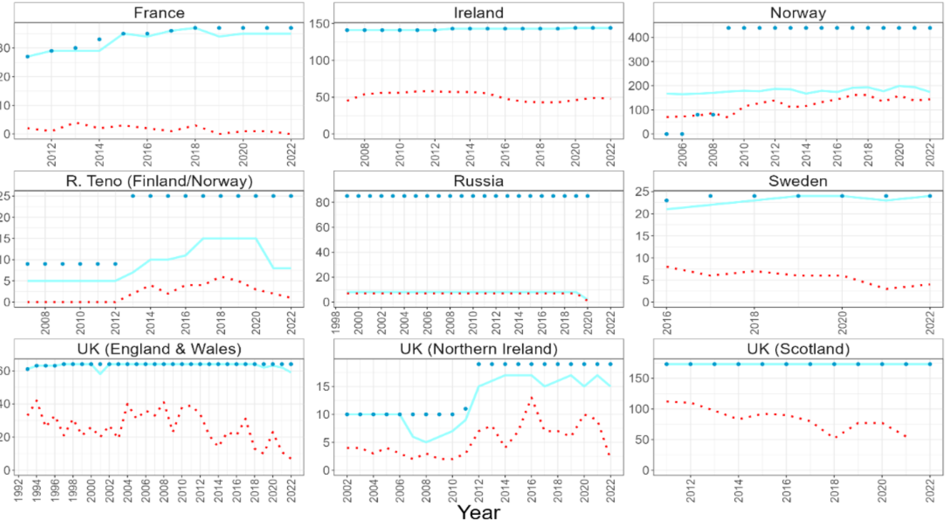


Figure 4: *sal.neac.all*

number of rivers with CLs

number assessed

number meeting or exceeding CLs

ToR 2.3 Stock Status: Return Rates (Marine Survival)

- Wild and hatchery rates available
- 1SW declining trend since 1980 though wild: flattening
- 2SW N-NEAC very variable but declining
- 2SW S-NEAC wild: increasing
- Little improvement of stock status over time
- Mainly a consequence of continuing poor survival in the marine environment

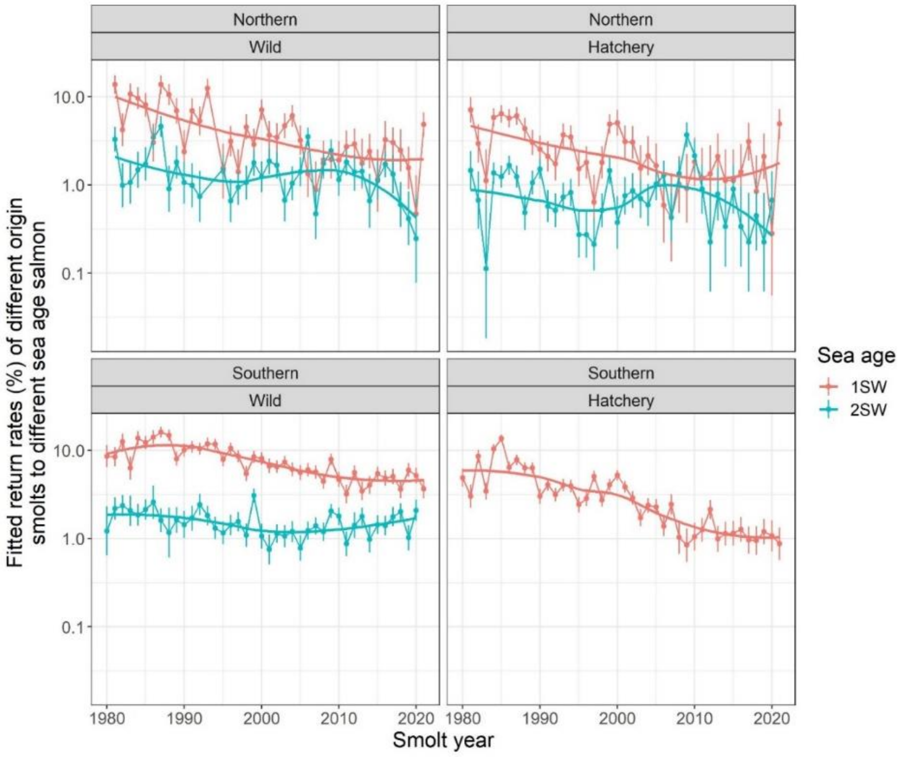


Figure 9: *sal.neac.all*

ToR 2.4 Risks of salmon bycatch in pelagic and coastal fisheries and effectiveness and adequacy of current bycatch monitoring programmes

- ICES 2004, 2005 made many recommendations to improve knowledge for bycatch in Pelagic fisheries; few have been actioned so our understanding has not advanced much.
- Two definitions of Risk:
  - Risk of exposure: same place (location and depth)
  - Risk to stock: quantity of bycatch versus stock abundances and CLs
- WGBYC has a Bycatch Evaluation and Assessment Matrix (BEAM) which could be applied to salmon but the low detectability of salmon is a challenge
- Monitoring focuses mostly on demersal fisheries
- Few pelagic fishery catches are screened for bycatch, and only a small proportion of each catch
- Difficulties to obtain information on observer methods, effort and findings

ToR 2.4 Risks of salmon bycatch in pelagic and coastal fisheries and effectiveness and adequacy of current bycatch monitoring programmes

ICES CIEM

WGNAS proposed series of data deficiencies, monitoring needs and research requirements

1. Improved understanding of post-smolt and adult salmon migration routes.
2. A quantitative analysis of the risk of exposure and bycatch risk to stocks requires access to gear- and fisheries-specific fishing effort data (both inshore and offshore data) at an ICES rectangle by month.
3. Include salmon on ICES WGBYC list of species and data calls.
4. Standardise salmon bycatch monitoring programmes across countries, including minimum effort per fishery and standards for data recording and reporting.
5. Improve at-sea and onshore observer screening, including better salmon identification guidance.
6. eDNA data collection from scientific and commercial pelagic trawls may help improve detection of salmon and improve knowledge of their migratory pathways.

sal.nac.all

Atlantic salmon from North America

ToR 3.1: NAC Catch

Catch details in Table 1: *sal.nac.all*

2021

NAC Total: 100 t

CA: 98 t SPM: 2 t USA: 0 t

% coastal – 7.5%

Unreported: 19 t

2022

NAC Total: 101 t

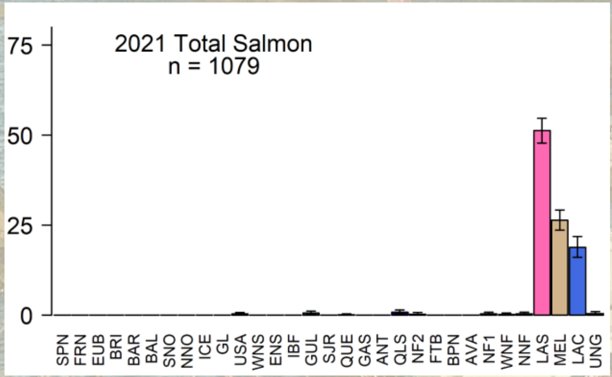
CA: 100 t SPM: 1 t USA: 0 t

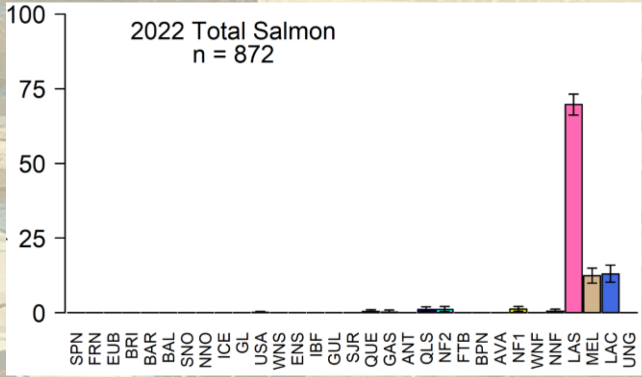
% coastal – 6.8%

Unreported: 18 t

ToR 3.1 Origin and Composition of Catches: Labrador Subsistence Fisheries

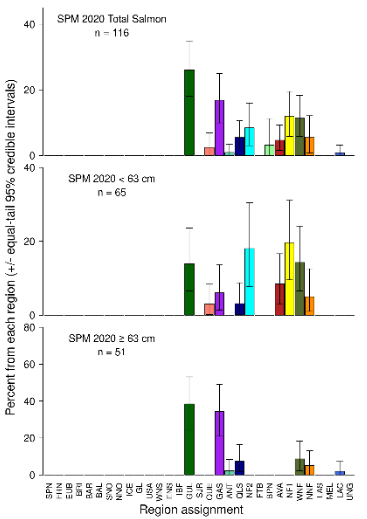
- >95% samples from Labrador genetic groups
- Percent catch sampled:
  - 2021 - 7.9%   2022 - 6.4%
- USA origin salmon
  - 2021: 3
  - 2022: 1





from Figures 5 and 6: *sal.nac.all*

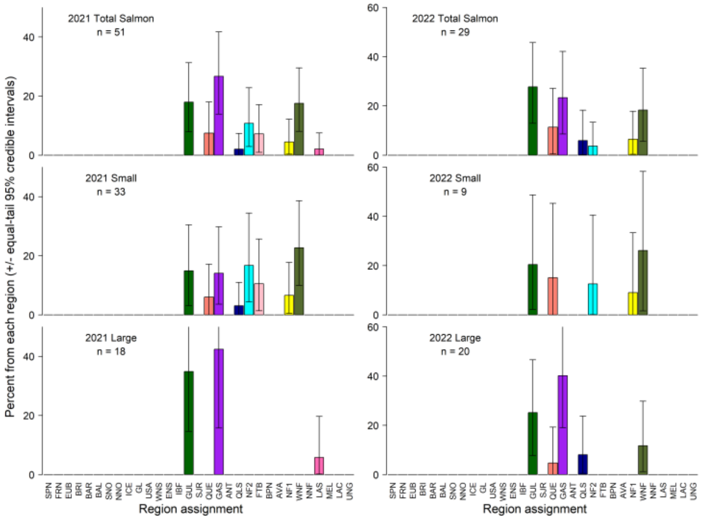
ToR 3.1 Origin and Composition of Catches: Saint Pierre and Miquelon



>94% samples from Quebec, Gulf and Newfoundland

- Large salmon mainly (>77%) from Quebec and Gulf groups.
- Small salmon from Newfoundland groups >48%.

(Figures from ICES WGNAS 2023)



ToR 3.2 River Stocks with Established Conservation Limits (CLs)

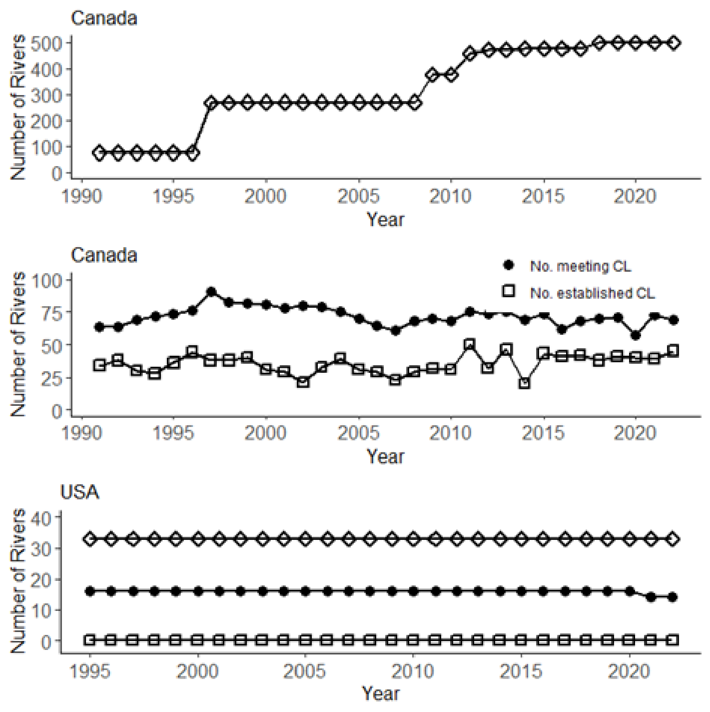


Figure 7: ***sal.nac.all***

Canada: 498 rivers since in 2018

- 57 to 91 rivers assessed annually from 1991-2022
- annual percent achieving CL ranged from 26% to 70% with no temporal trend.

USA: 33 rivers since 1995

- Sixteen rivers in assessed against annually 1995-2022
- none have met CLs to date

ToR 3.3 Salmon Returns: 1971 to 2022

Small Salmon (1SW)

- 540,700
- 92% to Newfoundland and Labrador
- highest in time-series for NL
- among lowest (4th) for Gulf and Scotia-Fundy

Large Salmon (MSW and repeats)

- 188,800
- 2nd highest in time-series for Labrador
- <2% to Scotia-Fundy and USA

2SW Salmon (subset of Large)

- 114,000
- 36% to Labrador, 28% Quebec, 28% Gulf
- 5% to Newfoundland

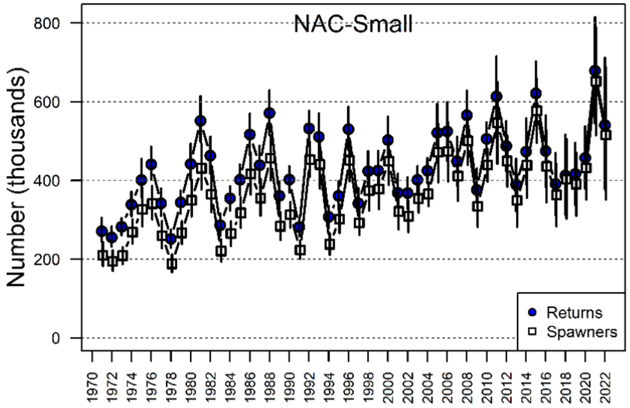


Figure 8: *sal.nac.all*

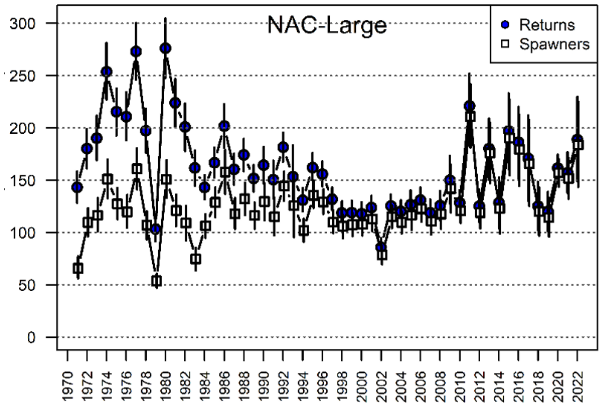


Figure 9: *sal.nac.all*

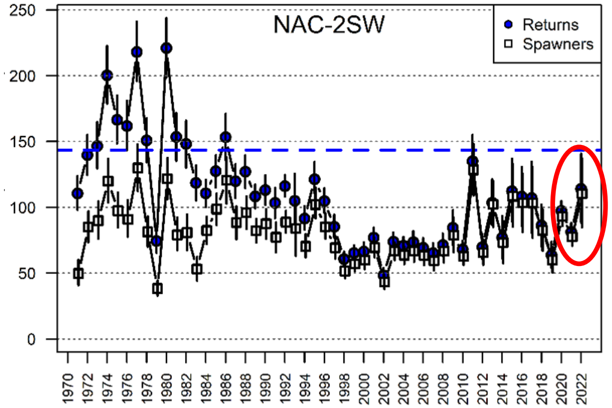
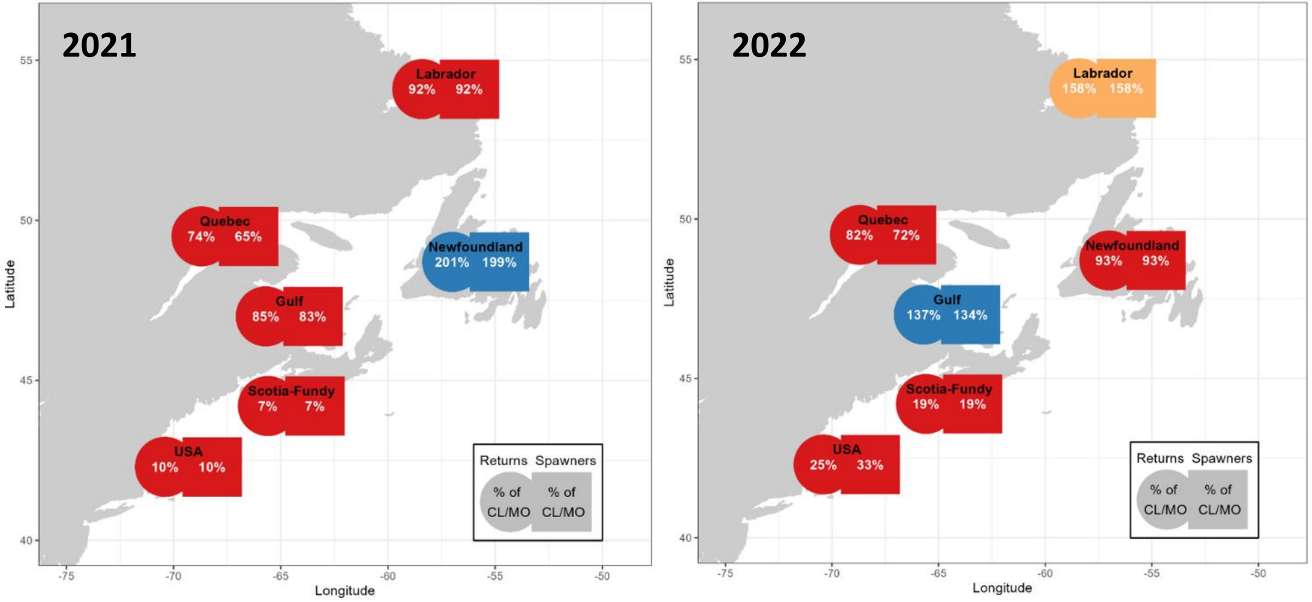


Figure 10: *sal.nac.all*

ToR 3.3 Status of Stocks: 2SW Returns By Region

- 2021: <CLs 5 of 6 Regions
- 2022: <CLs 4 of 6 Regions

- Large deficits are noted for Scotia-Fundy and USA regions



Full reproductive capacity

Risk suffering reduced reproductive capacity

Suffering reduced reproductive capacity

Figure 11: sal.nac.all

ToR 3.3 Degree of CL Attainment

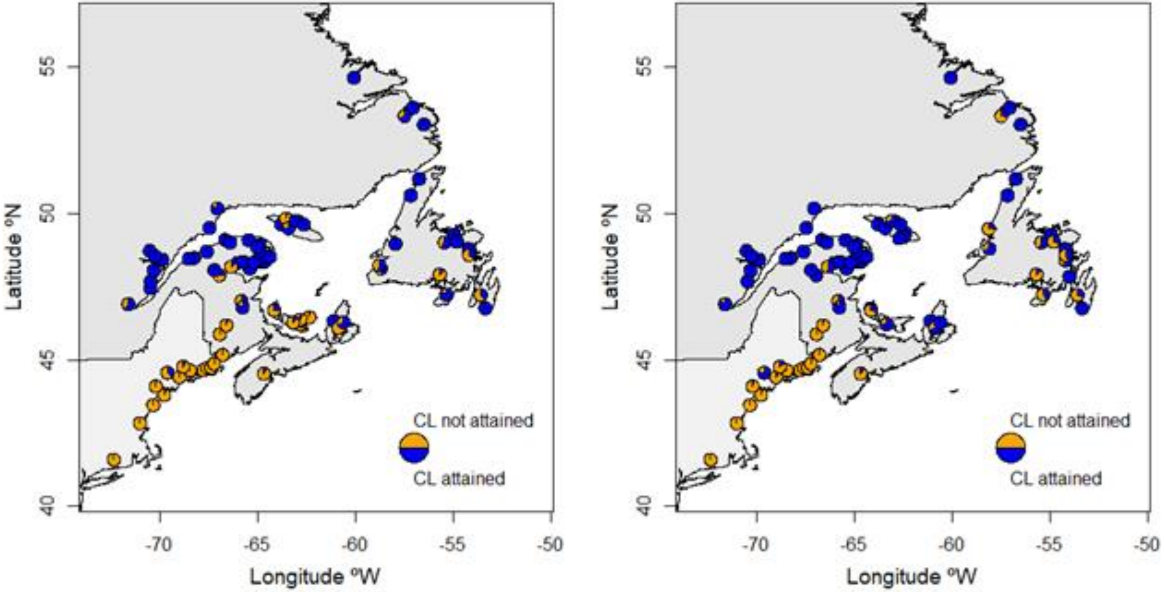


Figure 12: ***sal.nac.all***

Proportion CL Attained = egg deposition / CL

2021 – 87 assessed rivers

- 39 (45%) achieved or exceeded CLs
- 37 (43%) were at, or less, than 50% CL

2022 – 83 assessed rivers

- 45 (54%) achieved or exceeded CLs
- 25 (43%) were at, or less, than 50% CL

ToR 3.3 Pre-Fishery Abundance (PFA)

- **PFA: salmon at sea prior to all marine fisheries (1 August second summer at sea)**
  - Two components:
    - 1SW maturing (return as 1SW)
    - 1SW non-maturing (return as MSW)
- 2021 PFA 1SW non-maturing returned as 2SW salmon in 2022
  - suffering reduced reproductive capacity

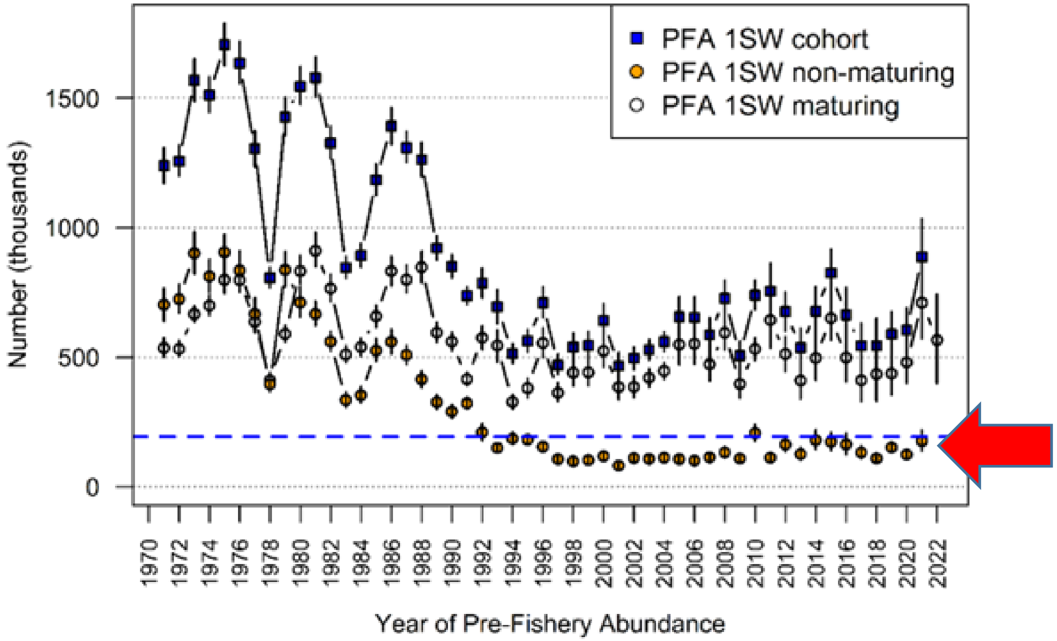


Figure 13: ***sal.nac.all***

sal.wgc.all

Atlantic Salmon at West Greenland

ICES CIEM

ToR 4.1 WGC Catch

Management Plan for Atlantic Salmon in Greenland (2021-2025)

- 3 management areas with specified seasons
- quota set by area and group (commercial and recreational)

Year	Quota	Landings	% Landings by User Group	Overharvest	Unreported
2021	27 t (+ 3 t East)	43.2 t	75% com. 25% rec.	13.2 t	10 t
2022	27 t (+ 3 t East)	29.8 t	69% com. 31% rec.	0 t	10 t

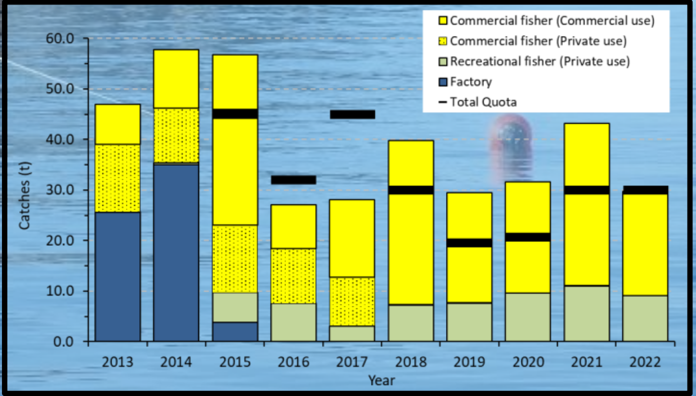
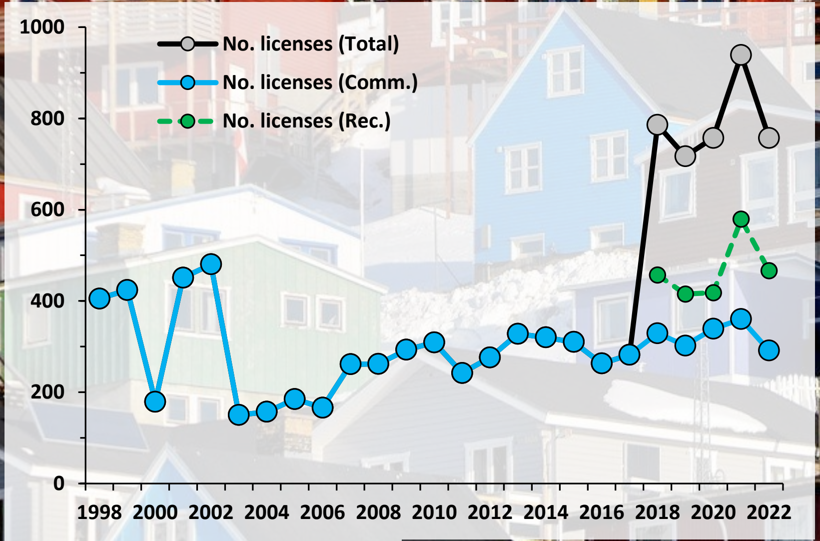


Figure 2: ***sal.wgc.all***

ToR 4.1 Fisheries: Licenses & Reporting



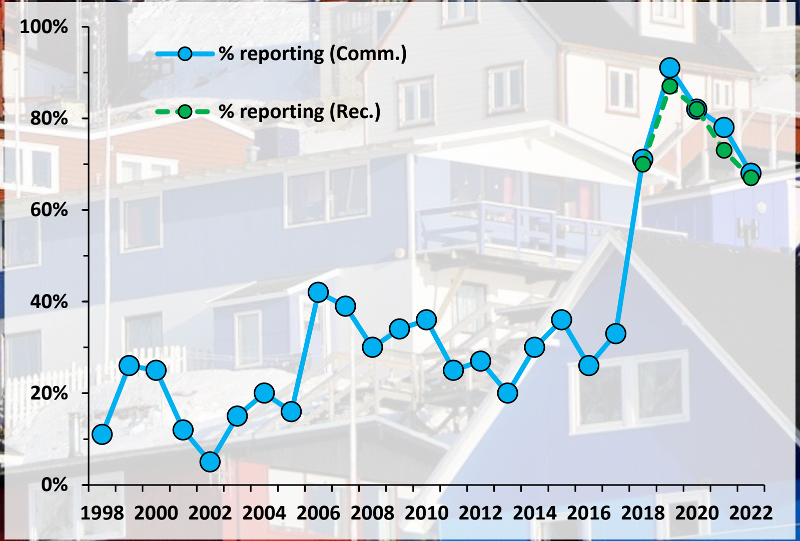


Figure 3: *sal.wgc.all*

ToR 4.1: Fisheries Sampling

# Samples Collected	% North American
2020 – 197	59%
2021 – 1548	83%
2022 – 672	91%

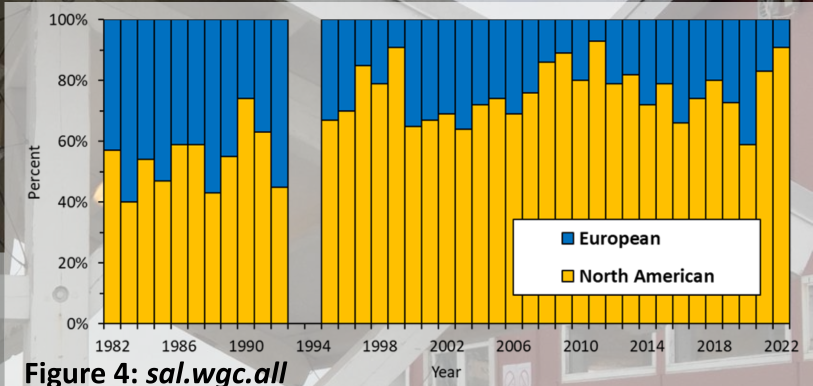
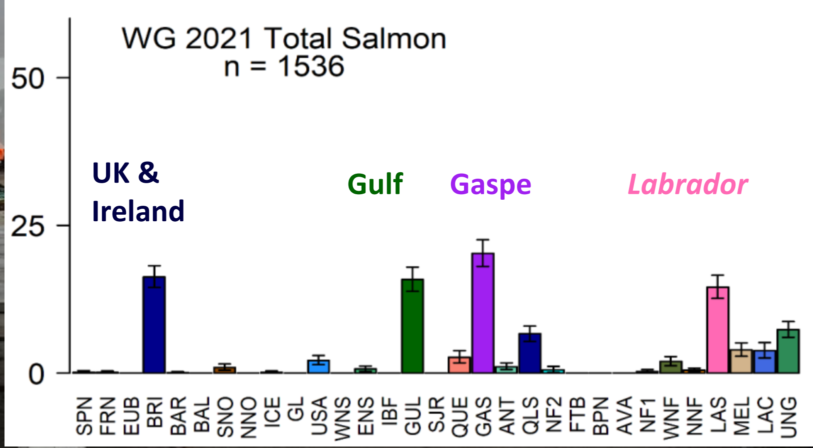


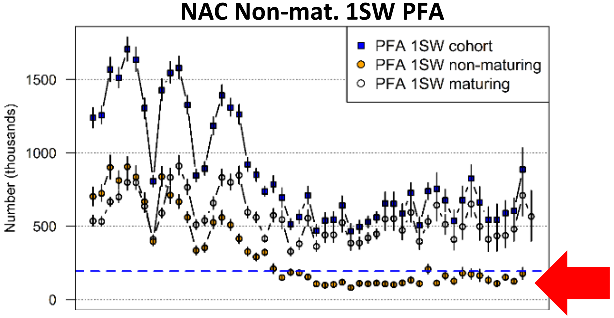
Figure 4: *sal.wgc.all*

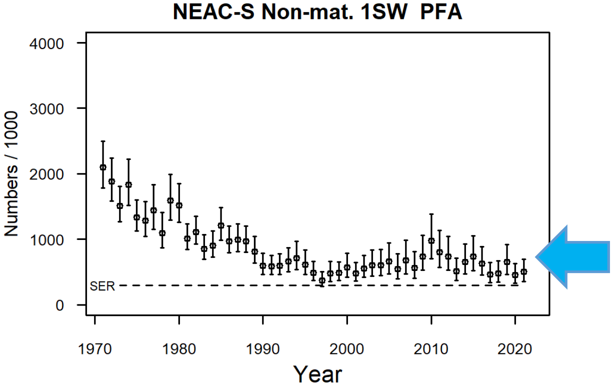


ToR 4.2 Status of Stocks

PFA estimates of non-maturing 1SW salmon:

- **NAC:** suffering reduced reproductive capacity
- **Southern NEAC:** full reduced reproductive capacity





Figures 7 and 8: ***sal.wgc.all***

2022 Spawners:

- NAC: 4 suffering, 1 at risk, and 1 full reproductive capacity
- Southern NEAC: full reproductive capacity

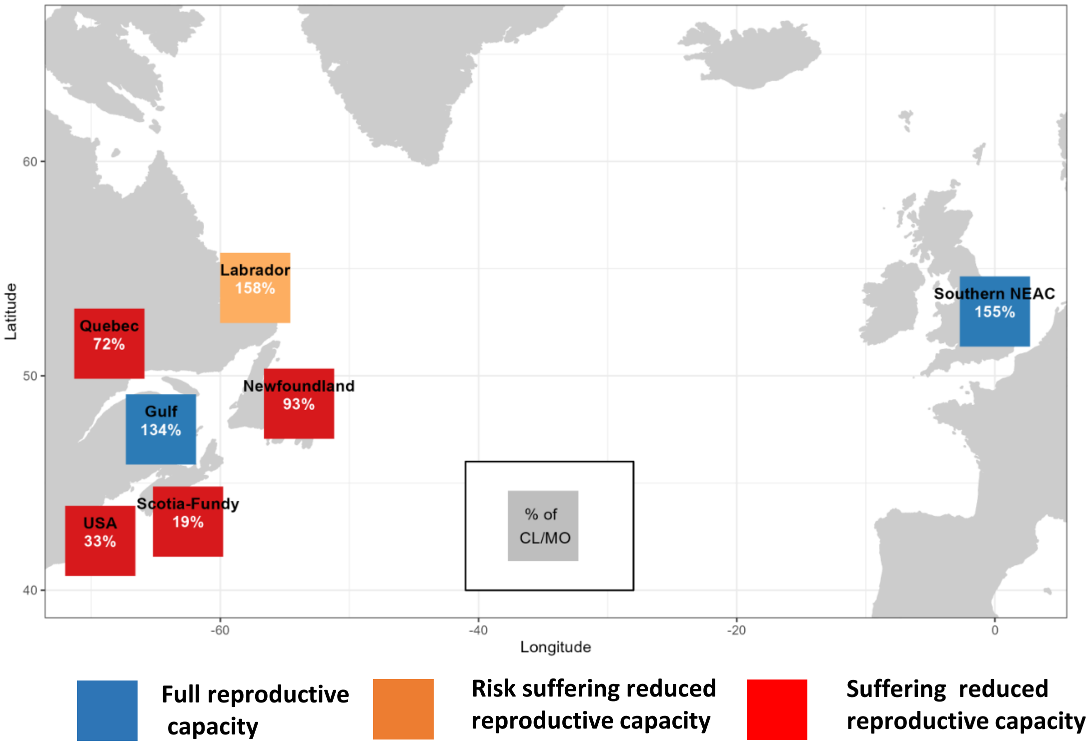


Figure 9: ***sal.wgc.all***

ToR 4.2 Status of Stocks: Exploitation

North American

- **4.8% (2021)**
- **6.7% (2022)**

European

- **1.4% (2021)**
- **0.6% (2022)**

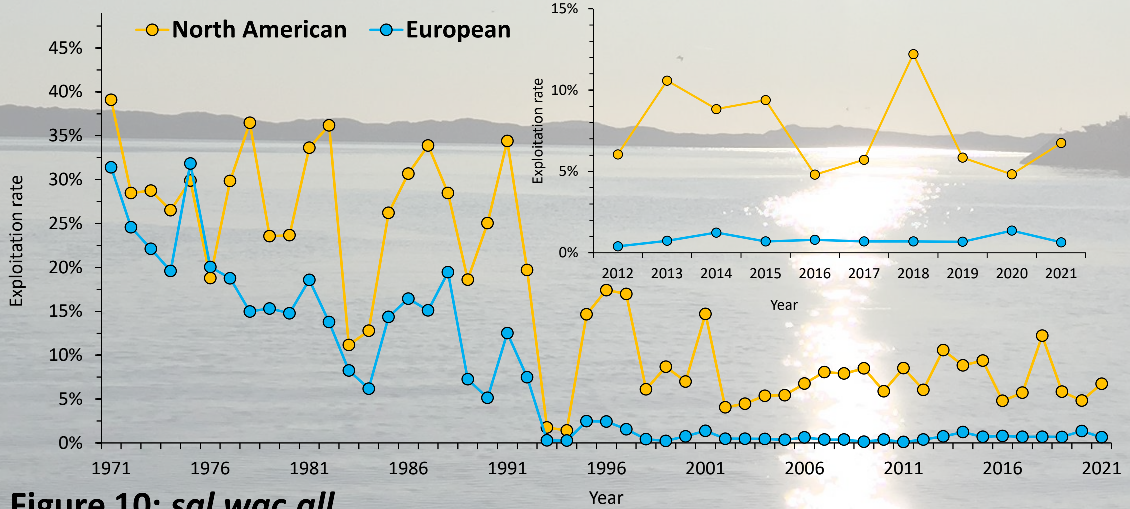


Figure 10: *sal.wgc.all*

ToR 4.2 Status of Stocks: Summary

- **Despite major changes in fisheries management in the past few decades and increasingly more restrictive fisheries measures, salmon returns have remained near historical lows.**
- **It is likely, therefore, that other factors besides fisheries are constraining production.**