ICES Advice on fishing opportunities, catch, and effort
Northeast and Northwest Atlantic ecoregions
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North Atlantic salmon (*Salmo salar*) stocks

Introduction

Main tasks

At its 2023 Statutory Meeting (2023/2/FRSG18), ICES resolved that the Working Group on North Atlantic Salmon (WGNAS, chaired by Alan Walker, UK) would meet in Copenhagen, Denmark from 11–21 March 2024 to consider questions posed to ICES by the North Atlantic Salmon Conservation Organization (NASCO).

The table below identifies the sections of the report (ICES, 2024) that provide response to the questions posed by NASCO in the Terms of Reference (ToR).

ToR	Question	Section
1	With respect to Atlantic salmon in the North Atlantic area:	sal.oth.all
1.1	provide an overview of salmon catches and landings by country, including unreported catches and catch and release, and production of farmed and ranched Atlantic salmon in 2023[1];	
1.2	report on significant new or emerging threats to, or opportunities for, salmon conservation and management[2];	
1.3	provide a compilation of tag releases by country in 2023;	
1.4	identify relevant data deficiencies, monitoring needs and research requirements;	
1.5	provide an update on the distribution and abundance of pink salmon across the North Atlantic through 2023;	
2	With respect to Atlantic salmon in the Northeast Atlantic Commission area:	sal.neac.all
2.1	describe the key events of the 2023 fishery[3];	
2.2	review and report on the development of age-specific stock conservation limits, including updating the time-series of the number of river stocks with established CLs by jurisdiction;	
2.3	describe the status of the stocks, including updating the time-series of trends in the number of river stocks meeting CLs by jurisdiction;	
2.4	provide catch options or alternative management advice for the 2024 / 2025–2026 / 2027 fishing seasons, with an assessment of risks relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding[4].	
3	With respect to Atlantic salmon in the North American Commission area:	sal.nac.all
3.1	describe the key events of the 2023 fishery (including the fishery at St Pierre and Miquelon)[3];	
3.2	update age-specific stock conservation limits based on new information as available, including updating the time-series of the number of river stocks with established CLs by jurisdiction; and,	
3.3	describe the status of the stocks, including updating the time-series of trends in the number of river stocks meeting CLs by jurisdiction;	
3.4	provide catch options or alternative management advice for 2024–2027 with an assessment of risks relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding4	
4	With respect to Atlantic salmon in the West Greenland Commission area:	sal.wgc.all
4.1	describe the key events of the 2023 fishery[3];	
4.2	describe the status of the stocks[5];	
4.3	provide catch options or alternative management advice for 2024-2026 with an assessment of risk relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding[4]	

[1] *With regard to ToR 1.1, for the estimates of unreported catch the information provided should, where possible, indicate the location of the unreported catch in the following categories: in-river; estuarine; and coastal. Numbers of salmon caught and released in recreational fisheries should be provided.*
[2] *With regard to ToR 1.2, ICES is requested to include reports on any significant advances in understanding of the biology of Atlantic salmon that is pertinent to NASCO.*
[3] *In the responses to ToRs 2.1, 3.1 and 4.1, ICES is asked to provide details of catch, gear, effort, composition and origin of the catch and rates of exploitation. For homewater fisheries, the information provided should indicate the location of the catch in the following categories: in-river; estuarine; and coastal. Information on any other sources of fishing mortality for salmon is also requested. For ToR 4.1, if any new surveys are conducted and reported to ICES, ICES should review the results and advise on the appropriateness of incorporating resulting estimates into the assessment process.*

[4] *In response to ToRs 2.4, 3.4 and 4.3, provide a detailed explanation and critical examination of any changes to the models used to provide catch advice and report on any developments in relation to incorporating environmental variables in these models. Also provide a detailed explanation and critical examination of any concerns with salmon data collected in 2023 which may affect the catch advice considering the restrictions on data collection programmes and fisheries due to the COVID 19 pandemic.*
[5] *In response to ToR 4.2, ICES is requested to provide a brief summary of the status of North American and North-East Atlantic salmon stocks. The detailed information on the status of these stocks should be provided in response to ToRs 2.3 and 3.3.*

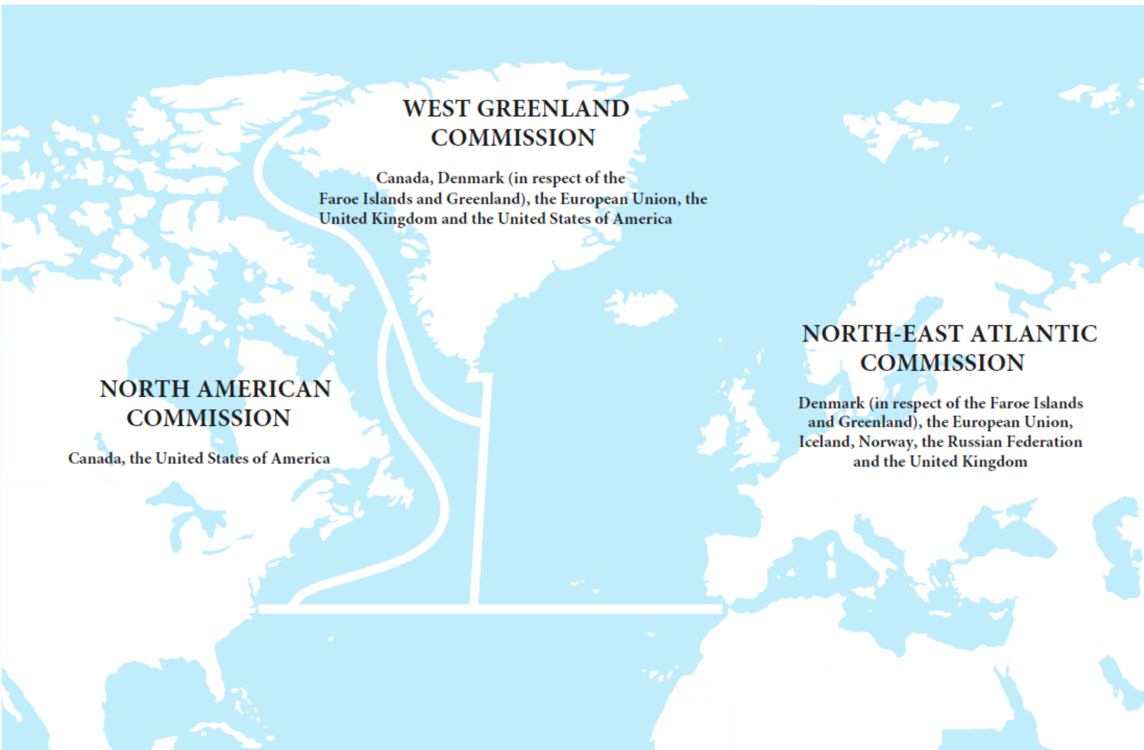
In response to the ToRs, WGNAS considered 32 working documents. A complete list of acronyms and abbreviations used in this advice is provided in Annex 2.

Please note that for practical reasons, several tables (A1.1–A1.4) are provided in Annex 1.

Management framework for Atlantic salmon in the North Atlantic

This advice has been generated by ICES in response to the request for advice posed by NASCO, pursuant to its role in international management of Atlantic salmon. NASCO was set up in 1984 by international convention (the Convention for the Conservation of Salmon in the North Atlantic Ocean) with a responsibility for the conservation, restoration, enhancement, and rational management of wild Atlantic salmon in the North Atlantic. Although sovereign states retain their role in the regulation of Atlantic salmon fisheries for Atlantic salmon originating in their own rivers, distant-water Atlantic salmon fisheries – such as those at Greenland and the Faroes which take Atlantic salmon originating in rivers of another Party – are regulated by NASCO under the terms of the Convention. NASCO now has eight Parties that are signatories to the Convention, including the EU, which represents its Member States.

NASCO's three commission areas – the North American Commission (NAC), the West Greenland Commission (WGC), and the North East Atlantic Commission (NEAC) – are shown in the map below. The islands of St Pierre and Miquelon, located off the southern coast of Newfoundland, are not members of the NAC, but France (in respect of St Pierre and Miquelon) participates as an observer to NASCO. The mid-Atlantic area is not covered by any of the three NASCO commissions; however, under Article 4 of its Convention, NASCO provides a forum for consultation and cooperation on matters concerning the Atlantic salmon stocks in this area.



Management objectives

NASCO's objective is:

"..to contribute through consultation and co-operation to the conservation, restoration, enhancement and rational management of salmon stocks… taking into account the best scientific evidence available…".

NASCO further states that "the Agreement on the Adoption of a Precautionary Approach states that an objective for the management of salmon fisheries is to provide the diversity and abundance of salmon stocks", and the organization's Standing Committee on the Precautionary Approach interprets this as being "to maintain both the productive capacity and diversity of salmon stocks" (NASCO, 1998).

NASCO's Action Plan for Application of the Precautionary Approach (NASCO, 1998) provides an interpretation of how this is to be achieved:

"Management measures should be aimed at maintaining all stocks above their conservation limits by the use of management targets".

"Socio-economic factors could be taken into account in applying the precautionary approach to fisheries management issues".

"The precautionary approach is an integrated approach that requires, *inter alia*, that stock rebuilding programmes (including as appropriate, habitat improvements, stock enhancement, and fishery management actions) be developed for stocks that are below conservation limits".

Basis of reference points and application of precaution

Atlantic salmon have characteristics of short-lived fish stocks. Mature abundance is sensitive to annual recruitment because the adult spawning stock consists of only a few age groups. Incoming recruitment is often the main component of the fishable stock. For such fish stocks, the ICES maximum sustainable yield (MSY) approach is aimed at achieving a target escapement (MSY $B_{escapement}$, the minimum amount of biomass left to spawn). No catch should be allowed unless this escapement can be achieved. The escapement level should be set so there is a low risk of future recruitment being impaired.

For Atlantic salmon, this approach has led to defining river-specific Conservation Limits (CLs) as equivalent to MSY $B_{escapement}$. Conservation Limits for North Atlantic salmon stock complexes have been defined by ICES as the level of a stock (number of spawners) that will achieve long-term average MSY. ICES considers that, to be consistent with the MSY and precautionary approaches, fisheries should only take place on Atlantic salmon from rivers where stocks have been shown to be at full reproductive capacity. Furthermore, due to differences in the status of individual stocks within stock complexes, mixed-stock fisheries present particular threats.

In many countries/jurisdictions, CLs are now defined using stock and recruitment relationships, and the corresponding CLs are not updated annually. In the other jurisdictions where such relationships are not available, stock–recruitment proxies are used to define the CLs, and these may vary from year to year as new data are added. NASCO has adopted the CLs as limit reference points (NASCO, 1998). Conservation Limits are used in reference to spawners. When referring to abundance prior to fisheries in the ocean (pre-fishery abundance [PFA]), the CLs are adjusted to account for natural mortality, and the adjusted value is referred to as the spawner escapement reserve (SER).

ICES benchmarked the Life-cycle Model (LCM) in 2023 and it was used for the first time for all North Atlantic salmon catch advice in 2024 to describe and forecast stock status (ICES, 2023, 2024a). This model uses a risk analysis framework that considers CLs. The risk analysis framework makes full use of the outputs from the LCM. The LCM outputs include estimates of returns and spawners (1SW and MSW), that are in line with run-reconstruction estimates and eggs (1SW and MSW). This model is used to evaluate the status relative to the reference points.

Management targets have not yet been defined for all North Atlantic salmon stocks. Where there are no specific management objectives, the MSY approach shall apply:

- ICES considers that if the lower bound of the 90% confidence interval of the current estimate of spawners is above the CL, then the stock is at full reproductive capacity (equivalent to a probability of at least 95% of meeting the CL).
- When the lower bound of the confidence interval is below the CL, but the midpoint is above, then ICES considers the stock to be at risk of suffering reduced reproductive capacity.
- Finally, when the midpoint is below the CL, ICES considers the stock to suffer reduced reproductive capacity.

For catch advice on the mixed-stock fishery at West Greenland (catching non-maturing one-sea-winter [1SW] fish from North America and non-maturing 1SW fish from southern NEAC [S-NEAC]), NASCO has adopted a risk level (probability) of 75% of simultaneous attainment of management objectives in seven assessment regions (ICES, 2003) as part of an agreed management plan. NASCO uses the same approach for catch advice for the mixed-stock fishery, affecting six assessment regions for the North American stock complex. ICES notes that the choice of a 75% probability for simultaneous attainment of six or seven stock assessment regions is approximately equivalent to a 95% probability of attainment for each individual unit (ICES, 2013).

There is no formally agreed management plan for the fishery at the Faroes. However, ICES has developed a risk-based framework for providing catch advice for fish exploited in this fishery (mainly multi-sea-winter [MSW] fish from NEAC countries). Catch advice is provided at both the stock complex and country level, with catch options tables providing the probability of meeting CLs in the individual stock complexes or countries, as well as in all the stock complexes or countries simultaneously. ICES has recommended (ICES, 2013) that management decisions should be based principally on a 95% probability of attainment of CLs in each stock complex/country individually. The simultaneous attainment probability may also be used as a guide, but managers should be aware that this probability will generally be quite low when large numbers of management units are used.

NASCO 1.1 Catches of North Atlantic salmon

Reported (i.e. nominal) catches of Atlantic salmon

In this document, nominal catches (landings) are equivalent to harvest. The reported catches do not include Atlantic salmon that have been caught and released (these are reported separately) nor do they include post-release mortalities, although the latter are included in the spawner estimates by some countries/jurisdictions. For clarity, detailed data are provided in Annex 1, tables A1.1–A1.4.

Reported total catches of Atlantic salmon in four North Atlantic regions from 1960 to 2023 are shown in Figure 1. Catches reported by country or jurisdiction are given in Table A1.1. Catch statistics in the North Atlantic include fish-farm escapees and, in some Northeast Atlantic countries, ranched fish. The data for 2023 are provisional.

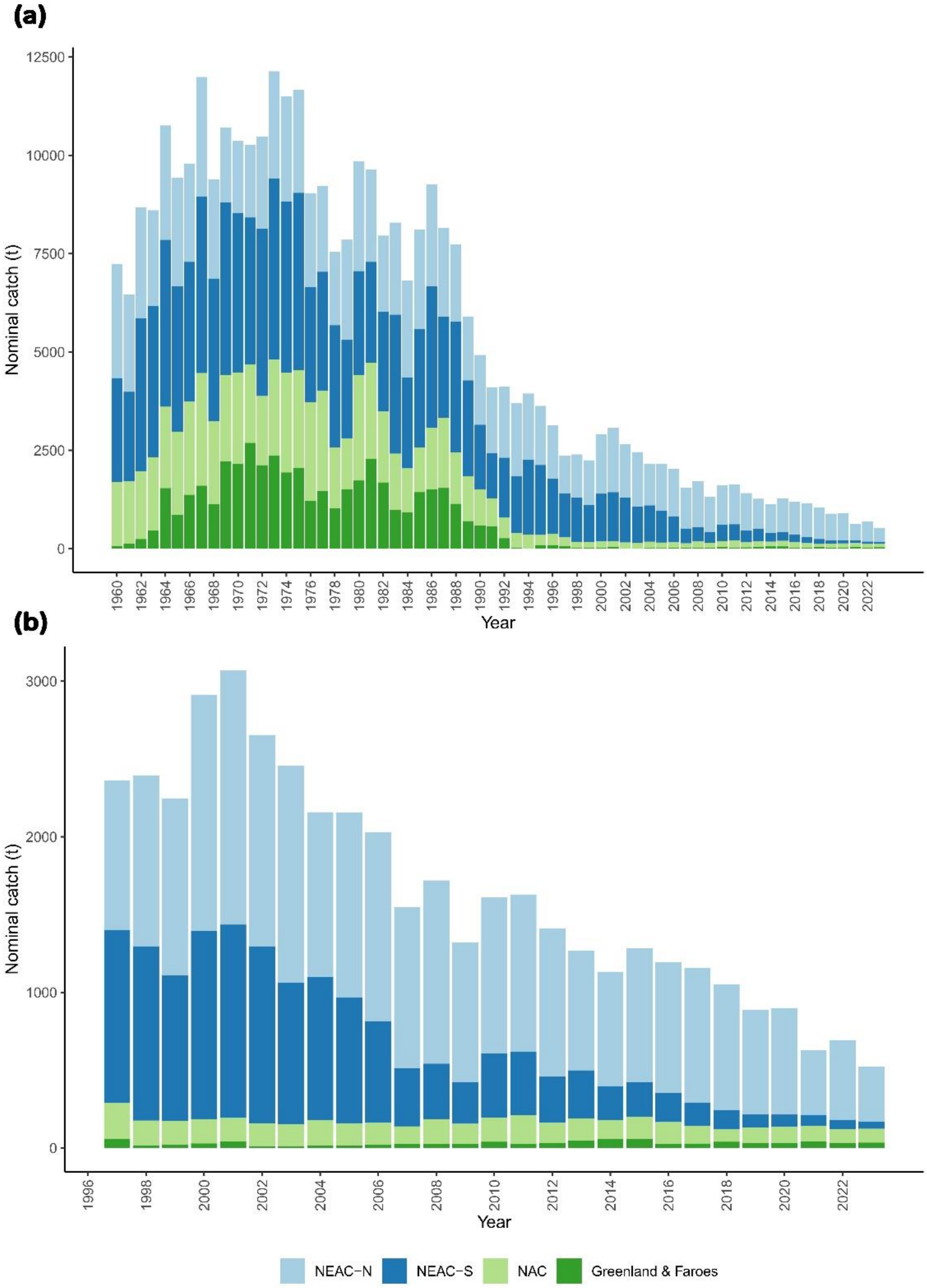


Figure 1 North Atlantic salmon stocks. Total reported catch of Atlantic salmon (tonnes; round fresh weight) in four North Atlantic regions, 1960–2023 (top) and 1997–2023 (bottom).

Icelandic catches have traditionally been separated into wild and ranched, reflecting the fact that Iceland has been the main North Atlantic country where large-scale ranching has been undertaken, with the specific intention of harvesting all returns at the release site and with no prospect of wild spawning success. The release of smolts for commercial ranching purposes ceased in Iceland in 1998, but ranching for angling fisheries in two Icelandic rivers continued into 2023 (Table A1.1). Catches in Sweden are also separated into wild and ranched over the entire time-series. The latter fish represent adult Atlantic salmon originating from hatchery-reared smolts that have been released under programmes to mitigate hydropower. These fish are also exploited very heavily in home waters and have no possibility to spawn naturally in the wild. While ranching does occur in some other countries, it is on a much smaller scale. The ranched components in Iceland and Sweden have therefore been included in the reported catch.

Table 1 North Atlantic salmon stocks. Reported catches (in tonnes) for the three NASCO commission areas for 2014–2023.

Area	Year									
	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NEAC	955	1081	1028	1015	928	756	761	487	569	452
NAC	122	144	140	113	80	101	105	100	91	89
WGC	58	57	28	28	40	29	32	43	31	34
Total	1135	1282	1196	1156	1048	886	898	630	691	576

The provisional total reported catch was 524 tonnes in 2023, the lowest in the time-series since 1960. NASCO requested that the reported catches in homewater fisheries be partitioned according to whether the catch is taken in coastal, estuarine, or in-river fisheries (Table 2).

Table 2 North Atlantic salmon stocks. The 2023 reported catches (in tonnes) for the NEAC and NAC commission areas.

Area	Coastal		Estuarine		In-river		Total
	Weight	% of total catch	Weight	% of total catch	Weight	% of total catch	Weight
NEAC	130	29	15	3	308	68	452
NAC	8	9	48	54	33	37	89

Coastal, estuarine, and in-river catch data aggregated by commission area are presented in Figure 2. In Northern NEAC (NEAC–N), catches in coastal fisheries have declined from 306 t in 2009 to 130 t in 2023, and in-river catches have declined from 595 t in 2009 to 276 t in 2023. There are no coastal fisheries in Iceland or Denmark. At the beginning of the time-series, about half the catch was reported from coastal fisheries and half from in-river fisheries, whereas, since 2008, coastal fisheries catches have represented around 29–44% of the total.

In Southern NEAC (NEAC–S), catches in coastal and estuarine fisheries have declined dramatically since 2006. While coastal fisheries have historically made up the largest component of the catch, these fisheries have declined the most, reflecting widespread measures to reduce exploitation in a number of countries; there have been no coastal catches since 2021. Estuarine fisheries have also declined, from 72 t in 2007 to 15 t in 2023. Since 2007, the majority of the catch in this area has been reported from in-river fisheries.

In NAC, the proportion of in-river fisheries catch has been about 50% since 2018, and the catch in coastal fisheries has been relatively small throughout the time-series (10 t or less).

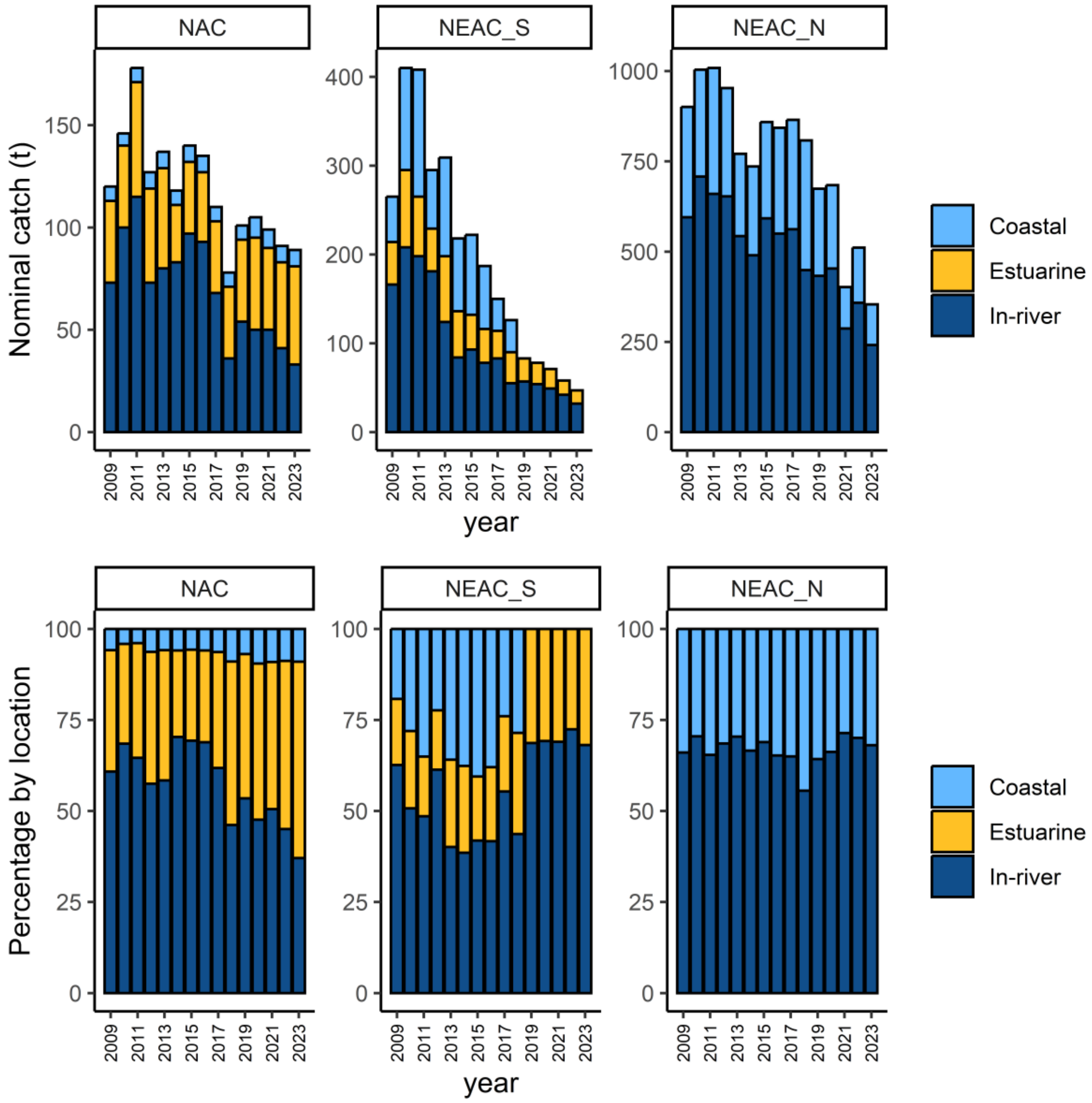


Figure 2 North Atlantic salmon stocks. Reported catches (tonnes; top panels) and percentages of the reported catches (bottom panels) from coastal, estuarine, and in-river fisheries for the NAC area, and for the Northern (NEAC–N) and Southern (NEAC–S) NEAC areas from 2009–2023. Note that scales of vertical axes in the top panels vary.

There is considerable variability in the distribution of the catch among individual countries (Figure 3; Table A1.2). In most countries, the majority of the catch is now reported from in-river fisheries, and across the time-series the coastal catches have declined markedly. Nominal catches (harvests) from rivers have also declined in many countries, as more of the fish caught are returned through catch and release schemes in angling fisheries and a few net fisheries.

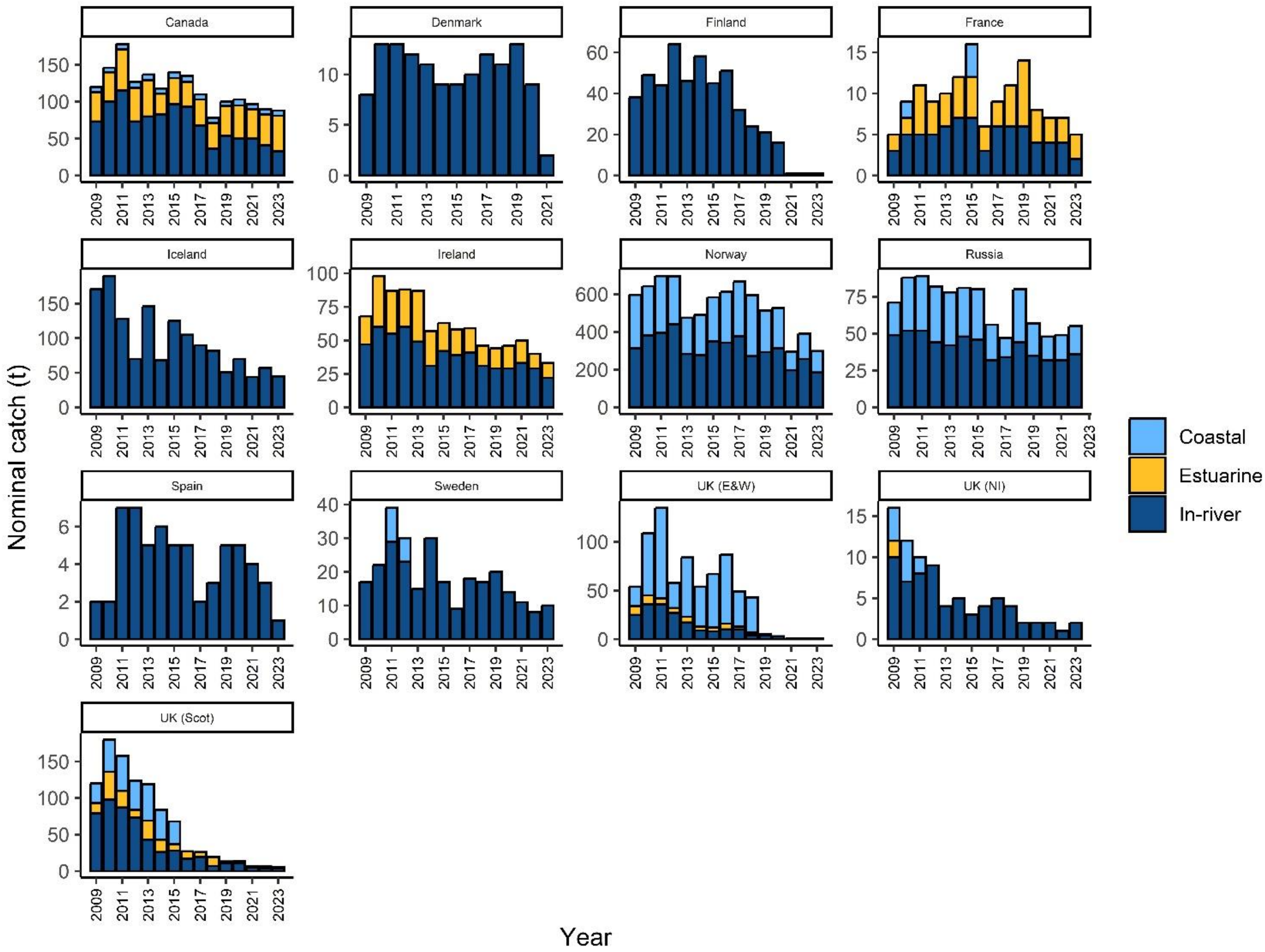


Figure 3 North Atlantic salmon stocks. Reported catch (tonnes) by country taken in coastal, estuarine, and in-river fisheries, 2009–2023. Note that scales on the *y*-axes vary. The US is not included because there has been no catch. One-hundred per cent of the fishery at St Pierre and Miquelon and at West Greenland occurs in coastal areas. These catches are not shown. For Germany, catch data was only available for 2023 and annual values prior to this are unknown. For Denmark, no catch weight data was provided for 2022 or 2023.

Unreported catches

The total unreported catch in NASCO areas was estimated at 121 t in 2023 (NEAC 95 t, NAC 16 t, and WGC 10 t). No estimates were provided for Russia, France, Spain, or St Pierre and Miquelon in 2023.

Table 3 North Atlantic salmon stocks. Unreported catch (in tonnes) by NASCO commission area in the last 10 years.

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
NEAC	256	299	297	318	278	238	238	134	174	95
NAC	21	17	27	25	24	12	27	19	18	16
WGC	10	10	10	10	10	10	10	10	10	10
Total	287	326	335	353	312	259	275	163	202	121

The 2023 unreported catches by country are provided in Table A1.3. Unreported catch estimates were not provided by category (coastal, estuarine, and in-river). Over recent years, efforts have been made to reduce the level of unreported catch in a number of countries.

Catch and release

The practice of catch and release (C&R) in angling fisheries has become increasingly common as an Atlantic salmon management/conservation measure in light of the widespread decline in Atlantic salmon abundance in the North Atlantic. In some areas of Canada and US, mandatory C&R became widely applied as a management measure in 1984, and many

European countries have introduced this in recent years, both as a result of statutory regulation and through voluntary practice. The reported catches do not include Atlantic salmon that have been caught and released, nor do they include post-release mortalities. Post-release mortality has not been estimated by every country. Table A1.4 presents C&R information from 1991 to 2023 for countries that provide records; C&R may also be practised in other countries while not being formally recorded. There are large differences in the percentage of the total angling catch that is released. In 2023, it ranged From 4% (France) to 96% (UK [Scotland]), reflecting varying management practices and angler attitudes among countries. Within countries, the percentage of released fish has increased over time. There is also evidence from some countries that larger MSW fish are released in higher proportions than smaller fish. Overall, more than 144 000 Atlantic salmon were reported to have been caught and released in the North Atlantic area in 2023.

Farming and sea ranching of Atlantic salmon

The provisional estimate of farmed Atlantic salmon production in the North Atlantic area for 2023 was 1 921 510 t (Figure 4). The production of farmed Atlantic salmon in this area has exceeded one million tonnes since 2009. Norway and UK (Scotland) continue to produce the majority of the farmed Atlantic salmon in the North Atlantic (79% and 10%, respectively). Farmed Atlantic salmon production in 2023 was above the previous five-year mean in all countries, with the exception of Ireland. Data for UK (Northern Ireland) since 2001 and data for the east coast of the US are not publicly available; this is also the case for some regions within countries in some years.

Worldwide production of farmed Atlantic salmon has been in excess of one million tonnes since 2001 and over two million tonnes since 2012. The worldwide production in 2023 was provisionally estimated at 2 814 561 t (Figure 4), which is slightly lower than 2022 but higher than the previous five-year mean (2 702 029 t). Production outside the North Atlantic is estimated to have accounted for almost one third of the total worldwide production in 2023, which is dominated by Chile.

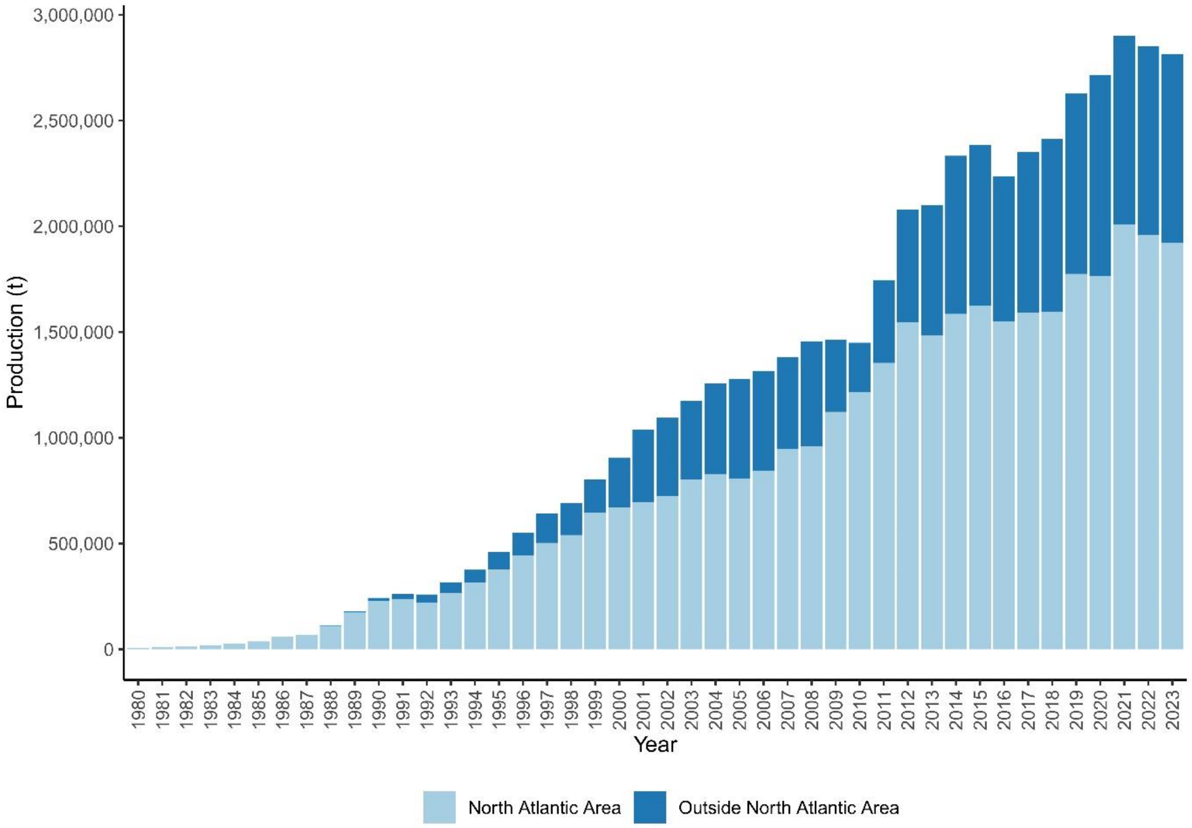


Figure 4 North Atlantic salmon stocks. Worldwide production of farmed Atlantic salmon, 1980–2023 (see Table 2.2.1.1 in ICES, 2024a).

The reported catch of Atlantic salmon in the North Atlantic was in the order of 0.02% of the worldwide production of farmed Atlantic salmon in 2023.

The total harvest of ranched Atlantic salmon in countries bordering the North Atlantic was 15 t in 2023, all taken in Iceland and Sweden (Figure 5), with the majority of the catch taken in Iceland (76% in 2023). No estimate was made of the ranched Atlantic salmon production in Norway in 2023, where such catches have been very low in recent years (< 1 t); nor in UK (Northern Ireland), where the proportion of ranched fish has not been assessed since 2008; nor in Ireland, where ranching is carried out in only a small number of rivers.

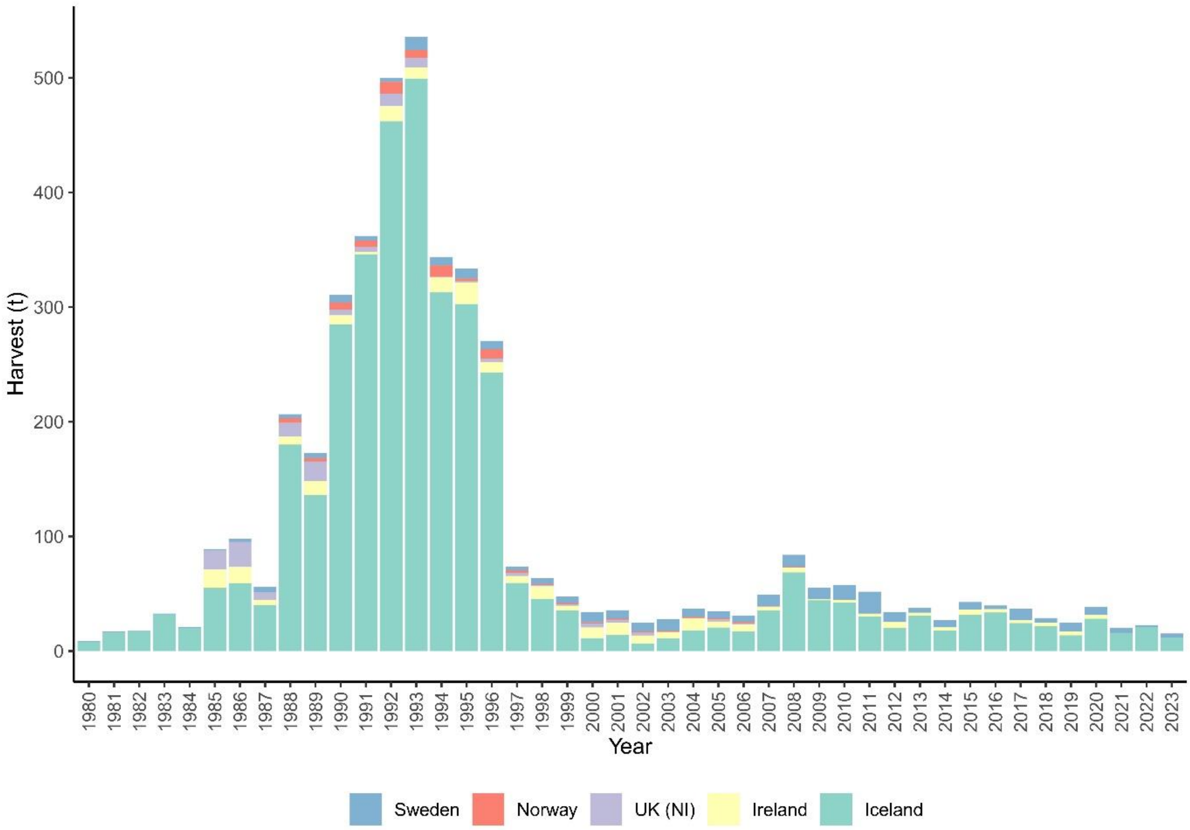


Figure 5 North Atlantic salmon stocks. Harvest of ranched Atlantic salmon (tonnes; round fresh weight) in the North Atlantic, 1980–2023 (ICES, 2024a).

NASCO 1.2 Significant, new, or emerging threats to, or opportunities for, Atlantic salmon conservation and management

A number of new or emerging threats to or opportunities for salmon conservation are considered by ICES (2024a); a summary of these is presented here.

Coronavirus (COVID-19)

There were no reported impacts of the COVID-19 pandemic on data collected in 2023 that would affect the catch advice provided in each NASCO Commission area.

Threats

- Aquaculture can pose threats to wild Atlantic salmon through a variety of pathways (ICES, 2021). A new development in Norway is that plans are now progressing for opening offshore areas for aquaculture in a number of proposed areas along the coast. Following a consultation process, three areas were selected for further evaluation and a programme for evaluation of the consequences of the planned offshore farming in these regions has been developed (Fiskeridirektoratet, 2022). Depending on the technology being developed for the offshore fish farms, the level of production in the areas, and their proximity to migration routes of wild post-smolts, aquaculture in these areas may have an effect on outmigrating post-smolts, not only originating from rivers in Norway, but potentially also from rivers further south in Europe. Further development of migration models for post-smolts from all regions would be needed to assess the potential impact.
- Urban runoff mortality syndrome (URMS) caused by 6PPD-quinone describes a phenomenon whereby exposure to stormwater can lead to acute mortality as high as 60–90% in Pacific salmonids. While a study investigating the acute toxicity of 6PPD-quinone exposure on early-life stages (alevins) of Atlantic salmon showed no obvious effect in terms of mortalities or substantial behavioural changes, the sensitivity of adult Atlantic salmon to 6PPD-quinone exposure (mortality, sublethal effects, or reproductive impairment) are unknown.

Opportunities

- There is a need for an enhanced genetic baseline which covers species distribution across Atlantic salmon rivers in the entire eastern Atlantic at a much greater resolution than what is currently available. While several genetic reference baselines are presently in use across the Atlantic salmon species range, they utilize relatively coarse spatial assignment units in some European areas of coverage. A project to plan the way forward towards a functional pan-European baseline has been initiated which will aim to provide a much higher spatial resolution for genetic assignment purposes. New stock assessment initiatives and associated management such as the LCM would benefit substantially from stock discrimination and assignment units at the anticipated higher resolution.
- A large collaborative research project entitled “Atlantic salmon in the eastern Canadian offshore regions: timing, duration and the effects of environmental variability and climate chang” is being conducted in Canada to determine the migration routes of Atlantic salmon at sea. The study will aim to identify the main migration routes and define their spatial distribution, from the time they leave their feeding grounds to their return to coastal areas near their natal rivers. The main objective of the study is to determine when, where, and how long Atlantic salmon are present in offshore areas to inform regulatory decision-making related to oil and gas exploration and development.
- A new method for estimating Atlantic salmon returns to the 64 principal Atlantic salmon rivers in the UK (England & Wales) has been developed as part of the Atlantic salmon stock assessment process. The new method uses fish counter−derived, fishery-independent estimates of returning Atlantic salmon numbers to 12 rivers, to estimate the run sizes from the other 52 rivers that only have fishery-dependent rod catch data. The methodology has been specifically developed in such a manner that it can be easily re-run for each annual Atlantic salmon stock assessment and is generalizable to other countries/jurisdictions with similar fishery-independent and fishery-dependent estimates of returning adult Atlantic salmon.
- A primary gap in our understanding of the North Atlantic decline in wild Atlantic salmon is in the ocean phase of their migration, and a better understanding of the spatial and temporal distribution of Atlantic salmon in the marine environment will allow researchers to begin understanding the physical and biological mechanisms that may be contributing to mortality. A five-year pop-off satellite tagging (PSAT) study on Atlantic salmon was initiated in 2018 with the goal of mapping the marine distribution and migration patterns for Atlantic salmon caught and

released at West Greenland. This will allow an evaluation of how physical and biological oceanographic features impact marine ecology and survival rates at sea in Atlantic salmon.

NASCO 1.3 Provision of a compilation of tag releases by country in 2023

Data on releases of tagged, finclipped, and other marked Atlantic salmon in 2023 are compiled as a separate report (ICES,2024b). In summary (Tables 4) and noting that no recent data were available from the Russian Federation (where large tagging programmes have taken place in recent years):

- Approximately 1.07 million Atlantic salmon were marked in 2023, reduced from the 1.5 million Atlantic salmon marked in 2022.
- The adipose clip was the most commonly used primary marker (0.804 million), with coded wire microtags (CWT) (127 000) being the next-most common.
- Most marks were applied to hatchery-origin juveniles (0.985 million in 2023), while 77 986 wild juveniles, 2 031 wild adults and 7 109 hatchery adults were marked in 2023.
- The use of Passive Integrated Transponder (PIT) tags, data storage tags (DSTs), radio, and/or sonic transmitting tags (pingers) has increased in recent years. In 2023, 60 726 Atlantic salmon were tagged with these tag types (Table 4), an increase compared to 2022 (50 002).

Since 2003, ICES has reported information on marks being applied to farmed Atlantic salmon to facilitate tracing the origin of farmed Atlantic salmon captured in the wild in the case of escape events. In US, genetic identification procedures have been adopted wherein broodstock are genetically screened, and the resulting database is used to match genotyped escaped farmed Atlantic salmon to a specific parental mating pair and subsequent hatchery of origin, stocking group, and marine site from which the individual escaped. This has also been applied in Iceland, where, in recent years, 20 out of 24 farmed escapees could be traced to the pens from which they had escaped by matching their genotypes to known parental genotypes, and a further three could be traced to foreign broodstocks.

Table 4 North Atlantic salmon stocks. Summary of Atlantic salmon tagged and marked in 2023. “Hatchery” and “Wild” juvenile refer to smolts and parr.

Country	Origin	Primary tag or mark				
		Microtag	External mark *	Adipose clip	Other internal†	Total
Canada	Hatchery adult	0	1143	241	417	1801
	Hatchery juvenile	0	0	1148	60	1208
	Wild adult	0	482	19	295	796
	Wild juvenile	0	11823	14688	1856	28367
	Total	**0**	**13448**	**16096**	**2628**	**32172**
Denmark	Hatchery adult	0	0	0	308	308
	Hatchery juvenile	0	0	298990	0	298990
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	0	0	0
	Total	**0**	**0**	**298990**	**308**	**299298**
France	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	62899	8445	0	71344
	Wild adult	0	0	0	200	200
	Wild juvenile	0	0	0	2656	2656
	Total	**0**	**62899**	**8445**	**2856**	**74200**
Iceland	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	0	0	0
	Wild adult	0	218	0	0	218
	Wild juvenile	1873	0	0	2784	4657
	Total	**1873**	**218**	**0**	**2784**	**4875**
Ireland	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	109540	0	0	0	109540
	Wild adult	0	0	0	0	0
	Wild juvenile	1153	0	0	3072	4225
	Total	**110693**	**0**	**0**	**3072**	**113765**
Norway	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	0	10 803	10803
	Wild adult	0	234	0	24	258
	Wild juvenile	0	0	0	9602	9602
	Total	**0**	**234**	**0**	**20429**	**20663**
Russian Federation	Hatchery adult					
	Hatchery juvenile					
	Wild adult					
	Wild juvenile					
	Total					
Spain	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	66400	0	66400
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	0	0	0
	Total	**0**	**0**	**66400**	**0**	**66400**
Sweden	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	163027	0	163027
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	0	384	384
	Total	**0**	**0**	**163027**	**384**	**163411**

Country	Origin	Primary tag or mark				
		Microtag	External mark *	Adipose clip	Other internal†	Total
UK (England & Wales)	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	0	0	0
	Wild adult	0	315	0	20	335
	Wild juvenile	3686	0	0	10270	13956
	Total	**3686**	**315**	**0**	**10290**	**14291**
UK (N. Ireland)	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	10357	0	56961	0	67318
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	0	0	0
	Total	**10357**	**0**	**56961**	**0**	**67318**
UK (Scotland)	Hatchery adult	0	22	0	0	22
	Hatchery juvenile	0	0	40482	0	40482
	Wild adult	0	111	0	0	111
	Wild juvenile	0	870	0	13269	14139
	Total	**0**	**1003**	**40482**	**13269**	**54754**
Germany	Hatchery Adult	0	0	10	0	10
	Hatchery Juvenile	0	1230	58550	5	59785
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**0**	**1230**	**58560**	**5**	**59795**
Greenland^	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	0	0	0
	Wild adult	0	0	0	107	107
	Wild juvenile	0	0	0	0	0
	Total	**0**	**0**	**0**	**107**	**107**
US	Hatchery adult	0	424	0	4544	4968
	Hatchery juvenile	0	0	95580	50	95630
	Wild adult	0	0	6	0	6
	Wild juvenile	0	0	0	0	0
	Total	**0**	**424**	**95 586**	**4594**	**100604**
All countries	Hatchery adult	0	1589	251	5269	7109
	Hatchery juvenile	119897	64129	789583	10918	984527
	Wild adult	0	1360	25	646	2031
	Wild juvenile	6712	12693	14688	43893	77986
	Total	**126609**	**79771**	**804547**	**60726**	**1071653**

* Includes Carlin, spaghetti, streamers, VIE, etc.
† Includes other internal tags (PIT, ultrasonic, radio, DST, etc.)
^ Individuals tagged in Greenland by the Atlantic Salmon Federation, details within Canada's tagging programme.

NASCO 1.4 Identify relevant data deficiencies, monitoring needs, and research requirements

ICES recommends that WGNAS should meet in 2025 (chaired by Alan Walker, UK). Unless otherwise notified, the working group intends to convene 17–28 March 2025, location to be confirmed.

Recommendations

The following relevant data deficiencies, monitoring needs, and research requirements were identified:

North Atlantic

- Complete and timely reporting of catch statistics from all fisheries, including by-catch, for all areas is recommended;
- Data call submissions were not received for the following countries/jurisdictions with known/historic Atlantic salmon fisheries or farmed Atlantic salmon production: Faroe Islands and Portugal. Equivalent data from Faroe Islands were received via national reports to the Working Group;
- ICES recommends that all countries/jurisdictions submit Atlantic salmon data through the ICES data call process.

North American Commission

- Improved sampling of all aspects of the Labrador and SPM fishery across the fishing season will improve the information on biological characteristics and stock origin of Atlantic salmon caught in these mixed-stock fisheries. A sampling rate of at least 10% of catches across the fishery season would be required to achieve a relatively unbiased estimate;
- Additional monitoring in Labrador should be considered to estimate stock status for that region. Additionally, efforts should be undertaken to evaluate the utility of other available data sources (e.g. iIndigenous and recreational catches and effort) to describe stock status in Labrador.

Northeast Atlantic Commission

- Data on catch numbers, exploitation rates and unreported catch rates were not available to the Working Group for the stock years 2021, 2022, and 2023 for any of the four Russian stock units. If Russian data are not provided in future years, the levels of uncertainty in the derived data will increase and, at some point, reach a level that means the process should not be applied;
- No river-specific CLs have been established for Russia, Denmark, Germany, and Spain. Iceland has developed provisional CLs and continues to work towards finalising an assessment process for determining CL attainment.

West Greenland Commission

- No recommendations specific to WGC are provided.

NASCO 1.5 Update on the distribution and abundance of pink salmon across the North Atlantic through 2023

There was a substantial increase in the abundance of pink salmon in 2023 in Norway, compared to previous years, were predominantly reported from the northern region of Troms and Finnmark. Large increases were also reported by Finland, in the Tana/Teno river system. Iceland and Greenland reported an increase in numbers, while all other countries/jurisdictions reported similar or lower numbers, compared to previous years. Pink salmon numbers were from catches, removals, counts or observations, in both fresh- and marine waters.

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Annex 1 Tables

Table A1.1 North Atlantic salmon stocks. Total reported catch of Atlantic salmon by country/jurisdiction@ (in tonnes, round fresh weight), 1960–2023 (2023 data are provisional).

Year	NAC area			NEAC–N (Northern area)								NEAC–S (Southern area)						Faroes & Greenland				Total catch	
	CA *	US	SPM	NO **	RU ***	IS		SE		DK* ^	FI	IE ^^^ $	UK E/W	UK NI $ $$	UK SO	FR $$$	ES #	FO ##	East GL	West GL ###	Other £	Reported catch	Un reported catch £ £
						Wild	Ranched^	Wild	Ranched ^^														
1960	1636	1	-	1659	1100	100	-	40	0	-	-	743	283	139	1443	-	33	-	-	60	-	7237	-
1961	1583	1	-	1533	790	127	-	27	0	-	-	707	232	132	1185	-	20	-	-	127	-	6464	-
1962	1719	1	-	1935	710	125	-	45	0	-	-	1459	318	356	1738	-	23	-	-	244	-	8673	-
1963	1861	1	-	1786	480	145	-	23	0	-	-	1458	325	306	1725	-	28	-	-	466	-	8604	-
1964	2069	1	-	2147	590	135	-	36	0	-	-	1617	307	377	1907	-	34	-	-	1539	-	10759	-
1965	2116	1	-	2000	590	133	-	40	0	-	-	1457	320	281	1593	-	42	-	-	861	-	9434	-
1966	2369	1	-	1791	570	104	2	36	0	-	-	1238	387	287	1595	-	42	-	-	1370	-	9792	-
1967	2863	1	-	1980	883	144	2	25	0	-	-	1463	420	449	2117	-	43	-	-	1601	-	11991	-
1968	2111	1	-	1514	827	161	1	20	0	-	-	1413	282	312	1578	-	38	5	-	1127	403	9793	-
1969	2202	1	-	1383	360	131	2	22	0	-	-	1730	377	267	1955	-	54	7	-	2210	893	11594	-
1970	2323	1	-	1171	448	182	13	20	0	-	-	1787	527	297	1392	-	45	12	-	2146	922	11286	-
1971	1992	1	-	1207	417	196	8	17	1	-	-	1639	426	234	1421	-	16	-	-	2689	471	10735	-
1972	1759	1	-	1578	462	245	5	17	1	-	32	1804	442	210	1727	34	40	9	-	2113	486	10965	-
1973	2434	3	-	1726	772	148	8	22	1	-	50	1930	450	182	2006	12	24	28	-	2341	533	12670	-
1974	2539	1	-	1633	709	215	10	31	1	-	76	2128	383	184	1628	13	16	20	-	1917	373	11877	-
1975	2485	2	-	1537	811	145	21	26	0	-	76	2216	447	164	1621	25	27	28	-	2030	475	12136	-
1976	2506	1	3	1530	542	216	9	20	0	-	66	1561	208	113	1019	9	21	40	<1	1175	289	9327	-
1977	2545	2	-	1488	497	123	7	9	1	-	59	1372	345	110	1160	19	19	40	6	1420	192	9414	-
1978	1545	4	-	1050	476	285	6	10	0	-	37	1230	349	148	1323	20	32	37	8	984	138	7682	-
1979	1287	3	-	1831	455	219	6	11	1	-	26	1097	261	99	1076	10	29	119	<05	1395	193	8118	-
1980	2680	6	-	1830	664	241	8	16	1	-	34	947	360	122	1134	30	47	536	<05	1194	277	10127	-
1981	2437	6	-	1656	463	147	16	25	1	-	44	685	493	101	1233	20	25	1025	<05	1264	313	9954	-
1982	1798	6	-	1348	364	130	17	24	1	-	54	993	286	132	1092	20	10	606	<05	1077	437	8395	-
1983	1424	1	3	1550	507	166	32	27	1	-	58	1656	429	187	1221	16	23	678	<05	310	466	8755	-
1984	1112	2	3	1623	593	139	20	39	1	-	46	829	345	78	1013	25	18	628	<05	297	101	6912	-
1985	1133	2	3	1561	659	162	55	44	1	-	49	1595	361	98	913	22	13	566	7	864	-	8108	-
1986	1559	2	3	1598	608	232	59	52	2	-	37	1730	430	109	1271	28	27	530	19	960	-	9255	315
1987	1784	1	2	1385	564	181	40	43	4	-	49	1239	302	56	922	27	18	576	<05	966	-	8159	2788
1988	1310	1	2	1076	420	217	180	36	4	-	36	1874	395	114	882	32	18	243	4	893	-	7737	3248
1989	1139	2	2	905	364	141	136	25	4	-	52	1079	296	142	895	14	7	364	-	337	-	5904	2277
1990	911	2	2	930	313	141	285	27	6	13	60	567	338	94	624	15	7	315	-	274	-	4925	1890
1991	711	1	1	876	215	129	346	34	4	3	70	404	200	55	462	13	11	95	4	472	-	4106	1682
1992	522	1	2	867	167	174	462	46	3	10	77	630	171	91	600	20	11	23	5	237	-	4119	1962
1993	373	1	3	923	139	157	499	44	12	9	70	541	248	83	547	16	8	23	-	-	-	3696	1644
1994	355	0	3	996	141	136	313	37	7	6	49	804	324	91	649	18	10	6	-	-	-	3945	1276
1995	260	0	1	839	128	146	303	28	9	3	48	790	295	83	588	10	9	5	2	83	-	3629	1060

Year	NAC area			NEAC–N (Northern area)								NEAC–S (Southern area)						Faroes & Greenland				Total catch	
	CA *	US	SPM	NO **	RU ***	IS		SE		DK* ^	FI	IE ^^^ $	UK E/W	UK NI $ $$	UK SO	FR $$$	ES #	FO ##	East GL	West GL ###	Other £	Reported catch	Un reported catch ££
						Wild	Ranched^	Wild	Ranched ^^														
1996	292	0	2	787	131	118	243	26	7	2	44	685	183	77	427	13	7	-	0	92	-	3136	1123
1997	229	0	2	630	111	97	59	15	4	1	45	570	142	93	296	8	4	-	1	58	-	2364	827
1998	157	0	2	740	131	119	46	10	5	1	48	624	123	78	283	8	4	6	0	11	-	2395	1210
1999	152	0	2	811	103	111	35	11	5	1	62	515	150	53	199	11	6	0	0	19	-	2247	1032
2000	153	0	2	1176	124	73	11	24	9	5	95	621	219	78	274	11	7	8	0	21	-	2912	1269
2001	148	0	2	1267	114	74	14	25	7	6	126	730	184	53	251	11	13	0	0	43	-	3069	1180
2002	148	0	2	1019	118	90	7	20	8	5	93	682	161	81	191	11	9	0	0	9	-	2654	1039
2003	141	0	3	1071	107	99	11	15	10	4	78	551	89	56	192	13	9	0	0	9	-	2457	847
2004	161	0	3	784	82	111	18	13	7	4	39	489	111	48	245	19	7	0	0	15	-	2157	686
2005	139	0	3	888	82	129	21	9	6	8	47	422	97	52	215	11	13	0	0	15	-	2155	700
2006	137	0	3	932	91	93	17	8	6	2	67	326	80	29	192	13	11	0	0	22	-	2028	670
2007	112	0	2	767	63	93	36	6	10	3	58	85	67	30	171	11	9	0	0	25	-	1548	475
2008	158	0	4	807	73	132	69	8	10	9	71	89	64	21	161	12	9	0	0	26	-	1721	443
2009	126	0	3	595	71	126	44	7	10	8	36	68	54	16	121	4	2	0	0.8	26	-	1318	343
2010	153	0	3	642	88	147	42	9	13	13	49	99	109	12	180	10	2	0	1.7	38	-	1610	393
2011	179	0	4	696	89	98	30	20	19	13	44	87	136	10	159	11	7	0	0.1	27	-	1629	421
2012	126	0	3	696	82	50	20	21	9	12	64	88	58	9	124	10	7	0	0.5	33	-	1412	403
2013	138		5	475	78	116	31	10	4	11	46	87	84	4	119	11	4	0	0	47	-	1269	306
2014	118		4	490	81	50	18	24	6	9	58	56	54	5	84	12	6	0	<0.5	58	-	1133	287
2015	140		4	583	80	94	31	11	7	9	45	63	68	3	68	16	5	0	1	56	-	1284	326
2016	135		5	612	56	71	34	6	3	9	51	58	86	5	27	6	5	0	2	26	-	1196	335
2017	110		3	667	47	66	24	9	10	12	32	59	49	5	27	10	2	0	<0.5	28	-	1159	353
2018	79		1	594	80	60	22	12	4	11	24	46	42	4	19	10	3	0	1	39	-	1052	312
2019	100		1	513	57	37	14	13	8	13	21	45	5	2	13	15	5	0	1	28	-	889	259
2020	103		2	527	49	42	28	7	7	9	16	46	3	2	14	8	5	0	1	31	-	899	275
2021	98		2	295	49[%]	41	16	6	5	2	1	51	1	2	7	7	4	0	1	42	-	627	164
2022	90		1	389	55[%]	37	20	7	2		1	40	1	1	6	7	3	0	1	30	-	691	201
2023	88		1	297	52[%]	34	11	6	4		1	33	1	2	5	5	1	0	1	33	-	576	112
2018–2022	94	0	1	464	58	43	20	9	5	9	13	45	10	2	12	9	4	0	1	34	-	832	242
2013–2022	111	0	3	515	63	61	24	10	5	9	30	55	39	3	38	10	4	0	1	38	-	1020	282

[@] Country/Jurisdiction codes: CA (Canada), US (United States of America), SPM (Saint Pierre and Miquelon), NO (Norway), RU (Russian Federation), IS (Iceland), SE (Sweden), DK (Denmark), FI (Finland), IE (Ireland), UK E/W (United Kingdom England & Wales), UK NI (Northern Ireland), UK SO (Scotland), FR (France), ES (Spain), FO (Faroes), GL (Greenland).
* Includes estimates of some local sales and, prior to 1984, bycatch.
** Before 1966, sea trout and sea charr included (5% of total).
*** Figures from 1991 to 2001 do not include catches taken in the recreational (rod) fishery; 2021 and 2022 data extracted from NASCO website at https://nasco.int/conservation/third-reporting-cycle-2/
^ From 1990, catch includes fish ranched for both commercial and angling purposes.
^^ Catches from hatchery-reared smolts released under programmes to mitigate for hydropower development.

^^^ Improved reporting of rod catches in 1994 and data derived from carcase tagging and logbooks from 2002.
$ Catch on River Foyle allocated 50% to Ireland and 50% to Northern Ireland.
$$ Angling catch (derived from carcase tagging and logbooks) first included in 2002.
$$$ Data for France include some unreported catches.
Spanish data until 2018 (inclusive), weights estimated from mean weight of fish caught in Asturias (80–90% of Spanish catch); weight for 2019 and 2020 for all Spain, supplied via data call.
Between 1991 and 1999, there was only a research fishery at Faroes. In 1997 and 1999, no fishery took place; the commercial fishery was resumed in 2000, but has not operated since 2001.
Includes catches made in the West Greenland area by Norway, Faroes, Sweden, and Denmark in 1965–1975.
£ Includes catches in Norwegian Sea by vessels from Denmark, Sweden, Germany, Norway, and Finland.
££ No unreported catch estimate available for Canada in 2007 and 2008. Data for Canada in 2009, 2010, and 2019 are incomplete. No unreported catch estimates available for Russian Federation since 2008.
% Russian Federation data extracted from NASCO website at https://nasco.int/conservation/third-reporting-cycle-2/.
*^ Catch weight data not provided by Denmark for 2022 nor 2023.

Table A1.2 North Atlantic salmon stocks. Reported catches (tonnes, round fresh weight) and % of the reported catches by country taken in coastal, estuarine, and in river fisheries, 2000–2023. Data for 2023 include provisional data.

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
Canada	2000	2	2	29	19	117	79	148
	2001	3	2	28	20	112	78	143
	2002	4	2	30	20	114	77	148
	2003	5	3	36	27	96	70	137
	2004	7	4	46	29	109	67	161
	2005	7	5	44	32	88	63	139
	2006	8	6	46	34	83	60	137
	2007	6	5	36	32	70	63	112
	2008	9	6	47	32	92	62	147
	2009	7	6	40	33	73	61	119
	2010	6	4	40	27	100	69	146
	2011	7	4	56	31	115	65	178
	2012	8	6	46	36	73	57	127
	2013	8	6	49	36	80	58	137
	2014	7	6	28	24	83	71	118
	2015	8	6	35	25	97	69	140
	2016	8	6	34	25	93	69	135
	2017	7	6	35	32	68	62	110
	2018	7	9	35	45	36	46	79
	2019	6	6	40	40	54	54	100
	2020	8	7	45	44	50	49	103
	2021	7	8	40	41	50	51	98
	2022	7	8	42	46	41	46	90
	2023	7	8	48	54	33	37	88
Denmark*^	2008	0	1	0	0	9	99	9
	2009	0	0	0	0	8	100	8

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
	2010	0	1	0	0	13	99	13
	2011	0	0	0	0	13	100	13
	2012	0	0	0	0	12	100	12
	2013	0	0	0	0	11	100	11
	2014	0	0	0	0	9	100	9
	2015	0	0	0	0	9	100	9
	2016	0	0	0	0	10	100	10
	2017	0	1	0	0	12	99	12
	2018	0	1	0	0	11	99	11
	2019	0	1	0	0	13	99	13
	2020	0	0	0	0	9	100	9
	2021	0	0	0	0	2	100	2
Finland	1996	0	0	0	0	44	100	44
	1997	0	0	0	0	45	100	45
	1998	0	0	0	0	48	100	48
	1999	0	0	0	0	63	100	63
	2000	0	0	0	0	96	100	96
	2001	0	0	0	0	126	100	126
	2002	0	0	0	0	94	100	94
	2003	0	0	0	0	75	100	75
	2004	0	0	0	0	39	100	39
	2005	0	0	0	0	47	100	47
	2006	0	0	0	0	67	100	67
	2007	0	0	0	0	59	100	59
	2008	0	0	0	0	71	100	71
	2009	0	0	0	0	38	100	38
	2010	0	0	0	0	49	100	49
	2011	0	0	0	0	44	100	44
	2012	0	0	0	0	64	100	64
	2013	0	0	0	0	46	100	46
	2014	0	0	0	0	58	100	58
	2015	0	0	0	0	45	100	45
	2016	0	0	0	0	51	100	51
	2017	0	0	0	0	32	100	32
	2018	0	0	0	0	24	100	24
	2019	0	0	0	0	21	100	21
	2020	0	0	0	0	16	100	16
	2021	0	0	0	0	1	100	1
	2022	0	0	0	0	1	100	1
	2023	0	0	0	0	1	100	1
France*^	1996			4	31	9	69	13
	1997			3	38	5	62	8

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
	1998	1	12	2	25	5	62	8
	1999	0	0	4	35	7	65	11
	2000	0	4	4	35	7	61	11
	2001	0	4	5	44	6	53	11
	2002	2	14	4	30	6	56	12
	2003	0	0	6	44	7	56	13
	2004	0	0	10	51	9	49	19
	2005	0	0	4	38	7	62	11
	2006	0	0	5	41	8	59	13
	2007	0	0	4	42	6	58	11
	2008	1	5	5	39	7	57	12
	2009	0	4	2	34	3	62	5
	2010	2	22	2	26	5	52	10
	2011	0	3	6	54	5	43	11
	2012	0	1	4	44	5	55	10
	2013	0	3	4	40	6	57	11
	2014	0	2	5	43	7	55	12
	2015	4	23	5	32	7	45	16
	2016	0	2	3	45	3	52	6
	2017	0	5	3	36	6	59	10
	2018	0	0	5	47	6	53	11
	2019	0	2	8	54	6	44	15
	2020	0	2	4	48	4	50	8
	2021	0	1	3	38	4	61	7
	2022	0	0	3	47	4	53	7
	2023	0	0	3	62	2	38	5
Germany	2023	0	0	0	0	0	100	0
Iceland^^^	1996	10	9	0	0	111	91	122
	1997	0	0	0	0	156	100	156
	1998	0	0	0	0	164	100	164
	1999	0	0	0	0	146	100	146
	2000	0	0	0	0	85	100	85
	2001	0	0	0	0	88	100	88
	2002	0	0	0	0	97	100	97
	2003	0	0	0	0	110	100	110
	2004	0	0	0	0	130	100	130
	2005	0	0	0	0	149	100	149
	2006	0	0	0	0	111	100	111
	2007	0	0	0	0	129	100	129
	2008	0	0	0	0	200	100	200
	2009	0	0	0	0	171	100	171
	2010	0	0	0	0	190	100	190

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
	2011	0	0	0	0	128	100	128
	2012	0	0	0	0	70	100	70
	2013	0	0	0	0	146	100	146
	2014	0	0	0	0	68	100	68
	2015	0	0	0	0	125	100	125
	2016	0	0	0	0	105	100	105
	2017	0	0	0	0	90	100	90
	2018	0	0	0	0	82	100	82
	2019	0	0	0	0	51	100	51
	2020	0	0	0	0	70	100	70
	2021	0	0	0	0	44	100	44
	2022	0	0	0	0	57	100	57
	2023	0	0	0	0	45	100	45
Ireland	1996	440	64	134	20	110	16	684
	1997	380	67	100	18	91	16	571
	1998	433	69	92	15	99	16	624
	1999	335	65	83	16	97	19	515
	2000	440	71	79	13	102	16	621
	2001	551	75	109	15	70	10	730
	2002	514	75	89	13	79	12	682
	2003	403	73	92	17	56	10	551
	2004	342	70	76	16	71	15	489
	2005	291	69	70	17	60	14	421
	2006	206	63	60	18	61	19	327
	2007	0	0	31	37	52	63	83
	2008	0	0	29	33	60	67	89
	2009	0	0	21	31	47	69	68
	2010	0	0	38	39	60	61	98
	2011	0	0	32	37	55	63	87
	2012	0	0	28	32	60	68	88
	2013	0	0	38	44	49	56	87
	2014	0	0	26	46	31	54	57
	2015	0	0	21	33	42	67	63
	2016	0	0	19	33	39	67	58
	2017	0	0	18	31	41	69	59
	2018	0	0	15	33	31	67	46
	2019	0	0	15	35	29	65	45
	2020	0	0	17	36	29	64	46
	2021	0	0	17	35	33	65	51
	2022	0	0	11	28	29	72	40
	2023	0	0	11	33	22	67	33
	1996	520	66	0	0	267	34	787

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
Norway	1997	394	63	0	0	235	37	629
	1998	410	55	0	0	331	45	741
	1999	483	60	0	0	327	40	810
	2000	619	53	0	0	557	47	1176
	2001	696	55	0	0	570	45	1266
	2002	596	58	0	0	423	42	1019
	2003	597	56	0	0	474	44	1071
	2004	469	60	0	0	316	40	785
	2005	463	52	0	0	424	48	888
	2006	512	55	0	0	420	45	932
	2007	427	56	0	0	340	44	767
	2008	382	47	0	0	425	53	807
	2009	284	48	0	0	312	52	595
	2010	260	41	0	0	382	59	642
	2011	302	43	0	0	394	57	696
	2012	255	37	0	0	440	63	696
	2013	192	40	0	0	283	60	475
	2014	213	43	0	0	277	57	490
	2015	233	40	0	0	350	60	583
	2016	269	44	0	0	343	56	612
	2017	290	44	0	0	376	56	666
	2018	323	54	0	0	271	46	594
	2019	219	43	0	0	293	57	513
	2020	215	41	0	0	312	59	527
	2021	98	33	0	0	197	67	295
	2022	134	34	0	0	256	66	389
	2023	113	38	0	0	185	62	297
Russian Federation[$]	1996	64	49	21	16	46	35	130
	1997	63	57	17	15	32	28	111
	1998	55	42	2	2	74	56	131
	1999	48	47	2	2	52	51	102
	2000	64	52	15	12	45	36	124
	2001	70	61	0	0	44	39	114
	2002	60	51	0	0	58	49	118
	2003	57	53	0	0	50	47	107
	2004	46	56	0	0	36	44	82
	2005	58	70	0	0	24	30	82
	2006	52	57	0	0	39	43	91
	2007	31	50	0	0	31	50	62
	2008	33	45	0	0	40	55	73
	2009	22	31	0	0	49	69	71
	2010	36	41	0	0	52	59	88

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
	2011	37	42	0	0	52	58	89
	2012	38	46	0	0	44	54	82
	2013	36	46	0	0	42	54	78
	2014	33	41	0	0	48	59	81
	2015	34	42	0	0	46	58	80
	2016	24	42	0	0	32	58	56
	2017	13	28	0	0	34	72	47
	2018	36	45	0	0	44	55	80
	2019	22	38	0	0	35	62	57
	2020	16	34	0	0	32	66	49
	2021	17	35	0	0	32	65	49
	2022	19	35	0	0	36	65	55
	2023	17	33	0	0	35	67	52
Spain^^	1996	0	0	0	0	7	100	7
	1997	0	0	0	0	4	100	4
	1998	0	0	0	0	4	100	4
	1999	0	0	0	0	6	100	6
	2000	0	0	0	0	7	100	7
	2001	0	0	0	0	13	100	13
	2002	0	0	0	0	9	100	9
	2003	0	0	0	0	7	100	7
	2004	0	0	0	0	7	100	7
	2005	0	0	0	0	13	100	13
	2006	0	0	0	0	10	100	10
	2007	0	0	0	0	9	100	9
	2008	0	0	0	0	9	100	9
	2009	0	0	0	0	2	100	2
	2010	0	0	0	0	2	100	2
	2011	0	0	0	0	7	100	7
	2012	0	0	0	0	7	100	7
	2013	0	0	0	0	5	100	5
	2014	0	0	0	0	6	100	6
	2015	0	0	0	0	5	100	5
	2016	0	0	0	0	5	100	5
	2017	0	0	0	0	2	100	2
	2018	0	0	0	0	3	100	3
	2019	0	0	0	0	5	100	5
	2020	0	0	0	3	5	97	5
	2021	0	0	0	1	4	99	4
	2022	0	0	0	0	3	100	3
	2023	0	0	0	0	1	100	1
	1996	19	58	0	0	14	42	33

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
Sweden***	1997	10	56	0	0	8	44	18
	1998	5	33	0	0	10	67	15
	1999	5	31	0	0	11	69	16
	2000	10	30	0	0	23	70	33
	2001	9	27	0	0	24	73	33
	2002	7	25	0	0	21	75	28
	2003	7	28	0	0	18	72	25
	2004	3	16	0	0	16	84	19
	2005	1	7	0	0	14	93	15
	2006	1	7	0	0	13	93	14
	2007	0	1	0	0	16	99	16
	2008	0	1	0	0	18	99	18
	2009	0	3	0	0	17	97	17
	2010	0	0	0	0	22	100	22
	2011	10	26	0	0	29	74	39
	2012	7	24	0	0	23	76	30
	2013	0	0	0	0	15	100	15
	2014	0	0	0	0	30	100	30
	2015	0	0	0	0	17	100	17
	2016	0	0	0	0	9	100	9
	2017	0	0	0	0	18	100	18
	2018	0	0	0	0	17	100	17
	2019	0	0	0	0	20	100	20
	2020	0	0	0	0	14	100	14
	2021	0	0	0	0	11	100	11
	2022	0	0	0	0	8	100	8
	2023	0	0	0	0	10	100	10
UK (England & Wales)	1996	83	45	42	23	58	31	183
	1997	81	57	27	19	35	24	142
	1998	65	53	19	16	38	31	123
	1999	101	67	23	15	26	17	150
	2000	157	72	25	12	37	17	219
	2001	129	70	24	13	31	17	184
	2002	108	67	24	15	29	18	161
	2003	42	47	27	30	20	23	89
	2004	39	35	19	17	53	47	111
	2005	32	33	28	29	36	37	97
	2006	30	37	21	26	30	37	80
	2007	24	36	13	20	30	44	67
	2008	22	34	8	13	34	53	64
	2009	20	37	9	16	25	47	54
	2010	64	59	9	8	36	33	109

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
	2011	93	69	6	5	36	27	136
	2012	26	45	5	8	27	47	58
	2013	61	73	6	7	17	20	84
	2014	41	75	4	8	9	17	54
	2015	55	82	4	6	8	12	68
	2016	71	82	6	6	10	11	86
	2017	36	73	3	7	10	19	49
	2018	36	84	3	8	4	8	42
	2019	0	0	1	12	4	88	5
	2020	0	0	0	0	3	100	3
	2021	0	0	0	0	1	100	1
	2022	0	0	0	0	1	100	1
	2023	0	0	0	0	1	100	1
UK (Northern Ireland)**	1999	44	83	9	17			53
	2000	63	82	14	18			77
	2001	41	77	12	23			53
	2002	40	49	24	29	18	22	81
	2003	25	45	20	35	11	20	56
	2004	23	48	11	22	14	29	48
	2005	25	49	13	25	14	26	52
	2006	13	45	6	22	9	32	28
	2007	6	21	6	20	17	59	30
	2008	4	19	4	22	12	59	21
	2009	4	24	2	15	10	62	16
	2010	5	39	0	0	7	61	12
	2011	2	24	0	0	8	76	10
	2012	0	0	0	0	9	100	9
	2013	0	1	0	0	4	99	4
	2014	0	0	0	0	5	100	5
	2015	0	0	0	0	3	100	3
	2016	0	0	0	0	4	100	4
	2017	0	0	0	0	5	100	5
	2018	0	0	0	0	4	100	4
	2019	0	0	0	0	2	100	2
	2020	0	0	0	0	2	100	2
	2021	0	0	0	0	2	100	2
	2022	0	0	0	0	1	100	1
	2023	0	0	0	0	2	100	2
UK (Scotland)	1996	129	30	80	19	218	51	427
	1997	79	27	33	11	184	62	296
	1998	60	21	28	10	195	69	283
	1999	35	18	23	11	141	71	199

Country	Year	Coastal		Estuarine		In-river		Total
		Weight (t)	% of total	Weight (t)	% of total	Weight (t)	% of total	Weight (t)
	2000	76	28	41	15	157	57	274
	2001	77	30	22	9	153	61	251
	2002	55	29	20	10	116	61	191
	2003	86	45	23	12	83	43	193
	2004	67	27	20	8	160	65	247
	2005	62	29	27	12	128	59	217
	2006	57	30	17	9	119	62	193
	2007	40	24	17	10	113	66	171
	2008	38	24	11	7	112	70	161
	2009	27	22	14	12	79	66	121
	2010	44	25	38	21	98	54	180
	2011	48	30	23	15	87	55	159
	2012	40	32	11	9	73	59	124
	2013	50	42	26	22	43	36	119
	2014	41	49	17	20	26	31	84
	2015	31	45	9	14	28	41	68
	2016	0	0	10	37	17	63	27
	2017	0	0	7	27	19	73	26
	2018	0	0	12	63	7	37	19
	2019	0	0	2	13	11	87	13
	2020	0	0	3	19	11	81	14
	2021	0	0	2	30	5	70	7
	2022	0	0	2	30	4	70	6
	2023	0	0	1	25	4	75	5

* An illegal net fishery operated from 1995 to 1998, catch unknown in the first three years but thought to be increasing. Fishery ceased in 1999. 2001–2002 catches from the illegal coastal net fishery in Lower Normandy are unknown.

** Rod catch data for river (rod) fisheries in UK (N. Ireland) from 2002.

*** Estuarine catch included in coastal catch.

^ Coastal catch included in estuarine catch.

^^ Spain catch to 2018 was Asturias catch raised, 2019 data for all Spain.

^^^ Iceland total catch includes ranched fish.

$ 2021, 2022 and 2023 data extracted from NASCO website at https://nasco.int/conservation/third-reporting-cycle-2/.

*^ Catch weight data not provided by Denmark for 2022 nor 2023.

Table A1.3 North Atlantic salmon stocks. Estimates for 2023 of unreported catches by various methods, in tonnes by country/jurisdiction within national EEZs in the North East Atlantic, North American, and West Greenland commissions of NASCO.

Commission area	Country/Jurisdiction	Unreported catch (tonnes)	Unreported as % of total North Atlantic catch (unreported + reported)	Unreported as % of total country/jurisdiction catch (unreported + reported)
NEAC	Denmark**			
NEAC	Finland	0	0.0	9
NEAC	Iceland	1	0.1	2
NEAC	Ireland	3	0.5	10
NEAC	Norway	89	14.1	23
NEAC	Sweden	1	0.2	9
NEAC	UK (England & Wales)	0	0.0	9
NEAC	UK (N. Ireland)	0	0.0	12
NEAC	UK (Scotland)	<1	0.1	9
NAC	US	0	0.0	
NAC	Canada	16	2.6	16
WGC	Greenland	10	0.0	10
Total unreported catch *		112	23	
Total reported catch of North Atlantic salmon		524		

* No unreported catch estimates are available for France, Spain, St. Pierre and Miquelon, or the Russian Federation in 2023.
** No catch weight data provided by Denmark

Table A1.4 North Atlantic salmon stocks. Numbers of fish caught and released (C&R) in angling fisheries along with the % of the total angling catch (released + retained) for countries in the North Atlantic where records are available, 1991–2023. Data for 2023 are provisional.

Year	Canada $		US		Iceland		Russia *		UK (E and W)		UK (Scotland)		Ireland		UK (N. Ireland) **		Denmark		Sweden		Norway ***		Total C&R
	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	
1991	22167	28	239	50			3211	51															25617
1992	37803	29	407	67			10120	73															48330
1993	44803	36	507	77			11246	82	1448	10													58004
1994	52887	43	249	95			12056	83	3227	13	6595	8											75014
1995	46029	46	370	100			11904	84	3189	20	1215	14											73643
1996	52166	41	542	100	669	2	10745	73	3428	20	1041	15											77963
1997	50009	50	333	100	1558	5	14823	87	3132	24	1096	18											80799
1998	56289	53	273	100	2826	7	12776	81	4378	30	1346	18											90006
1999	48720	50	211	100	3055	10	11450	77	4382	42	1484	28											82667
2000	64482	56	0	-	2918	11	12914	74	7470	42	2107	32											108856
2001	59387	55	0	-	3611	12	16945	76	6143	43	2772	38											113810
2002	50924	52	0	-	5985	18	25248	80	7658	50	2405	42											113873
2003	53645	55	0	-	5361	16	33862	81	6425	56	2917	55											128463
2004	62316	57	0	-	7362	16	24679	76	1321	48	4627	50					255	19					154102
2005	63005	62	0	-	9224	17	23592	87	1198	56	4616	55	2553	12			606	27					157128
2006	60486	62	1	100	8735	19	33380	82	1095	56	4766	55	5409	22	302	18	794	65					167735
2007	41192	58	3	100	9691	18	44341	90	1091	55	5566	61	15113	44	470	16	959	57					178356
2008	54887	53	61	100	17178	20	41881	86	1303	55	5334	62	13563	38	648	20	2033	71			5512	5	202164
2009	52151	59	0	-	17514	24			9096	58	4843	67	11422	39	847	21	1709	53			6696	6	147871
2010	55895	53	0	-	21476	29	14585	56	1501	60	7804	70	15142	40	823	25	2512	60			15041	12	218945
2011	71358	57	0	-	18593	32			1440	62	6487	73	12688	38	1197	36	2153	55	424	5	14303	12	200452
2012	43287	57	0	-	9752	28	4743	43	1195	65	6362	74	11891	35	5014	59	2153	55	404	6	18611	14	171435
2013	50630	59	0	-	23133	34	3732	39	1045	70	5400	80	10682	37	1507	64	1932	57	274	9	15953	15	172304
2014	41613	54	0	-	13616	41	8479	52	7992	78	3735	82	6537	37	1065	50	1918	61	982	15	20281	19	139838
2015	65440	64	0	-	21914	31	7028	50	8113	79	4683	84	9383	37	111	100	2989	70	690	14	25433	19	187938

Year	Canada [$]		US		Iceland		Russia [*]		UK (E and W)		UK (Scotland)		Ireland		UK (N. Ireland) [**]		Denmark		Sweden		Norway [***]		Total C&R
	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	Total C&R	% of rod catch	
2016	68925	65	0	-	22751	43	10793	76	9700	80	5018	90	10934	43	280	100	3801	72	362	17	25198	21	202930
2017	57357	66	0	-	19667	42	10110	77	1125	83	4565	90	12562	45	126	100	4435	69	680	14	25924	21	187768
2018	56011	82	0	-	19409	43	10799	73	6857	88	3506	93	9249	43	3247	49	4613	79	806	16	22024	22	168081
2019	60636	72	0	-	15185	52	12762	74	8171	89	4382	91	9790	48	5000	85	3913	70	747	15	21178	20	168445
2020	56618	72	0	-	21277	51	9508	65	1189	93	4285	92	12177	53	7333	89	4375	67	587	16	28753	23	195447
2021	67056	75	0	-	18734	54	10727	71	5534	95	3485	95	14272	54	5132	89	4016	70	680	21	21357	27	182409
2022	52127	76	0	-	23029	53	10324	64	6110	96	4147	96	13623	56	3578	86	4344	73	730	28	27189	28	182541
2023	42595	78	0	-	20069	63	10988	70	4644	95	3129	96	8786	51	2981	84	3015	69	941	29	18879	27	144211
Avg. 2018–	58490	75	0	-	19527	51	10824	72	7713	92	3961	93	11822	51	4858	80	4252	72	710	20	24100	24	179385
% change in 2023 from	−37	3	-	-	3	12	-	-	-66	3	-26	3	-34	0	-63	4	−41	−3	24	9	−28	3	−24

[*] Since 2009, data have been either unavailable or incomplete; however, catch and release is understood to have remained at similar high levels as before. 2021 and 2022 data extracted from NASCO website at https://nasco.int/conservation/third-reporting-cycle-2/

[**] UK (Northern Ireland) Data for 2006–2009. 2014 is for the DCAL area only; the figures from 2010 are a total for UK (Northern Ireland). Data for 2015, 2016, and 2017 are for River Bush only.

[***] The statistics were collected on a voluntary basis; the numbers reported must be viewed as a minimum.

[$] The numbers of released fish in the kelt fishery of New Brunswick are not included in the totals for Canada.

Annex 2 Glossary of acronyms and abbreviations

1SW *one-sea-winter*; maiden adult Atlantic salmon that has spent one winter at sea

2SW *two-sea-winter*; maiden adult Atlantic salmon that has spent two winters at sea

CL(s) *conservation limit(s*), **i.e. S_{lim}**; *d*emarcation of undesirable stock levels or levels of fishing activity; the ultimate objective of fisheries management will be to ensure a high probability of undesirable levels being avoided

C&R *catch and release;* catch and release is a practice within recreational fishing intended as a technique of conservation. After capture, the fish are unhooked and returned to the water before experiencing serious exhaustion or injury. Using barbless hooks, it is often possible to release the fish without removing it from the water (a slack line is frequently sufficient).

CWT *coded wire tag;* the CWT is a length of magnetized stainless steel wire 0.25 mm in diameter. The tag is marked with rows of numbers denoting specific batch or individual codes. Tags are cut from rolls of wire by an injector that hypodermically implants them into suitable tissue. The standard length of a tag is 1.1 mm.

DST *data storage tag;* a miniature data logger that is attached to fish and other marine animals, measuring salinity, temperature, and depth

EEZ *Exclusive Economic Zone;* EEZ is a concept adopted at the Third United Nations Conference on the Law of the Sea, whereby a coastal state assumes jurisdiction over the exploration and exploitation of marine resources in its adjacent section of the continental shelf, taken to be a band extending 200 miles from the shore

FWI *Framework of Indicators;* the FWI is a tool used to indicate if any significant change has occurred in the status of stocks used to inform the previously provided multiannual management advice

ICES *International Council for the Exploration of the Sea*; a global organization that develops science and advice to support the sustainable use of the oceans through the coordination of oceanic and coastal monitoring and research, and advising international commissions and governments on marine policy and management issues

MSY *maximum sustainable yield*; the largest average annual catch that may be taken from a stock continuously without affecting the catch of future years. A constant long-term MSY is not a reality in most fisheries, where stock sizes vary with the strength of year classes moving through the fishery.

MSW *multi-sea-winter*; an MSW Atlantic salmon is an adult Atlantic salmon that has spent two or more winters at sea and may be a repeat spawner

NAC *North American Commission*; the North American Atlantic Commission of NASCO or the North American Commission area of NASCO

NASCO *North Atlantic Salmon Conservation Organization*; an international organization, established by an inter-governmental convention in 1984. The objective of NASCO is to conserve, restore, enhance, and rationally manage the fisheries of Atlantic salmon through international cooperation, taking account of the best available scientific information.

NEAC *North-East Atlantic Commission*; the North-East Atlantic Commission of NASCO or the North-East Atlantic Commission area of NASCO

NEAC–N *North-East Atlantic Commission- northern area*; the northern portion of the North-East Atlantic Commission area of NASCO

NEAC–S *North-East Atlantic Commission – southern area*; the southern portion of the North-East Atlantic Commission area of NASCO

PFA *pre-fishery abundance;* the numbers of Atlantic salmon estimated to be alive in the ocean from a particular stock at a specified time. In the previous version of the stock complex Bayesian PFA forecast model two productivity parameters are calculated, for the *maturing* (PFAm) and *non-maturing* (PFAnm) components of the PFA. In the updated version only one productivity parameter is calculated; this parameter is used to calculate total PFA, which is then split into PFAm and PFAnm based upon the *proportion of PFAm* (p.PFAm).

PIT *passive integrated transponder;* PIT tags use radio frequency identification technology. PIT tags lack an internal power source. They are energized on encountering an electromagnetic field emitted from a transceiver. The tag's unique identity code is programmed into the microchip's nonvolatile memory.

SER *spawner escapement reserve;* the CL increased to take account of natural mortality between the recruitment date (assumed to be 1st of January) and the date of return to home waters

ToR *terms of reference*

WGC *West Greenland Commission*; the West Greenland Commission of NASCO or the West Greenland Commission area of NASCO

WGNAS *Working Group on North Atlantic Salmon*; ICES working group responsible for the annual assessment of the status of Atlantic salmon stocks across the North Atlantic and formulating catch advice for NASCO

Atlantic salmon (*Salmo salar*) from the Northeast Atlantic

Summary of advice for fishing seasons 2024/25, 2025/26, and 2026/27

ICES advises that, in the absence of specific management objectives and when the MSY approach is applied, the catch on both the Northern and Southern North-East Atlantic Commission (NEAC) area complexes at the Faroe Islands should be zero in each of the fishing seasons 2024/25, 2025/26, and 2026/27.

ICES advises that when the MSY approach is applied, fishing should only take place on Atlantic salmon from rivers where stocks are at full reproductive capacity. Mixed-stock fisheries present particular threats and should be managed based on the individual status of all stocks exploited in the fishery.

ICES non-fisheries conservation considerations

ICES advises that: i) all non-fisheries-related anthropogenic mortalities should be minimized (direct effects on Atlantic salmon survival) and ii) the quantity and quality of Atlantic salmon habitats, connectivity, and the physical, chemical, and biological properties of those habitats should be restored (indirect effects).

NASCO 2.1 Describe the key events of the 2023 fisheries

No significant changes in gear type used in the home-water fisheries were reported in the NEAC area in 2023.

No fishery for Atlantic salmon has operated at the Faroe Islands since 2000.

The reported (i.e. nominal) catch in the NEAC area in 2023 was 452 t, with 47 t reported in the Southern NEAC area and 405 t in the Northern NEAC area. Estimates of unreported catches across the NEAC area were estimated at 95 t. As in previous years, the location of the reported catches differed between the Southern and Northern areas (Table 1). In 2023, in-river and estuarine fisheries accounted for 68% and 32%, respectively, of the catches in the Southern NEAC area. In the Northern NEAC area, coastal fisheries accounted for 32% of the catches, with the remaining 68% coming from in-river fisheries.

Table 1 Atlantic salmon from the Northeast Atlantic. Catch by area and location in the NEAC area in 2023. Catches of NEAC origin Atlantic salmon at Greenland are reported in the West Greenland Commission area. For Iceland, all catches are reported under “Northern NEAC”. All weights are in tonnes.

Catches	Southern NEAC	Northern NEAC	Faroe Islands	Total NEAC
2023 reported catch (tonnes)	47	405	0	452
Catch as % of NEAC total	11	89	0	
Unreported catch (tonnes)	95		-	95
Location of catches	Southern NEAC	Northern NEAC	Faroe Islands	Total NEAC
% in-river	68	68	-	68
% in estuaries	32	0	-	3
% coastal	0	32	-	29

The NEAC area has seen a general reduction in catches since the 1980s (Figure 1; Table 2). This reflects a decline in fishing effort as a consequence of management measures and a reduction in the size of stocks. The reported catch for 2023 (452 t) was lower than for 2022 (569 t) and was below the previous five-year (by 46%) and ten-year (by 48%) means, and the lowest in the time-series in both areas. The catch in Southern NEAC, which constituted around two-thirds of the total NEAC catch in the early 1970s, has been lower than that in Northern NEAC area since 1999 (Figure 1).

1SW Atlantic salmon constituted 58% of the total catch in the Northern NEAC area in 2023 (Figure 2; no sea-age split-catch data available for the Russian Federation for 2023). For Southern NEAC countries, the overall percentage of 1SW fish in the catch in 2023 was estimated at 84%.

The contribution of escaped farmed Atlantic salmon in national catches in the NEAC area in 2023 was generally low in most countries and was similar to the values that have been reported in previous years. The estimated proportion of farmed

Atlantic salmon in Norwegian angling catches in 2023 (1%) was the lowest value in the time-series; the proportion in samples taken from Norwegian rivers in autumn (4%) was also among the lowest values in the time-series. No current data are available for the proportion of farmed Atlantic salmon in coastal fisheries in Norway. A small proportion of the catch in UK (Scotland; 1.63% of retained, 0.08% of all catch including catch and released Atlantic salmon) in 2023 was reported to be of farmed origin. In Iceland, an escapee event was reported in August 2023 in the Westfjords. The estimated number of escapees from this event was approximately 3 500. Removal efforts conducted through diver surveys removed 439 escaped Atlantic salmon from rivers. In addition, there were reports of 29 escaped Atlantic salmon caught in an annual monitoring survey in rivers close to the farming areas in the Westfjords.

Estimated exploitation rates have decreased since the early 1970s in both the Northern and Southern NEAC areas (Figure 3). The exploitation rate on 1SW Atlantic salmon in the Northern NEAC area was 30% in 2023, which was below the previous five-year (36%) and ten-year (40%) means. Exploitation on 1SW fish in the Southern NEAC complex was 7% in 2023, which was at the same level as the previous five-year (7%) mean but lower than the ten-year (9%) mean. Exploitation on MSW Atlantic salmon in the Northern NEAC area was 34% in 2023, which was lower than the previous five-year (38%) and ten-year (41%) mean. Exploitation on MSW fish in Southern NEAC was 3% in 2023, which was at the same level as the previous five-year (3%) mean but lower than the ten-year (5%) mean.

Estimates of the number of Atlantic salmon caught and released in angling fisheries are not complete for all NEAC countries. There are large differences between countries in the percentage of the total angling catch that is released – in 2023 this ranged from 4% in France to 96% in UK (Scotland) – reflecting varying management practices and angler attitudes among these countries. Catch and release mortality is also estimated for some countries, but these data are not included in the reported catch.

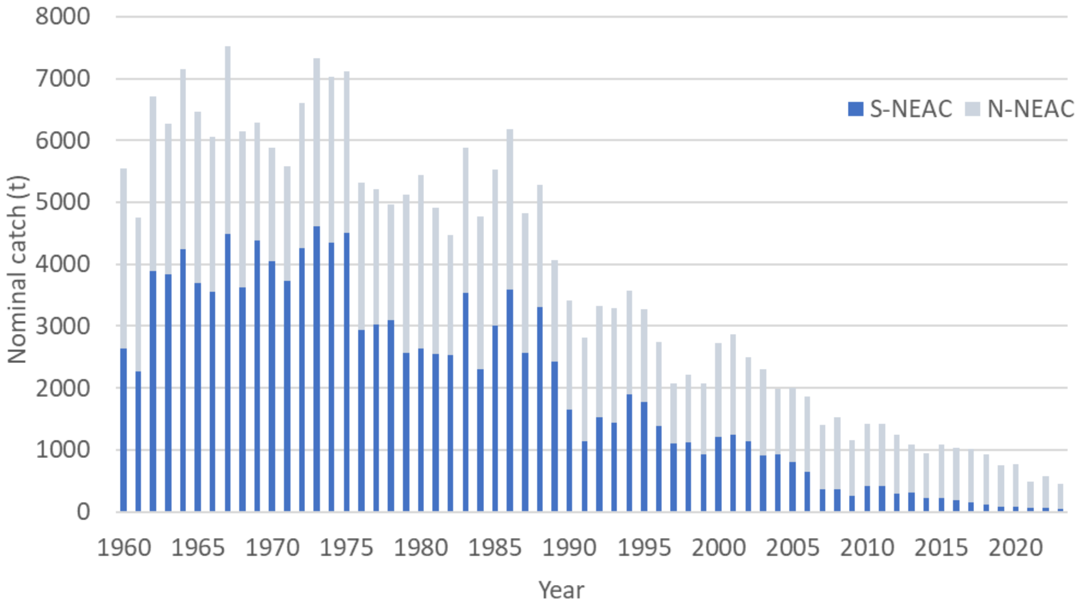

Figure 1 Atlantic salmon from the Northeast Atlantic. Reported catches of Atlantic salmon in the Southern and Northern NEAC areas (1970–2023).

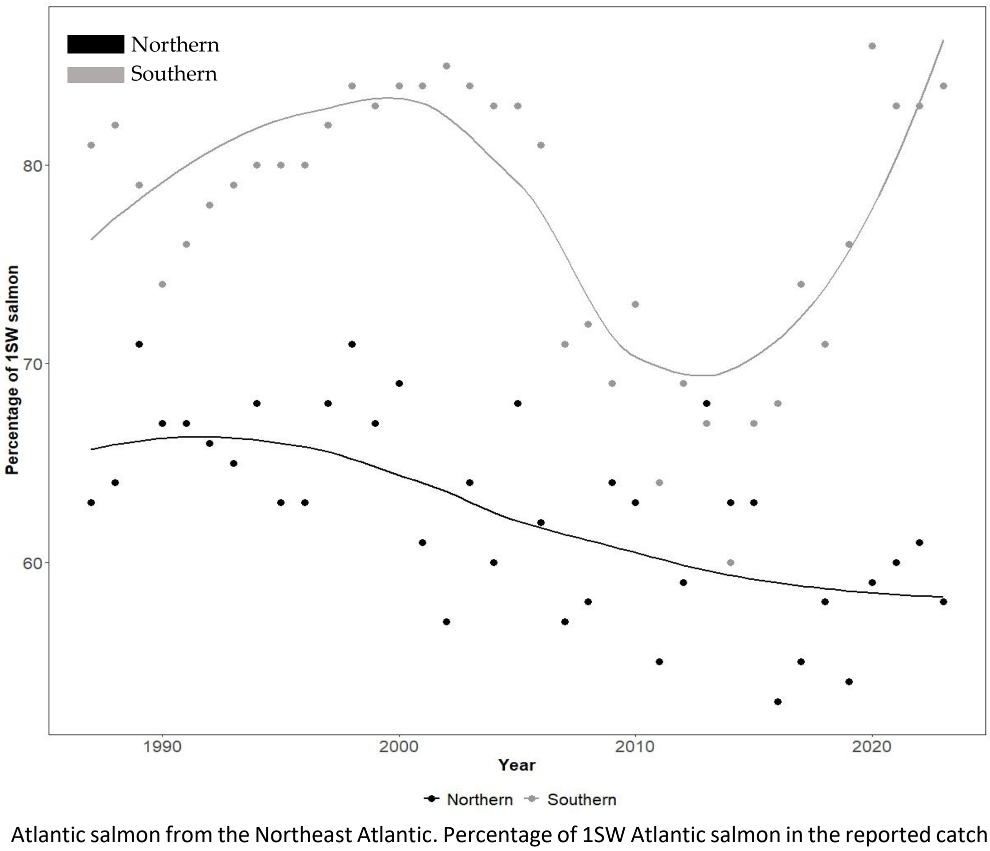

Figure 2 Atlantic salmon from the Northeast Atlantic. Percentage of 1SW Atlantic salmon in the reported catch for the Northern (black dots) and Southern (grey dots) stock complexes, 1987–2023. Curves represent the Northern (black line) and Southern (grey line) stock complexes with a Loess smoother (span = 85%) applied to the data. The Northern NEAC value for 2023 excludes the Russian Federation, as no sea-age split-catch data were available.

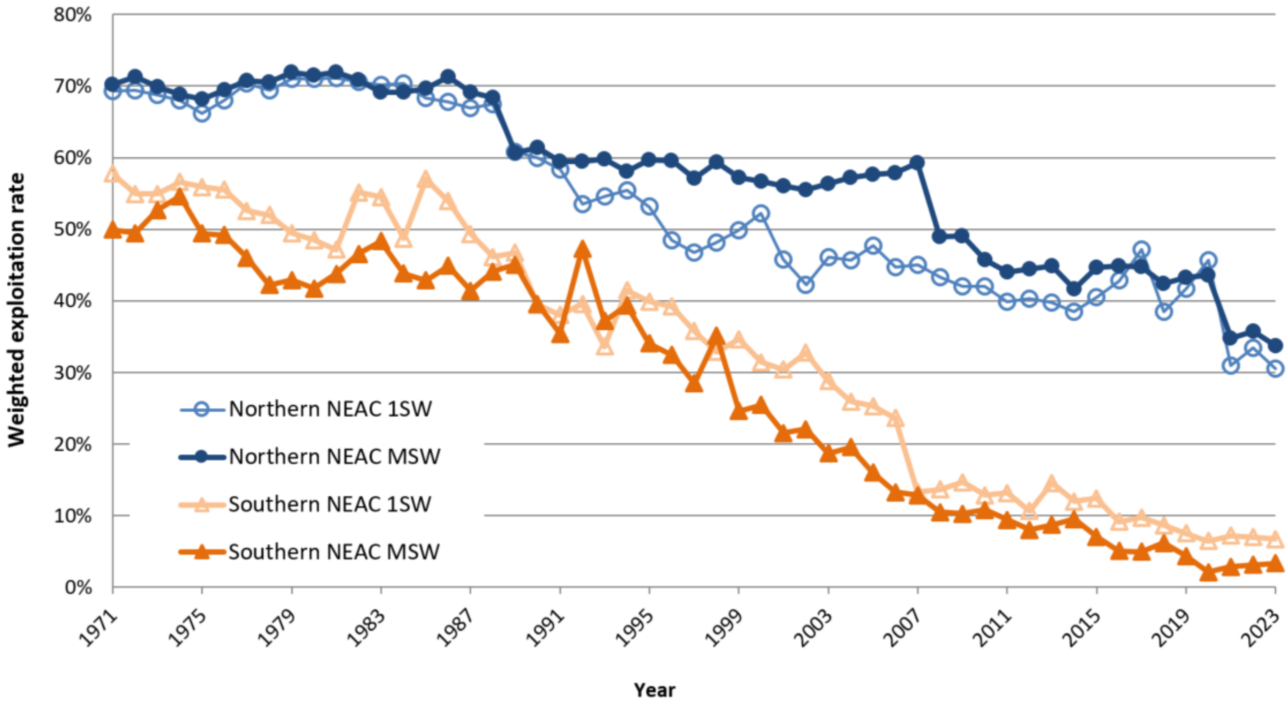

Figure 3 Atlantic salmon from the Northeast Atlantic. Mean annual exploitation rate of wild 1SW and MSW Atlantic salmon by fisheries in the Northern and Southern NEAC areas. National exploitation rates are an output of the NEAC Run Reconstruction Model (RRM). These were combined as appropriate by weighting each individual country/jurisdiction's exploitation rate to the reconstructed returns.

Table 2 Atlantic salmon from the Northeast Atlantic. Reported catch of Atlantic salmon in the NEAC area (in tonnes round fresh weight), 1960–2023. The 2023 values are provisional.

Year	Southern NEAC countries	Northern NEAC countries*	Faroe Islands**	Other catches in international waters	Total reported catch	Unreported catch	
						NEAC area ***	International waters^
1960	2641	2899	-	-	5540	-	-
1961	2276	2477	-	-	4753	-	-
1962	3894	2815	-	-	6709	-	-
1963	3842	2434	-	-	6276	-	-
1964	4242	2908	-	-	7150	-	-
1965	3693	2763	-	-	6456	-	-
1966	3549	2503	-	-	6052	-	-
1967	4492	3034	-	-	7526	-	-
1968	3623	2523	5	403	6554	-	-
1969	4383	1898	7	893	7181	-	-
1970	4048	1834	12	922	6816	-	-
1971	3736	1846	-	471	6053	-	-
1972	4257	2340	9	486	7092	-	-
1973	4604	2727	28	533	7892	-	-
1974	4352	2675	20	373	7420	-	-
1975	4500	2616	28	475	7619	-	-
1976	2931	2383	40	289	5643	-	-
1977	3025	2184	40	192	5441	-	-
1978	3102	1864	37	138	5141	-	-
1979	2572	2549	119	193	5433	-	-
1980	2640	2794	536	277	6247	-	-
1981	2557	2352	1025	313	6247	-	-
1982	2533	1938	606	437	5514	-	-
1983	3532	2341	678	466	7017	-	-
1984	2308	2461	628	101	5498	-	-

Year	Southern NEAC countries	Northern NEAC countries*	Faroe Islands**	Other catches in international waters	Total reported catch	Unreported catch	
						NEAC area ***	International waters^
1985	3002	2531	566	-	6099	-	-
1986	3595	2588	530	-	6713	-	-
1987	2564	2266	576	-	5406	2554	-
1988	3315	1969	243	-	5527	3087	-
1989	2433	1627	364	-	4424	2103	-
1990	1645	1775	315	-	3735	1779	180–350
1991	1145	1677	95	-	2917	1555	25–100
1992	1524	1806	23	-	3353	1825	25–100
1993	1443	1853	23	-	3319	1471	25–100
1994	1895	1685	6	-	3586	1157	25–100
1995	1775	1504	5	-	3284	942	-
1996	1392	1358	-	-	2750	947	-
1997	1112	961	-	-	2073	732	-
1998	1120	1099	6	-	2225	1108	-
1999	934	1139	0	-	2073	887	-
2000	1211	1518	8	-	2737	1135	-
2001	1242	1633	0	-	2875	1089	-
2002	1135	1361	0	-	2496	946	-
2003	909	1395	0	-	2304	719	-
2004	921	1059	0	-	1980	575	-
2005	811	1189	0	-	2000	605	-
2006	651	1216	0	-	1867	604	-
2007	373	1036	0	-	1409	465	-
2008	356	1179	0	-	1535	433	-
2009	266	899	0	-	1165	317	-
2010	412	1003	0	-	1415	357	-
2011	410	1009	0	-	1419	382	-
2012	297	954	0	-	1251	363	-
2013	309	771	0	-	1080	272	-
2014	217	736	0	-	953	256	-
2015	223	860	0	-	1083	298	-
2016	187	842	0	-	1029	298	-
2017	152	867	0	-	1019	318	-
2018	124	807	0	-	931	279	-
2019	85	676	0	-	761	237	-
2020	78	685	0	-	763	238	-
2021	72	415	0	-	487	135	-
2022	58	511	0	-	569	174	-
2023	47	405	0	-	452	94	-
Mean							
2018–2022	83	619	0	-	702	213	-
2013–2022	151	717	0	-	868	251	-

* All Icelandic catches have been included in Northern NEAC countries.
** Since 1991, fishing carried out at the Faroe Islands has only been for research purposes.
*** No unreported catch estimates are available for the Russian Federation since 2008.
^ Estimates refer to season ending in given year.

NASCO 2.2 Review and report on the development of age-specific stock Conservation Limits

National stocks within the NEAC area are combined into two geographic groups for the provision of management advice for the distant-water fisheries at West Greenland and the Faroe Islands. The Northern group consists of Finland, Norway, the Russian Federation, Sweden, and the northeastern region of Iceland. The Southern group consists of France, Ireland, UK (England and Wales), UK (Northern Ireland), UK (Scotland), and the southwestern region of Iceland. Four stock complexes are then defined, each comprising one of the two sea ages (1SW or MSW) per geographic group (Northern (N-)NEAC and Southern (S-)NEAC).

River-specific Conservation Limits (CLs; expressed in terms of either egg or spawner requirements) have been estimated for Atlantic salmon stocks in most countries/jurisdictions in the NEAC area (France, Ireland, UK [England and Wales], UK [Northern Ireland], UK [Scotland], Finland, Norway, and Sweden), and these, apart from France, are used in national assessments. In these cases, CL estimates for individual rivers are summed to provide estimates at the national level for these countries/jurisdictions. River-specific CLs have also been estimated for a number of rivers in the Russian Federation and Iceland, but these are not yet used in national assessments. An interim approach has been developed for countries/jurisdictions that do not use river-specific CLs in their national assessments. This approach is based on a model for Atlantic salmon stocks (pseudo-stock–recruitment relationships) that is updated annually and, as a result, the CLs may change slightly from year to year.

To provide catch advice to NASCO, CLs are required for stock complexes. These have been derived either by summing individual river CLs to country/jurisdiction level or by taking overall the CLs provided by the model and summing to the level of the four NEAC stock complexes.

Conservation Limits are provided for the four stock complexes (Table 3) by summing country/jurisdiction CLs to the level of the four NEAC stock complexes.

Table 3 Atlantic salmon from the Northeast Atlantic. Conservation Limits (CL) for the Atlantic salmon stock complexes in the NEAC area in 2023. Values are in numbers of fish.

Geographic group	Age group	CL
Northern NEAC	1SW	146036
	MSW	116715
Southern NEAC	1SW	443935
	MSW	186644

For the nine countries/jurisdictions where river-specific CLs are available, time-series indicating the development in the definition of these CLs, the number of rivers annually assessed against CLs, and the number of rivers that annually meet or exceed CLs (based on the number of spawners after fisheries have taken place) are provided in Figure 4. In addition, Iceland has set provisional CLs for all Atlantic salmon-producing rivers and continues to work towards finalizing an assessment process for determining CL attainment. In France, river-specific CLs were initially established in 2001. However, compliance with CLs has not been assessed to date. In previous advice, the number of rivers assessed actually corresponded to the number of rivers with TACs, and France assessed the number of rivers that reached or exceeded the TACs.

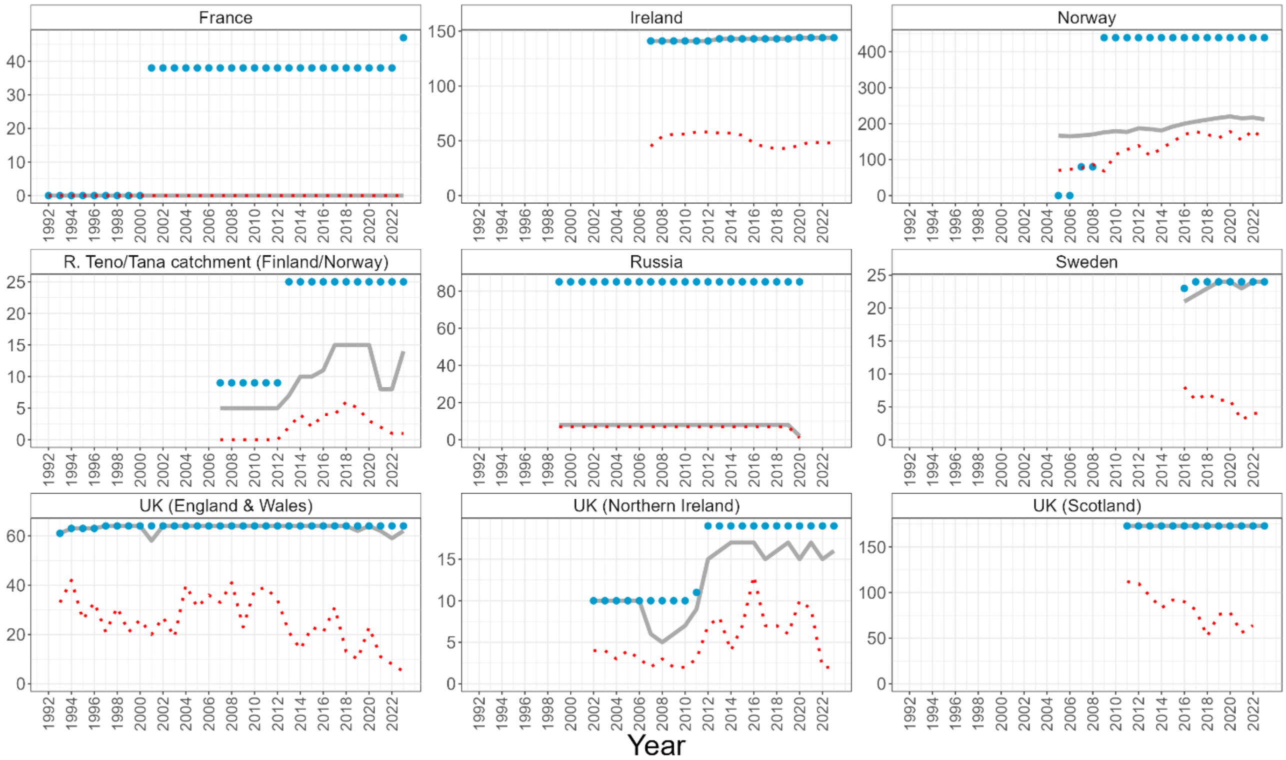

Figure 4 Atlantic salmon from the Northeast Atlantic. Time-series showing the number of rivers with established Conservation Limits (CLs; dotted blue lines), the number of rivers assessed annually (solid grey lines), and the number of rivers meeting CLs annually (dotted red lines) for countries/jurisdictions in the NEAC area. The River Tana/Teno (Finland/Norway) has multiple tributaries with separate CLs.

NASCO 2.3 Describe the status of the stocks

Trends in rivers meeting CLs

In the NEAC area, all jurisdictions except Iceland (northeast) and France currently assess Atlantic salmon stocks using river-specific CLs (Figure 4, Table 4). The attainment of CLs is assessed based on the number of spawners after fisheries have taken place.

Table 4 Atlantic salmon from the Northeast Atlantic. Summary of the attainment of Conservation Limits (CLs) in 2023 (2022 for UK [Scotland]) and trends based on all available data in the NEAC area. Further details can be found in ICES (2024a).

Country /Jurisdiction	Rivers with CLs (number)	Rivers assessed for compliance (number)	Rivers attaining CL (number)	Assessed rivers attaining CL (%)	Trend in the last 10 years
Northern NEAC					
Russian Federation	*	*	*	*	Unknown
Norway/Finland (Tana/Teno)	25	14	1	7	Variable
Norway	439	212	153	72	Increasing
Sweden	24	24	4	17	Decreasing
Southern NEAC					
UK (Scotland)	173	173	64	37	Decreasing
UK (Northern Ireland)	19	16	2	12	Variable
UK (England & Wales)	64	62	5	8	Decreasing
Ireland	144	144	48	33	Minor variability
France	47	0	n/a	n/a	n/a

* No data available.

Return rates

Return rate estimates, used as proxies for marine survival, are derived for a limited number of rivers and have time-series of different durations. Return rates of wild and hatchery smolts to Northern NEAC are variable. They have generally decreased since 1980, although rates of 1SW returns of wild smolts have stabilized since 2010, while those of hatchery smolts have increased since 2005. Rates of 2SW returns of wild and hatchery smolts to the Northern NEAC area are highly variable but have continued to decline since 2010 and 2005 for wild and hatchery smolts, respectively. Mean return rates of wild and hatchery smolts to the Southern NEAC are less variable, primarily because they are estimated from more rivers. They too have generally decreased since 1980, although rates of 2SW returns of wild smolts have started to increase since 2005, and rates of 1SW returns from hatchery smolts have stabilized since 2010 (Figure 5).

The low return rates in recent years highlighted in these analyses are broadly consistent with the trends in estimated returns and spawners as derived from the stock assessment model. These low rates suggest that abundance is strongly influenced by factors in the marine environment.

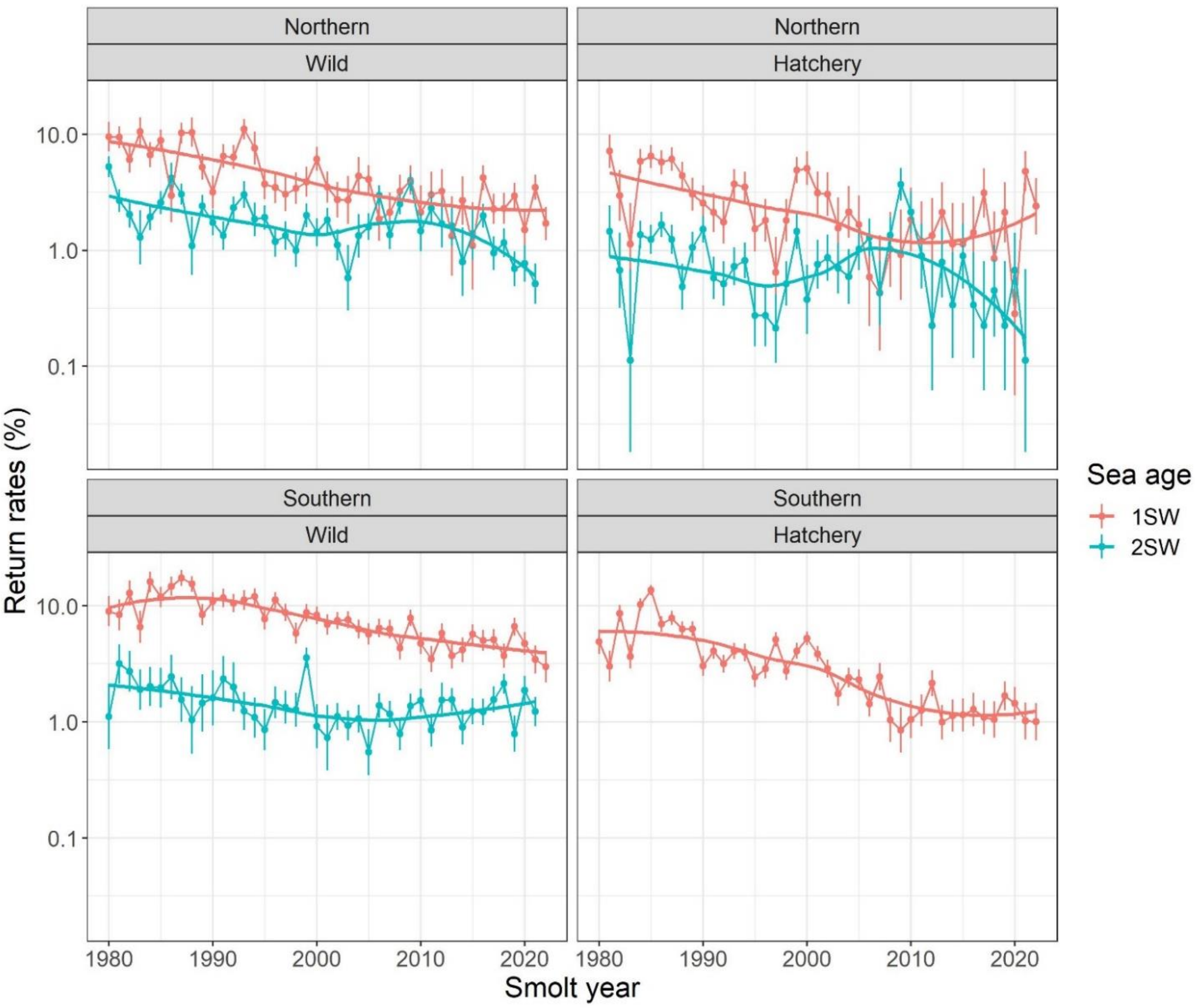

Figure 5 Atlantic salmon from the Northeast Atlantic. Modelled estimates of average return rates (in %) of wild (left-hand panels) and hatchery origin smolts (right-hand panels) of 1SW and 2SW Atlantic salmon to Northern (top panels) and Southern NEAC areas (bottom panels). For most rivers in Southern NEAC, the values represent returns to the coast prior to the home-water coastal fisheries. Mean annual return rates for each origin and area were estimated from a general linear model assuming quasi-Poisson errors (log-link function). Error bars represent standard errors. Trend lines are from locally weighted polynomial regression (LOESS) and are meant to be a visual interpretation aid. Following details in ICES (2021; tables 3.3.2.1 and 3.3.2.2), the analyses included estimated return rates (in %) for 1SW and 2SW returns by smolt year. Note that the *y*-axis is on a log 10 scale.

Stock status

ICES benchmarked the Life-cycle Model (LCM) in 2023 and it was used for the first time in 2024 to describe and forecast stock status (ICES, 2024b). This model uses a risk analysis framework that considers CLs. The risk analysis framework makes full use of the outputs from the LCM. The LCM outputs include estimates of returns and spawners (1SW and MSW), that are in line with run-reconstruction estimates and eggs (1SW and MSW).

The status of stocks in the Northeast Atlantic was assessed relative to the probability of returns and spawners exceeding CLs at the stock complex and national levels. This is summarized in Table 5 and Figure 6. Differences in CL attainment between returns and spawners are due to exploitation from home-water fisheries. Figures 7 and 8 show the hindcast of the abundance of stocks at the complex level as derived by the LCM. These estimates provide an index of the current statuses and historical trends in stocks based on fisheries data and model assumptions. It should be noted that the results for the full time-series can change when the assessment is re-run from year to year and as the input data are refined.

The assessment of 1SW and MSW returns and spawners against CLs for all countries in Northern and Southern NEAC can be found in Table 5 and Figure 6. Two main patterns are apparent. First, more stocks in Southern NEAC countries were suffering, or at risk of suffering, reduced reproductive capacity compared to Northern NEAC countries. Secondly, 1SW stocks were more likely to be suffering, or at risk of suffering, reduced reproductive capacity compared to MSW stocks.

Within Northern NEAC countries, returning 1SW and MSW stocks in Norway, Sweden, and Iceland (northeast) were at full reproductive capacity in 2023 (Table 5 and Figure 6). However, returns in the remaining countries were either suffering, or at risk of suffering, reduced reproductive capacity. There were changes to stock status between returns and spawners in Iceland (1SW and MSW), Sweden (1SW), and the Russian Federation (1SW and MSW) showing the impact of home-water exploitation on CL attainment in these areas. In all Northern NEAC countries, 1SW return and spawner estimates were among the lowest in the time-series. This was also the case for MSW returns in most countries. However, some MSW spawner estimates in 2023 were above their median rank (Table 5). Note that there are deficiencies in Russian Federation data since 2021, and therefore these results should be interpreted with caution.

With respect to Southern NEAC countries, all 1SW and MSW stocks were suffering reduced reproductive capacity in 2023, except for UK (Scotland) and MSW UK (England and Wales). In UK (Scotland), there was a change in stock status between returns and spawners for the 1SW component. In all Southern NEAC countries, 1SW return and spawner estimates were either the lowest, or second lowest, in the time-series. MSW return and spawner estimates were among the lowest in the time-series for all countries except UK (England and Wales; Table 5 and Figure 6).

Hindcast estimates of 1SW and MSW returns to Northern NEAC show a general decline over the period in both age classes (Figure 7). In 2023, the two returning age classes were considered to be at full reproductive capacity (i.e. the 5th percentile of the estimate was above the CL). However, 1SW and MSW return estimates were lower than the previous five-year mean and the second lowest in the time-series (Table 5). A decline in the hindcast 1SW spawner estimates was evident from around 2000 (Figure 7). This is reflected in the 2023 estimate of spawners from the Run Reconstruction Model which was amongst the lowest in the time-series and was determined to be at risk of suffering reduced reproductive capacity. In 2023, the MSW spawner abundance estimate from the run reconstruction was similar to the previous five-year mean, and the stock was considered to be at full reproductive capacity (Table 5 and Figure 7).

Hindcast estimates of 1SW and MSW returns to Southern NEAC show a general decline over the period in both age classes, with the decline more marked in the 1SW age class (Figure 8). In 2023, the 1SW returns stock component was suffering reduced reproductive capacity (i.e. the median estimate was below the CL), and the estimate was the lowest in the time-series. In 2023, the MSW returns stock component was the second lowest in the time-series, and this stock component was at risk of suffering reduced reproductive capacity. A decline of 1SW spawners was also evident (Figure 8) with this stock component in 2023 estimated from the Run Reconstruction Model to be suffering reduced reproductive capacity and the lowest in the time-series. In 2023, the spawner abundance estimates from the Run Reconstruction Model decreased by 25% from the previous five-year mean, and this stock component was considered to be at risk of suffering reproductive capacity (Table 5).

Table 5 Atlantic salmon from the Northeast Atlantic. Summary of national- and complex-level assessment of the status of stocks within NEAC. For each stock unit, a rank of the status of the stock over the time-series is given (1 as the highest) along with the per cent change for the most recent value versus the previous five-year mean (e.g. 2023 versus 2018–2022 average).

Returns	1SW				MSW			
Stock unit	Median (90% CI)	% change	Rank	Status	Median (90% CI)	% change	Rank	Status
River Tana/Teno (Norway & Finland)	10 (5.3,25.4)	−40	52/53	Suffering	10.3 (6,19.9)	−3	50/53	At risk
Iceland (northeast)	6.8 (5.2,10.4)	−30	50/53	Full	3.3 (2.1,7.6)	−7	51/53	Full
Norway	164.1 (138.9,196.4)	−18	52/53	Full	175.2 (142.8,223.8)	−20	51/53	Full
Russian Federation	79.2 (37.7,173.5)	10	48/53	At risk	63.7 (43.5,98.4)	10	47/53	Full
Sweden	3.3 (2.3,5.4)	−34	46/53	Full	6.3 (4.5,10.2)	−12	15/53	Full
Northern NEAC	**268.9 (214.5,366.9)**	**−13**	**52/53**	**Full**	**263.7 (221.6,321.2)**	**−12**	**52/53**	**Full**
UK (England & Wales)	21.6 (10.3,32.8)	−38	53/53	Suffering	83.3 (45.1,122.6)	−11	19/53	Full
France	3.5 (2.2,7.7)	−60	52/53	Suffering	4.7 (3.5,6.7)	−35	44/53	Suffering
Iceland (southwest)	19 (15.6,24.6)	−26	53/53	Full	4.8 (4.2,5.6)	4	39/53	Full
Ireland	108.8 (78.8,196.7)	−29	53/53	Suffering	13.4 (10.7,18.9)	−33	53/53	Suffering
UK (Northern Ireland)	9.9 (8.4,13.8)	−64	53/53	Suffering	1.3 (1.1,1.7)	−58	53/53	Suffering
UK (Scotland)	180.6 (123.2,270.4)	−22	52/53	Full	112.7 (73.3,176.6)	−33	53/53	At risk
Southern NEAC	**355 (276.4,468.4)**	**−29**	**53/53**	**Suffering**	**223.8 (164,295.3)**	**−26**	**52/53**	**At risk**
Spawners	1SW				MSW			
Stock unit	Median (90% CI)	% change	Rank	Status	Median (90% CI)	% change	Rank	Status
Iceland (northeast)	5.5 (3.8,9)	−22	42/53	Suffering	3.1 (1.9,7.4)	5	23/53	At risk
Norway	100.5 (77,131)	−6	42/53	Full	120.7 (89.9,168.7)	−10	19/53	Full
Russian Federation	65.3 (27.2,133.8)	22	43/53	At risk	29.8 (13,51.9)	17	47/52	At risk
Sweden	2.7 (1.8,4.8)	−33	46/53	Suffering	5.2 (3.4,9.1)	−9	7/53	Full
Northern NEAC	**188.4 (138.8,262.6)**	**1**	**46/53**	**At risk**	**172.1 (134.1,224.4)**	**−3**	**29/52**	**Full**
UK (England & Wales)	21.5 (10.2,32.7)	−36	53/53	Suffering	83.1 (44.9,122.4)	−10	9/53	Full
France	3.1 (1.8,7.3)	−60	52/53	Suffering	3.3 (2.2,5.3)	−35	44/53	Suffering
Iceland (southwest)	11.3 (8,17)	−23	53/53	Suffering	2.5 (1.9,3.2)	−7	32/53	At risk
Ireland	100.9 (70.9,188.8)	−29	52/53	Suffering	12 (9.3,17.5)	−33	53/53	Suffering
UK (Northern Ireland)	9.5 (7.9,13.4)	−64	53/53	Suffering	1.3 (1.1,1.7)	−58	53/53	Suffering
UK (Scotland)	162.3 (110,244)	−21	52/53	At risk	99.9 (64.1,158.1)	−33	44/53	At risk
Southern NEAC	**319.5 (245.6,427.9)**	**−29**	**53/53**	**Suffering**	**205.6 (148.5,272.6)**	**−25**	**44/53**	**At risk**

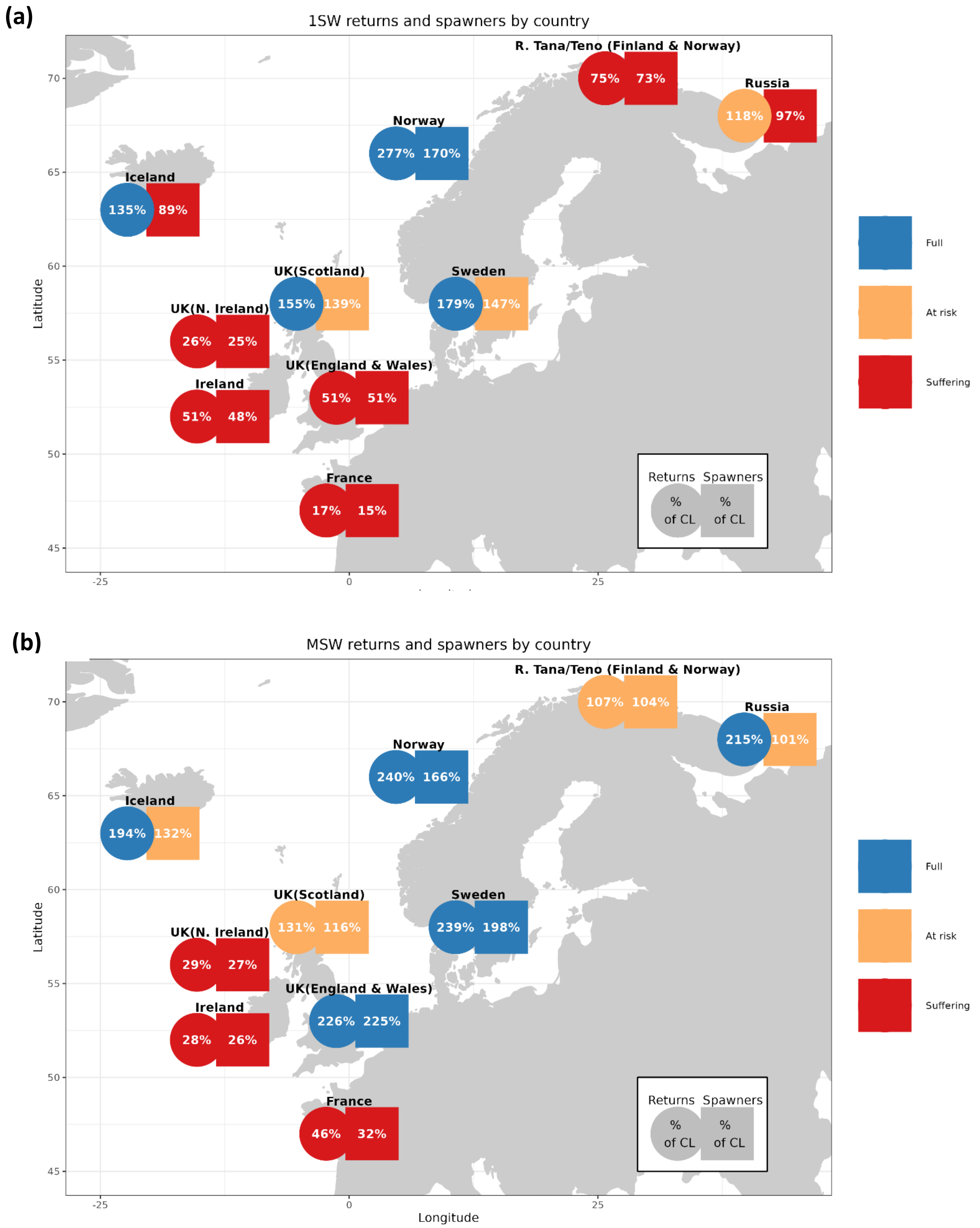

Figure 6a Atlantic salmon from the Northeast Atlantic. 1SW and **(b)** MSW returns and spawners in per cent of Conservation Limit (% of CL) for 2023. The per cent of CL is based on the median of the Monte Carlo distribution as derived from the Run Reconstruction Model. The coloured shading represents the three ICES stock status designations: **Full** (at full reproductive capacity: the 5th percentile of the spawner estimate is above the CL); **At Risk** (at risk of suffering reduced reproductive capacity: median spawner estimate is above the CL, but the 5th percentile is below); and **Suffering** (suffering reduced reproductive capacity: median spawner estimate is below the CL).

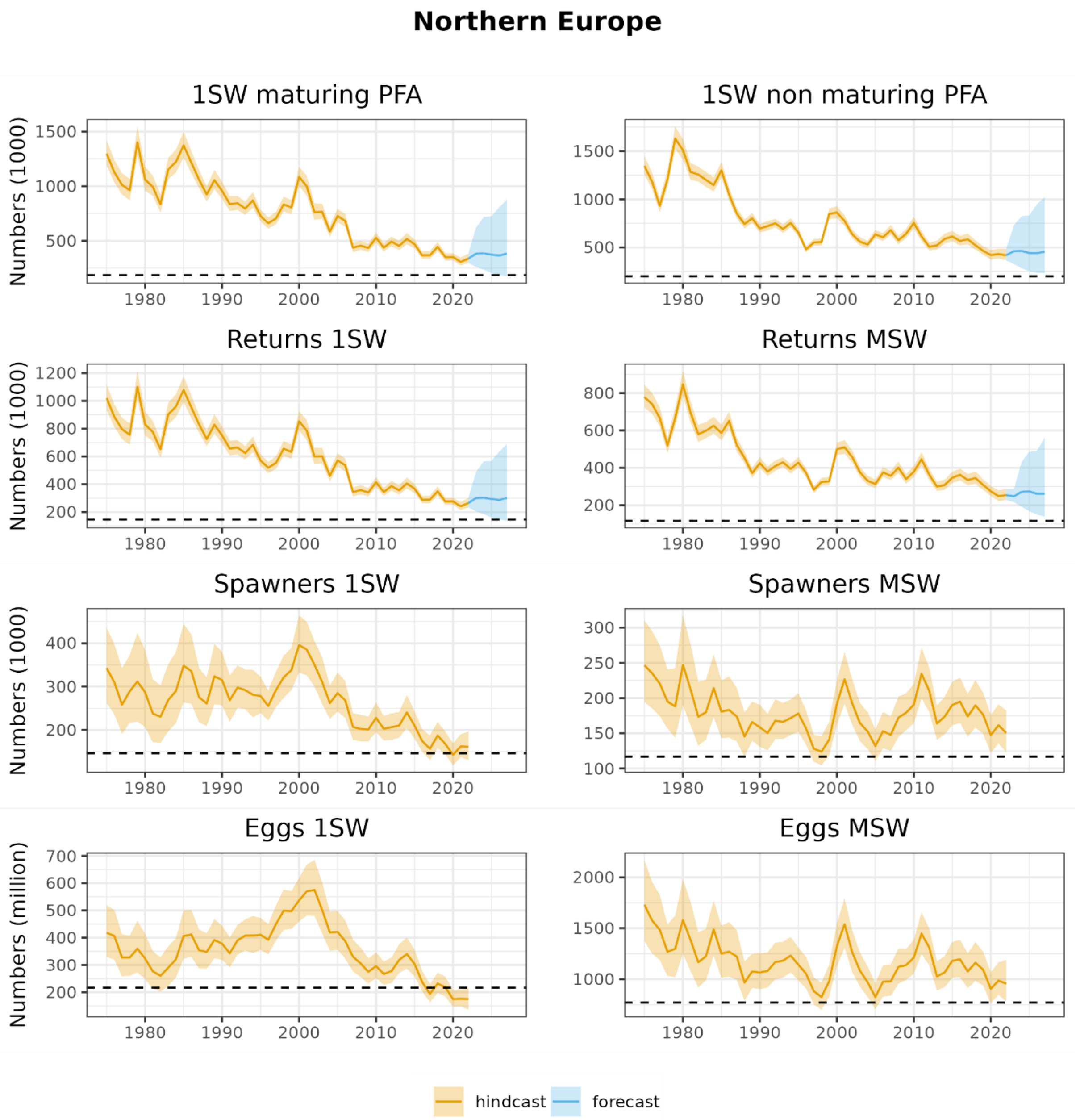

Figure 7 Atlantic salmon from the Northeast Atlantic. Northern NEAC (aggregate). 1SW maturing and 1SW non-maturing pre-fishery abundance (PFA), returns of 1SW and MSW fish, 1SW and MSW spawners, and egg deposition from 1SW and MSW spawners derived from the Life-cycle Model (LCM). Solid line: median of the marginal posterior distributions; shaded area: 90% Bayesian credibility interval; orange shaded area: hindcasting on the historical time-series; blue shaded area (for PFA and returns): forecasting obtained under a scenario with zero catches in all fisheries. The horizontal dotted black lines are the age-specific SER values (in number of fish; PFA panels), the age-specific conservation limits (in number of fish; spawner and return panels) and the age-specific Conservation Limits (in eggs; eggs panels). Years refer to year of return, with the exception of PFA non-maturing, which is year of return minus one.

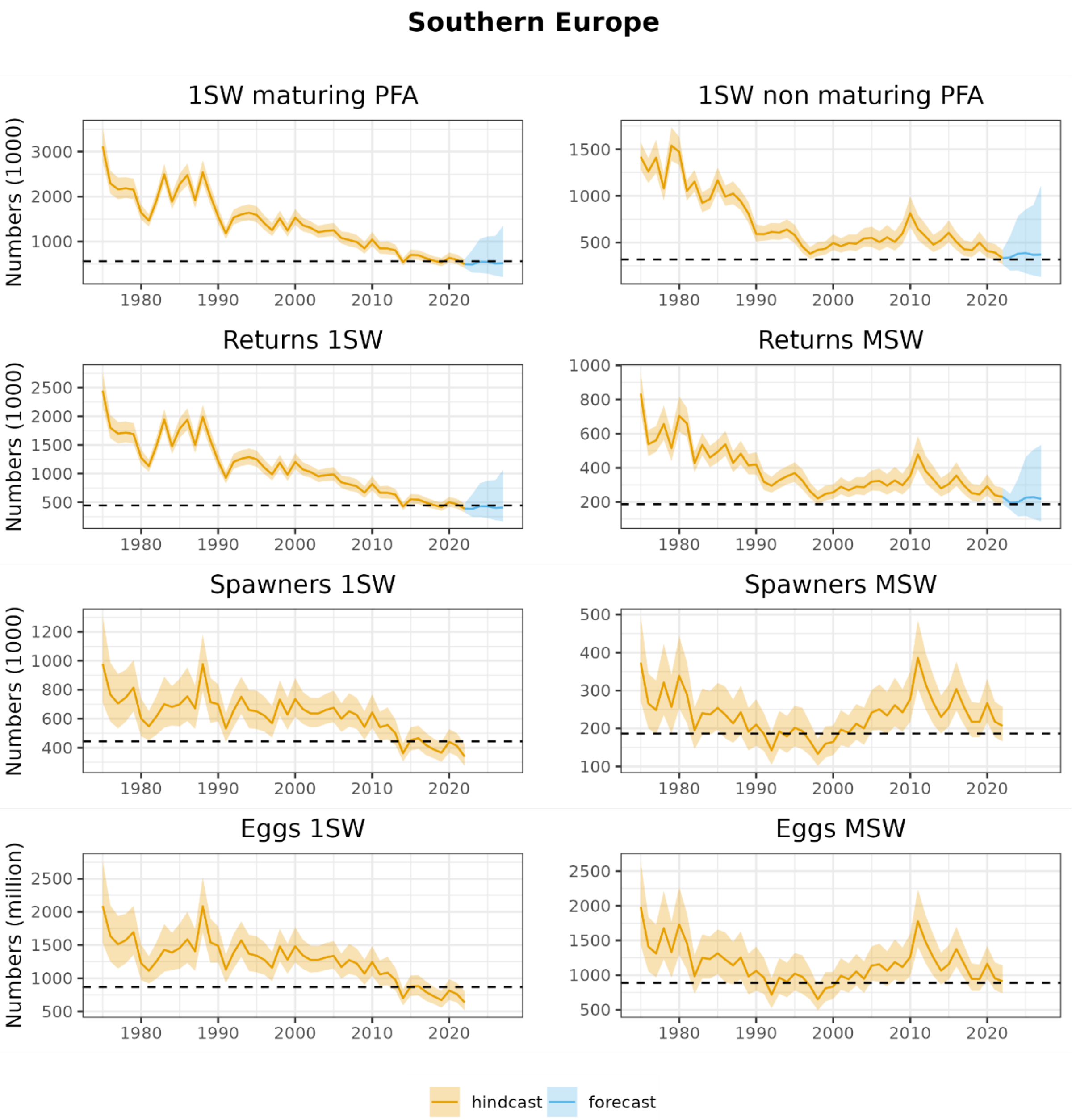

Figure 8 Southern NEAC (aggregate). 1SW maturing and 1SW non-maturing PFA, returns of 1SW and MSW fish, 1SW and MSW spawners, and egg deposition from 1SW and MSW spawners derived from the Life-cycle Model (LCM). Solid line: median of the marginal posterior distributions; shaded area: 90% Bayesian credibility interval; orange shaded area: hindcasting on the historical time-series; blue shaded area (for PFA and returns): forecasting obtained under a scenario with zero catches in all fisheries; the horizontal dotted black lines are the age-specific SER values (in number of fish; PFA panels), the age-specific Conservation Limits (in number of fish; spawner and return panels) and the age-specific Conservation Limits (in eggs; eggs panels). Years refer to year of return, with the exception of PFA non-maturing, which is year of return minus one.

NASCO 2.4. Provide catch options or alternative management advice for the 2024/25–2026/27 fishing seasons, with an assessment of risks relative to the objective of exceeding stock Conservation Limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding

Forecasts until 2027 for the Southern and Northern NEAC complexes were developed within the LCM (figures 7 and 8). The probabilities of meeting CLs under different catch scenarios in the Faroe Islands in fishing seasons 2024/25–2026/27, assuming that the agreed catch allocation is fully taken, are provided in Table 6 for the stock complexes. The corresponding forecast harvest rates, for fish taken at the Faroe Islands, are presented in Table 7. The probabilities of meeting CLs in the individual NEAC countries are presented in tables 8 and 9. The probabilities of meeting CLs are higher in the Northern than in the Southern complex and are generally higher for the Northern countries than the Southern countries.

MSY approach

ICES considers that, to be consistent with both MSY and the precautionary approach, fisheries should only take place on Atlantic salmon from stocks that can be shown to be at full reproductive capacity. Due to the different status of individual stocks, mixed-stock fisheries present particular threats.

No specific risk level has so far been agreed by NASCO for the provision of catch advice for the Faroe Islands fishery; in the absence of this, ICES uses a 95% probability of meeting individual CLs, applied at the level of the European stock complexes (Southern and Northern NEAC) and the NEAC countries/jurisdictions for 1SW and MSW components separately. In the absence of any fisheries in the Faroe Islands in 2024/25–2026/27, there is a less than 95% probability of meeting the CLs for the Southern NEAC complex for both the 1SW and MSW component and for the Northern NEAC 1SW component (Table 6). Among countries/jurisdictions, only Norway meets its CL for the 1SW component (2024/25–2026/27 for TACs that ICES has investigated that are ≤ 200 25 t) (Table 8), and only the Russian Federation and Norway meet their CLs for the MSW component (2024/season for TACs ≤ 160 t and ≤ 20 t for the Russian Federation and Norway, respectively; Table 9). Therefore, in the absence of specific management objectives, ICES advises that there are no mixed-stock fisheries options at the Faroe Islands in fishing seasons 2024/25–2026/27.

Additional considerations

ICES emphasizes that the national stock CLs discussed above are not appropriate for the management of home-water fisheries, particularly where these exploit multiple river stocks. This is because the national stock CLs will not take account of differences in the status of different river stocks or sub-river populations. Management at finer scales should take account of individual river stock status. Nevertheless, given that not all stocks are currently at full reproductive capacity, the combined CLs for the main stock groups (national stock CLs) exploited by the distant-water fisheries can be used to provide general management advice to the distant-water fisheries.

Fisheries on mixed stocks pose particular difficulties for management when they cannot only target stocks that are at full reproductive capacity. The management of a fishery should ideally be based on the status of all stocks exploited in the fishery. Conservation would be best achieved if fisheries target stocks that have been shown to be at full reproductive capacity. Fisheries in estuaries and especially in rivers are more likely to meet this requirement. While the abundance of stocks remains low, even in the absence of a fishery at the Faroe Islands, particular care should be taken to ensure that fisheries in home waters are managed to protect river stocks that are below their CLs.

The probabilities of meeting CLs for the 1SW Atlantic salmon are hardly affected by the catch options at the Faroe Islands (within the range considered in Table 6), principally because the exploitation rates on the 1SW stock components in the fishery would be expected to be very low (Table 7).

Data and methods

The basic input data used to estimate the historical pre-fishery abundances (PFAs) are the number of returns, spawners and egg deposition, the catch in numbers of 1SW and MSW Atlantic salmon in each country, unreported catch levels, and exploitation rates. Error values are included to account for uncertainties. In some countries, where the retained catch is low, or information on catch is lacking, fishery-independent data are used (e.g. fish counters). Data beginning in 1971 are available for most countries. In addition, catches at the Faroe Islands (equal to 0 since 2000) and catches of NEAC-origin Atlantic salmon at West Greenland are included.

The LCM used for hindcasting and forecasting uses data from all stock units in all stock complexes (Southern NEAC, Northern NEAC, and NAC) in a single model. This model includes different TAC options for Faroe Islands in its forecasting.

The risk framework was used to evaluate TAC options for the Faroe Islands fishery in the 2024/25, 2025/26, and 2026/27 fishing seasons, based on the NEAC stock complex and countries/jurisdictions. For any TAC option being evaluated, the amount of fish that would be caught at the Faroe Islands from each country/jurisdiction is estimated. These values are divided by the Faroe Islands' share allocation to estimate the total harvest that can be taken by each participating country at the Faroe Islands and in home-water fisheries combined (ICES, 2016). The risk analysis then estimates the probability of each country/jurisdiction achieving its management objectives for each TAC option, assuming that the total estimated harvest is taken.

Comparison with previous assessment and catch options

The most recent catch advice in 2021 concluded that there were no catch options at the Faroe Islands for fishing seasons 2021/22–2023/24 (ICES, 2021). The current assessment and forecast results in similar advice.

The advice this year is based on the risk assessment framework, as in 2021, but updated to accommodate the Life-cycle Model framework. This framework directly evaluates the risk (probability) of meeting CLs in the 1SW and MSW components of the Southern and Northern NEAC complexes, as well as at country/jurisdiction level, under different catch scenarios. Managers can choose the risk level which they consider appropriate. ICES considers, however, that to be consistent with both MSY and the precautionary approach and given that the CLs are considered to be limit reference points to be avoided with high probability, managers should choose a risk level that results in a low chance of failing to meet the CLs. ICES still considers that management decisions be based principally on a 95% probability of attainment of CLs in each stock complex or country/jurisdiction individually (ICES, 2013).

Assessment and management area

National stocks are combined into Southern NEAC and Northern NEAC groups. The groups fulfilled an agreed set of criteria for defining stock groups for the provision of management advice (ICES, 2005). At that time, consideration of the level of exploitation of national stocks resulted in the advice for the Faroe Islands fishery (both 1SW and MSW) being based on all NEAC area stocks and the advice for the West Greenland fishery being based on the Southern NEAC non-maturing 1SW stock only.

ICES (2012) previously emphasized the problem of basing a risk assessment and catch advice for the Faroe Islands fishery on management units comprising large numbers of river stocks. In providing catch advice at age and stock complex or country levels for the Northern and Southern NEAC areas, consideration needs to be given to the recent performance of the stocks within individual countries. At present, insufficient monitoring occurs to assess the performance of individual stocks in all countries or jurisdictions in the NEAC area, and in some instances river-specific CLs are in the process of being developed. Nonetheless, Figure 4 indicates that there are many rivers in the NEAC area that are not meeting their CLs.

Quality considerations

Uncertainties in input variables to the stock status and stock forecast are incorporated in the assessment. Provisional catch data for 2022 were updated where appropriate, and the assessment was extended to include data for 2023.

Table 6 Atlantic salmon from the Northeast Atlantic. Probability of Northern and Southern NEAC - 1SW and MSW stock complexes achieving their Conservation Limits (CLs) independently and simultaneously for different catch options for the Faroe Islands fishery in the 2024/25–2026/27 fishing seasons. Shaded cells denote achievement of CLs with ≥ 95% probability.

Fishing season	Catch option (t)	N-NEAC-1SW (%)	N-NEAC-MSW (%)	S-NEAC-1SW (%)	S-NEAC-MSW (%)	All complexes simultaneously (%)
2024/25	0	76	100	41	57	24
	20	76	100	40	51	22
	40	76	98	40	45	20
	60	75	93	40	41	18
	80	75	85	39	37	16
	100	75	78	39	32	13
	120	74	72	38	27	11
	140	74	66	37	24	10
	160	74	60	37	21	8
	180	73	57	36	18	7
	200	73	54	36	16	6
2025/26	0	73	100	36	57	21
	20	72	98	36	52	19
	40	72	93	35	47	17
	60	72	84	35	43	16
	80	72	74	35	38	13
	100	71	65	34	34	11
	120	71	56	34	29	9
	140	70	50	33	25	7
	160	70	43	33	22	6
	180	70	38	32	19	5
	200	70	34	32	17	4
2026/27	0	70	98	39	53	21
	20	70	95	38	47	19
	40	69	88	37	42	17
	60	69	80	37	37	14
	80	68	70	37	33	12
	100	68	61	36	30	10
	120	68	51	36	26	9
	140	68	44	36	24	7
	160	67	38	35	22	6
	180	67	34	34	20	6
	200	66	30	34	18	5

Table 7 Atlantic salmon from the Northeast Atlantic. Forecast harvest rates (%) for 1SW and MSW Atlantic salmon from Northern and Southern NEAC areas in all fisheries (assuming full catch allocations are taken) for different catch options in the Faroe Islands fishery in the 2024/25–2026/27 fishing seasons.

Fishing season	Catch option (t)	N-NEAC-1SW (%)	N-NEAC-MSW (%)	S-NEAC-1SW (%)	S-NEAC-MSW (%)
2024/25	0	0.0	0.0	0.0	0.0
	20	0.2	11.6	0.5	5.8
	40	0.3	23.2	1.0	11.6
	60	0.5	34.6	1.4	17.4
	80	0.7	45.0	1.9	23.3
	100	0.9	53.2	2.4	29.2
	120	1.0	59.1	2.8	35.1
	140	1.2	63.9	3.3	41.1
	160	1.4	67.6	3.8	47.0
	180	1.5	70.8	4.3	53.1
	200	1.7	73.4	4.7	59.1
2025/26	0	0.0	0.0	0.0	0.0
	20	0.2	11.5	0.5	6.1
	40	0.3	23.1	1.0	12.3
	60	0.5	34.3	1.5	18.5
	80	0.7	44.8	2.1	24.7
	100	0.8	54.6	2.6	31.0
	120	1.0	61.2	3.1	37.3
	140	1.2	66.6	3.6	43.7
	160	1.4	70.9	4.1	50.1
	180	1.5	74.2	4.6	56.5
	200	1.7	77.0	5.1	62.9
2026/27	0	0.0	0.0	0.0	0.0
	20	0.2	11.2	0.5	6.1
	40	0.3	22.5	1.0	12.2
	60	0.5	33.4	1.5	18.3
	80	0.7	43.3	2.0	24.5
	100	0.8	52.8	2.5	30.8
	120	1.0	59.5	3.0	37.0
	140	1.1	64.7	3.5	43.3
	160	1.3	69.5	4.0	49.7
	180	1.5	72.8	4.5	56.1
	200	1.6	75.6	5.0	62.5

Table 8 Atlantic salmon from the Northeast Atlantic. Probability (%) of National NEAC-1SW stock complexes achieving their Conservation Limits (CLs) individually and simultaneously for different catch options for the Faroe Islands fishery in the 2024/25–2026/27 fishing seasons. Shaded cells denote achievement of CLs with ≥ 95% probability.

Fishing season	Catch option (t)	Russian Federation (%)	Tana/Teno (Norway & Finland; %)	Norway (%)	Sweden (%)	Iceland (northeast; %)	Iceland (southwest; %)	UK (Scotland; %)	UK (Northern Ireland; %)	Ireland (%)	UK (England & Wales; %)	France (%)	All 1SW MUs simultaneously (%)
2024/25	0	8	33	99	73	61	62	74	5	25	35	3	0
	20	8	33	99	73	61	62	74	5	25	35	3	0
	40	8	33	99	73	61	61	74	5	25	34	3	0
	60	8	33	99	73	61	61	73	5	25	34	3	0
	80	8	33	99	73	60	60	73	5	24	34	3	0
	100	8	33	99	73	60	59	72	5	24	34	3	0
	120	8	33	99	72	60	58	72	5	24	34	3	0
	140	8	33	99	72	60	58	71	5	24	33	3	0
	160	8	33	99	72	60	57	71	5	24	33	3	0
	180	7	33	99	72	60	57	70	5	24	33	3	0
	200	7	33	99	71	59	57	69	5	24	32	3	0
2025/26	0	5	27	98	69	59	56	66	3	21	37	4	0
	20	5	27	98	69	59	56	66	3	21	37	4	0
	40	5	27	98	69	58	55	65	3	21	37	4	0
	60	5	27	98	69	58	55	65	3	21	36	4	0
	80	5	27	98	69	58	55	64	3	21	36	4	0
	100	5	27	98	69	58	54	64	3	20	36	4	0
	120	5	26	98	69	57	54	63	3	20	36	4	0
	140	5	26	98	69	57	53	62	3	20	36	4	0
	160	5	26	98	68	57	53	62	3	19	35	4	0
	180	5	26	98	68	56	53	61	3	19	35	4	0
	200	5	26	98	68	56	52	61	3	19	34	4	0
2026/27	0	5	40	97	72	54	58	60	10	24	40	9	0
	20	5	40	97	71	54	58	60	10	24	40	9	0
	40	5	40	97	71	54	58	59	10	24	40	9	0
	60	5	40	97	71	54	57	59	10	24	40	9	0
	80	5	40	97	71	54	57	59	10	24	39	9	0
	100	5	40	96	71	54	57	59	10	23	39	9	0
	120	5	40	96	71	54	56	58	9	23	39	9	0
	140	5	39	96	71	54	56	57	9	23	39	9	0
	160	5	39	96	71	54	56	57	9	22	39	9	0
	180	5	39	96	71	53	55	56	9	22	39	9	0
	200	5	39	96	70	53	55	56	9	22	38	9	0

Table 9 Atlantic salmon from the Northeast Atlantic. Probability (%) of National NEAC-MSW stock complexes achieving their Conservations Limits (CLs) individually and simultaneously for different catch options for the Faroe Islands fishery in the 2024/25–2026/27 fishing seasons. Shaded cells denote achievement of CL with ≥ 95% probability.

Fishing season	Catch option (t)	Russian Federation (%)	Tana/Teno (Norway & Finland; %)	Norway (%)	Sweden (%)	Iceland (northeast; %)	Iceland (southwest; %)	UK (Scotland; %)	UK (Northern Ireland; %)	Ireland (%)	UK (England & Wales; %)	France (%)	All 1SW MUs simultaneously (%)
	0	97	31	99	87	54	68	55	19	6	88	14	0
	20	97	29	97	81	46	65	50	17	5	85	12	0
	40	97	28	91	68	36	61	47	16	4	81	10	0
	60	96	26	79	54	25	58	42	14	4	76	9	0
	80	96	24	65	38	16	52	37	12	3	71	8	0
2024/25	100	96	22	52	27	10	49	33	10	3	66	7	0
	120	96	21	39	17	6	45	30	9	3	60	6	0
	140	95	19	31	11	4	40	27	8	2	55	4	0
	160	95	17	25	7	2	37	24	6	2	50	4	0
	180	94	17	20	5	2	32	21	6	2	45	4	0
	200	94	16	17	3	1	29	18	5	2	41	3	0
	0	92	31	98	82	47	65	53	14	8	79	11	0
	20	91	29	93	74	40	62	50	13	8	77	10	0
	40	89	28	83	62	31	58	46	12	7	73	9	0
	60	87	26	72	50	21	56	43	9	6	69	8	0
	80	84	24	58	36	14	52	40	8	5	63	7	0
2025/26	100	82	23	46	26	10	48	37	8	4	60	6	0
	120	79	21	37	20	7	44	33	7	4	55	5	0
	140	76	20	29	13	5	40	29	6	4	50	5	0
	160	74	19	23	9	3	38	27	5	3	47	4	0
	180	71	17	18	6	2	34	25	4	2	42	4	0
	200	66	16	16	5	2	29	22	4	2	37	3	0
	0	84	25	97	80	46	60	47	8	8	79	10	0
	20	82	23	91	74	40	57	43	7	8	74	9	0
	40	80	22	81	63	31	54	40	6	6	71	8	0
	60	78	21	69	52	24	52	37	6	6	68	8	0
	80	75	20	56	41	17	48	34	5	5	62	7	0
2026/27	100	72	18	46	31	13	45	30	5	4	57	6	0
	120	69	16	37	23	9	41	28	4	4	53	5	0
	140	66	16	29	17	6	36	25	4	4	48	5	0
	160	61	14	24	13	5	33	22	3	3	44	5	0
	180	57	12	20	10	4	30	20	3	3	41	4	0
	200	55	11	16	8	3	26	18	3	3	36	4	0

Conservation status

Atlantic salmon (*Salmo salar*) was assessed for the IUCN Red List of Threatened Species in 1996, for Europe in 2014, and globally in 2022, and it is listed globally as Threatened under criteria A2bd (Darwall, 2023). In addition, there are regional and national Red List assessments for this species.

This is for information purposes, and ICES does not formally endorse the methods used by third parties to create lists.

Scientific basis

Table 10 Atlantic salmon from the Northeast Atlantic. The basis of the assessment.

ICES stock data category	1 (ICES, 2023a)
Assessment type	A Run Reconstruction Model and a Bayesian Life-cycle Model (LCM), taking into account uncertainties in data and process error; results presented in a risk analysis framework (ICES, 2024a, 2024b)
Input data	Reported (i.e. nominal) catches (by sea-age class) for commercial and recreational fisheries; estimates of returns; estimates of unreported/illegal catches; estimates of exploitation rates; biological characteristics
Discards and bycatch	Discards are included in the risk-based framework for the Faroe Islands fishery; discards and bycatch are not relevant for other NEAC assessment areas
Indicators	None
Other information	Last benchmarked in 2023 (ICES, 2023b)
Working group	Working Group on North Atlantic Salmon (WGNAS)

Issues relevant for the non-fisheries conservation considerations

The abundance of Atlantic salmon is affected by similar non-fishing influences throughout the North Atlantic. Despite major changes in fisheries management two to three decades ago and increasingly restrictive fisheries measures since then, returns of most Atlantic salmon stocks are at near historic lows. The continued low and declining abundance of many Atlantic salmon stocks, despite significant fishery reductions, strengthens the conclusion that factors acting on survival in the first and second years at sea, at both local and broad ocean scales, are constraining abundance of Atlantic salmon. Declines in smolt production are also contributing to lower adult abundance.

Environmental conditions in both freshwater and marine environments have a marked effect on the status of Atlantic salmon stocks. There are a range of problems in the freshwater environment across the North Atlantic that play a significant role in explaining the poor status of stocks. In many cases, river damming and habitat deterioration have had a negative effect on freshwater environmental conditions. In the marine environment, return rates of adult Atlantic salmon declined through the 1980s and are now at the lowest levels in the time-series for some stocks, even after the closure of marine fisheries. Climatic factors modifying ecosystem conditions and the impact of predators of Atlantic salmon at sea are considered to be the main contributory factors to lower productivity, which is expressed almost entirely in terms of lower marine survival.

Identify relevant data deficiencies, monitoring needs, and research requirements

The 2024 ICES data call submissions were not received for the following NEAC jurisdictions with known/historic Atlantic salmon fisheries or farmed Atlantic salmon production: Faroe Islands and Portugal. Equivalent data from the Faroe Islands were received via national reports to ICES. ICES recommends that all countries submit Atlantic salmon data through the data call process, as this is the most effective and efficient way for data collation, quality assurance, analyses, and reporting to be automated.

Data on catch numbers, exploitation rates, and unreported catch rates were not available to ICES for the years 2021, 2022, and 2023 for any of the four Russian Federation stock units. In the absence of data, exploitation rates and unreported catch rates, together with their associated errors, were assumed unchanged from previous years of available data. With respect to catches, the total catch for the Russian Federation in wet mass for all stock units and sea ages combined was available for 2021 (48.82 t), 2022 (55.38 t), and 2023 (51.93 t; NASCO, 2023, 2024). The ratios of the total catch for the Russian Federation in 2021, 2022, and 2023 to the mean total catch for the last five years of available stock unit data (2016–2020) were used to scale the mean catches by sea age and stock unit for the same five-year period to derive estimated catches for 2021, 2022 and 2023. The method developed to fill these data gaps might improve with time; however, if Russian data are not provided in future years, the levels of uncertainty in the derived data will increase and, at some point, reach a level that means the process should not be applied.

No river-specific CLs have been established for Denmark, Germany, and Spain. Iceland has set provisional CLs for all Atlantic salmon-producing rivers and continues to work towards finalizing an assessment process for determining CL attainment. ICES has identified specific data deficiencies, monitoring needs, and research requirements which are outlined above in Section NASCO 2.4.

The full list of data deficiencies, monitoring needs, and research requirements for North Atlantic salmon is presented in Section 1.4 of ICES (2024c).

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Annex 1 Glossary of acronyms and abbreviations

1SW *one-sea-winter;* maiden adult Atlantic salmon that has spent one winter at sea

2SW *two-sea-winter*; maiden adult Atlantic salmon that has spent two winters at sea

CL(s) *Conservation Limit(s),* i.e. S_{lim}; demarcation of undesirable stock levels or levels of fishing activity; the ultimate objective when managing stocks and regulating fisheries will be to ensure that there is a high probability that undesirable levels are avoided

ICES *International Council for the Exploration of the Sea*

LCM *Life-cycle Model*

MSY *Maximum Sustainable Yield*; the largest average annual catch that may be taken from a stock continuously without affecting the catch of future years. A constant long-term MSY is not a reality in most fisheries, where stock sizes vary with the strength of year classes moving through the fishery.

MSW *multi-sea-winter*; an MSW Atlantic salmon is an adult Atlantic salmon which has spent two or more winters at sea and may be a repeat spawner

NASCO *North Atlantic Salmon Conservation Organization;* an international organization, established by an inter-governmental convention in 1984. The objective of NASCO is to conserve, restore, enhance, and rationally manage Atlantic salmon through international cooperation, taking account of the best available scientific information.

NEAC *North-East Atlantic Commission*; the commission within NASCO with responsibility for Atlantic salmon in the Northeast Atlantic

PFA *pre-fishery abundance*; the numbers of Atlantic salmon estimated to be alive in the ocean from a particular stock at a specified time

SER *spawner escapement reserve*; the CL increased to take account of natural mortality between the recruitment date (assumed to be 1st January) and the date of return to home-waters

TAC *total allowable catch*; the TAC is the quantity of fish that can be taken from each stock each year

Annex 2 General considerations

Management plans

The North Atlantic Salmon Conservation Organization (NASCO) has adopted an Action Plan for Application of the Precautionary Approach, which stipulates that management measures should be aimed at maintaining all stocks above their CLs through the use of management targets. Conservation Limits for North Atlantic salmon stock complexes have been defined by ICES as the level of a stock (number of spawners) that will achieve long-term average MSY. NASCO has adopted the region-specific CLs as limit reference points (S_{lim}); having populations fall below these limits should be avoided with high probability. Advice for the Faroe Islands fishery (which historically harvested both 1SW and MSW Atlantic salmon) is currently based upon all NEAC area stocks. The advice for the West Greenland fishery (ICES, 2024d) is based upon the Southern NEAC non-maturing 1SW stock and the non-maturing 1SW Atlantic salmon from North America. A 75 risk level (probability) of achieving the management objectives (CLs) simultaneously in four regions (Labrador, Newfoundland, Quebec, and Gulf), as well as being above the management objectives for Scotia-Fundy and USA, has been agreed by NASCO for the provision of catch advice at West Greenland. No specific risk level has so far been agreed by NASCO for the provision of catch advice for the Faroe Islands fishery; in the absence of this, ICES uses a 95% probability of meeting individual CLs, applied at the level of the European stock complexes (two areas and two age classes) and for the ten NEAC countries and two age classes.

Biology

Atlantic salmon (*Salmo salar*) is an anadromous species found in rivers of countries bordering the North Atlantic. In the Northeast Atlantic area, its current distribution extends from the Lima River (41°69’) in northern Portugal to the Pechora River (68°20’) in the northwest of the Russian Federation and west to Iceland (66°44’). Juveniles migrate to the ocean at the ages of one to eight years (dependent on latitude) and generally return after one or two years at sea. Long-distance migrations to ocean feeding grounds take place, with adult Atlantic salmon from the Northeast Atlantic stocks being exploited in waters near Greenland and previously the Faroe Islands.

Environmental and other influences on the stock

Environmental conditions in both freshwater and marine environments have a marked effect on the status of Atlantic salmon stocks. Across the North Atlantic, a range of problems in the freshwater environment play a significant role in explaining the poor status of stocks. In many cases, river damming and habitat deterioration have had a devastating effect on freshwater environmental conditions. In the marine environment, return rates of adult Atlantic salmon have declined since the 1980s and, for some stocks, are now amongst their lowest levels in the time-series, even after closure of marine fisheries. Climatic factors modifying ecosystem conditions and the impact of predators of Atlantic salmon at sea are considered to be the main contributing factors of lower productivity, which is expressed almost entirely in terms of lower return rates.

Effects of the fisheries on the ecosystem

Atlantic salmon fisheries have no, or only minor, influence on the marine ecosystem. The exploitation of Atlantic salmon in freshwater may affect the riverine ecosystem through changes in species composition. There is limited knowledge of the magnitude of these effects.

Quality considerations

Uncertainties in input variables to the stock status and stock forecast models are incorporated in the assessment. Data on catch numbers, exploitation rates and unreported catch rates were not available to ICES for the years 2021, 2022, and 2023 for any of the four Russian Federation stock units. In the absence of data, exploitation rates and unreported catch rates together with their associated errors were assumed unchanged from previous years. With respect to catches, the total catch for the Russian Federation in wet mass for all stock units and sea ages combined was available for 2021 (48.82 t), 2022 (55.38 t), and 2023 (51.93 t; NASCO, 2023, 2024). The ratios of the total catch for the Russian Federation to the mean total catch for the last five years of available stock unit data (2016–2020) were used to scale the mean catches by sea age and stock unit for the same five-year period to derive estimated catches for 2021, 2022, and 2023.

A variance adjustment parameter was added to the data for each Russian Federation stock unit and sea age. This parameter captures the necessary increase in the variance in return estimates to ensure that they reflect the expected uncertainty arising from the method of estimating catches as described above. The scaling parameters were derived numerically by considering the error between the returns derived from observed catches and the returns derived from catches estimated using the above method applied to the period 2016–2020. Additional details on the estimation of catches in 2021, 2022, and 2023 and the adjustment to the uncertainty in the returns can be found in ICES (2023b).

Atlantic salmon (*Salmo salar*) from North America

Summary of the advice for 2024, 2025, 2026 and to 2027

ICES advises that, in line with the management objectives (MOs) agreed by the North Atlantic Salmon Conservation Organization (NASCO) and according to the MSY approach, the catch of one-sea-winter (1SW) non-maturing Atlantic salmon and two-sea-winter (2SW) Atlantic salmon in mixed-stock fisheries in North America should be zero in each of the years 2024, 2025, 2026, and 2027.

ICES advises that when the MSY approach is applied, fishing should only take place on Atlantic salmon from rivers where stocks are at full reproductive capacity. Mixed-stock fisheries present particular threats and should be managed based on the individual status of all stocks exploited in the fishery.

ICES non-fisheries conservation considerations

ICES advises that: i) all non-fisheries-related anthropogenic mortalities should be minimized (direct effects on Atlantic salmon survival) and ii) the quantity and quality of Atlantic salmon habitats, connectivity, and the physical, chemical, and biological properties of the habitats should be restored (indirect effects).

NASCO 3.1 Describe the key events of the 2023 fisheries (including the fishery at Saint Pierre and Miquelon)

The provisional nominal (i.e. reported) catch of Atlantic salmon in eastern North America (NAC), including Canada, the French territory of Saint Pierre and Miquelon (SPM, islands located off the southern coast of Newfoundland), and the United States of America (US), was estimated at 89.4 tonnes (t) in 2023 (Canada: 88.0 t, SPM: 1.4 t, and US: 0 t; tables 1 and 2; Figure 1). Commercial fisheries in Canada have remained closed since 2000. There have been no commercial or recreational fisheries for anadromous Atlantic salmon in the US since 1999.

Unreported catch for Canada in 2023 was 16 t and for US 0 t. France (SPM) did not provide an unreported catch value.

The assessed stock units for North America are shown in Figure 2.

Three groups of fishers exploited Atlantic salmon in Canada in 2023: indigenous, Labrador resident subsistence, and recreational. The fishery in SPM included professional and recreational fishers.

For Canada, 8% of the catch in 2023 was taken in coastal areas (entirely from Labrador), 38% were taken in-river and 54% in estuaries. The catches from SPM were entirely from coastal areas. For eastern North America overall, 37% of the 2023 catch was in-river, 53% was estuarine, and 10% was coastal (Table 1).

Exploitation rates of both large (≥ 63 cm; multi-sea-winter [MSW] including maiden and repeat spawners) and small (mostly 1SW) Atlantic salmon remained relatively stable until 1984 and 1992, respectively. They then declined sharply with the introduction of restrictive management measures (Figure 3) and continued to decline in the 1990s. In the last few years, exploitation rates have remained among the lowest in the time-series.

The estimated number of Atlantic salmon caught and released in the recreational fisheries of Canada was 42 595 in 2023 representing about 57% of the total catch by number. Of these caught and released individuals, 21 845 were small and 20 750 large in 2023.

Table 1 Atlantic salmon from North America. Atlantic salmon catches and catch locations in the North American Commission (NAC) area in 2023. Catches of NAC-origin Atlantic salmon at Greenland are reported in the West Greenland Commission area.

	Canada					St Pierre & Miquelon	US	North America
	Commercial	Indigenous	Labrador resident	Recreational	Total			
2023 reported nominal catch (t)	0	64	1	23	88	1	0	89
% of NAC total	0	72	1	26	99	1	0	100
Unreported catch (t)					16	n/a	0	16
Location of catches								
% in-river					38	0	-	37
% in estuaries					54	0	-	53
% coastal					8	100	-	10

Table 2 Atlantic salmon from North America. Total nominal catch (in tonnes, round fresh weight) of Atlantic salmon in homewaters in North America for Canada (small (< 63 cm) and large (≥ 63 cm), and total Atlantic salmon), US, and France (Saint Pierre and Miquelon) from 1990 to 2023. The 2023 figures include provisional data.

Year	Canada			US	St Pierre & Miquelon
	Small Atlantic salmon	Large Atlantic salmon	Total		
1990	425	486	911	2	2
1991	341	370	711	1	1
1992	199	323	522	1	2
1993	159	214	373	1	3
1994	139	216	355	0	3
1995	107	153	260	0	1
1996	138	154	292	0	2
1997	103	126	229	0	2
1998	87	70	157	0	2
1999	88	64	152	0	2
2000	95	58	153	0	2
2001	86	61	148	0	2
2002	99	49	148	0	2
2003	81	60	141	0	3
2004	94	68	161	0	3
2005	83	56	139	0	3
2006	82	55	137	0	3
2007	63	49	112	0	2
2008	100	57	158	0	4
2009	74	52	126	0	3
2010	100	53	153	0	3
2011	110	69	179	0	4
2012	74	52	126	0	3
2013	72	66	137	0	5
2014	77	41	118	0	4
2015	86	54	140	0	4
2016	79	56	135	0	5
2017	55	55	110	0	3
2018	39	39	79	0	1
2019	53	47	100	0	1
2020	52	51	103	0	2
2021	58	40	98	0	2
2022	45	45	90	0	1
2023	36	52	88	0	1

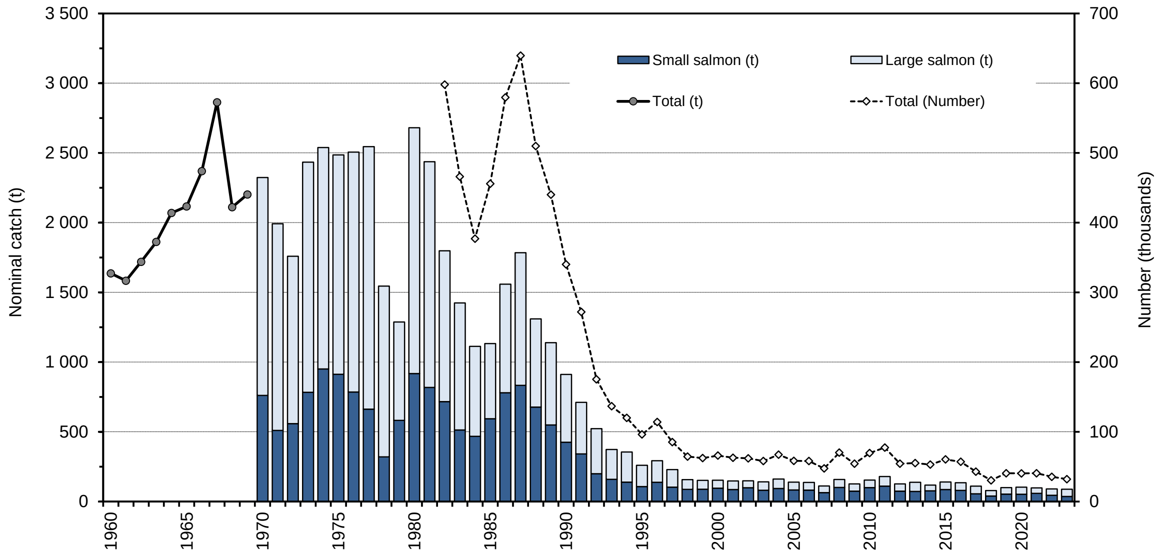

Figure 1 Atlantic salmon from North America. Reported nominal catch (tonnes [t] and number in thousands) of small (< 63 cm; 1SW) and large (≥ 63 cm; MSW including maiden and repeat spawners) Atlantic salmon in Canada (combined catches in US and Saint Pierre and Miquelon are ≤ 6 t in any year) from 1960 to 2023.

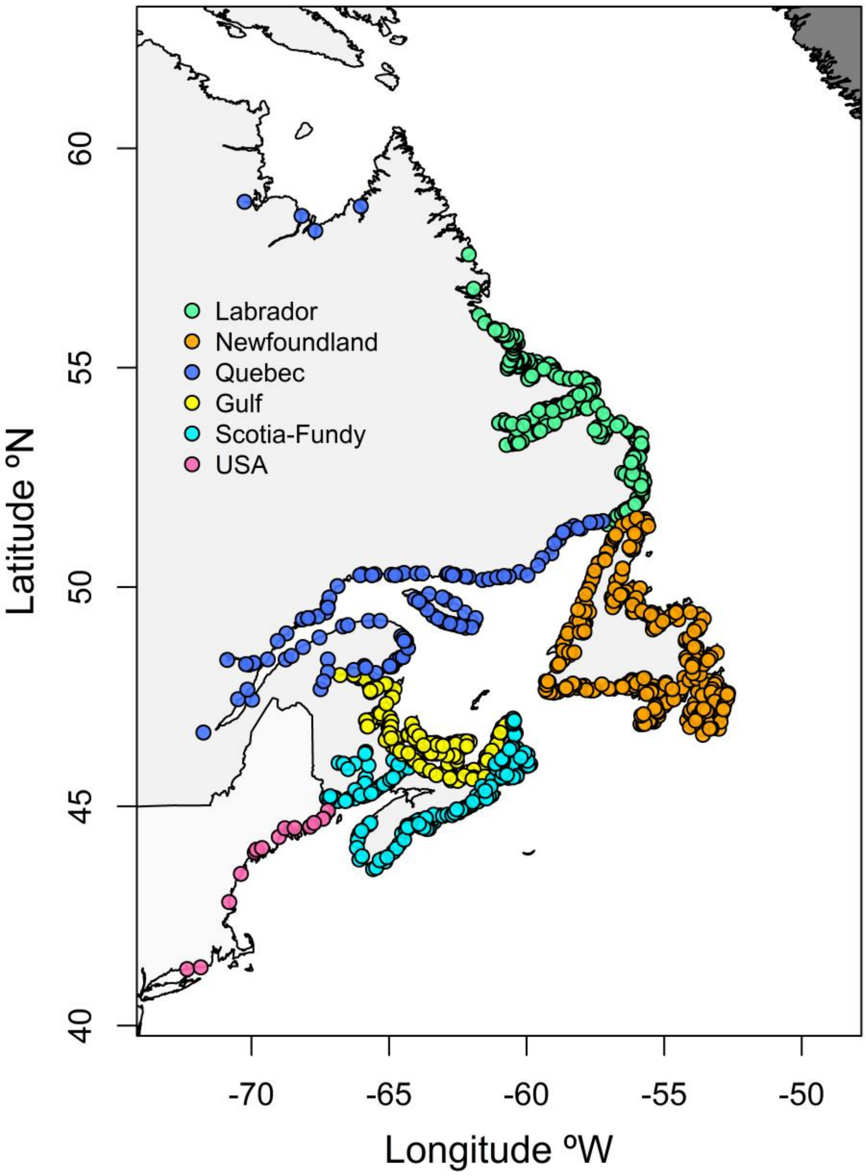

Figure 2 Atlantic salmon from North America. Stock units for Atlantic salmon (*Salmo salar*) in the NAC area. Dots indicate locations of Atlantic salmon rivers.

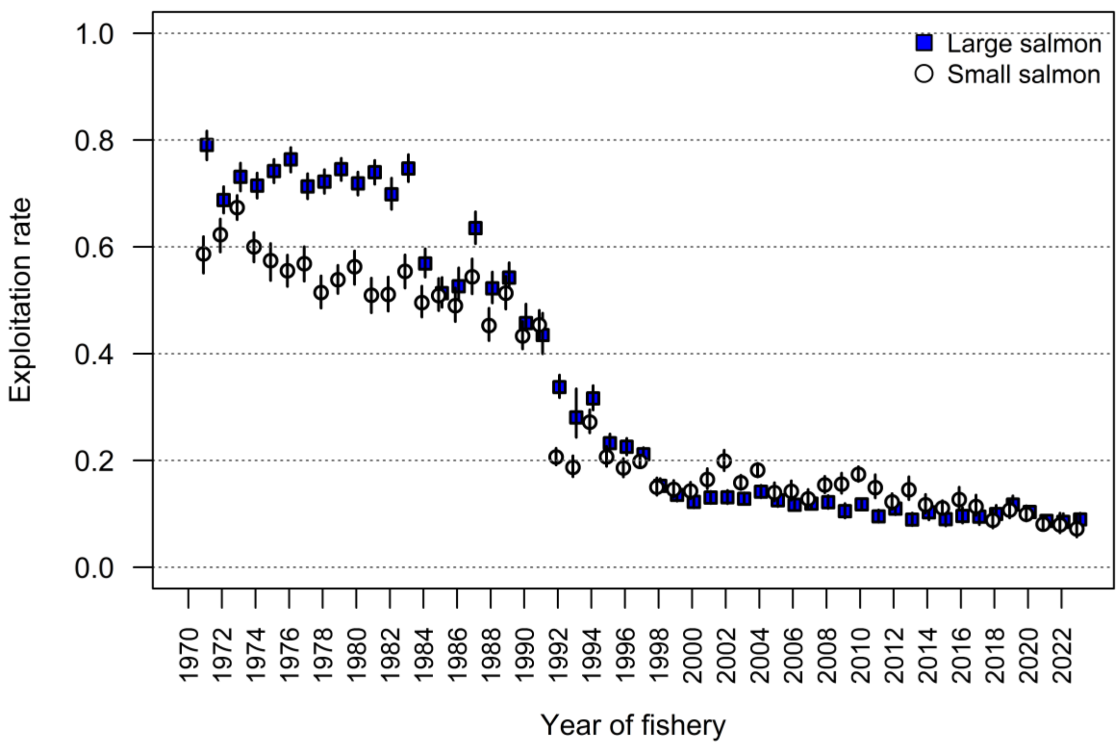

Figure 3 Atlantic salmon from North America. Exploitation rates (total retained nominal catch in NAC divided by total returns to the coast of NAC) in North America on small (< 63 cm; 1SW) and large (≥ 63 cm; MSW including maiden and repeat spawners) Atlantic salmon from 1971 to 2023.

Origin and composition of catches

In the past, Atlantic salmon from Canadian and American rivers were taken in marine commercial fisheries of eastern Canada. Sampling programmes of current marine fisheries (Labrador subsistence, as well as Saint Pierre and Miquelon) are used to monitor the stock composition of these mixed-stock fisheries.

A single nucleotide polymorphism (SNP) panel range-wide baseline has been used since 2018 to provide assignment of individual Atlantic salmon to one of 21 North American or ten European reporting groups (Jeffery *et al*., 2018; Figure 4). This assignment has 90% accuracy. The origin of Atlantic salmon in the mixed-stock fisheries has been previously reported for the Labrador subsistence fishery (Bradbury *et al*., 2015; ICES, 2015, 2020, 2021a, 2023a) and for the SPM fishery (ICES, 2015; Bradbury *et al*., 2016; ICES, 2020, 2023a).

The reporting groups from the genetic assignments do not correspond directly to the stock units used by ICES to characterize stock status and provide catch advice. Assessment of stock status and provision of catch advice is not possible at the scale of the genetic reporting groups, as historical catch reporting is available at a jurisdictional scale that is broader than these groups. The genetic reporting groups can, however, be aligned to the assessed stock units (Table 3).

Table 3 Atlantic salmon from North America. Correspondence between the stock units used by ICES (Figure 2) for the assessment of Atlantic salmon stock status and the genetic reporting groups defined using the single nucleotide polymorphism (SNP) range-wide baseline (Jeffery *et al.*, 2018; Figure 4).

Stock unit	Genetic reporting group	Group acronym
Labrador	Labrador Central	LAC
	Lake Melville	MEL
	Labrador South	LAS
Quebec	Ungava	UNG
	St Lawrence North Shore Lower	QLS
	Anticosti	ANT
	Gaspe Peninsula	GAS
	Quebec City Region	QUE
Gulf	Gulf of St Lawrence	GUL
Scotia–Fundy	Inner Bay of Fundy	IBF
	Eastern Nova Scotia	ENS
	Western Nova Scotia	WNS
	Saint John River & Aquaculture	SJR
Newfoundland	Northern Newfoundland	NNF
	Western Newfoundland	WNF
	Newfoundland 1	NF1
	Newfoundland 2	NF2
	Fortune Bay	FTB
	Burin Peninsula	BPN
	Avalon Peninsula	AVA
US	Maine, United States	USA
Europe	Spain	SPN
	France	FRN
	European Broodstock	EUB
	United Kingdom and Ireland	BRI
	Barents-White Seas	BAR
	Baltic Sea	BAL
	Southern Norway	SNO
	Northern Norway	NNO
	Iceland	ICE
	Greenland	GL

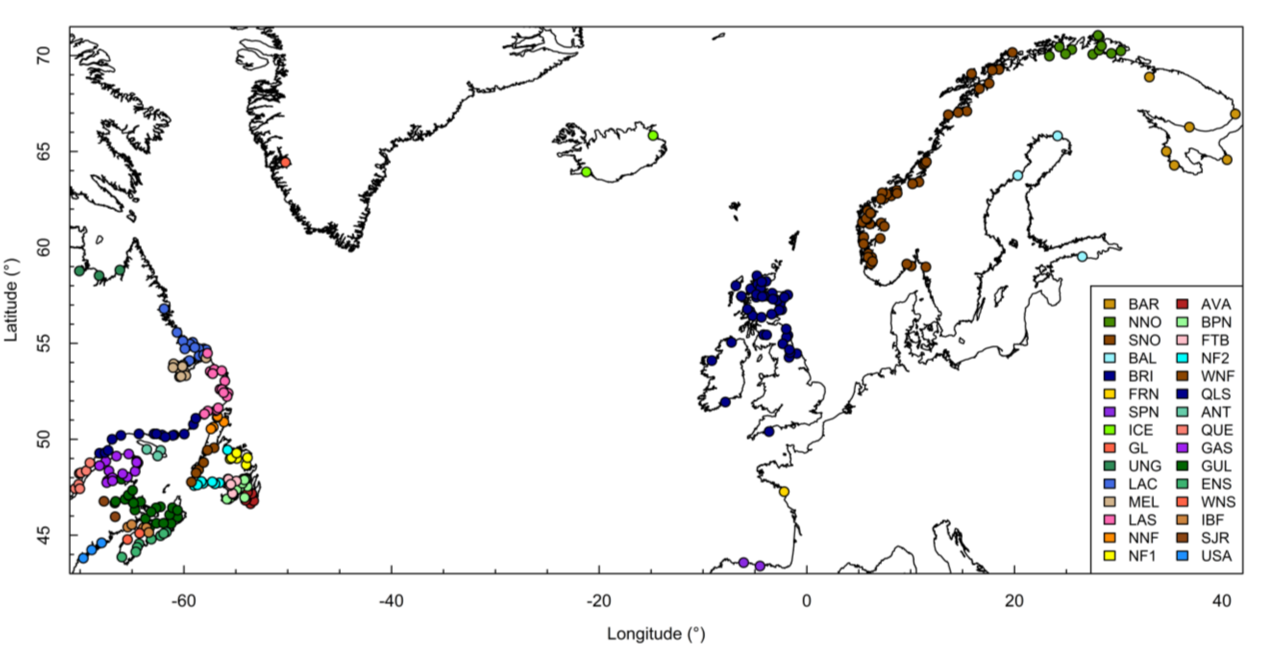

Figure 4 Atlantic salmon from North America. Map of sample locations used in the range-wide genetic baseline (single nucleotide polymorphisms [SNPs]) for Atlantic salmon. The SNP provided assignment of individual Atlantic salmon to 21 North America and ten European genetic reporting groups (labelled and identified by colour) and correspondence between genetic reporting groups and assessment regions for eastern North America are summarized in Table 3. The EUB (European Broodstock) reporting group is not represented on the map.

Labrador fishery origin and composition of the catches

Tissue samples from the Labrador subsistence Atlantic salmon fisheries were collected in 2023; with a sampling rate of 4.7%. The SNP panel successfully analysed 726 samples. As in previous years, the estimated origin of the samples was dominated (> 95%) by the Labrador genetic reporting groups. The dominance of these groups is consistent with previous analyses conducted for the period 2006–2022, which estimated that > 95% of the catch was attributable to Labrador stocks (ICES, 2019, 2020, 2021b, 2023a, 2023a). Furthermore, assignment of catches within the Labrador genetic reporting groups suggests a largely local catch within Atlantic salmon fishing areas (Figure 5).

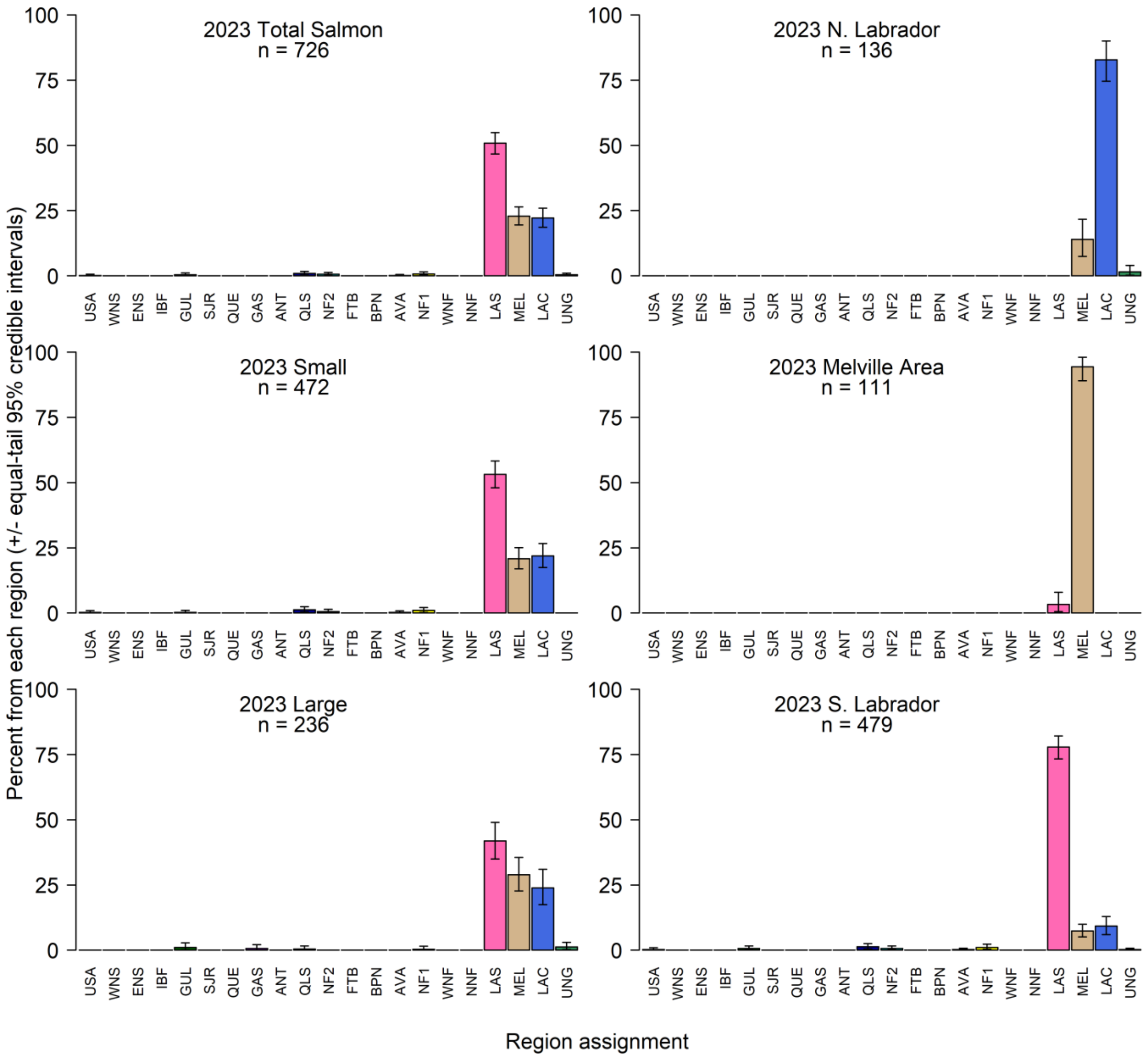

Figure 5 Atlantic salmon from North America. Percentages of Labrador subsistence fishery samples by size group and Labrador Salmon Fishing Area (Northern Labrador, Melville Area and Southern Labrador), assigned using single nucleotide polymorphisms (SNPs) to regional reporting groups of the North Atlantic for the 2023 fishery year. The reporting group colours used for the bars match those used in Figure 4. Note that 18 Atlantic salmon samples did not have size data.

Saint Pierre and Miquelon (SPM) fishery origin and composition of the catches

The SNP panel was used to analyse the 39 tissue samples (7% of the catch) collected in the SPM fishery in 2023. Samples were dominated (> 94%) by the genetic reporting groups in Quebec, Gulf, and Newfoundland. Large Atlantic salmon were mainly from the Gulf of St Lawrence group (82%), and small Atlantic salmon were from groups in Newfoundland (52%) and Quebec (38%).

NASCO 3.2 Update age-specific stock conservation limits (CLs) based on new information as available, including updating the time-series of the number of river stocks with established CLs by jurisdiction

Limit reference points in terms of 2SW Conservation Limits (CLs) have been defined for all six stock units in North America (MFFP, 2016; DFO, 2018; ICES, 2020). For Quebec, the 2SW CLs have been updated based on revised biological characteristics and the limit reference points used for domestic fishery management (MFFP, 2016). No other changes to the 2SW CLs or rebuilding management objectives (MOs) were made from those identified previously (ICES, 2020; Table 4). Total egg requirements by stock unit are presented for the first time in support of analysis and advice using the Life-cycle Model (LCM).

In Canada, CLs were first established in 1991 for 74 rivers. Since then, the number of rivers with defined CLs increased to 266 in 1997 and to 498 in 2018 (Figure 6). Conservation Limits have been established for 33 river stocks in US since 1995 (Figure 6). The number of rivers assessed annually has ranged from 57 to 91, and the annual percentages of these rivers achieving CL has ranged from 26% to 70% with no temporal trend.

Table 4 Atlantic salmon from North America. The 2SW Conservation Limits (CLs), 2SW rebuilding management objectives, and total egg requirements for the stock units in North America.

Country and commission area	Region	2SW spawner requirement (number of fish)	2SW rebuilding management objective (number of fish)	Total egg requirement (million eggs)
Canada	Labrador	34746		239.14
	Newfoundland	4022		417.78
	Quebec	17364		124.60
	Southern Gulf of St Lawrence	18737		171.82
	Scotia–Fundy	24705	10976	253.53
Canada total		99574		1206.87
US total		29199	4549	105.08
North America total		128773	15 525	1311.95

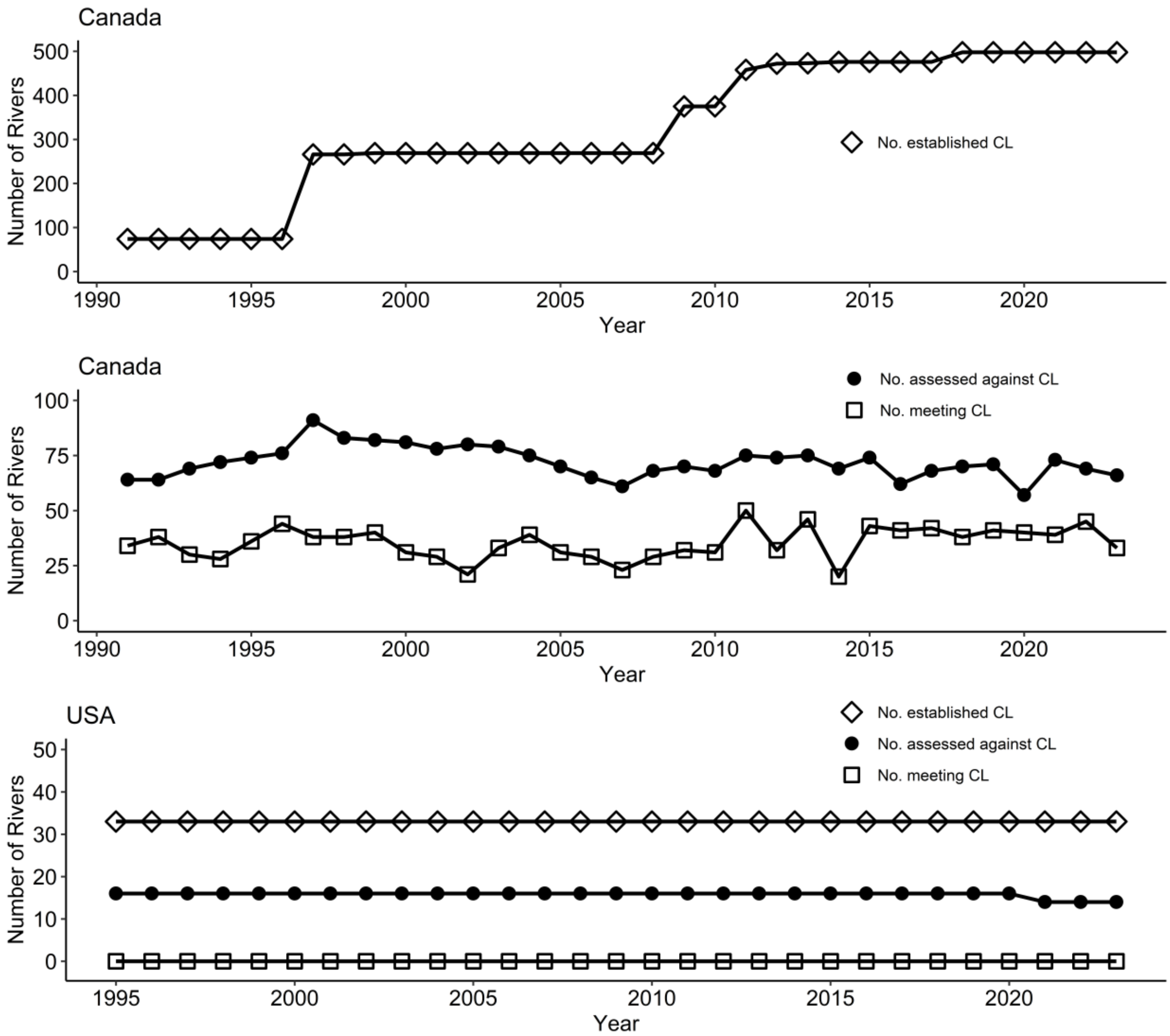

Figure 6 Atlantic salmon from North America. Time-series for Canada (1991–2023) and US (1995–2023) showing the number of rivers with established CLs (diamonds), the number of rivers assessed (circles), and the number of assessed rivers meeting Conservation Limits (CLs; squares) for the period 1991–2023. Further details can be found in ICES (2024a).

NASCO 3.3 Describe the status of the stocks, including updating the time-series of trends in the number of river stocks meeting CLs by jurisdiction

Stock status is presented for the six stock units identified in Figure 2 and overall for the North American Commission area (NAC).

Returns of 1SW (small Atlantic salmon), MSW (large Atlantic salmon including maiden and repeat spawners), and 2SW (a subset of MSW) Atlantic salmon to each stock unit were estimated by the run-reconstruction methods reported in ICES (1993). Returns are the number of Atlantic salmon that returned to each geographic region, including fish caught by home-water commercial fisheries, except for the Newfoundland and Labrador regions, where returns do not include catches in commercial, indigenous, or subsistence fisheries.

ICES benchmarked the LCM in 2023 and it was used for the first time in 2024 to describe and forecast stock status (ICES, 2024a). This model uses a risk analysis framework that considers CLs or alternate MOs of the NAC and NEAC areas (Table 8). The risk analysis framework makes full use of the outputs from the LCM. For each of the six stock units, and overall for NAC, the LCM provided estimates of the pre-fishery abundance (PFA) for maturing 1SW, non-maturing 1SW, and maturity groups combined (total PFA) as of 01 January of the first winter at sea for the time-series 1971 to 2022 and forecasts of abundance for the 2023–2026 PFA years. Pre-fishery abundance estimates account for returns to rivers and fisheries at sea in North America and West Greenland and are corrected for natural mortality. Catches of North American–origin Atlantic salmon in the fishery at the Faroes are not included. The LCM outputs also include estimates of returns and spawners (1SW, MSW, and 2SW), that are in line with run-reconstruction estimates and eggs (1SW and MSW). Outputs from the LCM for NAC and by stock unit are shown in Figure 7 (total area) and figures 8 to 13 (by stock unit).

The total number of 1SW Atlantic salmon returning to NAC in 2023 was 499 900. The 1SW returns were the highest of the time-series for Labrador but lowest for Gulf and Quebec. The returns of 1SW increased from the previous five-year mean for Labrador (58%) but decreased for all other regions (−45% to −73%). Labrador and Newfoundland combined accounted for 95% of the total 1SW Atlantic salmon returns for NAC.

The total number of MSW Atlantic salmon returning to NAC in 2023 was 168 700. MSW Atlantic salmon returns were the highest of the time-series for Labrador and increased from the previous five-year mean for Labrador (92%) and USA (81%) but decreased for all other regions (−9% to −54%). Labrador and Quebec combined accounted for 65% of the total MSW Atlantic salmon returns for NAC.

The total number of 2SW Atlantic salmon (subset of MSW) returning to NAC in 2023 was 112 100. The 2SW Atlantic salmon returns increased from the previous five-year mean for Labrador (92%) and USA (85%) but decreased for all other regions (−10% to −41%). On average (2018-2022), the majority of 2SW Atlantic salmon returns (93%) for NAC were from Labrador (36%), Quebec (30%), and Gulf (27%). There are few 2SW Atlantic salmon returns to Newfoundland (5%), as the majority of the large Atlantic salmon returns to that region are comprised of previously spawned 1SW Atlantic salmon. On average (2018–2022), Scotia–Fundy and US each represent less than 1% of NAC 2SW returns respectively.

In 2023, the median estimates of 2SW Atlantic salmon returns and spawners to rivers were above the respective 2SW CLs (i.e. at full reproductive capacity) in two stock units of NAC (Labrador and Quebec). All other regions were at risk of suffering or suffering reduced reproductive capacity (Figure 14). Total eggs from returns and spawners exceeded the CLs in only two stock units (Labrador and Quebec; Figure 15). Particularly large deficits relative to CLs and rebuilding management objectives are noted in the Scotia–Fundy region.

River-specific assessments were provided for 79 rivers in 2023. Egg depositions by all sea ages combined exceeded or equaled the river-specific CLs in 33 of the 79 assessed rivers (42%) and were less than 50% of CLs in 33 rivers (42%; Figure 16). Large deficiencies in egg depositions (< 10% CLs) were noted in 14 assessed rivers in 2023.

Estimates of PFA (defined as the number of maturing and non-maturing 1SW Atlantic salmon) indicate continued low abundance of North American Atlantic salmon in the ocean. The total PFA in the Northwest Atlantic has shown an overall declining trend since the 1970s, with a period of persistent low abundance since the early 1990s. During 1992 to 2022, the mean total PFA was 815 000 fish, about half the mean abundance (1 634 400 fish) during 1971 to 1991.

Despite major changes in fisheries, returns to the southern regions of NAC (Scotia–Fundy and US) remain near historical lows and many populations are currently at risk of extirpation. All Atlantic salmon stocks within the US and the Scotia–Fundy regions have been or are being considered for listing under country specific species at risk legislation. The continued low abundance of Atlantic salmon stocks across North America, despite significant fishery reductions, strengthens the conclusions that factors acting on survival in the first and second years at sea, at both local and broad ocean scales, are constraining abundance of Atlantic salmon. Declines in smolt production in some rivers of eastern North America are now being observed and are also contributing to lower adult abundance.

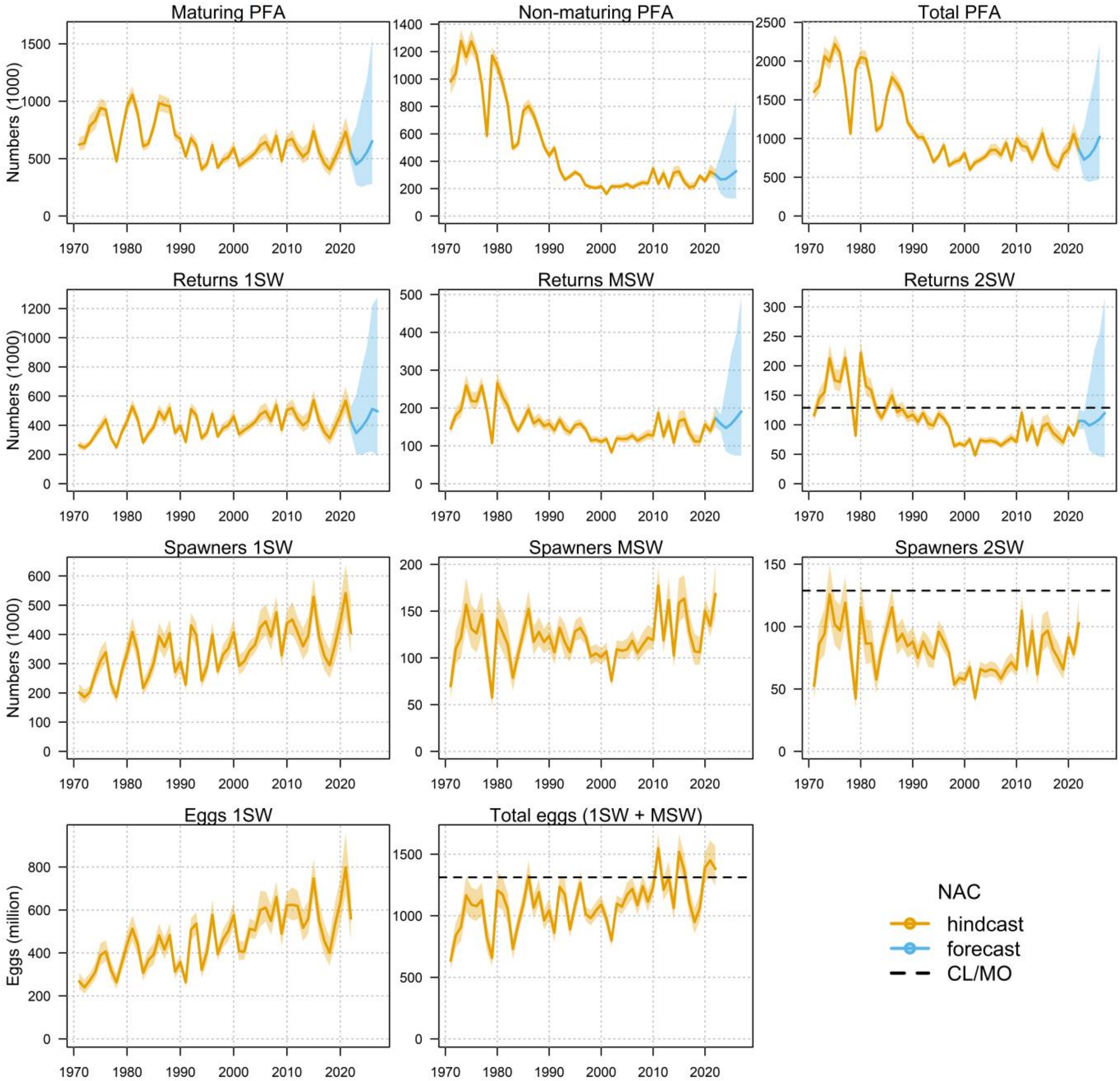

Figure 7 Atlantic salmon from North America. Estimated (median with 5th to 95th percentile range) pre-fishery abundance (PFA) for 1SW maturing and 1SW non-maturing and total Atlantic salmon, returns of 1SW, MSW, and 2SW, spawners of 1SW, MSW, and 2SW, and egg contribution from 1SW and total (1SW+MSW) for NAC as derived from the Life-cycle Model (LCM). Solid line: median of the marginal posterior distributions. Yellow shaded area: hindcasting on the historical time-series. Blue shaded area (for PFA and returns): forecasting obtained under a scenario with 0 catches in all marine fisheries. The dashed line corresponds to the Conservation Limit (CL) for NAC. Forecasts of PFA and returns are provided for years 2023 to 2027.

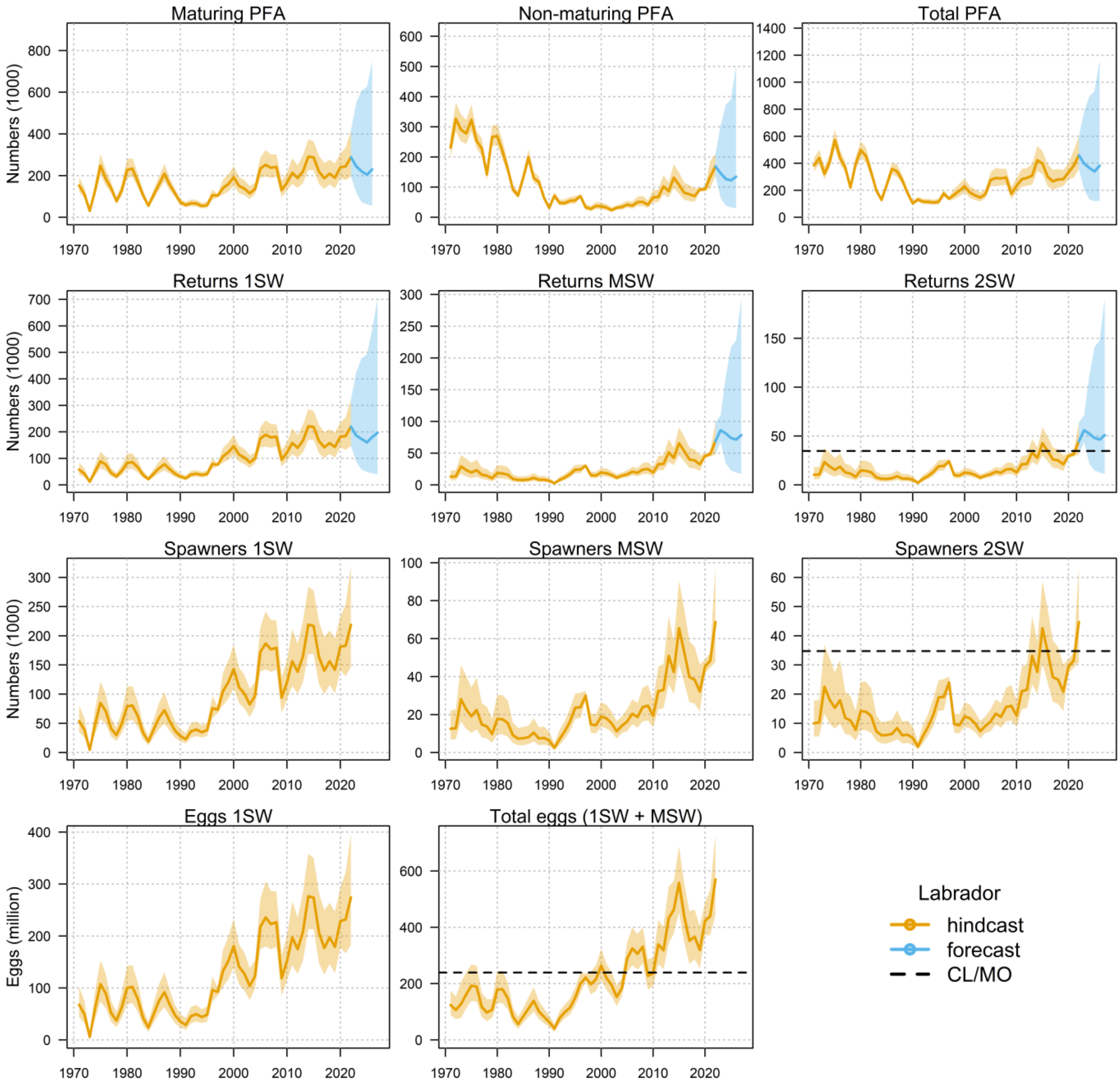

Figure 8 Atlantic salmon from North America. Estimated (median with 5th to 95th percentile range) pre-fishery abundance (PFA) for 1SW maturing and 1SW non-maturing and total Atlantic salmon, returns of 1SW, MSW, and 2SW, spawners of 1SW, MSW, and 2SW, and egg contribution from 1SW and total (1SW+MSW) for Labrador as derived from the Life-cycle Model (LCM). Solid line: median of the marginal posterior distributions. Yellow shaded area: hindcasting on the historical time series. Blue shaded area (for PFA and returns): forecasting obtained under a scenario with 0 catches in all marine fisheries. The dashed line corresponds to the Conservation Limit (CL) for Labrador. Forecasts of PFA and returns are provided for years 2023–2027.

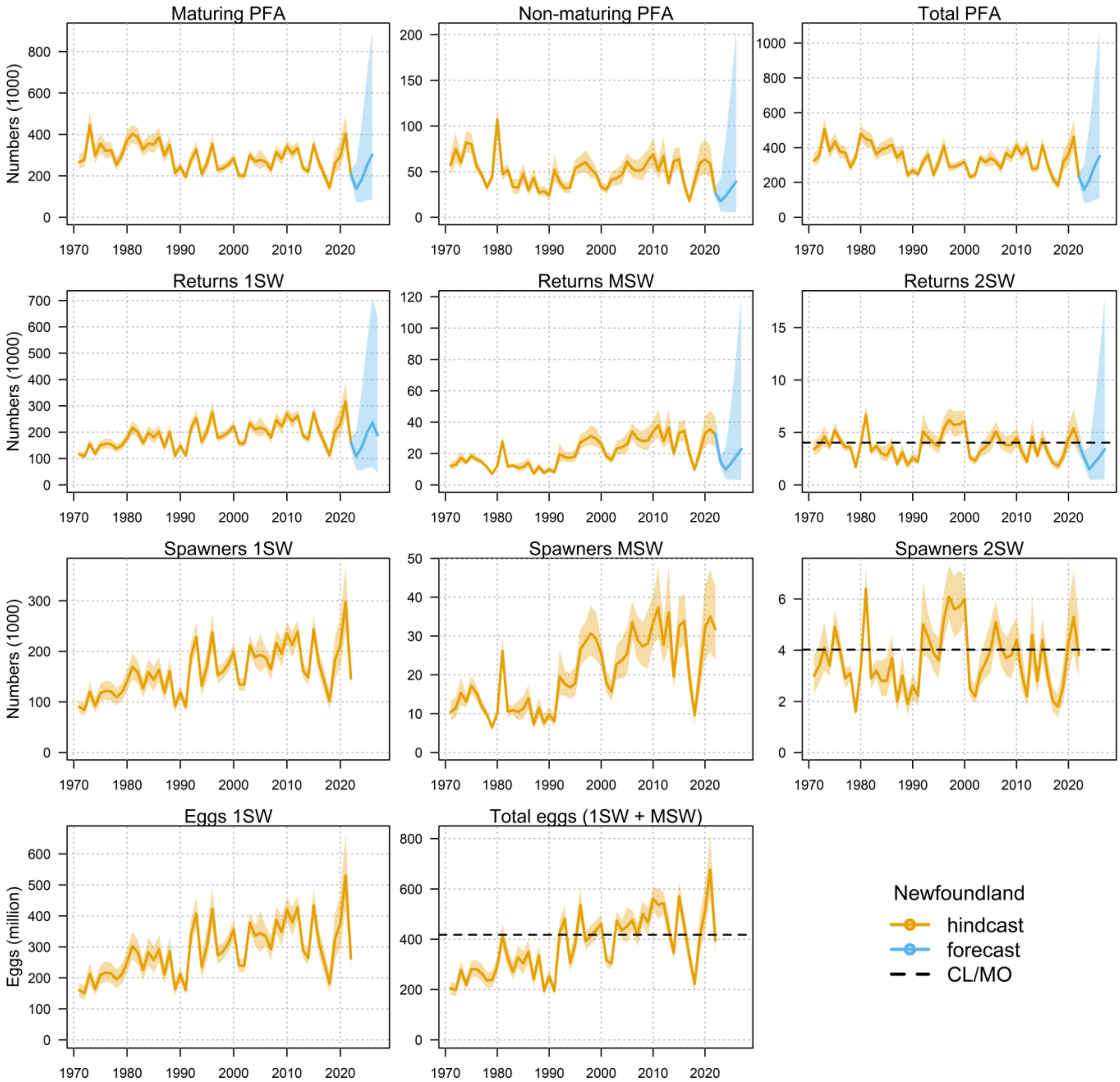

Figure 9 Atlantic salmon from North America. Estimated (median with 5th to 95th percentile range) Pre-fishery Abundance (PFA) for 1SW maturing and 1SW non-maturing and total Atlantic salmon, returns of 1SW, MSW, and 2SW, spawners of 1SW, MSW, and 2SW, and egg contribution from 1SW and total (1SW+MSW) for Newfoundland as derived from the Life-Cycle Model (LCM). Solid line: median of the marginal posterior distributions. Yellow shaded area: hindcasting on the historical time series. Blue shaded area (for PFA and returns): forecasting obtained under a scenario with 0 catches in all marine fisheries. The dashed line corresponds to the Conservation Limit (CL) for Newfoundland. Forecasts of PFA and returns are provided for years 2023–2027.

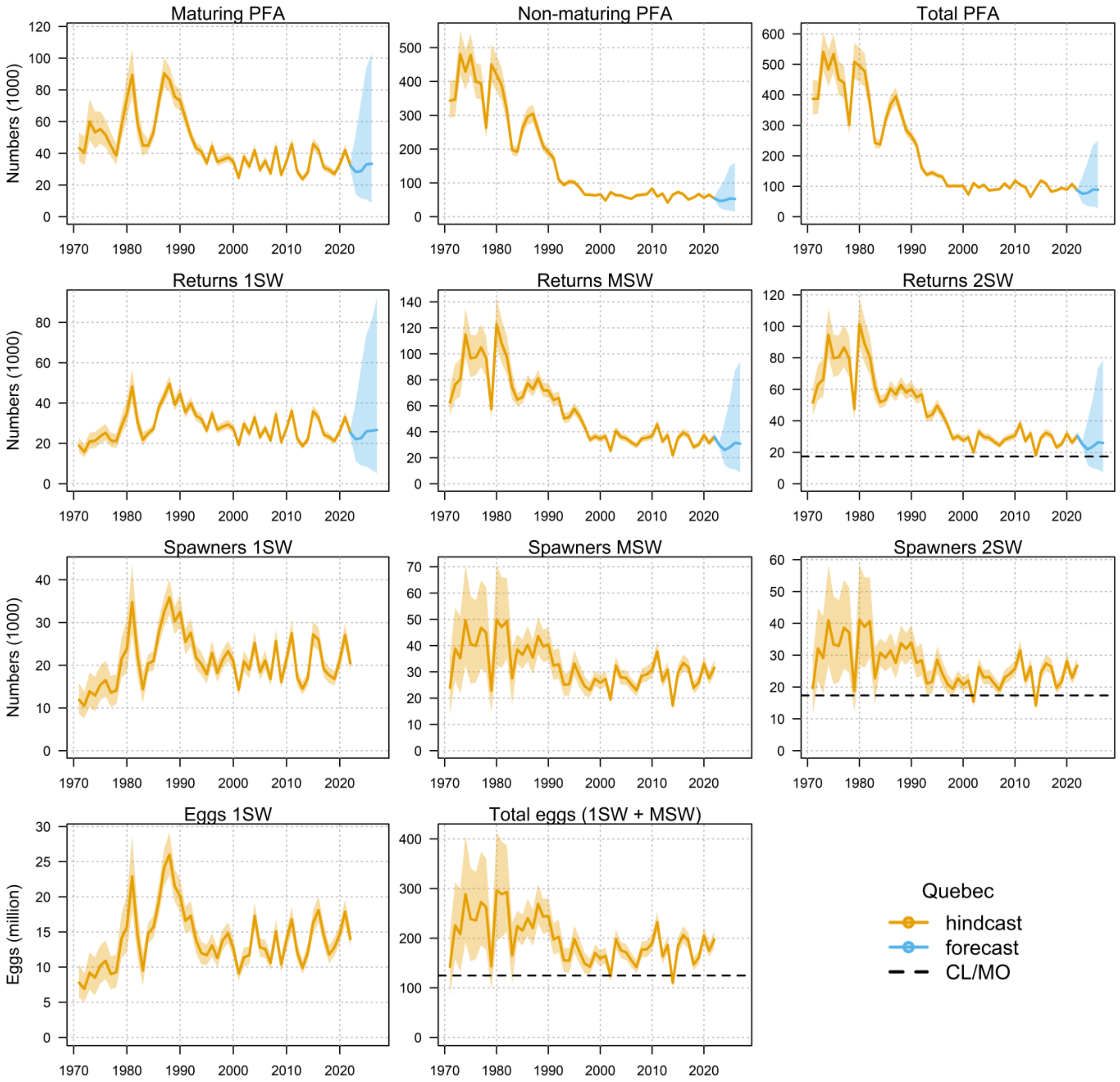

Figure 10 Atlantic salmon from North America. Estimated (median with 5th to 95th percentile range) pre-fishery abundance (PFA) for 1SW maturing and 1SW non-maturing and total Atlantic salmon, returns of 1SW, MSW, and 2SW, spawners of 1SW, MSW, and 2SW, and egg contribution from 1SW and total (1SW+MSW) for Quebec as derived from the Life-cycle Model (LCM). Solid line: median of the marginal posterior distributions. Yellow shaded area: hindcasting on the historical time-series. Blue shaded area (for PFA and returns): forecasting obtained under a scenario with 0 catches in all marine fisheries. The dashed line corresponds to the Conservation Limit (CL) for Quebec. Forecasts of PFA and returns are provided for years 2023–2027.

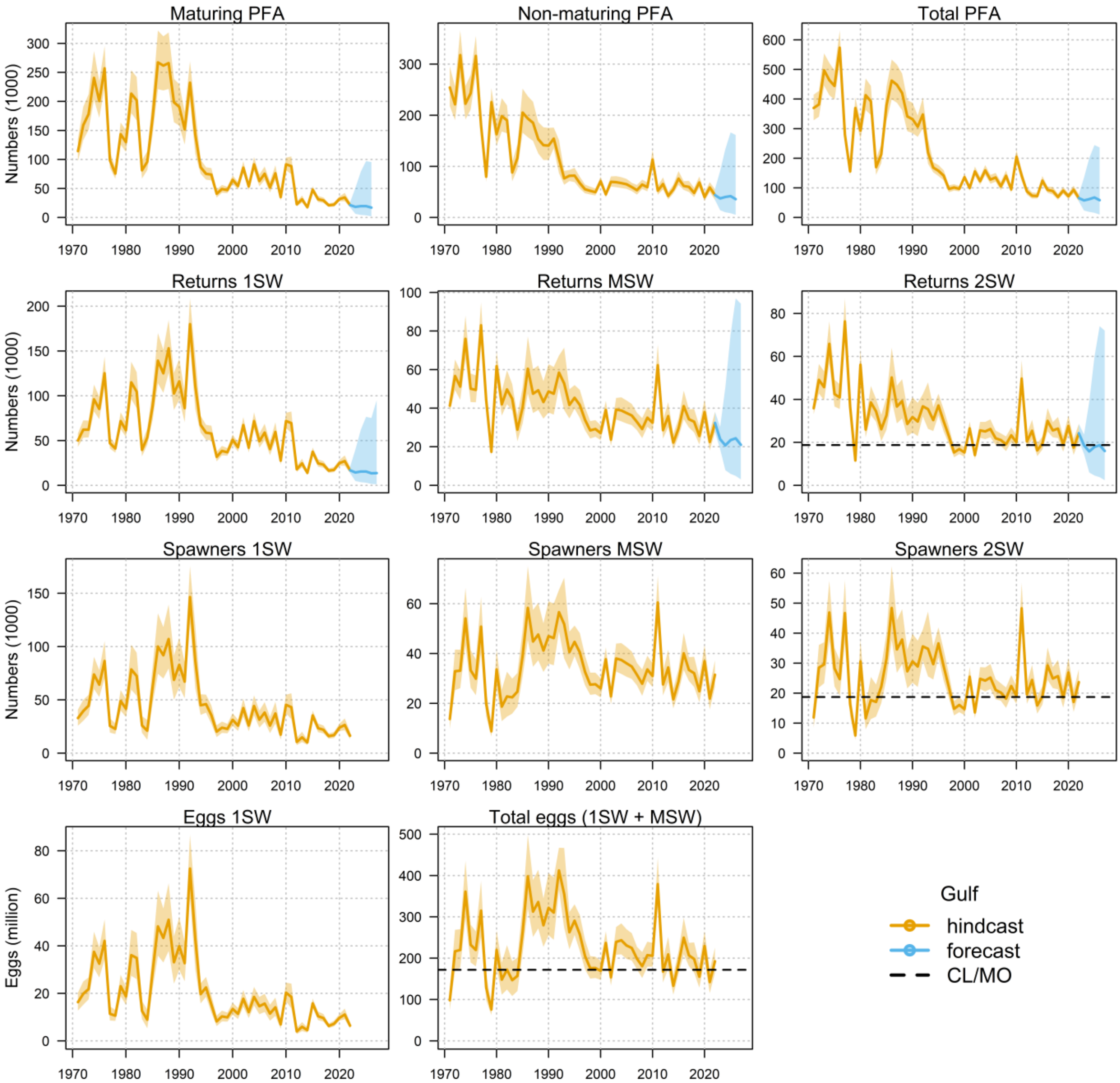

Figure 11 Atlantic salmon from North America. Estimated (median with 5th to 95th percentile range) pre-fishery abundance (PFA) for 1SW maturing and 1SW non-maturing and total Atlantic salmon, returns of 1SW, MSW, and 2SW, spawners of 1SW, MSW, and 2SW, and egg contribution from 1SW and total (1SW+MSW) for Gulf as derived from the Life-cycle Model (LCM). Solid line: median of the marginal posterior distributions. Yellow shaded area: hindcasting on the historical time-series. Blue shaded area (for PFA and returns): forecasting obtained under a scenario with 0 catches in all marine fisheries. The dashed line corresponds to the Conservation Limit (CL) for Gulf. Forecasts of PFA and returns are provided for years 2023–2027.

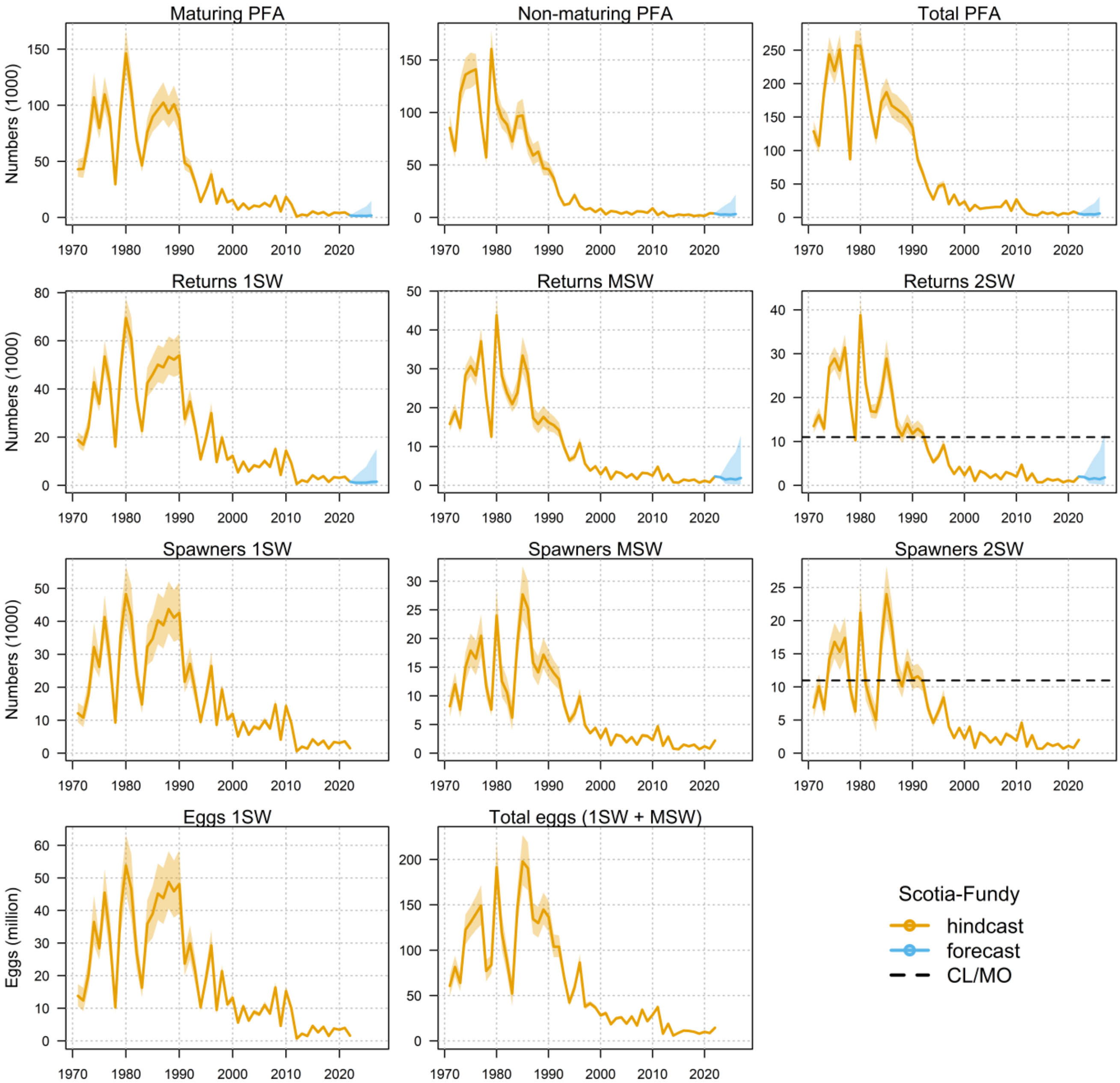

Figure 12 Atlantic salmon from North America. Estimated (median with 5th to 95th percentile range) pre-fishery abundance (PFA) for 1SW maturing and 1SW non-maturing and total Atlantic salmon, returns of 1SW, MSW, and 2SW, spawners of 1SW, MSW, and 2SW, and egg contribution from 1SW and total (1SW+MSW) for Scotia–Fundy as derived from the Life-cycle Model (LCM). Solid line: median of the marginal posterior distributions. Yellow shaded area: hindcasting on the historical time-series. Blue shaded area (for PFA and returns): forecasting obtained under a scenario with 0 catches in all marine fisheries. The dashed line corresponds to the management objectives (MOs) for Scotia–Fundy. Forecasts of PFA and returns are provided for years 2023–2027.

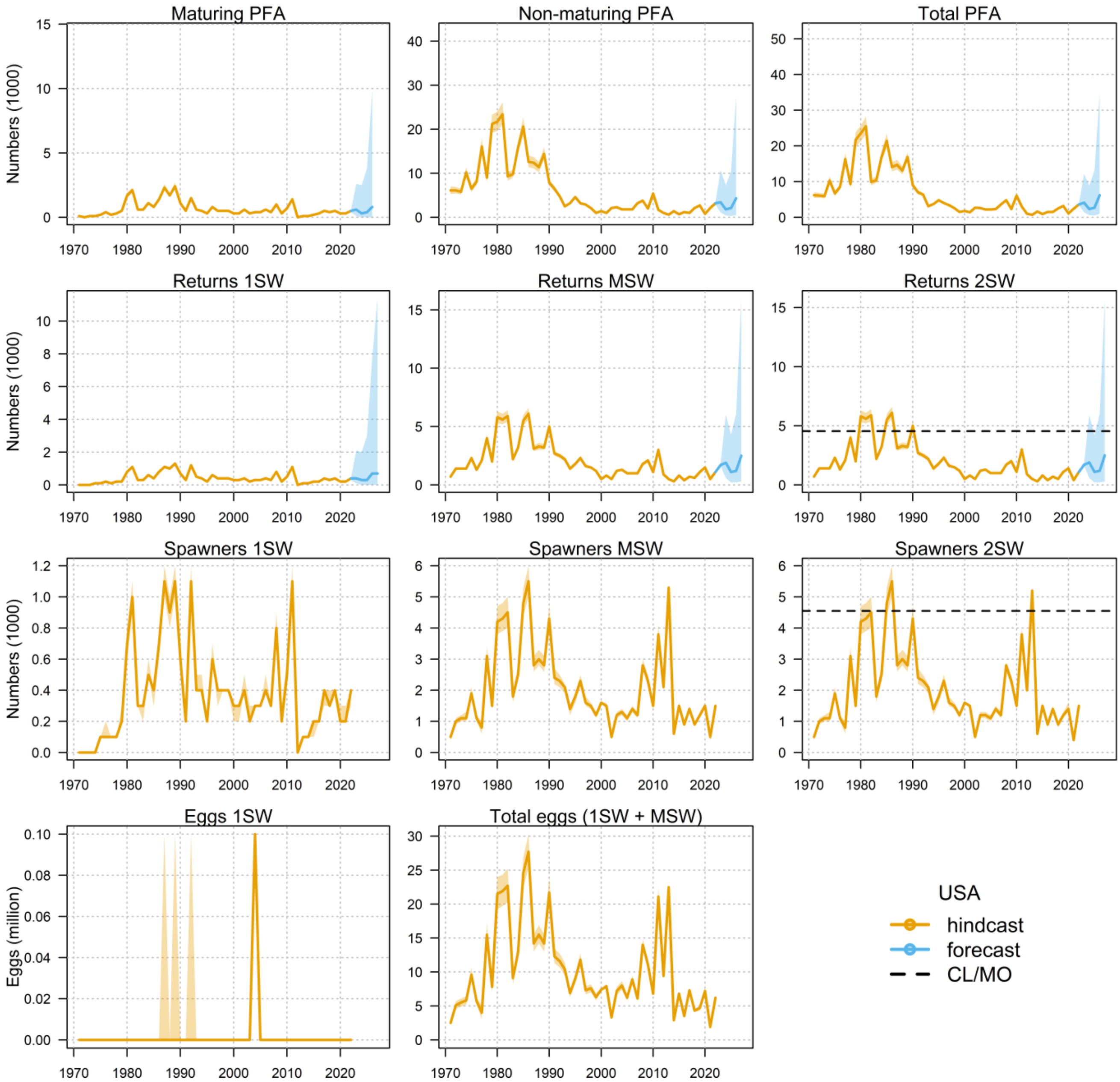

Figure 13 Atlantic salmon from North America. Estimated (median with 5th to 95th percentile range) pre-fishery abundance (PFA) for 1SW maturing and 1SW non-maturing and total Atlantic salmon, returns of 1SW, MSW, and 2SW, spawners of 1SW, MSW, and 2SW, and egg contribution from 1SW and total (1SW+MSW) for US as derived from the Life-cycle Model (LCM). Solid line: median of the marginal posterior distributions. Yellow shaded area: hindcasting on the historical time series. Blue shaded area (for PFA and returns): forecasting obtained under a scenario with 0 catches in all marine fisheries. The dashed line corresponds to the management objectives (MOs) for US. Forecasts of PFA and returns are provided for years 2023–2027. For US, estimated spawners exceed the estimated returns in the later years because of adult stocking restoration efforts; therefore, 2SW returns are assessed relative to the MOs for the US.

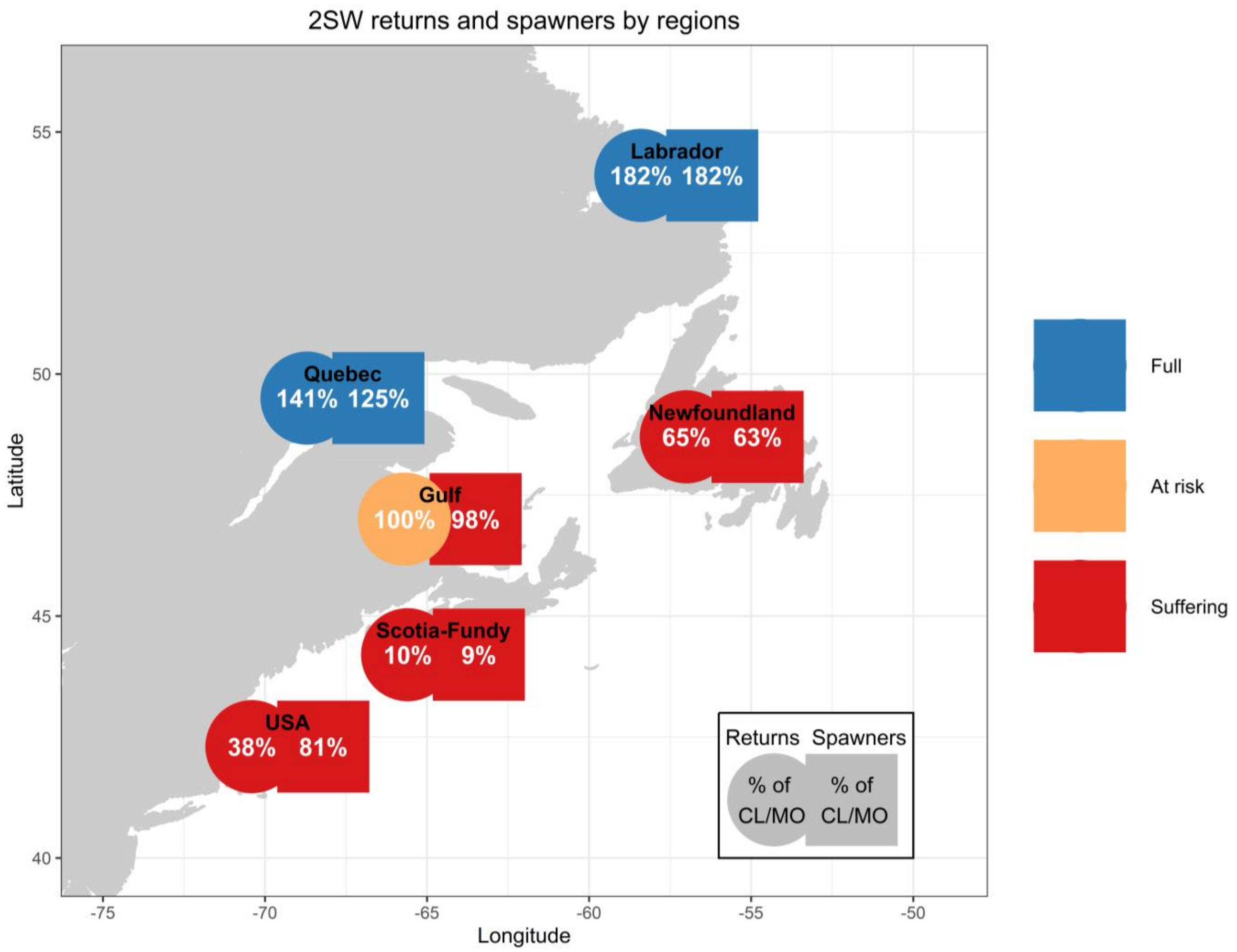

Figure 14 Atlantic salmon from North America. Estimated returns (circle symbol) and spawners (square symbol) of 2SW Atlantic salmon in 2023 to six stock units of North America relative to ICES stock status categories. The percentage of the 2SW Conservation Limits (CLs) for the four northern regions and to the rebuilding management objectives (MOs) for the two southern areas are shown based on the median of the Monte Carlo distributions from the run reconstruction. The colour shading is interpreted as follows: blue refers to the stock being at full reproductive capacity (median and 5th percentile of the Monte Carlo distributions are above the CL), orange refers to the stock being at risk of suffering reduced reproductive capacity (median is above but the 5th percentile is below the CL), and red refers to the stock suffering reduced reproductive capacity (the median is below the CL).

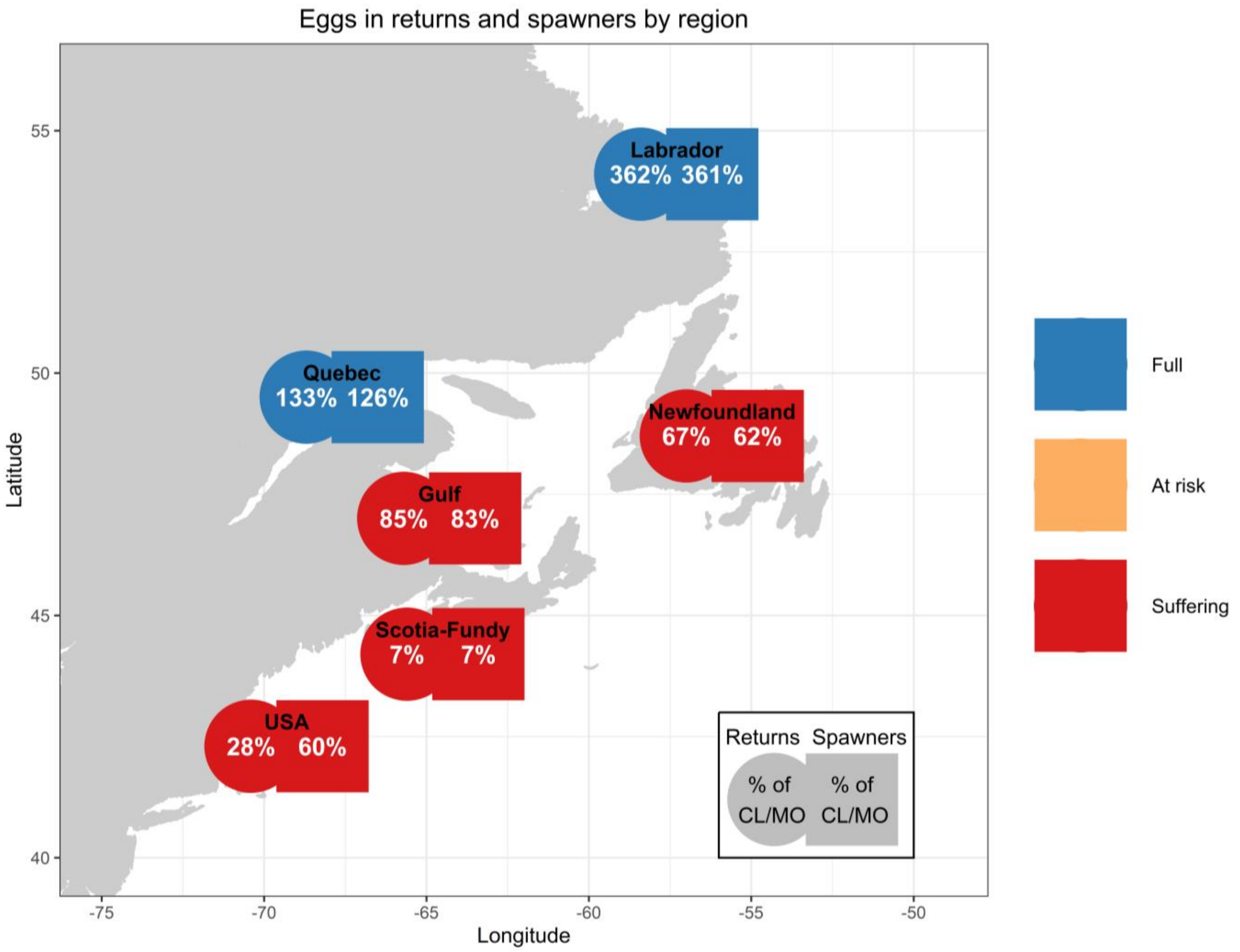

Figure 15 Atlantic salmon from North America. Estimated total eggs in the returns (circle symbol) and spawners (square symbol) of Atlantic salmon in 2023 to six stock units of North America relative to ICES stock status categories. The percentage of the Conservation Limits (CLs) for the four northern regions and to the rebuilding management objectives (MOs) for the two southern areas are shown based on the median of the Monte Carlo distribution from the run reconstruction. The colour shading is interpreted as follows: blue refers to the stock being at full reproductive capacity (median and 5th percentile of the Monte Carlo distributions are above the CL), orange refers to the stock being at risk of suffering reduced reproductive capacity (median is above but the 5th percentile is below the CL), and red refers to the stock suffering reduced reproductive capacity (the median is below the CL).

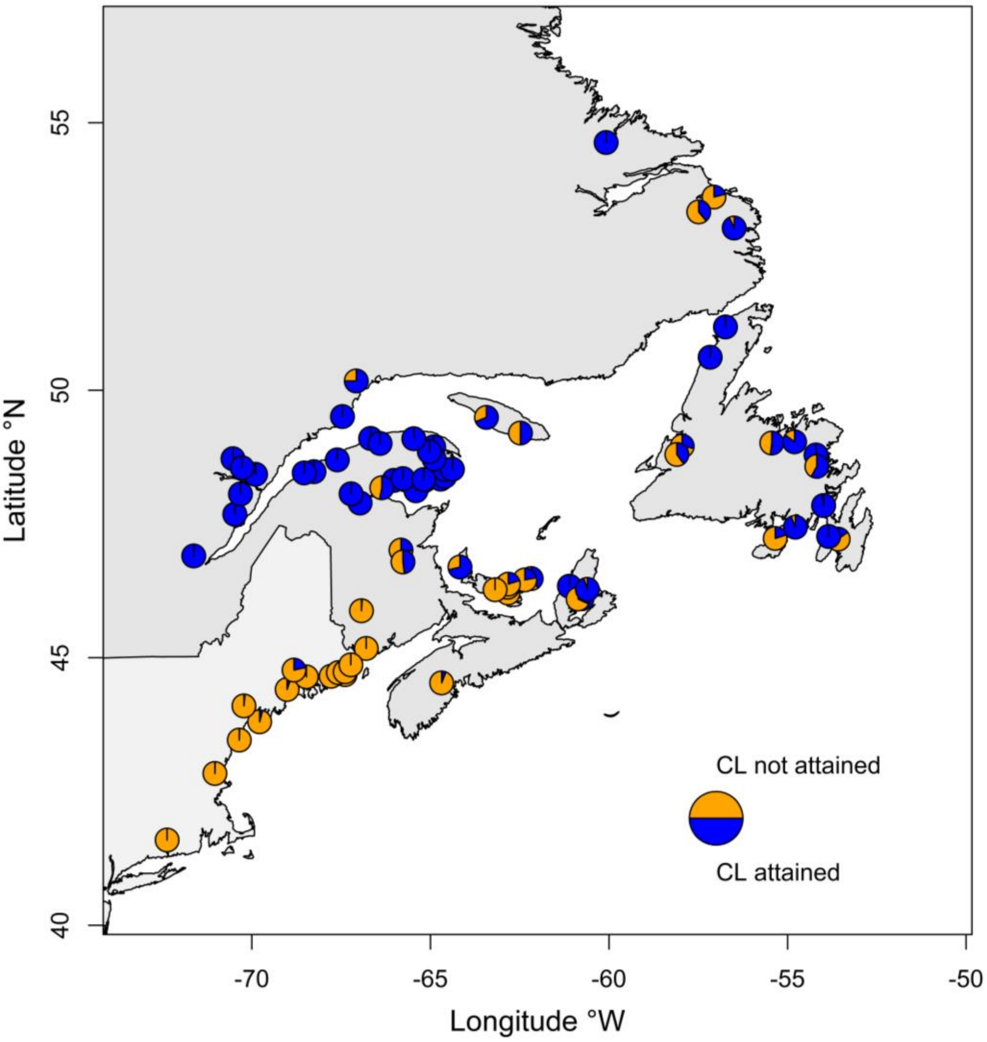

Figure 16 Atlantic salmon from North America. Degree of attainment for the river-specific Conservation Limit (CL) egg requirement in 79 assessed rivers in 2023.

NASCO 3.4 Provide catch options or alternative management advice for 2024–2027 with an assessment of risks relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding

Assessment of risks from exploitation in the mixed-stock fisheries for NAC for 2024–2027 are based on the application of the LCM. Catch options are only considered for the non-maturing 1SW and maturing 2SW components, as the maturing 1SW component is not fished outside home waters, and in the absence of significant marine interceptory fisheries, is managed in home waters.

Relevant factors to be considered in management

The management for all fisheries should be based upon assessments of the status of individual stocks. Fisheries on mixed stocks, particularly in coastal waters or on the high seas, pose particular difficulties for management, as they target all stocks present, whether or not they are meeting their individual CL. Conservation would be best achieved if fisheries target stocks that have been shown to be meeting CL. Fisheries in estuaries and especially rivers are more likely to meet this requirement.

Wild Atlantic salmon populations are now critically low in the southern regions (Scotia–Fundy, US) of North America, and the remnant populations require alternative conservation actions including habitat restoration, captive rearing strategies, and very restrictive fisheries regulation in some areas to maintain the genetic integrity of the stocks and improve their chances of persistence.

Updated forecast and catch options for the 2024–2027 fisheries

It is possible to provide catch options on 2SW Atlantic salmon in the NAC area for 2024. The forecast for 2024 for 2SW maturing fish is based on a forecast of the 2023 non-maturing 1SW Atlantic salmon PFA and accounting for fish which were already removed from the cohort by fisheries in Greenland and Labrador as 1SW non-maturing fish in 2023. The forecasts of the 2SW Atlantic salmon returns in 2024 for NAC and by stock unit are presented in figures 7–13.

As the 5th percentiles of the predicted numbers of 2SW Atlantic salmon returning to the stock units in North America in 2024 are below the 2SW management objectives for all areas and overall for North America, there are no catch options on 2SW Atlantic salmon in mixed-stock fisheries in North America in 2024 that would allow the attainment of region-specific management objectives. A limited catch option may be available on individual rivers where CLs are being achieved; in these circumstances, there are no biological reasons to further restrict the catch.

The LCM provides forecasts of 2SW returns to regions of NAC for 2025–2027 return years in the absence of marine fishing. Catch options for 2SW Atlantic salmon returns to NAC in 2025–2027 are presented relative to the probability of meeting or exceeding 2SW CLs/MOs for the regions in the absence of any mixed-stock fisheries exploitation at sea (Table 5). For the six stock units in NAC, the probabilities of 2SW returns meeting or exceeding CLs/MOs in 2025–2027 range from a high of 0.76 for Quebec to a low of 0.01 for Scotia–Fundy.

There are, therefore, no mixed-stock fishery options on 1SW non-maturing Atlantic salmon in 2024–2026 or on 2SW Atlantic salmon in 2024–2027 that would provide a greater than 95% chance of meeting the individual management objectives. Catch advice is provided for both 1SW non-maturing and 2SW Atlantic salmon to accurately reflect the different model outputs, but these two different life stage designations, and subsequent advice, are for the same cohort.

The previous advice provided by ICES (2021b) indicated that there were no mixed-stock fishery catch options on the 1SW non-maturing Atlantic salmon in the period 2021–2023 or 2SW maturing component for the 2021–2024 return years. This year’s assessment confirms and continues the advice.

Table 5 Atlantic salmon from North America. Probabilities that returns of 2SW Atlantic salmon to the six stock units of NAC will meet or exceed the 2SW objectives in the absence of marine fisheries on the 1SW non-maturing and 2SW age groups for the 2SW Atlantic salmon return years 2025–2027.

Region	Region specific 2SW objective (number of fish)	Probability of meeting the 2SW objectives in the absence of fisheries for the 2SW return year		
		2025	2026	2027
Labrador	34746	0.69	0.65	0.69
Newfoundland	4022	0.18	0.34	0.43
Quebec	17364	0.74	0.76	0.72
Gulf	18737	0.48	0.50	0.44
Scotia–Fundy	10976	0.01	0.02	0.06
US	4549	0.04	0.08	0.30

Issues relevant for the non-fisheries conservation considerations

Abundance of Atlantic salmon is affected by similar non-fishing influences throughout the North Atlantic. Despite major changes in fisheries management two to three decades ago and increasingly restrictive fisheries measures since then, returns of most Atlantic salmon stocks are at near-historical lows. The continued low and declining abundance of many Atlantic salmon stocks, despite significant fishery reductions, strengthens the conclusion that factors acting on survival in the first and second years at sea, at both local and broad ocean scales, are constraining abundance of Atlantic salmon. Declines in smolt production are also contributing to lower adult abundance.

Environmental conditions in both freshwater and marine environments have a marked effect on the status of Atlantic salmon stocks. There are a range of problems in the freshwater environment across the North Atlantic that play a significant role in explaining the poor status of stocks. In many cases, river damming and habitat deterioration have had a negative effect on freshwater environmental conditions. In the marine environment, return rates of adult Atlantic salmon are now at the lowest levels in the time-series for some stocks, even after the closure of marine fisheries. Climatic factors modifying ecosystem conditions and the impact of predators of Atlantic salmon at sea are considered to be the main contributory factors to lower productivity, which is expressed almost entirely in terms of lower marine survival.

Conservation status

Atlantic salmon (*Salmo salar*) was assessed for the IUCN Red List of Threatened Species in 1996, for Europe in 2014, and globally in 2022, and it is listed globally as Threatened under criteria A2bd (Darwall, 2023). In addition, there are also regional and national Red List assessments for this species.

This is for information purposes, and ICES does not formally endorse the methods used by third parties to create lists.

Basis of the assessment

Table A1 Atlantic salmon from North America. The basis of the assessment.

ICES stock data category	1 (ICES, 2023b)
Assessment type	A Run Reconstruction Model and a Bayesian Life-cycle Model (LCM), taking into account uncertainties in data and process error. Results presented in a risk analysis framework (ICES, 2024a, 2024b).
Input data	Nominal catches (by sea-age class) for commercial, Indigenous, subsistence, and recreational fisheries; estimates of unreported/illegal catches; estimates of exploitation rates; natural mortalities (from earlier assessments); run reconstructions of returns and spawners to six stock units of NAC
Discards and bycatch	It is illegal to retain Atlantic salmon that are incidentally captured in fisheries not directed at Atlantic salmon (i.e. bycatch). In the directed recreational fishery, mortality from catch and release is accounted for in the regional assessments to estimate spawners. There is no accounting of discarding mortality in non-Atlantic salmon directed fisheries.
Indicators	None
Other information	Last benchmarked in 2023 (ICES, 2023a)
Working group	Working Group on North Atlantic Salmon (WGNAS)

Identify relevant data deficiencies, monitoring needs, and research requirements

The following data deficiencies, monitoring needs, and research requirements were identified as relevant to the NAC area:

- Improved sampling of all aspects of the Labrador and SPM fishery across the fishing season will improve the information on biological characteristics and stock origin of Atlantic salmon caught in these mixed-stock fisheries. A sampling rate of at least 10% of catches across the fishery season would be required to achieve a relatively unbiased estimate.
- Additional monitoring in Labrador should be considered to estimate stock status for that region. Additionally, efforts should be undertaken to evaluate the utility of other available data sources (e.g. indigenous and recreational catches and effort) to describe stock status in Labrador.

The full list of data deficiencies, monitoring needs, and research requirements for North Atlantic salmon is presented in Section 1.5 of ICES (2024c).

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Annex 1 Glossary of acronyms and abbreviations

1SW *one-sea-winter*; maiden adult Atlantic salmon that have spent one winter at sea.

2SW *two-sea-winter*; maiden adult Atlantic salmon that have spent two winters at sea

CL(s) *conservation limit(s)*, i.e. S_{lim}; demarcation of undesirable stock levels or levels of fishing activity; the ultimate objective when managing stocks and regulating fisheries will be to ensure that there is a high probability that undesirable levels are avoided

ICES *International Council for the Exploration of the Sea*

LCM *Life-cycle Model*

MSW *multi-sea-winter. A MSW Atlantic salmon is an adult Atlantic salmon which has spent two or more winters at sea and may be a repeat spawner.*

NAC *North American Commission*. A commission under NASCO.

NASCO *North Atlantic Salmon Conservation Organization*

PFA *pre-fishery abundance;* the numbers of Atlantic salmon estimated to be alive in the ocean from a particular stock at a specified time

SFA *Salmon Fishing Area*; the 23 areas for which Fisheries and Oceans Canada (DFO) manages the Atlantic salmon fisheries

SPM *the islands of Saint Pierre and Miquelon (France)*

Annex 2 General considerations

Management plans

The North Atlantic Salmon Conservation Organization (NASCO) has adopted an Action Plan for Application of the Precautionary Approach, which stipulates that management measures should be aimed at maintaining all stocks above their CLs through the use of management targets. Conservation limits for North Atlantic salmon stock complexes have been defined by ICES as the level of a stock (number of spawners) that will achieve long-term average MSY. NASCO has adopted the region-specific CLs as limit reference points (S_{lim}); having populations fall below these limits should be avoided with high probability. Within the management plan for the NAC, the following has been agreed for the provision of catch advice on 2SW Atlantic salmon exploited in North America (as non-maturing 1SW and 2SW Atlantic salmon): a risk level (probability) of 75% for simultaneous attainment of the 2SW CLs for the four northern regions (Labrador, Newfoundland, Quebec, Gulf); management objectives defined as achieving a 25% increase in 2SW returns relative to a baseline period (average returns in the period 1992–1996) for the Scotia–Fundy region; and the achievement of 2SW adult returns of 4549 fish or greater for the USA region of NAC.

Biology

Atlantic salmon (*Salmo salar*) is an anadromous species found in rivers of countries bordering the North Atlantic. In the Northwest Atlantic it ranges from the Connecticut River (USA, 41.6°N) northwards to the Ungava Bay rivers (58.8°N; Quebec, Canada). Juveniles emigrate to the ocean at ages of between one and eight years (dependent on latitude) and generally return after one or two years at sea. Long-distance migrations to ocean feeding grounds are known to take place, with adult Atlantic salmon from both the North American and Northeast Atlantic stocks migrating to West Greenland to feed in their second summer and autumn at sea. Recent genetic information has demonstrated that fish from North America were also exploited in the historical Faroes fishery in the North East Atlantic Commission (NEAC) area.

Environmental and other influences on the stock

Environmental conditions in both freshwater and marine environments have a marked effect on the status of Atlantic salmon stocks. Across the North Atlantic, a range of problems in the freshwater environment play a significant role in explaining the poor status of stocks. In many cases, river damming and habitat deterioration have had a devastating effect on freshwater environmental conditions. In the marine environment, return rates of adult Atlantic salmon have declined through the 1980s and are now at the lowest levels in the time-series for some stocks, even after the closure of marine fisheries. Climatic factors modifying ecosystem conditions and the impact of predators of Atlantic salmon at sea are considered to be the main contributory factors to lower productivity, which is expressed almost entirely in terms of lower marine survival.

Effects of the fisheries on the ecosystem

The current Atlantic salmon fisheries probably have no influence, or only a minor influence, on the marine ecosystem. The exploitation rate on Atlantic salmon, however, may affect the riverine ecosystem through changes in species composition. Knowledge on the magnitude of these effects is limited.

Quality considerations

Uncertainties in input variables to the stock status and stock forecast models are incorporated in the assessment. The reliability of catch statistics could be improved in all areas of eastern North America. Estimates of abundance of adult Atlantic salmon in some areas, Labrador in particular, are based on a small number of counting facilities raised to a large production area. In 2020, some regions were affected by the COVID-19 global pandemic and had to either modify the way returns estimates were produced (e.g. SFA15 using snorkel counts of spawners instead of angling data) or could not provide returns estimates (e.g. SFA 16, 17, 18, 19–21 and 23). When no data were available, the previous five-year mean was used for all SFAs, except for Newfoundland where the previous six-year mean was used.

Atlantic salmon (*Salmo salar*) at West Greenland

ICES advice on fishing opportunities for 2024, 2025, and 2026

ICES advises that, in line with the management objectives agreed by the North Atlantic Salmon Conservation Organization (NASCO) and consistent with the MSY approach, there should be zero catch at West Greenland in each of the years 2024, 2025, and 2026.

ICES advises that when the MSY approach is applied, fishing should only take place on Atlantic salmon from rivers where stocks are at full reproductive capacity. Mixed-stock fisheries present particular threats and should be managed based on the individual status of all stocks exploited in the fishery.

ICES non-fisheries conservation considerations

ICES advises that: i) all non-fisheries-related anthropogenic mortalities should be minimized (direct effects on Atlantic salmon survival) and ii) the quantity and quality of Atlantic salmon habitats, connectivity, and the physical, chemical, and biological properties of the habitats should be restored (indirect effects).

NASCO 4.1 Describe the key events of the 2023 fishery

Fishing for Atlantic salmon using hooks and fixed gillnets is currently allowed along the entire coast of Greenland. Commercial fishers are allowed to use up to 20 gillnets at a time as single gillnets fixed to the shore. The use of driftnets has been banned since 2020. Recreational licensed fishers can only use one gillnet fixed to the shore or rod and reel. Gillnets are the preferred gear in Greenland, but rod and reel catches and bycatch in poundnets are also noted in small amounts within the catch reports.

The commercial fishery for export has been closed since 1998, with the exception of 2001; the fishery for internal use, however, continues to this day. There are two landing categories reported for the fishery: commercial landings, where professional fishers can sell Atlantic salmon to hotels, institutions, and local markets, and recreational landings, where both professionals and non-professionals fish for private consumption. Since 2002, only licensed commercial fishers have been permitted to sell Atlantic salmon to hotels, institutions, and local markets, as well as to factories (when factory landings were allowed). People fishing for private consumption only were not required to have a licence until 2018 and are prohibited from selling Atlantic salmon.

In 2021, the Government of Greenland published a “Management Plan for Atlantic Salmon in Greenland” (GoG, 2021), which is to remain in force from 01 July 2021 through 31 December 2025. The management plan identifies two different user groups and three separate management areas (Figure 1), specifying fishing seasons for each; and it sets how the established total allowable catches (TAC) are to be distributed among regions/user groups.

In 2022, a multi-year regulatory measure was agreed at NASCO (NASCO, 2022) that stipulated a TAC of 27 t for the fishery at West Greenland for the years 2022–2025. The regulatory measure maintained many of the provisions from the preceding measures, such as a continuation of the ban on the export of wild Atlantic salmon, restricting the fishery to August through October, requiring all fishers to have a license, requiring fishers to allow samplers access to their catch, and requiring fishers to report their catch even when zero. The agreement outlined a new measure to minimize the likelihood of overharvest. At least for the first year of the agreement, it was agreed that the fishery would be closed when the registered catch had reached no more than 49% of the overall TAC to help ensure that the TAC would not be exceeded. In subsequent years, the percentage could be adjusted, in consultation with NASCO, based on previous experiences and the expected effect of new management measures. In 2023, the percentage remained at 49%. As outlined within the management plan, the Government of Greenland also allocated an additional 3 t TAC for the fishery at East Greenland.

Reported (i.e. nominal) catches of Atlantic salmon at Greenland (Table 1; Figure 2) increased through the 1960s, reached a peak of approximately 2 700 t in 1971, then decreased until the closure of the commercial fishery for export in 1998. Catches are reported from all six NAFO divisions and ICES Subarea 14.b, and proportions vary annually (Table 2). A total Atlantic salmon catch of 34.3 t was reported for the 2023 fishery. This represents a 4.3 t overharvest. A total Atlantic salmon catch of 33 t was reported for the fishery at West Greenland. This represents a 6 t overharvest for that segment. Unreported catch is assumed to have been at the same level (10 t) as historically reported by the Greenlandic authorities. Commercial landings represented the majority of the harvest at 25.2 t (73.5%), and the remaining 9.1 t (26.5%) was taken in recreational fisheries (Table 3). The number of licences issued, the number of fishers that reported, and the number of reports received have all increased greatly since 2017, a result of the new regulatory requirements both for all fishers to obtain a licence and for mandatory reporting (Figure 3).

The reported landings in West Greenland were adjusted for the assessment in some years using port sampling and/or telephone surveys (Table 4).

The sampling programme continued in 2023. Four international samplers participated, samples were collected from the city of Nuuk (NAFO Division 1D) by the Greenland Institute of Natural Resources (GINR), which also conducted a Citizen Science Programme. The Citizen Science Programme consisted of sending a mailing to all licence holders who had reported catches of five or more Atlantic salmon in the recent past. The mailing contained a letter requesting the fishers' participation, an instruction sheet, and five scale envelopes. It was requested that any collected samples and data be returned to the GINR at the conclusion of the fishing season. In total, 1 281 Atlantic salmon were sampled (international samplers [1 206], GINR [35] and Citizen Science [40]), this is a sampling rate of 10% of reported landings.

A summary of the biological characteristics and continent of origin for the 2023 fishery is presented in Table 5. In 2023 (figures 4 and 5), North American contributions to the fisheries was 62.5%, while the European contribution was 37.5% and approximately 10 900 (7 000 North American and 3 900 European) Atlantic salmon were harvested. The origin of Atlantic salmon harvested at West Greenland in the 2023 fishery has been estimated based on an updated genetic range-wide baseline using Single Nucleotide Polymorphisms (SNPs). This baseline, based on samples from 189 rivers from across the North Atlantic (Jeffery *et al.*, 2018), was updated in 2018 (ICES, 2018) and can discriminate Atlantic salmon from 21 North American and 10 European genetic reporting groups (Table 6, Figure 6).

As in previous years, the North American contributions to the West Greenland fishery are dominated by the Gaspe Peninsula, the Gulf of St Lawrence, and the Labrador South reporting groups (Table 7). These three groups accounted for 49% of the North American contributions. The Northeast Atlantic contributions were dominated by the UK and Ireland reporting group (94% of the European contribution). From North America, there are smaller contributions to the harvest for a number of other reporting groups (e.g. Eastern Nova Scotia, Labrador Central, Lake Melville, St Lawrence North Shore-Lower, Maine (US) and Newfoundland). These results are similar to those reported previously. No fish from the Kapisillit River, Greenland's only self-sustaining Atlantic salmon population, were identified in 2023. The SNP baseline, which includes fish from the Kapisillit, has only been used since 2017 and since that time only two Greenlandic fish have been identified (2018 and 2022).

Table 1 Atlantic salmon at West Greenland. Reported catches of Atlantic salmon at West Greenland since 1960 (tonnes, round fresh weight) by participating nations. For Greenlandic vessels specifically, all catches up to 1968 were taken with set gillnets only; catches 1968–2019 were taken with both set gillnets and driftnets; and catches from 2020 to the present were taken with set gillnets only. All non-Greenlandic vessel catches 1969–1975 were taken with driftnets. The quota figures apply to Greenlandic vessels only, and entries in parentheses identify when quotas did not apply to all sectors of the fishery.

Year	Norway	Faroe Islands	Sweden	Denmark	Greenland	Total	Quota	Comments
1960	-	-	-	-	60	60		
1961	-	-	-	-	127	127		
1962	-	-	-	-	244	244		
1963	-	-	-	-	466	466		
1964	-	-	-	-	1539	1539		
1965	-	36	-	-	825	858		Norwegian harvest figures not available but known to be less than Faroese catch
1966	32	87	-	-	1251	1370		
1967	78	155	-	85	1283	1601		
1968	138	134	4	272	579	1127		
1969	250	215	30	355	1360	2210		
1970	270	259	8	358	1244	2139		Greenlandic catch includes 7 t caught by longlines in the Labrador Sea
1971	340	255	-	645	1449	2689	-	
1972	158	144	-	401	1410	2113	1100	
1973	200	171	-	385	1585	2341	1100	
1974	140	110	-	505	1162	1917	1191	
1975	217	260	-	382	1171	2030	1191	
1976	-	-	-	-	1175	1175	1191	
1977	-	-	-	-	1420	1420	1191	
1978	-	-	-	-	984	984	1191	
1979	-	-	-	-	1395	1395	1191	
1980	-	-	-	-	1194	1194	1191	
1981	-	-	-	-	1264	1264	1265	Quota set to a specific opening date for the fishery
1982	-	-	-	-	1077	1077	1253	Quota set to a specific opening date for the fishery
1983	-	-	-	-	310	310	1191	
1984	-	-	-	-	297	297	870	
1985	-	-	-	-	864	864	852	
1986	-	-	-	-	960	960	909	
1987	-	-	-	-	966	966	935	
1988	-	-	-	-	893	893	840	Quota for 1988–1990 was 2 520 t with an opening date of 1 August. Annual catches were not to exceed an annual average (840 t) by more than 10%
1989	-	-	-	-	337	337	900	Quota adjusted to 900 t for later opening date
1990	-	-	-	-	274	274	924	Quota adjusted to 924 t for later opening date
1991	-	-	-	-	472	472	840	
1992	-	-	-	-	237	237	258	
1993	-	-	-	-			89	The fishery was suspended. NASCO adopt a new quota allocation model
1994	-	-	-	-			137	The fishery was suspended and the quota was bought out
1995	-	-	-	-	83	83	77	
1996	-	-	-	-	92	92	174	
1997	-	-	-	-	58	58	57	Private (non-commercial) catches to be reported after 1997
1998	-	-	-	-	11	11	20	Fishery restricted to catches used for internal consumption in Greenland
1999	-	-	-	-	19	19	20	Same as previous year
2000	-	-	-	-	21	21	20	Same as previous year
2001	-	-	-	-	43	43	114	Final quota calculated according to the *ad hoc* management system

Year	Norway	Faroe Islands	Sweden	Denmark	Greenland	Total	Quota	Comments
2002	-	-	-	-	9	9	55	Quota bought out; quota represented the maximum allowable catch (no factory landing allowed)
2003	-	-	-	-	9	9		Quota set to nil (no factory landing allowed); fishery restricted to catches used for internal consumption in Greenland
2004	-	-	-	-	15	15		Same as previous year
2005	-	-	-	-	15	15		Same as previous year
2006	-	-	-	-	22	22		Same as previous year
2007	-	-	-	-	25	25		Same as previous year
2008	-	-	-	-	26	26		Same as previous year
2009	-	-	-	-	26	26		Same as previous year
2010	-	-	-	-	40	40		Same as previous year
2011	-	-	-	-	28	28		Same as previous year
2012	-	-	-	-	33	33	(35)	35 t quota for factory landings only
2013	-	-	-	-	47	47	(35)	Same as previous year
2014	-	-	-	-	58	58	(30)	Quota for factory landings only
2015	-	-	-	-	57	57	45	Quota for all sectors (private and commercial) of the fishery
2016	-	-	-	-	27	27	32	Same as previous year
2017	-	-	-	-	28	28	45	Same as previous year
2018	-	-	-	-	40	40	30	Same as previous year
2019	-	-	-	-	30	30	19.5	Same as previous year
2020	-	-	-	-	32	32	21	Same as previous year
2021	-	-	-	-	43	43	30	Overall quota segregated across three management areas and two user groups with 27 t allocated for the fishery at West Greenland
2022	-	-	-	-	30	30	30	Same as previous year
2023	-	-	-	-	34	34	30	Same as previous year

Table 2 Atlantic salmon at West Greenland. Annual distribution of reported catches (in tonnes) at Greenland by NAFO division (where known). NAFO divisions and ICES Area 14b (East Greenland) are shown in Figure 1. Since 2005, gutted weights have been reported and converted to total weight by a factor of 1.11. Rounding issues are evident for some totals. No landings are reported for 1993 and 1994 as the fishery was suspended. From 1960-2007, entries of '+' represent reported catches of < 0.5 t and '-' indicate no reported catch. Post-2007, reported landings provide more specificity and exact reported values are provided.

Year	NAFO division						Unknown	West Greenland	ICES Division 14.b (East Greenland)	Total
	1A	1B	1C	1D	1E	1F				
1960	-	-	-	-	-	-	60	60	-	60
1961	-	-	-	-	-	-	127	127	-	127
1962	-	-	-	-	-	-	244	244	-	244
1963	1	172	180	68	45		-	466	-	466
1964	21	326	564	182	339	107	-	1539	-	1539
1965	19	234	274	86	202	10	36	861	-	861
1966	17	223	321	207	353	130	87	1338	-	1338
1967	2	205	382	228	336	125	236	1514	-	1514
1968	1	90	241	125	70	34	272	833	-	833
1969	41	396	245	234	370	-	867	2153	-	2153
1970	58	239	122	123	496	207	862	2107	-	2107
1971	144	355	724	302	410	159	560	2654	-	2654
1972	117	136	190	374	385	118	703	2023	-	2023
1973	220	271	262	440	619	329	200	2341	-	2341
1974	44	175	272	298	395	88	645	1917	-	1917
1975	147	468	212	224	352	185	442	2030	-	2030
1976	166	302	262	225	182	38		1175	-	1175
1977	201	393	336	207	237	46	-	1420	6	1426
1978	81	349	245	186	113	10	-	984	8	992
1979	120	343	524	213	164	31	-	1395	+	1395
1980	52	275	404	231	158	74	-	1194	+	1194
1981	105	403	348	203	153	32	20	1264	+	1264
1982	111	330	239	136	167	76	18	1077	+	1077
1983	14	77	93	41	55	30	-	310	+	310
1984	33	116	64	4	43	32	5	297	+	297
1985	85	124	198	207	147	103	-	864	7	871
1986	46	73	128	203	233	277	-	960	19	979
1987	48	114	229	205	261	109	-	966	+	966
1988	24	100	213	191	198	167	-	893	4	897
1989	9	28	81	73	75	71	-	337	-	337
1990	4	20	132	54	16	48	-	274	-	274
1991	12	36	120	38	108	158	-	472	4	476
1992	-	4	23	5	75	130	-	237	5	242
1993	-	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-	-
1995	+	10	28	17	22	5	-	83	2	85
1996	+	+	50	8	23	10	-	92	+	92
1997	1	5	15	4	16	17	-	58	1	59
1998	1	2	2	4	1	2	-	11	-	11
1999	+	2	3	9	2	2	-	19	+	19
2000	+	+	1	7	+	13	-	21	-	21
2001	+	1	4	5	3	28	-	43	-	43
2002	+	+	2	4	1	2	-	9	-	9
2003	1	+	2	1	1	5	-	9	-	9
2004	3	1	4	2	3	2	-	15	-	15
2005	1	3	2	1	3	5	-	15	-	15
2006	6	2	3	4	2	4	-	22	-	22
2007	2	5	6	4	5	2	-	25	-	25
2008	4.9	2.2	10.0	1.6	2.5	5.0	0	26.2	0	26.2
2009	0.2	6.2	7.1	3.0	4.3	4.8	0	25.6	0.8	26.3
2010	17.3	4.6	2.4	2.7	6.8	4.3	0	38.1	1.7	39.6
2011	1.8	3.7	5.3	8.0	4.0	4.6	0	27.4	0.1	27.5
2012	5.4	0.8	15.0	4.6	4.0	3.0	0	32.6	0.5	33.1
2013	3.1	2.4	17.9	13.4	6.4	3.8	0	47.0	0.0	47.0

Year	NAFO division						Unknown	West Greenland	ICES Division 14.b (East Greenland)	Total
	1A	1B	1C	1D	1E	1F				
2014	3.6	2.8	13.8	19.1	15.0	3.4	0	57.8	0.1	57.9
2015	0.8	8.8	10.0	18.0	4.2	14.1	0	55.9	1.0	56.8
2016	0.8	1.2	7.3	4.6	4.5	7.3	0	25.7	1.5	27.1
2017	1.1	1.7	9.3	6.9	3.2	5.6	0	27.8	0.3	28.0
2018	2.4	5.7	13.7	8.2	4.2	4.8	0	39.0	0.8	39.9
2019	0.8	3.0	4.4	8.0	4.8	7.3	0	28.3	1.4	29.8
2020	0.9	3.6	6.6	9.7	3.0	7.1	0	30.9	0.8	31.7
2021	1.3	5.1	13.8	10.5	3.4	7.4	0.3	41.8	1.4	43.2
2022	1.4	3.0	5.3	8.2	4.1	7.0	0.8	29.0	0.8	29.8
2023	1.4	5.0	8.0	4.8	7.3	6.3	0.2	33.0	1.3	34.3

Table 3 Atlantic salmon at West Greenland. Reported landings (in tonnes and percentage) from West Greenland and East Greenland and by landings type (commercial and recreational fishers) from 2021 to 2023.

Year	Reported landings					Landings type			
	West Greenland		East Greenland		Total	Commercial		Recreational	
	Tonnes	%	Tonnes	%	Tonnes	Tonnes	%	Tonnes	%
2021	41.8	96.8	1.4	3.2	43.2	32.2	74.6	11.0	25.4
2022	29.0	97.3	0.8	2.7	29.8	20.6	69.3	9.2	30.7
2023	33.0	96.2	1.3	3.8	34.3	25.2	73.5	9.1	26.5

Table 4 Atlantic salmon at West Greenland. Reported and adjusted landings (in tonnes) for the assessment of Atlantic salmon at West Greenland 2002–2023. The total adjusted landings do not include the unreported catch (10 tonnes per year since 2000).

Year	Reported landings (West Greenland)	Total adjusted landings
2002	9.0	9.8
2003	8.7	12.3
2004	14.7	17.2
2005	15.3	17.3
2006	23.0	23.0
2007	24.6	24.8
2008	26.1	28.6
2009	25.5	28.0
2010	37.9	43.1
2011	27.4	27.4
2012	32.6	34.6
2013	46.9	47.7
2014	57.7	70.5
2015	55.9	60.9
2016	25.7	30.2
2017	27.8	28.0
2018	39.0	39.0
2019	28.3	28.3
2020	30.9	30.9
2021	41.8	41.8
2022	29.0	29.0
2023	33.0	33.0

Table 5 Atlantic salmon at West Greenland. Summary of biological characteristics of catches of Atlantic salmon at West Greenland in 2023.

River age distribution (%) by origin								
Continent of origin	1	2	3	4	5	6	7	8
North America	1.0	15.8	26.4	29.9	23.1	3.8	0	0
Europe	27.1	49.8	17.6	4.5	0.5	0.5	0	0

Length and weight by origin and sea age								
Continent of origin	1 SW		2 SW		Previous spawners		All sea ages	
	Fork length (cm)	Whole weight (kg)	Fork length (cm)	Whole weight (kg)	Fork length (cm)	Whole weight (kg)	Fork length (cm)	Whole weight (kg)
North America	63.1	2.64	83.7	7.55	70.9	3.65	64.0	2.83
Europe	61.1	2.59	75.6	5.25	72.0	3.87	64.0	2.61

Sea age composition (%) by continent of origin			
Continent of origin	1SW	2SW	Previous spawners
North America	92.8	3.1	4.1
Europe	98.9	0.9	0.2

Table 6 Atlantic salmon at West Greenland. Correspondence between ICES regions used for the assessment of North American Atlantic salmon stock status and the genetic reporting groups defined using the SNP range-wide baseline (Jeffery *et al.*, 2018). See Figure 6 for map of genetic reporting groups.

ICES assessment region	Genetic reporting group	Group acronym
Quebec (North)	Ungava	UNG
Labrador	Labrador Central	LAC
	Lake Melville	MEL
	Labrador South	LAS
Quebec	St Lawrence North Shore Lower	QLS
	Anticosti	ANT
	Gaspe Peninsula	GAS
	Quebec City Region	QUE
Gulf	Gulf of St Lawrence	GUL
Scotia–Fundy	Inner Bay of Fundy	IBF
	Eastern Nova Scotia	ENS
	Western Nova Scotia	WNS
	Saint John River & Aquaculture	SJR
Newfoundland	Northern Newfoundland	NNF
	Western Newfoundland	WNF
	Newfoundland 1	NF1
	Newfoundland 2	NF2
	Fortune Bay	FTB
	Burin Peninsula	BPN
	Avalon Peninsula	AVA
US	Maine, United States	US
Europe	Spain	SPN
	France	FRN
	European Broodstock	EUB
	United Kingdom and Ireland	BRI
	Barents-White Seas	BAR
	Baltic Sea	BAL
	Southern Norway	SNO
	Northern Norway	NNO
	Iceland	ICE
	Greenland	GL

Table 7 Atlantic salmon at West Greenland. Bayesian estimates of mixture composition for the West Greenland Atlantic salmon fishery, by region and overall, for 2023. Baseline locations refer to regional reporting groups identified in Table 6 and Figure 6. Sample locations are identified by NAFO divisions. Mean estimates are provided with 95% confidence intervals. Estimates of mixture contributions not supported by significant individual assignments (P > 0.8) are represented as zero and, therefore, all columns may not add up to 100. Areas with no potential representation in the catch are not included in the table (i.e. areas with credible intervals with a lower bound of zero as this indicates little support for the mean assignment value). COO = continent of origin; EUR = Europe; NA = North America. No fishery in NAFO 1E.

Reporting group	COO	NAFO 1A			NAFO 1B			NAFO 1C			NAFO 1D			NAFO 1F			Overall		
		2.5%	Mean	97.5%	2.5%	Mean	97.5%	2.5%	Mean	97.5%	2.5%	Mean	97.5%	2.5%	Mean	97.5%	2.5%	Mean	97.5%
UK/Ireland	EUR	8.8	51.3	91.6	30.4	37.2	44.3	35	38.2	41.4	13.2	25.9	40.9	13.9	19.5	25.8	32.5	35.1	37.8
Iceland	EUR	0	0.2	0.3	0.0	0.5	2.0	0.5	1	1.8	0.0	0.0	0.0	0	0	0	0.4	0.8	1.3
Spain	EUR	0	1.9	30	0.3	1.6	3.9	0.4	0.9	1.6	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.9	1.4
France	EUR	0	0.1	0	0.0	0.5	2.0	0.0	0.2	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.6
Southern Norway	EUR	0	3.5	30.7	0	0.1	0.7	0.0	0.2	0.7	1.1	7.3	17.9	0.0	0.1	1.0	0.1	0.4	0.8
Ungava Bay	NA	0	0.2	1.2	3.8	7.0	11.0	14.3	16.8	19.4	7	17.9	32.1	6.1	10.1	15.1	12.5	14.4	16.4
Gaspé Peninnsula	NA	0	1.7	19.8	9.1	14.1	19.8	8.5	10.7	12.9	0.9	9	21.2	10	15.8	22.7	10.2	12.2	14.1
Labrador South	NA	0	13.4	63.6	5.5	9.9	15.4	6.5	8.5	10.7	1.8	11.1	25.3	11	16.6	22.9	8.1	9.9	11.8
Gulf of St Lawrence	NA	0	1.8	19.7	5.7	10	15.1	4.1	5.7	7.5	0.3	8.2	22.6	12.1	18.7	26	6.7	8.3	10.1
Labrador Central	NA	0	8.4	57.5	3.9	7.9	13.0	5.8	7.7	9.9	0	6.6	19.1	2.3	5.9	10.9	6	7.7	9.5
Lake Melville	NA	0	6.7	54.2	1.2	3.8	7.4	2.2	3.5	5.1	0	5.3	19.1	0.0	1.6	4.5	2.1	3.1	4.3
St. Lawrence North Shore-Lower	NA	0	1.2	14.7	0.6	2.2	4.9	1	1.8	2.8	0.1	2.8	10	0.7	2.8	6.1	1.4	2.1	3
Maine, United States	NA	0	0.2	1.1	0.1	1.1	3.1	0.6	1.3	2.1	0	0	0.1	0.5	2.2	4.9	0.8	1.3	2.1
Anticosti	NA	0	0.2	1.2	0.0	0.4	1.8	0.6	1.3	2.2	0.0	0.0	0.1	0.0	0.3	2.1	0.5	1.0	1.7
Western Newfoundland	NA	0	0.5	5	0.1	1.1	3.0	0.4	1	1.8	0	0.1	0.7	0	0	0.5	0.4	0.8	1.4
Eastern Nova Scotia	NA	0	0.6	7.6	0.2	1.3	3.5	0	0.1	0.4	0.0	2.7	9.7	0.0	0.0	0.3	0.1	0.4	0.9
Newfoundland 1	NA	0	0.4	4.5	0.0	0.4	1.9	0.1	0.5	1.1	0	0.1	0.5	0.0	0.0	0.1	0.1	0.4	0.8
Newfoundland 2	NA	0	0.7	8.6	0	0	0.4	0	0.2	0.7	0.0	0.1	0.9	1.0	3.1	6.4	0.1	0.5	1
Northern Newfoundland	NA	0	0.4	3.7	0	0.5	1.9	0	0.3	0.8	0.0	0.0	0.4	0.0	0.4	2.1	0.1	0.4	0.9

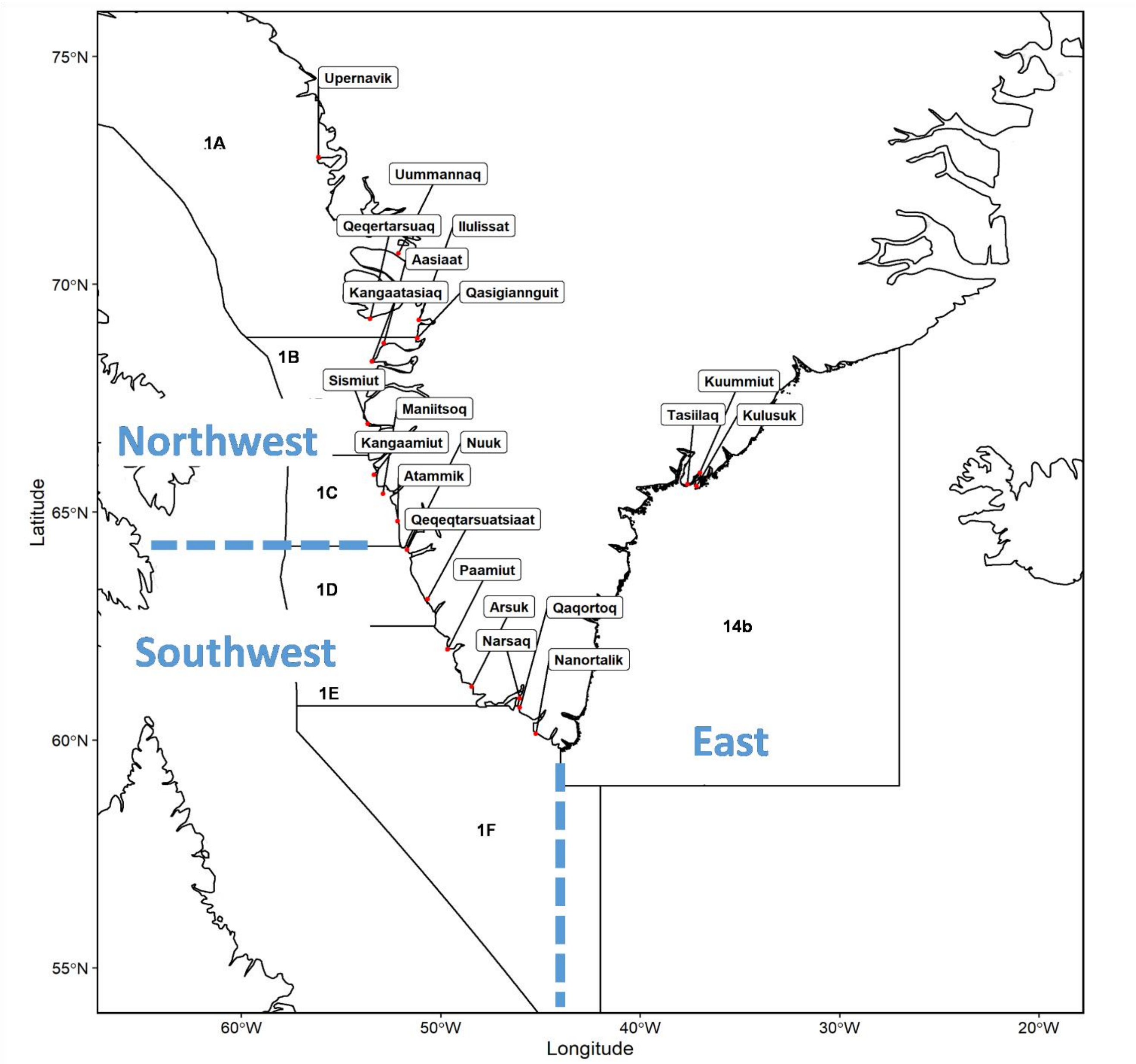

Figure 1 Atlantic salmon at West Greenland. Map of communities in south Greenland where Atlantic salmon have historically been landed and the corresponding NAFO divisions (1A–1F) and ICES subreas.

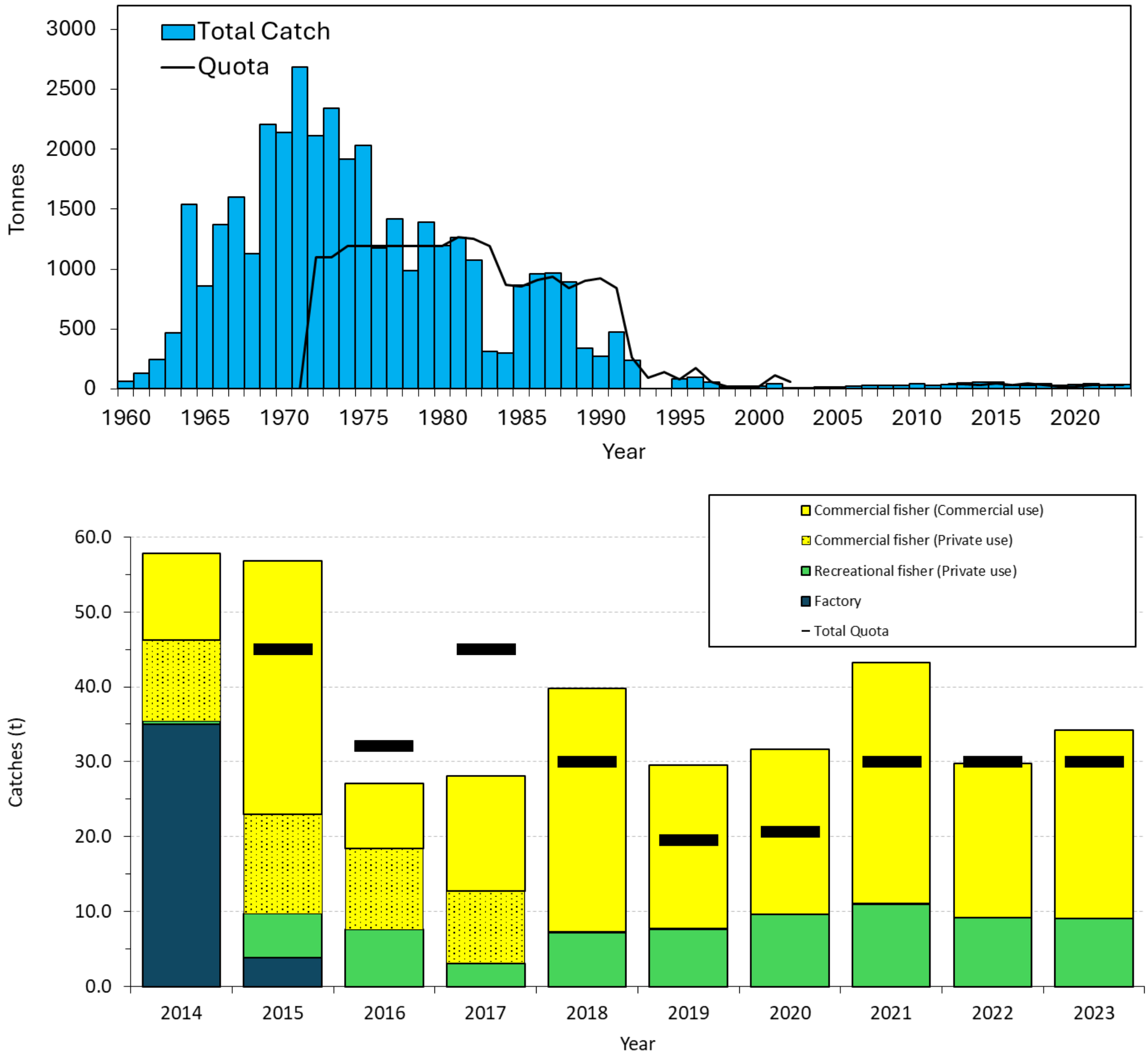

Figure 2 Atlantic salmon at West Greenland. Reported catches and quotas (tonnes, round fresh weight) of Atlantic salmon at West Greenland from 1960 to 2023 (upper panel). Landings from 2014 to 2023 are also displayed by landing type (lower panel). The quota for 2014 (30 t) was for factory landings only and is not shown in the figure.

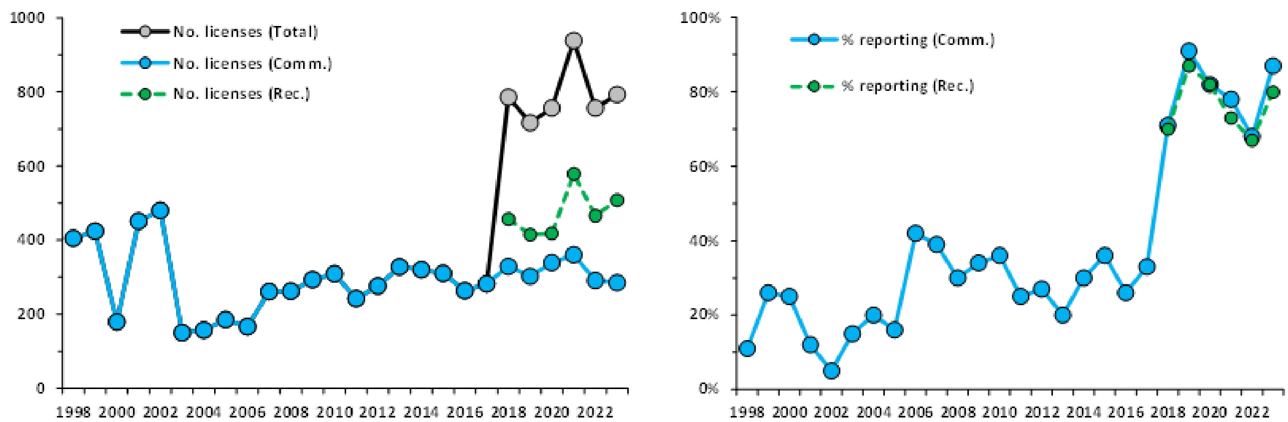

Figure 3 Atlantic salmon at West Greenland. Number of licences issued by licence type (left panel) and per cent of licensed fishers reporting by licence type (right panel). Starting in 2018, all fishers were required to have a licence.

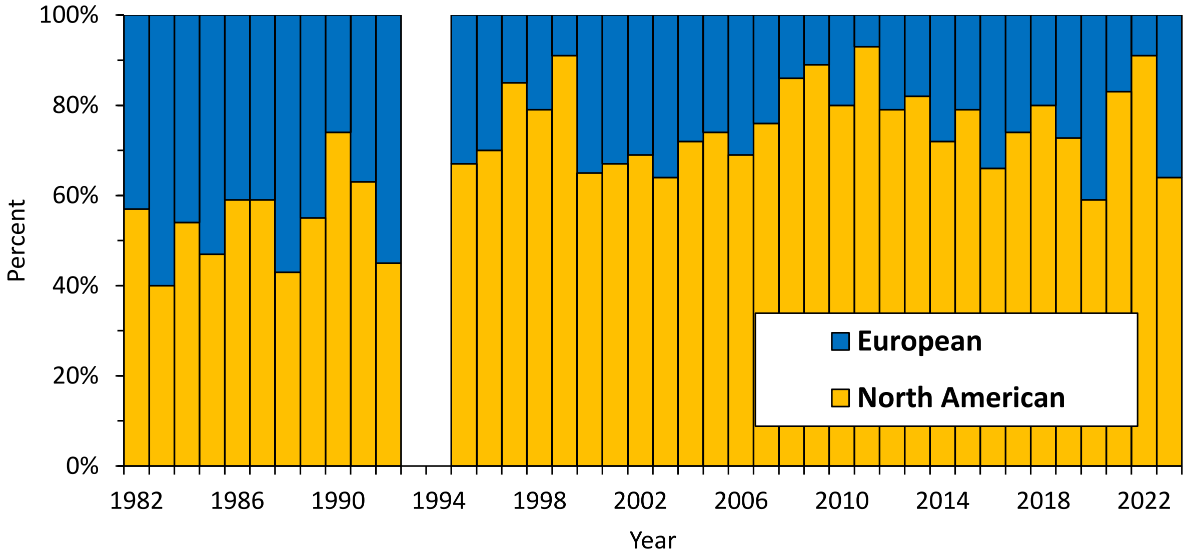

Figure 4 Atlantic salmon at West Greenland. Estimated per cent of continent of origin of Atlantic salmon harvested at West Greenland from 1982 to the present. There was no fishery in 1993 and 1994.

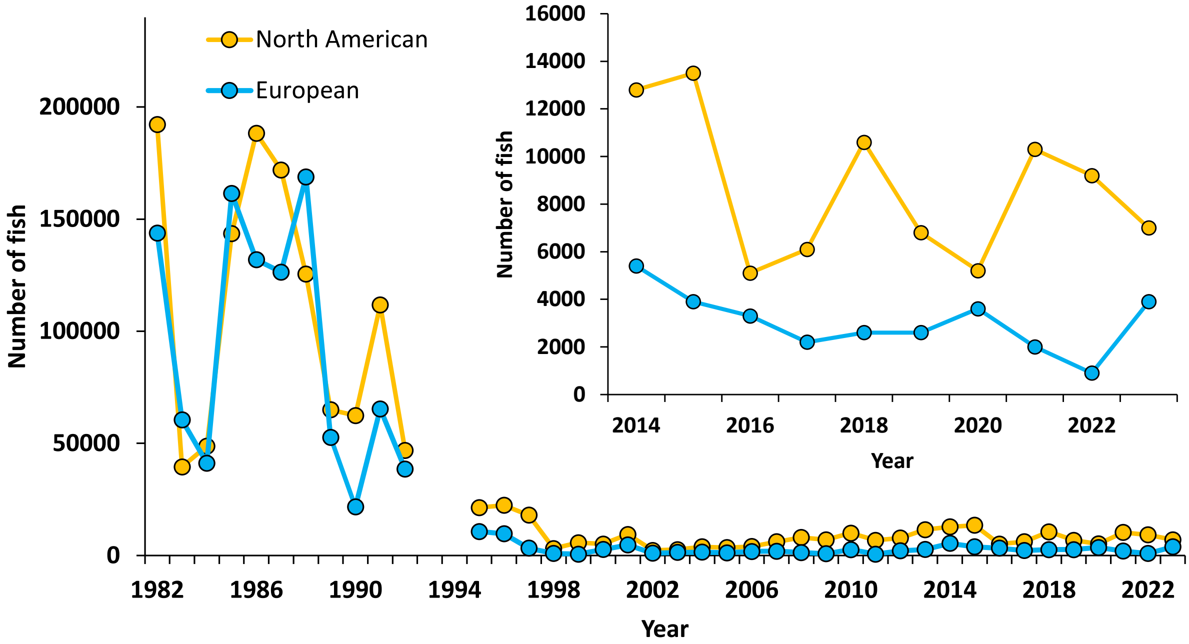

Figure 5 Atlantic salmon at West Greenland. Number of North American and European Atlantic salmon caught at West Greenland in 1982–2023 (main figure) and 2014–2023 (inset). Estimates are based on continent of origin by NAFO division, weighted by catch (weight) in each division. Unreported catch is not included. There was no fishery in 1993 or 1994.

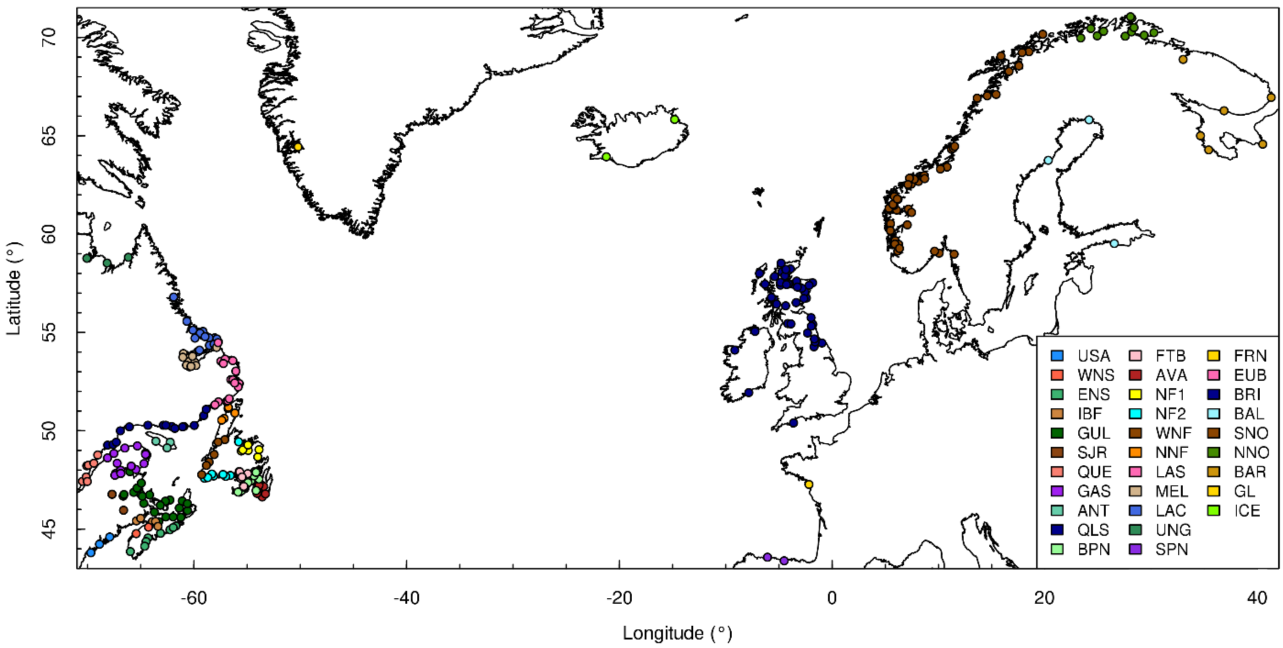

Figure 6 Atlantic salmon at West Greenland. Map of sample locations used in the range-wide genetic baseline (single nucleotide polymorphisms [SNPs]) for Atlantic salmon. The SNP provided assignment of individual Atlantic salmon to 21 North America and 10 European genetic reporting groups (labelled and identified by colour). The full names of the genetic reporting groups and the corresponding ICES assessment regions are provided in Table 6. The European Broodstock (EUB) reporting group is not represented on the map.

NASCO 4.2 Describe the status of the stocks

In 2023, the estimates (median) of spawner abundance for four of the seven stock complexes exploited at West Greenland were below Conservation Limits (CLs)/management objectives (MOs). Estimated spawners were below CLs for the Gulf and Newfoundland regions and below the MOs for the Scotia–Fundy and US regions and therefore suffering reduced reproductive capacity for all four regions. The S-NEAC (Southern North-East Atlantic Commission area) is considered to be at risk of suffering reduced reproductive capacity. The Labrador and Quebec regions were considered at full reproductive capacity. The percentage of the CL/MO attained ranged from 9% in Scotia–Fundy to 182% in Labrador (Figure 7). Particularly large deficits are noted in the Scotia–Fundy and US regions.

The exploitation rate (catch in Greenland divided by (Pre-Fishery Abundance [PFA]) in 2023 was 4.4% for NAC (North American Commission area) fish and 0.3% for S-NEAC fish (Figure 8). Despite major changes in fisheries management in the past few decades and increasingly restrictive fisheries measures, returns have remained low compared to historical levels. It is likely, therefore, that other factors besides fisheries are constraining production.

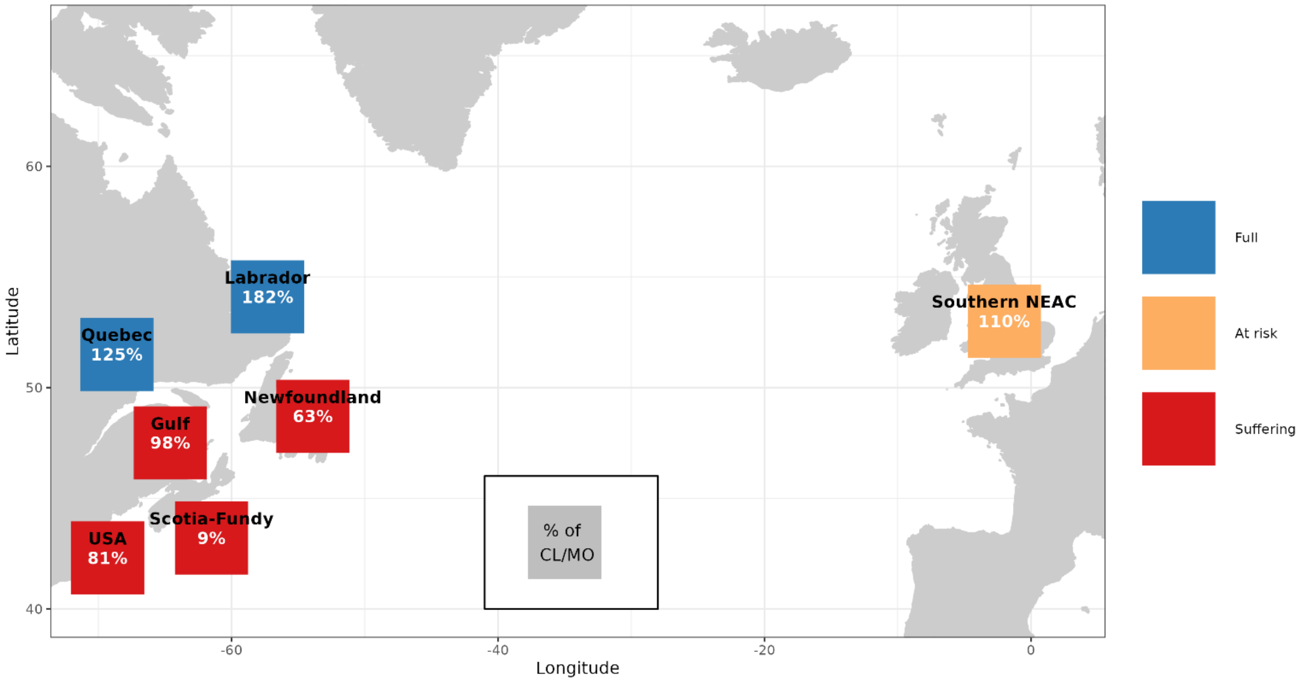

Figure 7 Atlantic salmon at West Greenland. Summary of 2SW (NAC regions) and MSW (southern NEAC) 2023 median (from the Monte Carlo posterior distributions) spawner estimates in relation to Conservation Limits (CLs) or management objectives (MOs; only for US and Scotia–Fundy). The colours used as shading represent the three ICES stock status designations: blue = Full (at full reproductive capacity; the 5th percentile of the spawner estimate is above the CL); orange = At risk (at risk of suffering reduced reproductive capacity; the median spawner estimate is above but the 5th percentile below the CL); red = Suffering (suffering reduced reproductive capacity; the median spawner estimate is below the CL).

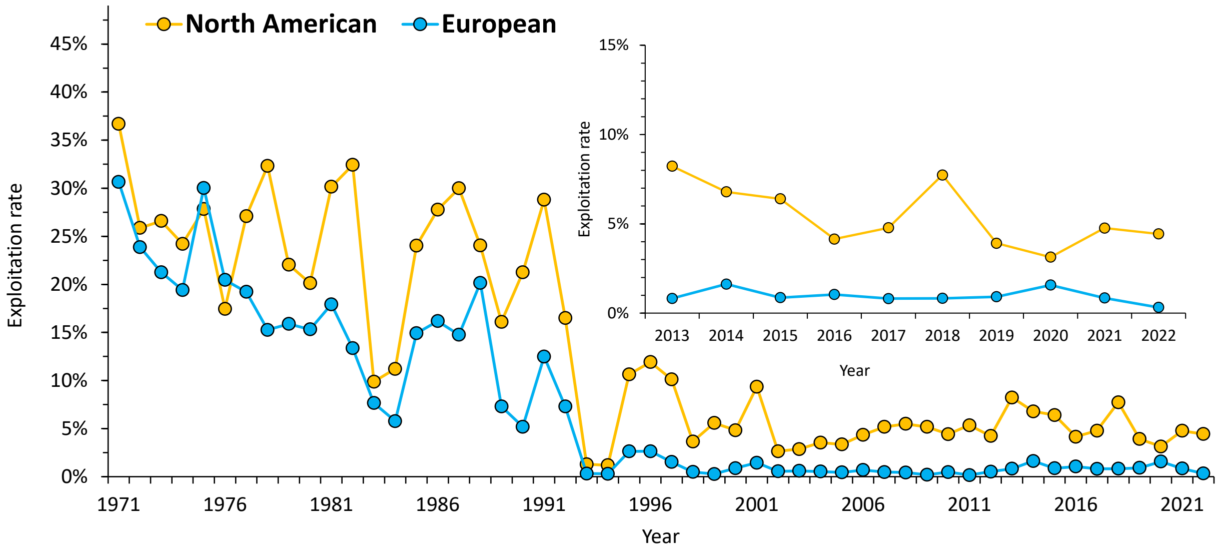

Figure 8 Atlantic salmon at West Greenland. Exploitation rate (%) for NAC 1SW non-maturing and European non-maturing Atlantic salmon at West Greenland in 1971–2022 and 2013–2022 (insert). Exploitation rate estimates are only available up to 2022, as 2023 exploitation rates are dependent on 2024 returns.

NASCO 4.3 Provide catch options or alternative management advice for 2024–2026 with an assessment of risk relative to the objective of exceeding stock conservation limits, or pre-defined NASCO Management Objectives, and advise on the implications of these options for stock rebuilding

Catch options for the West Greenland fishery for 2024 to 2026 are based on application of the recently benchmarked Life-cycle Model (LCM; ICES, 2023a, 2024b). This model uses a risk analysis framework that considers CLs or alternate MOs of the NAC and NEAC areas (Table 8). The risk analysis framework makes full use of the outputs from the LCM. The risks of the Greenland fishery to NAC and NEAC stock complexes are developed in parallel and combined into a single catch options table (Table 9, Figure 9). In summary, none of the stated management objectives would allow a mixed-stock fishery at West Greenland to take place in 2024, 2025, or 2026. Specifically:

- Even if there were no mixed-stock fisheries at Greenland and North America, the minimum probability to meet the conservation requirements among the four northern regions (Labrador, Newfoundland, Québec, and Gulf) is estimated to be 0.18, 0.34, and 0.43 in 2024, 2025, and 2026, respectively (Table 9). For all three years, Newfoundland has the lowest probability of the four regions.
- In the absence of any marine mixed-stock fishing mortality at Greenland and North America, there is a low probability (from 0.01 to 0.06) that the returns in the southern region of Scotia–Fundy will be sufficient to meet the stock rebuilding objective during the period 2024 to 2026. The probability of meeting or exceeding the stock rebuilding objective of the US region is estimated at 0.04 to 0.30 over the three years.
- In the absence of any marine mixed-stock fishing mortality at Greenland and in NEAC, the probabilities of meeting or exceeding the CL for the Southern NEAC MSW complex are 0.57, 0.57, and 0.53 in 2024 to 2026 respectively.
- In the absence of any marine mixed-stock fishing mortality on these stocks, there is a near zero probability (0.0 to 0.02) of meeting or exceeding the seven management objectives simultaneously in 2024 to 2026.

Relevant factors to be considered in management

The management of all fisheries should be based upon assessments of the status of individual stocks. Fisheries on mixed stocks, particularly in coastal waters or on the high seas, pose particular difficulties for management, as they target all stocks present, whether or not they are meeting their individual CLs. Conservation would be best achieved if fisheries target stocks that have been shown to be meeting CLs. Fisheries in estuaries and especially rivers are more likely to meet this requirement.

The Atlantic salmon caught in the West Greenland fishery are mostly (> 90%) non-maturing 1SW Atlantic salmon, most of which are destined to return to home waters in Europe or North America as 2SW fish. The primary European stocks contributing to the fishery in West Greenland are thought to originate in the southern MSW stock complex, although small numbers may also originate in northern Europe. Most MSW stocks in North America are thought to contribute to the fishery at West Greenland. Previous spawners, including Atlantic salmon that spawned first as 1SW and 2SW Atlantic salmon also contribute to the fishery but in generally low (< 5%) proportions.

Table 8 Atlantic salmon at West Greenland. Conservation Limits (CLs) and management objectives (MOs; only for US and Scotia–Fundy) and equivalent number of fish relevant to the development of catch options at West Greenland for the six geographic areas in the NAC area and the Southern NEAC non-maturing complex.

Area	Objective	Number of fish
United States	2SW proportion of recovery criteria	4549
Scotia–Fundy	25% increase from 2SW returns during 1992 to 1997	10976
Gulf	2SW conservation limit	18737
Québec	2SW conservation limit	17364
Newfoundland	2SW conservation limit	4022
Labrador	2SW conservation limit	34746
S-NEAC non-maturing complex	MSW conservation limit	174735

Table 9 Atlantic salmon at West Greenland. Catch options tables (tonnes) for the mixed-stock fishery at West Greenland by PFA year 2024 to 2026 and the probabilities of meeting or exceeding region-specific Conservation Limits (CLs)/management obectives (MOs).

	Probability of meeting or exceeding region-specific CL/MOs							
	Labrador (%)	Newfoundland (%)	Québec (%)	Gulf (%)	Scotia–Fundy (%)	US (%)	S-NEAC (aggregated; %)	NAC and S-NEAC (simultaneously; %)
2024 catch options								
0	69	18	74	48	1	4	57	0
10	68	18	71	47	1	3	56	0
20	65	17	69	44	1	3	56	0
30	63	16	67	42	1	3	55	0
40	61	15	64	40	1	2	55	0
50	58	14	61	38	1	2	54	0
60	56	14	58	36	1	2	53	0
70	53	12	56	34	1	2	53	0
80	52	12	53	32	1	2	52	0
90	51	11	50	30	0	2	52	0
100	48	11	47	29	0	1	51	0
2025 catch options								
0	65	34	76	50	2	8	57	0
10	64	32	74	49	2	7	57	0
20	62	31	73	47	2	7	56	0
30	60	30	70	46	2	7	55	0
40	58	29	68	45	2	6	55	0
50	56	28	67	44	2	6	55	0
60	55	27	65	43	2	6	54	0
70	53	26	63	41	2	5	54	0
80	52	25	60	40	1	5	53	0
90	50	24	57	38	1	5	53	0
100	48	24	56	36	1	4	52	0
2026 catch options								
0	69	43	72	44	6	30	53	2
10	68	42	70	43	6	30	52	2
20	66	41	68	42	6	28	51	2
30	65	40	66	40	5	27	51	2
40	63	39	64	40	5	26	51	2
50	62	37	62	39	5	25	50	2
60	60	37	61	38	5	24	49	1
70	59	35	60	37	4	24	49	1
80	57	34	58	36	4	23	48	1
90	55	33	57	34	4	22	47	1
100	54	32	56	33	4	21	47	1

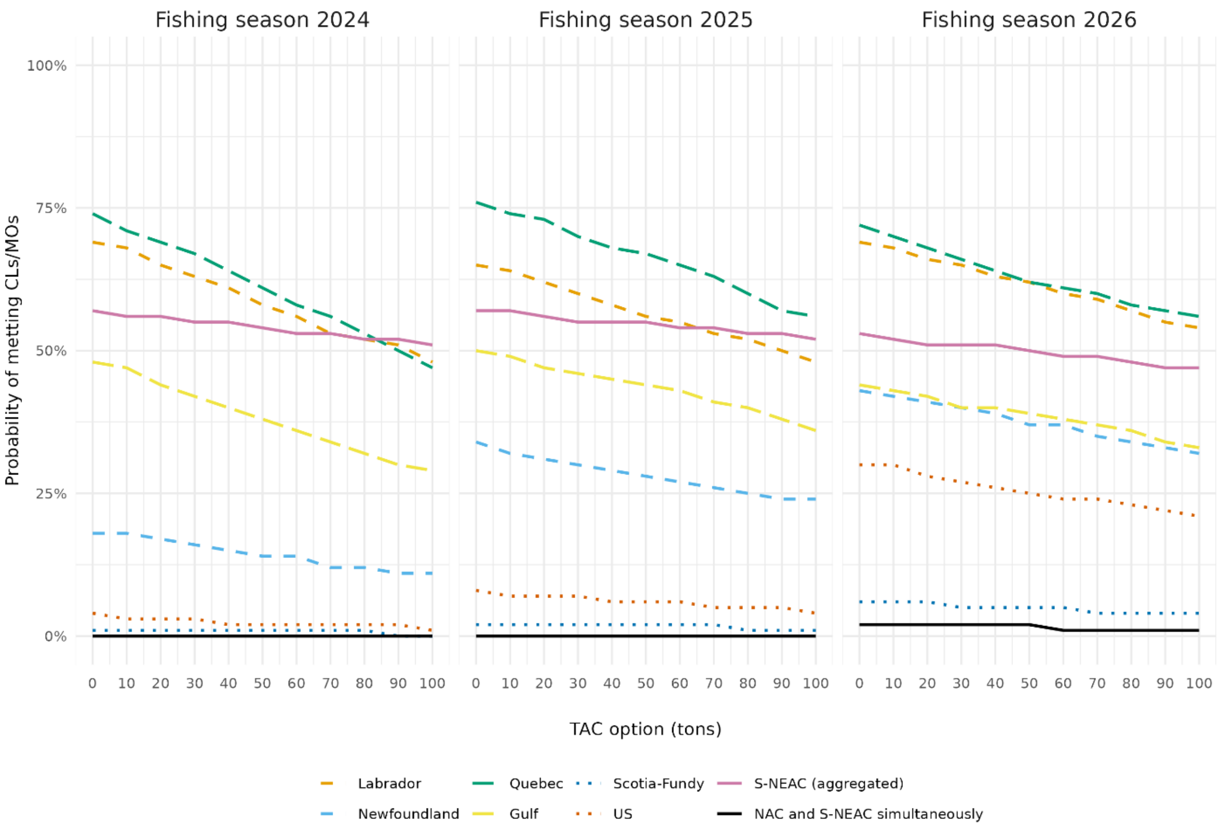

Figure 9 Atlantic salmon at West Greenland. Probability of six NAC regions and S-NEAC 2SW returns, and all stock complexes simultaneously, achieving their 2SW Conservation Limits (CLs)/management objectives (MOs) for different catch options for the 2024, 2025, and 2026 West Greenland fisheries. Catch options for the 2024–2026 fisheries will affect 2SW returns in 2025–2027 respectively.

Conservation status

Atlantic salmon (*Salmo salar*) was assessed for the IUCN Red List of Threatened Species in 1996, for Europe in 2014, and globally in 2022, and it is listed globally as Threatened under criteria A2bd (Darwall, 2023). In addition, there are regional and national Red List assessments for this species.

This is for information purposes and ICES does not formally endorse the methods used by third parties to create lists.

Scientific basis

Table 10 Atlantic Salmon at West Greenland. The basis of the assessment.

ICES stock data category	1 (ICES, 2023b)
Assessment type	Run Reconstruction Model and Bayesian Life-cycle Model taking into account uncertainties in data and process error. Results presented in a risk analysis framework (ICES, 2024a, 2024b).
Input data	Reported (i.e. nominal) catches (by sea age class and continent of origin) for internal use fisheries; estimates of returns; estimates of unreported/illegal catches; estimates of exploitation rates; biological characteristics
Discards and bycatch	No Atlantic salmon discards in the directed Atlantic salmon fishery. Atlantic salmon bycatch is known to occur, but it is not included in the assessment.
Indicators	None
Other information	Last benchmarked in 2023 (ICES, 2023a)
Working group	Working Group on North Atlantic Salmon (WGNAS)

Issues relevant for conservation advice

Abundance of Atlantic salmon is affected by similar non-fishing influences throughout the North Atlantic. Despite major changes in fisheries management two to three decades ago and increasingly more restrictive fisheries measures since then, returns of most Atlantic salmon stocks are at near-historical lows. The continued low and declining abundance of many Atlantic salmon stocks, despite significant fishery reductions, strengthens the conclusion that factors acting on survival in the first and second years at sea – at both local and broad ocean scales – are constraining abundance of Atlantic salmon. Declines in smolt production are also contributing to lower adult abundance.

Environmental conditions in both freshwater and marine environments have a marked effect on the status of Atlantic salmon stocks. There are a range of problems in the freshwater environment across the North Atlantic that play a significant role in explaining the poor status of stocks. In many cases, river damming and habitat deterioration have had a negative effect on freshwater environmental conditions. In the marine environment, return rates of adult Atlantic salmon have declined through the 1980s and are now at the lowest levels in the time-series for some stocks, even after closure of marine fisheries. Climatic factors modifying ecosystem conditions and the impact of predators of Atlantic salmon at sea are considered to be the main contributory factors to lower productivity, which is expressed almost entirely in terms of lower marine survival.

Identify relevant data deficiencies, monitoring needs, and research requirements

No data deficiencies, monitoring needs, or research requirements of relevance to the West Greenland Commission were identified. The full list of data deficiencies, monitoring needs, and research requirements for North Atlantic salmon is presented in Section 1.7 of ICES (2024c).

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Annex 1 Glossary of acronyms and abbreviations

1SW *one-sea-winter;* maiden adult Atlantic salmon that has spent one winter at sea
2SW *two-sea-winter;* maiden adult Atlantic salmon that has spent two winters at sea
MSW multi-*sea-winter*; *a*dult Atlantic salmon that has spent two or more winters at sea
CL(s) *conservation limits(s)*, i.e. S_{lim}; demarcation of undesirable stock levels or levels of fishing activity; the ultimate objective when managing stocks and regulating fisheries is to ensure that there is a high probability that undesirable levels are avoided
ICES *International Council for the Exploration of the Sea*
LCM *Life-cycle Model*
NAC *North American Commission;* a commission under NASCO
NAFO *Northwest Atlantic Fisheries Organization*; an intergovernmental fisheries science and management organization that ensures the long-term conservation and sustainable use of fishery resources in the Northwest Atlantic
NASCO *North Atlantic Salmon Conservation Organization*
NEAC *North-East Atlantic Commission*; a commission under NASCO
PFA *pre-fishery abundance*; the numbers of Atlantic salmon estimated to be alive in the ocean from a particular stock at a specific time.

Annex 2 General considerations

Management plans

The North Atlantic Salmon Conservation Organization (NASCO) has adopted an Action Plan for Application of the Precautionary Approach, which stipulates that management measures should be aimed at maintaining all stocks above their CLs by the use of management targets. Conservation Limits for North Atlantic salmon stock complexes have been defined by ICES as the level of a stock (number of spawners) that will achieve long-term average maximum sustainable yield (MSY). NASCO has adopted the region-specific CLs as limit reference points (S_{lim}); having populations fall below these limits should be avoided with high probability. Within the management plan, a simultaneous risk level (probability) of 75% has been agreed for the provision of catch advice on the stock complexes exploited at West Greenland (non-maturing 1SW fish from North America and Southern NEAC). The management objectives are to meet (a) the Southern NEAC MSW CL, (b) the 2SW CLs for the four northern areas of the NAC (Labrador, Newfoundland, Quebec, and Gulf) to achieve a 25% increase in returns of 2SW Atlantic salmon from the average returns in the period 1992–1996 for the Scotia–Fundy region of NAC, and (c) to achieve 2SW adult returns of 4549 fish or greater for US region of NAC. An FWI of indicators has been developed in support of the multiannual catch options.

Biology

Atlantic salmon (*Salmo salar*) is an anadromous species found in rivers of countries bordering the North Atlantic. In the Northeast Atlantic area its current distribution extends from the Lima River (41°69’) in northern Portugal to the Pechora River (68°20’) in Northwest Russia and Iceland (66°44’). In the Northwest Atlantic distribution ranges from the Connecticut River (US, 41°.6°’N) northwards to 60°29’ N in the Ungava Bay (Quebec, Canada). Juveniles migrate to the ocean at ages of between one and eight years (dependent on latitude) and generally return after one or two years at sea. Long-distance migrations to ocean feeding grounds are known to take place, with adult Atlantic salmon from both the North American and Northeast Atlantic stocks migrating to Greenland to feed during their second summer and autumn at sea.

Environmental and other influences on the stock

Environmental conditions in both freshwater and marine environments have a marked effect on the status of Atlantic salmon stocks. Across the North Atlantic, a range of problems in the freshwater environment play a significant role in explaining the poor status of stocks. In many cases river damming and habitat deterioration have had a devastating effect on freshwater environmental conditions. In the marine environment, return rates of adult Atlantic salmon have declined through the 1980s and are now at the lowest levels in the time-series for some stocks, even after closure of marine fisheries. Climatic factors modifying ecosystem conditions, and the impact of predators of Atlantic salmon at sea, are considered to be the main factors contributing to lower productivity, which is expressed almost entirely in terms of lower marine survival.

Effects of the fisheries on the ecosystem

The current Atlantic salmon fishery uses nearshore surface gillnets. There is no information on bycatch of other species with this gear. The fisheries probably have no influence, or only a minor influence, on the marine ecosystem.

Quality considerations

Uncertainties in input variables to the stock status and stock forecast models are incorporated in the assessment. Catch reporting at Greenland is considered to be incomplete.

The COVID-19 pandemic prevented the international sampling programme from taking place, which resulted in no data on biological characteristics, continent/region of origin, and non-reporting of harvest being available for 2020. Previous five-year mean values were used for the 2020 biological characteristics of Atlantic salmon in the fishery at West Greenland. For the 2020 assessment year, previous five-year mean values were used in some regions of NAC because of the impact of the COVID-19 pandemic on field programmes.