Published 4 May 2018
Version 2: 9 May 2018
https://doi.org/10.17895/ices.pub.4335

NORTH ATLANTIC SALMON STOCKS*

Introduction

Main tasks

At its 2017 Statutory Meeting, ICES resolved (C. Res. 2017/2/ACOM21) that the Working Group on North Atlantic Salmon [WGNAS] (chaired by Martha Robertson, Canada) would meet at invitation at Woods Hole, Massachusetts, USA, 4–13 April 2018 to consider questions posed to ICES by the North Atlantic Salmon Conservation Organization (NASCO).

The sections of the report which provide the responses to the terms of reference are identified below.

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 2017[1];	
1.2	report on significant new or emerging threats to, or opportunities for, salmon conservation and management[2];	
1.3	provide a review of examples of successes and failures in wild salmon restoration and rehabilitation and develop a classification of activities which could be recommended under various conditions or threats to the persistence of populations[3];	
1.4	provide a compilation of tag releases by country in 2017; and	
1.5	identify relevant data deficiencies, monitoring needs and research requirements.	
2	With respect to Atlantic salmon in the North-East Atlantic Commission area:	sal.27.neac
2.1	describe the key events of the 2017 fisheries[4];	
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 2018/19–2020/21 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[5]; and	
2.5	update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.	
3	With respect to Atlantic salmon in the North American Commission area:	sal.21.nac
3.1	describe the key events of the 2017 fisheries (including the fishery at St Pierre and Miquelon)[4];	
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 2018–2021 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[5]; and	
3.5	update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.	
4	With respect to Atlantic salmon in the West Greenland Commission area:	sal.2127.wgc
4.1	describe the key events of the 2017 fisheries[4];	
4.2	describe the status of the stocks[6];	
4.3	provide catch options or alternative management advice for 2018–2020 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[5];	
4.4	update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.	

* Version 2: In May 2018, an error was detected in the data presented on the nominal catches by country (Table 7). These values have been corrected in this version.

[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.] with respect to question 1.3, NASCO is aware that the WGERAAS final report is being prepared and will be submitted to ICES in 2017.

[4.] 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 home water 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 ICES should review the results of the recent phone surveys and advise on the appropriateness for incorporating resulting estimates of unreported catch into the assessment process.

[5.] In response to questions 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.

[6.] In response to question 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 questions 2.3 and 3.3.

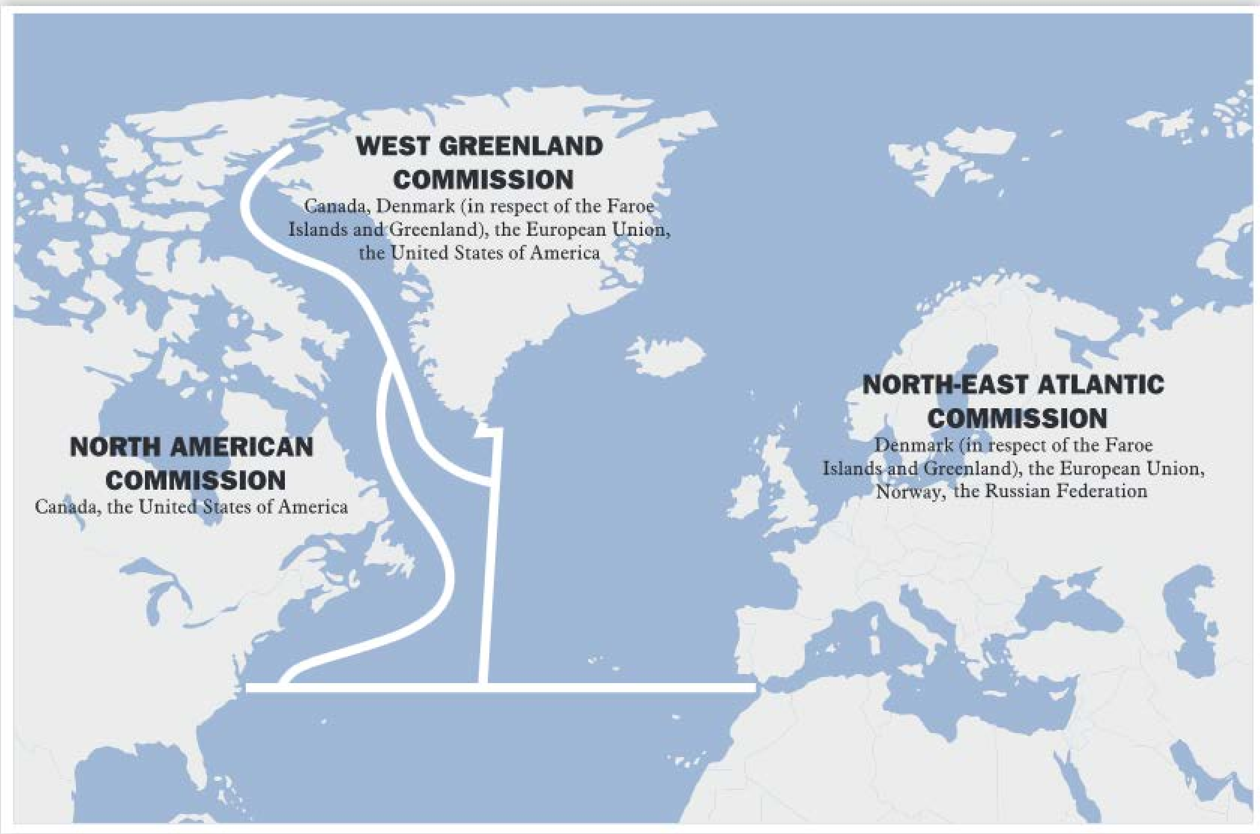
In response to the terms of reference, the working group considered 36 working documents. A complete list of acronyms and abbreviations used in this report is provided in Annex 1. References cited are given in Annex 2.

Please note that for practical reasons Tables 6–9 are found at the end, immediately before the annexes.

Management framework for salmon in the North Atlantic

The advice generated by ICES is in response to terms of reference posed by the North Atlantic Salmon Conservation Organization (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 Faroes, which take salmon originating in rivers of another Party, are regulated by NASCO under the terms of the Convention. NASCO now has six 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 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 but, under Article 4 of the NASCO 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 stated 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 NASCO's Standing Committee on the Precautionary Approach interpreted 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 there are only a few age groups in the adult spawning stock. 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 salmon, this approach has led to defining river-specific conservation limits (CLs) as equivalent to MSY $B_{escapement}$. 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 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), NASCO has adopted a risk level (probability) of 75% of simultaneous attainment of management objectives in seven geographic 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 geographic regions for the North American stock complex. ICES notes that the choice of a 75% risk (probability) for simultaneous attainment of six or seven stock units is approximately equivalent to a 95% probability of attainment for each individual unit (ICES, 2013).

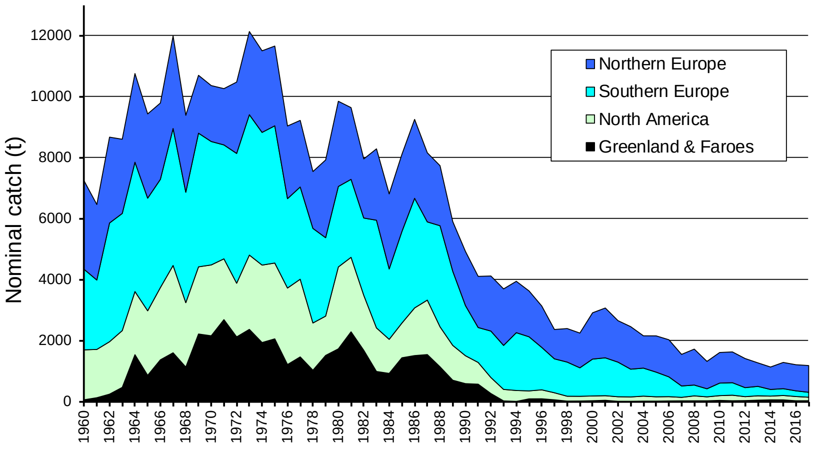
There is no formally agreed management plan for the fishery at the Faroes. However, ICES has developed a risk-based framework for providing catch advice for fish exploited in this fishery (mainly multi-sea-winter (MSW) fish from NEAC countries). Catch advice is provided at both the stock complex and country level and catch options tables provide the probability of meeting CLs in the individual stock complexes or countries, and 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 will generally be quite low when large numbers of management units are used.

NASCO 1.1 Catches of North Atlantic salmon

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 6–9 are provided at the end of the report.

Reported total nominal catches of salmon in four North Atlantic regions from 1960 to 2017 are shown in Figure 1. Nominal catches reported by country are given in Table 6. Catch statistics in the North Atlantic include fish farm escapees, and in some Northeast Atlantic countries also ranched fish.



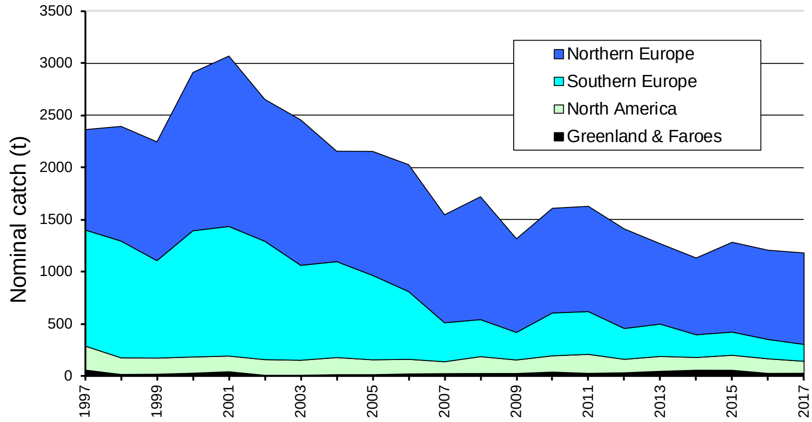


Figure 1 Total reported nominal catch of salmon (tonnes round fresh weight) in four North Atlantic regions, 1960–2017 (top) and 1997–2017 (bottom).

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 2017 (Table 6). 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 nominal harvest.

Table 1 Reported catches (in tonnes) for the three NASCO commission areas for 2008–2017.

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
NEAC	1533	1162	1414	1419	1250	1080	954	1083	1041	1038
NAC	162	129	156	182	129	143	122	144	140	115
WGC	26	26	40	28	33	47	58	57	27	28
Total	1721	1318	1610	1629	1412	1270	1134	1284	1208	1182

The provisional total nominal catch for 2017 was 1182 t, the second lowest in the time-series. NASCO requested that the nominal catches in home water fisheries be partitioned according to whether the catch is taken in coastal, estuarine, or in-river fisheries (Table 2).

Table 2 The 2017 nominal catches (in tonnes) for the NEAC and NAC commission areas.

Area	Coastal		Estuarine		In-River		Total
	Weight	%	Weight	%	Weight	%	Weight
NEAC 2017	340	33	32	3	665	64	1038
NAC 2017	13	11	33	29	69	60	115

Coastal, estuarine, and in-river catch data aggregated by commission area are presented in Figure 2. In Northern NEAC, a decreasing proportion and weight of the nominal catch was taken in coastal fisheries until 2013, followed by a modest increase since then to 2017. 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 only around one third of the total. In Southern NEAC, 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. Since 2007, the majority of the catch in this area has been reported from in-river fisheries. In NAC, two thirds of the total catch has been reported from in-river fisheries; the catch in coastal fisheries has been relatively small in any year (13 t or less).

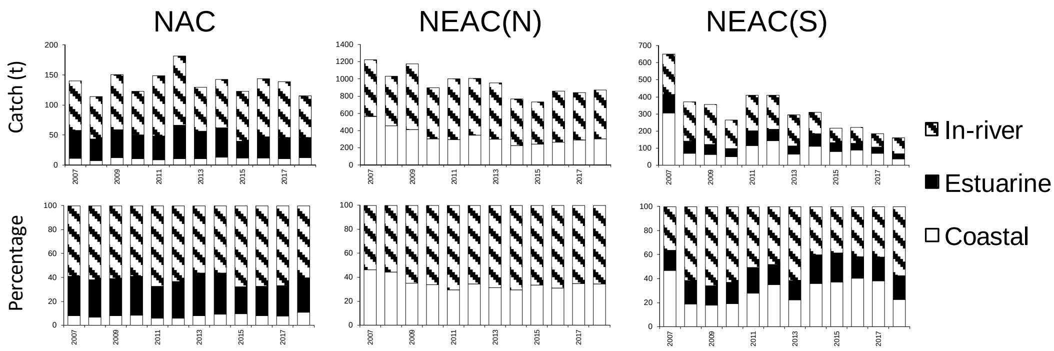


Figure 2 Nominal catches (tonnes; top panels) and percentages of the nominal catches (bottom panels) reported from coastal, estuarine, and in-river fisheries for the NAC area, and for the Northern (NEAC(N)) and Southern (NEAC(S)) NEAC areas, 2006–2017. Note that scales of vertical axes in the top panels vary.

There is considerable variability in the distribution of the catch among individual countries (Figure 3 and Table 7). 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, nominal catches from in-river fisheries have also declined in many countries as a result of increasing use of catch-and-release in angling fisheries.

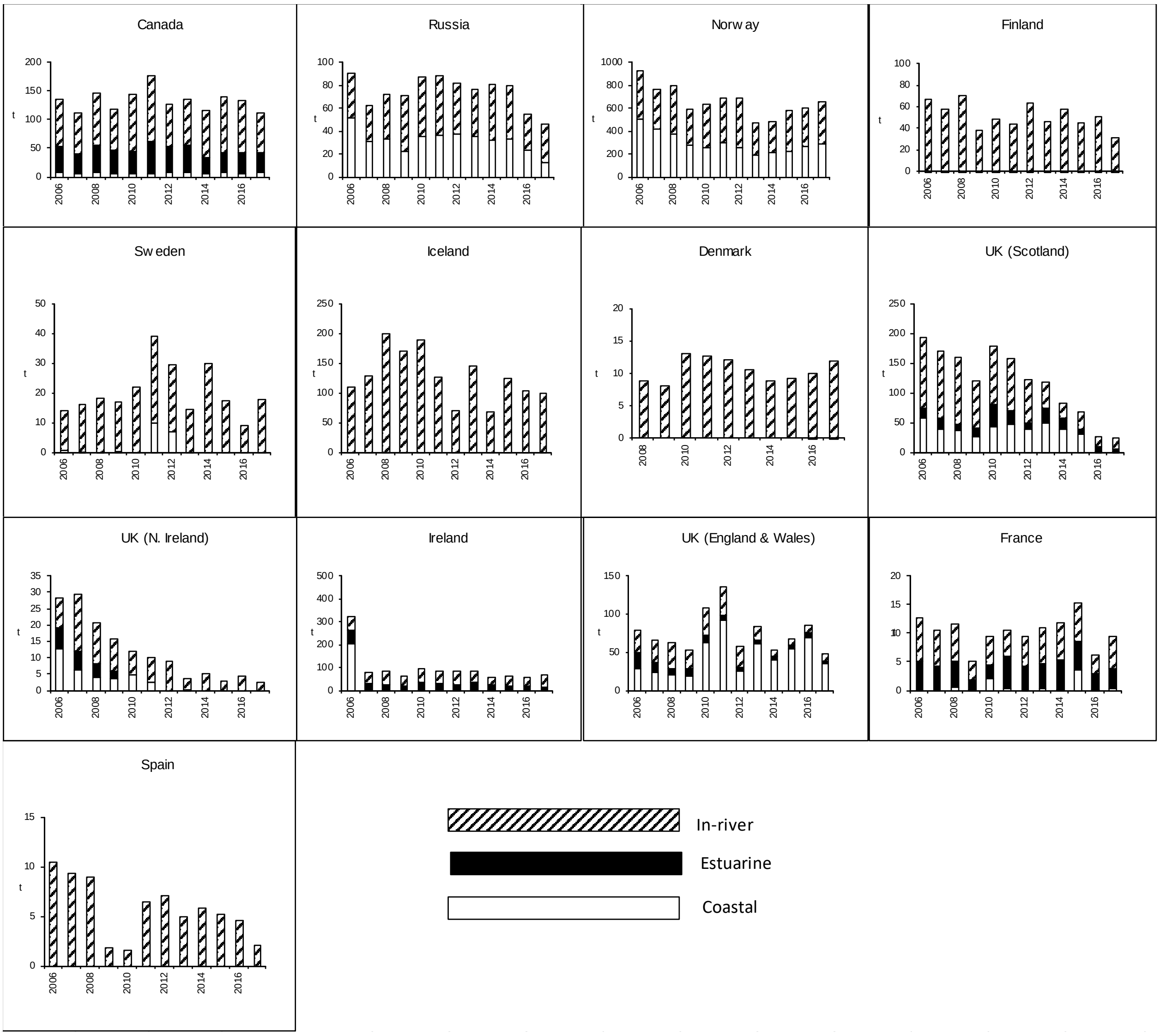


Figure 3 Nominal catch (tonnes) by country taken in coastal, estuarine, and riverine fisheries, 2006–2017 (except Denmark: 2008–2017). Note that scales on the *y*-axes vary. USA is not included because there has been no catch. 100% of the fishery at SPM and at West Greenland occurs in coastal areas. These catches are not shown.

Unreported catches

The total unreported catch in NASCO areas in 2017 was estimated at 353 t. No estimates were provided for Russia, France, Spain, or St Pierre and Miquelon in 2017. The unreported catch in the NEAC area in 2017 was estimated at 318 t, and that for the West Greenland and North American commission areas at 10 t and 25 t, respectively.

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

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
NEAC	433	317	357	382	363	272	256	298	298	318
NAC	-*	16	26	29	31	24	21	17	27	25
WGC	10	10	10	10	10	10	10	10	10	10
Total	443	343	393	421	403	306	287	325	335	353

* Data not available for Canada in 2008.

The 2017 unreported catch by country is provided in Table 8. 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 nominal catches do not include salmon that have been caught and released. Table 9 presents C&R information from 1991 to 2017 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 2017, it ranged from 15% in Sweden to 90% in UK (Scotland), reflecting varying management practices and angler attitudes among countries. Within countries, the percentage of fish released 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 179 000 salmon were reported to have been caught and released in the North Atlantic area in 2017.

Farming and sea ranching of Atlantic salmon

The provisional estimate of farmed Atlantic salmon production in the North Atlantic area for 2017 was more than 1624 kt (Figure 4). The production of farmed salmon in this area has been over one million tonnes since 2009. Norway and UK (Scotland) continue to produce the majority of the farmed salmon in the North Atlantic (80% and 11%, respectively). With the exception of Canada (production in 2017 assumed similar to 2016) and Faroes, farmed salmon production in 2017 was above the previous five-year average in all countries. Data for UK (N. Ireland) since 2001 and data for the east coast of the 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 2017 is provisionally estimated at 2310 kt (Figure 4), an increase compared to 2016 and higher than the previous five-year mean. Production outside the North Atlantic is estimated to have accounted for one third of the total worldwide production in 2017, dominated by Chile (78%).

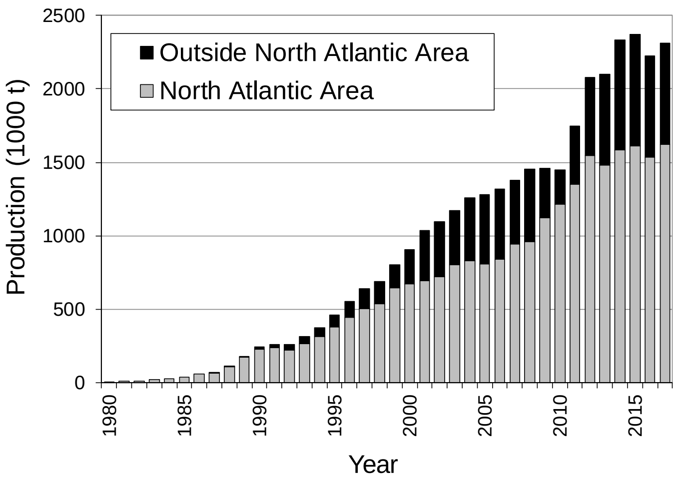


Figure 4 Worldwide production of farmed Atlantic salmon, 1980 to 2017.

The reported nominal catch of Atlantic salmon in the North Atlantic was in the order of 0.05% of the worldwide production of farmed Atlantic salmon in 2017.

The total harvest of ranched Atlantic salmon in countries bordering the North Atlantic in 2017 was 42 t, all taken in Iceland, Sweden, and Ireland (Figure 5), with the majority of the catch taken in Iceland (28 t). No estimate of ranched salmon production was made in Norway in 2017, where such catches have been very low in recent years (< 1 t), or in UK (N. Ireland), where the proportion of ranched fish has not been assessed since 2008.

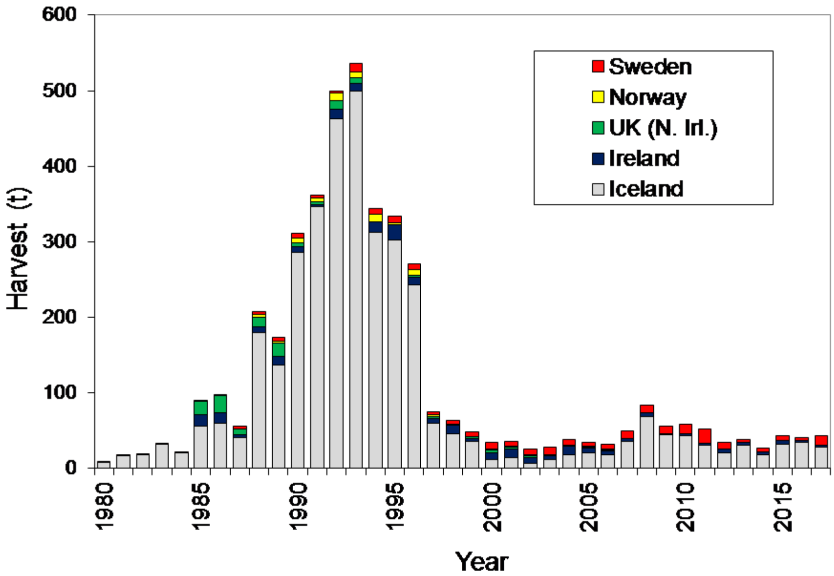


Figure 5 Harvest of ranched Atlantic salmon (tonnes round fresh weight) in the North Atlantic, 1980 to 2017.

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 (2018a) and a summary of these is presented below, sorted by threats to salmon stocks followed by opportunities. Details for these are available in the working group report (ICES, 2018a).

Diseases and parasites

Updates to previously identified diseases and parasites affecting North Atlantic salmon are reported in ICES (2018a).

- **Update on Red Vent Syndrome (*Anisakiasis*):** Monitoring for the presence of RVS has continued on three rivers in the UK (England & Wales) in 2017 and levels were comparable to those observed earlier in the time-series. High levels (82%) were reported in one river in Ireland.
- **Update on *Gyrodactylus salaris* eradication efforts in Norway**: Actions to eradicate the parasite from salmon rivers has primarily consisted of rotenone treatment. Of the 50 Norwegian salmon rivers with the parasite, 31 have been declared free of the parasite, 12 have been treated against the parasite and are currently awaiting a parasite-free declaration, and seven rivers are still infected.
- The presence of ***Gyrodactylus salaris* was confirmed in two rivers in Russia** in 2017 and is believed to have originated from transfers of rainbow trout to aquaculture sites in the area.
- Continued presence (since 2014) of **diseased salmon in rivers in Sweden** that drain in the Baltic Sea but are within 200 km of North Atlantic salmon rivers was reported in 2017. In previous years, symptoms indicative of Ulcerative Dermal Necrosis (UDN) were present. In 2017, most cases were attributed to RVS during summer and early autumn and to fungal infections during autumn.
- Continued **mortalities of salmon in Russian rivers in 2017** were reported in areas where mortalities had occurred in 2015 and 2016. No specific causes were identified but in 2015 and 2016, the timing of the disease incidence coincided with mass mortalities of farmed salmon in late autumn 2014 and spring/summer 2015 and with the disposal in summer 2015 of dead farmed fish in the area.
- Update on **sea lice investigations and sea lice management programmes in Norway**: The surveillance programme for sea lice infections on wild salmon postsmolts and sea trout at specific localities along the Norwegian coast continued in 2017 (Nilsen *et al.,* 2018). In general, the surveillance programme demonstrated varying infestation pressure along the coast during the post-smolt migration period in 2017. In 2017, a new management regime for salmonid aquaculture was implemented under which the level of aquaculture production in

13 defined production areas along the coast will be regulated and adjusted according to the estimated added mortality inferred for wild salmon populations from lice infestations.

Environmental and ecosystem interactions with Atlantic salmon

Information related to environmental and species interactions with Atlantic salmon were reported, including updates on possible recruitment effects of exceptional weather events, interactions with native fish species, and exceptional observations of pink salmon in the North Atlantic in 2017.

- **Consequences of poor juvenile recruitment in UK (England & Wales) observed in 2016**: Poor recruitment of juvenile salmonids, particularly salmon fry, in 2016 in many rivers in UK (England and Wales) was reflected in a very poor smolt run in 2017 on an index river in southern England where almost all the smolts migrate as one-year-olds. As the majority of rivers in England and Wales produce two-year-old smolts, the consequences of the 2016 event may result in lower smolt production in 2018. It was noted that juvenile (fry) recruitment in England and Wales in 2017 was better than in 2016.
- **Interactions between striped bass and Atlantic salmon in eastern Canada**: The abundances of Atlantic salmon and striped bass (*Morone saxatilis*), both native fish species in the southern Gulf of St Lawrence, have varied over time and the interactions between them can be complex. The increased abundance of striped bass, from low levels of approximately 5000 spawners in the mid 1990s to one million spawners in 2017, as well as the expansion in 2017 in striped bass distribution beyond its historical range (DFO, 2018), have raised concerns regarding the potential predation consequences of striped bass on salmon smolts. Striped bass are generalist feeders and salmon smolts, in low numbers and low overall proportions of samples, have been recorded from bass stomachs sampled in May and June in the Miramichi River, the only confirmed spawning location of striped bass of the southern Gulf of St. Lawrence (DFO, 2016). A recent study that inferred predation rates of striped bass using movement patterns of acoustically tagged smolts in the Miramichi, reported highly variable rates between years and smolt release locations, ranging from 2.6% to 19.9% (Daniels *et al.*, In press). These variations are consistent with the extent of spatial and temporal overlap of striped bass and salmon smolts within this river system. Further directed studies that provide information with which to address questions of predator–prey interactions of co-occurring species with salmon are required to support advice on management interventions.
- **Pink salmon observations in the North Atlantic area in 2017**: Pink salmon introductions to the White Sea basin in northern Russia in the mid-1980s led to the rapid establishment of self-sustaining, odd-year populations in the White Sea rivers in the Murmansk and Archangelsk regions of Russia. A commercial fishery for pink salmon takes place in the coastal areas of the White Sea concurrently with Atlantic salmon fisheries and using the same gears. As part of a wider review of interactions between exotic salmonids and Atlantic salmon, ICES previously described the development of the pink salmon populations in the White Sea and outlined the potential effects of pink salmon on native salmonids (ICES, 2013).
    - The total catch of pink salmon in 2017 in the Northwestern part of Russia was 374 t. However, occasional catches (2001) of pink salmon in excess of 300 t in Russia have previously been reported to ICES. Catches of pink salmon in 2017, at previously unrecorded levels, were reported in various countries around the North Atlantic over a wide geographical area (Table 4). The bulk of the recoveries were reported in Russia and Norway, but pink salmon occurred in most countries, ranging from France in the southern part of the Northeast Atlantic, the British Isles, Ireland, Iceland, and Greenland, as well as in Newfoundland and Labrador in the Northwest Atlantic. The number of pink salmon detected was related to the geographic location of rivers, with more fish in the northern areas than in southern areas. Overall, pink salmon were observed in more than 370 rivers outside Russia (Table 4).
    - It is, as yet, unclear whether the marked increase in pink salmon numbers in 2017 represents a one-off occurrence, due to particularly favourable conditions for a particular cohort of fish, or whether this might mark the start of a wider range expansion by the species. The widespread capture of fish around the North Atlantic represented a notable change from earlier years, despite the reported catch in Russia being similar to that reported occasionally in the past. Widespread spawning of pink salmon in many Norwegian rivers in 2017 will likely result in an increase in both the numbers and distribution of juveniles entering the marine environment, and this expected increase in distribution and abundance could, in turn, result in widespread distribution of pink salmon again in 2019.

- In response to the widespread occurrence of pink salmon in 2017, representatives from a range of Northeast Atlantic countries met in UK (Scotland) in September 2017 to discuss various issues, including:
  - A brief review of the history of pink salmon introductions within northern Russia and western Europe, the scale of historical catches around this area, and the nature of catches made in 2017;
  - An overview of pink salmon ecology, species plasticity, invasiveness, and implications of phenological change in support of formal risk assessments, including potential impacts on Atlantic salmon;
  - Current surveillance and management measures in use to examine their efficacy and explore the potential use of new monitoring tools (such as environmental DNA [eDNA]);
  - Identifying knowledge gaps, and how these might be addressed and by whom.
- In the event of a further large run of pink salmon in future, a range of new monitoring and research activities are expected to be initiated to better assess the potential impact of the species on Atlantic salmon and other native species. Risk assessments are also being developed in some countries (e.g. UK, Norway, Ireland).

Table 4 Reported or estimated numbers of pink salmon in different countries of the North Atlantic in 2017.

Country	Number of rivers where pink salmon are reported	Estimated number of fish			Total estimated number of pink salmon reported
		Caught in fisheries	Removed in targeted efforts	Observed, but not removed	
Russia		220 000			220 000 (based on a reported catch of 373.5 t, with an assumed mean weight per fish of 1.7 kg)
Norway	272	3 925	2 454	5 428	11 807
Finland		270		125	395 (Numbers adjusted to allocate fish to Finland & Norway)
Sweden	6	80			80
Denmark	8	11			11
Iceland	35	66			66
Germany	2	2		1	3
France	2	1		1	2
UK (England & Wales)	8	208			208
UK (Scotland)	22	99	26	14	139
UK (N. Ireland)	2	1		1	2
Ireland	11	33			33
Greenland		2			2
Canada	2	3			3
USA					0
Total	369	224 698	2 480	5 570	232 750

Opportunities for salmon conservation and management

Updates on projects related to classifying the status of salmon populations, considerations of impacts of research activities on salmon survival indices, activities to improve the information on salmon distribution and characteristics at sea, modelling the populations dynamics, frameworks to guide planning of research to improve the understanding of mortality at sea, and initiatives to secure sample archives and to extract additional information from historical sampling activities were reported to ICES (2018a).

- **Progress with implementing the Quality Norm for Norwegian salmon populations**: In August 2013, a management system – The Quality Norm for Wild Populations of Atlantic Salmon ("Kvalitetsnorm for ville bestander av Atlantisk laks") – was adopted by the Norwegian government (Anon., 2013) and details are provided in ICES (2014). In 2018, the Norwegian Scientific Advisory Committee for Atlantic Salmon classified all Norwegian salmon rivers based on available information on spawning population size from various data sources (Forseth *et al.*, 2018). To be able to classify all 448 rivers, this system used a simplified version of the quality norm. In summary, 41% of the populations were classified as being in a poor or very poor state, 35% were in a moderate state, 20% in a good or very good state, and 4% could not be classified because they were under reestablishment after treatment against *Gyrodactylus salaris*. This classification was translated into the classification system used in the NASCO rivers database.

- The **impact of capture and tagging** on estimates of Atlantic salmon adult return rates: Return rate estimates commonly depend on tagging a proportion of the smolt run and assessing the subsequent numbers of this tagged cohort subsequently returning as adults. However, scientific studies indicate that tagging can have a negative effect on smolt physiology, behaviour, and ultimately on survival (Riley *et al.*, 2007). Recent investigations carried out over seven years on the River Frome (southern England, UK [England & Wales]) examined the tagging effects on smolts and return rates as adults. In a number of years, return rates were very similar for both control and experimental groups (Riley *et al.*, In press). The results provide evidence that the impact of tagging processes was negligible in many years, and the results are reassuring in the context of ongoing investigations to derive and report marine return rates in support of national and international stock assessments.

- **Update on opportunities for investigating salmon at sea**
  - **The International Ecosystem Summer Survey of the Nordic Seas (IESSNS)**: a collaborative programme involving research vessels from Iceland, the Faroes, and Norway. Surveys are carried out annually in July–August in an area that overlaps in time and space with the known distribution of post-smolts in the North Atlantic. In 2017 a total of 36 post-smolt and adult salmon were caught (Figure 6). The Institute of Marine Research (Bergen, Norway) is developing a plan to collate all the information from the analysis of the samples over all years.

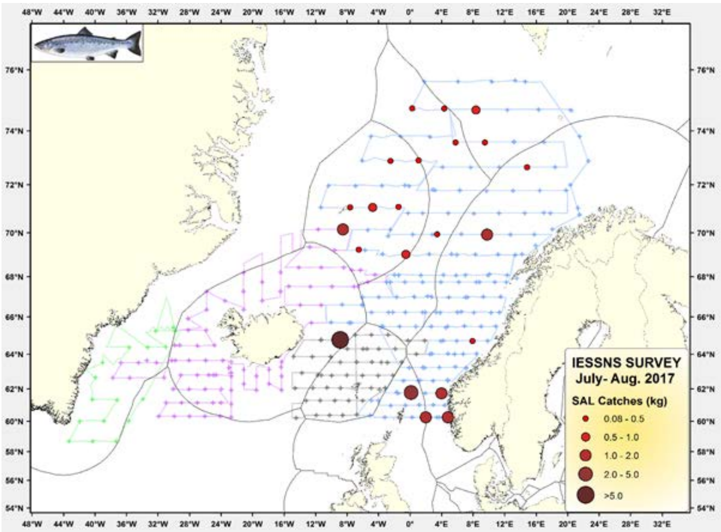


Figure 6 Catches (in kilogrammes) of Atlantic salmon taken during IESSNS surveys in the Northeast Atlantic in July 2017. This is the main survey where salmon would be expected to be taken in the survey nets.

  - **Bycatch of salmon in the Icelandic mackerel fishery**: Partial screening of the mackerel fishery catches has been undertaken by the Icelandic Directorate of Fisheries to check for bycatch of salmon. Since 2010, a total of 847 salmon have been recovered and the origin of a sample of these fish has been reported previously (originating from Iceland, the UK, Ireland, the Scandinavian countries, and Russia).
  - **Environmental DNA**: New national Norwegian research projects have been initiated to improve information on bycatch in pelagic fisheries by testing for salmon DNA in water (also called environmental DNA or eDNA) from commercial landings of pelagic fish.
  - **PIT tag screening programmes**: Screening of bycatch of salmon using automatic screening of PIT (Passive Integrated Tags) tags at factories processing pelagic fish is now possible. As the use of PIT tags for salmon is increasing rapidly, a more efficient identification of the origin of detected PIT-tagged salmon would be possible if lists of individual PIT tag numbers or codes were made available in a public database.
  - **Tracking and acoustic tagging studies:** NASCO's International Atlantic Salmon Research Board (IASRB) adopted a resolution in 2014 to further support the development of telemetry programmes in the ocean. The Atlantic Salmon Federation in Canada in partnership with the Oceans Tracking Network and a number of collaborators have continued to capture, sample, and tag with acoustic transmitters

smolts and kelts from a number of rivers in eastern Canada. Acoustic arrays have been positioned at key points in the Gulf of St. Lawrence leading to the Labrador Sea. Results from activities in 2017 indicated that kelts from Miramichi and Restigouche rivers crossed the Strait of Belle Isle array to the Labrador Sea during a three-week period at the end of June and early July, whereas smolts from many different stocks crossed this line together between 7 and 19 July (Figure 7). These studies provide useful information on migration routes and timing and have provided estimates of survival rates at several points along the migration corridor.

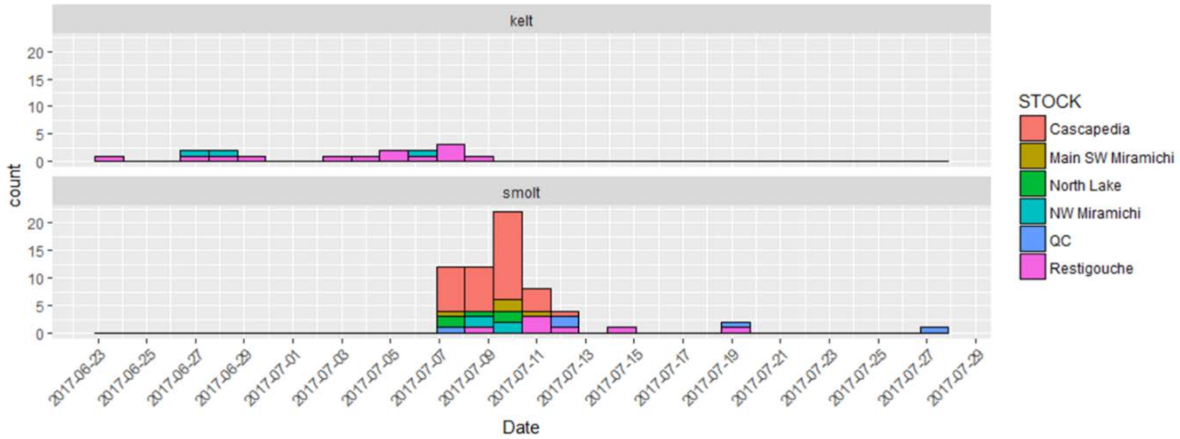


Figure 7 Counts and dates of acoustically tagged Atlantic salmon kelt (upper panel) and smolt (lower panel), originating from various Gulf of St. Lawrence rivers and crossing the Strait of Belle Isle receiver array in 2017.

- **Advances in genetic stock identification and mixed stock fishery analysis**: A genetic baseline for Atlantic salmon (*Salmo salar*) from North American and European rivers was constructed, based on single nucleotide polymorphism (SNP; Jeffery *et al.*, In press). This baseline provides accurate assignment to 29 regional groups spanning the North Atlantic (Figure 8). This baseline was applied to disentangle the stock composition of individuals in the West Greenland Atlantic salmon fishery for 2017. Consistent with the microsatellite baseline used to date, genetic mixture analysis with the SNPs indicated that 74% of individuals were North American in origin, largely from three regions: Gulf of St Lawrence, Gaspé Peninsula, and Labrador. European samples were from salmon originating in the United Kingdom and Ireland.

Further attempts to refine the spatial scale of genetic individual assignment have been recently described for the Labrador fishery (Sylvester *et al.*, 2017; Bradbury *et al.*, 2018) using large panels of sequenced microsatellites (101 sequenced loci). Using this technology, Bradbury *et al.* (2018) identified 26 groups across 36 different Labrador rivers compared to the three regional groups identified with the previous 13-microsatellite panel. Applied to the samples from the Labrador subsistence fisheries, the samples from the catches were less than 200 km from their region/river of origin. Furthermore, Sylvester *et al.* (2017) used sequencing of highly targeted amplicon panels to achieve highly accurate river-specific assignment to 12 rivers within the Lake Melville area of Labrador. Such finer scale resolution of population structure will be particularly important for salmon conservation and refined fisheries management considerations.

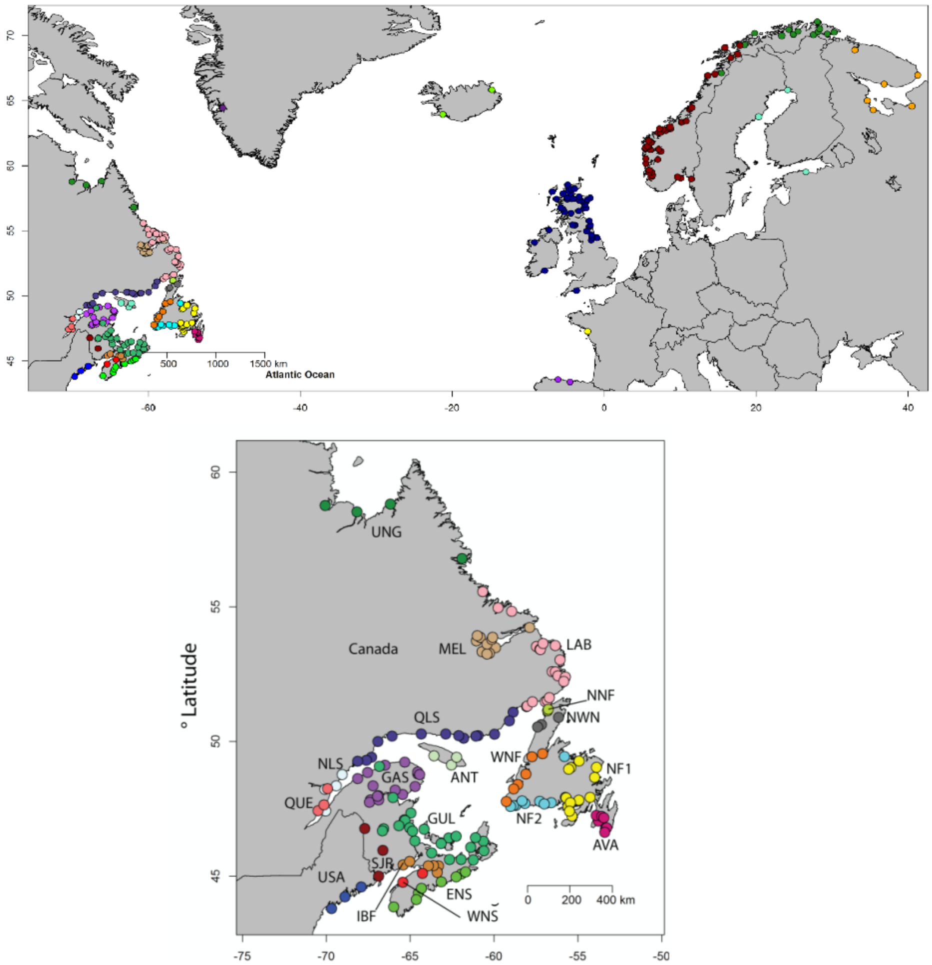


Figure 8 Range-wide SNPs baseline for Atlantic salmon following Jeffery *et al.* (In press), with eastern Atlantic groups highlighted (upper panel) and North American Atlantic reporting groups indicated (lower panel).

- **Progress in stock assessment models**: A life cycle model intended to improve the current assessment has been in development for several years. The version of the life cycle model reviewed in 2017 (ICES, 2017) was applied to six stock units in NAC and seven stock units in Southern NEAC, where all stock units follow the same life-history processes but with stock-specific parameters and data inputs. An extension of the life cycle model to 11 stock units in Northern NEAC was developed and presented in 2018 (Figure 9). Future developments will include embedding the three stock complexes within one single unique life-cycle model, thus providing an opportunity for modelling co-variation in the dynamics of the different populations that share migration routes and feeding areas at sea and which are harvested in mixed-stock fisheries, particularly at West Greenland for NAC and Southern NEAC. This model will also provide opportunities for examining potential factors that are conditioning survival of salmon at sea at different life stages and across salmon stocks in the North Atlantic.

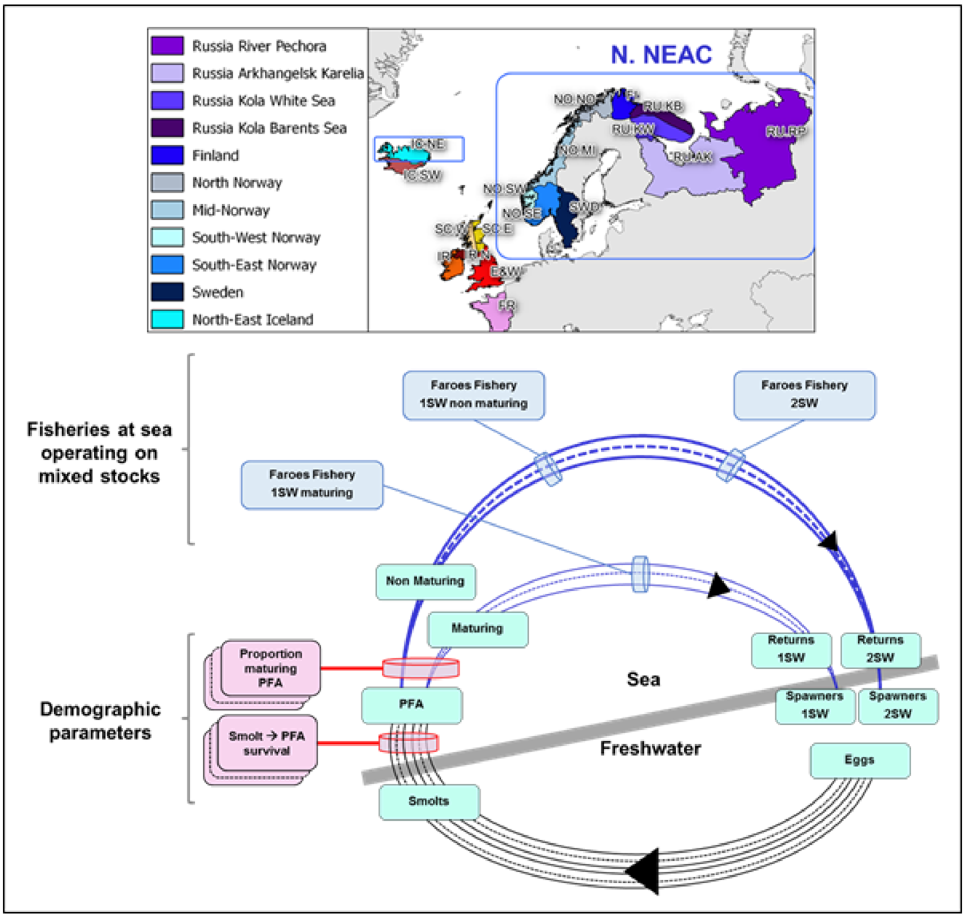


Figure 9 Schematic of the life-cycle model applied to the 11 stock units of Northern NEAC. Variables in light blue are the main stages considered in the stage-structured model. The smolt-to-PFA survival and the proportion of maturing PFA are estimated for the time-series (1971 to 2014) and modelled as a random walk with covariation among stock units. Stock units of the Northern NEAC complex are potentially harvested by the mixed-stock fishery operating around the Faroe Islands as 1SW maturing and non-maturing fish, and as 2SW fish.

- **A conceptual framework for evaluating marine mortality in Atlantic salmon**: A conceptual framework was developed during a workshop in November 2017 sponsored by the Atlantic Salmon Trust and the International Atlantic Salmon Research Board of NASCO, with scientists from both the Atlantic and Pacific regions participating. This framework is proposed to provide coherent guidance on how future research on marine survival can be identified and prioritized. Further details of the framework approach and its proposed future development will be available in the workshop report on the Atlantic Salmon Trust (AST) website. ICES recognises the value of developing high-level conceptual frameworks which may lead to hypothesis-led research into sources of, and partitioning of marine mortality in Atlantic salmon. ICES encourages the use of their ecosystem databases and products to assist with developing such frameworks and research into the underlying mechanistic relationships between variability in ecosystem drivers at particular domains and trends in salmon mortality.

- **Sampling, data, and archiving of historical samples**: The West Greenland fishery sampling programme conducted by parties to NASCO provides an opportunity to collect data and samples of potential two sea-winter Atlantic salmon from Southern Europe and North America that occur at an important summer and autumn feeding. A workshop was convened in December 2017 to review the current state of knowledge of Atlantic salmon at the summer feeding area off the coast of West Greenland, review current research efforts, identify research themes and projects to address data needs and knowledge gaps, and to develop protocols for providing access to database(s) and archived samples for collaborating researchers. The workshop concluded that it is important to continue the sampling programme at Greenland as the programme provides critical input data in support of ICES assessments. A number of recommendations were developed, including documenting the potential biases caused by the temporal changes in the design of the sampling programme, completing an inventory of the archive scale samples, database management and storage, data access, and sample access for the future. The workshop report will be published in one of the participating laboratories' reference document series.

- **Progress with establishing scale archive/biochronology repositories**: NASCO's International Atlantic Salmon Research Board (IASRB) has recognised the high value of archival scale collections that, as a result of advances in analytical methods, can now be used for genetic, stable isotope, and growth studies. There is some concern that these collections may be lost unless appropriate arrangements are in place to archive these and ensure their safe storage so that they may be available for analysis in the future. Several new initiatives with regard to scale archive collections and the establishment of permanent and secure repositories are being developed by individual parties: Unlocking the Archive (Ireland, National Funding 2017 to 2020), SAMARCH (EU Interreg UK/France, 2017 to 2022), Norwegian Research project (National Funding 2016 to 2018), and AST/Freshwater Biological Association (FBA). Common issues were identified with regard to establishing physical repositories of samples and a database to retain and manage the information, scale images, and growth information and to allow ease of analyses and retrieval of data and samples.

NASCO 1.3 Review of examples of successes and failures in wild salmon restoration and rehabilitation, and development of a classification of activities which could be recommended under various conditions or threats to the persistence of populations

The Working Group on the Effectiveness of Recovery Actions for Atlantic Salmon (WGERAAS) met on 18–22 February 2013 in Belfast, Northern Ireland, and at ICES HQ, Copenhagen, Denmark, on 12–16 May 2014 and again on 10–12 November 2015 to complete analysis of both the case studies and the Database on Effectiveness of Recovery Actions for Atlantic Salmon (DBERAAS). A range-wide overview of conservation status, programme goals, population stressors, and the benefits of recovery actions were discussed. Detailed case studies were compiled and presented on a number of rivers, providing "on-the-ground" examples of the effects of stressors, benefit of actions, and the results of recovery and rebuilding programmes. A total of 15 case studies were received, together with a total of 568 individual river stocks entered in DBERAAS. Analysis of the case studies as well as the DBERAAS have now been completed and the ICES report is currently being finalized.

An analysis of DBERAAS suggested that climate change effects (mainly expressed as low marine survival), barriers to migration, and habitat destruction were the most common stressors having a high or very high negative impact on Atlantic salmon populations. Improvements in river connectivity, improvements in water quality, and habitat restoration were the three actions most likely to have a high or very high benefit to recovery and restoration actions.

The case study conclusions were consistent with the results from DBERAAS, and further highlighted that successful restoration and recovery actions are generally characterized by being conducted on stocks experiencing relatively high marine survival and with few stressors acting on the stock, thereby reducing synergistic and additive effects. Successful recovery/restoration activities addressed most or all stressors and did not rely solely on stocking. Out of the 15 case studies, five achieved the project goals, nine did not achieve project goals, and two claimed partial achievement of project goals. Restoration programmes that do not achieve the objective of re-establishing a self-sustaining population or increasing population abundance to attain CLs are still valuable as they can reduce short-term extirpation risks.

Recommendations on appropriate recovery/rebuilding actions for Atlantic salmon are provided. As a general guiding principle, healthy and diverse habitat is needed to support healthy and resilient salmon populations. Further recommendations include:

- Pre-project assessments should establish the need for restoration action, identifying stressors and appropriate actions;
- Modelling population responses to actions under different stressor scenarios as part of the pre-project phase can be a very informative exercise to determine possible outcomes of different actions;
- Recovery and restoration programmes should principally be founded on habitat restoration and protection combined with sound management based on population monitoring;
- Stocking poses substantial risks to wild salmon populations and a time-limited stocking programme should generally only be considered in cases where population extirpation is imminent and all other fishery management and habitat restoration interventions have been realised; and
- Provide improved documentation relating to all restoration and recovery projects for Atlantic salmon, and a recommendation that after completion an in-depth evaluation and analysis exercise should be conducted, and results published so others can benefit from lessons learned.

NASCO 1.4 Provision of a compilation of tag releases by country in 2017

Data on releases of tagged, fin-clipped, and other marked salmon in 2017 are compiled as a separate report (ICES, 2018b). In summary (Table 7):

- Approximately 2.8 million salmon were marked in 2017, a decrease from the 3.2 million fish marked in 2016.
- The adipose clip was the most commonly used primary marker (2.19 million), with coded wire microtags (CWT) (0.332 million) being the next most common primary marker.
- A total of 33 873 fish were marked with external tags.
- Most marks were applied to hatchery-origin juveniles (2.70 million), while 76 712 wild juveniles and 10 625 adults were also marked.
- The use of PIT tags, Data Storage Tags (DSTs), and radio and/or sonic transmitting tags (pingers) has increased in recent years. In 2017, 132 725 salmon were tagged with these tag types (Table 5), twice the number in 2016 (64 669 salmon). ICES noted that not all electronic tags were being reported in the tag compilation. Tag users should be encouraged to include these tags or tagging programmes in the tag compilation as this greatly facilitates identification of the origin of tags recovered in fisheries or tag scanning programmes in other jurisdictions. A recommendation has been developed in a previous section (PIT tag screening programmes), relating to the creation of a database to record PIT tags, and programmes using PIT tags, on a European scale.

Since 2003, ICES has reported information on markers being applied to farmed salmon to facilitate tracing the origin of farmed salmon captured in the wild in the case of escape events. In the USA, genetic "marking" 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 salmon escaped.

Table 5 Summary of Atlantic salmon tagged and marked in 2017 – "Hatchery" and "Wild" juvenile refers to smolts and parr.

Country	Origin	Primary tag or mark			Other internal[1]	Total
		Microtag	External mark[2]	Adipose clip		
Canada	Hatchery Adult	0	2 052	0	2 086	**4 138**
	Hatchery Juvenile	0	54	160 161	155	**160 370**
	Wild Adult	0	2 299	0	89	**2 388**
	Wild Juvenile	0	7 979	14 621	498	**23 098**
	Total	**0**	**12 384**	**174 782**	**2 828**	**189 994**
Denmark	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	76 500	20 500	273 950	0	370 950
	Wild Adult	0	0	0	452	452
	Wild Juvenile	0	0	0	500	500
	Total	**76 500**	**20 500**	**273 950**	**952**	**371 902**
France	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile[3]	0	0	0	0	0
	Wild Adult[3]	0	836	0	0	836
	Wild Juvenile	0	3 503	0	0	3 503
	Total	**0**	**4 339**	**0**	**0**	**4 339**
Iceland	Hatchery Adult	0		0	0	0
	Hatchery Juvenile	66 757	0	0	0	66 757
	Wild Adult	0	272	0	0	272
	Wild Juvenile	6 331	0	0	0	6 331
	Total	**73 088**	**272**	**0**	**0**	**73 360**
Ireland	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	149 862	0	0	0	149 862
	Wild Adult	0	0	0	0	0
	Wild Juvenile	9 135	0	0	0	9 135
	Total	**158 997**	**0**	**0**	**0**	**158 997**
Norway	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	11 000	6 000	0	101 711	118 711
	Wild Adult	0	359	0	0	359
	Wild Juvenile	0	388	0	15 969	16 357
	Total	**11 000**	**6 747**	**0**	**117 680**	**135 427**

Country	Origin	Primary tag or mark			Other internal[1]	Total
		Microtag	External mark[2]	Adipose clip		
Russia	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	1 204 587	0	1 204 587
	Wild Adult	0	1 253	0	0	1 253
	Wild Juvenile	0	0	0	0	0
	Total	**0**	**1 253**	**1 204 587**	**0**	**1 205 840**
Spain	Hatchery Adult	0	0	0	0	**0**
	Hatchery Juvenile	0	87 570	0	0	**87 570**
	Wild Adult	0	0	0	0	**0**
	Wild Juvenile	0	0	0	0	**0**
	Total	**0**	**87 570**	**0**	**0**	**87 570**
Sweden	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	3000	167 886	0	170 886
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	500	0	0	500
	Total	**0**	**3 500**	**167 886**	**0**	**171 386**
UK (England & Wales)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	9 852	0	9 852
	Wild Adult	0	692	0	0	692
	Wild Juvenile	2 383	0	10 965		13 348
	Total	**2 383**	**692**	**20 817**	**0**	**23 892**
UK (N. Ireland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	9 936	0	47 735	0	57 671
	Wild Adult	0	0	0	0	0
	Wild Juvenile	0	0	0	0	0
	Total	**9 936**	**0**	**47 735**	**0**	**57 671**
UK (Scotland)	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	45 000	0	45 000
	Wild Adult	0	302	0	0	302
	Wild Juvenile	0	0	0	3 864	3 864
	Total	**0**	**302**	**45 000**	**3 864**	**49 166**
USA	Hatchery Adult	0	0	0	0	0
	Hatchery Juvenile	0	0	258 058	3 323	261 381
	Wild Adult	0	69	0	4 002	4 071
	Wild Juvenile	0	0	0	76	76
	Total	**0**	**69**	**258 058**	**7 401**	**265 528**
All Countries	Hatchery Adult	0	2 052	0	2 086	4 138
	Hatchery Juvenile	314 055	117 124	2 167 229	105 189	2 703 597
	Wild Adult	0	6 082	0	4 543	10 625
	Wild Juvenile	17 849	12 370	25 586	20 907	76 712
	Total	**331 904**	**137 628**	**2 192 815**	**132 725**	**2 795 072**

[1] Includes other internal tags (PIT, ultrasonic, radio, DST, etc.).
[2] Includes Carlin, spaghetti, streamers, VIE, etc.
[3] Includes external dye mark.

NASCO 1.5 Identify relevant data deficiencies, monitoring needs, and research requirements

ICES recommends that the WGNAS should meet in 2019 (Chair: Martha Robertson, Canada) to address questions posed by NASCO and by ICES. Unless otherwise notified, the working group intends to convene at the headquarters of ICES in Copenhagen, Denmark. The meeting will be held from 26 March to 4 April 2019.

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

North Atlantic

1) A workshop should be held on salmon scale archives/biochronology repositories to better align the management systems and goals.
2) For more efficient identification of the origin of PIT-tagged salmon detected in catches processed at pelagic fish factories, or tags detected in other fisheries, ICES recommends that lists of individual PIT tag numbers or codes, identifying the origin, source, or programme of the tags, be recorded and made available in a public

database, to coordinate on an international scale and facilitate identification of individual tagged fish taken in marine fisheries or surveys back to the source.

Northeast Atlantic Commission

No recommendations specific to NEAC are provided.

North American Commission

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

4) 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 in these mixed-stock fisheries.

5) 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.

West Greenland Commission

6) Efforts to improve the reporting system of catch in the Greenland fishery should continue and detailed statistics related to spatially and temporally explicit catch and effort data for both licensed and unlicensed fishers should be made available for analysis.

7) Continuation of the phone survey programme according to a standardized and consistent annual approach, with consideration given to surveying a larger proportion of licensed fishers and the inclusion of the non-licensed fishers. Information gained on the level of total catch for this fishery will provide for a more accurate assessment of the status of stocks and assessment of risk with varying levels of harvest.

8) Continuation of the broad geographic sampling programme, including in Nuuk (multiple NAFO divisions including factory landings when permitted). Furthermore, consideration should be given to expanding the programme across the fishing season to more accurately estimate continent and region of origin and biological characteristics of the mixed-stock fishery.

9) In preparation for the next update to the FWI, a full suite of all potential input datasets across all regions and stock complexes should be evaluated against country-specific management objectives for Southern NEAC.

Table 6 Reported total nominal catches of salmon by country (in tonnes round fresh weight), 1960 to 2017 (2017 figures include provisional data).

	NAC Area			NEAC (N. Area)								NEAC (S. Area)						Faroes & Greenland				Total	Unreported catches	
Year	Canada (1)	USA	St. P&M	Norway (2)	Russia (3)	Iceland Wild	Iceland Ranch (4)	Sweden Wild	Sweden Ranch (15)	Denmark	Finland	Ireland (5,6)	UK (E & W)	UK (N.Irl.) (6,7)	UK (Scotl.)	France (8)	Spain (9)	Faroes (10)	East Grld.	West Grld. (11)	Other (12)	Reported Nominal Catch	NASCO Areas (13)	International waters (14)
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	<0,5	1395	193	8118	-	-
1980	2680	6	-	1830	664	241	8	16	1	-	34	947	360	122	1134	30	47	536	<0,5	1194	277	10127	-	-
1981	2437	6	-	1656	463	147	16	25	1	-	44	685	493	101	1233	20	25	1025	<0,5	1264	313	9954	-	-
1982	1798	6	-	1348	364	130	17	24	1	-	54	993	286	132	1092	20	10	606	<0,5	1077	437	8395	-	-
1983	1424	1	3	1550	507	166	32	27	1	-	58	1656	429	187	1221	16	23	678	<0,5	310	466	8755	-	-
1984	1112	2	3	1623	593	139	20	39	1	-	46	829	345	78	1013	25	18	628	<0,5	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	<0,5	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	180-350

Table 6 (continued).

Year	NAC Area			NEAC (N. Area)								NEAC (S. Area)						Faroes & Greenland				Total	Unreported catches	
	Canada (1)	USA	St. P&M	Norway (2)	Russia (3)	Iceland Wild	Iceland Ranch (4)	Sweden Wild	Sweden Ranch (15)	Denmark	Finland	Ireland (5,6)	UK (E & W)	UK (N.Irl.) (6,7)	UK (Scotl.)	France (8)	Spain (9)	Faroes (10)	East Grld.	West Grld. (11)	Other (12)	Reported Nominal Catch	NASCO Areas (13)	International waters (14)
1991	711	1	1	876	215	129	346	34	4	3	70	404	200	55	462	13	11	95	4	472	-	4106	1682	25-100
1992	522	1	2	867	167	174	462	46	3	10	77	630	171	91	600	20	11	23	5	237	-	4119	1962	25-100
1993	373	1	3	923	139	157	499	44	12	9	70	541	248	83	547	16	8	23	-	-	-	3696	1644	25-100
1994	355	0	3	996	141	136	313	37	7	6	49	804	324	91	649	18	10	6	-	-	-	3945	1276	25-100
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	-
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	1	26	-	1318	343	-
2010	153	0	3	642	88	147	42	9	13	13	49	99	109	12	180	10	2	0	2	38	-	1610	393	-
2011	179	0	4	696	89	98	30	20	19	13	44	87	136	10	159	11	7	0	0	27	-	1629	421	-
2012	126	0	3	696	82	50	20	21	9	12	64	88	58	9	124	10	7	0	1	33	-	1412	403	-
2013	137	0	5	475	78	116	31	11	4	11	46	87	84	4	119	11	5	0	0	47	-	1270	306	-
2014	118	0	4	490	81	51	18	24	6	9	58	57	54	5	84	12	6	0	0	58	-	1134	287	-
2015	140	0	4	583	80	94	31	11	7	9	45	63	68	3	68	16	5	0	1	56	-	1284	325	-
2016	135	0	5	612	56	87	31	6	3	9	51	58	86	4	27	6	5	0	2	26	-	1208	335	-
2017	112	0	3	666	47	73	28	7	12	12	32	72	49	3	26	10	2	0	0	28	-	1182	353	
Average																								
2012-2016	131	0	4	571	75	80	26	15	6	10	53	71	70	5	84	11	6	0	1	44	-	1262	331	-
2007-2016	138	0	4	636	76	99	35	12	9	10	52	78	78	11	121	10	6	0	1	36	-	1413	373	-

Table 6 Footnotes

KEY:	
1. Includes estimates of some local sales, and, prior to 1984, by-catch	9. Weights estimated from mean weight of fish caught in Asturias (80-90% of Spanish catch).
2. Before 1966, sea trout and sea charr included (5% of total).	10. Between 1991 & 1999, there was only a research fishery at Faroes. In 1997 & 1999 no fishery took place; the commercial fishery resumed in 2000, but has not operated since 2001.
3. Figures from 1991 to 2000 do not include catches taken in the recreational (rod) fishery.	11. Includes catches made in the West Greenland area by Norway, Faroes, Sweden and Denmark in 1965–1975.
4 From 1990, catch includes fish ranched for both commercial and angling purposes.	12. Includes catches in Norwegian Sea by vessels from Denmark, Sweden, Germany, Norway and Finland.
5. Improved reporting of rod catches in 1994 and data derived from carcase tagging and log books from 2002.	13. No unreported catch estimate available for Canada in 2007 and 2008. Data for Canada in 2009 and 2010 are incomplete. No unreported catch estimates available for Russia since 2008.
6. Catch on River Foyle allocated 50% Ireland and 50% N. Ireland.	14. Estimates refer to season ending in given year.
7. Angling catch (derived from carcase tagging and log books) first included in 2002.	15. Catches from hatchery-reared smolts released under programmes to mitigate for hydropower development
8. Data for France include some unreported catches.	

Table 7† The catches (tonnes round fresh weight) and % of the nominal catches by country taken in coastal, estuarine, and in-river fisheries, 2000 to 2017. Data for 2017 includes 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	7	100	7
	2015	0	0	0	0	5	100	5
	2016	0	0	0	0	5	100	5
	2017	0	0	0	0	2	100	2
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
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
	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

† Version 2: table values corrected (Canada 2016-2017, Scotland 2017 and totals for 2017) and missing data added (UK (England & Wales) 2017 and Russia 2017).

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	weight
	2017	0	0	18	25	54	75	72
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	76	4	8	9	16	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
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	1	10	37	17	63	27
	2017	0	1	8	29	18	71	26
UK (N. 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	2	100	2
	2015	0	0	0	0	3	100	3
	2016	0	0	0	0	5	100	5
	2017	0	0	0	0	3	100	3

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	weight
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	101	100	101
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
	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
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	18	100	18

Country	Year	Coastal		Estuarine		In-river		Total
		Weight	%	Weight	%	Weight	%	weight
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
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
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

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	7	5	36	27	92	68	135
	2017	9	8	33	30	70	62	112
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
Total NEAC	2017	343	33	31	3	665	64	1039
Total NAC	2017	9	8	33	30	70	62	112

Table 8 Estimates of unreported catches by various methods, in tonnes by country within national EEZs in the North East Atlantic, North American, and West Greenland commissions of NASCO, 2017.

Commission Area	Country	Unreported catch (tonnes)	Unreported as % of total North Atlantic Catch (Unreported + reported)	Unreported as % of total National Catch (Unreported)
NEAC	Denmark	6	0.4	50
NEAC	Finland	6	0.4	19
NEAC	Iceland	2	0.2	2
NEAC	Ireland	7	0.5	10
NEAC	Norway	285	18.6	30
NEAC	Sweden	2	0.1	9
NEAC	UK (England &	6	0.4	12
NEAC	UK (N. Ireland)	0.3	0.02	10
NEAC	UK (Scotland)	3	0.2	11
NAC	USA	0	0.0	0
NAC	Canada	25	1.7	23
WGC	Greenland	10	0.7	36
Total unreported catch *		353	23.0	
Total reported catch of North Atlantic salmon		1181		

* No unreported catch estimate is available for France and Russia in 2017.
Unreported catch estimates are not provided for Spain or St. Pierre et Miquelon.

Table 9 Numbers of fish caught and released in angling fisheries along with the % of the total angling catch (released + retained) for countries in the North Atlantic where records are available, 1991–2017. Figures for 2017 are provisional.

Year	Canada [4]		USA		Iceland		Russia [1]		UK (E&W)		UK (Scotland)		Ireland		UK (N Ireland) [2]		Denmark		Sweden		Norway [3]	
	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total rod catch	Total	% of total 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			14303	12
2012	43287	57	0	-	9752	28	4743	43	11952	65	63628	74	11891	35	5014	59	2153	55			18611	14
2013	50630	59	0	-	23133	34	3732	39	10458	70	54002	80	10682	37	1507	64	1932	57	220	9	15953	15
2014	41613	54	0	-	13616	41	8479	52	7992	78	37355	82	6537	37	1065	50	1918	61	445	15	20281	19
2015	65440	64	0	-	21914	31	7028	50	8113	79	46836	84	9383	37	111	100	2989	70	725	19	25433	19
2016	68925	65	0	-	22751	43	10793	76	9700	80	49469	90	10280	41	280	100	3801	72	345	18	25198	21
2017	49513	66	0	-	21746	41	10110	77	11174	83	44257	90	11259	36	126	100	4435	69	681	15	25924	21
5-yr mean 2012-2016	53979	60			18233	35	6955	52	9643	74	50258	82	9755	37	1595	75	2559	63			21095	18
% change on 5-year mean	-8	10			19	15	45	48	16	12	-12	10	15	-4	-92	34	73	10			23	16

Key:
[1] Since 2009 data are either unavailable or incomplete, however catch-and-release is understood to have remained at similar high levels as before.
[2] Data for 2006-2009, 2014 is for the DCAL area only; the figures from 2010 are a total for UK (N.Ireland). Data for 2015, 2016 and 2017 is for R. Bush only.
[3] The statistics were collected on a voluntary basis, the numbers reported must be viewed as a minimum.
[4] Released fish in the kelt fishery of New Brunswick are not included in the totals for Canada.

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.

ACOM (*Advisory Committee*) of ICES. The Committee works on the basis of scientific assessment prepared in ICES expert groups. The advisory process includes peer review of the assessment before it can be used as the basis for advice. The Advisory Committee has one member from each ICES Member Country under the direction of an independent chair appointed by the Council.

AST *(Atlantic Salmon Trust).* A non-governmental organization dedicated to salmon and sea trout survival through research on the problems impacting migratory salmonids.

CL, i.e. S_{lim} (*conservation limit*). 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.

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.

DBERAAS (*Database on Effectiveness of Recovery Actions for Atlantic Salmon*). Database output from WGERAAS.

DFO *(Department of Fisheries and Oceans*). DFO and its Special Operating Agency, the Canadian Coast Guard, deliver programmes and services that support sustainable use and development of Canada's waterways and aquatic resources.

DNA (*deoxyribonucleic acid*). DNA is a nucleic acid that contains the genetic instructions used in the development and functioning of all known living organisms (with the exception of RNA – Ribonucleic Acid viruses). The main role of DNA molecules is the long-term storage of information. DNA is often compared to a set of blueprints, like a recipe or a code, since it contains the instructions needed to construct other components of cells, such as proteins and RNA molecules.

DST *(data storage tag*). A miniature data logger with sensors including salinity, temperature, and depth that is attached to fish and other marine animals.

eDNA *(environmental DNA).* DNA that is collected from environmental samples such as soil, water, or air, rather than directly sampled from an individual organism. As various organisms interact with the environment, DNA is released and accumulates in their surroundings.

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.

IASRB (*International Atlantic Salmon Research Board*). A platform established by NASCO in 2001 to encourage and facilitate cooperation and collaboration on research related to marine mortality in Atlantic salmon.

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.

IESSNS (*International Ecosystem Survey of the Nordic Seas*). A collaborative programme involving research vessels from Iceland, the Faroe Islands, and Norway.

IHN *(Infectious Haematopoietic Necrosis).* An infectious disease caused by the IHN virus.

IPN *(Infectious Pancreatic Necrosis).* An infectious disease caused by the IPN virus.

ISA *(Infectious Salmon Anaemia).* An infectious disease caused by the ISA virus.

MSA (*mixed-stock analysis*). Genetic analytical technique to estimate the proportions of various origins of fish in a mixed-stock fishery.

MSAT *(microsatellite).* A tract of repetitive DNA in which certain DNA motifs are repeated, typically 5–50 times. Can be used to estimate region of origin of salmon.

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.

NAFO (*Northwest Atlantic Fisheries Organization*). NAFO is an intergovernmental fisheries science and management organization that ensures the long-term conservation and sustainable use of the fishery resources in the Northwest Atlantic.

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 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.

NPAFC (*North Pacific Anadromous Fish Commission*). An international inter-governmental organization established by the Convention for the Conservation of Anadromous Stocks in the North Pacific Ocean. The Convention was signed on February 11, 1992, and took effect on February 16, 1993. The member countries are Canada, Japan, Republic of Korea, Russian Federation, and United States of America. As defined in the Convention, the primary objective of the NPAFC is to promote the conservation of anadromous stocks in the Convention Area. The Convention Area is the international waters of the North Pacific Ocean and its adjacent seas north of 33°North beyond the 200-mile zones (exclusive economic zones) of the coastal States.

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.

ROO *(region of origin)*

RVS (*Red Vent Syndrome*). This condition has been noted since 2005, and has been linked to the presence of a nematode worm, *Anisakis simplex*. This is a common parasite of marine fish and is also found in migratory species. The larval nematode stages in fish are usually found spirally coiled on the mesenteries, internal organs, and less frequently in the somatic muscle of host fish.

SALSEA (*Salmon at Sea*). An international programme of cooperative research, adopted in 2005, designed to improve understanding of the migration and distribution of salmon at sea in relation to feeding opportunities and predation.

SALSEA-Track (*Salmon at Sea Track*). SALSEA-Track is the second phase of the SALSEA programme. It employs advances in telemetry technology to precisely track Atlantic salmon along their migration routes through cooperative international research initiatives.

SER (*spawning 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.

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

S_{MSY} (*spawners for maximum sustainable yield*). The spawner abundance that generates recruitment at a level that provides a maximum exploitable yield (recruitment minus spawners).

SNP (*Single Nucleotide Polymorphism*). Type of genetic marker used in stock identification and population genetic studies.

S–R (*stock–recruitment*).

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

ToR (*terms of reference*).

UDN (*Ulcerative Dermal Necrosis*). Disease mainly affecting wild Atlantic salmon, sea trout, and sometimes other salmonids. It usually occurs in adult fish returning from the sea in the colder months of the year and starts as small lesions on the scale-less regions of the fish, mainly the snout, above the eye, and near the gill cover. On entry to freshwater lesions ulcerate and may become infected with secondary pathogens like the fungus *Saprolegnia* spp. Major outbreaks of UDN occurred in the 1880s (UK) and 1960s–1970s (UK and Ireland), but the disease has also been reported from France, and in 2015 from the Baltic and Russia.

VHS *(Viral Haemorrhagic Septicaemia)*. An infectious fish disease caused by the VHS virus.

WGC (*West Greenland Commission*). The West Greenland Commission of NASCO or the West Greenland Commission area of NASCO.

WGF (*West Greenland Fishery*). Regulatory measures for the WGF have been agreed by the West Greenland Commission of NASCO for most years since NASCO's establishment. These have resulted in greatly reduced allowable catches in the WGF, reflecting declining abundance of the salmon stocks in the area.

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.

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