North Atlantic salmon stocks

Introduction

Main tasks

At its 2020 Statutory Meeting, ICES resolved (C. Res. 2019/2/ACOM21) that the Working Group on North Atlantic Salmon (WGNAS, chaired by Dennis Ensing, UK) would meet in Copenhagen, Denmark, 21–31 March 2021 to consider questions posed to ICES by the North Atlantic Salmon Conservation Organization (NASCO). Due to the COVID-19 pandemic, the working group met via web conference to address these questions.

The table below identifies the sections of the report (ICES, 2021a) 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.nasco
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 2020[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 2020;	
1.4	identify relevant data deficiencies, monitoring needs and research requirements.	
2	With respect to Atlantic salmon in the Northeast Atlantic Commission area:	sal.neac.all
2.1	describe the key events of the 2020 fisheries[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 2021 / 2022–2023 / 2024 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]; and	
2.5	update the Framework of Indicators used to identify any significant change in the previously provided multiannual management advice.	
3	With respect to Atlantic salmon in the North American Commission area:	sal.nac.all
3.1	describe the key events of the 2020 fisheries (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;	
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 2021–2024 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] ; and	
3.5	update the Framework of Indicators used to identify any significant change in the previously provided multiannual management advice.	
4	With respect to Atlantic salmon in the West Greenland Commission area:	sal.wgc.all
4.1	describe the key events of the 2020 fisheries[3];	
4.2	describe the status of the stocks[5];	
4.3	provide catch options or alternative management advice for 2021–2023 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] ; and	
4.4	update the Framework of Indicators used to identify any significant change in the previously provided multiannual management advice.	

[1] With regard to question 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 question 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, including information on any new research into the migration and distribution of salmon at sea and the potential implications of climate change for salmon management.
[3] In the responses to questions 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 4.1, if any new phone surveys are conducted, ICES should review the results and advise on the appropriateness for incorporating resulting estimates of unreported catch into the assessment process.)
[4] In response to questions 2.4, 3.4 and 4.3, ICES is asked to 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 to provide a detailed explanation and critical examination of any concerns with salmon data collected in 2020 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 question 4.2, ICES is requested to provide a brief summary of the status of North American and Northeast Atlantic salmon stocks. The detailed information on the status of these stocks should be provided in response to questions 2.3 and 3.3.

In response to the ToR, the WGNAS considered 33 working documents. A complete list of acronyms and abbreviations used in this report is provided in Annex 1. References cited are given in Annex 2.

Please note that for practical reasons Tables 5–8 are found at the end, immediately before the annexes.

Management framework for salmon in the North Atlantic

This advice has been generated by ICES in response to the ToR posed by the NASCO, pursuant to its role in international management of 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 salmon in the North Atlantic. Although sovereign states retain their role in the regulation of salmon fisheries for salmon originating in their own rivers, distant-water salmon fisheries, such as those at Greenland and the Faroes, which take salmon originating in rivers of another Party, are regulated by NASCO under the terms of the Convention. NASCO now has seven 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 part 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 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".

Reference points and application of precaution

Atlantic salmon has 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, 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 salmon, this approach has led to defining river-specific conservation limits (CLs) as equivalent to MSY $B_{escapement}$. CLs 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 the precautionary approach, fisheries should only take place on salmon from rivers where stocks have been shown to be at full reproductive capacity. Furthermore, due to differences in status of individual stocks within stock complexes, mixed-stock fisheries present particular threats.

In many counties/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). CLs 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).

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 [NEAC–S]), 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 salmon

In this document, catches are equivalent to harvest, with the exception of the recreational fishery where catch-and-release is referred to. For clarity, detailed Tables 5–8 are provided at the end of the report.

Reported total catches of salmon in four North Atlantic regions from 1960 to 2020 are shown in Figure 1. Catches reported by country are given in Table 5. Catch statistics in the North Atlantic include fish-farm escapees and in some Northeast Atlantic countries also ranched fish.

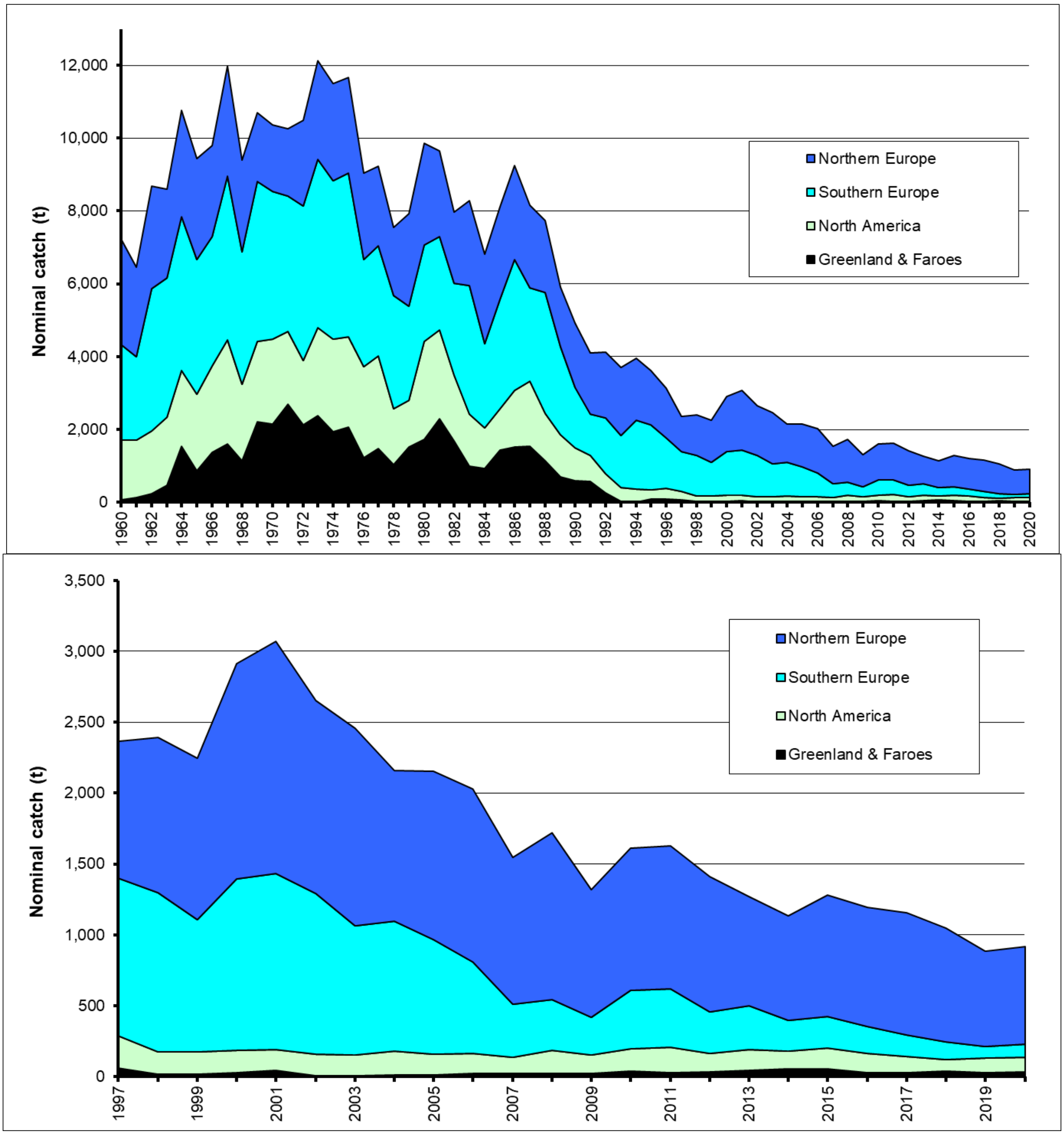

Figure 1 Total reported catch of salmon (tonnes, round fresh weight) in four North Atlantic regions, 1960–2020 (top) and 1997–2020 (bottom).

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 2020 (Table 5). Catches in Sweden are also separated into wild and ranched over the entire time-series. The latter fish represent adult 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 Reported catches (in tonnes) for the three NASCO commission areas for 2011–2020.

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NEAC	1419	1250	1080	954	1081	1028	1015	929	755	778
NAC	182	129	143	122	144	140	113	80	101	106
WGC	27	34	47	58	57	28	28	40	29	32
Total	1629	1412	1270	1134	1282	1196	1156	1049	886	915

The provisional total reported catch for 2020 was 915 t, the second lowest in the time-series. 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 The 2020 reported catches (in tonnes) for the NEAC and NAC commission areas.

Area	Coastal		Estuarine		In-river		Total
	Weight	%	Weight	%	Weight	%	Weight
NEAC 2020	231	30	23	3	524	67	778
NAC 2020	9	8	44	42	53	50	106

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 231 t in 2020, and in-river catches have declined from 594 t in 2009 to 454 t in 2020. There are no coastal fisheries in Iceland, Denmark, or Finland. 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 the coastal fisheries catches represent around 30%–40% of the total. In 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 2019. Since 2007, the majority of the catch in this area has been reported from in-river fisheries. In NAC, around two thirds of the total catch in this area has been taken by in-river fisheries, although it was about half since 2018; the catch in coastal fisheries has been relatively small throughout the time-series (13 t or less).

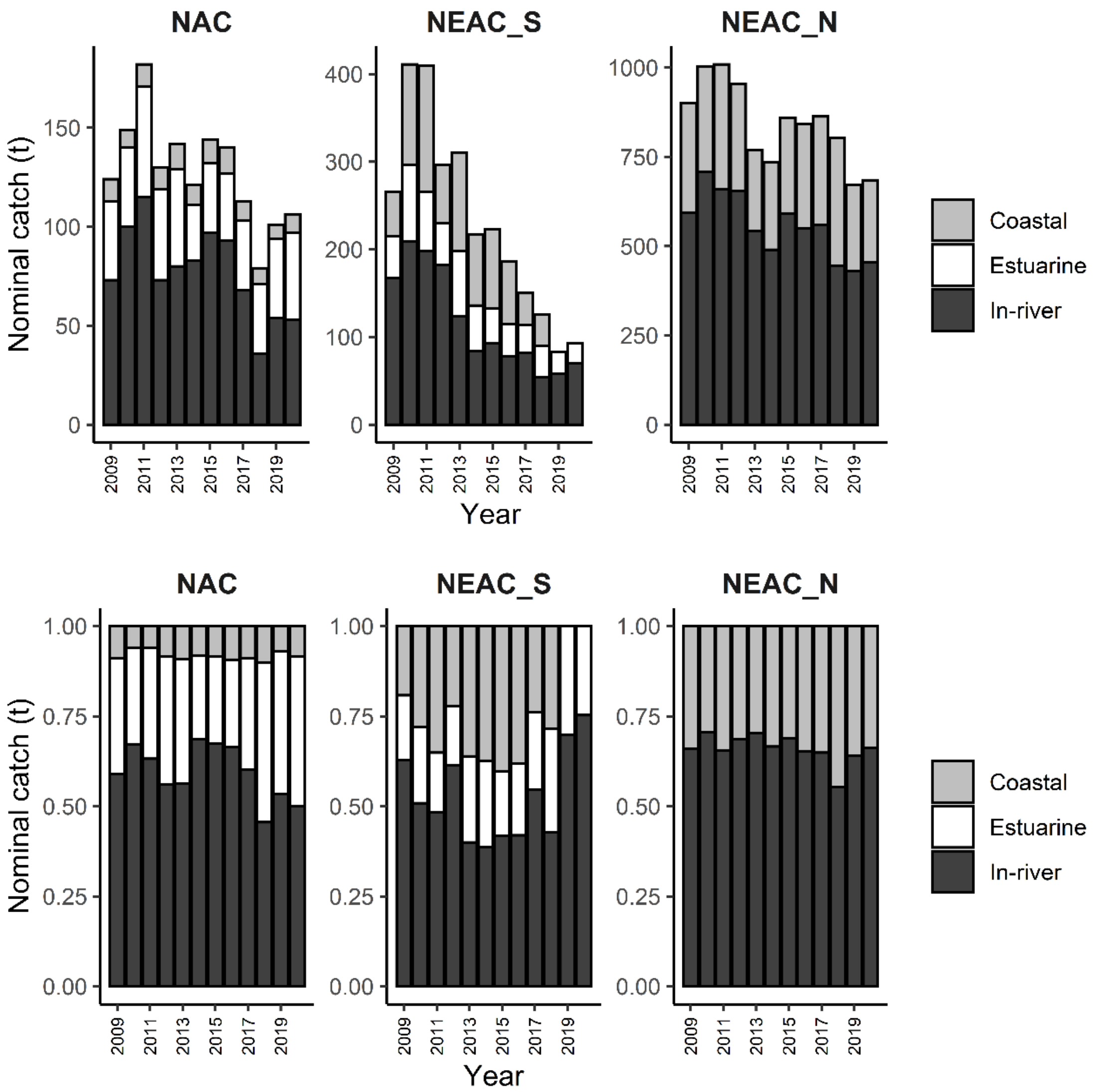

Figure 2 Reported catches (tonnes; top panels) and percentages of the reported catches (bottom panels) from coastal, estuarine, and in-river fisheries for the NAC area, and for the Northern (NEAC–N) and Southern (NEAC–S) NEAC areas in 2009–2020. Note that scales of vertical axes in the top panels vary.

There is considerable variability in the distribution of the catch among individual countries (Figure 3; Table 6). 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. However, reported catches from in-river fisheries have also declined in many countries as a result of increasing use of catch-and-release in angling fisheries.

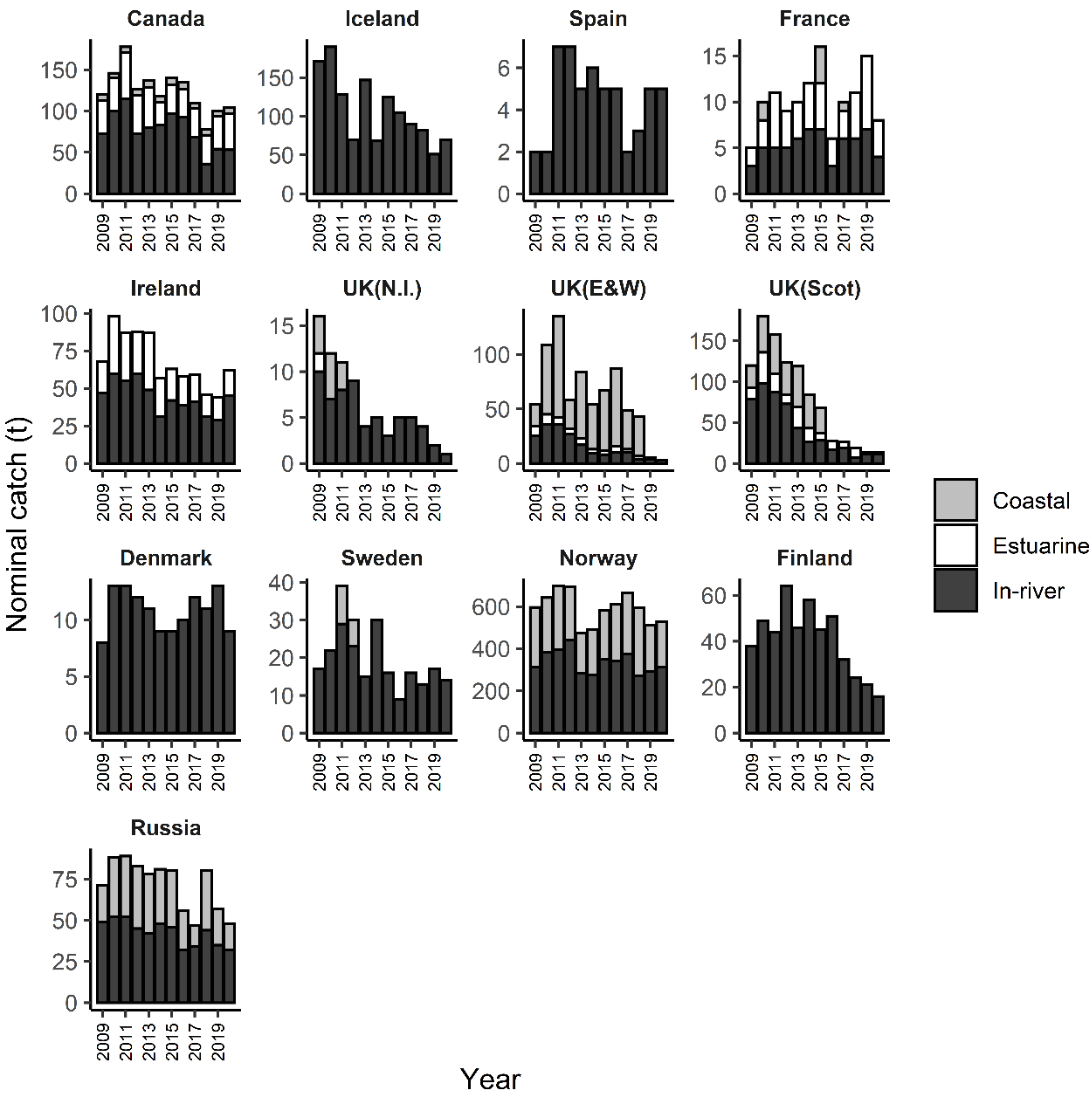

Figure 3 Reported catch (tonnes) by country taken in coastal, estuarine, and riverine fisheries, 2009–2020. Note that scales on the *y*-axes vary. USA is not included because there has been no catch. 100% of the fishery at St Pierre and Miquelon and at West Greenland occurs in coastal areas. These catches are not shown.

Unreported catches

The total unreported catch in NASCO areas in 2020 was estimated at 276 t. No estimates were provided for Russia, France, Spain, or St Pierre and Miquelon in 2020. The unreported catch in the NEAC area in 2020 was estimated at 239 t, and that for the West Greenland and North American commission areas at 10 t and 27 t, respectively.

Table 3 Unreported catch (in tonnes) by NASCO commission area in the last ten years.

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
NEAC	382	363	272	256	298	298	318	277	237	239
NAC	29	31	24	21	17	27	25	24	12	27
WGC	10	10	10	10	10	10	10	10	10	10
Total	421	403	306	287	325	335	353	311	259	276

The 2020 unreported catch by country is provided in Table 7. Unreported catch data 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 a salmon management/conservation measure in light of the widespread decline in salmon abundance in the North Atlantic. In some areas of Canada and USA, C&R became widely applied as a management measure in 1984, and in recent years this has been introduced in many European countries, both as a result of statutory regulation and through voluntary practice.The reported catches do not include 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 8 presents C&R information from 1991 to 2020 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 2020, it ranged from 16% in Sweden to 93% in UK (England and Wales), 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 196 000 salmon were reported to have been caught and released in the North Atlantic area in 2020.

Farming and sea ranching of Atlantic salmon

The provisional estimate of farmed Atlantic salmon production in the North Atlantic area for 2020 was 1 821 000 tonnes (Figure 4). The production of farmed salmon in this area has exceeded one million tonnes since 2009. Norway and UK (Scotland) continue to produce the majority of the farmed salmon in the North Atlantic (77% and 11%, respectively). Farmed salmon production in 2020 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 USA 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 2020 is provisionally estimated at 2 638 000 tonnes (Figure 4), which is higher than 2019, and higher than the previous five-year mean (2 394 000 tonnes). Production outside the North Atlantic is estimated to have accounted for one-third of the total worldwide production in 2020, dominated by Chile (81%).

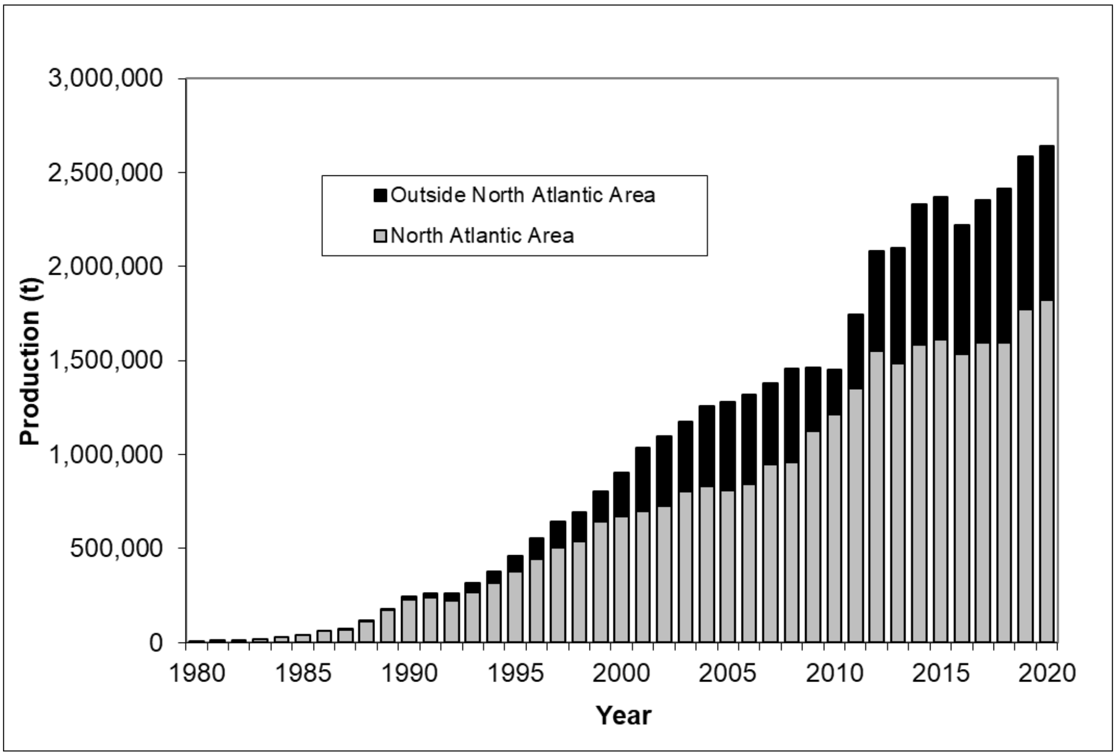

Figure 4 Worldwide production of farmed Atlantic salmon 1980 to 2020.

The reported catch of Atlantic salmon in the North Atlantic was in the order of 0.04% of the worldwide production of farmed Atlantic salmon in 2020.

The total harvest of ranched Atlantic salmon in countries bordering the North Atlantic in 2020 was 39 tonnes, all taken in Iceland, Sweden, and Ireland (Figure 5), with the majority of the catch taken in Iceland (28 tonnes). No estimate was made of the ranched salmon production in Norway in 2020, where such catches have been very low in recent years (< 1 tonne), or in UK (Northern Ireland), where the proportion of ranched fish has not been assessed since 2008.

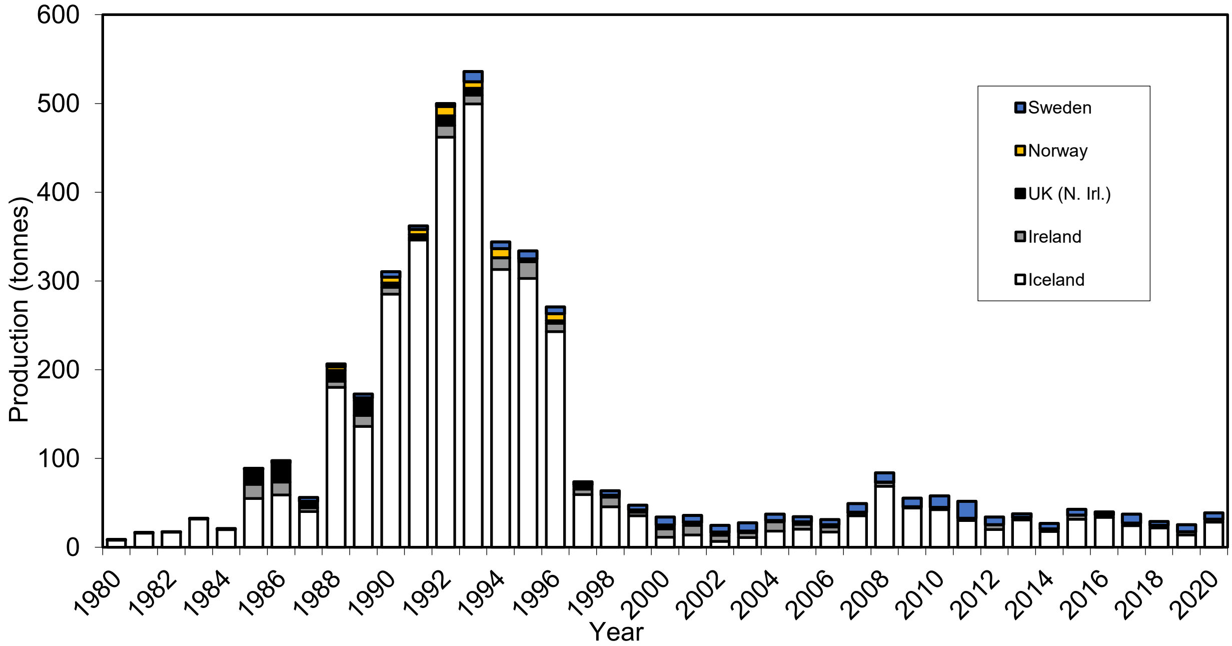

Figure 5 Harvest of ranched Atlantic salmon (tonnes round fresh weight) in the North Atlantic, 1980 to 2020.

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

A number of topics related to this term of reference were considered by ICES (2021a) and a summary of these is presented below. Details for these are available in the working group report (ICES, 2021a). ICES did not review any recent information on research into the migration and distribution of salmon at sea or the potential implications of climate change for salmon management.

Coronavirus (COVID-19)

The impact of the coronavirus (COVID-19) pandemic was not consistent among jurisdictions with respect to Atlantic salmon fisheries and ICES ability to report 2020 Atlantic salmon catches and status of stocks. There was little or no impact reported for Northern Ireland, Ireland, Iceland, Norway, Sweden and Denmark. In other jurisdictions, stay-at-home orders and travel restrictions affected fishing effort and Atlantic salmon population monitoring activities and also delayed the collection of fisheries statistics.

- In France, UK (Scotland), and UK (England and Wales) recreational fishing effort was reduced because of restrictions due to stay-at-home orders.
- Population monitoring activities were partially disrupted in France and UK (England and Wales), although mainly restricted to the collection of juvenile data. Only in France could adult MSW counts on some rivers not be provided in full.
- In UK (Scotland), collection of fishery statistics was delayed. By the time the 2021 WGNAS meeting convened, these data had not yet been officially published by the Scottish Government, which is a prerequisite for its release to be published by ICES. As an interim measure, 2019 catch statistics were provided for publication in ICES (2021a). However, the 2020 data were used for stock assessment analyses within the run-reconstruction PFA and forecast models.
- In the Maritimes, Gulf, and Labrador, and Newfoundland regions of Canada, population monitoring activities were affected and data could not be collected on every river. In such cases, return and spawner estimates were either estimated using alternative methods such as snorkel counts, or in the absence of that, the previous five-year average values were used, except for Newfoundland where previous six-year averages were used.
- In USA population monitoring activities for smolts were affected but adult monitoring was not.

Threats

- Red Skin Disease (RSD) is a recently defined disease with widespread outbreaks in salmon populations. One such case was in 2019, when several European countries reported Atlantic salmon returning to rivers with RSD in 2020 during late spring into summer. The majority of recorded cases are observed in MSW salmon with the exception of Ireland, where RSD is principally observed in 1SW salmon. This may be a consequence of the Irish stocks being predominantly 1SW. RSD was not reported in Greenland, Canada, or USA.
- A monitoring programme on the Lough Neagh catchment (UK [Northern Ireland]) documented a high incidence of river lamprey (*Lampetra fluviatilis*) parasitisation on Atlantic salmon smolts. An estimated 24% (out of 470) of smolts were considered heavily damaged and unlikely to survive the marine phase. A negative effect on adult salmon recruitment in rivers flowing into Lough Neagh is expected in 2021 (1SW) and 2022 (2SW). The causes of the high parasitism were thought to be associated with low flows restricting smolt migration towards the sea.
- Based on previous observations, substantial returns of odd-year pink salmon (*Oncorhynchus gorbuscha*) in 2021 and 2023 are expected on two major Atlantic salmon rivers in northernmost Finland and Norway, the Teno (Tana in Norwegian) and the Näätämöjoki (Neidenelva in Norwegian). In 2021, a research project funded by the Finnish Ministry of Foreign Affairs, and run in close collaboration with the Norwegian Institute of Nature Research (NINA), will track and sample pink salmon as they migrate within the Teno/Tana. A similar project is planned for tracking pink salmon in the River Näätämöjoki/Neidenelva in 2023. Collaboration and networking between Finland, Norway, and Russia will be further developed, especially with regards to future impacts of pink salmon and possible mitigation measures.

Opportunities

- An assessment of the performance of fishery sampling programmes to estimate catches of non-local origin salmon in mixed-stock fisheries was conducted and presented, using the Labrador subsistence food fishery as a case study. Of particular concern is the impact of the estimated catch of USA-origin salmon at Labrador because of the low abundance and endangered population status of salmon in the eastern USA. At present, sampling rates (% of catch sampled) are low (~4%) for the Labrador fishery and detection of USA-origin salmon (by genetic methods) is a rare event. By simulating catches, varying proportions of non-local origin salmon, and sampling rates it was determined that the current sampling rate produces positively biased and imprecise estimates of catches of USA-origin salmon in the Labrador fishery. A sampling rate of at least 10% of catches in Labrador would be required to achieve a relatively unbiased estimate.

- A German project "GeMoLaR*", running from 2020 to2024; is part of international coordinated genetic monitoring of reintroduced Atlantic salmon in the whole Rhine area. As in other countries bordering the Rhine, the salmon are genetically sampled according to a standardized protocol to investigate restocking success and the efficiency of different stocking strategies.
- The process for collecting salmon catch data necessary for fulfilling the ToR from NASCO to ICES was streamlined through the communication of an ICES Data Call for Atlantic salmon in January 2021. The Data Call resulted in more prompt and comprehensive reporting for the 2020 season. Eleven (of 13 reporting to ICES) countries/jurisdictions provided all, or almost all, of the data required for Section 1.1 of this Advice. This bodes well for the automation of this section's production based on Data Calls in future years.
- In January 2021, a workshop (ICES, 2021b) of jurisdictional experts and modelers was held to advance the application of the Bayesian Life Cycle Model (LCM) to Atlantic salmon stock assessment. The workshop reviewed the LCM, compared the current ICES PFA model with the LCM approach, and discussed the data inputs and process for running the LCM. New online tools were presented which simplify and strengthen the robustness of the stock assessment workflow from data input to production of catch advice. The decision was taken at the workshop to run the LCM in parallel with ICES PFA model during the 2021 WGNAS meeting. The LCM was run during WGNAS 2021 and the results presented to the group. A stock assessment using the new LCM approach is planned to be examined in a benchmark in 2022.

NASCO 1.3 Provision of a compilation of tag releases by country in 2020

Data on releases of tagged, finclipped, and other marked salmon in 2020 are compiled as a separate report (ICES, 2021c). In summary (Table 4):

- Approximately 1.96 million salmon were marked in 2020, reduced from the 2.2 million salmon marked in 2019.
- The adipose clip was the most commonly used primary marker (1.65 million), with coded wire microtags (CWT) (0.836 million) being the next most common.
- Most marks were applied to hatchery-origin juveniles (1.73 million), while 40 678 wild juveniles, 31 032 wild adults, and 160 355 hatchery adults were also marked.
- The use of Passive Integrated Transponder (PIT) tags, data storage tags (DSTs), radio and/or sonic transmitting tags (pingers) has increased in recent years but in 2020, 91 390 salmon were tagged with these tag types (Table 4), which was a marked decrease from previous year (161 705). Reduced numbers of tagged salmon in 2020 may in some countries be related to restrictions due to the COVID-19 pandemic. ICES notes that not all electronic tags were reported in the tag compilation. Tag users should be encouraged to include these tags or tagging programmes as this greatly facilitates identification of the origin of tags recovered in fisheries or tag scanning programmes in other jurisdictions.

Since 2003, ICES has reported information on marks being applied to farmed salmon to facilitate tracing the origin of farmed salmon captured in the wild in the case of escape events. In USA, genetic identification procedures have been adopted where broodstock are genetically screened, and the resulting database is used to match genotyped escaped farmed 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, 17 out of 21 farmed escapees could be traced to the pens they escaped from by matching their genotypes to known parental genotypes, and a further two could be traced to foreign broodstocks.

* https://www.gemolar.fish

Table 4 Summary of Atlantic salmon tagged and marked in 2020. 'Hatchery' and 'wild' juvenile refer to smolts and parr.

Country	Origin	Primary tag or mark			Other internal*	Total
		Microtag	External mark**	Adipose clip		
Canada	Hatchery adult	0	1414	10	513	1937
	Hatchery juvenile	0	964	0	0	964
	Wild adult	0	934	11	758	1703
	Wild juvenile	0	11666	7630	824	20120
	Total	0	14978	7651	2095	24724
Denmark	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	306000	0	306000
	Wild adult	0	0	0	870	870
	Wild juvenile	0	0	0	0	0
	Total	0	0	306000	870	306870
France	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	3960	0	3960
	Wild adult	0	0	0	575	575
	Wild juvenile	0	0	0	2912	2912
	Total	0	0	3960	3487	7447
Iceland	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	60126	0	0	0	60126
	Wild adult	0	165	0	0	165
	Wild juvenile	2687	0	0	382	3069
	Total	62813	165	0	382	63360
Ireland	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	126713	0	0	0	126713
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	0	2441	2441
	Total	126713	0	0	2441	129154
Norway	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	3609	0	52 965	56574
	Wild adult	0	436	0	23 229	23665
	Wild juvenile	0	501	0	80	581
	Total	0	4546	0	76274	80820
Russia	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	836774	0	836774
	Wild adult	0	238	0	0	238
	Wild juvenile	0	0	0	0	0
	Total	0	238	836774	0	837012
Spain	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	91518	0	91518
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	0	0	0
	Total	0	0	91518	0	91518
Sweden	Hatchery adult	0	0	158418	0	158418
	Hatchery juvenile	0	0	0	0	0
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	0	0	0
	Total	0	0	158418	0	158418
UK (England & Wales)	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	9600	0	9600
	Wild adult	0	564	0	0	564
	Wild juvenile	607	0	8263	100	8970
	Total	607	564	17863	100	19134
UK (N. Ireland)	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	5549	0	63440	0	68989
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	0	0	0
	Total	5549	0	63440	0	68989

Country	Origin	Primary tag or mark			Other internal*	Total
		Microtag	External mark**	Adipose clip		
UK (Scotland)	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	21500	0	21500
	Wild adult	0	585	0	1	586
	Wild juvenile	0	385	0	1995	2380
	Total	0	970	21500	1996	24466
Germany	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	77000	1286	78286
	Wild adult	0	15	0	0	15
	Wild juvenile	0	0	10	0	10
	Total	0	15	77010	1286	78311
Greenland	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	0	0	0
	Wild adult	0	0	0	0	0
	Wild juvenile	0	0	129	66	195
	Total	0	0	129	66	195
USA	Hatchery adult	0	0	0	0	0
	Hatchery juvenile	0	0	68030	0	68030
	Wild adult	0	88	170	2393	2651
	Wild juvenile	0	0	0	0	0
	Total	0	88	68200	2393	70681
All countries	Hatchery adult	0	1414	158428	513	160355
	Hatchery juvenile	192388	4573	1477822	54251	1729034
	Wild adult	0	3025	181	27826	31032
	Wild juvenile	3294	12552	16032	8800	40678
	Total	195682	21564	1652463	91390	1961099

* Includes other internal tags (PIT, ultrasonic, radio, DST, etc.).
** Includes Carlin, spaghetti, streamers, VIE, etc.

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

ICES recommends that WGNAS should meet in 2022 (Chaired by Dennis Ensing, UK) to address questions posed by NASCO and by ICES. Unless otherwise notified, the working group intends to convene at ICES Headquarters in Copenhagen, Denmark. The meeting will be held from 28 March to 7 April 2022.

Recommendations

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

North American Commission

A database is needed that lists individual PIT tag numbers or codes identifying the origin, source, or programme of the tags on a North Atlantic basin-wide scale. This is needed to facilitate identification of individual tagged fish taken in marine fisheries or surveys. Data on individual PIT tags used in Norway have now been compiled, but an ICES coordinated database is needed to store the data and is being considered by ICES. Tag users should be encouraged to include these tags or tagging programmes as this greatly facilitates identification of the origin of tags recovered in fisheries or tag scanning programmes in other jurisdictions.

Complete and timely reporting of catch statistics from all fisheries for all areas of eastern Canada is recommended.

Improved catch statistics and sampling of the Labrador and Saint Pierre and Miquelon fisheries is recommended. Improved catch statistics and sampling of all aspects of the fishery across the fishing season will improve the information on biological characteristics and stock origin of salmon harvested caught in these mixed-stock fisheries.

A sampling rate of at least 10% of catches in Labrador would be required to achieve a relatively unbiased estimate.

Additional monitoring should be considered in Labrador 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.

Northeast Atlantic Commission

Tag users should be encouraged to include these tags or tagging programmes as this greatly facilitates identification of the origin of tags recovered in fisheries or tag scanning programmes in other jurisdictions.

West Greenland Commission
No recommendations specific to WGC† are provided.

† Version 2: Acronym corrected.

Table 5 Total reported catch of salmon by country@ (in tonnes, round fresh weight), 1960–2020 (2020 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
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

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 ^^														
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	137	0	5	475	78	116	31	10	4	11	46	87	84	4	119	11	5	0	0.0	47	-	1269	306
2014	118	0	4	490	81	51	18	24	6	9	58	57	54	5	84	12	6	0	0.1	58	-	1134	287
2015	140	0	4	583	80	94	31	9	7	9	45	63	68	3	68	16	5	0	1.0	56	-	1282	325
2016	135	0	5	612	56	71	34	6	3	9	51	58	86	4	27	6	5	0	1.5	26	-	1195	335
2017	110	0	3	666	47	66	24	6	10	12	32	59	49	5	27	10	2	0	0.3	28	-	1156	353
2018	79	0	1	594	80	60	22	9	4	11	24	46	42	4	19	10	3	0	0.8	39	-	1049	311
2019	100	0	1	513	57	37	14	9	8	13	21	44	5	2	13	15	5	0	1.4	28	-	885	259
2020	104	0	2	527	49	42	28	7	7	9	16	62	3	1	13	9	5	0	0.8	31	-	915	276
2015–2019	128	0	3	594	64	66	25	8	6	11	35	54	50	4	31	11	4	0	1	35	-	1113	317
2010–2019	128	0	3	597	74	79	27	12	8	11	43	69	69	6	82	11	5	0	1	38	-	1276	339

@ Country/Jurisdiction codes: CA (Canada), US (United States of America), SPM (Saint Pierre and Miquelon), NO (Norway), RU (Russia), IS (Iceland), SE (Sweden), DK (Denmark), FI (Finland), IE (Ireland), UK E/W (United Kingdon England and 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 2000 do not include catches taken in the recreational (rod) fishery.

^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 N. 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 Russia since 2008.
£££ Scotland data for 2020 not available at time of printing, 2019 used as Provisional.

Table 6 Reported catches (tonnes, round fresh weight) and % of the reported catches by country taken in coastal, estuarine, and in-river fisheries, 2000 to 2020. Data for 2020 include provisional data.

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	Weight
Spain^^	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	11	100	11
	2007	0	0	0	0	10	100	10
	2008	0	0	0	0	10	100	10
	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	8	100	8
	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	0	5	100	5
France* ^	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	3	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	1	5	3	36	6	59	10
	2018	0	0	5	47	5	53	11
	2019	0	2	8	52	7	46	15
	2020	0	1	4	48	4	51	8
Ireland	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	20	30	47	70	67
	2010	0	0	38	39	60	61	99
	2011	0	0	32	37	55	63	87

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	Weight
	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	27	46	73	62
UK (England & Wales)	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
	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
UK (Scotland)$	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	87	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	27
	2018	0	0	12	63	7	37	19
	2019	0	0	2	14	11	86	13
	2020	0	0	2	14	11	86	13

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	Weight
UK (Northern Ireland)**	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	29
	2007	6	21	6	20	17	59	30
	2008	4	19	5	22	12	59	21
	2009	4	24	2	15	10	62	16
	2010	5	39	0	0	7	61	12
	2011	3	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	5	100	5
	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	1	100	1
Iceland^^^	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
	2011	0	0	0	0	128	100	128
	2012	0	0	0	0	70	100	70
	2013	0	0	0	0	147	100	147
	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	86
	2018	0	0	0	0	82	100	98
	2019	0	0	0	0	51	100	51
	2020	0	0	0	0	70	100	70
Denmark	2000							
	2001							
	2002							
	2003							
	2004							
	2005							
	2006							
	2007							
	2008	0	1	0	0	9	99	9
	2009	0	0	0	0	8	100	8
	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

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	Weight
	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
Sweden***	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	18	100	18
	2016	0	0	0	0	9	100	9
	2017	0	0	0	0	16	100	18
	2018	0	0	0	0	13	100	17
	2019	0	0	0	0	17	100	17
	2020	0	0	0	0	14	100	14
Norway	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

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	Weight
Finland	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
Russia	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	25	30	82
	2006	52	57	0	0	39	43	91
	2007	31	50	0	0	31	50	63
	2008	33	45	0	0	40	55	73
	2009	22	31	0	0	49	69	71
	2010	36	41	0	0	52	59	88
	2011	37	42	0	0	52	58	89
	2012	38	46	0	0	45	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	39	0	0	35	61	57
	2020	16	34	0	0	32	66	49

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	Weight
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	7	7	44	42	53	51	104
France (Islands of St. Pierre and Miquelon)	2000	2	100	0	0	0	0	2
	2001	2	100	0	0	0	0	2
	2002	2	100	0	0	0	0	2
	2003	3	100	0	0	0	0	3
	2004	3	100	0	0	0	0	3
	2005	3	100	0	0	0	0	3
	2006	4	100	0	0	0	0	4
	2007	2	100	0	0	0	0	2
	2008	3	100	0	0	0	0	3
	2009	3	100	0	0	0	0	3
	2010	3	100	0	0	0	0	3
	2011	4	100	0	0	0	0	4
	2012	1	100	0	0	0	0	1
	2013	5	100	0	0	0	0	5
	2014	4	100	0	0	0	0	4
	2015	4	100	0	0	0	0	4
	2016	5	100	0	0	0	0	5
	2017	3	100	0	0	0	0	3
	2018	1	100	0	0	0	0	1
	2019	1	100	0	0	0	0	1
	2020	2	100	0	0	0	0	2
Total NEAC	2020	231	30	23	3	524	67	778
Total NAC	2020	9	8	44	42	53	50	106

* 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 (Northern 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.
$ Scotland 2020 data not available at time of printing, 2019 data inserted as Provisional.

Table 7 Estimates for 2020 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 national catch (unreported)
NEAC	Denmark	1	0.1	12
NEAC	Finland	2	0.1	19
NEAC	Iceland	1	0.1	2
NEAC	Ireland	6	0.5	9
NEAC	Norway	226	19.8	30
NEAC	Sweden	1	0.1	9
NEAC	UK (England & Wales)	0	0.0	9
NEAC	UK (N. Ireland)	0.3	0.0	22
NEAC	UK (Scotland)**	1	0.1	9
NAC	USA	0	0.0	0
NAC	Canada	27	2.4	21
WGC	Greenland	10	0.9	24
Total unreported catch *		276	24.2	
Total reported catch of North Atlantic salmon		915		

* No unreported catch estimates are available for France, Spain, St. Pierre and Miquelon, or Russia in 2020.
** No Scotland 2020 data at time of printing, 2019 data input as Provisional.

Table 8 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, 1991–2020. Data for 2020 are provisional.

Year	Canada $		USA		Iceland		Russia *		UK (E and W)		UK (Scotland)$$		Ireland		UK (N. Ireland) **		Denmark		Sweden		Norway ***	
	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														
1992	37803	29	407	67			10120	73														
1993	44803	36	507	77			11246	82	1448	10												
1994	52887	43	249	95			12056	83	3227	13	6595	8										
1995	46029	46	370	100			11904	84	3189	20	12151	14										
1996	52166	41	542	100	669	2	10745	73	3428	20	10413	15										
1997	50009	50	333	100	1558	5	14823	87	3132	24	10965	18										
1998	56289	53	273	100	2826	7	12776	81	4378	30	13464	18										
1999	48720	50	211	100	3055	10	11450	77	4382	42	14846	28										
2000	64482	56	0	-	2918	11	12914	74	7470	42	21072	32										
2001	59387	55	0	-	3611	12	16945	76	6143	43	27724	38										
2002	50924	52	0	-	5985	18	25248	80	7658	50	24058	42										
2003	53645	55	0	-	5361	16	33862	81	6425	56	29170	55										
2004	62316	57	0	-	7362	16	24679	76	13211	48	46279	50					255	19				
2005	63005	62	0	-	9224	17	23592	87	11983	56	46165	55	2553	12			606	27				
2006	60486	62	1	100	8735	19	33380	82	10959	56	47669	55	5409	22	302	18	794	65				
2007	41192	58	3	100	9691	18	44341	90	10917	55	55660	61	15113	44	470	16	959	57				
2008	54887	53	61	100	17178	20	41881	86	13035	55	53347	62	13563	38	648	20	2033	71			5512	5
2009	52151	59	0	-	17514	24			9096	58	48436	67	11422	39	847	21	1709	53			6696	6
2010	55895	53	0	-	21476	29	14585	56	15012	60	78041	70	15142	40	823	25	2512	60			15041	12
2011	71358	57	0	-	18593	32			14406	62	64870	73	12688	38	1197	36	2153	55	424	5	14303	12
2012	43287	57	0	-	9752	28	4743	43	11952	65	63628	74	11891	35	5014	59	2153	55	404	6	18611	14
2013	50630	59	0	-	23133	34	3732	39	10458	70	54002	80	10682	37	1507	64	1932	57	274	9	15953	15
2014	41613	54	0	-	13616	41	8479	52	7992	78	37355	82	6537	37	1065	50	1918	61	982	15	20281	19
2015	65440	64	0	-	21914	31	7028	50	8113	79	46836	84	9383	37	111	100	2989	70	647	18	25433	19
2016	68925	65	0	-	22751	43	10793	76	9700	80	50186	90	10934	43	280	100	3801	72	362	17	25198	21
2017	57357	66	0	-	19667	42	10110	77	11255	83	45652	90	12562	45	126	100	4435	69	590	17	25924	21
2018	56011	82	0	-	19409	43	10779	73	6857	88	35066	93	9249	43	3247	49	4613	79	557	19	22024	22
2019	60636	72	0	-	15185	52	12762	74	8171	89	43825	91	9790	48	5000	85	3913	70	678	20	21178	20
2020	59627	72	0	-	21277	51	9508	65	10672	93	43825	91	13240	44	4813	91	4375	69	587	16	28753	23
Avg. 2015–2019	61674	70	0	-	19785	42	10298	70	8819	84	44313	90	10384	43	1753	87	3950	72	567	18	23951	21
% change from Avg. 2015–2019	-3	3	-	-	8	20	-8	-7	21	11	-1	1	28	2	175	5	11	-4	4	-12	20	13

* Since 2009 data have been either unavailable or incomplete; however, catch-and-release is understood to have remained at similar high levels as before.
** 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.
$$ Scotland 2020 data not available at time of printing, 2019 data provided as Provisional.

References

ICES. 2003. Report of the Working Group on North Atlantic Salmon (WGNAS), 31 March–10 April 2003, Copenhagen, Denmark. ICES CM 2003/ACFM:19. 297 pp.

ICES. 2013. Report of the Working Group on North Atlantic Salmon (WGNAS), 3–12 April 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:09. 379 pp.

ICES. 2021a. Working Group on North Atlantic Salmon (WGNAS). ICES Scientific Reports. 3:29. 407 pp. https://doi.org/10.17895/ices.pub.7923.

ICES. 2021b. Workshop for Salmon Life Cycle Modelling (WKSalModel). ICES Scientific Reports. 3:24. 20 pp. https://doi.org/10.17895/ices.pub.7921.

ICES. 2021c. ICES Compilation of microtags, finclip and external tag releases 2020 by the Working Group on North Atlantic Salmon (WGNAS 2021 Addendum).ICES Scientific Reports. 3:29. 48 pp.

NASCO. 1998. Agreement on Adoption of the Precautionary Approach. Report of the Fifteenth Annual Meeting of the Council, Edinburgh, UK, June 1998. CNL(98)46.

Recommended citation: ICES. 2021. North Atlantic salmon stocks *In* Report of the ICES Advisory Committee, 2021. ICES Advice 2021, sal.oth.nasco. https://doi.org/10.17895/ices.advice.8110.

Annex 1 Glossary of acronyms and abbreviations

1SW *one-sea-winter*. Maiden adult salmon that has spent one winter at sea.

2SW *two-sea-winter*. Maiden adult 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 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*. A MSW salmon is an adult 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 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 salmon stocks across the North Atlantic and formulating catch advice for NASCO.